Robinson+Cole

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Also admitted in Massachusetts

March 4, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
53 Dayton Road, Waterford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 135-foot level on the existing 180-foot tower at 53 Dayton Road in Waterford, Connecticut (the "Property"). The tower and underlying property are owned by Cohanzie Fire Company No. 5, Inc. The Council approved Cellco's shared use of this tower in 1998. Cellco now intends to modify its facility by replacing all of its existing antennas with three (3) model LNX-6514DS-VTM, 700 MHz antennas; three (3) model LNX-6512DS-VTM, 850 MHz antennas; three (3) model HBXX-6516DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same 135-foot level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent Daniel M. Steward, First Selectman for the Town of Waterford. A copy of this letter is being sent to Cohanzie Fire Company No. 5, Inc., the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed at the 135-foot level of the 180-foot tower.

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

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

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

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Daniel M. Steward, Waterford Frist Selectman
Cohanzie Fire Company No. 5, Inc.
Timothy Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896
Beamwidth, Horizontal Tolerance, degrees	±3	±3

* 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.

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	14.2 kg | 31.3 lb
Model with factory installed AISG 2.0 RET	LNX-6514DS-A1M

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6512DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Excellent choice to maximize both coverage and capacity in suburban and rural applications
- Ideal choice for site collocations and tough zoning restrictions
- Extended elevation tilt for maximum flexibility in urban core areas
- Remote beam tilt management is an optional feature using Andrew's Teletilt® system
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	14.1	15.0
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	19.0	17.0
Beam Tilt, degrees	0–15	0–15
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	28	28
CPR at Boresight, dB	12	12
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, maximum	379.8 N @ 150 km/h 85.4 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Product Specifications

LNX-6512DS-VTM

Depth	181.0 mm | 7.1 in
Length	1232.0 mm | 48.5 in
Width	301.0 mm | 11.9 in
Net Weight	13.0 kg | 28.7 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	LNX-6512DS-R2M
Model with Factory Installed AISG 2.0 Actuator	LNX-6512DS-A1M
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

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

Product Specifications

HBXX-6516DS-VTM

RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
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

600899A-2 — 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.

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°

**Values calculated using NGMN Alliance N-P-BASTA v9.6*

Mechanical Specifications

Color | Radome Material	Light gray | PVC, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1903.0 mm x 305.0 mm x 166.0 mm | 74.9 in x 12.0 in x 6.5 in
Net Weight	19.5 kg | 43.0 lb
Model with factory installed AISG 2.0 RET	HBXX-6517DS-A2M

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

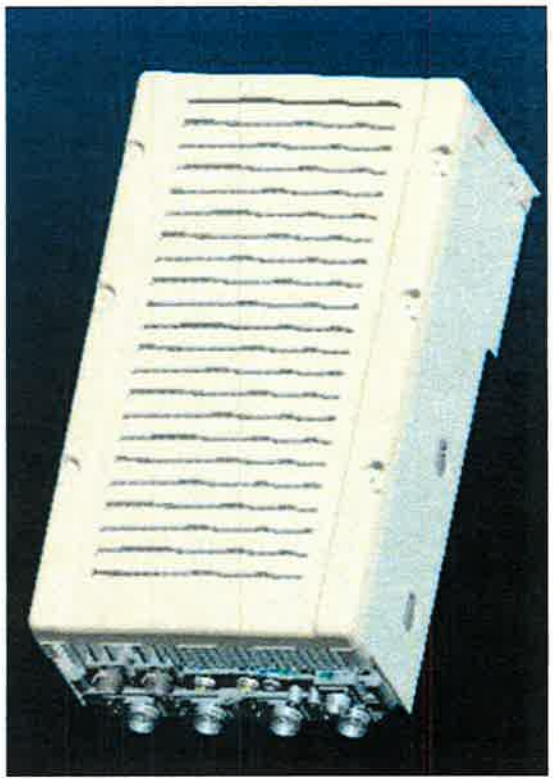
		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms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

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

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.

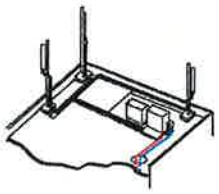
EASY INSTALLATION

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.

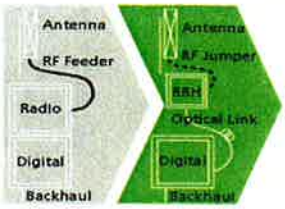
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

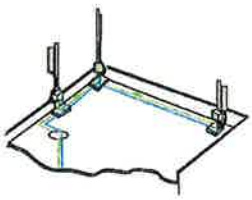
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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.

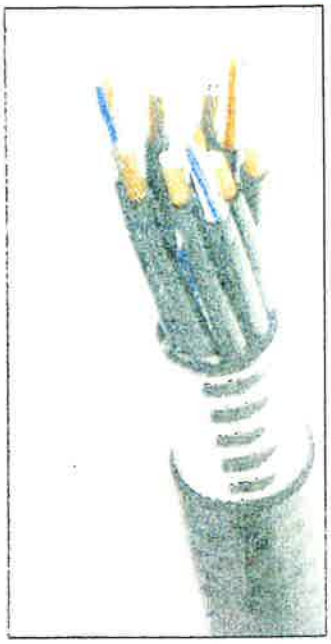


Figure 1: HYBRIFLEX Series

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)

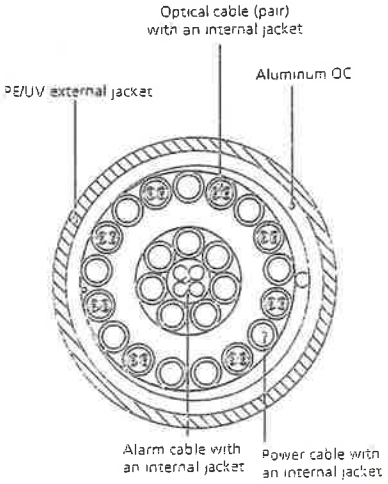


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Waterford								
Tower Height: 180ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	157	0.0165	880	0.5867	2.81%	
*AT&T UMTS	2	875	157	0.0255	1900	1.0000	2.55%	
*AT&T GSM	1	283	157	0.0041	880	0.5867	0.70%	
*AT&T GSM	4	525	157	0.0306	1900	1.0000	3.06%	
*AT&T LTE	1	1615	157	0.0236	740	0.4933	4.78%	
*T-Mobile PCS (GSM/UMT	4	12.0815	165	0.0006	1950	1.0000	0.06%	
*T-Mobile AWS (UMTS)	2	24.16301	165	0.0006	2100	1.0000	0.06%	
*MetroPCS	3	727	125	0.0502	2140	1.0000	5.02%	
*Public Safety	3	100	185	0.0032	150	0.2000	1.58%	
*Public Safety	1	100	185	0.0011	150	0.2000	0.53%	
Verizon PCS	**11**	**320**	**135**	**0.0694**	**1970**	**1.0000**	**6.94%**	
Verizon Cellular	**9**	**258**	**135**	**0.0458**	**869**	**0.5793**	**7.91%**	
Verizon AWS	**1**	**1888**	**135**	**0.0372**	**2145**	**1.0000**	**3.72%**	
Verizon 700	**1**	**707**	**135**	**0.0139**	**746**	**0.4973**	**2.80%**	
								42.53%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Existing ROHN Lattice Tower

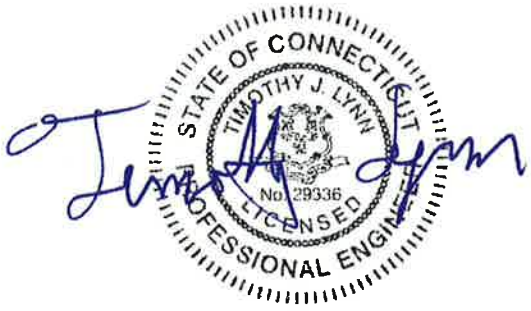
Proposed Verizon Wireless
Antenna Installation

Verizon Site Ref: Waterford

53 Dayton Road
Waterford, CT

Centek Project No. 15001.009

Date: February 6, 2015



Prepared for:

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

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

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Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing lattice tower located in Waterford, Connecticut.

The host tower is a 180-ft, nine-section, three legged, self-supporting tapered lattice tower originally designed and manufactured by ROHN Industries Inc., Eng file no. 38103AE, dated August 24, 1998. The tower geometry, structure member sizes and anchor bolt properties were obtained from a previous structural analysis report prepared by Centek Engineering job no. 12124.CO24 signed and sealed January 14, 2013. Original foundation loading was obtained from a structural analysis report prepared by URS Corporation, signed and sealed on November 8, 2002.

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

The tower consists of nine (9) tapered vertical sections with steel pipe legs conforming to ASTM A572-50. Horizontal and diagonal lateral support bracing consists of steel pipe construction conforming to ASTM A36M-42. 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 8.54-ft at the top and 25.48-ft at the base.

Verizon Wireless proposes the removal of fifteen (15) panel antennas and three (3) remote radio heads and the installation of twelve (12) panel antennas, six (6) remote radio heads and one (1) main distribution box 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 tower supports several communication antennas. The existing and proposed loads considered in the analysis consist of the following:

- TOWN (Existing):
  Antennas: Five (5) 15-ft Omni-directional whip antennas, two (2) 9-ft Omni-directional whip antennas and one (1) 8-ft Omni-directional whip antenna mounted on two (2) 6-ft side-arms and one (1) lightweight T-Arm to the top of the the tower.
  Coax Cables: One (1) 1-5/8" ∅ and seven (7) 7/8" ∅ coax cables (face mounted).
- T-Mobile (Existing):
  Antennas: Six (6) EMS RR90-17-02DP panel antennas, three (3) RFS APX16DWV-16DWVS panel antennas, six (6) 14"x8"x4" TMAs and three (3) 14"x9"x5" TMA's mounted to three (3) 10-ft T-Arms with a RAD center elevation of 163-ft above grade level.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables (face mounted).

- AT&T (Existing):
  Antennas: Six (6) Powerwave 7770 panel antennas, two (2) Andrew SBNH-1D6565C panel antennas, one (1) Powerwave P65-17-XLH-RR panel antennas, six (6) Powerwave LGP21401 TMA's, six (6) Powerwave LGP13519 Diplexers, six (6) Ericsson RRUS-11 remote radio heads and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted on three (3) 14' boom gates at a RAD center elevation of 157-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 3" dia. flex conduit (face mounted).
- TOWN (Existing):
  Antennas: One (1) 12-ft Omni-directional whip antenna mounted on a 6-ft side-arm with an elevation of 146-ft above grade level.
  Coax Cables: One (1) 7/8" ∅ coax cable (face mounted).
- MetroPCS (Existing):
  Antennas: Three (3) Kathrein 800-10504 panel antennas mounted to three (3) 10-ft T-Arms with a RAD center elevation of 126.5-ft above grade level.
  Coax Cables: Six (6) 7/8" ∅ coax cables (face mounted).
- VERIZON (Existing):
  GPS: One (1) GPS antenna mounted on a 1-ft standoff arm with a RAD center elevation of 51-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable (face mounted).
- VERIZON (Existing to Remain):
  Antennas: Three (3) Alcatel-Lucent RRH-2x40-07U and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted to three (3) existing 14-ft boom gates with a RAD center elevation of 135-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- VERIZON (Existing to Remove):
  Antennas: One (1) Antel BXA-70063-6CF panel antenna, two (2) Swedcom SLCP 2x6015 panel antennas, two (2) Antel LPA-80063-4CF panel antennnas, four (4) Swedcom SC-E 6014 rev2 panel antennas, two (2) Antel BXA-171063-12BF panel antennas, one (1) Swedcom SACP 2x5516 panel antenna, three (3) Antel BXA-171063-8CF panel antennas and three (3) Alcatel-Lucent RRH-2x40-AWS remote radio heads mounted to three (3) existing 14-ft boom gates with a RAD center elevation of 135-ft above grade level.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.

- **VERIZON (Proposed):**
  Antennas: Three (3) Andrew HBXX-6517DS panel antennas, three (3) Andrew HBXX-6516DS panel antennas, three (3) Andrew LNX-6514DS panel antennas, three (3) Andrew LNX-6512DS panel antennas, three (3) Alcatel-Lucent RRH-2x60-PCS remote radio heads, three (3) Alcatel-Lucent RRH-2x60-AWS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted to three (3) existing 14-ft boom gates with a RAD center elevation of 135-ft above existing grade.
  Coax Cables: One (1) 1-5/8" Ø fiber cable mounted to the exterior of the existing tower.

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 London; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Waterford; v = 115 mph (3 second gust) equivalent to v = 95 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	Appendix-K wind speed controls.	
Load Cases:	Load Case 1; 95 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 82 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 82 mph wind speed velocity represents 75% of the wind pressure generated by the 95 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 2, per tnxTower "Section Capacity Table", this tower was found to be at **66.4%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T9)	0'-0"-20'-0"	49.1%	**PASS**
Diagonal (T4)	100'-0"-120'-0"	65.0%	**PASS**
Secondary Horizontal (T4)	100'-0"-120'-0"	66.4%	**PASS**

Foundation and Anchors

The existing foundation information was unavailable for use in this structural analysis. Review of the foundation design consisted of a comparison of the proposed applied loads obtained from the tower design calculations; governing Load Case 2 with the original tower loading obtained from the aforementioned URS structural design report signed and sealed on November 8, 2002.

- The tower reactions developed from the governing Load Case 2 were used in the verification of the foundation:

Reactions	Vector	Proposed Base Reactions
Base	Shear	**70 kips**
	Compression	**82 kips**
	Moment	**7374 kip-ft**
Leg	Shear	**43 kips**
	Uplift	**306 kips**
	Compression	**361 kips**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	28.2%	**PASS**

- The foundation was found to be within allowable limits.

Tower Reactions	Original Tower Reactions	Proposed Reactions	Result
Leg Compression	732.9 kips	361 kips	**PASS**
Leg Uplift	621.3 kips	306 kips	**PASS**
Leg Shear	141.8 kips	43 kips	**PASS**
Overturning Moment	14472.6 kip-ft	7374 kip-ft	**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:

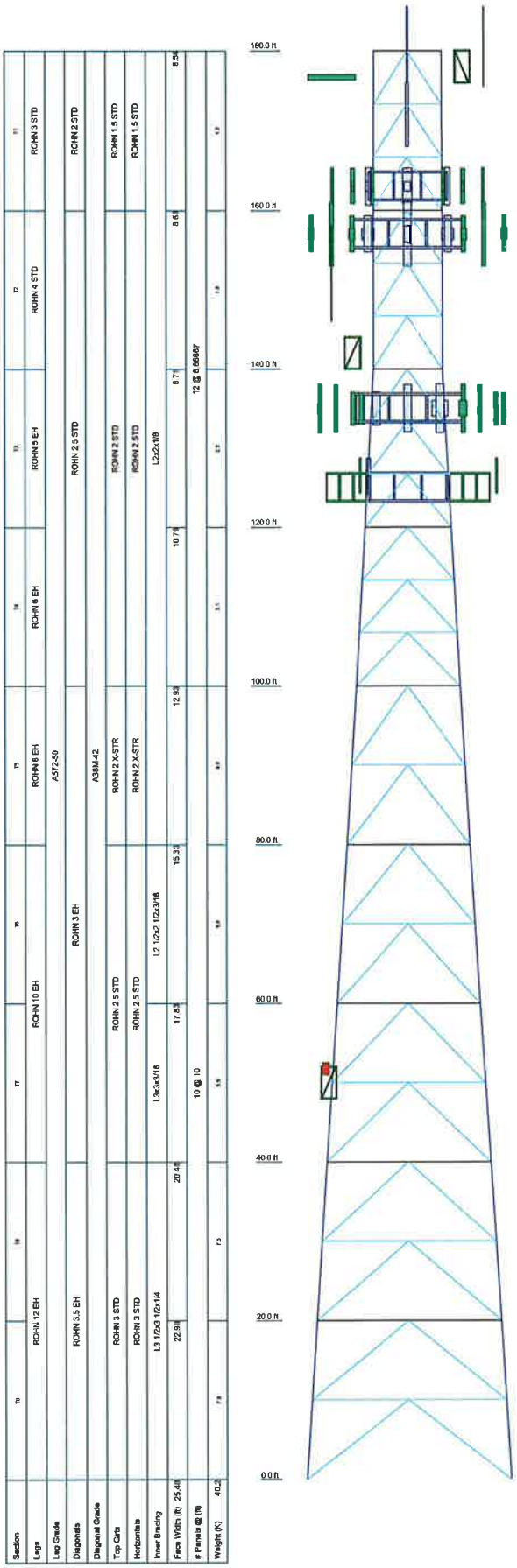
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or 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 RISATower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

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



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
15' 2.5" Dia omni (Town)	180	SBNH-1D6565C (AT&T - Existing)	157
15' 2.5" Dia omni (Town)	180	P65-17-XLH-RR (AT&T - Existing)	157
15' 2.5" Dia omni (Town)	180	(2) RRUS-11 (AT&T - Existing)	157
Rohn 6' Side-Arm(1) (Town)	178	(2) RRUS-11 (AT&T - Existing)	157
Rohn 6' Side-Arm(1) (Town)	176	(2) RRUS-11 (AT&T - Existing)	157
Filter (Town)	177	DC6-48-60-18-8F Surge Arrestor (AT&T - Existing)	157
15' 2.5" Dia omni (Town)	177	Rohn 6'x14' Boom Gate (3) (AT&T - Existing)	157
15' 2.5" Dia omni (Town)	177	12' x 2" Dia Omni (Town)	146
Prod 15' T-Frame Sector Mount (1) (Town)	177	Rohn 6' Side-Arm(1) (Town)	142
8' x 3" Dia Omni (Town)	176	LNX-6512DS (Verizon - Proposed)	135
9-ft Omni (Town)	176	HBXX-6516DS (Verizon - Proposed)	135
9-ft Omni (Town)	176	LNX-6514DS-VTM (Verizon - Proposed)	135
APX16DWV-16DWV-S-E-ACU (T-Mobile - Existing)	163	HBXX-6517DS (Verizon - Proposed)	135
		LNX-6512DS (Verizon - Proposed)	135
RR90-17-02DP (T-Mobile - Existing)	163	HBXX-6516DS (Verizon - Proposed)	135
RR90-17-02DP (T-Mobile - Existing)	163	LNX-6514DS-VTM (Verizon - Proposed)	135
APX16DWV-16DWV-S-E-ACU (T-Mobile - Existing)	163	HBXX-6517DS (Verizon - Proposed)	135
		LNX-6512DS (Verizon - Proposed)	135
RR90-17-02DP (T-Mobile - Existing)	163	HBXX-6516DS (Verizon - Proposed)	135
RR90-17-02DP (T-Mobile - Existing)	163	LNX-6514DS-VTM (Verizon - Proposed)	135
APX16DWV-16DWV-S-E-ACU (T-Mobile - Existing)	163	HBXX-6517DS (Verizon - Proposed)	135
		RRH2x40-07-U (Verizon - Existing)	135
RR90-17-02DP (T-Mobile - Existing)	163	RRH2x40-07-U (Verizon - Existing)	135
RR90-17-02DP (T-Mobile - Existing)	163	RRH2x40-07-U (Verizon - Existing)	135
(2) 14"x8"x4" TMA (T-Mobile - Existing)	163	RRH2x60-AWS (Verizon - Proposed)	135
(2) 14"x8"x4" TMA (T-Mobile - Existing)	163	RRH2x60-AWS (Verizon - Proposed)	135
(2) 14"x8"x4" TMA (T-Mobile - Existing)	163	RRH2x60-AWS (Verizon - Proposed)	135
14"x9"x5" TMA (T-Mobile - Existing)	163	RRH2x60-PCS (Verizon - Proposed)	135
14"x9"x5" TMA (T-Mobile - Existing)	163	RRH2x60-PCS (Verizon - Proposed)	135
14"x9"x5" TMA (T-Mobile - Existing)	163	RRH2x60-PCS (Verizon - Proposed)	135
Valmont 10' Wireless Frame (3) (T-Mobile - Existing)	163	DB-T1-6Z-8AB-0Z (Verizon - Existing)	135
		DB-T1-6Z-8AB-0Z (Verizon - Proposed)	135
(2) 7770.00 (AT&T - Existing)	157	Rohn 6'x14' Boom Gate (3) (Verizon - Existing)	135
(2) 7770.00 (AT&T - Existing)	157	800-10504 (MetroPCS - Existing)	126.5
(2) 7770.00 (AT&T - Existing)	157	800-10504 (MetroPCS - Existing)	126.5
(2) LGP21401 TMA (AT&T - Existing)	157	800-10504 (MetroPCS - Existing)	126.5
(2) LGP21401 TMA (AT&T - Existing)	157	10-ft T-Frame (MetroPCS - Existing)	125
(2) LGP21401 TMA (AT&T - Existing)	157	10-ft T-Frame (MetroPCS - Existing)	125
(2) LGP13519 Diplexer (AT&T - Existing)	157	10-ft T-Frame (MetroPCS - Existing)	125
(2) LGP13519 Diplexer (AT&T - Existing)	157	GPS (Verizon - Existing)	51
(2) LGP13519 Diplexer (AT&T - Existing)	157	1" Standoff Pipe (Verizon - Existing)	50
SBNH-1D6565C (AT&T - Existing)	157		

MATERIAL STRENGTH

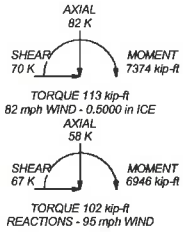
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36M-42	42 ksi	60 ksi

TOWER DESIGN NOTES

1. Tower designed for a 95 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 82 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 66.4%

△

MAX. CORNER REACTIONS AT BASE:
DOWN: 361 K
UPLIFT: -306 K
SHEAR: 43 K



TORQUE 113 kip-ft
82 mph WIND - 0.5000 in ICE

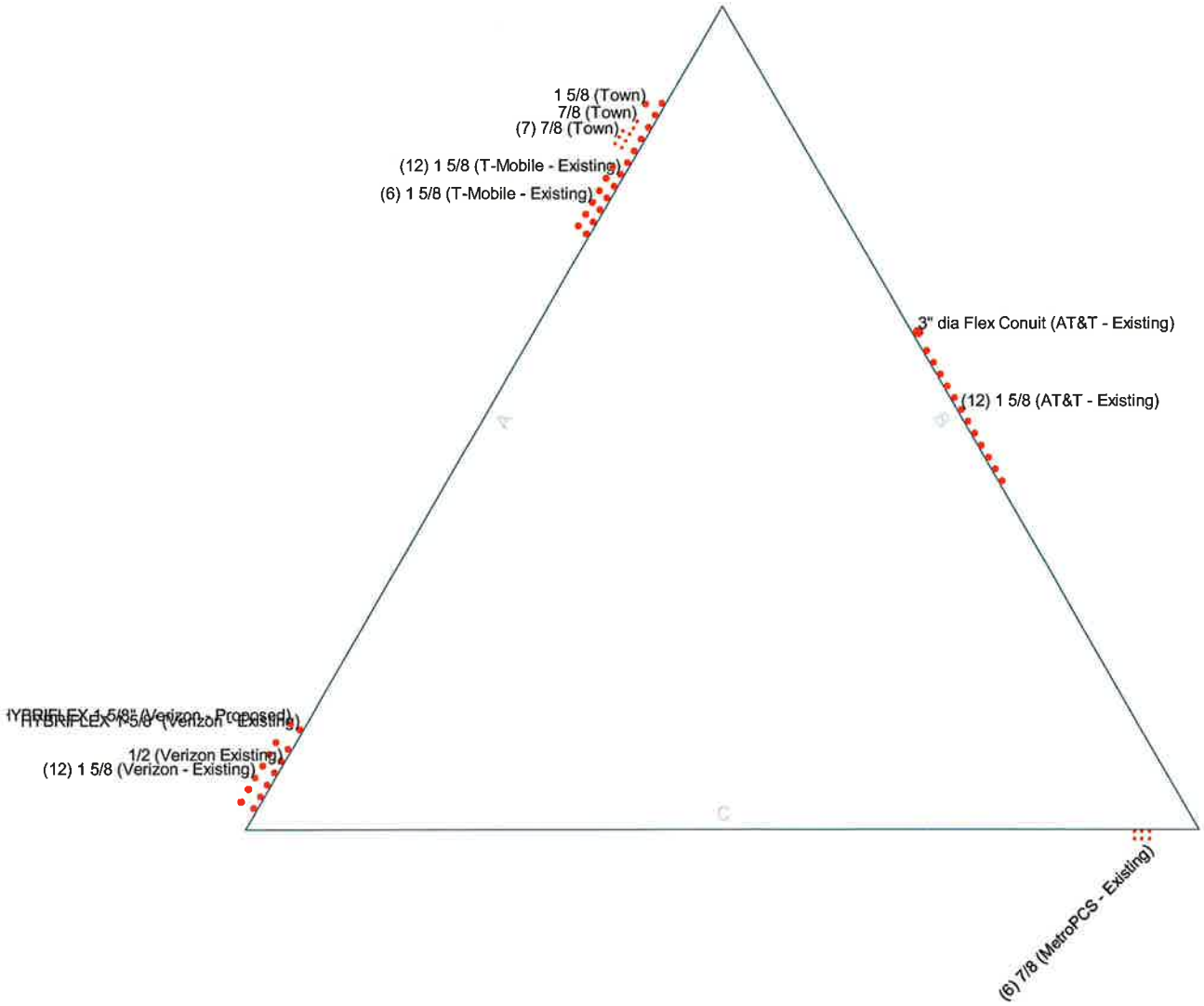
TORQUE 102 kip-ft
REACTIONS - 95 mph WIND

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

Job:	15001.009 - Waterford
Project:	160' Lattice Tower - 53 Dayton Road Waterford, CT
Client: Verizon Wireless	Drawn by: TJL — Appnd:
Code: TIA/EIA-222-F	Date: 02/06/15 — Scale: NTS
Path:	Dwg No. E-1

Feedline Plan

Round Flat App In Face App Out Face

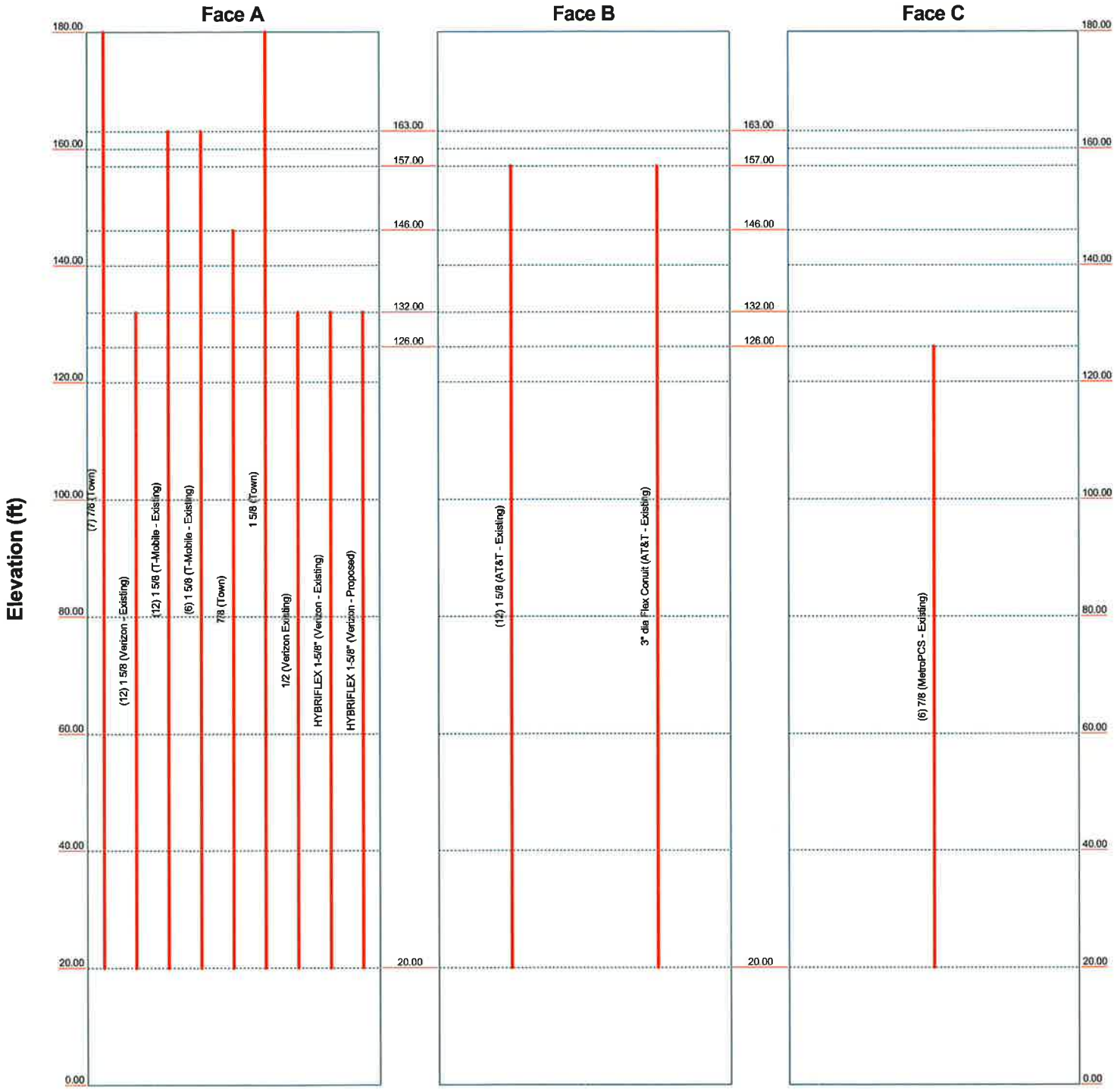


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: **15001.009 - Waterford**			
Project: ***180' Lattice Tower - 53 Dayton Road Waterford, CT***			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 02/06/15	Scale: NTS	
Path:		Dwg No. E-7	

Feedline Distribution Chart
0' - 180'

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: **15001.009 - Waterford**		
	Project: ***180' Lattice Tower - 53 Dayton Road Waterford, CT***		
	Client: Verizon Wireless	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 02/06/15	Scale: NTS
	Path:		Dwg No. E-7

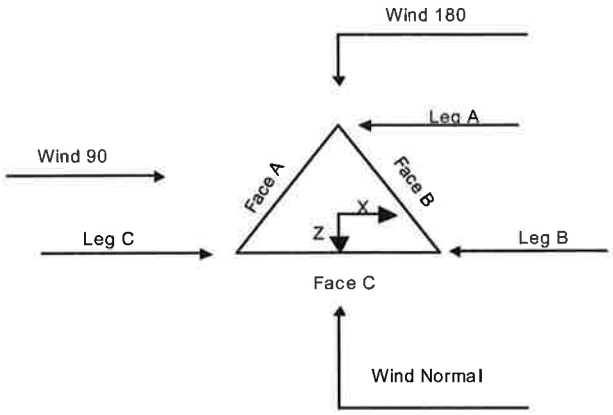
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 8.54 ft at the top and 25.48 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 95 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 82 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in 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	180.00-160.00			8.54	1	20.00
T2	160.00-140.00			8.63	1	20.00
T3	140.00-120.00			8.71	1	20.00
T4	120.00-100.00			10.79	1	20.00
T5	100.00-80.00			12.93	1	20.00
T6	80.00-60.00			15.33	1	20.00
T7	60.00-40.00			17.83	1	20.00
T8	40.00-20.00			20.48	1	20.00
T9	20.00-0.00			22.98	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	180.00-160.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T2	160.00-140.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T3	140.00-120.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T4	120.00-100.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T5	100.00-80.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T6	80.00-60.00	10.00	K Brace Down	No	Yes	0.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T7	60.00-40.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T8	40.00-20.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T9	20.00-0.00	10.00	K Brace Down	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A36M-42 (42 ksi)
T2 160.00-140.00	Pipe	ROHN 4 STD	A572-50 (50 ksi)	Pipe	ROHN 2.5 STD	A36M-42 (42 ksi)
T3 140.00-120.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 2.5 STD	A36M-42 (42 ksi)
T4 120.00-100.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 2.5 STD	A36M-42 (42 ksi)
T5 100.00-80.00	Pipe	ROHN 8 EH	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A36M-42 (42 ksi)
T6 80.00-60.00	Pipe	ROHN 10 EH	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A36M-42 (42 ksi)
T7 60.00-40.00	Pipe	ROHN 10 EH	A572-50 (50 ksi)	Pipe	ROHN 3 EH	A36M-42 (42 ksi)
T8 40.00-20.00	Pipe	ROHN 12 EH	A572-50 (50 ksi)	Pipe	ROHN 3.5 EH	A36M-42 (42 ksi)
T9 20.00-0.00	Pipe	ROHN 12 EH	A572-50 (50 ksi)	Pipe	ROHN 3.5 EH	A36M-42 (42 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 180.00-160.00	Pipe	ROHN 1.5 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T2 160.00-140.00	Pipe	ROHN 2 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T3 140.00-120.00	Pipe	ROHN 2 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T4 120.00-100.00	Pipe	ROHN 2 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T5 100.00-80.00	Pipe	ROHN 2 X-STR	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T6 80.00-60.00	Pipe	ROHN 2.5 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T7 60.00-40.00	Pipe	ROHN 2.5 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T8 40.00-20.00	Pipe	ROHN 3 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)
T9 20.00-0.00	Pipe	ROHN 3 STD	A36M-42 (42 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 180.00-160.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 1.5 STD	A572-50 (50 ksi)
T2 160.00-140.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T3 140.00-120.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T4 120.00-100.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T5 100.00-80.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 X-STR	A572-50 (50 ksi)
T6 80.00-60.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2.5 STD	A36 (36 ksi)
T7 60.00-40.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2.5 STD	A36 (36 ksi)
T8 40.00-20.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 3 STD	A36 (36 ksi)
T9 20.00-0.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 3 STD	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T1 180.00-160.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A572-50 (50 ksi)
T2 160.00-140.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A572-50 (50 ksi)
T3 140.00-120.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A572-50 (50 ksi)
T4 120.00-100.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A572-50 (50 ksi)
T5 100.00-80.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A572-50 (50 ksi)
T6 80.00-60.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A572-50 (50 ksi)
T7 60.00-40.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A572-50 (50 ksi)
T8 40.00-20.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A572-50 (50 ksi)
T9 20.00-0.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	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 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T7 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T8 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T9 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Single Diags X	K Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
T1	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
180.00-160.00				1	1	1	1	1	1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
160.00-140.00				1	1	1	1	1	1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1	1	1	1	1	1
T7	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1	1	1	1	1	1
T9 20.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.00-160.00	0.0000	1	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 160.00-140.00	0.0000	1	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 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 20.00-0.00	0.0000	1	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 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 180.00-160.00	Flange	0.8750 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.3750 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T2 160.00-140.00	Flange	1.0000 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.3750 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T3 140.00-120.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T4 120.00-100.00	Flange	1.0000 A325N	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T5 100.00-80.00	Flange	1.0000 A325N	12	0.7500 A325N	3	0.7500 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0
T6 80.00-60.00	Flange	1.0000 A325N	12	0.7500 A325N	3	0.7500 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0
T7 60.00-40.00	Flange	1.0000 A325N	16	0.7500 A325N	3	0.7500 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0
T8 40.00-20.00	Flange	1.0000 A325N	16	0.7500 A325N	3	0.7500 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	0.6250 A325N	0
T9 20.00-0.00	Flange	1.0000 A354-BC	24	0.7500 A325N	3	0.7500 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	2	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	B	Yes	Ar (CfAe)	157.00 - 20.00	0.0000	0	12	12	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
(AT&T - Existing) 7/8 (Town)	A	Yes	Ar (CfAe)	180.00 - 20.00	4.0000	0.33	7	4	1.1100	1.1100		0.54
1 5/8 (Verizon - Existing)	A	Yes	Ar (CfAe)	132.00 - 20.00	0.0000	-0.44	12	6	1.9800	1.9800		1.04
7/8 (MetroPCS - Existing)	C	Yes	Ar (CfAe)	126.00 - 20.00	0.0000	-0.44	6	3	1.1100	1.1100		0.54
1 5/8 (T-Mobile - Existing)	A	Yes	Ar (CfAe)	163.00 - 20.00	0.0000	0.3	12	12	1.9800	1.9800		1.04
1 5/8 (T-Mobile - Existing)	A	Yes	Ar (CfAe)	163.00 - 20.00	3.0000	0.26	6	6	1.9800	1.9800		1.04
7/8 (Town)	A	Yes	Ar (CfAe)	146.00 - 20.00	4.0000	0.35	1	1	1.1100	1.1100		0.54
1 5/8 (Town)	A	Yes	Ar (CfAe)	180.00 - 20.00	4.0000	0.37	1	1	1.9800	1.9800		1.04
1/2 (Verizon Existing)	A	Yes	Ar (CfAe)	132.00 - 20.00	0.0000	-0.42	1	1	0.5800	0.5800		0.25
HYBRIFLEX 1-5/8" (Verizon - Existing)	A	Yes	Ar (CfAe)	132.00 - 20.00	0.0000	-0.38	1	1	0.0000	1.9800		1.90
HYBRIFLEX 1-5/8" (Verizon - Proposed)	A	Yes	Ar (CfAe)	132.00 - 20.00	3.0000	-0.38	1	1	0.0000	1.9800		1.90
3" dia Flex Conuit (AT&T - Existing)	B	Yes	Ar (CfAe)	157.00 - 20.00	0.0000	-0.1	1	1	3.0000	3.0000		5.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	19.610	0.000	0.000	0.000	0.15
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	70.655	0.000	0.000	0.000	0.47
		B	37.910	0.000	0.000	0.000	0.30
		C	0.000	0.000	0.000	0.000	0.00
T3	140.00-120.00	A	88.370	0.000	0.000	0.000	0.68
		B	44.600	0.000	0.000	0.000	0.35
		C	1.665	0.000	0.000	0.000	0.02
T4	120.00-100.00	A	99.317	0.000	0.000	0.000	0.81
		B	44.600	0.000	0.000	0.000	0.35
		C	5.550	0.000	0.000	0.000	0.06
T5	100.00-80.00	A	99.317	0.000	0.000	0.000	0.81
		B	44.600	0.000	0.000	0.000	0.35
		C	5.550	0.000	0.000	0.000	0.06
T6	80.00-60.00	A	99.317	0.000	0.000	0.000	0.81

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		B	44.600	0.000	0.000	0.000	0.35
		C	5.550	0.000	0.000	0.000	0.06
T7	60.00-40.00	A	99.317	0.000	0.000	0.000	0.81
		B	44.600	0.000	0.000	0.000	0.35
		C	5.550	0.000	0.000	0.000	0.06
T8	40.00-20.00	A	99.317	0.000	0.000	0.000	0.81
		B	44.600	0.000	0.000	0.000	0.35
		C	5.550	0.000	0.000	0.000	0.06
T9	20.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

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 K
T1	180.00-160.00	A	0.500	32.443	0.000	0.000	0.000	0.40
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.500	109.488	0.000	0.000	0.000	1.19
		B		56.327	0.000	0.000	0.000	0.64
		C		0.000	0.000	0.000	0.000	0.00
T3	140.00-120.00	A	0.500	137.370	0.000	0.000	0.000	1.68
		B		66.267	0.000	0.000	0.000	0.76
		C		3.165	0.000	0.000	0.000	0.05
T4	120.00-100.00	A	0.500	154.317	0.000	0.000	0.000	1.98
		B		66.267	0.000	0.000	0.000	0.76
		C		10.550	0.000	0.000	0.000	0.18
T5	100.00-80.00	A	0.500	154.317	0.000	0.000	0.000	1.98
		B		66.267	0.000	0.000	0.000	0.76
		C		10.550	0.000	0.000	0.000	0.18
T6	80.00-60.00	A	0.500	154.317	0.000	0.000	0.000	1.98
		B		66.267	0.000	0.000	0.000	0.76
		C		10.550	0.000	0.000	0.000	0.18
T7	60.00-40.00	A	0.500	154.317	0.000	0.000	0.000	1.98
		B		66.267	0.000	0.000	0.000	0.76
		C		10.550	0.000	0.000	0.000	0.18
T8	40.00-20.00	A	0.500	154.317	0.000	0.000	0.000	1.98
		B		66.267	0.000	0.000	0.000	0.76
		C		10.550	0.000	0.000	0.000	0.18
T9	20.00-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

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	180.00-160.00	A	1.540	3.701	0.000	0.000
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T2	160.00-140.00	A	6.750	14.337	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
		B	3.622	7.376	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	140.00-120.00	A	7.894	16.838	0.000	0.000
		B	3.984	8.122	0.000	0.000
		C	0.149	0.388	0.000	0.000
T4	120.00-100.00	A	8.238	17.588	0.000	0.000
		B	3.700	7.553	0.000	0.000
		C	0.460	1.202	0.000	0.000
T5	100.00-80.00	A	6.853	14.104	0.000	0.000
		B	3.077	6.056	0.000	0.000
		C	0.383	0.964	0.000	0.000
T6	80.00-60.00	A	6.823	13.860	0.000	0.000
		B	3.064	5.952	0.000	0.000
		C	0.381	0.948	0.000	0.000
T7	60.00-40.00	A	6.496	13.207	0.000	0.000
		B	2.917	5.672	0.000	0.000
		C	0.363	0.903	0.000	0.000
T8	40.00-20.00	A	7.340	14.416	0.000	0.000
		B	3.296	6.191	0.000	0.000
		C	0.410	0.986	0.000	0.000
T9	20.00-0.00	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

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	180.00-160.00	-2.5110	-8.8573	-2.8369	-9.9858
T2	160.00-140.00	0.4387	-17.3492	0.2639	-18.5426
T3	140.00-120.00	-2.2856	-15.1624	-2.6116	-16.2555
T4	120.00-100.00	-3.9779	-14.5578	-4.2551	-15.5271
T5	100.00-80.00	-4.3188	-16.1422	-4.7599	-17.7619
T6	80.00-60.00	-4.4830	-17.0389	-5.0436	-19.1588
T7	60.00-40.00	-4.9944	-19.2366	-5.6165	-21.6388
T8	40.00-20.00	-4.9432	-19.2367	-5.6900	-22.1641
T9	20.00-0.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
15' 2.5" Dia omni (Town)	C	From Leg	3.00 0.00 7.50	0.0000	177.00	No Ice 1/2" Ice	3.75 5.28	3.75 5.28	0.05 0.08
15' 2.5" Dia omni	C	From Leg	3.00	0.0000	177.00	No Ice	3.75	3.75	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Town)			0.00 7.50			1/2" Ice	5.28	5.28	0.08
Filter	C	From Leg	3.00	0.0000	177.00	No Ice	0.44	0.44	0.01
(Town)			0.00 0.00			1/2" Ice	0.55	0.55	0.02
15' 2.5" Dia omni	C	From Leg	0.00	0.0000	180.00	No Ice	3.75	3.75	0.05
(Town)			0.00 7.50			1/2" Ice	5.28	5.28	0.08
15' 2.5" Dia omni	A	From Leg	0.00	0.0000	180.00	No Ice	3.75	3.75	0.05
(Town)			0.00 7.50			1/2" Ice	5.28	5.28	0.08
9-ft Omni	A	From Leg	6.00	0.0000	176.00	No Ice	2.25	2.25	0.03
(Town)			0.00 4.50			1/2" Ice	3.18	3.18	0.05
8' x 3" Dia Omni	A	From Leg	6.00	0.0000	176.00	No Ice	2.40	2.40	0.03
(Town)			0.00 -4.00			1/2" Ice	3.19	3.19	0.04
15' 2.5" Dia omni	B	From Leg	0.00	0.0000	180.00	No Ice	3.75	3.75	0.05
(Town)			0.00 7.50			1/2" Ice	5.28	5.28	0.08
9-ft Omni	B	From Leg	6.00	0.0000	176.00	No Ice	2.25	2.25	0.03
(Town)			0.00 4.50			1/2" Ice	3.18	3.18	0.05
Rohn 6' Side-Arm(1)	A	From Leg	3.00	0.0000	178.00	No Ice	10.60	10.60	0.14
(Town)			0.00 0.00			1/2" Ice	15.40	15.40	0.21
Rohn 6' Side-Arm(1)	B	From Leg	3.00	0.0000	178.00	No Ice	10.60	10.60	0.14
(Town)			0.00 0.00			1/2" Ice	15.40	15.40	0.21
Pirod 15' T-Frame Sector Mount (1)	C	From Leg	6.00	0.0000	177.00	No Ice	15.00	15.00	0.50
(Town)			0.00 0.00			1/2" Ice	20.60	20.60	0.65
APX16DWV-16DWV-S-E-A CU	A	From Leg	3.00	0.0000	163.00	No Ice	6.70	2.00	0.04
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	7.13	2.33	0.07
RR90-17-02DP	A	From Leg	3.00	0.0000	163.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			-5.00 0.00			1/2" Ice	4.77	2.31	0.04
RR90-17-02DP	A	From Leg	3.00	0.0000	163.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			5.00 0.00			1/2" Ice	4.77	2.31	0.04
APX16DWV-16DWV-S-E-A CU	B	From Leg	3.00	0.0000	163.00	No Ice	6.70	2.00	0.04
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	7.13	2.33	0.07
RR90-17-02DP	B	From Leg	3.00	0.0000	163.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			-5.00 0.00			1/2" Ice	4.77	2.31	0.04
RR90-17-02DP	B	From Leg	3.00	0.0000	163.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			5.00 0.00			1/2" Ice	4.77	2.31	0.04
APX16DWV-16DWV-S-E-A CU	C	From Leg	3.00	0.0000	163.00	No Ice	6.70	2.00	0.04
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	7.13	2.33	0.07
RR90-17-02DP	C	From Leg	3.00	0.0000	163.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			-5.00 0.00			1/2" Ice	4.77	2.31	0.04
RR90-17-02DP	C	From Leg	3.00	0.0000	163.00	No Ice	4.36	1.97	0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(T-Mobile - Existing)			5.00 0.00			1/2" Ice	4.77	2.31	0.04
(2) 14"x8"x4" TMA (T-Mobile - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	1.09 1.24	0.54 0.67	0.04 0.05
(2) 14"x8"x4" TMA (T-Mobile - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	1.09 1.24	0.54 0.67	0.04 0.05
(2) 14"x8"x4" TMA (T-Mobile - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	1.09 1.24	0.54 0.67	0.04 0.05
14"x9"x5" TMA (T-Mobile - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	1.23 1.38	0.68 0.81	0.04 0.05
14"x9"x5" TMA (T-Mobile - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	1.23 1.38	0.68 0.81	0.04 0.05
14"x9"x5" TMA (T-Mobile - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	1.23 1.38	0.68 0.81	0.04 0.05
Valmont 10' Wireless Frame (3) (T-Mobile - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice	30.70 42.00	30.70 42.00	0.71 0.86
(2) 7770.00 (AT&T - Existing)	A	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
(2) 7770.00 (AT&T - Existing)	B	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
(2) 7770.00 (AT&T - Existing)	C	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
(2) LGP21401 TMA (AT&T - Existing)	A	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) LGP21401 TMA (AT&T - Existing)	B	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) LGP21401 TMA (AT&T - Existing)	C	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) LGP13519 Diplexer (AT&T - Existing)	A	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	0.01 0.01
(2) LGP13519 Diplexer (AT&T - Existing)	B	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	0.01 0.01
(2) LGP13519 Diplexer (AT&T - Existing)	C	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	0.01 0.01
SBNH-1D6565C (AT&T - Existing)	A	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
SBNH-1D6565C (AT&T - Existing)	B	From Leg	6.00 0.00 0.00	0.0000	157.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
P65-17-XLH-RR	C	From Leg	6.00	0.0000	157.00	No Ice	11.47	6.80	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T - Existing)			0.00 0.00			1/2" Ice	12.08	7.38	0.12
(2) RRUS-11	A	From Leg	6.00	0.0000	157.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	B	From Leg	6.00	0.0000	157.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	C	From Leg	6.00	0.0000	157.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
DC6-48-60-18-8F Surge	A	From Leg	6.00	0.0000	157.00	No Ice	2.23	2.23	0.02
Arrestor			0.00			1/2" Ice	2.45	2.45	0.04
(AT&T - Existing)			0.00						
Rohn 6'x14' Boom Gate (3)	A	From Leg	3.00	0.0000	157.00	No Ice	52.00	52.00	1.75
(AT&T - Existing)			0.00			1/2" Ice	61.90	61.90	2.19
			0.00						
12' x 2" Dia Omni	C	From Leg	6.00	0.0000	146.00	No Ice	2.40	2.40	0.03
(Town)			0.00			1/2" Ice	3.63	3.63	0.05
			6.00						
Rohn 6' Side-Arm(1)	C	From Leg	3.00	0.0000	142.00	No Ice	10.60	10.60	0.14
(Town)			0.00			1/2" Ice	15.40	15.40	0.21
			0.00						
LNX-6512DS	A	From Leg	5.00	0.0000	135.00	No Ice	5.61	3.35	0.03
(Verizon - Proposed)			-6.00			1/2" Ice	6.01	3.71	0.06
			0.00						
HBXX-6516DS	A	From Leg	5.00	0.0000	135.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
LNX-6514DS-VTM	A	From Leg	5.00	0.0000	135.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBXX-6517DS	A	From Leg	5.00	0.0000	135.00	No Ice	8.74	5.24	0.05
(Verizon - Proposed)			4.00			1/2" Ice	9.31	5.71	0.10
			0.00						
LNX-6512DS	B	From Leg	5.00	0.0000	135.00	No Ice	5.61	3.35	0.03
(Verizon - Proposed)			-6.00			1/2" Ice	6.01	3.71	0.06
			0.00						
HBXX-6516DS	B	From Leg	5.00	0.0000	135.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
LNX-6514DS-VTM	B	From Leg	5.00	0.0000	135.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBXX-6517DS	B	From Leg	5.00	0.0000	135.00	No Ice	8.74	5.24	0.05
(Verizon - Proposed)			4.00			1/2" Ice	9.31	5.71	0.10
			0.00						
LNX-6512DS	C	From Leg	5.00	0.0000	135.00	No Ice	5.61	3.35	0.03
(Verizon - Proposed)			-6.00			1/2" Ice	6.01	3.71	0.06
			0.00						
HBXX-6516DS	C	From Leg	5.00	0.0000	135.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	6.35	3.61	0.07
			0.00						
LNX-6514DS-VTM	C	From Leg	5.00	0.0000	135.00	No Ice	8.41	5.41	0.04
(Verizon - Proposed)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
HBXX-6517DS	C	From Leg	5.00	0.0000	135.00	No Ice	8.74	5.24	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Proposed)			4.00 0.00			1/2" Ice	9.31	5.71	0.10
RRH2x40-07-U	A	From Leg	5.00	0.0000	135.00	No Ice	2.25	1.23	0.05
(Verizon - Existing)			4.00 0.00			1/2" Ice	2.45	1.39	0.07
RRH2x40-07-U	B	From Leg	5.00	0.0000	135.00	No Ice	2.25	1.23	0.05
(Verizon - Existing)			4.00 0.00			1/2" Ice	2.45	1.39	0.07
RRH2x40-07-U	C	From Leg	5.00	0.0000	135.00	No Ice	2.25	1.23	0.05
(Verizon - Existing)			4.00 0.00			1/2" Ice	2.45	1.39	0.07
RRH2x60-AWS	A	From Leg	5.00	0.0000	135.00	No Ice	2.19	1.43	0.05
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.40	1.61	0.07
RRH2x60-AWS	B	From Leg	5.00	0.0000	135.00	No Ice	2.19	1.43	0.05
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.40	1.61	0.07
RRH2x60-AWS	C	From Leg	5.00	0.0000	135.00	No Ice	2.19	1.43	0.05
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.40	1.61	0.07
RRH2x60-PCS	A	From Leg	5.00	0.0000	135.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.80	2.24	0.08
RRH2x60-PCS	B	From Leg	5.00	0.0000	135.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.80	2.24	0.08
RRH2x60-PCS	C	From Leg	5.00	0.0000	135.00	No Ice	2.58	2.03	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.80	2.24	0.08
DB-T1-6Z-8AB-0Z	A	From Leg	5.00	0.0000	135.00	No Ice	5.60	2.33	0.04
(Verizon - Existing)			4.00 0.00			1/2" Ice	5.92	2.56	0.08
DB-T1-6Z-8AB-0Z	B	From Leg	5.00	0.0000	135.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			4.00 0.00			1/2" Ice	5.92	2.56	0.08
Rohn 6'x14' Boom Gate (3)	A	From Leg	3.00	0.0000	135.00	No Ice	52.00	52.00	1.75
(Verizon - Existing)			0.00 0.00			1/2" Ice	61.90	61.90	2.19
800-10504	A	From Leg	4.00	0.0000	126.50	No Ice	3.35	1.86	0.02
(MetroPCS - Existing)			-5.00 0.00			1/2" Ice	3.70	2.19	0.04
800-10504	B	From Leg	4.00	0.0000	126.50	No Ice	3.35	1.86	0.02
(MetroPCS - Existing)			-5.00 0.00			1/2" Ice	3.70	2.19	0.04
800-10504	C	From Leg	4.00	0.0000	126.50	No Ice	3.35	1.86	0.02
(MetroPCS - Existing)			-5.00 0.00			1/2" Ice	3.70	2.19	0.04
10-ft T-Frame	A	From Leg	3.00	0.0000	125.00	No Ice	13.60	13.60	0.38
(MetroPCS - Existing)			0.00 0.00			1/2" Ice	17.50	17.50	0.53
10-ft T-Frame	B	From Leg	3.00	0.0000	125.00	No Ice	13.60	13.60	0.38
(MetroPCS - Existing)			0.00 0.00			1/2" Ice	17.50	17.50	0.53
10-ft T-Frame	C	From Leg	3.00	0.0000	125.00	No Ice	13.60	13.60	0.38
(MetroPCS - Existing)			0.00 0.00			1/2" Ice	17.50	17.50	0.53
1' Standoff Pipe	C	From Leg	0.50	0.0000	50.00	No Ice	0.16	0.16	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Existing)			0.00 0.00			1/2" Ice	0.23	0.23	0.01
GPS	C	From Leg	1.00	0.0000	51.00	No Ice	1.00	1.00	0.01
(Verizon - Existing)			0.00 0.00			1/2" Ice	1.50	1.50	0.01

Tower Pressures - No Ice

$G_H = 1.121$

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	170.00	1.597	37	177.533	A	0.000	42.770	11.667	27.28	0.000	0.000
180.00-160.00					B	0.000	24.700		47.23	0.000	0.000
					C	0.000	24.700		47.23	0.000	0.000
T2	150.00	1.541	36	180.900	A	0.000	94.781	15.000	15.83	0.000	0.000
160.00-140.00					B	0.000	65.164		23.02	0.000	0.000
					C	0.000	30.876		48.58	0.000	0.000
T3	130.00	1.48	34	204.284	A	0.000	115.854	18.577	16.03	0.000	0.000
140.00-120.00					B	0.000	75.994		24.44	0.000	0.000
					C	0.000	36.894		50.35	0.000	0.000
T4	110.00	1.411	33	248.257	A	0.000	132.140	22.125	16.74	0.000	0.000
120.00-100.00					B	0.000	81.962		26.99	0.000	0.000
					C	0.000	46.152		47.94	0.000	0.000
T5	90.00	1.332	31	297.001	A	0.000	140.177	28.819	20.56	0.000	0.000
100.00-80.00					B	0.000	89.236		32.30	0.000	0.000
					C	0.000	52.880		54.50	0.000	0.000
T6 80.00-60.00	70.00	1.24	29	349.552	A	0.000	150.274	35.927	23.91	0.000	0.000
					B	0.000	99.317		36.17	0.000	0.000
					C	0.000	62.950		57.07	0.000	0.000
T7 60.00-40.00	50.00	1.126	26	401.056	A	0.000	152.880	35.938	23.51	0.000	0.000
					B	0.000	101.742		35.32	0.000	0.000
					C	0.000	65.246		55.08	0.000	0.000
T8 40.00-20.00	30.00	1	23	455.891	A	0.000	165.382	42.611	25.76	0.000	0.000
					B	0.000	114.709		37.15	0.000	0.000
					C	0.000	78.545		54.25	0.000	0.000
T9 20.00-0.00	10.00	1	23	505.891	A	0.000	76.126	42.611	55.97	0.000	0.000
					B	0.000	76.126		55.97	0.000	0.000
					C	0.000	76.126		55.97	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.597	28	0.5000	179.200	A	0.000	62.677	15.000	23.93	0.000	0.000
						B	0.000	33.935		44.20	0.000	0.000
						C	0.000	33.935		44.20	0.000	0.000
T2 160.00-140.00	150.00	1.541	27	0.5000	182.567	A	0.000	135.244	18.333	13.56	0.000	0.000
						B	0.000	89.044		20.59	0.000	0.000
						C	0.000	40.093		45.73	0.000	0.000
T3 140.00-120.00	130.00	1.48	26	0.5000	205.953	A	0.000	165.484	21.916	13.24	0.000	0.000
						B	0.000	103.096		21.26	0.000	0.000
						C	0.000	47.728		45.92	0.000	0.000
T4 120.00-100.00	110.00	1.411	24	0.5000	249.927	A	0.000	188.194	25.465	13.53	0.000	0.000
						B	0.000	110.180		23.11	0.000	0.000
						C	0.000	60.813		41.87	0.000	0.000
T5 100.00-80.00	90.00	1.332	23	0.5000	298.671	A	0.000	197.357	32.160	16.30	0.000	0.000
						B	0.000	117.354		27.40	0.000	0.000
						C	0.000	66.730		48.19	0.000	0.000
T6 80.00-60.00	70.00	1.24	21	0.5000	351.222	A	0.000	208.274	39.269	18.85	0.000	0.000
						B	0.000	128.133		30.65	0.000	0.000
						C	0.000	77.420		50.72	0.000	0.000
T7 60.00-40.00	50.00	1.126	20	0.5000	402.726	A	0.000	211.927	39.281	18.54	0.000	0.000
						B	0.000	131.413		29.89	0.000	0.000
						C	0.000	80.465		48.82	0.000	0.000
T8 40.00-20.00	30.00	1	17	0.5000	457.561	A	0.000	224.765	45.953	20.44	0.000	0.000
						B	0.000	144.941		31.70	0.000	0.000
						C	0.000	94.429		48.66	0.000	0.000
T9 20.00-0.00	10.00	1	17	0.5000	507.561	A	0.000	88.317	45.953	52.03	0.000	0.000
						B	0.000	88.317		52.03	0.000	0.000
						C	0.000	88.317		52.03	0.000	0.000

Tower Pressure - Service

$G_H = 1.121$

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 180.00-160.00	170.00	1.597	10	177.533	A	0.000	42.770	11.667	27.28	0.000	0.000
					B	0.000	24.700		47.23	0.000	0.000
					C	0.000	24.700		47.23	0.000	0.000
T2 160.00-140.00	150.00	1.541	10	180.900	A	0.000	94.781	15.000	15.83	0.000	0.000
					B	0.000	65.164		23.02	0.000	0.000
					C	0.000	30.876		48.58	0.000	0.000
T3 140.00-120.00	130.00	1.48	9	204.284	A	0.000	115.854	18.577	16.03	0.000	0.000
					B	0.000	75.994		24.44	0.000	0.000
					C	0.000	36.894		50.35	0.000	0.000
T4 120.00-100.00	110.00	1.411	9	248.257	A	0.000	132.140	22.125	16.74	0.000	0.000
					B	0.000	81.962		26.99	0.000	0.000
					C	0.000	46.152		47.94	0.000	0.000
T5 100.00-80.00	90.00	1.332	9	297.001	A	0.000	140.177	28.819	20.56	0.000	0.000
					B	0.000	89.236		32.30	0.000	0.000
					C	0.000	52.880		54.50	0.000	0.000
T6 80.00-60.00	70.00	1.24	8	349.552	A	0.000	150.274	35.927	23.91	0.000	0.000
					B	0.000	99.317		36.17	0.000	0.000
					C	0.000	62.950		57.07	0.000	0.000
T7 60.00-40.00	50.00	1.126	7	401.056	A	0.000	152.880	35.938	23.51	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					B	0.000	101.742		35.32	0.000	0.000
					C	0.000	65.246		55.08	0.000	0.000
T8 40.00-20.00	30.00	1	6	455.891	A	0.000	165.382	42.611	25.76	0.000	0.000
					B	0.000	114.709		37.15	0.000	0.000
					C	0.000	78.545		54.25	0.000	0.000
T9 20.00-0.00	10.00	1	6	505.891	A	0.000	76.126	42.611	55.97	0.000	0.000
					B	0.000	76.126		55.97	0.000	0.000
					C	0.000	76.126		55.97	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	1	1	25.645	2.62	130.75	A
180.00-160.00			B	0.139	2.812	0.58	1	1	14.323			
			C	0.139	2.812	0.58	1	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	1	1	67.295	5.02	251.25	A
160.00-140.00			B	0.36	2.148	0.636	1	1	41.456			
			C	0.171	2.697	0.585	1	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	1	1	85.040	5.96	297.82	A
140.00-120.00			B	0.372	2.122	0.641	1	1	48.680			
			C	0.181	2.662	0.587	1	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	1	1	94.413	6.42	321.01	A
120.00-100.00			B	0.33	2.219	0.626	1	1	51.275			
			C	0.186	2.644	0.588	1	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	1	1	95.826	6.41	320.47	A
100.00-80.00			B	0.3	2.295	0.616	1	1	54.973			
			C	0.178	2.671	0.586	1	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	1	1	99.821	6.43	321.71	A
80.00-60.00			B	0.284	2.339	0.611	1	1	60.700			
			C	0.18	2.664	0.587	1	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	1	1	98.471	6.04	301.86	A
60.00-40.00			B	0.254	2.426	0.603	1	1	61.332			
			C	0.163	2.725	0.583	1	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	1	1	105.367	5.85	292.30	A
40.00-20.00			B	0.252	2.433	0.602	1	1	69.088			
			C	0.172	2.691	0.585	1	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	1	1	44.271	3.18	158.77	C
			B	0.15	2.77	0.582	1	1	44.271			
			C	0.15	2.77	0.582	1	1	44.271			
Sum Weight:	8.11	40.16						OTM	4215.10 kip-ft	47.92		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	0.825	1	25.645	2.62	130.75	A
180.00-160.00			B	0.139	2.812	0.58	0.825	1	14.323			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.139	2.812	0.58	0.825	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	0.825	1	67.295	5.02	251.25	A
160.00-140.00			B	0.36	2.148	0.636	0.825	1	41.456			
			C	0.171	2.697	0.585	0.825	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	0.825	1	85.040	5.96	297.82	A
140.00-120.00			B	0.372	2.122	0.641	0.825	1	48.680			
			C	0.181	2.662	0.587	0.825	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	0.825	1	94.413	6.42	321.01	A
120.00-100.00			B	0.33	2.219	0.626	0.825	1	51.275			
			C	0.186	2.644	0.588	0.825	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	0.825	1	95.826	6.41	320.47	A
100.00-80.00			B	0.3	2.295	0.616	0.825	1	54.973			
			C	0.178	2.671	0.586	0.825	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	0.825	1	99.821	6.43	321.71	A
80.00-60.00			B	0.284	2.339	0.611	0.825	1	60.700			
			C	0.18	2.664	0.587	0.825	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	0.825	1	98.471	6.04	301.86	A
60.00-40.00			B	0.254	2.426	0.603	0.825	1	61.332			
			C	0.163	2.725	0.583	0.825	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	0.825	1	105.367	5.85	292.30	A
40.00-20.00			B	0.252	2.433	0.602	0.825	1	69.088			
			C	0.172	2.691	0.585	0.825	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	0.825	1	44.271	3.18	158.77	C
			B	0.15	2.77	0.582	0.825	1	44.271			
			C	0.15	2.77	0.582	0.825	1	44.271			
Sum Weight:	8.11	40.16						OTM	4215.10 kip-ft	47.92		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	0.8	1	25.645	2.62	130.75	A
180.00-160.00			B	0.139	2.812	0.58	0.8	1	14.323			
			C	0.139	2.812	0.58	0.8	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	0.8	1	67.295	5.02	251.25	A
160.00-140.00			B	0.36	2.148	0.636	0.8	1	41.456			
			C	0.171	2.697	0.585	0.8	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	0.8	1	85.040	5.96	297.82	A
140.00-120.00			B	0.372	2.122	0.641	0.8	1	48.680			
			C	0.181	2.662	0.587	0.8	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	0.8	1	94.413	6.42	321.01	A
120.00-100.00			B	0.33	2.219	0.626	0.8	1	51.275			
			C	0.186	2.644	0.588	0.8	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	0.8	1	95.826	6.41	320.47	A
100.00-80.00			B	0.3	2.295	0.616	0.8	1	54.973			
			C	0.178	2.671	0.586	0.8	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	0.8	1	99.821	6.43	321.71	A
80.00-60.00			B	0.284	2.339	0.611	0.8	1	60.700			
			C	0.18	2.664	0.587	0.8	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	0.8	1	98.471	6.04	301.86	A
60.00-40.00			B	0.254	2.426	0.603	0.8	1	61.332			
			C	0.163	2.725	0.583	0.8	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	0.8	1	105.367	5.85	292.30	A

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
40.00-20.00			B	0.252	2.433	0.602	0.8	1	69.088			
			C	0.172	2.691	0.585	0.8	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	0.8	1	44.271	3.18	158.77	C
			B	0.15	2.77	0.582	0.8	1	44.271			
			C	0.15	2.77	0.582	0.8	1	44.271			
Sum Weight:	8.11	40.16						OTM	4215.10 kip-ft	47.92		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	0.85	1	25.645	2.62	130.75	A
180.00-160.00			B	0.139	2.812	0.58	0.85	1	14.323			
			C	0.139	2.812	0.58	0.85	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	0.85	1	67.295	5.02	251.25	A
160.00-140.00			B	0.36	2.148	0.636	0.85	1	41.456			
			C	0.171	2.697	0.585	0.85	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	0.85	1	85.040	5.96	297.82	A
140.00-120.00			B	0.372	2.122	0.641	0.85	1	48.680			
			C	0.181	2.662	0.587	0.85	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	0.85	1	94.413	6.42	321.01	A
120.00-100.00			B	0.33	2.219	0.626	0.85	1	51.275			
			C	0.186	2.644	0.588	0.85	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	0.85	1	95.826	6.41	320.47	A
100.00-80.00			B	0.3	2.295	0.616	0.85	1	54.973			
			C	0.178	2.671	0.586	0.85	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	0.85	1	99.821	6.43	321.71	A
80.00-60.00			B	0.284	2.339	0.611	0.85	1	60.700			
			C	0.18	2.664	0.587	0.85	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	0.85	1	98.471	6.04	301.86	A
60.00-40.00			B	0.254	2.426	0.603	0.85	1	61.332			
			C	0.163	2.725	0.583	0.85	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	0.85	1	105.367	5.85	292.30	A
40.00-20.00			B	0.252	2.433	0.602	0.85	1	69.088			
			C	0.172	2.691	0.585	0.85	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	0.85	1	44.271	3.18	158.77	C
			B	0.15	2.77	0.582	0.85	1	44.271			
			C	0.15	2.77	0.582	0.85	1	44.271			
Sum Weight:	8.11	40.16						OTM	4215.10 kip-ft	47.92		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.40	1.84	A	0.35	2.172	0.632	1	1	39.636	2.67	133.55	A

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
180.00-160.00			B	0.189	2.632	0.588	1	1	19.964			
			C	0.189	2.632	0.588	1	1	19.964			
T2	1.84	2.52	A	0.741	1.784	0.85	1	1	114.941	6.14	306.94	A
160.00-140.00			B	0.488	1.916	0.691	1	1	61.558			
			C	0.22	2.532	0.595	1	1	23.839			
T3	2.49	3.27	A	0.804	1.819	0.899	1	1	148.813	7.78	388.85	A
140.00-120.00			B	0.501	1.899	0.698	1	1	71.940			
			C	0.232	2.493	0.597	1	1	28.512			
T4	2.92	4.01	A	0.753	1.789	0.859	1	1	161.691	7.92	396.19	A
120.00-100.00			B	0.441	1.989	0.669	1	1	73.723			
			C	0.243	2.458	0.6	1	1	36.500			
T5	2.92	5.54	A	0.661	1.779	0.793	1	1	156.442	7.20	359.97	A
100.00-80.00			B	0.393	2.078	0.649	1	1	76.132			
			C	0.223	2.52	0.595	1	1	39.735			
T6	2.92	6.73	A	0.593	1.809	0.749	1	1	156.068	6.80	339.80	A
80.00-60.00			B	0.365	2.138	0.638	1	1	81.733			
			C	0.22	2.529	0.595	1	1	46.048			
T7	2.92	7.09	A	0.526	1.868	0.711	1	1	150.729	6.16	307.94	A
60.00-40.00			B	0.326	2.228	0.624	1	1	82.042			
			C	0.2	2.597	0.59	1	1	47.503			
T8	2.92	9.00	A	0.491	1.912	0.693	1	1	155.777	5.78	289.19	A
40.00-20.00			B	0.317	2.252	0.621	1	1	90.033			
			C	0.206	2.575	0.592	1	1	55.876			
T9 20.00-0.00	0.00	9.40	A	0.174	2.685	0.585	1	1	51.704	2.70	134.82	C
			B	0.174	2.685	0.585	1	1	51.704			
			C	0.174	2.685	0.585	1	1	51.704			
Sum Weight:	19.33	49.38						OTM	4889.58 kip-ft	53.14		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.40	1.84	A	0.35	2.172	0.632	0.825	1	39.636	2.67	133.55	A
180.00-160.00			B	0.189	2.632	0.588	0.825	1	19.964			
			C	0.189	2.632	0.588	0.825	1	19.964			
T2	1.84	2.52	A	0.741	1.784	0.85	0.825	1	114.941	6.14	306.94	A
160.00-140.00			B	0.488	1.916	0.691	0.825	1	61.558			
			C	0.22	2.532	0.595	0.825	1	23.839			
T3	2.49	3.27	A	0.804	1.819	0.899	0.825	1	148.813	7.78	388.85	A
140.00-120.00			B	0.501	1.899	0.698	0.825	1	71.940			
			C	0.232	2.493	0.597	0.825	1	28.512			
T4	2.92	4.01	A	0.753	1.789	0.859	0.825	1	161.691	7.92	396.19	A
120.00-100.00			B	0.441	1.989	0.669	0.825	1	73.723			
			C	0.243	2.458	0.6	0.825	1	36.500			
T5	2.92	5.54	A	0.661	1.779	0.793	0.825	1	156.442	7.20	359.97	A
100.00-80.00			B	0.393	2.078	0.649	0.825	1	76.132			
			C	0.223	2.52	0.595	0.825	1	39.735			
T6	2.92	6.73	A	0.593	1.809	0.749	0.825	1	156.068	6.80	339.80	A
80.00-60.00			B	0.365	2.138	0.638	0.825	1	81.733			
			C	0.22	2.529	0.595	0.825	1	46.048			
T7	2.92	7.09	A	0.526	1.868	0.711	0.825	1	150.729	6.16	307.94	A
60.00-40.00			B	0.326	2.228	0.624	0.825	1	82.042			
			C	0.2	2.597	0.59	0.825	1	47.503			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T8	2.92	9.00	A	0.491	1.912	0.693	0.825	1	155.777	5.78	289.19	A
40.00-20.00			B	0.317	2.252	0.621	0.825	1	90.033			
			C	0.206	2.575	0.592	0.825	1	55.876			
T9 20.00-0.00	0.00	9.40	A	0.174	2.685	0.585	0.825	1	51.704	2.70	134.82	C
			B	0.174	2.685	0.585	0.825	1	51.704			
			C	0.174	2.685	0.585	0.825	1	51.704			
Sum Weight:	19.33	49.38						OTM	4889.58 kip-ft	53.14		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.40	1.84	A	0.35	2.172	0.632	0.8	1	39.636	2.67	133.55	A
180.00-160.00			B	0.189	2.632	0.588	0.8	1	19.964			
			C	0.189	2.632	0.588	0.8	1	19.964			
T2	1.84	2.52	A	0.741	1.784	0.85	0.8	1	114.941	6.14	306.94	A
160.00-140.00			B	0.488	1.916	0.691	0.8	1	61.558			
			C	0.22	2.532	0.595	0.8	1	23.839			
T3	2.49	3.27	A	0.804	1.819	0.899	0.8	1	148.813	7.78	388.85	A
140.00-120.00			B	0.501	1.899	0.698	0.8	1	71.940			
			C	0.232	2.493	0.597	0.8	1	28.512			
T4	2.92	4.01	A	0.753	1.789	0.859	0.8	1	161.691	7.92	396.19	A
120.00-100.00			B	0.441	1.989	0.669	0.8	1	73.723			
			C	0.243	2.458	0.6	0.8	1	36.500			
T5	2.92	5.54	A	0.661	1.779	0.793	0.8	1	156.442	7.20	359.97	A
100.00-80.00			B	0.393	2.078	0.649	0.8	1	76.132			
			C	0.223	2.52	0.595	0.8	1	39.735			
T6	2.92	6.73	A	0.593	1.809	0.749	0.8	1	156.068	6.80	339.80	A
80.00-60.00			B	0.365	2.138	0.638	0.8	1	81.733			
			C	0.22	2.529	0.595	0.8	1	46.048			
T7	2.92	7.09	A	0.526	1.868	0.711	0.8	1	150.729	6.16	307.94	A
60.00-40.00			B	0.326	2.228	0.624	0.8	1	82.042			
			C	0.2	2.597	0.59	0.8	1	47.503			
T8	2.92	9.00	A	0.491	1.912	0.693	0.8	1	155.777	5.78	289.19	A
40.00-20.00			B	0.317	2.252	0.621	0.8	1	90.033			
			C	0.206	2.575	0.592	0.8	1	55.876			
T9 20.00-0.00	0.00	9.40	A	0.174	2.685	0.585	0.8	1	51.704	2.70	134.82	C
			B	0.174	2.685	0.585	0.8	1	51.704			
			C	0.174	2.685	0.585	0.8	1	51.704			
Sum Weight:	19.33	49.38						OTM	4889.58 kip-ft	53.14		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.40	1.84	A	0.35	2.172	0.632	0.85	1	39.636	2.67	133.55	A
180.00-160.00			B	0.189	2.632	0.588	0.85	1	19.964			
			C	0.189	2.632	0.588	0.85	1	19.964			
T2	1.84	2.52	A	0.741	1.784	0.85	0.85	1	114.941	6.14	306.94	A
160.00-140.00			B	0.488	1.916	0.691	0.85	1	61.558			
			C	0.22	2.532	0.595	0.85	1	23.839			
T3	2.49	3.27	A	0.804	1.819	0.899	0.85	1	148.813	7.78	388.85	A
140.00-120.00			B	0.501	1.899	0.698	0.85	1	71.940			
			C	0.232	2.493	0.597	0.85	1	28.512			
T4	2.92	4.01	A	0.753	1.789	0.859	0.85	1	161.691	7.92	396.19	A
120.00-100.00			B	0.441	1.989	0.669	0.85	1	73.723			
			C	0.243	2.458	0.6	0.85	1	36.500			
T5	2.92	5.54	A	0.661	1.779	0.793	0.85	1	156.442	7.20	359.97	A
100.00-80.00			B	0.393	2.078	0.649	0.85	1	76.132			
			C	0.223	2.52	0.595	0.85	1	39.735			
T6	2.92	6.73	A	0.593	1.809	0.749	0.85	1	156.068	6.80	339.80	A
80.00-60.00			B	0.365	2.138	0.638	0.85	1	81.733			
			C	0.22	2.529	0.595	0.85	1	46.048			
T7	2.92	7.09	A	0.526	1.868	0.711	0.85	1	150.729	6.16	307.94	A
60.00-40.00			B	0.326	2.228	0.624	0.85	1	82.042			
			C	0.2	2.597	0.59	0.85	1	47.503			
T8	2.92	9.00	A	0.491	1.912	0.693	0.85	1	155.777	5.78	289.19	A
40.00-20.00			B	0.317	2.252	0.621	0.85	1	90.033			
			C	0.206	2.575	0.592	0.85	1	55.876			
T9 20.00-0.00	0.00	9.40	A	0.174	2.685	0.585	0.85	1	51.704	2.70	134.82	C
			B	0.174	2.685	0.585	0.85	1	51.704			
			C	0.174	2.685	0.585	0.85	1	51.704			
Sum Weight:	19.33	49.38						OTM	4889.58 kip-ft	53.14		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	1	1	25.645	0.72	36.22	A
180.00-160.00			B	0.139	2.812	0.58	1	1	14.323			
			C	0.139	2.812	0.58	1	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	1	1	67.295	1.39	69.60	A
160.00-140.00			B	0.36	2.148	0.636	1	1	41.456			
			C	0.171	2.697	0.585	1	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	1	1	85.040	1.65	82.50	A
140.00-120.00			B	0.372	2.122	0.641	1	1	48.680			
			C	0.181	2.662	0.587	1	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	1	1	94.413	1.78	88.92	A
120.00-100.00			B	0.33	2.219	0.626	1	1	51.275			
			C	0.186	2.644	0.588	1	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	1	1	95.826	1.78	88.77	A
100.00-80.00			B	0.3	2.295	0.616	1	1	54.973			
			C	0.178	2.671	0.586	1	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	1	1	99.821	1.78	89.12	A
80.00-60.00			B	0.284	2.339	0.611	1	1	60.700			
			C	0.18	2.664	0.587	1	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	1	1	98.471	1.67	83.62	A
60.00-40.00			B	0.254	2.426	0.603	1	1	61.332			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.163	2.725	0.583	1	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	1	1	105.367	1.62	80.97	A
40.00-20.00			B	0.252	2.433	0.602	1	1	69.088			
			C	0.172	2.691	0.585	1	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	1	1	44.271	0.88	43.98	C
			B	0.15	2.77	0.582	1	1	44.271			
			C	0.15	2.77	0.582	1	1	44.271			
Sum Weight:	8.11	40.16						OTM	1167.62 kip-ft	13.27		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	0.825	1	25.645	0.72	36.22	A
180.00-160.00			B	0.139	2.812	0.58	0.825	1	14.323			
			C	0.139	2.812	0.58	0.825	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	0.825	1	67.295	1.39	69.60	A
160.00-140.00			B	0.36	2.148	0.636	0.825	1	41.456			
			C	0.171	2.697	0.585	0.825	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	0.825	1	85.040	1.65	82.50	A
140.00-120.00			B	0.372	2.122	0.641	0.825	1	48.680			
			C	0.181	2.662	0.587	0.825	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	0.825	1	94.413	1.78	88.92	A
120.00-100.00			B	0.33	2.219	0.626	0.825	1	51.275			
			C	0.186	2.644	0.588	0.825	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	0.825	1	95.826	1.78	88.77	A
100.00-80.00			B	0.3	2.295	0.616	0.825	1	54.973			
			C	0.178	2.671	0.586	0.825	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	0.825	1	99.821	1.78	89.12	A
80.00-60.00			B	0.284	2.339	0.611	0.825	1	60.700			
			C	0.18	2.664	0.587	0.825	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	0.825	1	98.471	1.67	83.62	A
60.00-40.00			B	0.254	2.426	0.603	0.825	1	61.332			
			C	0.163	2.725	0.583	0.825	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	0.825	1	105.367	1.62	80.97	A
40.00-20.00			B	0.252	2.433	0.602	0.825	1	69.088			
			C	0.172	2.691	0.585	0.825	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	0.825	1	44.271	0.88	43.98	C
			B	0.15	2.77	0.582	0.825	1	44.271			
			C	0.15	2.77	0.582	0.825	1	44.271			
Sum Weight:	8.11	40.16						OTM	1167.62 kip-ft	13.27		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	0.8	1	25.645	0.72	36.22	A
180.00-160.00			B	0.139	2.812	0.58	0.8	1	14.323			
			C	0.139	2.812	0.58	0.8	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	0.8	1	67.295	1.39	69.60	A
160.00-140.00			B	0.36	2.148	0.636	0.8	1	41.456			
			C	0.171	2.697	0.585	0.8	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	0.8	1	85.040	1.65	82.50	A
140.00-120.00			B	0.372	2.122	0.641	0.8	1	48.680			
			C	0.181	2.662	0.587	0.8	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	0.8	1	94.413	1.78	88.92	A
120.00-100.00			B	0.33	2.219	0.626	0.8	1	51.275			
			C	0.186	2.644	0.588	0.8	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	0.8	1	95.826	1.78	88.77	A
100.00-80.00			B	0.3	2.295	0.616	0.8	1	54.973			
			C	0.178	2.671	0.586	0.8	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	0.8	1	99.821	1.78	89.12	A
80.00-60.00			B	0.284	2.339	0.611	0.8	1	60.700			
			C	0.18	2.664	0.587	0.8	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	0.8	1	98.471	1.67	83.62	A
60.00-40.00			B	0.254	2.426	0.603	0.8	1	61.332			
			C	0.163	2.725	0.583	0.8	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	0.8	1	105.367	1.62	80.97	A
40.00-20.00			B	0.252	2.433	0.602	0.8	1	69.088			
			C	0.172	2.691	0.585	0.8	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	0.8	1	44.271	0.88	43.98	C
			B	0.15	2.77	0.582	0.8	1	44.271			
			C	0.15	2.77	0.582	0.8	1	44.271			
Sum Weight:	8.11	40.16						OTM	1167.62 kip-ft	13.27		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.25	A	0.241	2.465	0.6	0.85	1	25.645	0.72	36.22	A
180.00-160.00			B	0.139	2.812	0.58	0.85	1	14.323			
			C	0.139	2.812	0.58	0.85	1	14.323			
T2	0.77	1.83	A	0.524	1.871	0.71	0.85	1	67.295	1.39	69.60	A
160.00-140.00			B	0.36	2.148	0.636	0.85	1	41.456			
			C	0.171	2.697	0.585	0.85	1	18.058			
T3	1.05	2.50	A	0.567	1.828	0.734	0.85	1	85.040	1.65	82.50	A
140.00-120.00			B	0.372	2.122	0.641	0.85	1	48.680			
			C	0.181	2.662	0.587	0.85	1	21.644			
T4	1.23	3.13	A	0.532	1.862	0.714	0.85	1	94.413	1.78	88.92	A
120.00-100.00			B	0.33	2.219	0.626	0.85	1	51.275			
			C	0.186	2.644	0.588	0.85	1	27.120			
T5	1.23	4.62	A	0.472	1.939	0.684	0.85	1	95.826	1.78	88.77	A
100.00-80.00			B	0.3	2.295	0.616	0.85	1	54.973			
			C	0.178	2.671	0.586	0.85	1	30.997			
T6	1.23	5.62	A	0.43	2.008	0.664	0.85	1	99.821	1.78	89.12	A
80.00-60.00			B	0.284	2.339	0.611	0.85	1	60.700			
			C	0.18	2.664	0.587	0.85	1	36.922			
T7	1.23	5.88	A	0.381	2.102	0.644	0.85	1	98.471	1.67	83.62	A
60.00-40.00			B	0.254	2.426	0.603	0.85	1	61.332			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	0.163	2.725	0.583	0.85	1	38.071			
T8	1.23	7.52	A	0.363	2.142	0.637	0.85	1	105.367	1.62	80.97	A
40.00-20.00			B	0.252	2.433	0.602	0.85	1	69.088			
			C	0.172	2.691	0.585	0.85	1	45.960			
T9 20.00-0.00	0.00	7.82	A	0.15	2.77	0.582	0.85	1	44.271	0.88	43.98	C
			B	0.15	2.77	0.582	0.85	1	44.271			
			C	0.15	2.77	0.582	0.85	1	44.271			
Sum Weight:	8.11	40.16						OTM	1167.62 kip-ft	13.27		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	21.15					
Bracing Weight	19.01					
Total Member Self-Weight	40.16			-50.26	14.12	
Total Weight	57.52			-50.26	14.12	
Wind 0 deg - No Ice		-0.04	-66.64	-7087.95	18.89	-20.14
Wind 30 deg - No Ice		33.26	-57.69	-6142.69	-3497.84	-68.44
Wind 45 deg - No Ice		47.06	-47.09	-5023.28	-4955.01	-86.37
Wind 60 deg - No Ice		57.65	-33.29	-3564.97	-6073.54	-98.41
Wind 90 deg - No Ice		66.59	0.04	-45.49	-7018.06	-102.00
Wind 120 deg - No Ice		57.69	33.35	3472.71	-6078.31	-78.27
Wind 135 deg - No Ice		47.12	47.15	4929.50	-4961.75	-57.89
Wind 150 deg - No Ice		33.33	57.73	6046.93	-3506.10	-33.56
Wind 180 deg - No Ice		0.04	66.64	6987.42	9.35	20.14
Wind 210 deg - No Ice		-33.26	57.69	6042.17	3526.08	68.44
Wind 225 deg - No Ice		-47.06	47.09	4922.76	4983.25	86.37
Wind 240 deg - No Ice		-57.65	33.29	3464.45	6101.78	98.41
Wind 270 deg - No Ice		-66.59	-0.04	-55.03	7046.30	102.00
Wind 300 deg - No Ice		-57.69	-33.35	-3573.23	6106.55	78.27
Wind 315 deg - No Ice		-47.12	-47.15	-5030.03	4989.99	57.89
Wind 330 deg - No Ice		-33.33	-57.73	-6147.46	3534.34	33.56
Member Ice	9.22					
Total Weight Ice	81.65			-84.28	28.39	
Wind 0 deg - Ice		-0.03	-70.05	-7535.52	32.11	-23.92
Wind 30 deg - Ice		34.98	-60.65	-6535.38	-3691.86	-77.10
Wind 45 deg - Ice		49.48	-49.51	-5350.47	-5234.77	-96.65
Wind 60 deg - Ice		60.62	-35.00	-3806.68	-6418.99	-109.61
Wind 90 deg - Ice		70.01	0.03	-80.56	-7418.55	-112.76
Wind 120 deg - Ice		60.65	35.05	3644.56	-6422.71	-85.69
Wind 135 deg - Ice		49.53	49.55	5187.17	-5240.02	-62.82
Wind 150 deg - Ice		35.03	60.68	6370.54	-3698.30	-35.66
Wind 180 deg - Ice		0.03	70.05	7366.96	24.68	23.92
Wind 210 deg - Ice		-34.98	60.65	6366.83	3748.65	77.10
Wind 225 deg - Ice		-49.48	49.51	5181.92	5291.55	96.65
Wind 240 deg - Ice		-60.62	35.00	3638.13	6475.78	109.61
Wind 270 deg - Ice		-70.01	-0.03	-87.99	7475.34	112.76
Wind 300 deg - Ice		-60.65	-35.05	-3813.11	6479.50	85.69
Wind 315 deg - Ice		-49.53	-49.55	-5355.73	5296.81	62.82
Wind 330 deg - Ice		-35.03	-60.68	-6539.10	3755.09	35.66
Total Weight	57.52			-50.26	14.12	
Wind 0 deg - Service		-0.01	-18.46	-1981.10	6.54	-5.58

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 30 deg - Service		9.21	-15.98	-1719.25	-967.62	-18.96
Wind 45 deg - Service		13.04	-13.05	-1409.17	-1371.27	-23.92
Wind 60 deg - Service		15.97	-9.22	-1005.20	-1681.11	-27.26
Wind 90 deg - Service		18.45	0.01	-30.28	-1942.75	-28.26
Wind 120 deg - Service		15.98	9.24	944.29	-1682.43	-21.68
Wind 135 deg - Service		13.05	13.06	1347.84	-1373.14	-16.03
Wind 150 deg - Service		9.23	15.99	1657.37	-969.91	-9.30
Wind 180 deg - Service		0.01	18.46	1917.90	3.90	5.58
Wind 210 deg - Service		-9.21	15.98	1656.05	978.06	18.96
Wind 225 deg - Service		-13.04	13.05	1345.97	1381.71	23.92
Wind 240 deg - Service		-15.97	9.22	942.00	1691.55	27.26
Wind 270 deg - Service		-18.45	-0.01	-32.92	1953.19	28.26
Wind 300 deg - Service		-15.98	-9.24	-1007.49	1692.87	21.68
Wind 315 deg - Service		-13.05	-13.06	-1411.04	1383.58	16.03
Wind 330 deg - Service		-9.23	-15.99	-1720.57	980.35	9.30

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

Comb. No.	Description
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	32	5.51	-0.17	-0.23
			Max. Compression	19	-8.44	1.26	0.03
			Max. Mx	5	4.30	-1.40	0.80
			Max. My	14	-1.76	-0.00	-2.30
			Max. Vy	10	0.76	-1.40	-0.03
			Max. Vx	14	1.24	-0.00	-2.30
		Diagonal	Max Tension	20	3.99	0.00	0.00
			Max. Compression	20	-4.09	0.00	0.00
			Max. Mx	34	2.99	0.02	0.00
			Max. My	22	-0.23	0.00	0.00
			Max. Vy	34	0.01	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
		Horizontal	Max Tension	21	2.23	-0.01	0.00
			Max. Compression	29	-2.17	0.00	0.00
			Max. Mx	32	0.09	-0.02	-0.00
			Max. My	32	-0.22	-0.02	-0.00
			Max. Vy	32	-0.01	-0.02	-0.00
			Max. Vx	32	0.00	-0.02	-0.00
		Top Girt	Max Tension	27	0.80	-0.01	0.00
			Max. Compression	19	-0.80	-0.01	-0.00
			Max. Mx	32	-0.28	-0.01	-0.00
			Max. My	27	-0.23	-0.01	-0.00
			Max. Vy	32	-0.01	-0.01	-0.00
			Max. Vx	19	-0.00	-0.01	0.00
		Inner Bracing	Max Tension	19	0.01	0.00	0.00
			Max. Compression	19	-0.01	0.00	0.00
			Max. Mx	18	-0.00	-0.01	0.00
			Max. My	19	0.00	0.00	-0.00
			Max. Vy	18	0.01	0.00	0.00
			Max. Vx	19	0.00	0.00	0.00
T2	160 - 140	Leg	Max Tension	15	33.32	-0.69	-0.25
			Max. Compression	19	-41.71	0.62	0.18
			Max. Mx	10	8.54	1.80	-0.03
			Max. My	6	-1.90	0.00	-3.15
			Max. Vy	10	-1.09	-1.40	-0.03
			Max. Vx	6	1.87	0.00	2.29
		Diagonal	Max Tension	21	13.12	0.00	0.00
			Max. Compression	21	-13.25	0.00	0.00
			Max. Mx	34	11.42	0.03	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	22	-2.67	0.00	0.00
			Max. Vy	34	-0.02	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
		Horizontal	Max Tension	21	7.31	-0.01	0.00
			Max. Compression	29	-7.24	-0.03	-0.00
			Max. Mx	32	0.43	-0.05	-0.02
			Max. My	5	-2.84	-0.03	-0.02
			Max. Vy	32	-0.02	-0.05	-0.02
			Max. Vx	5	0.00	-0.03	-0.02
		Top Girt	Max Tension	5	5.35	-0.01	0.01
			Max. Compression	13	-5.30	-0.02	-0.01
			Max. Mx	32	-2.14	-0.03	-0.01
			Max. My	5	-2.59	-0.02	-0.02
			Max. Vy	32	-0.02	-0.03	-0.01
			Max. Vx	15	0.00	-0.02	-0.02
		Inner Bracing	Max Tension	13	0.09	0.00	0.00
			Max. Compression	13	-0.09	0.00	0.00
			Max. Mx	18	-0.00	-0.01	0.00
			Max. My	32	-0.01	0.00	0.00
			Max. Vy	18	-0.01	0.00	0.00
			Max. Vx	32	-0.00	0.00	0.00
T3	140 - 120	Leg	Max Tension	15	76.10	-0.38	0.00
			Max. Compression	19	-91.97	0.54	0.01
			Max. Mx	10	40.34	1.63	0.06
			Max. My	6	-8.99	-0.08	-2.47
			Max. Vy	10	1.69	-1.16	0.06
			Max. Vx	14	2.40	-0.06	-1.49
		Diagonal	Max Tension	29	16.56	0.00	0.00
			Max. Compression	29	-16.72	0.00	0.00
			Max. Mx	34	14.16	0.05	0.00
			Max. My	22	-4.70	0.00	0.00
			Max. Vy	34	-0.02	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
		Horizontal	Max Tension	21	10.36	-0.02	0.01
			Max. Compression	29	-10.62	-0.03	-0.01
			Max. Mx	32	0.92	-0.05	-0.02
			Max. My	27	-0.75	-0.04	-0.02
			Max. Vy	32	-0.02	-0.05	-0.02
			Max. Vx	27	0.01	-0.04	-0.02
		Top Girt	Max Tension	22	7.70	-0.01	0.01
			Max. Compression	30	-8.24	-0.03	-0.01
			Max. Mx	32	-3.72	-0.04	-0.02
			Max. My	24	3.21	0.00	0.02
			Max. Vy	32	-0.02	-0.04	-0.02
			Max. Vx	24	-0.00	0.00	0.02
		Inner Bracing	Max Tension	30	0.14	0.00	0.00
			Max. Compression	30	-0.14	0.00	0.00
			Max. Mx	18	-0.00	-0.01	0.00
			Max. My	32	-0.01	0.00	0.00
			Max. Vy	18	0.01	0.00	0.00
			Max. Vx	32	-0.00	0.00	0.00
T4	120 - 100	Leg	Max Tension	15	122.00	-0.40	0.02
			Max. Compression	19	-143.85	1.57	0.10
			Max. Mx	32	121.84	-1.58	-0.44
			Max. My	31	-15.94	0.00	-2.04
			Max. Vy	27	0.25	-1.56	-0.11
			Max. Vx	23	-0.39	0.00	2.03
		Diagonal	Max Tension	29	16.57	0.00	0.00
			Max. Compression	29	-16.74	0.00	0.00
			Max. Mx	34	14.07	0.06	0.00
			Max. My	22	-5.08	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	34	-0.03	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
		Horizontal	Max Tension	29	11.19	0.00	0.00
			Max. Compression	29	-11.41	-0.03	-0.00
			Max. Mx	32	1.39	-0.05	-0.02
			Max. My	27	-1.23	-0.04	-0.02
			Max. Vy	32	-0.02	-0.05	-0.02
			Max. Vx	27	0.00	-0.04	-0.02
		Top Girt	Max Tension	21	10.74	-0.02	0.01
			Max. Compression	29	-11.02	-0.03	-0.01
			Max. Mx	32	-3.32	-0.04	-0.02
			Max. My	27	-0.04	-0.04	-0.02
			Max. Vy	32	-0.02	-0.04	-0.02
			Max. Vx	27	0.00	-0.04	-0.02
		Inner Bracing	Max Tension	29	0.19	0.00	0.00
			Max. Compression	29	-0.19	0.00	0.00
			Max. Mx	18	-0.00	-0.02	0.00
			Max. My	32	-0.01	0.00	0.00
			Max. Vy	18	-0.01	0.00	0.00
			Max. Vx	32	0.00	0.00	0.00
T5	100 - 80	Leg	Max Tension	32	157.64	-1.16	-0.07
			Max. Compression	19	-184.13	1.41	0.04
			Max. Mx	32	137.03	-1.58	-0.44
			Max. My	31	-16.23	0.00	-2.04
			Max. Vy	27	-0.17	-1.56	-0.11
			Max. Vx	23	0.29	-0.00	2.03
		Diagonal	Max Tension	29	19.94	0.00	0.00
			Max. Compression	29	-20.23	0.00	0.00
			Max. Mx	20	18.50	0.15	0.00
			Max. My	22	-5.85	0.00	0.00
			Max. Vy	20	-0.05	0.00	0.00
			Max. Vx	22	0.00	0.00	0.00
		Horizontal	Max Tension	21	11.68	-0.04	0.00
			Max. Compression	29	-12.01	-0.05	-0.00
			Max. Mx	32	1.76	-0.07	-0.02
			Max. My	27	-1.60	-0.07	-0.02
			Max. Vy	32	-0.03	-0.07	-0.02
			Max. Vx	27	0.00	-0.07	-0.02
		Top Girt	Max Tension	21	11.40	-0.03	0.00
			Max. Compression	29	-11.89	-0.05	-0.00
			Max. Mx	32	-3.62	-0.06	-0.02
			Max. My	27	-0.27	-0.06	-0.02
			Max. Vy	32	-0.03	-0.06	-0.02
			Max. Vx	27	0.00	-0.06	-0.02
		Inner Bracing	Max Tension	29	0.21	0.00	0.00
			Max. Compression	29	-0.21	0.00	0.00
			Max. Mx	18	-0.00	-0.02	0.00
			Max. My	32	-0.01	0.00	0.00
			Max. Vy	18	0.01	0.00	0.00
			Max. Vx	32	0.00	0.00	0.00
T6	80 - 60	Leg	Max Tension	32	195.71	-2.05	-0.09
			Max. Compression	19	-228.20	2.21	0.02
			Max. Mx	32	195.35	-2.24	-0.12
			Max. My	31	-19.56	-0.01	-2.18
			Max. Vy	10	0.21	-1.96	-0.02
			Max. Vx	14	0.26	-0.01	-2.11
		Diagonal	Max Tension	29	18.65	0.00	0.00
			Max. Compression	29	-19.03	0.00	0.00
			Max. Mx	20	17.79	0.19	0.00
			Max. My	22	-5.18	0.00	0.00
			Max. Vy	20	-0.06	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	22	-0.00	0.00	0.00
		Horizontal	Max Tension	21	12.29	-0.06	0.01
			Max. Compression	29	-12.57	-0.08	-0.01
			Max. Mx	32	2.16	-0.10	-0.02
			Max. My	27	-2.02	-0.10	-0.02
			Max. Vy	32	-0.05	-0.10	-0.02
			Max. Vx	27	0.00	-0.10	-0.02
		Top Girt	Max Tension	21	11.87	-0.05	0.01
			Max. Compression	29	-12.22	-0.07	-0.01
			Max. Mx	32	-3.34	-0.09	-0.03
			Max. My	27	-0.11	-0.09	-0.03
			Max. Vy	32	-0.04	-0.09	-0.03
			Max. Vx	27	0.00	-0.09	-0.03
		Inner Bracing	Max Tension	29	0.21	0.00	0.00
			Max. Compression	29	-0.21	0.00	0.00
			Max. Mx	18	-0.01	-0.05	0.00
			Max. My	32	-0.01	0.00	0.00
			Max. Vy	18	-0.02	0.00	0.00
			Max. Vx	32	-0.00	0.00	0.00
T7	60 - 40	Leg	Max Tension	32	230.01	-1.86	-0.02
			Max. Compression	19	-268.94	2.47	0.10
			Max. Mx	22	226.97	-2.59	0.49
			Max. My	31	-24.08	-0.06	-3.25
			Max. Vy	10	0.21	-2.45	-0.09
			Max. Vx	6	-0.33	-0.04	3.07
		Diagonal	Max Tension	29	17.69	0.00	0.00
			Max. Compression	29	-18.14	0.00	0.00
			Max. Mx	20	16.69	0.23	0.00
			Max. My	22	-4.74	0.00	0.00
			Max. Vy	20	-0.07	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
		Horizontal	Max Tension	21	12.37	-0.09	0.01
			Max. Compression	29	-12.61	-0.10	-0.01
			Max. Mx	32	2.54	-0.12	-0.02
			Max. My	27	-2.40	-0.12	-0.02
			Max. Vy	32	-0.05	-0.12	-0.02
			Max. Vx	27	0.00	-0.12	-0.02
		Top Girt	Max Tension	21	12.27	-0.07	0.01
			Max. Compression	29	-12.62	-0.09	-0.01
			Max. Mx	32	-3.36	-0.11	-0.02
			Max. My	27	-0.18	-0.11	-0.02
			Max. Vy	32	-0.05	-0.11	-0.02
			Max. Vx	27	0.00	-0.11	-0.02
		Inner Bracing	Max Tension	29	0.22	0.00	0.00
			Max. Compression	29	-0.22	0.00	0.00
			Max. Mx	18	-0.01	-0.07	0.00
			Max. My	32	0.18	0.00	0.00
			Max. Vy	18	0.03	0.00	0.00
			Max. Vx	32	-0.00	0.00	0.00
T8	40 - 20	Leg	Max Tension	32	261.45	-2.83	-0.00
			Max. Compression	19	-307.73	1.64	-0.02
			Max. Mx	32	260.96	-3.58	-0.03
			Max. My	31	-24.85	-0.06	-3.25
			Max. Vy	24	0.21	2.92	-0.08
			Max. Vx	6	0.24	-0.04	3.07
		Diagonal	Max Tension	29	18.10	0.00	0.00
			Max. Compression	29	-18.77	0.00	0.00
			Max. Mx	20	17.52	0.33	0.00
			Max. My	22	-4.51	0.00	0.00
			Max. Vy	20	-0.09	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Horizontal	Max Tension	21	13.82	-0.14	0.01
			Max. Compression	29	-13.74	-0.16	-0.01
			Max. Mx	32	2.91	-0.19	-0.03
			Max. My	27	-2.77	-0.19	-0.03
			Max. Vy	32	-0.07	-0.19	-0.03
			Max. Vx	27	0.00	-0.19	-0.03
		Top Girt	Max Tension	29	13.48	-0.15	-0.01
			Max. Compression	29	-13.53	-0.15	-0.01
			Max. Mx	32	-2.59	-0.18	-0.03
			Max. My	27	0.53	-0.18	-0.03
			Max. Vy	32	-0.07	-0.18	-0.03
			Max. Vx	27	0.00	-0.18	-0.03
		Inner Bracing	Max Tension	29	0.23	0.00	0.00
			Max. Compression	29	-0.23	0.00	0.00
			Max. Mx	18	-0.01	-0.13	0.00
			Max. My	32	0.20	0.00	0.00
			Max. Vy	18	-0.05	0.00	0.00
			Max. Vx	32	-0.00	0.00	0.00
T9	20 - 0	Leg	Max Tension	32	292.06	1.26	-0.01
			Max. Compression	19	-345.16	0.00	-0.00
			Max. Mx	19	-327.02	8.66	-0.01
			Max. My	34	-24.08	4.93	3.43
			Max. Vy	19	0.95	8.66	-0.01
			Max. Vx	17	0.47	-0.10	3.23
		Diagonal	Max Tension	29	17.75	0.00	0.00
			Max. Compression	29	-18.53	0.00	0.00
			Max. Mx	21	17.18	0.39	0.00
			Max. My	30	3.05	0.00	-0.00
			Max. Vy	21	-0.10	0.00	0.00
			Max. Vx	30	-0.00	0.00	0.00
		Horizontal	Max Tension	28	14.69	0.00	0.00
			Max. Compression	29	-13.33	-0.14	-0.01
			Max. Mx	15	2.95	-0.17	-0.03
			Max. My	27	-3.14	-0.16	-0.03
			Max. Vy	32	-0.07	-0.16	-0.03
			Max. Vx	27	0.00	-0.16	-0.03
		Top Girt	Max Tension	21	13.54	-0.16	0.01
			Max. Compression	29	-14.35	-0.18	-0.01
			Max. Mx	32	-3.01	-0.21	-0.03
			Max. My	24	-1.69	-0.13	0.03
			Max. Vy	32	-0.08	-0.21	-0.03
			Max. Vx	30	-0.00	-0.13	0.03
		Inner Bracing	Max Tension	29	0.25	0.00	0.00
			Max. Compression	29	-0.25	0.00	0.00
			Max. Mx	18	-0.01	-0.16	0.00
			Max. My	24	0.23	0.00	-0.00
			Max. Vy	18	-0.05	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	30	356.24	35.79	-23.56
	Max. H_x	30	356.24	35.79	-23.56
	Max. H_z	21	-292.17	-30.90	22.09

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. Vert	22	-303.41	-32.71	21.74
	Min. H_x	22	-303.41	-32.71	21.74
	Min. H_z	29	345.01	34.01	-23.85
Leg B	Max. Vert	24	354.30	-36.06	-23.08
	Max. H_x	32	-305.93	33.04	21.32
	Max. H_z	33	-294.72	31.34	21.47
	Min. Vert	32	-305.93	33.04	21.32
	Min. H_x	24	354.30	-36.06	-23.08
	Min. H_z	25	343.09	-34.39	-23.18
Leg A	Max. Vert	19	361.15	-0.56	42.89
	Max. H_x	31	31.22	8.21	2.00
	Max. H_z	19	361.15	-0.56	42.89
	Min. Vert	27	-299.05	0.53	-39.15
	Min. H_x	23	30.89	-8.26	1.96
	Min. H_z	27	-299.05	0.53	-39.15

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	57.52	0.00	0.00	-50.33	14.14	0.00
Dead+Wind 0 deg - No Ice	57.52	-0.04	-66.63	-6942.60	18.92	-20.21
Dead+Wind 30 deg - No Ice	57.52	33.26	-57.69	-6016.91	-3425.11	-68.63
Dead+Wind 45 deg - No Ice	57.52	47.06	-47.09	-4920.67	-4852.18	-86.60
Dead+Wind 60 deg - No Ice	57.52	57.65	-33.28	-3492.54	-5947.64	-98.67
Dead+Wind 90 deg - No Ice	57.52	66.59	0.04	-45.84	-6872.76	-102.27
Dead+Wind 120 deg - No Ice	57.52	57.69	33.35	3399.68	-5952.52	-78.48
Dead+Wind 135 deg - No Ice	57.52	47.11	47.14	4826.39	-4859.04	-58.04
Dead+Wind 150 deg - No Ice	57.52	33.33	57.72	5920.75	-3433.46	-33.64
Dead+Wind 180 deg - No Ice	57.52	0.04	66.63	6841.80	9.45	20.21
Dead+Wind 210 deg - No Ice	57.52	-33.26	57.69	5916.00	3453.60	68.63
Dead+Wind 225 deg - No Ice	57.52	-47.06	47.09	4819.68	4880.69	86.60
Dead+Wind 240 deg - No Ice	57.52	-57.65	33.28	3391.48	5976.11	98.67
Dead+Wind 270 deg - No Ice	57.52	-66.59	-0.04	-55.28	6901.06	102.28
Dead+Wind 300 deg - No Ice	57.52	-57.69	-33.35	-3500.70	5980.69	78.48
Dead+Wind 315 deg - No Ice	57.52	-47.11	-47.14	-4927.33	4887.21	58.04
Dead+Wind 330 deg - No Ice	57.52	-33.33	-57.72	-6021.61	3461.66	33.64
Dead+Ice+Temp	81.65	0.00	0.00	-84.44	28.43	-0.00
Dead+Wind 0 deg+Ice+Temp	81.65	-0.03	-70.04	-7368.72	32.33	-24.04
Dead+Wind 30 deg+Ice+Temp	81.65	34.98	-60.64	-6391.07	-3608.37	-77.38
Dead+Wind 45 deg+Ice+Temp	81.65	49.48	-49.50	-5232.77	-5116.73	-96.99
Dead+Wind 60 deg+Ice+Temp	81.65	60.61	-34.99	-3723.64	-6274.46	-110.00
Dead+Wind 90 deg+Ice+Temp	81.65	70.00	0.03	-80.97	-7251.83	-113.15
Dead+Wind 120 deg+Ice+Temp	81.65	60.64	35.05	3560.55	-6278.28	-85.99
Dead+Wind 135 deg+Ice+Temp	81.65	49.52	49.55	5068.62	-5122.08	-63.04
Dead+Wind 150 deg+Ice+Temp	81.65	35.03	60.67	6225.49	-3614.86	-35.78
Dead+Wind 180 deg+Ice+Temp	81.65	0.03	70.04	7199.59	24.85	24.03
Dead+Wind 210 deg+Ice+Temp	81.65	-34.98	60.64	6221.82	3665.52	77.38
Dead+Wind 225 deg+Ice+Temp	81.65	-49.48	49.50	5063.44	5173.88	97.00
Dead+Wind 240 deg+Ice+Temp	81.65	-60.61	34.99	3554.23	6331.58	110.01
Dead+Wind 270 deg+Ice+Temp	81.65	-70.00	-0.03	-88.22	7308.78	113.15
Dead+Wind 300 deg+Ice+Temp	81.65	-60.64	-35.04	-3729.90	6335.07	85.99
Dead+Wind 315 deg+Ice+Temp	81.65	-49.52	-49.55	-5237.88	5178.86	63.03
Dead+Wind 330 deg+Ice+Temp	81.65	-35.03	-60.67	-6394.68	3671.69	35.77
Dead+Wind 0 deg - Service	57.52	-0.01	-18.46	-1959.60	15.47	-5.60
Dead+Wind 30 deg - Service	57.52	9.21	-15.98	-1703.16	-938.57	-19.01

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 45 deg - Service	57.52	13.04	-13.04	-1399.47	-1333.86	-23.99
Dead+Wind 60 deg - Service	57.52	15.97	-9.22	-1003.87	-1637.29	-27.33
Dead+Wind 90 deg - Service	57.52	18.45	0.01	-49.10	-1893.59	-28.33
Dead+Wind 120 deg - Service	57.52	15.98	9.24	905.33	-1638.66	-21.74
Dead+Wind 135 deg - Service	57.52	13.05	13.06	1300.53	-1335.76	-16.08
Dead+Wind 150 deg - Service	57.52	9.23	15.99	1603.67	-940.86	-9.32
Dead+Wind 180 deg - Service	57.52	0.01	18.46	1858.81	12.84	5.60
Dead+Wind 210 deg - Service	57.52	-9.21	15.98	1602.36	966.89	19.01
Dead+Wind 225 deg - Service	57.52	-13.04	13.04	1298.68	1362.21	23.99
Dead+Wind 240 deg - Service	57.52	-15.97	9.22	903.07	1665.68	27.33
Dead+Wind 270 deg - Service	57.52	-18.45	-0.01	-51.72	1921.89	28.33
Dead+Wind 300 deg - Service	57.52	-15.98	-9.24	-1006.12	1666.90	21.73
Dead+Wind 315 deg - Service	57.52	-13.05	-13.06	-1401.34	1364.05	16.08
Dead+Wind 330 deg - Service	57.52	-9.23	-15.99	-1704.47	969.16	9.32

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-57.52	0.00	-0.00	57.52	-0.00	0.000%
2	-0.04	-57.52	-66.64	0.04	57.52	66.63	0.005%
3	33.26	-57.52	-57.69	-33.26	57.52	57.69	0.005%
4	47.06	-57.52	-47.09	-47.06	57.52	47.09	0.005%
5	57.65	-57.52	-33.29	-57.65	57.52	33.28	0.005%
6	66.59	-57.52	0.04	-66.59	57.52	-0.04	0.005%
7	57.69	-57.52	33.35	-57.69	57.52	-33.35	0.005%
8	47.12	-57.52	47.15	-47.11	57.52	-47.14	0.005%
9	33.33	-57.52	57.73	-33.33	57.52	-57.72	0.005%
10	0.04	-57.52	66.64	-0.04	57.52	-66.63	0.005%
11	-33.26	-57.52	57.69	33.26	57.52	-57.69	0.005%
12	-47.06	-57.52	47.09	47.06	57.52	-47.09	0.005%
13	-57.65	-57.52	33.29	57.65	57.52	-33.28	0.005%
14	-66.59	-57.52	-0.04	66.59	57.52	0.04	0.005%
15	-57.69	-57.52	-33.35	57.69	57.52	33.35	0.005%
16	-47.12	-57.52	-47.15	47.11	57.52	47.14	0.005%
17	-33.33	-57.52	-57.73	33.33	57.52	57.72	0.005%
18	0.00	-81.65	0.00	-0.00	81.65	-0.00	0.000%
19	-0.03	-81.65	-70.05	0.03	81.65	70.04	0.006%
20	34.98	-81.65	-60.65	-34.98	81.65	60.64	0.007%
21	49.48	-81.65	-49.51	-49.48	81.65	49.50	0.007%
22	60.62	-81.65	-35.00	-60.61	81.65	34.99	0.007%
23	70.01	-81.65	0.03	-70.00	81.65	-0.03	0.007%
24	60.65	-81.65	35.05	-60.64	81.65	-35.05	0.006%
25	49.53	-81.65	49.55	-49.52	81.65	-49.55	0.006%
26	35.03	-81.65	60.68	-35.03	81.65	-60.67	0.006%
27	0.03	-81.65	70.05	-0.03	81.65	-70.04	0.006%
28	-34.98	-81.65	60.65	34.98	81.65	-60.64	0.006%
29	-49.48	-81.65	49.51	49.48	81.65	-49.50	0.006%
30	-60.62	-81.65	35.00	60.61	81.65	-34.99	0.006%
31	-70.01	-81.65	-0.03	70.00	81.65	0.03	0.007%
32	-60.65	-81.65	-35.05	60.64	81.65	35.04	0.007%
33	-49.53	-81.65	-49.55	49.52	81.65	49.55	0.007%
34	-35.03	-81.65	-60.68	35.03	81.65	60.67	0.006%
35	-0.01	-57.52	-18.46	0.01	57.52	18.46	0.002%
36	9.21	-57.52	-15.98	-9.21	57.52	15.98	0.002%
37	13.04	-57.52	-13.05	-13.04	57.52	13.04	0.002%
38	15.97	-57.52	-9.22	-15.97	57.52	9.22	0.002%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
39	18.45	-57.52	0.01	-18.45	57.52	-0.01	0.002%
40	15.98	-57.52	9.24	-15.98	57.52	-9.24	0.002%
41	13.05	-57.52	13.06	-13.05	57.52	-13.06	0.002%
42	9.23	-57.52	15.99	-9.23	57.52	-15.99	0.002%
43	0.01	-57.52	18.46	-0.01	57.52	-18.46	0.002%
44	-9.21	-57.52	15.98	9.21	57.52	-15.98	0.002%
45	-13.04	-57.52	13.05	13.04	57.52	-13.04	0.002%
46	-15.97	-57.52	9.22	15.97	57.52	-9.22	0.002%
47	-18.45	-57.52	-0.01	18.45	57.52	0.01	0.002%
48	-15.98	-57.52	-9.24	15.98	57.52	9.24	0.002%
49	-13.05	-57.52	-13.06	13.05	57.52	13.06	0.002%
50	-9.23	-57.52	-15.99	9.23	57.52	15.99	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00005309
2	Yes	6	0.00000001	0.00031952
3	Yes	6	0.00000001	0.00032659
4	Yes	6	0.00000001	0.00033149
5	Yes	6	0.00000001	0.00033517
6	Yes	6	0.00000001	0.00033497
7	Yes	6	0.00000001	0.00032666
8	Yes	6	0.00000001	0.00032234
9	Yes	6	0.00000001	0.00031940
10	Yes	6	0.00000001	0.00031919
11	Yes	6	0.00000001	0.00032516
12	Yes	6	0.00000001	0.00032900
13	Yes	6	0.00000001	0.00033236
14	Yes	6	0.00000001	0.00033481
15	Yes	6	0.00000001	0.00032998
16	Yes	6	0.00000001	0.00032586
17	Yes	6	0.00000001	0.00032197
18	Yes	6	0.00000001	0.00009209
19	Yes	6	0.00000001	0.00046443
20	Yes	6	0.00000001	0.00047409
21	Yes	6	0.00000001	0.00048054
22	Yes	6	0.00000001	0.00048533
23	Yes	6	0.00000001	0.00048472
24	Yes	6	0.00000001	0.00047251
25	Yes	6	0.00000001	0.00046597
26	Yes	6	0.00000001	0.00046135
27	Yes	6	0.00000001	0.00046096
28	Yes	6	0.00000001	0.00047048
29	Yes	6	0.00000001	0.00047642
30	Yes	6	0.00000001	0.00048144
31	Yes	6	0.00000001	0.00048477
32	Yes	6	0.00000001	0.00047770
33	Yes	6	0.00000001	0.00047212
34	Yes	6	0.00000001	0.00046707
35	Yes	6	0.00000001	0.00031359
36	Yes	6	0.00000001	0.00031818
37	Yes	6	0.00000001	0.00032103
38	Yes	6	0.00000001	0.00032311
39	Yes	6	0.00000001	0.00032174

40	Yes	6	0.00000001	0.00031255
41	Yes	6	0.00000001	0.00030707
42	Yes	6	0.00000001	0.00030271
43	Yes	6	0.00000001	0.00030138
44	Yes	6	0.00000001	0.00030948
45	Yes	6	0.00000001	0.00031479
46	Yes	6	0.00000001	0.00031943
47	Yes	6	0.00000001	0.00032329
48	Yes	6	0.00000001	0.00031994
49	Yes	6	0.00000001	0.00031728
50	Yes	6	0.00000001	0.00031477

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	2.682	35	0.1374	0.1286
T2	160 - 140	2.101	35	0.1343	0.1278
T3	140 - 120	1.555	35	0.1137	0.1022
T4	120 - 100	1.102	50	0.0904	0.0692
T5	100 - 80	0.740	50	0.0680	0.0432
T6	80 - 60	0.477	50	0.0513	0.0294
T7	60 - 40	0.277	50	0.0375	0.0192
T8	40 - 20	0.134	50	0.0235	0.0109
T9	20 - 0	0.045	42	0.0117	0.0050

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	15' 2.5" Dia omni	35	2.682	0.1374	0.1286	724519
178.00	Rohn 6' Side-Arm(1)	35	2.624	0.1375	0.1291	724519
177.00	15' 2.5" Dia omni	35	2.595	0.1375	0.1294	724519
176.00	9-ft Omni	35	2.565	0.1375	0.1296	724519
163.00	APX16DWV-16DWV-S-E-ACU	35	2.188	0.1358	0.1293	211604
157.00	(2) 7770.00	35	2.016	0.1322	0.1255	121327
146.00	12' x 2" Dia Omni	35	1.711	0.1210	0.1118	55132
142.00	Rohn 6' Side-Arm(1)	35	1.606	0.1161	0.1055	46162
135.00	LNX-6512DS	35	1.432	0.1078	0.0939	45689
126.50	800-10504	35	1.239	0.0979	0.0797	53571
125.00	10-ft T-Frame	35	1.206	0.0962	0.0772	55253
51.00	GPS	50	0.205	0.0311	0.0152	84815
50.00	1' Standoff Pipe	50	0.198	0.0303	0.0147	85580

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	9.592	19	0.4688	0.4866
T2	160 - 140	7.606	19	0.4574	0.4826
T3	140 - 120	5.721	34	0.3959	0.3903
T4	120 - 100	4.110	34	0.3226	0.2693
T5	100 - 80	2.783	34	0.2476	0.1706
T6	80 - 60	1.807	34	0.1889	0.1170
T7	60 - 40	1.053	34	0.1392	0.0767
T8	40 - 20	0.509	34	0.0876	0.0435
T9	20 - 0	0.169	26	0.0440	0.0201

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	15' 2.5" Dia omni	19	9.592	0.4688	0.4866	281352
178.00	Rohn 6' Side-Arm(1)	19	9.392	0.4689	0.4883	281352
177.00	15' 2.5" Dia omni	19	9.292	0.4689	0.4891	281352
176.00	9-ft Omni	19	9.192	0.4689	0.4899	281352
163.00	APX16DWV-16DWV-S-E-ACU	19	7.901	0.4621	0.4882	82009
157.00	(2) 7770.00	19	7.312	0.4511	0.4742	44241
146.00	12' x 2" Dia Omni	34	6.263	0.4176	0.4248	18869
142.00	Rohn 6' Side-Arm(1)	34	5.899	0.4032	0.4021	15724
135.00	LNX-6512DS	34	5.291	0.3777	0.3601	15375
126.50	800-10504	34	4.603	0.3468	0.3080	17470
125.00	10-ft T-Frame	34	4.486	0.3413	0.2990	17900
51.00	GPS	34	0.782	0.1156	0.0606	22796
50.00	1' Standoff Pipe	34	0.755	0.1130	0.0589	22968

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Leg	A325N	0.8750	4	1.38	26.45	0.052 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	3	1.36	6.44	0.212 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.6250	2	1.11	6.44	0.173 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.6250	2	0.40	6.44	0.062 ✓	1.333	Bolt Shear
T2	160	Leg	A325N	1.0000	4	8.33	34.56	0.241 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	3	4.42	6.44	0.686 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.6250	2	3.65	6.44	0.567 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.6250	2	2.68	6.44	0.415 ✓	1.333	Bolt Shear
T3	140	Leg	A325N	1.0000	6	12.68	34.56	0.367 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	3	5.57	6.44	0.865 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.6250	2	5.31	6.44	0.825 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.6250	2	4.12	6.44	0.639 ✓	1.333	Bolt Shear

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T4	120	Leg	A325N	1.0000	8	15.25	34.56	0.441 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	3	5.58	6.44	0.866 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.6250	2	5.70	6.44	0.885 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.6250	2	5.51	6.44	0.856 ✓	1.333	Bolt Shear
T5	100	Leg	A325N	1.0000	12	13.14	34.56	0.380 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	3	6.74	9.28	0.727 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.7500	2	6.01	9.28	0.647 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.7500	2	5.94	9.28	0.641 ✓	1.333	Bolt Shear
T6	80	Leg	A325N	1.0000	12	16.31	34.56	0.472 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	3	6.34	9.28	0.684 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.7500	2	6.29	9.28	0.678 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.7500	2	6.11	9.28	0.659 ✓	1.333	Bolt Shear
T7	60	Leg	A325N	1.0000	16	14.38	34.56	0.416 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	3	6.05	9.28	0.652 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.7500	2	6.30	9.28	0.679 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.7500	2	6.31	9.28	0.680 ✓	1.333	Bolt Shear
T8	40	Leg	A325N	1.0000	16	16.34	34.56	0.473 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	3	6.26	9.28	0.675 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.7500	2	6.91	9.28	0.745 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.7500	2	6.77	9.28	0.729 ✓	1.333	Bolt Shear
T9	20	Leg	A354-BC	1.0000	24	12.17	32.40	0.376 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.7500	3	6.18	9.28	0.666 ✓	1.333	Bolt Shear
		Horizontal	A325N	0.7500	2	7.35	9.28	0.792 ✓	1.333	Bolt Shear
		Top Girt	A325N	0.7500	2	7.18	9.28	0.773 ✓	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	ROHN 3 STD	20.00	6.67	68.8 K=1.00	21.168	2.2285	-8.44	47.17	0.179 ✓
T2	160 - 140	ROHN 4 STD	20.00	6.67	53.0 K=1.00	23.877	3.1741	-41.71	75.79	0.550 ✓
T3	140 - 120	ROHN 5 EH	20.04	6.68	43.6 K=1.00	25.320	6.1120	-91.97	154.75	0.594 ✓
T4	120 - 100	ROHN 6 EH	20.04	6.68	36.5	26.311	8.4049	-143.85	221.14	0.650

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
					K=1.00					✓
T5	100 - 80	ROHN 8 EH	20.05	10.02	41.8 K=1.00	25.578	12.7627	-184.13	326.44	0.564 ✓
T6	80 - 60	ROHN 10 EH	20.05	10.03	33.2 K=1.00	26.753	16.1007	-228.20	430.75	0.530 ✓
T7	60 - 40	ROHN 10 EH	20.06	10.03	33.2 K=1.00	26.752	16.1007	-268.94	430.73	0.624 ✓
T8	40 - 20	ROHN 12 EH	20.05	10.03	27.8 K=1.00	27.426	19.2423	-307.73	527.73	0.583 ✓
T9	20 - 0	ROHN 12 EH	20.05	10.03	27.8 K=1.00	27.426	19.2423	-345.16	527.73	0.654 ✓

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	ROHN 2 STD	7.94	7.67	117.0 K=1.00	10.914	1.0745	-4.09	11.73	0.349 ✓
T2	160 - 140	ROHN 2.5 STD	7.96	7.62	96.5 K=1.00	14.505	1.7040	-13.25	24.72	0.536 ✓
T3	140 - 120	ROHN 2.5 STD	8.58	8.21	104.0 K=1.00	13.250	1.7040	-16.72	22.58	0.740 ✓
T4	120 - 100	ROHN 2.5 STD	9.29	8.89	112.6 K=1.00	11.718	1.7040	-16.37	19.97	0.820 ✓
T5	100 - 80	ROHN 3 EH	12.60	12.01	126.9 K=1.00	9.277	3.0159	-19.64	27.98	0.702 ✓
T6	80 - 60	ROHN 3 EH	13.40	12.73	134.4 K=1.00	8.264	3.0159	-18.88	24.92	0.757 ✓
T7	60 - 40	ROHN 3 EH	14.32	13.69	144.6 K=1.00	7.143	3.0159	-17.76	21.54	0.825 ✓
T8	40 - 20	ROHN 3.5 EH	15.24	14.53	133.5 K=1.00	8.383	3.6784	-18.69	30.84	0.606 ✓
T9	20 - 0	ROHN 3.5 EH	16.20	15.52	142.6 K=1.00	7.346	3.6784	-18.26	27.02	0.676 ✓

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	ROHN 1.5 STD	8.60	4.15	80.1 K=1.00	18.999	0.7995	-2.17	15.19	0.143 ✓
T2	160 - 140	ROHN 2 STD	8.68	4.15	63.3 K=1.00	22.141	1.0745	-7.24	23.79	0.304 ✓
T3	140 - 120	ROHN 2 STD	10.10	4.82	73.4 K=1.00	20.294	1.0745	-10.62	21.81	0.487 ✓

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T4	120 - 100	ROHN 2 STD	12.22	5.83	88.9 K=1.00	17.170	1.0745	-11.41	18.45	0.618 ✔
T5	100 - 80	ROHN 2 X-STR	14.13	6.71	105.0 K=1.00	13.532	1.4773	-12.01	19.99	0.601 ✔
T6	80 - 60	ROHN 2.5 STD	16.58	7.84	99.3 K=1.00	13.063	1.7040	-12.57	22.26	0.565 ✔
T7	60 - 40	ROHN 2.5 STD	19.16	9.13	115.6 K=1.00	10.900	1.7040	-12.61	18.57	0.679 ✔
T8	40 - 20	ROHN 3 STD	21.73	10.33	106.6 K=1.00	12.129	2.2285	-13.74	27.03	0.508 ✔
T9	20 - 0	ROHN 3 STD	24.23	11.58	119.5 K=1.00	10.359	2.2285	-13.33	23.09	0.578 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	180 - 160	ROHN 1.5 STD	8.54	4.12	79.5 K=1.00	17.139	0.7995	-0.80	13.70	0.058 ✔
T2	160 - 140	ROHN 2 STD	8.63	4.17	63.6 K=1.00	19.331	1.0745	-5.30	20.77	0.255 ✔
T3	140 - 120	ROHN 2 STD	8.71	4.17	63.5 K=1.00	19.334	1.0745	-8.24	20.78	0.397 ✔
T4	120 - 100	ROHN 2 STD	10.79	5.16	78.7 K=1.00	17.251	1.0745	-11.02	18.54	0.595 ✔
T5	100 - 80	ROHN 2 X-STR	12.93	6.19	96.9 K=1.00	14.443	1.4773	-11.89	21.34	0.557 ✔
T6	80 - 60	ROHN 2.5 STD	15.33	7.31	92.5 K=1.00	15.149	1.7040	-12.23	25.81	0.474 ✔
T7	60 - 40	ROHN 2.5 STD	17.83	8.47	107.2 K=1.00	12.683	1.7040	-12.62	21.61	0.584 ✔
T8	40 - 20	ROHN 3 STD	20.48	9.79	101.0 K=1.00	13.762	2.2285	-13.53	30.67	0.441 ✔
T9	20 - 0	ROHN 3 STD	22.98	10.96	113.0 K=1.00	11.647	2.2285	-14.35	25.96	0.553 ✔

Inner Bracing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	180 - 160	L2x2x1/8	4.27	4.27	128.9 K=1.00	8.989	0.4844	-0.01	4.35	0.003 ✔
T2	160 - 140	L2x2x1/8	4.31	4.31	130.3 K=1.00	8.802	0.4844	-0.09	4.26	0.022 ✔
T3	140 - 120	L2x2x1/8	4.35	4.35	131.5	8.641	0.4844	-0.14	4.19	0.034

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
					K=1.00					✔
T4	120 - 100	L2x2x1/8	5.39	5.39	162.9 K=1.00	5.631	0.4844	-0.19	2.73	0.070 ✔
T5	100 - 80	L2x2x1/8	6.47	6.47	195.1 K=1.00	3.921	0.4844	-0.21	1.90	0.108 ✔
T6	80 - 60	L2 1/2x2 1/2x3/16	7.67	7.67	185.8 K=1.00	4.325	0.9020	-0.21	3.90	0.054 ✔
T7	60 - 40	L3x3x3/16	8.92	8.92	179.5 K=1.00	4.635	1.0900	-0.22	5.05	0.043 ✔
T8	40 - 20	L3 1/2x3 1/2x1/4	10.24	10.24	177.1 K=1.00	4.763	1.6900	-0.23	8.05	0.029 ✔
T9	20 - 0	L3 1/2x3 1/2x1/4	11.49	11.49	198.7 K=1.00	3.783	1.6900	-0.25	6.39	0.039 ✔

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	180 - 160	ROHN 3 STD	20.00	6.67	68.8	30.000	2.2285	5.51	66.85	0.082 ✔
T2	160 - 140	ROHN 4 STD	20.00	6.67	53.0	30.000	3.1741	33.32	95.22	0.350 ✔
T3	140 - 120	ROHN 5 EH	20.04	6.68	43.6	30.000	6.1120	76.10	183.36	0.415 ✔
T4	120 - 100	ROHN 6 EH	20.04	6.68	36.5	30.000	8.4049	122.00	252.15	0.484 ✔
T5	100 - 80	ROHN 8 EH	20.05	10.02	41.8	30.000	12.7627	157.64	382.88	0.412 ✔
T6	80 - 60	ROHN 10 EH	20.05	10.03	33.2	30.000	16.1007	195.71	483.02	0.405 ✔
T7	60 - 40	ROHN 10 EH	20.06	10.03	33.2	30.000	16.1007	230.01	483.02	0.476 ✔
T8	40 - 20	ROHN 12 EH	20.05	10.03	27.8	30.000	19.2423	261.45	577.27	0.453 ✔
T9	20 - 0	ROHN 12 EH	20.05	10.03	27.8	30.000	19.2423	292.06	577.27	0.506 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	ROHN 2 STD	7.94	7.67	117.0	25.200	1.0745	3.99	27.08	0.147 ✔
T2	160 - 140	ROHN 2.5 STD	7.96	7.62	96.5	25.200	1.7040	13.12	42.94	0.306 ✔
T3	140 - 120	ROHN 2.5 STD	8.58	8.21	104.0	25.200	1.7040	16.56	42.94	0.386 ✔
T4	120 - 100	ROHN 2.5 STD	8.81	8.41	106.5	25.200	1.7040	16.57	42.94	0.386 ✔
T5	100 - 80	ROHN 3 EH	12.25	11.66	123.1	25.200	3.0159	19.94	76.00	0.262 ✔
T6	80 - 60	ROHN 3 EH	12.99	12.32	130.1	25.200	3.0159	18.65	76.00	0.245 ✔
T7	60 - 40	ROHN 3 EH	13.85	13.23	139.7	25.200	3.0159	17.69	76.00	0.233 ✔
T8	40 - 20	ROHN 3.5 EH	14.77	14.07	129.2	25.200	3.6784	18.10	92.70	0.195 ✔
T9	20 - 0	ROHN 3.5 EH	15.71	15.04	138.1	25.200	3.6784	17.75	92.70	0.192 ✔

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	ROHN 1.5 STD	8.60	4.15	80.1	30.000	0.7995	2.23	23.98	0.093 ✔
T2	160 - 140	ROHN 2 STD	8.68	4.15	63.3	30.000	1.0745	7.31	32.24	0.227 ✔
T3	140 - 120	ROHN 2 STD	10.10	4.82	73.4	30.000	1.0745	10.36	32.24	0.321 ✔
T4	120 - 100	ROHN 2 STD	12.22	5.83	88.9	30.000	1.0745	11.19	32.24	0.347 ✔
T5	100 - 80	ROHN 2 X-STR	14.13	6.71	105.0	30.000	1.4773	11.68	44.32	0.264 ✔
T6	80 - 60	ROHN 2.5 STD	16.58	7.84	99.3	21.600	1.7040	12.29	36.81	0.334 ✔
T7	60 - 40	ROHN 2.5 STD	19.16	9.13	115.6	21.600	1.7040	12.37	36.81	0.336 ✔
T8	40 - 20	ROHN 3 STD	21.73	10.33	106.6	21.600	2.2285	13.82	48.13	0.287 ✔
T9	20 - 0	ROHN 3 STD	24.23	11.58	119.5	21.600	2.2285	14.69	48.13	0.305 ✔

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	ROHN 1.5 STD	8.54	4.12	79.5	25.200	0.7995	0.80	20.15	0.040 ✔
T2	160 - 140	ROHN 2 STD	8.63	4.17	63.6	25.200	1.0745	5.35	27.08	0.198 ✔
T3	140 - 120	ROHN 2 STD	8.71	4.17	63.5	25.200	1.0745	7.70	27.08	0.284 ✔
T4	120 - 100	ROHN 2 STD	10.79	5.16	78.7	25.200	1.0745	10.74	27.08	0.397 ✔
T5	100 - 80	ROHN 2 X-STR	12.93	6.19	96.9	25.200	1.4773	11.40	37.23	0.306 ✔
T6	80 - 60	ROHN 2.5 STD	15.33	7.31	92.5	25.200	1.7040	11.87	42.94	0.277 ✔
T7	60 - 40	ROHN 2.5 STD	17.83	8.47	107.2	25.200	1.7040	12.27	42.94	0.286 ✔
T8	40 - 20	ROHN 3 STD	20.48	9.79	101.0	25.200	2.2285	13.48	56.16	0.240 ✔
T9	20 - 0	ROHN 3 STD	22.98	10.96	113.0	25.200	2.2285	13.54	56.16	0.241 ✔

Inner Bracing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	180 - 160	L2x2x1/8	4.27	4.27	81.8	30.000	0.4844	0.01	14.53	0.001 ✔
T2	160 - 140	L2x2x1/8	4.31	4.31	82.7	30.000	0.4844	0.09	14.53	0.006 ✔
T3	140 - 120	L2x2x1/8	4.35	4.35	83.5	30.000	0.4844	0.14	14.53	0.010 ✔
T4	120 - 100	L2x2x1/8	5.39	5.39	103.4	30.000	0.4844	0.19	14.53	0.013 ✔
T5	100 - 80	L2x2x1/8	6.47	6.47	123.9	30.000	0.4844	0.21	14.53	0.014 ✔
T6	80 - 60	L2 1/2x2 1/2x3/16	7.67	7.67	118.2	30.000	0.9020	0.21	27.06	0.008 ✔
T7	60 - 40	L3x3x3/16	8.92	8.92	113.9	30.000	1.0900	0.22	32.70	0.007 ✔
T8	40 - 20	L3 1/2x3 1/2x1/4	10.24	10.24	112.7	30.000	1.6900	0.23	50.70	0.005 ✔
T9	20 - 0	L3 1/2x3 1/2x1/4	11.49	11.49	126.5	30.000	1.6900	0.25	50.70	0.005 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 3 STD	3	-8.44	62.88	13.4	Pass
T2	160 - 140	Leg	ROHN 4 STD	42	-41.71	101.02	41.3	Pass
T3	140 - 120	Leg	ROHN 5 EH	81	-91.97	206.29	44.6	Pass
T4	120 - 100	Leg	ROHN 6 EH	120	-143.85	294.78	48.8	Pass
T5	100 - 80	Leg	ROHN 8 EH	159	-184.13	435.15	42.3	Pass
T6	80 - 60	Leg	ROHN 10 EH	186	-228.20	574.19	39.7	Pass
T7	60 - 40	Leg	ROHN 10 EH	213	-268.94	574.16	46.8	Pass
T8	40 - 20	Leg	ROHN 12 EH	240	-307.73	703.47	43.7	Pass
T9	20 - 0	Leg	ROHN 12 EH	267	-345.16	703.47	49.1	Pass
T1	180 - 160	Diagonal	ROHN 2 STD	14	-4.09	15.63	26.2	Pass
T2	160 - 140	Diagonal	ROHN 2.5 STD	53	-13.25	32.95	40.2	Pass
							51.4 (b)	
T3	140 - 120	Diagonal	ROHN 2.5 STD	93	-16.72	30.10	55.5	Pass
							64.9 (b)	
T4	120 - 100	Diagonal	ROHN 2.5 STD	132	-16.37	26.62	61.5	Pass
							65.0 (b)	
T5	100 - 80	Diagonal	ROHN 3 EH	171	-19.64	37.30	52.7	Pass
							54.5 (b)	
T6	80 - 60	Diagonal	ROHN 3 EH	198	-18.88	33.22	56.8	Pass
T7	60 - 40	Diagonal	ROHN 3 EH	225	-17.76	28.72	61.9	Pass
T8	40 - 20	Diagonal	ROHN 3.5 EH	252	-18.69	41.11	45.5	Pass
							50.6 (b)	
T9	20 - 0	Diagonal	ROHN 3.5 EH	279	-18.26	36.02	50.7	Pass
T1	180 - 160	Horizontal	ROHN 1.5 STD	13	-2.17	20.25	10.7	Pass
							13.0 (b)	
T2	160 - 140	Horizontal	ROHN 2 STD	52	-7.24	31.71	22.8	Pass
							42.5 (b)	
T3	140 - 120	Horizontal	ROHN 2 STD	91	-10.62	29.07	36.6	Pass
							61.9 (b)	
T4	120 - 100	Horizontal	ROHN 2 STD	130	-11.41	24.59	46.4	Pass
							66.4 (b)	
T5	100 - 80	Horizontal	ROHN 2 X-STR	169	-12.01	26.65	45.1	Pass
							48.6 (b)	
T6	80 - 60	Horizontal	ROHN 2.5 STD	196	-12.57	29.67	42.4	Pass
							50.8 (b)	
T7	60 - 40	Horizontal	ROHN 2.5 STD	223	-12.61	24.76	50.9	Pass
							51.0 (b)	
T8	40 - 20	Horizontal	ROHN 3 STD	250	-13.74	36.03	38.1	Pass
							55.9 (b)	
T9	20 - 0	Horizontal	ROHN 3 STD	277	-13.33	30.77	43.3	Pass
							59.4 (b)	
T1	180 - 160	Top Girt	ROHN 1.5 STD	6	-0.80	18.26	4.4	Pass
							4.7 (b)	
T2	160 - 140	Top Girt	ROHN 2 STD	45	-5.30	27.69	19.1	Pass
							31.1 (b)	
T3	140 - 120	Top Girt	ROHN 2 STD	84	-8.24	27.69	29.8	Pass
							48.0 (b)	
T4	120 - 100	Top Girt	ROHN 2 STD	123	-11.02	24.71	44.6	Pass
							64.2 (b)	
T5	100 - 80	Top Girt	ROHN 2 X-STR	162	-11.89	28.44	41.8	Pass
							48.1 (b)	
T6	80 - 60	Top Girt	ROHN 2.5 STD	189	-12.23	34.41	35.5	Pass
							49.4 (b)	
T7	60 - 40	Top Girt	ROHN 2.5 STD	216	-12.62	28.81	43.8	Pass
							51.0 (b)	
T8	40 - 20	Top Girt	ROHN 3 STD	243	-13.53	40.88	33.1	Pass
							54.7 (b)	
T9	20 - 0	Top Girt	ROHN 3 STD	270	-14.35	34.60	41.5	Pass
							58.0 (b)	
T1	180 - 160	Inner Bracing	L2x2x1/8	38	-0.01	5.80	0.2	Pass
T2	160 - 140	Inner Bracing	L2x2x1/8	78	-0.09	5.68	1.6	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T3	140 - 120	Inner Bracing	L2x2x1/8	116	-0.14	5.58	2.6	Pass
T4	120 - 100	Inner Bracing	L2x2x1/8	155	-0.19	3.64	5.3	Pass
T5	100 - 80	Inner Bracing	L2x2x1/8	183	-0.21	2.53	8.1	Pass
T6	80 - 60	Inner Bracing	L2 1/2x2 1/2x3/16	209	-0.21	5.20	4.1	Pass
T7	60 - 40	Inner Bracing	L3x3x3/16	236	-0.22	6.73	3.2	Pass
T8	40 - 20	Inner Bracing	L3 1/2x3 1/2x1/4	264	-0.23	10.73	2.2	Pass
T9	20 - 0	Inner Bracing	L3 1/2x3 1/2x1/4	290	-0.25	8.52	2.9	Pass
							Summary	
						Leg (T9)	49.1	Pass
						Diagonal (T4)	65.0	Pass
						Horizontal (T4)	66.4	Pass
						Top Girt (T4)	64.2	Pass
						Inner Bracing (T5)	8.1	Pass
						Bolt Checks	66.4	Pass
						RATING =	**66.4**	**Pass**

SITE NAME	Waterford CT	ECP - CELL #	2	135
LATITUDE	41-222-40.22 N	LONGITUDE	72-08-21.65 W	
Notes: Change 700,AWS and PCS to RET Add RRH 2X60 PCS add RRH 2X60 AWS Add RRH 2X40 700 Add F Block		SAVE BUTTON		
		STRUCTURE TYPE	Lattice	

Add RRH 2X40 700	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	BXA-70063-6CF_2	SLCP 2X6015	SLCP 2X6015
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	0/0	4/0	4/0
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

700 Mhz - LTE Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	LNX-6514DS-A1M	LNX-6514DS-A1M	LNX-6514DS-A1M
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	120	240
DOWN TILT (MECH/ELEC)	0/0	0/6	0/4
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL	1 ALU RH_2X40 700	1 ALU RH_2X40 700	1 ALU RH_2X40 700
DIPLEXER - QTY / MODEL			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	#N/A	#N/A	#N/A
ANTENNA TYPE	LPA-80063-4CF	SC-E 6014 REV 2	SC-E 6014 REV 2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	4/0	6/0	4/0
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	#N/A	#N/A	#N/A
ANTENNA TYPE	LNX-6512DS-A1M	LNX-6512DS-A1M	LNX-6512DS-A1M
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	0/4	0/6	0/4
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEX WITH LTE CABLE			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	BXA-171063-8BF-2	BXA-171063-8BF-2	BXA-171063-8BF-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	0/0	4/0	4/0
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	HBXX-6516DS-A2M	HBXX-6516DS-A2M	HBXX-6516DS-A2M
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	0/2	0/4	0/4
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-PCS	1 ALU RH_2X60-PCS	1 ALU RH_2X60-PCS
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX			

AWS - LTE Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	2100 MHz BBU	2100 MHz BBU	2100 MHz BBU
ANTENNA TYPE	BXA-171063-12BF_2	SACP 2X5516	BXA-171063-12BF_2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	0/0	2/0	0/0
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL			
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX	1		DB-T1-6Z-8AB-0Z

AWS - LTE Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	2100 MHz BBU	2100 MHz BBU	2100 MHz BBU
ANTENNA TYPE	HBXX-6517DS-A2M	HBXX-6517DS-A2M	HBXX-6517DS-A2M
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	260
DOWN TILT (MECH/ELEC)	0/2	0/2	0/2
RAD CTR (FT AGL)	134.8	134.8	134.8
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-AWS	1 ALU RH_2X60-AWS	1 ALU RH_2X60-AWS
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX	2		DB-T1-6Z-8AB-0Z

NUMBER OF CABLE'S NEEDED					ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES		12	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS		36	TOP JUMPER (FT)			0
Equipment Cable Ordering		MAIN CABLE #	18 -	6	TOP JUMPER #	24	+	12
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES		1	FIBER LINE MODEL #			158-1-08U8-S8
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS		12	TOP JUMPER MODEL #			058-1-08U1-S1
Fiber Cable Ordering		FIBER CABLE	1 +	1	TOP JUMPER #	24	+	12

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - B	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-215	TX - 746-757	PCS (Watts)	60
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-17	RX - 776-787	LTE (Watts)	40
			AWS(Watts)	60

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Ray Paradis	Rob Hesselbach	RLP	12/26/2014
Revised By: Ray Paradis	Rob Hesselbach	RLP	2/6/2015

Site Configuration

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity, total	2
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Product Specifications

LNX-6514DS-VTM

Dimensions

Depth	181.0 mm | 7.1 in
Length	1847.0 mm | 72.7 in
Width	301.0 mm | 11.9 in
Net Weight	17.6 kg | 38.8 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	LNX-6514DS-R2M
Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
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

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

Product Specifications

LNX-6512DS-T4M

DualPol® Antenna, 698–896 MHz, 65° horizontal beamwidth, fixed electrical tilt

- Continuous wideband operation
- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Patented DualPol® technology
- Ideal choice for site collocations and tough zoning restrictions

CHARACTERISTICS

General Specifications

Antenna Type	DualPol®
Brand	DualPol®
Operating Frequency Band	698 – 896 MHz

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Beamwidth, Horizontal, degrees	65	65
Gain, dBd	12.4	13.3
Gain, dBi	14.5	15.4
Beamwidth, Vertical, degrees	18.7	16.2
Beam Tilt, degrees	4	4
Upper Sidelobe Suppression (USLS), typical, dB	20	20
Front-to-Back Ratio at 180°, dB	30	32
Isolation, dB	30	30
VSWR | Return Loss, db	1.35:1 | 16.5	1.35:1 | 16.5
Intermodulation Products, 3rd Order, 2 x 20 W, dBc	-150	-150
Input Power, maximum, watts	500	500
Polarization	±45°	±45°
Impedance, ohms	50	50
Lightning Protection	dc Ground	dc Ground

Product Specifications

LNX-6512DS-T4M

Mechanical Specifications

Color	Light gray
Connector Interface	7-16 DIN Female
Connector Location	Bottom
Connector Quantity	2
Wind Loading, maximum	379.8 N @ 150 km/h 85.4 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	1232.0 mm | 48.5 in
Width	301.0 mm | 11.9 in
Net Weight	12.8 kg | 28.2 lb

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2002/95/EC	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)

INCLUDED PRODUCTS

MTG-L-STD
Downtilt Mounting Kit for panel Antennas

www.commscope.com/andrew

Product Specifications

COMMSCOPE®

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HBXX-6516DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	22	22	21
CPR at Sector, dB	8	9	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 17.0 5 ° | 17.3 10 ° | 17.0	0 ° | 17.1 5 ° | 17.4 10 ° | 17.0	0 ° | 17.4 5 ° | 17.7 10 ° | 17.2
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	9

* 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® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6516DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
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

600899A-2 — 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.

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6517DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® single band, quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports, all types	4

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom

Product Specifications

HBXX-6517DS-VTM

RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1903.0 mm | 74.9 in
Width	305.0 mm | 12.0 in
Net Weight	19.5 kg | 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6517DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
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

600899A-2 — 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
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.

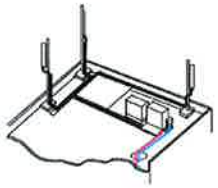
EASY INSTALLATION

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.

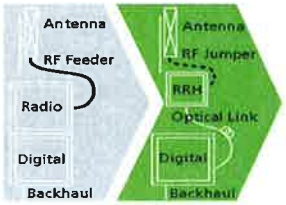
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

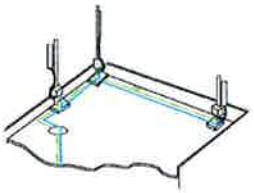
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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 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.