ROBINSON & COLE LLP

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

June 20, 2014

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

Re: **Completion of Construction Activity**

Dear Ms. Bachman:

The purpose of this letter is to notify the Siting Council that construction activity associated with the Cellco Partnership d/b/a Verizon Wireless telecommunications facility modifications listed below has been completed.

EM-VER-007-130226 – 260 Beckley Road, Berlin, Connecticut
EM-VER-011-130125 – 811 Blue Hills Avenue, Bloomfield, Connecticut
EM-VER-011-130214 – 785 Park Avenue, Bloomfield, Connecticut
EM-VER-012-130107 – 130 Vernon Road, Bolton, Connecticut
EM-VER-043-130220 – 148 Roberts Road, East Hartford, Connecticut
EM-VER-057-130214 – Butternut Hollow Road, Greenwich, Connecticut
EM-VER-059-130220 – 68 Groton Long Point Road, Groton, Connecticut
EM-VER-062-130128 – 265 Benham Street, Hamden, Connecticut
EM-VER-062-130220 – 890 Evergreen Avenue, Hamden, Connecticut
EM-VER-064-130125 – 590-600 Asylum Avenue, Hartford, Connecticut
EM-VER-064-130220 – 439-455 Homestead Avenue, Hartford, Connecticut
EM-VER-077-130220A – 60 Adams Street, Manchester, Connecticut
EM-VER-077-130220B – 266 Center Street, Manchester, Connecticut
EM-VER-080-130128 – 38 Elm Street, Meriden, Connecticut
EM-VER-096-130125 – 586 Danbury Road, New Milford, Connecticut
EM-VER-094-130114 – 605 Willard Avenue, Newington, Connecticut
EM-VER-094-130220 – 123 Costello Road, Newington, Connecticut
EM-VER-144-130227 – Indian Ledge Road, Trumbull, Connecticut
EM-VER-146-130123 – 777 Talcottville Road, Vernon, Connecticut
EM-VER-152-130301 – 41 Manitock Hill Road, Waterford, Connecticut
EM-VER-156-130227 – 85 Plainfield Avenue, West Haven, Connecticut

EM-VER-164-130128 – 482 Pigeon Hill Road, Windsor, Connecticut
EM-VER-169-130220 – 445 Prospect Street, Woodstock, Connecticut

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

Copy to:
Sandy M. Carter

ROBINSON & COLE LLP

KENNETH C. BALDWIN

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Also admitted in Massachusetts

May 3, 2013

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

Re: **EM-VER-011-130125 – 811 Blue Hills Avenue, Bloomfield, Connecticut**
EM-VER-029-120106 – 161 Pinney Street, Colebrook, Connecticut
EM-VER-066-120117 – 64 Hungerford Lane, Harwinton, Connecticut
EM-VER-065-120319 – 22 Welsh Road, Hartland, Connecticut
EM-VER-084-120924 – 1052 Boston Post Road, Milford, Connecticut
EM-VER-065-120319A – 350 Hartland Boulevard, Hartland, Connecticut

Completion of Construction Activity

Dear Ms. Bachman:

The purpose of this letter is to notify the Siting Council that construction activity associated with the above-referenced Cellco Partnership d/b/a Verizon Wireless telecommunications facilities has been completed.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

Copy to:
Sandy M. Carter

12218582-v1

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

February 21, 2013

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103

RE: **EM-VER-011-130125** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 811 Blue Hills Avenue, Bloomfield, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Within 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated January 23, 2013. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

L Roberts

Linda Roberts
Executive Director

LR/CDM/jb

c: The Honorable Sydney Schulman, Mayor, Town of Bloomfield
Louie Chapman, Jr., Town Manager, Town of Bloomfield
Thomas B. Hooper, Director of Planning, Town of Bloomfield

CONNECTICUT SITING COUNCIL

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
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www.ct.gov/csc

February 4, 2013

The Honorable Sydney Schulman
Mayor
Town of Bloomfield
Town Hall
800 Bloomfield Avenue
P. O. Box 337
Bloomfield, CT 06002-0337

RE: **EM-VER-011-130125** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 811 Blue Hills Avenue, Bloomfield, Connecticut.

Dear Mayor Schulman:

The Connecticut Siting Council (Council) received a request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72, a copy of which has already been provided to you.

If you have any questions or comments regarding the proposal, please call me or inform the Council by February 20, 2013.

Thank you for your cooperation and consideration.

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/jb

c: Louie Chapman, Jr., Town Manager, Town of Bloomfield
Thomas B. Hooper, Director of Planning, Town of Bloomfield

ROBINSON & COLE LLP

EM-VER-011-130125

KENNETH C. BALDWIN

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Also admitted in Massachusetts

January 23, 2013

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification**
811 Blue Hills Avenue, Bloomfield, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 107-foot level on an existing 110-foot tower at the above-referenced address. The tower is owned by Cellco and was approved by the Council in 2007 (Docket No. 336). Cellco now intends to add three (3) model BXA-171063-12BF AWS antennas to the antenna mounting platform at the same 107-foot level. Cellco also intends to install three (3) remote radio heads ("RRHs") on the tower behind its antennas. Attached behind Tab 1 are the specifications for Cellco's AWS antennas and RRHs.

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 Louis Chapman, Jr., Town Manager for the Town of Bloomfield. A copy of this letter is also being sent to Samo Realty LLC, the owner of the property on which the tower is located.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas will be located at the 107-foot level on the existing 110-foot tower.

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. Far Field Approximation tables for Cellco's four operating frequencies at the modified facility are included behind Tab 2.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report attached behind Tab 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,

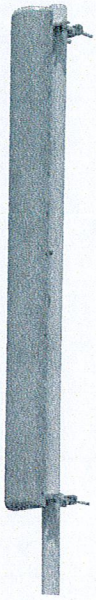
Kenneth C. Baldwin

Enclosures
Copy to:
Louie Chapman, Jr., Bloomfield Town Manager
Samo Realty LLC
Sandy M. Carter

BXA-171063-12BF-EDIN-X

Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 19.0 dBi

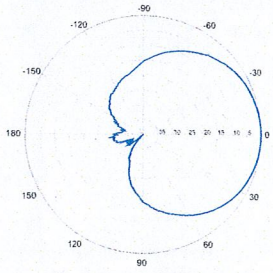


Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1820 x 154 x 105 mm	71.7 x 6.1 x 4.1 in
Depth with z-brackets	133 mm	5.2 in
Weight without mounting brackets	6.8 kg	15 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

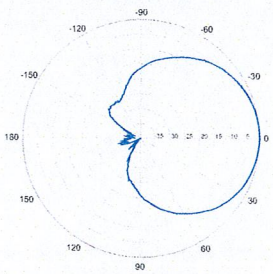
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12BF-EDIN-X-FP		

BXA-171063-12BF-EDIN-X



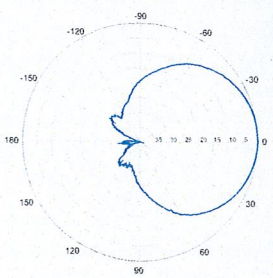
Horizontal | 1710-1880 MHz

BXA-171063-12BF-EDIN-X



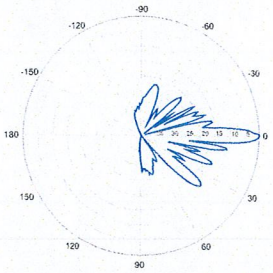
Horizontal | 1850-1990 MHz

BXA-171063-12BF-EDIN-X



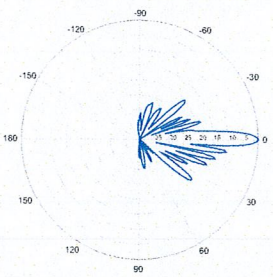
Horizontal | 1920-2170 MHz

BXA-171063-12BF-EDIN-0



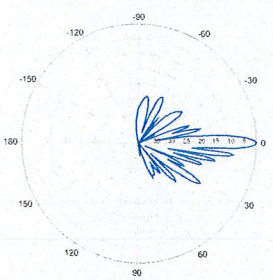
0° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-0

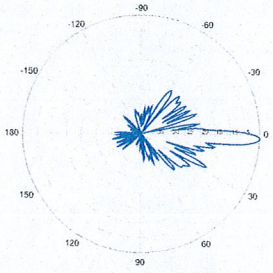


0° | Vertical | 1920-2170 MHz

BXA-171063-12BF-EDIN-X

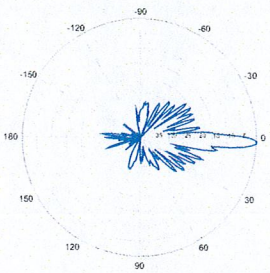
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12BF-EDIN-2



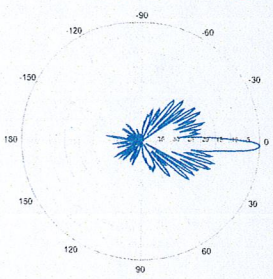
2° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-2



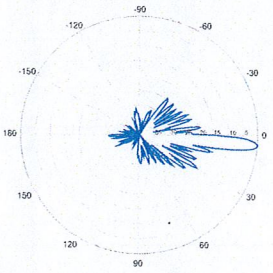
2° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-2



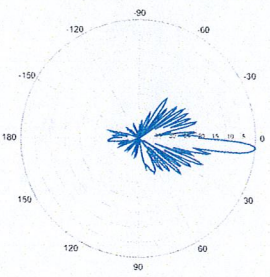
2° | Vertical | 1920-2170 MHz

BXA-171063-12BF-EDIN-5



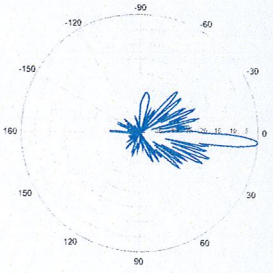
5° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-5

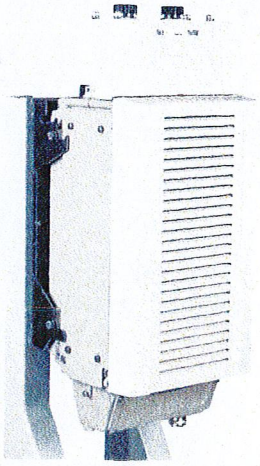


5° | Vertical | 1920-2170 MHz

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

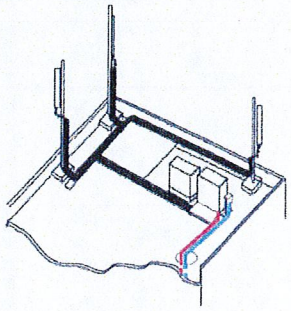
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

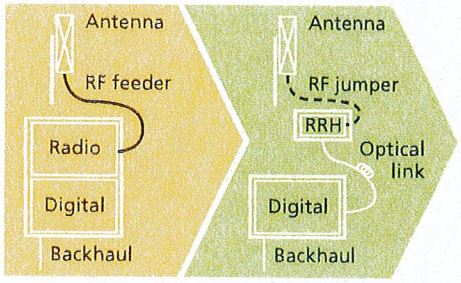
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

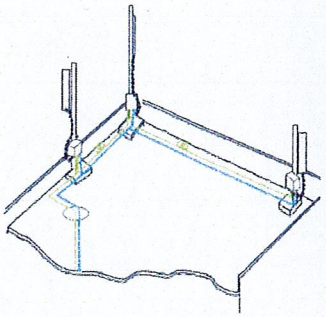
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

Alcatel·Lucent

Far Field Approximation
with downtilt variation

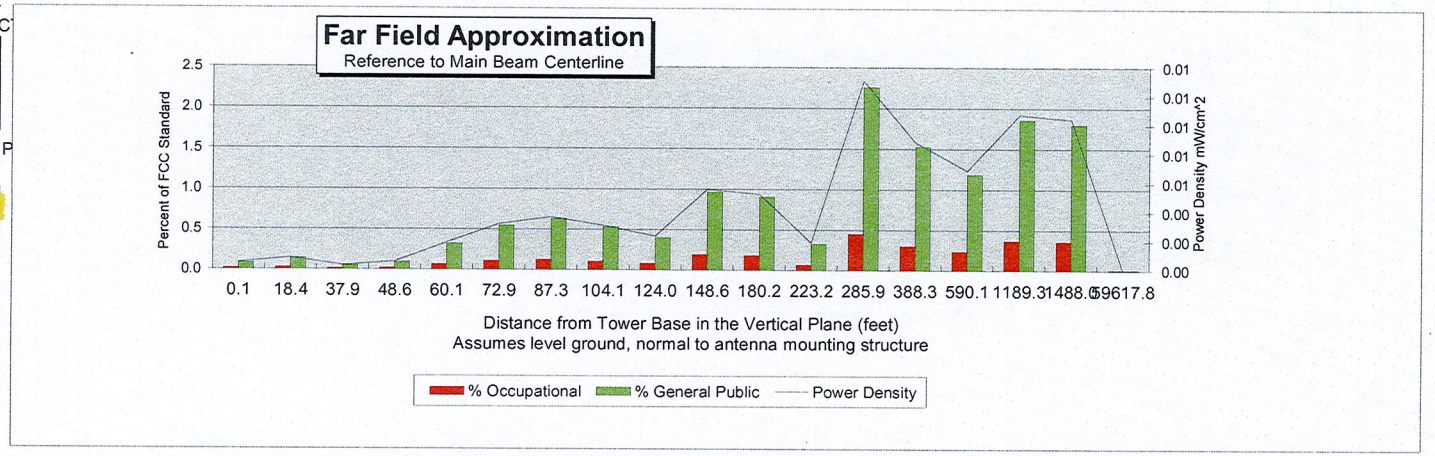
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BLOOMFIELD BLUE HILLS, C
Site #:	
Date:	11/13/12
Name:	Mark Brauer
File Name:	Bloomfield Blue Hills, CT - FF P

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**107.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**2394.0**



This approximation is only valid in the far field, which begins at: 64.4 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	0.1	
Solve for r, dx to antenna	104.0	105.6	110.7	114.8	120.1	127.0	135.8	147.1	161.9	181.4	208.1	246.2	304.2	402.0	599.2	1193.9	1491.7	#####	
Distance from Antenna Structure Base in Horizontal plane	0.1	18.4	37.9	48.6	60.1	72.9	87.3	104.1	124.0	148.6	180.2	223.2	285.9	388.3	590.1	1189.3	1488.0	#####	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	0	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.5	0.3	0.2	0.4	0.4	0.0	#NUM!
Percent of General Population Standard	0.08	0.14	0.05	0.09	0.32	0.54	0.63	0.53	0.40	0.96	0.91	0.33	2.25	1.53	1.19	1.86	1.80	0.00	#NUM!

Antenna Type DB846F65ZAXY
Max % 2.25%

Instructions:

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

Far Field Approximation
with downtilt variation

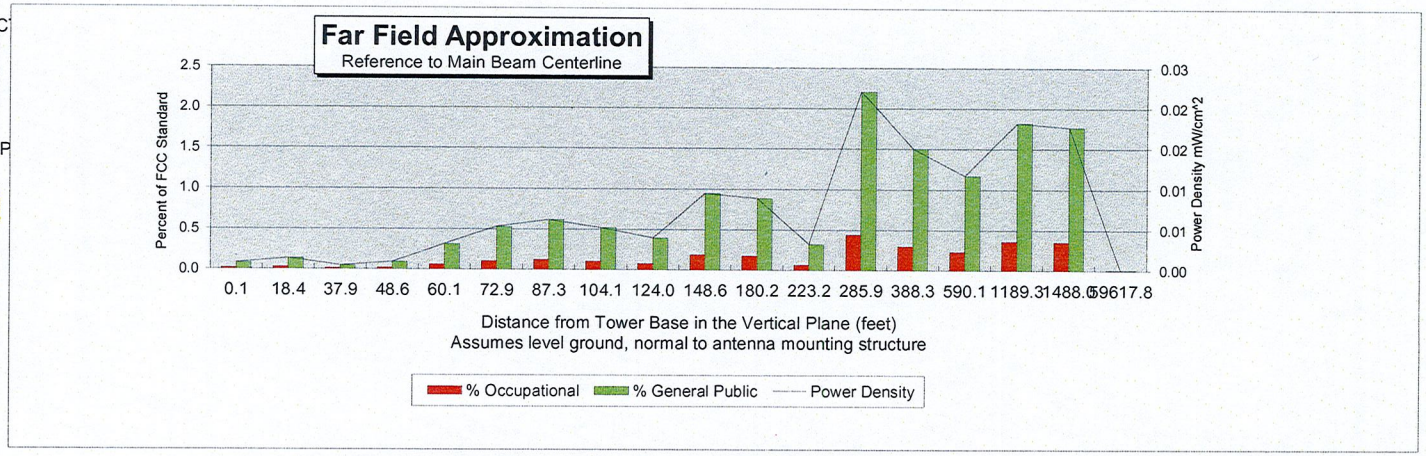
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BLOOMFIELD BLUE HILLS, C
Site #:	
Date:	11/13/12
Name:	Mark Brauer
File Name:	Bloomfield Blue Hills, CT - FF P

Operating Freq. (MHz)	**1970.0**
Antenna Height (ft):	**107.0**
Antenna Gain (dBi):	**18.1**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**2904.0**



This approximation is only valid in the far field, which begins at: 64.4 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	0.1	
Solve for r, dx to antenna	104.0	105.6	110.7	114.8	120.1	127.0	135.8	147.1	161.9	181.4	208.1	246.2	304.2	402.0	599.2	1193.9	1491.7	#####	
Distance from Antenna Structure Base in Horizontal plane	0.1	18.4	37.9	48.6	60.1	72.9	87.3	104.1	124.0	148.6	180.2	223.2	285.9	388.3	590.1	1189.3	1488.0	#####	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	0	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.02	0.02	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.4	0.4	0.0	#NUM!
Percent of General Population Standard	0.08	0.14	0.05	0.09	0.32	0.53	0.62	0.52	0.40	0.95	0.89	0.32	2.21	1.50	1.17	1.82	1.77	0.00	#NUM!

Antenna Type BXA-171063-12CF_2
Max % 2.21%

Instructions:

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

Far Field Approximation
with downtilt variation

Estimated Radiated Emission

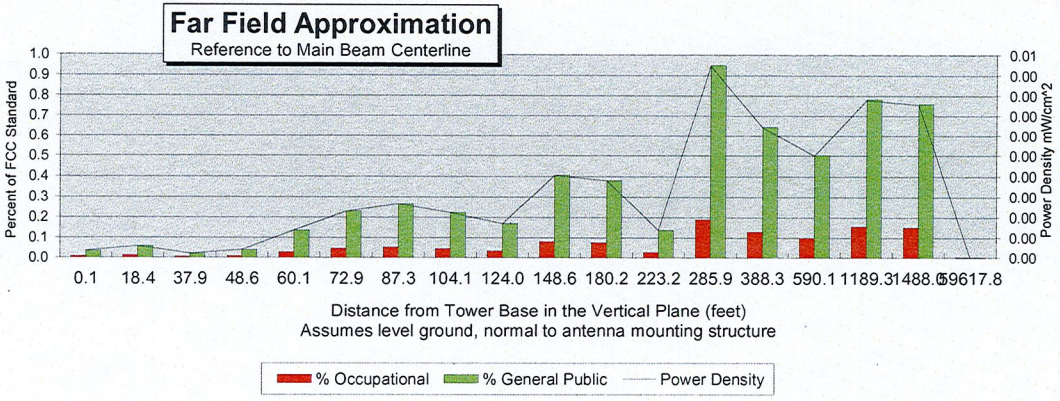
Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

verizonwireless

Location:	BLOOMFIELD BLUE HILLS, C
Site #:	
Date:	11/13/12
Name:	Mark Brauer
File Name:	Bloomfield Blue Hills, CT - FF P

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**107.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**867.0**



This approximation is only valid in the far field, which begins at: 64.4 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	0.1	
Solve for r, dx to antenna	104.0	105.6	110.7	114.8	120.1	127.0	135.8	147.1	161.9	181.4	208.1	246.2	304.2	402.0	599.2	1193.9	1491.7	#####	
Distance from Antenna Structure Base in Horizontal plane	0.1	18.4	37.9	48.6	60.1	72.9	87.3	104.1	124.0	148.6	180.2	223.2	285.9	388.3	590.1	1189.3	1488.0	#####	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	0	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.2	0.2	0.0	#NUM!
Percent of General Population Standard	0.03	0.06	0.02	0.04	0.14	0.23	0.26	0.22	0.17	0.41	0.38	0.14	0.95	0.64	0.50	0.78	0.76	0.00	#NUM!

Antenna Type DB846F65ZAXY
Max % 0.95%

Instructions:

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

Far Field Approximation
with downtilt variation

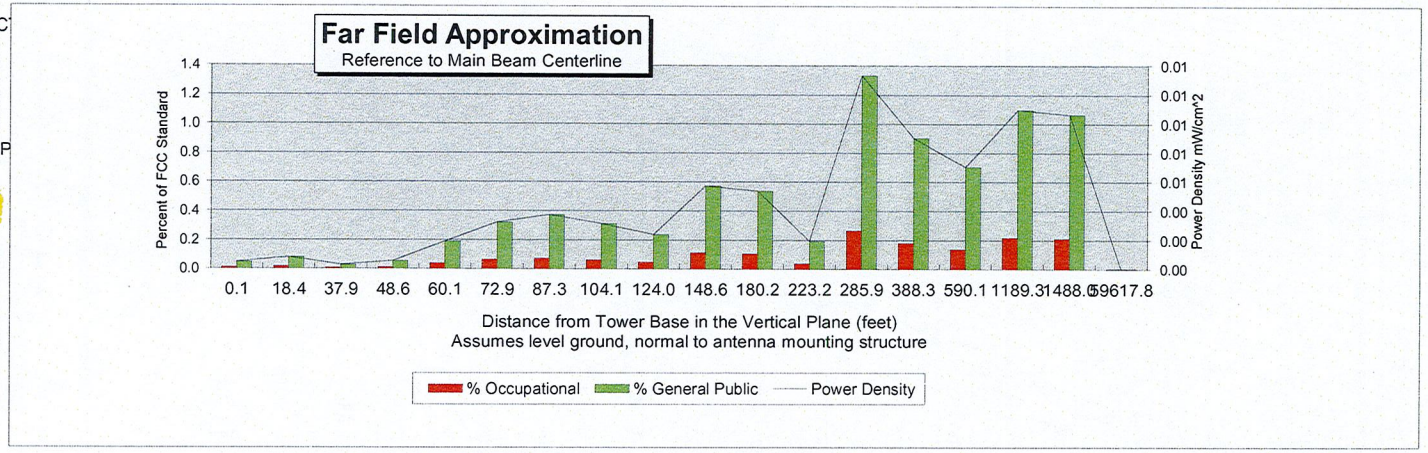
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	BLOOMFIELD BLUE HILLS, C
Site #:	
Date:	11/13/12
Name:	Mark Brauer
File Name:	Bloomfield Blue Hills, CT - FF P

Operating Freq. (MHz)	**2110.0**
Antenna Height (ft):	**107.0**
Antenna Gain (dBi):	**18.1**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**1750.0**



This approximation is only valid in the far field, which begins at: 64.4 Feet

Enter Main Beam Distance in feet below:

Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	0.1	
Solve for r, dx to antenna	104.0	105.6	110.7	114.8	120.1	127.0	135.8	147.1	161.9	181.4	208.1	246.2	304.2	402.0	599.2	1193.9	1491.7	#####	
Distance from Antenna Structure Base in Horizontal plane	0.1	18.4	37.9	48.6	60.1	72.9	87.3	104.1	124.0	148.6	180.2	223.2	285.9	388.3	590.1	1189.3	1488.0	#####	#NUM!
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	0	0
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	#NUM!
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.3	0.2	0.1	0.2	0.2	0.0	#NUM!
Percent of General Population Standard	0.05	0.08	0.03	0.06	0.19	0.32	0.37	0.31	0.24	0.57	0.54	0.19	1.33	0.90	0.70	1.10	1.06	0.00	#NUM!

Antenna Type BXA-171063-12CF_2
Max % 1.33%

Instructions:

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

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

110-ft Existing EEI Monopole

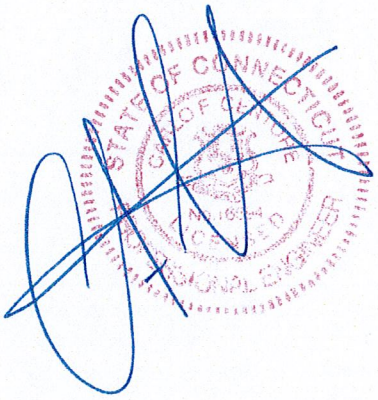
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Bloomfield Blue Hills

811 Blue Hills Ave
Bloomfield, CT

CENTEK Project No. 12124.CO56

Date: December 17, 2012



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

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

Table of Contents

Introduction

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

The host tower is a 110-ft tall extendable to 118-ft, three-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated; project no. 15165 dated December 5, 2007. The tower geometry, structure member sizes and foundation system information were obtained from the original manufacturers design documents.

The tower consists of three (3) tapered vertical steel sections conforming to ASTM A572-65. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 17.00-in at the top and 51.00-in at the base.

Antenna and appurtenance information were obtained from a combination of a visual verification from grade conducted by Centek personnel on May 9, 2012 and a Verizon RF data sheet.

Verizon proposes the installation of three (3) panel antennas, three (3) RRH's and one (1) distribution box mounted to the existing T-arms. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- VERIZON (Existing to Remain):
  Antennas: Three (3) Antel BXA-70063-6CF, three (3) Antel BXA-171063-12BF and six (6) Antel LPA-80063/6CF panel antennas mounted on three (3) existing T-Arms with a RAD center elevation of 107-ft above grade level.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **VERIZON (Proposed):**
  Antennas: Three (3) Antel BXA-171063-12BF panel antennas and three (3) Alcatel-Lucent RRH2x40-AWS mounted to three (3) existing T-Arms noted above with a RAD center elevation of 107-ft above existing grade.
  Misc Equipment: One (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted with a RAD center elevation of 107-ft above existing grade.
  Cables: One (1) 1-5/8" ∅ fiber line running on the inside of the existing monopole.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Bloomfield; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F wind speed controls.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **37.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	73.96'-110.00'	37.8%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.0-ft ∅ x 27.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design report; project no. 15165 dated December 5, 2007. The base of the tower is connected to the foundation by means of (16) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

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

Location	Vector	Proposed Reactions
Base	Shear	11 kips
	Compression	16 kips
	Moment	870 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	23.2%	**PASS**
	Lateral Deflection	0.55in.	**PASS**

Note 1: Lateral deflection typically limited to 1.0 in. for monopole tower structures.

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Compression and Bending	23.2%	**PASS**
Base Plate	Bending	19.6%	**PASS**

Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Jason R. Mead
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

General Description of Structural Analysis Program - RisaTower

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

tnxTower Features:

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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM~LPILE Plus

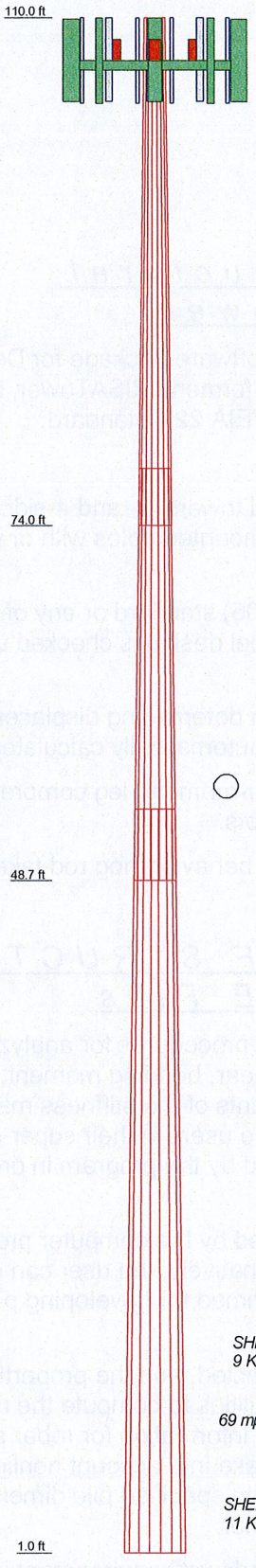
LPILE Plus is a special purpose program based on rational procedures for analyzing a pile under lateral loading. The program computes deflection, shear, bending moment, and soil response with respect to depth in nonlinear soils. Components of the stiffness matrix at the pile head may be computed internally by the program to help the users in their super-structure analysis. Several pile lengths may be automatically checked by the program in order to help the user produce a design with an optimum pile penetration.

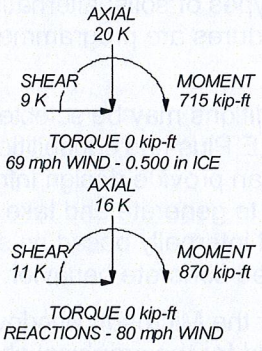
Soil behavior is modeled with p-y curves internally generated by the computer program following published recommendations for various types of soils; alternatively, the user can manually introduce other p-y curves. Special procedures are programmed for developing p-y curves for layered soils and for rocks.

Several types of pile-head boundary conditions may be selected, and the properties of the pile can also vary as a function of depth. LPILE Plus has capabilities to compute the ultimate-moment capacity of a pile's section and can provide design information for rebar arrangement. The user may optionally ask the program to generate and take into account nonlinear values of flexural stiffness (EI) which are generated internally based on specified pile dimensions, material properties, and cracked/uncracked concrete behavior.

A single, user-friendly interface written for the Microsoft Windows© environment is provided for the preparation of input, analytical run, and for the graphical observation of data contained in the output file. The program has been written in 32-bit programming codes for compatibility with the latest versions of the Microsoft Windows operating system. The program produces plain-text input and output files that may be observed and/or edited for their inclusion in project reports.

Section	1	2	3
Length (ft)	36.040	29.330	52.796
Number of Sides	18	18	18
Thickness (in)	0.188	0.313	0.313
Socket Length (ft)	4.083	5.083	
Top Dia (in)	17.000	26.984	34.074
Bot Dia (in)	28.660	36.320	51.000
Grade	A572-65		
Weight (K)	1.7	3.1	7.5





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LPA-80063/6CF (Verizon - Existing)	107	BXA-70063/6CF (Verizon - Existing)	107
BXA-70063/6CF (Verizon - Existing)	107	BXA-171063-12BF (Verizon - Proposed)	107
BXA-171063-12BF (Verizon - Proposed)	107	BXA-171063-12BF (Verizon - Existing)	107
BXA-171063-12BF (Verizon - Existing)	107	LPA-80063/6CF (Verizon - Existing)	107
LPA-80063/6CF (Verizon - Existing)	107	Valmont T-Arm (3) (Verizon)	107
LPA-80063/6CF (Verizon - Existing)	107	RRH2x40-AWS (Verizon - Proposed)	107
BXA-70063/6CF (Verizon - Existing)	107	RRH2x40-AWS (Verizon - Proposed)	107
BXA-171063-12BF (Verizon - Proposed)	107	RRH2x40-AWS (Verizon - Proposed)	107
BXA-171063-12BF (Verizon - Existing)	107	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	107
LPA-80063/6CF (Verizon - Existing)	107	Valmont Uni-Tri Bracket (Verizon - Proposed)	107
LPA-80063/6CF (Verizon - Existing)	107		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 37.8%

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

Job: *12124.CO56 - Bloomfield Blue Hills*		
Project: *110 EEI Monopole - 811 Blue Hills Ave Bloomfield, CT*		
Client: Verizon Wireless	Drawn by: jrm	App'd:
Code: TIA/EIA-222-F	Date: 12/17/12	Scale: NTS
Path: J:\Jobs\12124\00.WTCO56 - Bloomfield Blue Hills\Structural\ERI 110' EEI Monopole.eri		Dwg No. E-1

Tower Input Data

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

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	110.000-73.960	36.040	4.083	18	17.000	28.660	0.188	0.750	A572-65 (65 ksi)
L2	73.960-48.713	29.330	5.083	18	26.964	36.320	0.313	1.250	A572-65 (65 ksi)
L3	48.713-1.000	52.796		18	34.074	51.000	0.313	1.250	A572-65

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	17.262	10.006	357.308	5.968	8.636	41.374	715.086	5.004	2.662	14.197
	29.102	16.945	1735.491	10.108	14.559	119.202	3473.266	8.474	4.714	25.142
L2	28.703	26.435	2372.252	9.461	13.698	173.186	4747.625	13.220	4.196	13.426
	36.880	35.715	5850.235	12.783	18.451	317.076	11708.168	17.861	5.842	18.695
L3	36.254	33.487	4822.178	11.985	17.309	278.588	9650.700	16.747	5.447	17.43
	51.787	50.276	16319.130	17.994	25.908	629.888	32659.734	25.143	8.426	26.963

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 110.000-73.960				1	1	1		
L2 73.960-48.713				1	1	1		
L3 48.713-1.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
1 5/8 (Verizon - Existing)	C	No	Inside Pole	107.000 - 4.000	12	No Ice 1/2" Ice	0.000 0.000	0.001 0.001
1 5/8 (Verizon - Existing)	C	No	Inside Pole	107.000 - 4.000	6	No Ice 1/2" Ice	0.000 0.000	0.001 0.001
HYBRIFLEX 1-5/8" (Verizon - Proposed)	C	No	Inside Pole	107.000 - 4.000	1	No Ice 1/2" Ice	0.000 0.000	0.002 0.002

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	110.000-73.960	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.681
L2	73.960-48.713	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.521

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
L3	48.713-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.922

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	110.000-73.960	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.681
L2	73.960-48.713	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.521
L3	48.713-1.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.922

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft / C_AA_A		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
LPA-80063/6CF	A	From Face	3.000	0.000	107.000	No Ice	10.308	9.005	0.027
(Verizon - Existing)			-6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
BXA-70063/6CF	A	From Face	3.000	0.000	107.000	No Ice	7.731	4.158	0.017
(Verizon - Existing)			0.000			1/2" Ice	8.268	4.595	0.059
			0.000						
BXA-171063-12BF	A	From Face	3.000	0.000	107.000	No Ice	4.734	3.572	0.015
(Verizon - Proposed)			-4.000			1/2" Ice	5.180	4.007	0.042
			0.000						
BXA-171063-12BF	A	From Face	3.000	0.000	107.000	No Ice	4.734	3.572	0.015
(Verizon - Existing)			4.000			1/2" Ice	5.180	4.007	0.042
			0.000						
LPA-80063/6CF	A	From Face	3.000	0.000	107.000	No Ice	10.308	9.005	0.027
(Verizon - Existing)			6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-80063/6CF	B	From Face	3.000	0.000	107.000	No Ice	10.308	9.005	0.027
(Verizon - Existing)			-6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
BXA-70063/6CF	B	From Face	3.000	0.000	107.000	No Ice	7.731	4.158	0.017
(Verizon - Existing)			0.000			1/2" Ice	8.268	4.595	0.059
			0.000						
BXA-171063-12BF	B	From Face	3.000	0.000	107.000	No Ice	4.734	3.572	0.015
(Verizon - Proposed)			-4.000			1/2" Ice	5.180	4.007	0.042
			0.000						
BXA-171063-12BF	B	From Face	3.000	0.000	107.000	No Ice	4.734	3.572	0.015
(Verizon - Existing)			4.000			1/2" Ice	5.180	4.007	0.042

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.000						
LPA-80063/6CF	B	From Face	3.000	0.000	107.000	No Ice	10.308	9.005	0.027
(Verizon - Existing)			6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-80063/6CF	C	From Face	3.000	0.000	107.000	No Ice	10.308	9.005	0.027
(Verizon - Existing)			-6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
BXA-70063/6CF	C	From Face	3.000	0.000	107.000	No Ice	7.731	4.158	0.017
(Verizon - Existing)			0.000			1/2" Ice	8.268	4.595	0.059
			0.000						
BXA-171063-12BF	C	From Face	3.000	0.000	107.000	No Ice	4.734	3.572	0.015
(Verizon - Proposed)			-4.000			1/2" Ice	5.180	4.007	0.042
			0.000						
BXA-171063-12BF	C	From Face	3.000	0.000	107.000	No Ice	4.734	3.572	0.015
(Verizon - Existing)			4.000			1/2" Ice	5.180	4.007	0.042
			0.000						
LPA-80063/6CF	C	From Face	3.000	0.000	107.000	No Ice	10.308	9.005	0.027
(Verizon - Existing)			6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
Valmont T-Arm (3)	C	None		0.000	107.000	No Ice	21.000	21.000	1.008
(Verizon)						1/2" Ice	29.000	29.000	1.236
RRH2x40-AWS	A	From Face	2.500	0.000	107.000	No Ice	2.522	1.589	0.044
(Verizon - Proposed)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	B	From Face	2.500	0.000	107.000	No Ice	2.522	1.589	0.044
(Verizon - Proposed)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	C	From Face	2.500	0.000	107.000	No Ice	2.522	1.589	0.044
(Verizon - Proposed)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000						
DB-T1-6Z-8AB-0Z	C	From Face	0.500	0.000	107.000	No Ice	5.600	2.333	0.044
(Verizon - Proposed)			0.000			1/2" Ice	5.915	2.558	0.080
			0.000						
Valmont Uni-Tri Bracket	A	None		0.000	107.000	No Ice	1.750	1.750	0.290
(Verizon - Proposed)						1/2" Ice	1.940	1.940	0.306

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	90.694	1.335	0.022	68.566	A	0.000	68.566	68.566	100.00	0.000	0.000
110.000-73.96					B	0.000	68.566		100.00	0.000	0.000
0					C	0.000	68.566		100.00	0.000	0.000
L2	60.812	1.191	0.020	67.942	A	0.000	67.942	67.942	100.00	0.000	0.000
73.960-48.713					B	0.000	67.942		100.00	0.000	0.000
					C	0.000	67.942		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L3 48.713-1.000	23.619	1	0.017	172.370	A	0.000	172.370	172.370	100.00	0.000	0.000
					B	0.000	172.370		100.00	0.000	0.000
					C	0.000	172.370		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 110.000-73.960	90.694	1.335	0.016	0.500	71.569	A	0.000	71.569	71.569	100.00	0.000	0.000
						B	0.000	71.569		100.00	0.000	0.000
						C	0.000	71.569		100.00	0.000	0.000
L2 73.960-48.713	60.812	1.191	0.015	0.500	70.046	A	0.000	70.046	70.046	100.00	0.000	0.000
						B	0.000	70.046		100.00	0.000	0.000
						C	0.000	70.046		100.00	0.000	0.000
L3 48.713-1.000	23.619	1	0.012	0.500	176.346	A	0.000	176.346	176.346	100.00	0.000	0.000
						B	0.000	176.346		100.00	0.000	0.000
						C	0.000	176.346		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 110.000-73.960	90.694	1.335	0.012	68.566	A	0.000	68.566	68.566	100.00	0.000	0.000
					B	0.000	68.566		100.00	0.000	0.000
					C	0.000	68.566		100.00	0.000	0.000
L2 73.960-48.713	60.812	1.191	0.011	67.942	A	0.000	67.942	67.942	100.00	0.000	0.000
					B	0.000	67.942		100.00	0.000	0.000
					C	0.000	67.942		100.00	0.000	0.000
L3 48.713-1.000	23.619	1	0.009	172.370	A	0.000	172.370	172.370	100.00	0.000	0.000
					B	0.000	172.370		100.00	0.000	0.000
					C	0.000	172.370		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 110.000-73.960	0.681	1.653	A	1	0.65	1	1	1	68.566	1.644	0.046	C
			B	1	0.65	1	1	1	68.566			
			C	1	0.65	1	1	1	68.566			

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	1.456	0.058	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	3.142	0.066	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	305.670 kip-ft	6.243		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	1.644	0.046	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	1.456	0.058	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	3.142	0.066	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	305.670 kip-ft	6.243		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	1.644	0.046	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	1.456	0.058	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	3.142	0.066	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	305.670 kip-ft	6.243		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	1.644	0.046	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	1.456	0.058	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	3.142	0.066	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	305.670 kip-ft	6.243		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	2.171	A	1	0.65	1	1	1	71.569	1.287	0.036	C
110.000-73.96			B	1	0.65	1	1	1	71.569			
0			C	1	0.65	1	1	1	71.569			
L2	0.521	3.612	A	1	0.65	1	1	1	70.046	1.126	0.045	C
73.960-48.713			B	1	0.65	1	1	1	70.046			
			C	1	0.65	1	1	1	70.046			
L3	0.922	8.815	A	1	0.65	1	1	1	176.346	2.411	0.051	C
48.713-1.000			B	1	0.65	1	1	1	176.346			
			C	1	0.65	1	1	1	176.346			
Sum Weight:	2.124	14.599						OTM	237.350 kip-ft	4.824		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	2.171	A	1	0.65	1	1	1	71.569	1.287	0.036	C
110.000-73.96			B	1	0.65	1	1	1	71.569			
0			C	1	0.65	1	1	1	71.569			
L2	0.521	3.612	A	1	0.65	1	1	1	70.046	1.126	0.045	C
73.960-48.713			B	1	0.65	1	1	1	70.046			
			C	1	0.65	1	1	1	70.046			
L3	0.922	8.815	A	1	0.65	1	1	1	176.346	2.411	0.051	C
48.713-1.000			B	1	0.65	1	1	1	176.346			
			C	1	0.65	1	1	1	176.346			
Sum Weight:	2.124	14.599						OTM	237.350 kip-ft	4.824		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	2.171	A	1	0.65	1	1	1	71.569	1.287	0.036	C
110.000-73.96			B	1	0.65	1	1	1	71.569			
0			C	1	0.65	1	1	1	71.569			
L2	0.521	3.612	A	1	0.65	1	1	1	70.046	1.126	0.045	C
73.960-48.713			B	1	0.65	1	1	1	70.046			
			C	1	0.65	1	1	1	70.046			
L3	0.922	8.815	A	1	0.65	1	1	1	176.346	2.411	0.051	C
48.713-1.000			B	1	0.65	1	1	1	176.346			
			C	1	0.65	1	1	1	176.346			
Sum Weight:	2.124	14.599						OTM	237.350 kip-ft	4.824		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	2.171	A	1	0.65	1	1	1	71.569	1.287	0.036	C
110.000-73.96			B	1	0.65	1	1	1	71.569			
0			C	1	0.65	1	1	1	71.569			
L2	0.521	3.612	A	1	0.65	1	1	1	70.046	1.126	0.045	C
73.960-48.713			B	1	0.65	1	1	1	70.046			
			C	1	0.65	1	1	1	70.046			
L3	0.922	8.815	A	1	0.65	1	1	1	176.346	2.411	0.051	C
48.713-1.000			B	1	0.65	1	1	1	176.346			
			C	1	0.65	1	1	1	176.346			
Sum Weight:	2.124	14.599						OTM	237.350 kip-ft	4.824		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	0.925	0.026	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	0.819	0.032	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	1.768	0.037	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	171.940 kip-ft	3.512		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	0.925	0.026	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	0.819	0.032	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	1.768	0.037	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	171.940 kip-ft	3.512		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	0.925	0.026	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	0.819	0.032	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	1.768	0.037	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	171.940 kip-ft	3.512		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.681	1.653	A	1	0.65	1	1	1	68.566	0.925	0.026	C
110.000-73.96			B	1	0.65	1	1	1	68.566			
0			C	1	0.65	1	1	1	68.566			
L2	0.521	3.101	A	1	0.65	1	1	1	67.942	0.819	0.032	C
73.960-48.713			B	1	0.65	1	1	1	67.942			
			C	1	0.65	1	1	1	67.942			
L3	0.922	7.524	A	1	0.65	1	1	1	172.370	1.768	0.037	C
48.713-1.000			B	1	0.65	1	1	1	172.370			
			C	1	0.65	1	1	1	172.370			
Sum Weight:	2.124	12.278						OTM	171.940	3.512		

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

Force Totals

Load Case	Vertical Forces	Sum of Forces X	Sum of Forces Z	Sum of Overturning Moments, M_x	Sum of Overturning Moments, M_z	Sum of Torques
	K	K	K	kip-ft	kip-ft	kip-ft
Leg Weight	12.278					
Bracing Weight	0.000					
Total Member Self-Weight	12.278			0.055	0.000	
Total Weight	16.179			0.055	0.000	
Wind 0 deg - No Ice		0.000	-11.482	-860.968	0.000	0.000
Wind 30 deg - No Ice		5.678	-9.944	-745.613	-423.803	0.056
Wind 45 deg - No Ice		8.030	-8.119	-608.780	-599.348	0.080
Wind 60 deg - No Ice		9.834	-5.741	-430.457	-734.048	0.098
Wind 90 deg - No Ice		11.356	0.000	0.055	-847.606	0.113
Wind 120 deg - No Ice		9.834	5.741	430.567	-734.048	0.098
Wind 135 deg - No Ice		8.030	8.119	608.890	-599.348	0.080
Wind 150 deg - No Ice		5.678	9.944	745.723	-423.803	0.056
Wind 180 deg - No Ice		0.000	11.482	861.078	0.000	0.000
Wind 210 deg - No Ice		-5.678	9.944	745.723	423.803	-0.056
Wind 225 deg - No Ice		-8.030	8.119	608.890	599.348	-0.080
Wind 240 deg - No Ice		-9.834	5.741	430.567	734.048	-0.098
Wind 270 deg - No Ice		-11.356	0.000	0.055	847.606	-0.113
Wind 300 deg - No Ice		-9.834	-5.741	-430.457	734.048	-0.098
Wind 315 deg - No Ice		-8.030	-8.119	-608.780	599.348	-0.080
Wind 330 deg - No Ice		-5.678	-9.944	-745.613	423.803	-0.056
Member Ice	2.321					
Total Weight Ice	19.567			0.100	0.000	
Wind 0 deg - Ice		0.000	-9.236	-704.883	0.000	0.000
Wind 30 deg - Ice		4.569	-7.999	-610.433	-347.320	0.046
Wind 45 deg - Ice		6.462	-6.531	-498.398	-491.185	0.066
Wind 60 deg - Ice		7.914	-4.618	-352.392	-601.576	0.080
Wind 90 deg - Ice		9.139	0.000	0.100	-694.640	0.093
Wind 120 deg - Ice		7.914	4.618	352.592	-601.576	0.080
Wind 135 deg - Ice		6.462	6.531	498.599	-491.185	0.066
Wind 150 deg - Ice		4.569	7.999	610.634	-347.320	0.046
Wind 180 deg - Ice		0.000	9.236	705.083	0.000	0.000
Wind 210 deg - Ice		-4.569	7.999	610.634	347.320	-0.046
Wind 225 deg - Ice		-6.462	6.531	498.599	491.185	-0.066
Wind 240 deg - Ice		-7.914	4.618	352.592	601.576	-0.080
Wind 270 deg - Ice		-9.139	0.000	0.100	694.640	-0.093
Wind 300 deg - Ice		-7.914	-4.618	-352.392	601.576	-0.080
Wind 315 deg - Ice		-6.462	-6.531	-498.398	491.185	-0.066
Wind 330 deg - Ice		-4.569	-7.999	-610.433	347.320	-0.046
Total Weight	16.179			0.055	0.000	
Wind 0 deg - Service		0.000	-6.459	-484.271	0.000	0.000
Wind 30 deg - Service		3.194	-5.593	-419.383	-238.389	0.032
Wind 45 deg - Service		4.517	-4.567	-342.415	-337.133	0.045
Wind 60 deg - Service		5.532	-3.229	-242.108	-412.902	0.055
Wind 90 deg - Service		6.388	0.000	0.055	-476.778	0.064
Wind 120 deg - Service		5.532	3.229	242.218	-412.902	0.055
Wind 135 deg - Service		4.517	4.567	342.525	-337.133	0.045
Wind 150 deg - Service		3.194	5.593	419.493	-238.389	0.032
Wind 180 deg - Service		0.000	6.459	484.381	0.000	0.000

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 210 deg - Service		-3.194	5.593	419.493	238.389	-0.032
Wind 225 deg - Service		-4.517	4.567	342.525	337.133	-0.045
Wind 240 deg - Service		-5.532	3.229	242.218	412.902	-0.055
Wind 270 deg - Service		-6.388	0.000	0.055	476.778	-0.064
Wind 300 deg - Service		-5.532	-3.229	-242.108	412.902	-0.055
Wind 315 deg - Service		-4.517	-4.567	-342.415	337.133	-0.045
Wind 330 deg - Service		-3.194	-5.593	-419.383	238.389	-0.032

Load Combinations

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

Comb. No.	Description
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	110 - 73.96	Pole	Max Tension	19	0.000	0.000	-0.000
			Max. Compression	18	-5.318	0.000	-0.100
			Max. Mx	6	-3.647	-171.673	-0.054
			Max. My	10	-3.641	0.000	-175.437
			Max. Vy	6	6.624	-171.673	-0.054
			Max. Vx	10	6.752	0.000	-175.437
			Max. Torque	6			-0.113
L2	73.96 - 48.713	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-9.008	0.000	-0.100
			Max. Mx	6	-6.901	-348.589	-0.055
			Max. My	10	-6.897	0.000	-355.466
			Max. Vy	6	7.999	-348.589	-0.055
			Max. Vx	10	8.127	0.000	-355.466
			Max. Torque	6			-0.113
L3	48.713 - 1	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-19.567	0.000	-0.100
			Max. Mx	6	-16.175	-856.522	-0.056
			Max. My	10	-16.175	0.000	-870.151
			Max. Vy	6	11.361	-856.522	-0.056
			Max. Vx	10	11.488	0.000	-870.151
			Max. Torque	14			0.113

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	27	19.567	0.000	-9.236
	Max. H_x	14	16.179	11.356	0.000
	Max. H_z	2	16.179	0.000	11.482
	Max. M_x	2	870.039	0.000	11.482
	Max. M_z	6	856.522	-11.356	0.000
	Max. Torsion	14	0.113	11.356	0.000
	Min. Vert	1	16.179	0.000	0.000
	Min. H_x	6	16.179	-11.356	0.000
	Min. H_z	10	16.179	0.000	-11.482
	Min. M_x	10	-870.151	0.000	-11.482
	Min. M_z	14	-856.522	11.356	0.000
	Min. Torsion	6	-0.113	-11.356	0.000

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	16.179	0.000	0.000	0.055	0.000	0.000
Dead+Wind 0 deg - No Ice	16.179	0.000	-11.482	-870.039	0.000	0.000
Dead+Wind 30 deg - No Ice	16.179	5.678	-9.944	-753.469	-428.259	0.056
Dead+Wind 45 deg - No Ice	16.179	8.030	-8.119	-615.196	-605.651	0.080
Dead+Wind 60 deg - No Ice	16.179	9.834	-5.741	-434.993	-741.769	0.098
Dead+Wind 90 deg - No Ice	16.179	11.356	0.000	0.056	-856.522	0.113
Dead+Wind 120 deg - No Ice	16.179	9.834	5.741	435.106	-741.769	0.098
Dead+Wind 135 deg - No Ice	16.179	8.030	8.119	615.308	-605.651	0.080
Dead+Wind 150 deg - No Ice	16.179	5.678	9.944	753.582	-428.259	0.056
Dead+Wind 180 deg - No Ice	16.179	0.000	11.482	870.151	0.000	0.000
Dead+Wind 210 deg - No Ice	16.179	-5.678	9.944	753.582	428.259	-0.056
Dead+Wind 225 deg - No Ice	16.179	-8.030	8.119	615.308	605.651	-0.080
Dead+Wind 240 deg - No Ice	16.179	-9.834	5.741	435.106	741.769	-0.098
Dead+Wind 270 deg - No Ice	16.179	-11.356	0.000	0.056	856.522	-0.113
Dead+Wind 300 deg - No Ice	16.179	-9.834	-5.741	-434.993	741.769	-0.098
Dead+Wind 315 deg - No Ice	16.179	-8.030	-8.119	-615.196	605.651	-0.080
Dead+Wind 330 deg - No Ice	16.179	-5.678	-9.944	-753.469	428.259	-0.056
Dead+Ice+Temp	19.567	0.000	0.000	0.100	0.000	0.000
Dead+Wind 0 deg+Ice+Temp	19.567	0.000	-9.236	-714.896	0.000	0.000
Dead+Wind 30 deg+Ice+Temp	19.567	4.569	-7.999	-619.105	-352.246	0.046
Dead+Wind 45 deg+Ice+Temp	19.567	6.462	-6.531	-505.479	-498.151	0.065
Dead+Wind 60 deg+Ice+Temp	19.567	7.914	-4.618	-357.398	-610.108	0.080
Dead+Wind 90 deg+Ice+Temp	19.567	9.139	0.000	0.103	-704.493	0.093
Dead+Wind 120 deg+Ice+Temp	19.567	7.914	4.618	357.604	-610.108	0.080
Dead+Wind 135 deg+Ice+Temp	19.567	6.462	6.531	505.685	-498.151	0.066
Dead+Wind 150 deg+Ice+Temp	19.567	4.569	7.999	619.311	-352.246	0.046
Dead+Wind 180 deg+Ice+Temp	19.567	0.000	9.236	715.102	0.000	0.000
Dead+Wind 210 deg+Ice+Temp	19.567	-4.569	7.999	619.311	352.246	-0.046
Dead+Wind 225 deg+Ice+Temp	19.567	-6.462	6.531	505.685	498.151	-0.066
Dead+Wind 240 deg+Ice+Temp	19.567	-7.914	4.618	357.604	610.108	-0.080
Dead+Wind 270 deg+Ice+Temp	19.567	-9.139	0.000	0.103	704.493	-0.093
Dead+Wind 300 deg+Ice+Temp	19.567	-7.914	-4.618	-357.398	610.108	-0.080
Dead+Wind 315 deg+Ice+Temp	19.567	-6.462	-6.531	-505.479	498.151	-0.065
Dead+Wind 330 deg+Ice+Temp	19.567	-4.569	-7.999	-619.105	352.246	-0.046
Dead+Wind 0 deg - Service	16.179	0.000	-6.459	-489.426	0.000	0.000
Dead+Wind 30 deg - Service	16.179	3.194	-5.593	-423.848	-240.922	0.032
Dead+Wind 45 deg - Service	16.179	4.517	-4.567	-346.061	-340.715	0.045
Dead+Wind 60 deg - Service	16.179	5.532	-3.229	-244.685	-417.290	0.055
Dead+Wind 90 deg - Service	16.179	6.388	0.000	0.056	-481.845	0.063
Dead+Wind 120 deg - Service	16.179	5.532	3.229	244.798	-417.290	0.055
Dead+Wind 135 deg - Service	16.179	4.517	4.567	346.173	-340.715	0.045
Dead+Wind 150 deg - Service	16.179	3.194	5.593	423.961	-240.922	0.032
Dead+Wind 180 deg - Service	16.179	0.000	6.459	489.539	0.000	0.000
Dead+Wind 210 deg - Service	16.179	-3.194	5.593	423.961	240.922	-0.032
Dead+Wind 225 deg - Service	16.179	-4.517	4.567	346.173	340.715	-0.045
Dead+Wind 240 deg - Service	16.179	-5.532	3.229	244.798	417.290	-0.055
Dead+Wind 270 deg - Service	16.179	-6.388	0.000	0.056	481.845	-0.063
Dead+Wind 300 deg - Service	16.179	-5.532	-3.229	-244.685	417.290	-0.055
Dead+Wind 315 deg - Service	16.179	-4.517	-4.567	-346.061	340.715	-0.045
Dead+Wind 330 deg - Service	16.179	-3.194	-5.593	-423.848	240.922	-0.032

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.000	-16.179	0.000	0.000	16.179	0.000	0.000%
2	0.000	-16.179	-11.482	0.000	16.179	11.482	0.000%
3	5.678	-16.179	-9.944	-5.678	16.179	9.944	0.000%
4	8.030	-16.179	-8.119	-8.030	16.179	8.119	0.000%
5	9.834	-16.179	-5.741	-9.834	16.179	5.741	0.000%
6	11.356	-16.179	0.000	-11.356	16.179	0.000	0.000%
7	9.834	-16.179	5.741	-9.834	16.179	-5.741	0.000%
8	8.030	-16.179	8.119	-8.030	16.179	-8.119	0.000%
9	5.678	-16.179	9.944	-5.678	16.179	-9.944	0.000%
10	0.000	-16.179	11.482	0.000	16.179	-11.482	0.000%
11	-5.678	-16.179	9.944	5.678	16.179	-9.944	0.000%
12	-8.030	-16.179	8.119	8.030	16.179	-8.119	0.000%
13	-9.834	-16.179	5.741	9.834	16.179	-5.741	0.000%
14	-11.356	-16.179	0.000	11.356	16.179	0.000	0.000%
15	-9.834	-16.179	-5.741	9.834	16.179	5.741	0.000%
16	-8.030	-16.179	-8.119	8.030	16.179	8.119	0.000%
17	-5.678	-16.179	-9.944	5.678	16.179	9.944	0.000%
18	0.000	-19.567	0.000	0.000	19.567	0.000	0.000%
19	0.000	-19.567	-9.236	0.000	19.567	9.236	0.000%
20	4.569	-19.567	-7.999	-4.569	19.567	7.999	0.000%
21	6.462	-19.567	-6.531	-6.462	19.567	6.531	0.000%
22	7.914	-19.567	-4.618	-7.914	19.567	4.618	0.000%
23	9.139	-19.567	0.000	-9.139	19.567	0.000	0.000%
24	7.914	-19.567	4.618	-7.914	19.567	-4.618	0.000%
25	6.462	-19.567	6.531	-6.462	19.567	-6.531	0.000%
26	4.569	-19.567	7.999	-4.569	19.567	-7.999	0.000%
27	0.000	-19.567	9.236	0.000	19.567	-9.236	0.000%
28	-4.569	-19.567	7.999	4.569	19.567	-7.999	0.000%
29	-6.462	-19.567	6.531	6.462	19.567	-6.531	0.000%
30	-7.914	-19.567	4.618	7.914	19.567	-4.618	0.000%
31	-9.139	-19.567	0.000	9.139	19.567	0.000	0.000%
32	-7.914	-19.567	-4.618	7.914	19.567	4.618	0.000%
33	-6.462	-19.567	-6.531	6.462	19.567	6.531	0.000%
34	-4.569	-19.567	-7.999	4.569	19.567	7.999	0.000%
35	0.000	-16.179	-6.459	0.000	16.179	6.459	0.000%
36	3.194	-16.179	-5.593	-3.194	16.179	5.593	0.000%
37	4.517	-16.179	-4.567	-4.517	16.179	4.567	0.000%
38	5.532	-16.179	-3.229	-5.532	16.179	3.229	0.000%
39	6.388	-16.179	0.000	-6.388	16.179	0.000	0.000%
40	5.532	-16.179	3.229	-5.532	16.179	-3.229	0.000%
41	4.517	-16.179	4.567	-4.517	16.179	-4.567	0.000%
42	3.194	-16.179	5.593	-3.194	16.179	-5.593	0.000%
43	0.000	-16.179	6.459	0.000	16.179	-6.459	0.000%
44	-3.194	-16.179	5.593	3.194	16.179	-5.593	0.000%
45	-4.517	-16.179	4.567	4.517	16.179	-4.567	0.000%
46	-5.532	-16.179	3.229	5.532	16.179	-3.229	0.000%
47	-6.388	-16.179	0.000	6.388	16.179	0.000	0.000%
48	-5.532	-16.179	-3.229	5.532	16.179	3.229	0.000%
49	-4.517	-16.179	-4.567	4.517	16.179	4.567	0.000%
50	-3.194	-16.179	-5.593	3.194	16.179	5.593	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001

2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00019947
4	Yes	4	0.00000001	0.00022632
5	Yes	4	0.00000001	0.00019355
6	Yes	4	0.00000001	0.00001000
7	Yes	4	0.00000001	0.00019985
8	Yes	4	0.00000001	0.00022624
9	Yes	4	0.00000001	0.00019578
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00019578
12	Yes	4	0.00000001	0.00022624
13	Yes	4	0.00000001	0.00019985
14	Yes	4	0.00000001	0.00001000
15	Yes	4	0.00000001	0.00019355
16	Yes	4	0.00000001	0.00022632
17	Yes	4	0.00000001	0.00019947
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00056141
20	Yes	4	0.00000001	0.00072105
21	Yes	4	0.00000001	0.00076541
22	Yes	4	0.00000001	0.00071728
23	Yes	4	0.00000001	0.00055497
24	Yes	4	0.00000001	0.00071964
25	Yes	4	0.00000001	0.00076589
26	Yes	4	0.00000001	0.00072040
27	Yes	4	0.00000001	0.00056179
28	Yes	4	0.00000001	0.00072040
29	Yes	4	0.00000001	0.00076589
30	Yes	4	0.00000001	0.00071964
31	Yes	4	0.00000001	0.00055497
32	Yes	4	0.00000001	0.00071728
33	Yes	4	0.00000001	0.00076541
34	Yes	4	0.00000001	0.00072105
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00004845
37	Yes	4	0.00000001	0.00005484
38	Yes	4	0.00000001	0.00004631
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00004867
41	Yes	4	0.00000001	0.00005482
42	Yes	4	0.00000001	0.00004707
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00004707
45	Yes	4	0.00000001	0.00005482
46	Yes	4	0.00000001	0.00004867
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00004631
49	Yes	4	0.00000001	0.00005484
50	Yes	4	0.00000001	0.00004845

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 73.96	12.827	43	1.161	0.001
L2	78.043 - 48.713	6.016	43	0.766	0.000
L3	53.796 - 1	2.766	43	0.502	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
107.000	LPA-80063/6CF	43	12.130	1.123	0.001	20967

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	110 - 73.96	22.794	10	2.063	0.002
L2	78.043 - 48.713	10.692	10	1.361	0.000
L3	53.796 - 1	4.916	10	0.892	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
107.000	LPA-80063/6CF	10	21.555	1.995	0.002	11820

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		ksi	in^2	K	K	
L1	110 - 73.96 (1)	TP28.66x17x0.188	36.040	0.000	0.0	39.000	16.159	-3.641	630.184	0.006
L2	73.96 - 48.713 (2)	TP36.32x26.964x0.313	29.330	0.000	0.0	39.000	34.107	-6.897	1330.160	0.005
L3	48.713 - 1 (3)	TP51x34.074x0.313	52.796	0.000	0.0	37.642	50.276	-16.175	1892.490	0.009

Pole Bending Design Data

Section No.	Elevation	Size	Actual M_x	Actual f_{bx}	Allow. F_{bx}	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y	Actual f_{by}	Allow. F_{by}	Ratio $\frac{f_{by}}{F_{by}}$
	ft		kip-ft	ksi	ksi		kip-ft	ksi	ksi	
L1	110 - 73.96 (1)	TP28.66x17x0.188	175.437	19.428	39.000	0.498	0.000	0.000	39.000	0.000

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L2	73.96 - 48.713 (2)	TP36.32x26.964x0.313	355.467	14.758	39.000	0.378	0.000	0.000	39.000	0.000
L3	48.713 - 1 (3)	TP51x34.074x0.313	870.150	16.577	37.642	0.440	0.000	0.000	37.642	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	110 - 73.96 (1)	TP28.66x17x0.188	6.752	0.418	26.000	0.032	0.000	0.000	26.000	0.000
L2	73.96 - 48.713 (2)	TP36.32x26.964x0.313	8.127	0.238	26.000	0.018	0.000	0.000	26.000	0.000
L3	48.713 - 1 (3)	TP51x34.074x0.313	11.488	0.228	26.000	0.018	0.000	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	110 - 73.96 (1)	0.006	0.498	0.000	0.032	0.000	0.504 ✓	1.333	H1-3+VT ✓
L2	73.96 - 48.713 (2)	0.005	0.378	0.000	0.018	0.000	0.384 ✓	1.333	H1-3+VT ✓
L3	48.713 - 1 (3)	0.009	0.440	0.000	0.018	0.000	0.449 ✓	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	110 - 73.96	Pole	TP28.66x17x0.188	1	-3.641	840.035	37.8	Pass
L2	73.96 - 48.713	Pole	TP36.32x26.964x0.313	2	-6.897	1773.103	28.8	Pass
L3	48.713 - 1	Pole	TP51x34.074x0.313	3	-16.175	2522.689	33.7	Pass
							Summary	
						Pole (L1)	37.8	Pass
						RATING =	**37.8**	**Pass**

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		110-ft EEI Monopole Bloomfield, CT
Rev. 0: 12/17/12		Prepared by: J.R.M. Checked by: C.F.C. Job No. 12124.CO56

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 870·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 11·kips	(Input From RisaTower)
Axial Force =	Axial := 16·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 16	(User Input)
Diameter of Bolt Circle =	D_{bc} := 59.00·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 100·ksi	(User Input)
Bolt Yield Strength =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 50

Plate Yield Strength =	Fy_{bp} := 50·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.5·in	(User Input)
Base Plate Diameter =	D_{bp} := 65.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 51.00·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 29.5 \cdot in$

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

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

$d_1 = 11.29 \cdot in$
$d_2 = 20.86 \cdot in$
$d_3 = 27.25 \cdot in$
$d_4 = 29.50 \cdot in$
$d_5 = 27.25 \cdot in$
$d_6 = 20.86 \cdot in$
$d_7 = 11.29 \cdot in$
$d_8 = 0.00 \cdot in$
$d_9 = -11.29 \cdot in$
$d_{10} = -20.86 \cdot in$
$d_{11} = -27.25 \cdot in$
etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 25.5 \cdot in$

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

$MA_1 = 0.00 \cdot in$
$MA_2 = 0.00 \cdot in$
$MA_3 = 1.75 \cdot in$
$MA_4 = 4.00 \cdot in$
$MA_5 = 1.75 \cdot in$
$MA_6 = 0.00 \cdot in$
$MA_7 = 0.00 \cdot in$
$MA_8 = 0.00 \cdot in$
$MA_9 = 0.00 \cdot in$
$MA_{10} = 0.00 \cdot in$
$MA_{11} = 0.00 \cdot in$
etc

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 32.2 \cdot in$

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		110-ft EEI Monopole Bloomfield, CT
Rev. 0: 12/17/12		Prepared by: J.R.M. Checked by: C.F.C. Job No. 12124.CO56

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 6.962 \times 10^3 \cdot in^2$

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

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

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

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

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

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 43.2 \cdot kips$

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

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

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 22$ Bolts are "upset bolts". Use net area per AISC

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

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.172 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 2.5 \cdot ksi$

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

Check Combined Stress Requirement:

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

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

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

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = 45.2 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 13.9 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

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

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 23.2$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

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

$C_1 = 17.9 \cdot kips$ $C_7 = 17.9 \cdot kips$

$C_2 = 32.3 \cdot kips$ $C_8 = 1.0 \cdot kips$

$C_3 = 41.9 \cdot kips$ $C_9 = -15.9 \cdot kips$

$C_4 = 45.2 \cdot kips$ $C_{10} = -30.3 \cdot kips$

$C_5 = 41.9 \cdot kips$ $C_{11} = -39.9 \cdot kips$

$C_6 = 32.3 \cdot kips$ etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 9.8 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 49.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 19.6$

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

Condition3 = "Ok"

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Subject:	CAISSON FOUNDATION
Location:	110-ft EEI Monopole Bloomfield, CT
Rev. 0: 12/17/12	Prepared by: J.R.M. Checked by: C.F.C. Job No. 12124.CO56

Caisson Foundation:

Input Data:

Shear Force =	$S := 11k$	*USER INPUT-FROM RISATower*
Overturning Moment =	$M := 870ft \cdot k$	*USER INPUT-FROM RISATower*
Applied Axial Load =	$A1 := 16k$	*USER INPUT-FROM RISATower*
Bending Moment =	$Mu := 956ft \cdot k$	*USER INPUT--FROM LPILE*
Moment Capacity =	$Mn := 5321ft \cdot k$	*USER INPUT--FROM LPILE*
Foundation Diameter =	$d := 7.0ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 27.0ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 1.0ft$	*USER INPUT*
Number of Rebar =	$n := 36$	*USER INPUT*
Area of Rebar =	$Ar := 0.79in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 4ksi$	*USER INPUT*

Check Foundation Depth:

Depth of Caisson Below Ground Level =

$$LD := L_c - L_{pag} = 26ft$$ (TIA/EIA-222-F 7.2.5)

Depth Required =

$$LD1 := 2.0ft + \left(\frac{S \cdot ft^2}{3k \cdot d}\right) + 2ft \cdot .5\left(\frac{M \cdot ft}{3 \cdot k \cdot d} + \frac{S \cdot ft}{2k} + \frac{S^2 \cdot ft^3}{18k^2 \cdot d^2}\right)^{.5} = 16.24ft$$

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

DepthCheck = "OK"

Check Moment Capacity:

Factor of Safety =

$$FS := \frac{Mn}{Mu} = 5.6$$

Factor of Safety Required =

$FS_{reqd} := 1.3$

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

FOSCheck = "OK"

Check Axial Capacity:

Concrete Weight =

$$A2 := .150\frac{k}{ft^3} \cdot LD \cdot \pi \frac{d^2}{4} = 150.1 \cdot kips$$

Total Axial Load =

$$AT := A1 + A2 = 166.1 \cdot kips$$

Area of Concrete =

$$Ag := \pi \cdot \frac{d^2}{4} = 38.48ft^2$$

Axial Capacity =

$$Po := n \cdot Ar \cdot fy + (Ag - n \cdot Ar) \cdot 0.85 \cdot f'c = 20451.7 \cdot kips$$

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

AxialCheck = "OK"

Bloomfield Blue Hills Caisson Analysis.lpo

LPILE Plus for Windows, Version 5.0 (5.0.39)

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

This program is licensed to:

User
Centek Engineering, Inc.

Path to file locations: J:\Jobs\1212400.WI\CO56 - Bloomfield Blue Hills\Structural\LPile\
Name of input data file: Bloomfield Blue Hills Caisson Analysis.lpd
Name of output file: Bloomfield Blue Hills Caisson Analysis.lpo
Name of plot output file: Bloomfield Blue Hills Caisson Analysis.lpp
Name of runtime file: Bloomfield Blue Hills Caisson Analysis.lpr

Time and Date of Analysis

Date: December 17, 2012 Time: 9:51:36

Problem Title

12124.CO56 - Bloomfield Blue Hills

Program Options

Units Used in Computations - US Customary Units: Inches, Pounds

Basic Program Options:

Analysis Type 3:
- Computation of Nonlinear Bending Stiffness and Ultimate Bending Moment Capacity with Pile Response Computed Using Nonlinear EI

Computation Options:
- User-specified p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- Analysis includes computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-04 in
- Maximum allowable deflection = 1.0000E+02 in

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

Pile Structural Properties and Geometry

Pile Length = 324.00 in

Depth of ground surface below top of pile = 12.00 in

Slope angle of ground surface = .00 deg.

Structural properties of pile defined using 2 points

Point	Depth X in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	0.0000	84.00000000	2443920.	5541.8000	3000000.
2	324.0000	84.00000000	2443920.	5541.8000	3000000.

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

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is modelled using user-specified p-y curves
Distance from top of pile to top of layer = 12.000 in
Distance from top of pile to bottom of layer = 60.000 in

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 60.000 in
Distance from top of pile to bottom of layer = 228.000 in
p-y subgrade modulus k for top of soil layer = 35.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 35.000 lbs/in**3

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 336.000 in
p-y subgrade modulus k for top of soil layer = 100.000 lbs/in**3
p-y subgrade modulus k for bottom of layer = 100.000 lbs/in**3

(Depth of lowest layer extends 12.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 6 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	.00000
2	60.00	.00000
3	60.00	.07200
4	228.00	.07200
5	228.00	.03800
6	336.00	.03800

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

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

Shear Strength of Soils

Shear strength parameters with depth defined using 4 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	60.000	.00000	32.00	------	------
2	228.000	.00000	32.00	------	------
3	228.000	.00000	32.00	------	------
4	336.000	.00000	32.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) Values of E50 are reported for clay strata.
(3) Default values will be generated for E50 when input values are 0.
(4) RQD and k_rm are reported only for weak rock strata.

User-specified p-y Curves

User-specified p-y curves defined using 2 curves.

User-specified curve number 1 at depth = 12.000in

Point No.	y in	p, lbs/in
1	.0000	.000

User-specified curve number 2 at depth = 60.000in

Point No.	y in	p, lbs/in
1	.0000	.000

Loading Type

Static loading criteria was used for computation of p-y curves.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 11000.000 lbs
Bending moment at pile head = 10440000.000 in-lbs
Axial load at pile head = 16000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 84.0000 in

Material Properties:

Compressive Strength of Concrete = 4.000 kip/in**2
Yield Stress of Reinforcement = 60. kip/in**2
Modulus of Elasticity of Reinforcement = 29000. kip/in**2
Number of Reinforcing Bars = 36
Area of Single Bar = .79000 in**2
Number of Rows of Reinforcing Bars = 19
Area of Steel = 28.440 in**2
Area of Shaft = 5541.769 in**2
Percentage of Steel Reinforcement = .513 percent
Cover Thickness (edge to bar center) = 4.000 in

Unfactored Axial Squash Load Capacity = 20451.72 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	.790	38.000
2	1.580	37.423
3	1.580	35.708
4	1.580	32.909
5	1.580	29.110
6	1.580	24.426
7	1.580	19.000
8	1.580	12.997
9	1.580	6.599
10	1.580	0.000
11	1.580	-6.599
12	1.580	-12.997
13	1.580	-19.000
14	1.580	-24.426
15	1.580	-29.110
16	1.580	-32.909
17	1.580	-35.708
18	1.580	-37.423
19	.790	-38.000

Axial Thrust Force = 16000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
5914929.	9.463887E+12	6.250000E-07	.00002712	43.39882833	96.35706860	714.10376
11776526.	9.421221E+12	.00000125	.00005347	42.77379566	188.56829	1405.55009
17584967.	9.378649E+12	.00000188	.00007981	42.56530792	279.47341	2096.98862
23340251.	9.336100E+12	.00000250	.00010615	42.46095139	369.07240	2788.41898
29042378.	9.293561E+12	.00000313	.00013249	42.39824635	457.36530	3479.84108
29042378.	7.744634E+12	.00000375	.00006962	18.56484121	239.26427	6681.07352
29042378.	6.638258E+12	.00000438	.00008059	18.41968185	276.07965	7813.00287
29042378.	5.808476E+12	.00000500	.00009156	18.31296962	312.71675	8944.61940
29042378.	5.163089E+12	.00000563	.00010255	18.23189467	349.17502	10075.92218
29042378.	4.646780E+12	.00000625	.00011375	18.19999892	386.12218	11201.25020
29042378.	4.224346E+12	.00000688	.00012498	18.17936593	422.97208	12325.48892
29042378.	3.872317E+12	.00000750	.00013601	18.13529617	458.91359	13455.57308
29042378.	3.574446E+12	.00000813	.00014706	18.09950513	494.67776	

14585.30410					
29042378.	3.319129E+12	.00000875	.00015811	18.07023293	530.26424
15714.67839					
29042378.	3.097854E+12	.00000938	.00016918	18.04617780	565.67234
16843.69541					
29042378.	2.904238E+12	.00001000	.00018026	18.02637094	600.90161
17972.35243					
29042378.	2.733400E+12	.00001063	.00019136	18.01007134	635.95156
19100.64677					
29042378.	2.581545E+12	.00001125	.00020246	17.99670070	670.82167
20228.57640					
29042378.	2.445674E+12	.00001188	.00021358	17.98580092	705.51130
21356.13981					
29042378.	2.323390E+12	.00001250	.00022471	17.97700900	740.01998
22483.33424					
29042378.	2.212753E+12	.00001313	.00023586	17.97003204	774.34727
23610.15656					
29042378.	2.112173E+12	.00001375	.00024701	17.96462470	808.49245
24736.60590					
29042378.	2.020339E+12	.00001438	.00025818	17.96058923	842.45503
25862.67936					
29042378.	1.936159E+12	.00001500	.00026937	17.95775789	876.23439
26988.37532					
29042378.	1.858712E+12	.00001563	.00028056	17.95599550	909.83015
28113.68954					
29042378.	1.787223E+12	.00001625	.00029177	17.95517939	943.24153
29238.62171					
29042378.	1.721030E+12	.00001688	.00030299	17.95521444	976.46822
30363.16693					
29042378.	1.659564E+12	.00001750	.00031423	17.95600802	1009.50929
31487.32593					
29042378.	1.602338E+12	.00001813	.00032548	17.95749253	1042.36451
32611.09299					
29042378.	1.548927E+12	.00001875	.00033674	17.95959789	1075.03298
33734.46865					
29042378.	1.498961E+12	.00001938	.00034802	17.96227401	1107.51440
34857.44729					
29042378.	1.452119E+12	.00002000	.00035931	17.96546835	1139.80798
35980.02836					
29042378.	1.408115E+12	.00002063	.00037061	17.96913832	1171.91313
37102.20914					
29042378.	1.366700E+12	.00002125	.00038193	17.97324640	1203.82924
38223.98691					
29396641.	1.343846E+12	.00002188	.00039326	17.97776002	1235.55575
39345.35849					
30212598.	1.342782E+12	.00002250	.00040461	17.98264915	1267.09200
40466.32143					
31027831.	1.341744E+12	.00002313	.00041597	17.98788875	1298.43748
41586.87210					
31842329.	1.340730E+12	.00002375	.00042734	17.99345130	1329.59126
42707.01042					
32656094.	1.339737E+12	.00002438	.00043873	17.99931926	1360.55296
43826.73120					
34281410.	1.337811E+12	.00002563	.00046155	18.01189631	1421.89742
46064.90955					
35903740.	1.335953E+12	.00002688	.00048443	18.02548724	1482.46545
48301.38588					
37523056.	1.334153E+12	.00002813	.00050737	18.03998691	1542.25176
50536.13568					
39139318.	1.332402E+12	.00002938	.00053037	18.05530518	1601.25072
52769.13690					
40752498.	1.330694E+12	.00003063	.00055344	18.07137197	1659.45694
55000.36277					

42362555.	1.329021E+12	.00003188	.00057656	18.08812469	1716.86457
57229.78974					
43969463.	1.327380E+12	.00003313	.00059975	18.10551578	1773.46808
59457.38891					
45378921.	1.320114E+12	.00003438	.00062202	18.09501904	1826.84043
60000.00000					
46491509.	1.305025E+12	.00003563	.00064283	18.04426521	1875.76856
60000.00000					
47463706.	1.287151E+12	.00003688	.00066294	17.97793776	1922.24319
60000.00000					
48315523.	1.267292E+12	.00003813	.00068243	17.89986187	1966.54947
60000.00000					
49089913.	1.246728E+12	.00003938	.00070152	17.81628603	2009.22388
60000.00000					
49757531.	1.224801E+12	.00004063	.00072001	17.72331744	2049.90053
60000.00000					
50423819.	1.204151E+12	.00004188	.00073853	17.63663739	2090.04326
60000.00000					
50995021.	1.182493E+12	.00004313	.00075648	17.54155594	2128.29272
60000.00000					
51502084.	1.160610E+12	.00004438	.00077404	17.44320506	2165.13667
60000.00000					
52008050.	1.139902E+12	.00004563	.00079163	17.35082477	2201.49630
60000.00000					
52512913.	1.120275E+12	.00004688	.00080925	17.26394194	2237.36949
60000.00000					
52928672.	1.099817E+12	.00004813	.00082624	17.16871029	2271.40106
60000.00000					
53301816.	1.079530E+12	.00004938	.00084296	17.07258493	2304.34463
60000.00000					
53674052.	1.060228E+12	.00005063	.00085970	16.98166662	2336.84761
60000.00000					
54045368.	1.041838E+12	.00005188	.00087646	16.89557987	2368.90794
60000.00000					
54415758.	1.024297E+12	.00005313	.00089324	16.81398672	2400.52379
60000.00000					
55060805.	1.012613E+12	.00005438	.00091350	16.80000025	2438.37425
60000.00000					
55074651.	9.901061E+11	.00005563	.00093002	16.71953112	2468.40144
60000.00000					
55334185.	9.729088E+11	.00005688	.00094545	16.62323052	2495.88774
60000.00000					
55593019.	9.564390E+11	.00005813	.00096089	16.53141600	2522.99940
60000.00000					
55851174.	9.406514E+11	.00005938	.00097635	16.44381219	2549.73559
60000.00000					
56108638.	9.255033E+11	.00006063	.00099183	16.36015874	2576.09457
60000.00000					
56365394.	9.109559E+11	.00006188	.00100734	16.28021532	2602.07450
60000.00000					
56621464.	8.969737E+11	.00006313	.00102286	16.20376915	2627.67447
60000.00000					
56840432.	8.829582E+11	.00006438	.00103799	16.12412864	2652.18054
60000.00000					
57017489.	8.688379E+11	.00006563	.00105266	16.04058784	2675.52782
60000.00000					
57193969.	8.552369E+11	.00006688	.00106735	15.96043915	2698.53458
60000.00000					
57369868.	8.421265E+11	.00006813	.00108206	15.88349730	2721.19950
60000.00000					
57545194.	8.294803E+11	.00006938	.00109679	15.80959207	2743.52149
60000.00000					
57719927.	8.172733E+11	.00007063	.00111154	15.73856074	2765.49890

60000.00000					
57894084.	8.054829E+11	.00007188	.00112630	15.67025810	2787.13077
60000.00000					
58067639.	7.940874E+11	.00007313	.00114108	15.60454148	2808.41531
60000.00000					
58240597.	7.830668E+11	.00007438	.00115588	15.54128319	2829.35132
60000.00000					
58584744.	7.620780E+11	.00007688	.00118554	15.42167348	2870.17300
60000.00000					
58925681.	7.423708E+11	.00007938	.00122223	15.39817411	2919.14333
60000.00000					
59144552.	7.223762E+11	.00008188	.00124910	15.25617403	2952.88331
60000.00000					
59361676.	7.035458E+11	.00008438	.00127603	15.12333387	2985.47597
60000.00000					
59577061.	6.857791E+11	.00008688	.00130303	14.99887508	3016.91337
60000.00000					
59790678.	6.689866E+11	.00008938	.00133009	14.88209921	3047.18662
60000.00000					
60002518.	6.530886E+11	.00009188	.00135721	14.77238792	3076.28711
60000.00000					
60212541.	6.380137E+11	.00009438	.00138440	14.66918296	3104.20551
60000.00000					
60420762.	6.236982E+11	.00009688	.00141166	14.57199365	3130.93340
60000.00000					
60615364.	6.099659E+11	.00009938	.00143873	14.47780341	3156.21292
60000.00000					
60748489.	5.963042E+11	.00010188	.00146457	14.37613803	3179.10466
60000.00000					
60880088.	5.832823E+11	.00010438	.00149047	14.27991754	3200.92078
60000.00000					
61010141.	5.708551E+11	.00010688	.00151642	14.18876392	3221.65319
60000.00000					
61138630.	5.589818E+11	.00010938	.00154244	14.10233420	3241.29375
60000.00000					
61265550.	5.476250E+11	.00011188	.00156852	14.02031797	3259.83435
60000.00000					
61762700.	5.400018E+11	.00011438	.00160125	14.00000042	3281.77398
60000.00000					
61762700.	5.284509E+11	.00011688	.00163480	13.98762864	3302.35776
60000.00000					
61762700.	5.173839E+11	.00011938	.00165968	13.90311152	3316.09196
60000.00000					
61816170.	5.072096E+11	.00012188	.00168462	13.82255727	3328.81746
60000.00000					
61926645.	4.979027E+11	.00012438	.00170963	13.74573308	3340.52647
60000.00000					
62035704.	4.889514E+11	.00012688	.00173469	13.67242366	3351.21097
60000.00000					
62143333.	4.803349E+11	.00012938	.00175981	13.60243124	3360.86285
60000.00000					
62249521.	4.720343E+11	.00013188	.00178500	13.53557307	3369.47385
60000.00000					
62337910.	4.639100E+11	.00013438	.00180965	13.46718031	3376.85447
60000.00000					
62398691.	4.558808E+11	.00013688	.00183339	13.39459437	3382.98047
60000.00000					
62458258.	4.481310E+11	.00013938	.00185717	13.32501251	3388.17859
60000.00000					
62516615.	4.406457E+11	.00014188	.00188102	13.25828201	3392.44182
60000.00000					
62573761.	4.334113E+11	.00014438	.00190492	13.19426018	3395.76295
60000.00000					

62629646.	4.264146E+11	.00014688	.00192888	13.13280684	3398.13455
60000.00000					
62684292.	4.196438E+11	.00014938	.00195290	13.07380182	3399.54925
60000.00000					
62737480.	4.130863E+11	.00015188	.00197698	13.01712495	3399.79019
60000.00000					
62784815.	4.067033E+11	.00015438	.00200111	12.96266860	3393.87510
60000.00000					
62831728.	4.005210E+11	.00015688	.00202531	12.91033262	3387.94405
60000.00000					
62878182.	3.945298E+11	.00015938	.00204957	12.86001688	3381.99707
60000.00000					
62924185.	3.887208E+11	.00016188	.00207388	12.81163377	3382.03449
60000.00000					
62969740.	3.830859E+11	.00016438	.00209826	12.76510066	3386.73569
60000.00000					
63014833.	3.776170E+11	.00016688	.00212271	12.72033745	3390.73704
60000.00000					
63059452.	3.723067E+11	.00016938	.00214721	12.67726904	3394.03161
60000.00000					
63103604.	3.671482E+11	.00017188	.00217178	12.63582784	3396.61242
60000.00000					
63103604.	3.618845E+11	.00017438	.00219712	12.59999925	3398.52625
60000.00000					
63103604.	3.517971E+11	.00017938	.00226012	12.59999925	3396.41491
60000.00000					
63282556.	3.432274E+11	.00018438	.00232312	12.59999925	3382.54280
60000.00000					
63451240.	3.350561E+11	.00018938	.00237394	12.53566450	3375.49664
60000.00000					
63523441.	3.268087E+11	.00019438	.00242188	12.45984918	3383.99362
60000.00000					
63565236.	3.188225E+11	.00019938	.00246764	12.37686914	3390.26751
60000.00000					
63593590.	3.111613E+11	.00020438	.00251253	12.29372388	3394.86743
60000.00000					
63621282.	3.038628E+11	.00020938	.00255759	12.21535510	3398.02295
60000.00000					
63648297.	2.969017E+11	.00021438	.00260282	12.14144486	3399.70707
60000.00000					
63673886.	2.902513E+11	.00021938	.00264838	12.07237619	3397.17387
60000.00000					
63697808.	2.838900E+11	.00022438	.00269430	12.00802642	3389.66353
60000.00000					
63721417.	2.778045E+11	.00022938	.00274033	11.94693357	3382.12583
60000.00000					
63744699.	2.719774E+11	.00023438	.00278646	11.88889486	3374.56042
60000.00000					
63767664.	2.663923E+11	.00023938	.00283270	11.83372754	3366.96675
60000.00000					
63790299.	2.610345E+11	.00024438	.00287905	11.78126138	3365.53540
60000.00000					
63812585.	2.558901E+11	.00024938	.00292550	11.73133868	3373.10584
60000.00000					
63834551.	2.509466E+11	.00025438	.00297207	11.68382174	3379.77029
60000.00000					
63856153.	2.461924E+11	.00025938	.00301875	11.63857287	3385.51434
60000.00000					
63877391.	2.416166E+11	.00026438	.00306555	11.59547192	3390.32377
60000.00000					
63898274.	2.372094E+11	.00026938	.00311247	11.55440873	3394.18397
60000.00000					
63918786.	2.329614E+11	.00027438	.00315950	11.51527816	3397.07969

60000.00000					
63936188.	2.288544E+11	.00027938	.00320725	11.48010296	3399.03200
60000.00000					
63952210.	2.248869E+11	.00028438	.00325534	11.44736356	3399.93845
60000.00000					
63966663.	2.210511E+11	.00028938	.00330386	11.41723019	3395.75800
60000.00000					
63980354.	2.173430E+11	.00029438	.00335261	11.38889426	3389.35179
60000.00000					
63993861.	2.137582E+11	.00029938	.00340142	11.36173993	3382.92698
60000.00000					
64007200.	2.102906E+11	.00030438	.00345031	11.33571464	3376.48312
60000.00000					
64016523.	2.069221E+11	.00030938	.00350020	11.31377989	3369.77364
60000.00000					
64022402.	2.036498E+11	.00031438	.00355097	11.29532236	3362.83327
60000.00000					
64028029.	2.004792E+11	.00031938	.00360183	11.27775604	3355.86647
60000.00000					
64033399.	1.974055E+11	.00032438	.00365280	11.26104587	3348.87270
60000.00000					

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 63847.47428 in-kip

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

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 11000.000 lbs
Specified moment at pile head = 10440000.000 in-lbs
Specified axial load at pile head = 16000.000 lbs

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

Depth X	Deflect. y	Moment M	Shear V	Slope S	Total Stress	Flx. Rig. EI	Soil Res. Es*h p
in	in	lbs-in	lbs	Rad.	lbs/in**2	lbs-in**2	lbs/in F/L
0.000	.546869	1.04E+07	11000.	-.002249	182.304	9.43E+12	0.000 0.000
25.920	.488947	1.07E+07	11000.	-.002220	187.220	9.43E+12	0.000 0.000
51.840	.431790	1.10E+07	11000.	-.002190	192.135	9.42E+12	0.000 0.000
77.760	.375418	1.13E+07	10102.	-.002159	196.983	9.42E+12	-140.456 1212.189
103.680	.319850	1.15E+07	1356.340	-.002128	199.914	9.42E+12	-488.987 4953.312
129.600	.265098	1.13E+07	-13558.	-.002097	197.367	9.42E+12	-645.780 7892.640
155.520	.211151	1.07E+07	-31279.	-.002066	187.455	9.43E+12	-705.919 10832.
181.440	.157966	9.69E+06	-49329.	-.002038	169.482	9.43E+12	-671.418

13771.							
207.360	.105469	8.20E+06	-65276.	-.002013	143.844	9.44E+12	-543.966
16711.							
233.280	.053554	6.34E+06	-79543.	-.001993	111.905	9.46E+12	-868.385
52537.							
259.200	.002086	4.08E+06	-91859.	-.001979	72.921	9.46E+12	-39.233
60936.							
285.120	-.049092	1.79E+06	-79308.	-.001971	33.731	9.46E+12	1050.536
69334.							
311.040	-.100139	2.35E+05	-35117.	-.001969	6.919	9.46E+12	2402.458
77732.							

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection	=	.54686911 in
Computed slope at pile head	=	-.00224912
Maximum bending moment	=	11466630. lbs-in
Maximum shear force	=	-91859.16916 lbs
Depth of maximum bending moment	=	106.92000 in
Depth of maximum shear force	=	259.20000 in
Number of iterations	=	6
Number of zero deflection points	=	1

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

Type 1 = Shear and Moment, y = pile-head displacment in
Type 2 = Shear and Slope, M = Pile-head Moment lbs-in
Type 3 = Shear and Rot. Stiffness, V = Pile-head Shear Force lbs
Type 4 = Deflection and Moment, S = Pile-head Slope, radians
Type 5 = Deflection and Slope, R = Rot. Stiffness of Pile-head in-lbs/rad

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 11000.	M= 1.04E+07	16000.0000	.5468691	1.1467E+07	-91859.1692

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

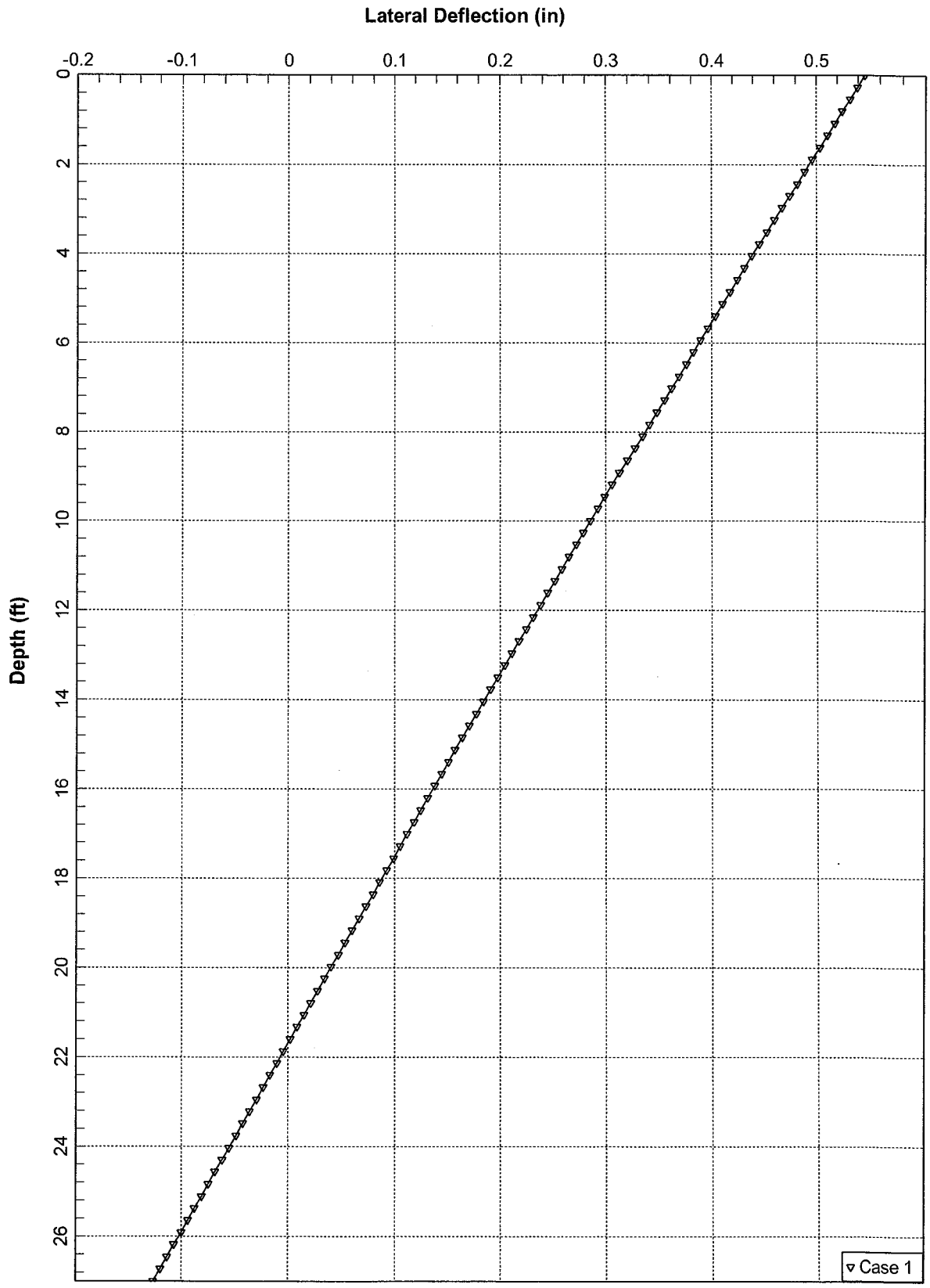
Top y	Shear React.	Mom. React.	K22	K32

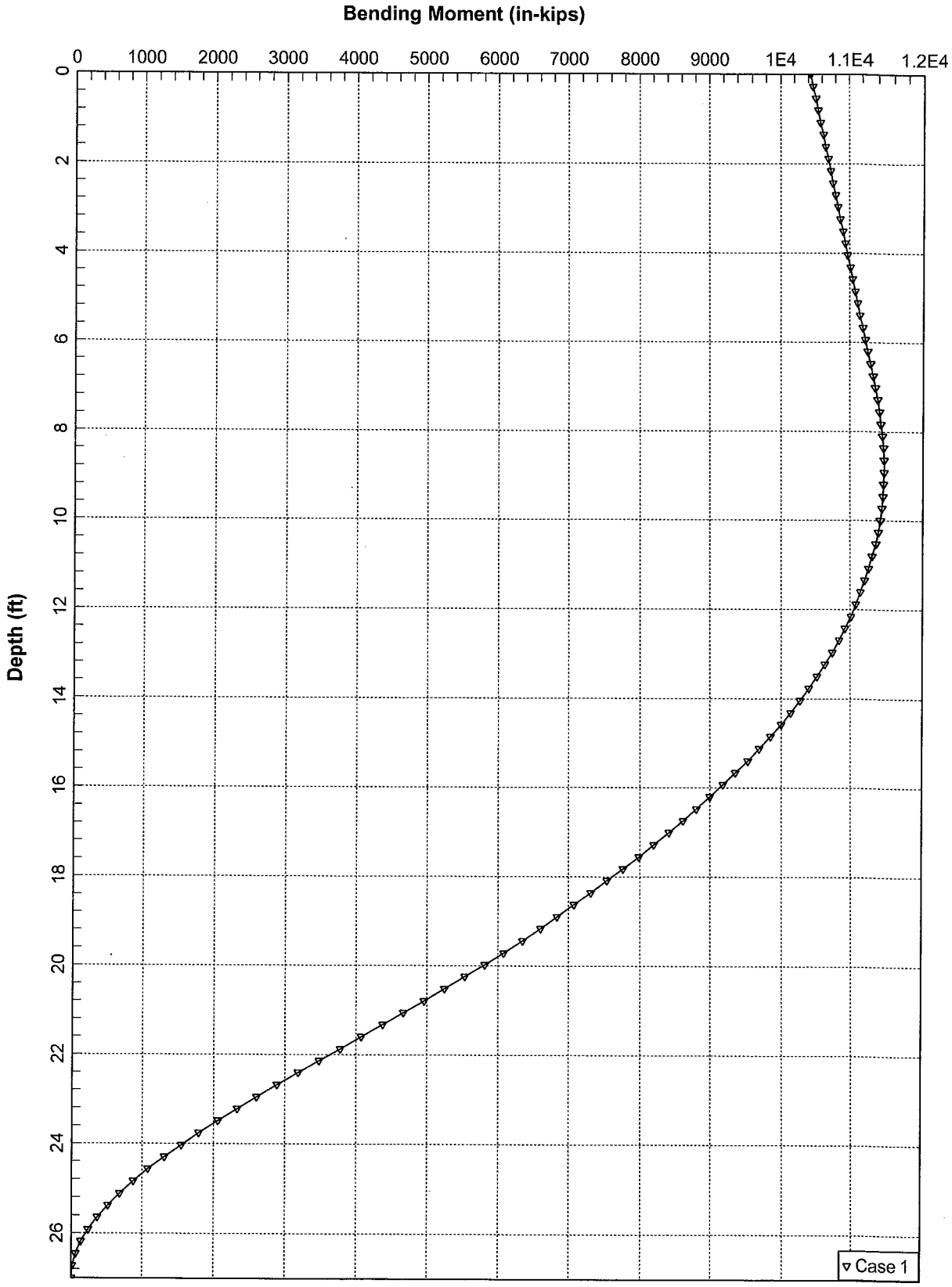
in	lbs	in-lbs	lbs/in	in-lbs/in
.00104834	1100.00002	261593.16489	1049279.	2.495310E+08
.00315582	3311.32995	787473.88120	1049279.	2.495310E+08
.00500185	5248.33380	1248117.	1049279.	2.495310E+08
.00631163	6622.65990	1574948.	1049279.	2.495310E+08
.00732758	7688.67005	1828458.	1049279.	2.495310E+08
.00815766	8559.66375	2035590.	1049279.	2.495310E+08
.00885949	9296.07844	2210719.	1049279.	2.495310E+08
.00946745	9933.98986	2362422.	1049279.	2.495310E+08
.01000370	10496.66760	2496234.	1049278.	2.495310E+08
.01048345	11000.00000	2615943.	1049273.	2.495307E+08

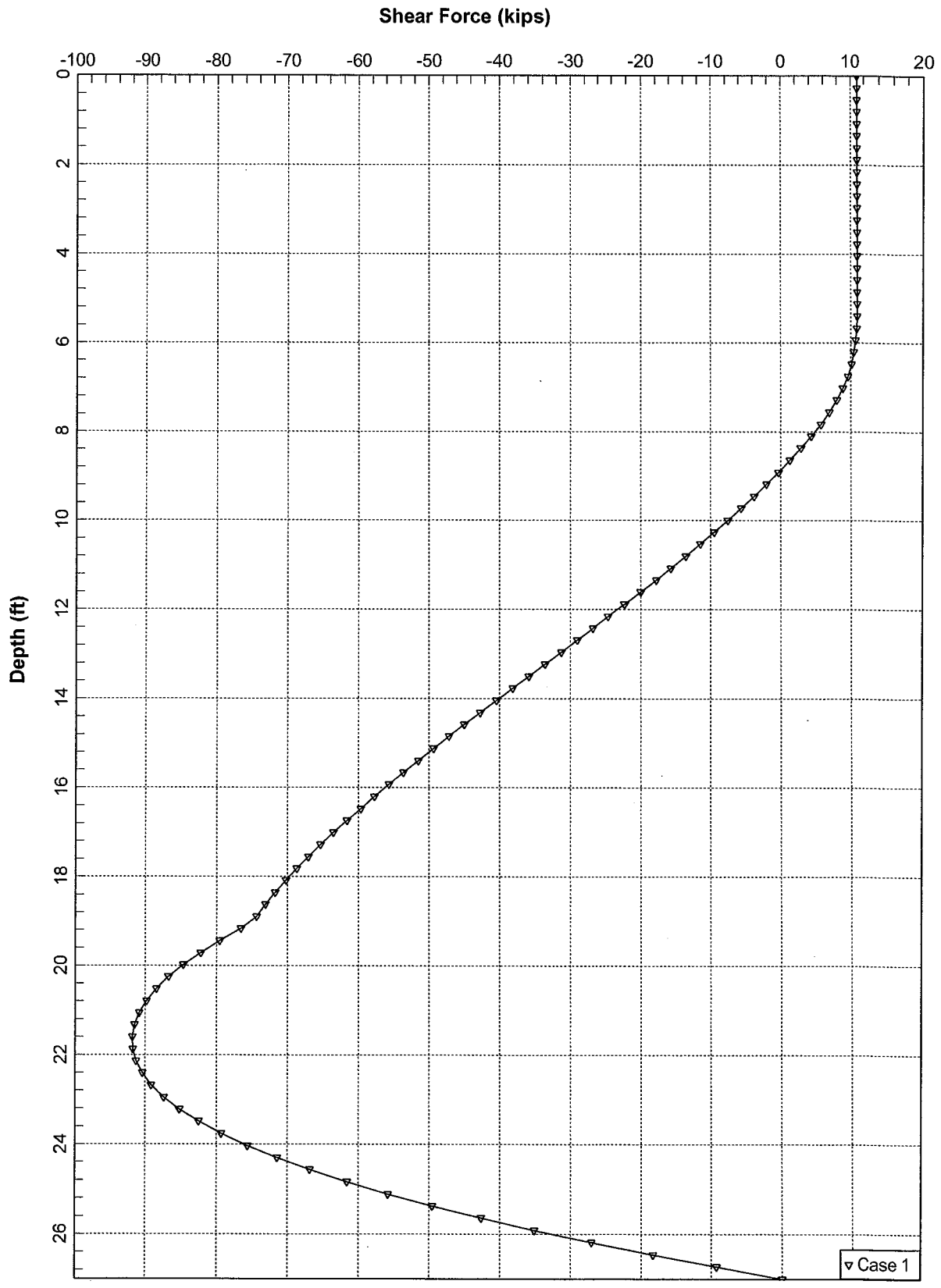
Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
.00001598	3987.89480	1044000.	2.495310E+08	6.532529E+10
.00004811	12004.75935	3142753.	2.495310E+08	6.532529E+10
.00007625	19027.09340	4981146.	2.495310E+08	6.532529E+10
.00009622	24009.52018	6285506.	2.495237E+08	6.532337E+10
.00011174	27874.24046	7297247.	2.494622E+08	6.530716E+10
.00012443	31032.02507	8123899.	2.493943E+08	6.528914E+10
.00013517	33701.95384	8822824.	2.493350E+08	6.527333E+10
.00014447	36014.79277	9428259.	2.492851E+08	6.525997E+10
.00015268	38054.89101	9962292.	2.492429E+08	6.524867E+10
.00016003	39879.84250	10440000.	2.492070E+08	6.523900E+10

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

The analysis ended normally.


Lateral Deflection (in)
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 1


Bending Moment (in-kips)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
1E4
1.1E4
1.2E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 1


Shear Force (kips)
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Case 1

SITE NAME	BLOOMFIELD BLUE HILLS CT	ECP - CELL #	8	280
LATITUDE		LONGITUDE		
Additional Comments: LTE AWS. Add 1 fiber line (8 pair hybrid), 3 RRH's, 1 Main Distribution Box, 3 antennas. 15 antennas, 19 lines.		SAVE BUTTON		
		STRUCTURE TYPE	MONOPOLE	

AWS - LTE ANTENNA ADD	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz eNodeB		2100 MHz eNodeB		2100 MHz eNodeB	
ANTENNA TYPE	BXA-171063-12BF-EDIN-2		BXA-171063-12BF-EDIN-2		BXA-171063-12BF-EDIN-2	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	30		150		270	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	107		107		107	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS	1	ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX	1				DB-T1-6Z-8AB-0Z	

700 Mhz - LTE Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	700 MHz eNodeB	700 MHz eNodeB	700 MHz eNodeB
ANTENNA TYPE	BXA-70063-6CF-EDIN-2	BXA-70063-6CF-EDIN-2	BXA-70063-6CF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	5	4	4
RAD CTR (FT AGL)	107	107	107
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

700 Mhz - LTE Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	700 MHz eNodeB	700 MHz eNodeB	700 MHz eNodeB
ANTENNA TYPE	BXA-70063-6CF-EDIN-2	BXA-70063-6CF-EDIN-2	BXA-70063-6CF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	5	4	4
RAD CTR (FT AGL)	107	107	107
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0B	Cellular Modcell 4.0B	Cellular Modcell 4.0B
ANTENNA TYPE	LPA-80063-6CF-EDIN-5	LPA-80063-6CF-EDIN-5	LPA-80063-6CF-EDIN-5
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	3	4	2
RAD CTR (FT AGL)	107	107	107
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0B	Cellular Modcell 4.0B	Cellular Modcell 4.0B
ANTENNA TYPE	LPA-80063-6CF-EDIN-5	LPA-80063-6CF-EDIN-5	LPA-80063-6CF-EDIN-5
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	3	4	2
RAD CTR (FT AGL)	107	107	107
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEX WITH LTE CABLE			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	2	2	2
RAD CTR (FT AGL)	107	107	107
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0B	PCS Modcell 4.0B	PCS Modcell 4.0B
ANTENNA TYPE	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2

QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	2	2	2
RAD CTR (FT AGL)	107	107	107
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE			

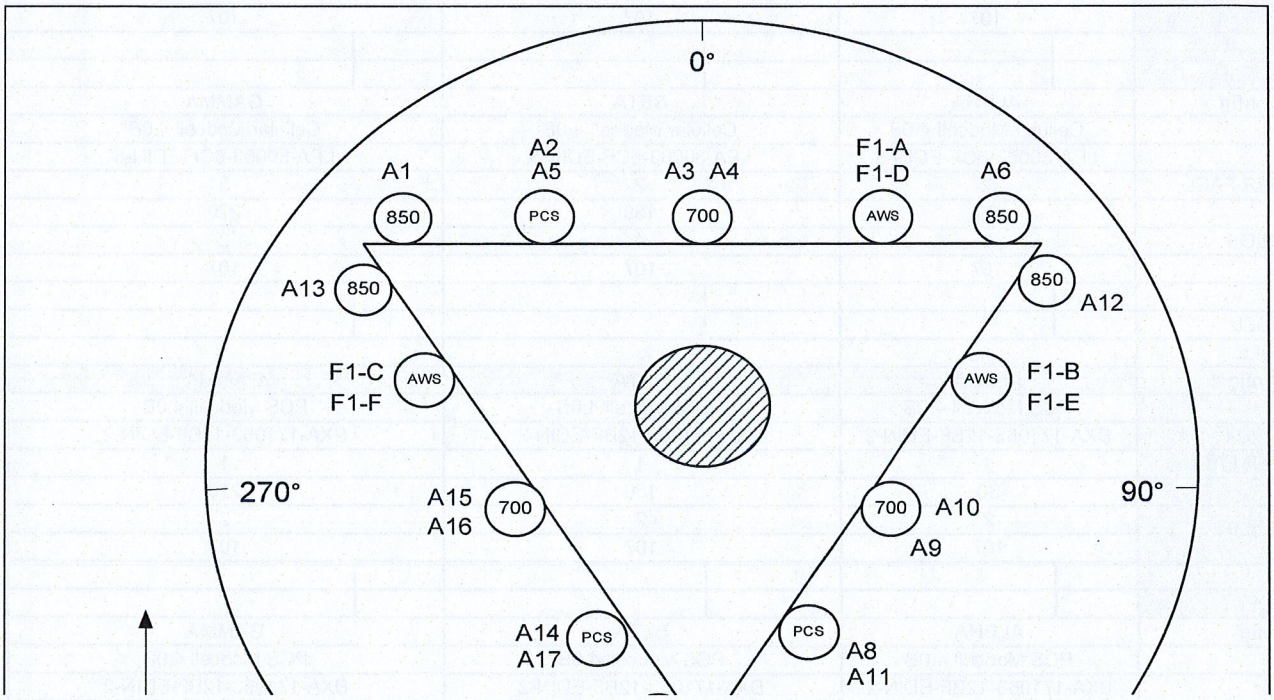
NUMBER OF CABLE'S NEEDED						ESTIMATED CABLE LENGTH			
MAINLINE SIZE		TOTAL # OF MAINLINES			18	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS			24	TOP JUMPER (FT)			
		MAIN CABLE #	18	+	0	TOP JUMPER #	18	+	6
FIBER LINE SIZE	1 5/8"	TOTAL # OF FIBER LINES			1	FIBER LINE MODEL #			HB158-1-08U8-S8J18
JUMPER SIZE	1 1/4"	TOTAL # OF TOP JUMPERS			3	TOP JUMPER MODEL #			HB114-1-08U4-S4J18
Fiber Cable Ordering		FIBER CABLE #	0	+	1	TOP JUMPER #	0	+	3

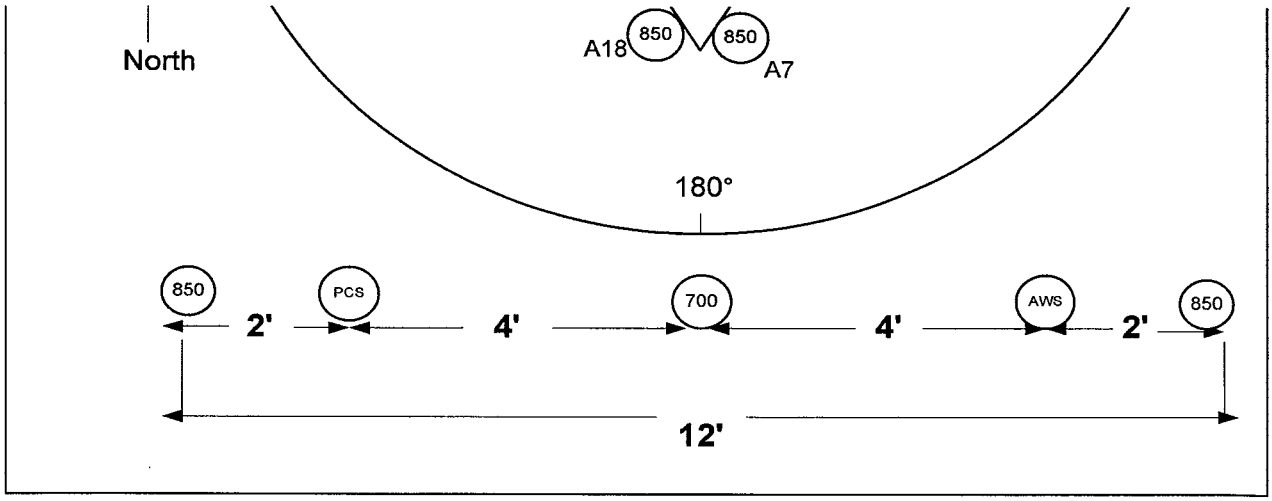
TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - Block	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-2155	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-1755	RX - 776-787	700 Mhz / AWS (Watts)	40

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

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Jay Latorre	Robert Hesselbach	JL	10/30/2012

Site Configuration




North
A18
850
850
A7
180°
850
PCS
700
AWS
850
2'
4'
4'
2'
12'

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt.

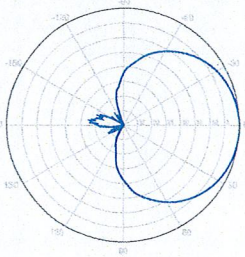
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 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	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

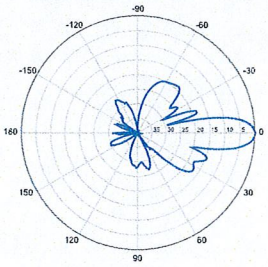
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



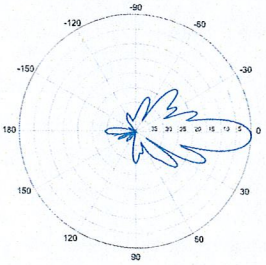
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

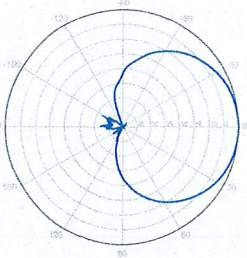


0° | Vertical | 750 MHz

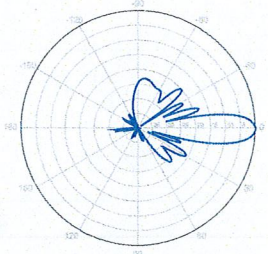
BXA-70063-6CF-EDIN-2



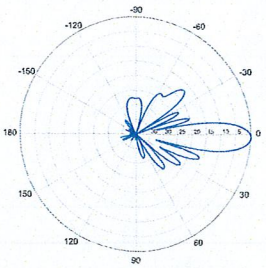
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



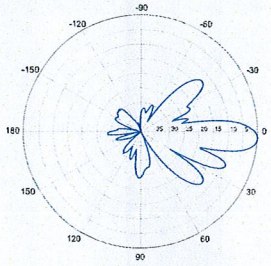
2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

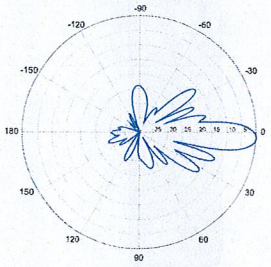
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

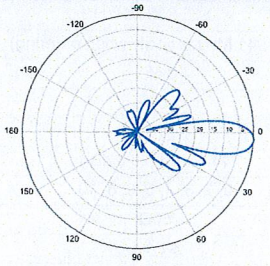


3° | Vertical | 750 MHz

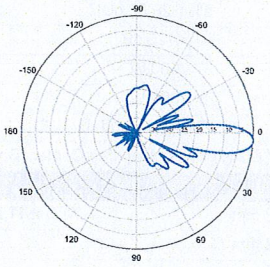


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

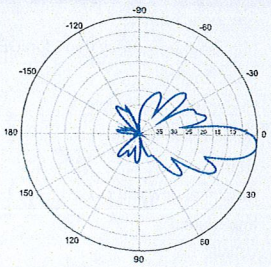


4° | Vertical | 750 MHz

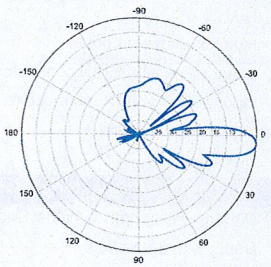


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

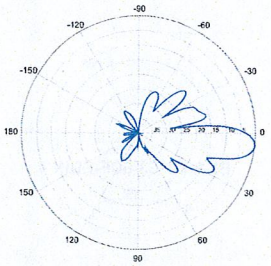


5° | Vertical | 750 MHz

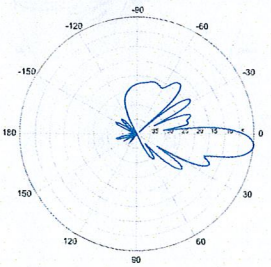


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

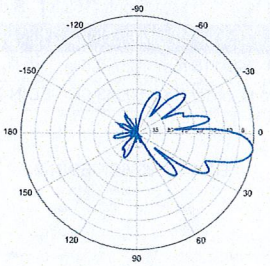


6° | Vertical | 750 MHz

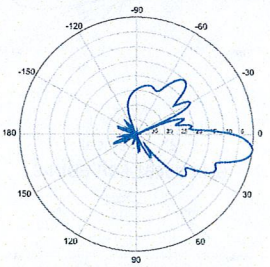


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

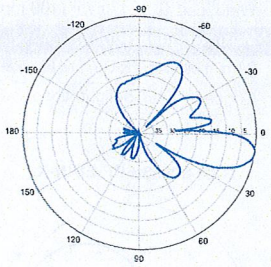


8° | Vertical | 750 MHz

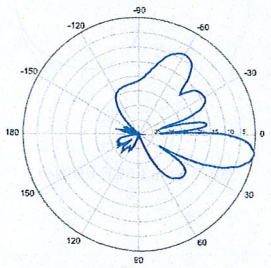


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

Amphenol ANTENNA SOLUTIONS

BXA-80063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

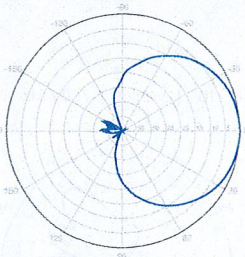
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics				
Frequency bands	806-900 MHz*			
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)			
Polarization	±45°			
Horizontal beamwidth	63°			
Vertical beamwidth	11°			
Gain	14.5 dBd (16.6 dBi)			
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10			
Impedance	50Ω			
VSWR	≤1.4:1			
Upper sidelobe suppression (0°)	-18.2 dB			
Front-to-back ratio (+/-30°)	-36.3 dB			
Null fill	5% (-26.02 dB)			
Isolation between ports	< -25 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	1804 x 285 x 132 mm		71.0 x 11.2 x 5.2 in	
Depth with z-brackets	172 mm		6.8 in	
Weight without mounting brackets	7.9 kg		17 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.51 m^2	Side: 0.24 m^2	Front: 5.5 ft^2	Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N	Side: 391 N	Front: 169 lbf	Side: 89 lbf

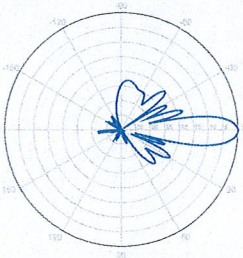
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-80063-6CF-EDIN-X-FP		

BXA-80063-6CF-EDIN-X



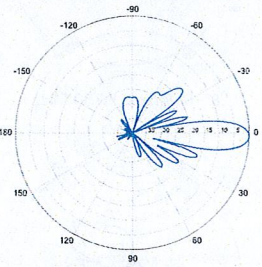
Horizontal

BXA-80063-6CF-EDIN-0



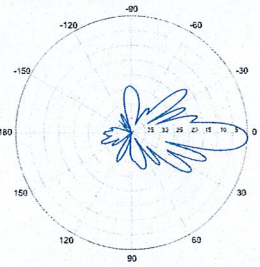
0° | Vertical

BXA-80063-6CF-EDIN-2



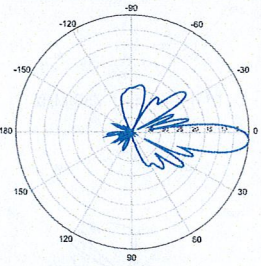
2° | Vertical

BXA-80063-6CF-EDIN-3



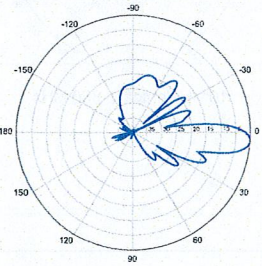
3° | Vertical

BXA-80063-6CF-EDIN-4



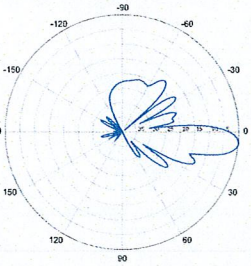
4° | Vertical

BXA-80063-6CF-EDIN-5



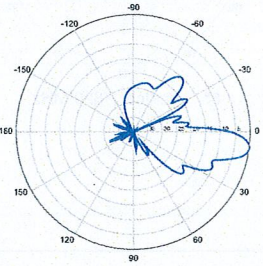
5° | Vertical

BXA-80063-6CF-EDIN-6



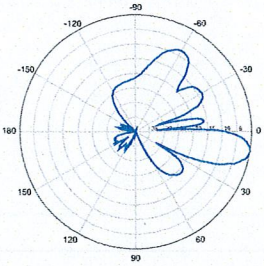
6° | Vertical

BXA-80063-6CF-EDIN-8



8° | Vertical

BXA-80063-6CF-EDIN-10



10° | Vertical

Amphenol ANTENNA SOLUTIONS

BXA-80063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

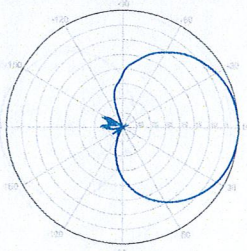
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics				
Frequency bands	806-900 MHz*			
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)			
Polarization	±45°			
Horizontal beamwidth	63°			
Vertical beamwidth	11°			
Gain	14.5 dBd (16.6 dBi)			
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10			
Impedance	50Ω			
VSWR	≤1.4:1			
Upper sidelobe suppression (0°)	-18.2 dB			
Front-to-back ratio (+/-30°)	-36.3 dB			
Null fill	5% (-26.02 dB)			
Isolation between ports	< -25 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	1804 x 285 x 132 mm		71.0 x 11.2 x 5.2 in	
Depth with z-brackets	172 mm		6.8 in	
Weight without mounting brackets	7.9 kg		17 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.51 m^2	Side: 0.24 m^2	Front: 5.5 ft^2	Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N	Side: 391 N	Front: 169 lbf	Side: 89 lbf

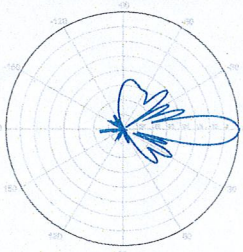
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-80063-6CF-EDIN-X-FP		

BXA-80063-6CF-EDIN-X



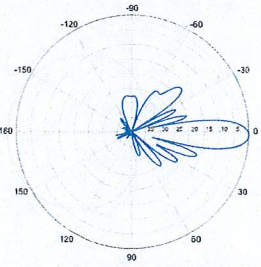
Horizontal

BXA-80063-6CF-EDIN-0



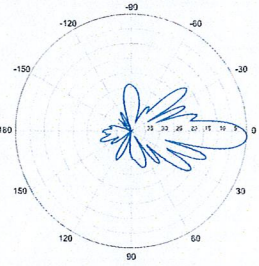
0° | Vertical

BXA-80063-6CF-EDIN-2



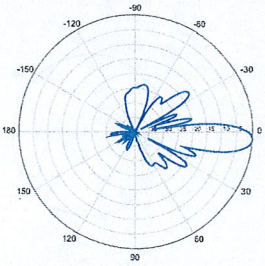
2° | Vertical

BXA-80063-6CF-EDIN-3



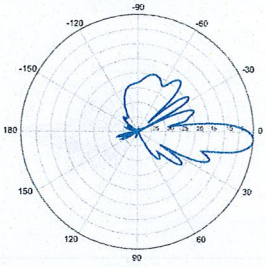
3° | Vertical

BXA-80063-6CF-EDIN-4



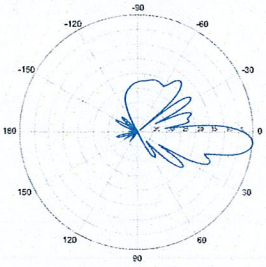
4° | Vertical

BXA-80063-6CF-EDIN-5



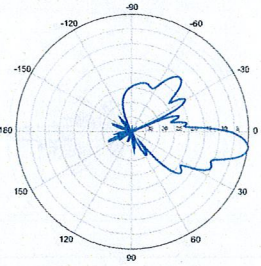
5° | Vertical

BXA-80063-6CF-EDIN-6



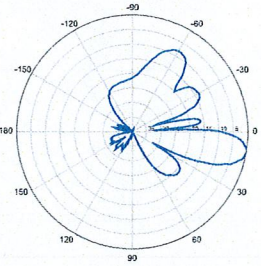
6° | Vertical

BXA-80063-6CF-EDIN-8



8° | Vertical

BXA-80063-6CF-EDIN-10



10° | Vertical

BXA-171063-12BF-EDIN-X

Replace "X" with desired electrical downtilt.

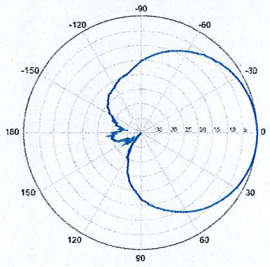
X-Pol | FET Panel | 63° | 19.0 dBi

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	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1820 x 154 x 105 mm	71.7 x 6.1 x 4.1 in
Depth with z-brackets	133 mm	5.2 in
Weight without mounting brackets	6.8 kg	15 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.28 m^2 Side: 0.19 m^2	Front: 3.1 ft^2 Side: 2.1 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf

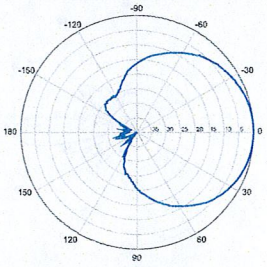
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12BF-EDIN-X-FP		

BXA-171063-12BF-EDIN-X



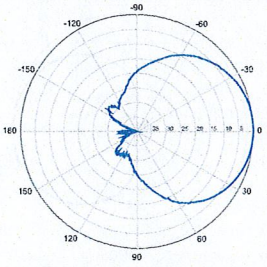
Horizontal | 1710-1880 MHz

BXA-171063-12BF-EDIN-X



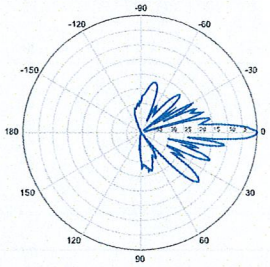
Horizontal | 1850-1990 MHz

BXA-171063-12BF-EDIN-X



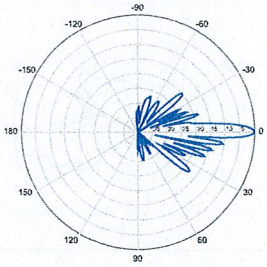
Horizontal | 1920-2170 MHz

BXA-171063-12BF-EDIN-0



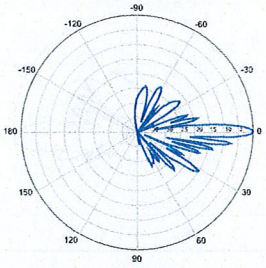
0° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-0

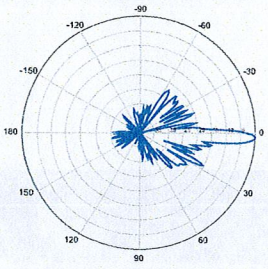


0° | Vertical | 1920-2170 MHz

BXA-171063-12BF-EDIN-X

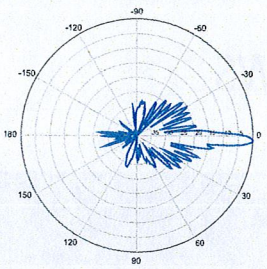
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12BF-EDIN-2



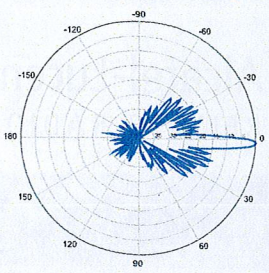
2° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-2



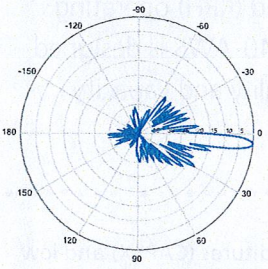
2° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-2



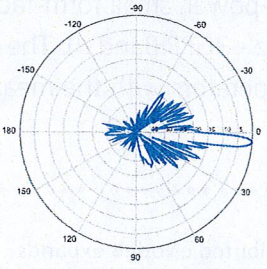
2° | Vertical | 1920-2170 MHz

BXA-171063-12BF-EDIN-5



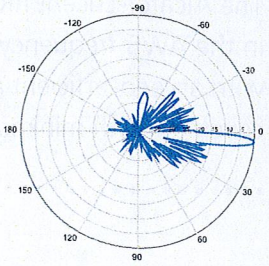
5° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-5

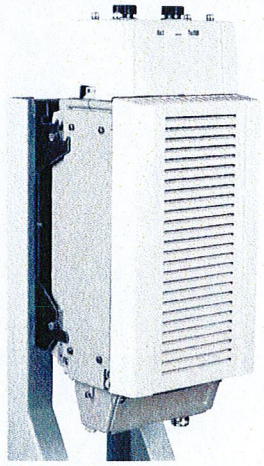


5° | Vertical | 1920-2170 MHz

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

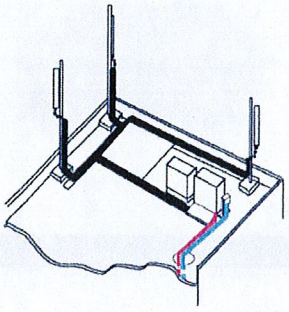
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

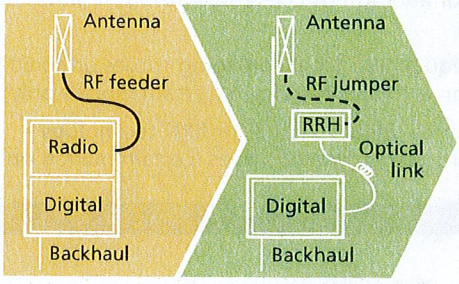
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

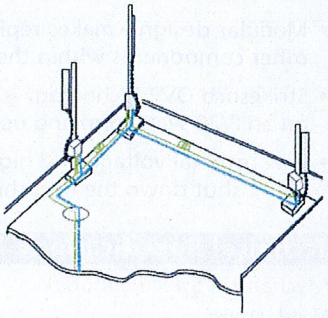
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

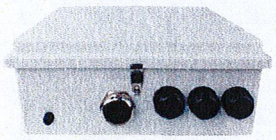
Alcatel·Lucent

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

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



Features/Benefits

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

Technical Specifications

Mechanical Specifications

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

Electrical Specifications

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

* This data is provisional and subject to change.