Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

December 23, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
76 East Ridge Road, Ridgefield, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the top of the existing 130-foot tower at 76 East Ridge Road in Ridgefield, Connecticut (the "Property"). The tower and underlying property are owned by the Town of Ridgefield. The Council approved Cellco's use of the tower in 1989. Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model 800 10735V01, 700 MHz antennas; two (2) model HBXX9014DS, 1900 MHz antennas; one (1) model HBXX6516DS, 1900 MHz antenna; two (2) model HBXX9014DS, 2100 MHz antennas; and one (1) model HBXX6516DS, 2100 MHz antenna, all at the same level on the tower. Cellco also intends to replace three (3) remote radio heads ("RRHs") and install six (6) new RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Rudy Marconi, First Selectman of the Town of Ridgefield.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located at the 128-foot level on the 130-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/or local criteria.

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

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Rudy Marconi, Ridgefield First Selectman
Tim Parks

ATTACHMENT 1

KATHREIN
SCALA DIVISION

800 10735V01

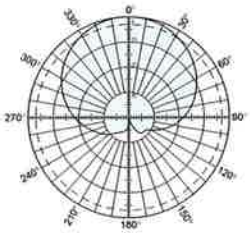
65° Single Band Panel Antenna, 6'

	Antenna
Single Band (MHz)	**698–894**
Dual Polarization	**X**
HPBW	**65°**
Adj. Electrical Downtilt Manual or optional remote control	**0°–10°**

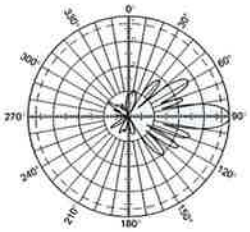
General specifications:

Frequency range	698–894 MHz
VSWR	<1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Maximum input power	500 watts per input (at 50°C)
Connector	2 x 7-16 DIN female (long neck) (bottom mounted)
Isolation	>30 dB
Electrical downtilt	0–10 degrees (continuously adjustable)
See reverse for order information.	

698–894 MHz



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–10° electrical downtilt

Specifications:

	698–806 MHz	824–894 MHz
Gain	15.5 dBi	16 dBi
Front-to-back ratio	>30 dB (co-polar) 35 dB (average)	>30 dB (co-polar) 35 dB (average)
+45° and -45° polarization horizontal beamwidth	67° (half-power)	65° (half-power)
+45° and -45° polarization vertical beamwidth	11.3° (half-power)	10° (half-power)
Min. sidelobe suppression for first sidelobe above main beam average	0° 5° 10° T 16 17 17 dB 16 19 20 dB	0° 5° 10° T 18 17 16 dB 20 20 20 dB
Cross polar ratio Main direction 0° Sector ±60°	 25 dB (typical) >11 dB, Average: 15 dB	 25 dB (typical) >11 dB, Average: 15 dB

IRT specifications:

Logical interface ex factory[1]	3GPP/AISG 2.0
Protocols	AISG 1.1 and 3GPP/AISG 2.0 compliant
Hardware interface[2]	2 x 8 pin connector acc. IEC 60130-9; according to AISG: – IRT in (male): Control / Daisy chain in – IRT in (female): Daisy chain out
Power supply	10–30 V
Power consumption	<1 watt (standby) <8.5 watts (motor activated)
Adjustment time (full range)	40 sec.
Adjustment cycles	>50,000
Certification	FCC 15.107 Class B Computing Devices

[1] The protocol of the logical interface can be switched from 3GPP/AISG 2.0 to AISG 1.1 and vice versa with a vendor specific command. Start-up operation of the RCU 86010149 is possible in an RET system supporting AISG 1.1 or supporting 3GPP/AISG 2.0 after performing a layer 2 reset before address assignment. The protocol can also be changed as follows: AISG 1.1 to 3GPP: Enter "3GPP" into the additional data filed "Installer's ID" and perform a layer 7 reset or a power reset. 3GPP to AISG 1.1: Enter "AISG 1" into the additional datafield "Installer's ID" and perform a layer 2 reset or a power reset. After switching the protocol any other information can be entered into the "Installer's ID" field.

[2] The tightning torque for fixing the connector must be 0.5 – 1.0 Nm ('hand-tightened'). The connector should be tightened by hand only!

11387-D
936.4273/a

RoHS
Lead-Free
Oct 19, 2012

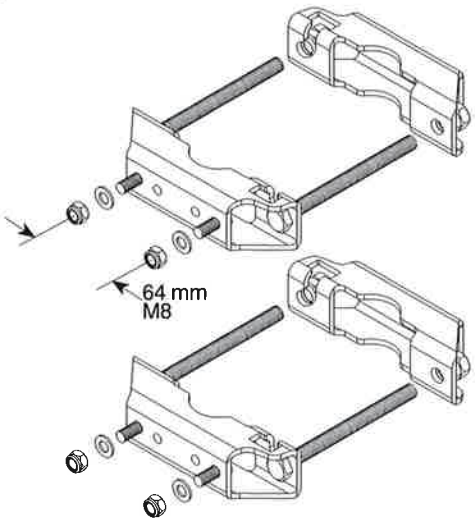
AISG
Antenna Interface Standards Group

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

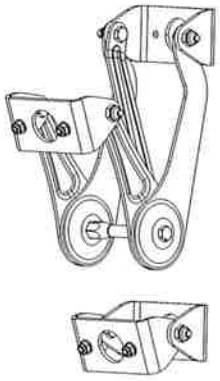
KATHREIN
SCALA DIVISION

800 10735V01

65° Single Band Panel Antenna, 6'



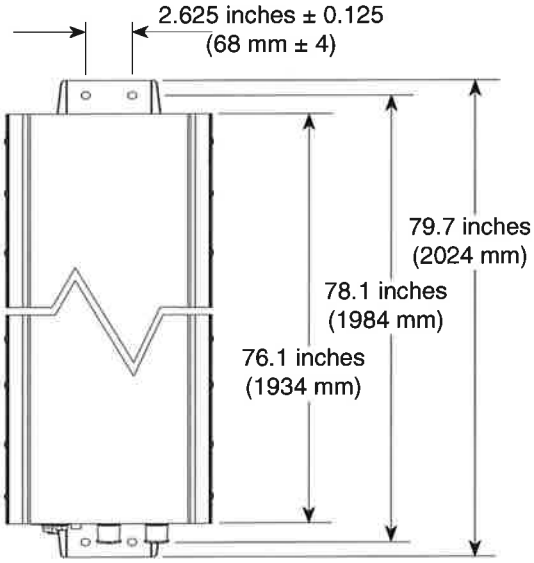
Mounting Brackets
for use with 2-point mount antennas
Mast dia. 2–4.5 inches (50–115 mm)
Weight: 4.4 lb (2 kg)



Mechanical Tilt Brackets
for use with 2-point mount antennas
Weight: 9.5 lb (4.3 kg)
(Model 850 10008)

Mechanical specifications:

Weight	30.9 lb (14 kg)	35.3 lb (16 kg) clamps included
Dimensions H x W x D	76.1 x 11.9 x 3.9 inches (1934 x 303 x 99 mm)	
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 203 lbf / 70 lbf / 232 lbf (900 N / 310 N / 1030 N) H (Heavy)	
Wind survival rating*	150 mph (240 kph)	
Shipping dimensions	81.1 x 12.4 x 4.5 inches (2060 x 315 x 115 mm)	
Shipping weight	39.7 lb (18 kg)	
Mounting bracket	2-point hot-dip galvanized with stainless steel hardware for 2 to 4.5 inch (50 to 115 mm) OD masts.	

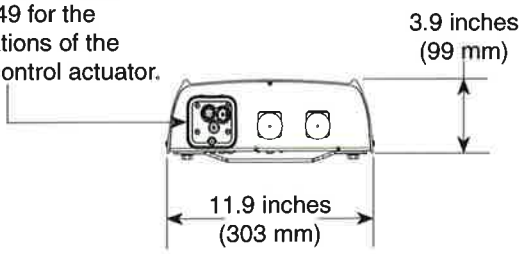


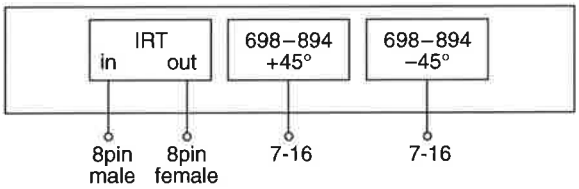
KATHREIN 860 10149

FC Tested To Comply With FCC Standards

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: Refer to part number 860 10149 for the specifications of the remote control actuator.





Order Information:

Model	Description
800 10735V01	Antenna with mounting bracket 0°–10° electrical downtilt
800 10735V01K	Antenna with mounting bracket and mechanical tilt bracket 0°–10° electrical downtilt

*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Product Specifications

COMMSCOPE®

on the go

HBXX-9014DS-VTM

DualPol® Quad Teletilt® Antenna, 1710–2180 MHz, 90° horizontal beamwidth, RET compatible

- 2x2 MIMO ready
- Two DualPol® antennas under one radome
- High front-to-back ratio aids in minimizing co-channel interference
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- Enhanced control of out-of-sector power improves co-channel interference, reduces softer hand-offs, improves capacity
- Fully supports PCS 1900, GSM 1800, UMTS 2100, and AWS spectrum

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	16.0	16.0	16.2
Beamwidth, Horizontal, degrees	90	90	90
Beamwidth, Vertical, degrees	7.4	7.0	6.6
Beam Tilt, degrees	0–10	0–10	0–10
USLS, typical, dB	17	17	18
Front-to-Back Ratio at 180°, dB	30	30	30
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4:1 | 15.6	1.4:1 | 15.6	1.4:1 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-150	-150	-150
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm
Lightning Protection	dc Ground	dc Ground	dc Ground

Mechanical Specifications

Color | Radome Material	Light gray | PVC, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	419.5 N @ 150 km/h 94.3 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.00 mm | 50.94 in
Width	305.00 mm | 12.01 in
Net Weight	13.50 kg | 29.76 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-9014DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-9014DS-A2M

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2002/95/EC	Compliant by Exemption

Product Specifications

HBXX-9014DS-VTM

China RoHS SJ/T 11364-2006 Above Maximum Concentration Value (MCV)
ISO 9001:2008 Designed, manufactured and/or distributed under this quality management system


Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

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

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

Electrical Specifications

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

Electrical Specifications, BASTA*

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

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

COMMSCOPE®

HBXX-6516DS-VTM

POWERED BY ANDREW.

Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	419.0 N @ 150 km/h 94.2 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1297.0 mm | 51.1 in
Width	305.0 mm | 12.0 in
Net Weight	13.9 kg | 30.6 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
RET System	Teletilt®

Packed Dimensions

Depth	294.0 mm | 11.6 in
Length	1609.0 mm | 63.3 in
Width	409.0 mm | 16.1 in
Shipping Weight	25.1 kg | 55.3 lb

Regulatory Compliance/Certifications

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


Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

Product Specifications

HBXX-6516DS-VTM

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

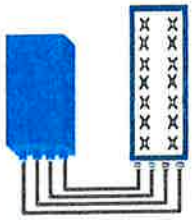
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

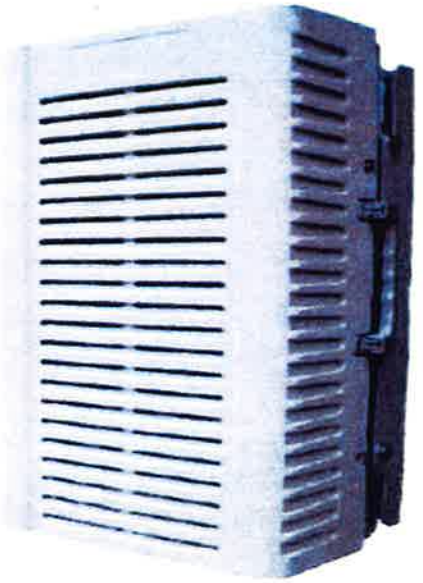
Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W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

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

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

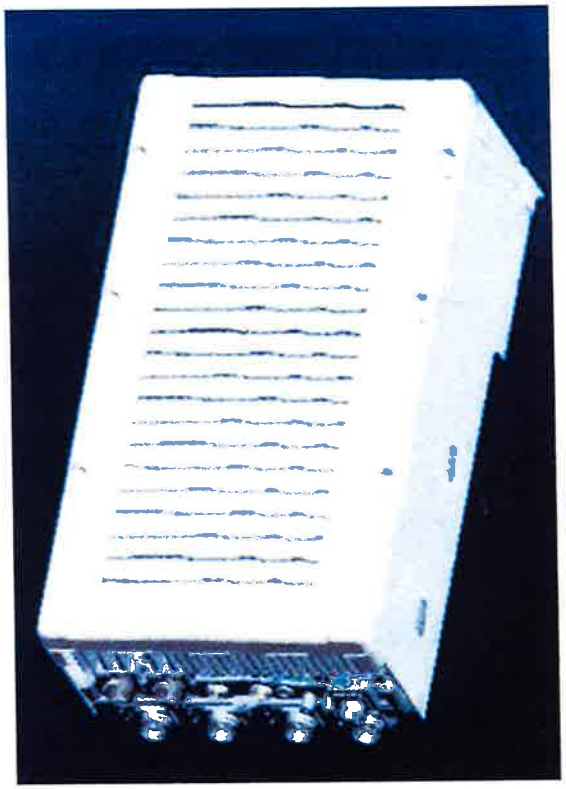


** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

Alcatel·Lucent

B66A RRH 4X45 - PHYSICAL CHARACTERISTICS- TARGET 15.1

B4 RRH4x45-4R (AWS-Extension Band)	
Frequency Band	**LR15.1 – B4 / LR16.1 B66 (AWS 1 and 3 only)**
RF Output Power	**2x90W/4x45W (SW configurable)**
Operational range	**2110-2180 MHz, DL/ 1710-1780 MHz UL**
Instantaneous Bandwidth	**70MHz**
Configuration (HW readiness)	**LTE: 2T2R, 2T4R, 4T4R**
Carrier Bandwidths	**5, 10, 15 and 20 MHz**
Interfaces	**2x CPRI Rate 7 Ports Antenna Connectors 4.3-10**
AISG Support	**AISG 2.0 for RET Internal Smart Bias T**
Monitor Ports	**NA (Spec An to replace ports)**
Environmental	**GR487 Compliance / GR3178 Compliance (with exceptions)**
Mounting options	**Pole/Wall**
Connectors location	**All bottom**
External Alarms	**4**
Annual Return Rate (Target)	**<2%**
Operating Temperature	**-40 C to +55 C (without solar load)**

- Commercial Product Will include B66 support of AWS 1 and 3.
- Lower AWS 3 UL Not in 3GPP Band 66 Definition

Physical Dimensions – Not to Exceed		
	W/O Solar Shield	With Solar Shield
Dimensions HxWxD	H = 26in (H=660mm) W = 11.4in (W=290mm) D = 5.9in (D=150mm)	H = 26.6in (H=675mm) W = 12in (W=304mm) D = 6.8n (D=173mm)
Volume	29l	35.5l
Weight		64lbs / 29kg

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)

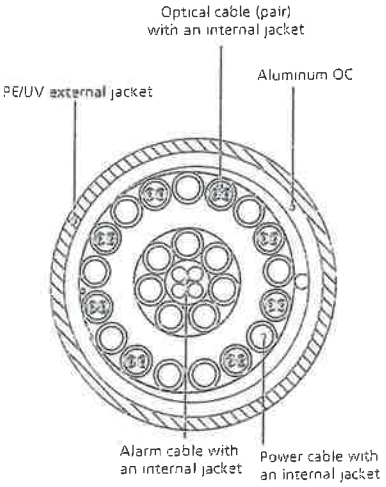


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Ridgefield								
Tower Height: 130'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint CDMA/LTE	3	693	118	0.0596	1900	1.0000	0.60%	
*Sprint CDMA/LTE	1	390	118	0.0112	850	0.5667	0.20%	
*Sprint CDMA/LTE	2	693	118	0.0397	2500	1.0000	0.40%	
*T-Mobile LTE	2	2334	100	0.1900	2100	1.0000	1.90%	
*T-Mobile GSM/UMTS	4	1167	100	0.1900	1900/2100	1.0000	1.90%	
*T-Mobile LTE	1	865	100	0.0352	700	1.0000	0.35%	
Verizon	**1**	**1285**	**128**	**0.0282**	**1970**	**1.0000**	**2.82%**	
Verizon	**9**	**224**	**128**	**0.0442**	**869**	**0.5793**	**7.64%**	
Verizon	**1**	**1483**	**128**	**0.0325**	**2145**	**1.0000**	**3.25%**	
Verizon	**1**	**593**	**128**	**0.0130**	**746**	**0.4973**	**2.62%**	
								21.7%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

130-ft Existing Valmont Monopole

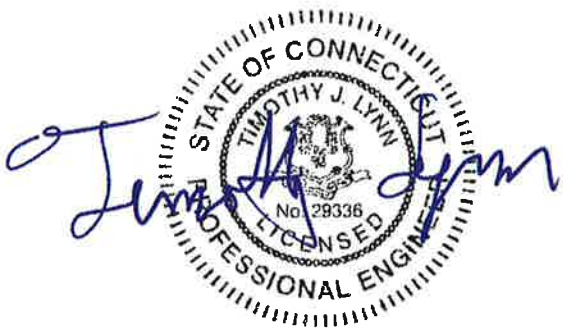
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Ridgefield

76 East Ridge Road
Ridgefield, CT

Centek Project No. 15001.095

Date: September 8, 2015



Prepared for:

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

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

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing monopole (tower) located in Ridgefield, CT.

The host tower is a 130-ft tall, three-section, twelve sided, tapered monopole, originally designed and manufactured by Valmont Industries Inc.; order no. 10533-89 dated October 24, 1989. The tower geometry, structure member sizes and foundation system information were obtained from the original manufacturers design documents. Tower reinforcement was obtained from a structural analysis report prepared by Infinigy for T-Mobile, job no. 379-015 dated April 24, 2015.

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

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 16.26-in at the top and 43.80-in at the base.

Verizon proposes the removal of nine (9) panel antennas and three (3) remote radio heads and the installation of nine (9) panel antennas, nine (9) remote radio heads and one (1) main distribution box on the existing 13-ft platform with handrails. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- UNKNOWN (EXSITING):
  Antennas: One (1) RFS PD 440 dipole antenna mounted on the Verizon 13-ft platform with handrails with an elevation of 130-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- SPRINT (EXSITING):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM-14 panel antennas, three (3) 1900MHz 4X45W RRH's, three (3) 800MHz 2X50W RRH's and three (3) TD-RRH8x20-25 RRH's mounted on a 13-ft platform with handrails with a RAD center elevation of 118-ft above grade level.
  Coax Cables: Three (3) 1-5/8" ∅ and one (1) 1-1/4" ∅ fiber cables running on the exterior of the existing tower.
- T-MOBILE (EXSITING):
  Antennas: Six (6) Ericsson Air21 panel antennas, three (3) Andrew LNX-6515DS panel antennas, three (3) TMAs and three (3) Ericsson RRUS-11 remote radio heads mounted on a 13-ft platform with handrails with a RAD center elevation of 100-ft above grade level.
  Coax Cables: Twenty-four (24) 7/8" ∅ coax cables running on the inside of the existing tower.

- UNKNOWN (EXSITING):
  Antennas: One (1) RFS PD 440 dipole antenna and two (2) RFS PD 1142 Omni-directional whip antennas mounted on the T-Mobile 13-ft platform with handrails with an elevation of 100-ft above grade level.
  Coax Cables: Three (3) 1/2" ∅ coax cables running on the inside of the existing tower.
- UNKNOWN (EXSITING):
  Antennas: One (1) RFS PD 1121-6 dipole antenna and one (1) RFS PD 1142 Omni-directional whip antenna mounted on one (1) 3-ft standoff with an elevation of 86-ft above grade level.
  Coax Cables: Two (2) 1/2" ∅ coax cables running on the inside of the existing tower.
- UNKNOWN (EXSITING):
  Antennas: One (1) RFS PD 1142 and one (1) RFS PD 1167 Omni-directional whip antennas mounted on two (2) 3-ft standoffs with an elevation of 58-ft above grade level.
  Coax Cables: Two (2) 1/2" ∅ coax cables running on the inside of the existing tower.
- VERIZON (EXSITING TO REMAIN):
  Antennas: One (1) GPS antenna mounted on a 3-ft standoff with an elevation of 50-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Three (3) Antel BXA-80080/4CF panel antennas and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on the existing 13-ft platform with handrails with a RAD center elevation of 128-ft above grade level.
  Coax Cables: Twelve (12) 7/8" ∅ coax cables running on the inside of the existing tower and six (6) 7/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber cable running on the exterior of the existing tower.
- VERIZON (EXISTING TO REMOVE):
  Antennas: Three (3) RFS APX75-866512T0, three (3) RYMSA MG D3-800T0 panel antennas, three (3) BXA-171063-12BF panel antennas and three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads mounted on the existing 13-ft platform with handrails with a RAD center elevation of 128-ft above grade level.
- **VERIZON (PROPOSED):**
  Antennas: Three (3) Kathrein 800-10735, four (4) Andrew HBXX-9014DS and two (2) Andrew HBXX-6516DS panel antennas mounted on the existing 13-ft platform with handrails with a RAD center elevation of 128-ft above grade level.
  Appurtenances: Three (3) Alcatel-Lucent RRH2x60-LTE remote radio heads, three (3) Alcatel-Lucent RRH4x45/2x90-AWS remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z distribution box mounted on the existing 13-ft platform with handrails with a RAD center elevation of 128-ft above grade level.
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running on the exterior of the existing tower.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed as indicated in this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Ridgefield; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **98.7%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	89.92'-130.00'	98.7%	**PASS**
Reinforcement (L3)	0.0'-20.00'	97.5%	**PASS**

Foundation and Anchors

The existing foundation consists of a 6-ft ∅ x 21.0-ft long reinforced concrete caisson. The base of the tower is connected to the foundation by means of (12) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 8.5-ft into the concrete foundation structure and three (3) additional Williams R7S 1-7/8" 150ksi spin lock anchors per the aforementioned Infinigy structural report and mod design.

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

Location	Vector	Proposed Reactions
Base	Shear	31 kips
	Compression	30 kips
	Moment	2895 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	76.5%	**PASS**
	Lateral Deflection	0.91in.	**PASS**

Note 1: Lateral deflection typically limited to 1.0 in. for monopole tower structures.

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	92.2%	**PASS**
Base Plate	Bending	30.3%	**PASS**

Conclusion and Recommendations

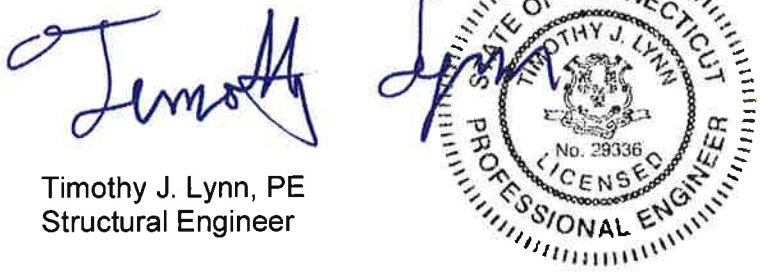
This analysis shows that the subject tower **is adequate** to support the proposed antenna configuration with the below recommendations.

- **All reinforcements per the structural analysis and mod report prepared by Infinigy for T-Mobile dated April 24, 2015 must be completed prior to the Verizon Wireless antenna upgrade.**
- **All coax cables routed as specified in Section 3 of this report.**

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

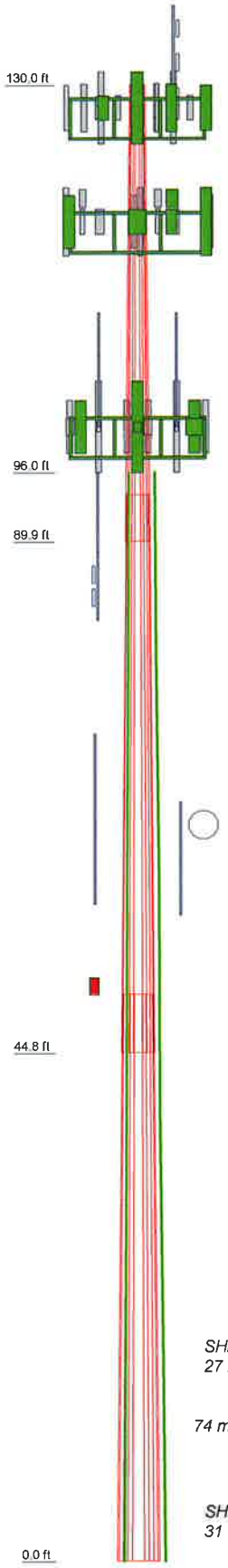
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

TnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, TnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

TnxTower Features:

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



Length (ft)	40.08	49.17	50.00	20.00	20.00	20.00	16.00	20.00	2.0
Number of Sides	12	12	12						
Thickness (in)	0.2190	0.3130	0.3750						
Socket Length (ft)	4.08	5.17							
Top Dia (in)	16.2600	23.7435	32.7973						
Bot Dia (in)	25.0800	34.5600	43.8000						
Grade	A572-65					A	A		
Tube Length (ft)		4.9	7.8						
Reinf Size									
Reinf Grade									
Weight (K)	14.6								

AXIAL
39 K

SHEAR
27 K

MOMENT
2586 kip-ft

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

AXIAL
30 K

SHEAR
31 K

MOMENT
2895 kip-ft

TORQUE 1 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
440-3 (Town - Existing)	130	FD-RRH 2x50 800 (Sprint - Existing)	118
800-10735 (Verizon - Proposed)	128	FD-RRH 2x50 800 (Sprint - Existing)	118
HBXX-9014DS (Verizon - Proposed)	128	TD-RRH8x20-25 (Sprint - Existing)	118
BXA-80080/4CF (Verizon - Existing)	128	TD-RRH8x20-25 (Sprint - Existing)	118
HBX-6516DS (Verizon - Proposed)	128	TD-RRH8x20-25 (Sprint - Existing)	118
800-10735 (Verizon - Proposed)	128	APXVSPP18-C-A20 (Sprint - Existing)	118
HBXX-6516DS (Verizon - Proposed)	128	Valmont 13' Platform w/Rails (Sprint - Existing)	117
BXA-80080/4CF (Verizon - Existing)	128		
HBXX-9014DS (Verizon - Proposed)	128	AIR21 B2A/B4P (T-Mobile - Existing)	100
800-10735 (Verizon - Proposed)	128	AIR21 B2A/B4P (T-Mobile - Existing)	100
HBXX-9014DS (Verizon - Proposed)	128	AIR21 B4A/B2P (T-Mobile - Existing)	100
BXA-80080/4CF (Verizon - Existing)	128	AIR21 B4A/B2P (T-Mobile - Existing)	100
RRH2x60-PCS (Verizon - Proposed)	128	AIR21 B4A/B2P (T-Mobile - Existing)	100
RRH2x60-PCS (Verizon - Proposed)	128	LNX-6515DS (T-Mobile - Existing)	100
RRH2x60-PCS (Verizon - Proposed)	128	LNX-6515DS (T-Mobile - Existing)	100
RRH2x60-07-U (Verizon - Proposed)	128	LNX-6515DS (T-Mobile - Existing)	100
RRH2x60-07-U (Verizon - Proposed)	128	TMA 10"x8"x3" (T-Mobile - Existing)	100
RRH2x60-07-U (Verizon - Proposed)	128	TMA 10"x8"x3" (T-Mobile - Existing)	100
RRH4x45/2x90-AWS (Verizon - Proposed)	128	TMA 10"x8"x3" (T-Mobile - Existing)	100
		RRUS-11 (T-Mobile - Existing)	100
RRH4x45/2x90-AWS (Verizon - Proposed)	128	RRUS-11 (T-Mobile - Existing)	100
		RRUS-11 (T-Mobile - Existing)	100
RRH4x45/2x90-AWS (Verizon - Proposed)	128	PD1142-1 (Town - Existing)	100
		PD1142-1 (Town - Existing)	100
DB-T1-6Z-8AB-0Z (Verizon - Existing)	128	440-3 (Town - Existing)	100
DB-T1-6Z-8AB-0Z (Verizon - Proposed)	128	AIR21 B2A/B4P (T-Mobile - Existing)	100
HBXX-9014DS (Verizon - Proposed)	128	Valmont 13' Platform w/Rails (T-Mobile - Existing)	99
Valmont 13' Platform w/Rails (Verizon - Existing)	127	3' Stand-off Mount (Town - Existing)	86
APXVSPP18-C-A20 (Sprint - Existing)	118	PD1142-1 (Town - Existing)	86
APXVSPP18-C-A20 (Sprint - Existing)	118	PD1121-6 (Town - Existing)	86
APXVTM14 (Sprint - Existing)	118	PD1142-1 (Town - Existing)	58
APXVTM14 (Sprint - Existing)	118	3' Stand-off Mount (Town - Existing)	58
APXVTM14 (Sprint - Existing)	118	PD1167 (Town - Existing)	58
FD-RRH 4x45 1900 (Sprint - Existing)	118	3' Stand-off Mount (Town - Existing)	58
FD-RRH 4x45 1900 (Sprint - Existing)	118	GPS (Verizon - Existing)	50
FD-RRH 4x45 1900 (Sprint - Existing)	118	3' GPS Stand-off Mount (Verizon - Existing)	50
FD-RRH 2x50 800 (Sprint - Existing)	118		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	Williams 150ksi	120 ksi	150 ksi

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. BETA RELEASE FOR TESTING ONLY
6. TOWER RATING: 98.7%

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

Job: 15001.095 - Ridgefield		
Project: 130' Valmont Monopole - 76 East Ridge Rd., Ridgefield,		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 09/08/15	Scale: NTS
Path:		Dwg No. E-1

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
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		Treat Feedline Bundles As Cylinder
	Consider Moments - Horizontals		Assume Legs Pinned		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Calculate Redundant Bracing Forces
	Use Moment Magnification		Use Clear Spans For Wind Area		Ignore Redundant Members in FEA
√	Use Code Stress Ratios		Use Clear Spans For KL/r		SR Leg Bolts Resist Compression
	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		All Leg Panels Have Same Allowable
	Escalate Ice	√	Bypass Mast Stability Checks		Offset Girt At Foundation
	Always Use Max Kz		Use Azimuth Dish Coefficients	√	Consider Feedline Torque
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Include Angle Block Shear Check
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Poles
	Leg Bolts Are At Top Of Section		SR Members Have Cut Ends		Include Shear-Torsion Interaction
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component		Always Use Sub-Critical Flow
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Use Top Mounted Sockets
	Add IBC .6D+W Combination		Use TIA-222-G Tension Splice Capacity Exemption		

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	130.00-89.92	40.08	4.08	12	16.2600	25.0800	0.2190	0.8760	A572-65 (65 ksi)
L2	89.92-44.84	49.17	5.17	12	23.7435	34.5600	0.3130	1.2520	A572-65 (65 ksi)
L3	44.84-0.00	50.00		12	32.7973	43.8000	0.3750	1.5000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	16.8336	11.3118	371.5183	5.7427	8.4227	44.1093	752.7969	5.5673	3.7708	17.218
	25.9647	17.5315	1383.0622	8.9002	12.9914	106.4595	2802.4590	8.6285	6.1345	28.012
L2	25.5110	23.6147	1654.7432	8.3881	12.2991	134.5415	3352.9584	11.6224	5.5244	17.65
	35.7791	34.5162	5167.1820	12.2604	17.9021	288.6358	10470.1117	16.9878	8.4232	26.911
L3	35.1313	39.1499	5252.9582	11.6072	16.9890	309.1977	10643.9175	19.2684	7.7847	20.759
	45.3451	52.4357	12620.9652	15.5461	22.6884	556.2739	25573.4973	25.8073	10.7334	28.622

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 130.00-89.92				1	1	1		
L2 89.92-44.84				1	1	1		
L3 44.84-0.00				1	1	1		

Pole Reinforcing Data

Height Above Base ft	Segment Length ft	No. of Segments	Offset in	Grade	Type	Size	Unbraced Length ft	K	Bolt Hole Dia. in	Bolts per Row	Shear Lag Factor U
0.00	20.00	3	6.0000	Williams 150ksi (120 ksi)	Solid Round	Williams R71 1-3/4"	2.50	0.80	0.0000	1	1.000
20.00	20.00	3	6.0000	Williams 150ksi (120 ksi)	Solid Round	Williams R71 1-3/4"	2.50	0.80	0.0000	1	1.000
40.00	20.00	3	6.0000	Williams 150ksi (120 ksi)	Solid Round	Williams R71 1-3/4"	2.50	0.80	0.0000	1	1.000
60.00	20.00	3	6.0000	Williams 150ksi (120 ksi)	Solid Round	Williams R71 1-3/4"	2.50	0.80	0.0000	1	1.000
80.00	16.00	3	6.0000	Williams 150ksi (120 ksi)	Solid Round	Williams R71 1-3/4"	2.50	0.80	0.0000	1	1.000

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	√
Anchor bolt grade	A615
Anchor bolt size	2.2500 in
Number of bolts	12
Embedment length	102.0000 in
f'_c	4 ksi
Grout space	4.5000 in

Base Plate Data	
Base plate grade	A607-60
Base plate thickness	2.5000 in
Bolt circle diameter	49.7500 in
Outer diameter	56.0800 in
Inner diameter	24.0000 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_A ft^2/ft	Weight plf
7/8 (Verizon - Existing)	A	No	Inside Pole	130.00 - 10.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1/2 (Verizon - Existing)	A	No	Inside Pole	50.00 - 10.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
LCF78-50J (7/8 FOAM) (T-Mobile - Existing)	C	No	Inside Pole	100.00 - 10.00	24	No Ice	0.00	0.53
						1/2" Ice	0.00	0.53
1/2 (Town)	A	No	Inside Pole	58.00 - 28.00	2	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2 (Town)	A	No	Inside Pole	86.00 - 28.00	2	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2 (Town)	A	No	Inside Pole	100.00 - 28.00	3	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2 (Town)	A	No	Inside Pole	130.00 - 28.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
7/8 (Verizon - Existing)	A	No	CaAa (Out Of Face)	126.00 - 10.00	2	No Ice	0.11	0.54
						1/2" Ice	0.21	1.52
7/8 (Verizon - Existing)	A	No	CaAa (Out Of Face)	126.00 - 10.00	4	No Ice	0.00	0.54
						1/2" Ice	0.00	1.52
HYBRIFLEX 1-5/8" (Verizon - Existing)	A	No	CaAa (Out Of Face)	126.00 - 10.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	3.41
HYBRIFLEX 1-5/8" (Sprint - Existing)	C	No	CaAa (Out Of Face)	118.00 - 10.00	3	No Ice	0.00	1.90
						1/2" Ice	0.00	3.41
HYBRIFLEX 1-1/4" (Sprint - Existing)	C	No	CaAa (Out Of Face)	118.00 - 10.00	1	No Ice	0.00	1.30
						1/2" Ice	0.00	2.55
HYBRIFLEX 1-5/8" (Verizon - Proposed)	A	No	CaAa (Out Of Face)	126.00 - 10.00	1	No Ice	0.20	1.90
						1/2" Ice	0.30	3.41

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
L1	130.00-89.92	A	0.000	0.000	0.000	15.154	0.53
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.32
L2	89.92-44.84	A	0.000	0.000	0.000	18.935	0.68
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.89
L3	44.84-0.00	A	0.000	0.000	0.000	14.631	0.51
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.69

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
L1	130.00-89.92	A	0.500	0.000	0.000	0.000	25.977	0.85
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.49
L2	89.92-44.84	A	0.500	0.000	0.000	0.000	32.460	1.08
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.15
L3	44.84-0.00	A	0.500	0.000	0.000	0.000	25.082	0.82
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.89

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	130.00-89.92	0.0000	-0.4750	0.0000	-0.6969
L2	89.92-44.84	0.0000	-0.5383	0.0000	-0.8147
L3	44.84-0.00	0.0000	-0.4321	0.0000	-0.6803

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
HBXX-9014DS	A	From Face	3.00	0.0000	128.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-3.00			1/2" Ice	6.35	3.61	0.07
			0.00						
800-10735	A	From Face	3.00	0.0000	128.00	No Ice	8.80	3.75	0.03
(Verizon - Proposed)			0.00			1/2" Ice	9.38	4.20	0.07
			0.00						
HBXX-9014DS	A	From Face	3.00	0.0000	128.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-3.00			1/2" Ice	6.35	3.61	0.07
			0.00						
BXA-80080/4CF	A	From Face	3.00	0.0000	128.00	No Ice	5.25	2.84	0.01
(Verizon - Existing)			-6.00			1/2" Ice	5.64	3.15	0.05
			0.00						
HBX-6516DS	B	From Face	3.00	0.0000	128.00	No Ice	3.33	1.99	0.01
(Verizon - Proposed)			-3.00			1/2" Ice	3.66	2.31	0.03
			0.00						
800-10735	B	From Face	3.00	0.0000	128.00	No Ice	8.80	3.75	0.03
(Verizon - Proposed)			0.00			1/2" Ice	9.38	4.20	0.07
			0.00						
HBXX-6516DS	B	From Face	3.00	0.0000	128.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-3.00			1/2" Ice	6.35	3.61	0.07
			0.00						

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
BXA-80080/4CF	B	From Face	3.00	0.0000	128.00	No Ice	5.25	2.84	0.01
(Verizon - Existing)			-6.00			1/2" Ice	5.64	3.15	0.05
			0.00						
HBXX-9014DS	C	From Face	3.00	0.0000	128.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-3.00			1/2" Ice	6.35	3.61	0.07
			0.00						
800-10735	C	From Face	3.00	0.0000	128.00	No Ice	8.80	3.75	0.03
(Verizon - Proposed)			0.00			1/2" Ice	9.38	4.20	0.07
			0.00						
HBXX-9014DS	C	From Face	3.00	0.0000	128.00	No Ice	5.94	3.28	0.04
(Verizon - Proposed)			-3.00			1/2" Ice	6.35	3.61	0.07
			0.00						
BXA-80080/4CF	C	From Face	3.00	0.0000	128.00	No Ice	5.25	2.84	0.01
(Verizon - Existing)			-6.00			1/2" Ice	5.64	3.15	0.05
			0.00						
RRH2x60-PCS	A	From Face	3.00	0.0000	128.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			-3.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	B	From Face	3.00	0.0000	128.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			-3.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	C	From Face	3.00	0.0000	128.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			-3.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-07-U	A	From Face	3.00	0.0000	128.00	No Ice	2.45	1.63	0.05
(Verizon - Proposed)			0.00			1/2" Ice	2.67	1.83	0.07
			0.00						
RRH2x60-07-U	B	From Face	3.00	0.0000	128.00	No Ice	2.45	1.63	0.05
(Verizon - Proposed)			0.00			1/2" Ice	2.67	1.83	0.07
			0.00						
RRH2x60-07-U	C	From Face	3.00	0.0000	128.00	No Ice	2.45	1.63	0.05
(Verizon - Proposed)			0.00			1/2" Ice	2.67	1.83	0.07
			0.00						
RRH4x45/2x90-AWS	A	From Face	3.00	0.0000	128.00	No Ice	3.01	1.91	0.08
(Verizon - Proposed)			3.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x45/2x90-AWS	B	From Face	3.00	0.0000	128.00	No Ice	3.01	1.91	0.08
(Verizon - Proposed)			3.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x45/2x90-AWS	C	From Face	3.00	0.0000	128.00	No Ice	3.01	1.91	0.08
(Verizon - Proposed)			3.00			1/2" Ice	3.26	2.13	0.10
			0.00						
DB-T1-6Z-8AB-0Z	A	From Face	3.00	0.0000	128.00	No Ice	5.60	2.33	0.04
(Verizon - Existing)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
DB-T1-6Z-8AB-0Z	B	From Face	3.00	0.0000	128.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
Valmont 13' Platform w/Rails	C	None		0.0000	127.00	No Ice	53.00	53.00	2.00
(Verizon - Existing)						1/2" Ice	68.00	68.00	3.00
APXVSPP18-C-A20	A	From Face	3.00	0.0000	118.00	No Ice	8.26	5.28	0.06
(Sprint - Existing)			-6.00			1/2" Ice	8.81	5.74	0.11
			0.00						
APXVSPP18-C-A20	B	From Face	3.00	0.0000	118.00	No Ice	8.26	5.28	0.06
(Sprint - Existing)			-6.00			1/2" Ice	8.81	5.74	0.11
			0.00						
APXVSPP18-C-A20	C	From Face	3.00	0.0000	118.00	No Ice	8.26	5.28	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Sprint - Existing)			-6.00 0.00			1/2" Ice	8.81	5.74	0.11
APXVTM14	A	From Face	3.00	0.0000	118.00	No Ice	6.90	3.61	0.06
(Sprint - Existing)			6.00 0.00			1/2" Ice	7.35	3.97	0.10
APXVTM14	B	From Face	3.00	0.0000	118.00	No Ice	6.90	3.61	0.06
(Sprint - Existing)			6.00 0.00			1/2" Ice	7.35	3.97	0.10
APXVTM14	C	From Face	3.00	0.0000	118.00	No Ice	6.90	3.61	0.06
(Sprint - Existing)			6.00 0.00			1/2" Ice	7.35	3.97	0.10
FD-RRH 4x45 1900	A	From Face	3.00	0.0000	118.00	No Ice	2.71	2.78	0.06
(Sprint - Existing)			-3.00 0.00			1/2" Ice	2.94	3.02	0.08
FD-RRH 4x45 1900	B	From Face	3.00	0.0000	118.00	No Ice	2.71	2.78	0.06
(Sprint - Existing)			-3.00 0.00			1/2" Ice	2.94	3.02	0.08
FD-RRH 4x45 1900	C	From Face	3.00	0.0000	118.00	No Ice	2.71	2.78	0.06
(Sprint - Existing)			-3.00 0.00			1/2" Ice	2.94	3.02	0.08
FD-RRH 2x50 800	A	From Face	3.00	0.0000	118.00	No Ice	2.40	2.25	0.06
(Sprint - Existing)			-3.00 2.00			1/2" Ice	2.61	2.46	0.09
FD-RRH 2x50 800	B	From Face	3.00	0.0000	118.00	No Ice	2.40	2.25	0.06
(Sprint - Existing)			-3.00 2.00			1/2" Ice	2.61	2.46	0.09
FD-RRH 2x50 800	C	From Face	3.00	0.0000	118.00	No Ice	2.40	2.25	0.06
(Sprint - Existing)			-3.00 2.00			1/2" Ice	2.61	2.46	0.09
TD-RRH8x20-25	A	From Face	3.00	0.0000	118.00	No Ice	4.72	1.70	0.07
(Sprint - Existing)			0.00 0.00			1/2" Ice	5.01	1.92	0.10
TD-RRH8x20-25	B	From Face	3.00	0.0000	118.00	No Ice	4.72	1.70	0.07
(Sprint - Existing)			0.00 0.00			1/2" Ice	5.01	1.92	0.10
TD-RRH8x20-25	C	From Face	3.00	0.0000	118.00	No Ice	4.72	1.70	0.07
(Sprint - Existing)			0.00 0.00			1/2" Ice	5.01	1.92	0.10
Valmont 13' Platform w/Rails	C	None		0.0000	117.00	No Ice	53.00	53.00	2.00
(Sprint - Existing)						1/2" Ice	68.00	68.00	3.00
AIR21 B2A/B4P	A	From Face	3.00	0.0000	100.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			5.00 0.00			1/2" Ice	6.98	4.77	0.12
AIR21 B2A/B4P	B	From Face	3.00	0.0000	100.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			5.00 0.00			1/2" Ice	6.98	4.77	0.12
AIR21 B2A/B4P	C	From Face	3.00	0.0000	100.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			5.00 0.00			1/2" Ice	6.98	4.77	0.12
AIR21 B4A/B2P	A	From Face	3.00	0.0000	100.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			-5.00 0.00			1/2" Ice	6.98	4.77	0.12
AIR21 B4A/B2P	B	From Face	3.00	0.0000	100.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			-5.00 0.00			1/2" Ice	6.98	4.77	0.12
AIR21 B4A/B2P	C	From Face	3.00	0.0000	100.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			-5.00			1/2" Ice	6.98	4.77	0.12

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						
LNX-6515DS	A	From Face	3.00	0.0000	100.00	No Ice	11.45	7.70	0.06
(T-Mobile - Existing)			0.00			1/2" Ice	12.06	8.29	0.12
			0.00						
LNX-6515DS	B	From Face	3.00	0.0000	100.00	No Ice	11.45	7.70	0.06
(T-Mobile - Existing)			0.00			1/2" Ice	12.06	8.29	0.12
			0.00						
LNX-6515DS	C	From Face	3.00	0.0000	100.00	No Ice	11.45	7.70	0.06
(T-Mobile - Existing)			0.00			1/2" Ice	12.06	8.29	0.12
			0.00						
TMA 10"x8"x3"	A	From Face	3.00	0.0000	100.00	No Ice	0.78	0.29	0.02
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
TMA 10"x8"x3"	B	From Face	3.00	0.0000	100.00	No Ice	0.78	0.29	0.02
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
TMA 10"x8"x3"	C	From Face	3.00	0.0000	100.00	No Ice	0.78	0.29	0.02
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
RRUS-11	A	From Face	3.00	0.0000	100.00	No Ice	2.99	1.25	0.05
(T-Mobile - Existing)			-5.00			1/2" Ice	3.23	1.41	0.07
			0.00						
RRUS-11	B	From Face	3.00	0.0000	100.00	No Ice	2.99	1.25	0.05
(T-Mobile - Existing)			-5.00			1/2" Ice	3.23	1.41	0.07
			0.00						
RRUS-11	C	From Face	3.00	0.0000	100.00	No Ice	2.99	1.25	0.05
(T-Mobile - Existing)			-5.00			1/2" Ice	3.23	1.41	0.07
			0.00						
Valmont 13' Platform w/Rails	C	None		0.0000	99.00	No Ice	40.00	40.00	1.70
(T-Mobile - Existing)						1/2" Ice	51.00	51.00	2.55
3' GPS Stand-off Mount	A	From Face	0.00	0.0000	50.00	No Ice	2.45	2.45	0.05
(Verizon - Existing)			0.00			1/2" Ice	3.98	3.98	0.07
			0.00						
GPS	A	From Face	3.00	0.0000	50.00	No Ice	1.00	1.00	0.01
(Verizon - Existing)			0.00			1/2" Ice	1.50	1.50	0.01
			0.00						
3' Stand-off Mount	B	From Face	0.00	0.0000	58.00	No Ice	2.45	2.45	0.05
(Town - Existing)			0.00			1/2" Ice	3.98	3.98	0.07
			0.00						
PD1167	B	From Face	3.00	0.0000	58.00	No Ice	1.06	1.06	0.01
(Town - Existing)			0.00			1/2" Ice	2.26	2.26	0.02
			4.00						
3' Stand-off Mount	A	From Face	0.00	0.0000	58.00	No Ice	2.45	2.45	0.05
(Town - Existing)			0.00			1/2" Ice	3.98	3.98	0.07
			0.00						
PD1142-1	A	From Face	3.00	0.0000	58.00	No Ice	1.32	1.32	0.01
(Town - Existing)			0.00			1/2" Ice	3.21	3.21	0.02
			7.50						
3' Stand-off Mount	A	From Face	0.00	0.0000	86.00	No Ice	2.45	2.45	0.05
(Town - Existing)			0.00			1/2" Ice	3.98	3.98	0.07
			0.00						
PD1142-1	A	From Face	3.00	0.0000	86.00	No Ice	1.32	1.32	0.01
(Town - Existing)			0.00			1/2" Ice	3.21	3.21	0.02
			5.00						
PD1121-6	A	From Face	3.00	0.0000	86.00	No Ice	0.23	0.23	0.00
(Town - Existing)			0.00			1/2" Ice	0.41	0.41	0.00
			0.00						

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
PD1142-1	A	From Face	3.00	0.0000	100.00	No Ice	1.32	1.32	0.01
(Town - Existing)			0.00			1/2" Ice	3.21	3.21	0.02
			5.00						
PD1142-1	B	From Face	3.00	0.0000	100.00	No Ice	1.32	1.32	0.01
(Town - Existing)			0.00			1/2" Ice	3.21	3.21	0.02
			5.00						
440-3	C	From Face	3.00	0.0000	100.00	No Ice	1.48	1.48	0.02
(Town - Existing)			0.00			1/2" Ice	2.66	2.66	0.03
			5.00						
440-3	B	From Face	3.00	0.0000	130.00	No Ice	1.48	1.48	0.02
(Town - Existing)			0.00			1/2" Ice	2.66	2.66	0.03
			2.00						

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	108.79	1.406	26	69.038	A	0.000	69.038	69.038	100.00	0.000	15.154
130.00-89.92					B	0.000	69.038		100.00	0.000	0.000
					C	0.000	69.038		100.00	0.000	0.000
L2 89.92-44.84	66.66	1.222	22	111.210	A	0.000	111.210	111.210	100.00	0.000	18.935
					B	0.000	111.210		100.00	0.000	0.000
					C	0.000	111.210		100.00	0.000	0.000
L3 44.84-0.00	21.49	1	19	145.221	A	0.000	145.221	145.221	100.00	0.000	14.631
					B	0.000	145.221		100.00	0.000	0.000
					C	0.000	145.221		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 130.00-89.92	108.79	1.406	19	0.5000	72.378	A	0.000	72.378	72.378	100.00	0.000	25.977
						B	0.000	72.378		100.00	0.000	0.000
						C	0.000	72.378		100.00	0.000	0.000
L2 89.92-44.84	66.66	1.222	17	0.5000	114.967	A	0.000	114.967	114.967	100.00	0.000	32.460
						B	0.000	114.967		100.00	0.000	0.000
						C	0.000	114.967		100.00	0.000	0.000
L3 44.84-0.00	21.49	1	14	0.5000	148.957	A	0.000	148.957	148.957	100.00	0.000	25.082
						B	0.000	148.957		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	0.000	148.957		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	108.79	1.406	9	69.038	A	0.000	69.038	69.038	100.00	0.000	15.154
130.00-89.92					B	0.000	69.038		100.00	0.000	0.000
					C	0.000	69.038		100.00	0.000	0.000
L2 89.92-44.84	66.66	1.222	8	111.210	A	0.000	111.210	111.210	100.00	0.000	18.935
					B	0.000	111.210		100.00	0.000	0.000
					C	0.000	111.210		100.00	0.000	0.000
L3 44.84-0.00	21.49	1	6	145.221	A	0.000	145.221	145.221	100.00	0.000	14.631
					B	0.000	145.221		100.00	0.000	0.000
					C	0.000	145.221		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	3.79	94.45	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	5.07	112.55	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	5.14	114.65	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	860.56 kip-ft	14.00		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	3.79	94.45	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	5.07	112.55	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	5.14	114.65	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	860.56 kip-ft	14.00		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	3.79	94.45	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	5.07	112.55	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	5.14	114.65	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	860.56 kip-ft	14.00		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	3.79	94.45	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	5.07	112.55	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	5.14	114.65	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	860.56 kip-ft	14.00		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.34	2.50	A	1	1.03	1	1	1	72.378	3.31	82.55	C
130.00-89.92			B	1	1.03	1	1	1	72.378			
			C	1	1.03	1	1	1	72.378			
L2	2.23	7.03	A	1	1.03	1	1	1	114.967	4.30	95.41	C
89.92-44.84			B	1	1.03	1	1	1	114.967			
			C	1	1.03	1	1	1	114.967			
L3 44.84-0.00	1.71	11.10	A	1	1.03	1	1	1	148.957	4.19	93.48	C
			B	1	1.03	1	1	1	148.957			
			C	1	1.03	1	1	1	148.957			
Sum Weight:	5.29	20.63						OTM	736.77 kip-ft	11.80		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.34	2.50	A	1	1.03	1	1	1	72.378	3.31	82.55	C
130.00-89.92			B	1	1.03	1	1	1	72.378			
			C	1	1.03	1	1	1	72.378			
L2	2.23	7.03	A	1	1.03	1	1	1	114.967	4.30	95.41	C
89.92-44.84			B	1	1.03	1	1	1	114.967			
			C	1	1.03	1	1	1	114.967			
L3 44.84-0.00	1.71	11.10	A	1	1.03	1	1	1	148.957	4.19	93.48	C
			B	1	1.03	1	1	1	148.957			
			C	1	1.03	1	1	1	148.957			
Sum Weight:	5.29	20.63						OTM	736.77 kip-ft	11.80		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.34	2.50	A	1	1.03	1	1	1	72.378	3.31	82.55	C
130.00-89.92			B	1	1.03	1	1	1	72.378			
			C	1	1.03	1	1	1	72.378			
L2	2.23	7.03	A	1	1.03	1	1	1	114.967	4.30	95.41	C
89.92-44.84			B	1	1.03	1	1	1	114.967			
			C	1	1.03	1	1	1	114.967			
L3 44.84-0.00	1.71	11.10	A	1	1.03	1	1	1	148.957	4.19	93.48	C
			B	1	1.03	1	1	1	148.957			
			C	1	1.03	1	1	1	148.957			
Sum Weight:	5.29	20.63						OTM	736.77 kip-ft	11.80		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.34	2.50	A	1	1.03	1	1	1	72.378	3.31	82.55	C
130.00-89.92			B	1	1.03	1	1	1	72.378			
			C	1	1.03	1	1	1	72.378			
L2	2.23	7.03	A	1	1.03	1	1	1	114.967	4.30	95.41	C
89.92-44.84			B	1	1.03	1	1	1	114.967			
			C	1	1.03	1	1	1	114.967			
L3 44.84-0.00	1.71	11.10	A	1	1.03	1	1	1	148.957	4.19	93.48	C
			B	1	1.03	1	1	1	148.957			
			C	1	1.03	1	1	1	148.957			
Sum Weight:	5.29	20.63						OTM	736.77 kip-ft	11.80		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	1.31	32.68	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	1.76	38.94	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	1.78	39.67	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	297.77 kip-ft	4.84		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	1.31	32.68	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	1.76	38.94	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	1.78	39.67	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	297.77 kip-ft	4.84		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	1.31	32.68	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	1.76	38.94	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	1.78	39.67	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	297.77 kip-ft	4.84		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.86	1.97	A	1	1.03	1	1	1	69.038	1.31	32.68	C
130.00-89.92			B	1	1.03	1	1	1	69.038			
			C	1	1.03	1	1	1	69.038			
L2	1.57	6.02	A	1	1.03	1	1	1	111.210	1.76	38.94	C
89.92-44.84			B	1	1.03	1	1	1	111.210			
			C	1	1.03	1	1	1	111.210			
L3 44.84-0.00	1.20	9.72	A	1	1.03	1	1	1	145.221	1.78	39.67	C
			B	1	1.03	1	1	1	145.221			
			C	1	1.03	1	1	1	145.221			
Sum Weight:	3.63	17.70						OTM	297.77 kip-ft	4.84		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	14.62					
Bracing Weight	3.08					
Total Member Self-Weight	17.70			-0.75	1.01	
Total Weight	30.11			-0.75	1.01	
Wind 0 deg - No Ice		-0.03	-30.86	-2792.94	4.39	-0.39
Wind 30 deg - No Ice		15.47	-26.71	-2417.17	-1399.84	-0.97
Wind 45 deg - No Ice		21.89	-21.80	-1972.74	-1981.83	-1.17
Wind 60 deg - No Ice		26.82	-15.41	-1393.92	-2428.70	-1.29
Wind 90 deg - No Ice		30.98	0.03	2.62	-2806.53	-1.27
Wind 120 deg - No Ice		26.84	15.45	1398.26	-2432.08	-0.91

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 135 deg - No Ice		21.93	21.84	1976.01	-1986.61	-0.62
Wind 150 deg - No Ice		15.51	26.74	2419.04	-1405.68	-0.30
Wind 180 deg - No Ice		0.03	30.86	2791.44	-2.36	0.39
Wind 210 deg - No Ice		-15.47	26.71	2415.67	1401.86	0.97
Wind 225 deg - No Ice		-21.89	21.80	1971.24	1983.86	1.17
Wind 240 deg - No Ice		-26.82	15.41	1392.42	2430.73	1.29
Wind 270 deg - No Ice		-30.98	-0.03	-4.13	2808.55	1.27
Wind 300 deg - No Ice		-26.84	-15.45	-1399.77	2434.10	0.91
Wind 315 deg - No Ice		-21.93	-21.84	-1977.52	1988.63	0.62
Wind 330 deg - No Ice		-15.51	-26.74	-2420.55	1407.71	0.30
Member Ice	2.93					
Total Weight Ice	39.34			-1.92	1.83	
Wind 0 deg - Ice		-0.02	-26.95	-2461.03	4.49	-0.60
Wind 30 deg - Ice		13.50	-23.33	-2130.24	-1231.31	-1.47
Wind 45 deg - Ice		19.10	-19.04	-1738.90	-1743.47	-1.77
Wind 60 deg - Ice		23.41	-13.46	-1229.17	-2136.69	-1.95
Wind 90 deg - Ice		27.04	0.02	0.74	-2469.05	-1.90
Wind 120 deg - Ice		23.43	13.49	1229.94	-2139.35	-1.34
Wind 135 deg - Ice		19.13	19.07	1738.81	-1747.23	-0.92
Wind 150 deg - Ice		13.54	23.35	2129.06	-1235.91	-0.43
Wind 180 deg - Ice		0.02	26.95	2457.19	-0.83	0.60
Wind 210 deg - Ice		-13.50	23.33	2126.41	1234.97	1.47
Wind 225 deg - Ice		-19.10	19.04	1735.06	1747.13	1.77
Wind 240 deg - Ice		-23.41	13.46	1225.34	2140.35	1.95
Wind 270 deg - Ice		-27.04	-0.02	-4.58	2472.72	1.90
Wind 300 deg - Ice		-23.43	-13.49	-1233.78	2143.01	1.34
Wind 315 deg - Ice		-19.13	-19.07	-1742.65	1750.89	0.92
Wind 330 deg - Ice		-13.54	-23.35	-2132.90	1239.57	0.43
Total Weight	30.11			-0.75	1.01	
Wind 0 deg - Service		-0.01	-10.68	-966.38	1.36	-0.13
Wind 30 deg - Service		5.35	-9.24	-836.36	-484.54	-0.34
Wind 45 deg - Service		7.57	-7.54	-682.58	-685.92	-0.41
Wind 60 deg - Service		9.28	-5.33	-482.29	-840.54	-0.45
Wind 90 deg - Service		10.72	0.01	0.94	-971.28	-0.44
Wind 120 deg - Service		9.29	5.35	483.86	-841.71	-0.31
Wind 135 deg - Service		7.59	7.56	683.77	-687.57	-0.22
Wind 150 deg - Service		5.37	9.25	837.07	-486.56	-0.10
Wind 180 deg - Service		0.01	10.68	965.93	-0.98	0.13
Wind 210 deg - Service		-5.35	9.24	835.90	484.91	0.34
Wind 225 deg - Service		-7.57	7.54	682.12	686.29	0.41
Wind 240 deg - Service		-9.28	5.33	481.84	840.92	0.45
Wind 270 deg - Service		-10.72	-0.01	-1.40	971.66	0.44
Wind 300 deg - Service		-9.29	-5.35	-484.32	842.09	0.31
Wind 315 deg - Service		-7.59	-7.56	-684.23	687.94	0.22
Wind 330 deg - Service		-5.37	-9.25	-837.53	486.93	0.10

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice

Comb. No.	Description
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	130 - 89.92	Pole	Max Tension	31	55.57	149.11	0.58
			Max. Compression	18	-16.23	0.25	0.47
			Max. Mx	14	-9.12	402.84	1.02
			Max. My	2	-9.15	1.03	398.90
			Max. Vy	14	-20.43	402.84	1.02
			Max. Vx	2	-20.30	1.03	398.90
			Max. Torque	32			-0.52
L2	89.92 - 44.836	Pole	Max Tension	31	56.10	717.29	1.69
			Max. Compression	1	-15.11	0.37	0.33

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	14	-11.42	1029.91	1.87
			Max. My	2	-11.47	2.07	1022.92
			Max. Vy	14	-24.10	1029.91	1.87
			Max. Vx	10	23.98	-0.94	-1022.23
			Max. Torque	31			-1.46
	60 - 80	Reinforcing	Max Tension	14	146.80	-0.00	0.13
			Max. Compression	23	-158.74	0.00	-0.15
			Max. Mx	7	126.25	-0.17	-0.00
			Max. My	14	146.59	-0.00	0.17
			Max. Vy	24	0.01	-0.16	-0.00
			Max. Vx	31	-0.01	-0.00	0.16
	80 - 96	Reinforcing	Max Tension	14	105.40	-0.00	0.08
			Max. Compression	23	-119.68	0.00	-0.15
			Max. Mx	2	-1.13	-0.16	0.00
			Max. My	14	105.23	-0.00	0.17
			Max. Vy	2	0.01	-0.16	0.00
			Max. Vx	14	-0.01	-0.00	0.17
L3	44.836 - 0	Pole	Max Tension	31	52.77	1095.73	2.52
			Max. Compression	1	-25.37	0.78	0.58
			Max. Mx	14	-22.26	2252.40	3.29
			Max. My	2	-22.29	3.67	2239.75
			Max. Vy	14	-28.57	2252.40	3.29
			Max. Vx	10	28.47	-1.72	-2238.56
			Max. Torque	22			1.96
	0 - 20	Reinforcing	Max Tension	14	181.91	-0.00	0.22
			Max. Compression	23	-192.33	-0.00	0.00
			Max. Mx	7	156.86	-0.22	-0.00
			Max. My	14	181.91	-0.00	0.22
			Max. Vy	7	-0.01	-0.22	-0.00
			Max. Vx	14	0.01	-0.00	0.22
	20 - 40	Reinforcing	Max Tension	14	174.05	-0.00	0.15
			Max. Compression	23	-185.26	0.00	-0.13
			Max. Mx	7	150.04	-0.15	-0.00
			Max. My	14	174.05	-0.00	0.15
			Max. Vy	22	0.00	0.14	-0.00
			Max. Vx	31	0.00	-0.00	0.14
	40 - 60	Reinforcing	Max Tension	14	153.26	-0.00	0.17
			Max. Compression	23	-165.79	0.00	-0.10
			Max. Mx	7	132.10	-0.17	-0.00
			Max. My	14	153.26	-0.00	0.17
			Max. Vy	7	-0.01	-0.17	-0.00
			Max. Vx	31	0.01	-0.00	0.15

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	1	25.37	-0.00	-0.00
	Max. H_x	14	22.29	28.55	0.02
	Max. H_z	2	22.32	0.02	28.44
	Max. M_x	2	2239.75	0.02	28.44
	Max. M_z	6	2250.33	-28.55	-0.02
	Max. Torsion	22	1.96	-22.05	12.67
	Min. Vert	31	-43.98	25.47	0.02
	Min. H_x	6	22.29	-28.55	-0.02
	Min. H_z	10	22.33	-0.03	-28.44

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. M_x	10	-2238.56	-0.03	-28.44
	Min. M_z	14	-2252.40	28.55	0.02
	Min. Torsion	30	-1.93	22.05	-12.67
Reinf @ Azimuth 90 deg	Max. Vert	23	192.33	-0.21	0.00
	Max. H_x	14	-181.66	3.29	0.00
	Max. H_z	8	132.96	-0.37	0.85
	Min. Vert	14	-181.66	3.29	0.00
	Min. H_x	20	109.82	-0.56	-0.77
	Min. H_z	4	132.63	-0.37	-0.84
Reinf @ Azimuth -30 deg	Max. Vert	34	192.19	0.10	0.19
	Max. H_x	20	109.66	0.95	0.10
	Max. H_z	31	110.46	-0.39	0.88
	Min. Vert	9	-180.91	-1.64	-2.83
	Min. H_x	7	-156.62	-1.93	-1.94
	Min. H_z	9	-180.91	-1.64	-2.83
Reinf @ Azimuth 210 deg	Max. Vert	28	191.63	0.10	-0.19
	Max. H_x	26	109.43	0.95	-0.10
	Max. H_z	3	-180.61	-1.63	2.82
	Min. Vert	3	-180.61	-1.63	2.82
	Min. H_x	5	-156.26	-1.92	1.93
	Min. H_z	31	109.91	-0.39	-0.87

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	30.11	0.00	0.00	-0.75	1.01	0.00
Dead+Wind 0 deg - No Ice	30.11	-0.03	-30.86	-2878.68	4.81	-0.38
Dead+Wind 30 deg - No Ice	30.11	15.47	-26.71	-2491.13	-1442.95	-0.99
Dead+Wind 45 deg - No Ice	30.11	21.89	-21.80	-2033.28	-2042.95	-1.19
Dead+Wind 60 deg - No Ice	30.11	26.82	-15.41	-1436.92	-2503.41	-1.31
Dead+Wind 90 deg - No Ice	30.11	30.98	0.03	2.73	-2892.42	-1.26
Dead+Wind 120 deg - No Ice	30.11	26.84	15.45	1441.41	-2506.88	-0.87
Dead+Wind 135 deg - No Ice	30.11	21.93	21.84	2036.65	-2047.88	-0.59
Dead+Wind 150 deg - No Ice	30.11	15.51	26.74	2493.05	-1448.99	-0.28
Dead+Wind 180 deg - No Ice	30.11	0.03	30.86	2877.12	-2.19	0.38
Dead+Wind 210 deg - No Ice	30.11	-15.47	26.71	2490.03	1444.76	0.95
Dead+Wind 225 deg - No Ice	30.11	-21.89	21.80	2031.72	2044.50	1.14
Dead+Wind 240 deg - No Ice	30.11	-26.82	15.41	1434.89	2505.23	1.26
Dead+Wind 270 deg - No Ice	30.11	-30.98	-0.03	-4.27	2895.05	1.26
Dead+Wind 300 deg - No Ice	30.11	-26.84	-15.45	-1442.49	2508.70	0.93
Dead+Wind 315 deg - No Ice	30.11	-21.93	-21.84	-2038.19	2049.43	0.65
Dead+Wind 330 deg - No Ice	30.11	-15.51	-26.74	-2495.06	1450.81	0.32
Dead+Ice+Temp	39.34	-0.00	-0.00	-1.95	1.85	0.00
Dead+Wind 0 deg+Ice+Temp	39.34	-0.02	-26.95	-2573.24	4.90	-0.60
Dead+Wind 30 deg+Ice+Temp	39.34	13.50	-23.33	-2227.15	-1287.44	-1.48
Dead+Wind 45 deg+Ice+Temp	39.34	19.10	-19.04	-1818.07	-1823.06	-1.79
Dead+Wind 60 deg+Ice+Temp	39.34	23.41	-13.46	-1285.25	-2234.17	-1.96
Dead+Wind 90 deg+Ice+Temp	39.34	27.04	0.02	0.79	-2581.49	-1.90
Dead+Wind 120 deg+Ice+Temp	39.34	23.43	13.49	1286.06	-2236.95	-1.32
Dead+Wind 135 deg+Ice+Temp	39.34	19.13	19.07	1817.98	-1827.00	-0.90
Dead+Wind 150 deg+Ice+Temp	39.34	13.54	23.35	2225.90	-1292.28	-0.41
Dead+Wind 180 deg+Ice+Temp	39.34	0.02	26.95	2569.20	-0.70	0.60

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+Wind 210 deg+Ice+Temp	39.34	-13.50	23.33	2223.41	1291.09	1.46
Dead+Wind 225 deg+Ice+Temp	39.34	-19.10	19.04	1814.02	1826.54	1.75
Dead+Wind 240 deg+Ice+Temp	39.34	-23.41	13.46	1280.90	2237.83	1.93
Dead+Wind 270 deg+Ice+Temp	39.34	-27.04	-0.02	-4.81	2585.68	1.90
Dead+Wind 300 deg+Ice+Temp	39.34	-23.43	-13.49	-1289.77	2240.61	1.36
Dead+Wind 315 deg+Ice+Temp	39.34	-19.13	-19.07	-1822.00	1830.49	0.93
Dead+Wind 330 deg+Ice+Temp	39.34	-13.54	-23.35	-2230.24	1295.94	0.44
Dead+Wind 0 deg - Service	30.11	-0.01	-10.68	-998.14	2.26	-0.13
Dead+Wind 30 deg - Service	30.11	5.35	-9.24	-863.91	-499.34	-0.34
Dead+Wind 45 deg - Service	30.11	7.57	-7.54	-705.16	-707.24	-0.41
Dead+Wind 60 deg - Service	30.11	9.28	-5.33	-498.41	-866.86	-0.45
Dead+Wind 90 deg - Service	30.11	10.72	0.01	0.43	-1001.82	-0.44
Dead+Wind 120 deg - Service	30.11	9.29	5.35	498.95	-868.07	-0.31
Dead+Wind 135 deg - Service	30.11	7.59	7.56	705.32	-708.95	-0.22
Dead+Wind 150 deg - Service	30.11	5.37	9.25	863.56	-501.44	-0.10
Dead+Wind 180 deg - Service	30.11	0.01	10.68	996.58	-0.16	0.13
Dead+Wind 210 deg - Service	30.11	-5.35	9.24	862.35	501.43	0.34
Dead+Wind 225 deg - Service	30.11	-7.57	7.54	703.60	709.33	0.41
Dead+Wind 240 deg - Service	30.11	-9.28	5.33	496.84	868.95	0.45
Dead+Wind 270 deg - Service	30.11	-10.72	-0.01	-1.99	1003.92	0.44
Dead+Wind 300 deg - Service	30.11	-9.29	-5.35	-500.51	870.17	0.32
Dead+Wind 315 deg - Service	30.11	-7.59	-7.56	-706.88	711.04	0.22
Dead+Wind 330 deg - Service	30.11	-5.37	-9.25	-865.13	503.53	0.10

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	-30.11	0.00	0.00	30.11	0.00	0.000%
2	-0.03	-30.11	-30.86	0.03	30.11	30.86	0.000%
3	15.47	-30.11	-26.71	-15.47	30.11	26.71	0.000%
4	21.89	-30.11	-21.80	-21.89	30.11	21.80	0.000%
5	26.82	-30.11	-15.41	-26.82	30.11	15.41	0.000%
6	30.98	-30.11	0.03	-30.98	30.11	-0.03	0.000%
7	26.84	-30.11	15.45	-26.84	30.11	-15.45	0.000%
8	21.93	-30.11	21.84	-21.93	30.11	-21.84	0.000%
9	15.51	-30.11	26.74	-15.51	30.11	-26.74	0.000%
10	0.03	-30.11	30.86	-0.03	30.11	-30.86	0.000%
11	-15.47	-30.11	26.71	15.47	30.11	-26.71	0.000%
12	-21.89	-30.11	21.80	21.89	30.11	-21.80	0.000%
13	-26.82	-30.11	15.41	26.82	30.11	-15.41	0.000%
14	-30.98	-30.11	-0.03	30.98	30.11	0.03	0.000%
15	-26.84	-30.11	-15.45	26.84	30.11	15.45	0.000%
16	-21.93	-30.11	-21.84	21.93	30.11	21.84	0.000%
17	-15.51	-30.11	-26.74	15.51	30.11	26.74	0.000%
18	0.00	-39.34	0.00	0.00	39.34	0.00	0.000%
19	-0.02	-39.34	-26.95	0.02	39.34	26.95	0.000%
20	13.50	-39.34	-23.33	-13.50	39.34	23.33	0.000%
21	19.10	-39.34	-19.04	-19.10	39.34	19.04	0.000%
22	23.41	-39.34	-13.46	-23.41	39.34	13.46	0.000%
23	27.04	-39.34	0.02	-27.04	39.34	-0.02	0.000%
24	23.43	-39.34	13.49	-23.43	39.34	-13.49	0.000%
25	19.13	-39.34	19.07	-19.13	39.34	-19.07	0.000%
26	13.54	-39.34	23.35	-13.54	39.34	-23.35	0.000%
27	0.02	-39.34	26.95	-0.02	39.34	-26.95	0.000%
28	-13.50	-39.34	23.33	13.50	39.34	-23.33	0.000%
29	-19.10	-39.34	19.04	19.10	39.34	-19.04	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
30	-23.41	-39.34	13.46	23.41	39.34	-13.46	0.000%
31	-27.04	-39.34	-0.02	27.04	39.34	0.02	0.000%
32	-23.43	-39.34	-13.49	23.43	39.34	13.49	0.000%
33	-19.13	-39.34	-19.07	19.13	39.34	19.07	0.000%
34	-13.54	-39.34	-23.35	13.54	39.34	23.35	0.000%
35	-0.01	-30.11	-10.68	0.01	30.11	10.68	0.000%
36	5.35	-30.11	-9.24	-5.35	30.11	9.24	0.000%
37	7.57	-30.11	-7.54	-7.57	30.11	7.54	0.000%
38	9.28	-30.11	-5.33	-9.28	30.11	5.33	0.000%
39	10.72	-30.11	0.01	-10.72	30.11	-0.01	0.000%
40	9.29	-30.11	5.35	-9.29	30.11	-5.35	0.000%
41	7.59	-30.11	7.56	-7.59	30.11	-7.56	0.000%
42	5.37	-30.11	9.25	-5.37	30.11	-9.25	0.000%
43	0.01	-30.11	10.68	-0.01	30.11	-10.68	0.000%
44	-5.35	-30.11	9.24	5.35	30.11	-9.24	0.000%
45	-7.57	-30.11	7.54	7.57	30.11	-7.54	0.000%
46	-9.28	-30.11	5.33	9.28	30.11	-5.33	0.000%
47	-10.72	-30.11	-0.01	10.72	30.11	0.01	0.000%
48	-9.29	-30.11	-5.35	9.29	30.11	5.35	0.000%
49	-7.59	-30.11	-7.56	7.59	30.11	7.56	0.000%
50	-5.37	-30.11	-9.25	5.37	30.11	9.25	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	5	0.00000001	0.00010841
3	Yes	6	0.00000001	0.00027071
4	Yes	6	0.00000001	0.00029176
5	Yes	6	0.00000001	0.00026546
6	Yes	5	0.00000001	0.00024989
7	Yes	6	0.00000001	0.00026317
8	Yes	6	0.00000001	0.00030019
9	Yes	6	0.00000001	0.00028081
10	Yes	5	0.00000001	0.00007062
11	Yes	6	0.00000001	0.00030852
12	Yes	6	0.00000001	0.00032067
13	Yes	6	0.00000001	0.00025792
14	Yes	5	0.00000001	0.00029457
15	Yes	6	0.00000001	0.00025869
16	Yes	6	0.00000001	0.00031124
17	Yes	6	0.00000001	0.00030010
18	Yes	4	0.00000001	0.00007441
19	Yes	6	0.00000001	0.00016615
20	Yes	6	0.00000001	0.00088684
21	Yes	7	0.00000001	0.00005396
22	Yes	6	0.00000001	0.00095820
23	Yes	6	0.00000001	0.00017379
24	Yes	6	0.00000001	0.00092109
25	Yes	7	0.00000001	0.00005473
26	Yes	6	0.00000001	0.00092185
27	Yes	6	0.00000001	0.00016550
28	Yes	6	0.00000001	0.00096379
29	Yes	7	0.00000001	0.00005512
30	Yes	6	0.00000001	0.00090032

31	Yes	6	0.00000001	0.00017622
32	Yes	6	0.00000001	0.00094080
33	Yes	7	0.00000001	0.00005422
34	Yes	6	0.00000001	0.00093363
35	Yes	5	0.00000001	0.00008018
36	Yes	6	0.00000001	0.00004601
37	Yes	6	0.00000001	0.00005465
38	Yes	6	0.00000001	0.00004990
39	Yes	5	0.00000001	0.00012600
40	Yes	6	0.00000001	0.00004665
41	Yes	6	0.00000001	0.00005488
42	Yes	6	0.00000001	0.00004823
43	Yes	5	0.00000001	0.00007805
44	Yes	6	0.00000001	0.00004964
45	Yes	6	0.00000001	0.00005542
46	Yes	6	0.00000001	0.00004620
47	Yes	5	0.00000001	0.00012996
48	Yes	6	0.00000001	0.00004983
49	Yes	6	0.00000001	0.00005563
50	Yes	6	0.00000001	0.00004796

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	130 - 89.92	32.800	47	2.3255	0.0030
L2	94.003 - 44.836	16.958	47	1.6855	0.0017
L3	50.003 - 0	4.766	47	0.8842	0.0009

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
130.00	440-3	47	32.800	2.3255	0.0030	17932
128.00	HBXX-9014DS	47	31.862	2.2902	0.0029	17932
127.00	Valmont 13' Platform w/Rails	47	31.394	2.2726	0.0028	17932
118.00	APXVSPP18-C-A20	47	27.210	2.1136	0.0024	7471
117.00	Valmont 13' Platform w/Rails	47	26.751	2.0959	0.0024	6896
100.00	AIR21 B2A/B4P	47	19.332	1.7934	0.0019	2987
99.00	Valmont 13' Platform w/Rails	47	18.925	1.7754	0.0019	2891
86.00	3' Stand-off Mount	47	14.054	1.5405	0.0016	2503
58.00	3' Stand-off Mount	47	6.301	1.0292	0.0010	2555
50.00	3' GPS Stand-off Mount	47	4.766	0.8842	0.0009	2612

Maximum Tower Deflections - Design Wind

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

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	130 - 89.92	94.364	14	6.6931	0.0134
L2	94.003 - 44.836	48.836	14	4.8545	0.0081
L3	50.003 - 0	13.737	14	2.5484	0.0038

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
130.00	440-3	14	94.364	6.6931	0.0134	6371
128.00	HBXX-9014DS	14	91.669	6.5917	0.0130	6371
127.00	Valmont 13' Platform w/Rails	14	90.322	6.5410	0.0128	6371
118.00	APXVSPP18-C-A20	14	78.302	6.0844	0.0114	2653
117.00	Valmont 13' Platform w/Rails	14	76.985	6.0336	0.0112	2449
100.00	AIR21 B2A/B4P	14	55.661	5.1644	0.0089	1057
99.00	Valmont 13' Platform w/Rails	14	54.492	5.1129	0.0088	1023
86.00	3' Stand-off Mount	14	40.482	4.4374	0.0075	882
58.00	3' Stand-off Mount	14	18.159	2.9659	0.0046	891
50.00	3' GPS Stand-off Mount	14	13.735	2.5483	0.0038	909

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Concrete Stress ksi	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Critical Ratio
2.5000	12	2.2500	137.21	2.358	42.670		Bolt T	1.16
			118.09	2.800	45.000			✔
			1.16	0.84	0.95			

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	130 - 89.92 (1)	TP25.08x16.26x0.219	40.08	0.00	0.0	39.000	16.5880	-9.12	646.93	0.014
L2	89.92 - 44.836 (2)	TP34.56x23.7435x0.313	49.17	0.00	0.0	39.000	33.3705	-11.42	1301.45	0.009
L3	44.836 - 0 (3)	TP43.8x32.7973x0.375	50.00	0.00	0.0	39.000	52.4357	-22.26	2044.99	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	130 - 89.92 (1)	TP25.08x16.26x0.219	402.85	-50.746	39.000	1.301	0.00	0.000	39.000	0.000
L2	89.92 - 44.836 (2)	TP34.56x23.7435x0.313	1029.92	-45.823	39.000	1.175	0.00	0.000	39.000	0.000
L3	44.836 - 0 (3)	TP43.8x32.7973x0.375	2252.40	-48.589	39.000	1.246	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	130 - 89.92 (1)	TP25.08x16.26x0.219	0.014	1.301	0.000	1.315 ✔	1.333	H1-3 ✔
L2	89.92 - 44.836 (2)	TP34.56x23.7435x0.313	0.009	1.175	0.000	1.184 ✔	1.333	H1-3 ✔
L3	44.836 - 0 (3)	TP43.8x32.7973x0.375	0.011	1.246	0.000	1.257 ✔	1.333	H1-3 ✔

Reinforcing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L2	80 - 60	Williams R71 1-3/4"	20.00	2.50	48.0 K=0.80	48.279	3.1416	-158.75	151.67	1.047
L2	96 - 80	Williams R71 1-3/4"	16.00	2.50	48.0 K=0.80	48.279	3.1416	-119.68	151.67	0.789
L3	20 - 0	Williams R71 1-3/4"	20.00	2.50	48.0 K=0.80	48.279	3.1416	-192.20	151.67	1.267
L3	40 - 20	Williams R71 1-3/4"	20.00	2.50	48.0 K=0.80	48.279	3.1416	-185.26	151.67	1.221
L3	60 - 40	Williams R71 1-3/4"	20.00	2.50	48.0 K=0.80	48.279	3.1416	-165.54	151.67	1.091

Reinforcing Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L2	80 - 60	Williams R71 1-3/4"	0.15	-2.289	90.000	0.025	0.00	0.000	90.000	0.000
L2	96 - 80	Williams R71 1-3/4"	0.15	-2.220	90.000	0.025	0.00	0.000	90.000	0.000
L3	20 - 0	Williams R71 1-3/4"	0.19	-2.875	90.000	0.032	0.00	0.000	90.000	0.000
L3	40 - 20	Williams R71 1-3/4"	0.13	-1.967	90.000	0.022	0.00	0.000	90.000	0.000

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L3	60 - 40	Williams R71 1-3/4"	0.15	-2.246	90.000	0.025	0.00	0.000	90.000	0.000

Reinforcing Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	80 - 60	Williams R71 1-3/4"	1.047	0.025	0.000	1.072 ✔	1.333	H1-3 ✔
L2	96 - 80	Williams R71 1-3/4"	0.789	0.025	0.000	0.814 ✔	1.333	H1-3 ✔
L3	20 - 0	Williams R71 1-3/4"	1.267	0.032	0.000	1.299 ✔	1.333	H1-3 ✔
L3	40 - 20	Williams R71 1-3/4"	1.221	0.022	0.000	1.243 ✔	1.333	H1-3 ✔
L3	60 - 40	Williams R71 1-3/4"	1.091	0.025	0.000	1.116 ✔	1.333	H1-3 ✔

Tension Checks

Reinforcing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L2	80 - 60	Williams R71 1-3/4"	20.00	2.50	60.0	72.000	3.1416	146.59	226.19	0.648
L2	96 - 80	Williams R71 1-3/4"	16.00	2.50	60.0	72.000	3.1416	105.32	226.19	0.466
L3	20 - 0	Williams R71 1-3/4"	20.00	2.50	60.0	72.000	3.1416	181.91	226.19	0.804
L3	40 - 20	Williams R71 1-3/4"	20.00	2.50	60.0	72.000	3.1416	174.05	226.19	0.769
L3	60 - 40	Williams R71 1-3/4"	20.00	2.50	60.0	72.000	3.1416	153.26	226.19	0.678

Reinforcing Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L2	80 - 60	Williams R71 1-3/4"	0.17	2.664	90.000	0.030	0.00	0.000	90.000	0.000
L2	96 - 80	Williams R71 1-3/4"	0.17	2.531	90.000	0.028	0.00	0.000	90.000	0.000
L3	20 - 0	Williams R71 1-3/4"	0.22	3.386	90.000	0.038	0.00	0.000	90.000	0.000
L3	40 - 20	Williams R71 1-3/4"	0.15	2.349	90.000	0.026	0.00	0.000	90.000	0.000
L3	60 - 40	Williams R71 1-3/4"	0.17	2.594	90.000	0.029	0.00	0.000	90.000	0.000

Reinforcing Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	80 - 60	Williams R71 1-3/4"	0.648	0.030	0.000	0.678 ✔	1.333	H2-1 ✔
L2	96 - 80	Williams R71 1-3/4"	0.466	0.028	0.000	0.494 ✔	1.333	H2-1 ✔
L3	20 - 0	Williams R71 1-3/4"	0.804	0.038	0.000	0.842 ✔	1.333	H2-1 ✔
L3	40 - 20	Williams R71 1-3/4"	0.769	0.026	0.000	0.796 ✔	1.333	H2-1 ✔
L3	60 - 40	Williams R71 1-3/4"	0.678	0.029	0.000	0.706 ✔	1.333	H2-1 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	130 - 89.92	Pole	TP25.08x16.26x0.219	1	-9.12	862.36	98.7	Pass
L2	89.92 - 44.836	Pole	TP34.56x23.7435x0.313	2	54.20	1734.83	88.8	Pass
L3	44.836 - 0	Pole	TP43.8x32.7973x0.375	3	44.29	2725.97	94.3	Pass
L2	80 - 60	Reinforcing	Williams R71 1-3/4"	7	-158.75	202.18	80.4	Pass
	96 - 80	Reinforcing	Williams R71 1-3/4"	4	-119.68	202.18	61.0	Pass
L3	20 - 0	Reinforcing	Williams R71 1-3/4"	16	-192.20	202.18	97.5	Pass
	40 - 20	Reinforcing	Williams R71 1-3/4"	13	-185.26	202.18	93.3	Pass
	60 - 40	Reinforcing	Williams R71 1-3/4"	10	-165.54	202.18	83.8	Pass
							Summary	
						Pole (L1)	98.7	Pass
						Reinforcing (L3)	97.5	Pass
						Base Plate	87.2	Pass
						RATING =	**98.7**	**Pass**

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Subject: Anchor Bolt and Baseplate Analysis

Location: 130-ft Valmont Monopole
Ridgefield, CT

Rev. 0: 09/08/15

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 15001.095

Reinforced Anchor Bolt and Base Plate Analysis:

Input Data:

Note:
Base plate and anchor bolt information obtained from original Valmont design documents, Order No. 10533-89, dated 10/24/89. Anchor bolt reinforcement infomration obtained from design documents prepared by Infinigy for T-Mobile, job no. 379-015, dated 04/24/15.

Tower Reactions:

Overturning Moment =	OM := 2895·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 31·kips	(Input From tnxTower)
Axial Force =	Axial := 30·kips	(Input From tnxTower)

Original Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 12	(User Input)
Diameter of Bolt Circle =	D_{bc} := 49.75·in	(User Input)
Bolt "Column" Distance =	l := 3·in	(User Input)
Bolt Ultimate Strength =	F_u := 100·ksi	(User Input)
Bolt Yield Strength =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Anchor Bolt Reinf. Data:

Use A1035 Gr. 120

Number of Anchor Bolts =	No := 3	(User Input)
Diameter of Bolt Circle =	D_{bco} := 55.8·in	(User Input)
Bolt "Column" Distance =	lo := 3.0·in	(User Input)
Bolt Ultimate Strength =	F_{uo} := 150·ksi	(User Input)
Bolt Yield Strength =	F_{yo} := 120·ksi	(User Input)
Bolt Modulus =	Eo := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	Do := 1.875·in	(User Input)
Threads per Inch =	no := 6	(User Input)

Base Plate Data:

Use ASTM A572 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.5·in	(User Input)
Base Plate Diameter =	D_{bp} := 56.5·in	(User Input)
Outer Pole Diameter =	D_{pole} := 43.8·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 12.44in$ (User Input)

$d_2 := 21.54in$ (User Input)

$d_3 := 24.88in$ (User Input)

$d_4 := 13.95in$ (User Input)

$d_5 := 27.9in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3in$ (User Input)

(User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 0.8 \cdot 35.69in = 28.6 \cdot in$ (User Input)

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	130-ft Valmont Monopole Ridgefield, CT
Rev. 0: 09/08/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 15001.095

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Total Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 2 + (d_4)^2 \cdot 2 + (d_5)^2 \cdot 1\right] = 4880.54 \cdot in^2$

Gross Area of Inner Bolts = $A_{gi} := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Inner Bolt = $A_{ni} := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter of Inner Bolt = $D_{ni} := \frac{2 \cdot \sqrt{A_{ni}}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Inner Bolt = $ri := \frac{D_{ni}}{4} = 0.508 \cdot in$

Section Modulus of Inner Bolt = $S_{xi} := \frac{\pi \cdot D_{ni}^3}{32} = 0.826 \cdot in^3$

Check Inner Anchor Bolt Tension Force:

Maximum Tensile Force At Inner Bolts = $T_{Max} := OM \cdot \frac{d_3}{I_p} - \frac{Axial}{N} = 174.6 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_{gi} \cdot F_u\right) = 174.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.333 \cdot \left(0.60 \cdot A_{ni} \cdot F_y\right) = 194.812 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 89.6$ Bolts are "upset bolts". Use net area per AISC

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, "OK", "Overstressed"\right)$

Condition1 = "OK" Note Shear stress is negligible

Check Inner Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N + No}\right) \cdot l = 0.517 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_{xi}} = 7.5 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_{ni} \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_{ni} \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Inner Anchor Bolt Compression/Combined Stress:

Applied Compressive Force =

$$C_{Max} := OM \cdot \frac{d_3}{I_p} + \frac{Axial}{N} = 179.6 \cdot kips$$

Applied Compressive Stress =

$$f_a := \frac{C_{Max}}{A_{ni}} = 55.3 \cdot ksi$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{ri}\right)^2}{2 \cdot C_c^2}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{ri}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{ri}\right)^3}{8 \cdot C_c^3}} & \text{if } \dfrac{K \cdot l}{ri} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{ri}\right)^2} & \text{if } \dfrac{K \cdot l}{ri} > C_c \end{cases} = 45 \cdot ksi$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 92.2$$

Condition 2 =

$$Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, "OK", "Overstressed"\right)$$

Condition2 = "OK"

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	130-ft Valmont Monopole Ridgefield, CT
Rev. 0: 09/08/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 15001.095

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Gross Area of Inner Bolts = $A_{go} := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Inner Bolt = $A_{no} := \frac{\pi}{4} \cdot \left(Do - \frac{0.9743 \cdot in}{n} \right)^2 = 2.16 \cdot in^2$

Net Diameter of Inner Bolt = $D_{no} := \frac{2 \cdot \sqrt{A_{no}}}{\sqrt{\pi}} = 1.658 \cdot in$

Radius of Gyration of Inner Bolt = $ro := \frac{D_{no}}{4} = 0.415 \cdot in$

Section Modulus of Inner Bolt = $S_{xo} := \frac{\pi \cdot D_{no}^3}{32} = 0.448 \cdot in^3$

Check Outer Anchor Bolt Tension Force:

Maximum Tensile Force At Outer Bolts = $To_{Max} := OM \cdot \frac{d_5}{l_p} - \frac{Axial}{N} = 196.1 \cdot kips$

Allowable Tensile Force = $To_{ALL} := 289 \cdot kips$ (per Williams deisgn table)

Bolt Tension % of Capacity = $\frac{To_{Max}}{To_{ALL}} \cdot 100 = 67.9$

Condition3 = $Condition3 := if\left(\frac{To_{Max}}{To_{ALL}} \le 1.00, "OK", "Overstressed" \right)$

Condition3 = "OK"

Base Plate Analysis:

Force from Bolts =

$$C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 179.597 \cdot kips$$

Applied Bending Stress in Plate =

$$f_{bp} := \frac{6 \cdot (C_1 \cdot ma_1)}{B_{eff} \cdot t_{bp}^2} = 18.12 \cdot ksi$$

Allowable Bending Stress in Plate =

$$F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} \cdot 100 = 30.3$$

Condition5 =

$$Condition5 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$$

Condition5 = "Ok"

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Subject:		CAISSON FOUNDATION
Location:		130-ft Valmont Monopole Ridgefield, CT
Rev. 0: 9/08/15		Prepared by: TJL Checked by: C.F.C. Job No. 15001.095

Caisson Foundation:

Input Data:

Shear Force =	S := 31k	*USER INPUT-FROM tnxTower*
Overturning Moment =	M := 2895ft·k	*USER INPUT-FROM tnxTower*
Applied Axial Load =	A1 := 30k	*USER INPUT-FROM tnxTower*
Bending Moment =	Mu := 3010ft·k	*USER INPUT–FROM LPILE*
Moment Capacity =	Mn := 5115ft·k	*USER INPUT–FROM LPILE*
Foundation Diameter =	d := 6.0ft	*USER INPUT*
Overall Length of Caisson =	L_c := 21.0ft	*USER INPUT*
Depth From Top of Caisson to Grade =	L_{pag} := 0.5ft	*USER INPUT*
Number of Rebar =	n := 26	*USER INPUT*
Area of Rebar =	Ar := $1.56in^2$	*USER INPUT*
Rebar Yield Strength =	fy := 60ksi	*USER INPUT*
Concrete Comp Strength =	f'c := 3ksi	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{Mn}{Mu} = 1.7$

Factor of Safety Required = $FS_{reqd} := 1.3$

$FOSCheck := if(FS \geq FS_{reqd}, "OK", "NO GOOD")$

FOSCheck = "OK"

LPILE Plus for Windows, Version 5.0 (5.0.47)

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\1500100.WI\095 - Ridgefield CT\Backup Documentation\Calcs\L-Pile\
Name of input data file: Ridgefield Caisson Analysis.lpd
Name of output file: Ridgefield Caisson Analysis.lpo
Name of plot output file: Ridgefield Caisson Analysis.lpp
Name of runtime file: Ridgefield Caisson Analysis.lpr

Time and Date of Analysis

Date: September 8, 2015 Time: 15:50:28

Problem Title

15001.095 - Ridgefield

Program Options

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 3:
- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- Analysis includes computation of foundation stiffness matrix elements
- Output summary table of values for pile-head deflection, maximum bending moment, and shear force only
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:
- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-04 in
- Maximum allowable deflection = 1.0000E+02 in

Printing Options:
- Only summary tables of pile-head deflection, maximum bending moment, and maximum shear force are to be printed in output file.

Pile Structural Properties and Geometry

Pile Length = 252.00 in

Depth of ground surface below top of pile = 6.00 in

Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	72.00000000	1319167.	4071.5000	3122018.
2	252.0000	72.00000000	1319167.	4071.5000	3122018.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of moment of inertia and modulus of are not used for any computations other than total stress due to combined axial loading and bending.

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 6.000 in
Distance from top of pile to bottom of layer = 46.000 in
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in**3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 46.000 in
Distance from top of pile to bottom of layer = 102.000 in
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in**3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 102.000 in
Distance from top of pile to bottom of layer = 282.000 in
p-y subgrade modulus k for top of soil layer = 0.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 0.000 lbs/in**3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

(Depth of lowest layer extends 30.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	6.00	0.06700
2	46.00	0.06700
3	46.00	0.06700
4	102.00	0.06700
5	102.00	0.06700
6	282.00	0.05400

Shear Strength of Soils

Shear strength parameters with depth defined using 6 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	6.000	0.00000	30.00	------	------
2	46.000	0.00000	30.00	------	------
3	46.000	0.00000	30.00	------	------
4	102.000	0.00000	38.00	------	------
5	102.000	0.00000	38.00	------	------
6	282.000	0.00000	45.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.

(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

Loading Type

Static loading criteria was used for computation of p-y curves.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 31000.000 lbs
Bending moment at pile head = 34740000.000 in-lbs
Axial load at pile head = 30000.000 lbs

Non-zero moment at pile head for this load case indicates the pile-head may rotate under the applied pile-head loading, but is not a free-head (zero moment) condition.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness
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Number of sections = 1

Pile Section No. 1

The sectional shape is a circular drilled shaft (bored pile).

Outside Diameter = 72.0000 in

Material Properties:

Compressive Strength of Concrete = 3.000 kip/in**2
Yield Stress of Reinforcement = 60. kip/in**2
Modulus of Elasticity of Reinforcement = 29000. kip/in**2
Number of Reinforcing Bars = 26
Area of Single Bar = 1.56000 in**2
Number of Rows of Reinforcing Bars = 13
Area of Steel = 40.560 in**2
Area of Shaft = 4071.504 in**2
Percentage of Steel Reinforcement = 0.996 percent
Cover Thickness (edge to bar center) = 5.000 in

Unfactored Axial Squash Load Capacity = 12712.51 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	3.120	30.774
2	3.120	28.986
3	3.120	25.512
4	3.120	20.557
5	3.120	14.406
6	3.120	7.419
7	3.120	0.000
8	3.120	-7.419
9	3.120	-14.406
10	3.120	-20.557
11	3.120	-25.512
12	3.120	-28.986
13	3.120	-30.774

Axial Thrust Force = 30000.00 lbs

Bending Moment	Bending Stiffness	Bending Curvature	Maximum Strain	Neutral Axis Position	Max. Concrete Stress	Max. Steel Stress

in-lbs	lb-in2	rad/in	in/in	inches	psi	psi
3919835.	4.703802E+12	8.333333E-07	0.00003226	38.71751869	99.05840896	809.37777
7796305.	4.677783E+12	0.00000167	0.00006238	37.42593420	189.63641	1556.32895
11629628.	4.651851E+12	0.00000250	0.00009253	37.01153934	278.62891	2304.44980
15418703.	4.625611E+12	0.00000333	0.00012264	36.79214966	365.79293	3051.39206
15418703.	3.700489E+12	0.00000417	0.00008674	20.81867015	258.41846	5552.93268
15418703.	3.083741E+12	0.00000500	0.00010270	20.54086626	304.34244	6703.80078
15418703.	2.643206E+12	0.00000583	0.00011889	20.38152158	350.46856	7848.05672
15418703.	2.312805E+12	0.00000667	0.00013487	20.23031580	395.50433	8998.44080
15418703.	2.055827E+12	0.00000750	0.00015087	20.11611593	440.14742	10148.08437
15418703.	1.850244E+12	0.00000833	0.00016690	20.02784550	484.39611	11296.98132
15418703.	1.682040E+12	0.00000917	0.00018295	19.95845354	528.24860	12445.12615
15418703.	1.541870E+12	0.00001000	0.00019903	19.90324724	571.70327	13592.51108
15418703.	1.423265E+12	0.00001083	0.00021514	19.85897148	614.75831	14739.13030
15418703.	1.321603E+12	0.00001167	0.00023127	19.82330668	657.41201	15884.97615
15418703.	1.233496E+12	0.00001250	0.00024743	19.79454696	699.66250	17030.04270
15722494.	1.179187E+12	0.00001333	0.00026362	19.77141559	741.50796	18174.32301
16659933.	1.175995E+12	0.00001417	0.00027983	19.75293624	782.94653	19317.81013
17595855.	1.173057E+12	0.00001500	0.00029608	19.73835361	823.97648	20460.49535
18530245.	1.170331E+12	0.00001583	0.00031235	19.72706473	864.59578	21602.37301
19463092.	1.167786E+12	0.00001667	0.00032864	19.71859109	904.80251	22743.43560
20394388.	1.165394E+12	0.00001750	0.00034497	19.71254861	944.59487	23883.67394
21324117.	1.163134E+12	0.00001833	0.00036132	19.70861542	983.97069	25023.08289
22252269.	1.160988E+12	0.00001917	0.00037771	19.70653403	1022.92813	26161.65266
23178833.	1.158942E+12	0.00002000	0.00039412	19.70608556	1061.46512	27299.37593
24103795.	1.156982E+12	0.00002083	0.00041056	19.70708764	1099.57963	28436.24451
25027143.	1.155099E+12	0.00002167	0.00042704	19.70938575	1137.26956	29572.25030
25948865.	1.153283E+12	0.00002250	0.00044354	19.71284902	1174.53282	30707.38476
26868946.	1.151526E+12	0.00002333	0.00046007	19.71736372	1211.36721	31841.64037
27787376.	1.149822E+12	0.00002417	0.00047664	19.72283542	1247.77066	32975.00706
28704141.	1.148166E+12	0.00002500	0.00049323	19.72918046	1283.74098	34107.47612
29619223.	1.146551E+12	0.00002583	0.00050986	19.73632371	1319.27578	35239.04049
30532611.	1.144973E+12	0.00002667	0.00052651	19.74420297	1354.37285	36369.69044
31444296.	1.143429E+12	0.00002750	0.00054320	19.75276673	1389.03013	37499.41367
32354257.	1.141915E+12	0.00002833	0.00055992	19.76196134	1423.24500	38628.20464
33262482.	1.140428E+12	0.00002917	0.00057668	19.77174604	1457.01521	39756.05208
34168954.	1.138965E+12	0.00003000	0.00059346	19.78208220	1490.33833	40882.94682
35073663.	1.137524E+12	0.00003083	0.00061028	19.79293764	1523.21199	42008.87766
35976591.	1.136103E+12	0.00003167	0.00062714	19.80428231	1555.63372	43133.83454
36877722.	1.134699E+12	0.00003250	0.00064402	19.81608832	1587.60093	44257.80829
38674532.	1.131938E+12	0.00003417	0.00067790	19.84099424	1650.16168	46502.76187
40463959.	1.129227E+12	0.00003583	0.00071192	19.86749232	1710.87322	48743.65335
42245874.	1.126557E+12	0.00003750	0.00074608	19.89545596	1769.71417	50980.38957
44020136.	1.123918E+12	0.00003917	0.00078039	19.92478001	1826.66219	53212.87742
45786602.	1.121305E+12	0.00004083	0.00081484	19.95538080	1881.69428	55441.01875
47545119.	1.118709E+12	0.00004250	0.00084946	19.98718965	1934.78652	57664.71306
49295532.	1.116125E+12	0.00004417	0.00088422	20.02015293	1985.91429	59883.85390
50727705.	1.106786E+12	0.00004583	0.00091706	20.00862586	2032.08975	60000.00000
51848426.	1.091546E+12	0.00004750	0.00094789	19.95551813	2073.55661	60000.00000
52932359.	1.076590E+12	0.00004917	0.00097860	19.90369356	2113.14494	60000.00000
53815791.	1.058671E+12	0.00005083	0.00100791	19.82766259	2149.26643	60000.00000
54601872.	1.040036E+12	0.00005250	0.00103658	19.74445617	2183.07701	60000.00000
55384243.	1.022478E+12	0.00005417	0.00106535	19.66806257	2215.50229	60000.00000
56162844.	1.005902E+12	0.00005583	0.00109422	19.59789598	2246.52889	60000.00000
56717366.	9.863890E+11	0.00005750	0.00112120	19.49911344	2274.10227	60000.00000
57249077.	9.675900E+11	0.00005917	0.00114808	19.40418041	2300.26259	60000.00000
57777925.	9.497741E+11	0.00006083	0.00117504	19.31572115	2325.19249	60000.00000
58303888.	9.328622E+11	0.00006250	0.00120208	19.23324001	2348.88149	60000.00000
58819246.	9.166636E+11	0.00006417	0.00123200	19.19999993	2373.64920	60000.00000
59366882.	9.017754E+11	0.00006583	0.00125947	19.13121307	2394.89211	60000.00000
59729163.	8.848765E+11	0.00006750	0.00128459	19.03099072	2413.06159	60000.00000
60056985.	8.682938E+11	0.00006917	0.00130939	18.93100441	2429.88247	60000.00000
60382727.	8.524620E+11	0.00007083	0.00133427	18.83668935	2445.64507	60000.00000
60706360.	8.373291E+11	0.00007250	0.00135921	18.74766576	2460.34035	60000.00000
61027875.	8.228477E+11	0.00007417	0.00138422	18.66359460	2473.95933	60000.00000
61347232.	8.089745E+11	0.00007583	0.00140930	18.58415830	2486.49249	60000.00000
61664406.	7.956698E+11	0.00007750	0.00143445	18.50907147	2497.93027	60000.00000
61979377.	7.828974E+11	0.00007917	0.00145968	18.43807447	2508.26298	60000.00000
62292107.	7.706240E+11	0.00008083	0.00148498	18.37092483	2517.48052	60000.00000
62595322.	7.587312E+11	0.00008250	0.00151025	18.30601752	2525.53746	60000.00000
62778798.	7.458867E+11	0.00008417	0.00153372	18.22241628	2531.97870	60000.00000
62960602.	7.335216E+11	0.00008583	0.00155726	18.14279330	2537.45155	60000.00000
63140713.	7.216081E+11	0.00008750	0.00158086	18.06692970	2541.94788	60000.00000
63140713.	7.081201E+11	0.00008917	0.00160500	17.99999893	2545.52289	60000.00000
63534511.	6.994625E+11	0.00009083	0.00163408	17.98984730	2548.46157	60000.00000
63704717.	6.886996E+11	0.00009250	0.00165727	17.91644704	2549.69946	60000.00000
63872854.	6.782958E+11	0.00009417	0.00168053	17.84635556	2549.17957	60000.00000
64037991.	6.682225E+11	0.00009583	0.00170386	17.77940977	2545.26304	60000.00000
64202009.	6.584821E+11	0.00009750	0.00172726	17.71546161	2545.55682	60000.00000
64364887.	6.490577E+11	0.00009917	0.00175072	17.65436947	2547.84020	60000.00000
64687146.	6.310941E+11	0.00010250	0.00179787	17.54023397	2549.96530	60000.00000
65002938.	6.142010E+11	0.00010583	0.00184539	17.43676722	2543.76663	60000.00000
65314561.	5.983013E+11	0.00010917	0.00189318	17.34208953	2547.19844	60000.00000
65540650.	5.825836E+11	0.00011250	0.00193907	17.23614228	2549.69239	60000.00000
65697110.	5.671693E+11	0.00011583	0.00198349	17.12367618	2547.08159	60000.00000
65850507.	5.525917E+11	0.00011917	0.00202816	17.01953137	2541.82432	60000.00000
66002003.	5.387919E+11	0.00012250	0.00207300	16.92246974	2546.39931	60000.00000

66151575.	5.257079E+11	0.00012583	0.00211802	16.83196127	2549.13467	60000.00000
66540151.	5.151496E+11	0.00012917	0.00217000	16.80000007	2548.57123	60000.00000
66540151.	5.021898E+11	0.00013250	0.00221887	16.74621642	2542.45415	60000.00000
66619198.	4.904481E+11	0.00013583	0.00226324	16.66188133	2542.19069	60000.00000
66754766.	4.796750E+11	0.00013917	0.00230775	16.58261025	2546.12738	60000.00000
66889128.	4.693974E+11	0.00014250	0.00235240	16.50806630	2548.70780	60000.00000
67022268.	4.595813E+11	0.00014583	0.00239720	16.43794906	2549.90946	60000.00000
67153134.	4.501886E+11	0.00014917	0.00244225	16.37262547	2546.94872	60000.00000
67282564.	4.411971E+11	0.00015250	0.00248747	16.31127155	2542.17434	60000.00000
67411215.	4.325853E+11	0.00015583	0.00253280	16.25325000	2537.38061	60000.00000
67539059.	4.243292E+11	0.00015917	0.00257824	16.19836128	2541.83828	60000.00000
67666097.	4.164067E+11	0.00016250	0.00262379	16.14642942	2545.49578	60000.00000
67790459.	4.087867E+11	0.00016583	0.00266937	16.09669268	2548.07568	60000.00000
67844675.	4.010523E+11	0.00016917	0.00271133	16.02757752	2549.41533	60000.00000
67898468.	3.936143E+11	0.00017250	0.00275338	15.96163809	2549.98063	60000.00000
67951058.	3.864515E+11	0.00017583	0.00279563	15.89931643	2547.23291	60000.00000
68003197.	3.795527E+11	0.00017917	0.00283797	15.83982074	2543.66548	60000.00000
68055120.	3.729048E+11	0.00018250	0.00288036	15.78280771	2540.08814	60000.00000
68106827.	3.664941E+11	0.00018583	0.00292281	15.72814643	2536.50081	60000.00000
68158332.	3.603084E+11	0.00018917	0.00296532	15.67571890	2533.68463	60000.00000
68209608.	3.543356E+11	0.00019250	0.00300789	15.62540710	2537.59133	60000.00000
68209608.	3.483044E+11	0.00019583	0.00305500	15.59999907	2541.79558	60000.00000
68209608.	3.424750E+11	0.00019917	0.00310700	15.59999907	2545.78292	60000.00000
68325876.	3.374117E+11	0.00020250	0.00315900	15.59999907	2548.45554	60000.00000
68421097.	3.324102E+11	0.00020583	0.00320655	15.57836545	2549.67417	60000.00000
68449482.	3.272485E+11	0.00020917	0.00325058	15.54062784	2550.00000	60000.00000
68476687.	3.222432E+11	0.00021250	0.00329490	15.50541365	2546.83463	60000.00000
68503721.	3.173918E+11	0.00021583	0.00333928	15.47154486	2543.61159	60000.00000
68530605.	3.126872E+11	0.00021917	0.00338370	15.43895066	2540.37915	60000.00000
68557336.	3.081229E+11	0.00022250	0.00342819	15.40757740	2537.13717	60000.00000
68583900.	3.036925E+11	0.00022583	0.00347272	15.37737143	2533.88565	60000.00000
68610305.	2.993904E+11	0.00022917	0.00351732	15.34828770	2530.62433	60000.00000
68636547.	2.952110E+11	0.00023250	0.00356197	15.32028115	2528.15304	60000.00000
68688535.	2.871994E+11	0.00023917	0.00365144	15.26733434	2535.89982	60000.00000
68739838.	2.796197E+11	0.00024583	0.00374115	15.21822202	2541.99910	60000.00000
68790440.	2.724374E+11	0.00025250	0.00383110	15.17267168	2546.41079	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 68200.10296 in-kip

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Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 1

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head = 31000.000 lbs
Specified moment at pile head = 34740000.000 in-lbs
Specified axial load at pile head = 30000.000 lbs

Output Verification:

Computed forces and moments are within specified convergence limits.

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 31000.	M= 3.47E+07	30000.0000	0.9087607	3.6118E+07	-321482.

Computed Pile-head Stiffness Matrix Members
K22, K23, K32, K33 for Superstructure

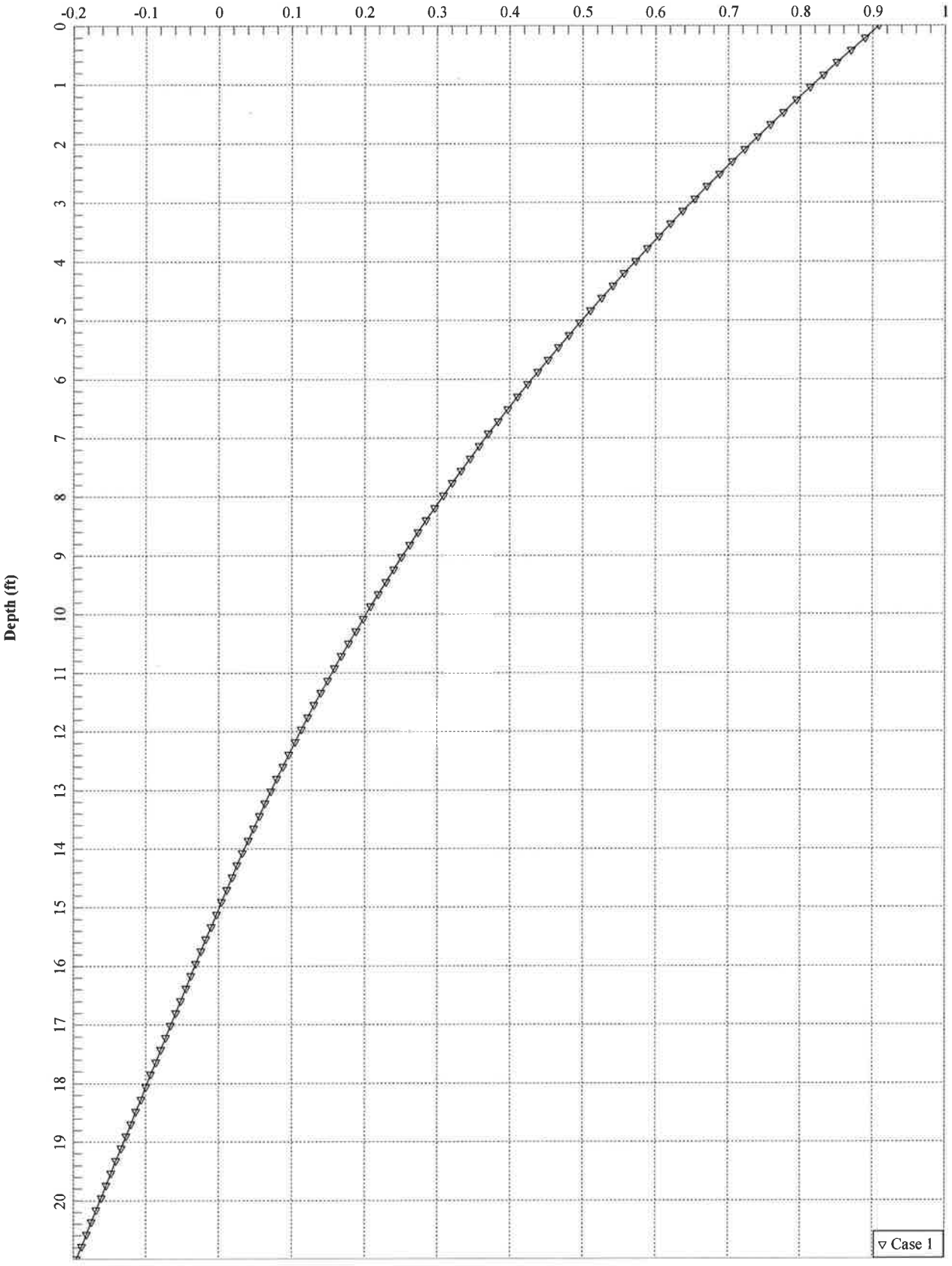
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00145487	3100.00005	446559.09092	2130778.	3.069414E+08

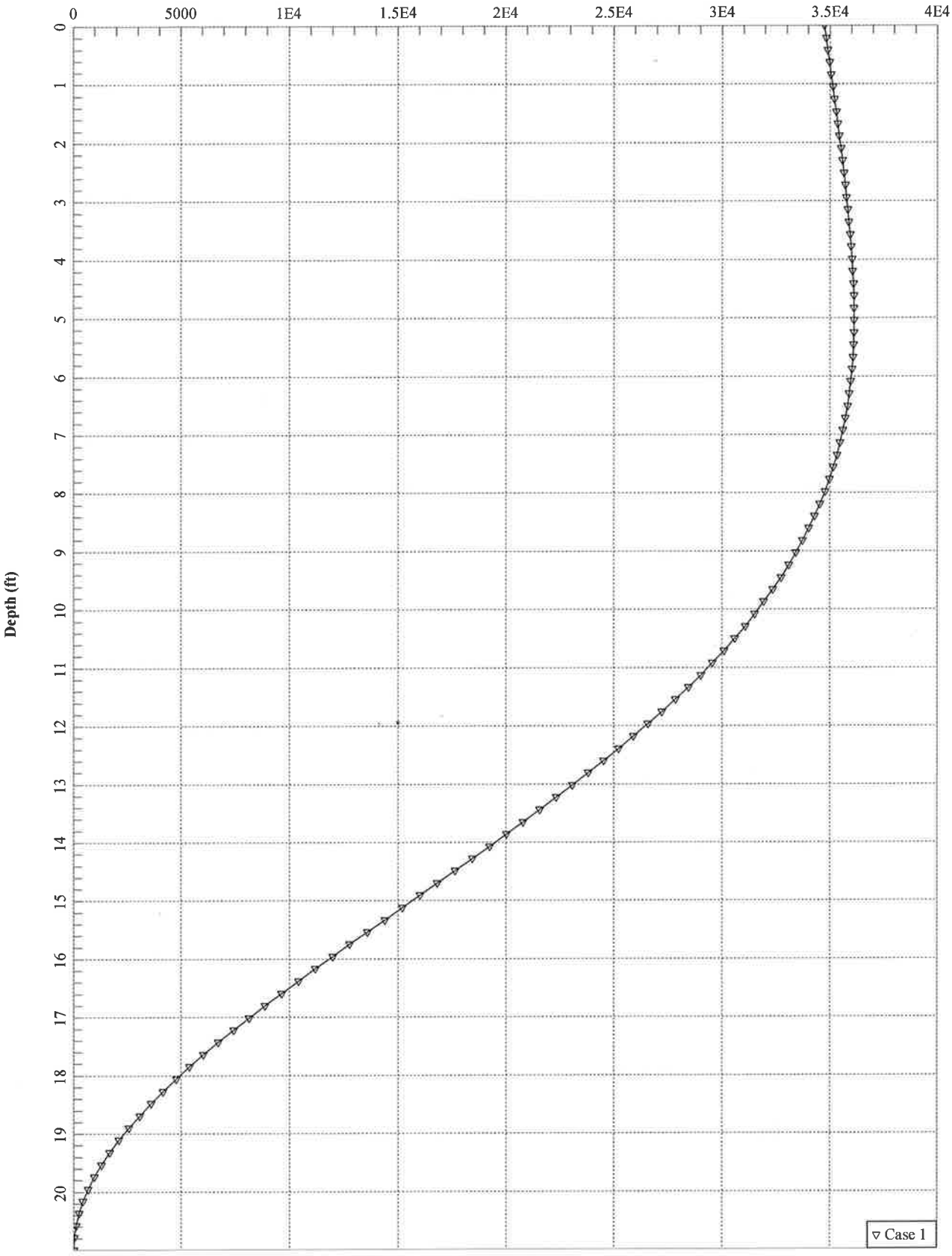
0.00437959	9331.92987	1344277.	2130778.	3.069414E+08
0.00694148	14790.75890	2130628.	2130778.	3.069414E+08
0.00875917	18663.85973	2688554.	2130778.	3.069414E+08
0.01016909	21668.07013	3121314.	2130778.	3.069414E+08
0.01132107	24122.68876	3474905.	2130778.	3.069414E+08
0.01229506	26198.03924	3773862.	2130778.	3.069414E+08
0.01313885	27995.78960	4032824.	2130764.	3.069388E+08
0.01388366	29581.51779	4261205.	2130672.	3.069224E+08
0.01455028	31000.00000	4465470.	2130543.	3.068992E+08

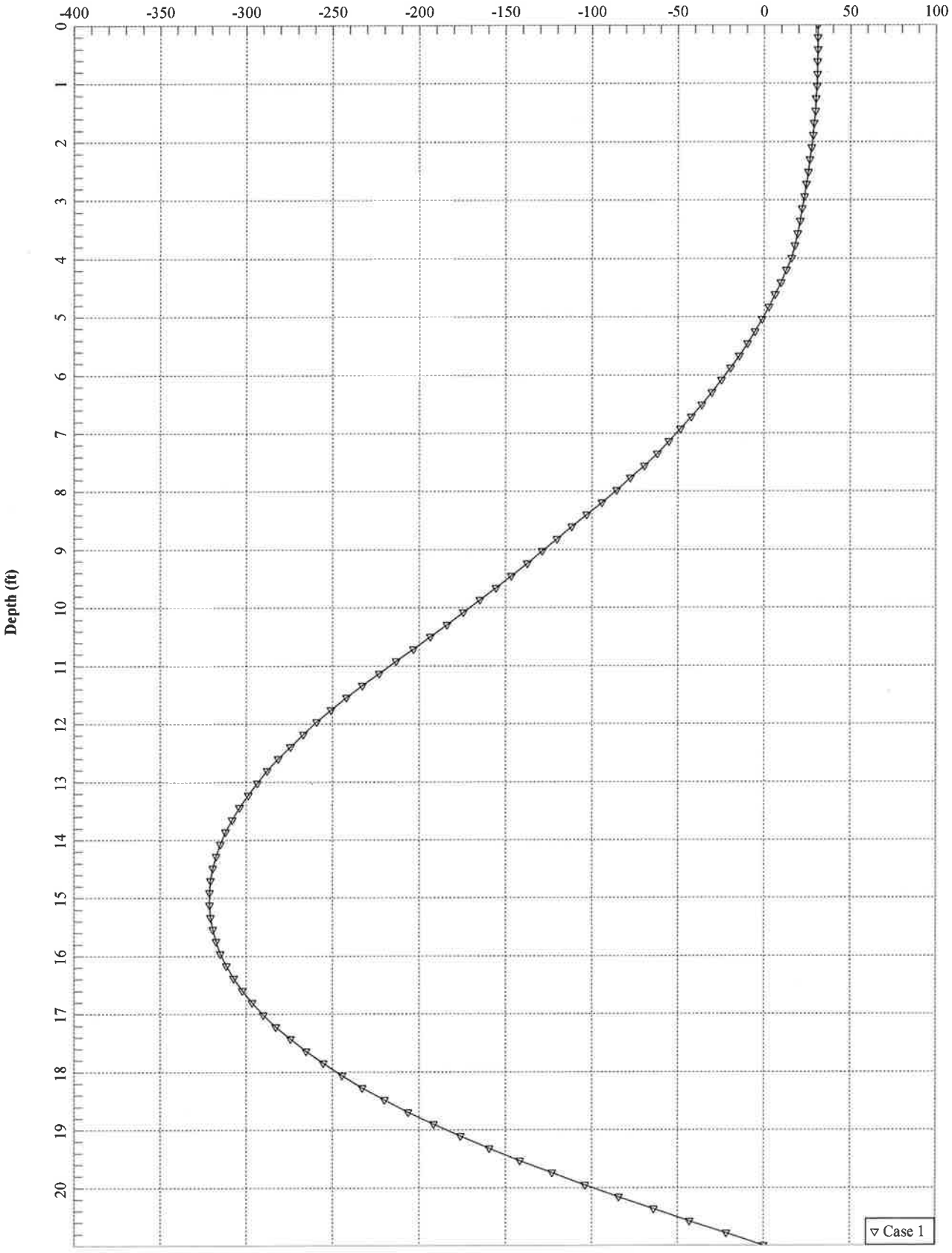
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00006359	19519.76084	3474000.	3.069414E+08	5.462744E+10
0.00019226	58773.93226	10457782.	3.056995E+08	5.439382E+10
0.00031228	93194.08843	16575192.	2.984294E+08	5.307767E+10
0.00080787	121255.50704	20915564.	1.500930E+08	2.588979E+10
0.00107836	144446.54193	24282218.	1.339503E+08	2.251774E+10
0.00127364	163481.03153	27032974.	1.283573E+08	2.122497E+10
0.00143192	179678.05301	29358706.	1.254803E+08	2.050300E+10
0.00156271	193602.58127	31373346.	1.238890E+08	2.007624E+10
0.00167689	205934.40153	33150385.	1.228075E+08	1.976899E+10
0.00177572	216841.83435	34740000.	1.221146E+08	1.956385E+10

K22 = abs(Shear Reaction/Top y)
K23 = abs(Shear Reaction/Top Rotation)
K32 = abs(Moment Reaction/Top y)
K33 = abs(Moment Reaction/Top Rotation)

The analysis ended normally.


Lateral Deflection (in)
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
▽ Case 1


Bending Moment (in-kips)
0
5000
1E4
1.5E4
2E4
2.5E4
3E4
3.5E4
4E4
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
▽ Case 1


Shear Force (kips)
-400
-350
-300
-250
-200
-150
-100
-50
0
50
100
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Case 1

SITE NAME	RIDGEFIELD CT			ECP - CELL #	5	0111		
LATITUDE	41-16-51.30 N			LONGITUDE	73-29-34.40 W			
NOTE: **Please Order Appropriate RET Cables.** Install PCS LTE antennas and RRH's. Install 60W RRH's for both 700Mhz and AWS. Install RET antennas.				SAVE BUTTON	PCS1			
				STRUCTURE TYPE	ROOFTOP			
700 Mhz - LTE Current Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 700 MHz TRDU		ALU 700 MHz TRDU		ALU 700 MHz TRDU			
ANTENNA TYPE	APX75-866512-T2 749MHZ		APX75-866512-T2 749MHZ		APX75-866512-T2 749MHZ			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	20		150		260			
DOWN TILT (ELEC+MECH)	2 Elec + 4 Mech		2 Elec + 0 Mech		2 Elec + 0 Mech			
RAD CTR (FT AGL)	128		128		128			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	NA		NA		NA			
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX								
700 Mhz - LTE Future Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH			
ANTENNA TYPE	80010735V01		80010735V01		80010735V01			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	20		150		260			
DOWN TILT (ELEC+MECH)	6 Elec + 0 Mech		4 Elec + 0 Mech		4 Elec + 0 Mech			
RAD CTR (FT AGL)	128		128		128			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z			
1900 PCS - Current Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	PCS Modcell 4.0		PCS Modcell 4.0		PCS Modcell 4.0			
ANTENNA TYPE	MG D3-800T0		MG D3-800T0		MG D3-800T0			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	0 Elec + 0 Mech		0 Elec + 0 Mech		0 Elec + 0 Mech			
RAD CTR (FT AGL)	128		128		128			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
1900 PCS - Future Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 1900 MHz RRH		ALU 1900 MHz RRH		ALU 1900 MHz RRH			
ANTENNA TYPE	HBXX-9014DS-A2M		HBXX-6516DS-A2M		HBXX-9014DS-A2M			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	20		150		260			
DOWN TILT (ELEC+MECH)	4 Elec + 0 Mech		4 Elec + 0 Mech		4 Elec + 0 Mech			
RAD CTR (FT AGL)	128		128		128			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X60-PCS	1	ALU RRH_2X60-PCS	1	ALU RRH_2X60-PCS		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX								
2100 AWS - Current Config	**ALPHA**		**BETA**		**GAMMA**			
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH			
ANTENNA TYPE	BXA-171063-12CF-EDIN-2		BXA-171063-12CF-EDIN-2		BXA-171063-12CF-EDIN-2			
QTY OF ANTENNAS PER FACE	1		1		1			
ORIENTATION (DEG)	30		150		270			
DOWN TILT (ELEC+MECH)	2 Elec + 3 Mech		2 Elec + 3 Mech		2 Elec + 4 Mech			
RAD CTR (FT AGL)	128		128		128			
TMA - QTY / MODEL								
DIPLEXER - QTY / MODEL								
RRH - QTY/MODEL	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS		
SECTOR DISTRIBUTION BOX								
MAIN DISTRIBUTION BOX								

2100 AWS - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	HBXX-9014DS-A2M		HBXX-6516DS-A2M		HBXX-9014DS-A2M	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	20		150		260	
DOWN TILT (ELEC+MECH)	4 Elec + 0 Mech		4 Elec + 0 Mech		4 Elec + 0 Mech	
RAD CTR (FT AGL)	128		128		128	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X60-AWS	1	ALU RRH_2X60-AWS	1	ALU RRH_2X60-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

850 Cellular - No Change	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0HD	Cellular Modcell 4.0HD	Cellular Modcell 4.0HD
ANTENNA TYPE	BXA-80080/4CF FP	BXA-80080/4CF FP	BXA-80080/4CF FP
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (ELEC+MECH)	0 Elec + 0 Mech	0 Elec + 0 Mech	0 Elec + 0 Mech
RAD CTR (FT AGL)	128	128	128
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

NUMBER OF CABLE'S NEEDED						ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES			18	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS			18	TOP JUMPER (FT)			12
Equipment Cable Ordering		MAIN CABLE #	18	+	0	TOP JUMPER #		+	0
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES			2	FIBER LINE MODEL #			HB158-1-08U8-S8J18
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS			9	TOP JUMPER MODEL #			HB058-1-08U1-S1J18
Fiber Cable Ordering		FIBER CABLE #	1	+	1	TOP JUMPER #	3	+	6

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

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/ BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/ BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By : Ryan Ulanday	Alex Restrepo	RU	7/13/2015

Site Configuration

Multi-band Panel

Frequency Range	698–894
Dual Polarization	X
Half-power Beam Width	65°
Integrated replaceable Remote Control Unit	iRCU
Adjustable Electrical Downtilt	0°–10°

KATHREIN

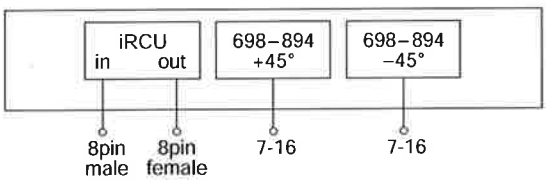
AISG Antenna Interface Standards Group

3GPP A GLOBAL INITIATIVE

XPol Panel iRCU 698–894 65° 16dBi 0°–10°T

Type No.	80010735V01	
A) Antenna specifications	R1	
	698–894	
Frequency range	698 – 806 MHz	824 – 894 MHz
Polarization	+45°, –45°	+45°, –45°
Gain	13.35 dBd / 15.5 dBi	13.85 dBd / 16 dBi
Horizontal Pattern:		
Half-power beam width	67°	65°
Front-to-back ratio	Copolar: > 30 dB Average: 35 dB	Copolar: > 30 dB Average: 35 dB
Cross polar ratio Maindirection 0° Sector ±60°	Typically: > 25 dB > 11 dB, Avg. 15 dB	Typically: > 25 dB > 11 dB, Avg. 15 dB
Vertical Pattern:		
Half-power beam width	11.3°	10°
Electrical tilt	0°–10°, continuously adjustable	
Min. sidelobe suppression for first sidelobe above main beam: Average:	0° ... 5° ... 10° T 16 ... 17 ... 17 dB 16 ... 19 ... 20 dB	0° ... 5° ... 10° T 18 ... 17 ... 16 dB 20 ... 20 ... 20 dB
Impedance	50 Ω	
VSWR	< 1.5	
Isolation, between ports	> 30 dB	
Intermodulation IM3	< –150 dBc (2 x 43 dBm carrier)	
Max. power per input	500 W (at 50 °C ambient temperature)	
Input	2 x 7-16 female iRCU in: 1 x 8pin male iRCU out: 1 x 8pin female	
Connector position	Bottom	
Wind load	Frontal: 900 N (at 150 km/h) 2260 N (at 150 mph) Lateral: 310 N (at 150 km/h) 760 N (at 150 mph) Rearside: 1030 N (at 150 km/h) 2580 N (at 150 mph)	
Max. wind velocity	241 km/h (150 mph)	
Height/width/depth	1934 / 303 / 99 mm (76.1 / 11.9 / 3.9 inches)	
Category of mounting hardware	H (Heavy)	
Weight	14 kg (30.9 lb) / 16 kg (35.3 lb) (clamps incl.)	
Packing size	2136 x 317 x 127 mm (84.1 x 12.5 x 5 inches)	
Scope of supply	Panel and 2 units of clamps 42 – 115 mm diameter	

iRCU specifications (86010149) see page 66



Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-9014DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 90° horizontal beamwidth, RET compatible

- Enhanced control of out-of-sector power improves co-channel interference, reduces softer hand-offs, improves capacity

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	16.0	16.0	16.2
Beamwidth, Horizontal, degrees	88	88	88
Beamwidth, Vertical, degrees	7.5	7.1	6.7
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	17	17	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	17	17	16
CPR at Sector, dB	8	9	8
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-150	-150	-150
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	15.9	15.9	16.0
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.4	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 15.9 5 ° | 16.1 10 ° | 15.7	0 ° | 15.9 5 ° | 16.1 10 ° | 15.7	0 ° | 16.0 5 ° | 16.2 10 ° | 15.7
Beamwidth, Horizontal Tolerance, degrees	±4.7	±3.1	±3.8
Beamwidth, Vertical Tolerance, degrees	±0.4	±0.4	±0.5
USLS, dB	17	18	18
Front-to-Back Total Power at 180° ± 30°, dB	21	21	21
CPR at Boresight, dB	19	20	20
CPR at Sector, dB	8	8	8

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-9014DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	420.0 N @ 150 km/h 94.4 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.0 mm | 50.9 in
Width	305.0 mm | 12.0 in
Net Weight	13.5 kg | 29.8 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-9014DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-9014DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

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

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

Electrical Specifications

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

Electrical Specifications, BASTA*

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

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6516DS-VTM

Mechanical Specifications

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

Dimensions

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

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

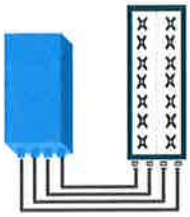
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

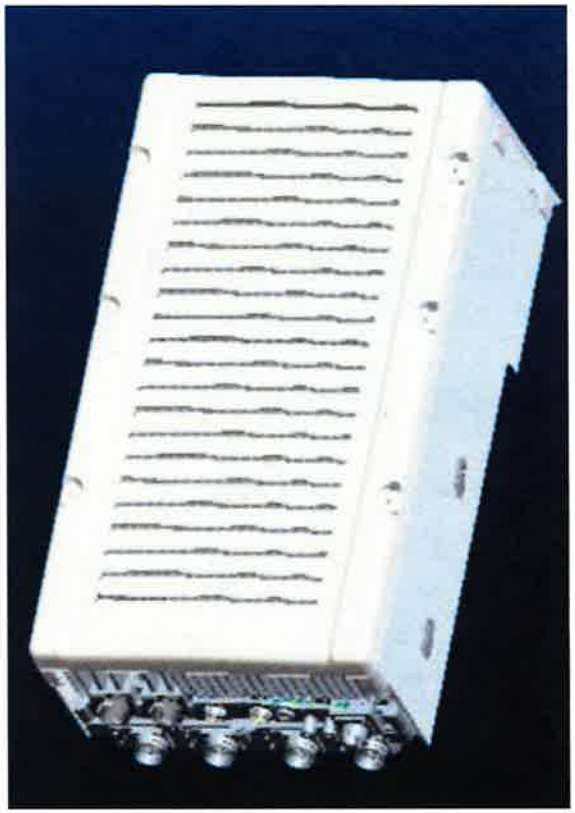
TECHNICAL SPECIFICATIONS

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

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

Alcatel·Lucent

VZW Network Equipment Reporting Form (NERF)

Vendor	Alcatel-Lucent		Model	B66a RRH 4Tx/4Rx 4x45W or 2x 90W (SW selectable)		Function	RRH for distributed architecture with a CPRI interface between digital and RF processing components. The RRH has 4 Tx ports and 4 Rx ports. Can be SW configured for 2 Tx with 90W rf per port or 4 Tx with 45W rf per port. The RRH has passive cooling only.		
*1)Equipment Configuration	*2)Heat Release @50°F Intake Temp [W]		*3)Airflow Rate @ 100% Activity Rate [cfm]		*4)Dimensions [in]		Non-Thermal Data		
	100% Activity	50% Activity	Nominal (70°F)	Max (95°F)	External (WxDxH)	Clear (F/R/S)	Installed Weight [lb]	*5)Sound @ Nominal [L_{WAd}]	*6)Name Plate [W]
Minimum			N/A Convection cooled	N/A Convection cooled	w/o Solar Shield W = 11.4in D = 6.7in H = 25.2in (W=290mm) (D=170mm) (H=640mm)	Front: 12" Rear: 7.5" Right: 12" Left: 12" Top: 12" Bottom: 24"			
Typical			N/A Convection cooled	N/A Convection cooled	with Solar Shield W = 12in D = 7.6in H = 25.8in (W=304mm) (D=193mm) (H=655mm)		62lb 72 lb(w mounting brackets)	N/A Convection cooled	
Full	825W (add 60W for AISG)	TBD	N/A Convection cooled	N/A Convection cooled	N/A			N/A Convection cooled	

*7)Equipment EC-Class	N/A Convection cooled	*10)Fan Speed	N/A Convection cooled	*13)Fan Hot-Swap	N/A Convection cooled	*16)Environ. Tests	N/A Convection cooled	*18)Temp. Rise [°F]	N/A Convection cooled
*8)Non-Optimal EC-Class	N/A Convection cooled	*11)Fan Logic	N/A Convection cooled	*14)Shut-Down	N/A Convection cooled	*17)Allow. Max [°F]	N/A Convection cooled	*19)Rec. Max [°F]	N/A Convection cooled
*9)Exhaust Openings	N/A Convection cooled	*12)Fan Alarm	N/A Convection cooled	*15)Temp. Access	N/A Convection cooled	*17)Allow. Min [°F]	N/A Convection cooled	*19)Rec. Min [°F]	N/A Convection cooled

Power Reporting					
Power Input	-48V	No. Power Supplies	N/A (Customer provided power plant)	Number of Inputs per Power Supply	1
*24)Maximum Demand (total system in Watts)	825W (add 60W for AISG)	Maximum Input (each power supply in Watts)	N/A (Customer provided power plant)	Maximum Output (each power supply in Watts)	58W (to AISG port, 29V/2A)
Power Supply Connection Type	DC entry via Conduit Box	Power Supply Make & Model	N/A (Customer provided power plant)		
Input Protection	no input fuse	Input Protection Make & Model	N/A (Customer provided power plant)		
Redundancy Scheme	N/A				
Nominal Voltage	-48VDC	Maximum Voltage	-57V	Minimum Voltage	-38V
*25)Max Current at Nominal Voltage	17.2A (add 1.2A if AISG port loaded 2A*29V)	*25)Max Current at Maximum Voltage	14.5A (add 1A if AISG port loaded 2A*29V)	*25)Max Current at Minimum Voltage	21.7A (add 1.5A if AISG port loaded 2A*29V)

Return completed forms to Engineering and Operations Support (EOS)

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Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

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

Features/Benefits

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

Technical Specifications

Mechanical Specifications

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

Electrical Specifications

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

* This data is provisional and subject to change.