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

April 8, 2013

Kenneth C. Baldwin, Esq.
Robinson & Cole
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-009-130312** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 39 Spring Hill Road, Bethel, 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:

- Prior to antenna installation, the base plate reinforcement identified in the Structural Analysis Report prepared by Centek Engineering dated March 7, 2013 and stamped by Carlo Centore shall be implemented;
- Within 45 days following completion of the antenna installation, a signed letter from a Professional Engineer duly licensed in the State of Connecticut shall be submitted to the Council to certify that the recommended modifications have been completed and the structure and foundation do not exceed 100 percent of the post-construction structural rating;
- 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 March 11, 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,

Linda Roberts
Executive Director

LR/CDM/jb

c: The Honorable Matthew S. Knickerbocker, First Selectman, Town of Bethel
Steve Palmer, Planning & Zoning Official, Town of Bethel
Valley Communications

ROBINSON & COLE LLP

ORIGINAL

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

December 26, 2013

David Martin
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-009-130312 – Cellco Partnership d/b/a Verizon Wireless**
39 Spring Hill Road, Bethel, Connecticut

Dear Mr. Martin:

On April 8, 2013, the Siting Council acknowledged receipt of Cellco's notice of intent to modify its telecommunications facility at 39 Spring Hill Road in Bethel. The modification involved the replacement of certain antennas and the installation of remote radio heads and fiber line.

As a condition of the acknowledgement, Cellco was required to provide the Council with a letter stating that the recommendations specified in the structural report were implemented. Attached is a Tower Modification Certification Letter verifying that these conditions have been satisfied. All construction associated with these modifications has now been completed.

If you have any questions please do not hesitate to contact me or Rachel Mayo.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Sandy M. Carter
Brian Ragozzine
Mark Gauger

CENTEK engineering

Centered on Solutions℠

November 27, 2013

Mr. Mark Gauger
Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Re: Existing Telecommunications Facility Tower Modification Certification Letter

Project:	**Verizon ~Bethel** 39 Spring Hill Road Bethel, CT
Tower Owner:	**Valley Communications**
Engineer:	**Centek Engineering** 63-2 North Branford Road, Branford, CT 06405

Centek Project No.: 13008.053

Dear Mr. Gauger,

We are providing this "Existing Telecommunications Facility Tower Modification Certification Letter" with regard to the antenna upgrade by Verizon Wireless at the above referenced project.

The following are the basis for substantiating compliance with the structural analysis (Centek Engineering Project No. 12124.CO4) dated March 7th, 2013:

- Review of the Centek Engineering structural analysis dated 03/27/2013.
- Review of the Centek Engineering subsequent structural analysis dated 10/18/2013 which was performed without the previous proposed Sprint base plate reinforcements referenced in the Centek Engineering structural analysis report dated 03/27/2013.
- Field observations by Centek personnel of the equipment upgrade installation on 11/23/2013 which determined all coax lines and associated equipment were installed in general compliance with the Centek Engineering structural analysis dated 03/27/2013 and subsequent structural analysis dated 10/18/2013.

With the completed upgrade, the tower and foundation do not exceed 100 percent of their post-construction structural rating.

The work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in general compliance with the documents referenced above.

Sincerely,

Carlo F. Centore, PE
Principal ~Structural Engineer

CC: Rachel Mayo, Tim Parks, Jim Smith

EM-VER-009-130312

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

March 11, 2013

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

Re: **Notice of Exempt Modification – Facility Modification**
39 Spring Hill Road, Bethel, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 95-foot level on the existing 125-foot tower at the above-referenced address. The tower is owned by Valley Communications. The Council approved Cellco's shared use of this tower in 2006. Cellco now intends replace nine (9) of its existing antennas with two (2) model BXA-80080-6CF cellular antennas; one (1) model BXA-80063-6BF cellular antenna; three (3) model BXA-70063-6CF LTE antennas; and three (3) model BXA-171063-8BF AWS antennas, at the same 95-foot level. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its antennas and one (1) HYBRIFLEX™ fiber cable inside the monopole tower. Attached behind Tab 1 are the specifications for the replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Matthew Knickerbocker, First Selectman for the Town of Bethel. A copy of this letter is also being sent to Suzanne M. and Robert H. Hull IV, the owners 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 and RRHs will be located at the 95-foot level on the 155-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 additional 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 modified facility is 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, with certain modifications, 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:
Matthew Knickerbocker, Bethel First Selectman
Suzanne M. and Robert H. Hull IV
Sandy M. Carter

Slant +/- 45° Dual Polarized, Panel 80° / 13.5 dBd

BXA-80080/6CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1844 mm	72.6 in
Width	285 mm	11.2 in
Depth	116 mm	4.6 in
Depth with z-bracket	156 mm	6.1 in
[4] Weight	10 kg	22.0 lbs
Wind Area		
Fore/Aft	0.53 m^2	5.7 ft^2
Side	0.21 m^2	2.3 ft^2
Rated Wind Velocity (Safety factor 2.0)	>277 km/hr	>172 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	765 N	172 lbs
Side	366 N	82 lbs

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiberglass radome.

Mounting and Downtilting

Mounting brackets attach to a pipe diameter of Ø50-160 mm (2.0-6.3 in).

Mounting bracket kit #36210002
Downtilt bracket kit #36114003

Electrical specifications

	Frequency Range	806-900 MHz*
	Impedance	50Ω
[3]	Connector(s)	NE or E-DIN 2 ports / center
[1]	VSWR	≤ 1.4:1
	Polarization	Slant ± 45°
[1]	Isolation Between Ports	< -30 dB
[1]	Gain	13.5 dBd
[2]	Power Rating	500 W
[1]	Half Power Angle	
	H-Plane	80°
	E-Plane	11°
[1]	Electrical Downtilt	0°
[1]	Null Fill	5%
	Lightning Protection	Direct Ground

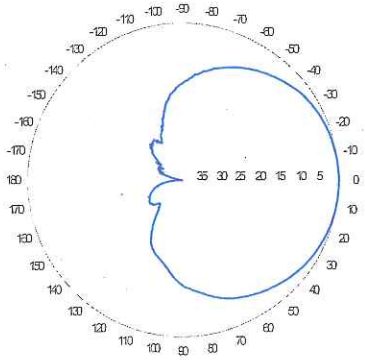
*Also available for 870-960 MHz. Consult your sales director for more information.

Patented Dipole Design: U.S. Patent No. 6,608,600 B2

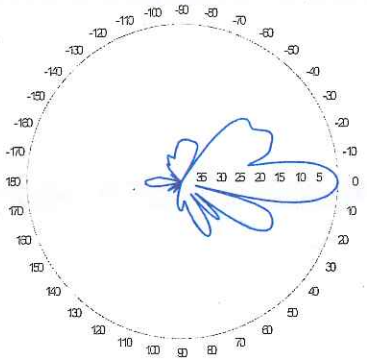
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector. E-DIN indicates an elongated DIN connector.
4) The antenna weight listed above does not include the bracket weight.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

Radiation pattern[1]



Horizontal



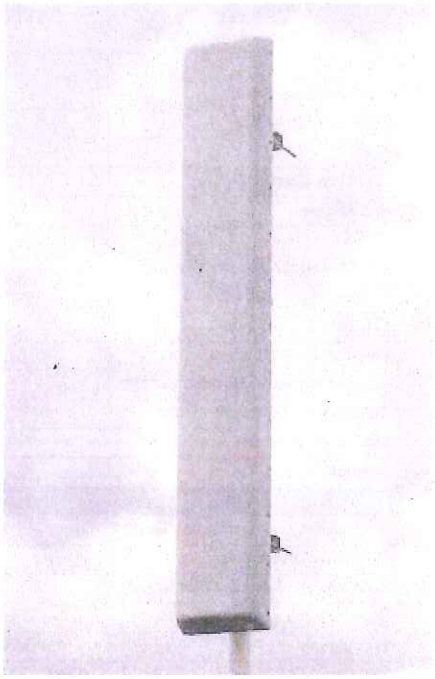
Vertical

Radiation patterns for all antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back ratio.

CF Denotes a Center-Fed Connector.

806-900 MHz



Amphenol Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- Watercut brass feedline assembly for consistent performance.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad band-width and superior performance.
- Air as insulation for virtually no internal signal loss.

This Amphenol Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connectors only.

Amphenol Antel, Inc.
The Antenna Technology Company

Amphenol Antel, Inc. 1300 Capital Drive Rockford, Illinois 61109 USA Tel. (815) 399-0001
Toll-Free (888) 417-9562 Fax. (815) 399-0156 antel@antelinc.com www.antelinc.com

Revision Date: 7/3/07

BXA-80063-6BF-EDIN-X

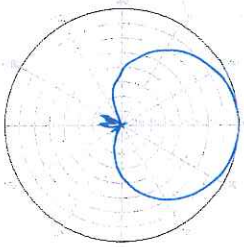
X-Pol | FET Panel | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt.

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

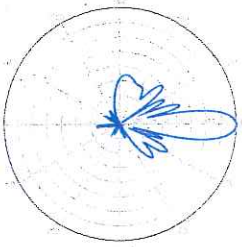
Electrical Characteristics				
Frequency bands	806-900 MHz*			
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)			
Polarization	±45°			
Horizontal beamwidth	63°			
Vertical beamwidth	11°			
Gain	14.5 dBd (16.6 dBi)			
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10, 15			
Impedance	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 N connectors	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN or N / Female / Bottom			
Mechanical Characteristics				
Dimensions Length x Width x Depth	1742 x 285 x 135 mm		68.6 x 11.2 x 5.3 in	
Depth with z-brackets	175 mm		6.9 in	
Weight without mounting brackets	8.7 kg		19.2 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.50 m²	Side: 0.24 m²	Front: 5.3 ft²	Side: 2.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 733 N	Side: 386 N	Front: 164 lbf	Side: 88 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-80063-6BF-EDIN-X-FP			

BXA-80063-6BF-EDIN-X



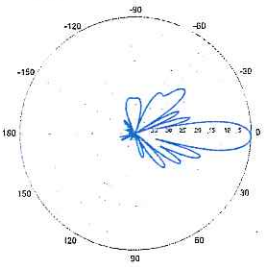
Horizontal

BXA-80063-6BF-EDIN-0



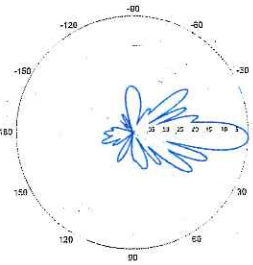
0° | Vertical

BXA-80063-6BF-EDIN-2



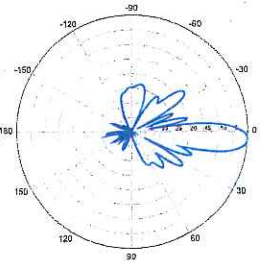
2° | Vertical

BXA-80063-6BF-EDIN-3



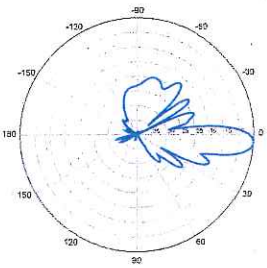
3° | Vertical

BXA-80063-6BF-EDIN-4



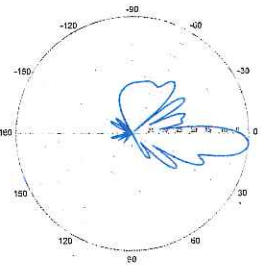
4° | Vertical

BXA-80063-6BF-EDIN-5



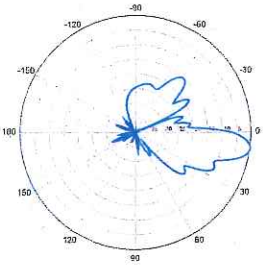
5° | Vertical

BXA-80063-6BF-EDIN-6



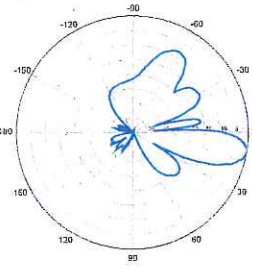
6° | Vertical

BXA-80063-6BF-EDIN-8



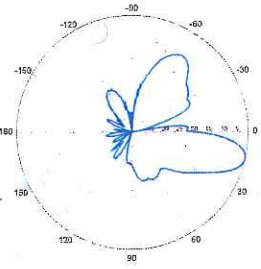
8° | Vertical

BXA-80063-6BF-EDIN-10



10° | Vertical

BXA-80063-6BF-EDIN-15



15° | Vertical

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

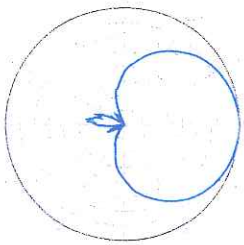
Replace "X" with desired electrical downtilt.

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

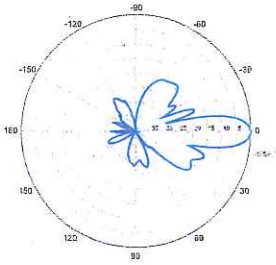
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



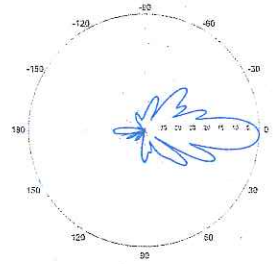
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

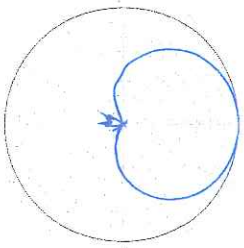


0° | Vertical | 750 MHz

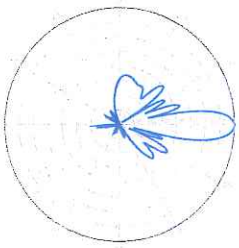
BXA-70063-6CF-EDIN-2



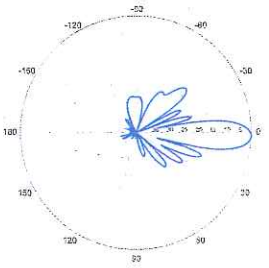
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



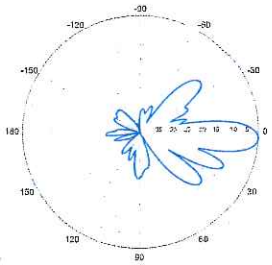
2° | Vertical | 850 MHz

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

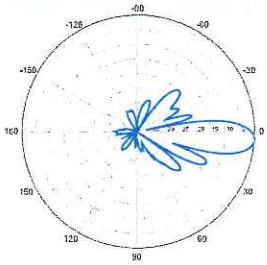
X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



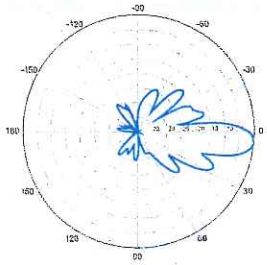
3° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-4

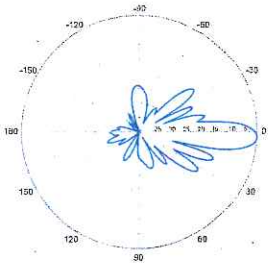


4° | Vertical | 750 MHz

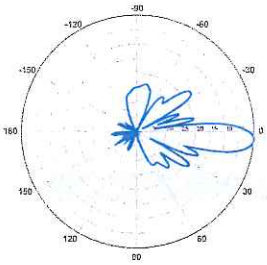
BXA-70063-6CF-EDIN-5



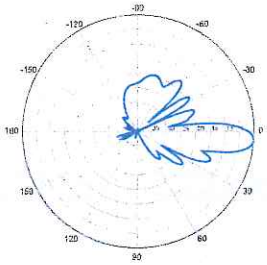
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

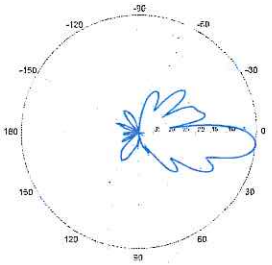


4° | Vertical | 850 MHz



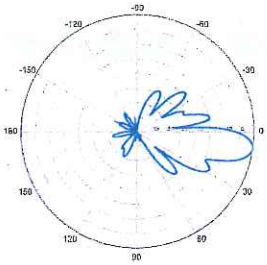
5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6



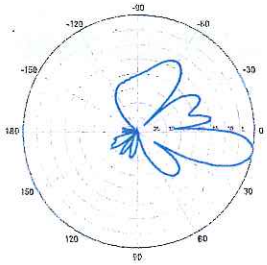
6° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-8

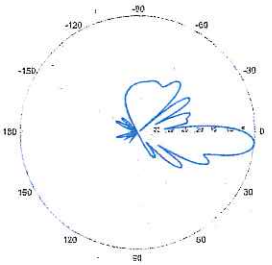


8° | Vertical | 750 MHz

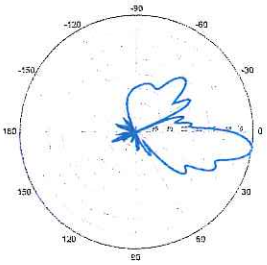
BXA-70063-6CF-EDIN-10



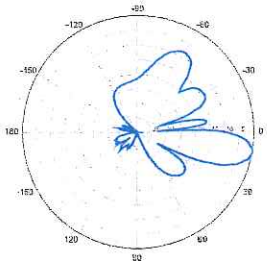
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

BXA-171063-8BF-EDIN-X

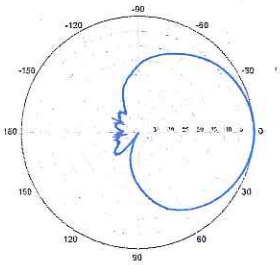
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 17.4 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	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 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	1232 x 154 x 105 mm		48.5 x 6.1 x 4.1 in
Depth with t-brackets	133 mm		5.2 in
Weight without mounting brackets	4.8 kg		10.5 lbs
Survival wind speed	296 km/hr		184 mph
Wind area	Front: 0.19 m^2 Side: 0.14 m^2		Front: 2.0 ft^2 Side: 1.5 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N		Front: 63 lbf Side: 50 lbf

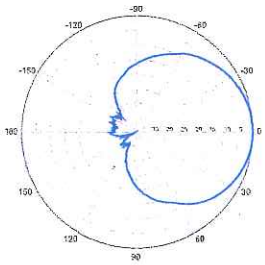
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-8BF-EDIN-X-FP		

BXA-171063-8BF-EDIN-X



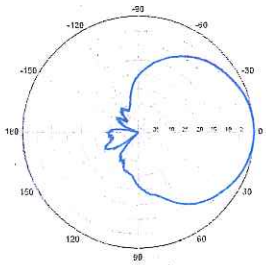
Horizontal | 1710-1880 MHz

BXA-171063-8BF-EDIN-X



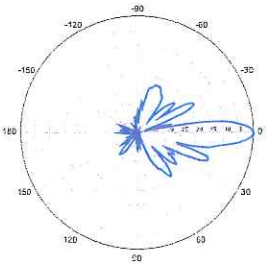
Horizontal | 1850-1990 MHz

BXA-171063-8BF-EDIN-X



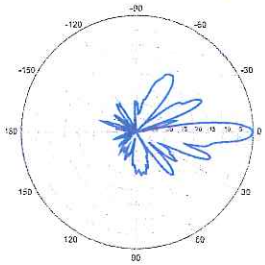
Horizontal | 1920-2170 MHz

BXA-171063-8BF-EDIN-0



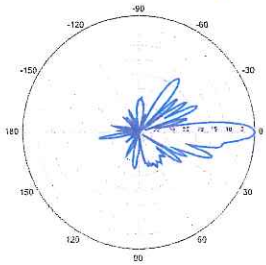
0° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-0

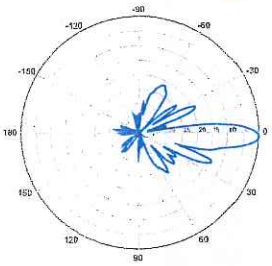


0° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-X

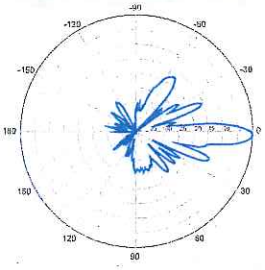
X-Pol | FET Panel | 63° | 17.4 dBi

BXA-171063-8BF-EDIN-2



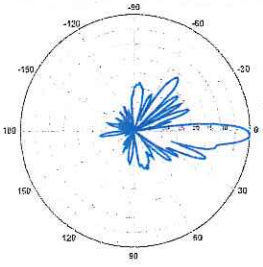
2° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-2



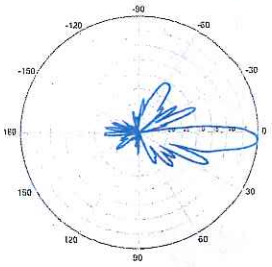
2° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-2



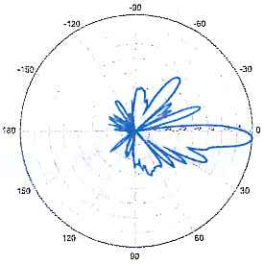
2° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-4



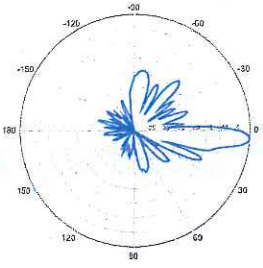
4° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-4



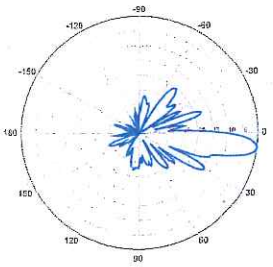
4° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-4



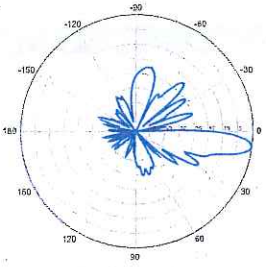
4° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-8



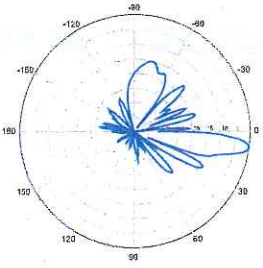
8° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-8



8° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-8



8° | Vertical | 1920-2170 MHz

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

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

A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

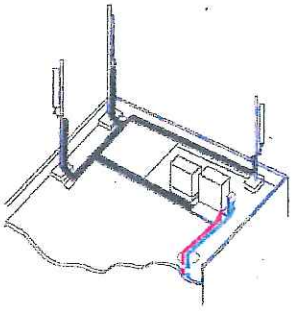
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and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

Features

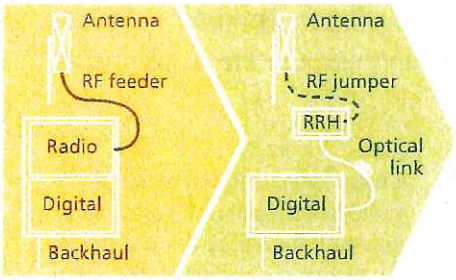
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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

Benefits

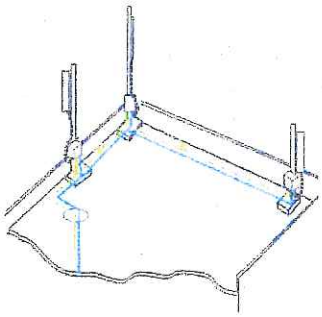
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48V

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Alarms and ports

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

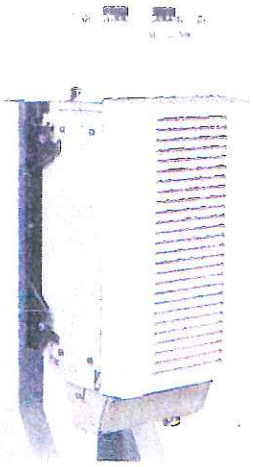
CPG2809100913 (09)

Alcatel·Lucent

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

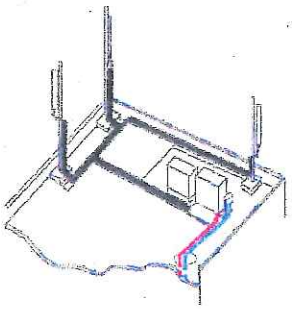
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

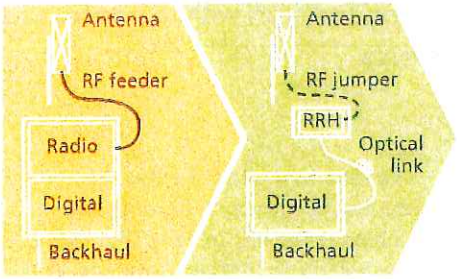
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

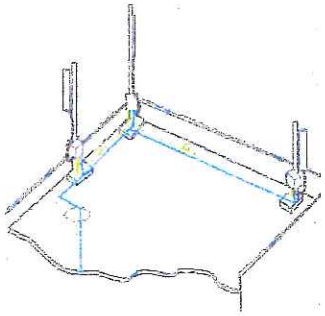
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

CPG2809100912 (09)

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

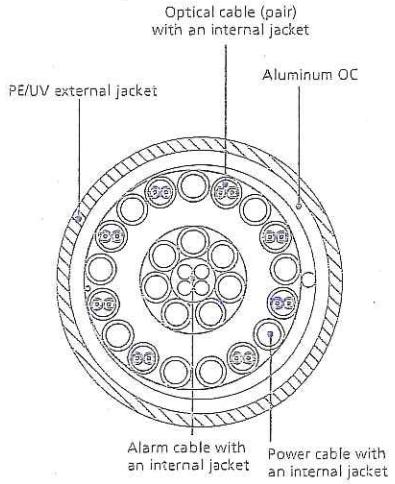


Figure 2: Construction Detail

* This data is provisional and subject to change.

Far Field Approximation
with downtilt variation

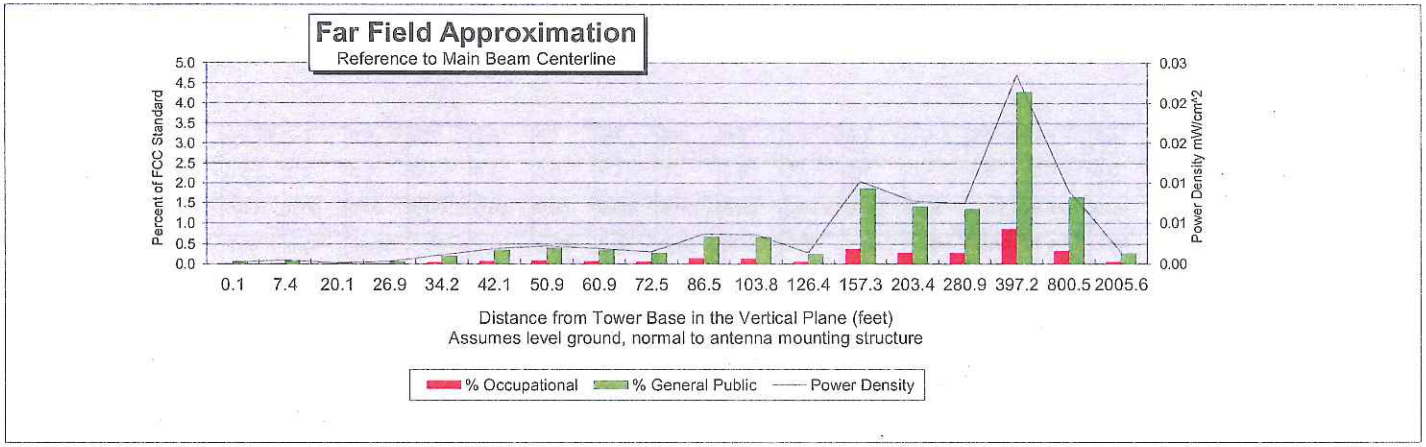
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bethel, CT
Site #:	
Date:	03/08/13
Name:	Justin Kober
File Name:	Bethel, CT - Cell FF Power

Operating Freq. (MHz)	824.0
Antenna Height (ft):	73.0
Antenna Gain (dBi):	15.2
Antenna Size (in.):	47.4
Downtilt (degrees):	4.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	837.0



Enter Main Beam Distance in feet below:

Calc Angle	90.0	84.0	74.0	69.0	64.0	59.0	54.0	49.0	44.0	39.0	34.0	29.0	24.0	19.0	14.0	10.0	5.0	2.0	
Solve for r, dx to antenna	70.0	70.4	72.8	75.0	77.9	81.7	86.6	92.8	100.8	111.3	125.2	144.5	172.2	215.1	289.5	403.3	803.6	2006.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	7.4	20.1	26.9	34.2	42.1	50.9	60.9	72.5	86.5	103.8	126.4	157.3	203.4	280.9	397.2	800.5	2005.6	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.4	0.3	0.3	0.9	0.3	0.1	
Percent of General Population Standard	0.0	0.1	0.0	0.1	0.2	0.3	0.4	0.4	0.3	0.7	0.7	0.3	1.9	1.4	1.3	4.3	1.6	0.3	

Antenna Type BXA-80063/4CF
Max% 4.29%

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 Pov
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

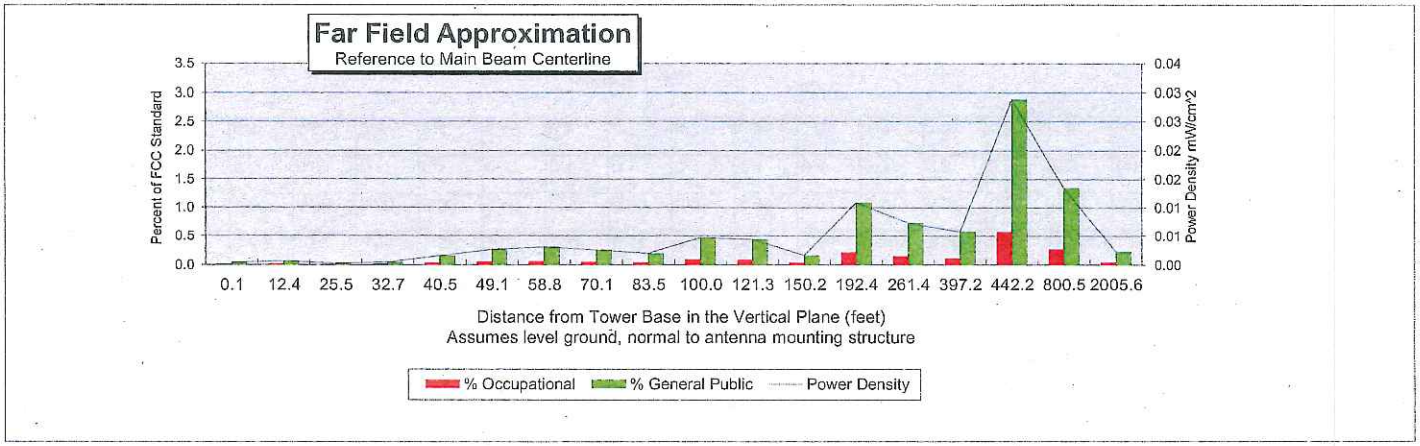
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bethel, CT
Site #:	
Date:	03/08/13
Name:	Justin Kober
File Name:	Bethel, CT - PCS FF Power

Operating Freq. (MHz)	1898.0
Antenna Height (ft):	73.0
Antenna Gain (dBi):	16.9
Antenna Size (in.):	54.3
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	858.0



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	9.0	5.0	2.0	
Solve for r, dx to antenna	70.0	71.1	74.5	77.3	80.9	85.5	91.4	99.0	108.9	122.1	140.1	165.7	204.8	270.6	403.3	447.7	803.6	2006.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	12.4	25.5	32.7	40.5	49.1	58.8	70.1	83.5	100.0	121.3	150.2	192.4	261.4	397.2	442.2	800.5	2005.6	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03	0.01	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.6	0.3	0.0	
Percent of General Population Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.4	0.2	1.1	0.7	0.6	2.9	1.4	0.2	

Antenna Type MG-D5-800TV2+45-1920-2
Max% 2.88%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Power
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

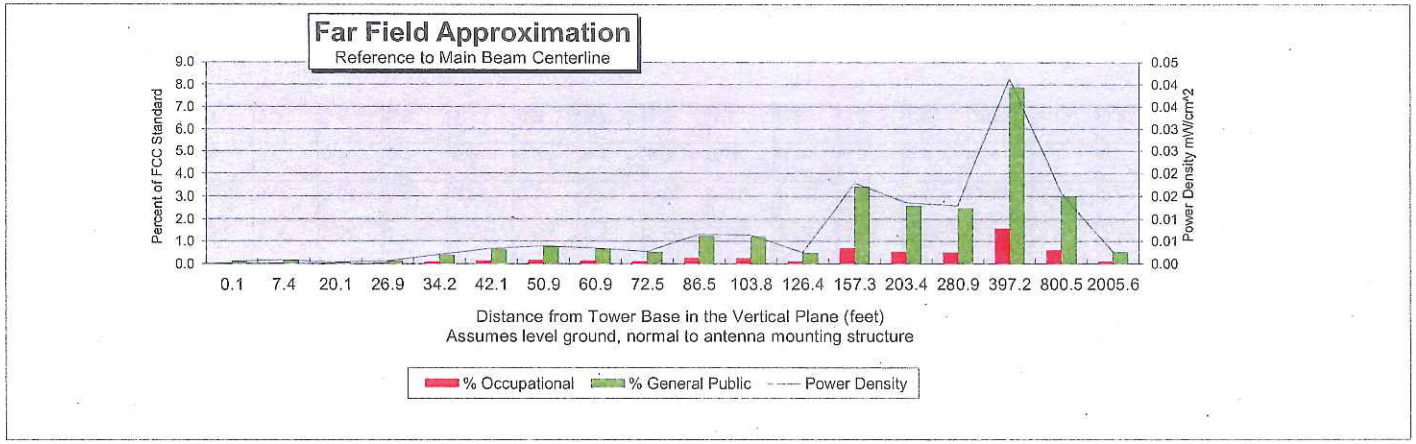
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bethel, CT
Site #:	
Date:	03/08/13
Name:	Justin Kober
File Name:	Bethel, CT - LTE FF Power

Operating Freq. (MHz)	787.0
Antenna Height (ft):	73.0
Antenna Gain (dBi):	16.7
Antenna Size (in.):	71.0
Downtilt (degrees):	4.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	1050.0



Enter Main Beam Distance in feet below:

Calc Angle	90.0	84.0	74.0	69.0	64.0	59.0	54.0	49.0	44.0	39.0	34.0	29.0	24.0	19.0	14.0	10.0	5.0	2.0	
Solve for r, dx to antenna	70.0	70.4	72.8	75.0	77.9	81.7	86.6	92.8	100.8	111.3	125.2	144.5	172.2	215.1	289.5	403.3	803.6	2006.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	7.4	20.1	26.9	34.2	42.1	50.9	60.9	72.5	86.5	103.8	126.4	157.3	203.4	280.9	397.2	800.5	2005.6	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.04	0.02	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.7	0.5	0.5	1.6	0.6	0.1	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.4	0.6	0.7	0.6	0.5	1.2	1.2	0.5	3.4	2.6	2.5	7.9	3.0	0.5	

Antenna Type BXA-70063-6CF-2
Max% 7.87%

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 Power
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

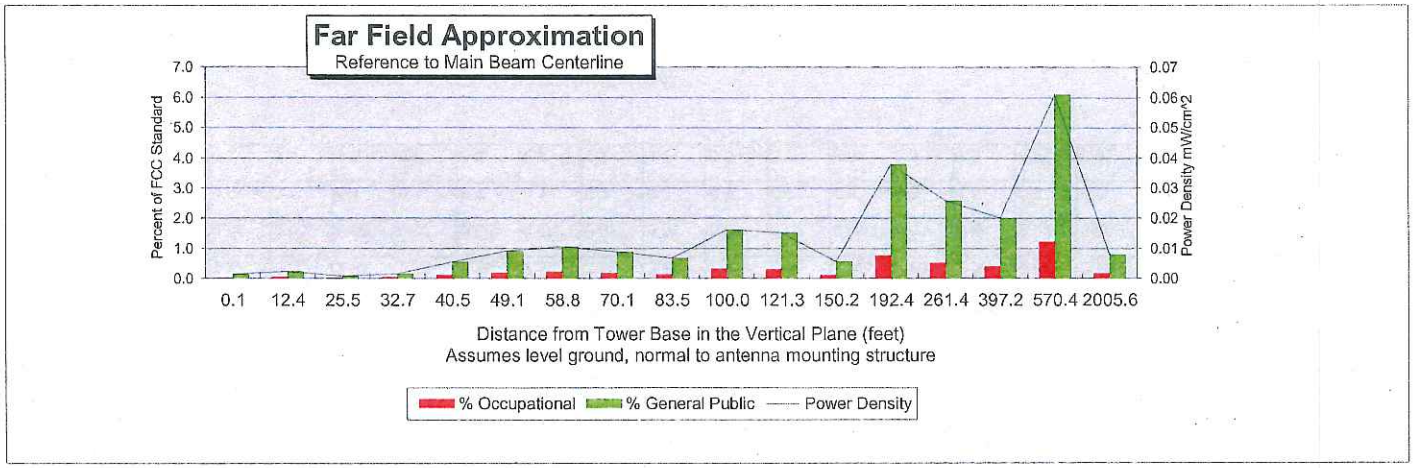
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Bethel, CT
Site #:	
Date:	03/08/13
Name:	Justin Kober
File Name:	Bethel, CT - AWS FF Power

Operating Freq. (MHz)	2145.0
Antenna Height (ft):	73.0
Antenna Gain (dBi):	19.2
Antenna Size (in.):	71.7
Downtilt (degrees):	0.0
Feedline Loss (dB):	0.0
Power @ J4 (w):	1750.0



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	7.0	2.0	
Solve for r, dx to antenna	70.0	71.1	74.5	77.3	80.9	85.5	91.4	99.0	108.9	122.1	140.1	165.7	204.8	270.6	403.3	574.7	2006.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	12.4	25.5	32.7	40.5	49.1	58.8	70.1	83.5	100.0	121.3	150.2	192.4	261.4	397.2	570.4	2005.6	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0	
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	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.04	0.03	0.02	0.06	0.01	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.8	0.5	0.4	1.2	0.2	
Percent of General Population Standard	0.1	0.2	0.1	0.2	0.5	0.9	1.1	0.9	0.7	1.6	1.5	0.6	3.8	2.6	2.0	6.1	0.8	

Antenna Type BXA-171063-12BF-EDIN-2
Max% 6.10%

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,
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

125-ft Existing EEI Monopole

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Bethel

38 Spring Hill Lane
Bethel, CT

Centek Project No. 12124.CO4

~~Date: December 11, 2012~~
~~Rev 1: February 13, 2013~~
Rev 2: March 7, 2013

Prepared for:

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

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

Table of Contents

Introduction

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

The host tower is a 125-ft tall, three-section, eighteen sided, tapered monopole originally designed and manufactured by EEI job no; 14009-E01, dated March 9, 2006. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned tower design documents. Antenna and appurtenance information were obtained from a previous structural report prepared by Centek Engineering job no. 11001.CO61 dated November 16, 2011, a structural report prepared by Salient Associates LLC, for Sprint dated October 12, 2012 and a Verizon RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 18.00-in at the top and 55.00-in at the base.

Verizon is proposing the removal of nine (9) panel antennas and the installation of nine (9) panel antennas, six (6) RRH's and one (1) distribution box mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- TOWN (Existing):
  Antennas: One (1) 18' x 4" Omni-directional whip antenna mounted on a 4-ft standoff with an elevation of 124-ft above existing grade.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- AT&T (Existing):
  Antennas: Six (6) Powerwave 7770 panel antennas, two (2) Powerwave P65-16-XLH-RR panel antennas, one (1) Powerwave P90-16-XLH-RR panel antennas, six (6) Powerwave LGP21401 TMA's and three (3) TT19-08BP111-001 TMA's mounted on a 13-ft low profile platform with a RAD center elevation of 123-ft above existing grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- AT&T (Existing):
  Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted to one (1) universal ring mount with a RAD center elevation of 123-ft above existing grade level.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running on the inside of the existing monopole.

- SPRINT (Existing/Reserved):
  Antennas: Three (3) Andrew DB950F85T2E-M and three (3) RFS APXVSPP18-C-A20 panel antennas mounted on a 13-ft low profile platform with a RAD center elevation of 114-ft above existing grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables and three (3) 1-1/4" ∅ Hybriflex cables running on the inside of the existing monopole.
- SPRINT (Existing/Reserved):
  Antennas: Three (3) ALU 1900 MHz RRH's and three (3) ALU 800 MHz RRH's flush mounted to the tower with a RAD center elevation of 109-ft above grade.
- T-MOBILE (Existing):
  Antennas: Three (3) RFS APX16DWV-16DWVS panel antennas, three (3) RFS APX16PV-16PVL-X panel antennas and six (6) Ericsson KRY-112 TMA's mounted on a 13-ft low profile platform with a RAD center elevation of 104-ft above existing grade.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- TOWN (Existing):
  Antennas: One (1) 20' 4-bay dipole antenna mounted on the T-Mobile 13-ft low profile platform with an elevation of 102-ft above existing grade.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- TOWN (Existing):
  Antennas: Two (2) 18' x 4" Omni-directional whip antennas mounted on the Verizon 13-ft low profile platform with an elevation of 92-ft above existing grade.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- NEXTEL (Existing):
  Antennas: Twelve (12) Andrew DB844H90E-XY panel antennas mounted on a 13-ft low profile platform with a RAD center elevation of 84-ft above existing grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- TOWN (Existing):
  Antennas: One (1) 20' 4-bay dipole antenna mounted on a 13-ft low profile platform with an elevation of 72-ft above existing grade.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing monopole.
- VERIZON (Existing to Remain):
  Antennas: Three (3) Antel BXA-171063-12BF panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted to one (1) low profile platform with a RAD center elevation of 95-ft above existing grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing monopole.

- VERIZON (Existing to Remove):
  Antennas: One (1) Swedcom SLCP 2x6014, two (2) Antel BXA-70063-4CF, two (2) Antel LPA-80063-8CF and four (4) LPA-80080-8CF panel antennas mounted to one (1) 13-ft low profile platform with a RAD center elevation of 95-ft above existing grade.
- **VERIZON (Proposed):**
  Antennas: One (1) RFS DB-T1-6Z-8AB-0Z main distribution box flush mounted with a RAD center elevation of 97-ft above existing grade.
  Coax Cables: One (1) 1-5/8" Ø fiber line running on the inside of the existing monopole.
- **VERIZON (Proposed):**
  Antennas: Three (3) Antel BXA-171063-8BF panel antennas, three (3) Antel BXA-70063-6CF panel antennas, one (1) Antel BXA-80063-6BF panel antenna, two (2) Antel BXA-80080-6CF panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads mounted to one (1) low profile platform with a RAD center elevation of 95-ft above existing grade.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

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

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Bethel; 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 wind speed controls.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

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

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **85.7%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L2)	47.67' – 96.04'	85.7%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7-ft square x 1-ft long reinforced concrete pier on a 25.0-ft square x 4.5-ft thick reinforce concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design documents. The base of the tower is connected to the foundation by means of (12) 2.25"Ø, ASTM A615-75 anchor bolts embedded approximately 5-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	26 kips
	Compression	35 kips
	Moment	2362 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad and Pier	OTM[2]	2.0	2.55	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment

- The anchor bolts and base plate **with the reinforcements per Salient Associates, LLC report dated October 12, 2012 were found** to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	84.2%	**PASS**
Base Plate	Bending	85.0%	**PASS**

Conclusion

This analysis shows that the subject tower **with the base plate reinforcement per Salient Associates, LLC report dated October 12, 2012 is adequate** to support the proposed modified antenna configuration.

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16664
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, EIT
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

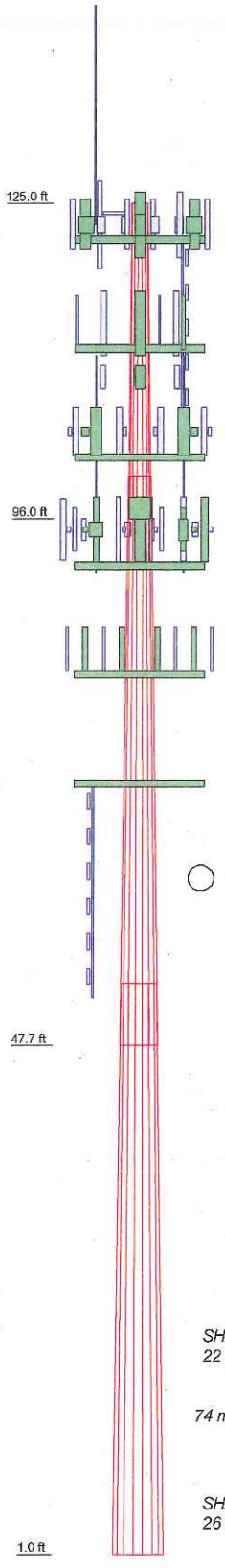
tnxTower is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, *tnxTower*, formerly RISATower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

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.

Section	1	2	3
Length (ft)	28.96	52.29	52.33
Number of Sides	18	18	18
Thickness (in)	0.1875	0.2500	0.3125
Socket Length (ft)	3.92	5.67	
Top Dia (in)	18.0000	25.3212	39.0504
Bot Dia (in)	29.9000	41.2800	55.0000
Grade	A572-65		
Weight (K)	1.3	4.7	8.3

14.2



AXIAL
42 K
SHEAR
22 K
MOMENT
2007 kip-ft
TORQUE 3 kip-ft
74 mph WIND - 0.5000 in ICE
AXIAL
35 K
SHEAR
26 K
MOMENT
2362 kip-ft
TORQUE 3 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
18' x 4" Dia Omni (Town - Existing)	124	APX16PV-16PVL-X (T-Mobile - Existing)	104
4-ft Standoff (Town - Existing)	124	APX16PV-16PVL-X (T-Mobile - Existing)	104
(2) 7770.00 (ATI - Existing)	123	APX16PV-16PVL-X (T-Mobile - Existing)	104
(2) 7770.00 (ATI - Existing)	123	(2) KRY 112 TMA (T-Mobile - Existing)	104
(2) 7770.00 (ATI - Existing)	123	(2) KRY 112 TMA (T-Mobile - Existing)	104
P90-16-XLH-RR (ATI - Existing)	123	ANT150D6-9 (Town - Existing)	102
P65-16-XLH-RR (ATI - Existing)	123	EEI 12-ft Low Profile Platform (T-Mobile - Existing)	102
P65-16-XLH-RR (ATI - Existing)	123	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	97
TT19-08BP111-001 TMA (ATI - Existing)	123	BXA-70063/6CF (Verizon - Proposed)	95
TT19-08BP111-001 TMA (ATI - Existing)	123	BXA-171063-12BF (Verizon - Existing)	95
TT19-08BP111-001 TMA (ATI - Existing)	123	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	95
(2) LGP21401 TMA (ATI - Existing)	123	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	95
(2) LGP21401 TMA (ATI - Existing)	123	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	95
(2) LGP21401 TMA (ATI - Existing)	123	RRH2x40-AWS (Verizon - Proposed)	95
(2) RRUS-11 (ATI - Existing)	123	RRH2x40-AWS (Verizon - Proposed)	95
(2) RRUS-11 (ATI - Existing)	123	RRH2x40-AWS (Verizon - Proposed)	95
(2) RRUS-11 (ATI - Existing)	123	RRH2x40-07-U (Verizon - Proposed)	95
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	123	RRH2x40-07-U (Verizon - Proposed)	95
Valmont Uni-Tri Bracket (ATI - Existing)	123	RRH2x40-07-U (Verizon - Proposed)	95
EEI 12-ft Low Profile Platform (ATI - Existing)	122	BXA-171063/8BF (Verizon - Proposed)	95
DB950F85T2E-M (Sprint - Existing)	114	BXA-171063-12BF (Verizon - Existing)	95
DB950F85T2E-M (Sprint - Existing)	114	BXA-80080-6CF (Verizon - Proposed)	95
DB950F85T2E-M (Sprint - Existing)	114	BXA-80063-6BF (Verizon - Proposed)	95
APXVSPP18-C-A20 (Sprint - Reserved)	114	BXA-171063/8BF (Verizon - Proposed)	95
APXVSPP18-C-A20 (Sprint - Reserved)	114	BXA-70063/6CF (Verizon - Proposed)	95
APXVSPP18-C-A20 (Sprint - Reserved)	114	BXA-171063-12BF (Verizon - Existing)	95
EEI Band-On 12' Low Profile Platform w/12 pipe (Sprint - Existing)	112	BXA-80080-6CF (Verizon - Proposed)	95
FD-RRH 2x50 800 (Sprint - Reserved)	109	BXA-171063/8BF (Verizon - Proposed)	95
FD-RRH 2x50 800 (Sprint - Reserved)	109	BXA-70063/6CF (Verizon - Proposed)	95
FD-RRH 2x50 800 (Sprint - Reserved)	109	EEI 12-ft Low Profile Platform (Verizon - Existing)	92
FD-RRH 4x40 1900 (Sprint - Reserved)	109	18' x 4" Dia Omni (Town - Existing)	92
FD-RRH 4x40 1900 (Sprint - Reserved)	109	18' x 4" Dia Omni (Town - Existing)	92
FD-RRH 4x40 1900 (Sprint - Reserved)	109	(4) DB844H90E-XY (Nextel - Existing)	84
(2) KRY 112 TMA (T-Mobile - Existing)	104	(4) DB844H90E-XY (Nextel - Existing)	84
APX16DWV-16DWV-S-E-ACU (T-Mobile - Existing)	104	(4) DB844H90E-XY (Nextel - Existing)	84
APX16DWV-16DWV-S-E-ACU (T-Mobile - Existing)	104	EEI 12-ft Low Profile Platform (Nextel - Existing)	82
APX16DWV-16DWV-S-E-ACU (T-Mobile - Existing)	104	EEI 12-ft Low Profile Platform (Town - Existing)	72
		ANT150D6-9 (Town - Existing)	72

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. TOWER RATING: 85.7%

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

Job: 12124.CO4 - Bethel		
Project: 125' EEI Monopole - 38 Sprill Hill Lane, Bethel, CT		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/07/13	Scale: NTS
Path: J:\Jobs\12124\00 WICO4- Bethel\Rev (2)\Cals\ERI Files\125' EEI Monopole, Bethel, CT.eri		Dwg No. E-1

tnxTower	Job	Page
	12124.CO4 - Bethel	1 of 21
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 125' EEI Monopole - 38 Sprill Hill Lane, Bethel, CT	**Date** 10:35:55 03/07/13
	Client Verizon Wireless	**Designed by** TJL

Tower Input Data

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

Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
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	125.00-96.04	28.96	3.92	18	18.0000	26.9000	0.1875	0.7500	A572-65 (65 ksi)
L2	96.04-47.67	52.29	5.67	18	25.3212	41.2800	0.2500	1.0000	A572-65 (65 ksi)
L3	47.67-1.00	52.33		18	39.0504	55.0000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	18.2777	10.6007	424.9328	6.3234	9.1440	46.4712	850.4248	5.3013	2.8380	15.136
	27.3150	15.8973	1433.1421	9.4829	13.6652	104.8753	2868.1699	7.9501	4.4044	23.49
L2	26.9257	19.8940	1579.8327	8.9003	12.8632	122.8182	3161.7442	9.9489	4.0165	16.066
	41.9168	32.5573	6924.5082	14.5657	20.9702	330.2064	13858.1278	16.2817	6.8253	27.301
L3	41.4066	38.4232	7284.5741	13.7520	19.8376	367.2100	14578.7333	19.2153	6.3229	20.233
	55.8485	54.2432	20495.5041	19.4141	27.9400	733.5542	41017.9768	27.1267	9.1300	29.216

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				1	1	1		
125.00-96.04								
L2 96.04-47.67				1	1	1		
L3 47.67-1.00				1	1	1		

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	12
Embedment length	60.0000 in
f'_c	3 ksi
Grout space	3.2500 in
Base plate grade	A572-60
Base plate thickness	1.7500 in
Bolt circle diameter	63.0000 in
Outer diameter	69.0000 in
Inner diameter	45.0000 in
Base plate type	Stiffened Plate
Bolts per stiffener	1
Stiffener thickness	0.5000 in
Stiffener height	12.0000 in

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8	C	No	Inside Pole	123.00 - 4.00	12	No Ice	0.00	1.04
(AT&T - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	113.00 - 4.00	6	No Ice	0.00	1.04
(Sprint - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	103.00 - 4.00	18	No Ice	0.00	1.04
(T-Mobile - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	93.00 - 4.00	12	No Ice	0.00	1.04
(Verizon - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	83.00 - 4.00	12	No Ice	0.00	1.04
(Nextel - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	123.00 - 4.00	4	No Ice	0.00	1.04

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
(Town - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	93.00 - 4.00	2	No Ice	0.00	1.04
(Town - Existing)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	73.00 - 4.00	2	No Ice	0.00	1.04
(Town - Existing)						1/2" Ice	0.00	1.04
HYBRIFLEX 1-5/8"	C	No	Inside Pole	93.00 - 1.00	1	No Ice	0.00	1.90
(Verizon - Proposed)						1/2" Ice	0.00	1.90
RG6-Fiber	C	No	Inside Pole	123.00 - 4.00	1	No Ice	0.00	1.00
(AT&T - Existing)						1/2" Ice	0.00	1.00
#8 AWG Copper Wire	C	No	Inside Pole	123.00 - 4.00	2	No Ice	0.00	0.05
(AT&T - Existing)						1/2" Ice	0.00	0.05
HYBRIFLEX 1-1/4"	C	No	Inside Pole	113.00 - 1.00	3	No Ice	0.00	1.30
(Sprint - Reserved)						1/2" Ice	0.00	1.30

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	125.00-96.04	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.78
L2	96.04-47.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	3.49
L3	47.67-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	3.41

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	125.00-96.04	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.78
L2	96.04-47.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	3.49
L3	47.67-1.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	3.41

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
18' x 4" Dia Omni	A	From Face	4.00	0.0000	124.00	No Ice	7.20	7.20	0.05
(Town - Existing)			0.00			1/2" Ice	9.04	9.04	0.10
			9.00						
4-ft Standoff	A	From Face	2.00	0.0000	124.00	No Ice	1.40	0.09	0.03
(Town - Existing)			0.00			1/2" Ice	1.73	0.13	0.04
			0.00						
(2) 7770.00	A	From Face	3.50	0.0000	123.00	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
(2) 7770.00	B	From Face	3.50	0.0000	123.00	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
(2) 7770.00	C	From Face	3.50	0.0000	123.00	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
P90-16-XLH-RR	A	From Face	3.50	0.0000	123.00	No Ice	10.69	7.58	0.07
(AT&T - Existing)			0.00			1/2" Ice	11.30	8.17	0.13
			0.00						
P65-16-XLH-RR	B	From Face	3.50	0.0000	123.00	No Ice	8.40	4.70	0.06
(AT&T - Existing)			0.00			1/2" Ice	8.95	5.15	0.11
			0.00						
P65-16-XLH-RR	C	From Face	3.50	0.0000	123.00	No Ice	8.40	4.70	0.06
(AT&T - Existing)			0.00			1/2" Ice	8.95	5.15	0.11
			0.00						
TT19-08BP111-001 TMA	A	From Face	3.50	0.0000	123.00	No Ice	0.64	0.52	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.76	0.62	0.02
			0.00						
TT19-08BP111-001 TMA	B	From Face	3.50	0.0000	123.00	No Ice	0.64	0.52	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.76	0.62	0.02
			0.00						
TT19-08BP111-001 TMA	C	From Face	3.50	0.0000	123.00	No Ice	0.64	0.52	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.76	0.62	0.02
			0.00						
(2) LGP21401 TMA	A	From Face	3.50	0.0000	123.00	No Ice	0.95	0.37	0.02
(AT&T - Existing)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) LGP21401 TMA	B	From Face	3.50	0.0000	123.00	No Ice	0.95	0.37	0.02
(AT&T - Existing)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) LGP21401 TMA	C	From Face	3.50	0.0000	123.00	No Ice	0.95	0.37	0.02
(AT&T - Existing)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) RRUS-11	A	From Face	0.50	0.0000	123.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	B	From Face	0.50	0.0000	123.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	C	From Face	0.50	0.0000	123.00	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
DC6-48-60-18-8F Surge	C	From Face	0.50	0.0000	123.00	No Ice	2.23	2.23	0.02
Arrestor			0.00			1/2" Ice	2.45	2.45	0.04
(AT&T - Existing)			0.00						
Valmont Uni-Tri Bracket	C	None		0.0000	123.00	No Ice	1.75	1.75	0.29
(AT&T - Existing)						1/2" Ice	1.94	1.94	0.31
EEI 12-ft Low Profile	C	None		0.0000	122.00	No Ice	15.00	15.00	1.50

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
Platform						1/2" Ice	18.40	18.40	1.75
(AT&T - Existing)									
ANT150D6-9	B	From Face	3.50	0.0000	102.00	No Ice	4.00	4.00	0.03
(Town - Existing)			0.00			1/2" Ice	4.60	4.60	0.03
			10.00						
DB950F85T2E-M	A	From Face	3.50	0.0000	114.00	No Ice	2.53	4.19	0.01
(Sprint - Existing)			-4.00			1/2" Ice	2.90	4.57	0.03
			0.00						
DB950F85T2E-M	B	From Face	3.50	0.0000	114.00	No Ice	2.53	4.19	0.01
(Sprint - Existing)			-4.00			1/2" Ice	2.90	4.57	0.03
			0.00						
DB950F85T2E-M	C	From Face	3.50	0.0000	114.00	No Ice	2.53	4.19	0.01
(Sprint - Existing)			-4.00			1/2" Ice	2.90	4.57	0.03
			0.00						
EEI Band-On 12' Low Profile	C	None		0.0000	112.00	No Ice	39.00	39.00	2.00
Platform w/12 pipe						1/2" Ice	50.00	50.00	3.00
(Sprint - Existing)									
APX16DWV-16DWV-S-E-A	A	From Face	3.50	0.0000	104.00	No Ice	6.70	2.00	0.04
CU			-4.00			1/2" Ice	7.13	2.33	0.07
(T-Mobile - Existing)			0.00						
APX16DWV-16DWV-S-E-A	B	From Face	3.50	0.0000	104.00	No Ice	6.70	2.00	0.04
CU			-4.00			1/2" Ice	7.13	2.33	0.07
(T-Mobile - Existing)			0.00						
APX16DWV-16DWV-S-E-A	C	From Face	3.50	0.0000	104.00	No Ice	6.70	2.00	0.04
CU			-4.00			1/2" Ice	7.13	2.33	0.07
(T-Mobile - Existing)			0.00						
APX16PV-16PVL-X	A	From Face	3.50	0.0000	104.00	No Ice	6.70	2.00	0.04
(T-Mobile - Existing)			4.00			1/2" Ice	7.13	2.33	0.07
			0.00						
APX16PV-16PVL-X	B	From Face	3.50	0.0000	104.00	No Ice	6.70	2.00	0.04
(T-Mobile - Existing)			4.00			1/2" Ice	7.13	2.33	0.07
			0.00						
APX16PV-16PVL-X	C	From Face	3.50	0.0000	104.00	No Ice	6.70	2.00	0.04
(T-Mobile - Existing)			4.00			1/2" Ice	7.13	2.33	0.07
			0.00						
(2) KRY 112 TMA	A	From Face	3.50	0.0000	104.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00						
(2) KRY 112 TMA	B	From Face	3.50	0.0000	104.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00						
(2) KRY 112 TMA	C	From Face	3.50	0.0000	104.00	No Ice	0.78	0.49	0.03
(T-Mobile - Existing)			0.00			1/2" Ice	0.90	0.59	0.03
			0.00						
EEI 12-ft Low Profile	C	None		0.0000	102.00	No Ice	15.00	15.00	1.50
Platform						1/2" Ice	18.40	18.40	1.75
(T-Mobile - Existing)									
BXA-80063-6BF	A	From Face	3.50	0.0000	95.00	No Ice	7.47	4.04	0.02
(Verizon - Proposed)			-6.00			1/2" Ice	7.99	4.46	0.06
			0.00						
BXA-171063/8BF	A	From Face	3.50	0.0000	95.00	No Ice	2.94	2.16	0.01
(Verizon - Proposed)			-4.00			1/2" Ice	3.26	2.46	0.03
			0.00						
BXA-70063/6CF	A	From Face	3.50	0.0000	95.00	No Ice	7.73	4.16	0.02
(Verizon - Proposed)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
BXA-171063-12BF	A	From Face	3.50	0.0000	95.00	No Ice	4.73	3.57	0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Existing)			4.00			1/2" Ice	5.18	4.01	0.04
			0.00						
BXA-80080-6CF	B	From Face	3.50	0.0000	95.00	No Ice	5.77	4.56	0.02
(Verizon - Proposed)			-6.00			1/2" Ice	6.22	5.00	0.05
			0.00						
BXA-171063/8BF	B	From Face	3.50	0.0000	95.00	No Ice	2.94	2.16	0.01
(Verizon - Proposed)			-4.00			1/2" Ice	3.26	2.46	0.03
			0.00						
BXA-70063/6CF	B	From Face	3.50	0.0000	95.00	No Ice	7.73	4.16	0.02
(Verizon - Proposed)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
BXA-171063-12BF	B	From Face	3.50	0.0000	95.00	No Ice	4.73	3.57	0.02
(Verizon - Existing)			4.00			1/2" Ice	5.18	4.01	0.04
			0.00						
BXA-80080-6CF	C	From Face	3.50	0.0000	95.00	No Ice	5.77	4.56	0.02
(Verizon - Proposed)			-6.00			1/2" Ice	6.22	5.00	0.05
			0.00						
BXA-171063/8BF	C	From Face	3.50	0.0000	95.00	No Ice	2.94	2.16	0.01
(Verizon - Proposed)			-4.00			1/2" Ice	3.26	2.46	0.03
			0.00						
BXA-70063/6CF	C	From Face	3.50	0.0000	95.00	No Ice	7.73	4.16	0.02
(Verizon - Proposed)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
BXA-171063-12BF	C	From Face	3.50	0.0000	95.00	No Ice	4.73	3.57	0.02
(Verizon - Existing)			4.00			1/2" Ice	5.18	4.01	0.04
			0.00						
(2) FD9R6004/2C-3L	A	From Face	3.50	0.0000	95.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon - Existing)			0.00						
(2) FD9R6004/2C-3L	B	From Face	3.50	0.0000	95.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon - Existing)			0.00						
(2) FD9R6004/2C-3L	C	From Face	3.50	0.0000	95.00	No Ice	0.37	0.08	0.00
Diplexer			0.00			1/2" Ice	0.45	0.14	0.01
(Verizon - Existing)			0.00						
RRH2x40-AWS	A	From Face	2.50	0.0000	95.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Face	2.50	0.0000	95.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-AWS	C	From Face	2.50	0.0000	95.00	No Ice	2.52	1.59	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	2.75	1.80	0.06
			0.00						
RRH2x40-07-U	A	From Face	2.50	0.0000	95.00	No Ice	2.25	1.23	0.05
(Verizon - Proposed)			4.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	B	From Face	2.50	0.0000	95.00	No Ice	2.25	1.23	0.05
(Verizon - Proposed)			4.00			1/2" Ice	2.45	1.39	0.07
			0.00						
RRH2x40-07-U	C	From Face	2.50	0.0000	95.00	No Ice	2.25	1.23	0.05
(Verizon - Proposed)			4.00			1/2" Ice	2.45	1.39	0.07
			0.00						
DB-T1-6Z-8AB-0Z	C	From Face	0.50	0.0000	97.00	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
EEI 12-ft Low Profile	C	None		0.0000	92.00	No Ice	15.00	15.00	1.50

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Platform (Verizon - Existing)							1/2" Ice	18.40	18.40	1.75
18' x 4" Dia Omni (Town - Existing)	A	From Face	3.50 0.00 9.00		0.0000	92.00	No Ice 1/2" Ice	7.20 9.04	7.20 9.04	0.05 0.10
18' x 4" Dia Omni (Town - Existing)	B	From Face	3.50 0.00 9.00		0.0000	92.00	No Ice 1/2" Ice	7.20 9.04	7.20 9.04	0.05 0.10
(4) DB844H90E-XY (Nextel - Existing)	A	From Face	3.50 0.00 0.00		0.0000	84.00	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.01 0.04
(4) DB844H90E-XY (Nextel - Existing)	B	From Face	3.50 0.00 0.00		0.0000	84.00	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.01 0.04
(4) DB844H90E-XY (Nextel - Existing)	C	From Face	3.50 0.00 0.00		0.0000	84.00	No Ice 1/2" Ice	2.87 3.18	3.73 4.10	0.01 0.04
EEI 12-ft Low Profile Platform (Nextel - Existing)	C	None			0.0000	82.00	No Ice 1/2" Ice	15.00 18.40	15.00 18.40	1.50 1.75
EEI 12-ft Low Profile Platform (Town - Existing)	C	None			0.0000	72.00	No Ice 1/2" Ice	15.00 18.40	15.00 18.40	1.50 1.75
ANT150D6-9 (Town - Existing)	A	From Face	3.50 0.00 -10.00		0.0000	72.00	No Ice 1/2" Ice	4.00 4.60	4.00 4.60	0.03 0.03
APXVSPP18-C-A20 (Sprint - Reserved)	A	From Face	3.00 0.00 0.00		0.0000	114.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVSPP18-C-A20 (Sprint - Reserved)	B	From Face	3.00 0.00 0.00		0.0000	114.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVSPP18-C-A20 (Sprint - Reserved)	C	From Face	3.00 0.00 0.00		0.0000	114.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
FD-RRH 2x50 800 (Sprint - Reserved)	A	From Face	3.00 0.00 0.00		0.0000	109.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - Reserved)	B	From Face	3.00 0.00 0.00		0.0000	109.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - Reserved)	C	From Face	3.00 0.00 0.00		0.0000	109.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 4x40 1900 (Sprint - Reserved)	A	From Face	3.00 0.00 0.00		0.0000	109.00	No Ice 1/2" Ice	2.61 2.84	2.71 2.95	0.06 0.08
FD-RRH 4x40 1900 (Sprint - Reserved)	B	From Face	3.00 0.00 0.00		0.0000	109.00	No Ice 1/2" Ice	2.61 2.84	2.71 2.95	0.06 0.08
FD-RRH 4x40 1900 (Sprint - Reserved)	C	From Face	3.00 0.00 0.00		0.0000	109.00	No Ice 1/2" Ice	2.61 2.84	2.71 2.95	0.06 0.08

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
L1	109.56	1.409	26	54.179	A	0.000	54.179	54.179	100.00	0.000	0.000
125.00-96.04					B	0.000	54.179		100.00	0.000	0.000
					C	0.000	54.179		100.00	0.000	0.000
L2 96.04-47.67	70.68	1.243	23	136.647	A	0.000	136.647	136.647	100.00	0.000	0.000
					B	0.000	136.647		100.00	0.000	0.000
					C	0.000	136.647		100.00	0.000	0.000
L3 47.67-1.00	23.31	1	19	186.235	A	0.000	186.235	186.235	100.00	0.000	0.000
					B	0.000	186.235		100.00	0.000	0.000
					C	0.000	186.235		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation	z	K_Z	q_z	t_Z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	in	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
L1 125.00-96.04	109.56	1.409	20	0.5000	56.593	A	0.000	56.593	56.593	100.00	0.000	0.000
						B	0.000	56.593		100.00	0.000	0.000
						C	0.000	56.593		100.00	0.000	0.000
L2 96.04-47.67	70.68	1.243	17	0.5000	140.678	A	0.000	140.678	140.678	100.00	0.000	0.000
						B	0.000	140.678		100.00	0.000	0.000
						C	0.000	140.678		100.00	0.000	0.000
L3 47.67-1.00	23.31	1	14	0.5000	190.124	A	0.000	190.124	190.124	100.00	0.000	0.000
						B	0.000	190.124		100.00	0.000	0.000
						C	0.000	190.124		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
L1	109.56	1.409	9	54.179	A	0.000	54.179	54.179	100.00	0.000	0.000
125.00-96.04					B	0.000	54.179		100.00	0.000	0.000
					C	0.000	54.179		100.00	0.000	0.000
L2 96.04-47.67	70.68	1.243	8	136.647	A	0.000	136.647	136.647	100.00	0.000	0.000
					B	0.000	136.647		100.00	0.000	0.000
					C	0.000	136.647		100.00	0.000	0.000
L3 47.67-1.00	23.31	1	6	186.235	A	0.000	186.235	186.235	100.00	0.000	0.000
					B	0.000	186.235		100.00	0.000	0.000

tnxTower	Job	Page
	12124.CO4 - Bethel	9 of 21
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 125' EEI Monopole - 38 Sprill Hill Lane, Bethel, CT	**Date** 10:35:55 03/07/13
	Client Verizon Wireless	**Designed by** TJL

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	0.000	186.235		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	1.55	53.56	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	3.43	70.97	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	3.82	81.93	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	492.89 kip-ft	8.81		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	1.55	53.56	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	3.43	70.97	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	3.82	81.93	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	492.89 kip-ft	8.81		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	1.55	53.56	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	3.43	70.97	C
96.04-47.67			B	1	0.65	1	1	1	136.647			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	3.82	81.93	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	492.89 kip-ft	8.81		

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 plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	1.55	53.56	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	3.43	70.97	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	3.82	81.93	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	492.89 kip-ft	8.81		

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 plf	Ctrl. Face
L1	0.78	1.72	A	1	0.65	1	1	1	56.593	1.22	41.96	C
125.00-96.04			B	1	0.65	1	1	1	56.593			
			C	1	0.65	1	1	1	56.593			
L2	3.49	5.69	A	1	0.65	1	1	1	140.678	2.65	54.80	C
96.04-47.67			B	1	0.65	1	1	1	140.678			
			C	1	0.65	1	1	1	140.678			
L3 47.67-1.00	3.41	9.64	A	1	0.65	1	1	1	190.124	2.93	62.73	C
			B	1	0.65	1	1	1	190.124			
			C	1	0.65	1	1	1	190.124			
Sum Weight:	7.68	17.05						OTM	381.92 kip-ft	6.79		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.72	A	1	0.65	1	1	1	56.593	1.22	41.96	C
125.00-96.04			B	1	0.65	1	1	1	56.593			
			C	1	0.65	1	1	1	56.593			
L2	3.49	5.69	A	1	0.65	1	1	1	140.678	2.65	54.80	C
96.04-47.67			B	1	0.65	1	1	1	140.678			
			C	1	0.65	1	1	1	140.678			
L3 47.67-1.00	3.41	9.64	A	1	0.65	1	1	1	190.124	2.93	62.73	C
			B	1	0.65	1	1	1	190.124			
			C	1	0.65	1	1	1	190.124			
Sum Weight:	7.68	17.05						OTM	381.92 kip-ft	6.79		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.72	A	1	0.65	1	1	1	56.593	1.22	41.96	C
125.00-96.04			B	1	0.65	1	1	1	56.593			
			C	1	0.65	1	1	1	56.593			
L2	3.49	5.69	A	1	0.65	1	1	1	140.678	2.65	54.80	C
96.04-47.67			B	1	0.65	1	1	1	140.678			
			C	1	0.65	1	1	1	140.678			
L3 47.67-1.00	3.41	9.64	A	1	0.65	1	1	1	190.124	2.93	62.73	C
			B	1	0.65	1	1	1	190.124			
			C	1	0.65	1	1	1	190.124			
Sum Weight:	7.68	17.05						OTM	381.92 kip-ft	6.79		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.72	A	1	0.65	1	1	1	56.593	1.22	41.96	C
125.00-96.04			B	1	0.65	1	1	1	56.593			
			C	1	0.65	1	1	1	56.593			
L2	3.49	5.69	A	1	0.65	1	1	1	140.678	2.65	54.80	C
96.04-47.67			B	1	0.65	1	1	1	140.678			
			C	1	0.65	1	1	1	140.678			
L3 47.67-1.00	3.41	9.64	A	1	0.65	1	1	1	190.124	2.93	62.73	C
			B	1	0.65	1	1	1	190.124			
			C	1	0.65	1	1	1	190.124			
Sum Weight:	7.68	17.05						OTM	381.92 kip-ft	6.79		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	0.54	18.53	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	1.19	24.56	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	1.32	28.35	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	170.55 kip-ft	3.05		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	0.54	18.53	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	1.19	24.56	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	1.32	28.35	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	170.55 kip-ft	3.05		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	0.54	18.53	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	1.19	24.56	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	1.32	28.35	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	170.55 kip-ft	3.05		

tnxTower	Job: 12124.CO4 - Bethel	Page: 13 of 21
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 125' EEI Monopole - 38 Sprill Hill Lane, Bethel, CT	Date: 10:35:55 03/07/13
	Client: Verizon Wireless	Designed by: TJL

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 plf	Ctrl. Face
L1	0.78	1.31	A	1	0.65	1	1	1	54.179	0.54	18.53	C
125.00-96.04			B	1	0.65	1	1	1	54.179			
			C	1	0.65	1	1	1	54.179			
L2	3.49	4.67	A	1	0.65	1	1	1	136.647	1.19	24.56	C
96.04-47.67			B	1	0.65	1	1	1	136.647			
			C	1	0.65	1	1	1	136.647			
L3 47.67-1.00	3.41	8.25	A	1	0.65	1	1	1	186.235	1.32	28.35	C
			B	1	0.65	1	1	1	186.235			
			C	1	0.65	1	1	1	186.235			
Sum Weight:	7.68	14.22						OTM	170.55 kip-ft	3.05		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	14.22					
Bracing Weight	0.00					
Total Member Self-Weight	14.22			-0.46	0.32	
Total Weight	34.51			-0.46	0.32	
Wind 0 deg - No Ice		-0.06	-26.19	-2291.72	5.93	-1.94
Wind 30 deg - No Ice		13.01	-22.66	-1981.94	-1137.02	-2.97
Wind 45 deg - No Ice		18.43	-18.48	-1616.66	-1611.02	-3.20
Wind 60 deg - No Ice		22.59	-13.05	-1141.23	-1975.22	-3.21
Wind 90 deg - No Ice		26.12	0.06	5.15	-2284.07	-2.58
Wind 120 deg - No Ice		22.65	13.14	1150.03	-1980.82	-1.27
Wind 135 deg - No Ice		18.51	18.56	1623.67	-1618.95	-0.45
Wind 150 deg - No Ice		13.11	22.71	1986.64	-1146.73	0.39
Wind 180 deg - No Ice		0.06	26.19	2290.80	-5.28	1.94
Wind 210 deg - No Ice		-13.01	22.66	1981.03	1137.67	2.97
Wind 225 deg - No Ice		-18.43	18.48	1615.75	1611.67	3.20
Wind 240 deg - No Ice		-22.59	13.05	1140.32	1975.87	3.21
Wind 270 deg - No Ice		-26.12	-0.06	-6.06	2284.72	2.58
Wind 300 deg - No Ice		-22.65	-13.14	-1150.94	1981.47	1.27
Wind 315 deg - No Ice		-18.51	-18.56	-1624.59	1619.60	0.45
Wind 330 deg - No Ice		-13.11	-22.71	-1987.55	1147.38	-0.39
Member Ice	2.83					
Total Weight Ice	41.64			-0.77	0.66	
Wind 0 deg - Ice		-0.05	-21.76	-1929.72	5.37	-1.74
Wind 30 deg - Ice		10.81	-18.82	-1668.94	-957.32	-2.72
Wind 45 deg - Ice		15.31	-15.35	-1361.42	-1356.56	-2.95
Wind 60 deg - Ice		18.77	-10.84	-961.17	-1663.31	-2.98
Wind 90 deg - Ice		21.70	0.05	3.94	-1923.44	-2.43
Wind 120 deg - Ice		18.82	10.92	967.78	-1668.01	-1.24
Wind 135 deg - Ice		15.38	15.42	1366.54	-1363.21	-0.49
Wind 150 deg - Ice		10.89	18.86	1672.11	-965.46	0.29
Wind 180 deg - Ice		0.05	21.76	1928.19	-4.04	1.74
Wind 210 deg - Ice		-10.81	18.82	1667.41	958.64	2.72

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 225 deg - Ice		-15.31	15.35	1359.89	1357.89	2.95
Wind 240 deg - Ice		-18.77	10.84	959.64	1664.64	2.98
Wind 270 deg - Ice		-21.70	-0.05	-5.47	1924.77	2.43
Wind 300 deg - Ice		-18.82	-10.92	-969.32	1669.34	1.24
Wind 315 deg - Ice		-15.38	-15.42	-1368.07	1364.54	0.49
Wind 330 deg - Ice		-10.89	-18.86	-1673.64	966.79	-0.29
Total Weight	34.51			-0.46	0.32	
Wind 0 deg - Service		-0.02	-9.06	-793.28	2.26	-0.67
Wind 30 deg - Service		4.50	-7.84	-686.09	-393.22	-1.03
Wind 45 deg - Service		6.38	-6.40	-559.70	-557.24	-1.11
Wind 60 deg - Service		7.82	-4.52	-395.19	-683.25	-1.11
Wind 90 deg - Service		9.04	0.02	1.48	-790.12	-0.89
Wind 120 deg - Service		7.84	4.55	397.63	-685.19	-0.44
Wind 135 deg - Service		6.40	6.42	561.53	-559.98	-0.16
Wind 150 deg - Service		4.54	7.86	687.12	-396.58	0.14
Wind 180 deg - Service		0.02	9.06	792.37	-1.62	0.67
Wind 210 deg - Service		-4.50	7.84	685.18	393.87	1.03
Wind 225 deg - Service		-6.38	6.40	558.78	557.88	1.11
Wind 240 deg - Service		-7.82	4.52	394.27	683.90	1.11
Wind 270 deg - Service		-9.04	-0.02	-2.40	790.77	0.89
Wind 300 deg - Service		-7.84	-4.55	-398.55	685.84	0.44
Wind 315 deg - Service		-6.40	-6.42	-562.44	560.63	0.16
Wind 330 deg - Service		-4.54	-7.86	-688.03	397.23	-0.14

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

Comb. No.	Description
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	125 - 96.04	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-12.06	0.49	0.38
			Max. Mx	14	-8.27	180.09	0.55
			Max. My	2	-8.27	0.54	179.71
			Max. Vy	14	-12.07	180.09	0.55
			Max. Vx	2	-12.05	0.54	179.71
			Max. Torque	3			2.09
L2	96.04 - 47.667	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-27.42	0.67	0.77
			Max. Mx	14	-21.08	1078.54	3.29
			Max. My	2	-21.08	3.16	1081.71
			Max. Vy	14	-22.56	1078.54	3.29
			Max. Vx	2	-22.64	3.16	1081.71
			Max. Torque	5			3.19
L3	47.667 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-41.64	0.67	0.77
			Max. Mx	14	-34.49	2351.34	6.24
			Max. My	2	-34.49	6.11	2358.52
			Max. Vy	14	-26.14	2351.34	6.24
			Max. Vx	2	-26.22	6.11	2358.52
			Max. Torque	5			3.19

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	19	41.64	0.05	21.76
	Max. H_x	14	34.51	26.12	0.06
	Max. H_z	2	34.51	0.06	26.19
	Max. M_x	2	2358.52	0.06	26.19
	Max. M_z	6	2350.65	-26.12	-0.06
	Max. Torsion	5	3.18	-22.59	13.05
	Min. Vert	1	34.51	0.00	0.00
	Min. H_x	6	34.51	-26.12	-0.06
	Min. H_z	10	34.51	-0.06	-26.19
	Min. M_x	10	-2357.56	-0.06	-26.19
	Min. M_z	14	-2351.34	26.12	0.06
	Min. Torsion	13	-3.18	22.59	-13.05

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	34.51	0.00	0.00	-0.46	0.32	0.00
Dead+Wind 0 deg - No Ice	34.51	-0.06	-26.19	-2358.52	6.11	-1.93
Dead+Wind 30 deg - No Ice	34.51	13.01	-22.66	-2039.72	-1170.17	-2.95
Dead+Wind 45 deg - No Ice	34.51	18.43	-18.48	-1663.78	-1658.00	-3.18
Dead+Wind 60 deg - No Ice	34.51	22.59	-13.05	-1174.49	-2032.81	-3.18
Dead+Wind 90 deg - No Ice	34.51	26.12	0.06	5.31	-2350.65	-2.56
Dead+Wind 120 deg - No Ice	34.51	22.65	13.14	1183.54	-2038.56	-1.25
Dead+Wind 135 deg - No Ice	34.51	18.51	18.56	1670.99	-1666.14	-0.44
Dead+Wind 150 deg - No Ice	34.51	13.11	22.71	2044.52	-1180.15	0.39
Dead+Wind 180 deg - No Ice	34.51	0.06	26.19	2357.56	-5.44	1.93
Dead+Wind 210 deg - No Ice	34.51	-13.01	22.66	2038.77	1170.83	2.95
Dead+Wind 225 deg - No Ice	34.51	-18.43	18.48	1662.84	1658.66	3.17
Dead+Wind 240 deg - No Ice	34.51	-22.59	13.05	1173.56	2033.48	3.18
Dead+Wind 270 deg - No Ice	34.51	-26.12	-0.06	-6.24	2351.34	2.56
Dead+Wind 300 deg - No Ice	34.51	-22.65	-13.14	-1184.50	2039.25	1.25
Dead+Wind 315 deg - No Ice	34.51	-18.51	-18.56	-1671.94	1666.82	0.45
Dead+Wind 330 deg - No Ice	34.51	-13.11	-22.71	-2045.48	1180.83	-0.39
Dead+Ice+Temp	41.64	0.00	0.00	-0.77	0.67	0.00
Dead+Wind 0 deg+Ice+Temp	41.64	-0.05	-21.76	-2003.75	5.60	-1.73
Dead+Wind 30 deg+Ice+Temp	41.64	10.81	-18.82	-1732.96	-994.02	-2.71
Dead+Wind 45 deg+Ice+Temp	41.64	15.31	-15.35	-1413.64	-1408.58	-2.93
Dead+Wind 60 deg+Ice+Temp	41.64	18.77	-10.84	-998.04	-1727.10	-2.96
Dead+Wind 90 deg+Ice+Temp	41.64	21.70	0.05	4.08	-1997.20	-2.41
Dead+Wind 120 deg+Ice+Temp	41.64	18.82	10.92	1004.88	-1731.97	-1.22
Dead+Wind 135 deg+Ice+Temp	41.64	15.38	15.42	1418.92	-1415.48	-0.48
Dead+Wind 150 deg+Ice+Temp	41.64	10.89	18.86	1736.21	-1002.48	0.29
Dead+Wind 180 deg+Ice+Temp	41.64	0.05	21.76	2002.11	-4.19	1.73
Dead+Wind 210 deg+Ice+Temp	41.64	-10.81	18.82	1731.33	995.42	2.70
Dead+Wind 225 deg+Ice+Temp	41.64	-15.31	15.35	1412.02	1409.99	2.93
Dead+Wind 240 deg+Ice+Temp	41.64	-18.77	10.84	996.42	1728.51	2.95
Dead+Wind 270 deg+Ice+Temp	41.64	-21.70	-0.05	-5.70	1998.63	2.41
Dead+Wind 300 deg+Ice+Temp	41.64	-18.82	-10.92	-1006.51	1733.40	1.23
Dead+Wind 315 deg+Ice+Temp	41.64	-15.38	-15.42	-1420.56	1416.91	0.48
Dead+Wind 330 deg+Ice+Temp	41.64	-10.89	-18.86	-1737.85	1003.90	-0.29
Dead+Wind 0 deg - Service	34.51	-0.02	-9.06	-817.02	2.34	-0.67
Dead+Wind 30 deg - Service	34.51	4.50	-7.84	-706.62	-404.97	-1.03
Dead+Wind 45 deg - Service	34.51	6.38	-6.40	-576.45	-573.90	-1.11
Dead+Wind 60 deg - Service	34.51	7.82	-4.52	-407.02	-703.69	-1.11
Dead+Wind 90 deg - Service	34.51	9.04	0.02	1.52	-813.75	-0.89

Load Combination	Vertical K	Shear$_x$ K	Shear$_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 120 deg - Service	34.51	7.84	4.55	409.52	-705.68	-0.44
Dead+Wind 135 deg - Service	34.51	6.40	6.42	578.31	-576.72	-0.15
Dead+Wind 150 deg - Service	34.51	4.54	7.86	707.66	-408.44	0.14
Dead+Wind 180 deg - Service	34.51	0.02	9.06	816.05	-1.66	0.67
Dead+Wind 210 deg - Service	34.51	-4.50	7.84	705.66	405.66	1.03
Dead+Wind 225 deg - Service	34.51	-6.38	6.40	575.48	574.58	1.11
Dead+Wind 240 deg - Service	34.51	-7.82	4.52	406.05	704.37	1.11
Dead+Wind 270 deg - Service	34.51	-9.04	-0.02	-2.48	814.44	0.89
Dead+Wind 300 deg - Service	34.51	-7.84	-4.55	-410.48	706.37	0.44
Dead+Wind 315 deg - Service	34.51	-6.40	-6.42	-579.27	577.41	0.15
Dead+Wind 330 deg - Service	34.51	-4.54	-7.86	-708.62	409.12	-0.14

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	0.00	-34.51	0.00	0.00	34.51	0.00	0.000%
2	-0.06	-34.51	-26.19	0.06	34.51	26.19	0.000%
3	13.01	-34.51	-22.66	-13.01	34.51	22.66	0.000%
4	18.43	-34.51	-18.48	-18.43	34.51	18.48	0.000%
5	22.59	-34.51	-13.05	-22.59	34.51	13.05	0.000%
6	26.12	-34.51	0.06	-26.12	34.51	-0.06	0.000%
7	22.65	-34.51	13.14	-22.65	34.51	-13.14	0.000%
8	18.51	-34.51	18.56	-18.51	34.51	-18.56	0.000%
9	13.11	-34.51	22.71	-13.11	34.51	-22.71	0.000%
10	0.06	-34.51	26.19	-0.06	34.51	-26.19	0.000%
11	-13.01	-34.51	22.66	13.01	34.51	-22.66	0.000%
12	-18.43	-34.51	18.48	18.43	34.51	-18.48	0.000%
13	-22.59	-34.51	13.05	22.59	34.51	-13.05	0.000%
14	-26.12	-34.51	-0.06	26.12	34.51	0.06	0.000%
15	-22.65	-34.51	-13.14	22.65	34.51	13.14	0.000%
16	-18.51	-34.51	-18.56	18.51	34.51	18.56	0.000%
17	-13.11	-34.51	-22.71	13.11	34.51	22.71	0.000%
18	0.00	-41.64	0.00	0.00	41.64	0.00	0.000%
19	-0.05	-41.64	-21.76	0.05	41.64	21.76	0.000%
20	10.81	-41.64	-18.82	-10.81	41.64	18.82	0.000%
21	15.31	-41.64	-15.35	-15.31	41.64	15.35	0.000%
22	18.77	-41.64	-10.84	-18.77	41.64	10.84	0.000%
23	21.70	-41.64	0.05	-21.70	41.64	-0.05	0.000%
24	18.82	-41.64	10.92	-18.82	41.64	-10.92	0.000%
25	15.38	-41.64	15.42	-15.38	41.64	-15.42	0.000%
26	10.89	-41.64	18.86	-10.89	41.64	-18.86	0.000%
27	0.05	-41.64	21.76	-0.05	41.64	-21.76	0.000%
28	-10.81	-41.64	18.82	10.81	41.64	-18.82	0.000%
29	-15.31	-41.64	15.35	15.31	41.64	-15.35	0.000%
30	-18.77	-41.64	10.84	18.77	41.64	-10.84	0.000%
31	-21.70	-41.64	-0.05	21.70	41.64	0.05	0.000%
32	-18.82	-41.64	-10.92	18.82	41.64	10.92	0.000%
33	-15.38	-41.64	-15.42	15.38	41.64	15.42	0.000%
34	-10.89	-41.64	-18.86	10.89	41.64	18.86	0.000%
35	-0.02	-34.51	-9.06	0.02	34.51	9.06	0.000%
36	4.50	-34.51	-7.84	-4.50	34.51	7.84	0.000%
37	6.38	-34.51	-6.40	-6.38	34.51	6.40	0.000%
38	7.82	-34.51	-4.52	-7.82	34.51	4.52	0.000%
39	9.04	-34.51	0.02	-9.04	34.51	-0.02	0.000%
40	7.84	-34.51	4.55	-7.84	34.51	-4.55	0.000%
41	6.40	-34.51	6.42	-6.40	34.51	-6.42	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
42	4.54	-34.51	7.86	-4.54	34.51	-7.86	0.000%
43	0.02	-34.51	9.06	-0.02	34.51	-9.06	0.000%
44	-4.50	-34.51	7.84	4.50	34.51	-7.84	0.000%
45	-6.38	-34.51	6.40	6.38	34.51	-6.40	0.000%
46	-7.82	-34.51	4.52	7.82	34.51	-4.52	0.000%
47	-9.04	-34.51	-0.02	9.04	34.51	0.02	0.000%
48	-7.84	-34.51	-4.55	7.84	34.51	4.55	0.000%
49	-6.40	-34.51	-6.42	6.40	34.51	6.42	0.000%
50	-4.54	-34.51	-7.86	4.54	34.51	7.86	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	0.00088264
3	Yes	5	0.00000001	0.00020437
4	Yes	5	0.00000001	0.00025441
5	Yes	5	0.00000001	0.00025089
6	Yes	4	0.00000001	0.00086057
7	Yes	5	0.00000001	0.00021885
8	Yes	5	0.00000001	0.00025164
9	Yes	5	0.00000001	0.00022086
10	Yes	4	0.00000001	0.00080619
11	Yes	5	0.00000001	0.00025012
12	Yes	5	0.00000001	0.00025451
13	Yes	5	0.00000001	0.00020407
14	Yes	4	0.00000001	0.00093919
15	Yes	5	0.00000001	0.00023432
16	Yes	5	0.00000001	0.00025239
17	Yes	5	0.00000001	0.00023187
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00010086
20	Yes	5	0.00000001	0.00035202
21	Yes	5	0.00000001	0.00043328
22	Yes	5	0.00000001	0.00041319
23	Yes	5	0.00000001	0.00010152
24	Yes	5	0.00000001	0.00036945
25	Yes	5	0.00000001	0.00042915
26	Yes	5	0.00000001	0.00037301
27	Yes	5	0.00000001	0.00009881
28	Yes	5	0.00000001	0.00041185
29	Yes	5	0.00000001	0.00043347
30	Yes	5	0.00000001	0.00035160
31	Yes	5	0.00000001	0.00010376
32	Yes	5	0.00000001	0.00039260
33	Yes	5	0.00000001	0.00043204
34	Yes	5	0.00000001	0.00038812
35	Yes	4	0.00000001	0.00014668
36	Yes	4	0.00000001	0.00034882
37	Yes	4	0.00000001	0.00050159
38	Yes	4	0.00000001	0.00052375
39	Yes	4	0.00000001	0.00015092
40	Yes	4	0.00000001	0.00037470
41	Yes	4	0.00000001	0.00046172
42	Yes	4	0.00000001	0.00038248

43	Yes	4	0.00000001	0.00014191
44	Yes	4	0.00000001	0.00052082
45	Yes	4	0.00000001	0.00050177
46	Yes	4	0.00000001	0.00034807
47	Yes	4	0.00000001	0.00015574
48	Yes	4	0.00000001	0.00043869
49	Yes	4	0.00000001	0.00046701
50	Yes	4	0.00000001	0.00042895

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	125 - 96.04	21.663	50	1.5643	0.0142
L2	99.957 - 47.667	13.789	50	1.3788	0.0062
L3	53.334 - 1	3.570	50	0.6476	0.0016

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
124.00	18' x 4" Dia Omni	50	21.338	1.5586	0.0139	22193
123.00	(2) 7770.00	50	21.012	1.5529	0.0135	22193
122.00	EEI 12-ft Low Profile Platform	50	20.687	1.5471	0.0132	22193
114.00	DB950F85T2E-M	50	18.104	1.4980	0.0103	10087
112.00	EEI Band-On 12' Low Profile Platform w/12 pipe	50	17.468	1.4842	0.0097	8535
109.00	FD-RRH 2x50 800	50	16.525	1.4620	0.0087	6935
104.00	APX16DWV-16DWV-S-E-ACU	50	14.989	1.4194	0.0072	5284
102.00	ANT150D6-9	50	14.390	1.4001	0.0067	4851
97.00	DB-T1-6Z-8AB-0Z	50	12.938	1.3451	0.0056	4314
95.00	BXA-80063-6BF	50	12.376	1.3204	0.0052	4227
92.00	EEI 12-ft Low Profile Platform	50	11.554	1.2807	0.0047	4113
84.00	(4) DB844H90E-XY	50	9.494	1.1625	0.0036	3836
82.00	EEI 12-ft Low Profile Platform	50	9.010	1.1307	0.0033	3773
72.00	EEI 12-ft Low Profile Platform	50	6.784	0.9630	0.0025	3484

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	125 - 96.04	62.394	17	4.5033	0.0408
L2	99.957 - 47.667	39.741	17	3.9742	0.0177
L3	53.334 - 1	10.301	17	1.8685	0.0047

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
124.00	18' x 4" Dia Omni	17	61.457	4.4871	0.0401	7829
123.00	(2) 7770.00	17	60.520	4.4709	0.0390	7829
122.00	EEI 12-ft Low Profile Platform	17	59.585	4.4546	0.0380	7829
114.00	DB950F85T2E-M	17	52.157	4.3150	0.0298	3557
112.00	EEI Band-On 12' Low Profile Platform w/12 pipe	17	50.328	4.2758	0.0279	3010
109.00	FD-RRH 2x50 800	17	47.615	4.2123	0.0251	2445
104.00	APX16DWV-16DWV-S-E-ACU	17	43.197	4.0906	0.0208	1862
102.00	ANT150D6-9	17	41.473	4.0352	0.0192	1709
97.00	DB-T1-6Z-8AB-0Z	17	37.292	3.8773	0.0161	1518
95.00	BXA-80063-6BF	17	35.674	3.8063	0.0150	1486
92.00	EEI 12-ft Low Profile Platform	17	33.309	3.6925	0.0135	1445
84.00	(4) DB844H90E-XY	17	27.376	3.3524	0.0102	1344
82.00	EEI 12-ft Low Profile Platform	17	25.981	3.2607	0.0096	1321
72.00	EEI 12-ft Low Profile Platform	17	19.566	2.7776	0.0071	1216

Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual Allowable Ratio Bolt Tension	Actual Allowable Ratio Bolt Compression	Actual Allowable Ratio Plate Stress	Actual Allowable Ratio Stiffener Stress	Controlling Condition	Ratio
in		in	K	K	ksi	ksi		
1.7500	12	2.2500	147.09	152.83	50.994	23.016	Plate	1.13
			131.21	217.81	45.000	45.000		✓
			1.12	0.70	1.13	0.51		

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	125 - 96.04 (1)	TP26.9x18x0.1875	28.96	0.00	0.0	39.000	15.1809	-8.27	592.05	0.014
L2	96.04 - 47.667 (2)	TP41.28x25.3212x0.25	52.29	0.00	0.0	38.202	31.1849	-21.08	1191.32	0.018
L3	47.667 - 1 (3)	TP55x39.0504x0.3125	52.33	0.00	0.0	36.209	54.2432	-34.49	1964.10	0.018

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	125 - 96.04 (1)	TP26.9x18x0.1875	180.40	22.643	39.000	0.581	0.00	0.000	39.000	0.000
L2	96.04 - 47.667 (2)	TP41.28x25.3212x0.25	1083.50	42.929	38.202	1.124	0.00	0.000	38.202	0.000
L3	47.667 - 1 (3)	TP55x39.0504x0.3125	2361.86	38.637	36.209	1.067	0.00	0.000	36.209	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	125 - 96.04 (1)	TP26.9x18x0.1875	12.08	0.795	26.000	0.061	0.58	0.036	26.000	0.001
L2	96.04 - 47.667 (2)	TP41.28x25.3212x0.25	22.67	0.727	26.000	0.056	0.39	0.008	26.000	0.000
L3	47.667 - 1 (3)	TP55x39.0504x0.3125	26.25	0.484	26.000	0.037	0.39	0.003	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	125 - 96.04 (1)	0.014	0.581	0.000	0.061	0.001	0.596 ✓	1.333	H1-3+VT ✓
L2	96.04 - 47.667 (2)	0.018	1.124	0.000	0.056	0.000	1.142 ✓	1.333	H1-3+VT ✓
L3	47.667 - 1 (3)	0.018	1.067	0.000	0.037	0.000	1.085 ✓	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	125 - 96.04	Pole	TP26.9x18x0.1875	1	-8.27	789.21	44.7	Pass
L2	96.04 - 47.667	Pole	TP41.28x25.3212x0.25	2	-21.08	1588.03	85.7	Pass
L3	47.667 - 1	Pole	TP55x39.0504x0.3125	3	-34.49	2618.15	81.4	Pass
						Summary		
						Pole (L2)	85.7	Pass
						Base Plate	85.0	Pass
						RATING =	**85.7**	**Pass**

CENTEK engineering
Centered on Solutions
63-2 North Branford Road
Branford, CT 06405
www.centekeng.com
P: (203) 488-0580
F: (203) 488-8587

Subject:	Foundation Analysis
Location:	125-ft Monopole Bethel, CT
Rev. 2: 3/7/13	Prepared by: T.J.L. Checked by: C.F.C. Job No. 12124.CO4

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 2362 \cdot ft \cdot kips$	(User Input from RISATower)	
Shear Force =	$Shear := 26 \cdot kip$	(User Input from RISATower)	
Axial Force =	$Axial := 35 \cdot kip$	(User Input from RISATower)	
Tower Height =	$H_t := 125 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 4.5 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 1 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 1.0 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 7.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 4.5 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 25.0 \cdot ft$	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts =	$L_{st} := 72 \cdot in$	(User Input)	
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12.0 \cdot in$	(User Input)	
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)	
Base Plate Bolt Circle =	$MP := 63.0 \cdot in$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 3000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 1 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

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Pier Reinforcement:

Bar Size =	$BS_{pier} := 9$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.128 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 24$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 0.5 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 9$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.128 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 28$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 9$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.128 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 28$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =

$$A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.999 \cdot in^2$$

Pad Top Reinforcement Bar Area =

$$A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.999 \cdot in^2$$

Pad Bottom Reinforcement Bar Area =

$$A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.999 \cdot in^2$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

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Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}\left(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}\right) = 150\cdot\text{pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}\left(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}\right) = 100\cdot\text{pcf}$$

Passive Pressure =

$$P_{pn} := K_p\cdot\gamma_s\cdot n + c\cdot 2\cdot\sqrt{K_p} = 0.3\cdot\text{ksf}$$

$$P_{pt} := K_p\cdot\gamma_s\cdot\left(D_f - T_f\right) + c\cdot 2\cdot\sqrt{K_p} = 0\cdot\text{ksf}$$

$$P_{top} := \text{if}\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0.3\cdot\text{ksf}$$

$$P_{bot} := K_p\cdot\gamma_s\cdot D_f + c\cdot 2\cdot\sqrt{K_p} = 1.35\cdot\text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0.825\cdot\text{ksf}$$

$$T_p := \text{if}\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 3.5$$

$$A_p := W_f\cdot T_p = 87.5$$

Ultimate Shear =

$$S_u := P_{ave}\cdot A_p = 72.188\cdot\text{kip}$$

Weight of Concrete Pad =

$$WT_c := \left[\left(W_f^2\cdot T_f\right) + d_p^2\cdot L_p\right]\cdot\gamma_c = 429.225\cdot\text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left(W_f^2 - d_p^2\right)\cdot\begin{cases}\left(L_p - L_{pag} - n\right) & \text{if } \left(L_p - L_{pag} - n\right) \geq 0 \\ 0 & \text{if } \left(L_p - L_{pag} - n\right) \leq 0\end{cases}\right]\cdot\gamma_s = 0\cdot\text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left(\frac{D_f^2\cdot\tan\left(\Phi_s\right)}{2}\cdot W_f\right)\cdot\gamma_s = 14.614\cdot\text{kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2\cdot\left[\left(D_f\right)^3\cdot\frac{\tan\left(\Phi_s\right)}{3}\right]\cdot\gamma_s = 3.507\cdot\text{kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 464.225\cdot\text{kip}$$

Resisting Moment =

$$M_r := \left(WT_{tot}\right)\cdot\frac{W_f}{2} + S_u\cdot\frac{T_f}{3} + \left[\left(WT_{s2} + WT_{s3}\right)\cdot\left(W_f + \frac{D_f\cdot\tan\left(\Phi_s\right)}{3}\right)\right] = 6380\cdot\text{kip}\cdot\text{ft}$$

Overturning Moment =

$$M_{ot} := \text{OM} + \text{Shear}\cdot\left(L_p + T_f\right) = 2505\cdot\text{kip}\cdot\text{ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 2.55$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$\text{OverTurning\_Moment\_Check} := \text{if}\left(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"}\right)$$

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{\mu \cdot WT_{tot}}{FS_{req}} = 104.451 \cdot kips$

$Shear\_Check := if(S_p > Shear, "Okay", "No Good")$

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 625$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 2604.17 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.705 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < q_s, "Okay", "No Good")$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.219 \cdot ksf$

$Min\_Pressure\_Check := if[(P_{min} \geq 0) \cdot (P_{min} < q_s), "Okay", "No Good"]$

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 7.384$

Distance to Kern = $X_k := \frac{W_f}{6} = 4.167$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 5.396$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e\right)} = 1.743 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 1.743 \cdot ksf$

$Pressure\_Check := if(q_{adj} < q_s, "Okay", "No Good")$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 9.185 \times 10^3 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > LF \cdot Axial, "Okay", "No Good")$

Bearing_Check = "Okay"

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 49.872 \cdot in$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$

$d_2 := d_1 - d$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := \left(d_p + d\right) \cdot \pi = 35$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} = 97.7$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 527.3$

Guess Value = $v_u := 1ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := \text{Find}(v_u) = 3.2 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 331.1 \cdot kips$

Required Shear Strength = $V_{req} := LF \cdot V_u = 441.4 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 3906 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 1.007 \cdot ksf$

Maximum Bending at Face of Pier = $M_n := \frac{1}{\phi_m} \cdot \left[\left(q_{adj} - q_b \right) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 1684.5 \cdot kip \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2} = 30.1 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f_c}} \right) = 0.0005$

$\rho_{min} := 1.333 \cdot \rho = 0.00067$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases}$$ (ACI -2008 7.12.2.1)

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 13.465 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 28 \cdot in^2$$

$$Pad\_Reinforcement\_Bot := if(As_{prov} > As, "Okay", "No Good")$$

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 13.5 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 28 \cdot in^2$$

$$Pad\_Reinforcement\_Top := if(As_{prov} > As, "Okay", "No Good")$$

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 9.72 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0$$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 34.8 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in$$ (ACI-2008 12.2.1)

$$L_{dbtCheck} := if(L_{dbt} \geq L_{dbmin}, "Use\ L.dbt", "Use\ L.dbmin")$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 105 \cdot in$$

$$Lpad\_Check := if(L_{Pad} > L_{dbt}, "Okay", "No Good")$$

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 5541.77 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.05 \cdot A_p = 2.77 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 23.98 \cdot in^2$

$Steel\_Area\_Check := if(A_{sprov} > A_{smin}, "Okay", "No Good")$

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 9.868 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 78 \cdot in$

Maximum Moment in Pier = $M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2} \right) \right] \cdot LF = 38406.4 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$(D \; N \; n \; P_u \; M_{xu}) := \left(d_p \cdot 12 \; NB_{pier} \; BS_{pier} \; \frac{Axial \cdot 1.333}{kips} \; \frac{M_p}{in \cdot kips} \right)$

$(D \; N \; n \; P_u \; M_{xu}) = (84 \;\; 24 \;\; 9 \;\; 46.655 \;\; 3.841 \times 10^4)$

$(\phi P_n \; \phi M_{xn} \; f_{sp} \; \rho) := (0 \;\; 0 \;\; 0 \;\; 0)$

$(\phi P_n \; \phi M_{xn} \; f_{sp} \; \rho) := \phi P'_n(D, N, n, P_u, M_{xu})^T$

$(\phi P_n \; \phi M_{xn} \; f_{sp} \; \rho) = (58.512 \;\; 4.817 \times 10^4 \;\; -60 \;\; 4.331 \times 10^{-3})$

$Axial\_Load\_Check := if(\phi P_n \geq P_u, "Okay", "No Good")$

Axial_Load_Check = "Okay"

$Bending\_Check := if(\phi M_{xn} \geq M_{xu}, "Okay", "No Good")$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 9 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 51 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 34.85 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 17.299 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right)$

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 24.713 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 20.304 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 24.713 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

Tie Size and Spacing in Column:

Minimum Tie Size =

$Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 3$

Used #4 Ties

Seismic Factor =

$z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 18.048 \cdot in$

$s_{lim2} := 48 \cdot d_{Tie} \cdot z = 24 \cdot in$

$s_{lim3} := D_f \cdot z = 54 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing =

$$s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 18 \cdot in$$

Number of Ties Required =

$$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 1.333$$

Check Anchor Steel Embedment:

Depth Available =

$D_{ab} := L_{st} - A_{BP} = 5 \cdot ft$

Length of Anchor Bolt =

$$L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 12.552 \cdot ft$$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

SITE NAME	BETHEL CT	ECP - CELL #	AWS1	5	184
LATITUDE	41-21-43.44 N	LONGITUDE	73-23-45.30 W		
		SAVE BUTTON			
Additional Comments:		STRUCTURE TYPE	MONOPOLE		

AWS - LTE ANTENNA ADD	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz eNodeB		2100 MHz eNodeB		2100 MHz eNodeB	
ANTENNA TYPE	BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0		BXA-171063-8BF-EDIN-0	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	0		90		210	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	95		95		95	
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 eNodeB		700 eNodeB		700 eNodeB	
ANTENNA TYPE	SLCP 2X6014		BXA-70063-4CF		BXA-70063-4CF	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	0		90		210	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	95		95		95	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
700 Mhz - LTE Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	700 eNodeB		700 eNodeB		700 eNodeB	
ANTENNA TYPE	BXA-70063-6CF_2°		BXA-70063-6CF_2°		BXA-70063-6CF_2°	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	0		90		210	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	95		95		95	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						
RRH - QTY/MODEL	1	ALU RH_2X40-700	1	ALU RH_2X40-700	1	ALU RH_2X40-700
SECTOR DISTRIBUTION BOX						
MAIN DISTRIBUTION BOX						
850 Celluar - Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	LPA-80063/8CF		LPA-80080/8CF		LPA-80080/8CF	
QTY OF ANTENNAS PER FACE	2		2		2	
ORIENTATION (DEG)	0		90		210	
DOWN TILT (MECH/DEG)	5		0		3	
RAD CTR (FT AGL)	95		95		95	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L
850 Celluar - Future Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	Cellular Mod 4.0B		Cellular Mod 4.0B		Cellular Mod 4.0B	
ANTENNA TYPE	BXA-80063-6BF_2°		BXA-80080-6CF		BXA-80080-6CF_2°	
QTY OF ANTENNAS PER FACE	1		1		1	
ORIENTATION (DEG)	0		90		210	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	95		95		95	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L	2	FD9R6004/2C-3L
DIPLEX WITH LTE CABLE						
1900 PCS - Current Config	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	PCS Mod 4.0B		PCS Mod 4.0B		PCS Mod 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)	0		90		210	
DOWN TILT (MECH/DEG)	0		0		0	
RAD CTR (FT AGL)	95		95		95	
TMA - QTY / MODEL						
DIPLEXER - QTY / MODEL						

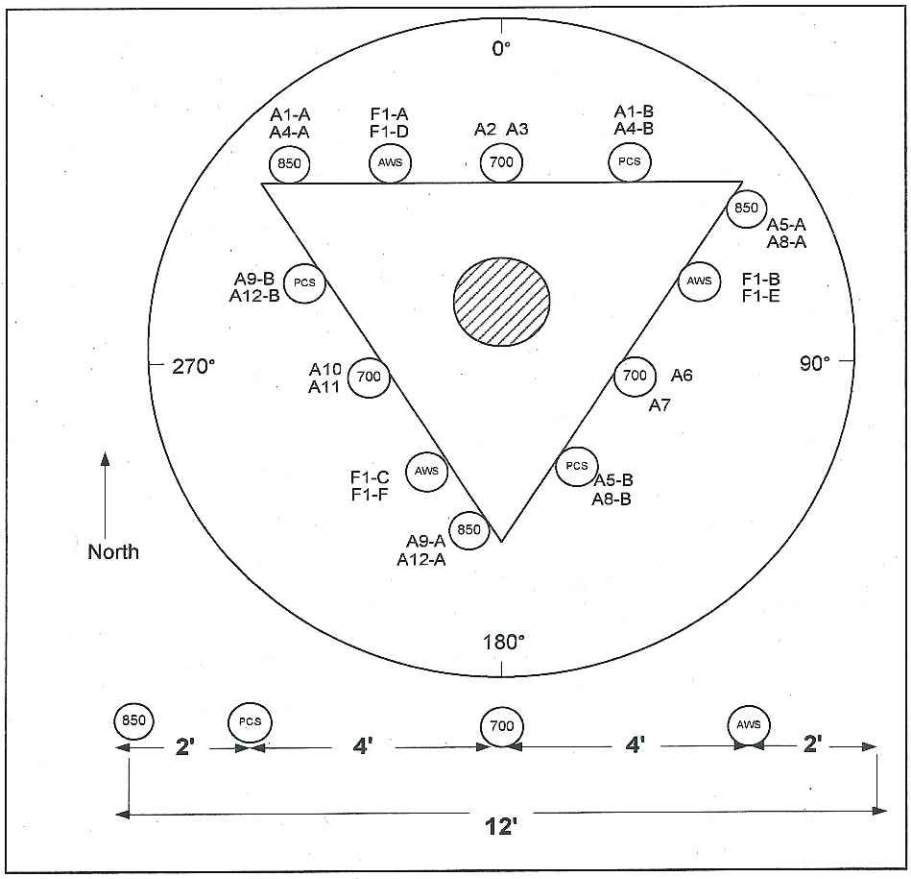
1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2	BXA-171063-12BF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	0	90	210
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	95	95	95
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	DIPLEX with Cellular Cable	DIPLEX with Cellular Cable	DIPLEX with Cellular Cable

NUMBER OF CABLE'S NEEDED				Fiber Lines Model number	
TOTAL # FIBER LINES	1	TOTAL # OF MAINLINES	12	FIBER LINE MODEL #	HB158-1-08U8-S8J18
TOTAL # TOP JUMPERS	12	TOTAL # OF TOP JUMPERS	12	FIBER TOP JUMPER MODEL #	HB114-1-08U4-S4J18
Equipment Cable Ordering		MAIN CABLE # 12 +		TOP JUMPER # 12 +	

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	LTE/ AWS (Watts)	40

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

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Dany Bustamante / Jay Latorre	Robert Hesselbach	DB / JFL	12/26/2012



Amphenol ANTENNA SOLUTIONS

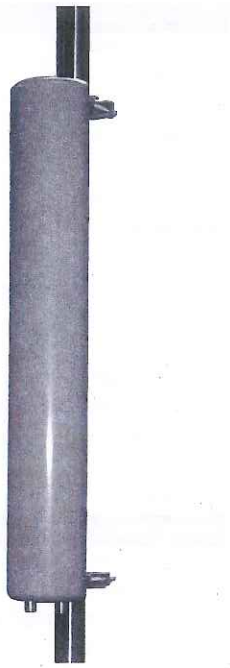
BXA-171063-8BF-EDIN-X

Replace "X" with desired electrical downtilt.

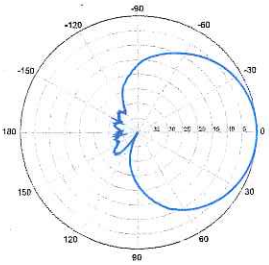
X-Pol | FET Panel | 63° | 17.4 dBi

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	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 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	1232 x 154 x 105 mm		48.5 x 6.1 x 4.1 in
Depth with t-brackets	133 mm		5.2 in
Weight without mounting brackets	4.8 kg		10.5 lbs
Survival wind speed	296 km/hr		184 mph
Wind area	Front: 0.19 m² Side: 0.14 m²		Front: 2.0 ft² Side: 1.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N		Front: 63 lbf Side: 50 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-171063-8BF-EDIN-X-FP		

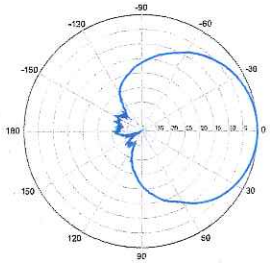


BXA-171063-8BF-EDIN-X



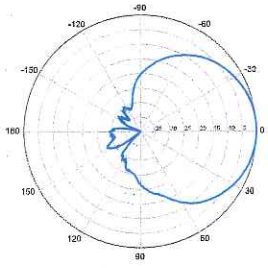
Horizontal | 1710-1880 MHz

BXA-171063-8BF-EDIN-X



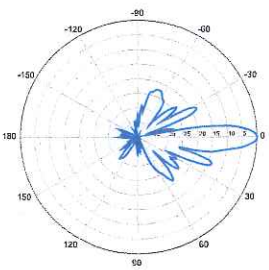
Horizontal | 1850-1990 MHz

BXA-171063-8BF-EDIN-X



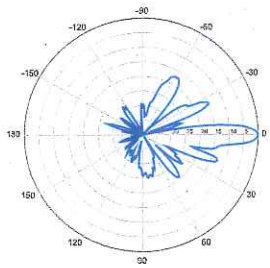
Horizontal | 1920-2170 MHz

BXA-171063-8BF-EDIN-0



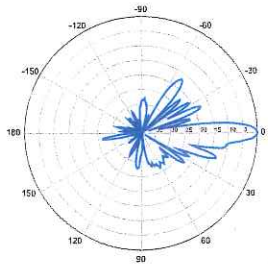
0° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-0



0° | Vertical | 1920-2170 MHz

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

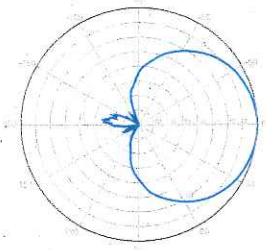
Replace "X" with desired electrical downtilt.

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

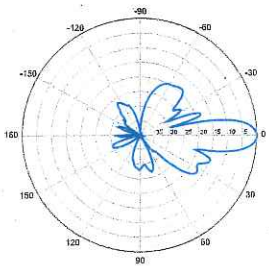
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



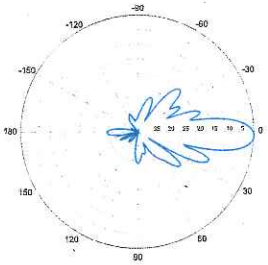
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

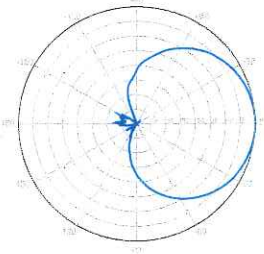


0° | Vertical | 750 MHz

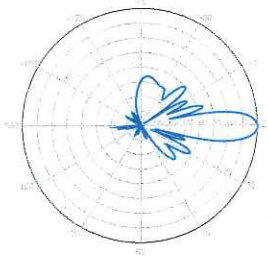
BXA-70063-6CF-EDIN-2



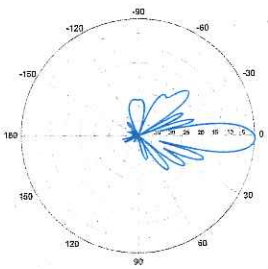
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

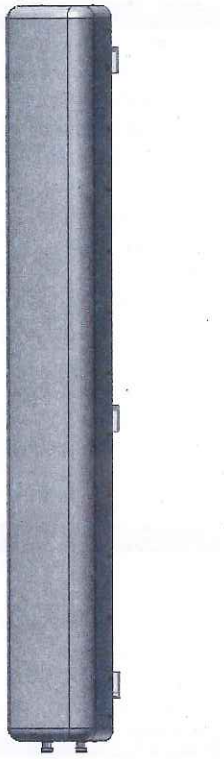
Amphenol ANTENNA SOLUTIONS

BXA-80063-6BF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

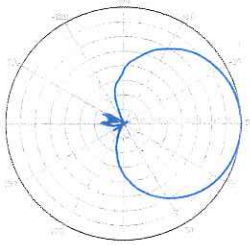
Replace "X" with desired electrical downtilt.

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



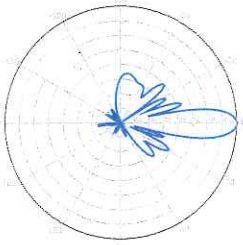
Electrical Characteristics				
Frequency bands	806-900 MHz*			
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)			
Polarization	±45°			
Horizontal beamwidth	63°			
Vertical beamwidth	11°			
Gain	14.5 dBd (16.6 dBi)			
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10, 15			
Impedance	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 N connectors	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN or N / Female / Bottom			
Mechanical Characteristics				
Dimensions Length x Width x Depth	1742 x 285 x 135 mm		68.6 x 11.2 x 5.3 in	
Depth with z-brackets	175 mm		6.9 in	
Weight without mounting brackets	8.7 kg		19.2 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.50 m²	Side: 0.24 m²	Front: 5.3 ft²	Side: 2.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 733 N	Side: 386 N	Front: 164 lbf	Side: 88 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-80063-6BF-EDIN-X-FP			

BXA-80063-6BF-EDIN-X



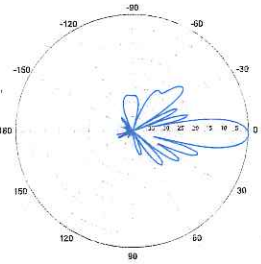
Horizontal

BXA-80063-6BF-EDIN-0



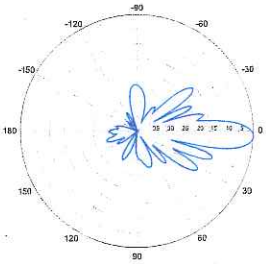
0° | Vertical

BXA-80063-6BF-EDIN-2



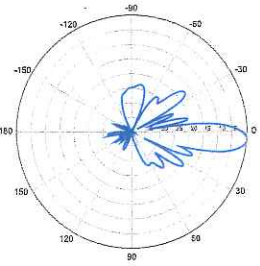
2° | Vertical

BXA-80063-6BF-EDIN-3



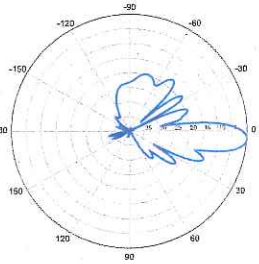
3° | Vertical

BXA-80063-6BF-EDIN-4



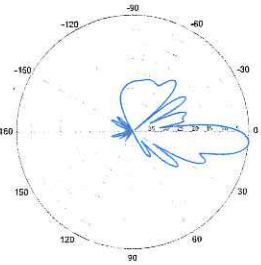
4° | Vertical

BXA-80063-6BF-EDIN-5



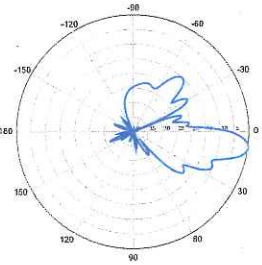
5° | Vertical

BXA-80063-6BF-EDIN-6



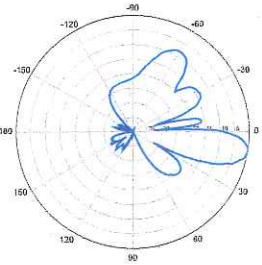
6° | Vertical

BXA-80063-6BF-EDIN-8



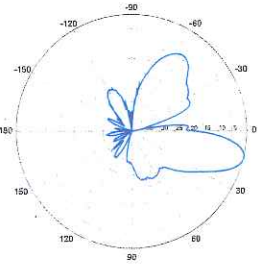
8° | Vertical

BXA-80063-6BF-EDIN-10



10° | Vertical

BXA-80063-6BF-EDIN-15



15° | Vertical

Amphenol ANTENNA SOLUTIONS

BXA-80080-6CF-EDIN-X

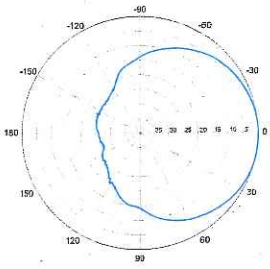
X-Pol | FET Panel | 80° | 13.5 dBd

Replace "X" with desired electrical downtilt.

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

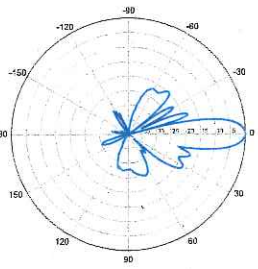
Electrical Characteristics				
Frequency bands	806-900 MHz*			
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)			
Polarization	±45°			
Horizontal beamwidth	80°			
Vertical beamwidth	10°			
Gain	13.5 dBd (15.6 dBi)			
Electrical downtilt (X)	0, 2, 4, 6, 8, 10			
Impedance	50Ω			
VSWR	≤1.4:1			
Upper sidelobe suppression (0°)	-18.6 dB			
Front-to-back ratio (+/-30°)	-25.6 dB			
Null fill	5% (-26.02 dB)			
Isolation between ports	< -30 dB			
Input power with EDIN connectors	500 W			
Input power with NE connectors	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)			
Mechanical Characteristics				
Dimensions Length x Width x Depth	1804 x 204 x 151 mm		71.0 x 8.0 x 5.9 in	
Depth with z-brackets	191 mm		7.5 in	
Weight without mounting brackets	8.2 kg		18 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.37 m^2	Side: 0.27 m^2	Front: 3.9 ft^2	Side: 2.9 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 531 N	Side: 475 N	Front: 119 lbf	Side: 104 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-80080-6CF-EDIN-X-FP			

BXA-80080-6CF-EDIN-X



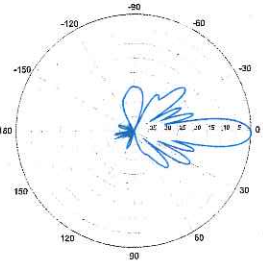
Horizontal

BXA-80080-6CF-EDIN-0



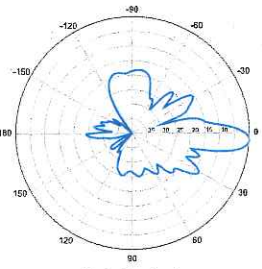
0° | Vertical

BXA-80080-6CF-EDIN-2



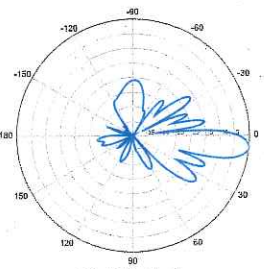
2° | Vertical

BXA-80080-6CF-EDIN-4



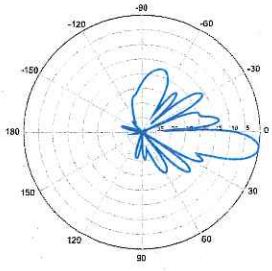
4° | Vertical

BXA-80080-6CF-EDIN-6



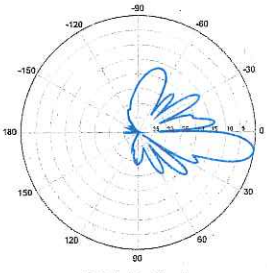
6° | Vertical

BXA-80080-6CF-EDIN-8



8° | Vertical

BXA-80080-6CF-EDIN-10



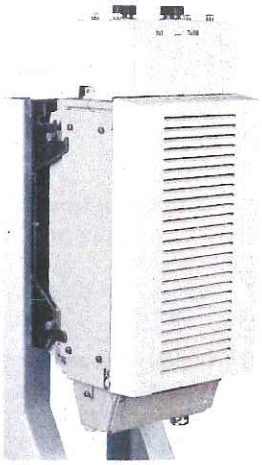
10° | Vertical

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.

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

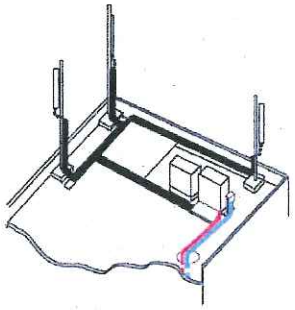
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

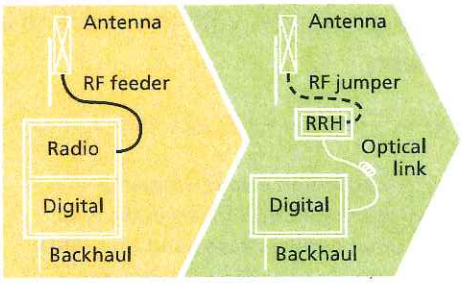
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

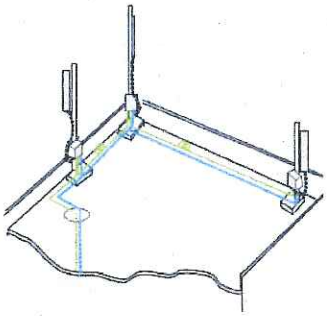
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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

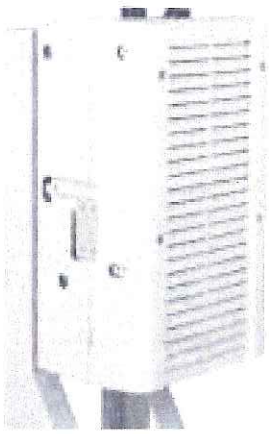
- Two optical ports to support daisy-chaining
- Six external alarms

Alcatel·Lucent

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

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



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

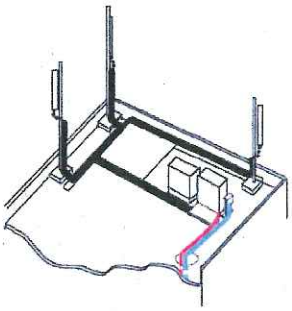
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and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

Features

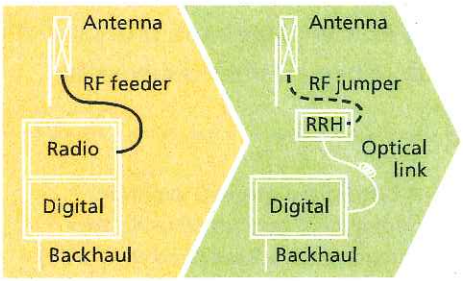
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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

Benefits

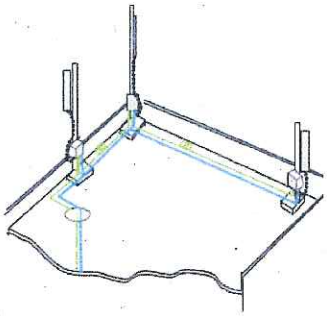
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48V

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Alarms and ports

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

CPG2809100913 (09)

Alcatel·Lucent

Product Data Sheet 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.

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

March 13, 2013

The Honorable Matthew S. Knickerbocker
First Selectman
Town of Bethel
1 School Street
Bethel Municipal Center
Bethel, CT 06801-2105

RE: **EM-VER-009-130312** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 39 Spring Hill Road, Bethel, Connecticut.

Dear Mr. Knickerbocker:

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 March 27, 2013.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts
Executive Director

LR/jb

c: Steve Palmer, Planning & Zoning Official, Town of Bethel

CSC
CONNECTICUT SITING COUNCIL