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Also admitted in Massachusetts

January 23, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
5 Perryridge Road, Greenwich, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 124-foot level on the existing 164-foot tower at 5 Perryridge Road in Greenwich (the "Property"). The tower and underlying property are owned by Greenwich Hospital. Cellco's shared use of this tower was approved in 2002. Cellco now intends to modify its facility by adding three (3) model MG D3-800Tx, 2100 MHz antennas, for a total of fifteen (15) antennas, all at the same 124-foot level. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 700 MHz and 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Peter Tesei, First Selectman and Diane W. Fox, Director of Planning and Zoning for the Town of Greenwich.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's proposed antennas and RRHs will be located at the 124-foot level on the 164-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.

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

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Peter Tesei, Greenwich First Selectman
Diane W. Fox, Director of Planning and Zoning
Sandy M. Carter

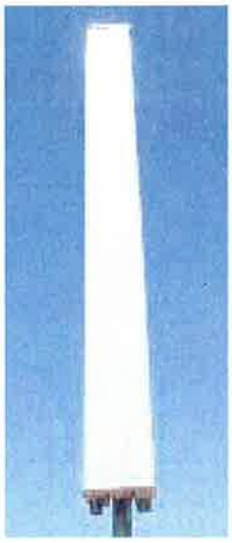
ATTACHMENT 1

MG D3-800Tx

Xpol GSM1800+PCS & UMTS Panel Antenna
15.9 dBd/18 dBi
WIDE BAND 1710-2170 MHz
H 65° V 6.5°

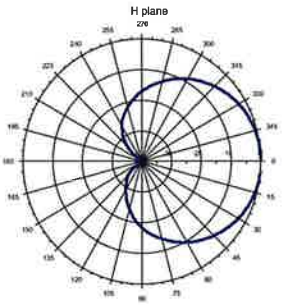
Electrical Specifications

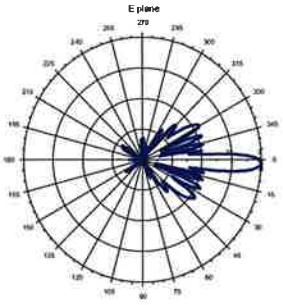
Antenna Model	MG D3-800Tx		
Frequency Range (MHz)	1710-1880	1850-1990	1920-2170
Impedance	50 Ohms		
VSWR	1.40:1		
Polarization	±45°		
Isolation between Ports (dB)	30		
Average Gain (dBd/dBi)	15.7/17.8	15.9/18	16.15/18.25
Horizontal Beamwidth (deg)	65°±5°		
Vertical Beamwidth (deg)	6.5°±0.5°	6.3°±0.5°	6.3°±0.5°
Electrical Tilt (deg)	Fixed 0°-14°		
Sidelobe Suppression (dB)	18	18	18
Front to Back Ratio (dB) @180°±20°	30		
Polarization Isolation (dB) @3 dB Beamwidth	20		
Maximum Power per Input (w)	250		
Intermodulation Products (dBc)	-150		
Connectors	2 x 7/16 Female		
Connector Position	Antenna Bottom		



Mechanical & Environmental Specifications

Dimensions (mm)	1380 x 160 x 90
Survival Wind Speed	200 km/h
Front Windload (N) @ 160 km/h	335
Lateral Windload (N) @ 160 km/h	188
Antenna Weight (kg)	7
Clamps Weight (kg)	2
Mast Mounting	50 to 135 mm
Radome Color	Grey
Grounding	All metallic parts are DC grounded
Temperature Range	-55 to +60ºC
Humidity	100 %





Shipping Specifications

Dimensions (mm)	1580 x 340 x 210
Weight (kg)	12
Material	Cardboard and Foam

Ctra. Campo Real, Km 2,100
28500 Arganda del Rey
Madrid-Spain

RYMSA

Phone: 34 91 876 06 81
Fax: 34 91 876 07 09
E-mail: telecom.commercial@rymsa.com
Web: www.rymsa.com

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

A distributed eNodeB expands 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 an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), 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 — a fraction of the time required for a traditional BTS.

Excellent RF performance

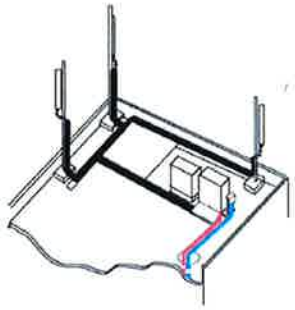
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced.
The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.

Features

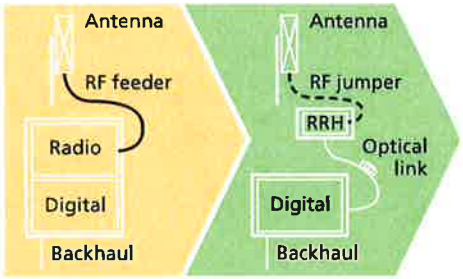
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

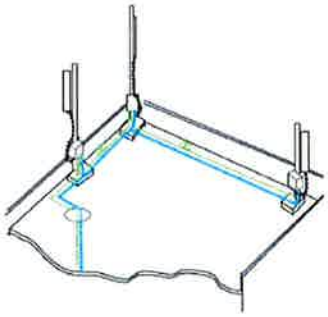
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - ¬ TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
  - ¬ One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - ¬ Single mode dual fiber (SM/DF)
- Multi-mode variant
  - ¬ Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

Alcatel·Lucent

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.

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

A distributed eNodeB expands 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 an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-07-U is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-07-U is compact and weights less than 23 kg (50 lb), 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 — a fraction of the time required for a traditional BTS.

Excellent RF performance

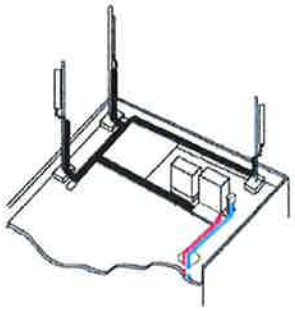
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-07-U provides more RF power while at the same time consuming less electricity.

Features

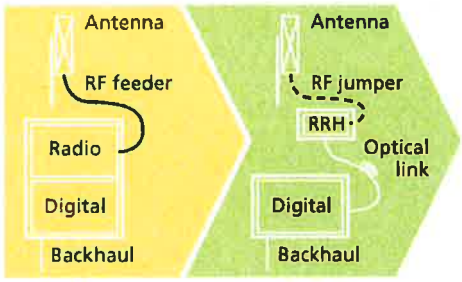
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

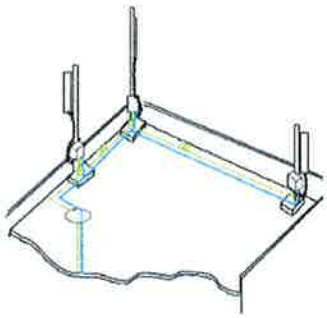
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - ¬ 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - ¬ TMA
  - ¬ Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - ¬ One SM fiber (9/125 µm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - ¬ Two MM fibers (50/125 µm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Alarms and ports

- Six external alarms
- Two optical ports to support daisy-chaining

CPG2809100913 (09)

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

Structure			
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
Mechanical Properties			
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)
Electrical Properties			
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)
Fiber Optic Properties			
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
DC Power Cable Properties			
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
Environment			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

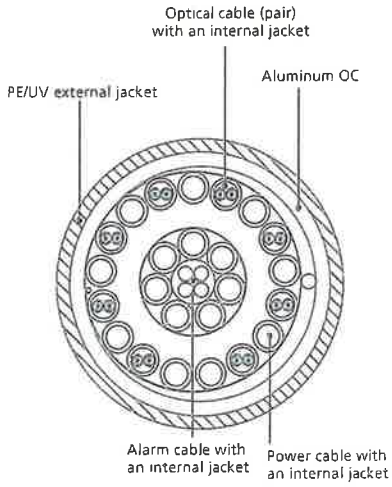


Figure 2: Construction Detail

* This data is provisional and subject to change.

ATTACHMENT 2

	General	Power	Density					
Site Name: Greenwich								
Tower Height: Verizon @ 124'								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*AT&T GSM	6	427	134	0.0513	1900	1.0000	5.13%	
*AT&T GSM	15	296	134	0.0889	880	0.5867	15.16%	
*AT&T UMTS	1	500	134	0.0100	880	0.5867	1.71%	
*AT&T UMTS	2	500	134	0.0200	1900	1.0000	2.00%	
*AT&T LTE	1	500	134	0.0100	740	0.4933	2.03%	
*MW to Bruce	1	4878	160	0.0685	17960	1.0000	6.85%	
*MW to PD	1	122	160	0.0017	18762	1.0000	0.17%	
*MW to Putnam	1	4878	160	0.0685	17500	1.0000	6.85%	
*Trunked System	1	148	164	0.0020	886.7875	0.5912	0.33%	
*Trunked System	1	148	164	0.0020	867.0625	0.5780	0.34%	
*Trunked System	1	148	164	0.0020	868.15	0.5788	0.34%	
*Trunked System	1	148	164	0.0020	868.4	0.5789	0.34%	
*Trunked System	1	148	164	0.0020	868.7	0.5791	0.34%	
*Trunked System	1	148	164	0.0020	868.7	0.5791	0.34%	
*Mutual Aid	1	218.3	155	0.0033	866.0125	0.5773	0.57%	
*Mutual Aid	1	218.3	155	0.0033	866.5125	0.5777	0.57%	
*CMED	1	150	151	0.0024	463	0.3087	0.77%	
*Fire Paging	1	100	125	0.0023	164.175	0.2000	1.15%	
*SP Hotline	1	100	110	0.0030	154.175	0.2000	1.49%	
*Sprint CDMA/LTE	3	778	154	0.0354	1900	1.0000	3.54%	
*Sprint CDMA/LTE	1	438	154	0.0066	850	0.5667	1.17%	
*Clearwire	2	153	154	0.0046	2496	1.0000	0.46%	
*Clearwire	1	211	154	0.0032	11 GHz	1.0000	0.32%	
*T-Mobile PCS (GSM/UMTS)	2	12.0815	144	0.0004	1950	1.0000	0.04%	
*T-Mobile AWS (UMTS)	2	12.0815	144	0.0004	2100	1.0000	0.04%	
*T-Mobile AWS (LTE)	2	24.16301	144	0.0008	2100	1.0000	0.08%	
*Nextel	12	100	113	0.0338	851	0.5673	5.96%	
*Sprint/Nextel WiMAX	3	562	154	0.0256	2657	1.0000	2.56%	
Verizon	**15**	**434**	**124**	**0.1522**	**1970**	**1.0000**	**15.22%**	
Verizon	**9**	**319**	**124**	**0.0671**	**869**	**0.5790**	**11.60%**	
Verizon	**1**	**1750**	**124**	**0.0409**	**2145**	**1.0000**	**4.09%**	
Verizon	**1**	**691**	**124**	**0.0162**	**698**	**0.4650**	**3.48%**	
* Source: Siting Council								**95.0%**

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

164-ft Existing EEI Monopole

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Greenwich

5 Perryridge Road
Greenwich, CT

CENTEK Project No. 13001.081

~~Date: November 18, 2013~~

Rev 1: November 19, 2013

Prepared for:

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

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

Table of Contents

Introduction

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

The host tower is a 164-ft tall, five-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 11030 dated August 21, 2002. The tower geometry, structure member sizes and foundation system information were obtained from the original manufacturers design documents.

Antenna and appurtenance information were obtained from a previous structural analysis report prepared by Centek engineering; job no; 12083, dated September 25, 2012, visual verification conducted from grade by Centek personnel on November 16, 2013 and a Verizon RF data sheet.

The tower is made up of five (5) tapered vertical sections consisting of A572-65 pole sections. The bottom four (4) vertical tower sections are slip joint connected while the top section is flange connected. The diameter of the pole (flat-flat) is 47.0-in at the top and 76.0-in at the base.

Verizon proposes the installation of three (3) panel antennas, six (6) remote radio heads and one (1) main distribution box mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The existing, proposed and future loads considered in this analysis consist of the following:

- TOWN (EXISTING):
  Antennas: One (1) PD1142-1 Omni-directional whip antenna, one (1) PD620-3 Omni-directional whip antenna, one (1) ALR8 Omni-directional whip antenna, three (3) BMR10 Omni-directional whip antennas and one (1) camera mounted on a PiROD 13-ft low profile platform with an elevation of 164-ft above grade level.
  Coax Cables: Six (6) 1/2" ∅, one (1) 5/8" ∅, three (3) 7/8" ∅ and two (2) 1-1/4" ∅ coax cables running on the inside of the existing tower.
- TOWN (EXISTING):
  Antennas: Two (2) 4 FT Dishes and one (1) 2 Ft Dish mounted on three 4'x4" pipe mounts with a RAD center elevation of 160-ft above grade level.
  Coax Cables: Three (3) 1-1/4" ∅ coax cables running on the inside of the existing tower.

- CLEARWIRE (EXISTING):
  Antennas: Three (3) Argus LLPX310R panel antennas, three (3) Samsung FDD-R6-RRH, two (2) Dragonwave Horizon ODU's and two (2) Dragonwave A-ANT-23-G-2-C dishes mounted on the Sprint 13-ft low profile platform with a RAD center elevation of 154-ft above the existing tower base plate.
  Coax Cables: Two (2) 2" ∅ conduits and two (2) 5/8" ∅ coax cables running on the inside of the existing tower.
- SPRINT (EXISTING):
  Antennas: Two (2) RFS APXVSPP18-C-A20 panel antennas, one (1) Powerwave P40-16-XLPP-RR-A panel antennas and one (1) GPS antenna mounted to a low profile platform with a RAD center elevation of 154-ft above the existing tower base plate. Three (3) ALU 1900 MHz RRH's and three (3) ALU 800 MHz RRH's mounted on a universal tr-bracket below the existing low profile platform.
  Coax Cables: Three (3) 1-5/8" ∅ Hybriflex cables and one (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- T-MOBILE (EXISTING/RESERVED):
  Antennas: Six (6) Ericsson AIR21 panel antennas, three (3) TMA's and three (3) Bias Tee's mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 144-ft above grade level.
  Coax Cables: Fourteen (14) 1-5/8" ∅ coax cables and three (3) 1-5/8" ∅ fiber cables running on the inside of the existing tower.
- AT&T (EXISTING):
  Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted to one (1) universal ring mount with a RAD center elevation of 138-ft above grade level.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running on the inside of the existing tower.
- AT&T (EXISTING):
  Antennas: Six (6) Powerwave 7770.00 panel antennas, three (3) Powerwave P65-16-XLH-RR panel antennas and six (6) LGP21401 TMA's mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 134-ft above grade level.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower
- VERIZON (EXISTING TO REMAIN):
  Antennas: Six (6) Decibel 844G65T6ZAXY panel antennas, three (3) Andrew LNX-6514DS-T4M panel antennas, three (3) RYMSA MG D3-800T0 panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 124-ft above grade level.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.

- VERIZON (EXISTING TO REMOVE):
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **VERIZON (PROPOSED):**
  Antennas: Three (3) RYMSA MG D3-800T0 panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads, three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 124-ft above grade level.
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running on the inside of the existing tower.
- NEXTEL (EXISTING):
  Antennas: Twelve (12) Decibel DB846G90A-XY panel antennas mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 114-ft above grade level.
- UNKNOWN (EXISTING):
  Antennas: Three GPS antennas mounted on three (3) standoffs with a RAD center elevation of 50-ft above grade level.
  Coax Cables: Three (3) 7/8" ∅ coax cables running on the exterior of the existing tower.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All 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]*
	Greenwich; v = 100 mph (3 second gust) equivalent to v = 80 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **47.9%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L5)	1.50'-39.88'	47.9%	**PASS**

- The tower deflection (tilt) was found to be within allowable limits.

Deflection (degrees)	Proposed	Allowable (1)	Result
Tilt	1.41	1.9	**PASS**

(1) Allowable tilt taken from original EEI design documents job no. 11030 dated 8/21/02.

Foundation and Anchors

The existing foundation consists of a 9.0 ∅ x 28.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design report; project no. 11030 dated August 21, 2002. The base of the tower is connected to the foundation by means of (30) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	45 kips
	Compression	80 kips
	Moment	5000 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	56.5%	**PASS**
	Lateral Deflection	0.57 in.(1)	**PASS**

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

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Tension	56.2%	**PASS**
Flange Plate	Bending	43.2%	**PASS**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Bending	49.1%	**PASS**
Base Plate	Bending	38.5%	**PASS**

Conclusion

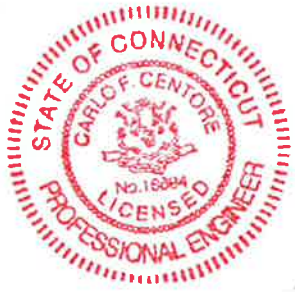
This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration.

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:

Carlo F. Centore, PE
Principal ~ Structural Engineer



Prepared 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.

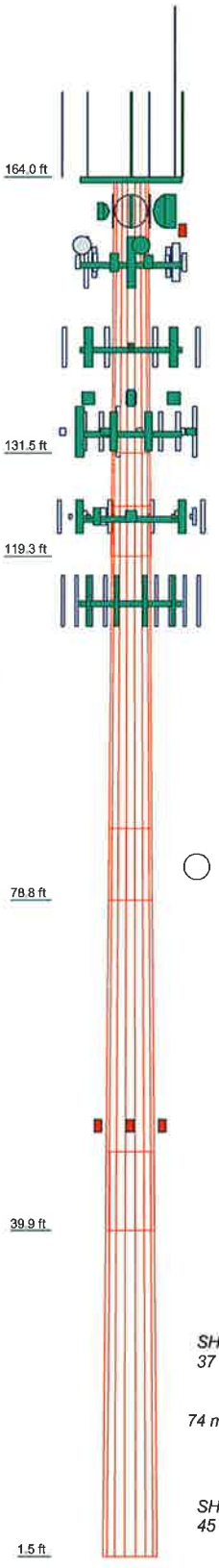
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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	5
Length (ft)	32.50	12.21	46.50	47.33	47.63
Number of Sides	18	18	18	18	18
Thickness (in)	0.3125	0.3750	0.4375	0.5625	0.5625
Socket Length (ft)		6.00	8.42	9.25	
Top Dia (in)	47.0000	53.4200	54.0585	60.4813	66.7412
Bot Dia (in)	53.4200	56.1500	62.9700	69.6600	76.0000
Grade			A572-65		
Weight (K)	5.5	2.7	12.8	18.5	20.5

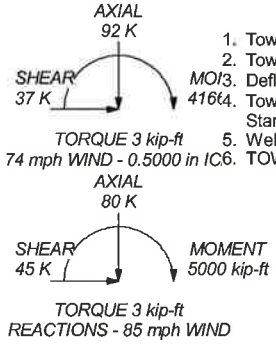


DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PD1142-1 (Town Existing)	164	DC6-48-60-18-8F Surge Arrestor (AT&T Existing)	138
PD620-3 (Town Existing)	164		
ALR8 (Town Existing)	164	Valmont Uni-Tri Bracket (AT&T Existing)	138
BMR10 (Town Existing)	164	P65-16-XLH-RR (AT&T Existing)	134
BMR10 (Town Existing)	164	7770.00 (AT&T Existing)	134
BMR10 (Town Existing)	164	7770.00 (AT&T Existing)	134
Camera (Town Existing)	164	P65-16-XLH-RR (AT&T Existing)	134
Low Profile Platform (Town Existing)	164	(2) LGP214nn TMA (AT&T Existing)	134
4'x4" Pipe Mount (Town Existing)	160	(2) LGP214nn TMA (AT&T Existing)	134
4'x4" Pipe Mount (Town Existing)	160	(2) LGP214nn TMA (AT&T Existing)	134
4'x4" Pipe Mount (Town Existing)	160	Low Profile Platform (AT&T Existing)	134
4 FT DISH (Town Existing)	160	7770.00 (AT&T Existing)	134
4 FT DISH (Town Existing)	160	7770.00 (AT&T Existing)	134
2 FT DISH (Town Existing)	160	P65-16-XLH-RR (AT&T Existing)	134
Horizon ODU (Clearwire Existing)	154	7770.00 (AT&T Existing)	134
Horizon ODU (Clearwire Existing)	154	7770.00 (AT&T Existing)	134
APXVSPP18-C-A20 (Sprint Existing)	154	844G65T6ZAXY (Verizon Existing)	124
P40-16-XLPP-RR-A (Sprint Existing)	154	MG D3-800TX (Verizon Existing)	124
APXVSPP18-C-A20 (Sprint Existing)	154	LNX-6514DS-T0M (Verizon Existing)	124
FD-RRH 4x45 1900 (Sprint Existing)	154	MG D3-800TX (Verizon Proposed)	124
FD-RRH 4x45 1900 (Sprint Existing)	154	844G65T6ZAXY (Verizon Existing)	124
FD-RRH 4x45 1900 (Sprint Existing)	154	844G65T6ZAXY (Verizon Existing)	124
FD-RRH 2x50 800 (Sprint Existing)	154	MG D3-800TX (Verizon Existing)	124
FD-RRH 2x50 800 (Sprint Existing)	154	LNX-6514DS-T0M (Verizon Existing)	124
FD-RRH 2x50 800 (Sprint Existing)	154	MG D3-800TX (Verizon Proposed)	124
GPS (Sprint Existing)	154	844G65T6ZAXY (Verizon Existing)	124
Low Profile Platform (Sprint Existing)	154	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	124
LLPX310R (Clearwire Existing)	154		
LLPX310R (Clearwire Existing)	154	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	124
LLPX310R (Clearwire Existing)	154	(2) FD9R6004/2C-3L Diplexer (Verizon Existing)	124
A-Ant-23G-2-C (Clearwire Existing)	154		
A-Ant-23G-2-C (Clearwire Existing)	154	RRH2x40-AWS (Verizon Proposed)	124
Remote Radio Head FD R6 RRH (Clearwire Existing)	151.5	RRH2x40-AWS (Verizon Proposed)	124
Valmont Uni-Tri Bracket (Sprint Existing)	151.5	RRH2x40-AWS (Verizon Proposed)	124
Remote Radio Head FD R6 RRH (Clearwire Existing)	151.5	RRH2x40-07-U (Verizon Proposed)	124
		RRH2x40-07-U (Verizon Proposed)	124
Remote Radio Head FD R6 RRH (Clearwire Existing)	151.5	RRH2x40-07-U (Verizon Proposed)	124
		DB-T1-6Z-8AB-0Z (Verizon Proposed)	124
TMA 10"x8"x3" (T-Mobile Reserved)	144	Low Profile Platform (Verizon Existing)	124
Smart Bias T (T-Mobile Reserved)	144	844G65T6ZAXY (Verizon Existing)	124
Smart Bias T (T-Mobile Reserved)	144	MG D3-800TX (Verizon Existing)	124
Smart Bias T (T-Mobile Reserved)	144	LNX-6514DS-T0M (Verizon Existing)	124
Low Profile Platform (T-Mobile Existing)	144	MG D3-800TX (Verizon Proposed)	124
(2) AIR21 (T-Mobile Reserved)	144	844G65T6ZAXY (Verizon Existing)	124
(2) AIR21 (T-Mobile Reserved)	144	(4) DB846G90A-XY (Nextel Existing)	114
TMA 10"x8"x3" (T-Mobile Reserved)	144	(4) DB846G90A-XY (Nextel Existing)	114
TMA 10"x8"x3" (T-Mobile Reserved)	144	(4) DB846G90A-XY (Nextel Existing)	114
(2) AIR21 (T-Mobile Reserved)	144	Low Profile Platform (Nextel Existing)	114
(2) RRUS-11 (AT&T Existing)	138	GPS	51.5
(2) RRUS-11 (AT&T Existing)	138	GPS	51.5
(2) RRUS-11 (AT&T Existing)	138	GPS	51.5

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			



TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 47.9%

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

Job: 13001.081 - Greenwich			
Project: 164' EEI Monopole - 5 Perryridge Rd., Greenwich, CT			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 11/19/13	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	13001.081 - Greenwich	1 of 22
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 164' EEI Monopole - 5 Perryridge Rd., Greenwich, CT	Date 17:40:52 11/19/13
	Client Verizon Wireless	Designed by TJL

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 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	164.00-131.50	32.50	0.00	18	47.0000	53.4200	0.3125	1.2500	A572-65 (65 ksi)
L2	131.50-119.29	12.21	6.00	18	53.4200	56.1500	0.3750	1.5000	A572-65 (65 ksi)
L3	119.29-78.79	46.50	8.42	18	54.0585	62.9700	0.4375	1.7500	A572-65 (65 ksi)
L4	78.79-39.88	47.33	9.25	18	60.4813	69.6600	0.5625	2.2500	A572-65 (65 ksi)
L5	39.88-1.50	47.63		18	66.7412	76.0000	0.5625	2.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	47.7251	46.3082	12752.5270	16.5741	23.8760	534.1149	25521.8341	23.1585	7.7220	24.71
	54.2441	52.6760	18769.9004	18.8532	27.1374	691.6627	37564.4987	26.3430	8.8519	28.326
L2	54.2441	63.1368	22444.4518	18.8310	27.1374	827.0684	44918.4365	31.5744	8.7419	23.312
	57.0162	66.3862	26091.2194	19.8001	28.5242	914.7047	52216.7704	33.1994	9.2224	24.593
L3	56.0600	74.4594	27047.4669	19.0354	27.4617	984.9157	54130.5236	37.2368	8.7443	19.987
	63.9414	86.8342	42898.2727	22.1990	31.9888	1341.0421	85852.9920	43.4253	10.3127	23.572
L4	63.0724	106.9776	48524.0652	21.2712	30.7245	1579.3269	97111.9796	53.4990	9.6547	17.164
	70.7346	123.3649	74413.8720	24.5296	35.3873	2102.8424	148925.6597	61.6942	11.2702	20.036
L5	69.5966	118.1537	65376.3617	23.4934	33.9045	1928.2498	130838.7474	59.0881	10.7564	19.123
	77.1724	134.6842	96834.1984	26.7803	38.6080	2508.1382	193795.8137	67.3549	12.3860	22.02

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 164.00-131.50				1	1	1		
L2 131.50-119.29				1	1	1		
L3 119.29-78.79				1	1	1		
L4 78.79-39.88				1	1	1		
L5 39.88-1.50				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1/2 (Town Existing)	A	No	Inside Pole	164.00 - 4.50	6	No Ice 1/2" Ice	0.00 0.00	0.25 0.25
5/8 (Town Existing)	A	No	Inside Pole	164.00 - 4.50	1	No Ice 1/2" Ice	0.00 0.00	0.40 0.40
7/8 (Town Existing)	A	No	Inside Pole	164.00 - 4.50	3	No Ice 1/2" Ice	0.00 0.00	0.54 0.54
1 1/4 (Town Existing)	A	No	Inside Pole	164.00 - 4.50	5	No Ice 1/2" Ice	0.00 0.00	0.66 0.66
1/2 (Sprint Existing)	B	No	Inside Pole	154.00 - 7.50	1	No Ice 1/2" Ice	0.00 0.00	0.25 0.25
2" Rigid Conduit (Clearwire Existing)	B	No	Inside Pole	154.00 - 7.50	2	No Ice 1/2" Ice	0.00 0.00	2.80 2.80
LDF4.5-50 (5/8 FOAM) (Clearwire Existing)	B	No	Inside Pole	154.00 - 7.50	2	No Ice 1/2" Ice	0.00 0.00	0.15 0.15
1 5/8 (T-Mobile Existing)	B	No	Inside Pole	144.00 - 4.50	14	No Ice 1/2" Ice	0.00 0.00	1.04 1.04
1 5/8	A	No	Inside Pole	134.00 - 11.50	12	No Ice	0.00	1.04

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
(AT&T Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	124.00 - 7.50	6	No Ice	0.00	1.04
(Verizon Existing)						1/2" Ice	0.00	1.04
RG6-Fiber	A	No	Inside Pole	134.00 - 11.50	1	No Ice	0.00	0.00
(AT&T Existing)						1/2" Ice	0.00	0.00
#8 AWG Copper WIre	A	No	Inside Pole	134.00 - 11.50	2	No Ice	0.00	0.00
(AT&T Existing)						1/2" Ice	0.00	0.00
7/8	B	No	CaAa (Out Of Face)	51.50 - 4.50	3	No Ice	0.11	0.54
						1/2" Ice	0.21	1.52
HYBRIFLEX 1-5/8"	B	No	Inside Pole	154.00 - 7.50	3	No Ice	0.00	1.90
(Sprint Proposed)						1/2" Ice	0.00	1.90
HYBRIFLEX 1-5/8"	B	No	Inside Pole	144.00 - 7.50	3	No Ice	0.00	1.90
(T-Mobile - Reserved)						1/2" Ice	0.00	1.90
HYBRIFLEX 1-5/8"	C	No	Inside Pole	124.00 - 7.50	1	No Ice	0.00	1.90
(Verizon Proposed)						1/2" Ice	0.00	1.90

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	164.00-131.50	A	0.000	0.000	0.000	0.000	0.25
		B	0.000	0.000	0.000	0.000	0.52
		C	0.000	0.000	0.000	0.000	0.00
L2	131.50-119.29	A	0.000	0.000	0.000	0.000	0.24
		B	0.000	0.000	0.000	0.000	0.39
		C	0.000	0.000	0.000	0.000	0.04
L3	119.29-78.79	A	0.000	0.000	0.000	0.000	0.78
		B	0.000	0.000	0.000	0.000	1.30
		C	0.000	0.000	0.000	0.000	0.33
L4	78.79-39.88	A	0.000	0.000	0.000	0.000	0.75
		B	0.000	0.000	0.000	3.869	1.27
		C	0.000	0.000	0.000	0.000	0.32
L5	39.88-1.50	A	0.000	0.000	0.000	0.000	0.60
		B	0.000	0.000	0.000	11.782	1.14
		C	0.000	0.000	0.000	0.000	0.26

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	164.00-131.50	A	0.500	0.000	0.000	0.000	0.000	0.25
		B		0.000	0.000	0.000	0.000	0.52
		C		0.000	0.000	0.000	0.000	0.00
L2	131.50-119.29	A	0.500	0.000	0.000	0.000	0.000	0.24
		B		0.000	0.000	0.000	0.000	0.39
		C		0.000	0.000	0.000	0.000	0.04
L3	119.29-78.79	A	0.500	0.000	0.000	0.000	0.000	0.78
		B		0.000	0.000	0.000	0.000	1.30
		C		0.000	0.000	0.000	0.000	0.33
L4	78.79-39.88	A	0.500	0.000	0.000	0.000	0.000	0.75
		B		0.000	0.000	0.000	7.355	1.30
		C		0.000	0.000	0.000	0.000	0.32
L5	39.88-1.50	A	0.500	0.000	0.000	0.000	0.000	0.60

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
		B		0.000	0.000	0.000	22.395	1.24
		C		0.000	0.000	0.000	0.000	0.26

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	164.00-131.50	0.0000	0.0000	0.0000	0.0000
L2	131.50-119.29	0.0000	0.0000	0.0000	0.0000
L3	119.29-78.79	0.0000	0.0000	0.0000	0.0000
L4	78.79-39.88	0.1320	0.0762	0.2434	0.1405
L5	39.88-1.50	0.3779	0.2182	0.6797	0.3924

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
4'x4" Pipe Mount	A	From Face	0.50	0.0000	160.00	No Ice	1.32	1.32	0.04
(Town Existing)			0.00			1/2" Ice	1.58	1.58	0.06
			0.00						
4'x4" Pipe Mount	B	From Face	0.50	0.0000	160.00	No Ice	1.32	1.32	0.04
(Town Existing)			0.00			1/2" Ice	1.58	1.58	0.06
			0.00						
4'x4" Pipe Mount	C	From Face	0.50	0.0000	160.00	No Ice	1.32	1.32	0.04
(Town Existing)			0.00			1/2" Ice	1.58	1.58	0.06
			0.00						
PD1142-1	A	From Face	4.00	0.0000	164.00	No Ice	1.32	1.32	0.01
(Town Existing)			0.00			1/2" Ice	3.21	3.21	0.02
			5.00						
PD620-3	B	From Face	4.00	0.0000	164.00	No Ice	3.83	3.83	0.05
(Town Existing)			0.00			1/2" Ice	5.99	5.99	0.08
			10.00						
ALR8	C	From Face	4.00	0.0000	164.00	No Ice	8.10	8.10	0.10
(Town Existing)			0.00			1/2" Ice	10.80	10.80	0.15
			5.00						
BMR10	A	From Face	4.00	0.0000	164.00	No Ice	8.64	8.64	0.10
(Town Existing)			-6.00			1/2" Ice	10.80	10.80	0.15
			5.00						
BMR10	B	From Face	4.00	0.0000	164.00	No Ice	8.64	8.64	0.10
(Town Existing)			-6.00			1/2" Ice	10.80	10.80	0.15
			5.00						
BMR10	C	From Face	4.00	0.0000	164.00	No Ice	8.64	8.64	0.10
(Town Existing)			-6.00			1/2" Ice	10.80	10.80	0.15
			5.00						
Camera	C	From Face	4.00	0.0000	164.00	No Ice	3.00	3.00	0.10
(Town Existing)			0.00			1/2" Ice	4.00	4.00	0.15

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
			2.00						
Low Profile Platform	C	None		0.0000	164.00	No Ice	15.70	15.70	1.30
(Town Existing)						1/2" Ice	20.10	20.10	1.76
LLPX310R	A	From Face	3.00	0.0000	154.00	No Ice	4.83	1.95	0.03
(Clearwire Existing)			0.00			1/2" Ice	5.18	2.21	0.05
			0.00						
LLPX310R	B	From Face	3.00	0.0000	154.00	No Ice	4.83	1.95	0.03
(Clearwire Existing)			0.00			1/2" Ice	5.18	2.21	0.05
			0.00						
LLPX310R	C	From Face	3.00	0.0000	154.00	No Ice	4.83	1.95	0.03
(Clearwire Existing)			0.00			1/2" Ice	5.18	2.21	0.05
			0.00						
Remote Radio Head FD R6	A	From Face	3.00	0.0000	151.50	No Ice	1.80	0.78	0.03
RRH			0.00			1/2" Ice	1.99	0.92	0.04
(Clearwire Existing)			0.00						
Remote Radio Head FD R6	B	From Face	3.00	0.0000	151.50	No Ice	1.80	0.78	0.03
RRH			0.00			1/2" Ice	1.99	0.92	0.04
(Clearwire Existing)			0.00						
Remote Radio Head FD R6	C	From Face	3.00	0.0000	151.50	No Ice	1.80	0.78	0.03
RRH			0.00			1/2" Ice	1.99	0.92	0.04
(Clearwire Existing)			0.00						
Horizon ODU	A	None		0.0000	154.00	No Ice	0.79	0.17	0.00
(Clearwire Existing)						1/2" Ice	0.91	0.25	0.00
Horizon ODU	C	None		0.0000	154.00	No Ice	0.79	0.17	0.00
(Clearwire Existing)						1/2" Ice	0.91	0.25	0.00
APXVSPP18-C-A20	A	From Face	4.00	0.0000	154.00	No Ice	8.26	5.28	0.06
(Sprint Existing)			0.00			1/2" Ice	8.81	5.74	0.11
			0.00						
P40-16-XLPP-RR-A	B	From Face	4.00	0.0000	154.00	No Ice	10.50	3.52	0.05
(Sprint Existing)			0.00			1/2" Ice	10.98	3.87	0.11
			0.00						
APXVSPP18-C-A20	C	From Face	4.00	0.0000	154.00	No Ice	8.26	5.28	0.06
(Sprint Existing)			0.00			1/2" Ice	8.81	5.74	0.11
			0.00						
FD-RRH 4x45 1900	A	From Face	4.00	0.0000	154.00	No Ice	2.71	2.78	0.06
(Sprint Existing)			2.00			1/2" Ice	2.94	3.02	0.08
			0.00						
FD-RRH 4x45 1900	B	From Face	4.00	0.0000	154.00	No Ice	2.71	2.78	0.06
(Sprint Existing)			2.00			1/2" Ice	2.94	3.02	0.08
			0.00						
FD-RRH 4x45 1900	C	From Face	4.00	0.0000	154.00	No Ice	2.71	2.78	0.06
(Sprint Existing)			2.00			1/2" Ice	2.94	3.02	0.08
			0.00						
FD-RRH 2x50 800	A	From Face	4.00	0.0000	154.00	No Ice	2.40	2.25	0.06
(Sprint Existing)			-2.00			1/2" Ice	2.61	2.46	0.09
			0.00						
FD-RRH 2x50 800	B	From Face	4.00	0.0000	154.00	No Ice	2.40	2.25	0.06
(Sprint Existing)			-2.00			1/2" Ice	2.61	2.46	0.09
			0.00						
FD-RRH 2x50 800	C	From Face	4.00	0.0000	154.00	No Ice	2.40	2.25	0.06
(Sprint Existing)			-2.00			1/2" Ice	2.61	2.46	0.09
			0.00						
Valmont Uni-Tri Bracket	A	None		0.0000	151.50	No Ice	1.75	1.75	0.29
(Sprint Existing)						1/2" Ice	1.94	1.94	0.31
GPS	C	From Face	4.00	0.0000	154.00	No Ice	1.00	1.00	0.01
(Sprint Existing)			-6.00			1/2" Ice	1.50	1.50	0.01
			3.00						

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
Low Profile Platform	C	None		0.0000	154.00	No Ice	15.70	15.70	1.30
(Sprint Existing)						1/2" Ice	20.10	20.10	1.76
(2) AIR21	A	From Face	4.00	0.0000	144.00	No Ice	6.53	4.36	0.08
(T-Mobile Reserved)			0.00			1/2" Ice	6.98	4.77	0.12
			0.00						
(2) AIR21	B	From Face	4.00	0.0000	144.00	No Ice	6.53	4.36	0.08
(T-Mobile Reserved)			0.00			1/2" Ice	6.98	4.77	0.12
			0.00						
(2) AIR21	C	From Face	4.00	0.0000	144.00	No Ice	6.53	4.36	0.08
(T-Mobile Reserved)			0.00			1/2" Ice	6.98	4.77	0.12
			0.00						
TMA 10"x8"x3"	A	From Face	4.00	0.0000	144.00	No Ice	0.78	0.29	0.02
(T-Mobile Reserved)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
TMA 10"x8"x3"	B	From Face	4.00	0.0000	144.00	No Ice	0.78	0.29	0.02
(T-Mobile Reserved)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
TMA 10"x8"x3"	C	From Face	4.00	0.0000	144.00	No Ice	0.78	0.29	0.02
(T-Mobile Reserved)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
Smart Bias T	A	From Face	4.00	0.0000	144.00	No Ice	0.16	0.08	0.00
(T-Mobile Reserved)			0.00			1/2" Ice	0.21	0.12	0.00
			0.00						
Smart Bias T	B	From Face	4.00	0.0000	144.00	No Ice	0.16	0.08	0.00
(T-Mobile Reserved)			0.00			1/2" Ice	0.21	0.12	0.00
			0.00						
Smart Bias T	C	From Face	4.00	0.0000	144.00	No Ice	0.16	0.08	0.00
(T-Mobile Reserved)			0.00			1/2" Ice	0.21	0.12	0.00
			0.00						
Low Profile Platform	C	None		0.0000	144.00	No Ice	15.70	15.70	1.30
(T-Mobile Existing)						1/2" Ice	20.10	20.10	1.76
(2) RRUS-11	A	From Face	0.50	0.0000	138.00	No Ice	2.99	1.25	0.05
(AT&T Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	B	From Face	0.50	0.0000	138.00	No Ice	2.99	1.25	0.05
(AT&T Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	C	From Face	0.50	0.0000	138.00	No Ice	2.99	1.25	0.05
(AT&T Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	138.00	No Ice	2.23	2.23	0.02
Arrestor			0.00			1/2" Ice	2.45	2.45	0.04
(AT&T Existing)			0.00						
Valmont Uni-Tri Bracket	C	None		0.0000	138.00	No Ice	1.75	1.75	0.29
(AT&T Existing)						1/2" Ice	1.94	1.94	0.31
7770.00	A	From Face	3.00	0.0000	134.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			-2.00			1/2" Ice	6.31	3.27	0.07
			0.00						
7770.00	A	From Face	3.00	0.0000	134.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			2.00			1/2" Ice	6.31	3.27	0.07
			0.00						
P65-16-XLH-RR	A	From Face	3.00	0.0000	134.00	No Ice	8.40	4.70	0.06
(AT&T Existing)			6.00			1/2" Ice	8.95	5.15	0.11
			0.00						
7770.00	B	From Face	3.00	0.0000	134.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			-2.00			1/2" Ice	6.31	3.27	0.07
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
7770.00	B	From Face	3.00	0.0000	134.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			2.00			1/2" Ice	6.31	3.27	0.07
			0.00						
P65-16-XLH-RR	B	From Face	3.00	0.0000	134.00	No Ice	8.40	4.70	0.06
(AT&T Existing)			6.00			1/2" Ice	8.95	5.15	0.11
			0.00						
7770.00	C	From Face	3.00	0.0000	134.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			2.00			1/2" Ice	6.31	3.27	0.07
			0.00						
7770.00	C	From Face	3.00	0.0000	134.00	No Ice	5.88	2.93	0.04
(AT&T Existing)			-2.00			1/2" Ice	6.31	3.27	0.07
			0.00						
P65-16-XLH-RR	C	From Face	3.00	0.0000	134.00	No Ice	8.40	4.70	0.06
(AT&T Existing)			6.00			1/2" Ice	8.95	5.15	0.11
			0.00						
(2) LGP214nn TMA	A	From Face	3.00	0.0000	134.00	No Ice	1.29	0.23	0.01
(AT&T Existing)			-2.00			1/2" Ice	1.45	0.31	0.02
			0.00						
(2) LGP214nn TMA	B	From Face	3.00	0.0000	134.00	No Ice	1.29	0.23	0.01
(AT&T Existing)			-2.00			1/2" Ice	1.45	0.31	0.02
			0.00						
(2) LGP214nn TMA	C	From Face	3.00	0.0000	134.00	No Ice	1.29	0.23	0.01
(AT&T Existing)			-2.00			1/2" Ice	1.45	0.31	0.02
			0.00						
Low Profile Platform	C	None		0.0000	134.00	No Ice	15.70	15.70	1.30
(AT&T Existing)						1/2" Ice	20.10	20.10	1.76
844G65T6ZAXY	A	From Face	4.00	0.0000	124.00	No Ice	4.67	3.73	0.01
(Verizon Existing)			-6.00			1/2" Ice	5.05	4.10	0.04
			0.00						
MG D3-800TX	A	From Face	4.00	0.0000	124.00	No Ice	3.45	2.22	0.00
(Verizon Existing)			-4.00			1/2" Ice	3.80	2.55	0.02
			0.00						
LNX-6514DS-T0M	A	From Face	4.00	0.0000	124.00	No Ice	8.41	5.41	0.04
(Verizon Existing)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
MG D3-800TX	A	From Face	4.00	0.0000	124.00	No Ice	3.45	2.22	0.00
(Verizon Proposed)			4.00			1/2" Ice	3.80	2.55	0.02
			0.00						
844G65T6ZAXY	A	From Face	4.00	0.0000	124.00	No Ice	4.67	3.73	0.01
(Verizon Existing)			6.00			1/2" Ice	5.05	4.10	0.04
			0.00						
844G65T6ZAXY	B	From Face	4.00	0.0000	124.00	No Ice	4.67	3.73	0.01
(Verizon Existing)			-6.00			1/2" Ice	5.05	4.10	0.04
			0.00						
MG D3-800TX	B	From Face	4.00	0.0000	124.00	No Ice	3.45	2.22	0.00
(Verizon Existing)			-4.00			1/2" Ice	3.80	2.55	0.02
			0.00						
LNX-6514DS-T0M	B	From Face	4.00	0.0000	124.00	No Ice	8.41	5.41	0.04
(Verizon Existing)			0.00			1/2" Ice	8.96	5.86	0.09
			0.00						
MG D3-800TX	B	From Face	4.00	0.0000	124.00	No Ice	3.45	2.22	0.00
(Verizon Proposed)			4.00			1/2" Ice	3.80	2.55	0.02
			0.00						
844G65T6ZAXY	B	From Face	4.00	0.0000	124.00	No Ice	4.67	3.73	0.01
(Verizon Existing)			6.00			1/2" Ice	5.05	4.10	0.04
			0.00						
844G65T6ZAXY	C	From Face	4.00	0.0000	124.00	No Ice	4.67	3.73	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon Existing)			-6.00 0.00			1/2" Ice	5.05	4.10	0.04
MG D3-800TX	C	From Face	4.00	0.0000	124.00	No Ice	3.45	2.22	0.00
(Verizon Existing)			-4.00 0.00			1/2" Ice	3.80	2.55	0.02
LNX-6514DS-T0M	C	From Face	4.00	0.0000	124.00	No Ice	8.41	5.41	0.04
(Verizon Existing)			0.00 0.00			1/2" Ice	8.96	5.86	0.09
MG D3-800TX	C	From Face	4.00	0.0000	124.00	No Ice	3.45	2.22	0.00
(Verizon Proposed)			4.00 0.00			1/2" Ice	3.80	2.55	0.02
844G65T6ZAXY	C	From Face	4.00	0.0000	124.00	No Ice	4.67	3.73	0.01
(Verizon Existing)			6.00 0.00			1/2" Ice	5.05	4.10	0.04
(2) FD9R6004/2C-3L	B	From Face	3.00	0.0000	124.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon Existing)			0.00						
(2) FD9R6004/2C-3L	C	From Face	3.00	0.0000	124.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon Existing)			0.00						
(2) FD9R6004/2C-3L	A	From Face	3.00	0.0000	124.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon Existing)			0.00						
RRH2x40-AWS	A	From Face	4.00	0.0000	124.00	No Ice	2.52	1.59	0.04
(Verizon Proposed)			4.00 0.00			1/2" Ice	2.75	1.80	0.06
RRH2x40-AWS	B	From Face	4.00	0.0000	124.00	No Ice	2.52	1.59	0.04
(Verizon Proposed)			4.00 0.00			1/2" Ice	2.75	1.80	0.06
RRH2x40-AWS	C	From Face	4.00	0.0000	124.00	No Ice	2.52	1.59	0.04
(Verizon Proposed)			4.00 0.00			1/2" Ice	2.75	1.80	0.06
RRH2x40-07-U	A	From Face	4.00	0.0000	124.00	No Ice	2.25	1.23	0.05
(Verizon Proposed)			0.00 0.00			1/2" Ice	2.45	1.39	0.07
RRH2x40-07-U	B	From Face	4.00	0.0000	124.00	No Ice	2.25	1.23	0.05
(Verizon Proposed)			0.00 0.00			1/2" Ice	2.45	1.39	0.07
RRH2x40-07-U	C	From Face	4.00	0.0000	124.00	No Ice	2.25	1.23	0.05
(Verizon Proposed)			0.00 0.00			1/2" Ice	2.45	1.39	0.07
DB-T1-6Z-8AB-0Z	A	From Face	4.00	0.0000	124.00	No Ice	5.60	2.33	0.04
(Verizon Proposed)			4.00 0.00			1/2" Ice	5.92	2.56	0.08
Low Profile Platform	C	None		0.0000	124.00	No Ice	15.70	15.70	1.30
(Verizon Existing)						1/2" Ice	20.10	20.10	1.76
(4) DB846G90A-XY	A	From Face	4.00	0.0000	114.00	No Ice	4.99	5.87	0.02
(Nextel Existing)			0.00 0.00			1/2" Ice	5.44	6.32	0.05
(4) DB846G90A-XY	B	From Face	4.00	0.0000	114.00	No Ice	4.99	5.87	0.02
(Nextel Existing)			0.00 0.00			1/2" Ice	5.44	6.32	0.05
(4) DB846G90A-XY	C	From Face	4.00	0.0000	114.00	No Ice	4.99	5.87	0.02
(Nextel Existing)			0.00 0.00			1/2" Ice	5.44	6.32	0.05
Low Profile Platform	C	None		0.0000	114.00	No Ice	15.70	15.70	1.30
(Nextel Existing)						1/2" Ice	20.10	20.10	1.76

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
GPS	A	From Face	1.50 0.00 0.00	0.0000	51.50	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	0.01 0.01
GPS	B	From Face	1.50 0.00 0.00	0.0000	51.50	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	0.01 0.01
GPS	C	From Face	1.50 0.00 0.00	0.0000	51.50	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	0.01 0.01

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
4 FT DISH (Town Existing)	A	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	Worst		160.00	4.00	No Ice 1/2" Ice	12.56 13.09	0.17 0.24
4 FT DISH (Town Existing)	B	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	Worst		160.00	4.00	No Ice 1/2" Ice	12.56 13.09	0.17 0.24
2 FT DISH (Town Existing)	C	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	Worst		160.00	2.00	No Ice 1/2" Ice	3.14 3.41	0.03 0.04
A-Ant-23G-2-C (Clearwire Existing)	A	Paraboloid w/Radome	From Face	3.10 -2.52 2.00	Worst		154.00	2.17	No Ice 1/2" Ice	3.72 4.01	0.03 0.05
A-Ant-23G-2-C (Clearwire Existing)	C	Paraboloid w/Radome	From Face	3.80 -1.24 2.00	Worst		154.00	2.17	No Ice 1/2" Ice	3.72 4.01	0.03 0.05

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 164.00-131.50	147.53	1.534	28	135.985	A B C	0.000 0.000 0.000	135.985 135.985 135.985	135.985	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L2 131.50-119.29	125.34	1.464	27	55.744	A B C	0.000 0.000 0.000	55.744 55.744 55.744	55.744	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000

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
L3	98.89	1.368	25	199.426	A	0.000	199.426	199.426	100.00	0.000	0.000
119.29-78.79					B	0.000	199.426		100.00	0.000	0.000
					C	0.000	199.426		100.00	0.000	0.000
L4 78.79-39.88	59.42	1.183	22	213.639	A	0.000	213.639	213.639	100.00	0.000	0.000
					B	0.000	213.639		100.00	0.000	3.869
					C	0.000	213.639		100.00	0.000	0.000
L5 39.88-1.50	20.36	1	18	231.142	A	0.000	231.142	231.142	100.00	0.000	0.000
					B	0.000	231.142		100.00	0.000	11.782
					C	0.000	231.142		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G 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	147.53	1.534	21	0.5000	138.694	A	0.000	138.694	138.694	100.00	0.000	0.000
164.00-131.50						B	0.000	138.694		100.00	0.000	0.000
						C	0.000	138.694		100.00	0.000	0.000
L2	125.34	1.464	20	0.5000	56.761	A	0.000	56.761	56.761	100.00	0.000	0.000
131.50-119.29						B	0.000	56.761		100.00	0.000	0.000
						C	0.000	56.761		100.00	0.000	0.000
L3 119.29-78.79	98.89	1.368	19	0.5000	202.801	A	0.000	202.801	202.801	100.00	0.000	0.000
						B	0.000	202.801		100.00	0.000	0.000
						C	0.000	202.801		100.00	0.000	0.000
L4 78.79-39.88	59.42	1.183	16	0.5000	216.881	A	0.000	216.881	216.881	100.00	0.000	0.000
						B	0.000	216.881		100.00	0.000	7.355
						C	0.000	216.881		100.00	0.000	0.000
L5 39.88-1.50	20.36	1	14	0.5000	234.341	A	0.000	234.341	234.341	100.00	0.000	0.000
						B	0.000	234.341		100.00	0.000	22.395
						C	0.000	234.341		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	147.53	1.534	10	135.985	A	0.000	135.985	135.985	100.00	0.000	0.000
164.00-131.50					B	0.000	135.985		100.00	0.000	0.000
					C	0.000	135.985		100.00	0.000	0.000
L2	125.34	1.464	9	55.744	A	0.000	55.744	55.744	100.00	0.000	0.000
131.50-119.29					B	0.000	55.744		100.00	0.000	0.000
					C	0.000	55.744		100.00	0.000	0.000
L3	98.89	1.368	9	199.426	A	0.000	199.426	199.426	100.00	0.000	0.000
119.29-78.79					B	0.000	199.426		100.00	0.000	0.000
					C	0.000	199.426		100.00	0.000	0.000
L4 78.79-39.88	59.42	1.183	8	213.639	A	0.000	213.639	213.639	100.00	0.000	0.000

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
					B	0.000	213.639		100.00	0.000	3.869
					C	0.000	213.639		100.00	0.000	0.000
L5 39.88-1.50	20.36	1	6	231.142	A	0.000	231.142	231.142	100.00	0.000	0.000
					B	0.000	231.142		100.00	0.000	11.782
					C	0.000	231.142		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.77	5.47	A	1	0.65	1	1	1	135.985	4.24	130.34	C
164.00-131.50			B	1	0.65	1	1	1	135.985			
			C	1	0.65	1	1	1	135.985			
L2	0.67	2.69	A	1	0.65	1	1	1	55.744	1.66	135.82	C
131.50-119.29			B	1	0.65	1	1	1	55.744			
			C	1	0.65	1	1	1	55.744			
L3	2.41	12.76	A	1	0.65	1	1	1	199.426	5.53	136.63	C
119.29-78.79			B	1	0.65	1	1	1	199.426			
			C	1	0.65	1	1	1	199.426			
L4	2.34	18.55	A	1	0.65	1	1	1	213.639	5.25	134.97	C
78.79-39.88			B	1	0.65	1	1	1	213.639			
			C	1	0.65	1	1	1	213.639			
L5 39.88-1.50	2.00	20.49	A	1	0.65	1	1	1	231.142	5.06	131.96	C
			B	1	0.65	1	1	1	231.142			
			C	1	0.65	1	1	1	231.142			
Sum Weight:	8.19	59.96						OTM	1762.61 kip-ft	21.74		

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	0.77	5.47	A	1	0.65	1	1	1	135.985	4.24	130.34	C
164.00-131.50			B	1	0.65	1	1	1	135.985			
			C	1	0.65	1	1	1	135.985			
L2	0.67	2.69	A	1	0.65	1	1	1	55.744	1.66	135.82	C
131.50-119.29			B	1	0.65	1	1	1	55.744			
			C	1	0.65	1	1	1	55.744			
L3	2.41	12.76	A	1	0.65	1	1	1	199.426	5.53	136.63	C
119.29-78.79			B	1	0.65	1	1	1	199.426			
			C	1	0.65	1	1	1	199.426			
L4	2.34	18.55	A	1	0.65	1	1	1	213.639	5.25	134.97	C
78.79-39.88			B	1	0.65	1	1	1	213.639			
			C	1	0.65	1	1	1	213.639			
L5 39.88-1.50	2.00	20.49	A	1	0.65	1	1	1	231.142	5.06	131.96	C
			B	1	0.65	1	1	1	231.142			
			C	1	0.65	1	1	1	231.142			
Sum Weight:	8.19	59.96						OTM	1762.61 kip-ft	21.74		

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	0.77	5.47	A	1	0.65	1	1	1	135.985	4.24	130.34	C
164.00-131.50			B	1	0.65	1	1	1	135.985			
			C	1	0.65	1	1	1	135.985			
L2	0.67	2.69	A	1	0.65	1	1	1	55.744	1.66	135.82	C
131.50-119.29			B	1	0.65	1	1	1	55.744			
			C	1	0.65	1	1	1	55.744			
L3	2.41	12.76	A	1	0.65	1	1	1	199.426	5.53	136.63	C
119.29-78.79			B	1	0.65	1	1	1	199.426			
			C	1	0.65	1	1	1	199.426			
L4	2.34	18.55	A	1	0.65	1	1	1	213.639	5.25	134.97	C
78.79-39.88			B	1	0.65	1	1	1	213.639			
			C	1	0.65	1	1	1	213.639			
L5 39.88-1.50	2.00	20.49	A	1	0.65	1	1	1	231.142	5.06	131.96	C
			B	1	0.65	1	1	1	231.142			
			C	1	0.65	1	1	1	231.142			
Sum Weight:	8.19	59.96						OTM	1762.61 kip-ft	21.74		

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	0.77	6.49	A	1	0.65	1	1	1	138.694	3.24	99.70	C
164.00-131.50			B	1	0.65	1	1	1	138.694			
			C	1	0.65	1	1	1	138.694			
L2	0.67	3.11	A	1	0.65	1	1	1	56.761	1.27	103.72	C
131.50-119.29			B	1	0.65	1	1	1	56.761			
			C	1	0.65	1	1	1	56.761			
L3	2.41	14.25	A	1	0.65	1	1	1	202.801	4.22	104.21	C
119.29-78.79			B	1	0.65	1	1	1	202.801			
			C	1	0.65	1	1	1	202.801			
L4	2.37	20.14	A	1	0.65	1	1	1	216.881	4.09	105.20	C
78.79-39.88			B	1	0.65	1	1	1	216.881			
			C	1	0.65	1	1	1	216.881			
L5 39.88-1.50	2.10	22.21	A	1	0.65	1	1	1	234.341	4.10	106.72	C
			B	1	0.65	1	1	1	234.341			
			C	1	0.65	1	1	1	234.341			
Sum Weight:	8.32	66.20						OTM	1355.40 kip-ft	16.92		

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	0.77	6.49	A	1	0.65	1	1	1	138.694	3.24	99.70	C
164.00-131.50			B	1	0.65	1	1	1	138.694			
			C	1	0.65	1	1	1	138.694			
L2	0.67	3.11	A	1	0.65	1	1	1	56.761	1.27	103.72	C
131.50-119.29			B	1	0.65	1	1	1	56.761			
			C	1	0.65	1	1	1	56.761			
L3	2.41	14.25	A	1	0.65	1	1	1	202.801	4.22	104.21	C
119.29-78.79			B	1	0.65	1	1	1	202.801			
			C	1	0.65	1	1	1	202.801			
L4	2.37	20.14	A	1	0.65	1	1	1	216.881	4.09	105.20	C
78.79-39.88			B	1	0.65	1	1	1	216.881			
			C	1	0.65	1	1	1	216.881			
L5 39.88-1.50	2.10	22.21	A	1	0.65	1	1	1	234.341	4.10	106.72	C
			B	1	0.65	1	1	1	234.341			
			C	1	0.65	1	1	1	234.341			
Sum Weight:	8.32	66.20						OTM	1355.40 kip-ft	16.92		

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	0.77	6.49	A	1	0.65	1	1	1	138.694	3.24	99.70	C
164.00-131.50			B	1	0.65	1	1	1	138.694			
			C	1	0.65	1	1	1	138.694			
L2	0.67	3.11	A	1	0.65	1	1	1	56.761	1.27	103.72	C
131.50-119.29			B	1	0.65	1	1	1	56.761			
			C	1	0.65	1	1	1	56.761			
L3	2.41	14.25	A	1	0.65	1	1	1	202.801	4.22	104.21	C
119.29-78.79			B	1	0.65	1	1	1	202.801			
			C	1	0.65	1	1	1	202.801			
L4	2.37	20.14	A	1	0.65	1	1	1	216.881	4.09	105.20	C
78.79-39.88			B	1	0.65	1	1	1	216.881			
			C	1	0.65	1	1	1	216.881			
L5 39.88-1.50	2.10	22.21	A	1	0.65	1	1	1	234.341	4.10	106.72	C
			B	1	0.65	1	1	1	234.341			
			C	1	0.65	1	1	1	234.341			
Sum Weight:	8.32	66.20						OTM	1355.40 kip-ft	16.92		

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	0.77	5.47	A	1	0.65	1	1	1	135.985	1.47	45.10	C
164.00-131.50			B	1	0.65	1	1	1	135.985			
			C	1	0.65	1	1	1	135.985			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L2	0.67	2.69	A	1	0.65	1	1	1	55.744	0.57	47.00	C
131.50-119.29			B	1	0.65	1	1	1	55.744			
			C	1	0.65	1	1	1	55.744			
L3	2.41	12.76	A	1	0.65	1	1	1	199.426	1.91	47.28	C
119.29-78.79			B	1	0.65	1	1	1	199.426			
			C	1	0.65	1	1	1	199.426			
L4	2.34	18.55	A	1	0.65	1	1	1	213.639	1.82	46.70	C
78.79-39.88			B	1	0.65	1	1	1	213.639			
			C	1	0.65	1	1	1	213.639			
L5 39.88-1.50	2.00	20.49	A	1	0.65	1	1	1	231.142	1.75	45.66	C
			B	1	0.65	1	1	1	231.142			
			C	1	0.65	1	1	1	231.142			
Sum Weight:	8.19	59.96						OTM	609.90 kip-ft	7.52		

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	0.77	5.47	A	1	0.65	1	1	1	135.985	1.47	45.10	C
164.00-131.50			B	1	0.65	1	1	1	135.985			
			C	1	0.65	1	1	1	135.985			
L2	0.67	2.69	A	1	0.65	1	1	1	55.744	0.57	47.00	C
131.50-119.29			B	1	0.65	1	1	1	55.744			
			C	1	0.65	1	1	1	55.744			
L3	2.41	12.76	A	1	0.65	1	1	1	199.426	1.91	47.28	C
119.29-78.79			B	1	0.65	1	1	1	199.426			
			C	1	0.65	1	1	1	199.426			
L4	2.34	18.55	A	1	0.65	1	1	1	213.639	1.82	46.70	C
78.79-39.88			B	1	0.65	1	1	1	213.639			
			C	1	0.65	1	1	1	213.639			
L5 39.88-1.50	2.00	20.49	A	1	0.65	1	1	1	231.142	1.75	45.66	C
			B	1	0.65	1	1	1	231.142			
			C	1	0.65	1	1	1	231.142			
Sum Weight:	8.19	59.96						OTM	609.90 kip-ft	7.52		

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	0.77	5.47	A	1	0.65	1	1	1	135.985	1.47	45.10	C
164.00-131.50			B	1	0.65	1	1	1	135.985			
			C	1	0.65	1	1	1	135.985			
L2	0.67	2.69	A	1	0.65	1	1	1	55.744	0.57	47.00	C
131.50-119.29			B	1	0.65	1	1	1	55.744			
			C	1	0.65	1	1	1	55.744			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L3	2.41	12.76	A	1	0.65	1	1	1	199.426	1.91	47.28	C
119.29-78.79			B	1	0.65	1	1	1	199.426			
			C	1	0.65	1	1	1	199.426			
L4	2.34	18.55	A	1	0.65	1	1	1	213.639	1.82	46.70	C
78.79-39.88			B	1	0.65	1	1	1	213.639			
			C	1	0.65	1	1	1	213.639			
L5 39.88-1.50	2.00	20.49	A	1	0.65	1	1	1	231.142	1.75	45.66	C
			B	1	0.65	1	1	1	231.142			
			C	1	0.65	1	1	1	231.142			
Sum Weight:	8.19	59.96						OTM	609.90 kip-ft	7.52		

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	59.96					
Bracing Weight	0.00					
Total Member Self-Weight	59.96			0.95	-0.51	
Total Weight	80.48			0.95	-0.51	
Wind 0 deg - No Ice		0.02	-44.52	-4903.43	-5.44	1.46
Wind 30 deg - No Ice		22.36	-38.56	-4248.84	-2468.95	2.39
Wind 60 deg - No Ice		38.71	-22.28	-2455.51	-4271.04	2.67
Wind 90 deg - No Ice		44.69	-0.02	-3.98	-4928.85	2.24
Wind 120 deg - No Ice		38.69	22.24	2448.87	-4266.11	1.21
Wind 150 deg - No Ice		22.33	38.54	4245.81	-2460.41	-0.15
Wind 180 deg - No Ice		-0.02	44.52	4905.34	4.42	-1.46
Wind 210 deg - No Ice		-22.36	38.56	4250.74	2467.92	-2.39
Wind 240 deg - No Ice		-38.71	22.28	2457.41	4270.02	-2.67
Wind 270 deg - No Ice		-44.69	0.02	5.88	4927.82	-2.24
Wind 300 deg - No Ice		-38.69	-22.24	-2446.97	4265.09	-1.21
Wind 330 deg - No Ice		-22.33	-38.54	-4243.91	2459.39	0.15
Member Ice	6.24					
Total Weight Ice	92.50			1.43	-0.95	
Wind 0 deg - Ice		0.01	-36.56	-4072.71	-4.58	1.36
Wind 30 deg - Ice		18.36	-31.67	-3528.70	-2050.30	2.31
Wind 60 deg - Ice		31.79	-18.29	-2038.79	-3546.90	2.63
Wind 90 deg - Ice		36.69	-0.01	-2.20	-4093.36	2.25
Wind 120 deg - Ice		31.77	18.27	2035.36	-3543.27	1.27
Wind 150 deg - Ice		18.33	31.66	3527.93	-2044.01	-0.05
Wind 180 deg - Ice		-0.01	36.56	4075.58	2.68	-1.36
Wind 210 deg - Ice		-18.36	31.67	3531.56	2048.41	-2.31
Wind 240 deg - Ice		-31.79	18.29	2041.65	3545.00	-2.63
Wind 270 deg - Ice		-36.69	0.01	5.07	4091.47	-2.25
Wind 300 deg - Ice		-31.77	-18.27	-2032.49	3541.37	-1.27
Wind 330 deg - Ice		-18.33	-31.66	-3525.06	2042.11	0.05
Total Weight	80.48			0.95	-0.51	
Wind 0 deg - Service		0.01	-15.40	-1696.18	-2.02	0.51
Wind 30 deg - Service		7.74	-13.34	-1469.68	-854.45	0.83
Wind 60 deg - Service		13.40	-7.71	-849.15	-1478.01	0.92
Wind 90 deg - Service		15.46	-0.01	-0.87	-1705.62	0.78
Wind 120 deg - Service		13.39	7.70	847.87	-1476.30	0.42
Wind 150 deg - Service		7.73	13.34	1469.65	-851.49	-0.05
Wind 180 deg - Service		-0.01	15.40	1697.86	1.39	-0.51

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 210 deg - Service		-7.74	13.34	1471.35	853.81	-0.83
Wind 240 deg - Service		-13.40	7.71	850.83	1477.37	-0.92
Wind 270 deg - Service		-15.46	0.01	2.54	1704.99	-0.78
Wind 300 deg - Service		-13.39	-7.70	-846.19	1475.67	-0.42
Wind 330 deg - Service		-7.73	-13.34	-1467.97	850.86	0.05

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	164 - 131.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-19.86	-0.68	-1.65
			Max. Mx	5	-14.75	-361.73	0.86
			Max. My	8	-14.75	1.47	-360.16
			Max. Vy	5	19.44	-361.73	0.86
			Max. Vx	8	19.34	1.47	-360.16
			Max. Torque	10			3.57
L2	131.5 - 119.29	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21.76	-0.68	-1.65
			Max. Mx	5	-16.43	-485.08	1.39
			Max. My	8	-16.43	2.00	-482.90
			Max. Vy	5	20.30	-485.08	1.39
			Max. Vx	8	20.20	2.00	-482.90
			Max. Torque	10			3.57
L3	119.29 - 78.79	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-42.34	-0.40	-1.12
			Max. Mx	5	-33.53	-1620.53	2.45
			Max. My	8	-33.54	2.98	-1611.67
			Max. Vy	5	33.69	-1620.53	2.45
			Max. Vx	8	33.51	2.98	-1611.67
			Max. Torque	10			2.48
L4	78.79 - 39.88	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-63.39	-0.50	-1.17
			Max. Mx	5	-53.19	-3004.38	3.19
			Max. My	8	-53.19	3.71	-2988.85
			Max. Vy	5	38.96	-3004.38	3.19
			Max. Vx	8	38.79	3.71	-2988.85
			Max. Torque	10			2.52
L5	39.88 - 1.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-92.50	-0.95	-1.43
			Max. Mx	5	-80.47	-4999.57	4.05
			Max. My	8	-80.47	4.50	-4975.70
			Max. Vy	5	44.71	-4999.57	4.05
			Max. Vx	8	44.54	4.50	-4975.70
			Max. Torque	10			2.70

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	92.50	-36.69	0.01
	Max. H_x	11	80.48	44.69	-0.02
	Max. H_z	2	80.48	-0.02	44.52
	Max. M_x	2	4973.76	-0.02	44.52
	Max. M_z	5	4999.57	-44.69	0.02
	Max. Torsion	10	2.70	38.71	-22.28
	Min. Vert	30	80.48	-15.46	0.01
	Min. H_x	5	80.48	-44.69	0.02
	Min. H_z	8	80.48	0.02	-44.52
	Min. M_x	8	-4975.70	0.02	-44.52
	Min. M_z	11	-4998.52	44.69	-0.02
	Min. Torsion	4	-2.70	-38.71	22.28

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	80.48	0.00	0.00	0.95	-0.51	0.00
Dead+Wind 0 deg - No Ice	80.48	0.02	-44.52	-4973.76	-5.55	1.46
Dead+Wind 30 deg - No Ice	80.48	22.36	-38.56	-4309.78	-2504.40	2.40
Dead+Wind 60 deg - No Ice	80.48	38.71	-22.28	-2490.74	-4332.33	2.70
Dead+Wind 90 deg - No Ice	80.48	44.69	-0.02	-4.05	-4999.57	2.27
Dead+Wind 120 deg - No Ice	80.48	38.69	22.24	2483.99	-4327.31	1.24
Dead+Wind 150 deg - No Ice	80.48	22.33	38.54	4306.70	-2495.70	-0.13
Dead+Wind 180 deg - No Ice	80.48	-0.02	44.52	4975.70	4.50	-1.46
Dead+Wind 210 deg - No Ice	80.48	-22.36	38.56	4311.73	2503.35	-2.40
Dead+Wind 240 deg - No Ice	80.48	-38.71	22.28	2492.69	4331.29	-2.70
Dead+Wind 270 deg - No Ice	80.48	-44.69	0.02	6.00	4998.52	-2.27
Dead+Wind 300 deg - No Ice	80.48	-38.69	-22.24	-2482.04	4326.27	-1.24
Dead+Wind 330 deg - No Ice	80.48	-22.33	-38.54	-4304.76	2494.65	0.13
Dead+Ice+Temp	92.50	0.00	0.00	1.43	-0.95	0.00
Dead+Wind 0 deg+Ice+Temp	92.50	0.01	-36.56	-4145.18	-4.69	1.36
Dead+Wind 30 deg+Ice+Temp	92.50	18.36	-31.67	-3591.49	-2086.82	2.32
Dead+Wind 60 deg+Ice+Temp	92.50	31.79	-18.29	-2075.08	-3610.05	2.66
Dead+Wind 90 deg+Ice+Temp	92.50	36.69	-0.01	-2.25	-4166.23	2.29
Dead+Wind 120 deg+Ice+Temp	92.50	31.77	18.27	2071.57	-3606.33	1.30
Dead+Wind 150 deg+Ice+Temp	92.50	18.33	31.66	3590.72	-2080.38	-0.03
Dead+Wind 180 deg+Ice+Temp	92.50	-0.01	36.56	4148.12	2.75	-1.36
Dead+Wind 210 deg+Ice+Temp	92.50	-18.36	31.67	3594.44	2084.89	-2.32
Dead+Wind 240 deg+Ice+Temp	92.50	-31.79	18.29	2078.02	3608.12	-2.66
Dead+Wind 270 deg+Ice+Temp	92.50	-36.69	0.01	5.19	4164.30	-2.29
Dead+Wind 300 deg+Ice+Temp	92.50	-31.77	-18.27	-2068.63	3604.40	-1.30
Dead+Wind 330 deg+Ice+Temp	92.50	-18.33	-31.66	-3587.77	2078.44	0.03
Dead+Wind 0 deg - Service	80.48	0.01	-15.40	-1720.54	-2.26	0.51
Dead+Wind 30 deg - Service	80.48	7.74	-13.34	-1490.77	-866.99	0.83
Dead+Wind 60 deg - Service	80.48	13.40	-7.71	-861.29	-1499.56	0.93
Dead+Wind 90 deg - Service	80.48	15.46	-0.01	-0.77	-1730.45	0.79
Dead+Wind 120 deg - Service	80.48	13.39	7.70	860.22	-1497.82	0.43
Dead+Wind 150 deg - Service	80.48	7.73	13.34	1490.98	-863.98	-0.04
Dead+Wind 180 deg - Service	80.48	-0.01	15.40	1722.49	1.22	-0.51
Dead+Wind 210 deg - Service	80.48	-7.74	13.34	1492.72	865.95	-0.83
Dead+Wind 240 deg - Service	80.48	-13.40	7.71	863.24	1498.51	-0.93
Dead+Wind 270 deg - Service	80.48	-15.46	0.01	2.71	1729.41	-0.79
Dead+Wind 300 deg - Service	80.48	-13.39	-7.70	-858.28	1496.77	-0.43
Dead+Wind 330 deg - Service	80.48	-7.73	-13.34	-1489.03	862.94	0.04

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	-80.48	0.00	0.00	80.48	0.00	0.000%
2	0.02	-80.48	-44.52	-0.02	80.48	44.52	0.000%
3	22.36	-80.48	-38.56	-22.36	80.48	38.56	0.000%
4	38.71	-80.48	-22.28	-38.71	80.48	22.28	0.000%
5	44.69	-80.48	-0.02	-44.69	80.48	0.02	0.000%
6	38.69	-80.48	22.24	-38.69	80.48	-22.24	0.000%
7	22.33	-80.48	38.54	-22.33	80.48	-38.54	0.000%
8	-0.02	-80.48	44.52	0.02	80.48	-44.52	0.000%
9	-22.36	-80.48	38.56	22.36	80.48	-38.56	0.000%
10	-38.71	-80.48	22.28	38.71	80.48	-22.28	0.000%
11	-44.69	-80.48	0.02	44.69	80.48	-0.02	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
12	-38.69	-80.48	-22.24	38.69	80.48	22.24	0.000%
13	-22.33	-80.48	-38.54	22.33	80.48	38.54	0.000%
14	0.00	-92.50	0.00	0.00	92.50	0.00	0.000%
15	0.01	-92.50	-36.56	-0.01	92.50	36.56	0.000%
16	18.36	-92.50	-31.67	-18.36	92.50	31.67	0.000%
17	31.79	-92.50	-18.29	-31.79	92.50	18.29	0.000%
18	36.69	-92.50	-0.01	-36.69	92.50	0.01	0.000%
19	31.77	-92.50	18.27	-31.77	92.50	-18.27	0.000%
20	18.33	-92.50	31.66	-18.33	92.50	-31.66	0.000%
21	-0.01	-92.50	36.56	0.01	92.50	-36.56	0.000%
22	-18.36	-92.50	31.67	18.36	92.50	-31.67	0.000%
23	-31.79	-92.50	18.29	31.79	92.50	-18.29	0.000%
24	-36.69	-92.50	0.01	36.69	92.50	-0.01	0.000%
25	-31.77	-92.50	-18.27	31.77	92.50	18.27	0.000%
26	-18.33	-92.50	-31.66	18.33	92.50	31.66	0.000%
27	0.01	-80.48	-15.40	-0.01	80.48	15.40	0.000%
28	7.74	-80.48	-13.34	-7.74	80.48	13.34	0.000%
29	13.40	-80.48	-7.71	-13.40	80.48	7.71	0.000%
30	15.46	-80.48	-0.01	-15.46	80.48	0.01	0.000%
31	13.39	-80.48	7.70	-13.39	80.48	-7.70	0.000%
32	7.73	-80.48	13.34	-7.73	80.48	-13.34	0.000%
33	-0.01	-80.48	15.40	0.01	80.48	-15.40	0.000%
34	-7.74	-80.48	13.34	7.74	80.48	-13.34	0.000%
35	-13.40	-80.48	7.71	13.40	80.48	-7.71	0.000%
36	-15.46	-80.48	0.01	15.46	80.48	-0.01	0.000%
37	-13.39	-80.48	-7.70	13.39	80.48	7.70	0.000%
38	-7.73	-80.48	-13.34	7.73	80.48	13.34	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	0.00005572
3	Yes	4	0.00000001	0.00056890
4	Yes	4	0.00000001	0.00049078
5	Yes	4	0.00000001	0.00008551
6	Yes	4	0.00000001	0.00054866
7	Yes	4	0.00000001	0.00052288
8	Yes	4	0.00000001	0.00005327
9	Yes	4	0.00000001	0.00049537
10	Yes	4	0.00000001	0.00057880
11	Yes	4	0.00000001	0.00008830
12	Yes	4	0.00000001	0.00050218
13	Yes	4	0.00000001	0.00052259
14	Yes	4	0.00000001	0.00000001
15	Yes	5	0.00000001	0.00002344
16	Yes	5	0.00000001	0.00003087
17	Yes	5	0.00000001	0.00003041
18	Yes	5	0.00000001	0.00002360
19	Yes	5	0.00000001	0.00003073
20	Yes	5	0.00000001	0.00003050
21	Yes	5	0.00000001	0.00002346
22	Yes	5	0.00000001	0.00003043
23	Yes	5	0.00000001	0.00003100
24	Yes	5	0.00000001	0.00002359

25	Yes	5	0.00000001	0.00003035
26	Yes	5	0.00000001	0.00003048
27	Yes	4	0.00000001	0.00001468
28	Yes	4	0.00000001	0.00004146
29	Yes	4	0.00000001	0.00003371
30	Yes	4	0.00000001	0.00001769
31	Yes	4	0.00000001	0.00003891
32	Yes	4	0.00000001	0.00003580
33	Yes	4	0.00000001	0.00001464
34	Yes	4	0.00000001	0.00003381
35	Yes	4	0.00000001	0.00004282
36	Yes	4	0.00000001	0.00001778
37	Yes	4	0.00000001	0.00003389
38	Yes	4	0.00000001	0.00003571

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	164 - 131.5	10.526	30	0.4889	0.0017
L2	131.5 - 119.29	7.258	30	0.4614	0.0008
L3	125.29 - 78.79	6.664	30	0.4503	0.0007
L4	87.21 - 39.88	3.424	30	0.3431	0.0004
L5	49.13 - 1.5	1.154	30	0.2094	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
164.00	PD1142-1	30	10.526	0.4889	0.0017	216347
160.00	4 FT DISH	30	10.116	0.4870	0.0015	216347
156.00	A-Ant-23G-2-C	30	9.707	0.4849	0.0014	135217
154.00	LLPX310R	30	9.503	0.4838	0.0014	108173
151.50	Remote Radio Head FD R6 RRH	30	9.248	0.4822	0.0013	86539
144.00	(2) AIR21	30	8.491	0.4765	0.0011	54086
138.00	(2) RRUS-11	30	7.893	0.4703	0.0010	41605
134.00	7770.00	30	7.500	0.4651	0.0009	36094
124.00	844G65T6ZAXY	30	6.543	0.4477	0.0007	28810
114.00	(4) DB846G90A-XY	30	5.627	0.4242	0.0005	25279
51.50	GPS	30	1.256	0.2186	0.0002	11274

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	164 - 131.5	30.404	5	1.4118	0.0048
L2	131.5 - 119.29	20.965	5	1.3328	0.0024
L3	125.29 - 78.79	19.252	5	1.3008	0.0020

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L4	87.21 - 39.88	9.890	5	0.9913	0.0010
L5	49.13 - 1.5	3.335	5	0.6050	0.0005

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
164.00	PD1142-1	5	30.404	1.4118	0.0048	75430
160.00	4 FT DISH	5	29.221	1.4063	0.0045	75430
156.00	A-Ant-23G-2-C	5	28.039	1.4004	0.0041	47144
154.00	LLPX310R	5	27.449	1.3971	0.0040	37715
151.50	Remote Radio Head FD R6 RRH	5	26.714	1.3928	0.0038	30172
144.00	(2) AIR21	5	24.526	1.3764	0.0032	18857
138.00	(2) RRUS-11	5	22.801	1.3586	0.0028	14505
134.00	7770.00	5	21.666	1.3436	0.0025	12581
124.00	844G65T6ZAXY	5	18.902	1.2932	0.0020	9986
114.00	(4) DB846G90A-XY	5	16.256	1.2255	0.0016	8760
51.50	GPS	5	3.629	0.6316	0.0005	3903

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	164 - 131.5 (1)	TP53.42x47x0.3125	32.50	162.50	103.4	13.959	52.6760	-14.75	735.30	0.020
L2	131.5 - 119.29 (2)	TP56.15x53.42x0.375	12.21	162.50	100.9	14.665	64.7894	-16.43	950.11	0.017
L3	119.29 - 78.79 (3)	TP62.97x54.0585x0.4375	46.50	162.50	90.2	18.264	84.5934	-33.53	1545.03	0.022
L4	78.79 - 39.88 (4)	TP69.66x60.4813x0.5625	47.33	162.50	81.6	21.155	120.1620	-53.19	2542.07	0.021
L5	39.88 - 1.5 (5)	TP76x66.7412x0.5625	47.63	162.50	72.8	23.922	134.6840	-80.47	3221.92	0.025

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	164 - 131.5 (1)	TP53.42x47x0.3125	362.52	-6.290	36.775	0.171	0.00	0.000	36.775	0.000
L2	131.5 - 119.29 (2)	TP56.15x53.42x0.375	486.18	-6.698	39.000	0.172	0.00	0.000	39.000	0.000
L3	119.29 - 78.79 (3)	TP62.97x54.0585x0.4375	1620.86	-15.285	39.000	0.392	0.00	0.000	39.000	0.000
L4	78.79 - 39.88	TP69.66x60.4813x0.5625	3004.38	-18.075	39.000	0.463	0.00	0.000	39.000	0.000

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L5	39.88 - 1.5 (4) (5)	TP76x66.7412x0.5625	4999.57	-23.920	39.000	0.613	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	164 - 131.5 (1)	TP53.42x47x0.3125	0.020	0.171	0.000	0.191 ✔	1.333	H1-3 ✔
L2	131.5 - 119.29 (2)	TP56.15x53.42x0.375	0.017	0.172	0.000	0.189 ✔	1.333	H1-3 ✔
L3	119.29 - 78.79 (3)	TP62.97x54.0585x0.4375	0.022	0.392	0.000	0.414 ✔	1.333	H1-3 ✔
L4	78.79 - 39.88 (4)	TP69.66x60.4813x0.5625	0.021	0.463	0.000	0.484 ✔	1.333	H1-3 ✔
L5	39.88 - 1.5 (5)	TP76x66.7412x0.5625	0.025	0.613	0.000	0.638 ✔	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	164 - 131.5	Pole	TP53.42x47x0.3125	1	-14.75	980.15	14.3	Pass
L2	131.5 - 119.29	Pole	TP56.15x53.42x0.375	2	-16.43	1266.50	14.2	Pass
L3	119.29 - 78.79	Pole	TP62.97x54.0585x0.4375	3	-33.53	2059.52	31.0	Pass
L4	78.79 - 39.88	Pole	TP69.66x60.4813x0.5625	4	-53.19	3388.58	36.3	Pass
L5	39.88 - 1.5	Pole	TP76x66.7412x0.5625	5	-80.47	4294.82	47.9	Pass
							Summary	
						Pole (L5)	47.9	Pass
						RATING =	**47.9**	**Pass**

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Subject:	Flange Bolt and Plate Analysis
Location:	164-ft EEI Monopole Greenwich, CT
Rev. 0: 11/18/13	Prepared by: T.J.L. Checked by: C.F.C. Job No. 13001.081

Flange Bolt and Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 362ft·kips	(Input From RisaTower)
Shear Force =	Shear := 19.5·kips	(Input From RisaTower)
Axial Force =	Axial := 19.9·kips	(Input From RisaTower)

Flange Bolt Data:

Use ASTM A325

Number of Flange Bolts =	N := 12	(User Input)
Diameter of Bolt Circle =	D_{bc} := 58.00·in	(User Input)
Bolt Ultimate Strength =	F_u := 120·ksi	(User Input)
Bolt Yield Strength =	F_y := 92·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 1.00·in	(User Input)

Flange Plate Data:

Use ASTM A36

Plate Yield Strength =	Fy_{bp} := 36.00·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 1.00·in	(User Input)
Flange Plate Diameter =	D_{bp} := 61.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 53.42·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 29 \cdot in$

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

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

$d_1 = 14.50 \cdot in$ $d_7 = -14.50 \cdot in$

$d_2 = 25.11 \cdot in$ $d_8 = -25.11 \cdot in$

$d_3 = 29.00 \cdot in$ $d_9 = -29.00 \cdot in$

$d_4 = 25.11 \cdot in$ $d_{10} = -25.11 \cdot in$

$d_5 = 14.50 \cdot in$ $d_{11} = -14.50 \cdot in$

$d_6 = 0.00 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 26.7 \cdot in$

Moment Arms of Bolts about Neutral Axis = $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00 \cdot in$ $MA_7 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 2.29 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 0.00 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 0.00 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 0.00 \cdot in$ etc

Effective Width of Plate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 23.6 \cdot in$

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Subject:	Flange Bolt and Plate Analysis
Location:	164-ft EEI Monopole Greenwich, CT
Rev. 0: 11/18/13	Prepared by: T.J.L. Checked by: C.F.C. Job No. 13001.081

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 5.046 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 23.3 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 41.5 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} = 56.2 \cdot \%$

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

Condition1 = "OK"

Flange Plate Analysis:

Force from Bolts = $C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$

$C_1 = 14.1 \cdot kips$ $C_7 = -10.8 \cdot kips$

$C_2 = 23.3 \cdot kips$ $C_8 = -20.0 \cdot kips$

$C_3 = 26.6 \cdot kips$ $C_9 = -23.3 \cdot kips$

$C_4 = 23.3 \cdot kips$ $C_{10} = -20.0 \cdot kips$

$C_5 = 14.1 \cdot kips$ $C_{11} = -10.8 \cdot kips$

$C_6 = 1.7 \cdot kips$ etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 15.5 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 35.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 43.2 \cdot \%$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition2 = "Ok"

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		164-ft EEI Monopole Greenwich, CT
Rev. 1: 11/19/13		Prepared by: T.J.L. Checked by: C.F.C. Job No. 13001.081

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 5000·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 45·kips	(Input From RisaTower)
Axial Force =	Axial := 80·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 30	(User Input)
Diameter of Bolt Circle =	D_{bc} := 86.00·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strenght =	F_u := 100·ksi	(User Input)
Bolt Yeild Strenght =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 GR 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 3.0·in	(User Input)
Base Plate Diameter =	D_{bp} := 92.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 76.00·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 43 \cdot in$

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

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

$d_1 = 8.94 \cdot in$
$d_2 = 17.49 \cdot in$
$d_3 = 25.27 \cdot in$
$d_4 = 31.96 \cdot in$
$d_5 = 37.24 \cdot in$
$d_6 = 40.90 \cdot in$
$d_7 = 42.76 \cdot in$
$d_8 = 42.76 \cdot in$
$d_9 = 40.90 \cdot in$
$d_{10} = 37.24 \cdot in$
$d_{11} = 31.96 \cdot in$
etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 38 \cdot in$

Moment Arms of Bolts about Neutral Axis = $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00 \cdot in$
$MA_2 = 0.00 \cdot in$
$MA_3 = 0.00 \cdot in$
$MA_4 = 0.00 \cdot in$
$MA_5 = 0.00 \cdot in$
$MA_6 = 2.90 \cdot in$
$MA_7 = 4.76 \cdot in$
$MA_8 = 4.76 \cdot in$
$MA_9 = 2.90 \cdot in$
$MA_{10} = 0.00 \cdot in$
$MA_{11} = 0.00 \cdot in$
etc

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 41.5 \cdot in$

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	164-ft EEI Monopole Greenwich, CT
Rev. 1: 11/19/13	Prepared by: T.J.L. Checked by: C.F.C. Job No. 13001.081

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 2.773 \times 10^4 \cdot in^2$

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

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

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

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

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

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 90.4 \cdot kips$

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

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

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 46.4\,\%$ Bolts are "upset bolts". Use net area per AISC

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

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.375 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 5.5 \cdot ksi$

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

Check Combined Stress Requirement:

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

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

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

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = 95.7 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 29.5 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

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

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 49.1 \cdot \%$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$

$C_1 = 22.0 \cdot kips$ $C_7 = 95.2 \cdot kips$

$C_2 = 40.5 \cdot kips$ $C_8 = 95.2 \cdot kips$

$C_3 = 57.3 \cdot kips$ $C_9 = 91.1 \cdot kips$

$C_4 = 71.8 \cdot kips$ $C_{10} = 83.2 \cdot kips$

$C_5 = 83.2 \cdot kips$ $C_{11} = 71.8 \cdot kips$

$C_6 = 91.1 \cdot kips$ etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 23.1 \cdot ksi$

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

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 38.5 \cdot \%$

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

Condition3 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	164-ft EEI Monopole Greenwich, CT
Rev. 1: 11/19/13	Prepared by: TJL Checked by: C.F.C. Job No. 13001.081

Caisson Foundation:

Input Data:

Shear Force =	S := 45k	*USER INPUT-FROM tnxTower*
Overturning Moment =	M := 5000ft·k	*USER INPUT-FROM tnxTower*
Applied Axial Load =	A1 := 80k	*USER INPUT-FROM tnxTower*
Bending Moment =	Mu := 5239ft·k	*USER INPUT–FROM LPILE*
Moment Capacity =	Mn := 12301ft·k	*USER INPUT–FROM LPILE*
Foundation Diameter =	d := 9.0ft	*USER INPUT*
Overall Length of Caisson =	L_c := 28.0ft	*USER INPUT*
Depth From Top of Caisson to Grade =	L_{pag} := 1.0ft	*USER INPUT*
Number of Rebar =	n := 33	*USER INPUT*
Area of Rebar =	Ar := $1.560in^2$	*USER INPUT*
Rebar Yield Strength =	fy := 60ksi	*USER INPUT*
Concrete Comp Strength =	f'c := 3ksi	*USER INPUT*

Check Moment Capacity:

Factor of Safety = $FS := \frac{Mn}{Mu} = 2.3$

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\1300100.WI\081 - Greenwich\Backup Documentation\Calcs\Rev (1)\Foundation\
Name of input data file: Greenwich Hospital Caisson Analysis.lpd
Name of output file: Greenwich Hospital Caisson Analysis.lpo
Name of plot output file: Greenwich Hospital Caisson Analysis.lpp
Name of runtime file: Greenwich Hospital Caisson Analysis.lpr

Time and Date of Analysis

Date: November 19, 2013 Time: 17:49:22

Problem Title

13001.081 - Greenwich

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 = 336.00 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	108.00000	6678285.	9160.9000	3600000.
2	336.0000	108.00000	6678285.	9160.9000	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 4 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 = 20.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 20.000 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 = 72.000 in
p-y subgrade modulus k for top of soil layer = 90.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 90.000 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 72.000 in
Distance from top of pile to bottom of layer = 132.000 in
p-y subgrade modulus k for top of soil layer = 150.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 150.000 lbs/in**3

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 132.000 in
Distance from top of pile to bottom of layer = 360.000 in
p-y subgrade modulus k for top of soil layer = 250.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 250.000 lbs/in**3

(Depth of lowest layer extends 24.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 8 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	0.06900
4	72.00	0.06900
5	72.00	0.06900
6	132.00	0.06900
7	132.00	0.07500
8	360.00	0.07500

Shear Strength of Soils

Shear strength parameters with depth defined using 8 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	20.00	------	------
2	48.000	0.00000	20.00	------	------
3	48.000	0.00000	30.00	------	------
4	72.000	0.00000	30.00	------	------
5	72.000	0.00000	35.00	------	------
6	132.000	0.00000	35.00	------	------
7	132.000	0.00000	42.00	------	------
8	360.000	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 = 45000.000 lbs
Bending moment at pile head = 60000000.000 in-lbs
Axial load at pile head = 80000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 108.0000 in

Material Properties:

Compressive Strength of Concrete	=	3.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2
Number of Reinforcing Bars	=	33
Area of Single Bar	=	1.56000 in**2
Number of Rows of Reinforcing Bars	=	33
Area of Steel	=	51.480 in**2
Area of Shaft	=	9160.884 in**2
Percentage of Steel Reinforcement	=	0.562 percent
Cover Thickness (edge to bar center)	=	4.000 in

Unfactored Axial Squash Load Capacity = 26317.78 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	49.943
2	1.560	49.491
3	1.560	48.591
4	1.560	47.250
5	1.560	45.482
6	1.560	43.301
7	1.560	40.729
8	1.560	37.787
9	1.560	34.504
10	1.560	30.908
11	1.560	27.032
12	1.560	22.911
13	1.560	18.583
14	1.560	14.087
15	1.560	9.463
16	1.560	4.753
17	1.560	0.000
18	1.560	-4.753

19	1.560	-9.463
20	1.560	-14.087
21	1.560	-18.583
22	1.560	-22.911
23	1.560	-27.032
24	1.560	-30.908
25	1.560	-34.504
26	1.560	-37.787
27	1.560	-40.729
28	1.560	-43.301
29	1.560	-45.482
30	1.560	-47.250
31	1.560	-48.591
32	1.560	-49.491
33	1.560	-49.943

Axial Thrust Force = 80000.00 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
11414048.	2.282810E+13	5.000000E-07	0.00002975	59.50370139	91.44846262	803.98249
22713314.	2.271331E+13	0.00000100	0.00005688	56.87884980	173.25283	1531.84429
33889199.	2.259280E+13	0.00000150	0.00008397	55.97875088	253.56037	2258.61213
44950064.	2.247503E+13	0.00000200	0.00011113	55.56667024	332.71077	2987.58216
55888765.	2.235551E+13	0.00000250	0.00013824	55.29660934	410.30859	3714.89828
55888765.	1.862959E+13	0.00000300	0.00008446	28.15421301	251.00284	6593.65639
55888765.	1.596822E+13	0.00000350	0.00009669	27.62498957	286.07932	7746.31531
55888765.	1.397219E+13	0.00000400	0.00010893	27.23165113	320.92830	8898.55904
55888765.	1.241973E+13	0.00000450	0.00012149	26.99735266	356.44865	10041.45487
55888765.	1.117775E+13	0.00000500	0.00013369	26.73844117	390.64813	11194.71424
55888765.	1.016159E+13	0.00000550	0.00014591	26.52941555	424.62338	12347.52525
55888765.	9.314794E+12	0.00000600	0.00015815	26.35782284	458.37363	13499.88468
55888765.	8.598271E+12	0.00000650	0.00017040	26.21504670	491.89823	14651.78837
55888765.	7.984109E+12	0.00000700	0.00018266	26.09492022	525.19625	15803.23469
55888765.	7.451835E+12	0.00000750	0.00019495	25.99293405	558.26702	16954.21916
55888765.	6.986096E+12	0.00000800	0.00020725	25.90569574	591.10966	18104.73972
55888765.	6.575149E+12	0.00000850	0.00021956	25.83062071	623.72347	19254.79195
55888765.	6.209863E+12	0.00000900	0.00023189	25.76569086	656.10756	20404.37346
55888765.	5.883028E+12	0.00000950	0.00024424	25.70931619	688.26110	21553.48099
55888765.	5.588876E+12	0.00001000	0.00025660	25.66022855	720.18336	22702.11014
55888765.	5.322739E+12	0.00001050	0.00026898	25.61739796	751.87351	23850.25756
55888765.	5.080797E+12	0.00001100	0.00028138	25.57997793	783.33057	24997.92110
55888765.	4.859893E+12	0.00001150	0.00029379	25.54727966	814.55390	26145.09512
55888765.	4.657397E+12	0.00001200	0.00030622	25.51871735	845.54245	27291.77806
55888765.	4.471101E+12	0.00001250	0.00031867	25.49380499	876.29537	28437.96621
55888765.	4.299136E+12	0.00001300	0.00033114	25.47213703	906.81198	29583.65368
55888765.	4.139908E+12	0.00001350	0.00034362	25.45335621	937.09116	30728.83921
56816392.	4.058314E+12	0.00001400	0.00035612	25.43716639	967.13218	31873.51743
58727532.	4.050175E+12	0.00001450	0.00036864	25.42330688	996.93405	33017.68526
60636478.	4.042432E+12	0.00001500	0.00038117	25.41155237	1026.49582	34161.33935
62543223.	4.035047E+12	0.00001550	0.00039373	25.40170974	1055.81665	35304.47492
64447754.	4.027985E+12	0.00001600	0.00040630	25.39360839	1084.89559	36447.08798
66350062.	4.021216E+12	0.00001650	0.00041889	25.38710028	1113.73177	37589.17361
68250115.	4.014713E+12	0.00001700	0.00043149	25.38204700	1142.32399	38730.73074
70147920.	4.008453E+12	0.00001750	0.00044412	25.37833911	1170.67157	39871.75163
72043458.	4.002414E+12	0.00001800	0.00045677	25.37587041	1198.77345	41012.23320
73936699.	3.996578E+12	0.00001850	0.00046943	25.37454432	1226.62847	42152.17334
75827648.	3.990929E+12	0.00001900	0.00048211	25.37428361	1254.23585	43291.56492
77716278.	3.985450E+12	0.00001950	0.00049481	25.37501103	1281.59444	44430.40528
81486541.	3.974953E+12	0.00002050	0.00052027	25.37917596	1335.56137	46706.41155
85247369.	3.964994E+12	0.00002150	0.00054581	25.38658208	1388.52098	48980.15537
88998628.	3.955495E+12	0.00002250	0.00057143	25.39685279	1440.46464	51251.60049
92740203.	3.946392E+12	0.00002350	0.00059713	25.40968233	1491.38377	53520.70607
96471962.	3.937631E+12	0.00002450	0.00062291	25.42481321	1541.26942	55787.43244
1.001938E+08	3.929167E+12	0.00002550	0.00064877	25.44202656	1590.11222	58051.74123
1.038667E+08	3.919498E+12	0.00002650	0.00067463	25.45785910	1637.73894	60000.00000
1.067657E+08	3.882390E+12	0.00002750	0.00069884	25.41223472	1681.10772	60000.00000
1.091962E+08	3.831445E+12	0.00002850	0.00072202	25.33402151	1721.59036	60000.00000
1.113155E+08	3.773408E+12	0.00002950	0.00074451	25.23770982	1759.89756	60000.00000
1.135610E+08	3.723312E+12	0.00003050	0.00076860	25.20000011	1800.02423	60000.00000
1.149341E+08	3.648700E+12	0.00003150	0.00079042	25.09263557	1835.32622	60000.00000
1.165041E+08	3.584740E+12	0.00003250	0.00081136	24.96485192	1868.34773	60000.00000
1.178718E+08	3.518562E+12	0.00003350	0.00083172	24.82745093	1899.66965	60000.00000
1.191988E+08	3.455038E+12	0.00003450	0.00085200	24.69578880	1930.13565	60000.00000
1.203547E+08	3.390273E+12	0.00003550	0.00087177	24.55691689	1959.08383	60000.00000
1.215071E+08	3.328961E+12	0.00003650	0.00089158	24.42678040	1987.40058	60000.00000
1.224914E+08	3.266436E+12	0.00003750	0.00091083	24.28884190	2014.22431	60000.00000
1.234644E+08	3.206867E+12	0.00003850	0.00093009	24.15830308	2040.40556	60000.00000
1.243820E+08	3.148912E+12	0.00003950	0.00094919	24.03019756	2065.70461	60000.00000
1.251958E+08	3.091254E+12	0.00004050	0.00096793	23.89960724	2089.88231	60000.00000
1.260067E+08	3.036305E+12	0.00004150	0.00098671	23.77617842	2113.48789	60000.00000
1.267891E+08	2.983274E+12	0.00004250	0.00100542	23.65685016	2136.37983	60000.00000
1.274610E+08	2.930138E+12	0.00004350	0.00102370	23.53325075	2158.13138	60000.00000
1.281303E+08	2.879332E+12	0.00004450	0.00104201	23.41596955	2179.33622	60000.00000
1.288288E+08	2.831402E+12	0.00004550	0.00106470	23.39999861	2205.03779	60000.00000

1.295114E+08	2.785191E+12	0.00004650	0.00108285	23.28699821	2224.72508	60000.00000
1.300452E+08	2.737793E+12	0.00004750	0.00110013	23.16055030	2242.88955	60000.00000
1.305768E+08	2.692306E+12	0.00004850	0.00111744	23.03996676	2260.56560	60000.00000
1.311063E+08	2.648613E+12	0.00004950	0.00113478	22.92490000	2277.75063	60000.00000
1.316337E+08	2.606608E+12	0.00005050	0.00115216	22.81502491	2294.44171	60000.00000
1.320954E+08	2.564959E+12	0.00005150	0.00116919	22.70276803	2310.27428	60000.00000
1.325204E+08	2.524198E+12	0.00005250	0.00118605	22.59146386	2325.43756	60000.00000
1.329435E+08	2.484926E+12	0.00005350	0.00120294	22.48488790	2340.13291	60000.00000
1.333646E+08	2.447058E+12	0.00005450	0.00121986	22.38277620	2354.35733	60000.00000
1.337838E+08	2.410519E+12	0.00005550	0.00123681	22.28489703	2368.10843	60000.00000
1.342010E+08	2.375239E+12	0.00005650	0.00125379	22.19103152	2381.38363	60000.00000
1.345418E+08	2.339857E+12	0.00005750	0.00127031	22.09228975	2393.79118	60000.00000
1.348746E+08	2.305548E+12	0.00005850	0.00128681	21.99670869	2405.71519	60000.00000
1.352056E+08	2.272363E+12	0.00005950	0.00130334	21.90483230	2417.18689	60000.00000
1.358621E+08	2.209139E+12	0.00006150	0.00133649	21.73147255	2438.76275	60000.00000
1.367504E+08	2.153550E+12	0.00006350	0.00137160	21.60000032	2459.59723	60000.00000
1.371630E+08	2.094092E+12	0.00006550	0.00140987	21.52468711	2479.92872	60000.00000
1.376446E+08	2.039179E+12	0.00006750	0.00144097	21.34769672	2494.39172	60000.00000
1.381202E+08	1.987341E+12	0.00006950	0.00147218	21.18248981	2507.23008	60000.00000
1.385898E+08	1.938318E+12	0.00007150	0.00150351	21.02810401	2518.42541	60000.00000
1.390288E+08	1.891548E+12	0.00007350	0.00153470	20.88020700	2527.88399	60000.00000
1.393827E+08	1.846128E+12	0.00007550	0.00156516	20.73059446	2535.49233	60000.00000
1.397310E+08	1.802980E+12	0.00007750	0.00159573	20.59010357	2541.52238	60000.00000
1.400736E+08	1.761932E+12	0.00007950	0.00162642	20.45807129	2545.95616	60000.00000
1.404105E+08	1.722829E+12	0.00008150	0.00165721	20.33389252	2548.77516	60000.00000
1.407416E+08	1.685528E+12	0.00008350	0.00168812	20.21702331	2549.96046	60000.00000
1.410338E+08	1.649519E+12	0.00008550	0.00171881	20.10302514	2546.05263	60000.00000
1.412706E+08	1.614521E+12	0.00008750	0.00174896	19.98808712	2541.08003	60000.00000
1.415048E+08	1.581059E+12	0.00008950	0.00177922	19.87952203	2543.49548	60000.00000
1.415048E+08	1.546501E+12	0.00009150	0.00181170	19.79999882	2547.09008	60000.00000
1.417490E+08	1.516032E+12	0.00009350	0.00185130	19.79999882	2549.59126	60000.00000
1.423149E+08	1.490209E+12	0.00009550	0.00188479	19.73599273	2548.66993	60000.00000
1.425214E+08	1.461758E+12	0.00009750	0.00191421	19.63287681	2544.45698	60000.00000
1.427264E+08	1.434437E+12	0.00009950	0.00194371	19.53479487	2540.22852	60000.00000
1.429197E+08	1.408076E+12	0.00010150	0.00197311	19.43950349	2539.68478	60000.00000
1.430641E+08	1.382262E+12	0.00010350	0.00200167	19.33982509	2543.23114	60000.00000
1.432072E+08	1.357415E+12	0.00010550	0.00203032	19.24471396	2546.04356	60000.00000
1.433492E+08	1.333481E+12	0.00010750	0.00205905	19.15392548	2548.11260	60000.00000
1.434898E+08	1.310409E+12	0.00010950	0.00208786	19.06723756	2549.42864	60000.00000
1.436292E+08	1.288154E+12	0.00011150	0.00211676	18.98443776	2549.98176	60000.00000
1.437652E+08	1.266654E+12	0.00011350	0.00214586	18.90621167	2547.23726	60000.00000
1.439000E+08	1.245887E+12	0.00011550	0.00217504	18.83148426	2543.69730	60000.00000
1.440340E+08	1.225821E+12	0.00011750	0.00220428	18.75981778	2540.14669	60000.00000
1.441672E+08	1.206420E+12	0.00011950	0.00223358	18.69106740	2536.58524	60000.00000
1.442996E+08	1.187651E+12	0.00012150	0.00226295	18.62509149	2535.56084	60000.00000
1.444193E+08	1.169387E+12	0.00012350	0.00229207	18.55928618	2539.21120	60000.00000
1.445110E+08	1.151482E+12	0.00012550	0.00232056	18.49051970	2542.22053	60000.00000
1.446020E+08	1.134133E+12	0.00012750	0.00234911	18.42436355	2544.74716	60000.00000
1.446924E+08	1.117316E+12	0.00012950	0.00237771	18.36070830	2546.78588	60000.00000
1.447822E+08	1.101005E+12	0.00013150	0.00240638	18.29943806	2548.33115	60000.00000
1.448713E+08	1.085178E+12	0.00013350	0.00243510	18.24045628	2549.37749	60000.00000
1.449598E+08	1.069814E+12	0.00013550	0.00246389	18.18366641	2549.91925	60000.00000
1.450466E+08	1.054884E+12	0.00013750	0.00249279	18.12941283	2548.73887	60000.00000
1.451319E+08	1.040372E+12	0.00013950	0.00252182	18.07759255	2545.85696	60000.00000
1.455127E+08	1.014026E+12	0.00014350	0.00258300	18.00000054	2539.54654	60000.00000
1.466286E+08	9.940921E+11	0.00014750	0.00265500	18.00000054	2531.33751	60000.00000
1.476109E+08	9.743296E+11	0.00015150	0.00272700	18.00000054	2536.11274	60000.00000
1.476109E+08	9.492664E+11	0.00015550	0.00279085	17.94756871	2542.45988	60000.00000
1.476109E+08	9.254604E+11	0.00015950	0.00284823	17.85726625	2546.13196	60000.00000
1.476109E+08	9.028191E+11	0.00016350	0.00290481	17.76642305	2548.52908	60000.00000
1.476109E+08	8.812593E+11	0.00016750	0.00296157	17.68101937	2549.79469	60000.00000
1.476109E+08	8.607051E+11	0.00017150	0.00301961	17.60705477	2548.05205	60000.00000
1.476109E+08	8.410879E+11	0.00017550	0.00307860	17.54187065	2543.38826	60000.00000
1.476109E+08	8.223450E+11	0.00017950	0.00313771	17.48025602	2538.70356	60000.00000
1.476109E+08	8.044192E+11	0.00018350	0.00319693	17.42198879	2533.99757	60000.00000
1.476109E+08	7.872583E+11	0.00018750	0.00325629	17.36686939	2529.26982	60000.00000
1.476109E+08	7.708143E+11	0.00019150	0.00331577	17.31472081	2524.51963	60000.00000
1.476109E+08	7.550431E+11	0.00019550	0.00337538	17.26537246	2519.74659	60000.00000
1.476109E+08	7.399044E+11	0.00019950	0.00343605	17.22328860	2525.61440	60000.00000
1.476109E+08	7.253608E+11	0.00020350	0.00349750	17.18674082	2531.88106	60000.00000
1.476109E+08	7.113780E+11	0.00020750	0.00355914	17.15246862	2537.25879	60000.00000
1.476109E+08	6.979240E+11	0.00021150	0.00362025	17.11703128	2541.59831	60000.00000
1.476109E+08	6.849695E+11	0.00021550	0.00367988	17.07602888	2544.82944	60000.00000
1.476109E+08	6.724872E+11	0.00021950	0.00373967	17.03722805	2547.29607	60000.00000
1.476109E+08	6.604516E+11	0.00022350	0.00379962	17.00053221	2548.98022	60000.00000
1.476109E+08	6.488393E+11	0.00022750	0.00385973	16.96585447	2549.86302	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 147610.93014 in-kip

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

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)

Specified shear force at pile head = 45000.000 lbs
Specified moment at pile head = 60000000.000 in-lbs
Specified axial load at pile head = 80000.000 lbs

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. p lbs/in	Es*h F/L
0.000	0.566561	6.00E+07	45000.	-0.003954	493.887	4.04E+12	0.000	0.000
26.880	0.465664	6.12E+07	43917.	-0.003551	503.690	4.04E+12	-138.582	999.936
53.760	0.375712	6.23E+07	35138.	-0.003140	512.656	4.04E+12	-864.350	7729.897
80.640	0.296909	6.29E+07	-184.105	-0.002723	517.023	4.03E+12	-1871.727	21182.
107.520	0.229344	6.21E+07	-63366.	-0.002306	510.603	4.04E+12	-2685.249	39340.
134.400	0.172859	5.94E+07	-1.38E+05	-0.001901	488.915	4.05E+12	-3643.028	70813.
161.280	0.126303	5.44E+07	-2.35E+05	-0.001641	448.276	2.24E+13	-3510.629	93392.
188.160	0.083040	4.68E+07	-3.22E+05	-0.001580	387.380	2.25E+13	-2866.128	1.16E+05
215.040	0.041278	3.73E+07	-3.85E+05	-0.001529	309.987	2.25E+13	-1702.088	1.39E+05
241.920	0.000706	2.65E+07	-4.09E+05	-0.001491	222.890	2.27E+13	-33.867	1.61E+05
268.800	-0.039020	1.57E+07	-3.82E+05	-0.001467	135.834	2.28E+13	2133.452	1.84E+05
295.680	-0.078244	6.52E+06	-2.90E+05	-0.001454	61.483	2.28E+13	4803.811	2.06E+05
322.560	-0.117252	8.30E+05	-1.19E+05	-0.001450	15.442	2.28E+13	7986.652	2.29E+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 = 0.56656095 in
Computed slope at pile head = -0.00395438
Maximum bending moment = 62861261. lbs-in
Maximum shear force = -409206.51200 lbs
Depth of maximum bending moment = 80.64000000 in
Depth of maximum shear force = 241.92000 in
Number of iterations = 73
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= 45000.	M= 6.00E+07	80000.0000	0.5665609	6.2861E+07	-409207.

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

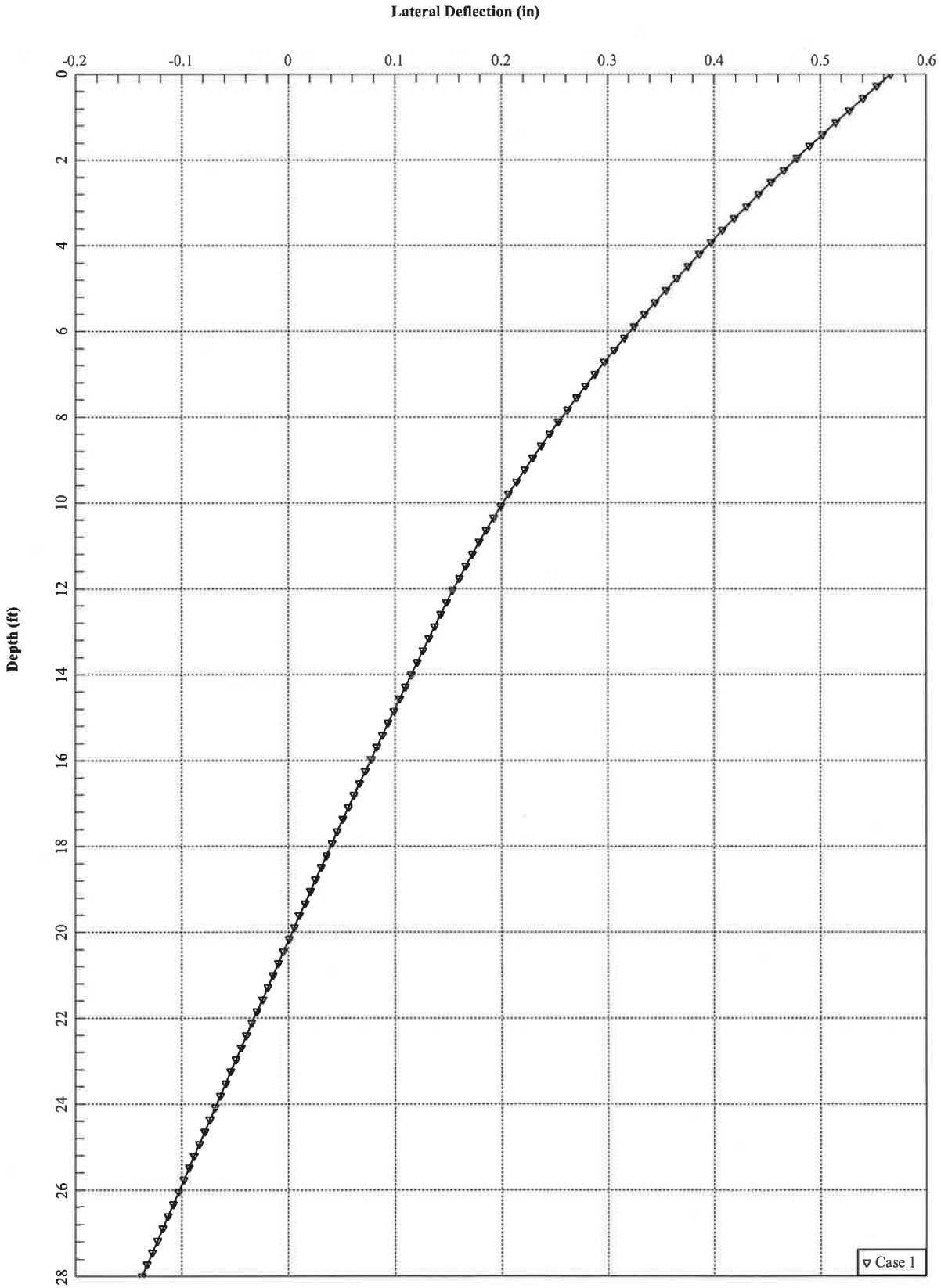
Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
0.00116276	4500.00007	899592.35597	3870117.	7.736729E+08
0.00350024	13546.34980	2708043.	3870117.	7.736729E+08
0.00554775	21470.45646	4292146.	3870117.	7.736729E+08
0.00700049	27092.69961	5416086.	3870117.	7.736729E+08
0.00812731	31453.65020	6287881.	3870117.	7.736729E+08
0.00904800	35016.80627	7000189.	3870117.	7.736729E+08
0.00982642	38029.41180	7602437.	3870117.	7.736729E+08
0.01050073	40639.04941	8124128.	3870117.	7.736729E+08
0.01109551	42940.91292	8584293.	3870117.	7.736729E+08
0.01162755	45000.00000	8995923.	3870117.	7.736729E+08

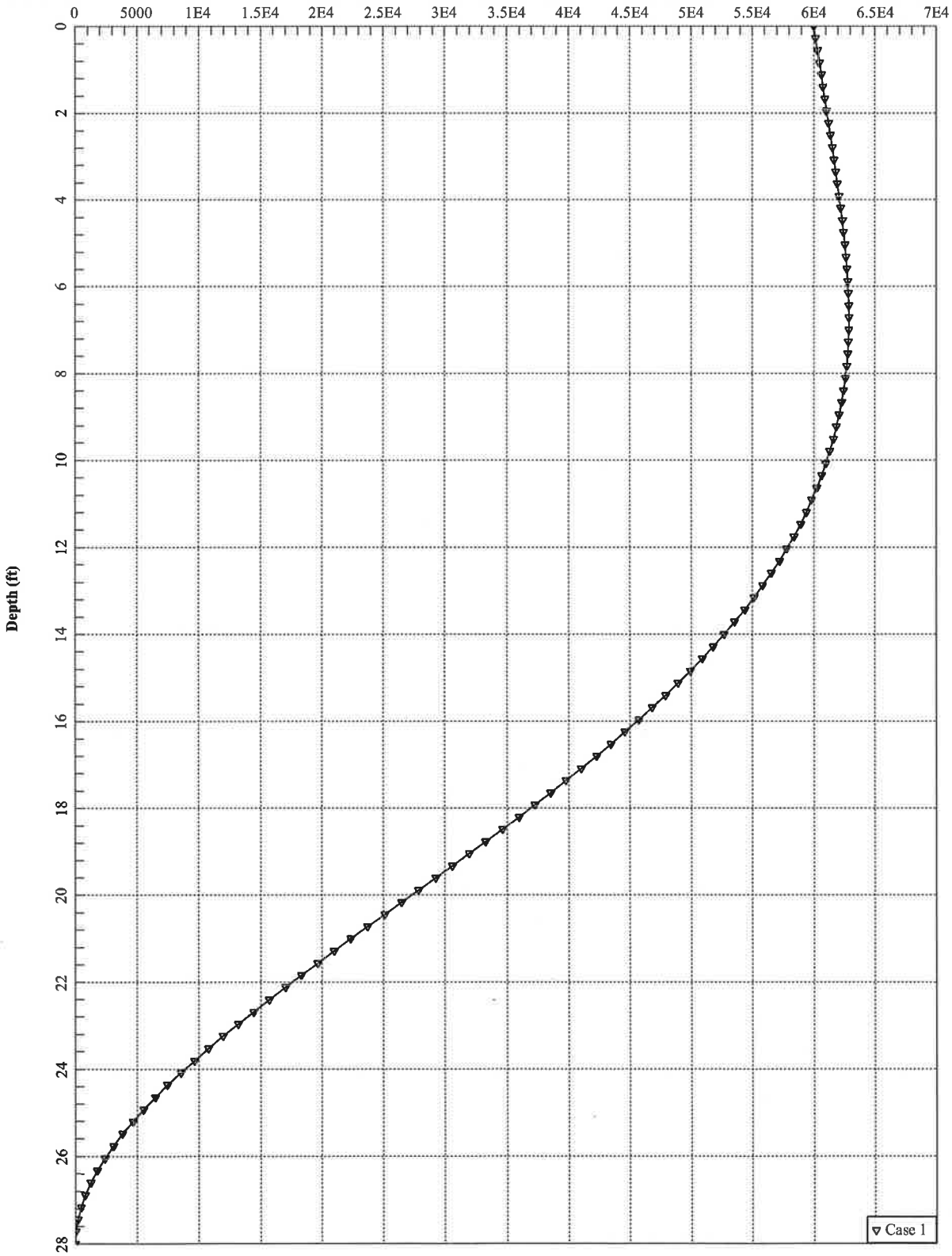
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad

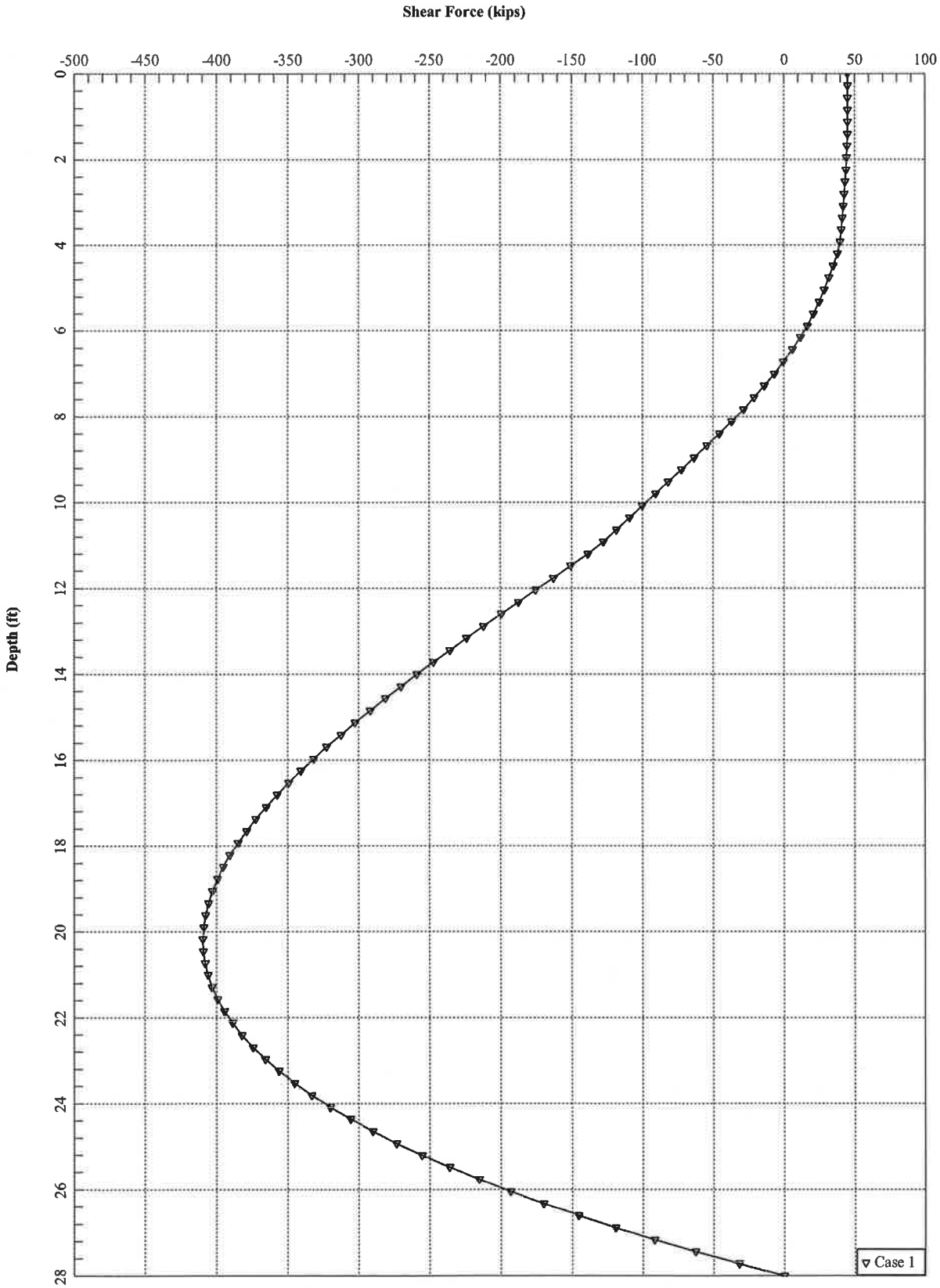
0.00003193	24699.50863	6000000.	7.736729E+08	1.879405E+11
0.00009622	74355.61625	18061800.	7.727660E+08	1.877134E+11
0.00015284	117865.55754	28627275.	7.711775E+08	1.873042E+11
0.00019319	148745.12135	36123599.	7.699583E+08	1.869887E+11
0.00022459	172702.22879	41938200.	7.689642E+08	1.867317E+11
0.00025031	192279.94235	46689075.	7.681766E+08	1.865273E+11
0.00027210	208834.95763	50705882.	7.674828E+08	1.863476E+11
0.00029102	223177.34553	54185399.	7.668798E+08	1.861913E+11
0.00030836	235831.35725	57254551.	7.647880E+08	1.856733E+11
0.00032866	247170.66172	60000000.	7.520612E+08	1.825608E+11

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
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1


Bending Moment (in-kips)
0
5000
1E4
1.5E4
2E4
2.5E4
3E4
3.5E4
4E4
4.5E4
5E4
5.5E4
6E4
6.5E4
7E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1


Shear Force (kips)
-500
-450
-400
-350
-300
-250
-200
-150
-100
-50
0
50
100
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1

SITE NAME	GREENWICH CT			ECP - CELL #		5	89
LATITUDE	41-02-02.17 N			LONGITUDE		73-37-51 W	
				SAVE BUTTON			
AWS: Remove 6 coax runs, add 700 RRHs, add AWS antenna, fiber & RRH.				STRUCTURE TYPE		MONOPOLE	
2100 Mhz - LTE ADD	**ALPHA**		**BETA**			**GAMMA**	
EQUIPMENT TYPE	2100 BBU & RRH		2100 BBU & RRH			2100 BBU & RRH	
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 (MECH/DEG)	0		0			0	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEXER - QTY / MODEL							
RRH - QTY/MODEL	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS		1	ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX							
MAIN DISTRIBUTION BOX	1					DB-T1-6Z-8AB-0Z	
700 Mhz - LTE Current Config	**ALPHA**		**BETA**			**GAMMA**	
EQUIPMENT TYPE	700 MHz eNodeB + TRDU		700 MHz eNodeB + TRDU			700 MHz eNodeB + TRDU	
ANTENNA TYPE	LNX-6514DS-T4M		LNX-6514DS-T4M			LNX-6514DS-T4M	
QTY OF ANTENNAS PER FACE	1		1			1	
ORIENTATION (DEG)	30		160			270	
DOWN TILT (MECH/DEG)	2		2			2	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEXER - QTY / MODEL							
RRH - QTY/MODEL							
SECTOR DISTRIBUTION BOX							
MAIN DISTRIBUTION BOX							
700 Mhz - LTE Future Config	**ALPHA**		**BETA**			**GAMMA**	
EQUIPMENT TYPE	700 MHz eNodeB + TRDU		700 MHz eNodeB + TRDU			700 MHz eNodeB + TRDU	
ANTENNA TYPE	LNX-6514DS-T4M		LNX-6514DS-T4M			LNX-6514DS-T4M	
QTY OF ANTENNAS PER FACE	1		1			1	
ORIENTATION (DEG)	30		160			270	
DOWN TILT (MECH/DEG)	2		2			2	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEXER - QTY / MODEL							
RRH - QTY/MODEL	1	ALU RH_2X40-700U	1	ALU RH_2X40-700U		1	ALU RH_2X40-700U
SECTOR DISTRIBUTION BOX							
MAIN DISTRIBUTION BOX							
850 Celluar - Current Config	**ALPHA**		**BETA**			**GAMMA**	
EQUIPMENT TYPE	Cellular Modcell 4.0HD		Cellular Modcell 4.0HD			Cellular Modcell 4.0HD	
ANTENNA TYPE	DB844G65A-XY		DB844G65A-XY			DB844G65A-XY	
QTY OF ANTENNAS PER FACE	2		2			2	
ORIENTATION (DEG)	30		150			270	
DOWN TILT (MECH/DEG)	0		0			0	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEXER - QTY / MODEL	2		2			2	
DIPLEXER KIT - QTY / MODEL							
850 Celluar - Future Config	**ALPHA**		**BETA**			**GAMMA**	
EQUIPMENT TYPE	Cellular Modcell 4.0HD		Cellular Modcell 4.0HD			Cellular Modcell 4.0HD	
ANTENNA TYPE	DB844G65A-XY		DB844G65A-XY			DB844G65A-XY	
QTY OF ANTENNAS PER FACE	2		2			2	
ORIENTATION (DEG)	30		150			270	
DOWN TILT (MECH/DEG)	0		0			0	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEXER - QTY / MODEL	2		2			2	
DIPLEXER KIT - QTY / MODEL							
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 (MECH/DEG)	0		0			0	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEXER - QTY / MODEL	2		2			2	
DIPLEXER KIT - QTY / MODEL							
1900 PCS - Future 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 (MECH/DEG)	0		0			0	
RAD CTR (FT AGL)	124		124			124	
TMA - QTY / MODEL							
DIPLEX WITH CELLULAR CABLE	DIPLEXED W/CELL		DIPLEXED W/CELL			DIPLEXED W/CELL	

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

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

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/	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/	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/	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/	F1-E	1700	Tx/Rx	BLUE/BLUE/BR	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By :Maria Montrose	Robert Hesselbach	MMM	10/17/2013

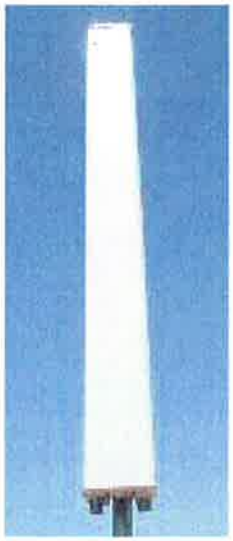
Site Configuration

MG D3-800Tx

Xpol GSM1800+PCS & UMTS Panel Antenna
15.9 dBd/18 dBi
WIDE BAND 1710-2170 MHz
H 65º V 6.5º

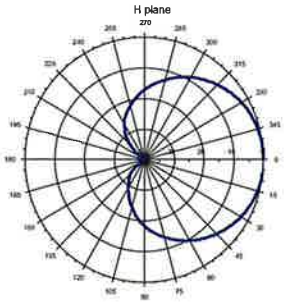
Electrical Specifications

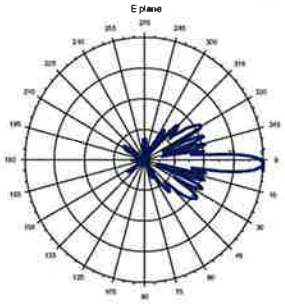
Antenna Model	MG D3-800Tx		
Frequency Range (MHz)	1710-1880	1850-1990	1920-2170
Impedance	50 Ohms		
VSWR	1.40:1		
Polarization	±45º		
Isolation between Ports (dB)	30		
Average Gain (dBd/dBi)	15.7/17.8	15.9/18	16.15/18.25
Horizontal Beamwidth (deg)	65º±5º		
Vertical Beamwidth (deg)	6.5º±0.5º	6.3º±0.5º	6.3º±0.5º
Electrical Tilt (deg)	Fixed 0º-14º		
Sidelobe Suppression (dB)	18	18	18
Front to Back Ratio (dB) @180º±20º	30		
Polarization Isolation (dB) @3 dB Beamwidth	20		
Maximum Power per Input (w)	250		
Intermodulation Products (dBc)	-150		
Connectors	2 x 7/16 Female		
Connector Position	Antenna Bottom		



Mechanical & Environmental Specifications

Dimensions (mm)	1380 x 160 x 90
Survival Wind Speed	200 km/h
Front Windload (N) @ 160 km/h	335
Lateral Windload (N) @ 160 km/h	188
Antenna Weight (kg)	7
Clamps Weight (kg)	2
Mast Mounting	50 to 135 mm
Radome Color	Grey
Grounding	All metallic parts are DC grounded
Temperature Range	-55 to +60ºC
Humidity	100 %





Shipping Specifications

Dimensions (mm)	1580 x 340 x 210
Weight (kg)	12
Material	Cardboard and Foam

Ctra. Campo Real, Km 2,100
28500 Arganda del Rey
Madrid-Spain

RYMSA

Phone: 34 91 876 06 81
Fax: 34 91 876 07 09
E-mail: telecom.commercial@rymsa.com
Web: www.rymsa.com

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

A distributed eNodeB expands 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 an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), 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 — a fraction of the time required for a traditional BTS.

Excellent RF performance

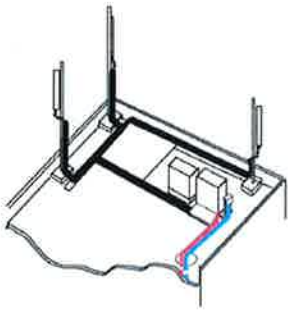
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.

Features

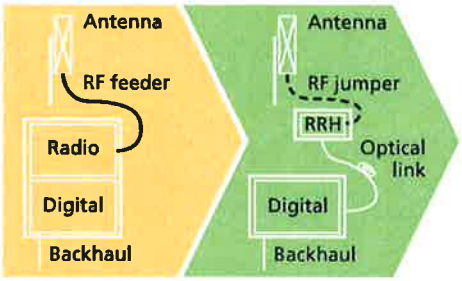
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

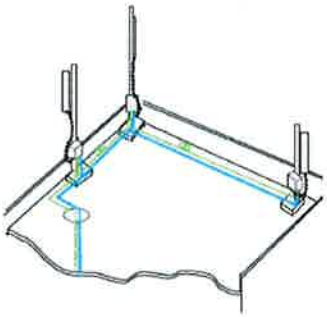
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - ¬ TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
  - ¬ One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - ¬ Single mode dual fiber (SM/DF)
- Multi-mode variant
  - ¬ Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

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Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

A distributed eNodeB expands 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 an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-07-U is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-07-U is compact and weights less than 23 kg (50 lb), 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 — a fraction of the time required for a traditional BTS.

Excellent RF performance

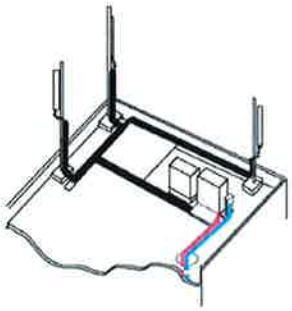
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-07-U provides more RF power while at the same time consuming less electricity.

Features

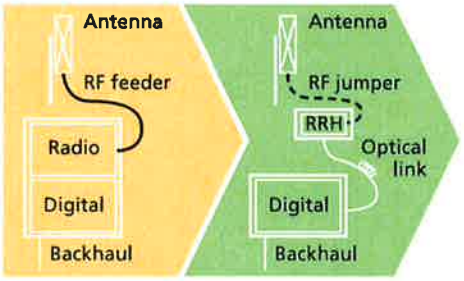
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

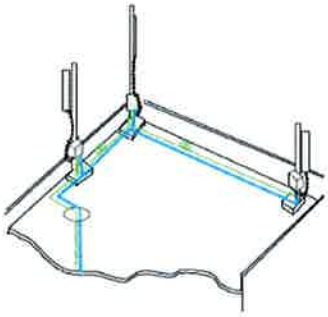
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - ¬ 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - ¬ TMA
  - ¬ Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - ¬ One SM fiber (9/125 µm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - ¬ Two MM fibers (50/125 µm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Alarms and ports

- Six external alarms
- Two optical ports to support daisy-chaining

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CPG2809100913 (09)

Alcatel·Lucent

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.