

March 6, 2017

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

**Re: Docket No. 449 – Message Center Management Tower
186 Black Rock Turnpike, Redding, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) received Connecticut Siting Council (“Council”) approval to share the above-referenced Message Center Management (“MCM”) tower in Docket No. 449. Construction of the new tower site at 186 Black Rock Turnpike in Redding commenced last Summer. Since the time of the Council’s Docket No. 449 approval, Cellco has decided to change the model of its antennas and remote radio heads (RRHs) for this facility to take advantage of the latest technology available.

The purpose of this letter is to provide the Council with notice of Cellco’s intent to install twelve (12) SBNHH-1D65B antennas that will be used to transmit in all of Cellco’s licensed frequency ranges. Cellco will also install a total of nine (9) RRHs (three (3) Model ALURRH2X60-700U; three (3) Model ALURRH2X60-PCS; and three (3) Model ALURRH4X45-AWS). Copies of specifications for the new antennas and RRHs are enclosed.

The above-referenced equipment modifications result in a minor increase in the radio frequency emissions from the Cellco facility to 43.44% of the FCC standards under the worst-case assumptions included in this calculation. A revised general power density table is also attached.

Robinson+Cole

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Finally, Cellco has confirmed that the new MCM tower is structurally capable of supporting Cellco's new antennas and RRHs. Enclosed is a Structural Analysis Report confirming that the tower is capable of supporting Cellco's proposed antennas and related equipment.

Cellco expects that it will be installing its antennas and equipment on the tower in the near future. If you have any questions or need any additional information please do not hesitate to contact me.

Sincerely,



Kenneth C. Baldwin

KCB/kmd
Enclosures
Copy to:
Elizabeth Jamieson
Anthony Befera



SBNHH-1D65C

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	16.2	16.0	17.7	17.9	18.5	18.5
Beamwidth, Horizontal, degrees	66	64	70	65	63	58
Beamwidth, Vertical, degrees	8.9	7.8	5.7	5.2	5.0	4.4
Beam Tilt, degrees	0–11	0–11	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	11	12	15	15	15	14
Front-to-Back Ratio at 180°, dB	29	31	27	27	28	27
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR Return Loss, dB	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	400	400	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*

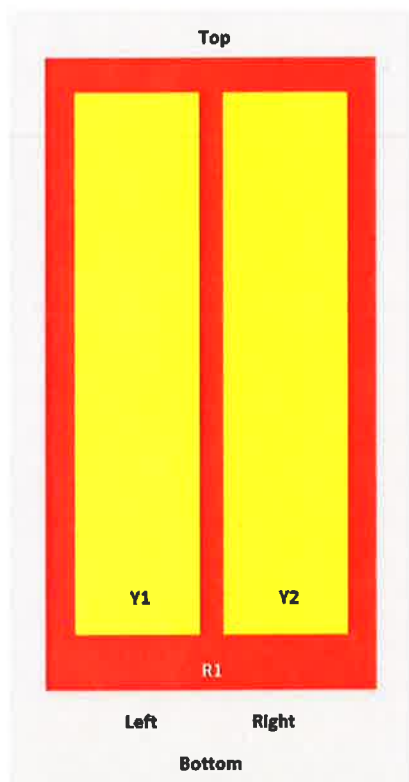
Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	15.8	15.6	17.3	17.8	18.2	18.1
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.5	±0.3	±0.2	±0.5	±0.4
Gain by Beam Tilt, average, dBi	0° 16.0	0° 15.8	0° 17.3	0° 17.7	0° 18.0	0° 17.9
	5° 16.0	5° 15.8	4° 17.4	4° 17.8	4° 18.2	4° 18.2
	11° 15.5	11° 15.2	7° 17.3	7° 17.7	7° 18.1	7° 18.2
Beamwidth, Horizontal Tolerance, degrees	±1.2	±1.9	±3.4	±3.8	±4.7	±3.7
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.5	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	13	14	17	16	17	15
Front-to-Back Total Power at 180° ± 30°, dB	26	24	27	25	25	26
CPR at Boresight, dB	29	22	20	21	19	21
CPR at Sector, dB	14	11	13	11	9	5

* 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.](#)

Array Layout

SBNHH-1D65C

SBNHH 65



Array	Freq (MHz)	Ports	REF (MREF)	AISG REF UID
R1	698-896	1-2	1	ARXXXXXXXXXXXXXXXXX.1
Y1	1695-2360	3-4	2	ARXXXXXXXXXXXXXXXXX.2
Y2	1695-2360	5-6		

View from the front of the antenna
 (Sizes of colored boxes are not true depictions of array sizes)

General Specifications

Operating Frequency Band	1695 – 2360 MHz 698 – 896 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female
Color	Light gray

Product Specifications

SBNHH-1D65C

Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	879.0 N @ 150 km/h 197.6 lbf @ 150 km/h
Wind Loading, lateral	273.0 N @ 150 km/h 61.4 lbf @ 150 km/h
Wind Loading, rear	1033.0 N @ 150 km/h 232.2 lbf @ 150 km/h
Wind Speed, maximum	241 km/h 150 mph

Dimensions

Length	2453.0 mm 96.6 in
Width	301.0 mm 11.9 in
Depth	180.0 mm 7.1 in
Net Weight, without mounting kit	22.5 kg 49.6 lb

Remote Electrical Tilt (RET) Information

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

Packed Dimensions

Length	2628.0 mm 103.5 in
Width	390.0 mm 15.4 in
Depth	296.0 mm 11.7 in
Shipping Weight	35.2 kg 77.6 lb

Regulatory Compliance/Certifications

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



Included Products

Product Specifications



SBNHH-1D65C

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.

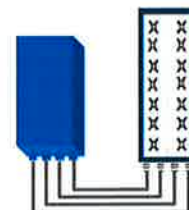


FEATURES

- 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

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz -- 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity schema	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Size (HxWxD) in mm (in.)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield)
Volume in L	38 (with solar shield)
Weight in kg (lb) (w/o mounting HW)	26 (57.2) (with solar shield)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) IP65
Wind load (@150km/h or 93mph)	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

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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.

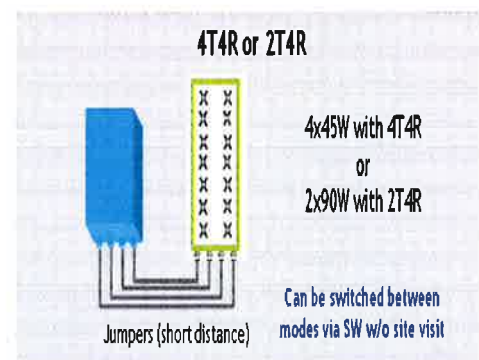
Its compactness and slim design makes the Alcatel-Lucent B66a RRH4x45 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the 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.)	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield)
Volume in Liters	35.5 (with solar shield) 29.7 (without solar shield)
Weight in kg (lb) (w/o mounting HW)	25.8kg (56.8lb) (with solar shield)
DC voltage range	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	750W typical @100% RF load (in 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) UL50E Type 4 Enclosure
Wind load (@150km/h or 93mph)	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

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General Power Density

Site Name: REDDING NE, CT
 Cumulative Power Density

Operator	Operating Frequency (MHz)	Number of Trans.	ERP Per Trans. (watts)	Total ERP (watts)	Distance to Target (feet)	Calculated Power Density (mW/cm ²)	Maximum Permissible Exposure* (mW/cm ²)	Fraction of MPE (%)
VZW PCS	1970	2	2061	4122	135	0.0813	1.0	8.13%
VZW Cellular	869	9	332	2988	135	0.0590	0.5793333333	10.18%
VZW AWS	2145	2	3406	6812	135	0.1344	1.0	13.44%
VZW 700	746	2	1473	2946	135	0.0581	0.4973333333	11.69%
Total Percentage of Maximum Permissible Exposure								43.44%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz

mW/cm² = milliwatts per square centimeter

ERP = Effective Radiated Power

Absolute worst case maximum values used.

STRUCTURAL ANALYSIS REPORT

For

REDDING NE CT

186 BLACK ROCK TURNPIKE
REDDING, CT 06896

149-ft Monopole

Prepared for:

verizon^v

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

Dated: March 3, 2017

Prepared by:



1600 Osgood Street Bldg. 20N Suite 3090
North Andover, MA 01845
(P) 978.557.5553 (F) 978.336.5586
www.hudsondesigngroupllc.com





SCOPE OF WORK:

Hudson Design Group LLC (HDG) has been authorized by Verizon to conduct a structural evaluation of the 149' monopole supporting the proposed Verizon's antennas located at elevation 135' above the ground level.

This report represents this office's findings, conclusions and recommendations pertaining to the support of Verizon's proposed antennas listed below.

Record drawings of the existing monopole prepared by Valmont Structures, dated December 11, 2015, were available and obtained for our use.

CONCLUSION SUMMARY:

Based on our evaluation, we have determined that the existing monopole and foundation **ARE IN CONFORMANCE** with the ANSI/TIA-222-G Standard for the loading considered under the criteria listed in this report. The monopole structure is rated at 63.4% - (Pole section L2 from EL.106.4' to EL.130.5' Controlling).



APPURTENANCES CONFIGURATION:

Tenant	Appurtenances	Elev.	Mount
AT&T	(12) HPA-65R-BUU-H8 Antennas	145'	Steel Platform
AT&T	(9) RRUS-11	145'	Steel Platform
AT&T	(6) RRUS-12	145'	Steel Platform
AT&T	(6) A2 Module	145'	Steel Platform
AT&T	(3) RRUS-E2	145'	Steel Platform
AT&T	(3) RRUS-32	145'	Steel Platform
AT&T	(4) DC6-48-60-18-8F	145'	Steel Platform
VERIZON	(9) SBNHH-1D65B Antennas	135'	Steel Platform
VERIZON	(3) RRH 2X60-700U	135'	Steel Platform
VERIZON	(3) RRH 4X45 AWS	135'	Steel Platform
VERIZON	DB-T1-6Z-8AB-0Z	135'	Steel Platform
VERIZON (Reserved)	(3) SBNHH-1D65B Antennas	135'	Steel Platform
VERIZON (Reserved)	(3) RRH 2X60 PCS	135'	Steel Platform
VERIZON (Reserved)	DB-T1-6Z-8AB-0Z	135'	Steel Platform

**Proposed/Reserved VERIZON Appurtenances shown in Bold.*

VERIZON EXISTING/PROPOSED COAX CABLES:

Tenant	Coax Cables	Elev.	Mount
VERIZON	(2) Fiber Cables	135'	Inside Monopole

**Proposed VERIZON Coax Cables shown in Bold.*



ANALYSIS RESULTS SUMMARY:

Component	Max. Stress Ratio	Elev. of Component (ft)	Pass/Fail	Comments
Pole Section-L1	44.9 %	130.5 – 149	PASS	
Pole Section-L2	63.4 %	106.4 – 130.5	PASS	Controlling
Pole Section-L3	52.3 %	79.6 – 106.4	PASS	
Pole Section-L4	50.7 %	46.1 – 79.6	PASS	
Pole Section-L5	47.4 %	0 – 46.1	PASS	
Base Plate & Anchor Bolts	49.9 %	0	PASS	

FOUNDATION ANALYSIS RESULTS SUMMARY:

	Design Reactions (DL + WL)	Base Reactions (DL + WL)	Pass/Fail	Comments
AXIAL	61.8 k	35.5 k	PASS	
SHEAR	42.1 k	25.2 k	PASS	
MOMENT	4899 ft-k	2847 ft-k	PASS	

****Reactions at the base of the tower under TIA/EIA G are factored; base reactions shown above have been un-factored for true comparison to original design reactions.**



DESIGN CRITERIA:

1. EIA/TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

County: Fairfield
Wind Load: 110 mph (3 second gust)
Structural Class: II
Exposure Category: B
Topographic Category: 1
Ice Thickness: 0.75 inch

2. Approximate height above grade to proposed antennas: 135'

Calculations and referenced documents are attached

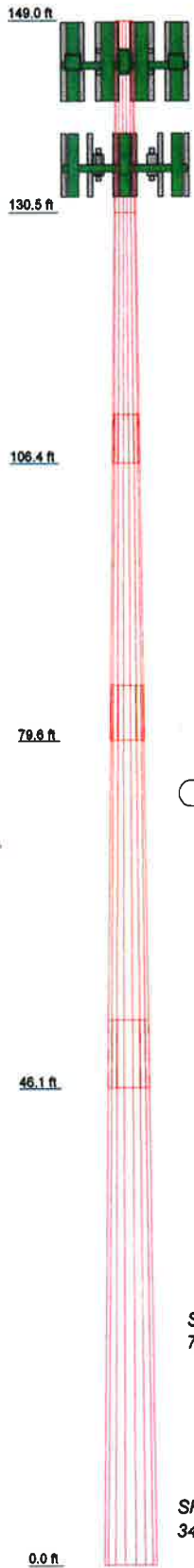
ASSUMPTIONS:

1. The monopole dimensions, member sizes and material strength are as indicated in the record drawings prepared by Valmont Structures, dated December 11, 2015.
2. The appurtenances configuration is as stated in the record drawings prepared by Valmont Structures, dated December 11, 2015. All antennas, coax cables and waveguide cables are assumed to be properly installed and supported as per the manufacturer's requirements.
3. The monopole and foundation are properly constructed and maintained. All structural members and their connections are assumed to be in good condition and are free from defects with no deterioration to its member capacities.
4. The support mounts and platforms are not analyzed and are considered adequate to support the loading. The analysis is limited to the primary support structure itself.
5. All prior structural modification, if any, are assumed to be as per the data supplied (if available), and installed properly.

SUPPORT RECOMMENDATIONS:

HDG recommends that the proposed antennas, RRHs and distribution box be mounted on the proposed steel platform supported by the monopole.

Section	1	2	3	4	5	
Length (ft)	18.50	24.08	31.42	38.92	52.50	29548.0
Number of Sides	18	18	18	18	18	
Thickness (in)	0.1875	0.2500	0.3750	0.4375	0.5000	
Socket Length (ft)		4.58	5.42	6.42		
Top Dia (in)	18.7500	25.0400	30.1195	36.8091	45.2289	
Bot Dia (in)	25.0400	31.9300	39.1100	47.9400	60.2500	
Grade						
Weight (lb)	832.0	1835.8	4357.2	7712.4	14810.5	



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PIROD 13' Low Profile Platform (ATD)	145	DC8-48-80-18-8F	145
(4) HPA-65R-BUU-H8 w/mount pipe	145	PIROD 13' Low Profile Platform (VERIZON - proposed)	135
(4) HPA-65R-BUU-H8 w/mount pipe	145	(3) SBNHH-1D65B w/ Mount Pipe	135
(4) HPA-65R-BUU-H8 w/mount pipe	145	(3) SBNHH-1D65B w/ Mount Pipe	135
(3) Ericason RRUS-11	145	(3) SBNHH-1D65B w/ Mount Pipe	135
(3) Ericason RRUS-11	145	RRH2x60-700	135
(3) Ericason RRUS-11	145	RRH2x60-700	135
(2) Ericason RRUS-12	145	RRH2x60-700	135
(2) Ericason RRUS-12	145	B66A RRH 4X45	135
(2) Ericason A2 Module	145	B66A RRH 4X45	135
(2) Ericason A2 Module	145	B66A RRH 4X45	135
Ericason RRUS-E2	145	RFS DB-T1-8Z-8AB-0Z	135
Ericason RRUS-E2	145	SBNHH-1D65B w/ Mount Pipe (VERIZON - reserved)	135
Ericason RRUS-32	145	SBNHH-1D65B w/ Mount Pipe	135
Ericason RRUS-32	145	SBNHH-1D65B w/ Mount Pipe	135
Ericason RRUS-32	145	RRH2x60 PCS	135
(2) DC8-48-80-18-8F	145	RRH2x60 PCS	135
DC8-48-80-18-8F	145	RRH2x60 PCS	135
		RFS DB-T1-8Z-8AB-0Z	135

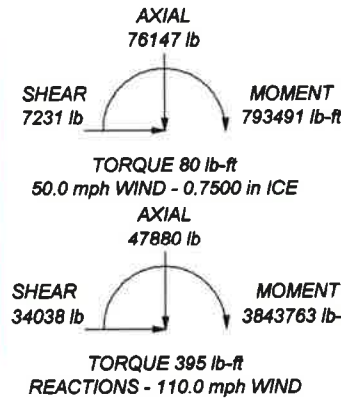
MATERIAL STRENGTH


GRADE	Fy	Fu	GRADE	Fy	Fu
A572-85	65 ksi	80 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 110.0 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50.0 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60.0 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 63.4%


ALL REACTIONS ARE FACTORED



 Hudson Design Group LLC 1600 Osgood Street Bldg. 20N Suite 3090 North Andover, MA 01845 Phone: (978) 557-5553 FAX: (978) 336-5586	Job: REDDING NE Project: 149 ft Monopole
	Client: VERIZON Code: TIA-222-G Path:



CALCULATIONS

 Hudson Design Group LLC 1600 Osgood Street Bldg. 20N Suite 3090 North Andover, MA 01845 Phone: (978) 557-5553 FAX: (978) 336-5586	Job	REDDING NE	Page	1 of 9
	Project	149 ft Monopole	Date	13:29:04 03/03/17
	Client	VERIZON	Designed by	kw

Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Fairfield County, Connecticut.

Basic wind speed of 110.0 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 56.0 pcf.

A wind speed of 50.0 mph is used in combination with ice.

Temperature drop of 50.0 °F.

Deflections calculated using a wind speed of 60.0 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	149.00-130.50	18.50	0.00	18	19.7500	25.0400	0.1875	0.7500	A572-65 (65 ksi)
L2	130.50-106.42	24.08	4.58	18	25.0400	31.9300	0.2500	1.0000	A572-65 (65 ksi)
L3	106.42-79.58	31.42	5.42	18	30.1195	39.1100	0.3750	1.5000	A572-65 (65 ksi)
L4	79.58-46.08	38.92	6.42	18	36.8091	47.9400	0.4375	1.7500	A572-65 (65 ksi)
L5	46.08-0.00	52.50		18	45.2289	60.2500	0.5000	2.0000	A572-65 (65 ksi)

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	24
Embedment length	54.0000 in
f_c	4.0 ksi
Grout space	2.0000 in



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Base Plate Data

Base plate grade	A572-50
Base plate thickness	3.5000 in
Bolt circle diameter	67.6800 in
Outer diameter	74.8200 in
Inner diameter	45.0000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _{AA} ft ² /ft	Weight plf
1 5/8	A	No	Inside Pole	145.00 - 8.00	24	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04

1 5/8 Fiber Cable (VERIZON - proposed)	A	No	Inside Pole	135.00 - 8.00	2	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight lb
PIROD 13' Low Profile Platform (AT&T)	A	None		0.0000	145.00	No Ice	15.70	15.70	1300.00
						1/2" Ice	20.10	20.10	1765.00
						1" Ice	24.50	24.50	2230.00
(4) HPA-65R-BUU-H8 w/mount pipe	A	From Face	3.00 0.00 0.00	0.0000	145.00	No Ice	13.05	9.42	97.20
						1/2" Ice	13.66	10.82	192.07
						1" Ice	14.27	12.07	296.65
(4) HPA-65R-BUU-H8 w/mount pipe	B	From Face	3.00 0.00 0.00	0.0000	145.00	No Ice	13.05	9.42	97.20
						1/2" Ice	13.66	10.82	192.07
						1" Ice	14.27	12.07	296.65
(4) HPA-65R-BUU-H8 w/mount pipe	C	From Face	3.00 0.00 0.00	0.0000	145.00	No Ice	13.05	9.42	97.20
						1/2" Ice	13.66	10.82	192.07
						1" Ice	14.27	12.07	296.65
(3) Ericsson RRUS-11	A	From Face	2.00 0.00 0.00	0.0000	145.00	No Ice	2.79	1.19	50.70
						1/2" Ice	3.00	1.34	71.57
						1" Ice	3.21	1.50	95.48
(3) Ericsson RRUS-11	B	From Face	2.00 0.00 0.00	0.0000	145.00	No Ice	2.79	1.19	50.70
						1/2" Ice	3.00	1.34	71.57
						1" Ice	3.21	1.50	95.48
(3) Ericsson RRUS-11	C	From Face	2.00 0.00 0.00	0.0000	145.00	No Ice	2.79	1.19	50.70
						1/2" Ice	3.00	1.34	71.57
						1" Ice	3.21	1.50	95.48
(2) Ericsson RRUS-12	A	From Face	2.00 0.00 0.00	0.0000	145.00	No Ice	3.15	1.29	58.00
						1/2" Ice	3.36	1.44	81.22
						1" Ice	3.59	1.60	107.64
(2) Ericsson RRUS-12	B	From Face	2.00 0.00 0.00	0.0000	145.00	No Ice	3.15	1.29	58.00
						1/2" Ice	3.36	1.44	81.22
						1" Ice	3.59	1.60	107.64




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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA}		Weight
			Horz	Vert			Front	Side	
			ft	ft	°	ft	ft ²	ft ²	lb
(2) Ericsson RRUS-12	C	From Face	2.00	0.00	0.0000	145.00	No Ice 3.15	1.29	58.00
			0.00	0.00			1/2" Ice 3.36	1.44	81.22
			0.00	0.00			1" Ice 3.59	1.60	107.64
(2) Ericsson A2 Module	A	From Face	2.00	0.00	0.0000	145.00	No Ice 2.08	0.50	22.00
			0.00	0.00			1/2" Ice 2.26	0.61	34.73
			0.00	0.00			1" Ice 2.44	0.73	49.92
(2) Ericsson A2 Module	B	From Face	2.00	0.00	0.0000	145.00	No Ice 2.08	0.50	22.00
			0.00	0.00			1/2" Ice 2.26	0.61	34.73
			0.00	0.00			1" Ice 2.44	0.73	49.92
(2) Ericsson A2 Module	C	From Face	2.00	0.00	0.0000	145.00	No Ice 2.08	0.50	22.00
			0.00	0.00			1/2" Ice 2.26	0.61	34.73
			0.00	0.00			1" Ice 2.44	0.73	49.92
Ericsson RRUS-E2	A	From Face	2.00	0.00	0.0000	145.00	No Ice 3.31	2.42	77.00
			0.00	0.00			1/2" Ice 3.56	2.64	104.93
			0.00	0.00			1" Ice 3.81	2.86	136.47
Ericsson RRUS-E2	B	From Face	2.00	0.00	0.0000	145.00	No Ice 3.31	2.42	77.00
			0.00	0.00			1/2" Ice 3.56	2.64	104.93
			0.00	0.00			1" Ice 3.81	2.86	136.47
Ericsson RRUS-E2	C	From Face	2.00	0.00	0.0000	145.00	No Ice 3.31	2.42	77.00
			0.00	0.00			1/2" Ice 3.56	2.64	104.93
			0.00	0.00			1" Ice 3.81	2.86	136.47
Ericsson RRUS-32	A	From Face	2.00	0.00	0.0000	145.00	No Ice 3.31	2.42	77.00
			0.00	0.00			1/2" Ice 3.56	2.64	104.93
			0.00	0.00			1" Ice 3.81	2.86	136.47
Ericsson RRUS-32	B	From Face	2.00	0.00	0.0000	145.00	No Ice 3.31	2.42	77.00
			0.00	0.00			1/2" Ice 3.56	2.64	104.93
			0.00	0.00			1" Ice 3.81	2.86	136.47
Ericsson RRUS-32	C	From Face	2.00	0.00	0.0000	145.00	No Ice 3.31	2.42	77.00
			0.00	0.00			1/2" Ice 3.56	2.64	104.93
			0.00	0.00			1" Ice 3.81	2.86	136.47
(2) DC6-48-60-18-8F	A	From Face	2.00	0.00	0.0000	145.00	No Ice 0.79	0.79	20.00
			0.00	0.00			1/2" Ice 1.27	1.27	35.12
			0.00	0.00			1" Ice 1.45	1.45	52.57
DC6-48-60-18-8F	B	From Face	2.00	0.00	0.0000	145.00	No Ice 0.79	0.79	20.00
			0.00	0.00			1/2" Ice 1.27	1.27	35.12
			0.00	0.00			1" Ice 1.45	1.45	52.57
DC6-48-60-18-8F	C	From Face	2.00	0.00	0.0000	145.00	No Ice 0.79	0.79	20.00
			0.00	0.00			1/2" Ice 1.27	1.27	35.12
			0.00	0.00			1" Ice 1.45	1.45	52.57

PiROD 13' Low Profile Platform (VERIZON - proposed)	A	None			0.0000	135.00	No Ice 15.70	15.70	1300.00
							1/2" Ice 20.10	20.10	1765.00
							1" Ice 24.50	24.50	2230.00
(3) SBNHH-1D65B w/ Mount Pipe	A	From Face	3.00	0.00	0.0000	135.00	No Ice 8.42	7.09	66.55
			0.00	0.00			1/2" Ice 8.98	8.27	135.68
			0.00	0.00			1" Ice 9.50	9.17	212.84
(3) SBNHH-1D65B w/ Mount Pipe	B	From Face	3.00	0.00	0.0000	135.00	No Ice 8.42	7.09	66.55
			0.00	0.00			1/2" Ice 8.98	8.27	135.68
			0.00	0.00			1" Ice 9.50	9.17	212.84
(3) SBNHH-1D65B w/ Mount Pipe	C	From Face	3.00	0.00	0.0000	135.00	No Ice 8.42	7.09	66.55
			0.00	0.00			1/2" Ice 8.98	8.27	135.68
			0.00	0.00			1" Ice 9.50	9.17	212.84
RRH2x60-700	A	From Face	2.00	0.00	0.0000	135.00	No Ice 3.50	1.82	60.00
			0.00	0.00			1/2" Ice 3.76	2.05	82.72
			0.00	0.00			1" Ice 4.03	2.29	109.06
RRH2x60-700	B	From Face	2.00	0.00	0.0000	135.00	No Ice 3.50	1.82	60.00
			0.00	0.00			1/2" Ice 3.76	2.05	82.72

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral	Azimuth Adjustment	Placement	C _{AA}		Weight	
						Front	Side		
			Vert	°	ft	ft ²	ft ²	lb	
RRH2x60-700	C	From Face	0.00	0.0000	135.00	1" Ice	4.03	2.29	109.06
			2.00			No Ice	3.50	1.82	60.00
			0.00			1/2" Ice	3.76	2.05	82.72
			0.00			1" Ice	4.03	2.29	109.06
B66A RRH 4X45	A	From Face	2.00	0.0000	135.00	No Ice	2.66	1.59	64.00
			0.00			1/2" Ice	2.88	1.77	84.35
			0.00			1" Ice	3.10	1.96	107.85
			0.00			No Ice	2.66	1.59	64.00
B66A RRH 4X45	B	From Face	2.00	0.0000	135.00	1/2" Ice	2.88	1.77	84.35
			0.00			1" Ice	3.10	1.96	107.85
			0.00			No Ice	2.66	1.59	64.00
			0.00			1/2" Ice	2.88	1.77	84.35
B66A RRH 4X45	C	From Face	2.00	0.0000	135.00	1" Ice	3.10	1.96	107.85
			0.00			No Ice	2.66	1.59	64.00
			0.00			1/2" Ice	2.88	1.77	84.35
			0.00			1" Ice	3.10	1.96	107.85
RFS DB-T1-6Z-8AB-0Z	A	From Face	2.00	0.0000	135.00	No Ice	4.80	2.00	44.00
			0.00			1/2" Ice	5.07	2.19	80.13
			0.00			1" Ice	5.35	2.39	120.22
			0.00			No Ice	4.80	2.00	44.00

SBNHH-1D65B w/ Mount Pipe (VERIZON - reserved)	A	From Face	3.00	0.0000	135.00	No Ice	8.42	7.09	66.55
			0.00			1/2" Ice	8.98	8.27	135.68
			0.00			1" Ice	9.50	9.17	212.84
			0.00			No Ice	8.42	7.09	66.55
SBNHH-1D65B w/ Mount Pipe	B	From Face	3.00	0.0000	135.00	1/2" Ice	8.98	8.27	135.68
			0.00			1" Ice	9.50	9.17	212.84
			0.00			No Ice	8.42	7.09	66.55
			0.00			1/2" Ice	8.98	8.27	135.68
SBNHH-1D65B w/ Mount Pipe	C	From Face	3.00	0.0000	135.00	1" Ice	9.50	9.17	212.84
			0.00			No Ice	8.42	7.09	66.55
			0.00			1/2" Ice	8.98	8.27	135.68
			0.00			1" Ice	9.50	9.17	212.84
RRH2x60 PCS	A	From Face	2.00	0.0000	135.00	No Ice	2.15	1.35	55.00
			0.00			1/2" Ice	2.34	1.50	72.75
			0.00			1" Ice	2.54	1.67	93.35
			0.00			No Ice	2.15	1.35	55.00
RRH2x60 PCS	B	From Face	2.00	0.0000	135.00	1/2" Ice	2.34	1.50	72.75
			0.00			1" Ice	2.54	1.67	93.35
			0.00			No Ice	2.15	1.35	55.00
			0.00			1/2" Ice	2.34	1.50	72.75
RRH2x60 PCS	C	From Face	2.00	0.0000	135.00	1" Ice	2.54	1.67	93.35
			0.00			No Ice	2.15	1.35	55.00
			0.00			1/2" Ice	2.34	1.50	72.75
			0.00			1" Ice	2.54	1.67	93.35
RFS DB-T1-6Z-8AB-0Z	B	From Face	2.00	0.0000	135.00	No Ice	4.80	2.00	44.00
			0.00			1/2" Ice	5.07	2.19	80.13
			0.00			1" Ice	5.35	2.39	120.22
			0.00			No Ice	4.80	2.00	44.00

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
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




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Comb. No.	Description
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 Reactions


Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	36	76147.12	7230.52	0.00
	Max. H _x	20	47879.94	34037.73	0.00
	Max. H _z	2	47879.94	0.00	33881.59
	Max. M _x	2	3822329.27	0.00	33881.59
	Max. M _z	8	3843637.91	-34037.73	0.00
	Max. Torsion	7	394.48	-29477.54	16940.79
	Min. Vert	25	35909.96	17018.86	29342.31
	Min. H _x	8	47879.94	-34037.73	0.00
	Min. H _z	14	47879.94	0.00	-33881.59
	Min. M _x	14	-3821928.21	0.00	-33881.59
	Min. M _z	20	-3843762.78	34037.73	0.00
	Min. Torsion	19	-394.56	29477.54	-16940.79

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Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
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Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear _x lb	Shear _y lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _y lb-ft	Torque lb-ft
Dead Only	39899.95	0.00	0.00	-160.25	49.72	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	47879.94	-0.00	-33881.59	-3822329.27	62.18	-113.09
0.9 Dead+1.6 Wind 0 deg - No Ice	35909.96	-0.00	-33881.59	-3797979.76	46.00	-112.51
1.2 Dead+1.6 Wind 30 deg - No Ice	47879.94	17018.86	-29342.31	-3310252.12	-1921807.74	-292.58
0.9 Dead+1.6 Wind 30 deg - No Ice	35909.96	17018.86	-29342.31	-3289156.90	-1909602.49	-292.70
1.2 Dead+1.6 Wind 60 deg - No Ice	47879.94	29477.54	-16940.79	-1911246.93	-3328692.64	-393.72
0.9 Dead+1.6 Wind 60 deg - No Ice	35909.96	29477.54	-16940.79	-1899046.10	-3307541.41	-394.48
1.2 Dead+1.6 Wind 90 deg - No Ice	47879.94	34037.73	-0.00	-199.53	-3843637.91	-389.37
0.9 Dead+1.6 Wind 90 deg - No Ice	35909.96	34037.73	-0.00	-147.67	-3819214.13	-390.60
1.2 Dead+1.6 Wind 120 deg - No Ice	47879.94	29477.54	16940.79	1910847.38	-3328691.79	-280.71
0.9 Dead+1.6 Wind 120 deg - No Ice	35909.96	29477.54	16940.79	1898750.39	-3307540.77	-282.06
1.2 Dead+1.6 Wind 150 deg - No Ice	47879.94	17018.86	29342.31	3309851.56	-1921806.90	-96.82
0.9 Dead+1.6 Wind 150 deg - No Ice	35909.96	17018.86	29342.31	3288860.43	-1909601.85	-97.92
1.2 Dead+1.6 Wind 180 deg - No Ice	47879.94	-0.00	33881.59	3821928.21	62.18	113.09
0.9 Dead+1.6 Wind 180 deg - No Ice	35909.96	-0.00	33881.59	3797682.91	46.00	112.51
1.2 Dead+1.6 Wind 210 deg - No Ice	47879.94	-17018.86	29342.31	3309851.79	1921931.38	292.69
0.9 Dead+1.6 Wind 210 deg - No Ice	35909.96	-17018.86	29342.31	3288860.60	1909693.95	292.80
1.2 Dead+1.6 Wind 240 deg - No Ice	47879.94	-29477.54	16940.79	1910847.61	3328816.53	393.79
0.9 Dead+1.6 Wind 240 deg - No Ice	35909.96	-29477.54	16940.79	1898750.56	3307633.07	394.56
1.2 Dead+1.6 Wind 270 deg - No Ice	47879.94	-34037.73	-0.00	-199.53	3843762.78	389.37
0.9 Dead+1.6 Wind 270 deg - No Ice	35909.96	-34037.73	-0.00	-147.67	3819306.52	390.59
1.2 Dead+1.6 Wind 300 deg - No Ice	47879.94	-29477.54	-16940.79	-1911247.16	3328817.38	280.63
0.9 Dead+1.6 Wind 300 deg - No Ice	35909.96	-29477.54	-16940.79	-1899046.27	3307633.71	281.98
1.2 Dead+1.6 Wind 330 deg - No Ice	47879.94	-17018.86	-29342.31	-3310252.35	1921932.22	96.71
0.9 Dead+1.6 Wind 330 deg - No Ice	35909.96	-17018.86	-29342.31	-3289157.08	1909694.59	97.83
1.2 Dead+1.0 Ice+1.0 Temp	76147.12	0.00	0.00	-713.77	218.79	0.00

 Hudson Design Group LLC 1600 Osgood Street Bldg. 20N Suite 3090 North Andover, MA 01845 Phone: (978) 557-5553 FAX: (978) 336-5586	Job	REDDING NE	Page	7 of 9
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	Client	VERIZON	Designed by	kw

Load Combination	Vertical	Shear _x	Shear _z	Overturning Moment, M _x	Overturning Moment, M _z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	76147.12	-0.00	-7208.42	-790888.85	248.34	-33.37
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	76147.12	3615.26	-6242.68	-685037.92	-396372.99	-65.37
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	76147.12	6261.81	-3604.21	-395848.00	-686719.80	-79.86
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	76147.12	7230.52	-0.00	-807.40	-792994.05	-72.95
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	76147.12	6261.81	3604.21	394233.19	-686719.79	-46.50
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	76147.12	3615.26	6242.68	683423.11	-396372.98	-7.59
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	76147.12	-0.00	7208.42	789274.03	248.34	33.35
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	76147.12	-3615.26	6242.68	683423.14	396869.68	65.35
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	76147.12	-6261.81	3604.21	394233.23	687216.52	79.83
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	76147.12	-7230.52	-0.00	-807.40	793490.80	72.92
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	76147.12	-6261.81	-3604.21	-395848.03	687216.53	46.47
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	76147.12	-3615.26	-6242.68	-685037.96	396869.68	7.56
Dead+Wind 0 deg - Service	39899.95	-0.00	-5637.11	-634019.86	52.00	-18.95
Dead+Wind 30 deg - Service	39899.95	2831.54	-4881.88	-549099.69	-318666.63	-49.20
Dead+Wind 60 deg - Service	39899.95	4904.38	-2818.55	-317093.55	-551984.75	-66.27
Dead+Wind 90 deg - Service	39899.95	5663.08	-0.00	-167.42	-637385.07	-65.59
Dead+Wind 120 deg - Service	39899.95	4904.38	2818.55	316758.69	-551984.73	-47.32
Dead+Wind 150 deg - Service	39899.95	2831.54	4881.88	548764.80	-318666.61	-16.38
Dead+Wind 180 deg - Service	39899.95	-0.00	5637.11	633684.97	52.00	18.95
Dead+Wind 210 deg - Service	39899.95	-2831.54	4881.88	548764.81	318770.62	49.20
Dead+Wind 240 deg - Service	39899.95	-4904.38	2818.55	316758.70	552088.75	66.27
Dead+Wind 270 deg - Service	39899.95	-5663.08	-0.00	-167.42	637489.09	65.58
Dead+Wind 300 deg - Service	39899.95	-4904.38	-2818.55	-317093.56	552088.77	47.32
Dead+Wind 330 deg - Service	39899.95	-2831.54	-4881.88	-549099.69	318770.64	16.38

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.00	-39899.95	0.00	0.00	39899.95	0.00	0.000%
2	0.00	-47879.94	-33881.59	0.00	47879.94	33881.59	0.000%
3	0.00	-35909.96	-33881.59	0.00	35909.96	33881.59	0.000%
4	17018.86	-47879.94	-29342.31	-17018.86	47879.94	29342.31	0.000%
5	17018.86	-35909.96	-29342.31	-17018.86	35909.96	29342.31	0.000%
6	29477.54	-47879.94	-16940.79	-29477.54	47879.94	16940.79	0.000%
7	29477.54	-35909.96	-16940.79	-29477.54	35909.96	16940.79	0.000%
8	34037.73	-47879.94	0.00	-34037.73	47879.94	0.00	0.000%
9	34037.73	-35909.96	0.00	-34037.73	35909.96	0.00	0.000%
10	29477.54	-47879.94	16940.79	-29477.54	47879.94	-16940.79	0.000%
11	29477.54	-35909.96	16940.79	-29477.54	35909.96	-16940.79	0.000%
12	17018.86	-47879.94	29342.31	-17018.86	47879.94	-29342.31	0.000%
13	17018.86	-35909.96	29342.31	-17018.86	35909.96	-29342.31	0.000%
14	0.00	-47879.94	33881.59	0.00	47879.94	-33881.59	0.000%
15	0.00	-35909.96	33881.59	0.00	35909.96	-33881.59	0.000%



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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
16	-17018.86	-47879.94	29342.31	17018.86	47879.94	-29342.31	0.000%
17	-17018.86	-35909.96	29342.31	17018.86	35909.96	-29342.31	0.000%
18	-29477.54	-47879.94	16940.79	29477.54	47879.94	-16940.79	0.000%
19	-29477.54	-35909.96	16940.79	29477.54	35909.96	-16940.79	0.000%
20	-34037.73	-47879.94	0.00	34037.73	47879.94	0.00	0.000%
21	-34037.73	-35909.96	0.00	34037.73	35909.96	0.00	0.000%
22	-29477.54	-47879.94	-16940.79	29477.54	47879.94	16940.79	0.000%
23	-29477.54	-35909.96	-16940.79	29477.54	35909.96	16940.79	0.000%
24	-17018.86	-47879.94	-29342.31	17018.86	47879.94	29342.31	0.000%
25	-17018.86	-35909.96	-29342.31	17018.86	35909.96	29342.31	0.000%
26	0.00	-76147.12	0.00	0.00	76147.12	0.00	0.000%
27	0.00	-76147.12	-7208.41	0.00	76147.12	7208.42	0.000%
28	3615.25	-76147.12	-6242.66	-3615.26	76147.12	6242.68	0.000%
29	6261.80	-76147.12	-3604.20	-6261.81	76147.12	3604.21	0.000%
30	7230.50	-76147.12	0.00	-7230.52	76147.12	0.00	0.000%
31	6261.80	-76147.12	3604.20	-6261.81	76147.12	-3604.21	0.000%
32	3615.25	-76147.12	6242.66	-3615.26	76147.12	-6242.68	0.000%
33	0.00	-76147.12	7208.41	0.00	76147.12	-7208.42	0.000%
34	-3615.25	-76147.12	6242.66	3615.26	76147.12	-6242.68	0.000%
35	-6261.80	-76147.12	3604.20	6261.81	76147.12	-3604.21	0.000%
36	-7230.50	-76147.12	0.00	7230.52	76147.12	0.00	0.000%
37	-6261.80	-76147.12	-3604.20	6261.81	76147.12	3604.21	0.000%
38	-3615.25	-76147.12	-6242.66	3615.26	76147.12	6242.68	0.000%
39	0.00	-39899.95	-5637.11	0.00	39899.95	5637.11	0.000%
40	2831.54	-39899.95	-4881.88	-2831.54	39899.95	4881.88	0.000%
41	4904.37	-39899.95	-2818.55	-4904.38	39899.95	2818.55	0.000%
42	5663.08	-39899.95	0.00	-5663.08	39899.95	0.00	0.000%
43	4904.37	-39899.95	2818.55	-4904.38	39899.95	-2818.55	0.000%
44	2831.54	-39899.95	4881.88	-2831.54	39899.95	-4881.88	0.000%
45	0.00	-39899.95	5637.11	0.00	39899.95	-5637.11	0.000%
46	-2831.54	-39899.95	4881.88	2831.54	39899.95	-4881.88	0.000%
47	-4904.37	-39899.95	2818.55	4904.38	39899.95	-2818.55	0.000%
48	-5663.08	-39899.95	0.00	5663.08	39899.95	0.00	0.000%
49	-4904.37	-39899.95	-2818.55	4904.38	39899.95	2818.55	0.000%
50	-2831.54	-39899.95	-4881.88	2831.54	39899.95	4881.88	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	149 - 130.5	13.0841	48	0.8957	0.0006
L2	130.5 - 106.42	9.6896	48	0.8247	0.0004
L3	111 - 79.58	6.6787	48	0.6369	0.0002
L4	85 - 46.08	3.7066	48	0.4423	0.0001
L5	52.5 - 0	1.3440	48	0.2422	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.00	PIROD 13' Low Profile Platform	48	12.3289	0.8865	0.0006	24454



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Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
135.00	PiROD 13' Low Profile Platform	48	10.4818	0.8516	0.0005	8734

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	θP_{allow} lb	% Capacity	Pass Fail
L1	149 - 130.5	Pole	TP25.04x19.75x0.1875	1	-7593.51	1009340.00	44.9	Pass
L2	130.5 - 106.42	Pole	TP31.93x25.04x0.25	2	-10277.40	1694230.00	63.4	Pass
L3	106.42 - 79.58	Pole	TP39.11x30.1195x0.375	3	-16163.40	3288180.00	52.3	Pass
L4	79.58 - 46.08	Pole	TP47.94x36.8091x0.4375	4	-26222.80	4660290.00	50.7	Pass
L5	46.08 - 0	Pole	TP60.25x45.2289x0.5	5	-47861.30	6701510.00	47.4	Pass
Summary								
Pole (L2)							63.4	Pass
Base Plate							49.9	Pass
RATING =							63.4	Pass