Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

February 28, 2017

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification**
160 Deer Run Road, Wilton, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains nine (9) antennas at the 98-foot level of the existing 118-foot tower at 160 Deer Run Road in Wilton, Connecticut (the "Property"). The tower and underlying property are owned by the Westport Broadcasting Company LLC ("WBC"). SBA manages the facility for WBC. The Council approved Cellco's shared use of the existing tower in 2006 (Docket No. 308). Cellco now intends to modify its facility by replacing six (6) of its existing antennas with three (3) model SBNHH-1D85B, 700 MHz antennas and three (3) model SBNHH-1D85B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") and two (2) HYBRIFLEX™ antenna cables. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Lynne Vanderslice, First Selectman for the Town of Wilton, Robert Nerney, Wilton's Director of Planning and Land Use Management, WBC, the owner of the tower and Property and SBA, the tower manager.

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 structure. Cellco's new antennas and RRHs will be installed on its existing platform at the 98-foot level of the 118-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 General Power Density table for Cellco's modified facility is included in Attachment 2. Please note that the Council's RF database lists the T-Mobile antennas at a height of 140 feet on the 118-foot tower. According to the Structural Analysis, T-Mobile's antennas are located at the 118-foot level on the tower.

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 included in Attachment 3).

A copy of the Wilton's parcel map and property owner information is included in Attachment 4.

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Lynne Vanderslice, Wilton First Selectman
Robert Nerney, Wilton Director of Planning and Land Use Management
Westport Broadcasting Company LLC
SBA
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

SBNHH-1D85B

Multiband Antenna, 698–896 and 2x 1695–2360 MHz, 85° horizontal beamwidth, internal RETs.

- Interleaved dipole technology providing for attractive, low wind load mechanical package
- Three internal RETs for independent tilt on all three bands

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.5	14.4	17.0	17.6	17.9	17.9
Beamwidth, Horizontal, degrees	83	86	81	79	79	79
Beamwidth, Vertical, degrees	12.3	11.1	5.7	5.3	5.0	4.6
Beam Tilt, degrees	0–12	0–12	0–8	0–8	0–8	0–8
USLS (First Lobe), dB	19	18	15	16	17	18
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	25	25	25	25
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.3	14.2	16.8	17.4	17.7	17.8
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.5	±0.5	±0.3	±0.4	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.2	0 ° | 14.1	0 ° | 16.8	0 ° | 17.5	0 ° | 17.7	0 ° | 17.6
	6 ° | 14.3	6 ° | 14.3	4 ° | 16.8	4 ° | 17.5	4 ° | 17.8	4 ° | 18.0
	12 ° | 14.1	12 ° | 13.9	8 ° | 16.7	8 ° | 17.2	8 ° | 17.5	8 ° | 17.6
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±4.8	±3.2	±3.8	±1.9
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.9	±0.2	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	16	14	15	16	17	18
Front-to-Back Total Power at 180° ± 30°, dB	23	23	27	26	25	27
CPR at Boresight, dB	20	20	23	22	18	22
CPR at Sector, dB	15	16	12	13	10	6

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

General Specifications

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

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground

Product Specifications

SBNHH-1D85B

Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, frontal	618.0 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Loading, lateral	197.0 N @ 150 km/h 44.3 lbf @ 150 km/h
Wind Loading, rear	728.0 N @ 150 km/h 163.7 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Depth	180.0 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight, without mounting kit	19.1 kg | 42.1 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (2) | Low band (1)
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	1 female | 1 male

Packed Dimensions

Depth	299.0 mm | 11.8 in
Length	1970.0 mm | 77.6 in
Width	409.0 mm | 16.1 in
Shipping Weight	31.2 kg | 68.8 lb

Regulatory Compliance/Certifications

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

Product Specifications

SBNHH-1D85B

Included Products

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

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

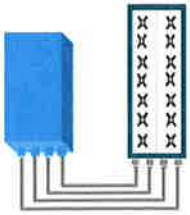
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

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

ALCATEL-LUCENT B25 RRH4X30

Alcatel-Lucent Band 25 Remote Radio Head 4x30W is the new addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B25 RRH4x30 allows operators to have a compact radio solution to deploy LTE in the PCS band (1.9 GHz, 3GPP band 25), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B25 RRH4x30 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity, LTE carriers from 3 MHz up to 20 MHz and up to 65 MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30 is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

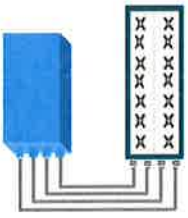
Its compactness and slim design makes the Alcatel-Lucent B25 RRH4x30 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 1.9 GHz band (PCS, 3GPP band 2 & 25)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- Ready for 3, 5, 10, 15 or 20MHz LTE carrier operation with 4Rx Diversity
- Ready to support up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- Convection-cooled (fan-less)
- Supports AISG 2.0 devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in PCS band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Full flexibility for multiple carriers operation over entire PCS spectrum
- Improves downlink spectral efficiency and cell edge throughput through MIMO4
- Increases LTE coverage thanks to 4-way Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options (Pole or Wall)



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	3GPP bands 2 & 25 (PCS-G) DL: 1930 - 1995 MHz UL: 1850 - 1915 MHz
Instantaneous bandwidth - #carriers	65MHz – Up to 4 LTE carriers (in 40MHz occupied bandwidth)
LTE carrier bandwidth	3, 5, 10, 15 or 20 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure (3GPP band 2) **RX Diversity scheme**	2.0 dB typ. (<2.5 dB max) 2 or 4 way Rx diversity
Sizes (HxWxD)(w/ solar shield) in mm (in.) **Volume (w/ solar shield) in L** **Weight (w/ solar shield) in kg (lb)**	538 x 304 x 182 (21.2" x 12.0" x 7.2") 30 24 (53)
DC voltage range **DC power consumption**	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 580W typical @100% RF load
Environmental conditions **Wind load (@150km/h or 93mph)**	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5 (> 14dB)
CPRI ports	2 CPRI ports (HW ready for Rate7 / 9.8 Gbps)
AISG interfaces	1 AISG2.0 output (RS485), +24V/2A DC power Integrated Smart Bias Tees (x2)
Misc. Interfaces	1 external alarms connector (4 alarms) 4 RF Tx & 4 RF Rx monitor ports 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

ALCATEL-LUCENT B66A RRH4X45

The Alcatel-Lucent B66a Remote Radio Head 4x45 is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering. Its operational range covers beyond that of B4 (AWS) and B10 (AWS+).

Supporting 2Tx/4Tx MIMO and 2-way/4-way Rx diversity, the Alcatel-Lucent B66a RRH4x45 allows operators to have a compact radio solution to deploy LTE in the 2100 band (3GPP band 4, 10, and 66), providing them with the means to achieve high capacity, high quality, high reliability, large instantaneous bandwidth, and high coverage with minimum site requirements.

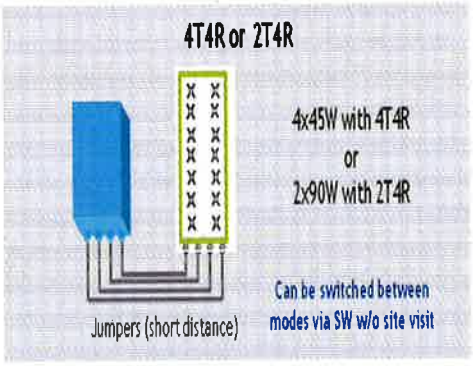
The Alcatel-Lucent B66a RRH4x45 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x90W or 4x45W RF output power. It also supports 4-way Rx diversity at the 70 MHz instantaneous bandwidth.

The Alcatel-Lucent B66a RRH4x45 is a compact (near zero-footprint) solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

Its compactness and slim design makes the Alcatel-Lucent B66a RRH4x45 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 2110 - 2180 MHz band/DL, 1710-1780MHz/UL (3GPP band 4, 10, and 66a)
- LTE 2Tx or 4Tx MIMO (SW selectable)
- Configuration: 2T2R/2T4R/4T4R
- Output power: Up to 2x90W or 4x45W (SW configurable)
- 70MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports



BENEFITS

- Compact to reduce additional footprint when adding LTE in AWS 1-3 band
- Selection of MIMO configuration (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through 4Tx MIMO
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall

TECHNICAL SPECIFICATIONS

Features & Performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R selectable by SW)
Frequency band	AWS 1-3, B4/B66a DL: 2110-2180 MHz / UL: 1710-1780 MHz
Instantaneous bandwidth - #carriers	70 MHz – 4 LTE MIMO carriers (in 70 MHz occupied bandwidth)
LTE carrier bandwidth	5, 10, 15, 20 MHz
RF output power	2x90W or 4x45W (selectable by SW)
Noise figure – RX Diversity scheme **Receiver Sensivity (FRC A1-3)**	2 dB typical (<2.5 dB max) – 2 or 4 way Rx diversity -104.5 dBm maximum
Sizes (HxWxD) in mm (in.) **Volume in Liters** **Weight in kg (lb) (w/o mounting HW)**	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield) 35.5 (with solar shield) 29.7 (without solar shield) 25.8kg (56.8lb) (with solar shield)
DC voltage range **DC power consumption**	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 750W typical @100% RF load (in 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions **Wind load (@150km/h or 93mph)**	-40°C (-40°F) /+55°C (+131°F) UL50E Type 4 Enclosure 250N (56lb) Frontal/150N (34lb) Lateral
Antenna ports	4 ports 4.3-10 female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate 7, 9.8 Gbps) SFP: SMDF (HW supports also SMSF and MMDF)
AISG interfaces	1 AISG 2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-487 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 / FCC Part 15 / GR-3178-CORE

Alcatel·Lucent

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)

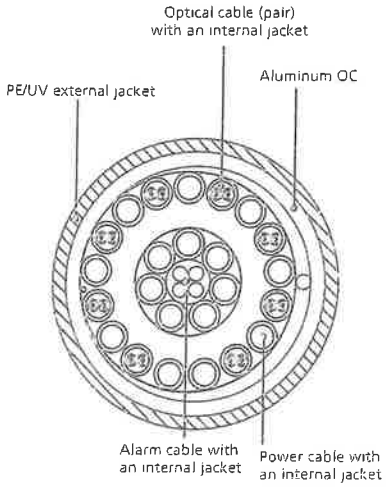


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Wilton W								
Tower Height: 118ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T	1	500	110	880	0.0166	0.5867	0.28%	
*AT&T	1	500	110	1900	0.0166	1.0000	0.17%	
*AT&T	3	427	110	1900	0.0426	1.0000	0.43%	
*AT&T	6	296	110	880	0.0591	0.5867	1.01%	
*AT&T	1	500	110	740	0.0166	0.4933	0.34%	
*T-Mobile	2	2335	140	2100	0.0935	1.0000	0.94%	
*T-Mobile	4	1167	140	1900/2100	0.0935	1.0000	0.93%	
*T-Mobile	1	865	140	700	0.0173	0.4667	0.37%	
*Sprint	12	100	88	851	0.0642	0.5673	1.13%	
*Existing various antennas	(percentages based on field readings measured on March 16, 2006)						3.30%	
Verizon PCS	**2**	**1866**	**98**	**0.1397**	**1970**	**1.0000**	**13.97%**	
Verizon Cellular	**9**	**330**	**98**	**0.1112**	**869**	**0.5793**	**19.19%**	
Verizon AWS	**2**	**2268**	**98**	**0.1698**	**2145**	**1.0000**	**16.98%**	
Verizon 700	**2**	**739**	**98**	**0.0553**	**746**	**0.497333**	**11.13%**	
								70.17%
* Source: Siting Council								

ATTACHMENT 3

FDH VELOCITEL

ENGINEERING INNOVATION

Structural Analysis for SBA Network Services, Inc.

118.0' Self-Support Tower (118.0' AGL)

SBA Site Name: Wilton CT/Optasite
SBA Site ID: CT98078-L
Verizon Site Name: Wilton West
Verizon Site ID: 118060
Site Address: 160 Deer Run Rd, Wilton, CT 06897

FDH Velocitel Project Number 17PSUO1400

Analysis Results

Tower Components	85.4%	Sufficient
Foundation	44.9%	Sufficient

Prepared By:

Cary Webb, PE
Project Engineer II

Reviewed By:

Dennis D. Abel, PE
Director of Structural Engineering
CT License No. 23247

Velocitel, Inc., d.b.a. FDH Velocitel
6521 Meridien Drive
Raleigh, NC, 27616
(919) 755-1012
Structural@fdhvelocitel.com

STATE OF CONNECTICUT DENNIS ABEL No. 23247 LICENSED PROFESSIONAL ENGINEER

01-17-2017

January 17, 2017

Prepared pursuant to the ANSI/TIA-222-G Structural Standard for Antenna Supporting Structures and Antennas and the 2016 Connecticut State Building Code

TABLE OF CONTENTS

EXECUTIVE SUMMARY

At the request of SBA Network Services, Inc., FDH Velocitel performed a structural analysis of the existing Self-Support Tower located in Wilton, CT to determine whether the tower is structurally adequate to support the antenna configuration in place per **Table 1** pursuant to the *ANSI/TIA-222-G Structural Standard for Antenna Supporting Structures and Antennas and the 2016 Connecticut State Building Code*. Information pertaining to the antenna loading, current tower geometry, member sizes, and below grade parameters was obtained from:

Source	Document Type	Reference	Date
World Tower	Tower & Foundation Drawings	Drawing No. Q06515	October 16, 2006
JWB Tower Services, LLC	Tower Mapping	FCC No. 1256129	May 11, 2011
JGI Eastern, Inc.	Geotechnical Report	Project No. 06517G	August 31, 2006
SBA Network Services, Inc.	-	-	-

The ultimate design wind speed per the *2016 Connecticut State Building Code* is 120 mph without ice and 50 mph with 3/4" radial ice. This is converted to a basic design wind speed of 93 mph per Section 1609.3 and Appendix N as required for use in the *TIA-222-G* Standard per Exception #5 of Section 1609.1.1. Ice is considered to increase with height. Furthermore, this structure was analyzed as a Risk Category II structure in Exposure B using Topographic Category 1 and Spectral Response Accelerations of S_s = 0.231 and S_1 = 0.068

Note: Per *Section 2.7.3* of the *ANSI/TIA-222-G* Standard, the seismic/earthquake loading effects can be ignored if the spectral response acceleration at short periods (S_S) is less than or equal to 1.00. The tower's location mandates a design S_S of less than 1.00, thus seismic loading was not considered as part of the analysis of this structure.

Conclusions

With the antenna configuration in place per **Table 1** we have determined the tower stress level to be sufficient and the foundation(s) to be sufficient pursuant to the requirements stipulated by *ANSI/TIA-222-G Structural Standard for Antenna Supporting Structures and Antennas and the 2016 Connecticut State Building Code* provided the **Recommendations** listed below are satisfied. For a more detailed description of the analysis of the tower, see the **Results** section of this report.

Our structural analysis has been performed assuming all information provided to FDH Velocitel is accurate (i.e., the structure member information, tower layout, existing antenna loading, and proposed antenna loading) and that the tower has been properly erected and maintained per the original design drawings.

Recommendations

To ensure the requirements of the current analysis standards are met with the antenna configuration in place per **Table 1**, we have the following recommendations:

1. Feed lines to be installed as shown in **Figure 1** in the Appendix.
2. RRU/RRH Stipulation: The equipment may be installed in any arrangement as determined by the client.
3. The existing diplexers should be installed directly behind the proposed/existing panel antennas.

APPURTENANCE LISTING

The antennas and equipment, with their corresponding feed lines, considered for this analysis are shown in **Table 1**. *If the actual layout determined in the field deviates from the layout, FDH Velocitel should be contacted to perform a revised analysis.*

Table 1 - Appurtenance Loading

Existing Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
124	(1) 12' x 3" Ø Omni	(2) 7/8"	---	118	(2) Pipe Mounts
123	(1) 10' x 3" Ø Omni				
118	(3) Ericsson Air 21 B2A/B4P (3) Ericsson Air 21 B4A/B2P (3) Ericsson KRY 112/71 (3) Commscope LNX-6515DS-VTM (3) Ericsson S11B12	(12) 1-5/8" (1) 1-5/8" Fiber	T-Mobile		(3) T-Arms (Assumed CaAa=11.59 ft²)
110	(6) Powerwave 7770 (3) Powerwave P65-16-XLH-RR (5) Powerwave LGP 21401 (1) Andrew E15Z01P13 (6) Ericsson RRUS-11 (2) Raycap DC6-48-60-18-8F	(12) 1-5/8" (1) 3" Flex Conduit	AT&T	110	(3) Face Mounts
98	(3) RFS BXA 185085/12CF (3) RFS 80090/8 (3) RFS APX75-8665-12 (6) RFS RDR6004	(12) 1-5/8"	Verizon	98	(3) T-Frames
87	(3) 60"x12"x5" Panels	(9) 1-5/8"	Sprint	87	(3) Side Arms
70	(1) 8'x3"Ø Omni	(1) 1/2"	---	65	(1) Side Arm
68	(1) 10'x3"Ø Omni	(2) 7/8"	---	62	(1) Side Arm
56	(1) 10'x3"Ø Omni				
60	(1) Scala PR-850	(1) 7/8"	---	56	(1) Pipe Mount
52	(1) Scala PR-850	(1) 7/8"			
58	(1) Scala PR-850	(1) 7/8"		58	Direct

Proposed Carrier Final Loading:

Antenna Elevation (ft)	Description	Feed Lines	Carrier	Mount Elevation (ft)	Mount Type
98	(6) Andrew SBNHH-1D85B (3) RFS 80090/8 (3) Alcatel Lucent B13 RRH 4x30-4R (3) Alcatel Lucent B66A RRH 4x45 (6) RFS RDR6004 (2) Raycap RC2DC-3315-PF48	(12) 1-5/8" (2) 1-5/8" Hybrid	Verizon	98	(3) T-Frames

RESULTS

The following material grades for individual members were used for analysis:

Table 2 - Material Grade

Member Type	Material Grade
Legs	A572-50
Bracing	A36

Table 3 and **Table 4** display the summary of capacities for the analyzed structure and its additional components. Values greater than 100% indicate locations where the maximum force in the member exceeds its capacity. **Table 5** displays the maximum dish rotations at service winds speeds.

If the assumptions outlined in this report differ from actual field conditions, FDH Velocitel should be contacted to perform a revised analysis. Furthermore, as no information pertaining to the allowable twist and sway requirements for the appurtenances was provided, deflection and rotation were not taken into consideration when performing this analysis.

See the **Appendix** for detailed modeling information.

Table 3 - Structure Member Capacities

Section No.	Elevation (ft.)	Component Type	Size	% Capacity	Pass / Fail
T1	118 - 100	Leg	1 3/4	45.5	Pass
T2	100 - 80	Leg	2 1/2	49.5	Pass
T3	80 - 60	Leg	2 3/4	59.8	Pass
T4	60 - 40	Leg	3	62.7	Pass
T5	40 - 20	Leg	3 1/4	62.4	Pass
T6	20 - 10	Leg	3 1/2	55.6	Pass
T7	10 - 0	Leg	3 1/2	60.1	Pass
T1	118 - 100	Diagonal	L2x2x1/8	29.3 54.6 (b)	Pass
T2	100 - 80	Diagonal	L2x2x3/16	41.7 73.6 (b)	Pass
T3	80 - 60	Diagonal	L2x2x3/16	36.5 54.2 (b)	Pass
T4	60 - 40	Diagonal	L2x2x3/16	57.1 65.5 (b)	Pass
T5	40 - 20	Diagonal	L3x3x1/4	37.1 55.7 (b)	Pass
T6	20 - 10	Diagonal	L3x3x1/4	39.1 55.1 (b)	Pass
T7	10 - 0	Diagonal	L3x3x1/4	43.3 54.7 (b)	Pass
T5	40 - 20	Secondary Horizontal	L2x2x1/8	56.6 68.5 (b)	Pass
T6	20 - 10	Secondary Horizontal	L2x2x1/8	68.3 71.1 (b)	Pass
T7	10 - 0	Secondary Horizontal	L2x2x1/8	85.4	Pass
T1	118 - 100	Top Girt	L2x2x1/8	14.3	Pass

Table 4 – Additional Structure Component Capacities

Elevation (ft.)	Component	% Capacity	Pass / Fail	Notes
0	Anchor Rods	62.5	Pass	-
0	Foundation (Soil Interaction)	44.9	Pass	-
0	Foundation (Structural)	32.7	Pass	-

Table 5 - Maximum Dish Rotations at Service Wind Speeds

Centerline Elevation (ft.)	Dish	Tilt (deg)*	Twist (deg)*
60	(1) Scala PR-850	0.0929	0.0081
58	(1) Scala PR-850	0.0894	0.0077
52	(1) Scala PR-850	0.0791	0.0063

*Allowable tilt and twist to be reviewed by the carrier.

GENERAL COMMENTS

This engineering analysis is based upon the theoretical capacity of the structure. It is not a condition assessment of the tower and its foundation. It is the responsibility of SBA Network Services, Inc. to verify that the tower modeled and analyzed is the correct structure (with accurate antenna loading information) modeled. If there are substantial modifications to be made or the assumptions made in this analysis are not accurate, FDH Velocitel should be notified immediately to perform a revised analysis.

LIMITATIONS

All opinions and conclusions are considered accurate to a reasonable degree of engineering certainty based upon the evidence available at the time of this report. All opinions and conclusions are subject to revision based upon receipt of new or additional/updated information. All services are provided exercising a level of care and diligence equivalent to the standard and care of our profession. No other warranty or guarantee, expressed or implied, is offered. Our services are confidential in nature and we will not release this report to any other party without the client's consent. The use of this engineering work is limited to the express purpose for which it was commissioned and it may not be reused, copied, or distributed for any other purpose without the written consent of FDH Velocitel.

APPENDIX

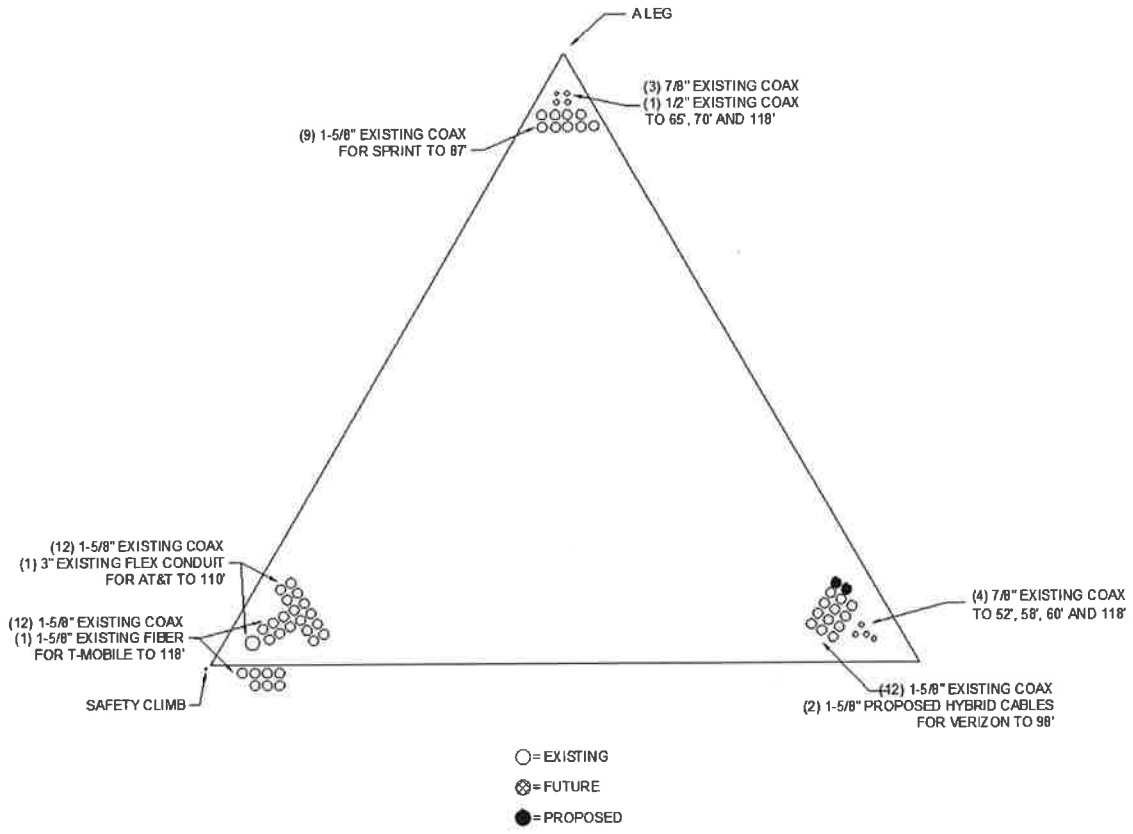
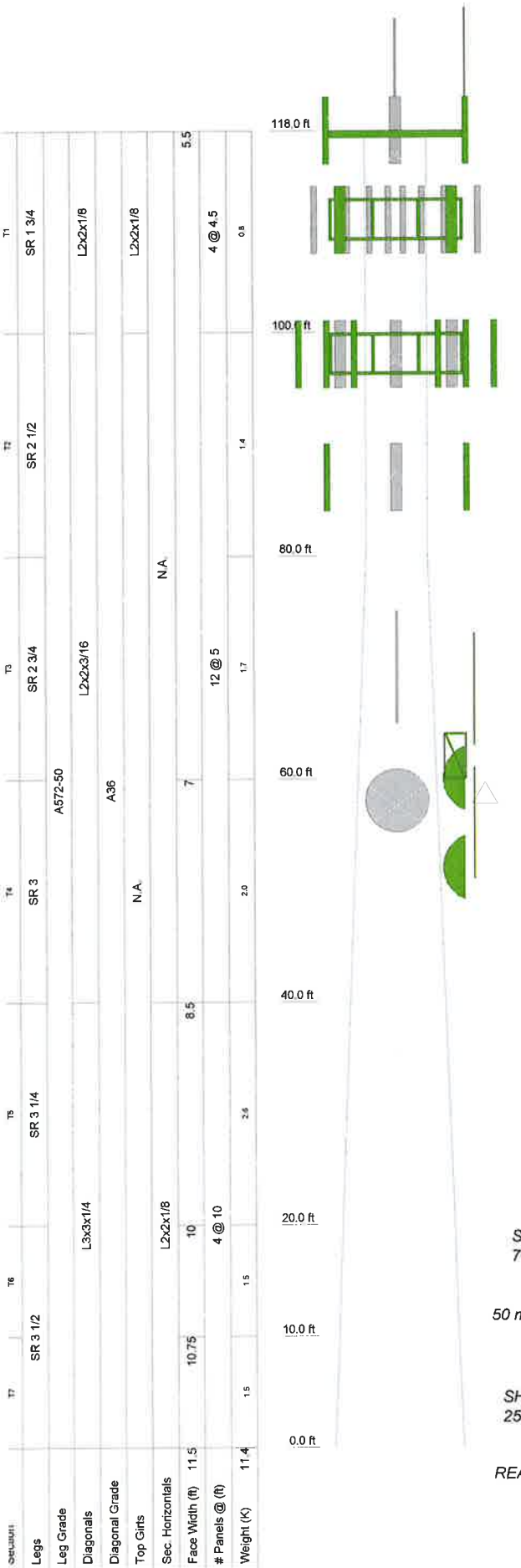


Figure 1 – Feed Line Layout



MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 93 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 85.4%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 188 K
SHEAR: 15 K

UPLIFT: -164 K
SHEAR: 14 K

AXIAL 80 K
SHEAR 7 K *MOMENT 559 kip-ft*

TORQUE 2 kip-ft
50 mph WIND - 0.7500 in ICE

AXIAL 30 K
SHEAR 25 K *MOMENT 1769 kip-ft*

TORQUE 4 kip-ft
REACTIONS - 93 mph WIND

FDH VELOCITEL
Tower Analysis
FDH Velocitel
6521 Meridien Drive, Suite 107
Raleigh, North Carolina 27616
Phone: 9197551012
FAX: 9197551031

Job:	**Wilton, CT-Optasite, CT98078-L**		
Project:	**17PSUO1400**		
Client:	SBA Network Services, Inc.	Drawn by: Cary J. Webb, PE	App'd:
Code:	TIA-222-G	Date: 01/17/17	Scale: N
Path:			Dwg No.

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	118	DC6-48-60-18-8F	110
Pipe Mount	118	DC6-48-60-18-8F	110
Pipe Mount	118	(3) Face Mounts	110
3"Ø x 10' Omni	118	(2) SBNHH-1D85B w/Mount Pipe	98
3"x12' Omni	118	(2) SBNHH-1D85B w/Mount Pipe	98
AIR 21 B2A/B4P w/Mount Pipe	118	(2) SBNHH-1D85B w/Mount Pipe	98
AIR 21 B2A/B4P w/Mount Pipe	118	BXA-80090/8CF	98
AIR 21 B2A/B4P w/Mount Pipe	118	BXA-80090/8CF	98
AIR 21 B4A/B2P w/Mount Pipe	118	BXA-80090/8CF	98
AIR 21 B4A/B2P w/Mount Pipe	118	B13 RRH 4x30-4R	98
AIR 21 B4A/B2P w/Mount Pipe	118	B13 RRH 4x30-4R	98
LNX-6515DS-VTM w/ Mount Pipe	118	B13 RRH 4x30-4R	98
LNX-6515DS-VTM w/ Mount Pipe	118	B66A RRH4X45	98
LNX-6515DS-VTM w/ Mount Pipe	118	B66A RRH4X45	98
KRY 112 71	118	B66A RRH4X45	98
KRY 112 71	118	(2) FD9R6004/2C-3L Diplexer	98
KRY 112 71	118	(2) FD9R6004/2C-3L Diplexer	98
S11B12	118	(2) FD9R6004/2C-3L Diplexer	98
S11B12	118	RC2DC-3315-PF-48	98
S11B12	118	RC2DC-3315-PF-48	98
(3) T-Arms	118	(3) T-Frames	98
(2) 7770	110	60" x 12" x 5" w/ Mount Pipe	87
(2) 7770	110	60" x 12" x 5" w/ Mount Pipe	87
(2) 7770	110	60" x 12" x 5" w/ Mount Pipe	87
P65-16-XLH-RR	110	(3) Side Arm	87
P65-16-XLH-RR	110	3"Ø x 8' Omni	65
P65-16-XLH-RR	110	(1) Side Arm	65
(2) LGP21401 TMA	110	3"Ø x 10' Omni	62
(2) LGP21401 TMA	110	3"Ø x 10' Omni	62
LGP21401 TMA	110	(1) Side Arm	62
E15Z01P13 TMA	110	PR-850	58
(2) RRUS-11	110	Pipe Mount	56
(2) RRUS-11	110	PR-850	56
(2) RRUS-11	110	PR-850	56

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 93 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 85.4%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:

DOWN: 188 K

SHEAR: 15 K

UPLIFT: -164 K

SHEAR: 14 K

AXIAL 80 K

SHEAR 7 K *MOMENT 559 kip-ft*

TORQUE 2 kip-ft

50 mph WIND - 0.7500 in ICE

AXIAL 30 K

SHEAR 25 K *MOMENT 1769 kip-ft*

TORQUE 4 kip-ft

REACTIONS - 93 mph WIND

FDH VELOCITEL ENGINEERING PRODUCTS

Tower Analysis

FDH Velocitel

6521 Meridien Drive, Suite 107

Raleigh, North Carolina 27616

Phone: 9197551012

FAX: 9197551031

Job:	**Wilton, CT-Optasite, CT98078-L**		
Project:	**17PSUO1400**		
Client:	SBA Network Services, Inc.	Drawn by: Cary J. Webb, PE	App'd:
Code:	TIA-222-G	Date: 01/17/17	Scale: N
Path:			Dwg No.

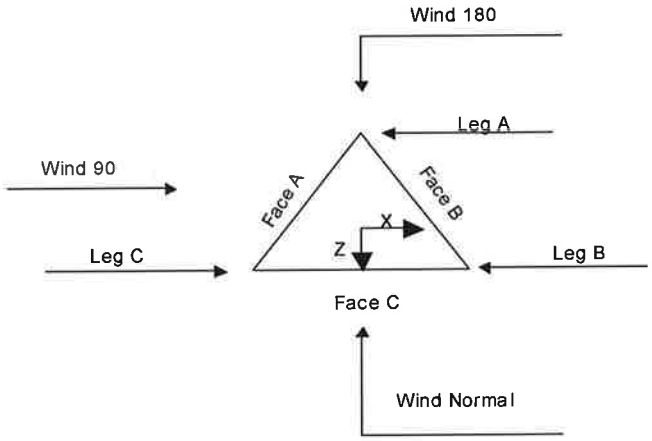
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 118.00 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 5.50 ft at the top and 11.50 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Tower is located in Fairfield County, Connecticut.
ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
Basic wind speed of 93 mph.
Structure Class II.
Exposure Category B.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Horizontals	Assume Legs Pinned	√ Calculate Redundant Bracing Forces
Consider Moments - Diagonals	√ Assume Rigid Index Plate	Ignore Redundant Members in FEA
Use Moment Magnification	√ Use Clear Spans For Wind Area	√ SR Leg Bolts Resist Compression
√ Use Code Stress Ratios	√ Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	Offset Girt At Foundation
Escalate Ice	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Include Angle Block Shear Check
Use Special Wind Profile	√ Project Wind Area of Appurt.	Use TIA-222-G Bracing Resist. Exemption
√ Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Use TIA-222-G Tension Splice Exemption
Leg Bolts Are At Top Of Section	Add IBC .6D+W Combination	Poles
√ Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Include Shear-Torsion Interaction
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Always Use Sub-Critical Flow
SR Members Have Cut Ends	Treat Feed Line Bundles As Cylinder	Use Top Mounted Sockets
SR Members Are Concentric		



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	118.00-100.00			5.50	1	18.00
T2	100.00-80.00			5.50	1	20.00
T3	80.00-60.00			5.50	1	20.00
T4	60.00-40.00			7.00	1	20.00
T5	40.00-20.00			8.50	1	20.00
T6	20.00-10.00			10.00	1	10.00
T7	10.00-0.00			10.75	1	10.00

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	118.00-100.00	4.50	X Brace	No	No	0.0000	0.0000
T2	100.00-80.00	5.00	X Brace	No	No	0.0000	0.0000
T3	80.00-60.00	5.00	X Brace	No	No	0.0000	0.0000
T4	60.00-40.00	5.00	X Brace	No	No	0.0000	0.0000
T5	40.00-20.00	10.00	X Brace	No	Yes	0.0000	0.0000
T6	20.00-10.00	10.00	X Brace	No	Yes	0.0000	0.0000
T7	10.00-0.00	10.00	X Brace	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 118.00-100.00	Solid Round	1 3/4	A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T2 100.00-80.00	Solid Round	2 1/2	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T3 80.00-60.00	Solid Round	2 3/4	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T4 60.00-40.00	Solid Round	3	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T5 40.00-20.00	Solid Round	3 1/4	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T6 20.00-10.00	Solid Round	3 1/2	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T7 10.00-0.00	Solid Round	3 1/2	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 118.00-100.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		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
T5 40.00-20.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T6 20.00-10.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T7 10.00-0.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft^2	in					in	in	in
T1 118.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 20.00-10.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 10.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Brace Diags X	K Brace Diags Y	Single Diags X	Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
ft																	
T1 118.00-100.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T2 100.00-80.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T3 80.00-60.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T4 60.00-40.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T5 40.00-20.00	No	No	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
T6 20.00-10.00	No	No	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1
T7 10.00-0.00	No	No	1	1	1	1	1	1	1	1	1	1	1	0.5	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 118.00-100.00	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

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
T2 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
T3 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
T4 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
T5 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
T6 20.00-10.00	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 10.00-0.00	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 118.00-100.00	Flange	0.7500 A325N	4	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 100.00-80.00	Flange	0.7500 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 80.00-60.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 60.00-40.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1
T6 20.00-10.00	Flange	1.0000 A449	0	0.6250 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1
T7 10.00-0.00	Flange	1.0000 A449	0	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1

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
***												
Safety Line 3/8	C	No	Ar (CaAa)	118.00 - 0.00	0.0000	0.5	1	1	0.3750	0.3750		0.22
***												
1-5/8"	A	No	Ar (CaAa)	118.00 - 0.00	-8.0000	-0.4	6	3	0.5000	1.9800		0.82
1-5/8"	C	No	Ar (CaAa)	118.00 - 0.00	0.0000	0.45	7	4	0.5000	1.9800		0.82
Feedline Ladder (Af) 1.5"	C	No	Af (CaAa)	118.00 - 0.00	0.0000	0.45	1	1	1.5000	1.5000		4.20
T-Brackets	A	No	Af (CaAa)	118.00 - 0.00	-10.0000	-0.38	1	1	1.0000	1.0000		4.20
***												
1-5/8"	A	No	Ar (CaAa)	110.00 - 0.00	-14.0000	-0.35	12	2	0.5000	1.9800		0.82
3"	A	No	Ar (CaAa)	110.00 - 0.00	-6.0000	-0.45	1	1	3.0100	3.0100		1.78

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	No	Ar (CaAa)	98.00 - 0.00	-10.0000	0.4	14	3	0.5000	1.9800		0.82
T-Brackets	B	No	Af (CaAa)	98.00 - 0.00	-10.0000	0.4	1	1	1.0000	1.0000		4.20
***												
1-5/8"	A	No	Ar (CaAa)	87.00 - 0.00	-10.0000	0.42	9	2	0.5000	1.9800		0.82
T-Brackets	A	No	Af (CaAa)	118.00 - 0.00	-8.0000	0.43	1	1	1.0000	1.0000		4.20
***												
1/2"	A	No	Ar (CaAa)	65.00 - 0.00	-1.0000	0.48	1	1	0.5000	0.5800		0.15
***												
7/8"	A	No	Ar (CaAa)	62.00 - 0.00	-3.0000	0.48	3	2	0.5000	1.0800		0.29
7/8"	A	No	Ar (CaAa)	118.00 - 62.00	-3.0000	0.48	1	1	0.5000	1.0800		0.29
***												
7/8"	B	No	Ar (CaAa)	118.00 - 60.00	-4.0000	0.46	1	1	0.5000	1.0800		0.29
**												
7/8"	B	No	Ar (CaAa)	60.00 - 58.00	-4.0000	0.46	2	2	0.5000	1.0800		0.29
***												
7/8"	B	No	Ar (CaAa)	58.00 - 52.00	-4.0000	0.46	3	2	0.5000	1.0800		0.29
***												
7/8"	B	No	Ar (CaAa)	52.00 - 0.00	-4.0000	0.46	4	2	0.5000	1.0800		0.29

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	118.00-100.00	A	0.000	0.000	56.098	0.000	0.36
		B	0.000	0.000	1.944	0.000	0.01
		C	0.000	0.000	30.123	0.000	0.18
T2	100.00-80.00	A	0.000	0.000	98.601	0.000	0.56
		B	0.000	0.000	55.056	0.000	0.29
		C	0.000	0.000	33.470	0.000	0.20
T3	80.00-60.00	A	0.000	0.000	122.489	0.000	0.65
		B	0.000	0.000	60.933	0.000	0.32
		C	0.000	0.000	33.470	0.000	0.20
T4	60.00-40.00	A	0.000	0.000	127.247	0.000	0.67
		B	0.000	0.000	66.311	0.000	0.33
		C	0.000	0.000	33.470	0.000	0.20
T5	40.00-20.00	A	0.000	0.000	127.247	0.000	0.67
		B	0.000	0.000	67.413	0.000	0.34
		C	0.000	0.000	33.470	0.000	0.20
T6	20.00-10.00	A	0.000	0.000	63.623	0.000	0.33
		B	0.000	0.000	33.707	0.000	0.17
		C	0.000	0.000	16.735	0.000	0.10
T7	10.00-0.00	A	0.000	0.000	63.623	0.000	0.33
		B	0.000	0.000	33.707	0.000	0.17
		C	0.000	0.000	16.735	0.000	0.10

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	118.00-100.00	A	1.690	0.000	0.000	86.022	0.000	1.58
		B		0.000	0.000	8.029	0.000	0.11

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
		C		0.000	0.000	51.121	0.000	0.86
T2	100.00-80.00	A	1.658	0.000	0.000	136.835	0.000	2.50
		B		0.000	0.000	59.052	0.000	1.21
		C		0.000	0.000	56.324	0.000	0.94
T3	80.00-60.00	A	1.617	0.000	0.000	166.238	0.000	2.96
		B		0.000	0.000	64.021	0.000	1.31
		C		0.000	0.000	55.712	0.000	0.92
T4	60.00-40.00	A	1.564	0.000	0.000	180.628	0.000	3.03
		B		0.000	0.000	75.011	0.000	1.38
		C		0.000	0.000	54.916	0.000	0.89
T5	40.00-20.00	A	1.486	0.000	0.000	177.252	0.000	2.91
		B		0.000	0.000	73.866	0.000	1.35
		C		0.000	0.000	53.759	0.000	0.85
T6	20.00-10.00	A	1.386	0.000	0.000	86.471	0.000	1.38
		B		0.000	0.000	36.038	0.000	0.65
		C		0.000	0.000	26.140	0.000	0.40
T7	10.00-0.00	A	1.242	0.000	0.000	83.349	0.000	1.28
		B		0.000	0.000	34.740	0.000	0.60
		C		0.000	0.000	25.070	0.000	0.37

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	118.00-100.00	-4.3238	2.9790	-2.6908	1.4824
T2	100.00-80.00	-2.0924	2.6144	-1.4870	1.7011
T3	80.00-60.00	-1.9350	1.6324	-1.4329	1.2106
T4	60.00-40.00	-2.1129	1.6058	-1.8284	1.0980
T5	40.00-20.00	-2.4839	1.7516	-2.2120	1.2012
T6	20.00-10.00	-2.8167	1.8610	-2.5015	1.2844
T7	10.00-0.00	-3.0435	1.9384	-2.7017	1.3562

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	2	Safety Line 3/8	100.00 - 118.00	0.6000	0.6000
T1	4	1-5/8"	100.00 - 118.00	0.6000	0.6000
T1	5	1-5/8"	100.00 - 118.00	0.6000	0.6000
T1	6	Feedline Ladder (Af) 1.5"	100.00 - 118.00	0.6000	0.6000
T1	7	T-Brackets	100.00 - 118.00	0.6000	0.6000
T1	9	1-5/8"	100.00 - 110.00	0.6000	0.6000
T1	10	3"	100.00 - 110.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	16	T-Brackets	100.00 - 118.00	0.6000	0.6000
T1	21	7/8"	100.00 - 118.00	0.6000	0.6000
T1	23	7/8"	100.00 - 118.00	0.6000	0.6000
T2	2	Safety Line 3/8	80.00 - 100.00	0.6000	0.6000
T2	4	1-5/8"	80.00 - 100.00	0.6000	0.6000
T2	5	1-5/8"	80.00 - 100.00	0.6000	0.6000
T2	6	Feedline Ladder (Af) 1.5"	80.00 - 100.00	0.6000	0.6000
T2	7	T-Brackets	80.00 - 100.00	0.6000	0.6000
T2	9	1-5/8"	80.00 - 100.00	0.6000	0.6000
T2	10	3"	80.00 - 100.00	0.6000	0.6000
T2	12	1-5/8"	80.00 - 98.00	0.6000	0.6000
T2	13	T-Brackets	80.00 - 98.00	0.6000	0.6000
T2	15	1-5/8"	80.00 - 87.00	0.6000	0.6000
T2	16	T-Brackets	80.00 - 100.00	0.6000	0.6000
T2	21	7/8"	80.00 - 100.00	0.6000	0.6000
T2	23	7/8"	80.00 - 100.00	0.6000	0.6000
T3	2	Safety Line 3/8	60.00 - 80.00	0.6000	0.6000
T3	4	1-5/8"	60.00 - 80.00	0.6000	0.6000
T3	5	1-5/8"	60.00 - 80.00	0.6000	0.6000
T3	6	Feedline Ladder (Af) 1.5"	60.00 - 80.00	0.6000	0.6000
T3	7	T-Brackets	60.00 - 80.00	0.6000	0.6000
T3	9	1-5/8"	60.00 - 80.00	0.6000	0.6000
T3	10	3"	60.00 - 80.00	0.6000	0.6000
T3	12	1-5/8"	60.00 - 80.00	0.6000	0.6000
T3	13	T-Brackets	60.00 - 80.00	0.6000	0.6000
T3	15	1-5/8"	60.00 - 80.00	0.6000	0.6000
T3	16	T-Brackets	60.00 - 80.00	0.6000	0.6000
T3	18	1/2"	60.00 - 65.00	0.6000	0.6000
T3	20	7/8"	60.00 - 62.00	0.6000	0.6000
T3	21	7/8"	62.00 - 80.00	0.6000	0.6000
T3	23	7/8"	60.00 - 80.00	0.6000	0.6000
T4	2	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T4	4	1-5/8"	40.00 - 60.00	0.6000	0.6000
T4	5	1-5/8"	40.00 - 60.00	0.6000	0.6000
T4	6	Feedline Ladder (Af) 1.5"	40.00 - 60.00	0.6000	0.6000
T4	7	T-Brackets	40.00 - 60.00	0.6000	0.6000
T4	9	1-5/8"	40.00 - 60.00	0.6000	0.6000
T4	10	3"	40.00 - 60.00	0.6000	0.6000
T4	12	1-5/8"	40.00 - 60.00	0.6000	0.6000
T4	13	T-Brackets	40.00 - 60.00	0.6000	0.6000
T4	15	1-5/8"	40.00 - 60.00	0.6000	0.6000
T4	16	T-Brackets	40.00 - 60.00	0.6000	0.6000
T4	18	1/2"	40.00 - 60.00	0.6000	0.6000
T4	20	7/8"	40.00 - 60.00	0.6000	0.6000
T4	25	7/8"	58.00 - 60.00	0.6000	0.6000
T4	27	7/8"	52.00 - 58.00	0.6000	0.6000
T4	29	7/8"	40.00 - 52.00	0.6000	0.6000
T5	2	Safety Line 3/8	20.00 - 40.00	0.6000	0.6000
T5	4	1-5/8"	20.00 - 40.00	0.6000	0.6000
T5	5	1-5/8"	20.00 - 40.00	0.6000	0.6000
T5	6	Feedline Ladder (Af) 1.5"	20.00 - 40.00	0.6000	0.6000
T5	7	T-Brackets	20.00 - 40.00	0.6000	0.6000
T5	9	1-5/8"	20.00 - 40.00	0.6000	0.6000
T5	10	3"	20.00 - 40.00	0.6000	0.6000
T5	12	1-5/8"	20.00 - 40.00	0.6000	0.6000
T5	13	T-Brackets	20.00 - 40.00	0.6000	0.6000
T5	15	1-5/8"	20.00 - 40.00	0.6000	0.6000
T5	16	T-Brackets	20.00 - 40.00	0.6000	0.6000
T5	18	1/2"	20.00 - 40.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	20	7/8"	20.00 - 40.00	0.6000	0.6000
T5	29	7/8"	20.00 - 40.00	0.6000	0.6000
T6	2	Safety Line 3/8	10.00 - 20.00	0.6000	0.6000
T6	4	1-5/8"	10.00 - 20.00	0.6000	0.6000
T6	5	1-5/8"	10.00 - 20.00	0.6000	0.6000
T6	6	Feedline Ladder (Af) 1.5"	10.00 - 20.00	0.6000	0.6000
T6	7	T-Brackets	10.00 - 20.00	0.6000	0.6000
T6	9	1-5/8"	10.00 - 20.00	0.6000	0.6000
T6	10	3"	10.00 - 20.00	0.6000	0.6000
T6	12	1-5/8"	10.00 - 20.00	0.6000	0.6000
T6	13	T-Brackets	10.00 - 20.00	0.6000	0.6000
T6	15	1-5/8"	10.00 - 20.00	0.6000	0.6000
T6	16	T-Brackets	10.00 - 20.00	0.6000	0.6000
T6	18	1/2"	10.00 - 20.00	0.6000	0.6000
T6	20	7/8"	10.00 - 20.00	0.6000	0.6000
T6	29	7/8"	10.00 - 20.00	0.6000	0.6000
T7	2	Safety Line 3/8	0.00 - 10.00	0.6000	0.6000
T7	4	1-5/8"	0.00 - 10.00	0.6000	0.6000
T7	5	1-5/8"	0.00 - 10.00	0.6000	0.6000
T7	6	Feedline Ladder (Af) 1.5"	0.00 - 10.00	0.6000	0.6000
T7	7	T-Brackets	0.00 - 10.00	0.6000	0.6000
T7	9	1-5/8"	0.00 - 10.00	0.6000	0.6000
T7	10	3"	0.00 - 10.00	0.6000	0.6000
T7	12	1-5/8"	0.00 - 10.00	0.6000	0.6000
T7	13	T-Brackets	0.00 - 10.00	0.6000	0.6000
T7	15	1-5/8"	0.00 - 10.00	0.6000	0.6000
T7	16	T-Brackets	0.00 - 10.00	0.6000	0.6000
T7	18	1/2"	0.00 - 10.00	0.6000	0.6000
T7	20	7/8"	0.00 - 10.00	0.6000	0.6000
T7	29	7/8"	0.00 - 10.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Lightning Rod	C	None			0.0000	118.00	No Ice	0.25	0.25	0.03
							1/2" Ice	0.66	0.66	0.03
							1" Ice	0.97	0.97	0.04
***										
Pipe Mount	A	From Leg	0.00	0.00	0.0000	118.00	No Ice	1.20	1.20	0.02
			0.00	0.00			1/2" Ice	1.50	1.50	0.03
			0.00	0.00			1" Ice	1.81	1.81	0.04
Pipe Mount	B	From Leg	0.00	0.00	0.0000	118.00	No Ice	1.20	1.20	0.02
			0.00	0.00			1/2" Ice	1.50	1.50	0.03
			0.00	0.00			1" Ice	1.81	1.81	0.04
3"Ø x 10' Omni	A	From Leg	4.00	0.00	0.0000	118.00	No Ice	3.00	3.00	0.05
			0.00	0.00			1/2" Ice	4.03	4.03	0.07
			5.00	0.00			1" Ice	5.03	5.03	0.10
3"x12' Omni	B	From Leg	4.00	0.00	0.0000	118.00	No Ice	3.60	3.60	0.03
			0.00	0.00			1/2" Ice	4.83	4.83	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
			6.00			1" Ice	6.08	6.08	0.08
***									
AIR 21 B2A/B4P w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	7.09 7.78 8.37	6.02 7.17 8.03	0.12 0.18 0.25
AIR 21 B2A/B4P w/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	7.09 7.78 8.37	6.02 7.17 8.03	0.12 0.18 0.25
AIR 21 B2A/B4P w/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	7.09 7.78 8.37	6.02 7.17 8.03	0.12 0.18 0.25
AIR 21 B4A/B2P w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	7.09 7.78 8.37	6.02 7.17 8.03	0.12 0.18 0.24
AIR 21 B4A/B2P w/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	7.09 7.78 8.37	6.02 7.17 8.03	0.12 0.18 0.24
AIR 21 B4A/B2P w/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	7.09 7.78 8.37	6.02 7.17 8.03	0.12 0.18 0.24
LNX-6515DS-VTM w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	11.68 12.40 13.14	9.84 11.37 12.91	0.08 0.17 0.27
LNX-6515DS-VTM w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	11.68 12.40 13.14	9.84 11.37 12.91	0.08 0.17 0.27
LNX-6515DS-VTM w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	11.68 12.40 13.14	9.84 11.37 12.91	0.08 0.17 0.27
KRY 112 71	A	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.45 0.56 0.68	0.01 0.02 0.03
KRY 112 71	B	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.45 0.56 0.68	0.01 0.02 0.03
KRY 112 71	C	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.45 0.56 0.68	0.01 0.02 0.03
S11B12	A	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	2.83 3.04 3.26	1.18 1.33 1.48	0.05 0.07 0.10
S11B12	B	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	2.83 3.04 3.26	1.18 1.33 1.48	0.05 0.07 0.10
S11B12	C	From Leg	4.00 0.00 0.00	0.0000	118.00	No Ice 1/2" Ice 1" Ice	2.83 3.04 3.26	1.18 1.33 1.48	0.05 0.07 0.10
(3) T-Arms	C	None		0.0000	118.00	No Ice 1/2" Ice 1" Ice	11.59 15.44 19.29	11.59 15.44 19.29	0.77 0.99 1.21
***									
(2) 7770	A	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	5.88 6.31 6.75	2.93 3.27 3.63	0.03 0.06 0.10
(2) 7770	B	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	5.88 6.31 6.75	2.93 3.27 3.63	0.03 0.06 0.10

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
(2) 7770	C	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	5.88 6.31 6.75	2.93 3.27 3.63	0.03 0.06 0.10
P65-16-XLH-RR	A	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	8.13 8.59 9.05	4.70 5.15 5.60	0.05 0.10 0.15
P65-16-XLH-RR	B	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	8.13 8.59 9.05	4.70 5.15 5.60	0.05 0.10 0.15
P65-16-XLH-RR	C	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	8.13 8.59 9.05	4.70 5.15 5.60	0.05 0.10 0.15
(2) LGP21401 TMA	A	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.37 0.48 0.60	0.02 0.02 0.03
(2) LGP21401 TMA	B	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.37 0.48 0.60	0.02 0.02 0.03
LGP21401 TMA	C	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.37 0.48 0.60	0.02 0.02 0.03
E15Z01P13 TMA	C	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.73 0.86 0.99	0.02 0.03 0.04
(2) RRUS-11	A	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	2.52 2.72 2.92	1.07 1.21 1.36	0.06 0.07 0.10
(2) RRUS-11	B	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	2.52 2.72 2.92	1.07 1.21 1.36	0.06 0.07 0.10
(2) RRUS-11	C	From Face	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	2.52 2.72 2.92	1.07 1.21 1.36	0.06 0.07 0.10
DC6-48-60-18-8F	A	From Face	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	2.20 2.40 2.60	3.70 3.94 4.19	0.02 0.05 0.09
DC6-48-60-18-8F	B	From Face	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	2.20 2.40 2.60	3.70 3.94 4.19	0.02 0.05 0.09
(3) Face Mounts	C	None		0.0000	110.00	No Ice 1/2" Ice 1" Ice	19.73 27.41 35.09	19.73 27.41 35.09	0.82 1.17 1.51
***									
(2) SBNHH-1D85B w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	8.47 9.00 9.53	7.44 8.47 9.37	0.08 0.16 0.24
(2) SBNHH-1D85B w/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	8.47 9.00 9.53	7.44 8.47 9.37	0.08 0.16 0.24
(2) SBNHH-1D85B w/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	8.47 9.00 9.53	7.44 8.47 9.37	0.08 0.16 0.24
BXA-80090/8CF	A	From Leg	4.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	8.29 8.88 9.47	6.45 7.02 7.61	0.02 0.07 0.13
BXA-80090/8CF	B	From Leg	4.00 0.00	0.0000	98.00	No Ice 1/2" Ice	8.29 8.88	6.45 7.02	0.02 0.07

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
			0.00			1" Ice	9.47	7.61	0.13
BXA-80090/8CF	C	From Leg	4.00	0.0000	98.00	No Ice	8.29	6.45	0.02
			0.00			1/2" Ice	8.88	7.02	0.07
			0.00			1" Ice	9.47	7.61	0.13
B13 RRH 4x30-4R	A	From Leg	4.00	0.0000	98.00	No Ice	2.13	1.59	0.06
			0.00			1/2" Ice	2.32	1.76	0.08
			0.00			1" Ice	2.52	1.94	0.10
B13 RRH 4x30-4R	B	From Leg	4.00	0.0000	98.00	No Ice	2.13	1.59	0.06
			0.00			1/2" Ice	2.32	1.76	0.08
			0.00			1" Ice	2.52	1.94	0.10
B13 RRH 4x30-4R	C	From Leg	4.00	0.0000	98.00	No Ice	2.13	1.59	0.06
			0.00			1/2" Ice	2.32	1.76	0.08
			0.00			1" Ice	2.52	1.94	0.10
B66A RRH4X45	A	From Leg	4.00	0.0000	98.00	No Ice	2.58	1.63	0.06
			0.00			1/2" Ice	2.79	1.81	0.08
			0.00			1" Ice	3.01	2.00	0.10
B66A RRH4X45	B	From Leg	4.00	0.0000	98.00	No Ice	2.58	1.63	0.06
			0.00			1/2" Ice	2.79	1.81	0.08
			0.00			1" Ice	3.01	2.00	0.10
B66A RRH4X45	C	From Leg	4.00	0.0000	98.00	No Ice	2.58	1.63	0.06
			0.00			1/2" Ice	2.79	1.81	0.08
			0.00			1" Ice	3.01	2.00	0.10
(2) FD9R6004/2C-3L Diplexer	A	From Leg	4.00	0.0000	98.00	No Ice	0.00	0.08	0.00
			0.00			1/2" Ice	0.00	0.14	0.01
			0.00			1" Ice	0.00	0.20	0.01
(2) FD9R6004/2C-3L Diplexer	B	From Leg	4.00	0.0000	98.00	No Ice	0.00	0.08	0.00
			0.00			1/2" Ice	0.00	0.14	0.01
			0.00			1" Ice	0.00	0.20	0.01
(2) FD9R6004/2C-3L Diplexer	C	From Leg	4.00	0.0000	98.00	No Ice	0.00	0.08	0.00
			0.00			1/2" Ice	0.00	0.14	0.01
			0.00			1" Ice	0.00	0.20	0.01
RC2DC-3315-PF-48	A	From Leg	4.00	0.0000	98.00	No Ice	2.52	1.77	0.04
			0.00			1/2" Ice	2.73	1.95	0.06
			0.00			1" Ice	2.95	2.14	0.09
RC2DC-3315-PF-48	B	From Leg	4.00	0.0000	98.00	No Ice	2.52	1.77	0.04
			0.00			1/2" Ice	2.73	1.95	0.06
			0.00			1" Ice	2.95	2.14	0.09
(3) T-Frames	C	None		0.0000	98.00	No Ice	17.87	17.87	0.80
						1/2" Ice	25.31	25.31	1.16
						1" Ice	32.75	32.75	1.52
***									
60" x 12" x 5" w/ Mount Pipe	A	From Leg	4.00	0.0000	87.00	No Ice	6.74	5.07	0.07
			0.00			1/2" Ice	7.37	6.01	0.13
			0.00			1" Ice	7.96	6.80	0.19
60" x 12" x 5" w/ Mount Pipe	B	From Leg	4.00	0.0000	87.00	No Ice	6.74	5.07	0.07
			0.00			1/2" Ice	7.37	6.01	0.13
			0.00			1" Ice	7.96	6.80	0.19
60" x 12" x 5" w/ Mount Pipe	C	From Leg	4.00	0.0000	87.00	No Ice	6.74	5.07	0.07
			0.00			1/2" Ice	7.37	6.01	0.13
			0.00			1" Ice	7.96	6.80	0.19
(3) Side Arm	C	None		0.0000	87.00	No Ice	6.18	6.18	0.33
						1/2" Ice	8.56	8.56	0.40
						1" Ice	10.94	10.94	0.47
***									
3"Ø x 8' Omni	A	From Leg	4.00	0.0000	65.00	No Ice	2.40	2.40	0.05
			0.00			1/2" Ice	3.19	3.19	0.07
			5.00			1" Ice	3.67	3.67	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(1) Side Arm	A	From Leg	2.00	0.0000	65.00	No Ice	1.67	3.27	0.06
			0.00			1/2" Ice	2.51	4.99	0.09
			0.00			1" Ice	3.35	6.71	0.12
***									
3"Ø x 10' Omni	B	From Leg	4.00	0.0000	62.00	No Ice	3.00	3.00	0.05
			0.00			1/2" Ice	4.03	4.03	0.07
			-6.00			1" Ice	5.03	5.03	0.10
3"Ø x 10' Omni	B	From Leg	4.00	0.0000	62.00	No Ice	3.00	3.00	0.05
			0.00			1/2" Ice	4.03	4.03	0.07
			6.00			1" Ice	5.03	5.03	0.10
(1) Side Arm	B	From Leg	2.00	0.0000	62.00	No Ice	21.88	20.17	0.67
			0.00			1/2" Ice	30.43	28.95	0.97
			0.00			1" Ice	38.98	37.73	1.27
***									
Pipe Mount	B	From Leg	0.00	0.0000	56.00	No Ice	1.60	1.60	0.03
			0.00			1/2" Ice	2.42	2.42	0.04
			0.00			1" Ice	3.24	3.24	0.06

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
PR-850	A	Grid	From Leg	0.50	0.0000		58.00	5.67	No Ice	25.22	0.04
				0.00					1/2" Ice	25.97	0.17
				0.00					1" Ice	26.71	0.30
**											
PR-850	B	Grid	From Leg	0.50	0.0000		56.00	5.67	No Ice	25.22	0.04
				0.00					1/2" Ice	25.97	0.17
				4.00					1" Ice	26.71	0.30
PR-850	B	Grid	From Leg	0.50	0.0000		56.00	5.67	No Ice	25.22	0.04
				0.00					1/2" Ice	25.97	0.17
				-4.00					1" Ice	26.71	0.30
**											

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice

Comb. No.	Description
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	118 - 100	Leg	Max Tension	23	12.53	-0.08	-0.05
			Max. Compression	18	-16.22	0.17	-0.10
			Max. Mx	20	-1.70	-0.33	0.00
			Max. My	2	0.32	-0.02	-0.32
			Max. Vy	20	0.83	0.00	0.00
			Max. Vx	14	-0.86	0.00	0.00
		Diagonal	Max Tension	24	2.48	0.00	0.00
			Max. Compression	12	-2.52	0.00	0.00
			Max. Mx	34	0.37	0.02	-0.00
			Max. My	24	-2.45	-0.00	-0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	34	-0.02	0.02	-0.00
			Max. Vx	24	0.00	-0.00	-0.01
		Top Girt	Max Tension	3	0.62	0.00	0.00
			Max. Compression	14	-0.66	0.00	0.00
			Max. Mx	26	-0.05	-0.04	0.00
			Max. My	18	-0.33	0.00	-0.00
			Max. Vy	26	0.03	0.00	0.00
			Max. Vx	18	0.00	0.00	0.00
T2	100 - 80	Leg	Max Tension	15	48.09	0.01	-0.11
			Max. Compression	18	-55.78	0.12	-0.06
			Max. Mx	8	-2.83	0.69	-0.02
			Max. My	2	7.56	-0.03	-0.70
			Max. Vy	8	-0.44	-0.18	-0.04
			Max. Vx	2	0.45	-0.00	0.20
		Diagonal	Max Tension	20	5.03	0.00	0.00
			Max. Compression	8	-5.17	0.00	0.00
			Max. Mx	34	0.55	0.03	-0.00
			Max. My	12	-5.09	-0.01	-0.01
			Max. Vy	34	-0.02	0.03	-0.00
			Max. Vx	12	-0.00	0.00	0.00
T3	80 - 60	Leg	Max Tension	15	80.04	-0.12	0.08
			Max. Compression	10	-91.53	0.21	0.02
			Max. Mx	2	-90.19	0.25	-0.11
			Max. My	16	-4.94	-0.04	-0.35
			Max. Vy	22	0.20	-0.23	-0.02
			Max. Vx	4	0.32	-0.01	-0.27
		Diagonal	Max Tension	20	3.70	0.00	0.00
			Max. Compression	8	-3.75	0.00	0.00
			Max. Mx	35	1.03	0.03	0.00
			Max. My	20	-3.58	-0.01	0.01
			Max. Vy	35	-0.03	0.03	0.00
			Max. Vx	20	-0.00	0.00	0.00
T4	60 - 40	Leg	Max Tension	15	109.75	-0.13	-0.01
			Max. Compression	10	-124.70	-0.02	-0.00
			Max. Mx	2	-98.17	0.25	-0.11
			Max. My	5	-4.60	-0.01	-0.27
			Max. Vy	22	-0.19	-0.23	-0.02
			Max. Vx	3	-0.22	-0.13	-0.26
		Diagonal	Max Tension	24	4.47	0.00	0.00
			Max. Compression	24	-4.56	0.00	0.00
			Max. Mx	35	1.12	0.03	-0.00
			Max. My	14	-3.73	-0.00	0.00
			Max. Vy	33	0.03	0.03	0.00
			Max. Vx	34	-0.00	0.00	0.00
T5	40 - 20	Leg	Max Tension	15	133.07	0.38	0.00
			Max. Compression	10	-151.33	-0.39	-0.00
			Max. Mx	10	-151.18	0.72	-0.00
			Max. My	12	-7.67	-0.08	-0.63
			Max. Vy	10	-0.28	0.72	-0.00
			Max. Vx	12	-0.18	-0.08	-0.63
		Diagonal	Max Tension	25	5.81	0.07	-0.01
			Max. Compression	24	-6.08	0.00	0.00
			Max. Mx	10	4.66	0.11	0.02
			Max. My	12	-6.00	-0.04	0.03
			Max. Vy	33	0.05	0.09	0.00
			Max. Vx	12	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	10	3.12	0.01	-0.01
			Max. Compression	10	-3.12	0.00	0.00
			Max. Mx	36	-0.04	0.03	0.00
			Max. My	14	-0.25	0.01	0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	34	-0.03	0.03	0.00
			Max. Vx	14	-0.00	0.00	0.00
T6	20 - 10	Leg	Max Tension	15	145.96	0.29	-0.00
			Max. Compression	10	-166.23	-0.65	-0.00
			Max. Mx	10	-166.04	0.84	-0.00
			Max. My	12	-8.90	-0.09	-0.77
			Max. Vy	10	0.30	0.84	-0.00
			Max. Vx	12	0.21	-0.09	-0.77
		Diagonal	Max Tension	21	5.75	0.06	0.01
			Max. Compression	20	-5.87	0.00	0.00
			Max. Mx	32	1.29	0.11	-0.01
			Max. My	20	-5.84	-0.02	0.03
			Max. Vy	33	0.06	0.11	0.01
			Max. Vx	20	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	10	3.24	0.00	-0.00
			Max. Compression	10	-3.24	0.00	0.00
			Max. Mx	36	-0.08	0.04	0.00
			Max. My	6	-0.35	0.01	0.01
			Max. Vy	36	0.03	0.04	0.00
			Max. Vx	14	-0.00	0.00	0.00
T7	10 - 0	Leg	Max Tension	15	157.91	0.46	-0.00
			Max. Compression	10	-180.15	-0.00	0.00
			Max. Mx	10	-179.96	0.73	-0.00
			Max. My	12	-9.39	-0.09	-0.77
			Max. Vy	10	-0.30	0.73	-0.00
			Max. Vx	12	-0.20	-0.09	-0.77
		Diagonal	Max Tension	21	5.71	0.07	-0.01
			Max. Compression	20	-6.04	0.00	0.00
			Max. Mx	12	2.15	0.10	0.01
			Max. My	17	-5.23	-0.02	0.02
			Max. Vy	34	0.05	0.06	0.01
			Max. Vx	16	-0.00	-0.01	0.02
		Secondary Horizontal	Max Tension	10	3.50	0.01	-0.01
			Max. Compression	10	-3.50	0.00	0.00
			Max. Mx	34	-0.54	0.03	0.00
			Max. My	3	3.42	0.01	-0.01
			Max. Vy	34	-0.03	0.03	0.00
			Max. Vx	3	-0.00	0.01	-0.01

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	185.88	12.99	-7.25
	Max. H_x	18	185.88	12.99	-7.25
	Max. H_z	7	-162.58	-11.77	6.56
	Min. Vert	7	-162.58	-11.77	6.56
	Min. H_x	7	-162.58	-11.77	6.56
	Min. H_z	18	185.88	12.99	-7.25
Leg B	Max. Vert	10	187.56	-13.05	-7.47
	Max. H_x	23	-163.88	11.79	6.78
	Max. H_z	23	-163.88	11.79	6.78
	Min. Vert	23	-163.88	11.79	6.78
	Min. H_x	10	187.56	-13.05	-7.47

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg A	Min. H_z	10	187.56	-13.05	-7.47
	Max. Vert	2	185.54	0.14	14.93
	Max. H_x	20	9.66	1.63	0.44
	Max. H_z	2	185.54	0.14	14.93
	Min. Vert	15	-164.14	-0.15	-13.54
	Min. H_x	8	8.76	-1.64	0.36
	Min. H_z	15	-164.14	-0.15	-13.54

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	24.87	0.00	0.00	6.63	0.13	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	29.84	-0.09	-24.44	-1748.73	5.58	2.59
0.9 Dead+1.6 Wind 0 deg - No Ice	22.38	-0.09	-24.44	-1748.53	5.54	2.59
1.2 Dead+1.6 Wind 30 deg - No Ice	29.84	11.78	-20.37	-1466.48	-851.56	3.32
0.9 Dead+1.6 Wind 30 deg - No Ice	22.38	11.78	-20.37	-1466.62	-850.51	3.31
1.2 Dead+1.6 Wind 60 deg - No Ice	29.84	20.33	-11.66	-838.30	-1472.80	4.05
0.9 Dead+1.6 Wind 60 deg - No Ice	22.38	20.33	-11.66	-839.24	-1470.97	4.04
1.2 Dead+1.6 Wind 90 deg - No Ice	29.84	23.72	0.06	11.84	-1712.08	3.28
0.9 Dead+1.6 Wind 90 deg - No Ice	22.38	23.72	0.06	9.83	-1709.96	3.27
1.2 Dead+1.6 Wind 120 deg - No Ice	29.84	21.29	12.33	892.89	-1527.05	0.97
0.9 Dead+1.6 Wind 120 deg - No Ice	22.38	21.29	12.33	889.78	-1525.17	0.96
1.2 Dead+1.6 Wind 150 deg - No Ice	29.84	12.00	20.63	1497.61	-864.16	-1.53
0.9 Dead+1.6 Wind 150 deg - No Ice	22.38	12.00	20.63	1493.73	-863.11	-1.53
1.2 Dead+1.6 Wind 180 deg - No Ice	29.84	0.12	23.53	1713.23	-7.08	-2.76
0.9 Dead+1.6 Wind 180 deg - No Ice	22.38	0.12	23.53	1709.07	-7.11	-2.76
1.2 Dead+1.6 Wind 210 deg - No Ice	29.84	-11.70	20.42	1485.08	847.34	-3.25
0.9 Dead+1.6 Wind 210 deg - No Ice	22.38	-11.70	20.42	1481.21	846.23	-3.24
1.2 Dead+1.6 Wind 240 deg - No Ice	29.84	-21.08	12.11	879.67	1515.30	-4.09
0.9 Dead+1.6 Wind 240 deg - No Ice	22.38	-21.08	12.11	876.56	1513.36	-4.08
1.2 Dead+1.6 Wind 270 deg - No Ice	29.84	-23.72	-0.08	2.85	1712.37	-3.43
0.9 Dead+1.6 Wind 270 deg - No Ice	22.38	-23.72	-0.08	0.85	1710.18	-3.42
1.2 Dead+1.6 Wind 300 deg - No Ice	29.84	-20.46	-11.87	-850.92	1480.49	-0.75
0.9 Dead+1.6 Wind 300 deg -	22.38	-20.46	-11.87	-851.85	1478.59	-0.74

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
No Ice 1.2 Dead+1.6 Wind 330 deg - No Ice	29.84	-11.95	-20.66	-1483.08	861.92	1.60
0.9 Dead+1.6 Wind 330 deg - No Ice	22.38	-11.95	-20.66	-1483.22	860.80	1.61
1.2 Dead+1.0 Ice+1.0 Temp	79.89	0.00	0.00	25.90	7.22	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	79.89	-0.28	-7.40	-513.94	23.24	1.00
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	79.89	3.57	-6.17	-427.88	-254.78	1.43
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	79.89	6.20	-3.55	-235.54	-448.37	1.49
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	79.89	7.20	0.01	26.69	-520.48	1.08
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	79.89	6.35	3.83	303.29	-456.96	0.18
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	79.89	3.59	6.35	490.17	-256.05	-0.86
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	79.89	0.04	7.24	556.84	4.97	-1.52
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	79.89	-3.52	6.26	484.84	266.32	-1.74
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	79.89	-6.49	3.58	289.09	478.85	-1.25
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	79.89	-7.29	-0.18	15.91	540.55	-0.47
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	79.89	-6.36	-3.69	-243.30	471.76	0.10
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	79.89	-3.82	-6.27	-433.66	283.89	0.55
Dead+Wind 0 deg - Service	24.87	-0.02	-6.36	-449.96	1.53	0.67
Dead+Wind 30 deg - Service	24.87	3.07	-5.30	-376.60	-221.26	0.86
Dead+Wind 60 deg - Service	24.87	5.29	-3.03	-213.32	-382.73	1.05
Dead+Wind 90 deg - Service	24.87	6.17	0.02	7.66	-444.93	0.85
Dead+Wind 120 deg - Service	24.87	5.54	3.21	236.67	-396.84	0.25
Dead+Wind 150 deg - Service	24.87	3.12	5.37	393.85	-224.54	-0.40
Dead+Wind 180 deg - Service	24.87	0.03	6.12	449.89	-1.76	-0.72
Dead+Wind 210 deg - Service	24.87	-3.04	5.31	390.59	220.33	-0.84
Dead+Wind 240 deg - Service	24.87	-5.48	3.15	233.23	393.95	-1.06
Dead+Wind 270 deg - Service	24.87	-6.17	-0.02	5.32	445.17	-0.89
Dead+Wind 300 deg - Service	24.87	-5.32	-3.09	-216.60	384.90	-0.19
Dead+Wind 330 deg - Service	24.87	-3.11	-5.37	-380.91	224.12	0.42

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-24.87	0.00	0.00	24.87	0.00	0.000%
2	-0.09	-29.84	-24.44	0.09	29.84	24.44	0.000%
3	-0.09	-22.38	-24.44	0.09	22.38	24.44	0.000%
4	11.78	-29.84	-20.37	-11.78	29.84	20.37	0.000%
5	11.78	-22.38	-20.37	-11.78	22.38	20.37	0.000%
6	20.33	-29.84	-11.66	-20.33	29.84	11.66	0.000%
7	20.33	-22.38	-11.66	-20.33	22.38	11.66	0.000%
8	23.72	-29.84	0.06	-23.72	29.84	-0.06	0.000%
9	23.72	-22.38	0.06	-23.72	22.38	-0.06	0.000%
10	21.29	-29.84	12.33	-21.29	29.84	-12.33	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
11	21.29	-22.38	12.33	-21.29	22.38	-12.33	0.000%
12	12.00	-29.84	20.63	-12.00	29.84	-20.63	0.000%
13	12.00	-22.38	20.63	-12.00	22.38	-20.63	0.000%
14	0.12	-29.84	23.53	-0.12	29.84	-23.53	0.000%
15	0.12	-22.38	23.53	-0.12	22.38	-23.53	0.000%
16	-11.70	-29.84	20.42	11.70	29.84	-20.42	0.000%
17	-11.70	-22.38	20.42	11.70	22.38	-20.42	0.000%
18	-21.08	-29.84	12.11	21.08	29.84	-12.11	0.000%
19	-21.08	-22.38	12.11	21.08	22.38	-12.11	0.000%
20	-23.72	-29.84	-0.08	23.72	29.84	0.08	0.000%
21	-23.72	-22.38	-0.08	23.72	22.38	0.08	0.000%
22	-20.46	-29.84	-11.87	20.46	29.84	11.87	0.000%
23	-20.46	-22.38	-11.87	20.46	22.38	11.87	0.000%
24	-11.95	-29.84	-20.66	11.95	29.84	20.66	0.000%
25	-11.95	-22.38	-20.66	11.95	22.38	20.66	0.000%
26	0.00	-79.89	0.00	0.00	79.89	0.00	0.000%
27	-0.28	-79.89	-7.40	0.28	79.89	7.40	0.000%
28	3.57	-79.89	-6.17	-3.57	79.89	6.17	0.000%
29	6.20	-79.89	-3.55	-6.20	79.89	3.55	0.000%
30	7.20	-79.89	0.01	-7.20	79.89	-0.01	0.000%
31	6.35	-79.89	3.83	-6.35	79.89	-3.83	0.000%
32	3.59	-79.89	6.35	-3.59	79.89	-6.35	0.000%
33	0.04	-79.89	7.24	-0.04	79.89	-7.24	0.000%
34	-3.52	-79.89	6.26	3.52	79.89	-6.26	0.000%
35	-6.49	-79.89	3.58	6.49	79.89	-3.58	0.000%
36	-7.29	-79.89	-0.18	7.29	79.89	0.18	0.000%
37	-6.36	-79.89	-3.69	6.36	79.89	3.69	0.000%
38	-3.82	-79.89	-6.27	3.82	79.89	6.27	0.000%
39	-0.02	-24.87	-6.36	0.02	24.87	6.36	0.000%
40	3.07	-24.87	-5.30	-3.07	24.87	5.30	0.000%
41	5.29	-24.87	-3.03	-5.29	24.87	3.03	0.000%
42	6.17	-24.87	0.02	-6.17	24.87	-0.02	0.000%
43	5.54	-24.87	3.21	-5.54	24.87	-3.21	0.000%
44	3.12	-24.87	5.37	-3.12	24.87	-5.37	0.000%
45	0.03	-24.87	6.12	-0.03	24.87	-6.12	0.000%
46	-3.04	-24.87	5.31	3.04	24.87	-5.31	0.000%
47	-5.48	-24.87	3.15	5.48	24.87	-3.15	0.000%
48	-6.17	-24.87	-0.02	6.17	24.87	0.02	0.000%
49	-5.32	-24.87	-3.09	5.32	24.87	3.09	0.000%
50	-3.11	-24.87	-5.37	3.11	24.87	5.37	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000377
3	Yes	4	0.00000001	0.00000422
4	Yes	4	0.00000001	0.00000666
5	Yes	4	0.00000001	0.00000624
6	Yes	4	0.00000001	0.00000837
7	Yes	4	0.00000001	0.00000754
8	Yes	4	0.00000001	0.00000683
9	Yes	4	0.00000001	0.00000642
10	Yes	4	0.00000001	0.00000404
11	Yes	4	0.00000001	0.00000448

12	Yes	4	0.00000001	0.00000703
13	Yes	4	0.00000001	0.00000657
14	Yes	4	0.00000001	0.00000860
15	Yes	4	0.00000001	0.00000772
16	Yes	4	0.00000001	0.00000683
17	Yes	4	0.00000001	0.00000636
18	Yes	4	0.00000001	0.00000379
19	Yes	4	0.00000001	0.00000422
20	Yes	4	0.00000001	0.00000680
21	Yes	4	0.00000001	0.00000641
22	Yes	4	0.00000001	0.00000852
23	Yes	4	0.00000001	0.00000770
24	Yes	4	0.00000001	0.00000684
25	Yes	4	0.00000001	0.00000643
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00000715
28	Yes	4	0.00000001	0.00000724
29	Yes	4	0.00000001	0.00000743
30	Yes	4	0.00000001	0.00000737
31	Yes	4	0.00000001	0.00000739
32	Yes	4	0.00000001	0.00000759
33	Yes	4	0.00000001	0.00000774
34	Yes	4	0.00000001	0.00000761
35	Yes	4	0.00000001	0.00000745
36	Yes	4	0.00000001	0.00000748
37	Yes	4	0.00000001	0.00000754
38	Yes	4	0.00000001	0.00000734
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
T1	118 - 100	2.324	43	0.1587	0.0096
T2	100 - 80	1.721	43	0.1503	0.0094
T3	80 - 60	1.104	43	0.1269	0.0089
T4	60 - 40	0.619	43	0.0929	0.0081
T5	40 - 20	0.272	43	0.0591	0.0034
T6	20 - 10	0.074	43	0.0279	0.0014
T7	10 - 0	0.019	43	0.0139	0.0006

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
118.00	Lightning Rod	43	2.324	0.1587	0.0096	363971
110.00	(2) 7770	43	2.054	0.1558	0.0095	227482
98.00	(2) SBNHH-1D85B w/Mount Pipe	43	1.655	0.1487	0.0093	81128
87.00	60" x 12" x 5" w/ Mount Pipe	43	1.308	0.1368	0.0090	39994
65.00	3"Ø x 8' Omni	43	0.728	0.1017	0.0086	36134
62.00	3"Ø x 10' Omni	43	0.662	0.0964	0.0083	37157
60.00	PR-850	43	0.619	0.0929	0.0081	37293
58.00	PR-850	43	0.578	0.0894	0.0077	36700
56.00	Pipe Mount	43	0.538	0.0859	0.0073	35651
52.00	PR-850	43	0.463	0.0791	0.0063	33429

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	118 - 100	8.883	10	0.6078	0.0370
T2	100 - 80	6.572	10	0.5749	0.0361
T3	80 - 60	4.215	10	0.4845	0.0343
T4	60 - 40	2.366	10	0.3534	0.0311
T5	40 - 20	1.041	10	0.2256	0.0131
T6	20 - 10	0.283	10	0.1065	0.0054
T7	10 - 0	0.072	10	0.0531	0.0025

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
118.00	Lightning Rod	10	8.883	0.6078	0.0370	96552
110.00	(2) 7770	10	7.848	0.5967	0.0368	60345
98.00	(2) SBNHH-1D85B w/Mount Pipe	10	6.322	0.5688	0.0359	21489
87.00	60" x 12" x 5" w/ Mount Pipe	10	4.994	0.5228	0.0347	10564
65.00	3"Ø x 8' Omni	10	2.779	0.3871	0.0333	9453
62.00	3"Ø x 10' Omni	10	2.527	0.3668	0.0321	9768
60.00	PR-850	10	2.366	0.3534	0.0311	9832
58.00	PR-850	10	2.209	0.3401	0.0297	9688
56.00	Pipe Mount	10	2.057	0.3269	0.0281	9409
52.00	PR-850	10	1.769	0.3011	0.0244	8814

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	118	Leg	A325N	0.7500	4	3.13	29.82	0.105 ✔	1	Bolt Tension

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
		Diagonal	A325N	0.6250	1	2.48	4.55	0.546 ✔	1	Member Block Shear
		Top Girt	A325N	0.6250	1	0.62	4.55	0.136 ✔	1	Member Block Shear
T2	100	Leg	A325N	0.7500	4	12.02	29.82	0.403 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	1	5.03	6.83	0.736 ✔	1	Member Block Shear
T3	80	Leg	A325N	1.0000	4	20.01	53.01	0.377 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	1	3.70	6.83	0.542 ✔	1	Member Block Shear
T4	60	Leg	A325N	1.0000	4	27.44	53.01	0.518 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	1	4.47	6.83	0.655 ✔	1	Member Block Shear
T5	40	Leg	A325N	1.0000	6	22.16	53.01	0.418 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	1	5.81	10.44	0.557 ✔	1	Member Bearing
		Secondary Horizontal	A325N	0.6250	1	3.12	4.55	0.685 ✔	1	Member Block Shear
T6	20	Diagonal	A325N	0.6250	1	5.75	10.44	0.551 ✔	1	Member Bearing
		Secondary Horizontal	A325N	0.6250	1	3.24	4.55	0.711 ✔	1	Member Block Shear
T7	10	Diagonal	A325N	0.6250	1	5.71	10.44	0.547 ✔	1	Member Bearing
		Secondary Horizontal	A325N	0.6250	1	3.50	4.55	0.769 ✔	1	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	118 - 100	1 3/4	18.00	4.50	123.4 K=1.00	2.4053	-16.22	35.67	0.455 [1] ✔
T2	100 - 80	2 1/2	20.00	5.00	96.0 K=1.00	4.9087	-55.78	112.60	0.495 [1] ✔
T3	80 - 60	2 3/4	20.02	5.00	87.4 K=1.00	5.9396	-91.53	152.99	0.598 [1] ✔
T4	60 - 40	3	20.02	5.00	80.1 K=1.00	7.0686	-124.70	199.04	0.627 [1] ✔
T5	40 - 20	3 1/4	20.02	5.20	76.8 K=1.00	8.2958	-151.34	242.55	0.624 [1] ✔
T6	20 - 10	3 1/2	10.01	5.19	71.1 K=1.00	9.6211	-166.23	299.12	0.556 [1] ✔
T7	10 - 0	3 1/2	10.01	5.17	70.9 K=1.00	9.6211	-180.15	299.63	0.601 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	118 - 100	L2x2x1/8	7.11	3.34	105.6 K=1.05	0.4844	-2.52	8.60	0.293 [1] ✔
T2	100 - 80	L2x2x3/16	7.43	3.46	108.9 K=1.04	0.7150	-5.17	12.40	0.417 [1] ✔
T3	80 - 60	L2x2x3/16	8.45	4.08	124.3 K=1.00	0.7150	-3.75	10.28	0.365 [1] ✔
T4	60 - 40	L2x2x3/16	9.70	4.69	143.0 K=1.00	0.7150	-4.51	7.90	0.571 [1] ✔
T5	40 - 20	L3x3x1/4	13.88	7.02	142.2 K=1.00	1.4400	-5.97	16.09	0.371 [1] ✔
T6	20 - 10	L3x3x1/4	14.41	7.26	147.2 K=1.00	1.4400	-5.87	15.01	0.391 [1] ✔
T7	10 - 0	L3x3x1/4	14.96	7.54	152.8 K=1.00	1.4400	-6.04	13.94	0.433 [1] ✔

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T5	40 - 20	L2x2x1/8	9.61	4.67	141.0 K=1.00	0.4844	-3.12	5.51	0.566 [1] ✔
T6	20 - 10	L2x2x1/8	10.36	5.03	152.0 K=1.00	0.4844	-3.24	4.74	0.683 [1] ✔
T7	10 - 0	L2x2x1/8	11.11	5.41	163.3 K=1.00	0.4844	-3.50	4.10	0.854 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	118 - 100	L2x2x1/8	5.50	5.11	154.4 K=1.00	0.4844	-0.66	4.59	0.143 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	118 - 100	1 3/4	18.00	4.50	123.4	2.4053	12.53	108.24	0.116 [1] ✔
T2	100 - 80	2 1/2	20.00	5.00	96.0	4.9087	48.09	220.89	0.218 [1] ✔
T3	80 - 60	2 3/4	20.02	5.00	87.4	5.9396	80.04	267.28	0.299 [1] ✔
T4	60 - 40	3	20.02	5.00	80.1	7.0686	109.75	318.09	0.345 [1] ✔
T5	40 - 20	3 1/4	20.02	4.81	71.0	8.2958	133.07	373.31	0.356 [1] ✔
T6	20 - 10	3 1/2	10.01	4.82	66.2	9.6211	145.96	432.95	0.337 [1] ✔
T7	10 - 0	3 1/2	10.01	4.84	66.3	9.6211	157.91	432.95	0.365 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	118 - 100	L2x2x1/8	7.11	3.34	66.3	0.2930	2.48	12.74	0.195 [1] ✔
T2	100 - 80	L2x2x3/16	7.43	3.46	69.5	0.4308	5.03	18.74	0.268 [1] ✔
T3	80 - 60	L2x2x3/16	8.45	4.08	81.7	0.4308	3.70	18.74	0.198 [1] ✔
T4	60 - 40	L2x2x3/16	9.70	4.69	93.6	0.4308	4.47	18.74	0.239 [1] ✔
T5	40 - 20	L3x3x1/4	13.37	6.77	87.4	0.9394	5.81	40.86	0.142 [1] ✔
T6	20 - 10	L3x3x1/4	14.41	7.26	93.7	0.9394	5.75	40.86	0.141 [1] ✔
T7	10 - 0	L3x3x1/4	14.96	7.54	97.2	0.9394	5.71	40.86	0.140 [1] ✔

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T5	40 - 20	L2x2x1/8	9.61	4.67	179.0	0.2930	3.12	12.74	0.245 [1] ✔
T6	20 - 10	L2x2x1/8	10.36	5.03	193.0	0.2930	3.24	12.74	0.254 [1] ✔
T7	10 - 0	L2x2x1/8	11.11	5.41	207.3	0.2930	3.50	12.74	0.275 [1] ✔

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	118 - 100	L2x2x1/8	5.50	5.11	102.6	0.2930	0.62	12.74	0.049 [1] ✔

[1] $P_u / \phi P_n$ controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	118 - 100	Leg	1 3/4	1	-16.22	35.67	45.5	Pass
T2	100 - 80	Leg	2 1/2	31	-55.78	112.60	49.5	Pass
T3	80 - 60	Leg	2 3/4	59	-91.53	152.99	59.8	Pass
T4	60 - 40	Leg	3	86	-124.70	199.04	62.7	Pass
T5	40 - 20	Leg	3 1/4	113	-151.34	242.55	62.4	Pass
T6	20 - 10	Leg	3 1/2	134	-166.23	299.12	55.6	Pass
T7	10 - 0	Leg	3 1/2	146	-180.15	299.63	60.1	Pass
T1	118 - 100	Diagonal	L2x2x1/8	9	-2.52	8.60	29.3 54.6 (b)	Pass
T2	100 - 80	Diagonal	L2x2x3/16	35	-5.17	12.40	41.7 73.6 (b)	Pass
T3	80 - 60	Diagonal	L2x2x3/16	62	-3.75	10.28	36.5 54.2 (b)	Pass
T4	60 - 40	Diagonal	L2x2x3/16	91	-4.51	7.90	57.1 65.5 (b)	Pass
T5	40 - 20	Diagonal	L3x3x1/4	118	-5.97	16.09	37.1 55.7 (b)	Pass
T6	20 - 10	Diagonal	L3x3x1/4	136	-5.87	15.01	39.1 55.1 (b)	Pass
T7	10 - 0	Diagonal	L3x3x1/4	148	-6.04	13.94	43.3 54.7 (b)	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T5	40 - 20	Secondary Horizontal	L2x2x1/8	121	-3.12	5.51	56.6 68.5 (b)	Pass
T6	20 - 10	Secondary Horizontal	L2x2x1/8	142	-3.24	4.74	68.3 71.1 (b)	Pass
T7	10 - 0	Secondary Horizontal	L2x2x1/8	154	-3.50	4.10	85.4	Pass
T1	118 - 100	Top Girt	L2x2x1/8	4	-0.66	4.59	14.3	Pass
							Summary	
							Leg (T4) 62.7	Pass
							Diagonal (T2) 73.6	Pass
							Secondary Horizontal (T7) 85.4	Pass
							Top Girt (T1) 14.3	Pass
							Bolt Checks 76.9	Pass
							RATING = 85.4	**Pass**

FDH VELOCITEL
ENGINEERING INNOVATION
FDH Velocitel., 6521 Meridien Dr. Raleigh, NC 27616, Ph. 919.755.1012, Fax 919.755.1031

SST - Anchor Rod Interaction Check per 4.9.9 TIA-222-G

Project No.	17PSUO1400
Site Name	Wilton CT Optasite
Site ID	CT98078-L

RISA Reactions per Leg		
Pu	188	kips
Vu	15	kips

Anchor Rod Properties:			
F_{yb}, Anchor Rod Ult. Yield Stress	92	ksi	
F_{ub}, Anchor Rod Ult. Tensile Stress	120	ksi	
number of anchor rods per leg	6	-	
diameter of anchor rod	1	in	
A_{net}, anchor rods	0.606	in^2	*(use Table 7-18 AISC, Net Tensile Area)*
η, detail type factor	0.5	-	*(see Fig. 4-4 Anchor Rod Detail Type)*
L_{ar}, unbraced length	1.0	in	

Capacity:			
$øR_{nt}$, design tensile strength	58.18	kips	
$øR_{nv}$, design shear strength	31.81	kips	
$øR_{nm}$, design flexural strength	8.80	kip-in	
Interaction Equation	62.5%	OK	*(TIA-222-G section 4.9.9)*
Interaction Equation	N/A	OK	*(TIA-222-G section 4.9.9)*

Equations:

$øR_{nt} = 0.8*F_{ub}*A_{net}$

$øR_{nt} = 0.75*0.45*F_{ub}*A_{b}$

$øR_{nt} = 0.9*Fy_{b}*d^3/6$

Interaction Equation = [Pu/leg+(Vu/leg)/η]/øRnt

Interaction Equation = [(Vu/øRnv)^2+(Pu/øRnt+Mu/øRnm)^2]

FDH VELOCITEL
ENGINEERING INNOVATION

Combined Foundation (3 Piers, 1 Pad)

Project Data

Project Number:	*Project*	17PSUO1400
Site Name:	*SiteName*	Wilton CT Optasite
Site ID:	*SiteID*	CT98078-L

Tower & Leg Reactions

Tower Shear:	*TwrV*	25	kip
Tower Moment:	*TwrM*	1769	ft-kip
Tower Weight:	*TwrWt*	30	kip
Leg Compression:	*LegC*	188	kip
Leg Shear (leg in compression):	*LegVcomp*	15	kip
Uplift:	*LegU*	164	kip
Leg Shear (leg in tension):	*LegVup*	14	kip

Code & Design Parameters

Standard:	*Standard*	TIA-222-G	-
Maximum Soil Stress Ratio:	*SRmaxSoil*	110%	-
Maximum Steel Stress Ratio:	*SRmaxStr*	105%	-
Results Type:	*ResultsType*	Steel Only	-

Site Details

Frost Depth:	*Frost*	3.33	ft
Water Depth:	*Water*	10	ft
Depth Neglected:	*Neglect*	3.33	ft
Seismic Design Category:	*SDC*	B	-

Soil Parameters

Bearing Pressure Capacity:	*Bc*	12000	psf
Ultimate or Allowable:	*BcUltAll*	Ultimate	-
Bearing Pressure Type:	*BcType*	Net	-
Unit Weight:	*gamma*	120	pcf
Angle of Internal Friction:	*phi*	30	deg
Cohesion:	*cohesion*		psf
Sliding Friction Coefficient:	*mu*	0.5	-
Passive Pressure Coefficient:	*Kp*	3.00	-
Passive Pressure Coeff. Override:	*KpOver*		-

Material Specifications

Concrete Strength:	*fc*	3000	psi
Concrete Weight:	*ConcUnitWt*	150	pcf
Rebar Yield Strength:	*Fy*	60	ksi
Clear Cover:	*cc*	3	in

Design Dimensions

Tower Width:	*TwrW*	11.5	ft
Number of Tower Legs:	*Legs*	3	-
Tower/Foundation Offset:	*Offset*	FALSE	TRUE/FALSE
Bearing Depth:	*D*	8.5	ft
Pad Width:	*W*	19	ft
Pad Thickness:	*T*	2	ft
Pier Diameter/Width:	*Dp*	3	ft
Pier Shape:	*Shape*	Round	-
Pier Extension:	*Ext*	0.5	ft

Reinforcement

Pad Reinforcement Quantity:	*PadQty*	26	-
Pad Reinforcement Size:	*PadSize*	9	-
Pier Reinforcement Quantity:	*PierQty*	16	-
Pier Reinforcement Size:	*PierSize*	8	-
Pier Reinforcement Hook:	*PierHook*	TRUE	TRUE/FALSE
Tie Reinforcement Size:	*TieSize*	4	-
Tie Reinforcement Spacing:	*TieSp*	12	in

Anchor Embedment

Anchor Bolt Diameter:	*ABDia*		in
Anchor Bolt Length:	*ABL*		in
Anchor Bolt Exposed:	*ABExp*		in
Embedment Plate Diameter:	*ABPlateD*		in
Embedment Plate Thickness:	*ABPlateT*		in
Anchor Bolt Embedment Length:	*ABEmbed*		in

Steel & Soil Checks

Lateral:	*=LatRatio*	N/A
Overturning:	*=OTRatio*	N/A
Bearing:	*=QRatio*	N/A
Pad One-Way Shear:	*=V1Ratio*	24.8%
Pad Two-Way Shear:	*=V2Ratio*	32.7%
Pad Flexure:	*=FlexRatio*	16.5%
Pad Minimum Reinforcement:	*=MinPadCheck*	OK
Pad Reinforcement Development:	*=DevPadCheck*	OK
Pier Compression:	*=CompRatio*	12.2%
Pier Tension & Bending:	*=PierStrRatio*	Use DSMC
Pier Minimum Reinforcement:	*=MinPierCheck*	OK
Pier Reinforcement Development:	*=DevPierCCheck1*	OK
Pier Reinforcement Development:	*=DevPierTCheck1*	OK
Pier Reinforcement Development:	*=DevPierTCheck2*	OK
Pier Hook Development:	*=DevHookCheck*	OK
Anchor Embedment:	*=ABCheck*	NOT CHECKED

Controlling Percentages

Soil Stress Ratio:	**N/A**
Structure Stress Ratio:	**32.7%**

SOLVE

Notes:

1. This sheet is a supplement to the BSPSQP Pad Pier sheet, which should be used to calculate actual overturning and bearing capacities.
2. If pier appears to be overstressed in bending and tension, use the Drilled Shaft Moment Capacity for a less conservative capacity.
3. Enter 0 for rebar quantity and 0 for anchor bolt length if unknown.
4. Buoyant weights for concrete and soil must be entered directly in the "ConcUnitWt" and "gamma" cells.

(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)

Site Data

Site ID: *CT98078-L*
Site Name: *Wilton CT Optasite*

Loads Already Factored		
For P (DL)	1.2	<----Disregard
For P,V, and M (WL)	1.35	<----Disregard

Pad & Pier Data		
Base PL Dist. Above Pier:	3	in
Pier Dist. Above Grade:	6	in
Pad Bearing Depth, D:	8.5	ft
Pad Thickness, T:	2	ft
Pad Width=Length, L:	19	ft
Pier Cross Section Shape:	Round	<--Pull Down
Enter Pier Diameter:	5.196152	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	21.21	ft^2
Pier Height:	7.00	ft
Soil (above pad) Height:	6.50	ft

Soil Parameters		
Unit Weight, γ:	120.0	pcf
Ultimate Bearing Capacity, qn:	13.02	ksf
Strength Reduct. factor, ϕ:	0.75	
Angle of Friction, Φ:	30.0	degrees
Undrained Shear Strength, Cu:		ksf
Allowable Bearing: ϕ*qn:	9.77	ksf
Passive Pres. Coeff., Kp	3.00	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	25.0	kips
Pad Force Location Above D:	0.96	ft
ϕ(Passive Pressure Moment):	23.89	ft-kips
Factored O.T. M(WL), "1.6W":	2000.3	ft-kips
Factored OT (MW-Msoil), M1	1976.36	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	3.75	ft
Sum of Soil Wedges Wt:	55.94	kips
Soil Wedges ecc, K1:	8.98	ft
Ftg+Soil above Pad wt:	395.6	kips
Unfactored (Total ftg-soil Wt):	451.54	kips
1.2D. **No Soil Wedges.**	504.73	kips
0.9D. **With Soil Wedges**	428.89	kips

Resistance due to Cohesion (Vertical)		
ϕ*(1/2*Cu)(Total Vert. Planes)	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Monopole Base Reaction Forces		
TIA Revision:	G	<--Pull Down
Factored DL Axial, PDu:	30	kips
Factored WL Shear, Vu:	25	kips
Factored WL Moment, Mu:	1769	ft-kips

Load Factor	Shaft Factored Loads		
1.00	1.2D+1.6W, Pu:	30	kips
0.90	0.9D+1.6W, Pu:	22.5	kips
1.00	Vu:	25	kips
	Mu:	1769	ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(**No Soil Wedges**) [Reaction+Conc+Soil]	504.73	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	1976.36	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 =	3.92	ft
Orthogonal qu=	2.55	ksf
qu/ϕ*qn Ratio=	**26.12%**	Pass

Diagonal Direction:

ecc2 = (0.707M1)/P1 =	2.77	ft
Diagonal qu=	2.78	ksf
qu/ϕ*qn Ratio=	**28.52%**	Pass

Run <-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(**w/ Soil Wedges**) [Reaction+Conc+Soil]	428.89	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	1524.07	ft-kips

Orthogonal ecc3 = M2/P2 =	3.55	ft
Ortho Non Bearing Length,NBL=	7.11	ft
Orthogonal qu=	2.08	ksf
Diagonal qu=	2.20	ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	1769.00		
M Orthogonal:	3942.87	**44.87%**	Pass
M Diagonal:	3942.87	**44.87%**	Pass

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

Site ID: *CT98078-L*
Site Name: *Wilton CT Optasite*

Loads Already Factored		
For M (WL)	1.3	<----Disregard
For P (DL)	1.3	<----Disregard

Pier Properties

Concrete:

Pier Diameter =	3	ft
Concrete Area =	1017.9	in^2

Reinforcement:

Clear Cover to **Tie**=	3	in
Horiz. **Tie** Bar Size=	4	
Vert. Cage Diameter =	2.33	ft
Vert. Cage Diameter =	28.00	in
Vertical Bar Size =	8	
Bar Diameter =	1.00	in
Bar Area =	0.79	in^2
Number of Bars =	16	
As Total=	12.64	in^2
A s/ Aconc, Rho:	0.0124	1.24%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:

(3)*(Sqrt(f'c)/Fy:	0.0027
200 / Fy:	0.0033

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	1.24%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	1727.31	kips
at Mu=(ϕ=0.65)Mn=	419.11	ft-kips
Max Tu, (φ=0.9) Tn =	682.56	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces

TIA Revision:	G	
Max. Factored Shaft Mu:	98	ft-kips (* Note)
Max. Factored Shaft Pu:	164	kips
Max Axial Force Type:	Tension	

(*) Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

Load Factor	Shaft Factored Loads		
1.00	Mu:	98	ft-kips
1.00	Pu:	164	kips

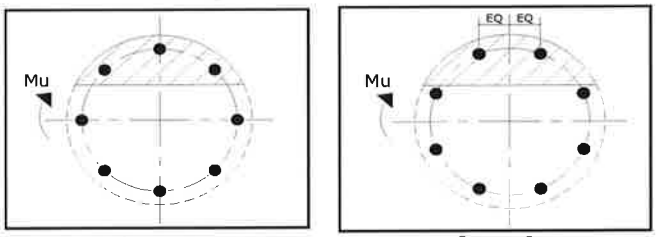
Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2008	
Seismic Properties		
Seismic Design Category =	B	
Seismic Risk =	**Low**	

Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1 Case 2

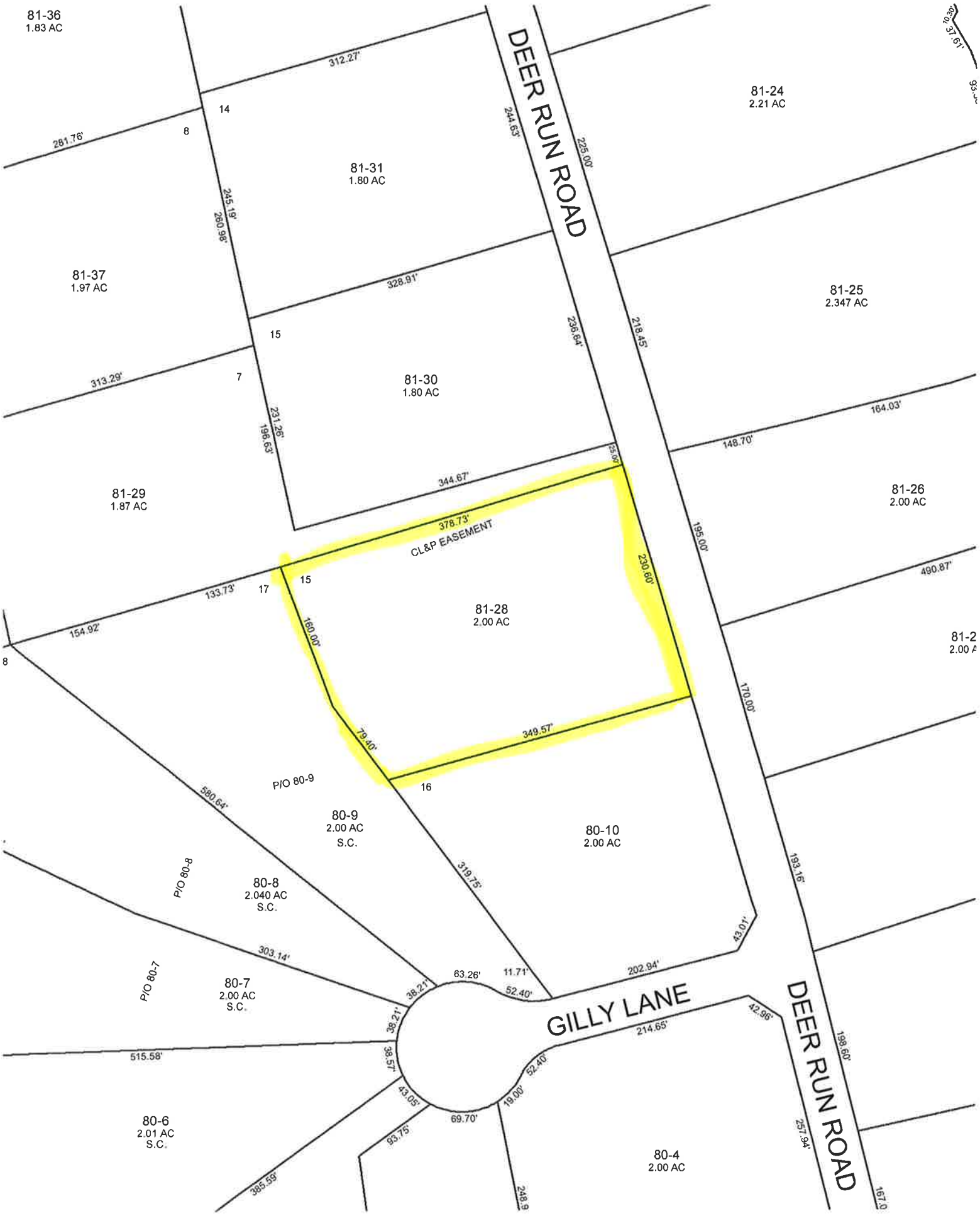
Dist. From Edge to Neutral Axis:	**7.10**	in
Extreme Steel Strain, εt:	**0.0104**	
	εt > 0.0050, Tension Controlled	
Reduction Factor,φ:	**0.900**	

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	-164.00	kips
Drilled Shaft Moment Capacity, φMn:	**575.60**	ft-kips
Drilled Shaft Superimposed Mu:	**98.00**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**17.0%**

ATTACHMENT 4


81-36
1.83 AC
312.27'
DEER RUN ROAD
81-24
2.21 AC
14
8
281.76'
244.63'
225.00'
81-31
1.80 AC
245.19'
260.98'
81-37
1.97 AC
328.91'
81-25
2.347 AC
15
236.64'
218.45'
313.29'
7
81-30
1.80 AC
231.26'
196.63'
164.03'
148.70'
344.67'
81-29
1.87 AC
81-26
2.00 AC
378.73'
CL&P EASEMENT
195.00'
490.87'
133.73'
17
15
230.60'
154.92'
81-28
2.00 AC
160.00'
170.00'
79.40'
349.57'
16
P/O 80-9
580.64'
80-9
2.00 AC
S.C.
80-10
2.00 AC
319.75'
193.16'
P/O 80-8
80-8
2.040 AC
S.C.
303.14'
43.01'
P/O 80-7
80-7
2.00 AC
S.C.
63.26'
11.71'
202.94'
38.21'
52.40'
GILLY LANE
DEER RUN ROAD
42.96'
214.65'
38.21'
198.60'
515.58'
38.57'
52.40'
43.05'
19.00'
80-6
2.01 AC
S.C.
69.70'
93.75'
257.94'
80-4
2.00 AC
385.59'
248.9
167.0

160 DEER RUN RD

Location	160 DEER RUN RD	**Mblu**	81/ / 28/ /
Acct#	001780	**Owner**	WESTPORT BROADCASTING CO LLC
Assessment	$555,100	**Appraisal**	$793,000
PID	4243	**Building Count**	1

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2015	$286,800	$506,200	$793,000
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2015	$200,760	$354,340	$555,100

Owner of Record

Owner	WESTPORT BROADCASTING CO LLC	**Sale Price**	$400,000
Co-Owner		**Certificate**	
Address	PO BOX 1041 VIRGINIA BEACH, VA 23451	**Book & Page**	1081/0146
		Sale Date	02/11/1998
		Instrument	00

Ownership History

Ownership History					
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Instrument**	**Sale Date**
WESTPORT BROADCASTING CO LLC	$400,000		1081/0146	00	02/11/1998
FLAMM, DONALD	$50,000		0177/0277	00	06/27/1972

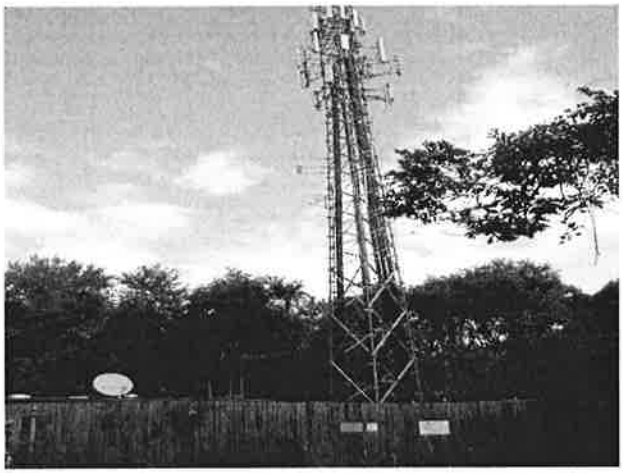
Building Information

Building 1 : Section 1

Year Built:	
Living Area:	0
Replacement Cost:	$0
Building Percent Good:	
Replacement Cost Less Depreciation:	$0

Building Attributes	
Field	**Description**
Style	Outbuildings
Model	
Grade:	
Occupancy	
Exterior Wall 1	
Exterior Wall 2	
Roof Structure:	
Roof Cover	
Interior Wall 1	
Interior Wall 2	
Interior Flr 1	
Interior Flr 2	
Heat Fuel	
Heat Type:	
AC Type:	
Total Bedrooms:	
Total Bthrms:	
Total Half Baths:	
Total Rooms:	
Bath Style:	
Kitchen Style:	
Elevator	
Fireplaces	
Sauna	
Spa/Jet Tub	
Whirlpool Tub	
Cath. Ceil	

Building Photo



(http://images.vgsi.com/photos/WiltonCTPhotos//\00\01\07/87

Building Layout

Building Layout

Building Sub-Areas (sq ft)	Legend
No Data for Building Sub-Areas	

Extra Features

Extra Features	Legend
No Data for Extra Features	

Land

Land Use

Use Code	5-1
Description	Vacant Res
Zone	R-2

Land Line Valuation

Size (Acres)	2
Frontage	
Depth	

Neighborhood	05	**Assessed Value**	$354,340
Alt Land Appr	No	**Appraised Value**	$506,200
Category			

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
SHD2	Shed Good			476 S.F.	$6,000	1
PAT1	Patio			892 S.F.	$4,000	1
FN3	Fence 6'			180 L.F.	$1,800	1
CLT	CELL TOWER			1 UNITS	$275,000	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2014	$286,800	$506,200	$793,000
2013	$286,800	$506,200	$793,000
2012	$286,800	$506,200	$793,000

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2014	$200,760	$354,340	$555,100
2013	$200,760	$354,340	$555,100
2012	$200,760	$354,340	$555,100