Robinson+Cole

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September 20, 2016

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

Re: **Notice of Exempt Modification – Facility Modification**
623 Honeyspot Road, Stratford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 82-foot level of the existing 102-foot tower at 623 Honeyspot Road in Stratford, Connecticut (the "Property"). The tower and underlying property are owned by Becker LLC. The Council approved Cellco's use of this tower in 1999. Cellco now intends to modify its facility by replacing six (6) existing antennas with three (3) model SBNHH-1D65B, 700/1900 MHz antennas and three (3) model SBNHH-1D65B, 1900 MHz antennas, all at the same 82-foot level on the tower. Cellco also intends to replace six (6) remote radio heads ("RRHs") and install three (3) new RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being sent to John Harkins, Mayor for the Town of Stratford. A copy of this letter is also being sent to Becker LLC, the tower and property 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).

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1. The proposed modifications will not result in an increase in the height of the existing structure. Cellco's new antennas and RRHs will be installed at a centerline height of 82 feet on the existing 102-foot tower.

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

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

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

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

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

A copy of the Town Assessor's Parcel Map and property owner information is included in Attachment 4.

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
John Harkins, Stratford Mayor
Becker LLC
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

SBNHH-1D65B

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	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 (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	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, beampeak to 20° above beampeak, 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 Type	Sector with internal RET
Band	Multiband
Brand	DualPol®
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground

Product Specifications

SBNHH-1D65B

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

Dimensions

Depth	180.0 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight, without mounting kit	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

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

Packed Dimensions

Depth	296.0 mm | 11.7 in
Length	2025.0 mm | 79.7 in
Width	390.0 mm | 15.4 in
Shipping Weight	31.0 kg | 68.3 lb

Regulatory Compliance/Certifications

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

Product Specifications

SBNHH-1D65B

Included Products

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

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

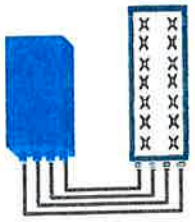
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

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

ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-1900A-4R FOR BAND 2/25 APPLICATIONS

The Alcatel-Lucent RRH2x60-1900A-4R is a high power, small form factor Remote Radio Head operating in the PCS 1900MHz frequency band for WCDMA and LTE technologies. 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 RRH2x60-1900A-4R 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 RRH2x60-1900A-4R integrates all the latest technologies. This allows operators 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.

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 RRH2x60-1900A-4R 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).

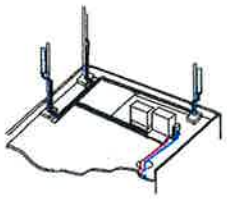
The Alcatel-Lucent RRH2x60-1900A-4R is a very cost-effective solution to deploy LTE MIMO.

EASY INSTALLATION

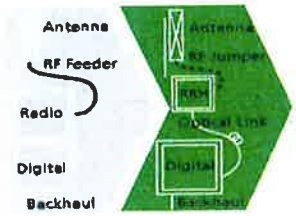
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-1900A-4R installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-1900A-4R is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

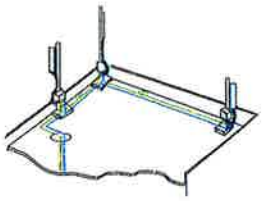
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-190A-4R is compact and weighs about 21 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-1900A-4R integrates two power amplifiers of 60W rating (at each antenna connector)
- RRH2x60-1900A-4R can operate WCDMA only, LTE only or a mix of WCDMA and LTE
- RRH2x60-1900A-4R offers the possibility for WCDMA (non MIMO) to operate the two radio chains independently (2 blocks of 20 MHz anywhere in the band)
- RRH2x60-1900A-4R is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

- HxWxD : 500x285x208 mm (30l with solar shield)
- Weight : 21 kg (46 lbs) (with solar shield)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption: 460W typ. @2x60W (100%RF)

RF Characteristics

- Supported spectrum: DL 1930-1990 / UL 1850-1910
- Frequency band: 3GPP band 2/25
- Output power: 2x60W at antenna connectors
- Technology supported: W-CDMA and LTE
- Instantaneous bandwidth: 20 MHz (MIMO) or 2x20 MHz (non MIMO)
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -124.8dBm for WCDMA and -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 15km 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: ETS300-019-1-4 class4.1E
- Ingress Protection: IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

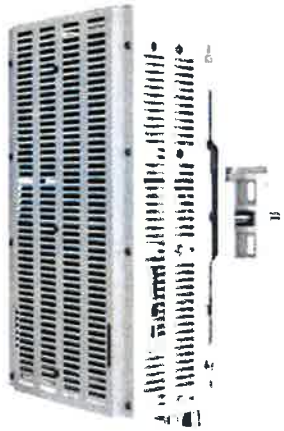
- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089
- Safety : IEC60950-1, EN 60825-1
- Regulatory: CE Mark-European Directive 2002/95/EC (RoHS), 2002/96/EC (WEEE), 1999/5/EC (R&TTE)
- Health : EN 50385

Alcatel·Lucent

B66A RRH 4X45 - PHYSICAL CHARACTERISTICS- TARGET 15.1

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

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



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

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm²(8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

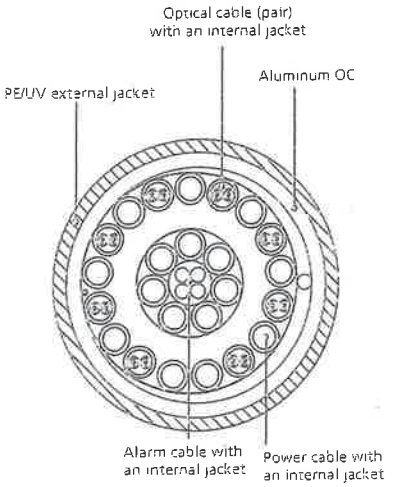


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Stratford								
Tower Height: 102Ft.								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*AT&T	2	414	90	850	0.0422	0.5667	0.74%	
*AT&T	2	656	90	1900	0.0669	1.0000	0.67%	
*AT&T	2	1298	90	700	0.1323	0.4667	2.83%	
*AT&T	2	439	90	850	0.0447	0.5667	0.79%	
*AT&T	2	2204	90	1900	0.2246	1.0000	2.25%	
*AT&T	2	2154	90	2300	0.2195	1.0000	2.20%	
Clearwire	2	153	72	2496	0.0253	1.0000	0.25%	
Clearwire	1	211	72	11 GHz	0.0174	1.0000	0.17%	
*Sprint	4	69	72	1900	0.0229	1.0000	0.23%	
*Sprint	1	39	72	850	0.0032	0.5667	0.06%	
*Sprint	2	69	72	2500	0.0114	1.0000	0.11%	
Nextel	9	100	58	851	0.1197	0.5673	2.11%	
MetroPCS	7	735	104.5	2310	0.1907	1.0000	1.91%	
Com-tronics							4.26%	
Verizon PCS	**1**	2240	**82**	**0.1198**	**1970**	**1.0000**	**11.98%**	
Verizon Cellular	**9**	422	**82**	**0.2031**	**869**	**0.5793**	**35.06%**	
Verizon AWS	**1**	2199	**82**	**0.1176**	**2145**	**1.0000**	**11.76%**	
Verizon 700	**1**	564	**82**	**0.0302**	**746**	**0.4973**	**6.06%**	
								83.44%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

102-ft Existing EEI Monopole

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Stratford

627 Honeyspot Road
Stratford, CT

CENTEK Project No. 16001.32

Date: September 7, 2016

Prepared for:

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

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

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Introduction

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

The host tower is a 102-ft tall, three-section, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 5553 dated September 9, 1999. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis report prepared by URS Corporation job no; 36931189.00000 (VZ5-042), dated April 12, 2010. Tower reinforced was obtained from a previous structural analysis prepared by Destek dated March 8, 2016.

Antenna and appurtenance information were obtained from the aforementioned Destek structural report, visual verification from grade conducted by Centek personnel on August 25, 2016 and a Verizon RF data sheet.

The tower is made up of two (2) tapered vertical sections consisting of A572-65 pole sections slip joint connected and one (1) 13" diameter pipe flange connected to the top of the tower. The diameter of the pole (flat-flat) is 13.00-in at the top and 40.00-in at the base.

Verizon proposes the removal of six (6) panel antennas and six (6) remote radio heads and the installation of six (6) panel antennas, nine (9) remote radio heads and one (1) main distribution box mounted to the existing 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:

- METROPCS (EXISTING):
  Antennas: Six (6) Kathrein 800-10504 panel antennas mounted on three (3) T-Arms with a RAD center elevation of 101-ft above grade level.
  Coax Cables: Twelve (12) 7/8" ∅ coax cables running inside the monopole.
- AT&T (EXISTING):
  Antennas: Three (3) Powerwave 7770.00 panel antennas, three (3) KMW AM-X-CD-16-65-00T panel antennas, three (3) Quintel QS66512-3 panel antennas, twelve (12) LGP21401 TMA's, six (6) TPX-070821 diplexers, six (6) Ericsson RRUS-11, three (3) Ericsson RRUS-32 and two (2) Raycap DC6-48-60-18-8F surge arrestors mounted on a platform with a RAD center elevation of 90-ft above grade level.
  Coax Cables: Twelve (12) 1-1/4" ∅ coax cables, one (1) fiber cable and two (2) dc control cables running on the inside of the existing monopole
- SPRINT (EXISTING):
  Appurtenances: Six (6) 1900 remote radio heads, three (3) 800 remote radio heads and three (3) TD-RRH8x20 remote radio heads flush mounted with an elevation of 74-ft above grade level.
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM14 panel antennas and two (2) 2-ft microwave dishes mounted on three (3) T-arms with a RAD center elevation of 72-ft above grade level.
  Coax Cables: Six (6) 1-1/4" ∅ cables on the exterior of the existing monopole

- TOWN (EXISTING):
  Antennas: One (1) 20-ft Omni-directional whip antenna, two (2) 12-ft Omni-directional whip antennas and three (3) 10-ft Omni-directional whip antennas mounted on a T-Arm with an elevation of 28-ft above grade level.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Six (6) Antel BXA-70063-6CF panel antennas and one (1) Raycap RC2DC-3315-PF-48 main distribution box mounted on a platform with a RAD center elevation of 82-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber cable running inside the monopole running inside the monopole.
- VERIZON (EXISTING TO REMOVE):
  Antennas: Three (3) RYMSA MG D3-800T0 panel antennas, three (3) Antel BXA-171063-8BF panel antennas, three (3) Alcatel-Lucent RRH2x40-700 remote radio heads and three (3) Alcatel-Lucent RRH2x40-AWS remote radio heads mounted on a platform with a RAD center elevation of 82-ft above grade level.
- **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 RRH4x45/2x90-AWS remote radio heads and one (1) Raycap RC2DC-3315-PF-48 main distribution box mounted on a platform with a RAD center elevation of 82-ft above grade level.
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running inside the monopole.

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 coax cables to be installed as indicated in this report.

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Stratford; v = 110 mph (3 second gust) equivalent to v = 90 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	Appendix-K wind speed controls.	
Load Cases:	Load Case 1; 90 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; 78 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 78 mph wind speed velocity represents 75% of the wind pressure generated by the 90 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **98.2%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L2)	65.00'-89.73'	98.2%	**PASS**

(1) Wall thickness increased in bottom 65-ft of tower to account for previous reinforcement.

Foundation and Anchors

The existing foundation consists of a 6.0 ∅ x 16.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned URS structural report. The base of the tower is connected to the foundation by means of (10) 2.25"∅, ASTM A615-75 anchor bolts embedded 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	22 kips
	Compression	26 kips
	Moment	1587 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	68.4%	**PASS**
	Lateral Deflection	0.60 in.(1)	**PASS**

(2) Lateral deflection typically limited to 1.0 in. for monopole tower structures.

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	52.9%	**PASS**
Base Plate	Bending	59.6%	**PASS**

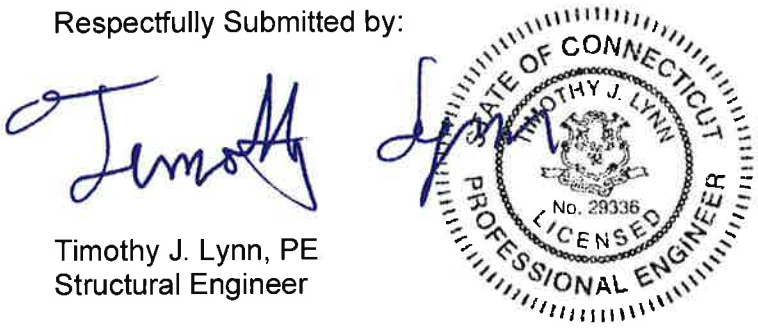
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

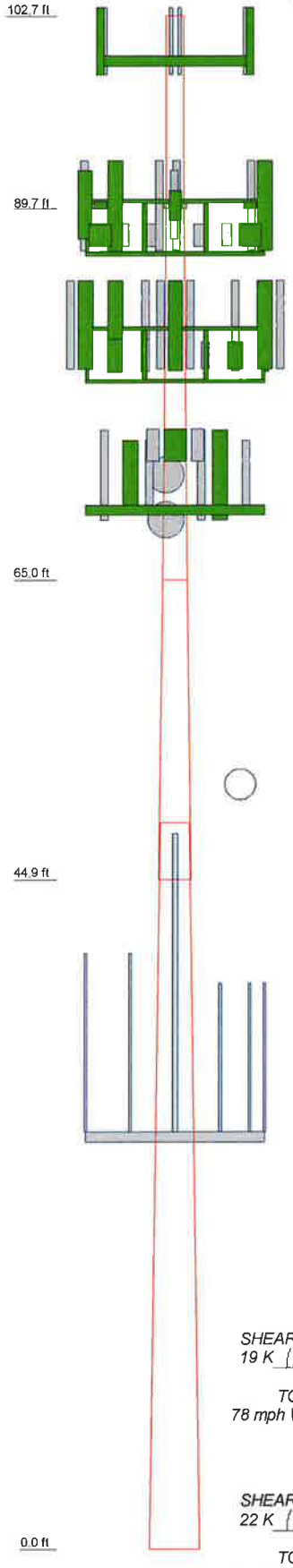
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

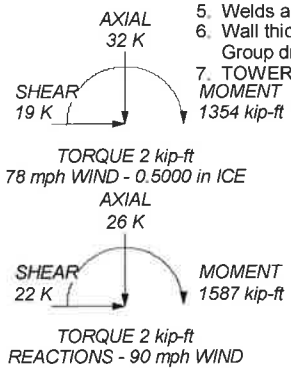
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

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

Section	1	2	3	4
Length (ft)	12.92	24.73	20.07	48.78
Number of Sides	1	18	18	18
Thickness (in)	0.2500	0.2500	0.6000	0.6000
Socket Length (ft)			3.85	
Top Dia (in)	13.0000	13.0000	20.6140	24.4073
Bot Dia (in)	13.0000	20.6140	26.7925	40.0000
Grade	A53-B-35	A53-B-35	A572-65	A572-65
Weight (K)	0.4	1.1	3.0	10.0





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) 800-10504 (MetroPCS)	101	SBNHH-1D65B (Verizon Proposed)	82
(2) 800-10504 (MetroPCS)	101	BXA-70063/6CF (Verizon Existing)	82
(2) 800-10504 (MetroPCS)	101	RC2DC-3315-PF-48 (Verizon Existing)	82
4-ft x 4-ft T-Arm (MetroPCS)	100	RC2DC-3315-PF-48 (Verizon Proposed)	82
4-ft x 4-ft T-Arm (MetroPCS)	100		
4-ft x 4-ft T-Arm (MetroPCS)	100	RRH4x45/2x90-AWS (Verizon Proposed)	80
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	90	RRH4x30-B13 (Verizon Proposed)	80
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	90	RRH4x30-B13 (Verizon Proposed)	80
		RRH4x30-B13 (Verizon Proposed)	80
Valmont Uni-Tri Bracket (ATI Existing)	90	RRH2x60-PCS (Verizon Proposed)	80
7770.00 (ATI Existing)	90	RRH2x60-PCS (Verizon Proposed)	80
AM-X-CD-16-65-00T-RET(72") (ATI Existing)	90	RRH2x60-PCS (Verizon Proposed)	80
		RRH4x45/2x90-AWS (Verizon Proposed)	80
QS66512-3 (ATI Existing)	90		
7770.00 (ATI Existing)	90	RRH4x45/2x90-AWS (Verizon Proposed)	80
AM-X-CD-16-65-00T-RET(72") (ATI Existing)	90	10' Platform w/rails (Verizon Existing)	80
QS66512-3 (ATI Existing)	90	(2) FD-RRH 4x40 1900 (Sprint)	74
7770.00 (ATI Existing)	90	(2) FD-RRH 4x40 1900 (Sprint)	74
AM-X-CD-16-65-00T-RET(72") (ATI Existing)	90	(2) FD-RRH 4x40 1900 (Sprint)	74
		FD-RRH 2x50 800 (Sprint)	74
QS66512-3 (ATI Existing)	90	FD-RRH 2x50 800 (Sprint)	74
(4) LGP21401 TMA (ATI Existing)	90	FD-RRH 2x50 800 (Sprint)	74
(4) LGP21401 TMA (ATI Existing)	90	TD-RRH8x20-25 (Sprint)	74
(4) LGP21401 TMA (ATI Existing)	90	TD-RRH8x20-25 (Sprint)	74
(2) TPX-070821 (ATI Existing)	90	TD-RRH8x20-25 (Sprint)	74
(2) TPX-070821 (ATI Existing)	90	APXVTM14 (Sprint)	72
(2) TPX-070821 (ATI Existing)	90	APXVSPP18-C-A20 (Sprint)	72
Platform w/rails (ATI Existing)	86.5	APXVTM14 (Sprint)	72
(2) RRUS-11 (ATI Existing)	88	APXVSPP18-C-A20 (Sprint)	72
(2) RRUS-11 (ATI Existing)	88	APXVTM14 (Sprint)	72
RRUS-32 (ATI Existing)	88	APXVSPP18-C-A20 (Sprint)	72
RRUS-32 (ATI Existing)	88	A-ANT-23G-2	72
RRUS-32 (ATI Existing)	88	A-ANT-23G-2	72
(2) RRUS-11 (ATI Existing)	88	Rohn T-Arm (1) (Sprint)	70
BXA-70063/6CF (Verizon Existing)	82	Rohn T-Arm (1) (Sprint)	70
SBNHH-1D65B (Verizon Proposed)	82	Rohn T-Arm (1) (Sprint)	70
SBNHH-1D65B (Verizon Proposed)	82	12' x 2" Dia Omni	28
BXA-70063/6CF (Verizon Existing)	82	10' x 2" Dia Omni	28
BXA-70063/6CF (Verizon Existing)	82	10' x 2" Dia Omni	28
SBNHH-1D65B (Verizon Proposed)	82	10' x 2" Dia Omni	28
SBNHH-1D65B (Verizon Proposed)	82	Rohn T-Arm (1)	28
BXA-70063/6CF (Verizon Existing)	82	20' x 3" Dia Omni	28
BXA-70063/6CF (Verizon Existing)	82	12' x 2" Dia Omni	28
SBNHH-1D65B (Verizon Proposed)	82		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 78 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. Wall thickness increased in tower section 2 to account for reinforcement design per Atlantis Group drawings dated 10.8.14
7. TOWER RATING: 98.2%

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

Job: 16001.32 - Stratford			
Project: 102' EEI Monopole - 627 Honeyspot Road Stratford,			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 09/07/16	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 90 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 78 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..
Wall thickness increased in tower section 2 to account for reinforcement design per Atlantis Group drawings dated 10.8.14.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

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	102.65-89.73	12.92	0.00	Round	13.0000	13.0000	0.2500		A53-B-35 (35 ksi)
L2	89.73-65.00	24.73	0.00	18	13.0000	20.6140	0.2500	1.0000	A572-65 (65 ksi)
L3	65.00-44.93	20.07	3.85	18	20.6140	26.7925	0.6000	2.4000	A572-65 (65 ksi)
L4	44.93-0.00	48.78		18	24.4073	40.0000	0.6000	2.4000	A572-65

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 (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	13.0000	10.0138	203.5623	4.5087	6.5000	31.3173	407.1246	5.0039	0.0000	0
	13.0000	10.0138	203.5623	4.5087	6.5000	31.3173	407.1246	5.0039	0.0000	0
L2	13.2005	10.1171	207.7854	4.5263	6.6040	31.4636	415.8441	5.0595	1.8480	7.392
	20.9320	16.1588	846.5910	7.2292	10.4719	80.8440	1694.2960	8.0810	3.1881	12.752
L3	20.9320	38.1147	1928.8449	7.1050	10.4719	184.1922	3860.2278	19.0610	2.5721	4.287
	27.2058	49.8810	4323.4106	9.2983	13.6106	317.6505	8652.5100	24.9452	3.6595	6.099
L4	26.0335	45.3386	3246.5743	8.4516	12.3989	261.8437	6497.4205	22.6736	3.2397	5.399
	40.6171	75.0334	14715.8140	13.9870	20.3200	724.2034	29450.9913	37.5238	5.9840	9.973

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	Double Angle Stitch Bolt Spacing Redundants in
L1 102.65-89.73				1	1	1			
L2 89.73-65.00				1	1	1			
L3 65.00-44.93				1	1	1			
L4 44.93-0.00				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
7/8 (MetroPCS)	C	No	Inside Pole	102.00 - 20.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1 1/4 (AT&T)	C	No	Inside Pole	90.00 - 20.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
Fiber Trunk (AT&T)	C	No	Inside Pole	90.00 - 20.00	1	No Ice	0.00	1.00
						1/2" Ice	0.00	1.00
DC Trunk (AT&T)	C	No	Inside Pole	90.00 - 20.00	2	No Ice	0.00	0.11
						1/2" Ice	0.00	0.11
1 5/8 (Verizon)	C	No	Inside Pole	82.00 - 20.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
HYBRIFLEX 1-5/8" (Verizon)	C	No	Inside Pole	82.00 - 20.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
HYBRIFLEX 1-5/8" (Verizon - Proposed)	C	No	Inside Pole	82.00 - 20.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
1 1/4 (Sprint)	C	No	CaAa (Out Of Face)	66.00 - 20.00	2	No Ice	0.16	0.66
						1/2" Ice	0.25	1.91
1 1/4 (Sprint)	C	No	CaAa (Out Of Face)	66.00 - 20.00	4	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91

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	102.65-89.73	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.08
L2	89.73-65.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.310	0.67
L3	65.00-44.93	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.222	0.72
L4	44.93-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	7.728	0.89

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	102.65-89.73	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.08
L2	89.73-65.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.510	0.67
L3	65.00-44.93	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	10.236	0.87
L4	44.93-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	12.714	1.08

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	102.65-89.73	0.0000	0.0000	0.0000	0.0000
L2	89.73-65.00	-0.0196	0.0113	-0.0304	0.0175
L3	65.00-44.93	-0.3481	0.2010	-0.5095	0.2941
L4	44.93-0.00	-0.1898	0.1096	-0.2926	0.1689

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
(2) 800-10504 (MetroPCS)	A	From Face	2.00 0.00 0.00	0.0000	101.00	No Ice 1/2" Ice	3.35 3.70	1.86 2.19	0.02 0.04
(2) 800-10504 (MetroPCS)	B	From Face	2.00 0.00 0.00	0.0000	101.00	No Ice 1/2" Ice	3.35 3.70	1.86 2.19	0.02 0.04
(2) 800-10504 (MetroPCS)	C	From Face	2.00 0.00 0.00	0.0000	101.00	No Ice 1/2" Ice	3.35 3.70	1.86 2.19	0.02 0.04
4-ft x 4-ft T-Arm (MetroPCS)	A	From Face	2.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	3.27 4.20	3.27 4.20	0.20 0.26
4-ft x 4-ft T-Arm (MetroPCS)	B	From Face	2.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	3.27 4.20	3.27 4.20	0.20 0.26
4-ft x 4-ft T-Arm (MetroPCS)	C	From Face	2.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	3.27 4.20	3.27 4.20	0.20 0.26
(2) RRUS-11 (AT&T Existing)	A	From Face	0.50 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
(2) RRUS-11 (AT&T Existing)	B	From Face	0.50 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
(2) RRUS-11 (AT&T Existing)	C	From Face	0.50 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
RRUS-32 (AT&T Existing)	A	From Face	0.50 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	0.00 0.00	2.76 3.02	0.08 0.10
RRUS-32 (AT&T Existing)	B	From Face	0.50 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	0.00 0.00	2.76 3.02	0.08 0.10
RRUS-32 (AT&T Existing)	C	From Face	0.50 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	0.00 0.00	2.76 3.02	0.08 0.10
DC6-48-60-18-8F Surge Arrestor (AT&T Existing)	C	From Face	0.50 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T Existing)	C	From Face	0.50 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
Valmont Uni-Tri Bracket (AT&T Existing)	C	None		0.0000	90.00	No Ice 1/2" Ice	1.75 1.94	1.75 1.94	0.29 0.31
7770.00 (AT&T Existing)	A	From Face	3.00 6.00 0.00	0.0000	90.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
AM-X-CD-16-65-00T-RET(72") (AT&T Existing)	A	From Face	3.00 4.00 0.00	0.0000	90.00	No Ice 1/2" Ice	8.26 8.81	4.64 5.09	0.05 0.10
QS66512-3 (AT&T Existing)	A	From Face	3.00 -6.00 0.00	0.0000	90.00	No Ice 1/2" Ice	8.40 8.95	6.80 7.27	0.11 0.17
7770.00 (AT&T Existing)	B	From Face	3.00 6.00 0.00	0.0000	90.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	0.04 0.07
AM-X-CD-16-65-00T-RET(7	B	From Face	3.00	0.0000	90.00	No Ice	8.26	4.64	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
2")			4.00			1/2" Ice	8.81	5.09	0.10
(AT&T Existing)			0.00						
QS66512-3	B	From Face	3.00	0.0000	90.00	No Ice	8.40	6.80	0.11
(AT&T Existing)			-6.00			1/2" Ice	8.95	7.27	0.17
			0.00						
7770.00	C	From Face	3.00	0.0000	90.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			6.00			1/2" Ice	6.31	3.27	0.07
			0.00						
AM-X-CD-16-65-00T-RET(7	C	From Face	3.00	0.0000	90.00	No Ice	8.26	4.64	0.05
2")			4.00			1/2" Ice	8.81	5.09	0.10
(AT&T Existing)			0.00						
QS66512-3	C	From Face	3.00	0.0000	90.00	No Ice	8.40	6.80	0.11
(AT&T Existing)			-6.00			1/2" Ice	8.95	7.27	0.17
			0.00						
(4) LGP21401 TMA	A	From Face	3.00	0.0000	90.00	No Ice	0.00	0.37	0.02
(AT&T Existing)			0.00			1/2" Ice	0.00	0.48	0.02
			0.00						
(4) LGP21401 TMA	B	From Face	3.00	0.0000	90.00	No Ice	0.00	0.37	0.02
(AT&T Existing)			0.00			1/2" Ice	0.00	0.48	0.02
			0.00						
(4) LGP21401 TMA	C	From Face	3.00	0.0000	90.00	No Ice	0.00	0.37	0.02
(AT&T Existing)			0.00			1/2" Ice	0.00	0.48	0.02
			0.00						
(2) TPX-070821	A	From Face	3.00	0.0000	90.00	No Ice	0.55	0.12	0.01
(AT&T Existing)			0.00			1/2" Ice	0.65	0.17	0.01
			0.00						
(2) TPX-070821	B	From Face	3.00	0.0000	90.00	No Ice	0.55	0.12	0.01
(AT&T Existing)			0.00			1/2" Ice	0.65	0.17	0.01
			0.00						
(2) TPX-070821	C	From Face	3.00	0.0000	90.00	No Ice	0.55	0.12	0.01
(AT&T Existing)			0.00			1/2" Ice	0.65	0.17	0.01
			0.00						
Platform w/rails	C	None		0.0000	88.50	No Ice	21.00	21.00	1.50
(AT&T Existing)						1/2" Ice	26.00	26.00	1.75
BXA-70063/6CF	A	From Face	4.00	0.0000	82.00	No Ice	7.73	4.16	0.01
(Verizon Existing)			-6.00			1/2" Ice	8.27	4.60	0.05
			0.00						
SBNHH-1D65B	A	From Face	4.00	0.0000	82.00	No Ice	8.33	5.34	0.04
(Verizon Proposed)			0.00			1/2" Ice	8.88	5.79	0.09
			0.00						
SBNHH-1D65B	A	From Face	4.00	0.0000	82.00	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	82.00	No Ice	7.73	4.16	0.01
(Verizon Existing)			6.00			1/2" Ice	8.27	4.60	0.05
			0.00						
BXA-70063/6CF	B	From Face	4.00	0.0000	82.00	No Ice	7.73	4.16	0.01
(Verizon Existing)			-6.00			1/2" Ice	8.27	4.60	0.05
			0.00						
SBNHH-1D65B	B	From Face	4.00	0.0000	82.00	No Ice	8.33	5.34	0.04
(Verizon Proposed)			0.00			1/2" Ice	8.88	5.79	0.09
			0.00						
SBNHH-1D65B	B	From Face	4.00	0.0000	82.00	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	B	From Face	4.00	0.0000	82.00	No Ice	7.73	4.16	0.01
(Verizon Existing)			6.00			1/2" Ice	8.27	4.60	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
BXA-70063/6CF	C	From Face	4.00	0.0000	82.00	No Ice	7.73	4.16	0.01
(Verizon Existing)			-6.00			1/2" Ice	8.27	4.60	0.05
			0.00						
SBNHH-1D65B	C	From Face	4.00	0.0000	82.00	No Ice	8.33	5.34	0.04
(Verizon Proposed)			0.00			1/2" Ice	8.88	5.79	0.09
			0.00						
SBNHH-1D65B	C	From Face	4.00	0.0000	82.00	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	C	From Face	4.00	0.0000	82.00	No Ice	7.73	4.16	0.01
(Verizon Existing)			6.00			1/2" Ice	8.27	4.60	0.05
			0.00						
RRH4x45/2x90-AWS	A	From Face	4.00	0.0000	80.00	No Ice	3.01	1.91	0.08
(Verizon Proposed)			4.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x45/2x90-AWS	B	From Face	4.00	0.0000	80.00	No Ice	3.01	1.91	0.08
(Verizon Proposed)			4.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x45/2x90-AWS	C	From Face	4.00	0.0000	80.00	No Ice	3.01	1.91	0.08
(Verizon Proposed)			4.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x30-B13	A	From Face	4.00	0.0000	80.00	No Ice	0.00	1.89	0.06
(Verizon Proposed)			0.00			1/2" Ice	0.00	2.09	0.08
			0.00						
RRH4x30-B13	B	From Face	4.00	0.0000	80.00	No Ice	0.00	1.89	0.06
(Verizon Proposed)			0.00			1/2" Ice	0.00	2.09	0.08
			0.00						
RRH4x30-B13	C	From Face	4.00	0.0000	80.00	No Ice	0.00	1.89	0.06
(Verizon Proposed)			0.00			1/2" Ice	0.00	2.09	0.08
			0.00						
RRH2x60-PCS	A	From Face	4.00	0.0000	80.00	No Ice	2.51	1.55	0.06
(Verizon Proposed)			-4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	B	From Face	4.00	0.0000	80.00	No Ice	2.51	1.55	0.06
(Verizon Proposed)			-4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	C	From Face	4.00	0.0000	80.00	No Ice	2.51	1.55	0.06
(Verizon Proposed)			-4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RC2DC-3315-PF-48	A	From Face	1.00	0.0000	82.00	No Ice	0.00	2.29	0.03
(Verizon Existing)			1.00			1/2" Ice	0.00	2.51	0.05
			0.00						
RC2DC-3315-PF-48	B	From Face	1.00	0.0000	82.00	No Ice	0.00	2.29	0.03
(Verizon Proposed)			1.00			1/2" Ice	0.00	2.51	0.05
			0.00						
10' Platform w/rails	C	None		0.0000	80.00	No Ice	21.00	21.00	1.50
(Verizon Existing)						1/2" Ice	26.00	26.00	1.75
APXVSPP18-C-A20	A	From Face	3.00	0.0000	72.00	No Ice	8.26	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.81	5.74	0.11
			0.00						
APXVTM14	A	From Face	3.00	0.0000	72.00	No Ice	6.90	3.61	0.06
(Sprint)			3.00			1/2" Ice	7.35	3.97	0.10
			0.00						
APXVSPP18-C-A20	B	From Face	3.00	0.0000	72.00	No Ice	8.26	5.28	0.06
(Sprint)			-3.00			1/2" Ice	8.81	5.74	0.11
			0.00						

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
APXVTM14 (Sprint)	B	From Face	3.00 3.00 0.00	0.0000	72.00	No Ice 1/2" Ice	6.90 7.35	3.61 3.97	0.06 0.10
APXVSPP18-C-A20 (Sprint)	C	From Face	3.00 -3.00 0.00	0.0000	72.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVTM14 (Sprint)	C	From Face	3.00 3.00 0.00	0.0000	72.00	No Ice 1/2" Ice	6.90 7.35	3.61 3.97	0.06 0.10
(2) FD-RRH 4x40 1900 (Sprint)	A	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	0.00 0.00	2.71 2.95	0.06 0.08
(2) FD-RRH 4x40 1900 (Sprint)	B	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	0.00 0.00	2.71 2.95	0.06 0.08
(2) FD-RRH 4x40 1900 (Sprint)	C	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	0.00 0.00	2.71 2.95	0.06 0.08
FD-RRH 2x50 800 (Sprint)	A	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint)	B	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint)	C	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
TD-RRH8x20-25 (Sprint)	A	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	4.72 5.01	1.70 1.92	0.07 0.10
TD-RRH8x20-25 (Sprint)	B	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	4.72 5.01	1.70 1.92	0.07 0.10
TD-RRH8x20-25 (Sprint)	C	From Face	1.00 0.00 0.00	0.0000	74.00	No Ice 1/2" Ice	4.72 5.01	1.70 1.92	0.07 0.10
Rohn T-Arm (1) (Sprint)	A	None		0.0000	70.00	No Ice 1/2" Ice	7.33 10.00	7.33 10.00	0.38 0.49
Rohn T-Arm (1) (Sprint)	B	None		0.0000	70.00	No Ice 1/2" Ice	7.33 10.00	7.33 10.00	0.38 0.49
Rohn T-Arm (1) (Sprint)	C	None		0.0000	70.00	No Ice 1/2" Ice	7.33 10.00	7.33 10.00	0.38 0.49
20' x 3" Dia Omni	A	From Leg	0.00 0.00 10.00	0.0000	28.00	No Ice 1/2" Ice	6.00 8.03	6.00 8.03	0.05 0.09
12' x 2" Dia Omni	A	From Leg	3.00 -3.00 6.00	0.0000	28.00	No Ice 1/2" Ice	2.40 3.63	2.40 3.63	0.03 0.05
12' x 2" Dia Omni	A	From Leg	3.00 -6.00 6.00	0.0000	28.00	No Ice 1/2" Ice	2.40 3.63	2.40 3.63	0.03 0.05
10' x 2" Dia Omni	A	From Leg	3.00 3.00 5.00	0.0000	28.00	No Ice 1/2" Ice	2.00 3.02	2.00 3.02	0.02 0.03
10' x 2" Dia Omni	A	From Leg	3.00 5.00 5.00	0.0000	28.00	No Ice 1/2" Ice	2.00 3.02	2.00 3.02	0.02 0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10' x 2" Dia Omni	A	From Leg	3.00 6.00 5.00	0.0000	28.00	No Ice 1/2" Ice	2.00 3.02	2.00 3.02	0.02 0.03
Rohn T-Arm (1)	A	From Leg	0.00 0.00 0.00	0.0000	28.00	No Ice 1/2" Ice	7.33 10.00	7.33 10.00	0.38 0.49

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
A-ANT-23G-2	A	Paraboloid w/Radome	From Face	0.00 0.00 0.00	Worst		72.00	2.50	No Ice 1/2" Ice	4.91 5.24	0.04 0.07
A-ANT-23G-2	A	Paraboloid w/Radome	From Face	0.00 0.00 -3.00	Worst		72.00	2.50	No Ice 1/2" Ice	4.91 5.24	0.04 0.07

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	96.19	1.358	28	13.997	A	0.000	13.997	13.997	100.00	0.000	0.000
102.65-89.73					B	0.000	13.997		100.00	0.000	0.000
					C	0.000	13.997		100.00	0.000	0.000
L2 89.73-65.00	76.43	1.271	26	34.636	A	0.000	34.636	34.636	100.00	0.000	0.000
					B	0.000	34.636		100.00	0.000	0.000
					C	0.000	34.636		100.00	0.000	0.310
L3 65.00-44.93	54.53	1.154	24	39.644	A	0.000	39.644	39.644	100.00	0.000	0.000
					B	0.000	39.644		100.00	0.000	0.000
					C	0.000	39.644		100.00	0.000	6.222
L4 44.93-0.00	20.84	1	21	122.880	A	0.000	122.880	122.880	100.00	0.000	0.000
					B	0.000	122.880		100.00	0.000	0.000
					C	0.000	122.880		100.00	0.000	7.728

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 102.65-89.73	96.19	1.358	21	0.5000	15.073	A	0.000	15.073	15.073	100.00	0.000	0.000
						B	0.000	15.073		100.00	0.000	0.000
						C	0.000	15.073		100.00	0.000	0.000
L2 89.73-65.00	76.43	1.271	20	0.5000	36.697	A	0.000	36.697	36.697	100.00	0.000	0.000
						B	0.000	36.697		100.00	0.000	0.000
						C	0.000	36.697		100.00	0.000	0.510
L3 65.00-44.93	54.53	1.154	18	0.5000	41.316	A	0.000	41.316	41.316	100.00	0.000	0.000
						B	0.000	41.316		100.00	0.000	0.000
						C	0.000	41.316		100.00	0.000	10.236
L4 44.93-0.00	20.84	1	16	0.5000	126.624	A	0.000	126.624	126.624	100.00	0.000	0.000
						B	0.000	126.624		100.00	0.000	0.000
						C	0.000	126.624		100.00	0.000	12.714

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	96.19	1.358	9	13.997	A	0.000	13.997	13.997	100.00	0.000	0.000
102.65-89.73					B	0.000	13.997		100.00	0.000	0.000
					C	0.000	13.997		100.00	0.000	0.000
L2 89.73-65.00	76.43	1.271	8	34.636	A	0.000	34.636	34.636	100.00	0.000	0.000
					B	0.000	34.636		100.00	0.000	0.000
					C	0.000	34.636		100.00	0.000	0.310
L3 65.00-44.93	54.53	1.154	7	39.644	A	0.000	39.644	39.644	100.00	0.000	0.000
					B	0.000	39.644		100.00	0.000	0.000
					C	0.000	39.644		100.00	0.000	6.222
L4 44.93-0.00	20.84	1	6	122.880	A	0.000	122.880	122.880	100.00	0.000	0.000
					B	0.000	122.880		100.00	0.000	0.000
					C	0.000	122.880		100.00	0.000	7.728

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.59	1	1	1	13.997	0.39	30.41	C
102.65-89.73			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			
L2	0.67	1.11	A	1	0.65	1	1	1	34.636	1.02	41.11	C
89.73-65.00			B	1	0.65	1	1	1	34.636			
			C	1	0.65	1	1	1	34.636			
L3	0.72	3.00	A	1	0.65	1	1	1	39.644	1.29	64.48	C
65.00-44.93			B	1	0.65	1	1	1	39.644			
			C	1	0.65	1	1	1	39.644			
L4 44.93-0.00	0.89	9.99	A	1	0.65	1	1	1	122.880	3.07	68.39	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			B	1	0.65	1	1	1	122.880			
			C	1	0.65	1	1	1	122.880			
Sum Weight:	2.36	14.54						OTM	250.09 kip-ft	5.78		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.59	1	1	1	13.997	0.39	30.41	C
102.65-89.73			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			
L2	0.67	1.11	A	1	0.65	1	1	1	34.636	1.02	41.11	C
89.73-65.00			B	1	0.65	1	1	1	34.636			
			C	1	0.65	1	1	1	34.636			
L3	0.72	3.00	A	1	0.65	1	1	1	39.644	1.29	64.48	C
65.00-44.93			B	1	0.65	1	1	1	39.644			
			C	1	0.65	1	1	1	39.644			
L4 44.93-0.00	0.89	9.99	A	1	0.65	1	1	1	122.880	3.07	68.39	C
			B	1	0.65	1	1	1	122.880			
			C	1	0.65	1	1	1	122.880			
Sum Weight:	2.36	14.54						OTM	250.09 kip-ft	5.78		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.59	1	1	1	13.997	0.39	30.41	C
102.65-89.73			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			
L2	0.67	1.11	A	1	0.65	1	1	1	34.636	1.02	41.11	C
89.73-65.00			B	1	0.65	1	1	1	34.636			
			C	1	0.65	1	1	1	34.636			
L3	0.72	3.00	A	1	0.65	1	1	1	39.644	1.29	64.48	C
65.00-44.93			B	1	0.65	1	1	1	39.644			
			C	1	0.65	1	1	1	39.644			
L4 44.93-0.00	0.89	9.99	A	1	0.65	1	1	1	122.880	3.07	68.39	C
			B	1	0.65	1	1	1	122.880			
			C	1	0.65	1	1	1	122.880			
Sum Weight:	2.36	14.54						OTM	250.09 kip-ft	5.78		

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	0.08	0.55	A	1	0.59	1	1	1	15.073	0.32	24.56	C
102.65-89.73			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2	0.67	1.37	A	1	0.65	1	1	1	36.697	0.81	32.92	C
89.73-65.00			B	1	0.65	1	1	1	36.697			
			C	1	0.65	1	1	1	36.697			
L3	0.87	3.30	A	1	0.65	1	1	1	41.316	1.13	56.07	C
65.00-44.93			B	1	0.65	1	1	1	41.316			
			C	1	0.65	1	1	1	41.316			
L4 44.93-0.00	1.08	10.91	A	1	0.65	1	1	1	126.624	2.50	55.63	C
			B	1	0.65	1	1	1	126.624			
			C	1	0.65	1	1	1	126.624			
Sum Weight:	2.71	16.14						OTM	206.19 kip-ft	4.76		

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	0.08	0.55	A	1	0.59	1	1	1	15.073	0.32	24.56	C
102.65-89.73			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2	0.67	1.37	A	1	0.65	1	1	1	36.697	0.81	32.92	C
89.73-65.00			B	1	0.65	1	1	1	36.697			
			C	1	0.65	1	1	1	36.697			
L3	0.87	3.30	A	1	0.65	1	1	1	41.316	1.13	56.07	C
65.00-44.93			B	1	0.65	1	1	1	41.316			
			C	1	0.65	1	1	1	41.316			
L4 44.93-0.00	1.08	10.91	A	1	0.65	1	1	1	126.624	2.50	55.63	C
			B	1	0.65	1	1	1	126.624			
			C	1	0.65	1	1	1	126.624			
Sum Weight:	2.71	16.14						OTM	206.19 kip-ft	4.76		

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	0.08	0.55	A	1	0.59	1	1	1	15.073	0.32	24.56	C
102.65-89.73			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2	0.67	1.37	A	1	0.65	1	1	1	36.697	0.81	32.92	C
89.73-65.00			B	1	0.65	1	1	1	36.697			
			C	1	0.65	1	1	1	36.697			
L3	0.87	3.30	A	1	0.65	1	1	1	41.316	1.13	56.07	C
65.00-44.93			B	1	0.65	1	1	1	41.316			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	41.316			
L4 44.93-0.00	1.08	10.91	A	1	0.65	1	1	1	126.624	2.50	55.63	C
			B	1	0.65	1	1	1	126.624			
			C	1	0.65	1	1	1	126.624			
Sum Weight:	2.71	16.14						OTM	206.19 kip-ft	4.76		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.594	1	1	1	13.997	0.12	9.45	C
102.65-89.73			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2	0.67	1.11	A	1	0.65	1	1	1	34.636	0.31	12.69	C
89.73-65.00			B	1	0.65	1	1	1	34.636			
			C	1	0.65	1	1	1	34.636			
L3	0.72	3.00	A	1	0.65	1	1	1	39.644	0.40	19.90	C
65.00-44.93			B	1	0.65	1	1	1	39.644			
			C	1	0.65	1	1	1	39.644			
L4 44.93-0.00	0.89	9.99	A	1	0.65	1	1	1	122.880	0.95	21.11	C
			B	1	0.65	1	1	1	122.880			
			C	1	0.65	1	1	1	122.880			
Sum Weight:	2.36	14.54						OTM	77.27 kip-ft	1.78		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.594	1	1	1	13.997	0.12	9.45	C
102.65-89.73			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2	0.67	1.11	A	1	0.65	1	1	1	34.636	0.31	12.69	C
89.73-65.00			B	1	0.65	1	1	1	34.636			
			C	1	0.65	1	1	1	34.636			
L3	0.72	3.00	A	1	0.65	1	1	1	39.644	0.40	19.90	C
65.00-44.93			B	1	0.65	1	1	1	39.644			
			C	1	0.65	1	1	1	39.644			
L4 44.93-0.00	0.89	9.99	A	1	0.65	1	1	1	122.880	0.95	21.11	C
			B	1	0.65	1	1	1	122.880			
			C	1	0.65	1	1	1	122.880			
Sum Weight:	2.36	14.54						OTM	77.27 kip-ft	1.78		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.08	0.44	A	1	0.594	1	1	1	13.997	0.12	9.45	C
102.65-89.73			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2	0.67	1.11	A	1	0.65	1	1	1	34.636	0.31	12.69	C
89.73-65.00			B	1	0.65	1	1	1	34.636			
			C	1	0.65	1	1	1	34.636			
L3	0.72	3.00	A	1	0.65	1	1	1	39.644	0.40	19.90	C
65.00-44.93			B	1	0.65	1	1	1	39.644			
			C	1	0.65	1	1	1	39.644			
L4 44.93-0.00	0.89	9.99	A	1	0.65	1	1	1	122.880	0.95	21.11	C
			B	1	0.65	1	1	1	122.880			
			C	1	0.65	1	1	1	122.880			
Sum Weight:	2.36	14.54						OTM	77.27 kip-ft	1.78		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	14.54					
Bracing Weight	0.00					
Total Member Self-Weight	14.54			-1.00	0.19	
Total Weight	26.20			-1.00	0.19	
Wind 0 deg - No Ice		0.00	-22.01	-1554.82	0.19	-0.12
Wind 30 deg - No Ice		10.95	-19.06	-1346.65	-772.45	-1.25
Wind 60 deg - No Ice		18.97	-11.00	-777.91	-1338.06	-2.05
Wind 90 deg - No Ice		21.90	0.00	-1.00	-1545.09	-2.30
Wind 120 deg - No Ice		18.97	11.00	775.91	-1338.06	-1.93
Wind 150 deg - No Ice		10.95	19.06	1344.64	-772.45	-1.04
Wind 180 deg - No Ice		0.00	22.01	1552.82	0.19	0.12
Wind 210 deg - No Ice		-10.95	19.06	1344.64	772.83	1.25
Wind 240 deg - No Ice		-18.97	11.00	775.91	1338.44	2.05
Wind 270 deg - No Ice		-21.90	0.00	-1.00	1545.47	2.30
Wind 300 deg - No Ice		-18.97	-11.00	-777.91	1338.44	1.93
Wind 330 deg - No Ice		-10.95	-19.06	-1346.65	772.83	1.04
Member Ice	1.59					
Total Weight Ice	31.56			-1.33	0.56	
Wind 0 deg - Ice		0.00	-18.69	-1317.37	0.56	-0.06
Wind 30 deg - Ice		9.30	-16.18	-1141.06	-653.95	-1.30
Wind 60 deg - Ice		16.11	-9.34	-659.35	-1133.09	-2.19
Wind 90 deg - Ice		18.60	0.00	-1.33	-1308.46	-2.49
Wind 120 deg - Ice		16.11	9.34	656.70	-1133.09	-2.12
Wind 150 deg - Ice		9.30	16.18	1138.40	-653.95	-1.19
Wind 180 deg - Ice		0.00	18.69	1314.72	0.56	0.06
Wind 210 deg - Ice		-9.30	16.18	1138.40	655.08	1.30
Wind 240 deg - Ice		-16.11	9.34	656.70	1134.22	2.19
Wind 270 deg - Ice		-18.60	0.00	-1.33	1309.59	2.49
Wind 300 deg - Ice		-16.11	-9.34	-659.35	1134.22	2.12
Wind 330 deg - Ice		-9.30	-16.18	-1141.06	655.08	1.19
Total Weight	26.20			-1.00	0.19	
Wind 0 deg - Service		0.00	-6.79	-480.76	0.01	-0.04

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 30 deg - Service		3.38	-5.88	-416.50	-238.49	-0.39
Wind 60 deg - Service		5.85	-3.40	-240.93	-413.09	-0.63
Wind 90 deg - Service		6.76	0.00	-1.10	-477.00	-0.71
Wind 120 deg - Service		5.85	3.40	238.72	-413.09	-0.59
Wind 150 deg - Service		3.38	5.88	414.29	-238.49	-0.32
Wind 180 deg - Service		0.00	6.79	478.55	0.01	0.04
Wind 210 deg - Service		-3.38	5.88	414.29	238.52	0.39
Wind 240 deg - Service		-5.85	3.40	238.72	413.12	0.63
Wind 270 deg - Service		-6.76	0.00	-1.10	477.03	0.71
Wind 300 deg - Service		-5.85	-3.40	-240.93	413.12	0.59
Wind 330 deg - Service		-3.38	-5.88	-416.50	238.52	0.32

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 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	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	102.65 - 89.73	Pole	Max Tension	2	0.00	-0.00	-0.00
			Max. Compression	14	-3.36	0.00	-0.08
			Max. Mx	11	-2.09	17.54	-0.02
			Max. My	8	-2.09	0.00	-17.58
			Max. Vy	11	-4.86	17.54	-0.02
			Max. Vx	2	-4.86	0.00	17.50
			Max. Torque	5			-0.22
L2	89.73 - 65	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-14.62	0.05	0.05
			Max. Mx	11	-10.26	309.71	0.05
			Max. My	2	-10.25	0.02	311.55
			Max. Vy	11	-17.18	309.71	0.05
			Max. Vx	2	-17.28	0.02	311.55
			Max. Torque	9			-0.27
L3	65 - 44.93	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-17.92	0.21	-0.04
			Max. Mx	11	-13.41	595.91	0.03
			Max. My	2	-13.40	0.08	599.40
			Max. Vy	11	-18.15	595.91	0.03
			Max. Vx	2	-18.26	0.08	599.40
			Max. Torque	9			-0.28
L4	44.93 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-31.56	0.56	1.33
			Max. Mx	11	-26.19	1577.93	1.02
			Max. My	2	-26.19	0.19	1587.47
			Max. Vy	11	-21.92	1577.93	1.02
			Max. Vx	2	-22.02	0.19	1587.47
			Max. Torque	24			-2.51

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	15	31.56	0.00	18.69
	Max. H_x	11	26.20	21.90	0.00
	Max. H_z	2	26.20	0.00	22.01
	Max. M_x	2	1587.47	0.00	22.01
	Max. M_z	5	1577.54	-21.90	0.00
	Max. Torsion	18	2.49	-18.60	0.00
	Min. Vert	1	26.20	0.00	0.00
	Min. H_x	5	26.20	-21.90	0.00
	Min. H_z	8	26.20	0.00	-22.01
	Min. M_x	8	-1585.44	0.00	-22.01
	Min. M_z	11	-1577.93	21.90	0.00
	Min. Torsion	24	-2.49	18.60	0.00

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	26.20	0.00	0.00	-1.00	0.19	0.00
Dead+Wind 0 deg - No Ice	26.20	0.00	-22.01	-1587.47	0.19	-0.12
Dead+Wind 30 deg - No Ice	26.20	10.95	-19.06	-1374.93	-788.67	-1.25
Dead+Wind 60 deg - No Ice	26.20	18.97	-11.00	-794.25	-1366.17	-2.05
Dead+Wind 90 deg - No Ice	26.20	21.90	-0.00	-1.02	-1577.54	-2.30
Dead+Wind 120 deg - No Ice	26.20	18.97	11.00	792.22	-1366.16	-1.93
Dead+Wind 150 deg - No Ice	26.20	10.95	19.06	1372.90	-788.67	-1.04
Dead+Wind 180 deg - No Ice	26.20	0.00	22.01	1585.44	0.19	0.12
Dead+Wind 210 deg - No Ice	26.20	-10.95	19.06	1372.90	789.06	1.25
Dead+Wind 240 deg - No Ice	26.20	-18.97	11.00	792.22	1366.55	2.05
Dead+Wind 270 deg - No Ice	26.20	-21.90	-0.00	-1.02	1577.93	2.30
Dead+Wind 300 deg - No Ice	26.20	-18.97	-11.00	-794.25	1366.55	1.93
Dead+Wind 330 deg - No Ice	26.20	-10.95	-19.06	-1374.93	789.06	1.04
Dead+Ice+Temp	31.56	0.00	0.00	-1.33	0.56	0.00
Dead+Wind 0 deg+Ice+Temp	31.56	0.00	-18.69	-1353.62	0.58	-0.06
Dead+Wind 30 deg+Ice+Temp	31.56	9.30	-16.18	-1172.45	-671.95	-1.30
Dead+Wind 60 deg+Ice+Temp	31.56	16.11	-9.34	-677.49	-1164.28	-2.19
Dead+Wind 90 deg+Ice+Temp	31.56	18.60	0.00	-1.35	-1344.48	-2.49
Dead+Wind 120 deg+Ice+Temp	31.56	16.11	9.34	674.79	-1164.27	-2.13
Dead+Wind 150 deg+Ice+Temp	31.56	9.30	16.18	1169.75	-671.95	-1.19
Dead+Wind 180 deg+Ice+Temp	31.56	0.00	18.69	1350.92	0.58	0.06
Dead+Wind 210 deg+Ice+Temp	31.56	-9.30	16.18	1169.75	673.10	1.30
Dead+Wind 240 deg+Ice+Temp	31.56	-16.11	9.34	674.79	1165.43	2.19
Dead+Wind 270 deg+Ice+Temp	31.56	-18.60	0.00	-1.35	1345.64	2.49
Dead+Wind 300 deg+Ice+Temp	31.56	-16.11	-9.34	-677.49	1165.43	2.13
Dead+Wind 330 deg+Ice+Temp	31.56	-9.30	-16.18	-1172.45	673.11	1.19
Dead+Wind 0 deg - Service	26.20	0.00	-6.79	-491.03	0.19	-0.04
Dead+Wind 30 deg - Service	26.20	3.38	-5.88	-425.38	-243.46	-0.39
Dead+Wind 60 deg - Service	26.20	5.85	-3.40	-246.02	-421.83	-0.63
Dead+Wind 90 deg - Service	26.20	6.76	0.00	-1.02	-487.12	-0.71
Dead+Wind 120 deg - Service	26.20	5.85	3.40	243.99	-421.83	-0.60
Dead+Wind 150 deg - Service	26.20	3.38	5.88	423.35	-243.46	-0.32
Dead+Wind 180 deg - Service	26.20	0.00	6.79	488.99	0.19	0.04
Dead+Wind 210 deg - Service	26.20	-3.38	5.88	423.35	243.85	0.39
Dead+Wind 240 deg - Service	26.20	-5.85	3.40	243.99	422.22	0.63
Dead+Wind 270 deg - Service	26.20	-6.76	0.00	-1.02	487.51	0.71
Dead+Wind 300 deg - Service	26.20	-5.85	-3.40	-246.02	422.22	0.60
Dead+Wind 330 deg - Service	26.20	-3.38	-5.88	-425.38	243.85	0.32

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-26.20	0.00	0.00	26.20	0.00	0.000%
2	0.00	-26.20	-22.01	0.00	26.20	22.01	0.000%
3	10.95	-26.20	-19.06	-10.95	26.20	19.06	0.000%
4	18.97	-26.20	-11.00	-18.97	26.20	11.00	0.000%
5	21.90	-26.20	0.00	-21.90	26.20	0.00	0.000%
6	18.97	-26.20	11.00	-18.97	26.20	-11.00	0.000%
7	10.95	-26.20	19.06	-10.95	26.20	-19.06	0.000%
8	0.00	-26.20	22.01	0.00	26.20	-22.01	0.000%
9	-10.95	-26.20	19.06	10.95	26.20	-19.06	0.000%
10	-18.97	-26.20	11.00	18.97	26.20	-11.00	0.000%
11	-21.90	-26.20	0.00	21.90	26.20	0.00	0.000%
12	-18.97	-26.20	-11.00	18.97	26.20	11.00	0.000%
13	-10.95	-26.20	-19.06	10.95	26.20	19.06	0.000%
14	0.00	-31.56	0.00	0.00	31.56	0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
15	0.00	-31.56	-18.69	0.00	31.56	18.69	0.000%
16	9.30	-31.56	-16.18	-9.30	31.56	16.18	0.000%
17	16.11	-31.56	-9.34	-16.11	31.56	9.34	0.000%
18	18.60	-31.56	0.00	-18.60	31.56	0.00	0.000%
19	16.11	-31.56	9.34	-16.11	31.56	-9.34	0.000%
20	9.30	-31.56	16.18	-9.30	31.56	-16.18	0.000%
21	0.00	-31.56	18.69	0.00	31.56	-18.69	0.000%
22	-9.30	-31.56	16.18	9.30	31.56	-16.18	0.000%
23	-16.11	-31.56	9.34	16.11	31.56	-9.34	0.000%
24	-18.60	-31.56	0.00	18.60	31.56	0.00	0.000%
25	-16.11	-31.56	-9.34	16.11	31.56	9.34	0.000%
26	-9.30	-31.56	-16.18	9.30	31.56	16.18	0.000%
27	0.00	-26.20	-6.79	0.00	26.20	6.79	0.000%
28	3.38	-26.20	-5.88	-3.38	26.20	5.88	0.000%
29	5.85	-26.20	-3.40	-5.85	26.20	3.40	0.000%
30	6.76	-26.20	0.00	-6.76	26.20	0.00	0.000%
31	5.85	-26.20	3.40	-5.85	26.20	-3.40	0.000%
32	3.38	-26.20	5.88	-3.38	26.20	-5.88	0.000%
33	0.00	-26.20	6.79	0.00	26.20	-6.79	0.000%
34	-3.38	-26.20	5.88	3.38	26.20	-5.88	0.000%
35	-5.85	-26.20	3.40	5.85	26.20	-3.40	0.000%
36	-6.76	-26.20	0.00	6.76	26.20	0.00	0.000%
37	-5.85	-26.20	-3.40	5.85	26.20	3.40	0.000%
38	-3.38	-26.20	-5.88	3.38	26.20	5.88	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	0.00008748
3	Yes	5	0.00000001	0.00010672
4	Yes	5	0.00000001	0.00011219
5	Yes	4	0.00000001	0.00022497
6	Yes	5	0.00000001	0.00010710
7	Yes	5	0.00000001	0.00010936
8	Yes	4	0.00000001	0.00008742
9	Yes	5	0.00000001	0.00011153
10	Yes	5	0.00000001	0.00010608
11	Yes	4	0.00000001	0.00022502
12	Yes	5	0.00000001	0.00011099
13	Yes	5	0.00000001	0.00010872
14	Yes	4	0.00000001	0.00000001
15	Yes	5	0.00000001	0.00008855
16	Yes	5	0.00000001	0.00022348
17	Yes	5	0.00000001	0.00023007
18	Yes	5	0.00000001	0.00008910
19	Yes	5	0.00000001	0.00022342
20	Yes	5	0.00000001	0.00022665
21	Yes	5	0.00000001	0.00008847
22	Yes	5	0.00000001	0.00022902
23	Yes	5	0.00000001	0.00022268
24	Yes	5	0.00000001	0.00008915
25	Yes	5	0.00000001	0.00022907
26	Yes	5	0.00000001	0.00022558
27	Yes	4	0.00000001	0.00002219

28	Yes	4	0.00000001	0.00019080
29	Yes	4	0.00000001	0.00021525
30	Yes	4	0.00000001	0.00003762
31	Yes	4	0.00000001	0.00019202
32	Yes	4	0.00000001	0.00020139
33	Yes	4	0.00000001	0.00002214
34	Yes	4	0.00000001	0.00021173
35	Yes	4	0.00000001	0.00018844
36	Yes	4	0.00000001	0.00003765
37	Yes	4	0.00000001	0.00020941
38	Yes	4	0.00000001	0.00019889

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	102.65 - 89.73	14.871	27	1.4017	0.0006
L2	89.73 - 65	11.107	27	1.3636	0.0006
L3	65 - 44.93	5.199	27	0.8129	0.0009
L4	48.78 - 0	2.835	27	0.5794	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	(2) 800-10504	27	14.382	1.4035	0.0006	12926
100.00	4-ft x 4-ft T-Arm	27	14.086	1.4044	0.0006	12926
90.00	DC6-48-60-18-8F Surge Arrestor	27	11.183	1.3666	0.0006	5208
88.50	Platform w/rails	27	10.763	1.3484	0.0006	4748
88.00	(2) RRUS-11	27	10.625	1.3415	0.0006	4622
82.00	BXA-70063/6CF	27	9.016	1.2291	0.0006	3585
80.00	RRH4x45/2x90-AWS	27	8.505	1.1827	0.0006	3341
74.00	(2) FD-RRH 4x40 1900	27	7.062	1.0303	0.0007	2773
72.00	A-ANT-23G-2	27	6.615	0.9785	0.0008	2624
70.00	Rohn T-Arm (1)	27	6.185	0.9279	0.0008	2489
69.00	A-ANT-23G-2	27	5.978	0.9033	0.0009	2428
28.00	20' x 3" Dia Omni	27	1.114	0.3370	0.0005	6215

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	102.65 - 89.73	48.050	2	4.5313	0.0018
L2	89.73 - 65	35.893	2	4.4086	0.0018
L3	65 - 44.93	16.805	2	2.6285	0.0029
L4	48.78 - 0	9.164	2	1.8733	0.0027

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
101.00	(2) 800-10504	2	46.471	4.5374	0.0018	4055
100.00	4-ft x 4-ft T-Arm	2	45.515	4.5401	0.0018	4055
90.00	DC6-48-60-18-8F Surge Arrestor	2	36.138	4.4182	0.0018	1632
88.50	Platform w/rails	2	34.782	4.3594	0.0019	1487
88.00	(2) RRUS-11	2	34.335	4.3369	0.0019	1447
82.00	BXA-70063/6CF	2	29.137	3.9738	0.0020	1120
80.00	RRH4x45/2x90-AWS	2	27.487	3.8237	0.0021	1043
74.00	(2) FD-RRH 4x40 1900	2	22.826	3.3312	0.0025	864
72.00	A-ANT-23G-2	2	21.380	3.1638	0.0026	817
70.00	Rohn T-Arm (1)	2	19.993	3.0002	0.0027	775
69.00	A-ANT-23G-2	2	19.323	2.9207	0.0028	755
28.00	20' x 3" Dia Omni	2	3.600	1.0894	0.0017	1922

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	12.92	102.65	273.2	2.001	10.0138	-3.09	20.03	0.154
L2	89.73 - 65 (2)	TP20.614x13x0.25	24.73	102.65	170.4	5.143	16.1588	-10.25	83.11	0.123
L3	65 - 44.93 (3)	TP26.7925x20.614x0.6	20.07	102.65	138.8	7.756	47.6239	-13.40	369.39	0.036
L4	44.93 - 0 (4)	TP40x24.4073x0.6	48.78	102.65	134.5	8.252	49.1218	-15.30	405.35	0.038

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 $\frac{f_{bv}}{F_{bv}}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	15.65	-5.996	23.100	0.260	0.00	0.000	23.100	0.000
L2	89.73 - 65 (2)	TP20.614x13x0.25	311.55	-46.245	39.000	1.186	0.00	0.000	39.000	0.000
L3	65 - 44.93 (3)	TP26.7925x20.614x0.6	599.40	-24.867	39.000	0.638	0.00	0.000	39.000	0.000
L4	44.93 - 0 (4)	TP40x24.4073x0.6	714.22	-27.831	39.000	0.714	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	102.65 - 89.73 (1)	TP13x13x0.25	0.154	0.260	0.000	0.414 ✔	1.333	H1-3 ✔
L2	89.73 - 65 (2)	TP20.614x13x0.25	0.123	1.186	0.000	1.309 ✔	1.333	H1-3 ✔
L3	65 - 44.93 (3)	TP26.7925x20.614x0.6	0.036	0.638	0.000	0.674 ✔	1.333	H1-3 ✔
L4	44.93 - 0 (4)	TP40x24.4073x0.6	0.038	0.714	0.000	0.751 ✔	1.333	H1-3 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	102.65 - 89.73	Pole	TP13x13x0.25	1	-3.09	26.71	31.1	Pass
L2	89.73 - 65	Pole	TP20.614x13x0.25	2	-10.25	110.79	98.2	Pass
L3	65 - 44.93	Pole	TP26.7925x20.614x0.6	3	-13.40	492.40	50.6	Pass
L4	44.93 - 0	Pole	TP40x24.4073x0.6	4	-15.30	540.34	56.4	Pass
							Summary	
						Pole (L2)	98.2	Pass
						RATING =	**98.2**	**Pass**

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Subject: Anchor Bolt and Baseplate Analysis

Location: Stratford, CT

Rev. 0: 9/6/16

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 16001.32

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$M := 1587 \cdot ft \cdot kips$	(Input From RisaTower)
Shear Force =	$V := 22 \cdot kips$	(Input From RisaTower)
Axial Force =	$P := 26 \cdot kips$	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 10$	(User Input)
Diameter of Bolt Circle =	$d_{bc} := 48 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n_t := 4.5$	(User Input)

Base Plate Data:

Plate Yield Strength =	$Fy_{bp} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 1.75 \cdot in$	(User Input)
Base Plate Diameter =	$d_{bp} := 54 \cdot in$	(User Input)
Outer Pole Diameter =	$d_{pole} := 40 \cdot in$	(User Input)
Inner Plate Diameter =	$d_i := 32 \cdot in$	(User Input)
Stiffener Height =	$H_{stiff} := 6 \cdot in$	(User Input)
Stiffener Thickness =	$Thk_{stiff} := 0.5 \cdot in$	(User Input)
Number of Stiffeners per Bolt =	$n_{stiff} := 2$	(User Input)
Grout Strength =	$F_c := 3000$ psi	(User Input)

Effective Width of Baseplate for Bending = $b_{eff} := \frac{\pi \cdot d_{pole}}{N} = 12.566 \cdot in$ (User Input)

Axial Load Eccentricity from Center of Base Plate = $e := \frac{M}{P} = 61.038\,ft$

Distance to Axial Load from Nuetral Axis = $q := 721.576 \cdot in$ (User Input) (Computed Based Complete Circular Base Plate Method)

$$n := \frac{29000}{57 \cdot \sqrt{F_c}} = 9.289$$

$$A_{bolt} := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n_t} \right)^2 = 3.248 \cdot in^2$$

Distance to Bolts =

Radius of Bolt Circle = $R_{bc} := \frac{d_{bc}}{2} = 24 \cdot in$

Distance to Bolts = $i := 1 .. N$

$$y_i := \left| \begin{array}{l} \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N} \right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{array} \right.$$

Transformed Bolt Area =	Bolt Moment Area:	Bolt Moments of Inertia:
$na_1 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$	$Q_{b1} := na_1 \cdot (e - y_1) = 19337.8 \cdot in^3$	$I_{b1} := \left[na_1 \cdot (e - y_1)^2 \right] + \frac{(na_1)^2}{4 \cdot \pi} = 13891465.7 \cdot in^4$
$na_2 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$	$Q_{b2} := na_2 \cdot (e - y_2) = 19103.1 \cdot in^3$	$I_{b2} := \left[na_2 \cdot (e - y_2)^2 \right] + \frac{(na_2)^2}{4 \cdot \pi} = 13556318.1 \cdot in^4$
$na_3 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$	$Q_{b3} := na_3 \cdot (e - y_3) = 19103.1 \cdot in^3$	$I_{b3} := \left[na_3 \cdot (e - y_3)^2 \right] + \frac{(na_3)^2}{4 \cdot \pi} = 13556318.1 \cdot in^4$
$na_4 := A_{bolt} \cdot (n - 1) = 26.92 \cdot in^2$	$Q_{b4} := na_4 \cdot (e - y_4) = 19337.8 \cdot in^3$	$I_{b4} := \left[na_4 \cdot (e - y_4)^2 \right] + \frac{(na_4)^2}{4 \cdot \pi} = 13891465.7 \cdot in^4$
$na_5 := A_{bolt} \cdot n = 30.167 \cdot in^2$	$Q_{b5} := na_5 \cdot (e - y_5) = 22096.4 \cdot in^3$	$I_{b5} := \left[na_5 \cdot (e - y_5)^2 \right] + \frac{(na_5)^2}{4 \cdot \pi} = 16184809.7 \cdot in^4$
$na_6 := A_{bolt} \cdot n = 30.167 \cdot in^2$	$Q_{b6} := na_6 \cdot (e - y_6) = 22521.9 \cdot in^3$	$I_{b6} := \left[na_6 \cdot (e - y_6)^2 \right] + \frac{(na_6)^2}{4 \cdot \pi} = 16814233.1 \cdot in^4$
$na_7 := A_{bolt} \cdot n = 30.167 \cdot in^2$	$Q_{b7} := na_7 \cdot (e - y_7) = 22784.9 \cdot in^3$	$I_{b7} := \left[na_7 \cdot (e - y_7)^2 \right] + \frac{(na_7)^2}{4 \cdot \pi} = 17209241.5 \cdot in^4$
$na_8 := A_{bolt} \cdot n = 30.167 \cdot in^2$	$Q_{b8} := na_8 \cdot (e - y_8) = 22784.9 \cdot in^3$	$I_{b8} := \left[na_8 \cdot (e - y_8)^2 \right] + \frac{(na_8)^2}{4 \cdot \pi} = 17209241.5 \cdot in^4$
$na_9 := A_{bolt} \cdot n = 30.167 \cdot in^2$	$Q_{b9} := na_9 \cdot (e - y_9) = 22521.9 \cdot in^3$	$I_{b9} := \left[na_9 \cdot (e - y_9)^2 \right] + \frac{(na_9)^2}{4 \cdot \pi} = 16814233.1 \cdot in^4$
$na_{10} := A_{bolt} \cdot n = 30.167 \cdot in^2$	$Q_{b10} := na_{10} \cdot (e - y_{10}) = 22096.4 \cdot in^3$	$I_{b10} := \left[na_{10} \cdot (e - y_{10})^2 \right] + \frac{(na_{10})^2}{4 \cdot \pi} = 16184809.7 \cdot in^4$

$na_{tot} := na_1 + na_2 + na_3 + na_4 + na_5 + na_6 + na_7 + na_8 + na_9 + na_{10} = 288.682 \cdot in^2$

$Qb_{tot} := Q_{b1} + Q_{b2} + Q_{b3} + Q_{b4} + Q_{b5} + Q_{b6} + Q_{b7} + Q_{b8} + Q_{b9} + Q_{b10} = 211688.33 \cdot in^3$

$Ib_{tot} := I_{b1} + I_{b2} + I_{b3} + I_{b4} + I_{b5} + I_{b6} + I_{b7} + I_{b8} + I_{b9} + I_{b10} = 155312136.21 \cdot in^4$

Outer Cicle Area:

$r := \frac{d_{bp}}{2} = 27 \cdot in$

$l_0 := r - e + q = 16.114 \cdot in$

$y_0 := r - l_0 = 10.886 \cdot in$

$A_1 := \frac{r^2 \cdot \pi}{2} - y_0 \cdot \sqrt{\left(r^2 - y_0^2\right)} - r^2 \cdot \operatorname{asin}\left(\frac{y_0}{r}\right) = 573.6 \cdot in^2$

Inner Circle Area:

$r_i := \frac{d_i}{2} = 16 \cdot in$

$l := r_i - e + q = 5.114 \cdot in$

$y_c := \max\left(r_i - l, -r_i\right) = 10.886 \cdot in$

$A_c := -\left[\frac{r_i^2 \cdot \pi}{2} - y_c \cdot \sqrt{\left(r_i^2 - y_c^2\right)} - r_i^2 \cdot \operatorname{asin}\left(\frac{y_c}{r_i}\right)\right] = -82.9 \cdot in^2$

$A_T := A_1 + A_c + na_{tot} = 779.382 \cdot in^2$

Moment Area:

$Y_1 := \frac{\left[2 \cdot \left(r^2 - y_0^2\right)^{1.5}\right]}{3 \cdot A_1} = 17.531 \cdot in$

$Q_1 := A_1 \cdot \left(e - Y_1\right) = 410104.5 \cdot in^3$

$Y_{1c} := \frac{\left[-2 \cdot \left(r_i^2 - y_c^2\right)^{1.5}\right]}{3 \cdot A_c} = 12.962 \cdot in$

$Q_c := A_c \cdot \left(e - Y_{1c}\right) = -59667.5 \cdot in^3$

$Q_T := Q_1 + Q_c + Qb_{tot} = 562125.41 \cdot in^3$

Moments of Inertia:

$$I_1 := \left[\frac{\pi \cdot r^4}{8} + \frac{y_0 \cdot \sqrt{\left(r^2 - y_0^2\right)^3}}{2} - \frac{r^2 \cdot y_0 \cdot \sqrt{\left(r^2 - y_0^2\right)}}{4} - \frac{r^4 \cdot \operatorname{asin}\left(\frac{y_0}{r}\right)}{4}\right] - A_1 \cdot Y_1^2 + A_1 \cdot \left(e - Y_1\right)^2 = 14139.97\,ft^4$$

$$I_c := \left[\frac{\pi \cdot r_i^4}{8} + \frac{y_c \cdot \sqrt{\left(r_i^2 - y_c^2\right)^3}}{2} - \frac{r_i^2 \cdot y_c \cdot \sqrt{\left(r_i^2 - y_c^2\right)}}{4} - \frac{r_i^4 \cdot \operatorname{asin}\left(\frac{y_c}{r_i}\right)}{4}\right] - A_c \cdot Y_{1c}^2 + A_c \cdot \left(e - Y_{1c}\right)^2 = -2068.99\,ft^4$$

$$I_T := I_1 + I_c + Ib_{tot} = 19560.956\,ft^4$$

$$q_{calc} := \frac{I_T}{Q_T} = 721.576 \cdot in$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_1 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -9 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_2 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -32 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_3 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -32 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_4 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n-1) \cdot A_{bolt}\right] = -9 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_5 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 33 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_6 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 76 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_7 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 103 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_8 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 103 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_9 - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 76 \cdot kips$$

$$P_{bolt} := \frac{\left[P \cdot \left(e - y_{10} - q_{calc}\right)\right]}{q_{calc} \cdot A_T - Q_T} \cdot \left[(n) \cdot A_{bolt}\right] = 33 \cdot kips$$

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	Stratford, CT
Rev. 0: 9/6/16	Prepared by: T.J.L. Checked by: C.F.C. Job No. 16001.32

Anchor Bolt Check:

Maximum Bolt Force in Compression = $C_{max} := 32 \cdot kips$

Maximum Bolt Force in Tension = $T_{max} := 103 \cdot kips$

Check Anchor Bolt Tension Force:

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

Bolt Tension % of Capacity = $\frac{T_{max}}{T_{ALL}} = 52.9 \cdot \%$

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

Condition1 = "OK"

Grout Check:

$y := .5 \cdot d_{bp} - e + q_{calc} = 16.114 \cdot in$

Grout Stress at Edge of Plate = $f_{cmax} := \frac{P \cdot y}{q_{calc} \cdot A_T - Q_T} = 1.63 \cdot ksi$

$y_{bc} := .5 \cdot d_{bc} - e + q_{calc} = 13.114 \cdot in$

Grout Stress at Bolt = $f_c := \frac{P \cdot y_{bc}}{q \cdot A_T - Q_T} = 1323.7 psi$

Plate Bending Stress % of Capacity = $\frac{f_{cmax}}{F_c \cdot psi} = 54.3 \cdot \%$

Condition2 = $Condition2 := if\left(\frac{f_{cmax}}{F_c \cdot psi} < 1.00, "Ok", "Overstressed"\right)$

Condition2 = "Ok"

Base Plate Check:

Effective Area of Stiffener = $A_{stiff} := H_{stiff} Thk_{stiff} n_{stiff} = 6 \cdot in^2$

Effective Area of Base Plate = $A_{bp} := b_{eff} t_{bp} = 21.991 \cdot in^2$

Distance to Stiffener Centroid = $y_{stiff} := t_{bp} + \frac{H_{stiff}}{2} = 4.75 \cdot in$

Distance to Base Plate Centroid = $y_{bp} := \frac{t_{bp}}{2} = 0.875 \cdot in$

Moment Area of Stiffener = $Ay_{stiff} := A_{stiff} y_{stiff} = 28.5 \cdot in^3$

Moment Area of Base Plate = $Ay_{bp} := A_{bp} \cdot y_{bp} = 19.242 \cdot in^3$

Distance to Built up Section Centroid = $\Upsilon := \frac{(Ay_{stiff} + Ay_{bp})}{(A_{stiff} + A_{bp})} = 1.706 \cdot in$

Distance to Stiffener Centroid from Centroid = $d_{stiff} := |\Upsilon - y_{stiff}| = 3.044 \cdot in$

Distance to Base Plate Centroid from Centroid = $D_{bp} := |\Upsilon - y_{bp}| = 0.831 \cdot in$

Moment of Inertia of Stiffener = $I_{stiff} := \frac{Thk_{stiff} H_{stiff}^3}{12} \cdot n_{stiff} + A_{stiff} d_{stiff}^2 = 73.61 \cdot in^4$

Moment of Inertia of Base Plate = $I_{bp} := \frac{b_{eff} t_{bp}^3}{12} + A_{bp} \cdot D_{bp}^2 = 20.785 \cdot in^4$

Total Moment of Inertia = $I_{tot} := I_{stiff} + I_{bp} = 94.394 \cdot in^4$

Distance to Extreme Fiber = $c_{bp} := \begin{cases} (H_{stiff} + t_{bp} - \Upsilon) & \text{if } (H_{stiff} + t_{bp} - \Upsilon) \geq \Upsilon \\ \Upsilon & \text{otherwise} \end{cases} = 6.044 \cdot in$

Built up Section Modulus = $S_x := \frac{I_{tot}}{c_{bp}} = 15.617 \cdot in^3$

$y_{pole} := .5 \cdot d_{pole} - e + q_{calc} = 9.1 \cdot in$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Check Bending on Compression Side:

Grout Stress at the Pole Face = $f_{pole} := \frac{P \cdot y_{pole}}{q_{calc} \cdot A_T - Q_T} = 0.921 \cdot ksi$

Maximum Moment in Plate =

$$M_{max} := \frac{b_{eff} f_{pole} \cdot \left(\frac{d_{bp} - d_{pole}}{2}\right)^2}{2} + \frac{b_{eff} \left(f_{cmax} - f_{pole}\right) \cdot \left(\frac{d_{bp} - d_{pole}}{2}\right)^2}{3} + C_{max} \cdot \left(\frac{d_{bc} - d_{pole}}{2}\right) = 557 \cdot k \cdot in$$

Maximum Bending Stress in Plate = $f_b := \frac{M_{max}}{S_x} = 35.7 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_b}{F_{bp}} = 59.6 \cdot \%$

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

Condition3 = "Ok"

Check Bending on Tension Side:

Maximum Moment in Plate = $M_{max} := T_{max} \cdot \left(\frac{d_{bc} - d_{pole}}{2}\right) = 412 \cdot k \cdot in$

Maximum Bending Stress in Plate = $f_b := \frac{M_{max}}{S_x} = 26.4 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_b}{F_{bp}} = 44.1 \cdot \%$

Condition4 = $Condition4 := if\left(\frac{f_b}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition4 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	102-ft EEI Monopole Stratford, CT
Rev. 0: 9/06/16	Prepared by: TJL Checked by: C.F.C. Job No. 16001.32

Caisson Foundation:

Input Data:

Shear Force =	$S := 22k$	*USER INPUT-FROM tnxTower*
Overturning Moment =	$M := 1587ft \cdot k$	*USER INPUT-FROM tnxTower*
Applied Axial Load =	$A1 := 26k$	*USER INPUT-FROM tnxTower*
Bending Moment =	$Mu := 1683ft \cdot k$	*USER INPUT–FROM LPILE*
Moment Capacity =	$Mn := 3490ft \cdot k$	*USER INPUT–FROM LPILE*
Foundation Diameter =	$d := 6ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 16ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 1.0ft$	*USER INPUT*
Number of Rebar =	$n := 14$	*USER INPUT*
Area of Rebar =	$Ar := 1.560in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 4ksi$	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{0.9 \cdot Mn}{Mu} = 1.9$

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

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

FOSCheck = "OK"

LPILE Plus for Windows, Version 5.0 (5.0.47)

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

This program is licensed to:

TJL
Centek Engineering

Files Used for Analysis

Path to file locations: J:\Jobs\1600100.WI\32_Stratford CT\Backup Documentation\Calcs\Foundation\
Name of input data file: Caisson Analysis.lpd
Name of output file: Caisson Analysis.lpo
Name of plot output file: Caisson Analysis.lpp
Name of runtime file: Caisson Analysis.lpr

Time and Date of Analysis

Date: September 6, 2016 Time: 16:37:42

Problem Title

16001.32 - Stratford

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 = 192.00 in

Depth of ground surface below top of pile = 12.00 in

Slope angle of ground surface = 0.00 deg.

Structural properties of pile defined using 2 points

Point No.	Point Depth in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	72.00000000	1319167.	4071.5000	3600000.
2	192.0000	72.00000000	1319167.	4071.5000	3600000.

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 = 12.000 in
Distance from top of pile to bottom of layer = 48.000 in
p-y subgrade modulus k for top of soil layer = 10.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 10.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 48.000 in
Distance from top of pile to bottom of layer = 252.000 in
p-y subgrade modulus k for top of soil layer = 1000.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 1000.000 lbs/in**3

(Depth of lowest layer extends 60.00 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	12.00	0.05800
2	48.00	0.05800
3	48.00	0.09800
4	252.00	0.09800

**** WARNING - POSSIBLE INPUT DATA ERROR ****

Values entered for effective unit weights of soil were outside the limits of 0.011574 pci (20 pcf) or 0.0810019 pci (140 pcf)
This data may be erroneous. Please check your data.

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	12.000	0.00000	30.00	------	------
2	48.000	0.00000	30.00	------	------
3	48.000	0.00000	42.00	------	------
4	252.000	0.00000	42.00	------	------

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 = 22000.000 lbs
Bending moment at pile head = 19044000.000 in-lbs
Axial load at pile head = 26000.000 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

---

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	=	4.000	kip/in**2
Yield Stress of Reinforcement	=	60.	kip/in**2
Modulus of Elasticity of Reinforcement	=	29000.	kip/in**2
Number of Reinforcing Bars	=	14	
Area of Single Bar	=	1.56000	in**2
Number of Rows of Reinforcing Bars	=	7	
Area of Steel	=	21.840	in**2
Area of Shaft	=	4071.504	in**2
Percentage of Steel Reinforcement	=	0.536	percent
Cover Thickness (edge to bar center)	=	4.000	in

Unfactored Axial Squash Load Capacity = 15079.26 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	3.120	31.198
2	3.120	25.019
3	3.120	13.884
4	3.120	0.000
5	3.120	-13.884
6	3.120	-25.019
7	3.120	-31.198

Axial Thrust Force = 26000.00 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
4256561.	5.107873E+12	8.333333E-07	0.00003182	38.17921007	112.93075	806.60850
8469392.	5.081635E+12	0.00000167	0.00006195	37.16961801	218.03724	1564.42004
12638433.	5.055373E+12	0.00000250	0.00009206	36.82458723	321.36235	2321.61533
16763750.	5.029125E+12	0.00000333	0.00012217	36.65198815	422.98111	3078.80253
16763750.	4.023300E+12	0.00000417	0.00007179	17.22893894	247.30299	6037.89114
16763750.	3.352750E+12	0.00000500	0.00008456	16.91217649	290.13713	7291.39992
16763750.	2.873786E+12	0.00000583	0.00009761	16.73255002	333.61782	8537.02005
16763750.	2.514563E+12	0.00000667	0.00011034	16.55172408	375.73827	9791.55403
16763750.	2.235167E+12	0.00000750	0.00012310	16.41306460	417.61807	11045.65672
16763750.	2.011650E+12	0.00000833	0.00013587	16.30393302	459.25650	12299.32537
16763750.	1.828773E+12	0.00000917	0.00014865	16.21628702	500.65281	13552.55714
16763750.	1.676375E+12	0.00001000	0.00016145	16.14476430	541.80622	14805.34938
16763750.	1.547423E+12	0.00001083	0.00017426	16.08565485	582.71603	16057.69871
16763750.	1.436893E+12	0.00001167	0.00018709	16.03630650	623.38144	17309.60250
16763750.	1.341100E+12	0.00001250	0.00019993	15.99477303	663.80159	18561.05856
16763750.	1.257281E+12	0.00001333	0.00021279	15.95959961	703.97583	19812.06285
16763750.	1.183324E+12	0.00001417	0.00022567	15.92966831	743.90322	21062.61356
16763750.	1.117583E+12	0.00001500	0.00023856	15.90411437	783.58307	22312.70679
16763750.	1.058763E+12	0.00001583	0.00025147	15.88225329	823.01458	23562.33949
16763750.	1.005825E+12	0.00001667	0.00026439	15.86353576	862.19683	24811.50942
16763750.	9.579286E+11	0.00001750	0.00027733	15.84751976	901.12905	

26060.21302					
16763750.	9.143864E+11	0.00001833	0.00029029	15.83384478	939.81052
27308.44607					
16763750.	8.746305E+11	0.00001917	0.00030326	15.82220829	978.24023
28556.20703					
16763750.	8.381875E+11	0.00002000	0.00031625	15.81236136	1016.41735
29803.49246					
16763750.	8.046600E+11	0.00002083	0.00032925	15.80409586	1054.34111
31050.29838					
16763750.	7.737116E+11	0.00002167	0.00034227	15.79723370	1092.01057
32296.62205					
17007765.	7.559007E+11	0.00002250	0.00035531	15.79162467	1129.42492
33542.45971					
17608729.	7.546598E+11	0.00002333	0.00036837	15.78714001	1166.58330
34787.80765					
18209074.	7.534789E+11	0.00002417	0.00038144	15.78366601	1203.48466
36032.66405					
18808802.	7.523521E+11	0.00002500	0.00039453	15.78111041	1240.12839
37277.02252					
19407905.	7.512738E+11	0.00002583	0.00040763	15.77938521	1276.51330
38520.88240					
20006380.	7.502392E+11	0.00002667	0.00042076	15.77841747	1312.63850
39764.23989					
20604229.	7.492447E+11	0.00002750	0.00043390	15.77814710	1348.50338
41007.08801					
21201441.	7.482861E+11	0.00002833	0.00044706	15.77851188	1384.10661
42249.42731					
21798013.	7.473605E+11	0.00002917	0.00046023	15.77946246	1419.44730
43491.25350					
22393948.	7.464649E+11	0.00003000	0.00047343	15.78095806	1454.52480
44732.55957					
22989238.	7.455969E+11	0.00003083	0.00048664	15.78295577	1489.33789
45973.34438					
23583876.	7.447540E+11	0.00003167	0.00049987	15.78541911	1523.88550
47213.60503					
24177866.	7.439343E+11	0.00003250	0.00051312	15.78832018	1558.16700
48453.33406					
25363866.	7.423571E+11	0.00003417	0.00053967	15.79531324	1625.92668
50931.19147					
26547214.	7.408525E+11	0.00003583	0.00056630	15.80374181	1692.60911
53406.88114					
27727878.	7.394101E+11	0.00003750	0.00059300	15.81344497	1758.20602
55880.36994					
28905818.	7.380209E+11	0.00003917	0.00061978	15.82428753	1822.70868
58351.62659					
29944235.	7.333282E+11	0.00004083	0.00064563	15.81138074	1883.65217
60000.00000					
30705962.	7.224932E+11	0.00004250	0.00066951	15.75314248	1938.70298
60000.00000					

31465946.	7.124365E+11	0.00004417	0.00069344	15.70052612	1992.86266
60000.00000					
32178625.	7.020791E+11	0.00004583	0.00071704	15.64449799	2045.23817
60000.00000					
32603190.	6.863829E+11	0.00004750	0.00074100	15.59999907	2097.43280
60000.00000					
33021271.	6.716191E+11	0.00004917	0.00076189	15.49600875	2141.81240
60000.00000					
33429098.	6.576216E+11	0.00005083	0.00078263	15.39608896	2185.11912
60000.00000					
33835911.	6.444935E+11	0.00005250	0.00080342	15.30325019	2227.75004
60000.00000					
34241697.	6.321544E+11	0.00005417	0.00082425	15.21684444	2269.70133
60000.00000					
34646445.	6.205333E+11	0.00005583	0.00084511	15.13630092	2310.96908
60000.00000					
35050148.	6.095678E+11	0.00005750	0.00086601	15.06111753	2351.54964
60000.00000					
35452804.	5.992023E+11	0.00005917	0.00088696	14.99085009	2391.43942
60000.00000					
35648076.	5.859958E+11	0.00006083	0.00090534	14.88226140	2425.56745
60000.00000					
35826855.	5.732297E+11	0.00006250	0.00092354	14.77670252	2458.77785
60000.00000					
36005008.	5.611170E+11	0.00006417	0.00094178	14.67705309	2491.46384
60000.00000					
36182532.	5.496081E+11	0.00006583	0.00096004	14.58286679	2523.62297
60000.00000					
36359424.	5.386581E+11	0.00006750	0.00097833	14.49374235	2555.25288
60000.00000					
36535670.	5.282266E+11	0.00006917	0.00099664	14.40931284	2586.35066
60000.00000					
36963767.	5.218414E+11	0.00007083	0.00102000	14.40000021	2625.63586
60000.00000					
36963767.	5.098451E+11	0.00007250	0.00103801	14.31744397	2654.88374
60000.00000					
37086028.	5.000363E+11	0.00007417	0.00105578	14.23523748	2683.15245
60000.00000					
37255431.	4.912804E+11	0.00007583	0.00107357	14.15700924	2710.91979
60000.00000					
37424242.	4.828934E+11	0.00007750	0.00109139	14.08250391	2738.18322
60000.00000					
37592462.	4.748521E+11	0.00007917	0.00110924	14.01148975	2764.94042
60000.00000					
37760088.	4.671351E+11	0.00008083	0.00112712	13.94375432	2791.18909
60000.00000					
37927114.	4.597226E+11	0.00008250	0.00114503	13.87910020	2816.92659
60000.00000					
38093543.	4.525965E+11	0.00008417	0.00116296	13.81734931	2842.15074

60000.00000					
38259360.	4.457401E+11	0.00008583	0.00118092	13.75833213	2866.85864
60000.00000					
38424566.	4.391379E+11	0.00008750	0.00119892	13.70189631	2891.04790
60000.00000					
38589167.	4.327757E+11	0.00008917	0.00121694	13.64790237	2914.71630
60000.00000					
38753138.	4.266401E+11	0.00009083	0.00123499	13.59621298	2937.86052
60000.00000					
38897016.	4.205083E+11	0.00009250	0.00125262	13.54180062	2959.88447
60000.00000					
38957380.	4.137067E+11	0.00009417	0.00126833	13.46901619	2978.92810
60000.00000					
39017377.	4.071378E+11	0.00009583	0.00128407	13.39899123	2997.57787
60000.00000					
39076992.	4.007897E+11	0.00009750	0.00129983	13.33158195	3015.83165
60000.00000					
39136231.	3.946511E+11	0.00009917	0.00131561	13.26665962	3033.68794
60000.00000					
39158834.	3.820374E+11	0.00010250	0.00135300	13.19999921	3074.71342
60000.00000					
39412769.	3.724041E+11	0.00010583	0.00138701	13.10558975	3109.72145
60000.00000					
39516941.	3.619872E+11	0.00010917	0.00141705	12.98062027	3138.75475
60000.00000					
39619784.	3.521759E+11	0.00011250	0.00144718	12.86378539	3166.33681
60000.00000					
39721280.	3.429175E+11	0.00011583	0.00147738	12.75438988	3192.45490
60000.00000					
39821417.	3.341657E+11	0.00011917	0.00150767	12.65181792	3217.09626
60000.00000					
39920171.	3.258789E+11	0.00012250	0.00153805	12.55551803	3240.24757
60000.00000					
40017531.	3.180201E+11	0.00012583	0.00156851	12.46500099	3261.89569
60000.00000					
40113472.	3.105559E+11	0.00012917	0.00159906	12.37982476	3282.02689
60000.00000					
40208000.	3.034566E+11	0.00013250	0.00162970	12.29959881	3300.62782
60000.00000					
40301078.	2.966951E+11	0.00013583	0.00166042	12.22396266	3317.68405
60000.00000					
40392691.	2.902469E+11	0.00013917	0.00169124	12.15259445	3333.18131
60000.00000					
40482829.	2.840900E+11	0.00014250	0.00172214	12.08520448	3347.10515
60000.00000					
40571469.	2.782044E+11	0.00014583	0.00175314	12.02152669	3359.44058
60000.00000					
40853264.	2.738766E+11	0.00014917	0.00179000	12.00000036	3372.10536
60000.00000					

41231450.	2.703702E+11	0.00015250	0.00183000	12.00000036	3383.21826
60000.00000					
41231450.	2.645868E+11	0.00015583	0.00186214	11.94953406	3390.03458
60000.00000					
41231450.	2.590458E+11	0.00015917	0.00189217	11.88796771	3394.78955
60000.00000					
41231450.	2.537320E+11	0.00016250	0.00192230	11.82954061	3398.02496
60000.00000					
41231450.	2.486319E+11	0.00016583	0.00195253	11.77407253	3399.72450
60000.00000					
41231450.	2.437327E+11	0.00016917	0.00198287	11.72139609	3396.96130
60000.00000					
41238637.	2.390646E+11	0.00017250	0.00201331	11.67136538	3389.44631
60000.00000					
41306884.	2.349207E+11	0.00017583	0.00204386	11.62383878	3381.90310
60000.00000					
41374514.	2.309275E+11	0.00017917	0.00207451	11.57868540	3386.49349
60000.00000					
41441532.	2.270769E+11	0.00018250	0.00210528	11.53578937	3391.57383
60000.00000					
41507916.	2.233610E+11	0.00018583	0.00213616	11.49503911	3395.47616
60000.00000					
41573661.	2.197727E+11	0.00018917	0.00216716	11.45633376	3398.18430
60000.00000					
41638753.	2.163052E+11	0.00019250	0.00219827	11.41957891	3399.68153
60000.00000					
41662079.	2.127425E+11	0.00019583	0.00222609	11.36727798	3399.01637
60000.00000					
41671855.	2.092311E+11	0.00019917	0.00225308	11.31252229	3393.47138
60000.00000					
41681453.	2.058343E+11	0.00020250	0.00228012	11.25985444	3387.91113
60000.00000					
41690883.	2.025468E+11	0.00020583	0.00230722	11.20917785	3382.33535
60000.00000					
41700142.	1.993632E+11	0.00020917	0.00233438	11.16040027	3376.74389
60000.00000					
41709214.	1.962787E+11	0.00021250	0.00236160	11.11343157	3379.33871
60000.00000					
41718115.	1.932886E+11	0.00021583	0.00238889	11.06819451	3383.94733
60000.00000					
41726827.	1.903886E+11	0.00021917	0.00241623	11.02460968	3387.98824
60000.00000					
41735352.	1.875746E+11	0.00022250	0.00244363	10.98260629	3391.45544
60000.00000					
41743692.	1.848429E+11	0.00022583	0.00247109	10.94211781	3394.34284
60000.00000					
41751827.	1.821898E+11	0.00022917	0.00249862	10.90307772	3396.64409
60000.00000					
41759775.	1.796119E+11	0.00023250	0.00252621	10.86543024	3398.35298

60000.00000					
41759775.	1.746053E+11	0.00023917	0.00258300	10.79999936	3399.98154
60000.00000					
41759775.	1.698703E+11	0.00024583	0.00265500	10.79999936	3387.41455
60000.00000					
41759775.	1.653852E+11	0.00025250	0.00272700	10.79999936	3373.67456
60000.00000					
41859735.	1.615167E+11	0.00025917	0.00278920	10.76218235	3372.17083
60000.00000					
41865884.	1.574892E+11	0.00026583	0.00284186	10.69036567	3379.69192
60000.00000					
41871754.	1.536578E+11	0.00027250	0.00289466	10.62261951	3386.06597
60000.00000					
41877357.	1.500084E+11	0.00027917	0.00294763	10.55866706	3391.27179
60000.00000					
41882684.	1.465283E+11	0.00028583	0.00300075	10.49825299	3395.28708
60000.00000					
41887723.	1.432059E+11	0.00029250	0.00305404	10.44114554	3398.08883
60000.00000					
41892466.	1.400305E+11	0.00029917	0.00310748	10.38713443	3399.65332
60000.00000					
41896611.	1.369916E+11	0.00030583	0.00316123	10.33645999	3398.18614
60000.00000					
41899746.	1.340792E+11	0.00031250	0.00321547	10.28950202	3391.25395
60000.00000					
41902773.	1.312881E+11	0.00031917	0.00326979	10.24476492	3384.29990
60000.00000					
41905701.	1.286108E+11	0.00032583	0.00332419	10.20211780	3377.32353
60000.00000					
41908506.	1.260406E+11	0.00033250	0.00337868	10.16143405	3370.32491
60000.00000					
41911214.	1.235711E+11	0.00033917	0.00343325	10.12260640	3363.30328
60000.00000					
41913794.	1.211965E+11	0.00034583	0.00348791	10.08552539	3356.25884
60000.00000					
41916273.	1.189114E+11	0.00035250	0.00354266	10.05010092	3349.19074
60000.00000					
41918620.	1.167108E+11	0.00035917	0.00359750	10.01623857	3356.34913
60000.00000					
41920858.	1.145900E+11	0.00036583	0.00365243	9.98386109	3363.80093
60000.00000					
41922966.	1.125449E+11	0.00037250	0.00370745	9.95288908	3370.58686
60000.00000					
41924953.	1.105713E+11	0.00037917	0.00376257	9.92325389	3376.69736
60000.00000					
41926823.	1.086656E+11	0.00038583	0.00381778	9.89489114	3382.12244
60000.00000					

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 41882.60828

in-kip

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 = 22000.000 lbs
Specified moment at pile head = 19044000.000 in-lbs
Specified axial load at pile head = 26000.000 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. Es*h p lbs/in	F/L
0.000	0.595332	1.90E+07	22000.	-0.005908	526.096	7.52E+11	0.000	0.000
15.360	0.507588	1.94E+07	21969.	-0.005516	535.379	7.51E+11	-17.055	64.512
30.720	0.425931	1.97E+07	21195.	-0.005116	544.518	7.51E+11	-79.734	359.424
46.080	0.350471	2.00E+07	19638.	-0.004709	553.152	7.50E+11	-119.441	654.336
61.440	0.281308	2.02E+07	-3041.223	-0.004296	557.542	7.50E+11	-2087.197	14246.
76.800	0.218486	1.99E+07	-42575.	-0.003885	548.554	7.50E+11	-3040.534	26719.
92.160	0.161891	1.88E+07	-95517.	-0.003488	520.082	7.52E+11	-3818.018	45281.
107.520	0.111131	1.69E+07	-1.59E+05	-0.003162	467.154	3.52E+12	-4331.523	74835.
122.880	0.062961	1.39E+07	-2.26E+05	-0.003113	386.593	5.05E+12	-4349.098	1.33E+05
138.240	0.015438	9.98E+06	-2.82E+05	-0.003077	278.776	5.07E+12	-1863.489	2.32E+05
153.600	-0.031622	5.65E+06	-2.65E+05	-0.003053	160.563	5.09E+12	4302.891	2.61E+05
168.960	-0.078417	2.18E+06	-1.80E+05	-0.003042	66.001	5.11E+12	6550.854	1.60E+05
184.320	-0.125105	2.58E+05	-66258.	-0.003038	13.426	5.11E+12	8248.049	1.27E+05

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	=	0.59533212 in
Computed slope at pile head	=	-0.00590820
Maximum bending moment	=	20198074. lbs-in
Maximum shear force	=	-287069.98517 lbs
Depth of maximum bending moment	=	59.52000000 in
Depth of maximum shear force	=	144.00000 in
Number of iterations	=	51
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= 22000.	M= 1.90E+07	26000.0000	0.5953321	2.0198E+07	-287070.

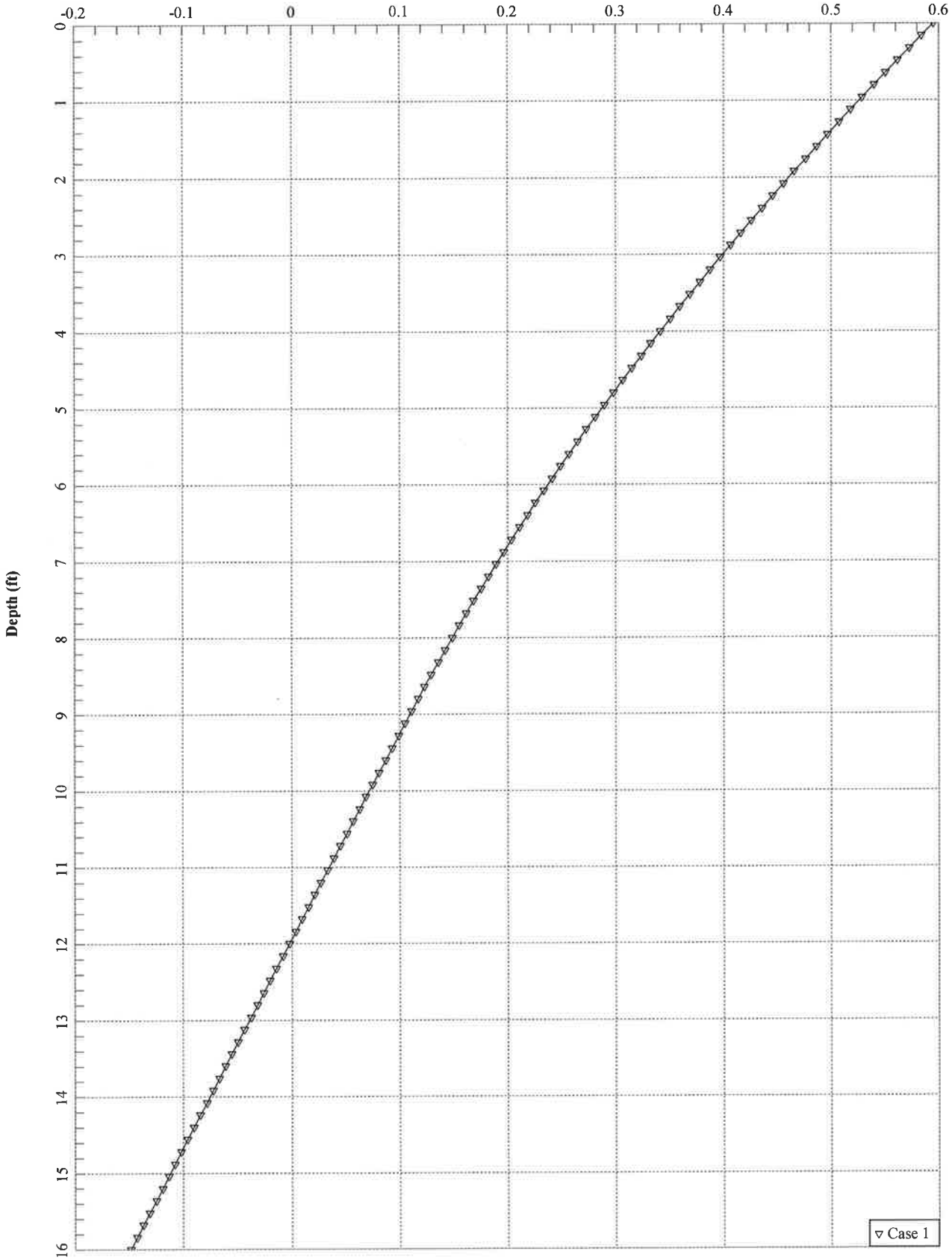
Computed Pile-head Stiffness Matrix Members
K22, K23, K32, K33 for Superstructure

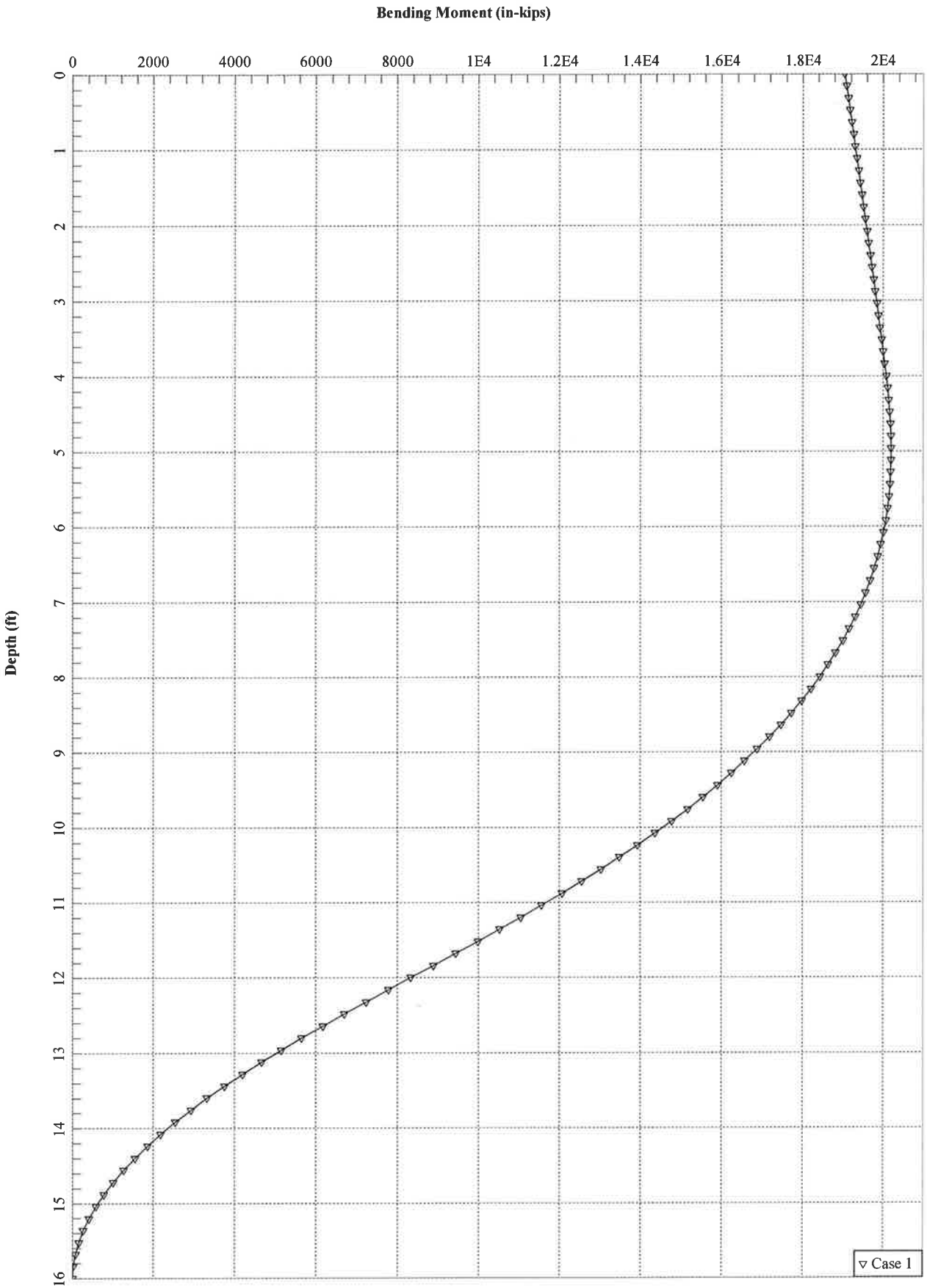
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00041825	2200.00003	241691.92645	5259999.	5.778634E+08
0.00125906	6622.65990	727565.18488	5259999.	5.778634E+08
0.00199556	10496.66760	1153164.	5259999.	5.778634E+08
0.00251812	13245.31981	1455130.	5259999.	5.778634E+08
0.00292345	15377.34010	1689354.	5259999.	5.778634E+08
0.00325463	17119.32751	1880729.	5259999.	5.778634E+08
0.00353463	18592.15688	2042534.	5259999.	5.778634E+08
0.00377718	19867.97971	2182696.	5259999.	5.778634E+08
0.00399113	20993.33521	2306327.	5259999.	5.778634E+08
0.00418251	22000.00000	2416919.	5259999.	5.778634E+08

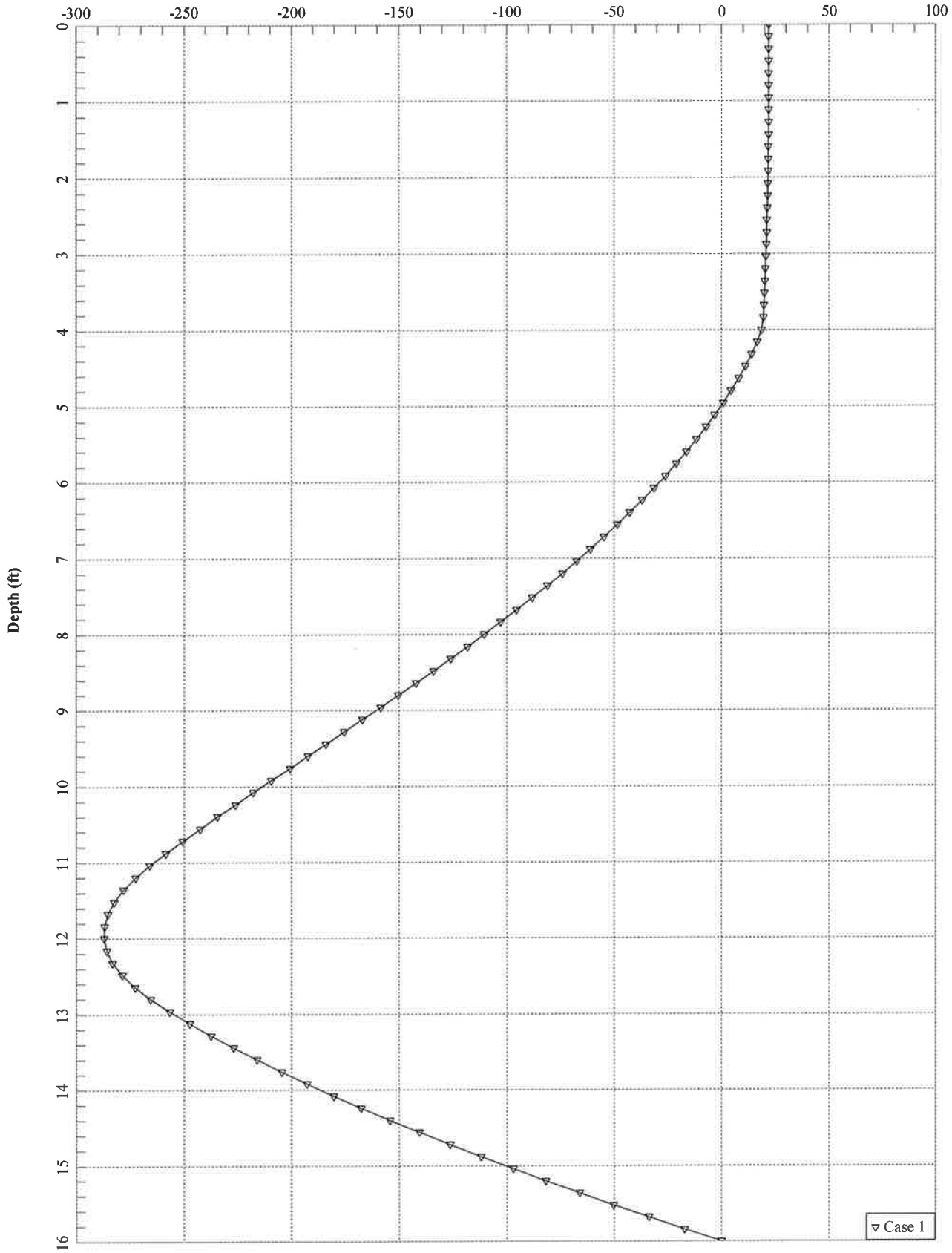
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00002434	14062.44097	1904400.	5.778634E+08	7.825690E+10
0.00007330	42332.76855	5732815.	5.774935E+08	7.820569E+10
0.00011641	67103.32369	9086297.	5.764599E+08	7.805703E+10
0.00014711	84683.12065	11465630.	5.756494E+08	7.793977E+10
0.00017098	98321.91186	13311185.	5.750529E+08	7.785280E+10
0.00019053	109467.41168	14819112.	5.745304E+08	7.777685E+10
0.00020710	118892.13615	16094047.	5.740897E+08	7.771269E+10
0.00022200	127058.40390	17198446.	5.723264E+08	7.746929E+10
0.00024025	134280.61515	18172594.	5.589112E+08	7.563911E+10
0.00026201	140786.97803	19044000.	5.373347E+08	7.268429E+10

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

The analysis ended normally.


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


Bending Moment (in-kips)
0
2000
4000
6000
8000
1E4
1.2E4
1.4E4
1.6E4
1.8E4
2E4
Depth (ft)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Case 1


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

SITE NAME	STRATFORD, CT		ECP - CELL #		5	0021
LATITUDE	41-10-36.79 N		LONGITUDE		73-08-46.18 W	
NOTE: **Please Order Appropriate RET Cables.** Install PCS LTE antennas and RRH's. Replace 700 and AWS antennas and RRH's. (ant rec updated 9/21/15)			SAVE BUTTON		PCS1	
			STRUCTURE TYPE		ROOFTOP	
700 Mhz - LTE Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH	
ANTENNA TYPE	BXA-70063-6CF-4-750MHZ		BXA-70063-6CF-2-750MHZ		BXA-70063-6CF-4-750MHZ	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U	1	ALU RRH_2X40-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	
700 Mhz - LTE Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	ALU 700 MHz RRH		ALU 700 MHz RRH		ALU 700 MHz RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	4 Elec + 0 Mech		4 Elec + 0 Mech		7 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U	1	ALU RRH_2X60-700U
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	
1900 PCS - Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	PCS Modcell 4.0		PCS Modcell 4.0		PCS Modcell 4.0	
ANTENNA TYPE	MG D3-800T0		MG D3-800T0		MG D3-800T0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
1900 PCS - Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	ALU 1900 MHz RRH		ALU 1900 MHz RRH		ALU 1900 MHz RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QTY OF ANTENNAS PER FACE	0 (shared w/ LTE 700)		0 (shared w/ LTE 700)		0 (shared w/ LTE 700)	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	3 Elec + 0 Mech		3 Elec + 0 Mech		3 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X60-PCS	1	ALU RRH_2X60-PCS	1	ALU RRH_2X60-PCS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						
2100 AWS - Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS	1	ALU RRH_2X40-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						

2100 AWS - Future Config	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	ALU 2100 MHz RRH		ALU 2100 MHz RRH		ALU 2100 MHz RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	3 Elec + 0 Mech		3 Elec + 0 Mech		3 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RRH_4x45-AWS	1	ALU RRH_4x45-AWS	1	ALU RRH_4x45-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	
850 Cellular - No Change	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	Cellular Modcell 4.0HD		Cellular Modcell 4.0HD		Cellular Modcell 4.0HD	
ANTENNA TYPE	BXA-70063-6CF-2-850MHZ		BXA-70063-6CF-2-850MHZ		BXA-70063-6CF-2-850MHZ	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (ELEC+MECH)	2 Elec + 0 Mech		2 Elec + 2 Mech		2 Elec + 0 Mech	
RAD CTR (FT AGL)	82		82		82	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

NUMBER OF CABLES NEEDED						ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES			12	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS			24	TOP JUMPER (FT)			12
Equipment Cable Ordering		**MAIN CABLE #**	12	+	0	**TOP JUMPER #**		+	0
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES			2	FIBER LINE MODEL #			HB158-1-08U8-S8J18
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS			9	TOP JUMPER MODEL #			HB058-1-08U1-S1J18
Fiber Cable Ordering		**FIBER CABLE #**	1	+	1	**TOP JUMPER #**	6	+	3

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

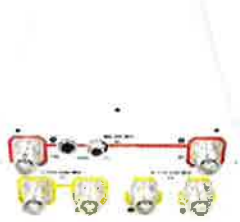
ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/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

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By : Ryan Ulanday	Alex Restrepo	RU	7/20/2015

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.

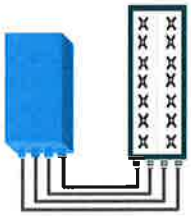
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

Alcatel·Lucent

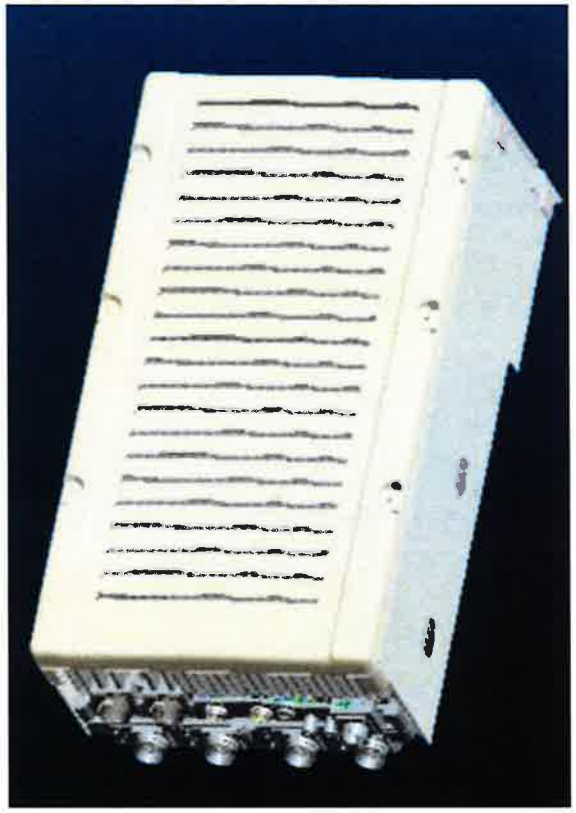
TECHNICAL SPECIFICATIONS

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

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

VZW Network Equipment Reporting Form (NERF)

Vendor	Alcatel-Lucent	Model	B66a RRH 4Tx/4Rx 4x45W or 2x 90W (SW selectable)	Function	RRH for distributed architecture with a CPRI interface between digital and RF processing components. The RRH has 4 Tx ports and 4 Rx ports. Can be SW configured for 2 Tx with 90W rf per port or 4 Tx with 45W rf per port. The RRH has passive cooling only.

*1)Equipment Configuration	*2)Heat Release @50°F Intake Temp [W]		*3)Airflow Rate @ 100% Activity Rate [cfm]		*4)Dimensions [in]		Non-Thermal Data		
	100% Activity	50% Activity	Nominal (70°F)	Max (95°F)	External (WxDxH)	Clear (F/R/S)	Installed Weight [lb]	*5)Sound @ Nominal [L_{WAd}]	*6)Name Plate [W]
Minimum			N/A Convection cooled	N/A Convection cooled	w/o Solar Shield W = 11.4in D = 6.7in H = 25.2in (W=290mm) (D=170mm) (H=640mm)	Front: 12" Rear: 7.5" Right: 12" Left: 12" Top: 12" Bottom: 24"			
Typical			N/A Convection cooled	N/A Convection cooled	with Solar Shield W = 12in D = 7.6in H = 25.8in (W=304mm) (D=193mm) (H=655mm)		62lb 72 lb(w mounting brackets)	N/A Convection cooled	
Full	825W (add 60W for AISG)	TBD	N/A Convection cooled	N/A Convection cooled	N/A			N/A Convection cooled	

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

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

Return completed forms to Engineering and Operations Support (EOS)

Richard.damiano@verizonwireless.com

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.

ATTACHMENT 4

Town of Stratford

Map Title

Legend

- Address Number
- Property Lines
  - Town Boundary
  - ROW
  - Property
  - Water Feature
- Parcels

141.9 0 70.97 141.9 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Created by Greater Bridgeport Regional Council

GBRC
Greater Bridgeport Regional Council

TOWN OF STRATFORD

Recent Sales in Neighborhood | Previous Parcel | Next Parcel | Field Definitions | Return to Main Search | Stratford Home

Owner and Parcel Information

Owner Name	BECKER LLC	**Today's Date**	September 15, 2016
Mailing Address	951 BEAVER DAM RD	**Account #**	0795100
	STRATFORD, CT 06614		
Location Address	623 HONEYSPOT RD	**Census Tract**	0804
Map / Block / Lot	30 /6 / 12 / 6/ Dev Lot: LTS 128 129 & 1	**Acreage**	0.22
Use Class / Description	322 Gar/Off	**Parcel Map**	Show Parcel Map Owner List By Radius

Current Appraised Value Information

Building Value	OB Value	Land Value	Special Land Value	Total Appraised Value	Net Appraised Value	Current Assessment
$ 228,200	$ 702,000	$ 195,000		$ 1,125,200	$ 1,125,200	$ 787,640

Assessment History

Year	Building	OB/Misc	Land	Total Assessment
Current	$ 159,740	$ 491,400	$ 136,500	$ 787,640
2015	$ 159,740	$ 491,400	$ 136,500	$ 787,640
2014	$ 159,740	$ 491,400	$ 136,500	$ 787,640

Land Information

Use	Class	Zoning	Area	Value
Gar/Off	C	CA	0.22 AC	$ 195,000

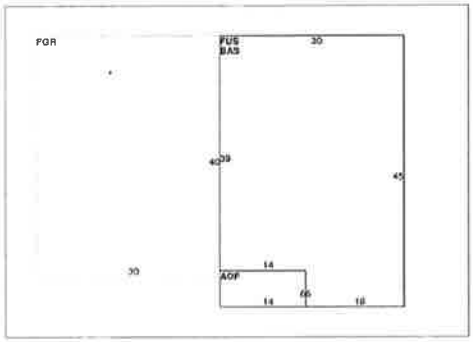
Commercial Building Information

Style	Year Built	Eff Year Built	Gross Area	Stories	Grade	Exterior Wall	Interior Wall	Wall Height	# Units
Telephone Bldg	1985	1991	3,816	1.00	B	Concr/Cinder	Drywall/Sheet	10	1
Roof Cover	**Roof Structure**	**Floor Type**	**Heat Type**	**Heat Fuel**	**AC Type**	**Sprinkler**	**Construction**	**Plumbing**	**Comm Walls**
Built Up	Flat	Vinyl/Asphalt Concr-Finished	Gas	Forced Air-Duc	Heat/AC Pkgs	%	Masonry	Average	0%

Building Sub Areas

Code	Description	Living Area	Gross Area	Effective Area
AOF	Office Area	84	84	
BAS	First Floor	1,266	1,266	
FGR	Garage	0	1,200	
FUS	Finished Upper Story	1,266	1,266	
	Totals	**2,616**	**3,816**	**3,096**

Building Sketch Enlarge



Building Photo Enlarge

Out Buildings / Extra Features

Description	Sub Description	Area	Year Built	Value
Air Condition		1,866 S.F.	1989	$ 3,800
Paving	Asphalt	4,000 S.F.	1985	$ 4,000
Mezzanine - Unfin		144 S.F.	1989	$ 1,500
Cell Recievers		4 Units	2009	$ 698,000

Sale Information

Sale Date	Sale Price	Deed Book/Page	Sale Qualification	Reason	Vacant or Improved	Owner
04/20/2010		3374/0243	Unqualified	Transfer of convenience	Improved	BECKER LLC
07/17/1984	$ 54,000	0597/0087	Qualified	WD	Improved	BECKER JOHN & DEBORAH (SV)
09/24/1982	$ 47,000	0573/0794	Qualified	WD	Improved	TOTH JOHN S & CAROL A (SV)

03/21/1969	$ 24,000	0448/0174	Qualified	WD	Improved	PAOLA FRANK & ROSALIE (SV)

Permit Information

Permit ID	Issue Date	Type	Description	Amount	Inspection Date	% Complete	Date Complete	Comments
21346	05/22/2015	EL	Electrical Per	$ 3,000		100		RADIO HEADS/CAB.
21816	10/28/2014	BP	Building Permi	$ 27,000		100		UPGRADE WIRELESS (TRANSCEND)
21313	04/15/2014	BP	Building Permi	$ 131,000		100		STRUCTURAL MODIFICA 9 EXISTING ANTENNAS
20614	04/25/2013	BP	Building Permi	$ 12,000		100		REPL SPRINT ANTENNAS
19269	03/05/2012	EL	Electrical Per	$ 5,000		100		WIRING
19416	08/10/2011	BP	Building Permi	$ 20,000		100		ADD ANTENNAS
19692	01/11/2011	BP	Building Permi	$ 6,000		100		CABINET INSTALL
18437	03/26/2010	CM	Commercial	$ 12,000		100		REM 12 ANT/REPL 6
13205	05/01/2008	EL	Electrical Per	$ 4,850	07/29/2009	100		NEW SERVICE TO CELLULAR EQUIP
13207	05/01/2008	EL	Electrical Per	$ 2,800	07/29/2009	100		ELECTRICAL
14869	06/27/2005	BP	Building Permi	$ 35,000	05/01/2006	100		TELE/COM EQUIP
11918	08/21/2001			$ 41,494	05/01/2006	100	11/14/2001	TELECOMMUNICATION SITE; BP#12311 4/23/02 $18K FACILITY C.O. 6/13/02;

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