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

September 22, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
38 Elm Street, Meriden, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas at the top of an existing roof-top lattice tower at 38 Elm Street in Meriden, Connecticut (the "Property"). The tower and underlying property are owned by Ashley Harriman LLC. The Council approved Cellco's shared use of this tower in 1995. Cellco now intends to replace nine (9) of its existing antennas with three (3) model SBNHH-1D65B, 700 MHz antennas; three (3) model SBNHH-1D65B, 1900 MHz antennas; and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace six (6) of its existing remote radio heads ("RRHs"), and install three (3) new RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Manuel A. Santos, Mayor of the City of Meriden. A copy of this letter is also being sent to Ashley Harriman LLC, the Property and tower owner.

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

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

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. Far Field Approximation tables for each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions safety standards established by the FCC.

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

6. The roof-top tower 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:
Manuel A. Santos, Meriden Mayor
Ashley Harriman LLC
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

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

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

General Specifications

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

Product Specifications

SBNHH-1D65B

Mechanical Specifications

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

Dimensions

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

Remote Electrical Tilt (RET) Information

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

Packed Dimensions

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

Regulatory Compliance/Certifications

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

Included Products

Product Specifications

SBNHH-1D65B

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

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

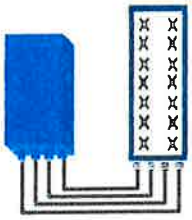
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

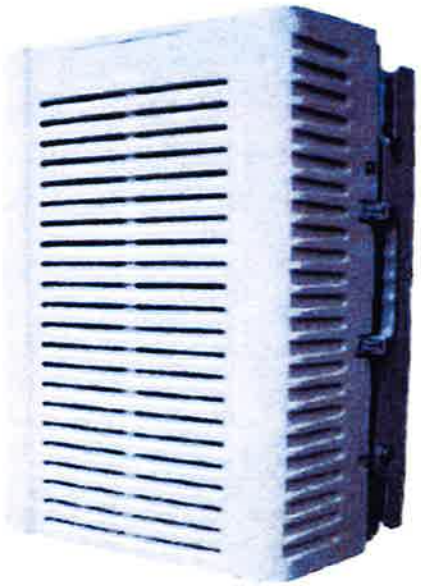
Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W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

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

	RRH2x60
RF Output Power	2x60W
Instantaneous Bandwidth	20MHz
Transmitter	2 TX
Receiver 1900 HW version 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)



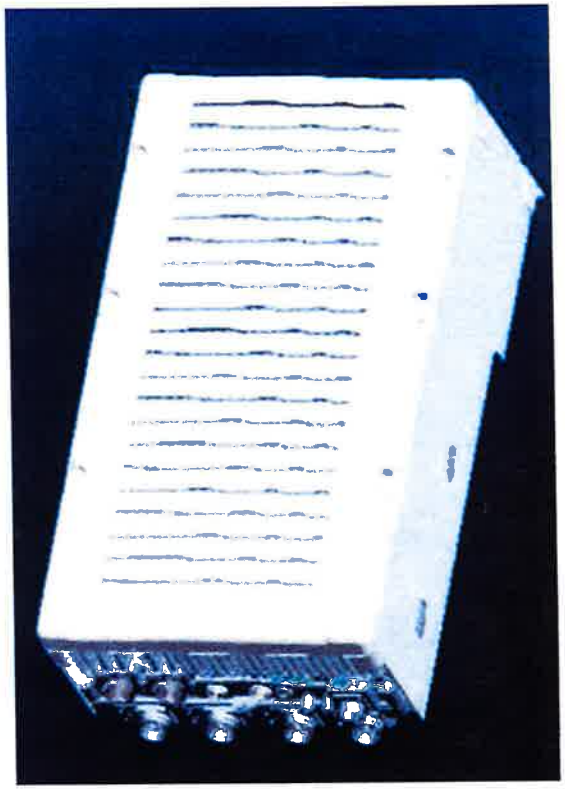
** Not a Verizon Wireless deployed product

Alcatel·Lucent

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

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.

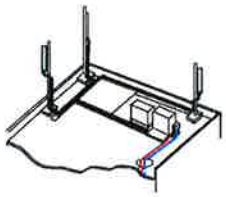
EASY INSTALLATION

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.

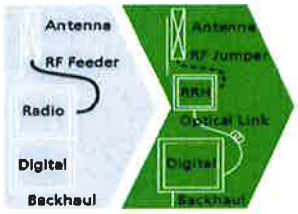
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

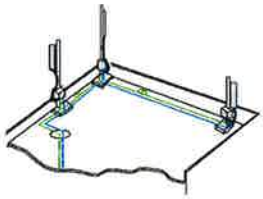
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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.

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)

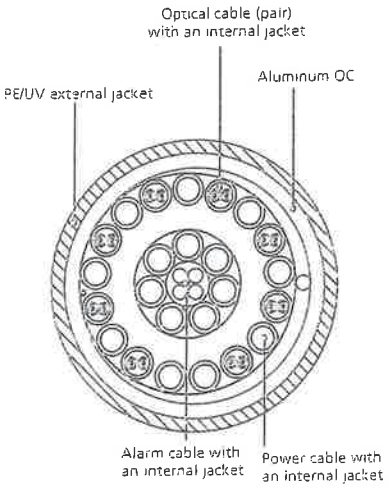


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

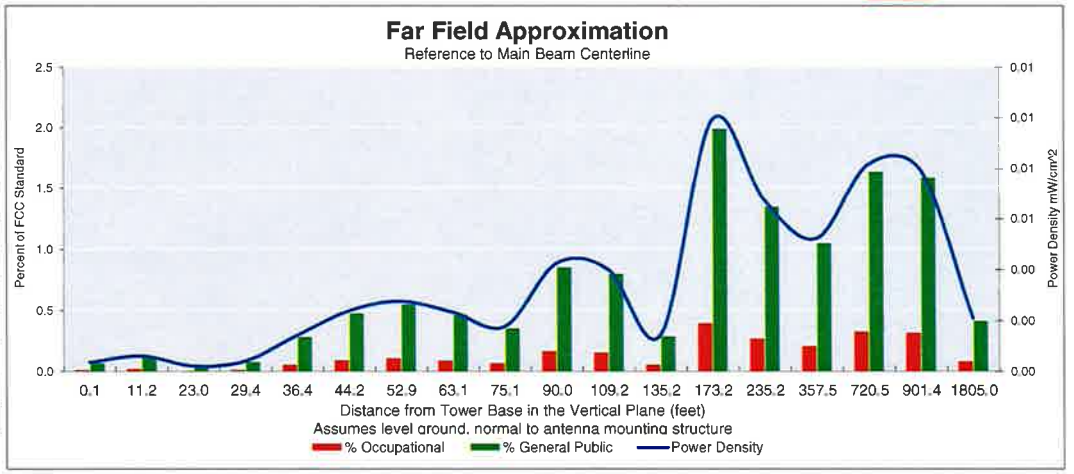
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MERIDEN E CT**
Site #:	2-0151
Date:	09/13/15
Name:	Jaime Laredo
File Name:	MERIDEN E CT - FF POWER (LTE-700).xlsx

Operating Freq. (MHz):	**746.0**
Antenna Height (ft):	**66.0**
Antenna Gain (dBi):	**14.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (W):	**1050.0**
No. 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	63.0	64.0	67.1	69.5	72.8	76.9	82.3	89.1	98.1	109.9	126.1	149.1	184.3	243.5	363.0	723.2	903.6	1806.1
Distance from Antenna Structure Base in Horizontal plane	0.1	11.2	23.0	29.4	36.4	44.2	52.9	63.1	75.1	90.0	109.2	135.2	173.2	235.2	357.5	720.5	901.4	1805.0
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.3	0.3	0.1
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	0.9	0.8	0.3	2.0	1.4	1.1	1.6	1.6	0.4

Antenna Type: **SBNHH-1D65B**

Max%: **1.99%**

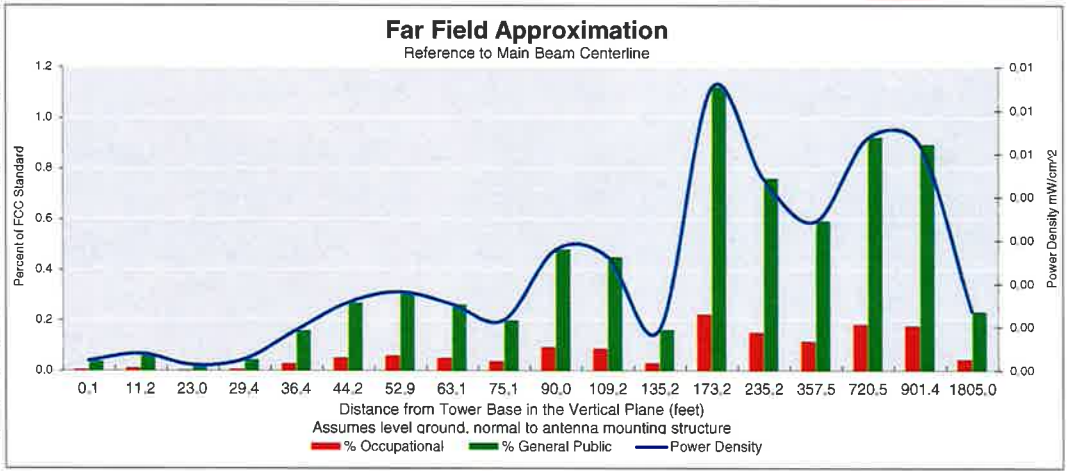
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MERIDEN E CT**
Site #:	2-0151
Date:	09/13/15
Name:	Jaime Laredo
File Name:	MERIDEN E CT - FF POWER (Cellular).xlsx

Operating Freq. (MHz):	**869.0**
Antenna Height (ft):	**66.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**70.9**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (W):	**437.0**
No. 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	63.0	64.0	67.1	69.5	72.8	76.9	82.3	89.1	98.1	109.9	126.1	149.1	184.3	243.5	363.0	723.2	903.6	1806.1
Distance from Antenna Structure Base in Horizontal plane	0.1	11.2	23.0	29.4	36.4	44.2	52.9	63.1	75.1	90.0	109.2	135.2	173.2	235.2	357.5	720.5	901.4	1805.0
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.2	0.1	0.2	0.2	0.0
Percent of General Population 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	1.1	0.8	0.6	0.9	0.9	0.2

Antenna Type: **LPA-80063/6CF**

Max%: **1.13%**

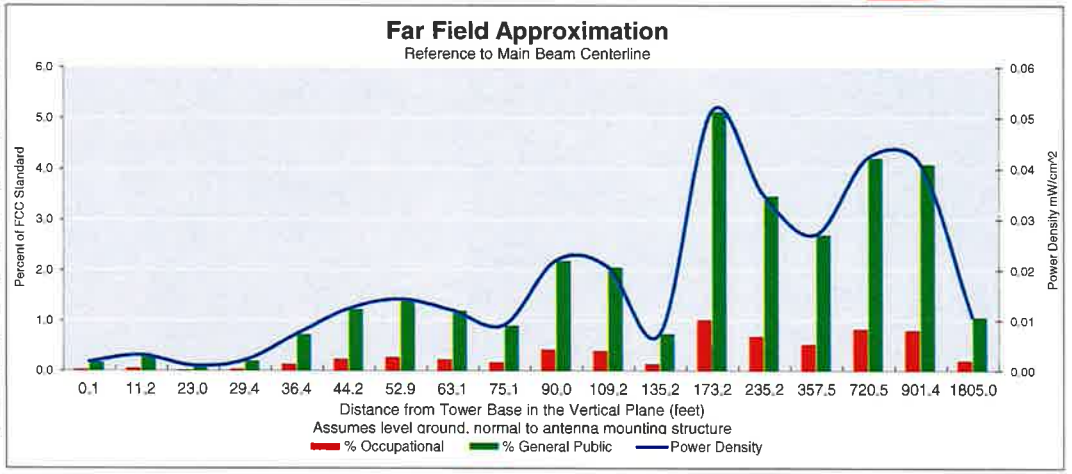
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MERIDEN E CT**
Site #:	2-0151
Date:	09/13/15
Name:	Jaime Laredo
File Name:	MERIDEN E CT - FF POWER (PCS).xlsx

Operating Freq. (MHz):	**1970.0**
Antenna Height (ft):	**66.0**
Antenna Gain (dBi):	**18.4**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (W):	**2333.2**
No. 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	63.0	64.0	67.1	69.5	72.8	76.9	82.3	89.1	98.1	109.9	126.1	149.1	184.3	243.5	363.0	723.2	903.6	1806.1
Distance from Antenna Structure Base in Horizontal plane	0.1	11.2	23.0	29.4	36.4	44.2	52.9	63.1	75.1	90.0	109.2	135.2	173.2	235.2	357.5	720.5	901.4	1805.0
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	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.05	0.03	0.03	0.04	0.04	0.01
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.2	0.2	0.4	0.4	0.1	1.0	0.7	0.5	0.8	0.8	0.2
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.7	1.2	1.4	1.2	0.9	2.2	2.1	0.7	5.1	3.5	2.7	4.2	4.1	1.1

Antenna Type: **SBNHH-1D65B**

Max%: **5.14%**

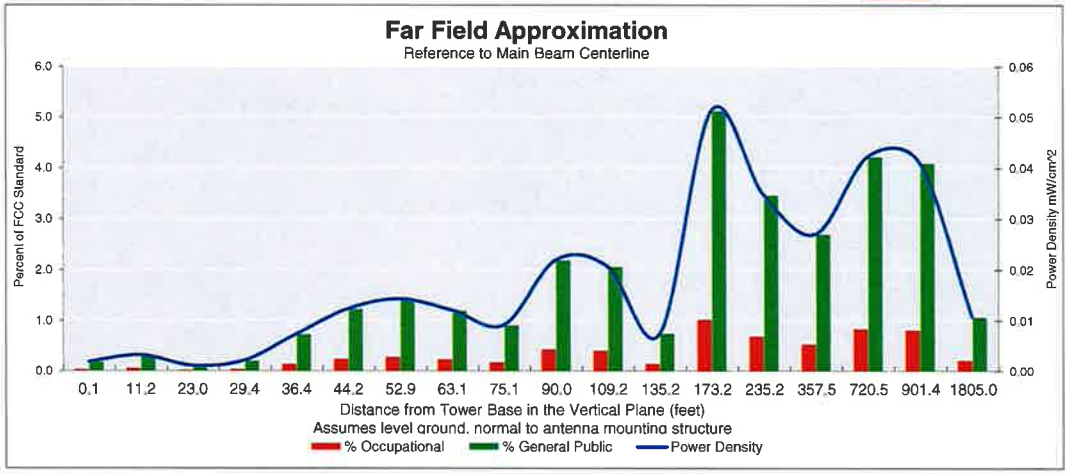
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MERIDEN E CT**
Site #:	2-0151
Date:	09/13/15
Name:	Jaime Laredo
File Name:	MERIDEN E CT - FF POWER (LTE-AWS).xlsx

Operating Freq. (MHz):	**2145.0**
Antenna Height (ft):	**66.0**
Antenna Gain (dBi):	**18.4**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (W):	**2333.2**
No. 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	63.0	64.0	67.1	69.5	72.8	76.9	82.3	89.1	98.1	109.9	126.1	149.1	184.3	243.5	363.0	723.2	903.6	1806.1
Distance from Antenna Structure Base in Horizontal plane	0.1	11.2	23.0	29.4	36.4	44.2	52.9	63.1	75.1	90.0	109.2	135.2	173.2	235.2	357.5	720.5	901.4	1805.0
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	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.05	0.03	0.03	0.04	0.04	0.01
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.2	0.2	0.4	0.4	0.1	1.0	0.7	0.5	0.8	0.8	0.2
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.7	1.2	1.4	1.2	0.9	2.2	2.1	0.7	5.1	3.5	2.7	4.2	4.1	1.1

Antenna Type: **SBNHH-1D65B**

Max%: **5.14%**

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

45-ft Existing ROHN Lattice Tower

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Meriden East

38 Elm Street
Meriden, CT

Centek Project No. 15001.086

Date: July 30, 2015

Prepared for:

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

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 roof mounted lattice tower located in Meriden, Connecticut.

The host tower is a 69-ft AGL (45-ft tower mounted on a steel dunage frame ±24' above grade), three legged, tapered lattice tower originally designed and manufactured by ROHN eng. file no. 31065JC, dated November 1994. The tower geometry and structure member sizes were obtained from the aforementioned ROHN design documents.

Antenna and appurtenance information were obtained from a previous structural report prepared by Centek Engineering job no. 13075.003 dated April 19, 2013 and a Verizon RF data sheet.

The tower is made of three (3) tapered vertical sections consisting of pipe legs conforming to ASTM A572 Gr. 50 and diagonal lateral support bracing consisting of structural steel angle shapes conforming to ASTM A36. The vertical tower sections are connected by bolted flange plates with the diagonal and horizontal bracing to pipe legs consisting of bolted connections. The width of the tower face is 6.52-ft at the top and 8.56-ft at the bottom.

Verizon Wireless proposes the replacement of nine (9) existing panel antennas and six (6) existing remote radio heads with nine (9) proposed panel antennas and nine (9) remote radio heads mounted on the existing boom gates. 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 and proposed loads considered in the analysis consist of the following:

- TOWN (Reserved):
  Antennas: One (1) 8-ft parabolic dish mounted on one (1) 6-ft pipe with a RAD center elevation of ±55-ft above finished grade (±31-ft above tower base).
  Coax Cables: One (1) WE65 coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- VERIZON (Existing to Remain):
  Antennas: Four (4) Antel LPA-80080/6CF panel antennas, two (2) Antel LPA-80063/6CF panel antennas and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on three (3) 15' Boom Gates with a RAD center elevation of ±66-ft above finished grade (±42-ft above tower base).
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber line running on a leg/face of the existing tower as specified in Section 3 of this report.
- VERIZON (Existing to Remove):
  Antennas: Three (3) Antel BXA-70063-6CF, three (3) Antel BXA-171063-8CF panel antennas, three (3) Antel BXA-171085-8CF panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads mounted on three (3) 15' Boom Gates with a RAD center elevation of ±66-ft above finished grade (±42-ft above tower base).

- **VERIZON (Proposed):**
  Antennas: Nine (9) Andrew SBNHH-1D65B panel antennas, three (3) Alcatel-Lucent RRH2x60-LTE remote radio heads, three (3) Alcatel-Lucent RRH2x60-AWS remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z distribution box mounted on three (3) 15' Boom Gates with a RAD center elevation of ±66-ft above finished grade (±42-ft above tower base).
  Coax Cables: One (1) 1-5/8" ∅ fiber cables 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.
- 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 coax cables should be routed as specified in section 3 of 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 of 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:	New Haven; v = 85 mph (fastest mile) Meriden; v = 100 mph (3 second gust) equivalent to v = 80 mph (fastest mile) *TIA/EIA-222-F wind speed controls.*	*[Section 16 of TIA/EIA-222-F-96]* *[Appendix K of the 2005 CT Building Code Supplement]*
Load Cases:	Load Case 1; 85 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; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 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 1, per tnxTower "Section Capacity Table", this tower was found to be at **93.4%** of its total capacity.

Tower Section	Elevation (AGL)	Stress Ratio (percentage of capacity)	Result
Leg (T3)	24'-0"-44'-0"	81.1%	**PASS**
Diagonal (T2)	44'-0"-64'-0"	93.4%	**PASS**

Steel Dunnage Frame and Anchors

The existing steel dunnage frame consists of W beams and bracing bearing on four (4) HSS14x14 steel columns.

Tower legs are connected to the steel dunnage frame by means of (4) 5/8" ∅, ASTM A325 anchor bolts per leg via a 5"x5"x3/4" base plate.

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

Reactions	Vector	Proposed Base Reactions
Base	Shear	**12.1 kips**
	Compression	**5.7 kips**
	Moment	**401 kip-ft**
Leg	Shear	**7.1 kips**
	Uplift	**51.0 kips**
	Compression	**55.9 kips**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	67.4%	**PASS**

Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

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.

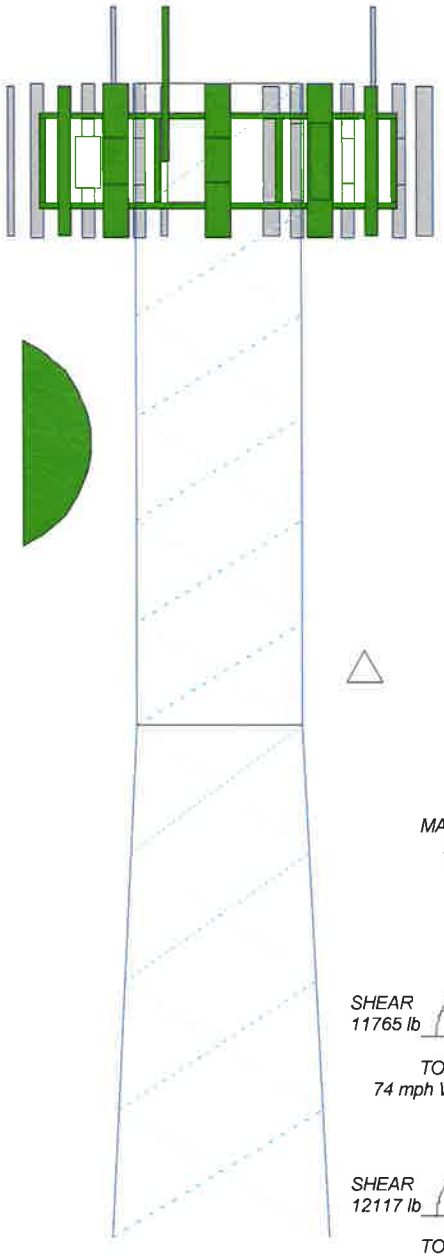
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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.

Section								
T1	ROHN 2 EH				L1 1/2x1 1/2x3/16	6.521	1 @ 5	184.9
T2	ROHN 2 X-STR	A572-50	L1 1/2x1 1/2x3/16	A36	N.A.		5 @ 4	691.7
T3	ROHN 2.5 EH		L1 3/4x1 3/4x3/16		L1 1/2x1 1/2x3/16	6.563	4 @ 5	935.5
Leg Grade								
Diagonals								
Diagonal Grade								
Top Girts								
Face Width (ft)	8.563							
# Panels @ (ft)								
Weight (lb)	1822.1							



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
6'x3" Pipe Mount (Empty)	69	SBNHH-1D65B (Verizon - Proposed)	66
6'x3" Pipe Mount (Empty)	69	LPA-80080-6CF (Verizon - Existing)	66
6'x3" Pipe Mount (Empty)	69	RRH2x60-AWS (Verizon - Proposed)	66
LPA-80080-6CF (Verizon - Existing)	66	RRH2x60-AWS (Verizon - Proposed)	66
SBNHH-1D65B (Verizon - Proposed)	66	RRH2x60-AWS (Verizon - Proposed)	66
SBNHH-1D65B (Verizon - Proposed)	66	RRH2x60-PCS (Verizon - Proposed)	66
SBNHH-1D65B (Verizon - Proposed)	66	RRH2x60-PCS (Verizon - Proposed)	66
LPA-80080-6CF (Verizon - Existing)	66	RRH2x60-PCS (Verizon - Proposed)	66
LPA-80063-6CF (Verizon - Existing)	66	RRH2x60-07-U (Verizon - Proposed)	66
SBNHH-1D65B (Verizon - Proposed)	66	RRH2x60-07-U (Verizon - Proposed)	66
SBNHH-1D65B (Verizon - Proposed)	66	RRH2x60-07-U (Verizon - Proposed)	66
SBNHH-1D65B (Verizon - Proposed)	66	DB-T1-6Z-8AB-0Z (Verizon - Existing)	66
LPA-80063-6CF (Verizon - Existing)	66	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	66
LPA-80080-6CF (Verizon - Existing)	66	Rohn 6'x15' Boom Gate (3) (Verizon - Existing)	66
SBNHH-1D65B (Verizon - Proposed)	66	8 FT DISH (Town Reserved)	55
SBNHH-1D65B (Verizon - Proposed)	66		

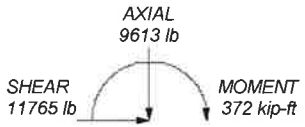
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

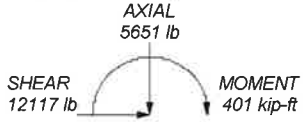
TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 93.4%

MAX. CORNER REACTIONS AT BASE:
DOWN: 55907 lb
UPLIFT: -50976 lb
SHEAR: 7125 lb



TORQUE 13 kip-ft
74 mph WIND - 0.5000 in ICE

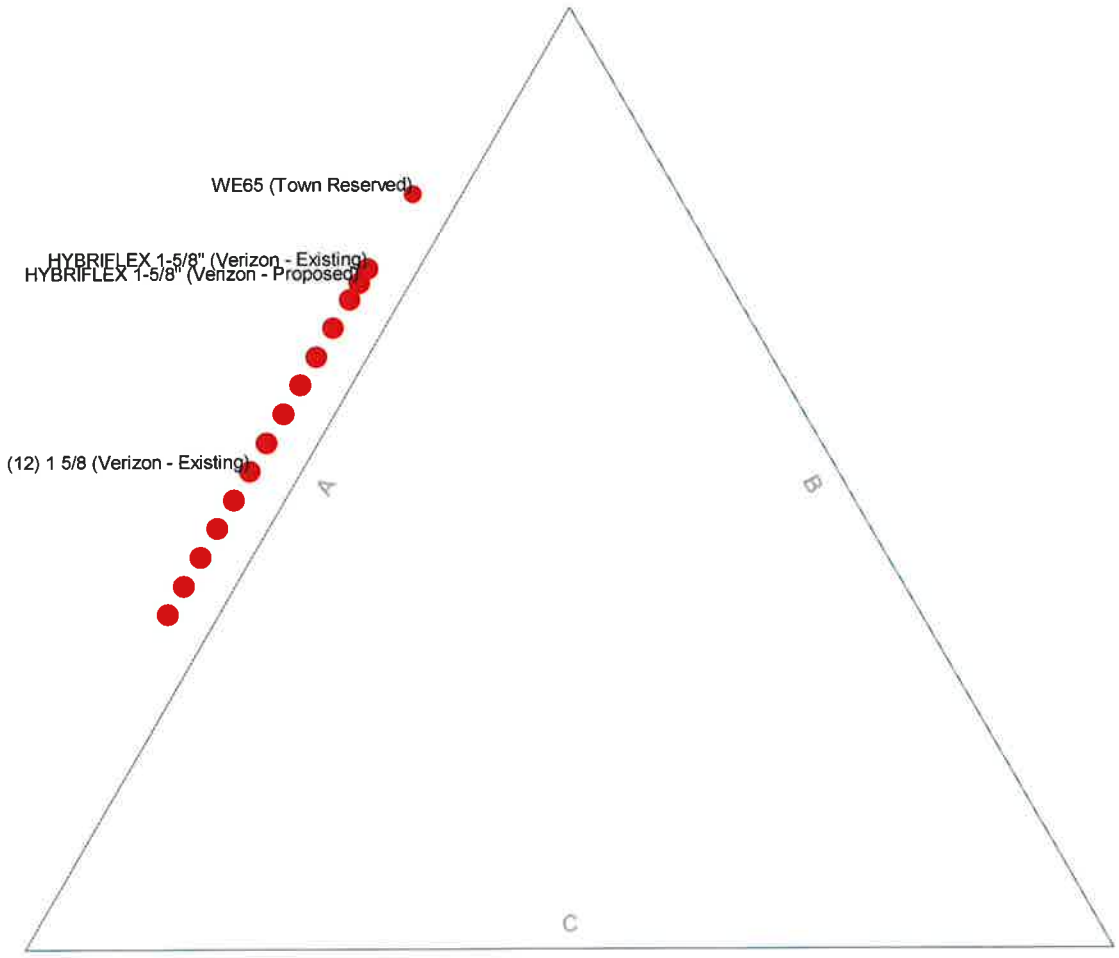


TORQUE 15 kip-ft
REACTIONS - 85 mph WIND

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

Job:	***15001.086 - Meriden East***		
Project:	***45ft ROHN Lattice Tower - 38 Elm St., Meriden,***		
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 07/30/15	Scale: NTS	
Path:		Dwg No. E-1	

Round Flat App In Face App Out Face

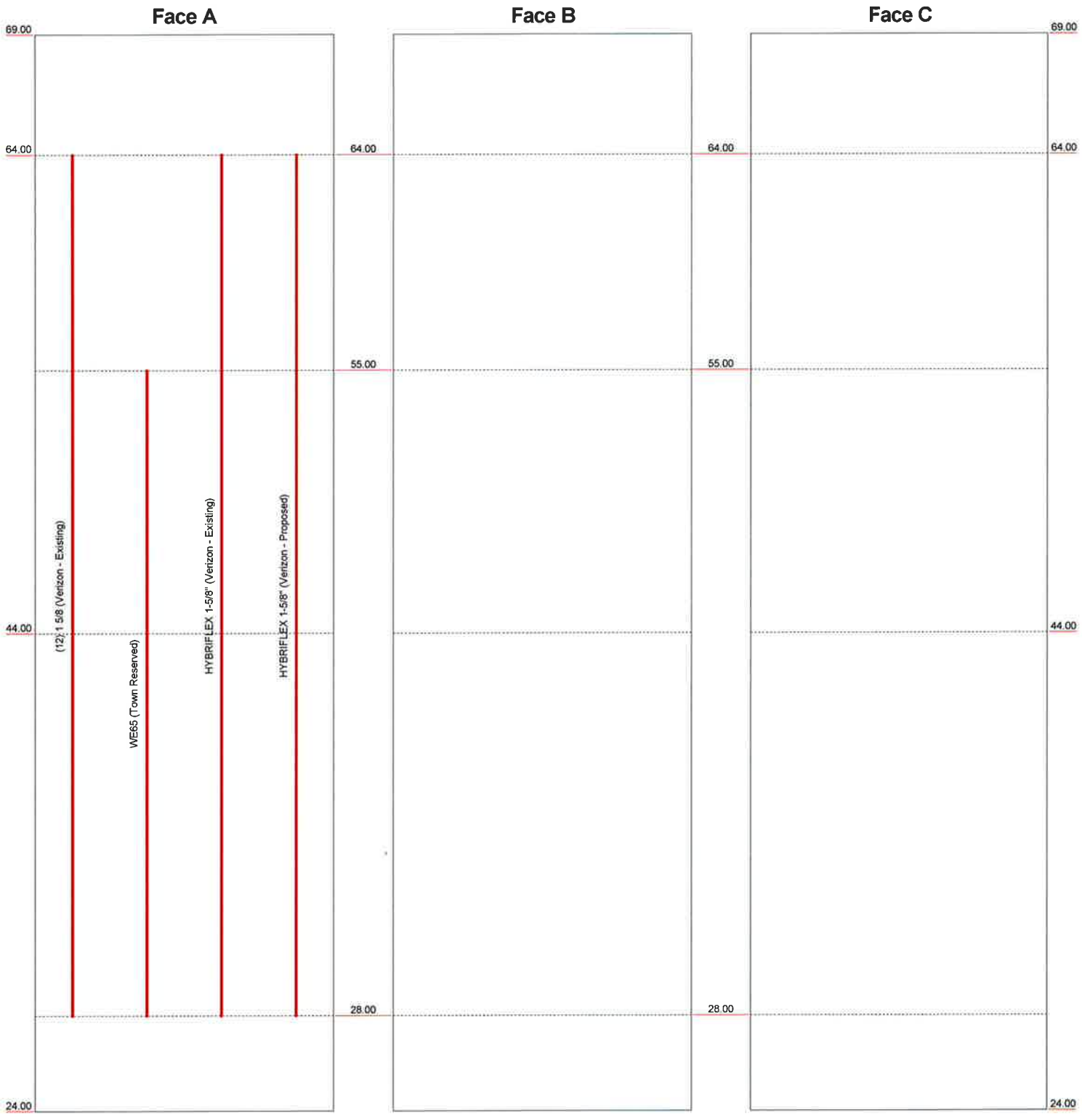


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 15001.086 - Meriden East			
Project: 45ft ROHN Lattice Tower - 38 Elm St., Meriden,			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 07/30/15	Scale: NTS	
Path:		Dwg No. E-7	

24' - 69'

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



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

Job:	***15001.086 - Meriden East***		
Project:	***45ft ROHN Lattice Tower - 38 Elm St., Meriden,***		
Client: Verizon Wireless		Drawn by: TJL	App'd:
Code: TIA/EIA-222-F		Date: 07/30/15	Scale: NTS
Path:			Dwg No. E-7

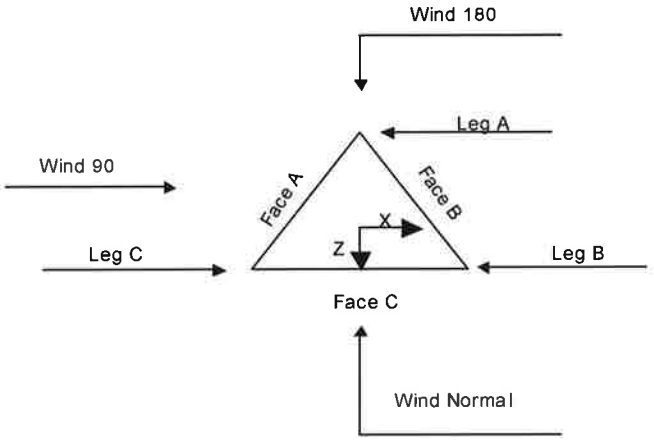
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 69.00 ft above the ground line.
The base of the tower is set at an elevation of 24.00 ft above the ground line.
The face width of the tower is 6.52 ft at the top and 8.56 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 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	69.00-64.00			6.52	1	5.00
T2	64.00-44.00			6.52	1	20.00
T3	44.00-24.00			6.56	1	20.00

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	69.00-64.00	5.00	X Brace	No	No	0.0000	0.0000
T2	64.00-44.00	4.00	X Brace	No	No	0.0000	0.0000
T3	44.00-24.00	5.00	X Brace	No	No	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 69.00-64.00	Pipe	ROHN 2 EH	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)
T2 64.00-44.00	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)
T3 44.00-24.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	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 69.00-64.00	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T3 44.00-24.00	Single Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 69.00-64.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 64.00-44.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 44.00-24.00	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
69.00-64.00				1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1
64.00-44.00				1	1	1	1	1	1	1
T3	Yes	No	1	1	1	1	1	1	1	1
44.00-24.00				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 69.00-64.00	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
T2 64.00-44.00	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
T3 44.00-24.00	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 in	Horiz. Top in	Vert. Bot. in	Horiz. Bot. in	Vert. Top in	Horiz. Top in	Vert. Bot. in	Horiz. Bot. in
ft								
T1 69.00-64.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T2 64.00-44.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T3 44.00-24.00	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 69.00-64.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 64.00-44.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 44.00-24.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	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)	A	Yes	Ar (CfAe)	64.00 - 28.00	3.0000	0	12	12	1.0000 1.9800	1.9800		1.04

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
WE65 (Town Reserved)	A	Yes	Ar (CfAe)	55.00 - 28.00	3.0000	0.28	1	1	1.5836	1.5836		0.53
HYBRIFLEX 1-5/8" (Verizon - Existing)	A	Yes	Ar (CfAe)	64.00 - 28.00	3.0000	0.2	1	1	1.9800	1.9800		1.90
HYBRIFLEX 1-5/8" (Verizon - Proposed)	A	Yes	Ar (CfAe)	64.00 - 28.00	3.0000	0.185	1	1	1.9800	1.9800		1.90

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 lb
T1	69.00-64.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	64.00-44.00	A	47.652	0.000	0.000	0.000	331.43
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T3	44.00-24.00	A	39.071	0.000	0.000	0.000	268.96
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

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 lb
T1	69.00-64.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	64.00-44.00	A	0.500	17.268	54.633	0.000	0.000	932.66
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	44.00-24.00	A	0.500	15.365	43.707	0.000	0.000	759.11
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	69.00-64.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000

Section	Elevation	Face	A_R	A_R Ice	A_F	A_F Ice
	ft		ft^2	ft^2	ft^2	ft^2
T2	64.00-44.00	A	0.000	3.512	3.491	5.267
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	44.00-24.00	A	0.000	2.612	2.982	4.509
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	69.00-64.00	0.0000	0.0000	0.0000	0.0000
T2	64.00-44.00	-10.0762	-7.2996	-8.8157	-6.5319
T3	44.00-24.00	-8.7710	-6.6164	-7.9234	-6.1465

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft ft ft	°	ft		ft^2	ft^2	lb
6'x3" Pipe Mount (Empty)	A	From Face	4.00 2.00 0.00	0.0000	69.00	No Ice 1/2" Ice	1.77 2.13	1.77 2.13	34.74 47.98
6'x3" Pipe Mount (Empty)	B	From Face	4.00 2.00 0.00	0.0000	69.00	No Ice 1/2" Ice	1.77 2.13	1.77 2.13	34.74 47.98
6'x3" Pipe Mount (Empty)	C	From Face	4.00 2.00 0.00	0.0000	69.00	No Ice 1/2" Ice	1.77 2.13	1.77 2.13	34.74 47.98
LPA-80080-6CF (Verizon - Existing)	A	From Face	4.00 -6.00 0.00	0.0000	66.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
SBNHH-1D65B (Verizon - Proposed)	A	From Face	4.00 -4.00 0.00	0.0000	66.00	No Ice 1/2" Ice	8.33 8.88	5.34 5.79	42.00 92.05
SBNHH-1D65B (Verizon - Proposed)	A	From Face	4.00 0.00 0.00	0.0000	66.00	No Ice 1/2" Ice	8.33 8.88	5.34 5.79	42.00 92.05
SBNHH-1D65B (Verizon - Proposed)	A	From Face	4.00 4.00 0.00	0.0000	66.00	No Ice 1/2" Ice	8.33 8.88	5.34 5.79	42.00 92.05
LPA-80080-6CF (Verizon - Existing)	A	From Face	4.00 6.00 0.00	0.0000	66.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-80063-6CF (Verizon - Existing)	B	From Face	4.00 -6.00 0.00	0.0000	66.00	No Ice 1/2" Ice	10.31 10.87	9.01 9.55	27.00 100.95

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 lb
SBNHH-1D65B	B	From Face	4.00	0.0000	66.00	No Ice	8.33	5.34	42.00
(Verizon - Proposed)			-4.00			1/2" Ice	8.88	5.79	92.05
			0.00						
SBNHH-1D65B	B	From Face	4.00	0.0000	66.00	No Ice	8.33	5.34	42.00
(Verizon - Proposed)			0.00			1/2" Ice	8.88	5.79	92.05
			0.00						
SBNHH-1D65B	B	From Face	4.00	0.0000	66.00	No Ice	8.33	5.34	42.00
(Verizon - Proposed)			4.00			1/2" Ice	8.88	5.79	92.05
			0.00						
LPA-80063-6CF	B	From Face	4.00	0.0000	66.00	No Ice	10.31	9.01	27.00
(Verizon - Existing)			6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
LPA-80080-6CF	C	From Face	4.00	0.0000	66.00	No Ice	4.33	9.09	21.00
(Verizon - Existing)			-6.00			1/2" Ice	4.76	9.64	69.24
			0.00						
SBNHH-1D65B	C	From Face	4.00	0.0000	66.00	No Ice	8.33	5.34	42.00
(Verizon - Proposed)			-4.00			1/2" Ice	8.88	5.79	92.05
			0.00						
SBNHH-1D65B	C	From Face	4.00	0.0000	66.00	No Ice	8.33	5.34	42.00
(Verizon - Proposed)			0.00			1/2" Ice	8.88	5.79	92.05
			0.00						
SBNHH-1D65B	C	From Face	4.00	0.0000	66.00	No Ice	8.33	5.34	42.00
(Verizon - Proposed)			4.00			1/2" Ice	8.88	5.79	92.05
			0.00						
LPA-80080-6CF	C	From Face	4.00	0.0000	66.00	No Ice	4.33	9.09	21.00
(Verizon - Existing)			6.00			1/2" Ice	4.76	9.64	69.24
			0.00						
RRH2x60-AWS	A	From Face	4.00	0.0000	66.00	No Ice	3.78	2.07	55.00
(Verizon - Proposed)			-4.00			1/2" Ice	4.09	2.35	78.25
			0.00						
RRH2x60-AWS	B	From Face	4.00	0.0000	66.00	No Ice	3.78	2.07	55.00
(Verizon - Proposed)			-4.00			1/2" Ice	4.09	2.35	78.25
			0.00						
RRH2x60-AWS	C	From Face	4.00	0.0000	66.00	No Ice	3.78	2.07	55.00
(Verizon - Proposed)			-4.00			1/2" Ice	4.09	2.35	78.25
			0.00						
RRH2x60-PCS	A	From Face	4.00	0.0000	66.00	No Ice	2.51	1.55	55.00
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	72.75
			0.00						
RRH2x60-PCS	B	From Face	4.00	0.0000	66.00	No Ice	2.51	1.55	55.00
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	72.75
			0.00						
RRH2x60-PCS	C	From Face	4.00	0.0000	66.00	No Ice	2.51	1.55	55.00
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	72.75
			0.00						
RRH2x60-07-U	A	From Face	4.00	0.0000	66.00	No Ice	2.45	1.63	50.00
(Verizon - Proposed)			0.00			1/2" Ice	2.67	1.83	68.08
			0.00						
RRH2x60-07-U	B	From Face	4.00	0.0000	66.00	No Ice	2.45	1.63	50.00
(Verizon - Proposed)			0.00			1/2" Ice	2.67	1.83	68.08
			0.00						
RRH2x60-07-U	C	From Face	4.00	0.0000	66.00	No Ice	2.45	1.63	50.00
(Verizon - Proposed)			0.00			1/2" Ice	2.67	1.83	68.08
			0.00						
DB-T1-6Z-8AB-0Z	A	From Face	4.00	0.0000	66.00	No Ice	5.60	2.33	44.00
(Verizon - Existing)			0.00			1/2" Ice	5.92	2.56	80.13
			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 lb
DB-T1-6Z-8AB-0Z (Verizon - Proposed)	A	From Face	4.00 0.00 0.00	0.0000	66.00	No Ice 1/2" Ice	5.60 5.92	2.33 2.56	44.00 80.13
Rohn 6'x15' Boom Gate (3) (Verizon - Existing)	A	None		0.0000	66.00	No Ice 1/2" Ice	53.20 63.30	53.20 63.30	1790.00 2230.00

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight lb
8 FT DISH (Town Reserved)	C	Paraboloid w/o Radome	From Leg	2.00 0.00 0.00	Worst		55.00	8.00	No Ice 1/2" Ice	50.30 51.29	251.00 514.30

Tower Pressures - No Ice

$G_H = 1.224$

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 69.00-64.00	66.50	1.222	23	33.597	A	2.747	1.983	1.983	41.93	0.000	0.000
					B	2.747	1.983		41.93	0.000	0.000
					C	2.747	1.983		41.93	0.000	0.000
T2 64.00-44.00	54.00	1.151	21	134.798	A	5.567	55.568	7.917	12.95	0.000	0.000
					B	9.058	7.917		46.64	0.000	0.000
					C	9.058	7.917		46.64	0.000	0.000
T3 44.00-24.00	34.00	1.009	19	156.058	A	7.918	48.671	9.599	16.96	0.000	0.000
					B	10.900	9.599		46.83	0.000	0.000
					C	10.900	9.599		46.83	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.224$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	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 69.00-64.00	66.50	1.222	17	0.5000	34.013	A	2.747	4.648	2.817	38.09	0.000	0.000

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
						B	2.747	4.648		38.09	0.000	0.000
						C	2.747	4.648		38.09	0.000	0.000
T2 64.00-44.00	54.00	1.151	16	0.5000	136.465	A	58.424	31.045	11.250	12.57	0.000	0.000
						B	9.058	17.288		42.70	0.000	0.000
						C	9.058	17.288		42.70	0.000	0.000
T3 44.00-24.00	34.00	1.009	14	0.5000	157.726	A	50.098	31.996	12.938	15.76	0.000	0.000
						B	10.900	19.243		42.92	0.000	0.000
						C	10.900	19.243		42.92	0.000	0.000

Tower Pressure - Service

$G_H = 1.224$

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 69.00-64.00	66.50	1.222	8	33.597	A	2.747	1.983	1.983	41.93	0.000	0.000
					B	2.747	1.983		41.93	0.000	0.000
					C	2.747	1.983		41.93	0.000	0.000
T2 64.00-44.00	54.00	1.151	7	134.798	A	5.567	55.568	7.917	12.95	0.000	0.000
					B	9.058	7.917		46.64	0.000	0.000
					C	9.058	7.917		46.64	0.000	0.000
T3 44.00-24.00	34.00	1.009	6	156.058	A	7.918	48.671	9.599	16.96	0.000	0.000
					B	10.900	9.599		46.83	0.000	0.000
					C	10.900	9.599		46.83	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	1	1	3.897	302.43	60.49	C
69.00-64.00			B	0.141	2.806	0.58	1	1	3.897			
			C	0.141	2.806	0.58	1	1	3.897			
T2	331.43	691.69	A	0.454	1.968	0.675	1	1	43.070	2208.57	110.43	A
64.00-44.00			B	0.126	2.862	0.578	1	1	13.634			
			C	0.126	2.862	0.578	1	1	13.634			
T3	268.96	935.50	A	0.363	2.143	0.637	1	1	38.924	1904.38	95.22	A
44.00-24.00			B	0.131	2.841	0.579	1	1	16.456			
			C	0.131	2.841	0.579	1	1	16.456			
Sum Weight:	600.39	1822.13						OTM	98.15 kip-ft	4415.38		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	0.825	1	3.417	265.13	53.03	C
69.00-64.00			B	0.141	2.806	0.58	0.825	1	3.417			
			C	0.141	2.806	0.58	0.825	1	3.417			
T2	331.43	691.69	A	0.454	1.968	0.675	0.825	1	42.096	2158.61	107.93	A
64.00-44.00			B	0.126	2.862	0.578	0.825	1	12.049			
			C	0.126	2.862	0.578	0.825	1	12.049			
T3	268.96	935.50	A	0.363	2.143	0.637	0.825	1	37.538	1836.59	91.83	A
44.00-24.00			B	0.131	2.841	0.579	0.825	1	14.549			
			C	0.131	2.841	0.579	0.825	1	14.549			
Sum Weight:	600.39	1822.13						OTM	94.39 kip-ft	4260.33		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	0.8	1	3.348	259.80	51.96	C
69.00-64.00			B	0.141	2.806	0.58	0.8	1	3.348			
			C	0.141	2.806	0.58	0.8	1	3.348			
T2	331.43	691.69	A	0.454	1.968	0.675	0.8	1	41.957	2151.48	107.57	A
64.00-44.00			B	0.126	2.862	0.578	0.8	1	11.823			
			C	0.126	2.862	0.578	0.8	1	11.823			
T3	268.96	935.50	A	0.363	2.143	0.637	0.8	1	37.340	1826.91	91.35	A
44.00-24.00			B	0.131	2.841	0.579	0.8	1	14.276			
			C	0.131	2.841	0.579	0.8	1	14.276			
Sum Weight:	600.39	1822.13						OTM	93.85 kip-ft	4238.18		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	0.85	1	3.485	270.46	54.09	C
69.00-64.00			B	0.141	2.806	0.58	0.85	1	3.485			
			C	0.141	2.806	0.58	0.85	1	3.485			
T2	331.43	691.69	A	0.454	1.968	0.675	0.85	1	42.235	2165.75	108.29	A
64.00-44.00			B	0.126	2.862	0.578	0.85	1	12.275			
			C	0.126	2.862	0.578	0.85	1	12.275			
T3	268.96	935.50	A	0.363	2.143	0.637	0.85	1	37.736	1846.28	92.31	A
44.00-24.00			B	0.131	2.841	0.579	0.85	1	14.821			
			C	0.131	2.841	0.579	0.85	1	14.821			
Sum Weight:	600.39	1822.13						OTM	94.93 kip-ft	4282.48		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	324.34	A	0.217	2.539	0.594	1	1	5.508	290.08	58.02	C
69.00-64.00			B	0.217	2.539	0.594	1	1	5.508			
			C	0.217	2.539	0.594	1	1	5.508			
T2	932.66	1133.67	A	0.656	1.78	0.789	1	1	82.925	2884.97	144.25	A
64.00-44.00			B	0.193	2.619	0.589	1	1	19.241			
			C	0.193	2.619	0.589	1	1	19.241			
T3	759.11	1452.18	A	0.52	1.875	0.708	1	1	72.755	2335.85	116.79	A
44.00-24.00			B	0.191	2.626	0.589	1	1	22.227			
			C	0.191	2.626	0.589	1	1	22.227			
Sum Weight:	1691.77	2910.19						OTM	122.24 kip-ft	5510.91		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	324.34	A	0.217	2.539	0.594	0.825	1	5.028	264.77	52.95	C
69.00-64.00			B	0.217	2.539	0.594	0.825	1	5.028			
			C	0.217	2.539	0.594	0.825	1	5.028			
T2	932.66	1133.67	A	0.656	1.78	0.789	0.825	1	72.701	2529.27	126.46	A
64.00-44.00			B	0.193	2.619	0.589	0.825	1	17.656			
			C	0.193	2.619	0.589	0.825	1	17.656			
T3	759.11	1452.18	A	0.52	1.875	0.708	0.825	1	63.988	2054.38	102.72	A
44.00-24.00			B	0.191	2.626	0.589	0.825	1	20.319			
			C	0.191	2.626	0.589	0.825	1	20.319			
Sum Weight:	1691.77	2910.19						OTM	107.67 kip-ft	4848.42		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	324.34	A	0.217	2.539	0.594	0.8	1	4.959	261.15	52.23	C
69.00-64.00			B	0.217	2.539	0.594	0.8	1	4.959			
			C	0.217	2.539	0.594	0.8	1	4.959			
T2	932.66	1133.67	A	0.656	1.78	0.789	0.8	1	71.240	2478.46	123.92	A
64.00-44.00			B	0.193	2.619	0.589	0.8	1	17.429			
			C	0.193	2.619	0.589	0.8	1	17.429			
T3	759.11	1452.18	A	0.52	1.875	0.708	0.8	1	62.736	2014.17	100.71	A
44.00-24.00			B	0.191	2.626	0.589	0.8	1	20.047			
			C	0.191	2.626	0.589	0.8	1	20.047			
Sum Weight:	1691.77	2910.19						OTM	105.59 kip-ft	4753.78		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	324.34	A	0.217	2.539	0.594	0.85	1	5.096	268.39	53.68	C
69.00-64.00			B	0.217	2.539	0.594	0.85	1	5.096			
			C	0.217	2.539	0.594	0.85	1	5.096			
T2	932.66	1133.67	A	0.656	1.78	0.789	0.85	1	74.161	2580.09	129.00	A
64.00-44.00			B	0.193	2.619	0.589	0.85	1	17.882			
			C	0.193	2.619	0.589	0.85	1	17.882			
T3	759.11	1452.18	A	0.52	1.875	0.708	0.85	1	65.241	2094.59	104.73	A
44.00-24.00			B	0.191	2.626	0.589	0.85	1	20.592			
			C	0.191	2.626	0.589	0.85	1	20.592			
Sum Weight:	1691.77	2910.19						OTM	109.75 kip-ft	4943.06		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	1	1	3.897	104.65	20.93	C
69.00-64.00			B	0.141	2.806	0.58	1	1	3.897			
			C	0.141	2.806	0.58	1	1	3.897			
T2	331.43	691.69	A	0.454	1.968	0.675	1	1	43.070	764.21	38.21	A
64.00-44.00			B	0.126	2.862	0.578	1	1	13.634			
			C	0.126	2.862	0.578	1	1	13.634			
T3	268.96	935.50	A	0.363	2.143	0.637	1	1	38.924	658.96	32.95	A
44.00-24.00			B	0.131	2.841	0.579	1	1	16.456			
			C	0.131	2.841	0.579	1	1	16.456			
Sum Weight:	600.39	1822.13						OTM	33.96 kip-ft	1527.81		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	0.825	1	3.417	91.74	18.35	C
69.00-64.00			B	0.141	2.806	0.58	0.825	1	3.417			
			C	0.141	2.806	0.58	0.825	1	3.417			
T2	331.43	691.69	A	0.454	1.968	0.675	0.825	1	42.096	746.92	37.35	A
64.00-44.00			B	0.126	2.862	0.578	0.825	1	12.049			
			C	0.126	2.862	0.578	0.825	1	12.049			
T3	268.96	935.50	A	0.363	2.143	0.637	0.825	1	37.538	635.50	31.77	A
44.00-24.00			B	0.131	2.841	0.579	0.825	1	14.549			
			C	0.131	2.841	0.579	0.825	1	14.549			
Sum Weight:	600.39	1822.13						OTM	32.66	1474.16		

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
									kip-ft			

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	0.8	1	3.348	89.90	17.98	C
69.00-64.00			B	0.141	2.806	0.58	0.8	1	3.348			
			C	0.141	2.806	0.58	0.8	1	3.348			
T2	331.43	691.69	A	0.454	1.968	0.675	0.8	1	41.957	744.46	37.22	A
64.00-44.00			B	0.126	2.862	0.578	0.8	1	11.823			
			C	0.126	2.862	0.578	0.8	1	11.823			
T3	268.96	935.50	A	0.363	2.143	0.637	0.8	1	37.340	632.15	31.61	A
44.00-24.00			B	0.131	2.841	0.579	0.8	1	14.276			
			C	0.131	2.841	0.579	0.8	1	14.276			
Sum Weight:	600.39	1822.13						OTM	32.48 kip-ft	1466.50		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	0.00	194.95	A	0.141	2.806	0.58	0.85	1	3.485	93.58	18.72	C
69.00-64.00			B	0.141	2.806	0.58	0.85	1	3.485			
			C	0.141	2.806	0.58	0.85	1	3.485			
T2	331.43	691.69	A	0.454	1.968	0.675	0.85	1	42.235	749.39	37.47	A
64.00-44.00			B	0.126	2.862	0.578	0.85	1	12.275			
			C	0.126	2.862	0.578	0.85	1	12.275			
T3	268.96	935.50	A	0.363	2.143	0.637	0.85	1	37.736	638.85	31.94	A
44.00-24.00			B	0.131	2.841	0.579	0.85	1	14.821			
			C	0.131	2.841	0.579	0.85	1	14.821			
Sum Weight:	600.39	1822.13						OTM	32.85 kip-ft	1481.83		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	838.05					
Bracing Weight	984.08					
Total Member Self-Weight	1822.13			-0.45	2.75	

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Total Weight	5651.74			-0.45	2.75	
Wind 0 deg - No Ice		66.86	-11864.96	-387.81	-0.06	-14.89
Wind 30 deg - No Ice		6052.68	-10193.69	-334.53	-197.16	-11.01
Wind 45 deg - No Ice		8509.51	-8327.43	-273.68	-278.13	-7.89
Wind 60 deg - No Ice		10378.33	-5901.78	-194.41	-339.76	-4.23
Wind 90 deg - No Ice		11989.56	-66.86	-3.26	-392.20	3.63
Wind 120 deg - No Ice		10464.93	5874.58	190.80	-340.68	10.54
Wind 135 deg - No Ice		8414.97	8232.89	268.81	-274.16	13.04
Wind 150 deg - No Ice		5936.88	10126.84	330.82	-192.30	14.65
Wind 180 deg - No Ice		-66.86	11687.77	382.61	5.56	14.79
Wind 210 deg - No Ice		-6052.68	10193.69	333.63	202.66	11.01
Wind 225 deg - No Ice		-8509.51	8327.43	272.78	283.63	7.89
Wind 240 deg - No Ice		-10531.79	5990.38	195.66	348.98	4.35
Wind 270 deg - No Ice		-11989.56	66.86	2.36	397.70	-3.63
Wind 300 deg - No Ice		-10311.48	-5785.98	-189.55	342.45	-10.56
Wind 315 deg - No Ice		-8414.97	-8232.89	-269.71	279.66	-13.04
Wind 330 deg - No Ice		-5936.88	-10126.84	-331.72	197.79	-14.65
Member Ice	1088.05					
Total Weight Ice	9615.05			-1.51	6.26	
Wind 0 deg - Ice		50.73	-11572.27	-360.28	4.13	-12.61
Wind 30 deg - Ice		5644.92	-9555.48	-302.47	-172.87	-9.55
Wind 45 deg - Ice		7889.94	-7750.25	-246.41	-244.50	-7.10
Wind 60 deg - Ice		9562.64	-5451.50	-174.42	-298.28	-4.18
Wind 90 deg - Ice		11201.98	-50.73	-3.64	-348.32	2.06
Wind 120 deg - Ice		10167.61	5742.21	176.03	-310.56	7.84
Wind 135 deg - Ice		7818.21	7678.52	240.38	-241.49	10.09
Wind 150 deg - Ice		5557.06	9504.75	297.32	-169.18	11.62
Wind 180 deg - Ice		-50.73	10815.15	340.62	8.39	12.10
Wind 210 deg - Ice		-5644.92	9555.48	299.45	185.40	9.55
Wind 225 deg - Ice		-7889.94	7750.25	243.39	257.03	7.10
Wind 240 deg - Ice		-10218.33	5830.07	179.72	325.22	4.77
Wind 270 deg - Ice		-11201.98	50.73	0.62	360.85	-2.06
Wind 300 deg - Ice		-9511.92	-5363.64	-170.73	308.68	-7.92
Wind 315 deg - Ice		-7818.21	-7678.52	-243.39	254.02	-10.09
Wind 330 deg - Ice		-5557.06	-9504.75	-300.34	181.71	-11.62
Total Weight	5651.74			-0.45	2.75	
Wind 0 deg - Service		23.13	-4105.52	-133.60	0.67	-5.15
Wind 30 deg - Service		2094.35	-3527.23	-115.17	-67.53	-3.81
Wind 45 deg - Service		2944.47	-2881.47	-94.11	-95.55	-2.73
Wind 60 deg - Service		3591.12	-2042.14	-66.68	-116.87	-1.46
Wind 90 deg - Service		4148.64	-23.13	-0.54	-135.02	1.26
Wind 120 deg - Service		3621.08	2032.73	66.61	-117.19	3.65
Wind 135 deg - Service		2911.75	2848.75	93.60	-94.17	4.51
Wind 150 deg - Service		2054.29	3504.10	115.06	-65.85	5.07
Wind 180 deg - Service		-23.13	4044.21	132.98	2.61	5.12
Wind 210 deg - Service		-2094.35	3527.23	116.03	70.81	3.81
Wind 225 deg - Service		-2944.47	2881.47	94.97	98.83	2.73
Wind 240 deg - Service		-3644.22	2072.80	68.29	121.45	1.51
Wind 270 deg - Service		-4148.64	23.13	1.40	138.30	-1.26
Wind 300 deg - Service		-3567.98	-2002.07	-65.00	119.19	-3.65
Wind 315 deg - Service		-2911.75	-2848.75	-92.74	97.46	-4.51
Wind 330 deg - Service		-2054.29	-3504.10	-114.19	69.13	-5.07

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
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 lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	69 - 64	Leg	Max Tension	32	11.34	-0.01	-0.00
			Max. Compression	19	-1721.06	-0.06	1.05
			Max. Mx	6	-1081.39	1.70	0.02

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	10	-1082.69	0.12	1.55
			Max. Vy	14	-1363.03	1.02	-0.02
			Max. Vx	2	-1327.81	-0.12	1.09
		Diagonal	Max Tension	6	1423.88	0.00	0.00
			Max. Compression	6	-1429.69	0.00	0.00
			Max. Mx	22	-1047.46	0.01	-0.00
			Max. My	6	-682.72	0.00	0.00
			Max. Vy	22	7.06	0.01	-0.00
			Max. Vx	6	-0.70	0.00	0.00
		Top Girt	Max Tension	5	593.01	0.00	0.00
			Max. Compression	13	-590.44	0.00	0.00
			Max. Mx	18	4.76	-0.02	0.00
			Max. My	34	-6.23	0.00	0.00
			Max. Vy	18	10.90	0.00	0.00
			Max. Vx	34	-0.00	0.00	0.00
T2	64 - 44	Leg	Max Tension	15	25239.94	-0.68	0.15
			Max. Compression	13	-28714.58	0.71	-0.04
			Max. Mx	13	-15064.76	0.86	-0.03
			Max. My	9	-1475.49	0.01	1.11
			Max. Vy	13	-461.79	0.86	-0.03
			Max. Vx	17	1285.48	-0.01	0.17
		Diagonal	Max Tension	10	4643.10	0.00	0.00
			Max. Compression	2	-4733.01	0.00	0.00
			Max. Mx	30	2925.89	0.01	0.00
			Max. My	2	-4129.29	-0.00	0.01
			Max. Vy	30	-8.90	0.01	0.00
			Max. Vx	2	2.31	-0.00	0.01
T3	44 - 24	Leg	Max Tension	5	48469.80	0.48	-0.03
			Max. Compression	13	-53207.11	0.60	-0.04
			Max. Mx	24	-31145.65	0.91	-0.12
			Max. My	17	-2239.42	-0.00	0.59
			Max. Vy	24	-335.81	0.91	-0.12
			Max. Vx	17	-220.75	-0.00	0.58
		Diagonal	Max Tension	19	3903.96	0.00	0.00
			Max. Compression	19	-4095.07	0.00	0.00
			Max. Mx	33	2136.92	0.03	0.00
			Max. My	10	-3765.85	-0.00	-0.01
			Max. Vy	33	13.10	0.03	0.00
			Max. Vx	10	3.14	0.00	0.00
		Top Girt	Max Tension	22	290.94	0.00	0.00
			Max. Compression	13	-94.12	0.00	0.00
			Max. Mx	18	257.70	-0.02	0.00
			Max. My	34	255.96	0.00	0.00
			Max. Vy	18	10.97	0.00	0.00
			Max. Vx	34	-0.32	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	13	55907.13	6020.68	-3809.54
	Max. H_x	13	55907.13	6020.68	-3809.54
	Max. H_z	3	-43758.72	-4432.34	4014.04
	Min. Vert	5	-50976.23	-5716.45	3622.72
	Min. H_x	22	-43486.67	-5763.78	3639.52
	Min. H_z	11	48111.30	4634.52	-4145.80

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg B	Max. Vert	7	54607.69	-6454.18	-2899.32
	Max. H_x	15	-50962.35	6168.60	2721.99
	Max. H_z	33	-42967.22	5933.58	2922.08
	Min. Vert	15	-50962.35	6168.60	2721.99
	Min. H_x	7	54607.69	-6454.18	-2899.32
	Min. H_z	7	54607.69	-6454.18	-2899.32
Leg A	Max. Vert	2	54253.52	-1005.16	6965.91
	Max. H_x	12	-34951.02	1280.38	-4693.39
	Max. H_z	2	54253.52	-1005.16	6965.91
	Min. Vert	10	-49783.36	1005.90	-6615.49
	Min. H_x	4	38842.47	-1306.68	4914.38
	Min. H_z	27	-42825.37	812.40	-6702.75

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	5651.30	0.01	-0.00	-0.45	2.75	0.00
Dead+Wind 0 deg - No Ice	5651.11	66.89	-11865.92	-388.36	-0.03	-14.90
Dead+Wind 30 deg - No Ice	5651.30	6053.27	-10194.55	-335.01	-197.42	-11.02
Dead+Wind 45 deg - No Ice	5651.42	8510.33	-8328.15	-274.08	-278.51	-7.90
Dead+Wind 60 deg - No Ice	5651.47	10379.30	-5902.31	-194.69	-340.24	-4.24
Dead+Wind 90 deg - No Ice	5651.29	11990.61	-66.91	-3.25	-392.75	3.63
Dead+Wind 120 deg - No Ice	5651.11	10465.79	5875.05	191.09	-341.15	10.55
Dead+Wind 135 deg - No Ice	5651.15	8415.65	8233.58	269.21	-274.53	13.05
Dead+Wind 150 deg - No Ice	5651.27	5937.36	10127.72	331.30	-192.54	14.66
Dead+Wind 180 deg - No Ice	5651.44	-66.85	11688.82	383.15	5.59	14.80
Dead+Wind 210 deg - No Ice	5651.27	-6053.13	10194.60	334.09	202.96	11.02
Dead+Wind 225 deg - No Ice	5651.15	-8510.17	8328.16	273.16	284.04	7.90
Dead+Wind 240 deg - No Ice	5651.09	-10532.61	5990.87	195.93	349.48	4.36
Dead+Wind 270 deg - No Ice	5651.27	-11990.58	66.82	2.37	398.26	-3.63
Dead+Wind 300 deg - No Ice	5651.44	-10312.41	-5786.50	-189.80	342.94	-10.56
Dead+Wind 315 deg - No Ice	5651.39	-8415.73	-8233.59	-270.07	280.06	-13.05
Dead+Wind 330 deg - No Ice	5651.27	-5937.42	-10127.67	-332.18	198.09	-14.66
Dead+Ice+Temp	9612.79	-0.00	-0.00	-1.51	6.27	0.00
Dead+Wind 0 deg+Ice+Temp	9601.62	50.72	-11572.57	-361.01	4.16	-12.62
Dead+Wind 30 deg+Ice+Temp	9601.60	5645.04	-9555.72	-303.09	-173.21	-9.57
Dead+Wind 45 deg+Ice+Temp	9601.58	7890.12	-7750.44	-246.92	-244.98	-7.12
Dead+Wind 60 deg+Ice+Temp	9601.58	9562.87	-5451.63	-174.77	-298.88	-4.19
Dead+Wind 90 deg+Ice+Temp	9601.60	11202.26	-50.70	-3.64	-349.02	2.06
Dead+Wind 120 deg+Ice+Temp	9601.62	10167.87	5742.36	176.41	-311.17	7.85
Dead+Wind 135 deg+Ice+Temp	9601.61	7818.42	7678.71	240.88	-241.96	10.10
Dead+Wind 150 deg+Ice+Temp	9601.59	5557.22	9504.98	297.94	-169.51	11.63
Dead+Wind 180 deg+Ice+Temp	9601.57	-50.73	10815.39	341.32	8.44	12.11
Dead+Wind 210 deg+Ice+Temp	9601.60	-5645.08	9555.70	300.06	185.80	9.57
Dead+Wind 225 deg+Ice+Temp	9601.61	-7890.16	7750.45	243.88	257.56	7.12
Dead+Wind 240 deg+Ice+Temp	9601.62	-10218.60	5830.22	180.08	325.88	4.78
Dead+Wind 270 deg+Ice+Temp	9601.59	-11202.26	50.75	0.63	361.58	-2.06
Dead+Wind 300 deg+Ice+Temp	9601.57	-9512.14	-5363.76	-171.06	309.31	-7.92
Dead+Wind 315 deg+Ice+Temp	9601.58	-7818.38	-7678.70	-243.87	254.53	-10.10
Dead+Wind 330 deg+Ice+Temp	9601.59	-5557.18	-9505.00	-300.94	182.10	-11.63
Dead+Wind 0 deg - Service	5651.29	23.15	-4105.84	-134.68	1.78	-5.16
Dead+Wind 30 deg - Service	5651.30	2094.54	-3527.50	-116.21	-66.51	-3.82
Dead+Wind 45 deg - Service	5651.30	2944.73	-2881.69	-95.13	-94.57	-2.73
Dead+Wind 60 deg - Service	5651.31	3591.43	-2042.31	-67.66	-115.93	-1.47
Dead+Wind 90 deg - Service	5651.30	4148.98	-23.15	-1.42	-134.10	1.26

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	kip-ft	kip-ft	kip-ft
Dead+Wind 120 deg - Service	5651.29	3621.37	2032.88	65.82	-116.25	3.65
Dead+Wind 135 deg - Service	5651.29	2911.99	2848.97	92.85	-93.20	4.51
Dead+Wind 150 deg - Service	5651.29	2054.45	3504.38	114.34	-64.83	5.07
Dead+Wind 180 deg - Service	5651.30	-23.12	4044.54	132.29	3.73	5.12
Dead+Wind 210 deg - Service	5651.29	-2094.49	3527.51	115.31	72.02	3.82
Dead+Wind 225 deg - Service	5651.29	-2944.68	2881.69	94.23	100.08	2.73
Dead+Wind 240 deg - Service	5651.29	-3644.48	2072.95	67.50	122.73	1.51
Dead+Wind 270 deg - Service	5651.29	-4148.95	23.13	0.52	139.61	-1.26
Dead+Wind 300 deg - Service	5651.30	-3568.26	-2002.24	-65.97	120.46	-3.65
Dead+Wind 315 deg - Service	5651.33	-2912.02	-2849.08	-93.75	98.70	-4.51
Dead+Wind 330 deg - Service	5651.29	-2054.44	-3504.37	-115.24	70.34	-5.07

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	-0.00	-5651.74	0.00	-0.01	5651.30	0.00	0.008%
2	66.86	-5651.74	-11864.96	-66.89	5651.11	11865.92	0.009%
3	6052.68	-5651.74	-10193.69	-6053.27	5651.30	10194.55	0.009%
4	8509.51	-5651.74	-8327.43	-8510.33	5651.42	8328.15	0.009%
5	10378.33	-5651.74	-5901.78	-10379.30	5651.47	5902.31	0.009%
6	11989.56	-5651.74	-66.86	-11990.61	5651.29	66.91	0.009%
7	10464.93	-5651.74	5874.58	-10465.79	5651.11	-5875.05	0.009%
8	8414.97	-5651.74	8232.89	-8415.65	5651.15	-8233.58	0.009%
9	5936.88	-5651.74	10126.84	-5937.36	5651.27	-10127.72	0.009%
10	-66.86	-5651.74	11687.77	66.85	5651.44	-11688.82	0.009%
11	-6052.68	-5651.74	10193.69	6053.13	5651.27	-10194.60	0.009%
12	-8509.51	-5651.74	8327.43	8510.17	5651.15	-8328.16	0.009%
13	-10531.79	-5651.74	5990.38	10532.61	5651.09	-5990.87	0.009%
14	-11989.56	-5651.74	66.86	11990.58	5651.27	-66.82	0.008%
15	-10311.48	-5651.74	-5785.98	10312.41	5651.44	5786.50	0.008%
16	-8414.97	-5651.74	-8232.89	8415.73	5651.39	8233.59	0.008%
17	-5936.88	-5651.74	-10126.84	5937.42	5651.27	10127.67	0.008%
18	-0.00	-9615.05	-0.00	0.00	9612.79	0.00	0.024%
19	50.73	-9615.05	-11572.27	-50.72	9601.62	11572.57	0.089%
20	5644.92	-9615.05	-9555.48	-5645.04	9601.60	9555.72	0.092%
21	7889.94	-9615.05	-7750.25	-7890.12	9601.58	7750.44	0.092%
22	9562.64	-9615.05	-5451.50	-9562.87	9601.58	5451.63	0.092%
23	11201.98	-9615.05	-50.73	-11202.26	9601.60	50.70	0.091%
24	10167.61	-9615.05	5742.21	-10167.87	9601.62	-5742.36	0.089%
25	7818.21	-9615.05	7678.52	-7818.42	9601.61	-7678.71	0.092%
26	5557.06	-9615.05	9504.75	-5557.22	9601.59	-9504.98	0.092%
27	-50.73	-9615.05	10815.15	50.73	9601.57	-10815.39	0.093%
28	-5644.92	-9615.05	9555.48	5645.08	9601.60	-9555.70	0.092%
29	-7889.94	-9615.05	7750.25	7890.16	9601.61	-7750.45	0.092%
30	-10218.33	-9615.05	5830.07	10218.60	9601.62	-5830.22	0.088%
31	-11201.98	-9615.05	50.73	11202.26	9601.59	-50.75	0.091%
32	-9511.92	-9615.05	-5363.64	9512.14	9601.57	5363.76	0.093%
33	-7818.21	-9615.05	-7678.52	7818.38	9601.58	7678.70	0.092%
34	-5557.06	-9615.05	-9504.75	5557.18	9601.59	9505.00	0.092%
35	23.13	-5651.74	-4105.52	-23.15	5651.29	4105.84	0.008%
36	2094.35	-5651.74	-3527.23	-2094.54	5651.30	3527.50	0.008%
37	2944.47	-5651.74	-2881.47	-2944.73	5651.30	2881.69	0.008%
38	3591.12	-5651.74	-2042.14	-3591.43	5651.31	2042.31	0.008%
39	4148.64	-5651.74	-23.13	-4148.98	5651.30	23.15	0.008%
40	3621.08	-5651.74	2032.73	-3621.37	5651.29	-2032.88	0.008%
41	2911.75	-5651.74	2848.75	-2911.99	5651.29	-2848.97	0.008%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
42	2054.29	-5651.74	3504.10	-2054.45	5651.29	-3504.38	0.008%
43	-23.13	-5651.74	4044.21	23.12	5651.30	-4044.54	0.008%
44	-2094.35	-5651.74	3527.23	2094.49	5651.29	-3527.51	0.008%
45	-2944.47	-5651.74	2881.47	2944.68	5651.29	-2881.69	0.008%
46	-3644.22	-5651.74	2072.80	3644.48	5651.29	-2072.95	0.008%
47	-4148.64	-5651.74	23.13	4148.95	5651.29	-23.13	0.008%
48	-3567.98	-5651.74	-2002.07	3568.26	5651.30	2002.24	0.008%
49	-2911.75	-5651.74	-2848.75	2912.02	5651.33	2849.08	0.008%
50	-2054.29	-5651.74	-3504.10	2054.44	5651.29	3504.37	0.008%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00064119
2	Yes	4	0.00000001	0.00087241
3	Yes	4	0.00000001	0.00088597
4	Yes	4	0.00000001	0.00089466
5	Yes	4	0.00000001	0.00089790
6	Yes	4	0.00000001	0.00088483
7	Yes	4	0.00000001	0.00086987
8	Yes	4	0.00000001	0.00087255
9	Yes	4	0.00000001	0.00088100
10	Yes	4	0.00000001	0.00089689
11	Yes	4	0.00000001	0.00088963
12	Yes	4	0.00000001	0.00088348
13	Yes	4	0.00000001	0.00088124
14	Yes	4	0.00000001	0.00089473
15	Yes	4	0.00000001	0.00090487
16	Yes	4	0.00000001	0.00089914
17	Yes	4	0.00000001	0.00088792
18	Yes	7	0.00000001	0.00047598
19	Yes	5	0.00000001	0.00035109
20	Yes	5	0.00000001	0.00036143
21	Yes	5	0.00000001	0.00036320
22	Yes	5	0.00000001	0.00036491
23	Yes	5	0.00000001	0.00036216
24	Yes	5	0.00000001	0.00035474
25	Yes	5	0.00000001	0.00036739
26	Yes	5	0.00000001	0.00036655
27	Yes	5	0.00000001	0.00036731
28	Yes	5	0.00000001	0.00035649
29	Yes	5	0.00000001	0.00035420
30	Yes	5	0.00000001	0.00034131
31	Yes	5	0.00000001	0.00034944
32	Yes	5	0.00000001	0.00035658
33	Yes	5	0.00000001	0.00035749
34	Yes	5	0.00000001	0.00035801
35	Yes	4	0.00000001	0.00086309
36	Yes	4	0.00000001	0.00086313
37	Yes	4	0.00000001	0.00086499
38	Yes	4	0.00000001	0.00086506
39	Yes	4	0.00000001	0.00085734
40	Yes	4	0.00000001	0.00085048
41	Yes	4	0.00000001	0.00085304
42	Yes	4	0.00000001	0.00085874

43	Yes	4	0.00000001	0.00087193
44	Yes	4	0.00000001	0.00087691
45	Yes	4	0.00000001	0.00087807
46	Yes	4	0.00000001	0.00087957
47	Yes	4	0.00000001	0.00088718
48	Yes	4	0.00000001	0.00088876
49	Yes	4	0.00000001	0.00088401
50	Yes	4	0.00000001	0.00087653

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	69 - 64	0.686	46	0.0958	0.0499
T2	64 - 44	0.578	46	0.0958	0.0498
T3	44 - 24	0.164	46	0.0582	0.0270

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
69.00	6'x3" Pipe Mount	46	0.686	0.0958	0.0499	60794
66.00	LPA-80080-6CF	46	0.622	0.0962	0.0501	60794
55.00	8 FT DISH	46	0.375	0.0849	0.0427	40586

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	69 - 64	1.952	13	0.2717	0.1441
T2	64 - 44	1.646	13	0.2716	0.1440
T3	44 - 24	0.469	13	0.1657	0.0781

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
69.00	6'x3" Pipe Mount	13	1.952	0.2717	0.1441	21385
66.00	LPA-80080-6CF	13	1.770	0.2726	0.1447	21385
55.00	8 FT DISH	13	1.069	0.2411	0.1236	14581

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	69	Leg	A325N	0.6250	4	2.83	13486.50	0.000 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	1429.69	4123.34	0.347 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.6250	1	593.01	6117.19	0.097 ✔	1.333	Member Bearing
T2	64	Leg	A325N	0.6250	4	6309.99	13497.80	0.467 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4733.01	4123.34	1.148 ✔	1.333	Bolt Shear
T3	44	Leg	A325N	0.6250	4	12117.50	13498.50	0.898 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4095.07	4123.34	0.993 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.6250	1	290.94	6117.19	0.048 ✔	1.333	Member Bearing

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 lb	Allow. P_a lb	Ratio P / P_a
T1	69 - 64	ROHN 2 EH	5.00	5.00	78.1 K=1.00	19.390	1.4807	-1676.45	28710.10	0.058* ✔
T2	64 - 44	ROHN 2 X-STR	20.00	4.00	62.6 K=1.00	22.265	1.4773	-28714.60	32890.90	0.873 ✔
T3	44 - 24	ROHN 2.5 EH	20.03	5.01	65.0 K=1.00	21.839	2.2535	-53207.10	49214.50	1.081 ✔

* DL controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	69 - 64	L1 1/2x1 1/2x3/16	7.83	3.80	155.4 K=1.00	6.185	0.5273	-1429.69	3261.42	0.438 ✔
T2	64 - 44	L1 1/2x1 1/2x3/16	7.26	3.52	143.9 K=1.00	7.211	0.5273	-4733.01	3802.92	1.245 ✔
T3	44 - 24	L1 3/4x1 3/4x3/16	9.28	4.66	162.9 K=1.00	5.625	0.6211	-3696.30	3493.47	1.058 ✔

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 lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	69 - 64	L1 1/2x1 1/2x3/16	6.52	6.05	247.6 K=1.00	2.437	0.5273	-590.44	1284.94	0.460 ✔
T3	44 - 24	KL/R > 200 (C) - 5 L1 1/2x1 1/2x3/16 KL/R > 200 (C) - 50	6.56	6.09	249.3 K=1.00	2.403	0.5273	-94.12	1267.12	0.074 ✔

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 lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	69 - 64	ROHN 2 EH	5.00	5.00	78.1	30.000	1.4807	11.34	44420.50	0.000 ✔
T2	64 - 44	ROHN 2 X-STR	20.00	4.00	62.6	30.000	1.4773	25239.90	44317.80	0.570 ✔
T3	44 - 24	ROHN 2.5 EH	20.03	5.01	65.0	30.000	2.2535	48469.80	67606.20	0.717 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	69 - 64	L1 1/2x1 1/2x3/16	7.83	3.80	102.8	29.000	0.3076	1423.88	8920.90	0.160 ✔
T2	64 - 44	L1 1/2x1 1/2x3/16	7.26	3.52	95.4	29.000	0.3076	4643.10	8920.90	0.520 ✔
T3	44 - 24	L1 3/4x1 3/4x3/16	8.45	4.26	97.7	29.000	0.3779	3903.96	10960.00	0.356 ✔

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 lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	69 - 64	L1 1/2x1 1/2x3/16	6.52	6.05	166.1	29.000	0.2900	593.01	8411.13	0.071 ✔
T3	44 - 24	L1 1/2x1 1/2x3/16	6.56	6.09	167.3	29.000	0.2900	257.72	8411.13	0.031* ✔

* DL controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	69 - 64	Leg	ROHN 2 EH	3	-1676.45	28710.10	9.4	Pass
T2	64 - 44	Leg	ROHN 2 X-STR	13	-28714.60	43843.57	65.5	Pass
T3	44 - 24	Leg	ROHN 2.5 EH	46	-53207.10	65602.93	81.1	Pass
T1	69 - 64	Diagonal	L1 1/2x1 1/2x3/16	9	-1429.69	4347.47	32.9	Pass
T2	64 - 44	Diagonal	L1 1/2x1 1/2x3/16	20	-4733.01	5069.29	93.4	Pass
T3	44 - 24	Diagonal	L1 3/4x1 3/4x3/16	56	-3696.30	4656.80	79.4	Pass
T1	69 - 64	Top Girt	L1 1/2x1 1/2x3/16	5	-590.44	1712.82	34.5	Pass
T3	44 - 24	Top Girt	L1 1/2x1 1/2x3/16	50	-94.12	1689.07	5.6	Pass
							Summary	
						Leg (T3)	81.1	Pass
						Diagonal (T2)	93.4	Pass
						Top Girt (T1)	34.5	Pass
						Bolt Checks	86.1	Pass
						RATING =	**93.4**	**Pass**

Element Map

Section No.	Section Elevation ft	Component Type	Element List
T1	69.00-64.00	Leg	1-3
		Diagonal	7-12
		Top Girt	4-6
T2	64.00-44.00	Leg	13-15
		Diagonal	16-45
T3	44.00-24.00	Leg	46-48
		Diagonal	52-75
		Top Girt	49-51
			Total number of elements: 75

SITE NAME	MERIDEN E CT	ECP & CELL #	2	0151
Note: PCS carrier add. Connect LTE-700 Rx only ports to AWS SBNHH low band ports.		LATITUDE	41-32-03.35 N	
		LONGITUDE	72-47-47.36 W	
		STRUCTURE TYPE	Lattice on Roof	

700 MHz LTE - CURRENT CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	LTE-700U BBU+RRH		LTE-700U BBU+RRH		LTE-700U BBU+RRH	
ANTENNA TYPE	BXA-70063-6CF-750MHZ		BXA-70063-6CF-750MHZ		BXA-70063-6CF-750MHZ	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-700U	1	ALU RH_2X40-700U	1	ALU RH_2X40-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1		DB-T1-6Z-8AB-0Z			

700 MHz LTE - FUTURE CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	LTE-700U BBU+RRH		LTE-700U BBU+RRH		LTE-700U BBU+RRH	
ANTENNA TYPE	SBNHH-1D65B_PORT 1 - +45_00DT_0725		SBNHH-1D65B_PORT 1 - +45_00DT_0725		SBNHH-1D65B_PORT 1 - +45_00DT_0725	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X60-700U	1	ALU RH_2X60-700U	1	ALU RH_2X60-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1		DB-T1-6Z-8AB-0Z			

850 MHz CELLULAR - CURRENT CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	LPA-80080/6CF		LPA-80063/6CF		LPA-80080/6CF	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

850 MHz CELLULAR - FUTURE CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	LPA-80080/6CF		LPA-80063/6CF		LPA-80080/6CF	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

1900 MHz PCS - CURRENT CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	PCS Mod 4.0B		PCS Mod 4.0B		PCS Mod 4.0B	
ANTENNA TYPE	BXA-171085-8CF-EDIN-2		BXA-171085-8CF-EDIN-2		BXA-171085-8CF-EDIN-2	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEX WITH CELLULAR CABLE						
RRH - QTY / MODEL						
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

1900 MHz PCS - FUTURE CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	LTE-PCS BBU+RRH		LTE-PCS BBU+RRH		LTE-PCS BBU+RRH	
ANTENNA TYPE	SBNHH-1D65B_PORT 2 - +45_00DT_1950		SBNHH-1D65B_PORT 2 - +45_00DT_1950		SBNHH-1D65B_PORT 2 - +45_00DT_1950	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEX WITH CELLULAR CABLE						
RRH - QTY / MODEL	1	ALU RH_2X60-PCS	1	ALU RH_2X60-PCS	1	ALU RH_2X60-PCS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

2100 MHz AWS - CURRENT CONFIG	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	LTE-AWS BBU+RRH		LTE-AWS BBU+RRH		LTE-AWS BBU+RRH	
ANTENNA TYPE	BXA-171063-8CF-EDIN-0		BXA-171063-8CF-EDIN-0		BXA-171063-8CF-EDIN-0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEX WITH LTE-700 CABLE						
RRH - QTY / MODEL	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1		DB-T1-6Z-8AB-0Z			
2100 MHz AWS - FUTURE CONFIG	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	LTE-AWS BBU+RRH		LTE-AWS BBU+RRH		LTE-AWS BBU+RRH	
ANTENNA TYPE	SBNHH-1D65B_PORT 2 - +45_00DT_2130		SBNHH-1D65B_PORT 2 - +45_00DT_2130		SBNHH-1D65B_PORT 2 - +45_00DT_2130	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	66		66		66	
TMA - QTY / MODEL						
DIPLEX WITH LTE-700 CABLE						
RRH - QTY / MODEL	1	ALU RH_2X60-AWS	1	ALU RH_2X60-AWS	1	ALU RH_2X60-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1		DB-T1-6Z-8AB-0Z			

NUMBER OF CABLES NEEDED				FIBER LINES MODEL NUMBER			
TOTAL # FIBER LINES	2	TOTAL # OF MAINLINES	6	FIBER LINE MODEL #		HB158-1-08U8-S8J18	
TOTAL # TOP JUMPERS	9	TOTAL # OF TOP JUMPERS	36	FIBER TOP JUMPER MODEL #		HB114-1-08U4-S4J18	
EQUIPMENT CABLE ORDERING		**MAIN CABLE #**	12	+	-6	**TOP JUMPER #**	24 + 12

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 MHz	TX: 746-757 MHz	PCS (Watts)	16
RX: 824-835/845-846.5 MHz	RX: 1890-1895/1745-1755 MHz	RX: 776-787 MHz	LTE/AWS/PCS (Watts)	60/60/60

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	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

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared by: Jaime Laredo	Alex Restrepo	JL	7/20/2015

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.

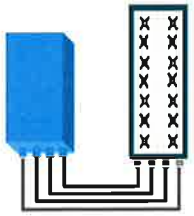
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

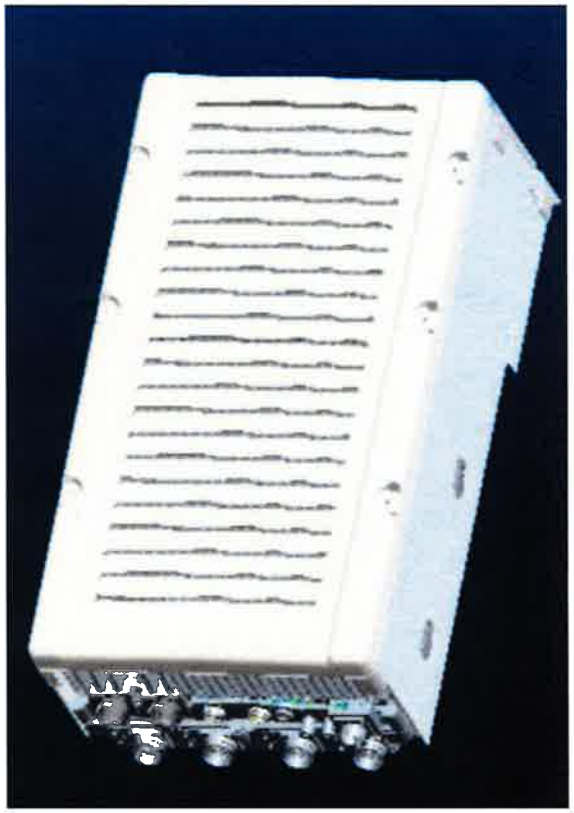
TECHNICAL SPECIFICATIONS

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.

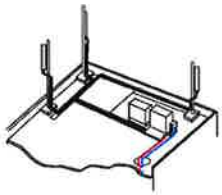
EASY INSTALLATION

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.

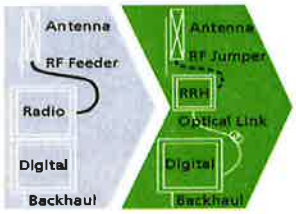
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

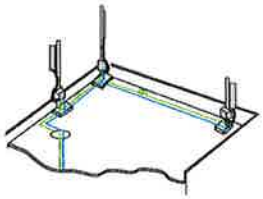
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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.

Dimensions and weights

- HxWxD ~~510x285x186mm~~ 36.7"x10.6"x5.8" (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.