Robinson+Cole

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Also admitted in Massachusetts

August 10, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
785 Park Avenue, Bloomfield, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 105-foot level of the existing 136-foot tower at 785 Park Avenue in Bloomfield, Connecticut (the "Property"). The tower is owned by Integrated Wireless Services LLC, ("Integrated"). The Council approved Cellco's use of this tower in 2002. Cellco now intends to replace six (6) of its existing antennas with three (3) model SBNHH-1D65B, 700/1900 MHz antennas and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same 105-foot level on the tower. Cellco also intends to install replace three (3) existing remote radio heads ("RRHs") with six (6) newer model RRHs and install six (6) additional RRHs and install 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 Philip K. Schenk, Jr., Town Manager of the Town of Bloomfield. The Town of Bloomfield is the owner of the Property. A copy of this letter is also being sent to Integrated, the tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRH's will be located at the 105-foot level on the 136-foot tower.

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

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

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

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Philip K. Schenk, Jr., Bloomfield Town Manager
Integrated Wireless Services LLC
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

General Specifications

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

Product Specifications

SBNHH-1D65B

Mechanical Specifications

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

Dimensions

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

Remote Electrical Tilt (RET) Information

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

Regulatory Compliance/Certifications

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

Included Products

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

* 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.

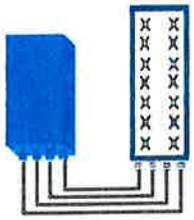
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

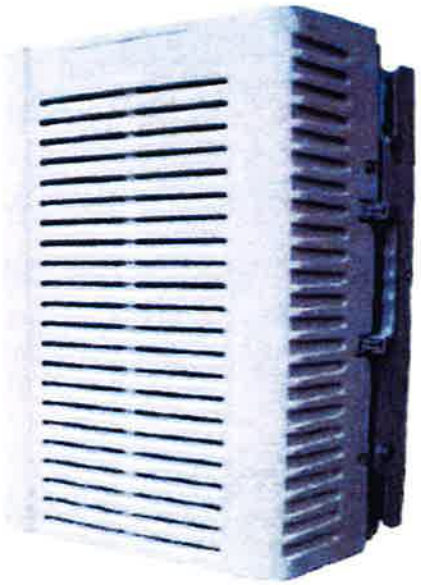
Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W 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)

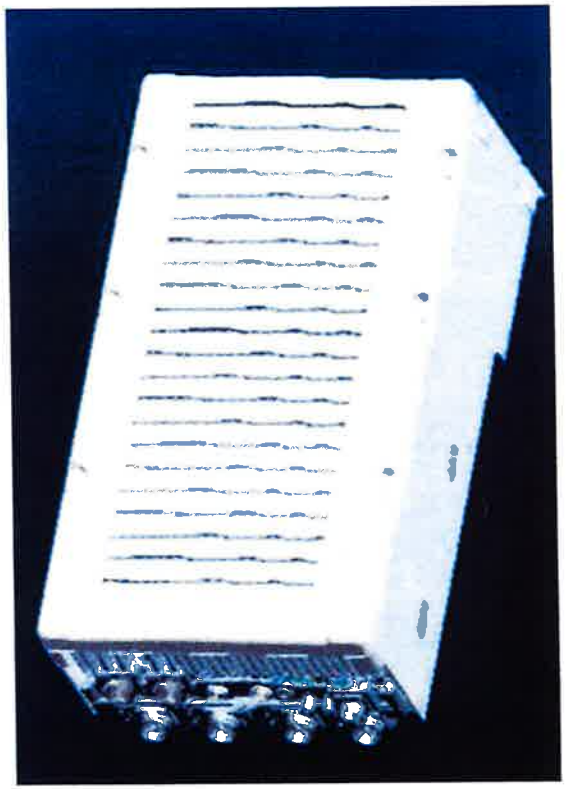


** Not a Verizon Wireless deployed product

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

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

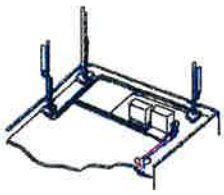
The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

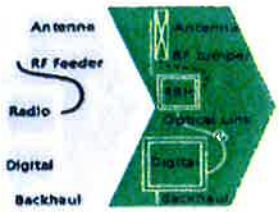
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

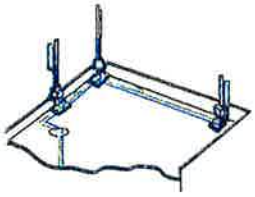
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control
- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-93-658 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)

* This data is provisional and subject to change

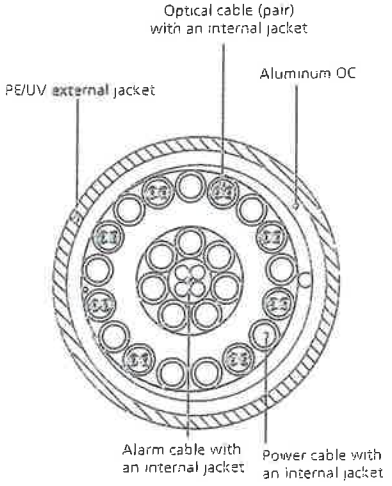


Figure 2: Construction Detail

ATTACHMENT 2

	General	Power	Density					
Site Name: Bloomfield 3								
Tower Height: 136Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Police UHF	1.25	74.82	143.5	0.0016	406	0.2707	0.60%	
*Police Back up repeater	1	161.2	144	0.0028	453.83	0.3026	0.92%	
*Hartford Co. Fire	1	86.35	147.2	0.0014	33.94	0.2000	0.72%	
*State Police	1	89.36	72.8	0.0061	45.86	0.2000	3.03%	
*NPSAC	1	34.98	141.5	0.0006	821.01	0.5473	0.11%	
*RAFS	2	39.02	94	0.0032	460.06	0.3067	1.04%	
*Nextel	12	100	89	0.0545	851	0.5673	9.60%	
*Clearwire	2	153	115	0.0083	2496	1.0000	0.83%	
*Clearwire	1	211	115	0.0057	11 GHz	1.0000	0.57%	
*T-Mobile PCS/AWS	2	953	138	0.0360	1900	1.0000	3.60%	
*T-Mobile PCS/AWS	4	476.5	138	0.0360	2100	1.0000	3.60%	
*T-Mobile LTE	1	445	138	0.0084	700	0.4667	1.80%	
Verizon PCS	**3**	**454**	**105**	**0.0444**	**1970**	**1.0000**	**4.44%**	
Verizon Cellular	**8**	**412**	**105**	**0.1075**	**869**	**0.5793**	**18.55%**	
Verizon AWS	**1**	**3500**	**105**	**0.1141**	**2145**	**1.0000**	**11.41%**	
Verizon 700	**1**	**2100**	**105**	**0.0685**	**746**	**0.4973**	**13.77%**	
								74.61%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

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Structural Analysis Report

136-ft Existing Summit Monopole

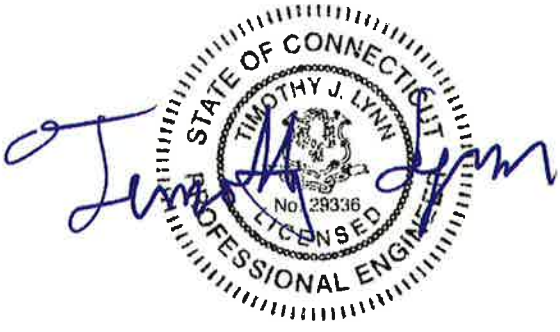
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Bloomfield 3

785 Park Avenue
Bloomfield, CT

Centek Project No. 15001.072

Date: July 14, 2015



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

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Introduction

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

The host tower is a 136-ft, three-section, eighteen sided, tapered monopole, originally manufactured by PennSummit Tubular, LLC job no; 18633 dated February 6, 2003 and designed by Paul J. Ford and Company job no; 29202-0288, dated August 20, 2002. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned design documents.

Antenna and appurtenance information were obtained from a previous structural report prepared by Centek job no. 14203.000 dated August 26, 2014 and a Verizon RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A607-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 23.00-in at the top and 43.36-in at the base.

Verizon Wireless proposes the removal of (6) of the existing (12) panel antennas and three (3) remote radio heads and the installation of six (6) panel antennas, nine (9) remote radio heads and one (1) distribution box mounted on the existing low profile platform. 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:

- TOWN (EXISTING):
  Antennas: One (1) 20-ft 8-bay dipole antenna pipe mounted with an elevation of 143-ft above existing grade.
  Coax Cables: Three (3) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- TOWN (EXISTING):
  Antennas: One (1) Motorola PTP400 microwave antenna pipe mounted with an elevation of 142-ft above existing grade.
  Coax Cables: One (1) Category 5e cable running on the inside of the existing tower.
- T-MOBILE (EXISTING):
  Antennas: Six (6) Ericsson AIR 21 panel antennas, three (3) Andrew LNX6515DS panel antennas, three (3) Ericsson KRY 112 144/1 TMA's and three (3) Ericsson RRUS-11 remote radio heads mounted on one (1) proposed Site Pro 12-ft 6-in low profile platform p/n RMQP-463 with a RAD center elevation of 138-ft above existing grade.
  Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower, six (6) 1-5/8" ∅ coax cables running on the exterior of the tower and one (1) 1-5/8" ∅ fiber cable running on the exterior of the existing tower.

- CLEARWIRE (EXISTING):
  Antennas: Two (2) Argus LLPX310R and one (1) Kathrein 840-10054 panel antennas, three (3) Andrew VHLP1-23 microwave dishes, one (1) GPS antenna and six (6) RRU's mounted on a universal tri-bracket assembly with three (3) dual standoff mounts with an elevation of 115-ft above existing grade.
  Coax Cables: Two (2) 3" ∅ flex conduits running on the exterior of the tower as specified in Section 3 of this report.
- EMPTY MOUNT (EXISTING):
  Mount: One (1) 13-ft low profile platform with a RAD center elevation of 95-ft above the existing grade.
- TOWN (EXISTING):
  Antennas: Three (3) Motorola PTP400 microwave antennas on three (3) 4'-6" by 3" ∅ pipe mounts with an elevation of 83-ft above the existing grade.
  Coax Cables: Three (3) Category 5e (1 Wire) cables running on the inside of the existing tower.
- VERIZON (EXISTING TO REMAIN):
  Antennas: One (1) Antel BXA-70063-6CF panel antenna, two (2) Swedcom SLCP 2X6014 panel antennas, one (1) Antel BXA-80080-6CF panel antenna, one (1) Antel BXA-80063-4BF panel antenna, one (1) Antel BXA-80080-4CF panel antenna and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a low profile platform with a RAD center elevation of 105-ft above existing grade.
  Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower and one (1) 1-5/8" ∅ fiber line running on the exterior of the existing monopole.
- VERIZON (EXISTING TO REMOVE):
  Antennas: One (1) Antel BXA-171063-12BF panel antenna, two (2) Antel BXA-171085-12BF panel antennas, two (2) Antel BXA-171085-8BF panel antennas, one (1) Antel BXA-171063-8BF panel antenna, three (3) Alcatel-Lucent RRH2x40-AWS remote radio heads and six (6) RFS FD9R6004/2C-3L Diplexers mounted on a low profile platform with a RAD center elevation of 105-ft above existing grade.
- **VERIZON (Proposed):**
  Antennas: Six (6) Andrew SBNHH-1D65B panel antennas, three (3) Alcatel-Lucent RRH2x60-700 remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads, three (3) Alcatel-Lucent RRH2x60-AWS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a low profile platform with a RAD center elevation of 105-ft above existing grade.
  Cables: One (1) 1-5/8" ∅ fiber cables 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:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Bloomfield; 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; 80 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; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 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", the maximum tower steel usage was found to be at **69.2%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	88.25'-137.00'	68.8%	**PASS**
Pole Shaft (L2)	47.25'-88.25'	66.3%	**PASS**
Pole Shaft (L3)	1.00'-47.25'	69.2%	**PASS**

Foundation and Anchors

The existing foundation consists of a 6.0-ft ∅ x 45.5-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned PJF design report; project no. 29202-0288 dated August 20, 2002. The base of the tower is connected to the foundation by means of (16) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

- 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	23 kips
	Compression	32 kips
	Moment	2119 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	65.3%	**PASS**
	Lateral Deflection	1.35 in (1)	

Note 1: Lateral deflection limited to 1.86" per Paul J. Ford L-Pile report dated August 20, 2002.

- 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	Combined Axial and Bending	65.8%	**PASS**
Base Plate	Bending	61.8%	**PASS**

Conclusion

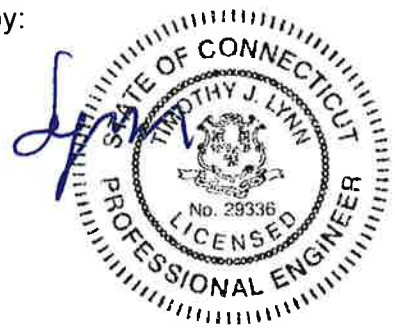
This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration with the below recommendations.

- **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:

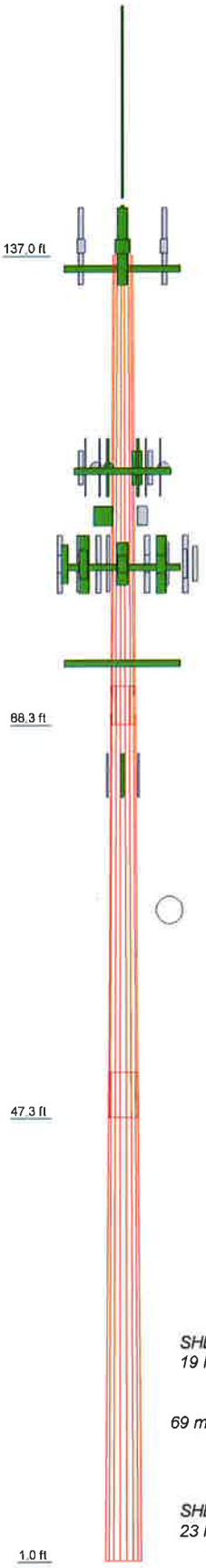
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or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

tnxTower Features:

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



Section	1	2	3
Length (ft)	48.75	45.00	51.00
Number of Sides	18	18	18
Thickness (in)	0.1875	0.3750	0.5000
Socket Length (ft)	4.00	4.75	
Top Dia (in)	23.0000	29.6932	35.3088
Bot Dia (in)	30.7000	36.8100	43.3600
Grade		A607-65	
Weight (K)	2.6	6.0	10.7

19.3

AXIAL
40 K

SHEAR
19 K

MOMENT
1844 kip-ft

TORQUE 1 kip-ft
69 mph WIND - 0.5000 in ICE

AXIAL
32 K

SHEAR
23 K

MOMENT
2119 kip-ft

TORQUE 1 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
20' 8 Bay Di-Pole (Town - Existing)	143	VHLP1-23 (Clearwire - Existing)	115
PTP400 (Town - Existing)	142	VHLP1-23 (Clearwire - Existing)	115
4'6"x3" Pipe Mount (Town - Existing)	140	VHLP1-23 (Clearwire - Existing)	115
(2) AIR21 (T-Mobile - Existing)	138	DB-T1-6Z-8AB-0Z (Verizon - Existing)	110
(2) AIR21 (T-Mobile - Existing)	138	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	110
(2) AIR21 (T-Mobile - Existing)	138	Valmont Uni-Tri Bracket (Verizon - Existing)	110
LNX-6515DS (T-Mobile - Existing)	138	RRH2x60-07-U (Verizon - Proposed)	105
LNX-6515DS (T-Mobile - Existing)	138	RRH2x60-07-U (Verizon - Proposed)	105
LNX-6515DS (T-Mobile - Existing)	138	RRH2x60-PCS (Verizon - Proposed)	105
KRY 112 TMA (T-Mobile - Existing)	138	RRH2x60-PCS (Verizon - Proposed)	105
KRY 112 TMA (T-Mobile - Existing)	138	RRH2x60-07-U (Verizon - Proposed)	105
KRY 112 TMA (T-Mobile - Existing)	138	13' Low Profile Platform (Verizon - Existing)	105
RRUS-11 (T-Mobile - Existing)	138	SBNHH-1D65B (Verizon - Proposed)	105
RRUS-11 (T-Mobile - Existing)	138	BXA-70063/6CF (Verizon - Existing)	105
RRUS-11 (T-Mobile - Existing)	138	SBNHH-1D65B (Verizon - Proposed)	105
Valmont 13' Low Profile Platform (T-Mobile - Existing)	136	BXA-80080-6CF (Verizon - Existing)	105
6'x3" Pipe Mount (Clearwire - Existing)	115	SBNHH-1D65B (Verizon - Proposed)	105
6'x3" Pipe Mount (Clearwire - Existing)	115	SLCP 2x6014 (Verizon - Existing)	105
6'x3" Pipe Mount (Clearwire - Existing)	115	SBNHH-1D65B (Verizon - Proposed)	105
6'x3" Pipe Mount (Clearwire - Existing)	115	BXA-80063-4BF (Verizon - Existing)	105
LLPX310R (Clearwire - Existing)	115	SBNHH-1D65B (Verizon - Proposed)	105
LLPX310R (Clearwire - Existing)	115	SLCP 2x6014 (Verizon - Existing)	105
840-10054 (Clearwire - Existing)	115	SBNHH-1D65B (Verizon - Proposed)	105
(2) RRU (Clearwire - Existing)	115	BXA-80080-4CF (Verizon - Existing)	105
(2) RRU (Clearwire - Existing)	115	RRH2x60-AWS (Verizon - Proposed)	105
(2) RRU (Clearwire - Existing)	115	RRH2x60-AWS (Verizon - Proposed)	105
GPS (Clearwire - Existing)	115	RRH2x60-AWS (Verizon - Proposed)	105
Valmont Uni-Tri Bracket (Clearwire - Existing)	115	RRH2x60-PCS (Verizon - Proposed)	105
Dual Standoff Mount B1827 (Clearwire - Existing)	115	13' Low Profile Platform (Empty)	95
Dual Standoff Mount B1827 (Clearwire - Existing)	115	PTP400 (Town - Existing)	83
Dual Standoff Mount B1827 (Clearwire - Existing)	115	4'6"x3" Pipe Mount (Town - Existing)	83
6'x3" Pipe Mount (Clearwire - Existing)	115	4'6"x3" Pipe Mount (Town - Existing)	83
6'x3" Pipe Mount (Clearwire - Existing)	115	4'6"x3" Pipe Mount (Town - Existing)	83
		PTP400 (Town - Existing)	83
		PTP400 (Town - Existing)	83

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 69.2%

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

Job: 15001.072- Bloomfield 3			
Project: 136' Summit Monopole - 785 Park Ave., Bloomfield,			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 07/14/15	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:

Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56.0 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

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	137.00-88.25	48.75	4.00	18	23.0000	30.7000	0.1875	0.7500	A607-65 (65 ksi)
L2	88.25-47.25	45.00	4.75	18	29.6932	36.8100	0.3750	1.5000	A607-65 (65 ksi)
L3	47.25-1.00	51.00		18	35.3088	43.3600	0.5000	2.0000	A607-65 (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	23.3548	13.5763	892.6152	8.0984	11.6840	76.3964	1786.4050	6.7894	3.7180	19.829
	31.1736	18.1588	2135.8907	10.8319	15.5956	136.9547	4274.5918	9.0811	5.0732	27.057
L2	30.7936	34.8960	3789.5511	10.4080	15.0841	251.2274	7584.0887	17.4513	4.5660	12.176
	37.3779	43.3668	7273.3077	12.9344	18.6995	388.9578	14556.1858	21.6875	5.8186	15.516
L3	36.6149	55.2415	8456.3100	12.3571	17.9369	471.4487	16923.7470	27.6260	5.3343	10.669
	44.0289	68.0188	15785.9556	15.2153	22.0269	716.6678	31592.6828	34.0159	6.7514	13.503

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 137.00-88.25				1	1	1		
L2 88.25-47.25				1	1	1		
L3 47.25-1.00				1	1	1		

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
1 5/8 (T-Mobile - Existing)	A	No	Inside Pole	137.00 - 4.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Verizon - Existing)	B	No	Inside Pole	106.00 - 4.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
CATEGORY 5e (1 WIRE) (Town - Existing)	C	No	Inside Pole	137.00 - 4.00	1	No Ice	0.00	0.21
						1/2" Ice	0.00	0.21
CATEGORY 5e (1 WIRE) (Town - Existing)	A	No	Inside Pole	86.00 - 4.00	3	No Ice	0.00	0.21
						1/2" Ice	0.00	0.21
1 5/8 (Town - Existing)	B	No	Inside Pole	137.00 - 4.00	3	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (T-Mobile - Existing)	A	No	CaAa (Out Of Face)	137.00 - 4.00	1	No Ice	0.20	1.04
						1/2" Ice	0.30	2.55
1 5/8 (T-Mobile - Existing)	A	No	CaAa (Out Of Face)	137.00 - 4.00	5	No Ice	0.00	1.04
						1/2" Ice	0.00	2.55
Clearwire Bundle (Clearwire - Existing)	C	No	CaAa (Out Of Face)	116.00 - 4.00	1	No Ice	0.30	2.50
						1/2" Ice	0.40	3.00
HYBRIFLEX 1-5/8" (Verizon - Existing)	B	No	CaAa (Out Of Face)	106.00 - 4.00	1	No Ice	0.20	1.90
						1/2" Ice	0.30	3.41
HYBRIFLEX 1-5/8" (T-Mobile - Existing)	A	No	CaAa (Out Of Face)	137.00 - 4.00	1	No Ice	0.20	1.90
						1/2" Ice	0.30	3.41
HYBRIFLEX 1-5/8" (Verizon - Proposed)	B	No	CaAa (Out Of Face)	106.00 - 4.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	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	137.00-88.25	A	0.000	0.000	0.000	19.305	1.01
		B	0.000	0.000	0.000	3.515	0.44
		C	0.000	0.000	0.000	8.325	0.08
L2	88.25-47.25	A	0.000	0.000	0.000	16.236	0.87
		B	0.000	0.000	0.000	8.118	0.80
		C	0.000	0.000	0.000	12.300	0.11
L3	47.25-1.00	A	0.000	0.000	0.000	17.127	0.92
		B	0.000	0.000	0.000	8.563	0.84
		C	0.000	0.000	0.000	12.975	0.12

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	137.00-88.25	A	0.500	0.000	0.000	0.000	29.055	1.52
		B		0.000	0.000	0.000	5.289	0.49
		C		0.000	0.000	0.000	11.100	0.09
L2	88.25-47.25	A	0.500	0.000	0.000	0.000	24.436	1.30
		B		0.000	0.000	0.000	12.218	0.92
		C		0.000	0.000	0.000	16.400	0.13
L3	47.25-1.00	A	0.500	0.000	0.000	0.000	25.777	1.38
		B		0.000	0.000	0.000	12.888	0.97
		C		0.000	0.000	0.000	17.300	0.14

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	137.00-88.25	-0.1037	-0.3104	-0.1102	-0.4291
L2	88.25-47.25	-0.1004	-0.1671	-0.0888	-0.2483
L3	47.25-1.00	-0.0983	-0.1636	-0.0886	-0.2476

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
20' 8 Bay Di-Pole	C	From Face	1.00	0.0000	143.00	No Ice	4.00	4.00	0.06
(Town - Existing)			0.00			1/2" Ice	6.00	6.00	0.10
			10.00						
PTP400	C	From Face	1.00	0.0000	142.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00			1/2" Ice	2.24	0.65	0.02
			0.00						

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
4'6"x3" Pipe Mount	C	From Face	1.00	0.0000	140.00	No Ice	1.30	1.30	0.03
(Town - Existing)			0.00			1/2" Ice	1.57	1.57	0.05
			0.00						
LLPX310R	A	From Face	3.00	0.0000	115.00	No Ice	4.83	1.95	0.03
(Clearwire - Existing)			-1.50			1/2" Ice	5.18	2.21	0.05
			0.00						
LLPX310R	B	From Face	3.00	0.0000	115.00	No Ice	4.83	1.95	0.03
(Clearwire - Existing)			-1.50			1/2" Ice	5.18	2.21	0.05
			0.00						
840-10054	C	From Face	3.00	0.0000	115.00	No Ice	5.19	1.36	0.00
(Clearwire - Existing)			-1.50			1/2" Ice	5.54	1.62	0.02
			0.00						
(2) RRU	A	From Face	3.00	0.0000	115.00	No Ice	1.80	0.78	0.03
(Clearwire - Existing)			0.00			1/2" Ice	2.00	0.92	0.04
			0.00						
(2) RRU	B	From Face	3.00	0.0000	115.00	No Ice	1.80	0.78	0.03
(Clearwire - Existing)			0.00			1/2" Ice	2.00	0.92	0.04
			0.00						
(2) RRU	C	From Face	3.00	0.0000	115.00	No Ice	1.80	0.78	0.03
(Clearwire - Existing)			0.00			1/2" Ice	2.00	0.92	0.04
			0.00						
GPS	A	From Face	3.00	0.0000	115.00	No Ice	1.00	1.00	0.01
(Clearwire - Existing)			0.00			1/2" Ice	1.50	1.50	0.01
			0.00						
Valmont Uni-Tri Bracket	C	None		0.0000	115.00	No Ice	1.75	1.75	0.29
(Clearwire - Existing)						1/2" Ice	1.94	1.94	0.31
Dual Standoff Mount B1827	A	None		0.0000	115.00	No Ice	1.40	1.40	0.10
(Clearwire - Existing)						1/2" Ice	1.75	1.75	0.13
Dual Standoff Mount B1827	B	None		0.0000	115.00	No Ice	1.40	1.40	0.10
(Clearwire - Existing)						1/2" Ice	1.75	1.75	0.13
Dual Standoff Mount B1827	C	None		0.0000	115.00	No Ice	1.40	1.40	0.10
(Clearwire - Existing)						1/2" Ice	1.75	1.75	0.13
6'x3" Pipe Mount	A	From Face	2.50	0.0000	115.00	No Ice	1.77	1.77	0.03
(Clearwire - Existing)			1.50			1/2" Ice	2.13	2.13	0.05
			0.00						
6'x3" Pipe Mount	B	From Face	2.50	0.0000	115.00	No Ice	1.77	1.77	0.03
(Clearwire - Existing)			1.50			1/2" Ice	2.13	2.13	0.05
			0.00						
6'x3" Pipe Mount	C	From Face	2.50	0.0000	115.00	No Ice	1.77	1.77	0.03
(Clearwire - Existing)			1.50			1/2" Ice	2.13	2.13	0.05
			0.00						
6'x3" Pipe Mount	A	From Face	2.50	0.0000	115.00	No Ice	1.77	1.77	0.03
(Clearwire - Existing)			-1.50			1/2" Ice	2.13	2.13	0.05
			0.00						
6'x3" Pipe Mount	B	From Face	2.50	0.0000	115.00	No Ice	1.77	1.77	0.03
(Clearwire - Existing)			-1.50			1/2" Ice	2.13	2.13	0.05
			0.00						
6'x3" Pipe Mount	C	From Face	2.50	0.0000	115.00	No Ice	1.77	1.77	0.03
(Clearwire - Existing)			-1.50			1/2" Ice	2.13	2.13	0.05
			0.00						
SBNHH-1D65B	A	From Face	4.00	0.0000	105.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	8.88	5.79	0.09
			0.00						
BXA-70063/6CF	A	From Face	4.00	0.0000	105.00	No Ice	7.73	4.16	0.01
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.05
			0.00						
SBNHH-1D65B	A	From Face	4.00	0.0000	105.00	No Ice	8.33	5.34	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Proposed)			4.00 0.00			1/2" Ice	8.88	5.79	0.09
BXA-80080-6CF	A	From Face	4.00	0.0000	105.00	No Ice	5.77	4.56	0.02
(Verizon - Existing)			6.00 0.00			1/2" Ice	6.22	5.00	0.05
SBNHH-1D65B	B	From Face	4.00	0.0000	105.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	8.88	5.79	0.09
SLCP 2x6014	B	From Face	4.00	0.0000	105.00	No Ice	7.21	5.67	0.02
(Verizon - Existing)			0.00 0.00			1/2" Ice	7.65	6.09	0.07
SBNHH-1D65B	B	From Face	4.00	0.0000	105.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			4.00 0.00			1/2" Ice	8.88	5.79	0.09
BXA-80063-4BF	B	From Face	4.00	0.0000	105.00	No Ice	4.86	2.38	0.01
(Verizon - Existing)			6.00 0.00			1/2" Ice	5.22	2.66	0.04
SBNHH-1D65B	C	From Face	4.00	0.0000	105.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	8.88	5.79	0.09
SLCP 2x6014	C	From Face	4.00	0.0000	105.00	No Ice	7.21	5.67	0.02
(Verizon - Existing)			0.00 0.00			1/2" Ice	7.65	6.09	0.07
SBNHH-1D65B	C	From Face	4.00	0.0000	105.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			4.00 0.00			1/2" Ice	8.88	5.79	0.09
BXA-80080-4CF	C	From Face	4.00	0.0000	105.00	No Ice	3.69	2.79	0.01
(Verizon - Existing)			6.00 0.00			1/2" Ice	4.06	3.10	0.04
RRH2x60-AWS	A	From Face	4.00	0.0000	105.00	No Ice	3.78	2.07	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	4.09	2.35	0.08
RRH2x60-AWS	B	From Face	4.00	0.0000	105.00	No Ice	3.78	2.07	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	4.09	2.35	0.08
RRH2x60-AWS	C	From Face	4.00	0.0000	105.00	No Ice	3.78	2.07	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	4.09	2.35	0.08
RRH2x60-PCS	A	From Face	4.00	0.0000	105.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	2.73	1.74	0.07
RRH2x60-PCS	B	From Face	4.00	0.0000	105.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	2.73	1.74	0.07
RRH2x60-PCS	C	From Face	4.00	0.0000	105.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	2.73	1.74	0.07
RRH2x60-07-U	A	From Face	4.00	0.0000	105.00	No Ice	2.45	1.63	0.05
(Verizon - Proposed)			0.00 0.00			1/2" Ice	2.67	1.83	0.07
RRH2x60-07-U	B	From Face	4.00	0.0000	105.00	No Ice	2.45	1.63	0.05
(Verizon - Proposed)			0.00 0.00			1/2" Ice	2.67	1.83	0.07
RRH2x60-07-U	C	From Face	4.00	0.0000	105.00	No Ice	2.45	1.63	0.05
(Verizon - Proposed)			0.00 0.00			1/2" Ice	2.67	1.83	0.07
DB-T1-6Z-8AB-0Z	C	From Face	0.00	0.0000	110.00	No Ice	5.60	2.33	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Existing)			2.00 0.00			1/2" Ice	5.92	2.56	0.08
DB-T1-6Z-8AB-0Z	B	From Face	0.00	0.0000	110.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			2.00 0.00			1/2" Ice	5.92	2.56	0.08
Valmont Uni-Tri Bracket	C	From Face	0.00	0.0000	110.00	No Ice	1.75	1.75	0.29
(Verizon - Existing)			0.00 0.00			1/2" Ice	1.94	1.94	0.31
13' Low Profile Platform	C	None		0.0000	105.00	No Ice	15.70	15.70	1.30
(Verizon - Existing)						1/2" Ice	20.10	20.10	1.76
13' Low Profile Platform	C	None		0.0000	95.00	No Ice	15.70	15.70	1.30
(Empty)						1/2" Ice	20.10	20.10	1.76
PTP400	A	From Face	1.00	0.0000	83.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00 0.00			1/2" Ice	2.24	0.65	0.02
PTP400	B	From Face	1.00	0.0000	83.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00 0.00			1/2" Ice	2.24	0.65	0.02
PTP400	C	From Face	1.00	0.0000	83.00	No Ice	2.04	0.53	0.01
(Town - Existing)			0.00 0.00			1/2" Ice	2.24	0.65	0.02
4'6"x3" Pipe Mount	A	From Face	0.50	0.0000	83.00	No Ice	1.30	1.30	0.03
(Town - Existing)			0.00 0.00			1/2" Ice	1.57	1.57	0.05
4'6"x3" Pipe Mount	B	From Face	0.50	0.0000	83.00	No Ice	1.30	1.30	0.03
(Town - Existing)			0.00 0.00			1/2" Ice	1.57	1.57	0.05
4'6"x3" Pipe Mount	C	From Face	0.50	0.0000	83.00	No Ice	1.30	1.30	0.03
(Town - Existing)			0.00 0.00			1/2" Ice	1.57	1.57	0.05
(2) AIR21	A	From Face	4.00	0.0000	138.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	6.98	4.77	0.12
(2) AIR21	B	From Face	4.00	0.0000	138.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	6.98	4.77	0.12
(2) AIR21	C	From Face	4.00	0.0000	138.00	No Ice	6.53	4.36	0.08
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	6.98	4.77	0.12
LNX-6515DS	A	From Face	4.00	0.0000	138.00	No Ice	11.45	7.70	0.06
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	12.06	8.29	0.12
LNX-6515DS	B	From Face	4.00	0.0000	138.00	No Ice	11.45	7.70	0.06
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	12.06	8.29	0.12
LNX-6515DS	C	From Face	4.00	0.0000	138.00	No Ice	11.45	7.70	0.06
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	12.06	8.29	0.12
KRY 112 TMA	A	From Face	4.00	0.0000	138.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	0.90	0.59	0.03
KRY 112 TMA	B	From Face	4.00	0.0000	138.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	0.90	0.59	0.03
KRY 112 TMA	C	From Face	4.00	0.0000	138.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00 0.00			1/2" Ice	0.90	0.59	0.03

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
RRUS-11	A	From Face	4.00	0.0000	138.00	No Ice	2.99	1.25	0.05
(T-Mobile - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
RRUS-11	B	From Face	4.00	0.0000	138.00	No Ice	2.99	1.25	0.05
(T-Mobile - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
RRUS-11	C	From Face	4.00	0.0000	138.00	No Ice	2.99	1.25	0.05
(T-Mobile - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
Valmont 13' Low Profile Platform	A	From Face	1.00	0.0000	136.00	No Ice	15.70	15.70	1.30
			0.00			1/2" Ice	20.10	20.10	1.76
(T-Mobile - Existing)			0.00						

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
VHLP1-23	A	Paraboloid w/o	From	3.00	Worst		115.00	1.27	No Ice	1.28	0.01
(Clearwire - Existing)		Radome	Face	1.50					1/2" Ice	1.45	0.01
				0.00							
VHLP1-23	B	Paraboloid w/o	From	3.00	Worst		115.00	1.27	No Ice	1.28	0.01
(Clearwire - Existing)		Radome	Face	1.50					1/2" Ice	1.45	0.01
				0.00							
VHLP1-23	C	Paraboloid w/o	From	3.00	Worst		115.00	1.27	No Ice	1.28	0.01
(Clearwire - Existing)		Radome	Face	1.50					1/2" Ice	1.45	0.01
				0.00							

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	111.84	1.417	23.17	109.078	A	0.000	109.078	109.078	100.00	0.000	19.305
137.00-88.25					B	0.000	109.078		100.00	0.000	3.515
					C	0.000	109.078		100.00	0.000	8.325
L2 88.25-47.25	67.54	1.227	20.02	114.690	A	0.000	114.690	114.690	100.00	0.000	16.236
					B	0.000	114.690		100.00	0.000	8.118
					C	0.000	114.690		100.00	0.000	12.300
L3 47.25-1.00	23.54	1	16.55	153.046	A	0.000	153.046	153.046	100.00	0.000	17.127
					B	0.000	153.046		100.00	0.000	8.563
					C	0.000	153.046		100.00	0.000	12.975

Tower Pressure - With Ice

$G_H = 1.690$

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
L1 137.00-88.25	111.84	1.417	17.38	0.5000	113.141	A	0.000	113.141	113.141	100.00	0.000	29.055
						B	0.000	113.141		100.00	0.000	5.289
						C	0.000	113.141		100.00	0.000	11.100
L2 88.25-47.25	67.54	1.227	15.01	0.5000	118.107	A	0.000	118.107	118.107	100.00	0.000	24.436
						B	0.000	118.107		100.00	0.000	12.218
						C	0.000	118.107		100.00	0.000	16.400
L3 47.25-1.00	23.54	1	12.41	0.5000	156.901	A	0.000	156.901	156.901	100.00	0.000	25.777
						B	0.000	156.901		100.00	0.000	12.888
						C	0.000	156.901		100.00	0.000	17.300

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	111.84	1.417	9.05	109.078	A	0.000	109.078	109.078	100.00	0.000	19.305
137.00-88.25					B	0.000	109.078		100.00	0.000	3.515
					C	0.000	109.078		100.00	0.000	8.325
L2 88.25-47.25	67.54	1.227	7.82	114.690	A	0.000	114.690	114.690	100.00	0.000	16.236
					B	0.000	114.690		100.00	0.000	8.118
					C	0.000	114.690		100.00	0.000	12.300
L3 47.25-1.00	23.54	1	6.46	153.046	A	0.000	153.046	153.046	100.00	0.000	17.127
					B	0.000	153.046		100.00	0.000	8.563
					C	0.000	153.046		100.00	0.000	12.975

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	1.53	2.63	A	1	0.65	1	1	1	109.078	4.00	81.97	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	3.76	91.76	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	3.86	83.54	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	780.27	11.62		

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

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 ft^2	F K	w plf	Ctrl. Face
L1	1.53	2.63	A	1	0.65	1	1	1	109.078	4.00	81.97	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	3.76	91.76	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	3.86	83.54	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	780.27 kip-ft	11.62		

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 ft^2	F K	w plf	Ctrl. Face
L1	1.53	2.63	A	1	0.65	1	1	1	109.078	4.00	81.97	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	3.76	91.76	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	3.86	83.54	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	780.27 kip-ft	11.62		

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 ft^2	F K	w plf	Ctrl. Face
L1	1.53	2.63	A	1	0.65	1	1	1	109.078	4.00	81.97	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			

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
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	3.76	91.76	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	3.86	83.54	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	780.27 kip-ft	11.62		

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	2.11	3.46	A	1	0.65	1	1	1	113.141	3.49	71.68	C
137.00-88.25			B	1	0.65	1	1	1	113.141			
			C	1	0.65	1	1	1	113.141			
L2	2.35	6.85	A	1	0.65	1	1	1	118.107	3.29	80.34	C
88.25-47.25			B	1	0.65	1	1	1	118.107			
			C	1	0.65	1	1	1	118.107			
L3 47.25-1.00	2.49	11.84	A	1	0.65	1	1	1	156.901	3.31	71.63	C
			B	1	0.65	1	1	1	156.901			
			C	1	0.65	1	1	1	156.901			
Sum Weight:	6.95	22.15						OTM	681.14 kip-ft	10.10		

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	2.11	3.46	A	1	0.65	1	1	1	113.141	3.49	71.68	C
137.00-88.25			B	1	0.65	1	1	1	113.141			
			C	1	0.65	1	1	1	113.141			
L2	2.35	6.85	A	1	0.65	1	1	1	118.107	3.29	80.34	C
88.25-47.25			B	1	0.65	1	1	1	118.107			
			C	1	0.65	1	1	1	118.107			
L3 47.25-1.00	2.49	11.84	A	1	0.65	1	1	1	156.901	3.31	71.63	C
			B	1	0.65	1	1	1	156.901			
			C	1	0.65	1	1	1	156.901			
Sum Weight:	6.95	22.15						OTM	681.14 kip-ft	10.10		

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	2.11	3.46	A	1	0.65	1	1	1	113.141	3.49	71.68	C
137.00-88.25			B	1	0.65	1	1	1	113.141			
			C	1	0.65	1	1	1	113.141			
L2	2.35	6.85	A	1	0.65	1	1	1	118.107	3.29	80.34	C
88.25-47.25			B	1	0.65	1	1	1	118.107			
			C	1	0.65	1	1	1	118.107			
L3 47.25-1.00	2.49	11.84	A	1	0.65	1	1	1	156.901	3.31	71.63	C
			B	1	0.65	1	1	1	156.901			
			C	1	0.65	1	1	1	156.901			
Sum Weight:	6.95	22.15						OTM	681.14 kip-ft	10.10		

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	2.11	3.46	A	1	0.65	1	1	1	113.141	3.49	71.68	C
137.00-88.25			B	1	0.65	1	1	1	113.141			
			C	1	0.65	1	1	1	113.141			
L2	2.35	6.85	A	1	0.65	1	1	1	118.107	3.29	80.34	C
88.25-47.25			B	1	0.65	1	1	1	118.107			
			C	1	0.65	1	1	1	118.107			
L3 47.25-1.00	2.49	11.84	A	1	0.65	1	1	1	156.901	3.31	71.63	C
			B	1	0.65	1	1	1	156.901			
			C	1	0.65	1	1	1	156.901			
Sum Weight:	6.95	22.15						OTM	681.14 kip-ft	10.10		

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	1.53	2.63	A	1	0.65	1	1	1	109.078	1.56	32.02	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	1.47	35.84	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	1.51	32.63	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	304.79 kip-ft	4.54		

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	1.53	2.63	A	1	0.65	1	1	1	109.078	1.56	32.02	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	1.47	35.84	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	1.51	32.63	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	304.79 kip-ft	4.54		

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	1.53	2.63	A	1	0.65	1	1	1	109.078	1.56	32.02	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	1.47	35.84	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	1.51	32.63	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	304.79 kip-ft	4.54		

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	1.53	2.63	A	1	0.65	1	1	1	109.078	1.56	32.02	C
137.00-88.25			B	1	0.65	1	1	1	109.078			
			C	1	0.65	1	1	1	109.078			
L2	1.78	5.99	A	1	0.65	1	1	1	114.690	1.47	35.84	C
88.25-47.25			B	1	0.65	1	1	1	114.690			
			C	1	0.65	1	1	1	114.690			
L3 47.25-1.00	1.88	10.70	A	1	0.65	1	1	1	153.046	1.51	32.63	C
			B	1	0.65	1	1	1	153.046			
			C	1	0.65	1	1	1	153.046			
Sum Weight:	5.18	19.32						OTM	304.79 kip-ft	4.54		

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	19.32					
Bracing Weight	0.00					
Total Member Self-Weight	19.32			-1.86	2.12	
Total Weight	31.79			-1.86	2.12	
Wind 0 deg - No Ice		0.04	-22.58	-2057.75	-2.59	-1.20
Wind 30 deg - No Ice		11.28	-19.58	-1784.67	-1023.74	-1.14
Wind 45 deg - No Ice		15.93	-16.00	-1458.93	-1446.23	-0.99
Wind 60 deg - No Ice		19.50	-11.33	-1033.89	-1770.01	-0.77
Wind 90 deg - No Ice		22.49	-0.04	-6.58	-2041.44	-0.20
Wind 120 deg - No Ice		19.46	11.25	1022.00	-1765.30	0.43
Wind 135 deg - No Ice		15.87	15.94	1448.54	-1439.56	0.71
Wind 150 deg - No Ice		11.21	19.53	1776.23	-1015.58	0.94
Wind 180 deg - No Ice		-0.04	22.58	2054.02	6.83	1.20
Wind 210 deg - No Ice		-11.28	19.58	1780.94	1027.98	1.14
Wind 225 deg - No Ice		-15.93	16.00	1455.20	1450.47	0.99
Wind 240 deg - No Ice		-19.50	11.33	1030.16	1774.25	0.77
Wind 270 deg - No Ice		-22.49	0.04	2.85	2045.68	0.20
Wind 300 deg - No Ice		-19.46	-11.25	-1025.73	1769.54	-0.43
Wind 315 deg - No Ice		-15.87	-15.94	-1452.26	1443.80	-0.71
Wind 330 deg - No Ice		-11.21	-19.53	-1779.96	1019.82	-0.94
Member Ice	2.83					
Total Weight Ice	39.62			-3.78	2.56	
Wind 0 deg - Ice		0.03	-19.43	-1770.44	-1.08	-1.21
Wind 30 deg - Ice		9.71	-16.84	-1535.58	-879.09	-1.18
Wind 45 deg - Ice		13.71	-13.76	-1255.58	-1242.40	-1.04
Wind 60 deg - Ice		16.78	-9.74	-890.27	-1520.86	-0.83
Wind 90 deg - Ice		19.36	-0.03	-7.42	-1754.44	-0.27
Wind 120 deg - Ice		16.75	9.69	876.40	-1517.22	0.37
Wind 135 deg - Ice		13.67	13.72	1242.86	-1237.25	0.67
Wind 150 deg - Ice		9.65	16.81	1524.37	-872.78	0.91
Wind 180 deg - Ice		-0.03	19.43	1762.88	6.20	1.21
Wind 210 deg - Ice		-9.71	16.84	1528.02	884.21	1.18
Wind 225 deg - Ice		-13.71	13.76	1248.02	1247.52	1.04
Wind 240 deg - Ice		-16.78	9.74	882.71	1525.99	0.83
Wind 270 deg - Ice		-19.36	0.03	-0.14	1759.56	0.27
Wind 300 deg - Ice		-16.75	-9.69	-883.96	1522.34	-0.37
Wind 315 deg - Ice		-13.67	-13.72	-1250.42	1242.37	-0.67
Wind 330 deg - Ice		-9.65	-16.81	-1531.93	877.90	-0.91
Total Weight	31.79			-1.86	2.12	
Wind 0 deg - Service		0.02	-8.82	-803.94	0.42	-0.47
Wind 30 deg - Service		4.41	-7.65	-697.27	-398.46	-0.44
Wind 45 deg - Service		6.22	-6.25	-570.03	-563.50	-0.39
Wind 60 deg - Service		7.62	-4.42	-404.00	-689.98	-0.30
Wind 90 deg - Service		8.79	-0.02	-2.70	-796.00	-0.08
Wind 120 deg - Service		7.60	4.40	399.09	-688.13	0.17
Wind 135 deg - Service		6.20	6.22	565.70	-560.89	0.28
Wind 150 deg - Service		4.38	7.63	693.71	-395.28	0.37
Wind 180 deg - Service		-0.02	8.82	802.22	4.10	0.47
Wind 210 deg - Service		-4.41	7.65	695.55	402.99	0.44
Wind 225 deg - Service		-6.22	6.25	568.30	568.02	0.39
Wind 240 deg - Service		-7.62	4.42	402.27	694.50	0.30
Wind 270 deg - Service		-8.79	0.02	0.98	800.53	0.08
Wind 300 deg - Service		-7.60	-4.40	-400.81	692.66	-0.17
Wind 315 deg - Service		-6.20	-6.22	-567.42	565.42	-0.28

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 330 deg - Service		-4.38	-7.63	-695.43	399.80	-0.37

Load Combinations

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

Comb. No.	Description
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	137 - 88.25	Pole	Max Tension	39	0.00	0.00	-0.00
			Max. Compression	18	-15.38	3.10	2.02
			Max. Mx	14	-10.10	371.16	0.37
			Max. My	2	-10.09	1.43	374.37
			Max. Vy	14	-14.84	371.16	0.37
			Max. Vx	2	-14.94	1.43	374.37
			Max. Torque	2			1.29
L2	88.25 - 47.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-24.21	3.02	2.88
			Max. Mx	14	-17.72	1051.40	-1.10
			Max. My	2	-17.71	-0.34	1058.71
			Max. Vy	14	-18.77	1051.40	-1.10
			Max. Vx	2	-18.86	-0.34	1058.71
			Max. Torque	19			1.08
L3	47.25 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-39.62	2.76	3.95
			Max. Mx	14	-31.77	2106.80	-2.91
			Max. My	2	-31.77	-2.62	2119.25
			Max. Vy	14	-22.52	2106.80	-2.91
			Max. Vx	2	-22.61	-2.62	2119.25
			Max. Torque	2			1.11

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	19	39.62	-0.03	19.43
	Max. H_x	14	31.79	22.49	-0.04
	Max. H_z	2	31.79	-0.04	22.58
	Max. M_x	2	2119.25	-0.04	22.58
	Max. M_z	6	2102.32	-22.49	0.04
	Max. Torsion	2	1.11	-0.04	22.58
	Min. Vert	1	31.79	0.00	0.00
	Min. H_x	6	31.79	-22.49	0.04
	Min. H_z	10	31.79	0.04	-22.58
	Min. M_x	10	-2115.37	0.04	-22.58
	Min. M_z	14	-2106.80	22.49	-0.04
	Min. Torsion	10	-1.10	0.04	-22.58

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	31.79	0.00	0.00	-1.92	2.21	-0.00
Dead+Wind 0 deg - No Ice	31.79	0.04	-22.58	-2119.25	-2.62	-1.11
Dead+Wind 30 deg - No Ice	31.79	11.28	-19.58	-1838.02	-1054.23	-1.04
Dead+Wind 45 deg - No Ice	31.79	15.93	-16.00	-1502.55	-1489.33	-0.89
Dead+Wind 60 deg - No Ice	31.79	19.50	-11.33	-1064.82	-1822.78	-0.68
Dead+Wind 90 deg - No Ice	31.79	22.49	-0.04	-6.81	-2102.32	-0.14
Dead+Wind 120 deg - No Ice	31.79	19.46	11.25	1052.52	-1817.94	0.44
Dead+Wind 135 deg - No Ice	31.79	15.87	15.94	1491.80	-1482.48	0.69
Dead+Wind 150 deg - No Ice	31.79	11.21	19.53	1829.29	-1045.83	0.89
Dead+Wind 180 deg - No Ice	31.79	-0.04	22.58	2115.37	7.10	1.10
Dead+Wind 210 deg - No Ice	31.79	-11.28	19.58	1834.13	1058.72	1.02
Dead+Wind 225 deg - No Ice	31.79	-15.93	16.00	1498.66	1493.81	0.87
Dead+Wind 240 deg - No Ice	31.79	-19.50	11.33	1060.92	1827.26	0.67
Dead+Wind 270 deg - No Ice	31.79	-22.49	0.04	2.91	2106.80	0.14
Dead+Wind 300 deg - No Ice	31.79	-19.46	-11.25	-1056.41	1822.41	-0.42
Dead+Wind 315 deg - No Ice	31.79	-15.87	-15.94	-1495.69	1486.95	-0.67
Dead+Wind 330 deg - No Ice	31.79	-11.21	-19.53	-1833.17	1050.30	-0.88
Dead+Ice+Temp	39.62	-0.00	-0.00	-3.95	2.76	-0.00
Dead+Wind 0 deg+Ice+Temp	39.62	0.03	-19.43	-1843.65	-1.01	-1.10
Dead+Wind 30 deg+Ice+Temp	39.62	9.71	-16.84	-1599.09	-915.25	-1.06
Dead+Wind 45 deg+Ice+Temp	39.62	13.71	-13.76	-1307.53	-1293.55	-0.92
Dead+Wind 60 deg+Ice+Temp	39.62	16.78	-9.74	-927.13	-1583.51	-0.73
Dead+Wind 90 deg+Ice+Temp	39.62	19.36	-0.03	-7.80	-1826.73	-0.19
Dead+Wind 120 deg+Ice+Temp	39.62	16.75	9.69	912.55	-1579.73	0.39
Dead+Wind 135 deg+Ice+Temp	39.62	13.67	13.72	1294.16	-1288.19	0.65
Dead+Wind 150 deg+Ice+Temp	39.62	9.65	16.81	1587.30	-908.68	0.86
Dead+Wind 180 deg+Ice+Temp	39.62	-0.03	19.43	1835.66	6.59	1.10
Dead+Wind 210 deg+Ice+Temp	39.62	-9.71	16.84	1591.09	920.83	1.05
Dead+Wind 225 deg+Ice+Temp	39.62	-13.71	13.76	1299.52	1299.13	0.91
Dead+Wind 240 deg+Ice+Temp	39.62	-16.78	9.74	919.12	1589.09	0.72
Dead+Wind 270 deg+Ice+Temp	39.62	-19.36	0.03	-0.20	1832.30	0.20
Dead+Wind 300 deg+Ice+Temp	39.62	-16.75	-9.69	-920.55	1585.29	-0.38
Dead+Wind 315 deg+Ice+Temp	39.62	-13.67	-13.72	-1302.16	1293.76	-0.64
Dead+Wind 330 deg+Ice+Temp	39.62	-9.65	-16.81	-1595.29	914.25	-0.85
Dead+Wind 0 deg - Service	31.79	0.02	-8.82	-829.63	0.35	-0.43
Dead+Wind 30 deg - Service	31.79	4.41	-7.65	-719.69	-410.73	-0.41
Dead+Wind 45 deg - Service	31.79	6.22	-6.25	-588.55	-580.81	-0.35
Dead+Wind 60 deg - Service	31.79	7.62	-4.42	-417.44	-711.16	-0.27
Dead+Wind 90 deg - Service	31.79	8.79	-0.02	-3.85	-820.43	-0.06
Dead+Wind 120 deg - Service	31.79	7.60	4.40	410.24	-709.26	0.17
Dead+Wind 135 deg - Service	31.79	6.20	6.22	581.96	-578.13	0.27
Dead+Wind 150 deg - Service	31.79	4.38	7.63	713.89	-407.44	0.35
Dead+Wind 180 deg - Service	31.79	-0.02	8.82	825.72	4.15	0.43
Dead+Wind 210 deg - Service	31.79	-4.41	7.65	715.78	415.24	0.40
Dead+Wind 225 deg - Service	31.79	-6.22	6.25	584.64	585.32	0.35
Dead+Wind 240 deg - Service	31.79	-7.62	4.42	413.53	715.67	0.26
Dead+Wind 270 deg - Service	31.79	-8.79	0.02	-0.06	824.94	0.06
Dead+Wind 300 deg - Service	31.79	-7.60	-4.40	-414.15	713.77	-0.17
Dead+Wind 315 deg - Service	31.79	-6.20	-6.22	-585.87	582.63	-0.27
Dead+Wind 330 deg - Service	31.79	-4.38	-7.63	-717.79	411.95	-0.35

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-31.79	0.00	0.00	31.79	0.00	0.000%
2	0.04	-31.79	-22.58	-0.04	31.79	22.58	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
3	11.28	-31.79	-19.58	-11.28	31.79	19.58	0.000%
4	15.93	-31.79	-16.00	-15.93	31.79	16.00	0.000%
5	19.50	-31.79	-11.33	-19.50	31.79	11.33	0.000%
6	22.49	-31.79	-0.04	-22.49	31.79	0.04	0.000%
7	19.46	-31.79	11.25	-19.46	31.79	-11.25	0.000%
8	15.87	-31.79	15.94	-15.87	31.79	-15.94	0.000%
9	11.21	-31.79	19.53	-11.21	31.79	-19.53	0.000%
10	-0.04	-31.79	22.58	0.04	31.79	-22.58	0.000%
11	-11.28	-31.79	19.58	11.28	31.79	-19.58	0.000%
12	-15.93	-31.79	16.00	15.93	31.79	-16.00	0.000%
13	-19.50	-31.79	11.33	19.50	31.79	-11.33	0.000%
14	-22.49	-31.79	0.04	22.49	31.79	-0.04	0.000%
15	-19.46	-31.79	-11.25	19.46	31.79	11.25	0.000%
16	-15.87	-31.79	-15.94	15.87	31.79	15.94	0.000%
17	-11.21	-31.79	-19.53	11.21	31.79	19.53	0.000%
18	0.00	-39.62	0.00	0.00	39.62	0.00	0.000%
19	0.03	-39.62	-19.43	-0.03	39.62	19.43	0.000%
20	9.71	-39.62	-16.84	-9.71	39.62	16.84	0.000%
21	13.71	-39.62	-13.76	-13.71	39.62	13.76	0.000%
22	16.78	-39.62	-9.74	-16.78	39.62	9.74	0.000%
23	19.36	-39.62	-0.03	-19.36	39.62	0.03	0.000%
24	16.75	-39.62	9.69	-16.75	39.62	-9.69	0.000%
25	13.67	-39.62	13.72	-13.67	39.62	-13.72	0.000%
26	9.65	-39.62	16.81	-9.65	39.62	-16.81	0.000%
27	-0.03	-39.62	19.43	0.03	39.62	-19.43	0.000%
28	-9.71	-39.62	16.84	9.71	39.62	-16.84	0.000%
29	-13.71	-39.62	13.76	13.71	39.62	-13.76	0.000%
30	-16.78	-39.62	9.74	16.78	39.62	-9.74	0.000%
31	-19.36	-39.62	0.03	19.36	39.62	-0.03	0.000%
32	-16.75	-39.62	-9.69	16.75	39.62	9.69	0.000%
33	-13.67	-39.62	-13.72	13.67	39.62	13.72	0.000%
34	-9.65	-39.62	-16.81	9.65	39.62	16.81	0.000%
35	0.02	-31.79	-8.82	-0.02	31.79	8.82	0.000%
36	4.41	-31.79	-7.65	-4.41	31.79	7.65	0.000%
37	6.22	-31.79	-6.25	-6.22	31.79	6.25	0.000%
38	7.62	-31.79	-4.42	-7.62	31.79	4.42	0.000%
39	8.79	-31.79	-0.02	-8.79	31.79	0.02	0.000%
40	7.60	-31.79	4.40	-7.60	31.79	-4.40	0.000%
41	6.20	-31.79	6.22	-6.20	31.79	-6.22	0.000%
42	4.38	-31.79	7.63	-4.38	31.79	-7.63	0.000%
43	-0.02	-31.79	8.82	0.02	31.79	-8.82	0.000%
44	-4.41	-31.79	7.65	4.41	31.79	-7.65	0.000%
45	-6.22	-31.79	6.25	6.22	31.79	-6.25	0.000%
46	-7.62	-31.79	4.42	7.62	31.79	-4.42	0.000%
47	-8.79	-31.79	0.02	8.79	31.79	-0.02	0.000%
48	-7.60	-31.79	-4.40	7.60	31.79	4.40	0.000%
49	-6.20	-31.79	-6.22	6.20	31.79	6.22	0.000%
50	-4.38	-31.79	-7.63	4.38	31.79	7.63	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00032840
3	Yes	5	0.00000001	0.00015782

4	Yes	5	0.00000001	0.00018330
5	Yes	5	0.00000001	0.00016623
6	Yes	4	0.00000001	0.00008675
7	Yes	5	0.00000001	0.00016284
8	Yes	5	0.00000001	0.00018066
9	Yes	5	0.00000001	0.00015564
10	Yes	4	0.00000001	0.00037875
11	Yes	5	0.00000001	0.00016937
12	Yes	5	0.00000001	0.00018393
13	Yes	5	0.00000001	0.00015992
14	Yes	4	0.00000001	0.00005994
15	Yes	5	0.00000001	0.00015977
16	Yes	5	0.00000001	0.00018304
17	Yes	5	0.00000001	0.00016802
18	Yes	4	0.00000001	0.00001511
19	Yes	5	0.00000001	0.00012000
20	Yes	5	0.00000001	0.00034852
21	Yes	5	0.00000001	0.00040288
22	Yes	5	0.00000001	0.00036175
23	Yes	5	0.00000001	0.00011645
24	Yes	5	0.00000001	0.00035281
25	Yes	5	0.00000001	0.00039557
26	Yes	5	0.00000001	0.00034282
27	Yes	5	0.00000001	0.00012001
28	Yes	5	0.00000001	0.00036598
29	Yes	5	0.00000001	0.00040352
30	Yes	5	0.00000001	0.00035120
31	Yes	5	0.00000001	0.00011694
32	Yes	5	0.00000001	0.00035357
33	Yes	5	0.00000001	0.00040418
34	Yes	5	0.00000001	0.00036524
35	Yes	4	0.00000001	0.00007485
36	Yes	4	0.00000001	0.00038036
37	Yes	4	0.00000001	0.00046963
38	Yes	4	0.00000001	0.00042447
39	Yes	4	0.00000001	0.00002455
40	Yes	4	0.00000001	0.00040716
41	Yes	4	0.00000001	0.00045542
42	Yes	4	0.00000001	0.00036997
43	Yes	4	0.00000001	0.00007819
44	Yes	4	0.00000001	0.00044357
45	Yes	4	0.00000001	0.00047526
46	Yes	4	0.00000001	0.00039279
47	Yes	4	0.00000001	0.00002344
48	Yes	4	0.00000001	0.00039876
49	Yes	4	0.00000001	0.00047746
50	Yes	4	0.00000001	0.00044322

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	137 - 88.25	27.803	35	1.7670	0.0063
L2	92.25 - 47.25	12.791	35	1.2998	0.0018
L3	52 - 1	4.039	35	0.7212	0.0007

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
143.00	20' 8 Bay Di-Pole	35	27.803	1.7670	0.0063	32777
142.00	PTP400	35	27.803	1.7670	0.0063	32777
140.00	4'6"x3" Pipe Mount	35	27.803	1.7670	0.0063	32777
138.00	(2) AIR21	35	27.803	1.7670	0.0063	32777
136.00	Valmont 13' Low Profile Platform	35	27.443	1.7577	0.0062	32777
115.00	VHLP1-23	35	20.017	1.5546	0.0038	7448
110.00	DB-T1-6Z-8AB-0Z	35	18.328	1.5028	0.0032	6069
105.00	SBNHH-1D65B	35	16.688	1.4493	0.0028	5120
95.00	13' Low Profile Platform	35	13.592	1.3339	0.0020	3906
83.00	PTP400	35	10.279	1.1772	0.0013	3528

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	137 - 88.25	70.840	2	4.4795	0.0162
L2	92.25 - 47.25	32.638	2	3.3153	0.0045
L3	52 - 1	10.313	2	1.8411	0.0017

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
143.00	20' 8 Bay Di-Pole	2	70.840	4.4795	0.0162	13148
142.00	PTP400	2	70.840	4.4795	0.0162	13148
140.00	4'6"x3" Pipe Mount	2	70.840	4.4795	0.0162	13148
138.00	(2) AIR21	2	70.840	4.4795	0.0162	13148
136.00	Valmont 13' Low Profile Platform	2	69.925	4.4565	0.0159	13148
115.00	VHLP1-23	2	51.034	3.9569	0.0096	2986
110.00	DB-T1-6Z-8AB-0Z	2	46.736	3.8283	0.0083	2432
105.00	SBNHH-1D65B	2	42.562	3.6936	0.0070	2051
95.00	13' Low Profile Platform	2	34.679	3.4018	0.0050	1563
83.00	PTP400	2	26.236	3.0042	0.0034	1403

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 $\frac{P}{P_a}$

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	137 - 88.25 (1)	TP30.7x23x0.1875	48.75	0.00	0.0	37.960	17.7828	-10.09	675.03	0.015
L2	88.25 - 47.25 (2)	TP36.81x29.6932x0.375	45.00	0.00	0.0	39.000	42.4726	-17.71	1656.43	0.011
L3	47.25 - 1 (3)	TP43.36x35.3088x0.5	51.00	0.00	0.0	39.000	68.0188	-31.77	2652.73	0.012

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	137 - 88.25 (1)	TP30.7x23x0.1875	374.38	34.209	37.960	0.901	0.00	0.000	37.960	0.000
L2	88.25 - 47.25 (2)	TP36.81x29.6932x0.375	1058.72	34.060	39.000	0.873	0.00	0.000	39.000	0.000
L3	47.25 - 1 (3)	TP43.36x35.3088x0.5	2119.26	35.485	39.000	0.910	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	137 - 88.25 (1)	TP30.7x23x0.1875	14.94	0.840	26.000	0.065	1.04	0.047	26.000	0.002
L2	88.25 - 47.25 (2)	TP36.81x29.6932x0.375	18.86	0.444	26.000	0.034	1.07	0.017	26.000	0.001
L3	47.25 - 1 (3)	TP43.36x35.3088x0.5	22.61	0.332	26.000	0.026	1.11	0.009	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	137 - 88.25 (1)	0.015	0.901	0.000	0.065	0.002	0.917 ✔	1.333	H1-3+VT ✔
L2	88.25 - 47.25 (2)	0.011	0.873	0.000	0.034	0.001	0.884 ✔	1.333	H1-3+VT ✔
L3	47.25 - 1 (3)	0.012	0.910	0.000	0.026	0.000	0.922 ✔	1.333	H1-3+VT ✔

Section Capacity Table

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

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	137 - 88.25	Pole	TP30.7x23x0.1875	1	-10.09	899.82	68.8	Pass
L2	88.25 - 47.25	Pole	TP36.81x29.6932x0.375	2	-17.71	2208.02	66.3	Pass
L3	47.25 - 1	Pole	TP43.36x35.3088x0.5	3	-31.77	3536.09	69.2	Pass
							Summary	
						Pole (L3)	69.2	Pass
						RATING =	**69.2**	**Pass**

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		136-ft Summit Monopole Bloomfield, CT
	Rev. 0: 7/14/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 15001.072

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2119·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 23·kips	(Input From tnxTower)
Axial Force =	Axial := 32·kips	(Input From tnxTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 16	(User Input)
Bolt "Column" Distance =	l := 3.0·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)

Base Plate Data:

Use ASTM A572 Gr. 55

Plate Yield Strength =	Fy_{bp} := 55·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 3.0·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 24.875in$ (User Input)

$d_2 := 23.375in$ (User Input)

$d_3 := 8.875in$ (User Input)

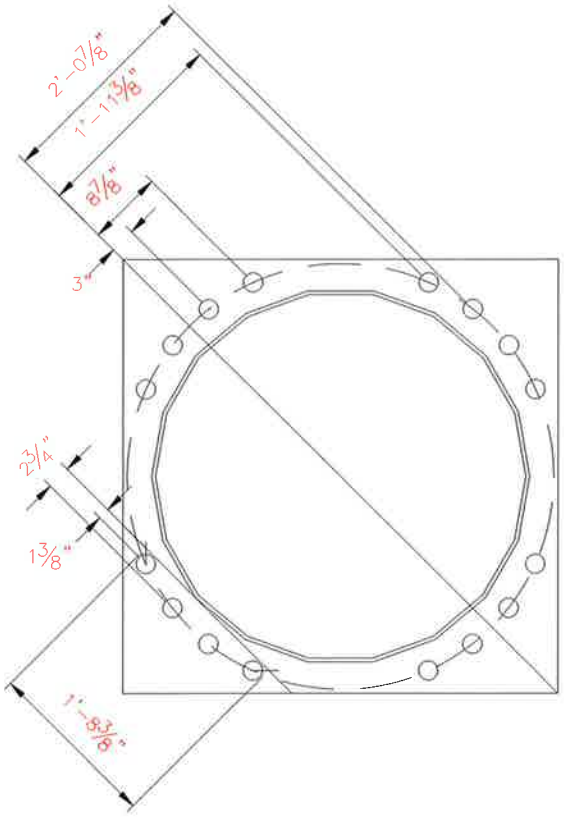
$d_4 := 3.0in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.75in$ (User Input)

$ma_2 := 1.375in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 20.375in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	136-ft Summit Monopole Bloomfield, CT
Rev. 0: 7/14/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 15001.072

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 \right] = 5012 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

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

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 124.2 \cdot kips$

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

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

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 63.8 \cdot \%$ 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 Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N} \right) \cdot l = 0.359 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 5.2 \cdot ksi$

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.

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

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

Check Anchor Bolt Compression/Combined Stress:

Applied Compressive Force =

$$C_{Max} := OM \cdot \frac{d_1}{l_p} + \frac{Axial}{N} = 128.2 \cdot kips$$

Applied Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 39.5 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

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

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 65.8 \cdot \%$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_1}{I_p} + \frac{Axial}{N} = 128.209 \cdot kips$

$C_2 := \frac{OM \cdot d_2}{I_p} + \frac{Axial}{N} = 120.599 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (2C_1 \cdot ma_1 + 2C_2 \cdot ma_2)}{B_{eff} \cdot t_{bp}^2} = 33.92 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 54.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 61.8 \cdot \%$

Condition3 = $Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	136-ft Summit Monopole Bloomfield, CT
Rev. 0: 7/14/15	Prepared by: T.J.L.. Checked by: C.F.C. Job No. 15001.072

Caisson Foundation:

Input Data:

Shear Force =	$S := 23k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 2119ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 32k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 2325ft \cdot k$	*USER INPUT–FROM LPILE*
Moment Capacity =	$Mn := 4619ft \cdot k$	*USER INPUT–FROM LPILE*
Foundation Diameter =	$d := 6.0ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 45.5ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 0.5ft$	*USER INPUT*
Number of Rebar =	$n := 20$	*USER INPUT*
Area of Rebar =	$Ar := 1.560in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 3ksi$	*USER INPUT*

Check Foundation Depth:

Depth of Caisson Below Ground Level = $LD := L_c - L_{pag} = 45ft$ (TIA/EIA-222-F 7.2.5)

Depth Required = $LD1 := 2.0ft + \left(\frac{S \cdot ft^2}{3k \cdot d}\right) + 2ft \cdot .5\left(\frac{M \cdot ft}{3 \cdot k \cdot d} + \frac{S \cdot ft}{2k} + \frac{S^2 ft^3}{18k^2 d^2}\right)^{.5} = 26.08ft$

$DepthCheck := if(LD1 \le LD, "OK", "NO GOOD")$

DepthCheck = "OK"

Check Moment Capacity:

Factor of Safety = $FS := \frac{Mn}{Mu} = 1.99$

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

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

FOSCheck = "OK"

Check Axial Capacity:

Concrete Weight = $A2 := .150\frac{k}{ft^3} \cdot LD \cdot \pi \frac{d^2}{4} = 190.9 \cdot kips$

Total Axial Load = $AT := A1 + A2 = 222.9 \cdot kips$

Area of Concrete = $Ag := \pi \cdot \frac{d^2}{4} = 28.27ft^2$

Axial Capacity = $Po := n \cdot Ar \cdot fy + (Ag - n \cdot Ar) \cdot 0.85 \cdot f'c = 12174.8 \cdot kips$

$AxialCheck := if(AT \le Po, "OK", "NO GOOD")$

AxialCheck = "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\072 - Bloomfield 3\Backup Documentation\MathCad\Foundation\
Name of input data file: Bloomfield Caisson Analysis.lpd
Name of output file: Bloomfield Caisson Analysis.lpo
Name of plot output file: Bloomfield Caisson Analysis.lpp
Name of runtime file: Bloomfield Caisson Analysis.lpr

Time and Date of Analysis

Date: July 14, 2015 Time: 11:13:13

Problem Title

15001.072 - Bloomfield 3

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 pile response for full length of pile
- 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:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 8

Pile Structural Properties and Geometry

Pile Length = 546.00 in

Depth of ground surface below top of pile = 66.00 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.	4071.0000	3122019.
2	546.0000	72.00000000	1319167.	4071.0000	3122019.

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 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 66.000 in
Distance from top of pile to bottom of layer = 126.000 in
p-y subgrade modulus k for top of soil layer = 60.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 60.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 126.000 in
Distance from top of pile to bottom of layer = 900.000 in
p-y subgrade modulus k for top of soil layer = 60.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 60.000 lbs/in**3

(Depth of lowest layer extends 354.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 4 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	66.00	0.03300
2	126.00	0.03300
3	126.00	0.03900
4	900.00	0.03900

Shear Strength of Soils

Shear strength parameters with depth defined using 4 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	66.000	0.00000	30.00	------	------
2	126.000	0.00000	30.00	------	------
3	126.000	0.00000	22.00	------	------
4	900.000	0.00000	22.00	------	------

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 = 23000.000 lbs
Bending moment at pile head = 25428000.000 in-lbs
Axial load at pile head = 32000.000 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 = 20
Area of Single Bar = 1.56000 in**2
Number of Rows of Reinforcing Bars = 11
Area of Steel = 31.200 in**2
Area of Shaft = 4071.504 in**2
Percentage of Steel Reinforcement = 0.766 percent
Cover Thickness (edge to bar center) = 4.000 in

Unfactored Axial Squash Load Capacity = 12174.78 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	32.000
2	3.120	30.434
3	3.120	25.889
4	3.120	18.809
5	3.120	9.889
6	3.120	0.000
7	3.120	-9.889
8	3.120	-18.809
9	3.120	-25.889
10	3.120	-30.434
11	1.560	-32.000

Axial Thrust Force = 32000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
3835000.	4.602000E+12	8.333333E-07	0.00003246	38.95317113	99.66471055	844.70164
7626467.	4.575880E+12	0.00000167	0.00006258	37.54603493	190.24288	1621.39169
11374781.	4.549913E+12	0.00000250	0.00009273	37.09347761	279.23775	2399.27713
15078915.	4.523675E+12	0.00000333	0.00012285	36.85477602	366.40136	3175.96168
15078915.	3.618940E+12	0.00000417	0.00008275	19.86082542	246.48754	5816.81693
15078915.	3.015783E+12	0.00000500	0.00009759	19.51733315	289.19174	7029.98669
15078915.	2.584957E+12	0.00000583	0.00011244	19.27557385	331.55796	8242.54876
15078915.	2.261837E+12	0.00000667	0.00012756	19.13348544	374.28436	9447.52615
15078915.	2.010522E+12	0.00000750	0.00014241	18.98799169	415.83948	10660.11181
15078915.	1.809470E+12	0.00000833	0.00015729	18.87432396	457.05877	11872.03838
15078915.	1.644973E+12	0.00000917	0.00017219	18.78382409	497.94089	13083.30010
15078915.	1.507892E+12	0.00001000	0.00018711	18.71071994	538.48446	14293.89122
15078915.	1.391900E+12	0.00001083	0.00020205	18.65101182	578.68797	15503.80712
15078915.	1.292478E+12	0.00001167	0.00021702	18.60185015	618.55015	16713.04070
15078915.	1.206313E+12	0.00001250	0.00023201	18.56113851	658.06943	17921.58729
15078915.	1.130919E+12	0.00001333	0.00024703	18.52730834	697.24438	19129.44077
15078915.	1.064394E+12	0.00001417	0.00026207	18.49916017	736.07354	20336.59503
15078915.	1.005261E+12	0.00001500	0.00027714	18.47576058	774.55539	21543.04415
15677250.	9.901421E+11	0.00001583	0.00029223	18.45637357	812.68845	22748.78180

16459700.	9.875820E+11	0.00001667	0.00030734	18.44041121	850.47121	23953.80125
17241016.	9.852009E+11	0.00001750	0.00032248	18.42739284	887.90195	25158.09813
18021197.	9.829744E+11	0.00001833	0.00033764	18.41693437	924.97933	26361.66323
18800230.	9.808816E+11	0.00001917	0.00035283	18.40870965	961.70158	27564.49222
19578107.	9.789053E+11	0.00002000	0.00036805	18.40245044	998.06705	28766.57874
20354822.	9.770315E+11	0.00002083	0.00038329	18.39793575	1034.07430	29967.91382
21130365.	9.752476E+11	0.00002167	0.00039856	18.39497244	1069.72152	31168.49231
21904727.	9.735434E+11	0.00002250	0.00041385	18.39339960	1105.00708	32368.30676
22677902.	9.719101E+11	0.00002333	0.00042917	18.39307988	1139.92933	33567.34928
23449876.	9.703397E+11	0.00002417	0.00044452	18.39389098	1174.48640	34765.61474
24220647.	9.688259E+11	0.00002500	0.00045989	18.39573419	1208.67676	35963.09271
24990198.	9.673625E+11	0.00002583	0.00047529	18.39851511	1242.49840	37159.77910
25758521.	9.659446E+11	0.00002667	0.00049072	18.40215647	1275.94956	38355.66566
26525615.	9.645678E+11	0.00002750	0.00050618	18.40659392	1309.02869	39550.74135
27291458.	9.632279E+11	0.00002833	0.00052167	18.41176093	1341.73356	40745.00311
28056049.	9.619217E+11	0.00002917	0.00053718	18.41760814	1374.06256	41938.43978
28819374.	9.606458E+11	0.00003000	0.00055272	18.42408621	1406.01364	43131.04499
29581428.	9.593977E+11	0.00003083	0.00056829	18.43115652	1437.58511	44322.80755
30342191.	9.581745E+11	0.00003167	0.00058389	18.43877614	1468.77464	45513.72392
31101663.	9.569743E+11	0.00003250	0.00059952	18.44691718	1499.58062	46703.78056
32616677.	9.546344E+11	0.00003417	0.00063088	18.46463907	1560.03333	49081.28679
34126375.	9.523640E+11	0.00003583	0.00066235	18.48411405	1618.92652	51455.25815
35630673.	9.501513E+11	0.00003750	0.00069394	18.50517905	1676.24342	53825.61779
37129471.	9.479865E+11	0.00003917	0.00072567	18.52769673	1731.96638	56192.29113
38622680.	9.458616E+11	0.00004083	0.00075752	18.55155981	1786.07759	58555.19460
40039057.	9.420955E+11	0.00004250	0.00078900	18.56477129	1837.71639	60000.00000
41133250.	9.313189E+11	0.00004417	0.00081829	18.52740061	1884.02815	60000.00000
42068078.	9.178490E+11	0.00004583	0.00084653	18.46974170	1927.14315	60000.00000
42999438.	9.052513E+11	0.00004750	0.00087486	18.41807377	1968.95430	60000.00000
43628961.	8.873687E+11	0.00004917	0.00090080	18.32138121	2005.84728	60000.00000
44238651.	8.702685E+11	0.00005083	0.00092667	18.22958314	2041.42691	60000.00000
44845914.	8.542079E+11	0.00005250	0.00095261	18.14497769	2075.90095	60000.00000
45450711.	8.390901E+11	0.00005417	0.00097862	18.06691682	2109.26011	60000.00000
45924377.	8.225262E+11	0.00005583	0.00100500	17.99999893	2141.85861	60000.00000
46486649.	8.084635E+11	0.00005750	0.00103194	17.94669807	2173.88236	60000.00000
46839108.	7.916469E+11	0.00005917	0.00105519	17.83426201	2200.32336	60000.00000
47189957.	7.757253E+11	0.00006083	0.00107851	17.72893274	2225.86539	60000.00000
47539196.	7.606271E+11	0.00006250	0.00110188	17.63015878	2250.50213	60000.00000
47886792.	7.462877E+11	0.00006417	0.00112532	17.53743589	2274.22634	60000.00000
48232735.	7.326491E+11	0.00006583	0.00114881	17.45031774	2297.03118	60000.00000
48577007.	7.196594E+11	0.00006750	0.00117237	17.36840093	2318.90952	60000.00000
48919589.	7.072712E+11	0.00006917	0.00119598	17.29132068	2339.85410	60000.00000
49260461.	6.954418E+11	0.00007083	0.00121966	17.21874654	2359.85746	60000.00000
49555810.	6.835284E+11	0.00007250	0.00124275	17.14140666	2378.38096	60000.00000
49734929.	6.705833E+11	0.00007417	0.00126419	17.04526556	2394.67377	60000.00000
49912878.	6.581918E+11	0.00007583	0.00128568	16.95399320	2410.19010	60000.00000
50089641.	6.463180E+11	0.00007750	0.00130721	16.86728060	2424.92439	60000.00000
50320848.	6.356318E+11	0.00007917	0.00133000	16.80000007	2439.65845	60000.00000
50474408.	6.244257E+11	0.00008083	0.00135563	16.77073610	2455.20714	60000.00000
50642763.	6.138517E+11	0.00008250	0.00137667	16.68694389	2466.98438	60000.00000
50810007.	6.036833E+11	0.00008417	0.00139776	16.60706770	2478.00731	60000.00000
50976139.	5.938968E+11	0.00008583	0.00141890	16.53088868	2488.27042	60000.00000
51141141.	5.844702E+11	0.00008750	0.00144009	16.45820081	2497.76792	60000.00000
51305010.	5.753833E+11	0.00008917	0.00146134	16.38881743	2506.49406	60000.00000
51467730.	5.666172E+11	0.00009083	0.00148263	16.32256258	2514.44287	60000.00000
51629287.	5.581545E+11	0.00009250	0.00150398	16.25927317	2521.60826	60000.00000
51789668.	5.499788E+11	0.00009417	0.00152539	16.19879901	2527.98409	60000.00000
51948863.	5.420751E+11	0.00009583	0.00154685	16.14100063	2533.56409	60000.00000
52106856.	5.344293E+11	0.00009750	0.00156836	16.08574712	2538.34185	60000.00000
52263637.	5.270283E+11	0.00009917	0.00158993	16.03291833	2542.31087	60000.00000
52573503.	5.129122E+11	0.00010250	0.00163324	15.93408859	2547.79590	60000.00000
52737505.	4.983071E+11	0.00010583	0.00167309	15.80870926	2549.90734	60000.00000
52868968.	4.842959E+11	0.00010917	0.00171242	15.68627179	2545.16518	60000.00000
52868968.	4.699464E+11	0.00011250	0.00175500	15.59999907	2545.65388	60000.00000
53164717.	4.589760E+11	0.00011583	0.00180053	15.54415762	2549.27416	60000.00000
53280801.	4.471116E+11	0.00011917	0.00183888	15.43112934	2549.11916	60000.00000
53394165.	4.358707E+11	0.00012250	0.00187749	15.32644165	2543.39864	60000.00000
53506242.	4.252152E+11	0.00012583	0.00191626	15.22855604	2543.68382	60000.00000
53616997.	4.150993E+11	0.00012917	0.00195519	15.13697040	2547.40473	60000.00000
53726400.	4.054823E+11	0.00013250	0.00199429	15.05123627	2549.50494	60000.00000
53834066.	3.963244E+11	0.00013583	0.00203358	14.97117770	2548.81944	60000.00000
53939455.	3.875889E+11	0.00013917	0.00207313	14.89675605	2543.63671	60000.00000
54043899.	3.792554E+11	0.00014250	0.00211281	14.82673323	2539.27004	60000.00000
54147384.	3.712963E+11	0.00014583	0.00215262	14.76082599	2543.89527	60000.00000
54249882.	3.636864E+11	0.00014917	0.00219257	14.69877470	2547.23892	60000.00000
54351378.	3.564025E+11	0.00015250	0.00223265	14.64034545	2549.28058	60000.00000
54451856.	3.494237E+11	0.00015583	0.00227288	14.58532584	2549.99915	60000.00000
54550035.	3.427227E+11	0.00015917	0.00231338	14.53433597	2545.52234	60000.00000
54647518.	3.362924E+11	0.00016250	0.00235399	14.48610985	2540.85459	60000.00000
54744359.	3.301167E+11	0.00016583	0.00239471	14.44045866	2536.16833	60000.00000
54853459.	3.242569E+11	0.00016917	0.00243600	14.40000021	2540.87810	60000.00000
55142332.	3.196657E+11	0.00017250	0.00248400	14.40000021	2545.65390	60000.00000
55423428.	3.152043E+11	0.00017583	0.00253200	14.40000021	2548.67933	60000.00000
55423428.	3.093401E+11	0.00017917	0.00257442	14.36885226	2549.84972	60000.00000
55423428.	3.036900E+11	0.00018250	0.00260979	14.30024135	2549.13358	60000.00000
55423428.	2.982427E+11	0.00018583	0.00264534	14.23501432	2546.05587	60000.00000
55423428.	2.929873E+11	0.00018917	0.00268093	14.17232358	2542.97028	60000.00000
55423428.	2.879139E+11	0.00019250	0.00271657	14.11203611	2539.87685	60000.00000

55423428.	2.830132E+11	0.00019583	0.00275225	14.05403388	2536.77543	60000.00000
55423428.	2.782766E+11	0.00019917	0.00278798	13.99820316	2533.66596	60000.00000
55423428.	2.736959E+11	0.00020250	0.00282375	13.94443882	2533.02959	60000.00000
55423428.	2.692636E+11	0.00020583	0.00285957	13.89264214	2536.39456	60000.00000
55423428.	2.649726E+11	0.00020917	0.00289544	13.84271872	2539.39752	60000.00000
55423428.	2.608161E+11	0.00021250	0.00293208	13.79801810	2542.16278	60000.00000
55423428.	2.567881E+11	0.00021583	0.00296938	13.75775063	2544.60684	60000.00000
55423428.	2.528826E+11	0.00021917	0.00300674	13.71898305	2546.60243	60000.00000
55423428.	2.490941E+11	0.00022250	0.00304417	13.68165314	2548.14424	60000.00000
55424390.	2.454217E+11	0.00022583	0.00308165	13.64570081	2549.22678	60000.00000
55440702.	2.419231E+11	0.00022917	0.00311920	13.61107028	2549.84446	60000.00000
55456705.	2.385235E+11	0.00023250	0.00315685	13.57785380	2549.47440	60000.00000
55487355.	2.320029E+11	0.00023917	0.00323257	13.51596773	2543.91086	60000.00000
55517712.	2.258348E+11	0.00024583	0.00330843	13.45800412	2538.32292	60000.00000
55547782.	2.199912E+11	0.00025250	0.00338443	13.40366471	2532.71002	60000.00000
55577548.	2.144471E+11	0.00025917	0.00346057	13.35267699	2527.07184	60000.00000
55607002.	2.091799E+11	0.00026583	0.00353686	13.30479848	2526.33669	60000.00000
55618864.	2.041059E+11	0.00027250	0.00361730	13.27450883	2534.17965	60000.00000
55622679.	1.992454E+11	0.00027917	0.00369974	13.25278509	2540.82826	60000.00000
55625765.	1.946091E+11	0.00028583	0.00378247	13.23312986	2545.71474	60000.00000
55628098.	1.901815E+11	0.00029250	0.00386552	13.21544445	2548.78585	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 55423.42750 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 = 23000.000 lbs
Specified moment at pile head = 25428000.000 in-lbs
Specified axial load at pile head = 32000.000 lbs

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. p lbs/in	Es*h F/L
0.000	1.351	2.54E+07	23000.	-0.008616	701.789	9.66E+11	0.000	0.000
43.680	1.000	2.64E+07	23000.	-0.007443	729.512	9.65E+11	0.000	0.000
87.360	0.701625	2.74E+07	20054.	-0.006222	756.653	9.63E+11	-277.365	2158.439
131.040	0.457282	2.79E+07	-3655.512	-0.004962	768.716	9.62E+11	-598.362	7144.511
174.720	0.268008	2.71E+07	-34372.	-0.003710	747.006	9.64E+11	-776.546	15820.
218.400	0.132115	2.48E+07	-68470.	-0.002530	685.739	9.68E+11	-755.555	31225.
262.080	0.044960	2.12E+07	-97056.	-0.001490	586.072	9.75E+11	-513.223	62326.
305.760	-0.000893	1.66E+07	-1.08E+05	-0.000646	461.396	9.87E+11	13.705	83780.
349.440	-0.019566	1.20E+07	-1.01E+05	-0.000337	335.839	4.54E+12	231.398	64574.
393.120	-0.032077	7.86E+06	-88676.	-0.000242	222.233	4.57E+12	335.826	57163.
436.800	-0.041286	4.33E+06	-71668.	-0.000185	126.128	4.60E+12	455.996	60305.
480.480	-0.048665	1.69E+06	-48464.	-0.000157	53.849	4.60E+12	609.306	68362.
524.160	-0.055305	2.02E+05	-18140.	-0.000149	13.381	4.60E+12	782.998	77301.

Please note that because this analysis makes computations of ultimate moment capacity and pile response using nonlinear bending stiffness that the above values of total stress due to combined axial stress and bending may not be representative of actual conditions.

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 1.35115528 in
Computed slope at pile head = -0.00861622
Maximum bending moment = 27890605. lbs-in
Maximum shear force = -108007.73069 lbs
Depth of maximum bending moment = 125.58000 in
Depth of maximum shear force = 305.76000 in
Number of iterations = 57
Number of zero deflection points = 1

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= 23000.	M= 2.54E+07	32000.0000	1.3512	2.7891E+07	-108008.

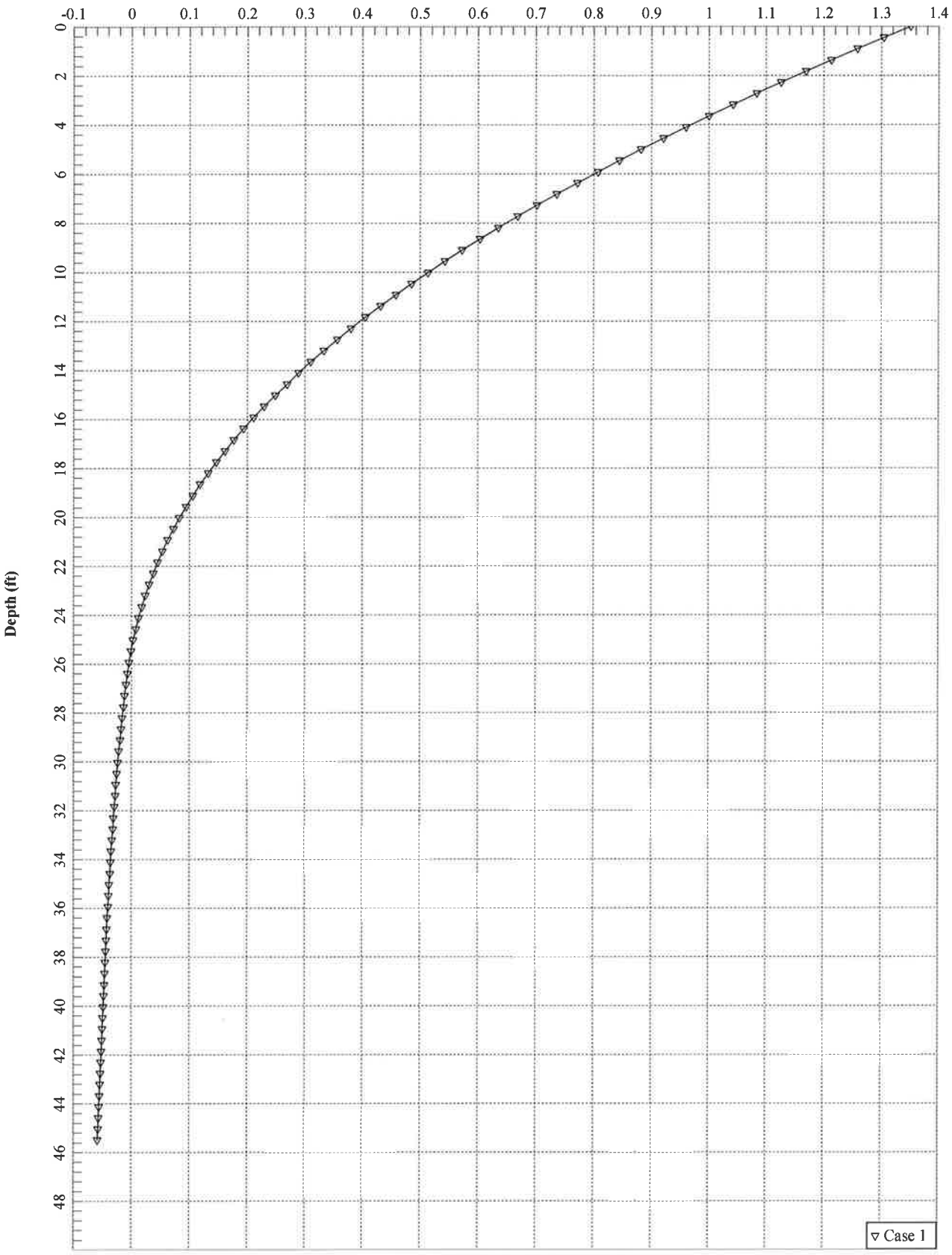
Computed Pile-head Stiffness Matrix Members
K22, K23, K32, K33 for Superstructure

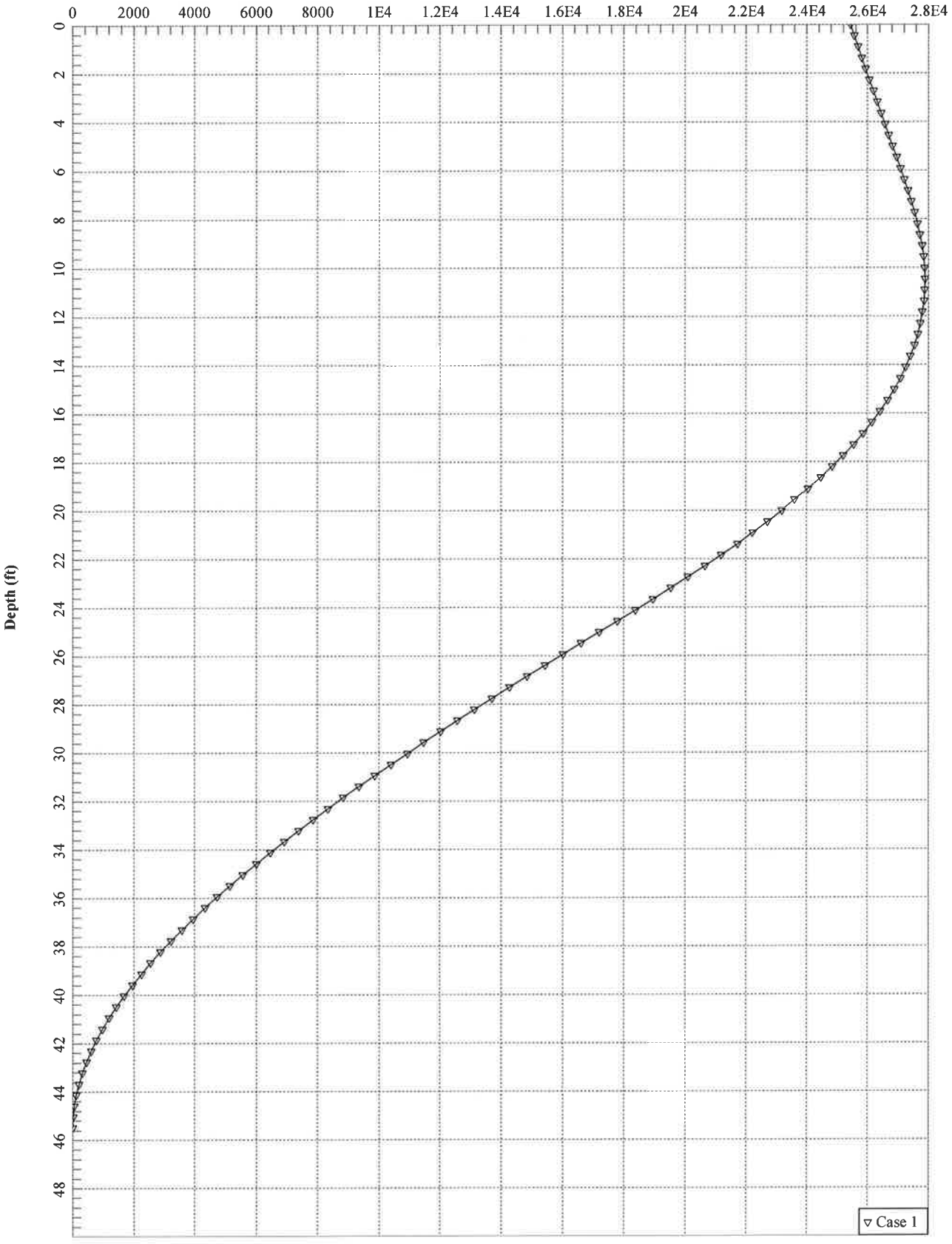
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00239143	2300.00003	392558.15684	961769.18692	1.641523E+08
0.00719891	6923.68990	1181718.	961769.18692	1.641523E+08
0.01141000	10973.78886	1872978.	961769.18692	1.641523E+08
0.01439782	13847.37980	2363436.	961769.18692	1.641523E+08
0.01671535	16076.31010	2743864.	961769.18692	1.641523E+08
0.01860891	17897.47876	3054696.	961769.18692	1.641523E+08
0.02020990	19437.25492	3317501.	961769.18692	1.641523E+08
0.02159673	20771.06970	3545153.	961769.18692	1.641523E+08
0.02282001	21947.57772	3745957.	961769.18692	1.641523E+08
0.02391426	23000.00000	3925582.	961769.18692	1.641523E+08

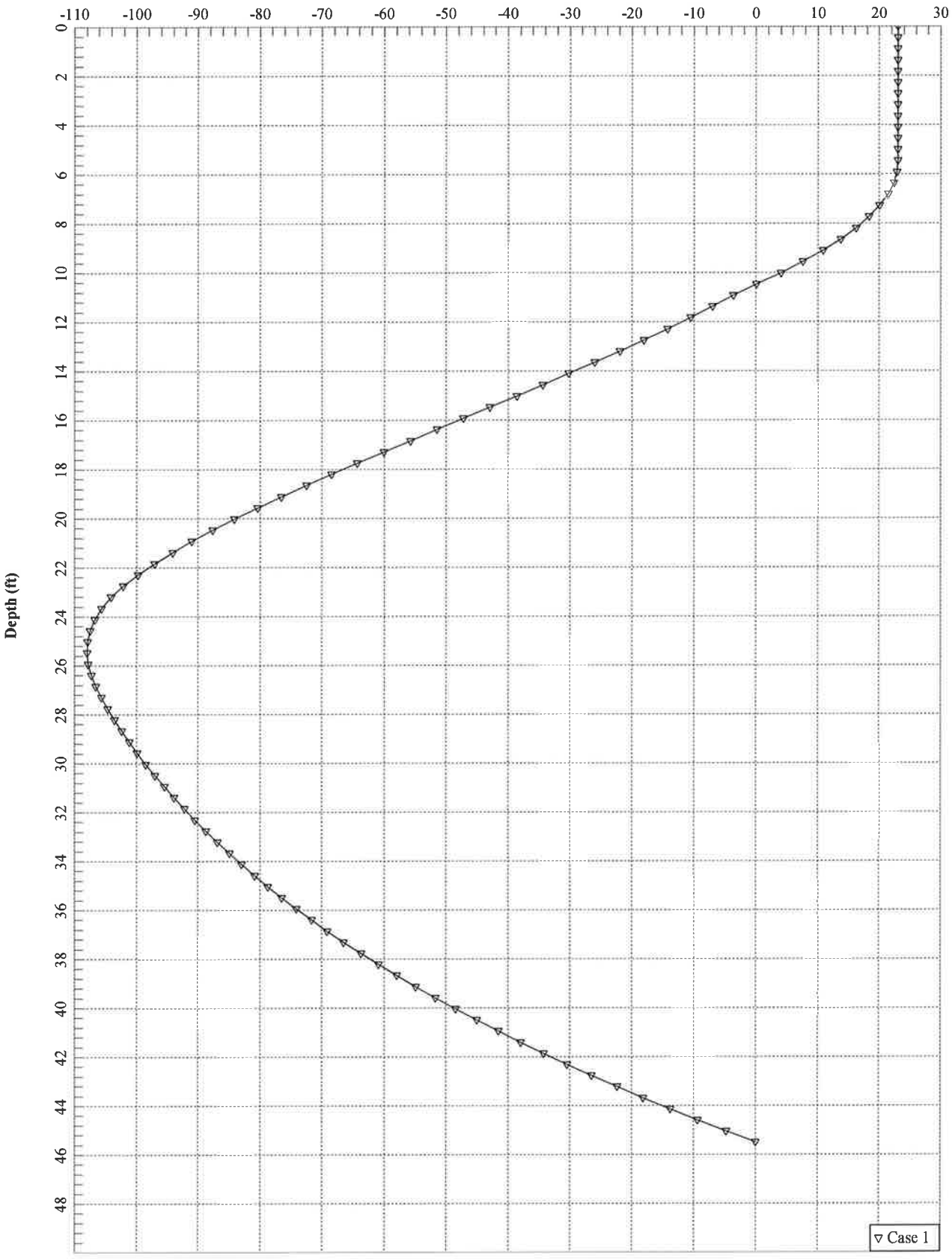
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00006051	9932.24436	2542800.	1.641523E+08	4.202540E+10
0.00018265	29907.35763	7654591.	1.637406E+08	4.190832E+10
0.00029102	47409.02609	12132239.	1.629044E+08	4.168816E+10
0.00036941	59809.29602	15309181.	1.619056E+08	4.144242E+10
0.00079170	71145.19093	17773409.	89864279.	2.244979E+10
0.00114994	83194.01869	19786830.	72346154.	1.720678E+10
0.00136484	92990.39005	21489153.	68132571.	1.574476E+10
0.00155425	101995.61776	22963772.	65623881.	1.477487E+10
0.00169771	109367.07596	24264479.	64420317.	1.429247E+10
0.00182865	116025.19346	25428000.	63448628.	1.390536E+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)
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
▽ Case 1


Bending Moment (in-kips)
0
2000
4000
6000
8000
1E4
1.2E4
1.4E4
1.6E4
1.8E4
2E4
2.2E4
2.4E4
2.6E4
2.8E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Case 1


Shear Force (kips)
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Case 1

SITE NAME	BLOOMFIELD 3 CT	ECP - CELL #	8	96
LATITUDE	41.828486	LONGITUDE	-72.733233	
700 tilt change plus RET antenna swap outs and 40W to 60W RRH upgrades. The 60W 4 port 700 RRH will be connected to the low band ports on the AWS and PCS antenna. Please note the electrical tilt for 700 are on the SBNHH antennas		SAVE BUTTON		
		STRUCTURE TYPE	MONOPOLE	

700 Mhz - LTE Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	700 MHz eNodeB	700 MHz eNodeB	700 MHz eNodeB
ANTENNA TYPE	BXA-70063-6CF-EDIN-2	SLCP 2X6014	SLCP 2X6014
QTY OF ANTENNAS PER FACE	leave as placeholder	leave as placeholder	leave as placeholder
ORIENTATION (DEG)	0	120	270
DOWN TILT (MECH/DEG)	0	4	2
RAD CTR (FT AGL)	105	105	105
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

700 Mhz - LTE Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	700 MHz eNodeB	700 MHz eNodeB	700 MHz eNodeB
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	120	270
DOWN TILT (MECH/DEG)	4 elect	5 elect	4 elect
RAD CTR (FT AGL)	105	105	105
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-700U	1 ALU RH_2X60-700U	1 ALU RH_2X60-700U
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0B	Cellular Modcell 4.0B	Cellular Modcell 4.0B
ANTENNA TYPE	BXA-80080-6CF-EDIN-2	BXA-80063-4BF-EDIN-0	BXA-80080-4CF-EDIN-0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	120	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	105	105	105
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	2	2	2

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0B	Cellular Modcell 4.0B	Cellular Modcell 4.0B
ANTENNA TYPE	BXA-80080-6CF-EDIN-2	BXA-80063-4BF-EDIN-0	BXA-80080-4CF-EDIN-0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	120	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	105	105	105
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	0	0	0
DIPLEX WITH LTE CABLE			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	BXA-171085-12BF-EDIN-0	BXA-171063-12BF-EDIN-0	BXA-171085-12BF-EDIN-0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	120	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	105	105	105
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	120	270
DOWN TILT (MECH/DEG)	2 elect	2 elect	2 elect
RAD CTR (FT AGL)	105	105	105
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	remove diplexing	remove diplexing	remove diplexing
RRH - QTY/MODEL	1 ALU RH_2X60-PCS	1 ALU RH_2X60-PCS	1 ALU RH_2X60-PCS
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX			

AWS - LTE ANTENNA ADD	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz eNodeB		2100 MHz eNodeB		2100 MHz eNodeB	
ANTENNA TYPE	BXA-171085-8BF-EDIN-0		BXA-171063-8BF-EDIN-0		BXA-171085-8BF-EDIN-0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	0		120		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	105		105		105	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

AWS - LTE ANTENNA ADD	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz eNodeB		2100 MHz eNodeB		2100 MHz eNodeB	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QTY OF ANTENNAS PER FACE	same as 700 antenna		same as 700 antenna		same as 700 antenna	
ORIENTATION (DEG)	0		120		270	
DOWN TILT (MECH/DEG)	2 elect		2 elect		2 elect	
RAD CTR (FT AGL)	105		105		105	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X60-AWS	1	ALU RH_2X60-AWS	1	ALU RH_2X60-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

NUMBER OF CABLE'S NEEDED						ESTIMATED CABLE LENGTH			
MAINLINE SIZE		TOTAL # OF MAINLINES			12	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS			36	TOP JUMPER (FT)			
		MAIN CABLE #	12	+	0	TOP JUMPER #	24	+	12
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES			2	FIBER LINE MODEL #			HB158-1-08U8-S8J18
JUMPER SIZE	1 1/4"	TOTAL # OF TOP JUMPERS			6	TOP JUMPER MODEL #			HB114-1-08U4-S4J18
Fiber Cable Ordering		FIBER CABLE #	1	+	1	TOP JUMPER #	3	+	3

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - Block	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-2155	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-1755	RX - 776-787	700 Mhz / AWS (Watts)	40

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

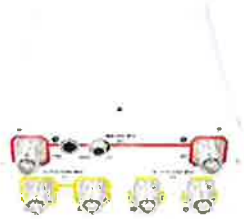
RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Mark Brauer	Robert Hesselbach	MB	4/17/2015

Site Configuration

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.



SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2 x 1710–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1710–1880	1850–1990	1920–2180	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1710–1880	1850–1990	1920–2180	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2360 MHz | 698 – 896 MHz

Mechanical Specifications

Product Specifications

SBNHH-1D65B

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

Dimensions

Depth	181.0 mm | 7.1 in
Length	1828.0 mm | 72.0 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

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

Regulatory Compliance/Certifications

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

Included Products

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

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

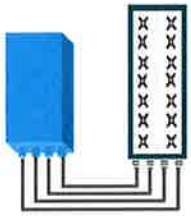
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

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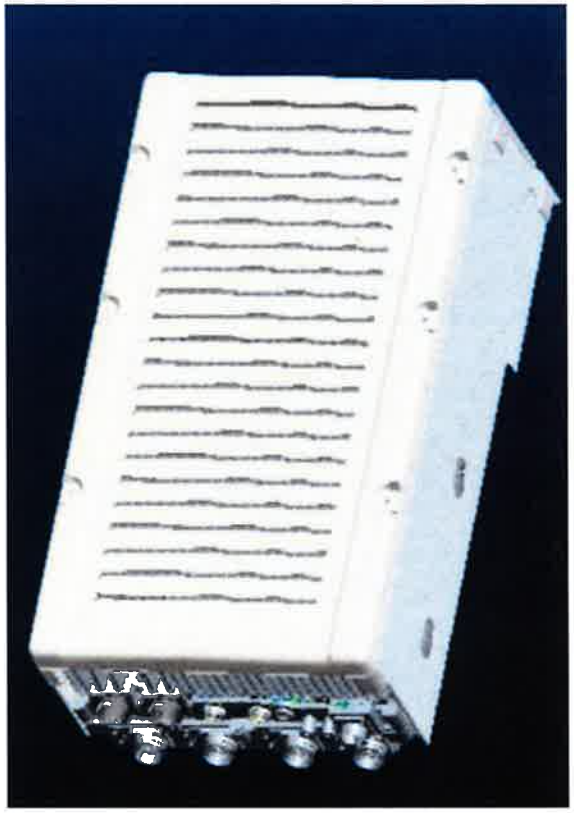
TECHNICAL SPECIFICATIONS

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.)

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ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

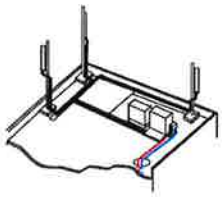
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

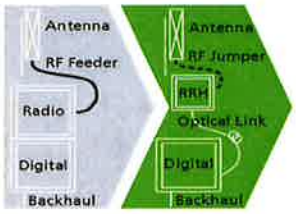
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

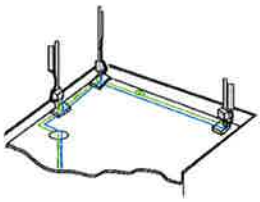
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

36.7"x10.6"x5.8"

- HxWxD : ~~518x285x186mm~~
  (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

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AT THE SPEED OF IDEAS™

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

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

Features/Benefits

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

Technical Specifications

Mechanical Specifications

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

Electrical Specifications

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

* This data is provisional and subject to change.