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Also admitted in Massachusetts

January 15, 2014

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

Re: **Notice of Exempt Modification – Antenna Swap**
1684 Chamberlain Highway, Berlin, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 94-foot level on the existing 123-foot tower at the above-referenced address. The tower is owned by Crown Castle. Cellco's shared use of this tower was approved in 2001. Cellco now intends to replace six (6) of its existing antennas with three (3) model BXA-70063-4CF 850 MHz antennas and three (3) model BXA-171063-12CF 2100 MHz antennas, at the same 94-foot level. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for the 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 Denise M. McNair, Town Manager for the Town of Berlin. A copy of this letter is also being sent to Ronald L. and Arlene G. Laviana, the owners of the property at 1684 Chamberlain Highway.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's proposed antennas and RRHs will be located at the 94-foot level on the 123-foot tower.

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

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

4. The operation of the 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 each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions limits established by the FCC.

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 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:
Denise M. McNair, Berlin Town Manager
Ronald L. and Arlene G. Laviana
Sandy M. Carter

ATTACHMENT 1

BXA-70063-4CF-EDIN-X

X-Pol | FET Panel | 63° | 13.0 dBd

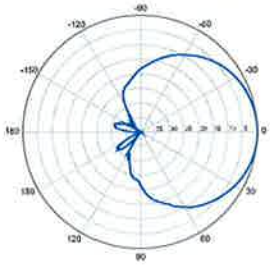
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	17°	15°
Gain	12.5 dBd (14.6 dBi)	13.0 dBd (15.1 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-16.3 dB	-22.1 dB
Front-to-back ratio (+/-30°)	-36.1 dB	-34.9 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -30 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1205 x 285 x 133 mm	47.4 x 11.2 x 5.2 in
Depth with z-brackets	173 mm	6.8 in
Weight without mounting brackets	4.5 kg	9.9 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.34 m^2 Side: 0.16 m^2	Front: 3.7 ft^2 Side: 1.7 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 498 N Side: 260 N	Front: 111 lbf Side: 55 lbf

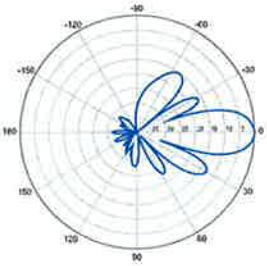
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting & Downtilt Bracket Kit	36210006	40-115 mm 1.57-4.5 in	4.1 kg 9 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-4CF-EDIN-X-FP		

BXA-70063-4CF-EDIN-X



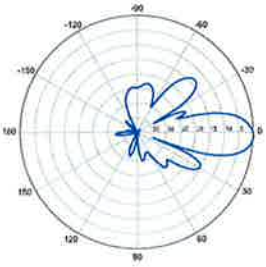
Horizontal | 750 MHz

BXA-70063-4CF-EDIN-0



0° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-2

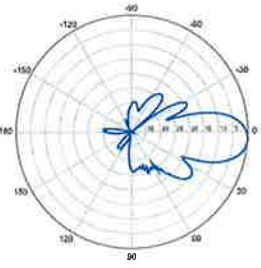


2° | Vertical | 750 MHz

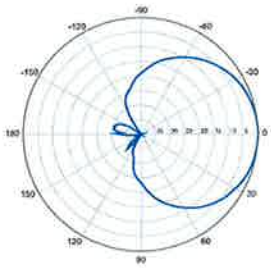
BXA-70063-4CF-EDIN-3

3° | Vertical | 750 MHz

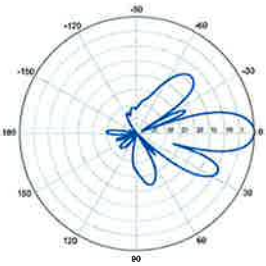
BXA-70063-4CF-EDIN-4



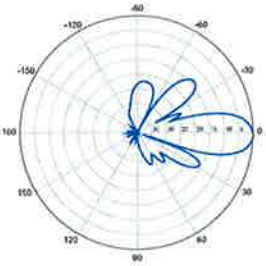
4° | Vertical | 750 MHz



Horizontal | 850 MHz

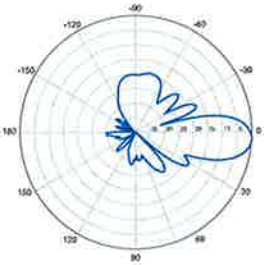


0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

3° | Vertical | 850 MHz

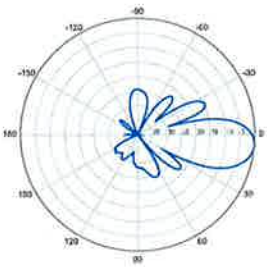


4° | Vertical | 850 MHz

BXA-70063-4CF-EDIN-X

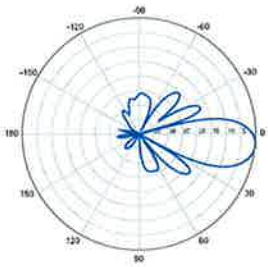
X-Pol | FET Panel | 63° | 13.0 dBd

BXA-70063-4CF-EDIN-5



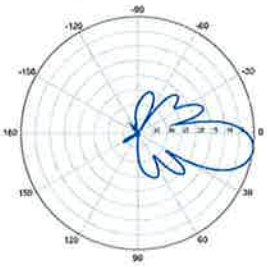
5° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-6



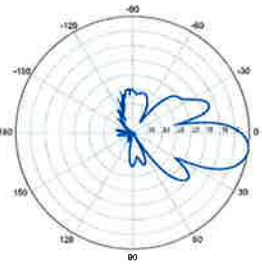
6° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-8



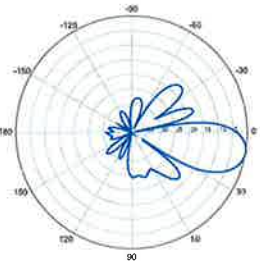
8° | Vertical | 750 MHz

BXA-70063-4CF-EDIN-9

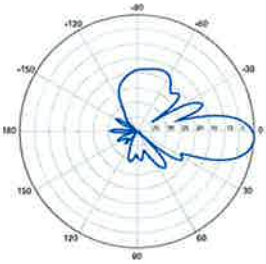


9° | Vertical | 750 MHz

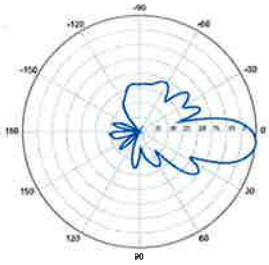
BXA-70063-4CF-EDIN-10



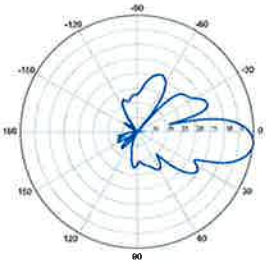
10° | Vertical | 750 MHz



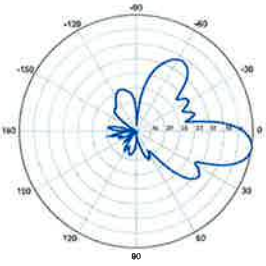
5° | Vertical | 850 MHz



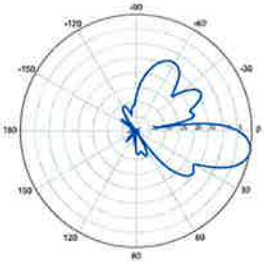
6° | Vertical | 850 MHz



8° | Vertical | 850 MHz

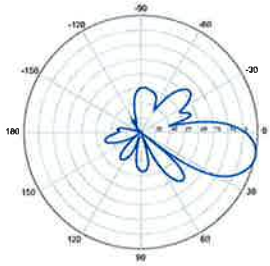


9° | Vertical | 850 MHz

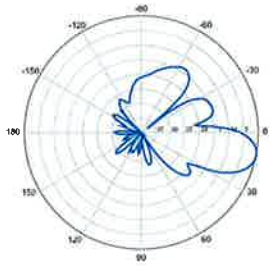


10° | Vertical | 850 MHz

BXA-70063-4CF-EDIN-12

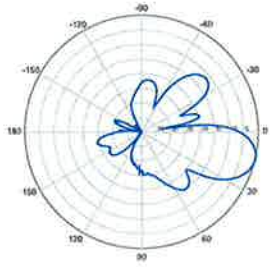


12° | Vertical | 750 MHz

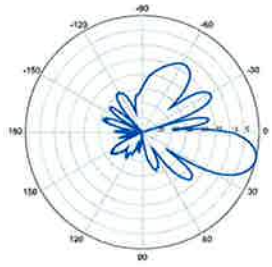


12° | Vertical | 850 MHz

BXA-70063-4CF-EDIN-14



14° | Vertical | 750 MHz



14° | Vertical | 850 MHz

Amphenol ANTENNA SOLUTIONS

BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

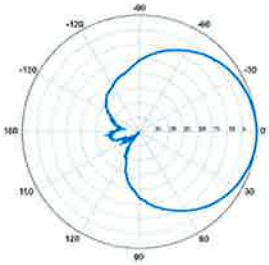
Replace "X" with desired electrical downtilt

Antenna is also available with NE 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

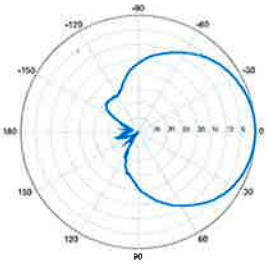
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



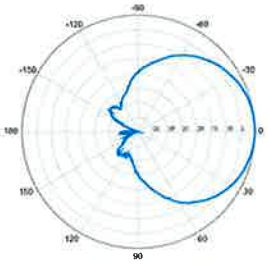
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



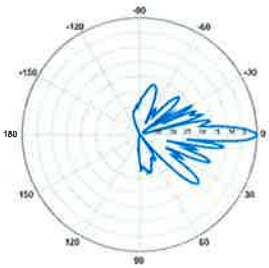
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



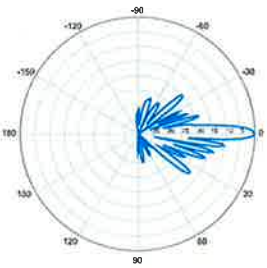
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



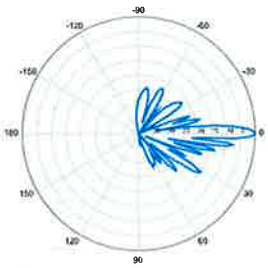
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0

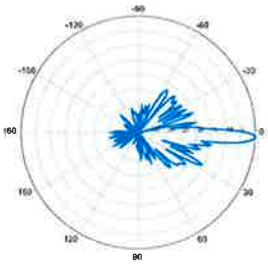


0° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-X

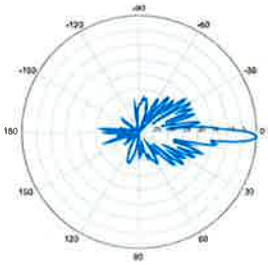
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2



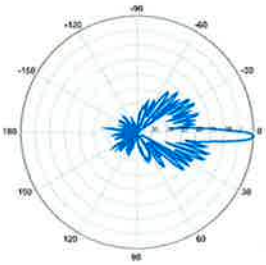
2° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2



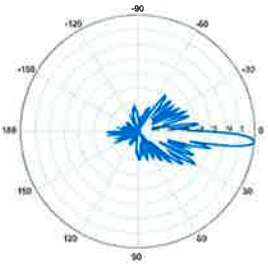
2° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



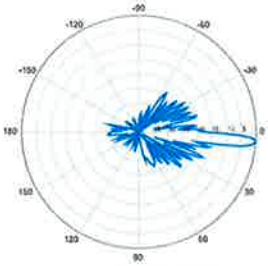
2° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-5



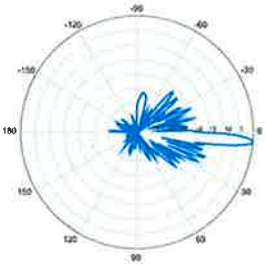
5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-5

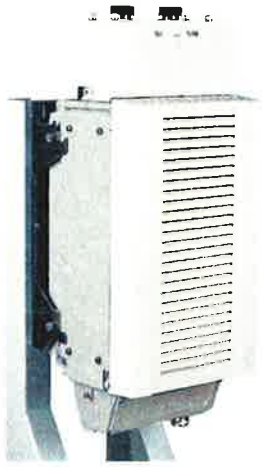


5° | Vertical | 1920-2170 MHz

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

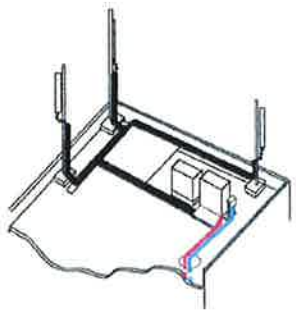
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

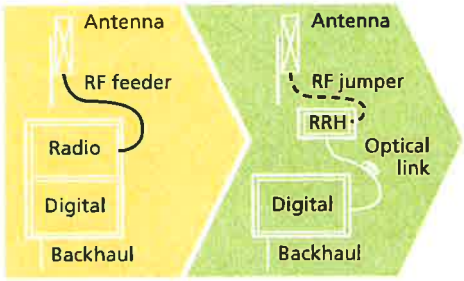
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

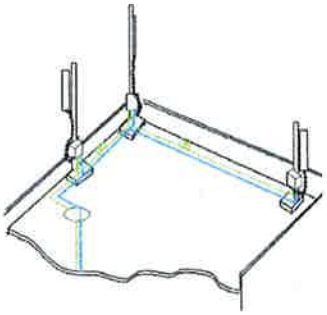
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility 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-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

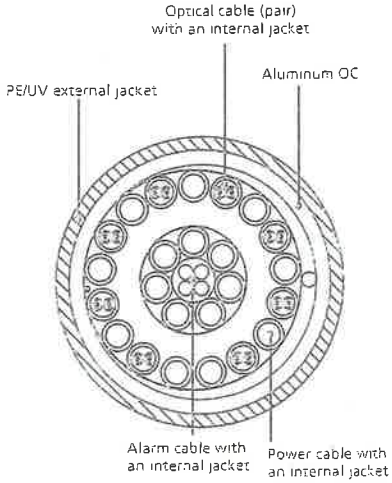


Figure 2: Construction Detail

- This data is provisional and subject to change

ATTACHMENT 2

Far Field Approximation
with downtilt variation

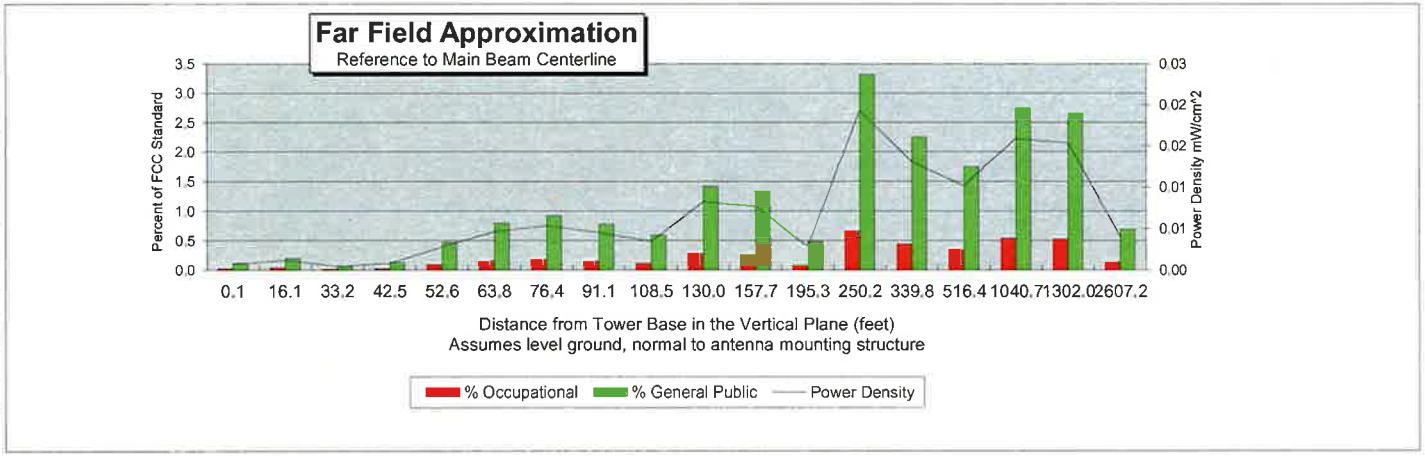
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BERLIN 3, CT
Site #:	
Date:	01/09/14
Name:	Mark Brauer
File Name:	Berlin 3, CT - FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**94.0**
Antenna Gain (dBi):	**15.2**
Antenna Size (in.):	**48.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**3773.0**



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	91.0	92.4	96.9	100.4	105.1	111.1	118.8	128.7	141.6	158.7	182.1	215.4	266.2	351.8	524.3	1044.6	1305.2	2608.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	16.1	33.2	42.5	52.6	63.8	76.4	91.1	108.5	130.0	157.7	195.3	250.2	339.8	516.4	1040.7	1302.0	2607.2	
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	
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	
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	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.02	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.7	0.5	0.4	0.5	0.5	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.5	0.8	0.9	0.8	0.6	1.4	1.3	0.5	3.3	2.3	1.8	2.7	2.7	0.7	

Antenna Type BXA-70063-4CF
Max% 3.32%

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 Po
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

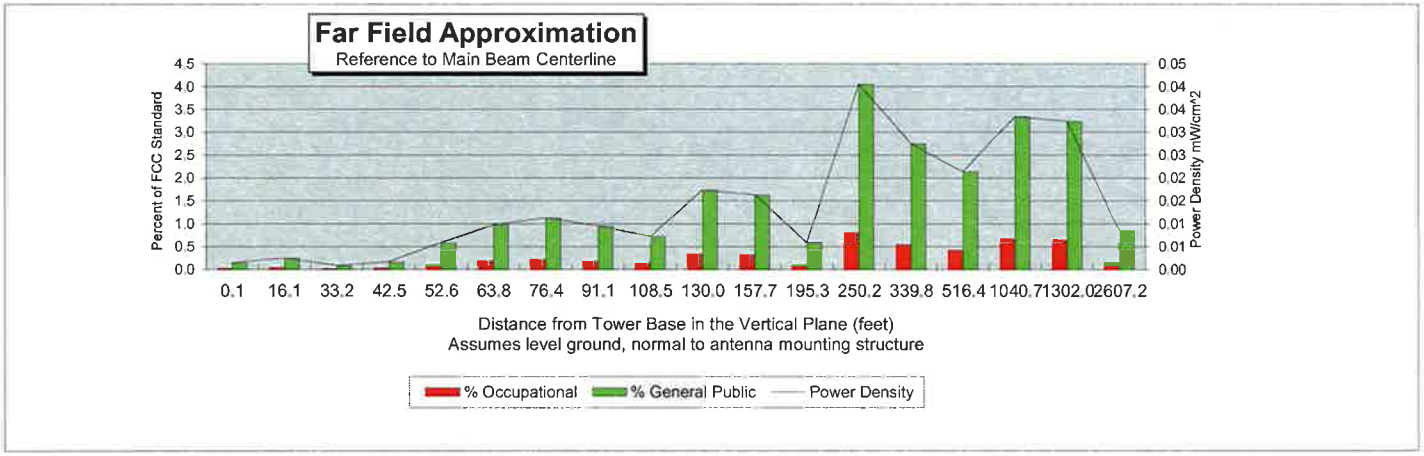
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BERLIN 3, CT
Site #:	
Date:	01/09/14
Name:	Mark Brauer
File Name:	Berlin 3, CT - FF Power

Operating Freq. (MHz)	**1945.0**
Antenna Height (ft):	**94.0**
Antenna Gain (dBi):	**17.1**
Antenna Size (in.):	**48.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**5124.0**



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	91.0	92.4	96.9	100.4	105.1	111.1	118.8	128.7	141.6	158.7	182.1	215.4	266.2	351.8	524.3	1044.6	1305.2	2608.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	16.1	33.2	42.5	52.6	63.8	76.4	91.1	108.5	130.0	157.7	195.3	250.2	339.8	516.4	1040.7	1302.0	2607.2	
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	
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	
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	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.04	0.03	0.02	0.03	0.03	0.01	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.8	0.5	0.4	0.7	0.6	0.2	
Percent of General Population Standard	0.1	0.2	0.1	0.2	0.6	1.0	1.1	1.0	0.7	1.7	1.6	0.6	4.0	2.7	2.1	3.3	3.2	0.8	

Antenna Type BXA-171063-8BF
Max% 4.05%

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 Po
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

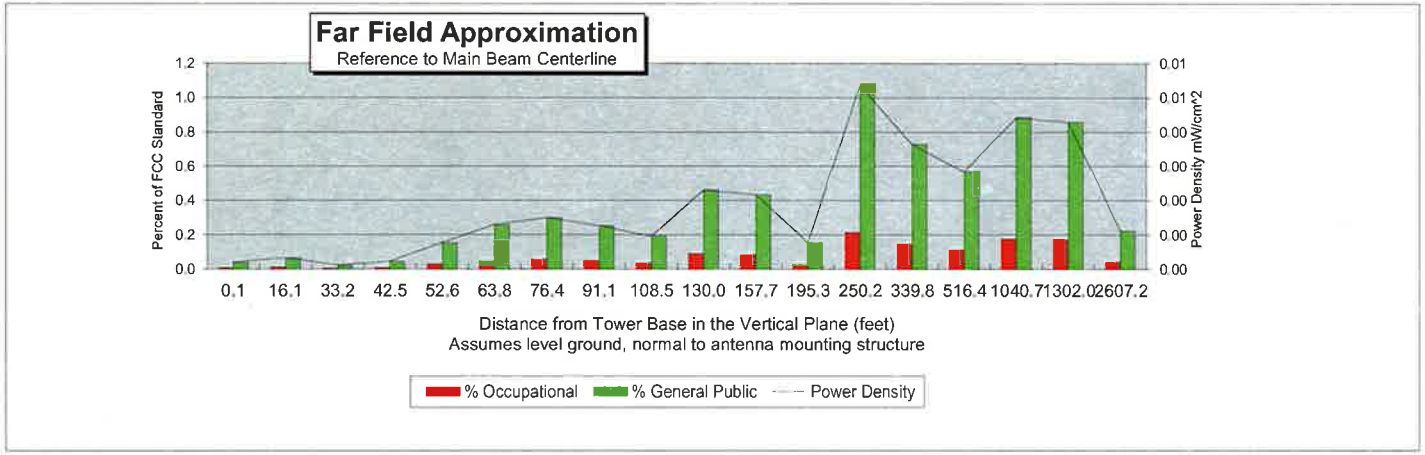
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BERLIN 3, CT
Site #:	
Date:	01/09/14
Name:	Mark Brauer
File Name:	Berlin 3, CT - FF Power

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**94.0**
Antenna Gain (dBi):	**15.2**
Antenna Size (in.):	**48.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1050.0**



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	91.0	92.4	96.9	100.4	105.1	111.1	118.8	128.7	141.6	158.7	182.1	215.4	266.2	351.8	524.3	1044.6	1305.2	2608.8
Distance from Antenna Structure Base in Horizontal plane	0.1	16.1	33.2	42.5	52.6	63.8	76.4	91.1	108.5	130.0	157.7	195.3	250.2	339.8	516.4	1040.7	1302.0	2607.2
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
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
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
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	0.00	0.00	0.00	0.00	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.2	0.2	0.0
Percent of General Population 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

Antenna Type BXA-70063-4CF
Max% 1.08%

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 Po
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

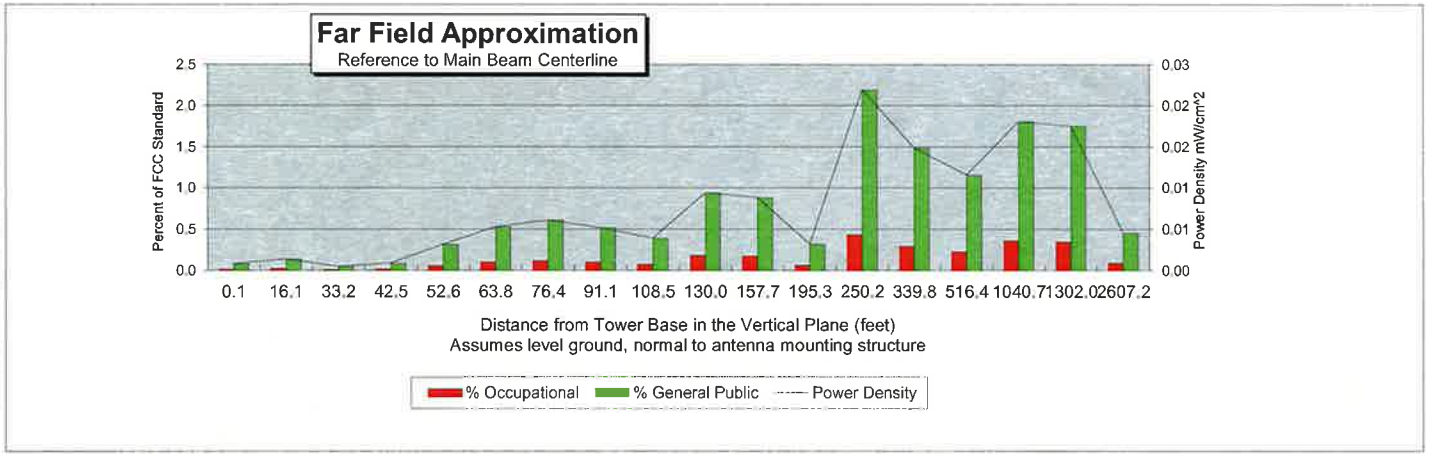
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BERLIN 3, CT
Site #:	
Date:	01/09/14
Name:	Mark Brauer
File Name:	BERLIN 3, CT - FF Power

Operating Freq. (MHz):	**2145.0**
Antenna Height (ft):	**94.0**
Antenna Gain (dBi):	**19.1**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1750.0**



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	91.0	92.4	96.9	100.4	105.1	111.1	118.8	128.7	141.6	158.7	182.1	215.4	266.2	351.8	524.3	1044.6	1305.2	2608.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	16.1	33.2	42.5	52.6	63.8	76.4	91.1	108.5	130.0	157.7	195.3	250.2	339.8	516.4	1040.7	1302.0	2607.2	
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	
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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	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.02	0.00	
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	0.4	0.3	0.1	
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	0.9	0.9	0.3	2.2	1.5	1.2	1.8	1.7	0.5	

Antenna Type BXA-171063-12CF
Max% 2.19%

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 Po
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

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 600 • Columbus, Ohio 43215-3708

Date: **November 11, 2013**

Veronica Harris
Crown Castle
1200 McArthur Blvd
Mahwah, NJ 07430

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
614.221.6679

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	117967
	Carrier Site Name:	Berlin 3 CT
Crown Castle Designation:	**Crown Castle BU Number:**	876382
	Crown Castle Site Name:	BERLIN / LAVIANA ORCHARD
	Crown Castle JDE Job Number:	249012
	Crown Castle Work Order Number:	672752
	Crown Castle Application Number:	203493 Rev. 0
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37513-0616
Site Data:	**1684 Chamberlain Highway, BERLIN, Hartford County, CT**	
	Latitude *41° 35' 23.07"*, Longitude *-72° 48' 19.2"*	
	123 Foot - Monopole Tower	

Dear Veronica Harris,

Paul J Ford and Company is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 593142, in accordance with application 203493, revision 0.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The structural analysis was performed for this tower in accordance with the requirements of the 2005 Connecticut Building Code and the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

We at *Paul J Ford and Company* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

Nick Parente, E.I.
Structural Designer

STATE OF CONNECTICUT
JOSEPH PACHICARAH JACOBS
22731
LICENSED
PROFESSIONAL ENGINEER

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tnxTower Report - version 6.1.3.1

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA
Table 1 - Proposed Antenna and Cable Information
Table 2 - Existing and Reserved Antenna and Cable Information

3) ANALYSIS PROCEDURE
Table 3 - Documents Provided
3.1) Analysis Method
3.2) Assumptions

4) ANALYSIS RESULTS
Table 4 – Section Capacity (Summary)
Table 5 - Tower Component Stresses vs. Capacity

5) APPENDIX A
TNX Tower Output

6) APPENDIX B
Base Level Drawing

7) APPENDIX C
Additional Calculations

1) INTRODUCTION

This tower is a 123 ft Monopole tower designed by SUMMIT in July of 2000. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of the 2005 Connecticut Building Code and the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
93.0	94.0	3	alcatel lucent	RRH2X40-AWS	1	1-5/8	-
		3	antel	BXA-171063-12CF-EDIN-X w/ Mount Pipe			
		3	antel	BXA-70063-4CF-EDIN-X w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
120.0	121.0	3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe	3	1-1/4	2
	120.0	1	tower mounts	Platform Mount [LP 712-1]	1	1/2	1
118.0	118.0	3	alcatel lucent	800MHz 2X50W RRH W/FILTER	-	-	2
		3	alcatel lucent	PCS 1900MHz 4x45W-65MHz			
		1	tower mounts	Side Arm Mount [SO 102-1]			
112.0	113.0	12	decibel	DB844H90E-XY w/Mount Pipe	12	7/8	1
	112.0	1	tower mounts	Platform Mount [LP 713-1]			
100.0	101.0	3	rfs celwave	APX16DWV-16DWV-S-E-A20 w/ mount pipe	6	1-5/8	2
		3	rfs celwave	ATMAA1412D-1A20			
		3	rfs celwave	ATMPP1412D-1CWA			
		3	ems wireless	RR65-18-02DP w/ Mount Pipe	6	1-5/8	1
	100.0	1	tower mounts	T-Arm Mount [TA 602-3]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
93.0	94.0	2	antel	BXA-171063-8BF-2 w/ Mount Pipe	-	-	1
		1	antel	BXA-171085-8BF-EDIN-0 w/ Mount Pipe			
		3	antel	BXA-70063-4CF-EDIN-X w/ Mount Pipe			
		4	rfs celwave	APL866513-42T0 w/ Mount Pipe	-	-	3
		2	rfs celwave	APL868013-42T0 w/ Mount Pipe			
	93.0	6	rfs celwave	FD9R6004/2C-3L	12	1-5/8	1
		1	tower mounts	Platform Mount [LP 712-1]			
75.0	75.0	3	rfs celwave	APXV18-206517S-C w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Pipe Mount [PM 601-3]			
65.0	66.0	6	powerwave technologies	P65-15-XLH-RR w/ Mount Pipe	1 2 12	3/8 3/4 1-5/8	1
		6	powerwave technologies	TT19-08BP111-001			
	65.0	6	ericsson	RRUS-11			
		3	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		1	tower mounts	T-Arm Mount [TA 702-3]			
50.0	51.0	1	lucent	KS24019-L112A	1	1/2	1
	50.0	1	tower mounts	Side Arm Mount [SO 702-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
GEOTECHNICAL REPORTS	Dr. Clarence Welti, 05/05/2000	1629353	CCISITES
TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	PJF, 29200-0802, 06/06/2000	1629413	CCISITES
TOWER MANUFACTURER DRAWINGS	PJF, 29200-0802, 06/06/2000	1629384	CCISITES
POST MOD BPSA	Vertical Solutions, 080828.04, 12/11/2008	2611098	CCISITES

3.1) Analysis Method

tnxTower (version 6.1.3.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) Monopole was reinforced in conformance with the referenced modification drawings.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	123 - 82.25	Pole	TP28.114x22x0.1875	1	-8.35	782.55	67.0	Pass
L2	82.25 - 57.75	Pole	TP31.4152x27.2139x0.25	2	-13.43	1285.62	91.2	Pass
L3	57.75 - 40.75	Pole	TP33.966x31.4152x0.4476	3	-16.17	1796.16	83.2	Pass
L4	40.75 - 29.75	Pole	TP35.1164x32.4332x0.4681	4	-20.31	1982.96	94.3	Pass
L5	29.75 - 0	Pole	TP39.58x35.1164x0.487	5	-27.97	2506.49	99.1	Pass
							Summary	
						Pole (L5)	99.1	Pass
						Rating =	99.1	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1,2	Anchor Rods	0	87.2	Pass
1	Base Plate	0	64.8	Pass
1,3	Base Foundation Soil Interaction	0	65.3	Pass
1	Base Foudnation Structural Steel	0	79.8	Pass

Structure Rating (max from all components) =	99.1%

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
2) Worst case scenario between existing and post installed anchors.
3) Foundation Analysis Notes: According to the procedures prescribed and agreed to by the Crown Castle Engineering Foundation Committee, held in January 2010, the existing caisson foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the caisson is the greater of the geotechnical report's recommendation, the frost depth of the site or half of the caisson diameter.

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

1) Tower is located in Hartford County, Connecticut.
2) Basic wind speed of 80.00 mph.
3) Nominal ice thickness of 1.0000 in.
4) Ice thickness is considered to increase with height.
5) Ice density of 56.00 pcf.
6) A wind speed of 37.60 mph is used in combination with ice.
7) Deflections calculated using a wind speed of 50.00 mph.
8) A non-linear (P-delta) analysis was used.
9) Pressures are calculated at each section.
10) Stress ratio used in pole design is 1.333.
11) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	123.0000-82.2500	40.7500	3.50	18	22.0000	28.1140	0.1875	0.7500	A607-60 (60 ksi)
L2	82.2500-57.7500	28.0000	0.00	18	27.2139	31.4152	0.2500	1.0000	A607-65 (65 ksi)
L3	57.7500-40.7500	17.0000	4.25	18	31.4152	33.9660	0.4476	1.7902	Reinf 48.08 ksi (48 ksi)
L4	40.7500-29.7500	15.2500	0.00	18	32.4332	35.1164	0.4681	1.8725	Reinf 48.16 ksi (48 ksi)
L5	29.7500-0.0000	29.7500		18	35.1164	39.5800	0.4870	1.9481	Reinf 51.86 ksi (52 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	22.3394	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	28.5477	16.6198	1637.5523	9.9139	14.2819	114.6592	3277.2593	8.3115	4.6181	24.63
L2	28.1670	21.3958	1965.3102	9.5722	13.8246	142.1599	3933.2064	10.6999	4.3496	17.399
	31.8998	24.7296	3034.5518	11.0636	15.9589	190.1476	6073.0965	12.3671	5.0891	20.356
L3	31.8998	43.9913	5329.9163	10.9935	15.9589	333.9771	10666.845	21.9998	4.7414	10.594

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
	34.4900	47.6148	6758.4488	11.8990	17.2547	391.6868	13525.7908	23.8119	5.1903	11.597
L4	33.6928	47.4941	6130.9566	11.3476	16.4761	372.1131	12269.9805	23.7516	4.8843	10.434
	35.6581	51.4808	7808.1088	12.3001	17.8391	437.6958	15626.4918	25.7453	5.3566	11.443
L5	35.6581	53.5301	8110.0693	12.2934	17.8391	454.6227	16230.8100	26.7701	5.3233	10.93
	40.1906	60.4300	11667.7604	13.8780	20.1066	580.2939	23350.8735	30.2207	6.1089	12.543

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
HB114-1-08U4-M5J(1 1/4")	C	No	CaAa (Out Of Face)	120.0000 - 0.0000	2	No Ice	0.0000	1.08
						1/2" Ice	0.0000	2.33
						1" Ice	0.0000	4.18
						2" Ice	0.0000	9.73
						4" Ice	0.0000	28.15
HB114-1-08U4-M5J(1 1/4")	C	No	CaAa (Out Of Face)	75.0000 - 0.0000	1	No Ice	0.0000	1.08
						1/2" Ice	0.0000	2.33
						1" Ice	0.0000	4.18
						2" Ice	0.0000	9.73
						4" Ice	0.0000	28.15
HB114-1-08U4-M5J(1 1/4")	C	No	CaAa (Out Of Face)	120.0000 - 75.0000	1	No Ice	0.1540	1.08
						1/2" Ice	0.2540	2.33
						1" Ice	0.3540	4.18
						2" Ice	0.5540	9.73
						4" Ice	0.9540	28.15
***								
LDF5-50A(7/8")	C	No	Inside Pole	112.0000 - 0.0000	12	No Ice	0.0000	0.33
						1/2" Ice	0.0000	0.33
						1" Ice	0.0000	0.33
						2" Ice	0.0000	0.33
						4" Ice	0.0000	0.33
***								
LDF7-50A(1-5/8")	C	No	Inside Pole	100.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
AL7-50(1 5/8)	C	No	Inside Pole	100.0000 - 0.0000	6	No Ice	0.0000	0.52
						1/2" Ice	0.0000	0.52
						1" Ice	0.0000	0.52
						2" Ice	0.0000	0.52
						4" Ice	0.0000	0.52
***								
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	93.0000 - 0.0000	1	No Ice	0.1980	0.82
						1/2" Ice	0.2980	2.33
						1" Ice	0.3980	4.46
						2" Ice	0.5980	10.54
						4" Ice	0.9980	30.04
LDF7-50A(1-5/8")	C	No	Inside Pole	93.0000 - 0.0000	12	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
***								
AVA7-50(1-5/8)	C	No	Inside Pole	75.0000 - 0.0000	4	No Ice	0.0000	0.70
						1/2" Ice	0.0000	0.70
						1" Ice	0.0000	0.70
						2" Ice	0.0000	0.70
						4" Ice	0.0000	0.70
AVA7-50(1-5/8)	C	No	CaAa (Out Of Face)	75.0000 - 0.0000	1	No Ice	0.0000	0.70
						1/2" Ice	0.0000	2.23

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1" Ice	0.0000	4.38
						2" Ice	0.0000	10.50
						4" Ice	0.0000	30.07
AVA7-50(1-5/8)	C	No	CaAa (Out Of Face)	75.0000 - 0.0000	1	No Ice	0.2010	0.70
						1/2" Ice	0.3010	2.23
						1" Ice	0.4010	4.38
						2" Ice	0.6010	10.50
						4" Ice	1.0010	30.07
***								
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	65.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	2.33
						1" Ice	0.0000	4.46
						2" Ice	0.0000	10.54
						4" Ice	0.0000	30.04
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	65.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	2.33
						1" Ice	0.0000	4.46
						2" Ice	0.0000	10.54
						4" Ice	0.0000	30.04
LDF7-50A(1-5/8")	C	No	Inside Pole	65.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
FB-L98B-002-75000(3/8")	C	No	Inside Pole	65.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.06
						1" Ice	0.0000	0.06
						2" Ice	0.0000	0.06
						4" Ice	0.0000	0.06
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	65.0000 - 0.0000	2	No Ice	0.0000	0.59
						1/2" Ice	0.0000	0.59
						1" Ice	0.0000	0.59
						2" Ice	0.0000	0.59
						4" Ice	0.0000	0.59
***								
LDF4-50A(1/2")	C	No	Inside Pole	50.0000 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
********** ********								
1 1/4" Flat Reinforcement	C	No	CaAa (Out Of Face)	59.5000 - 0.0000	1	No Ice	0.2083	0.00
						1/2" Ice	0.3194	0.00
						1" Ice	0.4306	0.00
						2" Ice	0.6528	0.00
						4" Ice	1.0972	0.00

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	123.0000-82.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	7.942	0.50
L2	82.2500-57.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	9.799	0.82
L3	57.7500-40.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	10.325	0.79
L4	40.7500-29.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.681	0.51
L5	29.7500-0.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00

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
		C	0.000	0.000	0.000	18.068	1.38

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	123.0000-82.2500	A	1.145	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	19.050	0.99
L2	82.2500-57.7500	A	1.094	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	21.467	1.77
L3	57.7500-40.7500	A	1.049	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	21.420	1.96
L4	40.7500-29.7500	A	1.008	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	13.860	1.27
L5	29.7500-0.0000	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	36.580	3.28

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	123.0000-82.2500	-0.2387	0.1378	-0.4748	0.2742
L2	82.2500-57.7500	-0.4487	0.2590	-0.7966	0.4599
L3	57.7500-40.7500	-0.6451	0.3725	-1.0721	0.6190
L4	40.7500-29.7500	-0.6502	0.3754	-1.0882	0.6282
L5	29.7500-0.0000	-0.6601	0.3811	-1.1026	0.6366

Discrete Tower Loads

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
3/4" x 8 ft lightning rod	C	None		0.0000	123.0000	No Ice	0.6000	0.6000	0.01
						1/2" Ice	1.4146	1.4146	0.02
						1" Ice	2.2458	2.2458	0.03
						2" Ice	3.6690	3.6690	0.07
						4" Ice	5.7417	5.7417	0.21
***									
2.375" OD x 5' Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	120.0000	No Ice	1.1875	1.1875	0.02
						1/2" Ice	1.4956	1.4956	0.03
						1" Ice	1.8071	1.8071	0.04
						2" Ice	2.4580	2.4580	0.08
						4" Ice	3.9194	3.9194	0.20
2.375" OD x 5' Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	120.0000	No Ice	1.1875	1.1875	0.02
						1/2" Ice	1.4956	1.4956	0.03
						1" Ice	1.8071	1.8071	0.04
						2" Ice	2.4580	2.4580	0.08
						4" Ice	3.9194	3.9194	0.20
2.375" OD x 5' Mount Pipe	C	From Face	4.0000 0.00	0.0000	120.0000	No Ice	1.1875	1.1875	0.02
						1/2"	1.4956	1.4956	0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
				1.00			Ice	1.8071	1.8071	0.04
							1" Ice	2.4580	2.4580	0.08
							2" Ice	3.9194	3.9194	0.20
							4" Ice			
APXVSPP18-C-A20 w/ Mount Pipe	A	From Face	4.0000		0.0000	120.0000	No Ice	8.4975	6.9458	0.08
			0.00				1/2"	9.1490	8.1266	0.15
			1.00				Ice	9.7672	9.0212	0.23
							1" Ice	11.0311	10.8440	0.41
							2" Ice	13.6786	14.8507	0.91
							4" Ice			
APXVSPP18-C-A20 w/ Mount Pipe	B	From Face	4.0000		0.0000	120.0000	No Ice	8.4975	6.9458	0.08
			0.00				1/2"	9.1490	8.1266	0.15
			1.00				Ice	9.7672	9.0212	0.23
							1" Ice	11.0311	10.8440	0.41
							2" Ice	13.6786	14.8507	0.91
							4" Ice			
APXVSPP18-C-A20 w/ Mount Pipe	C	From Face	4.0000		0.0000	120.0000	No Ice	8.4975	6.9458	0.08
			0.00				1/2"	9.1490	8.1266	0.15
			1.00				Ice	9.7672	9.0212	0.23
							1" Ice	11.0311	10.8440	0.41
							2" Ice	13.6786	14.8507	0.91
							4" Ice			
Platform Mount [LP 712-1]	C	None			0.0000	120.0000	No Ice	24.5300	24.5300	1.34
							1/2"	29.9400	29.9400	1.65
							Ice	35.3500	35.3500	1.96
							1" Ice	46.1700	46.1700	2.58
							2" Ice	67.8100	67.8100	3.82
							4" Ice			
**										
800MHz 2X50W RRH W/FILTER	A	From Face	2.0000		0.0000	118.0000	No Ice	2.4014	2.2536	0.06
			0.00				1/2"	2.6131	2.4602	0.09
			0.00				Ice	2.8335	2.6753	0.11
							1" Ice	3.3002	3.1316	0.17
							2" Ice	4.3372	4.1479	0.34
							4" Ice			
800MHz 2X50W RRH W/FILTER	B	From Face	2.0000		0.0000	118.0000	No Ice	2.4014	2.2536	0.06
			0.00				1/2"	2.6131	2.4602	0.09
			0.00				Ice	2.8335	2.6753	0.11
							1" Ice	3.3002	3.1316	0.17
							2" Ice	4.3372	4.1479	0.34
							4" Ice			
800MHz 2X50W RRH W/FILTER	C	From Face	2.0000		0.0000	118.0000	No Ice	2.4014	2.2536	0.06
			0.00				1/2"	2.6131	2.4602	0.09
			0.00				Ice	2.8335	2.6753	0.11
							1" Ice	3.3002	3.1316	0.17
							2" Ice	4.3372	4.1479	0.34
							4" Ice			
PCS 1900MHz 4x45W-65MHz	A	From Face	2.0000		0.0000	118.0000	No Ice	2.7087	2.6111	0.06
			0.00				1/2"	2.9477	2.8475	0.08
			0.00				Ice	3.1953	3.0925	0.11
							1" Ice	3.7164	3.6084	0.17
							2" Ice	4.8623	4.7439	0.35
							4" Ice			
PCS 1900MHz 4x45W-65MHz	B	From Face	2.0000		0.0000	118.0000	No Ice	2.7087	2.6111	0.06
			0.00				1/2"	2.9477	2.8475	0.08
			0.00				Ice	3.1953	3.0925	0.11
							1" Ice	3.7164	3.6084	0.17
							2" Ice	4.8623	4.7439	0.35
							4" Ice			
PCS 1900MHz 4x45W-65MHz	C	From Face	2.0000		0.0000	118.0000	No Ice	2.7087	2.6111	0.06
			0.00				1/2"	2.9477	2.8475	0.08
			0.00				Ice	3.1953	3.0925	0.11
							1" Ice	3.7164	3.6084	0.17
							2" Ice	4.8623	4.7439	0.35
							4" Ice			

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
Side Arm Mount [SO 102-1]	C	None		0.0000	118.0000	No Ice	1.5000	1.5000	0.03
						1/2" Ice	1.7400	1.7500	0.04
						1" Ice	1.9800	2.0000	0.04
						2" Ice	2.4600	2.5000	0.07
						4" Ice	3.4200	3.5000	0.11
**									
(4) DB844H90E-XY w/Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	112.0000	No Ice	3.5792	5.3958	0.04
						1/2" Ice	4.2014	6.4912	0.08
						1" Ice	4.7281	7.3017	0.13
						2" Ice	5.8573	8.9600	0.25
						4" Ice	8.2671	12.4914	0.62
(4) DB844H90E-XY w/Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	112.0000	No Ice	3.5792	5.3958	0.04
						1/2" Ice	4.2014	6.4912	0.08
						1" Ice	4.7281	7.3017	0.13
						2" Ice	5.8573	8.9600	0.25
						4" Ice	8.2671	12.4914	0.62
(4) DB844H90E-XY w/Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	112.0000	No Ice	3.5792	5.3958	0.04
						1/2" Ice	4.2014	6.4912	0.08
						1" Ice	4.7281	7.3017	0.13
						2" Ice	5.8573	8.9600	0.25
						4" Ice	8.2671	12.4914	0.62
Platform Mount [LP 713-1]	C	None		0.0000	112.0000	No Ice	31.2700	31.2700	1.51
						1/2" Ice	39.6800	39.6800	1.93
						1" Ice	48.0900	48.0900	2.35
						2" Ice	64.9100	64.9100	3.19
						4" Ice	98.5500	98.5500	4.86
***									
APX16DWV-16DWV-S-E-A20 w/ mount pipe	A	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	7.4657	3.4938	0.06
						1/2" Ice	7.9944	4.2631	0.11
						1" Ice	8.5176	4.9598	0.16
						2" Ice	9.5949	6.4031	0.30
						4" Ice	11.8728	9.4897	0.68
APX16DWV-16DWV-S-E-A20 w/ mount pipe	B	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	7.4657	3.4938	0.06
						1/2" Ice	7.9944	4.2631	0.11
						1" Ice	8.5176	4.9598	0.16
						2" Ice	9.5949	6.4031	0.30
						4" Ice	11.8728	9.4897	0.68
APX16DWV-16DWV-S-E-A20 w/ mount pipe	C	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	7.4657	3.4938	0.06
						1/2" Ice	7.9944	4.2631	0.11
						1" Ice	8.5176	4.9598	0.16
						2" Ice	9.5949	6.4031	0.30
						4" Ice	11.8728	9.4897	0.68
ATMAA1412D-1A20	A	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	1.1667	0.4667	0.01
						1/2" Ice	1.3136	0.5747	0.02
						1" Ice	1.4691	0.6914	0.03
						2" Ice	1.8062	0.9506	0.06
						4" Ice	2.5840	1.5728	0.14
ATMAA1412D-1A20	B	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	1.1667	0.4667	0.01
						1/2" Ice	1.3136	0.5747	0.02
						1" Ice	1.4691	0.6914	0.03
						2" Ice	1.8062	0.9506	0.06
						4" Ice	2.5840	1.5728	0.14
ATMAA1412D-1A20	C	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	1.1667	0.4667	0.01
						1/2" Ice	1.3136	0.5747	0.02
						Ice	1.4691	0.6914	0.03

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
						1" Ice	1.8062	0.9506	0.06
						2" Ice	2.5840	1.5728	0.14
						4" Ice			
ATMPP1412D-1CWA	A	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	1.1672	0.4159	0.01
						1/2" Ice	1.3174	0.5298	0.02
							1.4762	0.6523	0.03
						1" Ice	1.8197	0.9232	0.05
						2" Ice	2.6105	1.5688	0.13
						4" Ice			
ATMPP1412D-1CWA	B	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	1.1672	0.4159	0.01
						1/2" Ice	1.3174	0.5298	0.02
							1.4762	0.6523	0.03
						1" Ice	1.8197	0.9232	0.05
						2" Ice	2.6105	1.5688	0.13
						4" Ice			
ATMPP1412D-1CWA	C	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	1.1672	0.4159	0.01
						1/2" Ice	1.3174	0.5298	0.02
							1.4762	0.6523	0.03
						1" Ice	1.8197	0.9232	0.05
						2" Ice	2.6105	1.5688	0.13
						4" Ice			
RR65-18-02DP w/ Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	4.5931	3.3194	0.03
						1/2" Ice	5.0883	4.0888	0.07
							5.5778	4.7844	0.12
						1" Ice	6.5876	6.2255	0.22
						2" Ice	8.7306	9.3076	0.56
						4" Ice			
RR65-18-02DP w/ Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	4.5931	3.3194	0.03
						1/2" Ice	5.0883	4.0888	0.07
							5.5778	4.7844	0.12
						1" Ice	6.5876	6.2255	0.22
						2" Ice	8.7306	9.3076	0.56
						4" Ice			
RR65-18-02DP w/ Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	100.0000	No Ice	4.5931	3.3194	0.03
						1/2" Ice	5.0883	4.0888	0.07
							5.5778	4.7844	0.12
						1" Ice	6.5876	6.2255	0.22
						2" Ice	8.7306	9.3076	0.56
						4" Ice			
T-Arm Mount [TA 602-3]	C	None		0.0000	100.0000	No Ice	11.5900	11.5900	0.77
						1/2" Ice	15.4400	15.4400	0.99
							19.2900	19.2900	1.21
						1" Ice	26.9900	26.9900	1.64
						2" Ice	42.3900	42.3900	2.50
						4" Ice			
***									
DB-T1-6Z-8AB-0Z	A	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice	5.6000	2.3333	0.04
						1/2" Ice	5.9154	2.5580	0.08
							6.2395	2.7914	0.12
						1" Ice	6.9136	3.2840	0.21
						2" Ice	8.3654	4.3728	0.45
						4" Ice			
RRH2X40-AWS	A	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice	2.9388	2.0229	0.04
						1/2" Ice	3.1842	2.2440	0.06
							3.4382	2.4738	0.09
						1" Ice	3.9722	2.9593	0.15
						2" Ice	5.1437	4.0339	0.31
						4" Ice			
RRH2X40-AWS	B	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice	2.9388	2.0229	0.04
						1/2" Ice	3.1842	2.2440	0.06
							3.4382	2.4738	0.09
						1" Ice	3.9722	2.9593	0.15
						2" Ice	5.1437	4.0339	0.31
						4" Ice			
RRH2X40-AWS	C	From Face	4.0000	0.0000	93.0000	No Ice	2.9388	2.0229	0.04

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
			0.00 1.00			1/2" Ice	3.1842 3.4382	2.2440 2.4738	0.06 0.09
						1" Ice	3.9722	2.9593	0.15
						2" Ice	5.1437	4.0339	0.31
						4" Ice			
BXA-171063-12CF-EDIN-X w/ Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.0290 5.5830 6.1033 7.1662 9.4380	5.2887 6.4594 7.3479 9.1478 12.9475	0.04 0.09 0.14 0.27 0.68
BXA-171063-12CF-EDIN-X w/ Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.0290 5.5830 6.1033 7.1662 9.4380	5.2887 6.4594 7.3479 9.1478 12.9475	0.04 0.09 0.14 0.27 0.68
BXA-171063-12CF-EDIN-X w/ Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.0290 5.5830 6.1033 7.1662 9.4380	5.2887 6.4594 7.3479 9.1478 12.9475	0.04 0.09 0.14 0.27 0.68
BXA-70063-4CF-EDIN-X w/ Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-4CF-EDIN-X w/ Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-4CF-EDIN-X w/ Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-4CF-EDIN-X w/ Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-4CF-EDIN-X w/ Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-4CF-EDIN-X w/ Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-171063-8BF-2 w/ Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.1789 3.5550 3.9637 4.8533 6.7671	3.3530 3.9709 4.5951 5.8933 8.8855	0.03 0.06 0.10 0.19 0.49

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
BXA-171063-8BF-2 w/ Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.1789 3.5550 3.9637 4.8533 6.7671	3.3530 3.9709 4.5951 5.8933 8.8855	0.03 0.06 0.10 0.19 0.49
BXA-171085-8BF-EDIN-0 w/ Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.1789 3.5550 3.9637 4.8533 6.7671	3.3530 3.9709 4.5951 5.8933 8.8855	0.03 0.06 0.10 0.19 0.49
(2) FD9R6004/2C-3L	A	From Face	4.0000 0.00 0.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	B	From Face	4.0000 0.00 0.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	C	From Face	4.0000 0.00 0.00	0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
Platform Mount [LP 712-1]	C	None		0.0000	93.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	24.5300 29.9400 35.3500 46.1700 67.8100	24.5300 29.9400 35.3500 46.1700 67.8100	1.34 1.65 1.96 2.58 3.82
***									
APXV18-206517S-C w/ Mount Pipe	A	From Face	1.0000 0.00 0.00	0.0000	75.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.4042 5.9597 6.4808 7.5467 9.9193	4.7000 5.8600 6.7338 8.5150 12.2774	0.05 0.10 0.15 0.28 0.68
APXV18-206517S-C w/ Mount Pipe	B	From Face	1.0000 0.00 0.00	0.0000	75.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.4042 5.9597 6.4808 7.5467 9.9193	4.7000 5.8600 6.7338 8.5150 12.2774	0.05 0.10 0.15 0.28 0.68
APXV18-206517S-C w/ Mount Pipe	C	From Face	1.0000 0.00 0.00	0.0000	75.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.4042 5.9597 6.4808 7.5467 9.9193	4.7000 5.8600 6.7338 8.5150 12.2774	0.05 0.10 0.15 0.28 0.68
Pipe Mount [PM 601-3]	C	None		0.0000	75.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.3900 5.4800 6.5700 8.7500 13.1100	4.3900 5.4800 6.5700 8.7500 13.1100	0.20 0.24 0.28 0.36 0.53
***									
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice 1/2" Ice	8.4975 9.1490 9.7672	6.3042 7.4790 8.3676	0.07 0.14 0.21

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
						1" Ice	11.0311	10.1785	0.38
						2" Ice	13.6786	14.0237	0.87
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice	8.4975	6.3042	0.07
						1/2" Ice	9.1490	7.4790	0.14
							9.7672	8.3676	0.21
						1" Ice	11.0311	10.1785	0.38
						2" Ice	13.6786	14.0237	0.87
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice	8.4975	6.3042	0.07
						1/2" Ice	9.1490	7.4790	0.14
							9.7672	8.3676	0.21
						1" Ice	11.0311	10.1785	0.38
						2" Ice	13.6786	14.0237	0.87
						4" Ice			
(2) RRUS-11	C	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice	3.2486	1.3726	0.05
						1/2" Ice	3.4905	1.5510	0.07
							3.7411	1.7380	0.09
						1" Ice	4.2682	2.1381	0.15
						2" Ice	5.4260	3.0418	0.31
						4" Ice			
(2) RRUS-11	B	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice	3.2486	1.3726	0.05
						1/2" Ice	3.4905	1.5510	0.07
							3.7411	1.7380	0.09
						1" Ice	4.2682	2.1381	0.15
						2" Ice	5.4260	3.0418	0.31
						4" Ice			
(2) RRUS-11	A	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice	3.2486	1.3726	0.05
						1/2" Ice	3.4905	1.5510	0.07
							3.7411	1.7380	0.09
						1" Ice	4.2682	2.1381	0.15
						2" Ice	5.4260	3.0418	0.31
						4" Ice			
DC6-48-60-18-8F	A	From Face	4.0000 0.00 0.00	0.0000	65.0000	No Ice	2.5667	2.5667	0.02
						1/2" Ice	2.7978	2.7978	0.04
							3.0377	3.0377	0.07
						1" Ice	3.5432	3.5432	0.13
						2" Ice	4.6580	4.6580	0.30
						4" Ice			
(2) P65-15-XLH-RR w/ Mount Pipe	A	From Face	4.0000 0.00 1.00	0.0000	65.0000	No Ice	6.0666	4.1885	0.06
						1/2" Ice	6.5095	4.8037	0.11
							6.9621	5.4357	0.16
						1" Ice	7.8961	6.8365	0.29
						2" Ice	9.8876	9.9536	0.65
						4" Ice			
(2) P65-15-XLH-RR w/ Mount Pipe	B	From Face	4.0000 0.00 1.00	0.0000	65.0000	No Ice	6.0666	4.1885	0.06
						1/2" Ice	6.5095	4.8037	0.11
							6.9621	5.4357	0.16
						1" Ice	7.8961	6.8365	0.29
						2" Ice	9.8876	9.9536	0.65
						4" Ice			
(2) P65-15-XLH-RR w/ Mount Pipe	C	From Face	4.0000 0.00 1.00	0.0000	65.0000	No Ice	6.0666	4.1885	0.06
						1/2" Ice	6.5095	4.8037	0.11
							6.9621	5.4357	0.16
						1" Ice	7.8961	6.8365	0.29
						2" Ice	9.8876	9.9536	0.65
						4" Ice			
(2) TT19-08BP111-001	A	From Face	4.0000 0.00 1.00	0.0000	65.0000	No Ice	0.6362	0.5156	0.02
						1/2" Ice	0.7474	0.6187	0.02
							0.8672	0.7304	0.03
						1" Ice	1.1328	0.9796	0.05
						2" Ice	1.7678	1.5819	0.12
						4" Ice			
(2) TT19-08BP111-001	B	From Face	4.0000 0.00	0.0000	65.0000	No Ice	0.6362	0.5156	0.02
						1/2" Ice	0.7474	0.6187	0.02

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
			1.00			Ice	0.8672	0.7304	0.03
						1" Ice	1.1328	0.9796	0.05
						2" Ice	1.7678	1.5819	0.12
						4" Ice			
(2) TT19-08BP111-001	C	From Face	4.0000	0.0000	65.0000	No Ice	0.6362	0.5156	0.02
			0.00			1/2"	0.7474	0.6187	0.02
			1.00			Ice	0.8672	0.7304	0.03
						1" Ice	1.1328	0.9796	0.05
						2" Ice	1.7678	1.5819	0.12
						4" Ice			
T-Arm Mount [TA 702-3]	C	None		0.0000	65.0000	No Ice	5.6400	5.6400	0.34
						1/2"	6.5500	6.5500	0.43
						Ice	7.4600	7.4600	0.52
						1" Ice	9.2800	9.2800	0.70
						2" Ice	12.9200	12.9200	1.06
						4" Ice			
***									
KS24019-L112A	C	From Face	2.0000	0.0000	50.0000	No Ice	0.1556	0.1556	0.01
			0.00			1/2"	0.2247	0.2247	0.01
			1.00			Ice	0.3025	0.3025	0.01
						1" Ice	0.4840	0.4840	0.02
						2" Ice	0.9506	0.9506	0.06
						4" Ice			
Side Arm Mount [SO 702-1]	C	None		0.0000	50.0000	No Ice	1.0000	1.4300	0.03
						1/2"	1.0000	2.0500	0.04
						Ice	1.0000	2.6700	0.05
						1" Ice	1.0000	3.9100	0.07
						2" Ice	1.0000	6.3900	0.12
						4" Ice			

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 123.0000-82.2500	102.0855	1.381	22.58	85.089	A	0.000	85.089	85.089	100.00	0.000	0.000
					B	0.000	85.089		100.00	0.000	0.000
					C	0.000	85.089		100.00	0.000	7.942
L2 82.2500-57.7500	69.7462	1.238	20.29	60.387	A	0.000	60.387	60.387	100.00	0.000	0.000
					B	0.000	60.387		100.00	0.000	0.000
					C	0.000	60.387		100.00	0.000	9.799
L3 57.7500-40.7500	49.1395	1.12	18.36	46.312	A	0.000	46.312	46.312	100.00	0.000	0.000
					B	0.000	46.312		100.00	0.000	0.000
					C	0.000	46.312		100.00	0.000	10.325
L4 40.7500-29.7500	35.1980	1.019	16.69	31.303	A	0.000	31.303	31.303	100.00	0.000	0.000
					B	0.000	31.303		100.00	0.000	0.000
					C	0.000	31.303		100.00	0.000	6.681
L5 29.7500-0.0000	14.5787	1	16.38	92.592	A	0.000	92.592	92.592	100.00	0.000	0.000
					B	0.000	92.592		100.00	0.000	0.000
					C	0.000	92.592		100.00	0.000	18.068

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 123.0000-82.2500	102.0855	1.381	4.99	1.1451	92.867	A	0.000	92.867	92.867	100.00	0.000	0.000
						B	0.000	92.867		100.00	0.000	0.000
						C	0.000	92.867		100.00	0.000	19.050
L2 82.2500-57.7500	69.7462	1.238	4.48	1.0940	65.063	A	0.000	65.063	65.063	100.00	0.000	0.000
						B	0.000	65.063		100.00	0.000	0.000
						C	0.000	65.063		100.00	0.000	21.467
L3 57.7500-40.7500	49.1395	1.12	4.06	1.0489	49.284	A	0.000	49.284	49.284	100.00	0.000	0.000
						B	0.000	49.284		100.00	0.000	0.000
						C	0.000	49.284		100.00	0.000	21.420
L4 40.7500-29.7500	35.1980	1.019	3.69	1.0078	33.226	A	0.000	33.226	33.226	100.00	0.000	0.000
						B	0.000	33.226		100.00	0.000	0.000
						C	0.000	33.226		100.00	0.000	13.860
L5 29.7500-0.0000	14.5787	1	3.62	1.0000	97.551	A	0.000	97.551	97.551	100.00	0.000	0.000
						B	0.000	97.551		100.00	0.000	0.000
						C	0.000	97.551		100.00	0.000	36.580

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 123.0000-82.2500	102.0855	1.381	8.82	85.089	A	0.000	85.089	85.089	100.00	0.000	0.000
					B	0.000	85.089		100.00	0.000	0.000
					C	0.000	85.089		100.00	0.000	7.942
L2 82.2500-57.7500	69.7462	1.238	7.93	60.387	A	0.000	60.387	60.387	100.00	0.000	0.000
					B	0.000	60.387		100.00	0.000	0.000
					C	0.000	60.387		100.00	0.000	9.799
L3 57.7500-40.7500	49.1395	1.12	7.17	46.312	A	0.000	46.312	46.312	100.00	0.000	0.000
					B	0.000	46.312		100.00	0.000	0.000
					C	0.000	46.312		100.00	0.000	10.325
L4 40.7500-29.7500	35.1980	1.019	6.52	31.303	A	0.000	31.303	31.303	100.00	0.000	0.000
					B	0.000	31.303		100.00	0.000	0.000
					C	0.000	31.303		100.00	0.000	6.681
L5 29.7500-0.0000	14.5787	1	6.40	92.592	A	0.000	92.592	92.592	100.00	0.000	0.000
					B	0.000	92.592		100.00	0.000	0.000
					C	0.000	92.592		100.00	0.000	18.068

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice
15	Dead+Wind 0 deg+Ice
16	Dead+Wind 30 deg+Ice
17	Dead+Wind 60 deg+Ice
18	Dead+Wind 90 deg+Ice
19	Dead+Wind 120 deg+Ice
20	Dead+Wind 150 deg+Ice

Comb. No.	Description
21	Dead+Wind 180 deg+Ice
22	Dead+Wind 210 deg+Ice
23	Dead+Wind 240 deg+Ice
24	Dead+Wind 270 deg+Ice
25	Dead+Wind 300 deg+Ice
26	Dead+Wind 330 deg+Ice
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	123 - 82.25	Pole	Max Tension	24	0.00	-0.00	-0.00
			Max. Compression	14	-18.71	1.24	-0.00
			Max. Mx	11	-8.35	290.46	0.50
			Max. My	2	-8.36	0.76	289.66
			Max. Vy	11	-14.00	290.46	0.50
			Max. Vx	8	13.93	-0.18	-289.59
			Max. Torque	3			0.46
L2	82.25 - 57.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-28.10	3.03	-0.61
			Max. Mx	11	-13.43	741.13	1.95
			Max. My	8	-13.44	-1.38	-738.25
			Max. Vy	11	-19.22	741.13	1.95
			Max. Vx	8	19.16	-1.38	-738.25
			Max. Torque	3			0.95
L3	57.75 - 40.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-32.16	4.37	-1.41
			Max. Mx	11	-16.17	992.25	2.49
			Max. My	8	-16.18	-1.83	-988.49
			Max. Vy	11	-20.16	992.25	2.49
			Max. Vx	8	20.10	-1.83	-988.49
			Max. Torque	3			0.97
L4	40.75 - 29.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-38.02	6.02	-2.35
			Max. Mx	11	-20.31	1308.09	3.16
			Max. My	8	-20.32	-2.36	-1303.25
			Max. Vy	11	-21.17	1308.09	3.16
			Max. Vx	8	21.11	-2.36	-1303.25
			Max. Torque	3			1.01
L5	29.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-48.48	9.22	-4.19
			Max. Mx	11	-27.97	1963.28	4.39
			Max. My	8	-27.97	-3.34	-1956.33
			Max. Vy	11	-22.84	1963.28	4.39
			Max. Vx	8	22.78	-3.34	-1956.33
			Max. Torque	8			-1.11

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	24	48.48	6.78	0.01
	Max. H_x	11	27.98	22.82	0.05
	Max. H_z	2	27.98	0.05	22.76
	Max. M_x	2	1954.90	0.05	22.76
	Max. M_z	5	1959.73	-22.82	-0.05
	Max. Torsion	2	1.10	0.05	22.76
	Min. Vert	1	27.98	0.00	0.00
	Min. H_x	5	27.98	-22.82	-0.05
	Min. H_z	8	27.98	-0.05	-22.76
	Min. M_x	8	-1956.33	-0.05	-22.76
	Min. M_z	11	-1963.28	22.82	0.05
	Min. Torsion	8	-1.11	-0.05	-22.76

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	27.98	0.00	0.00	0.70	1.73	0.00
Dead+Wind 0 deg - No Ice	27.98	-0.05	-22.76	-1954.90	6.89	-1.10
Dead+Wind 30 deg - No Ice	27.98	11.37	-19.69	-1690.35	-974.56	-1.07
Dead+Wind 60 deg - No Ice	27.98	19.74	-11.34	-972.66	-1694.40	-0.76
Dead+Wind 90 deg - No Ice	27.98	22.82	0.05	5.83	-1959.73	-0.23
Dead+Wind 120 deg - No Ice	27.98	19.79	11.43	982.95	-1699.50	0.35
Dead+Wind 150 deg - No Ice	27.98	11.46	19.74	1696.88	-983.41	0.84
Dead+Wind 180 deg - No Ice	27.98	0.05	22.76	1956.33	-3.34	1.11
Dead+Wind 210 deg - No Ice	27.98	-11.37	19.69	1691.78	978.11	1.07
Dead+Wind 240 deg - No Ice	27.98	-19.74	11.34	974.10	1697.95	0.75
Dead+Wind 270 deg - No Ice	27.98	-22.82	-0.05	-4.39	1963.28	0.23
Dead+Wind 300 deg - No Ice	27.98	-19.79	-11.43	-981.51	1703.05	-0.35
Dead+Wind 330 deg - No Ice	27.98	-11.46	-19.74	-1695.44	986.96	-0.84
Dead+Ice	48.48	-0.00	0.00	4.19	9.22	-0.00
Dead+Wind 0 deg+Ice	48.48	-0.01	-6.77	-603.14	10.51	-0.37
Dead+Wind 30 deg+Ice	48.48	3.38	-5.85	-521.16	-294.06	-0.33
Dead+Wind 60 deg+Ice	48.48	5.87	-3.37	-298.40	-517.35	-0.20
Dead+Wind 90 deg+Ice	48.48	6.78	0.01	5.45	-599.51	-0.01
Dead+Wind 120 deg+Ice	48.48	5.88	3.39	308.97	-518.58	0.17
Dead+Wind 150 deg+Ice	48.48	3.40	5.87	530.83	-296.20	0.31
Dead+Wind 180 deg+Ice	48.48	0.01	6.77	611.56	8.03	0.37
Dead+Wind 210 deg+Ice	48.48	-3.38	5.85	529.59	312.59	0.33
Dead+Wind 240 deg+Ice	48.48	-5.87	3.37	306.83	535.88	0.20
Dead+Wind 270 deg+Ice	48.48	-6.78	-0.01	2.98	618.05	0.01
Dead+Wind 300 deg+Ice	48.48	-5.88	-3.39	-300.54	537.12	-0.17
Dead+Wind 330 deg+Ice	48.48	-3.40	-5.87	-522.40	314.74	-0.31
Dead+Wind 0 deg - Service	27.98	-0.02	-8.89	-763.91	3.78	-0.43
Dead+Wind 30 deg - Service	27.98	4.44	-7.69	-660.47	-379.96	-0.42
Dead+Wind 60 deg - Service	27.98	7.71	-4.43	-379.86	-661.41	-0.30
Dead+Wind 90 deg - Service	27.98	8.92	0.02	2.72	-765.15	-0.09
Dead+Wind 120 deg - Service	27.98	7.73	4.46	384.76	-663.40	0.14
Dead+Wind 150 deg - Service	27.98	4.48	7.71	663.90	-383.42	0.33
Dead+Wind 180 deg - Service	27.98	0.02	8.89	765.34	-0.22	0.43
Dead+Wind 210 deg - Service	27.98	-4.44	7.69	661.91	383.52	0.42
Dead+Wind 240 deg - Service	27.98	-7.71	4.43	381.30	664.96	0.30
Dead+Wind 270 deg - Service	27.98	-8.92	-0.02	-1.28	768.71	0.09
Dead+Wind 300 deg - Service	27.98	-7.73	-4.46	-383.32	666.96	-0.14
Dead+Wind 330 deg - Service	27.98	-4.48	-7.71	-662.47	386.98	-0.33

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-27.98	0.00	0.00	27.98	0.00	0.000%
2	-0.05	-27.98	-22.76	0.05	27.98	22.76	0.000%
3	11.37	-27.98	-19.69	-11.37	27.98	19.69	0.000%
4	19.74	-27.98	-11.34	-19.74	27.98	11.34	0.000%
5	22.82	-27.98	0.05	-22.82	27.98	-0.05	0.000%
6	19.79	-27.98	11.43	-19.79	27.98	-11.43	0.000%
7	11.46	-27.98	19.74	-11.46	27.98	-19.74	0.000%
8	0.05	-27.98	22.76	-0.05	27.98	-22.76	0.000%
9	-11.37	-27.98	19.69	11.37	27.98	-19.69	0.000%
10	-19.74	-27.98	11.34	19.74	27.98	-11.34	0.000%
11	-22.82	-27.98	-0.05	22.82	27.98	0.05	0.000%
12	-19.79	-27.98	-11.43	19.79	27.98	11.43	0.000%
13	-11.46	-27.98	-19.74	11.46	27.98	19.74	0.000%
14	0.00	-48.48	0.00	0.00	48.48	-0.00	0.000%
15	-0.01	-48.48	-6.77	0.01	48.48	6.77	0.000%
16	3.38	-48.48	-5.85	-3.38	48.48	5.85	0.000%
17	5.87	-48.48	-3.37	-5.87	48.48	3.37	0.000%
18	6.78	-48.48	0.01	-6.78	48.48	-0.01	0.000%
19	5.88	-48.48	3.39	-5.88	48.48	-3.39	0.000%
20	3.40	-48.48	5.87	-3.40	48.48	-5.87	0.000%
21	0.01	-48.48	6.77	-0.01	48.48	-6.77	0.000%
22	-3.38	-48.48	5.85	3.38	48.48	-5.85	0.000%
23	-5.87	-48.48	3.37	5.87	48.48	-3.37	0.000%
24	-6.78	-48.48	-0.01	6.78	48.48	0.01	0.000%
25	-5.88	-48.48	-3.39	5.88	48.48	3.39	0.000%
26	-3.40	-48.48	-5.87	3.40	48.48	5.87	0.000%
27	-0.02	-27.98	-8.89	0.02	27.98	8.89	0.000%
28	4.44	-27.98	-7.69	-4.44	27.98	7.69	0.000%
29	7.71	-27.98	-4.43	-7.71	27.98	4.43	0.000%
30	8.92	-27.98	0.02	-8.92	27.98	-0.02	0.000%
31	7.73	-27.98	4.46	-7.73	27.98	-4.46	0.000%
32	4.48	-27.98	7.71	-4.48	27.98	-7.71	0.000%
33	0.02	-27.98	8.89	-0.02	27.98	-8.89	0.000%
34	-4.44	-27.98	7.69	4.44	27.98	-7.69	0.000%
35	-7.71	-27.98	4.43	7.71	27.98	-4.43	0.000%
36	-8.92	-27.98	-0.02	8.92	27.98	0.02	0.000%
37	-7.73	-27.98	-4.46	7.73	27.98	4.46	0.000%
38	-4.48	-27.98	-7.71	4.48	27.98	7.71	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	123 - 82.25	28.452	37	1.9258	0.0023
L2	85.75 - 57.75	14.164	37	1.5995	0.0019
L3	57.75 - 40.75	6.322	37	1.0029	0.0010
L4	45 - 29.75	3.920	37	0.7925	0.0007
L5	29.75 - 0	1.727	37	0.5506	0.0005

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.0000	3/4" x 8 ft lightning rod	37	28.452	1.9258	0.0023	24512
120.0000	2.375" OD x 5' Mount Pipe	37	27.234	1.9125	0.0023	24512
118.0000	800MHz 2X50W RRH W/FILTER	37	26.423	1.9035	0.0023	24512
112.0000	(4) DB844H90E-XY w/Mount Pipe	37	24.005	1.8734	0.0023	11142
100.0000	APX16DWV-16DWV-S-E-A20 w/ mount pipe	37	19.307	1.7867	0.0022	5328

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
93.0000	DB-T1-6Z-8AB-0Z	37	16.706	1.7092	0.0021	4084
75.0000	APXV18-206517S-C w/ Mount Pipe	37	10.750	1.3801	0.0016	2839
65.0000	AM-X-CD-16-65-00T-RET w/ Mount Pipe	37	8.012	1.1535	0.0013	2519
50.0000	KS24019-L112A	37	4.793	0.8698	0.0008	3607

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	123 - 82.25	72.560	12	4.9153	0.0059
L2	85.75 - 57.75	36.150	12	4.0835	0.0049
L3	57.75 - 40.75	16.146	12	2.5614	0.0026
L4	45 - 29.75	10.013	12	2.0243	0.0018
L5	29.75 - 0	4.412	12	1.4067	0.0012

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.0000	3/4" x 8 ft lightning rod	12	72.560	4.9153	0.0059	9730
120.0000	2.375" OD x 5' Mount Pipe	12	69.456	4.8816	0.0058	9730
118.0000	800MHz 2X50W RRH W/FILTER	12	67.390	4.8585	0.0058	9730
112.0000	(4) DB844H90E-XY w/Mount Pipe	12	61.230	4.7819	0.0058	4422
100.0000	APX16DWV-16DWV-S-E-A20 w/ mount pipe	12	49.259	4.5608	0.0056	2112
93.0000	DB-T1-6Z-8AB-0Z	12	42.629	4.3632	0.0053	1618
75.0000	APXV18-206517S-C w/ Mount Pipe	12	27.444	3.5237	0.0041	1121
65.0000	AM-X-CD-16-65-00T-RET w/ Mount Pipe	12	20.459	2.9457	0.0032	993
50.0000	KS24019-L112A	12	12.243	2.2217	0.0021	1418

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	123 - 82.25 (1)	TP28.114x22x0.1875	40.7500	0.0000	0.0	36.000	16.3072	-8.35	587.06	0.014
L2	82.25 - 57.75 (2)	TP31.4152x27.2139x0.25	28.0000	0.0000	0.0	39.000	24.7296	-13.43	964.45	0.014
L3	57.75 - 40.75 (3)	TP33.966x31.4152x0.4476	17.0000	0.0000	0.0	28.848	46.7089	-16.17	1347.46	0.012
L4	40.75 - 29.75 (4)	TP35.1164x32.4332x0.4681	15.2500	0.0000	0.0	28.896	51.4808	-20.31	1487.59	0.014
L5	29.75 - 0 (5)	TP39.58x35.1164x0.487	29.7500	0.0000	0.0	31.116	60.4300	-27.97	1880.34	0.015

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	123 - 82.25	TP28.114x22x0.1875	290.71	31.607	36.000	0.878	0.00	0.000	36.000	0.000

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L2	82.25 - 57.75 (1)	TP31.4152x27.2139x0.25	742.17	46.838	39.000	1.201	0.00	0.000	39.000	0.000
L3	57.75 - 40.75 (2)	TP33.966x31.4152x0.447 6	993.59	31.641	28.848	1.097	0.00	0.000	28.848	0.000
L4	40.75 - 29.75 (3)	TP35.1164x32.4332x0.46 81	1309.7 9	35.910	28.896	1.243	0.00	0.000	28.896	0.000
L5	29.75 - 0 (4)	TP39.58x35.1164x0.487	1965.6 3	40.648	31.116	1.306	0.00	0.000	31.116	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	123 - 82.25 (1)	TP28.114x22x0.1875	14.03	0.860	24.000	0.072	0.04	0.002	24.000	0.000
L2	82.25 - 57.75 (2)	TP31.4152x27.2139x0.25	19.25	0.779	26.000	0.060	0.11	0.003	26.000	0.000
L3	57.75 - 40.75 (3)	TP33.966x31.4152x0.447 6	20.19	0.432	19.232	0.045	0.17	0.003	19.232	0.000
L4	40.75 - 29.75 (4)	TP35.1164x32.4332x0.46 81	21.20	0.412	19.264	0.043	0.23	0.003	19.264	0.000
L5	29.75 - 0 (5)	TP39.58x35.1164x0.487	22.87	0.378	20.744	0.036	0.35	0.004	20.744	0.000

Pole Interaction Design Data

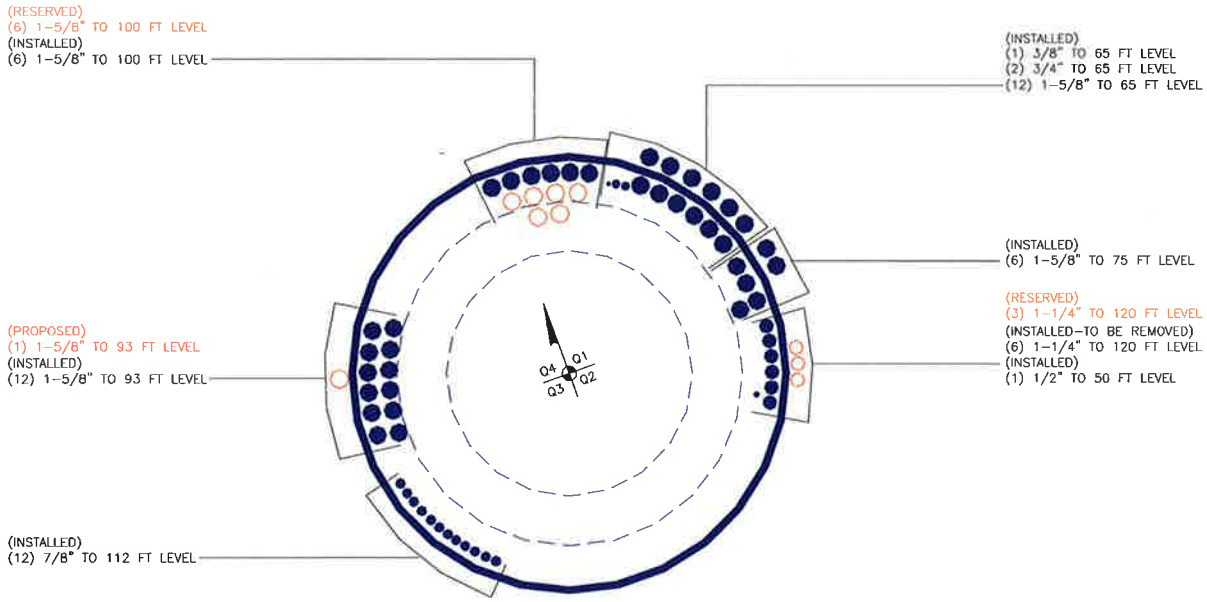
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	123 - 82.25 (1)	0.014	0.878	0.000	0.072	0.000	0.893 ✔	1.333	H1-3+VT ✔
L2	82.25 - 57.75 (2)	0.014	1.201	0.000	0.060	0.000	1.216 ✔	1.333	H1-3+VT ✔
L3	57.75 - 40.75 (3)	0.012	1.097	0.000	0.045	0.000	1.109 ✔	1.333	H1-3+VT ✔
L4	40.75 - 29.75 (4)	0.014	1.243	0.000	0.043	0.000	1.257 ✔	1.333	H1-3+VT ✔
L5	29.75 - 0 (5)	0.015	1.306	0.000	0.036	0.000	1.322 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	123 - 82.25	Pole	TP28.114x22x0.1875	1	-8.35	782.55	67.0	Pass
L2	82.25 - 57.75	Pole	TP31.4152x27.2139x0.25	2	-13.43	1285.62	91.2	Pass
L3	57.75 - 40.75	Pole	TP33.966x31.4152x0.4476	3	-16.17	1796.16	83.2	Pass
L4	40.75 - 29.75	Pole	TP35.1164x32.4332x0.4681	4	-20.31	1982.96	94.3	Pass
L5	29.75 - 0	Pole	TP39.58x35.1164x0.487	5	-27.97	2506.49	99.1	Pass
							Summary	
						Pole (L5)	99.1	Pass
						RATING =	**99.1**	**Pass**

APPENDIX B

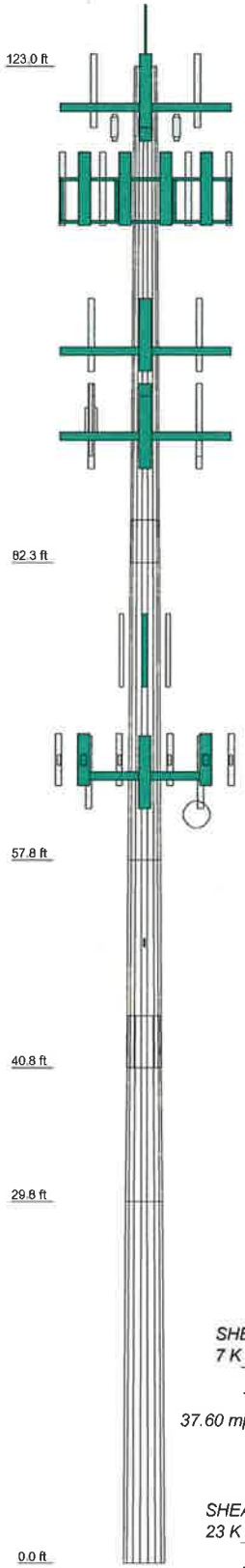
BASE LEVEL DRAWING



APPENDIX C

ADDITIONAL CALCULATIONS

Section	1	2	3	4	5
Length (ft)	40.7500	28.0000	17.0000	15.2500	29.7500
Number of Sides	18	18	18	18	18
Thickness (in)	0.1875	0.2500	0.4476	0.4681	0.4870
Socket Length (ft)	3.5000		4.2500		
Top Dia (in)	22.0000	27.2139	31.4152	32.4332	35.1164
Bot Dia (in)	28.1140	31.4152	33.9660	35.1164	39.5800
Grade	A607-60	A607-65	Reinf 48.08 ksi		Reinf 48.16 ksi / Reinf 51.86 ksi
Weight (K)	2.1	2.2	2.6	2.6	5.8



AXIAL 48 K
SHEAR 7 K
MOMENT 618 kip-ft
TORQUE 0 kip-ft
37.60 mph WIND - 1.0000 in ICE

AXIAL 28 K
SHEAR 23 K
MOMENT 1966 kip-ft
TORQUE 1 kip-ft
REACTIONS - 80.00 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
3/4" x 8 ft lightning rod	123	BXA-70063-4CF-EDIN-X w/ Mount Pipe	93
2.375" OD x 5' Mount Pipe	120	BXA-70063-4CF-EDIN-X w/ Mount Pipe	93
2.375" OD x 5' Mount Pipe	120	BXA-70063-4CF-EDIN-X w/ Mount Pipe	93
2.375" OD x 5' Mount Pipe	120	BXA-70063-4CF-EDIN-X w/ Mount Pipe	93
APXVSPP18-C-A20 w/ Mount Pipe	120	BXA-70063-4CF-EDIN-X w/ Mount Pipe	93
APXVSPP18-C-A20 w/ Mount Pipe	120	BXA-70063-4CF-EDIN-X w/ Mount Pipe	93
APXVSPP18-C-A20 w/ Mount Pipe	120	BXA-171063-8BF-2 w/ Mount Pipe	93
Platform Mount [LP 712-1]	120	BXA-171063-8BF-2 w/ Mount Pipe	93
800MHz 2X50W RRH W/FILTER	118	BXA-171085-8BF-EDIN-0 w/ Mount Pipe	93
800MHz 2X50W RRH W/FILTER	118	(2) FD9R6004/2C-3L	93
800MHz 2X50W RRH W/FILTER	118	(2) FD9R6004/2C-3L	93
PCS 1900MHz 4x45W-65MHz	118	(2) FD9R6004/2C-3L	93
PCS 1900MHz 4x45W-65MHz	118	Platform Mount [LP 712-1]	93
PCS 1900MHz 4x45W-65MHz	118	APXV18-206517S-C w/ Mount Pipe	75
Side Arm Mount [SO 102-1]	118	APXV18-206517S-C w/ Mount Pipe	75
(4) DB844H90E-XY w/Mount Pipe	112	APXV18-206517S-C w/ Mount Pipe	75
(4) DB844H90E-XY w/Mount Pipe	112	Pipe Mount [PM 601-3]	75
(4) DB844H90E-XY w/Mount Pipe	112	AM-X-CD-16-65-00T-RET w/ Mount Pipe	65
Platform Mount [LP 713-1]	112	AM-X-CD-16-65-00T-RET w/ Mount Pipe	65
APX16DWV-16DWV-S-E-A20 w/ mount pipe	100	AM-X-CD-16-65-00T-RET w/ Mount Pipe	65
APX16DWV-16DWV-S-E-A20 w/ mount pipe	100	(2) RRUS-11	65
APX16DWV-16DWV-S-E-A20 w/ mount pipe	100	(2) RRUS-11	65
ATMAA1412D-1A20	100	(2) RRUS-11	65
ATMAA1412D-1A20	100	DC6-48-60-18-8F	65
ATMAA1412D-1A20	100	(2) P65-15-XLH-RR w/ Mount Pipe	65
ATMPP1412D-1CWA	100	(2) P65-15-XLH-RR w/ Mount Pipe	65
ATMPP1412D-1CWA	100	(2) P65-15-XLH-RR w/ Mount Pipe	65
ATMPP1412D-1CWA	100	(2) TT19-08BP111-001	65
RR65-18-02DP w/ Mount Pipe	100	(2) TT19-08BP111-001	65
RR65-18-02DP w/ Mount Pipe	100	(2) TT19-08BP111-001	65
RR65-18-02DP w/ Mount Pipe	100	T-Arm Mount [TA 702-3]	65
T-Arm Mount [TA 602-3]	100	KS24019-L112A	50
DB-T1-6Z-8AB-0Z	93	Side Arm Mount [SO 702-1]	50
RRH2X40-AWS	93		
RRH2X40-AWS	93		
RRH2X40-AWS	93		
BXA-171063-12CF-EDIN-X w/ Mount Pipe	93		
BXA-171063-12CF-EDIN-X w/ Mount Pipe	93		
BXA-171063-12CF-EDIN-X w/ Mount Pipe	93		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-60	60 ksi	75 ksi	Reinf 48.16 ksi	48 ksi	61 ksi
A607-65	65 ksi	80 ksi	Reinf 51.86 ksi	52 ksi	65 ksi
Reinf 48.08 ksi	48 ksi	61 ksi			

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80.00 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 37.60 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50.00 mph wind.
5. TOWER RATING: 99.1%

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.4105

Job: *Ex. 123-ft Monopole / Berlin/Laviana Orchard*			
Project: *BU#876382 / PJF# 37513-0616 BP*			
Client: Crown Castle	Drawn by: Nick Parente, E.I.	App'd:	
Code: TIA/EIA-222-F	Date: 11/11/13	Scale: NTS	
Path:		Dwg No. E-1	

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 600 • Columbus, Ohio 43215-3708

v4.4 - Effective 7-12-13

Date: 11/11/2013
PJF Project: 37513-0616
Client Ref.# BU 876382
Site Name: Berlin/ Laviana Orchard
Description: 123 ft MP
Owner: CCI
Engineer: NZP

Asymmetric Anchor Rod Analysis

Moment =	1966	k-ft	TIA Ref.	F	Location =	Base Plate		
Axial =	26.0	kips	ASIF =	1.3333	η =	N/A	for BP, Rev. G Sect. 4.9.9	
Shear =	23.0	kips	Max Ratio =	105.0%	Threads =	N/A	for FP, Rev. G	
Anchor Qty =	12							

** For Post Installed Anchors: Check anchors for embedment, epoxy/grout bond, and capacity based on proof load. **

Item	Nominal Anchor Dia, in	Spec	Fy, ksi	Fu, ksi	Location, degrees	Anchor Circle, in	Area Override, in^2	Area, in^2	Max Net Compression, kips	Max Net Tension, kips	Load for Capacity Calc, kips	Capacity Override, kips	Capacity, kips	Capacity Ratio
1	2.250	#18J A615 Gr 75	75	100	37.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
2	2.250	#18J A615 Gr 75	75	100	52.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
3	2.250	#18J A615 Gr 75	75	100	127.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
4	2.250	#18J A615 Gr 75	75	100	142.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
5	2.250	#18J A615 Gr 75	75	100	217.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
6	2.250	#18J A615 Gr 75	75	100	232.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
7	2.250	#18J A615 Gr 75	75	100	307.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
8	2.250	#18J A615 Gr 75	75	100	322.5	46.00	0.00	3.98	170.21	165.54	165.54	0.00	195.00	84.9%
9	2.250	#18J A615 Gr 75	75	100	0.0	47.25	0.00	3.98	174.77	170.10	170.10	0.00	195.00	87.2%
10	2.250	#18J A615 Gr 75	75	100	90.0	47.25	0.00	3.98	174.77	170.10	170.10	0.00	195.00	87.2%
11	2.250	#18J A615 Gr 75	75	100	180.0	47.25	0.00	3.98	174.77	170.10	170.10	0.00	195.00	87.2%
12	2.250	#18J A615 Gr 75	75	100	270.0	47.25	0.00	3.98	174.77	170.10	170.10	0.00	195.00	87.2%
								47.76						

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

BU#:
Site Name:
App #:

Anchor Rod Data		
Qty:	8	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	46	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	44	in
Thick:	2.75	in
Grade:	55	ksi
Clip Distance:	5	in

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	39.58	in
Thick:	0.2812	in
Grade:	65	ksi
# of Sides:	0	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	1287	ft-kips
Unfactored Axial, P:	18.7	kips
Unfactored Shear, V:	15.3	kips

reactions adjusted to account for post installed anchor rods

Anchor Rod Results

TIA F --> Maximum Rod Tension	165.5 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	84.9% Pass

Base Plate Results Flexural Check

Base Plate Stress:	35.6 ksi
Allowable PL Bending Stress:	55.0 ksi
Base Plate Stress Ratio:	64.8% Pass

PL Ref. Data
Yield Line (in): 22.65
Max PL Length: 22.65

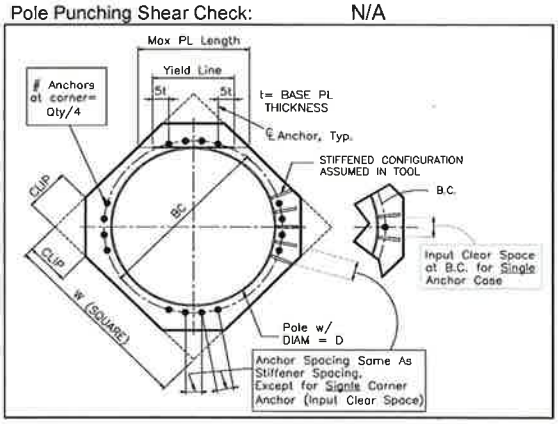
N/A - Unstiffened

Stiffener Results

Horizontal Weld :	N/A
Vertical Weld:	N/A
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	N/A
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	N/A
Plate Comp. (AISC Bracket):	N/A

Pole Results

Pole Punching Shear Check: N/A



** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 600 • Columbus, Ohio 43215-3708

Job Number:	37513-0616	**Page:**	1
Site Number:	876382	**By:**	nzp
Site Name:	Berlin/Laviana Orchard	**Date:**	11/11/2013

DRILLED PIER SOIL AND STEEL ANALYSIS - TIA/EIA-222-F

Unfactored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, M =	1966.0		k-ft
Shear, V =	23.0		kips
Axial Load, P =	28.0		kips
OTM =	1977.5	0.0	k-ft @ Ground

Safety Factors / Load Factors / Φ Factors

Tower Type =	Monopole DP
ACI Code =	ACI 318-02
Seismic Design Category =	D
Reference Standard =	TIA/EIA-222-F
Use 1.3 Load Factor?	Yes
Load Factor =	1.30

Drilled Pier Parameters

Diameter =	6	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	20	ft
fc' =	3	ksi
εc =	0.003	in/in
Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

	Safety Factor	Φ Factor
Soil Lateral Resistance =	2.00	0.75
Skin Friction =	2.00	0.75
End Bearing =	2.00	0.75
Concrete Wt. Resist Uplift =	1.25	

Load Combinations Checked per TIA/EIA-222-F

1. Ult. Skin Friction/2.00 + Ult. End Bearing/2.00 + Effective Soil Wt. - Buoyant Conc. Wt. ≥ Comp.
2. Ult. Skin Friction/2.00 + Buoyant Conc. Wt./1.25 ≥ Uplift
3. Ult. Skin Friction/1.50 + Buoyant Conc. Wt./1.50 ≥ Uplift

Steel Parameters

Number of Bars =	16	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#5	
Side Clear Cover to Ties =	4	in

Soil Parameters

Water Table Depth =	15.00	ft
Depth to Ignore Soil =	3.33	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?	Ground	

Above Full Cohesion Lateral Resistance = 4(Cohesion)(Dia)(H)
Below Full Cohesion Lateral Resistance = 8(Cohesion)(Dia)(H)

Direct Embed Pole Shaft Parameters

Dia @ Grade =		in
Dia @ Depth Below Grade =		in
Number of Sides =		
Thickness =		in
Fy =		ksi
Backfill Condition =		

Maximum Capacity Ratios

Maximum Soil Ratio =	100.0%
Maximum Steel Ratio =	100.0%

Define Soil Layers

Note: Cohesion = Undrained Shear Strength = Unconfined Compressive Strength / 2

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	5	135		38	Sand				5
2	10	135		38	Sand		600		15
3	5	135		38	Sand	40000	600		20
4									
5									
6									
7									
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	14.38	ft, from Grade
Bending Moment, M =	2308.14	k-ft, from COR
Resisting Moment, Ma =	3532.18	k-ft, from COR

MOMENT RATIO = 65.3% OK

Shear, V =	23.00	kips
Resisting Shear, Va =	35.20	kips

SHEAR RATIO = 65.3% OK

Soil Results: Uplift

Uplift, T =	0.00	kips
Allowable Uplift Cap., Ta =	62.50	kips

UPLIFT RATIO = 0.0% OK

Soil Results: Compression

Compression, C =	28.00	kips
Allowable Comp. Cap., Ca =	639.71	kips

COMPRESSION RATIO = 4.4% OK

Steel Results (ACI 318-02):

Minimum Steel Area =	13.57	sq in
Actual Steel Area =	24.96	sq in
Allowable Min Axial, Pa =	-1036.80	kips, Where Ma = 0 k-ft
Allowable Max Axial, Pa =	4726.51	kips, Where Ma = 0 k-ft

Axial Load, P =	49.21	kips @ 4.50 ft Below Grade
Moment, M =	2072.50	k-ft @ 4.50 ft Below Grade
Allowable Moment, Ma =	2598.27	k-ft

MOMENT RATIO = 79.8% OK

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

BU#: *876382*
Site Name: *Berlin/Laviana Orchard*
App #:

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	2072.5	ft-kips (* Note)
Max. Service Shaft P:	49.21	kips
Max Axial Force Type:	Comp.	

(*) Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

Enter Load Factors Below:		
For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Load Factor	Shaft Factored Loads		
1.30	Mu:	2694.25	ft-kips
1.30	Pu:	63.973	kips

Pier Properties

Concrete:

Pier Diameter =	6.0	ft
Concrete Area =	4071.5	in^2

Reinforcement:

Clear Cover to **Tie**=	4.00	in
Horiz. **Tie** Bar Size=	5	
Vert. Cage Diameter =	5.11	ft
Vert. Cage Diameter =	61.34	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	16	
As Total=	24.96	in^2
A s/ Aconc, Rho:	0.0061	0.61%

Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	

ACI 318 Code

Select Analysis ACI Code= 2002

Seismic Properties

Seismic Design Category = D
Seismic Risk = **High**

Solve (Run) <-- Press Upon Completing All Input

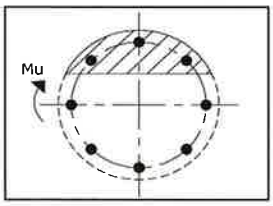
ACI 10.5 , ACI 21.10.4, and IBC 1810.

Min As for Flexural, Tension Controlled, Shafts:

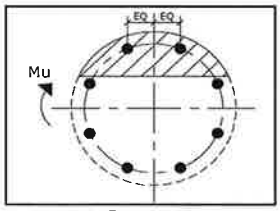
(3)*(Sqrt(f'c)/Fy:	0.0027
200 / Fy:	0.0033

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis: **12.64** in
Extreme Steel Strain, εt: **0.0127**
εt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.61%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	6144.47	kips
at Mu=(ϕ=0.65)Mn=	3164.92	ft-kips
Max Tu, (φ=0.9) Tn =	1347.84	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	63.97	kips
Drilled Shaft Moment Capacity, φMn:	**3377.76**	ft-kips
Drilled Shaft Superimposed Mu:	**2694.25**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR: 79.8%