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Also admitted in Massachusetts

February 14, 2014

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

Re: **Notice of Exempt Modification – Antenna Swap**
3965 Congress Street, Fairfield, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas at the 80-foot level of the existing 150-foot tower at 3965 Congress Street in Fairfield, Connecticut (the "Property"). The tower and underlying property are owned by the Town of Fairfield. The Council approved Cellco's use of the tower in 2004. Cellco now intends to replace three (3) of its existing antennas with three (3) model BXA-171063-12CF, 2100 MHz antennas, all at the same 80-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable attached to the outside of the monopole. 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 Michael C. Tetreau, First Selectman of the Town of Fairfield.

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. The replaced antennas and RRHs will be located on Cellco's existing platform at the 80-foot level on the tower.

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

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

4. The operation of the 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. Far Field Approximation tables for RF emissions from Cellco's modified facility are included in Attachment 2.

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Michael C. Tetreau, Fairfield First Selectman
Sandy M. Carter

ATTACHMENT 1

BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

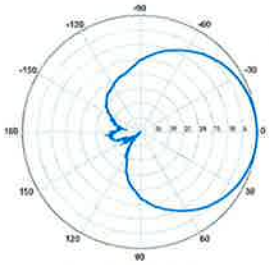
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	< -25 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1842 x 154 x 105 mm	72.5 x 6.1 x 4.1 in	
Depth with z-brackets	133 mm	5.2 in	
Weight without mounting brackets	5.8 kg	12.8 lbs	
Survival wind speed	> 201 km/hr	> 125 mph	
Wind area	Front: 0.28 m² Side: 0.19 m²	Front: 3.1 ft² Side: 2.1 ft²	
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf	

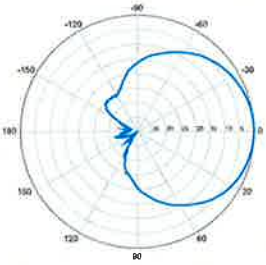
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



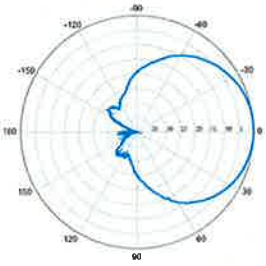
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



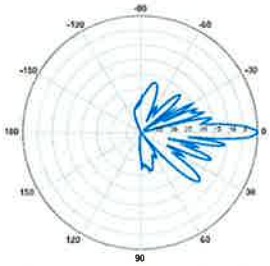
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



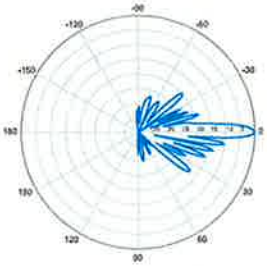
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



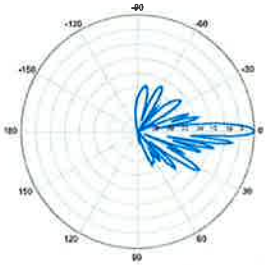
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0

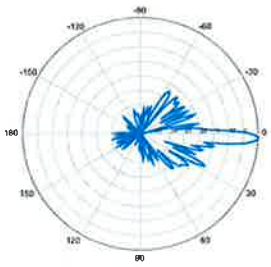


0° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-X

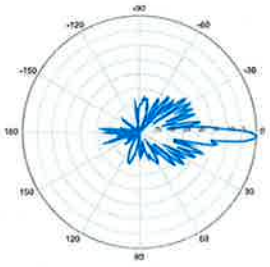
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2



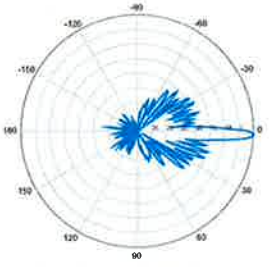
2° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2



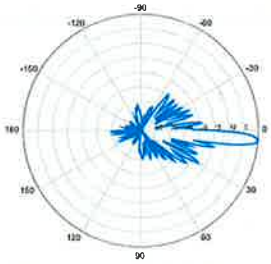
2° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



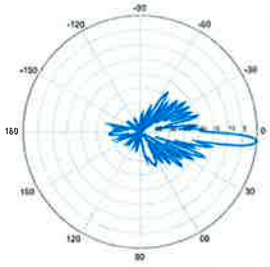
2° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-5



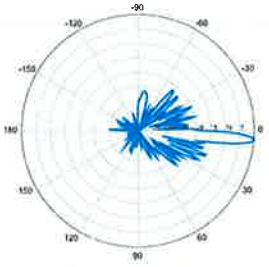
5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-5

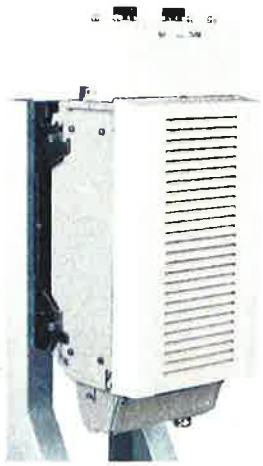


5° | Vertical | 1920-2170 MHz

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

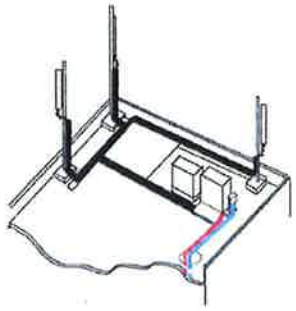
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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

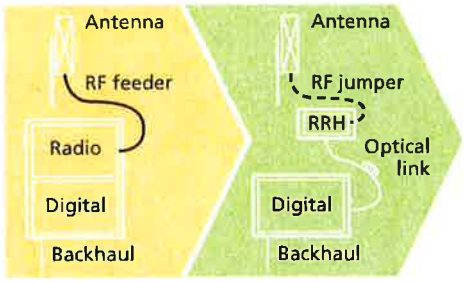
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

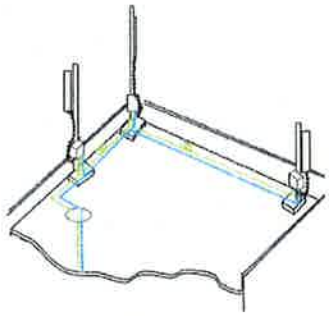
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

CPG2809100912 (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.

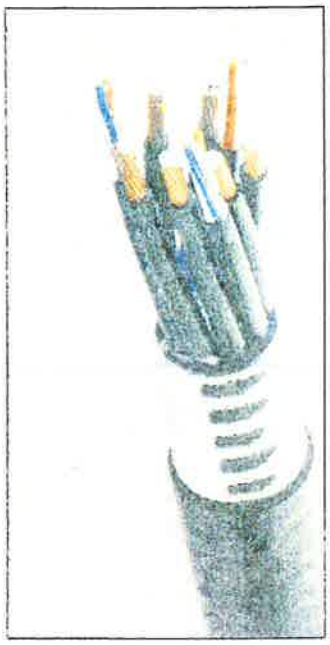


Figure 1: HYBRIFLEX Series

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

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm²(8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-93-638 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

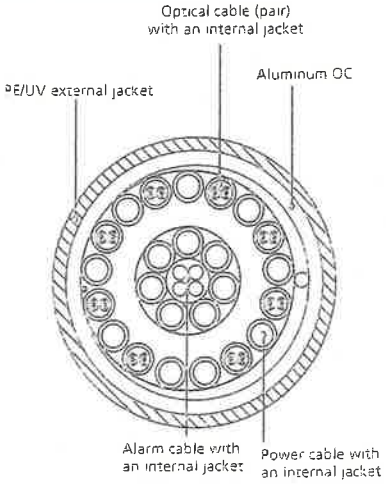


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

Far Field Approximation
with downtilt variation

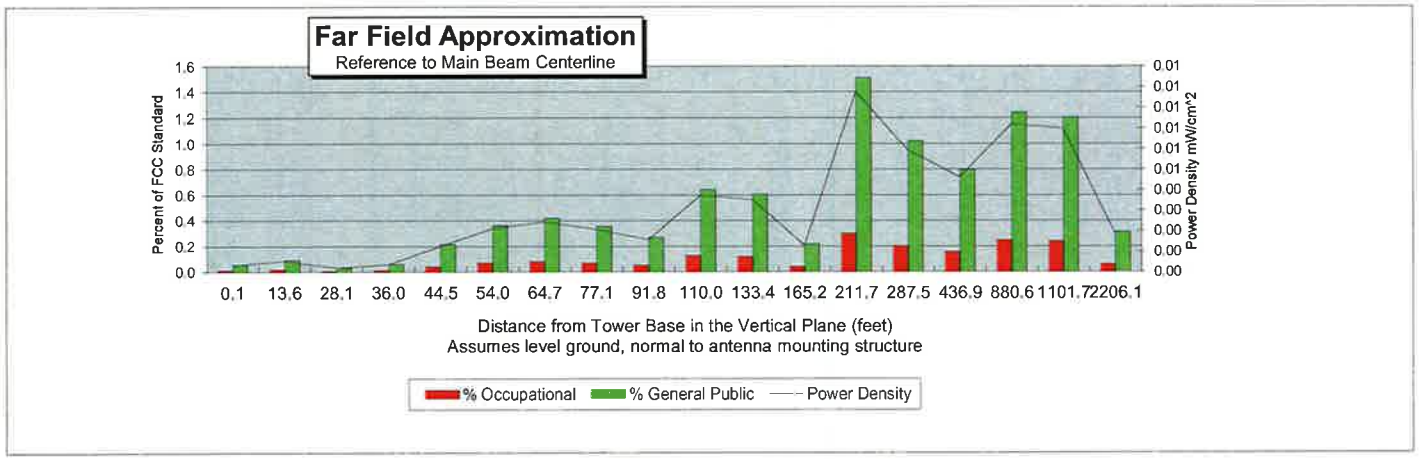
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	FAIRFIELD 2, CT
Site #:	5-0091
Date:	12/10/13
Name:	Ryan Ulanday
File Name:	FAIRFIELD 2, CT - FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**80.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**71.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**879.0**



This approximation is only valid in the far field, which begins at: 62.6 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	77.0	78.2	82.0	85.0	88.9	94.0	100.6	108.9	119.8	134.3	154.1	182.3	225.2	297.7	443.6	883.9	1104.4	2207.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	13.6	28.1	36.0	44.5	54.0	64.7	77.1	91.8	110.0	133.4	165.2	211.7	287.5	436.9	880.6	1101.7	2206.1	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.3	0.2	0.2	0.2	0.2	0.1	#NUM!
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.2	0.4	0.4	0.4	0.3	0.6	0.6	0.2	1.5	1.0	0.8	1.2	1.2	0.3	#NUM!

Antenna Type BXA-70063-6CF-2
Max% 1.51%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

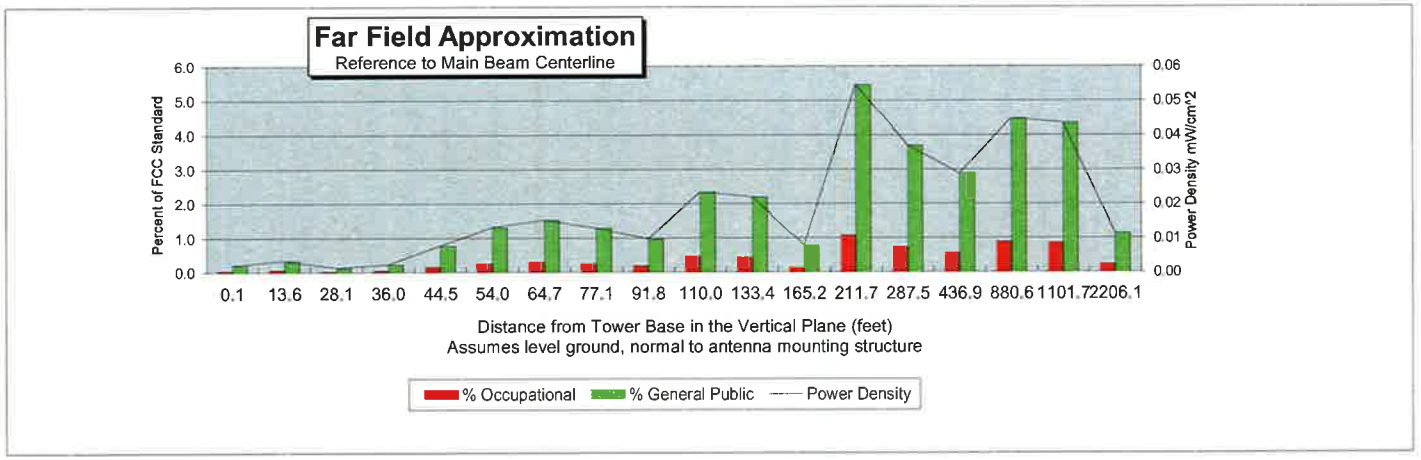
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	FAIRFIELD 2, CT
Site #:	5-0091
Date:	12/10/13
Name:	Ryan Ulanday
File Name:	FAIRFIELD 2, CT - FF Power

Operating Freq. (MHz)	**1971.0**
Antenna Height (ft):	**80.0**
Antenna Gain (dBi):	**17.1**
Antenna Size (in.):	**48.5**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**4995.0**



This approximation is only valid in the far field, which begins at: 29.2 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	77.0	78.2	82.0	85.0	88.9	94.0	100.6	108.9	119.8	134.3	154.1	182.3	225.2	297.7	443.6	883.9	1104.4	2207.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	13.6	28.1	36.0	44.5	54.0	64.7	77.1	91.8	110.0	133.4	165.2	211.7	287.5	436.9	880.6	1101.7	2206.1	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.05	0.04	0.03	0.04	0.04	0.01	#NUM!
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.4	0.2	1.1	0.7	0.6	0.9	0.9	0.2	#NUM!
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.8	1.3	1.5	1.3	1.0	2.3	2.2	0.8	5.5	3.7	2.9	4.5	4.4	1.1	#NUM!

Antenna Type BXA-171063-8BF-EDIN-0
Max% 5.45%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

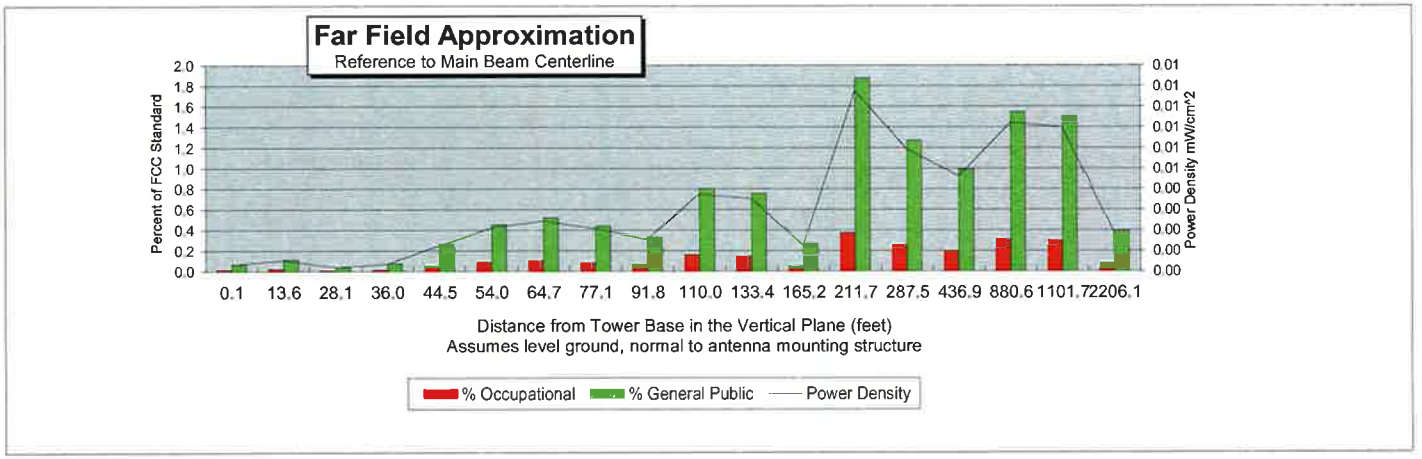
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	FAIRFIELD 2, CT
Site #:	5-0091
Date:	12/10/13
Name:	Ryan Ulanday
File Name:	FAIRFIELD 2, CT - FF Power

Operating Freq. (MHz)	**698.0**
Antenna Height (ft):	**80.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**71.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**879.0**



This approximation is only valid in the far field, which begins at: 62.6 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	77.0	78.2	82.0	85.0	88.9	94.0	100.6	108.9	119.8	134.3	154.1	182.3	225.2	297.7	443.6	883.9	1104.4	2207.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	13.6	28.1	36.0	44.5	54.0	64.7	77.1	91.8	110.0	133.4	165.2	211.7	287.5	436.9	880.6	1101.7	2206.1	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.3	0.3	0.1	#NUM!
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.5	0.4	0.3	0.8	0.8	0.3	1.9	1.3	1.0	1.5	1.5	0.4	#NUM!

Antenna Type BXA-70063-6CF-2
Max% 1.88%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pc
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

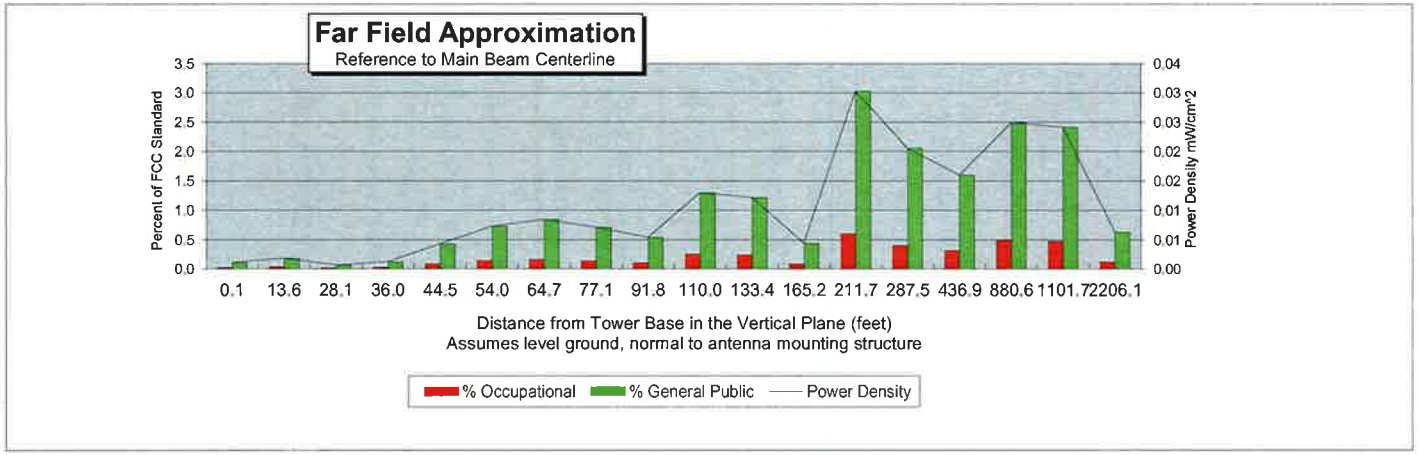
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	FAIRFIELD 2, CT
Site #:	5-0091
Date:	12/10/13
Name:	Ryan Ulanday
File Name:	FAIRFIELD 2, CT - FF Power

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**80.0**
Antenna Gain (dBi):	**19.1**
Antenna Size (in.):	**72.4**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1750.0**



This approximation is only valid in the far field, which begins at: 65.2 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	77.0	78.2	82.0	85.0	88.9	94.0	100.6	108.9	119.8	134.3	154.1	182.3	225.2	297.7	443.6	883.9	1104.4	2207.5	
Distance from Antenna Structure Base in Horizontal plane	0.1	13.6	28.1	36.0	44.5	54.0	64.7	77.1	91.8	110.0	133.4	165.2	211.7	287.5	436.9	880.6	1101.7	2206.1	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.03	0.02	0.02	0.02	0.02	0.01	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.3	0.2	0.1	0.6	0.4	0.3	0.5	0.5	0.1	#NUM!
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.4	0.7	0.8	0.7	0.5	1.3	1.2	0.4	3.0	2.1	1.6	2.5	2.4	0.6	#NUM!

Antenna Type BXA-171063-12CF-EDIN-2
Max% 3.03%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 P
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

150-ft Existing Valmont Monopole

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Fairfield 2

3965 Congress Street
Fairfield, CT

Centek Project No. 13001.101

Date: December 5, 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) located in Fairfield, CT.

The host tower is a 150-ft tall, three-section, twelve sided, tapered monopole, originally designed and manufactured by Valmont Structures. The manufacturer's drawings and calculations were unavailable for use in this report. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis report prepared by Centek Engineering job no; 12001.CO92, dated August 9, 2012.

Antenna and appurtenance information were obtained from the aforementioned Centek structural report, visual verification from grade conducted by Centek personnel on November 16, 2013 and a Verizon RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 23.61-in at the top and 49.6-in at the base.

Verizon proposes the installation of three (3) panel antennas, three (3) 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, proposed and future loads considered in this analysis consist of the following:

- TOWN (Existing):
  Antennas: One (1) DB810K Omni-directional whip antenna and two (2) 10-ft Dipole antennas mounted on the Nextel T-Arms with respective RAD center elevations of 157-ft and 154-ft above grade.
  Coax Cables: Three (3) 1-5/8"∅ coax cables running on the inside of the existing tower.
- NEXTEL (Existing):
  Antennas: Twelve (12) Andrew DB844H90E-XY panel antennas mounted on three (3) 12-ft T-Arms with a RAD center elevation of 149-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" coax cables running on the inside of the existing tower.
- SPRINT (Existing):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas mounted on a 13-ft platform with hand rails with a RAD center elevation of 138-ft above grade. Three (3) ALU 1900 MHz RRH's and three (3) ALU 800 MHz RRH's mounted on a universal tr-bracket above the existing platform.
  Coax Cables: Three (3) 1-5/8" ∅ Hybriflex 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 129-ft above grade.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running on the exterior of the existing tower.
- AT&T (Existing):
  Antennas: Six (6) Powerwave 7770 panel antennas, three (3) Powerwave P65-16-XLH-RR panel antennas and twelve (12) Powerwave LGP21401 TMA's mounted on an existing low profile platform with a RAD center elevation of 127-ft above grade.
  Coax Cables: Twelve (12) 1-1/4" ∅ coax cables running on the exterior of the existing tower.
- T-MOBILE (Existing):
  Antennas: Three (3) RFS APX16DWV-16DWV-S panel antennas and six (6) 10" by 8" by 3" TMA's mounted on a 13-ft platform with rails with a RAD center elevation of 113-ft above grade.
  Coax Cables: Twelve (12) 1-1/4" ∅ coax cables running on the exterior of the existing tower.
- TOWN (Existing):
  Antennas: Two (2) Andrew APSA685 Omni-directional whip antennas (inverted), one (1) DB-222 dipole antenna and one (1) PD1142-2B Omni-directional whip antenna mounted on two (2) standoffs with an elevation of 104-ft above grade.
  Coax Cables: Four (4) 1-5/8"∅ coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: Two (2) empty standoffs with a RAD center elevation of 104-ft above grade.
- UNKNOWN (Existing):
  Antennas: One (1) GPS antenna on a GPS Stand-off mount with a RAD center elevation of 40-ft above grade.
  Coax Cables: One (1) 1/2"∅ coax cable running on the exterior of the existing tower.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Three (3) Antel BXA-70063-6CF panel antennas, six (6) Andrew DB846F65ZAXY panel antennas, three (3) Antel BXA-171063-8BF panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted on an existing low profile platform with a RAD center elevation of 80-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the exterior of the existing tower.
- **VERIZON (Proposed):**
  Antennas: Three (3) BXA-171063-12CF panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on an existing low profile platform with a RAD center elevation of 80-ft above grade
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running on the exterior of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	New Haven; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Fairfield; v = 110 mph (3 second gust) equivalent to v = 90 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls.	
Load Cases:	Load Case 1; 90 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 78 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 78 mph wind speed velocity represents 75% of the wind pressure generated by the 90 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **97.9%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L3)	30.00'-47.83'	97.9%	**PASS**

Note 1: Equivalent thickness of 0.58" used for section L4 of pole shaft with reinforcement.

Foundation and Anchors

The existing foundation consists of a 6.6 ∅ x 26.6-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the design documents prepared by SAC, dated May 18, 1994. The base of the tower is connected to the foundation by means of (16) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 5-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	41 kips
	Compression	44 kips
	Moment	3929 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	0.31 in.(1)	**PASS**

(1) Lateral deflection typically limited to 1.0 in. for monopole tower structures. Based on service loads (V = 50 mph)

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	89.3%	**PASS**
Base Plate	Bending	93.0%	**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

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16894
LICENSED
PROFESSIONAL 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:

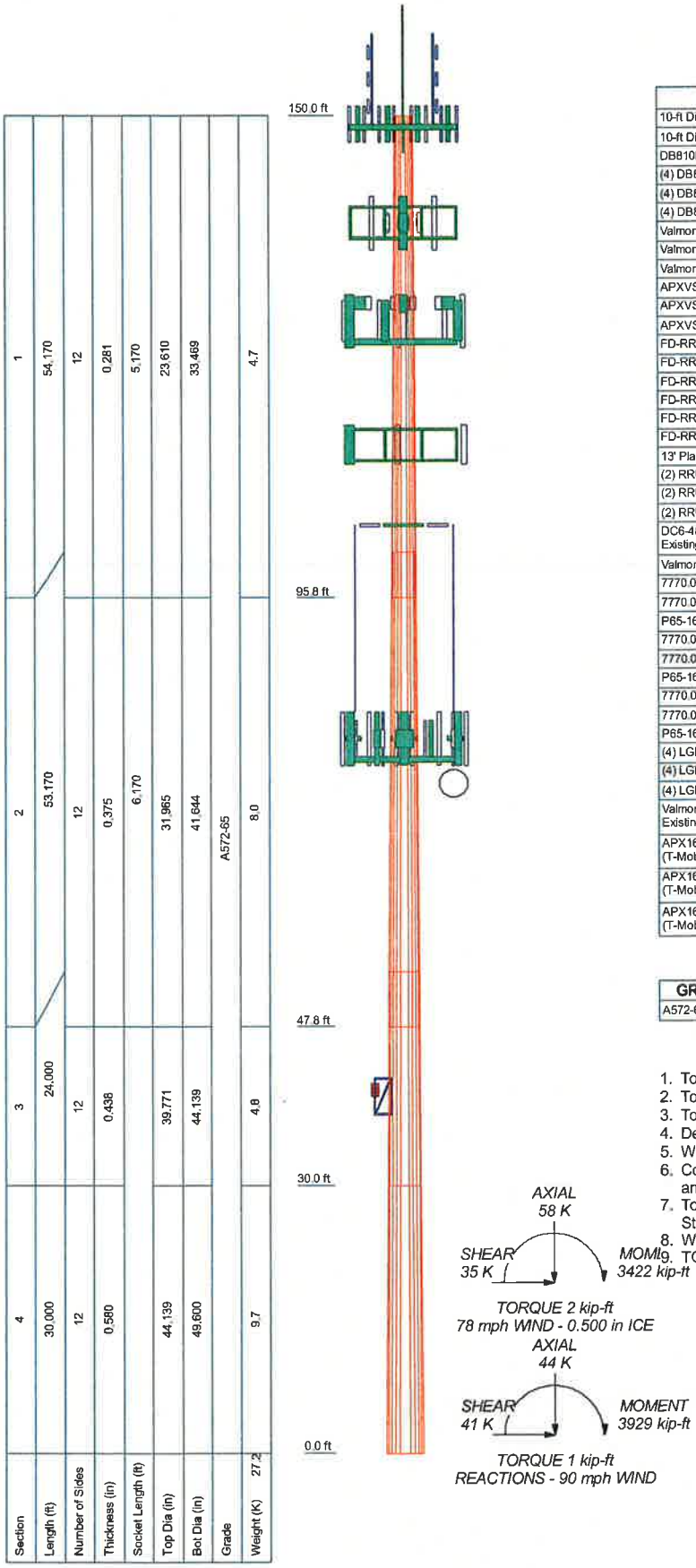
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of CENTEK engineering, Inc. or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

General Description of Structural Analysis Program

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

tnxTower Features:

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



Section	1	2	3	4
Length (ft)	54.170	53.170	24.000	30.000
Number of Sides	12	12	12	12
Thickness (in)	0.281	0.375	0.436	0.580
Socket Length (ft)	5.170	6.170		
Top Dia (in)	23.610	31.965	39.771	44.139
Bot Dia (in)	33.469	41.644	44.139	49.600
Grade	A572-65			
Weight (K)	4.7	8.0	4.8	9.7

Total Weight: 27.2 K

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10-ft Dipole (Town)	149	(2) 10"x8"x3" TMA (T-Mobile Existing)	113
10-ft Dipole (Town)	149	(2) 10"x8"x3" TMA (T-Mobile Existing)	113
DB810K (Town)	149	(2) 10"x8"x3" TMA (T-Mobile Existing)	113
(4) DB844H90E-XY (Nextel Existing)	149	13' Platform w/Rails (T-Mobile Existing)	113
(4) DB844H90E-XY (Nextel Existing)	149	4'-6" Standoff (Town - Existing)	104
(4) DB844H90E-XY (Nextel Existing)	149	4'-6" Standoff (Town - Existing)	104
Valmont T-Arm (1) (Nextel Existing)	149	4'-6" Standoff (Town - Existing)	104
Valmont T-Arm (1) (Nextel Existing)	149	4'-6" Standoff (Town - Existing)	104
Valmont T-Arm (1) (Nextel Existing)	149	1142-2B (Town - Existing)	104
APXVSPP18-C-A20 (Sprint Existing)	138	ASPA685 (Town - Existing)	104
APXVSPP18-C-A20 (Sprint Existing)	138	DB222 (Town - Existing)	104
APXVSPP18-C-A20 (Sprint Existing)	138	ASPA685 (Town - Existing)	104
FD-RRH 4x45 1900 (Sprint Existing)	138	DB846F65ZAXY (Verizon - Existing)	80
FD-RRH 4x45 1900 (Sprint Existing)	138	BXA-171063/8BF (Verizon - Existing)	80
FD-RRH 4x45 1900 (Sprint Existing)	138	BXA-70063/6CF (Verizon - Existing)	80
FD-RRH 2x50 800 (Sprint Existing)	138	DB846F65ZAXY (Verizon - Existing)	80
FD-RRH 2x50 800 (Sprint Existing)	138	DB846F65ZAXY (Verizon - Existing)	80
FD-RRH 2x50 800 (Sprint Existing)	138	BXA-171063/8BF (Verizon - Existing)	80
13' Platform w/Rails (Sprint Existing)	138	BXA-70063/6CF (Verizon - Existing)	80
(2) RRUS-11 (ATI Existing)	129	DB846F65ZAXY (Verizon - Existing)	80
(2) RRUS-11 (ATI Existing)	129	DB846F65ZAXY (Verizon - Existing)	80
(2) RRUS-11 (ATI Existing)	129	BXA-171063/8BF (Verizon - Existing)	80
DC6-48-60-18-8F Surge Arrestor (ATI Existing)	129	BXA-70063/6CF (Verizon - Existing)	80
		DB846F65ZAXY (Verizon - Existing)	80
Valmont Uni-Tri Bracket (ATI Existing)	129	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	80
7770.00 (ATI Existing)	127		
7770.00 (ATI Existing)	127	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	80
P65-16-XLH-RR (ATI Existing)	127		
7770.00 (ATI Existing)	127	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	80
7770.00 (ATI Existing)	127		
P65-16-XLH-RR (ATI Existing)	127	BXA-171063-12CF (Verizon - Proposed)	80
7770.00 (ATI Existing)	127		
7770.00 (ATI Existing)	127	BXA-171063-12CF (Verizon - Proposed)	80
P65-16-XLH-RR (ATI Existing)	127		
(4) LGP214nn TMA (ATI Existing)	127	BXA-171063-12CF (Verizon - Proposed)	80
(4) LGP214nn TMA (ATI Existing)	127	RRH2x40-AWS (Verizon - Proposed)	80
(4) LGP214nn TMA (ATI Existing)	127	RRH2x40-AWS (Verizon - Proposed)	80
Valmont 13' Low Profile Platform (ATI Existing)	125	RRH2x40-AWS (Verizon - Proposed)	80
		DB-T1-6Z-8AB-0Z (Verizon - Proposed)	80
APX16DWV-16DWV-S-E-ACU (T-Mobile Existing)	113	Valmont 13' Low Profile Platform (Verizon - Existing)	78
APX16DWV-16DWV-S-E-ACU (T-Mobile Existing)	113	Stand-off	40
APX16DWV-16DWV-S-E-ACU (T-Mobile Existing)	113	GPS (Existing)	40

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 78 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 97.9%

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

Job: 13001.101 - Fairfield 2			
Project: 150-ft Valmont Monopole - Fairfield, CT			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 12/04/13	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	13001.101 - Fairfield 2	1 of 23
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 150-ft Valmont Monopole - Fairfield, CT	**Date** 18:32:33 12/04/13
	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:

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 90 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 78 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
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	150.000-95.830	54.170	5.170	12	23.610	33.469	0.281	1.125	A572-65 (65 ksi)
L2	95.830-47.830	53.170	6.170	12	31.965	41.644	0.375	1.500	A572-65 (65 ksi)
L3	47.830-30.000	24.000	0.000	12	39.771	44.139	0.438	1.750	A572-65

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L4	30.000-0.000	30.000		12	44.139	49.600	0.580	2.320	(65 ksi) 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	24.443	21.131	1467.855	8.352	12.230	120.021	2974.272	10.400	5.574	19.814
	34.650	30.061	4226.132	11.881	17.337	243.765	8563.288	14.795	8.216	29.207
L2	34.067	38.145	4858.931	11.309	16.558	293.447	9845.511	18.774	7.562	20.165
	43.113	49.832	10832.905	14.774	21.572	502.184	21950.402	24.526	10.156	27.082
L3	42.336	55.411	10942.171	14.081	20.601	531.139	22171.804	27.272	9.486	21.683
	45.696	61.564	15007.519	15.645	22.864	656.382	30409.303	30.300	10.657	24.358
L4	45.696	81.351	19701.692	15.594	22.864	861.690	39920.969	40.038	10.275	17.715
	51.350	91.550	28079.524	17.549	25.693	1092.895	56896.728	45.058	11.738	20.239

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 150.000-95.830				1	1	1		
L2 95.830-47.830				1	1	1		
L3 47.830-30.000				1	1	1		
L4 30.000-0.000				1.2	1	1.1		

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	√
Anchor bolt grade	A615-75
Anchor bolt size	2.250 in
Number of bolts	16
Embedment length	60.000 in
f'_c	4.000 ksi
Grout space	3.000 in
Base plate grade	A633-60
Base plate thickness	2.750 in
Bolt circle diameter	57.850 in
Outer diameter	63.850 in
Inner diameter	40.000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
1 5/8 (Town - Existing)	A	No	Inside Pole	149.000 - 3.000	3	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (Nextel - Existing)	B	No	Inside Pole	149.000 - 3.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 1/4 (AT&T - Existing)	A	No	CaAa (Out Of Face)	125.000 - 3.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
1 1/4 (T-Mobile - Existing)	A	No	CaAa (Out Of Face)	110.000 - 3.000	2	No Ice	0.155	0.001
						1/2" Ice	0.255	0.002
1 1/4 (T-Mobile - Existing)	A	No	CaAa (Out Of Face)	110.000 - 3.000	10	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
1 5/8 (Verizon - Existing)	C	No	CaAa (Out Of Face)	77.000 - 3.000	2	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (Verizon - Existing)	C	No	CaAa (Out Of Face)	77.000 - 3.000	10	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003
7/8 (Town - Existing)	B	No	Inside Pole	104.000 - 3.000	4	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1/2 (GPS - Existing)	B	No	CaAa (Out Of Face)	40.000 - 3.000	1	No Ice	0.058	0.000
						1/2" Ice	0.158	0.001
RG6-Fiber (AT&T - Existing)	C	No	CaAa (Out Of Face)	129.000 - 3.000	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
#8 AWG Copper WIre (AT&T - Existing)	C	No	CaAa (Out Of Face)	129.000 - 3.000	2	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
HYBRIFLEX 1-5/8" (Sprint - Existing)	C	No	Inside Pole	138.000 - 3.000	3	No Ice	0.000	0.002
						1/2" Ice	0.000	0.002
HYBRIFLEX 1-5/8" (Verizon - Proposed)	C	No	CaAa (Out Of Face)	77.000 - 3.000	1	No Ice	0.000	0.002
						1/2" Ice	0.000	0.003

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	150.000-95.830	A	0.000	0.000	0.000	4.393	0.509
		B	0.000	0.000	0.000	0.000	0.681
		C	0.000	0.000	0.000	0.000	0.277
L2	95.830-47.830	A	0.000	0.000	0.000	14.880	0.910
		B	0.000	0.000	0.000	0.000	0.703
		C	0.000	0.000	0.000	11.551	0.746
L3	47.830-30.000	A	0.000	0.000	0.000	5.527	0.338
		B	0.000	0.000	0.000	0.580	0.264
		C	0.000	0.000	0.000	7.061	0.378
L4	30.000-0.000	A	0.000	0.000	0.000	8.370	0.512
		B	0.000	0.000	0.000	1.566	0.402
		C	0.000	0.000	0.000	10.692	0.572

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	150.000-95.830	A	0.500	0.000	0.000	0.000	7.227	1.159
		B		0.000	0.000	0.000	0.000	0.681

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
		C		0.000	0.000	0.000	0.000	0.323
L2	95.830-47.830	A	0.500	0.000	0.000	0.000	24.480	2.350
		B		0.000	0.000	0.000	0.000	0.703
		C		0.000	0.000	0.000	17.385	1.385
L3	47.830-30.000	A	0.500	0.000	0.000	0.000	9.093	0.873
		B		0.000	0.000	0.000	1.580	0.270
		C		0.000	0.000	0.000	10.627	0.752
L4	30.000-0.000	A	0.500	0.000	0.000	0.000	13.770	1.322
		B		0.000	0.000	0.000	4.266	0.420
		C		0.000	0.000	0.000	16.092	1.139

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10-ft Dipole (Town)	A	From Face	3.000 0.000 5.000	0.000	149.000	No Ice 1/2" Ice	3.150 5.670	3.150 5.670	0.032 0.042
10-ft Dipole (Town)	B	From Face	3.000 0.000 5.000	0.000	149.000	No Ice 1/2" Ice	3.150 5.670	3.150 5.670	0.032 0.042
DB810K (Town)	C	From Face	3.000 0.000 5.000	0.000	149.000	No Ice 1/2" Ice	4.075 5.734	4.075 5.734	0.035 0.065
(4) DB844H90E-XY (Nextel Existing)	A	From Face	3.000 0.000 0.000	0.000	149.000	No Ice 1/2" Ice	2.867 3.177	3.733 4.101	0.010 0.035
(4) DB844H90E-XY (Nextel Existing)	B	From Face	3.000 0.000 0.000	0.000	149.000	No Ice 1/2" Ice	2.867 3.177	3.733 4.101	0.010 0.035
(4) DB844H90E-XY (Nextel Existing)	C	From Face	3.000 0.000 0.000	0.000	149.000	No Ice 1/2" Ice	2.867 3.177	3.733 4.101	0.010 0.035
Valmont T-Arm (1) (Nextel Existing)	A	None		0.000	149.000	No Ice 1/2" Ice	10.540 14.450	10.540 14.450	0.336 0.412
Valmont T-Arm (1) (Nextel Existing)	B	None		0.000	149.000	No Ice 1/2" Ice	10.540 14.450	10.540 14.450	0.336 0.412
Valmont T-Arm (1) (Nextel Existing)	C	None		0.000	149.000	No Ice 1/2" Ice	10.540 14.450	10.540 14.450	0.336 0.412
APXVSPP18-C-A20 (Sprint Existing)	A	From Face	3.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	8.260 8.807	5.283 5.736	0.057 0.107
APXVSPP18-C-A20 (Sprint Existing)	B	From Face	3.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	8.260 8.807	5.283 5.736	0.057 0.107
APXVSPP18-C-A20 (Sprint Existing)	C	From Face	3.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	8.260 8.807	5.283 5.736	0.057 0.107
FD-RRH 4x45 1900 (Sprint Existing)	A	From Face	1.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	2.705 2.944	2.781 3.022	0.060 0.084
FD-RRH 4x45 1900	B	From Face	1.000	0.000	138.000	No Ice	2.705	2.781	0.060

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
(Sprint Existing)			0.000 0.000			1/2" Ice	2.944	3.022	0.084
FD-RRH 4x45 1900 (Sprint Existing)	C	From Face	1.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	2.705 2.944	2.781 3.022	0.060 0.084
FD-RRH 2x50 800 (Sprint Existing)	A	From Face	1.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	2.401 2.613	2.254 2.460	0.064 0.086
FD-RRH 2x50 800 (Sprint Existing)	B	From Face	1.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	2.401 2.613	2.254 2.460	0.064 0.086
FD-RRH 2x50 800 (Sprint Existing)	C	From Face	1.000 0.000 0.000	0.000	138.000	No Ice 1/2" Ice	2.401 2.613	2.254 2.460	0.064 0.086
13' Platform w/Rails (Sprint Existing)	C	None		0.000	138.000	No Ice 1/2" Ice	17.200 22.300	17.200 22.300	2.000 3.000
(2) RRUS-11 (AT&T Existing)	A	From Face	0.500 0.000 0.000	0.000	129.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(2) RRUS-11 (AT&T Existing)	B	From Face	0.500 0.000 0.000	0.000	129.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(2) RRUS-11 (AT&T Existing)	C	From Face	0.500 0.000 0.000	0.000	129.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
DC6-48-60-18-8F Surge Arrestor (AT&T Existing)	C	From Face	0.500 0.000 0.000	0.000	129.000	No Ice 1/2" Ice	2.228 2.447	2.228 2.447	0.020 0.039
Valmont Uni-Tri Bracket (AT&T Existing)	C	None		0.000	129.000	No Ice 1/2" Ice	1.750 1.940	1.750 1.940	0.290 0.306
7770.00 (AT&T Existing)	A	From Face	3.000 -6.000 0.000	0.000	127.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
7770.00 (AT&T Existing)	A	From Face	3.000 2.000 0.000	0.000	127.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
P65-16-XLH-RR (AT&T Existing)	A	From Face	3.000 6.000 0.000	0.000	127.000	No Ice 1/2" Ice	8.400 8.949	4.700 5.147	0.060 0.107
7770.00 (AT&T Existing)	B	From Face	3.000 -6.000 0.000	0.000	127.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
7770.00 (AT&T Existing)	B	From Face	3.000 2.000 0.000	0.000	127.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
P65-16-XLH-RR (AT&T Existing)	B	From Face	3.000 6.000 0.000	0.000	127.000	No Ice 1/2" Ice	8.400 8.949	4.700 5.147	0.060 0.107
7770.00 (AT&T Existing)	C	From Face	3.000 -6.000 0.000	0.000	127.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
7770.00 (AT&T Existing)	C	From Face	3.000 2.000 0.000	0.000	127.000	No Ice 1/2" Ice	5.882 6.314	2.928 3.273	0.035 0.068
P65-16-XLH-RR (AT&T Existing)	C	From Face	3.000 6.000 0.000	0.000	127.000	No Ice 1/2" Ice	8.400 8.949	4.700 5.147	0.060 0.107

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(4) LGP214nn TMA	A	From Face	3.000	0.000	127.000	No Ice	0.000	0.233	0.014
(AT&T Existing)			0.000			1/2" Ice	0.000	0.313	0.021
			0.000						
(4) LGP214nn TMA	B	From Face	3.000	0.000	127.000	No Ice	0.000	0.233	0.014
(AT&T Existing)			0.000			1/2" Ice	0.000	0.313	0.021
			0.000						
(4) LGP214nn TMA	C	From Face	3.000	0.000	127.000	No Ice	0.000	0.233	0.014
(AT&T Existing)			0.000			1/2" Ice	0.000	0.313	0.021
			0.000						
Valmont 13' Low Profile Platform	C	None		0.000	125.000	No Ice	15.700	15.700	1.300
(AT&T Existing)						1/2" Ice	20.100	20.100	1.765
APX16DWV-16DWV-S-E-A	A	From Face	3.000	0.000	113.000	No Ice	6.699	2.003	0.040
CU			6.000			1/2" Ice	7.131	2.326	0.071
(T-Mobile Existing)			0.000						
APX16DWV-16DWV-S-E-A	B	From Face	3.000	0.000	113.000	No Ice	6.699	2.003	0.040
CU			6.000			1/2" Ice	7.131	2.326	0.071
(T-Mobile Existing)			0.000						
APX16DWV-16DWV-S-E-A	C	From Face	3.000	0.000	113.000	No Ice	6.699	2.003	0.040
CU			6.000			1/2" Ice	7.131	2.326	0.071
(T-Mobile Existing)			0.000						
(2) 10"x8"x3" TMA	A	From Face	3.000	0.000	113.000	No Ice	0.778	0.292	0.015
(T-Mobile Existing)			6.000			1/2" Ice	0.899	0.380	0.020
			0.000						
(2) 10"x8"x3" TMA	B	From Face	3.000	0.000	113.000	No Ice	0.778	0.292	0.015
(T-Mobile Existing)			6.000			1/2" Ice	0.899	0.380	0.020
			0.000						
(2) 10"x8"x3" TMA	C	From Face	3.000	0.000	113.000	No Ice	0.778	0.292	0.015
(T-Mobile Existing)			6.000			1/2" Ice	0.899	0.380	0.020
			0.000						
13' Platform w/Rails	C	None		0.000	113.000	No Ice	17.200	17.200	2.000
(T-Mobile Existing)						1/2" Ice	22.300	22.300	3.000
4'-6" Standoff	A	From Face	3.000	0.000	104.000	No Ice	2.100	0.156	0.040
(Town - Existing)			0.000			1/2" Ice	2.480	0.212	0.057
			0.000						
4'-6" Standoff	A	From Face	3.000	0.000	104.000	No Ice	2.100	0.156	0.040
(Town - Existing)			0.000			1/2" Ice	2.480	0.212	0.057
			0.000						
4'-6" Standoff	B	From Face	3.000	0.000	104.000	No Ice	2.100	0.156	0.040
(Town - Existing)			0.000			1/2" Ice	2.480	0.212	0.057
			0.000						
4'-6" Standoff	C	From Face	3.000	0.000	104.000	No Ice	2.100	0.156	0.040
(Town - Existing)			0.000			1/2" Ice	2.480	0.212	0.057
			0.000						
1142-2B	B	From Face	5.000	0.000	104.000	No Ice	1.120	1.120	0.010
(Town - Existing)			0.000			1/2" Ice	2.535	2.535	0.021
			4.000						
ASPA685	B	From Face	5.000	0.000	104.000	No Ice	5.250	5.250	0.022
(Town - Existing)			0.000			1/2" Ice	7.379	7.379	0.060
			-10.500						
DB222	A	From Face	5.000	0.000	104.000	No Ice	1.600	1.600	0.016
(Town - Existing)			0.000			1/2" Ice	2.880	2.880	0.021
			5.000						
ASPA685	A	From Face	5.000	0.000	104.000	No Ice	5.250	5.250	0.022
(Town - Existing)			0.000			1/2" Ice	7.379	7.379	0.060
			-10.500						
DB846F65ZAXY	A	From Face	3.000	0.000	80.000	No Ice	7.033	6.158	0.021

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)			-6.000 0.000			1/2" Ice	7.536	6.619	0.070
BXA-171063/8BF (Verizon - Existing)	A	From Face	3.000 -3.000 0.000	0.000	80.000	No Ice 1/2" Ice	2.941 3.255	2.156 2.458	0.011 0.029
BXA-70063/6CF (Verizon - Existing)	A	From Face	3.000 0.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
DB846F65ZAXY (Verizon - Existing)	A	From Face	3.000 6.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.033 7.536	6.158 6.619	0.021 0.070
DB846F65ZAXY (Verizon - Existing)	B	From Face	3.000 -6.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.033 7.536	6.158 6.619	0.021 0.070
BXA-171063/8BF (Verizon - Existing)	B	From Face	3.000 -3.000 0.000	0.000	80.000	No Ice 1/2" Ice	2.941 3.255	2.156 2.458	0.011 0.029
BXA-70063/6CF (Verizon - Existing)	B	From Face	3.000 0.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
DB846F65ZAXY (Verizon - Existing)	B	From Face	3.000 6.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.033 7.536	6.158 6.619	0.021 0.070
DB846F65ZAXY (Verizon - Existing)	C	From Face	3.000 -6.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.033 7.536	6.158 6.619	0.021 0.070
BXA-171063/8BF (Verizon - Existing)	C	From Face	3.000 -3.000 0.000	0.000	80.000	No Ice 1/2" Ice	2.941 3.255	2.156 2.458	0.011 0.029
BXA-70063/6CF (Verizon - Existing)	C	From Face	3.000 0.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
DB846F65ZAXY (Verizon - Existing)	C	From Face	3.000 6.000 0.000	0.000	80.000	No Ice 1/2" Ice	7.033 7.536	6.158 6.619	0.021 0.070
(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	A	From Face	3.000 0.000 0.000	0.000	80.000	No Ice 1/2" Ice	0.367 0.451	0.085 0.136	0.003 0.005
(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	B	From Face	3.000 0.000 0.000	0.000	80.000	No Ice 1/2" Ice	0.367 0.451	0.085 0.136	0.003 0.005
(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	C	From Face	3.000 0.000 0.000	0.000	80.000	No Ice 1/2" Ice	0.367 0.451	0.085 0.136	0.003 0.005
BXA-171063-12CF (Verizon - Proposed)	A	From Face	3.000 3.000 0.000	0.000	80.000	No Ice 1/2" Ice	4.791 5.242	3.618 4.058	0.015 0.042
BXA-171063-12CF (Verizon - Proposed)	B	From Face	3.000 3.000 0.000	0.000	80.000	No Ice 1/2" Ice	4.791 5.242	3.618 4.058	0.015 0.042
BXA-171063-12CF (Verizon - Proposed)	C	From Face	3.000 3.000 0.000	0.000	80.000	No Ice 1/2" Ice	4.791 5.242	3.618 4.058	0.015 0.042
RRH2x40-AWS (Verizon - Proposed)	A	From Face	3.000 3.000 0.000	0.000	80.000	No Ice 1/2" Ice	2.522 2.753	1.589 1.795	0.044 0.061
RRH2x40-AWS	B	From Face	3.000	0.000	80.000	No Ice	2.522	1.589	0.044

tnxTower	Job: 13001.101 - Fairfield 2	Page: 8 of 23
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 150-ft Valmont Monopole - Fairfield, CT	Date: 18:32:33 12/04/13
	Client: Verizon Wireless	Designed by: TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Proposed)			3.000 0.000			1/2" Ice	2.753	1.795	0.061
RRH2x40-AWS	C	From Face	3.000	0.000	80.000	No Ice	2.522	1.589	0.044
(Verizon - Proposed)			3.000 0.000			1/2" Ice	2.753	1.795	0.061
DB-T1-6Z-8AB-0Z	C	From Face	3.000	0.000	80.000	No Ice	5.600	2.333	0.044
(Verizon - Proposed)			0.000 0.000			1/2" Ice	5.915	2.558	0.080
Valmont 13' Low Profile Platform	C	None		0.000	78.000	No Ice	15.700	15.700	1.300
(Verizon - Existing)						1/2" Ice	20.100	20.100	1.765
Stand-off	A	From Face	1.000	0.000	40.000	No Ice	0.750	0.750	0.027
			0.000 0.000			1/2" Ice	0.950	0.950	0.036
GPS	A	From Face	2.000	0.000	40.000	No Ice	1.000	1.000	0.010
(Existing)			0.000 0.000			1/2" Ice	1.500	1.500	0.015

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	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	121.781	1.452	0.030	128.832	A	0.000	128.832	128.832	100.00	0.000	4.393
150.000-95.83					B	0.000	128.832		100.00	0.000	0.000
0					C	0.000	128.832		100.00	0.000	0.000
L2	71.470	1.247	0.026	149.101	A	0.000	149.101	149.101	100.00	0.000	14.880
95.830-47.830					B	0.000	149.101		100.00	0.000	0.000
					C	0.000	149.101		100.00	0.000	11.551
L3	38.802	1.047	0.022	63.172	A	0.000	63.172	63.172	100.00	0.000	5.527
47.830-30.000					B	0.000	63.172		100.00	0.000	0.580
					C	0.000	63.172		100.00	0.000	7.061
L4	14.709	1	0.021	117.174	A	0.000	117.174	117.174	100.00	0.000	8.370
30.000-0.000					B	0.000	117.174		100.00	0.000	1.566
					C	0.000	117.174		100.00	0.000	10.692

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2

Section Elevation ft	z ft	K_Z	q_z ksf	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 150.000-95.830	121.781	1.452	0.023	0.500	133.346	A	0.000	133.346	133.346	100.00	0.000	7.227
						B	0.000	133.346		100.00	0.000	0.000
						C	0.000	133.346		100.00	0.000	0.000
L2 95.830-47.830	71.470	1.247	0.019	0.500	153.101	A	0.000	153.101	153.101	100.00	0.000	24.480
						B	0.000	153.101		100.00	0.000	0.000
						C	0.000	153.101		100.00	0.000	17.385
L3 47.830-30.000	38.802	1.047	0.016	0.500	64.658	A	0.000	64.658	64.658	100.00	0.000	9.093
						B	0.000	64.658		100.00	0.000	1.580
						C	0.000	64.658		100.00	0.000	10.627
L4 30.000-0.000	14.709	1	0.016	0.500	119.674	A	0.000	119.674	119.674	100.00	0.000	13.770
						B	0.000	119.674		100.00	0.000	4.266
						C	0.000	119.674		100.00	0.000	16.092

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	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 150.000-95.83	121.781	1.452	0.009	128.832	A	0.000	128.832	128.832	100.00	0.000	4.393
					B	0.000	128.832		100.00	0.000	0.000
0					C	0.000	128.832		100.00	0.000	0.000
L2 95.830-47.830	71.470	1.247	0.008	149.101	A	0.000	149.101	149.101	100.00	0.000	14.880
					B	0.000	149.101		100.00	0.000	0.000
					C	0.000	149.101		100.00	0.000	11.551
L3 47.830-30.000	38.802	1.047	0.007	63.172	A	0.000	63.172	63.172	100.00	0.000	5.527
					B	0.000	63.172		100.00	0.000	0.580
					C	0.000	63.172		100.00	0.000	7.061
L4 30.000-0.000	14.709	1	0.006	117.174	A	0.000	117.174	117.174	100.00	0.000	8.370
					B	0.000	117.174		100.00	0.000	1.566
					C	0.000	117.174		100.00	0.000	10.692

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 klf	Ctrl. Face
L1 150.000-95.83	1.467	4.718	A	1	1.03	1	1	1	128.832	6.961	0.128	C
			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2 95.830-47.830	2.359	7.959	A	1	1.03	1	1	1	149.101	7.826	0.163	C
			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3 47.830-30.000	0.979	4.777	A	1	1.03	1	1	1	63.172	2.872	0.161	C
			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4 30.000-0.000	1.486	9.708	A	1	1.03	1	1	1	117.174	4.952	0.165	C
			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			

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 klf	Ctrl. Face
Sum Weight:	6.291	27.161						OTM	1591.247 kip-ft	22.610		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	6.961	0.128	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	7.826	0.163	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	2.872	0.161	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	4.952	0.165	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	1591.247 kip-ft	22.610		

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 klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	6.961	0.128	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	7.826	0.163	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	2.872	0.161	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	4.952	0.165	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	1591.247 kip-ft	22.610		

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 klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	6.961	0.128	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	7.826	0.163	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	2.872	0.161	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	4.952	0.165	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	1591.247 kip-ft	22.610		

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 klf	Ctrl. Face
L1	2.163	5.703	A	1	1.03	1	1	1	133.346	5.506	0.102	C
150.000-95.83			B	1	1.03	1	1	1	133.346			
0			C	1	1.03	1	1	1	133.346			
L2	4.438	9.094	A	1	1.03	1	1	1	153.101	6.507	0.136	C
95.830-47.830			B	1	1.03	1	1	1	153.101			
			C	1	1.03	1	1	1	153.101			
L3	1.895	5.257	A	1	1.03	1	1	1	64.658	2.420	0.136	C
47.830-30.000			B	1	1.03	1	1	1	64.658			
			C	1	1.03	1	1	1	64.658			
L4	2.881	10.597	A	1	1.03	1	1	1	119.674	4.137	0.138	C
30.000-0.000			B	1	1.03	1	1	1	119.674			
			C	1	1.03	1	1	1	119.674			
Sum Weight:	11.377	30.651						OTM	1290.244 kip-ft	18.569		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	2.163	5.703	A	1	1.03	1	1	1	133.346	5.506	0.102	C
150.000-95.83			B	1	1.03	1	1	1	133.346			
0			C	1	1.03	1	1	1	133.346			
L2	4.438	9.094	A	1	1.03	1	1	1	153.101	6.507	0.136	C
95.830-47.830			B	1	1.03	1	1	1	153.101			
			C	1	1.03	1	1	1	153.101			
L3	1.895	5.257	A	1	1.03	1	1	1	64.658	2.420	0.136	C
47.830-30.000			B	1	1.03	1	1	1	64.658			
			C	1	1.03	1	1	1	64.658			

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 klf	Ctrl. Face
L4	2.881	10.597	A	1	1.03	1	1	1	119.674	4.137	0.138	C
30.000-0.000			B	1	1.03	1	1	1	119.674			
			C	1	1.03	1	1	1	119.674			
Sum Weight:	11.377	30.651						OTM	1290.244 kip-ft	18.569		

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 ft^2	F K	w klf	Ctrl. Face
L1	2.163	5.703	A	1	1.03	1	1	1	133.346	5.506	0.102	C
150.000-95.83			B	1	1.03	1	1	1	133.346			
0			C	1	1.03	1	1	1	133.346			
L2	4.438	9.094	A	1	1.03	1	1	1	153.101	6.507	0.136	C
95.830-47.830			B	1	1.03	1	1	1	153.101			
			C	1	1.03	1	1	1	153.101			
L3	1.895	5.257	A	1	1.03	1	1	1	64.658	2.420	0.136	C
47.830-30.000			B	1	1.03	1	1	1	64.658			
			C	1	1.03	1	1	1	64.658			
L4	2.881	10.597	A	1	1.03	1	1	1	119.674	4.137	0.138	C
30.000-0.000			B	1	1.03	1	1	1	119.674			
			C	1	1.03	1	1	1	119.674			
Sum Weight:	11.377	30.651						OTM	1290.244 kip-ft	18.569		

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 ft^2	F K	w klf	Ctrl. Face
L1	2.163	5.703	A	1	1.03	1	1	1	133.346	5.506	0.102	C
150.000-95.83			B	1	1.03	1	1	1	133.346			
0			C	1	1.03	1	1	1	133.346			
L2	4.438	9.094	A	1	1.03	1	1	1	153.101	6.507	0.136	C
95.830-47.830			B	1	1.03	1	1	1	153.101			
			C	1	1.03	1	1	1	153.101			
L3	1.895	5.257	A	1	1.03	1	1	1	64.658	2.420	0.136	C
47.830-30.000			B	1	1.03	1	1	1	64.658			
			C	1	1.03	1	1	1	64.658			
L4	2.881	10.597	A	1	1.03	1	1	1	119.674	4.137	0.138	C
30.000-0.000			B	1	1.03	1	1	1	119.674			
			C	1	1.03	1	1	1	119.674			
Sum Weight:	11.377	30.651						OTM	1290.244 kip-ft	18.569		

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 klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	2.148	0.040	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	2.415	0.050	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	0.886	0.050	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	1.528	0.051	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	491.126 kip-ft	6.978		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	2.148	0.040	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	2.415	0.050	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	0.886	0.050	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	1.528	0.051	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	491.126 kip-ft	6.978		

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 klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	2.148	0.040	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	2.415	0.050	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			

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 klf	Ctrl. Face
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	0.886	0.050	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	1.528	0.051	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	491.126 kip-ft	6.978		

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 klf	Ctrl. Face
L1	1.467	4.718	A	1	1.03	1	1	1	128.832	2.148	0.040	C
150.000-95.83			B	1	1.03	1	1	1	128.832			
0			C	1	1.03	1	1	1	128.832			
L2	2.359	7.959	A	1	1.03	1	1	1	149.101	2.415	0.050	C
95.830-47.830			B	1	1.03	1	1	1	149.101			
			C	1	1.03	1	1	1	149.101			
L3	0.979	4.777	A	1	1.03	1	1	1	63.172	0.886	0.050	C
47.830-30.000			B	1	1.03	1	1	1	63.172			
			C	1	1.03	1	1	1	63.172			
L4	1.486	9.708	A	1	1.03	1	1	1	117.174	1.528	0.051	C
30.000-0.000			B	1	1.03	1	1	1	117.174			
			C	1	1.03	1	1	1	117.174			
Sum Weight:	6.291	27.161						OTM	491.126 kip-ft	6.978		

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	27.161					
Bracing Weight	0.000					
Total Member Self-Weight	27.161			-0.122	0.280	
Total Weight	43.916			-0.122	0.280	
Wind 0 deg - No Ice		-0.041	-41.267	-3811.584	4.540	-0.346
Wind 30 deg - No Ice		20.548	-35.718	-3298.815	-1898.324	-0.927
Wind 45 deg - No Ice		29.080	-29.151	-2692.221	-2686.957	-1.132
Wind 60 deg - No Ice		35.631	-20.598	-1902.164	-3292.458	-1.259
Wind 90 deg - No Ice		41.167	0.041	4.138	-3804.306	-1.254
Wind 120 deg - No Ice		35.672	20.669	1909.298	-3296.718	-0.913
Wind 135 deg - No Ice		29.138	29.209	2698.001	-2692.981	-0.642
Wind 150 deg - No Ice		20.619	35.759	3302.831	-1905.702	-0.327
Wind 180 deg - No Ice		0.041	41.267	3811.340	-3.979	0.346
Wind 210 deg - No Ice		-20.548	35.718	3298.572	1898.884	0.927
Wind 225 deg - No Ice		-29.080	29.151	2691.977	2687.517	1.132

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 240 deg - No Ice		-35.631	20.598	1901.920	3293.019	1.259
Wind 270 deg - No Ice		-41.167	-0.041	-4.382	3804.867	1.254
Wind 300 deg - No Ice		-35.672	-20.669	-1909.542	3297.279	0.913
Wind 315 deg - No Ice		-29.138	-29.209	-2698.245	2693.541	0.642
Wind 330 deg - No Ice		-20.619	-35.759	-3303.075	1906.262	0.327
Member Ice	3.490					
Total Weight Ice	57.823			-0.197	0.345	
Wind 0 deg - Ice		-0.036	-35.159	-3277.363	4.072	-0.299
Wind 30 deg - Ice		17.512	-30.430	-2836.442	-1632.616	-1.191
Wind 45 deg - Ice		24.784	-24.836	-2314.868	-2310.940	-1.529
Wind 60 deg - Ice		30.368	-17.548	-1635.552	-2831.754	-1.763
Wind 90 deg - Ice		35.086	0.036	3.531	-3272.033	-1.863
Wind 120 deg - Ice		30.404	17.610	1641.614	-2835.481	-1.464
Wind 135 deg - Ice		24.835	24.886	2319.745	-2316.211	-1.106
Wind 150 deg - Ice		17.574	30.466	2839.776	-1639.072	-0.673
Wind 180 deg - Ice		0.036	35.159	3276.970	-3.382	0.299
Wind 210 deg - Ice		-17.512	30.430	2836.049	1633.306	1.191
Wind 225 deg - Ice		-24.784	24.836	2314.474	2311.630	1.529
Wind 240 deg - Ice		-30.368	17.548	1635.159	2832.444	1.763
Wind 270 deg - Ice		-35.086	-0.036	-3.924	3272.723	1.863
Wind 300 deg - Ice		-30.404	-17.610	-1642.008	2836.171	1.464
Wind 315 deg - Ice		-24.835	-24.886	-2320.139	2316.901	1.106
Wind 330 deg - Ice		-17.574	-30.466	-2840.169	1639.762	0.673
Total Weight	43.916			-0.122	0.280	
Wind 0 deg - Service		-0.013	-12.737	-1176.499	1.595	-0.107
Wind 30 deg - Service		6.342	-11.024	-1018.237	-585.709	-0.286
Wind 45 deg - Service		8.975	-8.997	-831.017	-829.114	-0.349
Wind 60 deg - Service		10.997	-6.357	-587.172	-1015.997	-0.389
Wind 90 deg - Service		12.706	0.013	1.193	-1173.975	-0.387
Wind 120 deg - Service		11.010	6.379	589.205	-1017.312	-0.282
Wind 135 deg - Service		8.993	9.015	832.632	-830.973	-0.198
Wind 150 deg - Service		6.364	11.037	1019.308	-587.986	-0.101
Wind 180 deg - Service		0.013	12.737	1176.255	-1.035	0.107
Wind 210 deg - Service		-6.342	11.024	1017.993	586.269	0.286
Wind 225 deg - Service		-8.975	8.997	830.773	829.674	0.349
Wind 240 deg - Service		-10.997	6.357	586.928	1016.558	0.389
Wind 270 deg - Service		-12.706	-0.013	-1.437	1174.535	0.387
Wind 300 deg - Service		-11.010	-6.379	-589.449	1017.872	0.282
Wind 315 deg - Service		-8.993	-9.015	-832.876	831.534	0.198
Wind 330 deg - Service		-6.364	-11.037	-1019.552	588.546	0.101

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	150 - 95.83	Pole	Max Tension	18	0.000	0.000	0.000
			Max. Compression	18	-19.900	0.210	0.479
			Max. Mx	14	-12.609	618.856	0.339
			Max. My	2	-12.612	0.332	618.809
			Max. Vy	14	-21.097	618.856	0.339
			Max. Vx	2	-21.050	0.332	618.809
			Max. Torque	31			-2.142
L2	95.83 - 47.83	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-35.379	0.210	0.119
			Max. Mx	14	-24.258	1906.331	2.196
			Max. My	2	-24.252	2.329	1907.744
			Max. Vy	14	-33.250	1906.331	2.196
			Max. Vx	2	-33.352	2.329	1907.744
			Max. Torque	31			-2.141

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L3	47.83 - 30	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-44.345	0.345	0.197
			Max. Mx	14	-31.942	2749.285	3.264
			Max. My	2	-31.939	3.432	2753.090
			Max. Vy	14	-36.905	2749.285	3.264
			Max. Vx	2	-37.006	3.432	2753.090
			Max. Torque	31			-1.859
L4	30 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-57.823	0.345	0.197
			Max. Mx	14	-43.894	3919.858	4.504
			Max. My	2	-43.894	4.674	3926.686
			Max. Vy	14	-41.190	3919.858	4.504
			Max. Vx	2	-41.290	4.674	3926.686
			Max. Torque	31			-1.859

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	19	57.823	0.036	35.159
	Max. H_x	14	43.916	41.167	0.041
	Max. H_z	2	43.916	0.041	41.267
	Max. M_x	2	3926.686	0.041	41.267
	Max. M_z	6	3919.276	-41.167	-0.041
	Max. Torsion	23	1.857	-35.086	-0.036
	Min. Vert	1	43.916	0.000	0.000
	Min. H_x	6	43.916	-41.167	-0.041
	Min. H_z	10	43.916	-0.041	-41.267
	Min. M_x	10	-3926.430	-0.041	-41.267
	Min. M_z	14	-3919.858	41.167	0.041
	Min. Torsion	31	-1.858	35.086	0.036

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	43.916	0.000	0.000	-0.122	0.280	0.000
Dead+Wind 0 deg - No Ice	43.916	-0.041	-41.267	-3926.686	4.674	-0.346
Dead+Wind 30 deg - No Ice	43.916	20.548	-35.718	-3398.449	-1955.705	-0.922
Dead+Wind 45 deg - No Ice	43.916	29.080	-29.151	-2773.536	-2768.175	-1.125
Dead+Wind 60 deg - No Ice	43.916	35.631	-20.598	-1959.617	-3391.977	-1.251
Dead+Wind 90 deg - No Ice	43.916	41.167	0.041	4.262	-3919.276	-1.245
Dead+Wind 120 deg - No Ice	43.916	35.672	20.669	1966.954	-3396.337	-0.905
Dead+Wind 135 deg - No Ice	43.916	29.138	29.209	2779.470	-2774.351	-0.636
Dead+Wind 150 deg - No Ice	43.916	20.619	35.759	3402.564	-1963.280	-0.324
Dead+Wind 180 deg - No Ice	43.916	0.041	41.267	3926.430	-4.092	0.344
Dead+Wind 210 deg - No Ice	43.916	-20.548	35.718	3398.197	1956.281	0.921
Dead+Wind 225 deg - No Ice	43.916	-29.080	29.151	2773.288	2768.750	1.124
Dead+Wind 240 deg - No Ice	43.916	-35.631	20.598	1959.372	3392.553	1.251
Dead+Wind 270 deg - No Ice	43.916	-41.167	-0.041	-4.503	3919.858	1.246
Dead+Wind 300 deg - No Ice	43.916	-35.672	-20.669	-1967.199	3396.926	0.907

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+Wind 315 deg - No Ice	43.916	-29.138	-29.209	-2779.719	2774.940	0.637
Dead+Wind 330 deg - No Ice	43.916	-20.619	-35.759	-3402.816	1963.868	0.324
Dead+Ice+Temp	57.823	0.000	0.000	-0.197	0.345	0.000
Dead+Wind 0 deg+Ice+Temp	57.823	-0.036	-35.159	-3420.132	4.245	-0.299
Dead+Wind 30 deg+Ice+Temp	57.823	17.512	-30.430	-2960.012	-1703.794	-1.188
Dead+Wind 45 deg+Ice+Temp	57.823	24.784	-24.836	-2415.716	-2411.689	-1.525
Dead+Wind 60 deg+Ice+Temp	57.823	30.368	-17.548	-1706.805	-2955.203	-1.758
Dead+Wind 90 deg+Ice+Temp	57.823	35.086	0.036	3.683	-3414.659	-1.857
Dead+Wind 120 deg+Ice+Temp	57.823	30.404	17.610	1713.119	-2959.061	-1.458
Dead+Wind 135 deg+Ice+Temp	57.823	24.835	24.886	2420.785	-2417.152	-1.102
Dead+Wind 150 deg+Ice+Temp	57.823	17.574	30.466	2963.466	-1710.497	-0.670
Dead+Wind 180 deg+Ice+Temp	57.823	0.036	35.159	3419.709	-3.516	0.298
Dead+Wind 210 deg+Ice+Temp	57.823	-17.512	30.430	2959.597	1704.512	1.187
Dead+Wind 225 deg+Ice+Temp	57.823	-24.784	24.836	2415.308	2412.404	1.524
Dead+Wind 240 deg+Ice+Temp	57.823	-30.368	17.548	1706.404	2955.921	1.758
Dead+Wind 270 deg+Ice+Temp	57.823	-35.086	-0.036	-4.078	3415.389	1.858
Dead+Wind 300 deg+Ice+Temp	57.823	-30.404	-17.610	-1713.520	2959.802	1.460
Dead+Wind 315 deg+Ice+Temp	57.823	-24.835	-24.886	-2421.194	2417.896	1.102
Dead+Wind 330 deg+Ice+Temp	57.823	-17.574	-30.466	-2963.882	1711.239	0.670
Dead+Wind 0 deg - Service	43.916	-0.013	-12.737	-1213.494	1.647	-0.107
Dead+Wind 30 deg - Service	43.916	6.342	-11.024	-1050.257	-604.137	-0.287
Dead+Wind 45 deg - Service	43.916	8.975	-8.997	-857.150	-855.201	-0.350
Dead+Wind 60 deg - Service	43.916	10.997	-6.357	-605.639	-1047.965	-0.389
Dead+Wind 90 deg - Service	43.916	12.706	0.013	1.226	-1210.912	-0.387
Dead+Wind 120 deg - Service	43.916	11.010	6.379	607.727	-1049.318	-0.282
Dead+Wind 135 deg - Service	43.916	8.993	9.015	858.808	-857.115	-0.198
Dead+Wind 150 deg - Service	43.916	6.364	11.037	1051.354	-606.482	-0.101
Dead+Wind 180 deg - Service	43.916	0.013	12.737	1213.237	-1.061	0.107
Dead+Wind 210 deg - Service	43.916	-6.342	11.024	1050.000	604.722	0.286
Dead+Wind 225 deg - Service	43.916	-8.975	8.997	856.894	855.786	0.350
Dead+Wind 240 deg - Service	43.916	-10.997	6.357	605.382	1048.550	0.389
Dead+Wind 270 deg - Service	43.916	-12.706	-0.013	-1.482	1211.498	0.388
Dead+Wind 300 deg - Service	43.916	-11.010	-6.379	-607.984	1049.904	0.282
Dead+Wind 315 deg - Service	43.916	-8.993	-9.015	-859.065	857.701	0.198
Dead+Wind 330 deg - Service	43.916	-6.364	-11.037	-1051.611	607.068	0.101

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	0.000	-43.916	0.000	0.000	43.916	0.000	0.000%
2	-0.041	-43.916	-41.267	0.041	43.916	41.267	0.000%
3	20.548	-43.916	-35.718	-20.548	43.916	35.718	0.000%
4	29.080	-43.916	-29.151	-29.080	43.916	29.151	0.000%
5	35.631	-43.916	-20.598	-35.631	43.916	20.598	0.000%
6	41.167	-43.916	0.041	-41.167	43.916	-0.041	0.000%
7	35.672	-43.916	20.669	-35.672	43.916	-20.669	0.000%
8	29.138	-43.916	29.209	-29.138	43.916	-29.209	0.000%
9	20.619	-43.916	35.759	-20.619	43.916	-35.759	0.000%
10	0.041	-43.916	41.267	-0.041	43.916	-41.267	0.000%
11	-20.548	-43.916	35.718	20.548	43.916	-35.718	0.000%
12	-29.080	-43.916	29.151	29.080	43.916	-29.151	0.000%
13	-35.631	-43.916	20.598	35.631	43.916	-20.598	0.000%
14	-41.167	-43.916	-0.041	41.167	43.916	0.041	0.000%
15	-35.672	-43.916	-20.669	35.672	43.916	20.669	0.000%
16	-29.138	-43.916	-29.209	29.138	43.916	29.209	0.000%
17	-20.619	-43.916	-35.759	20.619	43.916	35.759	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
18	0.000	-57.823	0.000	0.000	57.823	0.000	0.000%
19	-0.036	-57.823	-35.159	0.036	57.823	35.159	0.000%
20	17.512	-57.823	-30.430	-17.512	57.823	30.430	0.000%
21	24.784	-57.823	-24.836	-24.784	57.823	24.836	0.000%
22	30.368	-57.823	-17.548	-30.368	57.823	17.548	0.000%
23	35.086	-57.823	0.036	-35.086	57.823	-0.036	0.000%
24	30.404	-57.823	17.610	-30.404	57.823	-17.610	0.000%
25	24.835	-57.823	24.886	-24.835	57.823	-24.886	0.000%
26	17.574	-57.823	30.466	-17.574	57.823	-30.466	0.000%
27	0.036	-57.823	35.159	-0.036	57.823	-35.159	0.000%
28	-17.512	-57.823	30.430	17.512	57.823	-30.430	0.000%
29	-24.784	-57.823	24.836	24.784	57.823	-24.836	0.000%
30	-30.368	-57.823	17.548	30.368	57.823	-17.548	0.000%
31	-35.086	-57.823	-0.036	35.086	57.823	0.036	0.000%
32	-30.404	-57.823	-17.610	30.404	57.823	17.610	0.000%
33	-24.835	-57.823	-24.886	24.835	57.823	24.886	0.000%
34	-17.574	-57.823	-30.466	17.574	57.823	30.466	0.000%
35	-0.013	-43.916	-12.737	0.013	43.916	12.737	0.000%
36	6.342	-43.916	-11.024	-6.342	43.916	11.024	0.000%
37	8.975	-43.916	-8.997	-8.975	43.916	8.997	0.000%
38	10.997	-43.916	-6.357	-10.997	43.916	6.357	0.000%
39	12.706	-43.916	0.013	-12.706	43.916	-0.013	0.000%
40	11.010	-43.916	6.379	-11.010	43.916	-6.379	0.000%
41	8.993	-43.916	9.015	-8.993	43.916	-9.015	0.000%
42	6.364	-43.916	11.037	-6.364	43.916	-11.037	0.000%
43	0.013	-43.916	12.737	-0.013	43.916	-12.737	0.000%
44	-6.342	-43.916	11.024	6.342	43.916	-11.024	0.000%
45	-8.975	-43.916	8.997	8.975	43.916	-8.997	0.000%
46	-10.997	-43.916	6.357	10.997	43.916	-6.357	0.000%
47	-12.706	-43.916	-0.013	12.706	43.916	0.013	0.000%
48	-11.010	-43.916	-6.379	11.010	43.916	6.379	0.000%
49	-8.993	-43.916	-9.015	8.993	43.916	9.015	0.000%
50	-6.364	-43.916	-11.037	6.364	43.916	11.037	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	0.00024124
3	Yes	5	0.00000001	0.00031524
4	Yes	5	0.00000001	0.00035580
5	Yes	5	0.00000001	0.00032477
6	Yes	4	0.00000001	0.00034069
7	Yes	5	0.00000001	0.00031638
8	Yes	5	0.00000001	0.00035692
9	Yes	5	0.00000001	0.00032205
10	Yes	4	0.00000001	0.00022926
11	Yes	5	0.00000001	0.00032294
12	Yes	5	0.00000001	0.00035586
13	Yes	5	0.00000001	0.00031398
14	Yes	4	0.00000001	0.00037610
15	Yes	5	0.00000001	0.00032498
16	Yes	5	0.00000001	0.00035709
17	Yes	5	0.00000001	0.00031874
18	Yes	4	0.00000001	0.00000001

19	Yes	5	0.00000001	0.00040538
20	Yes	5	0.00000001	0.00086796
21	Yes	5	0.00000001	0.00097542
22	Yes	5	0.00000001	0.00088640
23	Yes	5	0.00000001	0.00040678
24	Yes	5	0.00000001	0.00086910
25	Yes	5	0.00000001	0.00097827
26	Yes	5	0.00000001	0.00088258
27	Yes	5	0.00000001	0.00040526
28	Yes	5	0.00000001	0.00088208
29	Yes	5	0.00000001	0.00097553
30	Yes	5	0.00000001	0.00086490
31	Yes	5	0.00000001	0.00040714
32	Yes	5	0.00000001	0.00088861
33	Yes	5	0.00000001	0.00097895
34	Yes	5	0.00000001	0.00087386
35	Yes	4	0.00000001	0.00010549
36	Yes	4	0.00000001	0.00047316
37	Yes	4	0.00000001	0.00055689
38	Yes	4	0.00000001	0.00050305
39	Yes	4	0.00000001	0.00011251
40	Yes	4	0.00000001	0.00047462
41	Yes	4	0.00000001	0.00055883
42	Yes	4	0.00000001	0.00049266
43	Yes	4	0.00000001	0.00010525
44	Yes	4	0.00000001	0.00049764
45	Yes	4	0.00000001	0.00055726
46	Yes	4	0.00000001	0.00046921
47	Yes	4	0.00000001	0.00011338
48	Yes	4	0.00000001	0.00050223
49	Yes	4	0.00000001	0.00055997
50	Yes	4	0.00000001	0.00048270

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 95.83	30.708	50	1.695	0.001
L2	101 - 47.83	14.432	50	1.355	0.001
L3	54 - 30	3.960	50	0.705	0.000
L4	30 - 0	1.164	50	0.370	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.000	10-ft Dipole	50	30.354	1.690	0.001	43842
138.000	APXVSPP18-C-A20	50	26.474	1.633	0.001	18267
129.000	(2) RRUS-11	50	23.357	1.582	0.001	10438
127.000	7770.00	50	22.675	1.569	0.001	9530
125.000	Valmont 13' Low Profile Platform	50	21.998	1.557	0.001	8767
113.000	APX16DWV-16DWV-S-E-ACU	50	18.069	1.468	0.001	5923
104.000	4'-6" Standoff	50	15.309	1.386	0.001	4768
80.000	DB846F65ZAXY	50	8.980	1.089	0.001	4257

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
78.000	Valmont 13' Low Profile Platform	50	8.525	1.061	0.001	4238
40.000	Stand-off	50	2.095	0.505	0.000	3556

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 95.83	99.105	2	5.478	0.007
L2	101 - 47.83	46.626	17	4.380	0.006
L3	54 - 30	12.805	17	2.279	0.002
L4	30 - 0	3.765	17	1.198	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.000	10-ft Dipole	2	97.964	5.462	0.007	13792
138.000	APXVSPP18-C-A20	17	85.458	5.277	0.007	5745
129.000	(2) RRUS-11	17	75.406	5.111	0.007	3281
127.000	7770.00	17	73.209	5.071	0.007	2995
125.000	Valmont 13' Low Profile Platform	17	71.028	5.030	0.007	2755
113.000	APX16DWV-16DWV-S-E-ACU	17	58.358	4.745	0.007	1859
104.000	4'-6" Standoff	17	49.455	4.480	0.007	1495
80.000	DB846F65ZAXY	17	29.027	3.521	0.004	1328
78.000	Valmont 13' Low Profile Platform	17	27.556	3.429	0.004	1322
40.000	Stand-off	17	6.777	1.634	0.001	1102

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual / Allowable Ratio Bolt Tension K	Actual / Allowable Ratio Concrete Stress ksi	Actual / Allowable Ratio Plate Stress ksi	Actual / Allowable Ratio Stiffener Stress ksi	Controlling Condition	Critical Ratio
2.750	16	2.250	155.953 131.211 1.19	2.762 2.800 0.99	55.622 45.000 1.24		Plate	1.24 ✓

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	150 - 95.83 (1)	TP33.469x23.61x0.281	54.170	0.000	0.0	39.000	29.209	-12.606	1139.140	0.011
L2	95.83 - 47.83 (2)	TP41.644x31.965x0.375	53.170	0.000	0.0	39.000	48.476	-24.251	1890.570	0.013
L3	47.83 - 30 (3)	TP44.139x39.771x0.438	24.000	0.000	0.0	39.000	61.564	-31.938	2401.020	0.013
L4	30 - 0 (4)	TP49.6x44.139x0.58	30.000	0.000	0.0	39.000	91.550	-43.894	3570.440	0.012

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 95.83 (1)	TP33.469x23.61x0.281	619.076	32.288	39.000	0.828	0.000	0.000	39.000	0.000
L2	95.83 - 47.83 (2)	TP41.644x31.965x0.375	1909.292	48.224	39.000	1.237	0.000	0.000	39.000	0.000
L3	47.83 - 30 (3)	TP44.139x39.771x0.438	2754.942	50.366	39.000	1.291	0.000	0.000	39.000	0.000
L4	30 - 0 (4)	TP49.6x44.139x0.58	3928.858	43.139	39.000	1.106	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	150 - 95.83 (1)	TP33.469x23.61x0.281	21.116	0.723	26.000	0.056	1.030	0.025	26.000	0.001
L2	95.83 - 47.83 (2)	TP41.644x31.965x0.375	33.363	0.688	26.000	0.054	0.432	0.005	26.000	0.000
L3	47.83 - 30 (3)	TP44.139x39.771x0.438	37.017	0.601	26.000	0.047	0.324	0.003	26.000	0.000
L4	30 - 0 (4)	TP49.6x44.139x0.58	41.300	0.451	26.000	0.035	0.324	0.002	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_w}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 95.83 (1)	0.011	0.828	0.000	0.056	0.001	0.840 ✔	1.333	H1-3+VT ✔
L2	95.83 - 47.83 (2)	0.013	1.237	0.000	0.054	0.000	1.250 ✔	1.333	H1-3+VT ✔
L3	47.83 - 30 (3)	0.013	1.291	0.000	0.047	0.000	1.305 ✔	1.333	H1-3+VT ✔
L4	30 - 0 (4)	0.012	1.106	0.000	0.035	0.000	1.119	1.333	H1-3+VT ✔

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{bv}}{F_{bv}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
							✓		

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	150 - 95.83	Pole	TP33.469x23.61x0.281	1	-12.606	1518.474	63.0	Pass
L2	95.83 - 47.83	Pole	TP41.644x31.965x0.375	2	-24.251	2520.130	93.8	Pass
L3	47.83 - 30	Pole	TP44.139x39.771x0.438	3	-31.938	3200.560	97.9	Pass
L4	30 - 0	Pole	TP49.6x44.139x0.58	4	-43.894	4759.396	83.9	Pass
							Summary	
						Pole (L3)	97.9	Pass
						Base Plate	92.7	Pass
						RATING =	**97.9**	**Pass**

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Subject:	CAISSON FOUNDATION ANALYSIS
Location:	Fairfield, CT
Rev. 0: 12/05/13	Prepared by: TJL Checked by: C.F.C. Job No. 13001.101

Caisson Foundation:

Input Data:

Shear Force =	S := 41k	*USER INPUT-FROM RisaTower*
Overturning Moment =	M := 3929ft·k	*USER INPUT-FROM RisaTower*
Applied Axial Load =	A1 := 44k	*USER INPUT-FROM RisaTower*
Bending Moment =	Mu := 4112ft·k	*USER INPUT–FROM LPILE*
Moment Capacity =	Mn := 9378ft·k	*USER INPUT–FROM LPILE*
Foundation Diameter =	d := 6.6ft	*USER INPUT*
Overall Length of Caisson =	L_c := 26.5ft	*USER INPUT*
Depth From Top of Caisson to Grade =	L_{pag} := 1ft	*USER INPUT*
Number of Rebar =	n := 40	*USER INPUT*
Area of Rebar =	$Ar := 1.56in^2$	*USER INPUT*
Rebar Yield Strength =	fy := 60ksi	*USER INPUT*
Concrete Comp Strength =	f'c := 3.0ksi	*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\101 - Fairfield 2\Backup Documentation\Calcs\Foundation\
Name of input data file: Caisson Analysis.lpd
Name of output file: Caisson Analysis.lpo
Name of plot output file: Caisson Analysis.lpp
Name of runtime file: Caisson Analysis.lpr

Time and Date of Analysis

Date: December 5, 2013 Time: 13:30:18

Problem Title

12001.C092 - Fairfield 2

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 = 318.00 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	78.00000000	1816972.	4778.4000	3122018.
2	318.0000	78.00000000	1816972.	4778.4000	3122018.

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

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 12.000 in
Distance from top of pile to bottom of layer = 48.000 in
p-y subgrade modulus k for top of soil layer = 10.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 10.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 48.000 in
Distance from top of pile to bottom of layer = 114.000 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 = 114.000 in
Distance from top of pile to bottom of layer = 318.000 in
p-y subgrade modulus k for top of soil layer = 27.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 27.000 lbs/in**3

(Depth of lowest layer extends 0.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	0.05700
2	48.00	0.05700
3	48.00	0.06900
4	114.00	0.06900
5	114.00	0.06100
6	318.00	0.06100

Shear Strength of Soils

Shear strength parameters with depth defined using 6 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	12.000	0.00000	30.00	------	------
2	48.000	0.00000	30.00	------	------
3	48.000	0.00000	35.00	------	------
4	114.000	0.00000	35.00	------	------
5	114.000	0.00000	30.00	------	------
6	318.000	0.00000	30.00	------	------

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 = 2

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 41000.000 lbs
Bending moment at pile head = 47148000.000 in-lbs
Axial load at pile head = 44000.000 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.

Load Case Number 2

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 1300.000 lbs
Bending moment at pile head = 14568000.000 in-lbs
Axial load at pile head = 44000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 78.0000 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 = 40
Area of Single Bar = 1.56000 in**2
Number of Rows of Reinforcing Bars = 21
Area of Steel = 62.400 in**2
Area of Shaft = 4778.362 in**2
Percentage of Steel Reinforcement = 1.306 percent
Cover Thickness (edge to bar center) = 4.000 in

Unfactored Axial Squash Load Capacity = 15769.70 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	35.000
2	3.120	34.569
3	3.120	33.287
4	3.120	31.185
5	3.120	28.316
6	3.120	24.749
7	3.120	20.572
8	3.120	15.890
9	3.120	10.816
10	3.120	5.475
11	3.120	0.000
12	3.120	-5.475
13	3.120	-10.816
14	3.120	-15.890
15	3.120	-20.572
16	3.120	-24.749
17	3.120	-28.316

18	3.120	-31.185
19	3.120	-33.287
20	3.120	-34.569
21	1.560	-35.000

Axial Thrust Force = 44000.00 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
5671609.	6.805931E+12	8.333333E-07	0.00003525	42.29798439	108.13396	925.53462
11278189.	6.766913E+12	0.00000167	0.00006787	40.72204855	206.00102	1774.89901
16820316.	6.728126E+12	0.00000250	0.00010053	40.21376958	301.99249	2625.49829
22296606.	6.688982E+12	0.00000333	0.00013316	39.94675192	395.85287	3474.85269
22296606.	5.351185E+12	0.00000417	0.00010050	24.12084773	298.69647	6027.06423
22296606.	4.459321E+12	0.00000500	0.00011911	23.82194844	351.83587	7275.81748
22296606.	3.822275E+12	0.00000583	0.00013775	23.61385891	404.43178	8523.65553
22296606.	3.344491E+12	0.00000667	0.00015642	23.46256819	456.48168	9770.57015
22296606.	2.972881E+12	0.00000750	0.00017537	23.38323721	508.70279	11009.14591
22296606.	2.675593E+12	0.00000833	0.00019410	23.29158130	559.61073	12254.53452
22296606.	2.432357E+12	0.00000917	0.00021285	23.22035381	609.97060	13498.92261
22296606.	2.229661E+12	0.00001000	0.00023164	23.16448250	659.77969	14742.30007
22790768.	2.103763E+12	0.00001083	0.00025047	23.12045494	709.03519	15984.65707
24464552.	2.096962E+12	0.00001167	0.00026933	23.08576754	757.73441	17225.98198
26135262.	2.090821E+12	0.00001250	0.00028823	23.05857459	805.87427	18466.26671
27802879.	2.085216E+12	0.00001333	0.00030717	23.03750226	853.45200	19705.49913
29467377.	2.080050E+12	0.00001417	0.00032614	23.02149752	900.46468	20943.66810
31128726.	2.075248E+12	0.00001500	0.00034515	23.00973746	946.90918	22180.76420
32786901.	2.070752E+12	0.00001583	0.00036419	23.00157818	992.78254	23416.77535
34441875.	2.066512E+12	0.00001667	0.00038328	22.99650362	1038.08169	24651.68992
36093620.	2.062493E+12	0.00001750	0.00040240	22.99409536	1082.80348	25885.49661
37742108.	2.058660E+12	0.00001833	0.00042156	22.99401167	1126.94470	27118.18380
39387309.	2.054990E+12	0.00001917	0.00044076	22.99597129	1170.50213	28349.73929
41029193.	2.051460E+12	0.00002000	0.00045999	22.99973944	1213.47247	29580.15113
42667734.	2.048051E+12	0.00002083	0.00047927	23.00512084	1255.85243	30809.40616
44302896.	2.044749E+12	0.00002167	0.00049859	23.01194814	1297.63854	32037.49259
45934653.	2.041540E+12	0.00002250	0.00051795	23.02008185	1338.82744	33264.39659
47562975.	2.038413E+12	0.00002333	0.00053735	23.02940342	1379.41571	34490.10369
49187819.	2.035358E+12	0.00002417	0.00055680	23.03980359	1419.39949	35714.60431
50809168.	2.032367E+12	0.00002500	0.00057628	23.05120102	1458.77556	36937.87926
52426977.	2.029431E+12	0.00002583	0.00059581	23.06351200	1497.53993	38159.91893
54041215.	2.026546E+12	0.00002667	0.00061538	23.07667145	1535.68896	39380.70741
55651848.	2.023704E+12	0.00002750	0.00063499	23.09062126	1573.21889	40600.22954
57258839.	2.020900E+12	0.00002833	0.00065465	23.10530797	1610.12573	41818.47195
58862157.	2.018131E+12	0.00002917	0.00067435	23.12068972	1646.40573	43035.41661
60461761.	2.015392E+12	0.00003000	0.00069410	23.13672468	1682.05477	44251.04953
62057616.	2.012679E+12	0.00003083	0.00071390	23.15337798	1717.06879	45465.35452
63649678.	2.009990E+12	0.00003167	0.00073374	23.17061707	1751.44355	46678.31665
65237914.	2.007320E+12	0.00003250	0.00075362	23.18841639	1785.17493	47889.91755
68402746.	2.002032E+12	0.00003417	0.00079354	23.22560039	1850.69022	50308.96761
71551773.	1.996794E+12	0.00003583	0.00083365	23.26476261	1913.57902	52722.36752
74684666.	1.991591E+12	0.00003750	0.00087397	23.30577984	1973.80487	55129.96442
77801052.	1.986410E+12	0.00003917	0.00091448	23.34854516	2031.32918	57531.61078
80900567.	1.981238E+12	0.00004083	0.00095521	23.39298418	2086.11240	59927.14123
83472928.	1.964069E+12	0.00004250	0.00099377	23.38280252	2135.08247	60000.00000
85599826.	1.938109E+12	0.00004417	0.00103042	23.33034602	2179.04155	60000.00000
87359822.	1.906032E+12	0.00004583	0.00106542	23.24547789	2218.65749	60000.00000
88990574.	1.873486E+12	0.00004750	0.00109989	23.15565839	2255.48271	60000.00000
90402656.	1.838698E+12	0.00004917	0.00113334	23.05106387	2289.10690	60000.00000
91788236.	1.805670E+12	0.00005083	0.00116680	22.95351747	2320.70273	60000.00000
92891535.	1.769363E+12	0.00005250	0.00119872	22.83278802	2348.89818	60000.00000
93988620.	1.735175E+12	0.00005417	0.00123075	22.72150335	2375.33454	60000.00000
95079397.	1.702915E+12	0.00005583	0.00126289	22.61885217	2399.99358	60000.00000
95934310.	1.668423E+12	0.00005750	0.00129357	22.49680004	2421.74953	60000.00000
96762584.	1.635424E+12	0.00005917	0.00132420	22.38081971	2441.77097	60000.00000
97585613.	1.604147E+12	0.00006083	0.00135493	22.27283826	2460.15338	60000.00000
98403314.	1.574453E+12	0.00006250	0.00138576	22.17223969	2476.88025	60000.00000
99263122.	1.546958E+12	0.00006417	0.00141808	22.10000101	2492.58936	60000.00000
99734738.	1.514958E+12	0.00006583	0.00144816	21.99739400	2505.47366	60000.00000
1.003254E+08	1.486302E+12	0.00006750	0.00147710	21.88299438	2516.31220	60000.00000
1.009119E+08	1.458967E+12	0.00006917	0.00150614	21.77546391	2525.67037	60000.00000
1.014941E+08	1.432858E+12	0.00007083	0.00153527	21.67433766	2533.53324	60000.00000
1.020720E+08	1.407890E+12	0.00007250	0.00156449	21.57919720	2539.88555	60000.00000
1.025497E+08	1.382693E+12	0.00007417	0.00159282	21.47623685	2544.56787	60000.00000
1.029582E+08	1.357690E+12	0.00007583	0.00162056	21.36998489	2547.75136	60000.00000
1.033631E+08	1.333717E+12	0.00007750	0.00164838	21.26942351	2549.55689	60000.00000
1.037637E+08	1.310700E+12	0.00007917	0.00167629	21.17420635	2549.03904	60000.00000
1.041588E+08	1.288562E+12	0.00008083	0.00170429	21.08401957	2544.86234	60000.00000
1.045511E+08	1.267286E+12	0.00008250	0.00173238	20.99857262	2547.77391	60000.00000
1.049407E+08	1.246820E+12	0.00008417	0.00176057	20.91760513	2549.48952	60000.00000
1.053273E+08	1.227114E+12	0.00008583	0.00178885	20.84091720	2549.62886	60000.00000
1.055803E+08	1.206632E+12	0.00008750	0.00182000	20.79999992	2544.73421	60000.00000
1.060158E+08	1.188962E+12	0.00008917	0.00184946	20.74157390	2546.53561	60000.00000
1.062692E+08	1.169936E+12	0.00009083	0.00187576	20.65059909	2548.53620	60000.00000
1.065210E+08	1.151578E+12	0.00009250	0.00190214	20.56368300	2549.69065	60000.00000
1.067710E+08	1.133851E+12	0.00009417	0.00192860	20.48072335	2549.43778	60000.00000

1.070180E+08	1.116709E+12	0.00009583	0.00195518	20.40188983	2545.72565	60000.00000
1.072638E+08	1.100141E+12	0.00009750	0.00198182	20.32637581	2543.59522	60000.00000
1.075084E+08	1.084118E+12	0.00009917	0.00200852	20.25402090	2546.25745	60000.00000
1.079939E+08	1.053599E+12	0.00010250	0.00206212	20.11820725	2549.45790	60000.00000
1.084730E+08	1.024942E+12	0.00010583	0.00211602	19.99384680	2547.34798	60000.00000
1.089068E+08	9.976198E+11	0.00010917	0.00216945	19.87286165	2542.37954	60000.00000
1.092152E+08	9.708014E+11	0.00011250	0.00222069	19.73949346	2546.86437	60000.00000
1.095209E+08	9.455045E+11	0.00011583	0.00227211	19.61533526	2549.39866	60000.00000
1.095209E+08	9.190568E+11	0.00011917	0.00232375	19.49999884	2548.72474	60000.00000
1.101868E+08	8.994841E+11	0.00012250	0.00238525	19.47142741	2541.35765	60000.00000
1.104724E+08	8.779268E+11	0.00012583	0.00243579	19.35725793	2543.25677	60000.00000
1.107567E+08	8.574710E+11	0.00012917	0.00248646	19.25000176	2546.90278	60000.00000
1.110394E+08	8.380332E+11	0.00013250	0.00253726	19.14914981	2549.15575	60000.00000
1.113206E+08	8.195384E+11	0.00013583	0.00258820	19.05425110	2549.99466	60000.00000
1.115912E+08	8.018528E+11	0.00013917	0.00263976	18.96835783	2545.55047	60000.00000
1.118202E+08	7.847031E+11	0.00014250	0.00269117	18.88542143	2540.71344	60000.00000
1.119503E+08	7.676591E+11	0.00014583	0.00274177	18.80069974	2538.26009	60000.00000
1.120704E+08	7.513098E+11	0.00014917	0.00279301	18.72410014	2542.67351	60000.00000
1.121896E+08	7.356693E+11	0.00015250	0.00284437	18.65157786	2546.06503	60000.00000
1.123079E+08	7.206922E+11	0.00015583	0.00289583	18.58288416	2548.41978	60000.00000
1.124252E+08	7.063366E+11	0.00015917	0.00294741	18.51778892	2549.72243	60000.00000
1.125394E+08	6.925502E+11	0.00016250	0.00299928	18.45710573	2548.80721	60000.00000
1.126217E+08	6.791260E+11	0.00016583	0.00305338	18.41233662	2544.25842	60000.00000
1.127033E+08	6.662265E+11	0.00016917	0.00310758	18.36994556	2539.69142	60000.00000
1.127841E+08	6.538211E+11	0.00017250	0.00316189	18.32980236	2535.10597	60000.00000
1.128642E+08	6.418816E+11	0.00017583	0.00321631	18.29179314	2536.59239	60000.00000
1.129434E+08	6.303820E+11	0.00017917	0.00327083	18.25580862	2541.15055	60000.00000
1.130219E+08	6.192980E+11	0.00018250	0.00332547	18.22175118	2544.78116	60000.00000
1.131580E+08	6.089218E+11	0.00018583	0.00338217	18.20000008	2547.65936	60000.00000
1.134064E+08	5.995052E+11	0.00018917	0.00344283	18.20000008	2549.57550	60000.00000
1.136443E+08	5.903599E+11	0.00019250	0.00350350	18.20000008	2548.72471	60000.00000
1.138690E+08	5.814588E+11	0.00019583	0.00356417	18.20000008	2543.78409	60000.00000
1.140886E+08	5.728299E+11	0.00019917	0.00362483	18.20000008	2538.84346	60000.00000
1.140886E+08	5.634006E+11	0.00020250	0.00368480	18.19653413	2534.02595	60000.00000
1.140886E+08	5.542767E+11	0.00020583	0.00374265	18.18290046	2529.57959	60000.00000
1.140886E+08	5.454436E+11	0.00020917	0.00379781	18.15686515	2532.84163	60000.00000
1.140886E+08	5.368877E+11	0.00021250	0.00385194	18.12677810	2537.01904	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 112540.50458 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 = 41000.000 lbs
Specified moment at pile head = 47148000.000 in-lbs
Specified axial load at pile head = 44000.000 lbs

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res. p lbs/in	Es*h F/L
0.000	1.977	4.71E+07	41000.	-0.011702	1021.206	2.04E+12	0.000	0.000
25.440	1.687	4.82E+07	39417.	-0.011107	1043.719	2.04E+12	-226.750	427.392
50.880	1.412	4.91E+07	27930.	-0.010499	1063.115	2.04E+12	-1389.003	3127.584
76.320	1.153	4.92E+07	-23684.	-0.009883	1066.045	2.04E+12	-2662.938	7344.288
101.760	0.909377	4.77E+07	-1.06E+05	-0.009275	1032.142	2.04E+12	-3795.628	13273.
127.200	0.680797	4.38E+07	-1.84E+05	-0.008703	950.184	2.05E+12	-2276.324	10633.
152.640	0.466048	3.85E+07	-2.38E+05	-0.008191	834.703	2.06E+12	-1878.404	12817.
178.080	0.263368	3.19E+07	-2.78E+05	-0.007757	693.389	2.07E+12	-1242.403	15001.
203.520	0.070618	2.45E+07	-2.99E+05	-0.007412	535.061	2.10E+12	-381.637	17186.
228.960	-0.115953	1.69E+07	-2.95E+05	-0.007293	371.682	6.73E+12	706.284	19370.
254.400	-0.300793	9.75E+06	-2.61E+05	-0.007243	218.391	6.77E+12	2038.782	21554.
279.840	-0.484692	3.94E+06	-1.89E+05	-0.007218	93.702	6.81E+12	3618.172	23738.
305.280	-0.668197	4.82E+05	-74706.	-0.007211	19.559	6.81E+12	5446.991	25923.

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection = 1.97728532 in
Computed slope at pile head = -0.01170185
Maximum bending moment = 49343876. lbs-in
Maximum shear force = -300812.42957 lbs

Depth of maximum bending moment = 66.78000000 in
Depth of maximum shear force = 213.06000 in
Number of iterations = 27
Number of zero deflection points = 1

Computed Values of Load Distribution and Deflection
for Lateral Loading for Load Case Number 2

Pile-head boundary conditions are Shear and Moment (Pile-head Condition Type 1)
Specified shear force at pile head = 1300.000 lbs
Specified moment at pile head = 14568000.000 in-lbs
Specified axial load at pile head = 44000.000 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	0.313992	1.46E+07	1300.000	-0.001811	321.900	6.74E+12	0.000	0.000
25.440	0.268623	1.46E+07	1048.055	-0.001756	322.629	6.74E+12	-36.103	427.392
50.880	0.224655	1.46E+07	-1524.444	-0.001701	322.862	6.74E+12	-688.798	9749.945
76.320	0.182089	1.43E+07	-23085.	-0.001646	316.525	6.74E+12	-975.197	17031.
101.760	0.140891	1.34E+07	-49566.	-0.001593	296.850	6.75E+12	-1077.143	24312.
127.200	0.100973	1.19E+07	-66565.	-0.001546	263.914	6.76E+12	-337.616	10633.
152.640	0.062190	1.01E+07	-74151.	-0.001504	225.428	6.77E+12	-250.656	12817.
178.080	0.024368	8.12E+06	-78902.	-0.001470	183.515	6.78E+12	-114.953	15001.
203.520	-0.012680	6.10E+06	-79592.	-0.001444	140.058	6.80E+12	68.523	17186.
228.960	-0.049146	4.12E+06	-75011.	-0.001425	97.606	6.81E+12	299.357	19370.
254.400	-0.085220	2.34E+06	-63955.	-0.001413	59.367	6.81E+12	577.623	21554.
279.840	-0.121069	9.32E+05	-45212.	-0.001407	29.206	6.81E+12	903.765	23738.
305.280	-0.156824	1.14E+05	-17557.	-0.001405	11.655	6.81E+12	1278.394	25923.

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. 2:

Pile-head deflection = 0.31399249 in
Computed slope at pile head = -0.00181091
Maximum bending moment = 14614270. lbs-in
Maximum shear force = -79885.81865 lbs
Depth of maximum bending moment = 44.52000000 in
Depth of maximum shear force = 193.98000 in
Number of iterations = 5
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= 41000.	M= 4.71E+07	44000.0000	1.9773	4.9344E+07	-300812.
1	V= 1300.000	M= 1.46E+07	44000.0000	0.3139925	1.4614E+07	-79885.8186

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

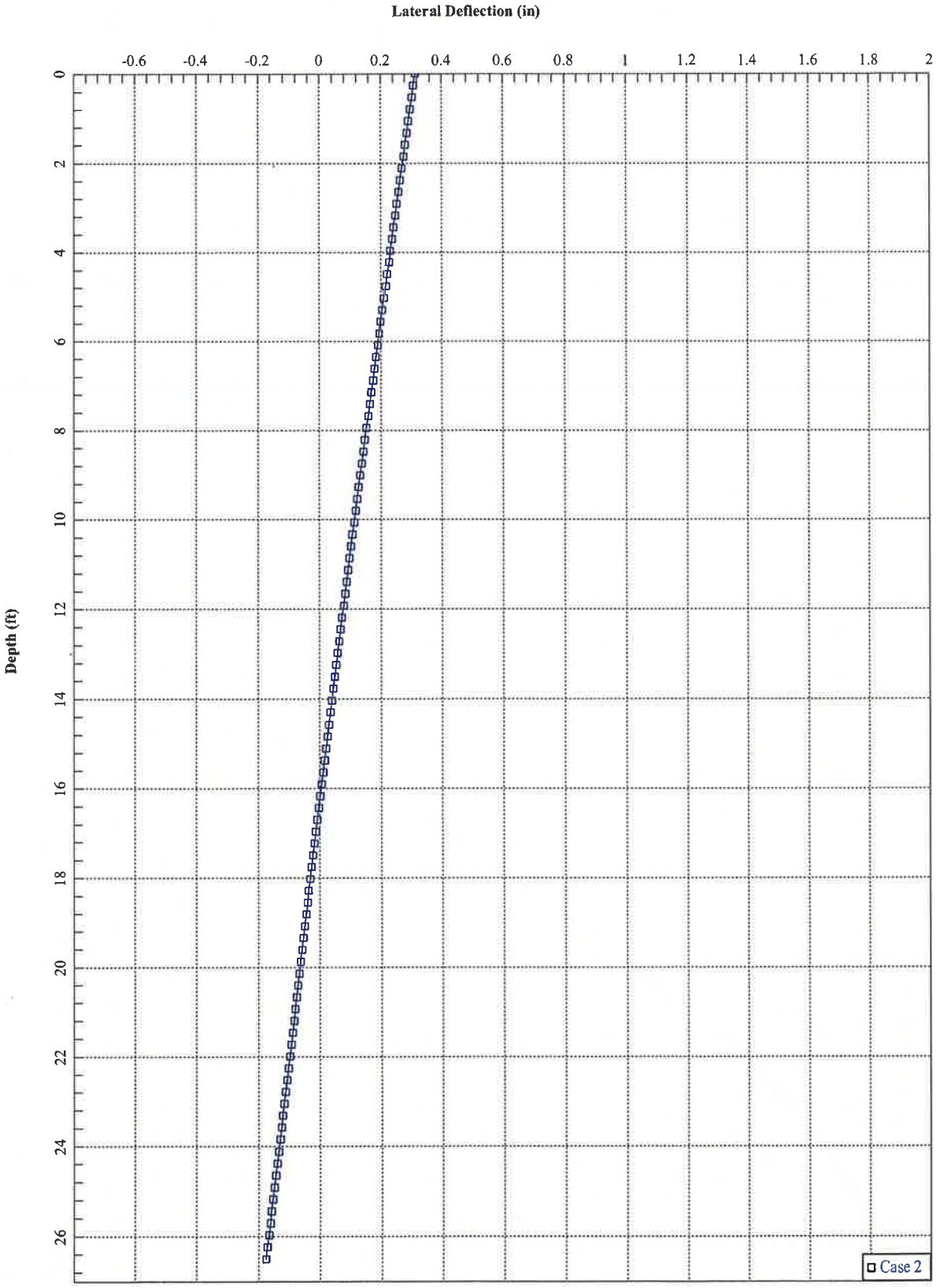
Top y	Shear React.	Mom. React.	K22	K32

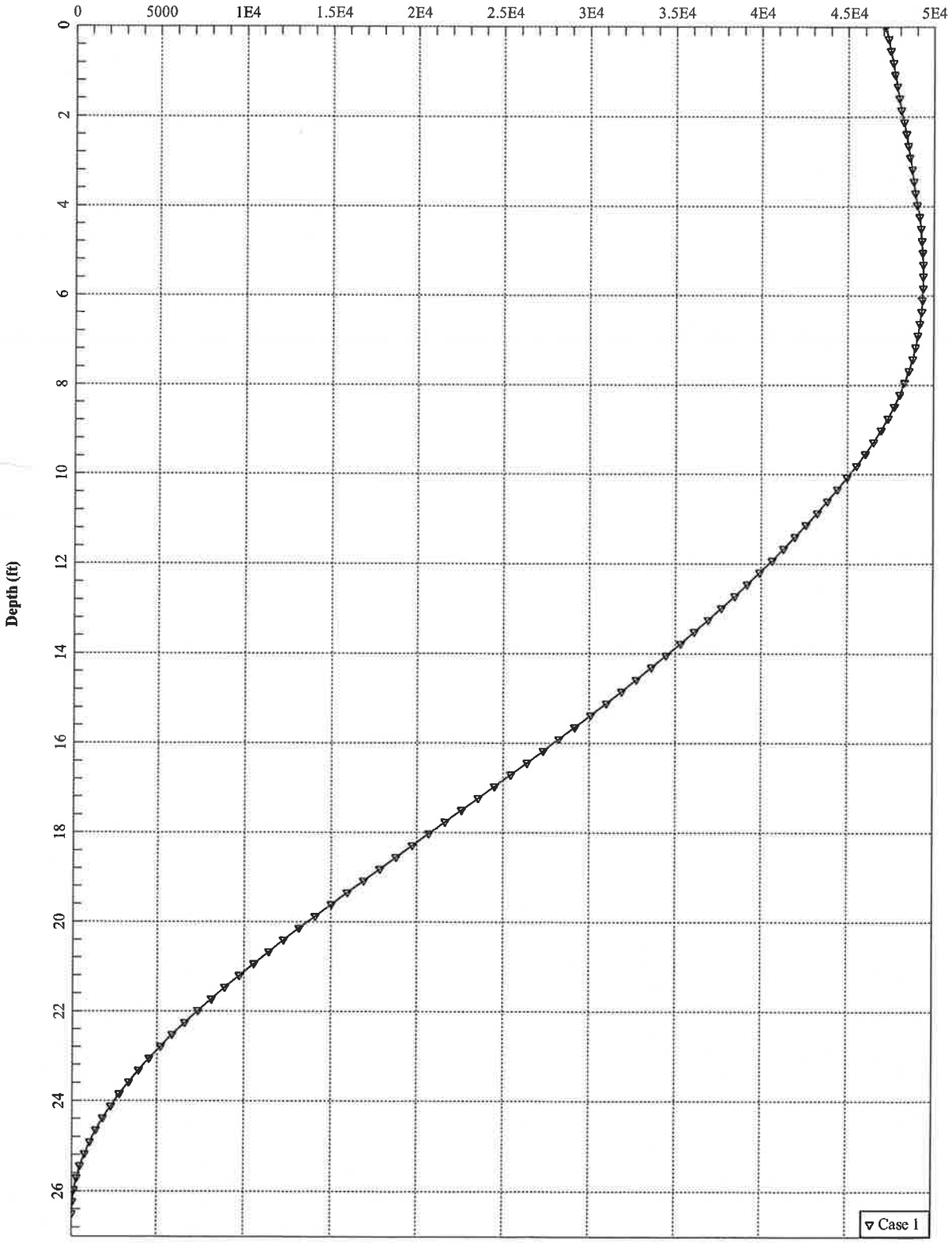
in	lbs	in-lbs	lbs/in	in-lbs/in
0.00400734	4100.00006	708704.28594	1023123.	1.768516E+08
0.01206329	12342.22982	2133412.	1023123.	1.768516E+08
0.01911986	19561.97144	3381379.	1023123.	1.768516E+08
0.02412658	24684.45964	4266825.	1023123.	1.768516E+08
0.02801009	28657.77018	4953630.	1023123.	1.768516E+08
0.03118315	31904.20127	5514791.	1023123.	1.768516E+08
0.03386641	34649.01964	5989223.	1023109.	1.768485E+08
0.03619196	37026.68947	6400135.	1023064.	1.768386E+08
0.03824402	39123.94289	6762543.	1023008.	1.768261E+08
0.04008016	41000.00000	7086700.	1022950.	1.768132E+08

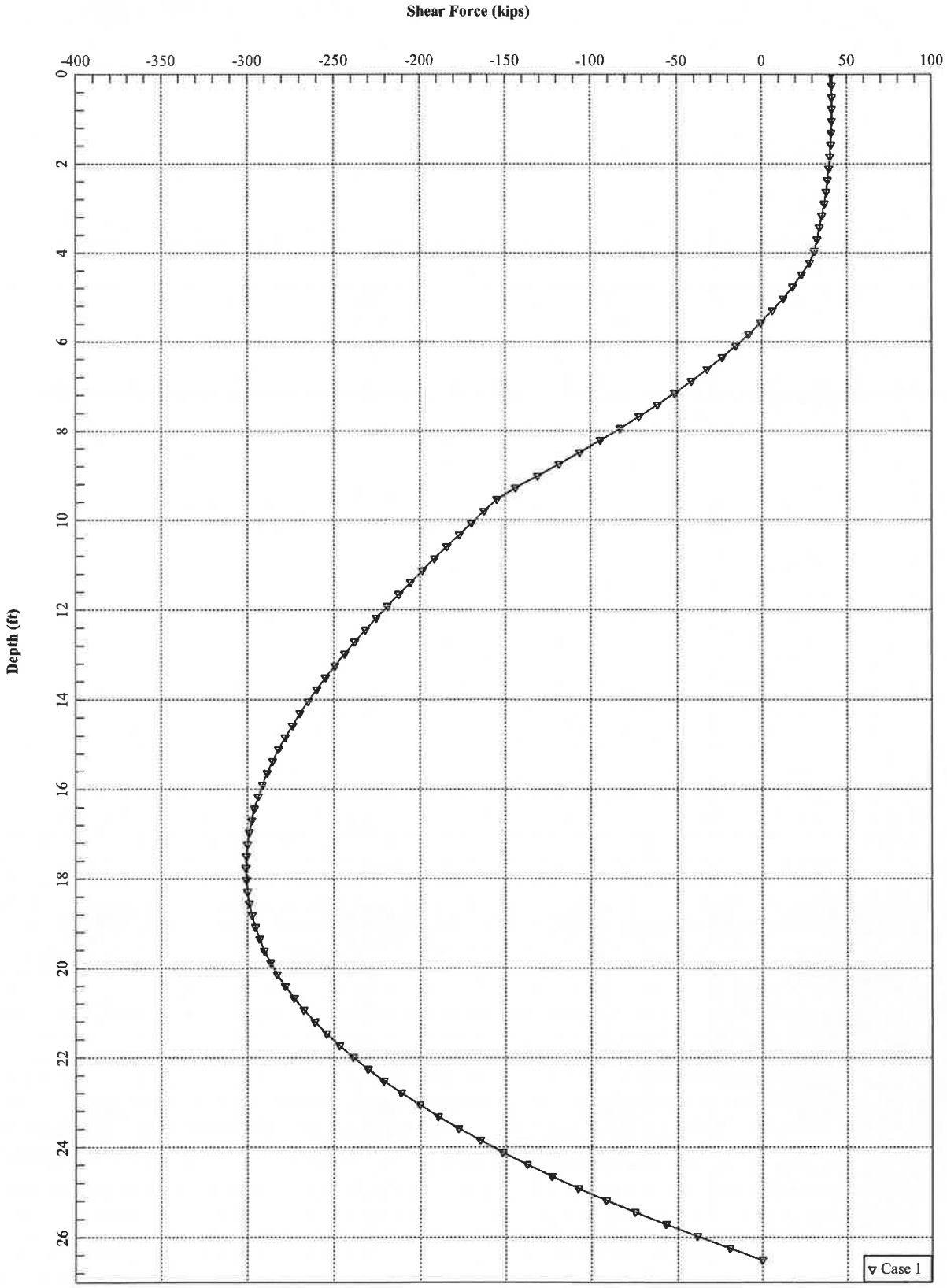
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
0.00012167	21517.76869	4714800.	1.768516E+08	3.875030E+10
0.00036715	64783.96697	14192962.	1.764515E+08	3.865725E+10
0.00058348	102700.21653	22495313.	1.760125E+08	3.855353E+10
0.00104766	131043.79612	28385924.	1.250822E+08	2.709455E+10
0.00137034	154352.16848	32955038.	1.126381E+08	2.404885E+10
0.00161074	173652.10123	36688275.	1.078086E+08	2.277722E+10
0.00180020	189886.78026	39844682.	1.054808E+08	2.213344E+10
0.00196536	204098.92474	42578887.	1.038480E+08	2.166464E+10
0.00210607	216550.45098	44990626.	1.028222E+08	2.136240E+10
0.00222700	227555.53268	47148000.	1.021801E+08	2.117104E+10

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

The analysis ended normally.


Lateral Deflection (in)
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 2


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


Shear Force (kips)
-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
Case 1

SITE NAME	FAIRFIELD 2 CT	ECP - CELL #	5	91
LATITUDE	41-11-16.35 N	LONGITUDE	73-17-51.42 W	
Additional Comments: 2014 AWS ADD.		SAVE BUTTON		
		STRUCTURE TYPE	MONOPOLE	

AWS - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	2100 MHz BBU	2100 MHz BBU	2100 MHz BBU
ANTENNA TYPE	BXA-171063-12CF-EDIN-2	BXA-171063-12CF-EDIN-2	BXA-171063-12CF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	160	270
DOWN TILT (MECH/DEG)	1	1	3
RAD CTR (FT AGL)	80	80	80
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 ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	BXA-70063-6CF_2	BXA-70063-6CF_2	BXA-70063-6CF_2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	160	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	80	80	80
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0	Cellular Modcell 4.0	Cellular Modcell 4.0
ANTENNA TYPE	DB846F65ZAXY	DB846F65ZAXY	DB846F65ZAXY
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	160	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	80	80	80
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0	Cellular Modcell 4.0	Cellular Modcell 4.0
ANTENNA TYPE	DB846F65ZAXY	DB846F65ZAXY	DB846F65ZAXY
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	160	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	80	80	80
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	2 FD9R6004/2C-3L	2 FD9R6004/2C-3L	2 FD9R6004/2C-3L
DIPLEX WITH LTE CABLE			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0	PCS Modcell 4.0	PCS Modcell 4.0
ANTENNA TYPE	BXA-171063-8BF-EDIN-0	BXA-171063-8BF-EDIN-0	BXA-171063-8BF-EDIN-0
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	160	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	80	80	80
TMA - QTY / MODEL			
DIPLEXER - 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	BXA-171063-8BF-EDIN-0	BXA-171063-8BF-EDIN-0	BXA-171063-8BF-EDIN-0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	160	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	80	80	80
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	DIPLEX with Cellular Cable	DIPLEX with Cellular Cable	DIPLEX with Cellular Cable

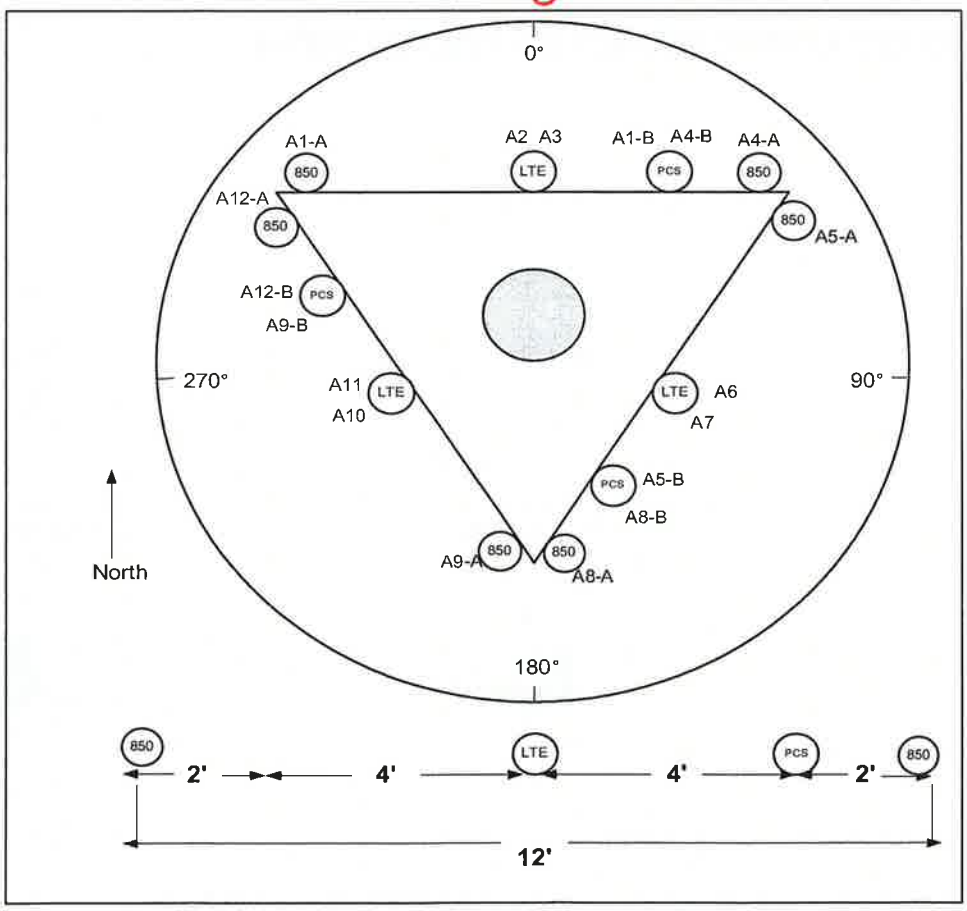
NUMBER OF CABLE'S NEEDED				ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES	12	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS	12	TOP JUMPER (FT)			12
Equipment Cable Ordering		MAIN CABLE	12 +	TOP JUMPER #	12	+	6
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES	1	FIBER LINE MODEL #			158-1-08U8-S8
JUMPER SIZE	5/8"	TOTAL # OF TOP JUMPERS	3	TOP JUMPER MODEL #			058-1-08U1-S1
Fiber Cable Ordering		FIBER CABLE	0 + 1	TOP JUMPER #	0	+	3

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - E	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-21	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-17	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-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/ WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/ WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	800	Tx6/Rx1	GREEN/GREEN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Maria Montrose	Rob Hesselbach	MMM	10/9/2013

Site Configuration



Amphenol ANTENNA SOLUTIONS

BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

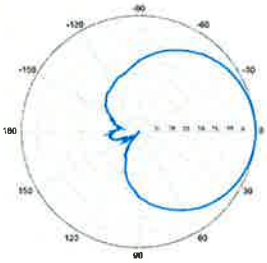
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connectors; Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	< -25 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1842 x 154 x 105 mm		72.5 x 6.1 x 4.1 in
Depth with z-brackets	133 mm		5.2 in
Weight without mounting brackets	5.8 kg		12.8 lbs
Survival wind speed	> 201 km/hr		> 125 mph
Wind area	Front: 0.28 m² Side: 0.19 m²		Front: 3.1 ft² Side: 2.1 ft²
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N		Front: 103 lbf Side: 68 lbf

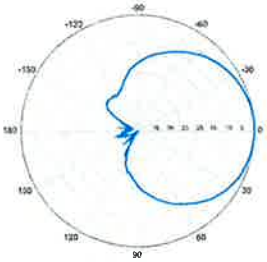
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



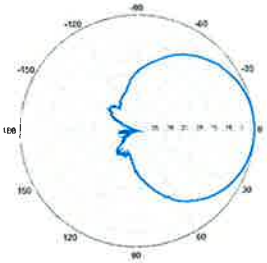
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



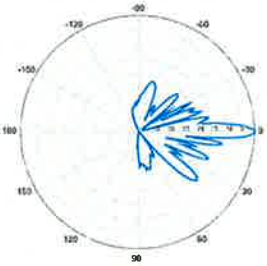
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



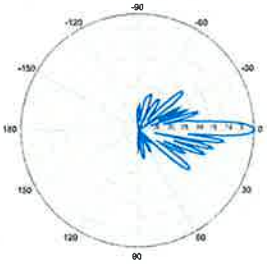
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



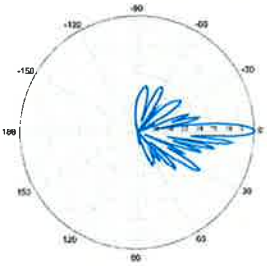
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0

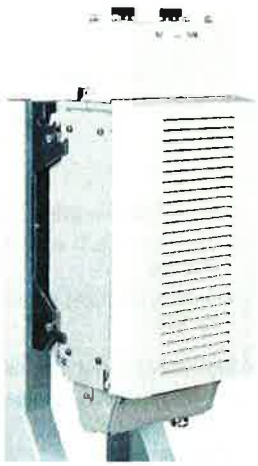


0° | Vertical | 1920-2170 MHz

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

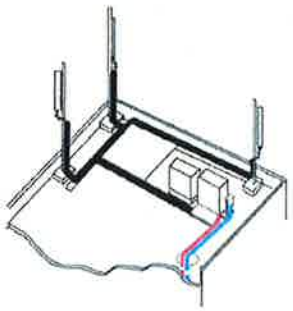
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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

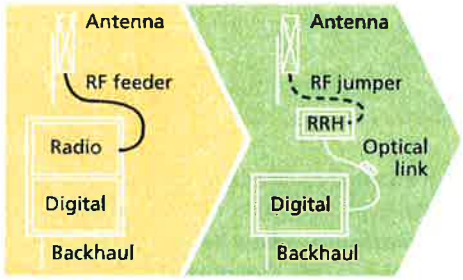
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

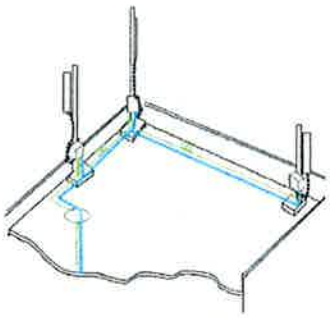
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

www.alcatel-lucent.com

CPG2809100912 (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.