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

Internet: ct.gov/csc

Daniel F. Caruso
Chairman

September 20, 2010

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

RE: **EM-VER-049-100114** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at Oliver Street, Enfield, Connecticut. Modification.

Dear Attorney Baldwin:

In addition to the Connecticut Siting Council (Council) acknowledgement dated March 8, 2010 (filing dated January 14, 2010), the Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 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 August 23, 2010. 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/laf

c: The Honorable Patrick L. Tallarita, Mayor, Town of Enfield
Matthew W. Coppler, Town Manager, Town of Enfield
Jose Giner, Director of Planning and Community Development, Town of Enfield
Crown Castle USA, Inc.

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
Internet: ct.gov/csc

Daniel F. Caruso
Chairman

March 8, 2010

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

RE: **EM-VER-049-100114** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at Oliver Street, Enfield, 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.

The proposed modifications are to be implemented as specified here and in your notice dated January 14, 2010, including the placement of all necessary equipment and shelters within the tower compound. 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. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP

c: Honorable Patrick L. Tallarita, Mayor, Town of Enfield
Matthew W. Coppler, Town Manager, Town of Enfield
Jose Giner, Director of Planning and Community Development, Town of Enfield
Crown Castle USA, Inc.

G:\EM\BAM-VERIZON\ENFIELD\dc030810OliverStreet.DOC

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

January 19, 2010

The Honorable Patrick L. Tallarita
Mayor
Town of Enfield
820 Enfield Street
Enfield, CT 06082

RE: **EM-VER-049-100114** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at Oliver Street, Enfield, Connecticut.

Dear Mayor Tallarita:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

If you have any questions or comments regarding this proposal, please call me or inform the Council by February 2, 2010.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/jbw

Enclosure: Notice of Intent

c: Matthew W. Coppler, Town Manager, Town of Enfield
Jose Giner, Director of Planning and Community Development, Town of Enfield

ROBINSON & COLE

EM-VER-049-100114

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

ORIGINAL

January 14, 2010

Via Hand Delivery

S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
Oliver Street, Enfield, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains wireless telecommunications antennas at the 152-foot level on the existing 150-foot tower at the above-referenced address. The tower is owned by Crown Castle USA, Inc. The Connecticut Siting Council ("Council") approved Cellco's use of the existing tower in 1991 in Docket No. 139. Cellco now intends to modify its installation by replacing all of its antennas with four (4) model LPA-80080/4CF cellular antennas; two (2) model LPA-80063/4CF cellular antennas; two (2) model BXA-185090/8CF_2 PCS antennas; one (1) model BXA-185063/8CF PCS antenna; two (2) model BXA-70063-6CF_4; and one (1) model BXA 70063/6CF_6 LTE (700 MHz) antenna, all at the same 152-foot level on the tower. Attached behind Tab 1 are the specifications for the proposed replacement antennas.

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 W. Coppler, Town Manager for the Town of Enfield. A copy of this letter is also being sent to Michael E. Smyth, the owner of the property on which the tower is located.

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

1. The proposed modifications will not result in any increase in the overall height of the existing tower. Cellco's antennas will be located at the same 152-foot level on the existing 150-foot tower.

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

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A Calculated Radio Frequency Emissions report, for the existing antennas and Cellco's modified facility, is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that the tower and foundation can support Cellco's proposed antennas modification. (See 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 W. Coppler, Enfield Town Manager
Michael E. Smyth
Sandy M. Carter

Vertically Polarized, Log Periodic 80° / 12.5 dBd

LPA-80080/4CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1200 mm	47.2 in
Width	140 mm	5.5 in
Depth	335 mm	13.2 in
Depth with z-bracket	375 mm	14.8 in
4) Weight	5.4 kg	12.0 lbs
Wind Area		
Fore/Aft	0.17 m^2	1.8 ft^2
Side	0.40 m^2	4.3 ft^2
Rated Wind Velocity (Safety factor 2.0)	>369 km/hr	>229 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	254 N	57.1 lbs
Side	574 N	129.0 lbs

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

Mounting and Downtilting

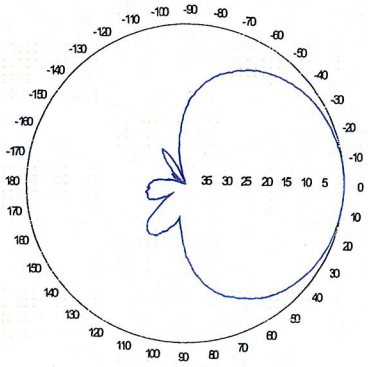
Mounting brackets attach to a pipe diameter of Ø50-102 mm (2.0-4.0 in). If the lock-down brace is used, the maximum diameter is Ø88.9 mm (3.5 in).

Mounting Bracket & Downtilt Bracket Kit #21699999

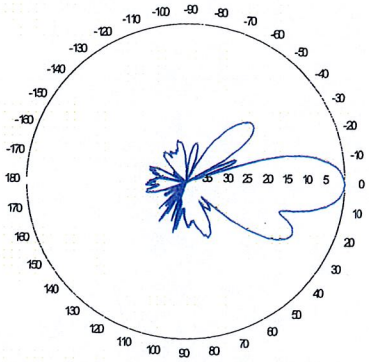
Electrical specifications

	Frequency Range	806-960 MHz
	Impedance	50Ω
3)	Connector(s)	NE or E-DIN 1 port / center
1)	VSWR	≤ 1.4:1
	Polarization	Vertical
1)	Gain	12.5 dBd
2)	Power Rating	500 W
1)	Half Power Angle	
	H-Plane	80°
	E-Plane	15°
1)	Electrical Downtilt	0°
1)	Null Fill	15%
	Lightning Protection	Direct Ground

Radiation pattern1)



Horizontal

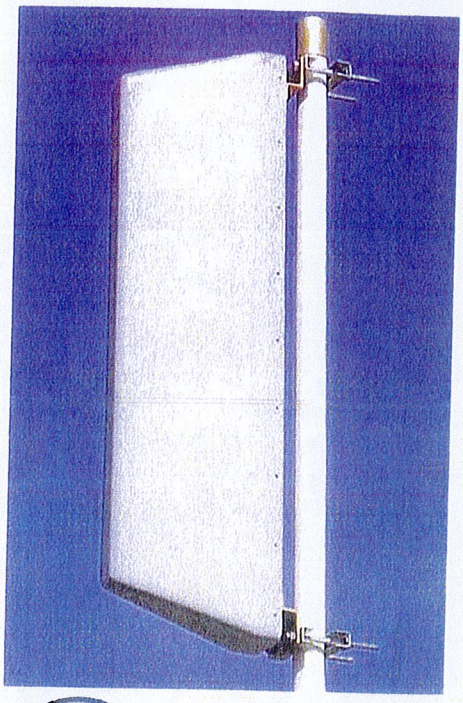


Vertical

Featuring upper side lobe suppression.

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.



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

- True log-periodic design allows for superior front-to-side characteristics to minimize sector overlap.
- 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 connector only.

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.

CF Denotes a Center-Fed Connector.

806-960 MHz

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

Amphenol Antel, Inc. The Antenna Technology Company

Revision Date: 7/5/07

Vertically Polarized Log Periodic 63° / 13.0 dBd
806-960 MHz

Mechanical specifications

Length	1205	mm	47.4	in
Width	386	mm	15.2	in
Depth	335	mm	13.2	in
Depth with z-bracket	375	mm	14.8	in
Weight [4]	9.1	kg	20	lbs
Wind Area Fore/Aft	0.47	m^2	5.0	ft^2
Wind Area Side	0.40	m^2	4.4	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	665	N	150	lbf
Side	577	N	130	lbf

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

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-102 mm; Ø2.0-4.0 in. If the lock-down brace is used, the maximum diameter is Ø88.9 mm (3.5 in).

Mounting & Downtilt Bracket Kit 21699999

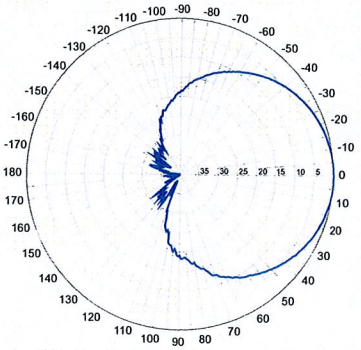
Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 1 port / Center
VSWR [1]	≤ 1.4:1
Polarization	Vertical
Gain [1]	13.0 dBd 15.0 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	63°
Vertical Beamwidth	15°
Electrical downtilt [5]	0°
Null fill [1]	10%
Lightning protection	Direct ground

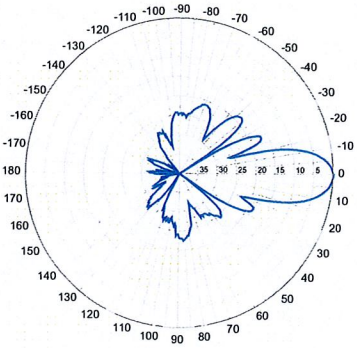
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector.
E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

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

Radiation-pattern[1]



Horizontal



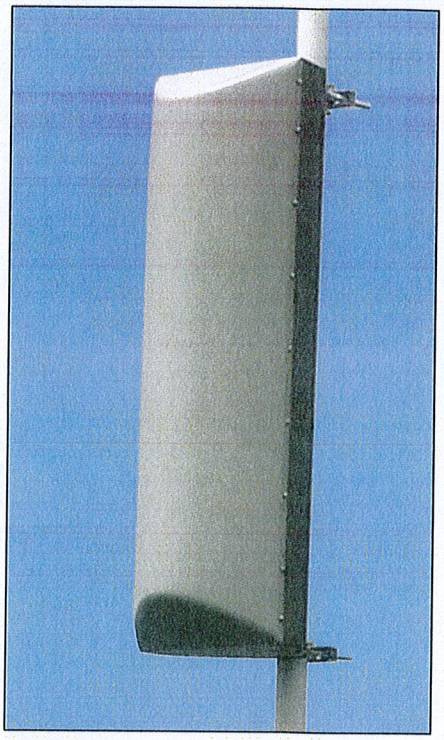
Vertical

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.

LPA-80063/4CF ___

When ordering replace "__" with connector type.



Featuring our Exclusive 3T Technology™ Antenna Design:

- True log-periodic design allows for superior front-to-side characteristics to minimize sector overlap.
- 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 bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date 12/26/08

806-960 MHz

815.399.0001 • antel@antelinc.com • www.antelinc.com

Amphenol Antel, Inc. The Antenna Technology Company

Slant +/- 45° Dual Polarized, Panel 90° / 16.5 dBi

BXA-185090/8CF __ 2°

When ordering replace "___" with connector type.

Mechanical specifications

Length	1225 mm	48.2 in
Width	154 mm	6.1 in
Depth	105 mm	4.1 in
Depth with t-bracket	133 mm	5.2 in
4) Weight	5.0 kg	11.0 lbs
Wind Area		
Fore/Aft	0.19 m^2	2.0 ft^2
Side	0.13 m^2	1.4 ft^2
Rated Wind Velocity (Safety factor 2.0)	>322 km/hr	>200 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	283 N	64.0 lbs
Side	211 N	47.5 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 Ø50-102 mm (2.0-4.0 in).

Mounting bracket kit #26799997
Downtilt bracket kit #26799999

The downtilt bracket kit includes the mounting bracket kit.

Electrical specifications

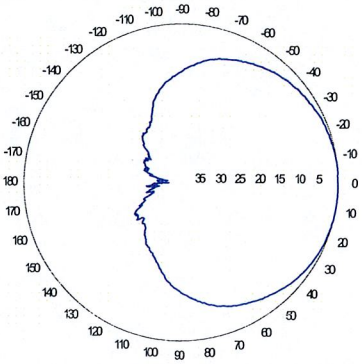
	Frequency Range	1850-1990 MHz
	Impedance	50Ω
3)	Connector(s)	NE or E-DIN 2 ports / center
1)	VSWR	≤ 1.4:1
	Polarization	Slant ± 45°
1)	Isolation Between Ports	< -30 dB
1)	Gain	16.5 dBi
2)	Power Rating	250 W
1)	Half Power Angle	
	H-Plane	90°
	E-Plane	7°
1)	Electrical Downtilt	2°
1)	Null Fill	5%
	Lightning Protection	Direct Ground

Patented Dipole Design: U.S. Patent No. 6,597,324 B2

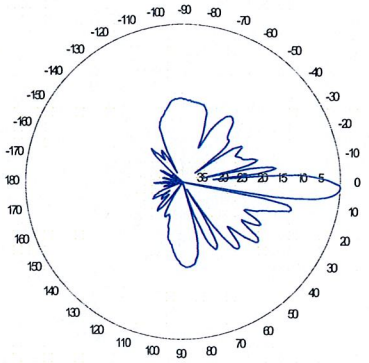
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector.
E-DIN indicates an elongated DIN connector.
4) The antenna weight listed above does not include the bracket weight.

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

Radiation pattern[1)]



Horizontal



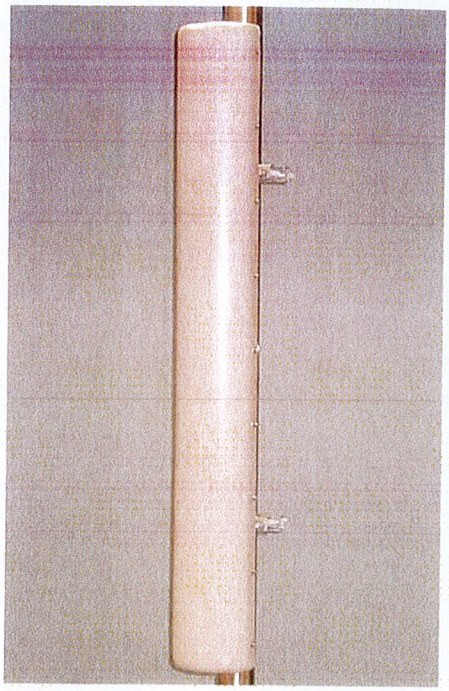
Vertical

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.

1850-1990 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. 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

Amphenol Antel, Inc. The Antenna Technology Company

Revision Date: 7/11/07

Slant +/- 45° Dual Polarized, Panel 63° / 18.5 dBi

BXA-185063/8CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1238 mm	48.8 in
Width	154 mm	6.1 in
Depth	80 mm	3.2 in
Depth with t-bracket	108 mm	4.3 in
4) Weight	4.5 kg	10.0 lbs
Wind Area		
Fore/Aft	0.19 m^2	2.1 ft^2
Side	0.10 m^2	1.1 ft^2
Rated Wind Velocity (Safety factor 2.0)	>322 km/hr	>200 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	288 N	65 lbs
Side	170 N	38 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 Ø50-102 mm (2.0-4.0 in).

Mounting bracket kit #26799997
Downtilt bracket kit #26799999

The downtilt bracket kit includes the mounting bracket kit.

Electrical specifications

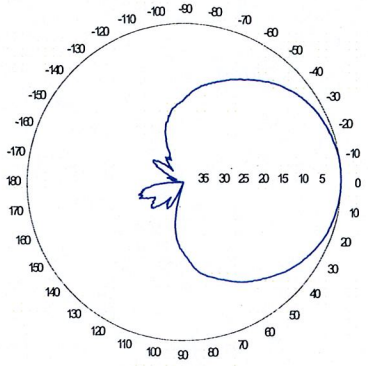
	Frequency Range	1850-1990 MHz
	Impedance	50Ω
3)	Connector(s)	NE or E-DIN 2 ports / center or bottom
1)	VSWR	≤ 1.4:1
	Polarization	Slant ± 45°
1)	Isolation Between Ports	< -30 dB
1)	Gain	18.5 dBi
2)	Power Rating	250 W
1)	Half Power Angle	
	H-Plane	63°
	E-Plane	7°
1)	Electrical Downtilt	0°
1)	Null Fill	5%
	Lightning Protection	Direct Ground

Patented Dipole Design: U.S. Patent No. 6,597,324 B2

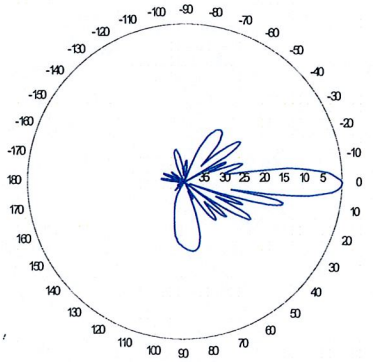
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector.
E-DIN indicates an elongated DIN connector.
4) The antenna weight listed above does not include the bracket weight.

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

Radiation pattern[1)]



Horizontal



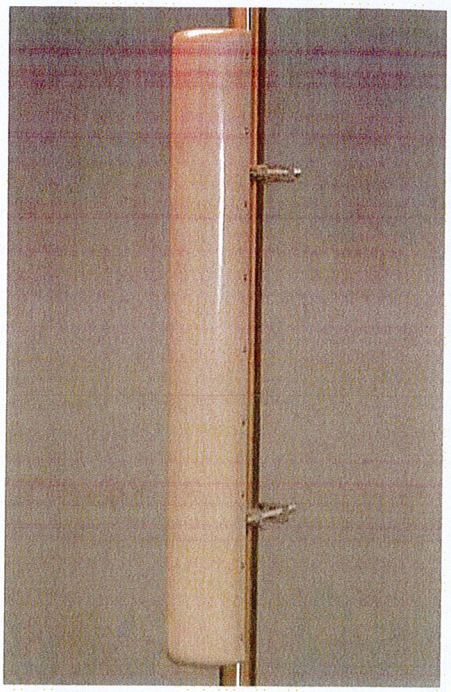
Vertical

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.

1850-1990 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 can be ordered with center-fed or bottom-fed connectors.

Center-fed: BXA-185063/8CF + (NE or E-DIN)
Bottom-fed: BXA-185063/8BF + (NE or E-DIN)

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

Amphenol Antel, Inc. The Antenna Technology Company

Revision Date: 7/11/07

Slant ±45° Dual Polarized, Panel 63° / 14.5 dBd
696-900 MHz

Mechanical specifications

Length	1804	mm	71.0	in
Width	285	mm	11.2	in
Depth	114	mm	4.5	in
Depth with z-bracket	154	mm	6.1	in
Weight [4]	7.9	kg	17.0	lbs
Wind Area Fore/Aft	0.51	m^2	5.5	ft^2
Wind Area Side	0.21	m^2	2.2	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	753	N	169	lbf
Side	351	N	79	lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in

Mounting Bracket Kit	36210003
Downtilt Bracket Kit	36210004

Electrical specifications

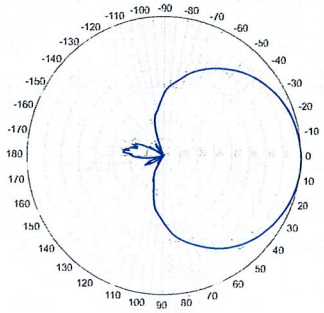
Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -25 dB
Gain [1]	14.5 dBd 16.5 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	63°
Vertical Beamwidth	11°
Electrical downtilt [5]	4°
Null fill [1]	5%
Lightning protection	Direct ground

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

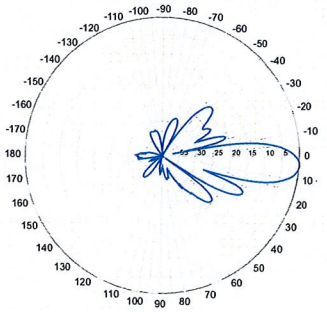
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector. E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

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

Radiation-pattern[1]
750 MHz

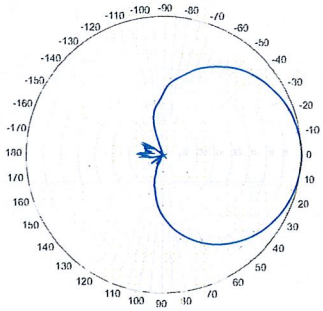


Horizontal

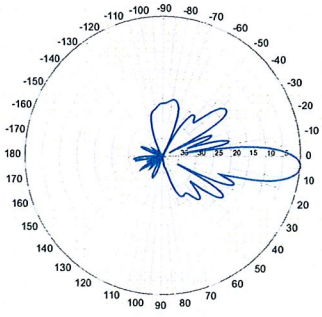


Vertical

850 MHz



Horizontal

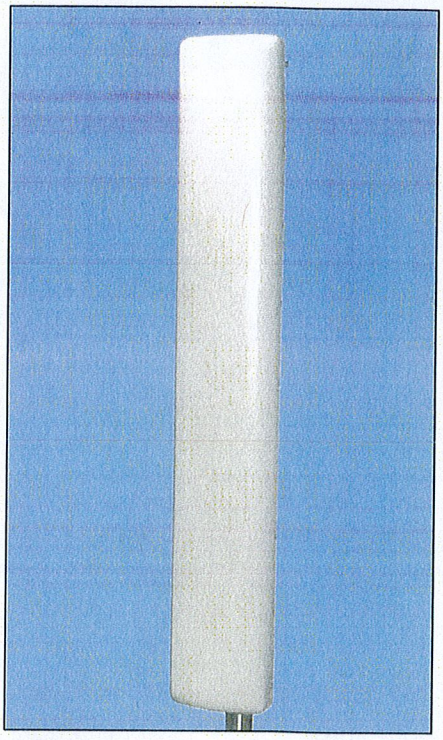


Vertical

696-900 MHz

BXA-70063/6CF__ 4°

When ordering replace "__" with connector type.



Featuring our Exclusive 3T 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.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date 04/09/09

815.399.0001 • antel@antelinc.com • www.antelinc.com

Slant ±45° Dual Polarized FET Panel 63° / 14.5 dBd
696-900 MHz

Mechanical specifications

Length	1804	mm	71.0	in
Width	285	mm	11.2	in
Depth	114	mm	4.5	in
Depth with z-bracket	154	mm	6.1	in
Weight [4]	7.9	kg	17.0	lbs
Wind Area Fore/Aft	0.51	m^2	5.5	ft^2
Wind Area Side	0.21	m^2	2.2	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	753	N	169	lbf
Side	351	N	79	lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in

Mounting Bracket Kit	36210003
Downtilt Bracket Kit	36210004
Mechanical Downtilt	0-14°

Electrical specifications

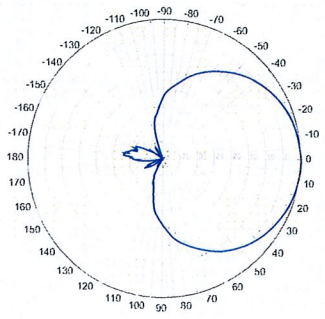
Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -25 dB
Gain [1]	14.5 dBd 16.5 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	63°
Vertical Beamwidth	11°
Electrical downtilt [5]	6°
Null fill [1]	5%
Lightning protection	Direct ground

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

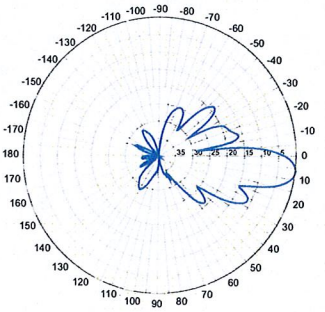
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector. E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

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

Radiation-pattern[1]
750 MHz

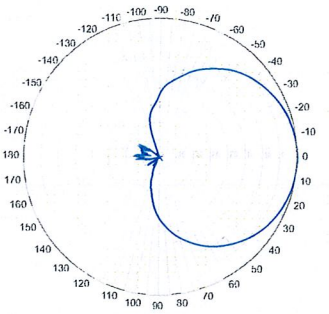


Horizontal

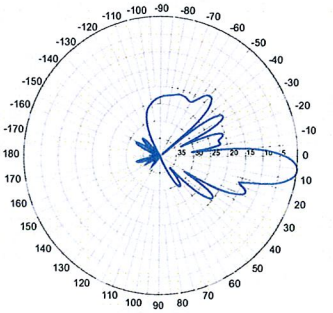


Vertical

850 MHz



Horizontal

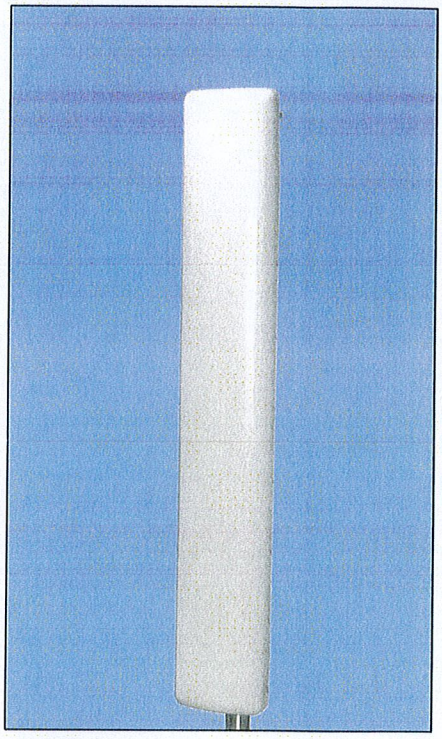


Vertical

696-900 MHz

BXA-70063/6CF__ 6°

When ordering replace "__" with connector type.



Featuring our Exclusive 3T 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.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date 04/15/09

815.399.0001 • antel@antelinc.com • www.antelinc.com

Amphenol Antel, Inc. The Antenna Technology Company

	General	Power	Density					
Site Name: Enfield								
Tower Height: Verizon @ 152Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Cingular GSM	2	427	160	0.0120	1900	1.0000	1.20%	
*Cingular UMTS	1	500	160	0.0070	880	0.5867	1.20%	
*T-Mobile GSM	8	135	117	0.0284	1945	1.0000	2.84%	
*T-Mobile UMTS	2	760	117	0.0399	2100	1.0000	3.99%	
*Sprint	11	132	140	0.0266	1900	1.0000	2.66%	
*Nextel	1	541.67	130	0.0115	851	0.5673	2.03%	
*XM Sat Radio	1	292.72	95	0.0117	2330	1.0000	1.17%	
*Page Net	1	510.47	110	0.0152	930	0.6200	2.45%	
Verizon	**3**	**436**	**152**	**0.0204**	**1970**	**1.0000**	**2.04%**	
Verizon	**9**	**288**	**152**	**0.0403**	**869**	**0.5793**	**6.96%**	
Verizon	**1**	**834**	**152**	**0.0130**	**757**	**0.4973**	**2.61%**	
								29.14%
* Source: Siting Council								

Date: **December 17, 2009**

Mitzi Parker
Crown Castle USA Inc.
3530 Toringdon Way, Suite 300
Charlotte, NC 28277

Crown Castle USA, Inc.
2000 Corporate Drive
Canonsburg, PA 15317
(724) 416-2000

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate Carrier Site Name:**	Enfield CT
Crown Castle Designation:	**Crown Castle BU Number:**	806373
	Crown Castle Site Name:	HRT 101 943232
	Crown Castle JDE Job Number:	128352
	Crown Castle Work Order Number:	309073
Engineering Firm Designation:	**Crown Castle USA, Inc. Project Number:**	309073
Site Data:	**OFF OLIVER ST., ENFIELD, Hartford County, CT** **Latitude *41° 57' 36.2"*, Longitude *-72° 35' 32.3"*** **150 Foot - Monopole Tower**	

Dear Mitzi Parker,

Crown Castle USA, Inc. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 309073, in accordance with application 91605, revision 1.

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

LC1: Existing + Reserved + Proposed Equipment — **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and local code requirements based upon a wind speed of 80 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

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

Structural analysis prepared by: Jose Arroyo Monroy, Engineer I

Respectfully submitted by:

Douglas K. Pineo

Douglas K. Pineo, P.E.
Manager Structural Design

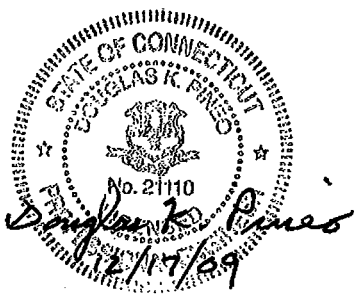


TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150 ft Monopole tower designed by Valmont in November of 1991. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-E.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 69.3 mph with 0.5 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150	152	1	antel	BXA-185063/8CF w/ Mount Pipe	-	-	1
		2	antel	BXA-185090/8CFx2 w/ Mount Pipe			
		2	antel	BXA-70063/6CFx4 w/ Mount Pipe			
		1	antel	BXA-70063/6CFx6 w/ Mount Pipe			
		2	antel	LPA-80063/4CF w/ Mount Pipe			
		4	antel	LPA-80080/4CF w/ Mount Pipe			

Notes:
1) Proposed Equipment

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
152	160	6	powerwave technologies	7770.00 w/ Mount Pipe	24	1-5/8	1
		6	powerwave technologies	LGP13519			
		6	powerwave technologies	LGP21401			
	152	1	tower mounts	Side Arm Mount [SO 701-3]			
150	152	6	decibel	DB948F85T2E-M w/ Mount Pipe	12	1-5/8	3
		6	swedcom	ALP 9212-N w/ Mount Pipe			
	150	1	tower mounts	Platform Mount [LP 713-1]	-	-	1
137	137	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Platform Mount [LP 713-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
126	127	9	swedcom	ALP 9212-N w/ Mount Pipe	9	7/8	1
	126	-	-	-	12	1-1/4	4
		1	tower mounts	T-Arm Mount [TA 602-3]	-	-	1
		6	andrew	ONEBASE TWIN DUAL DUPLEX TMA			
116	117	3	ems wireless	DR65-18-02DPL2Q w/ Mount Pipe	2	1-5/8	1
		3	rfs celwave	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	6	1-1/4	
	116	1	tower mounts	Side Arm Mount [SO 701-3]			
50	50	1	symmetricom	58532A	1	1/2	2
40	40	1	unknown	GPS	1	1/2	1

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be replaced by proposed. Feedlines to be reused
4) SLA feedlines controlling

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
147	147	4	-	PD10017	-	-
140	140	12	-	PD1132	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH	821582	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Valmont	821581	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont	822743	CCISITES

3.1) Analysis Method

RISATower (version 5.3.1.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) The base plate grout was not considered in the analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. Crown Castle USA, Inc. should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 97.1667	Pole	TP31.13x20.3x0.25	1	-9.50	1250.85	88.2	Pass
L2	97.1667 - 49.0833	Pole	TP40.49x29.6392x0.375	2	-19.31	2442.03	93.0	Pass
L3	49.0833 - 0	Pole	TP49.8x38.5268x0.438	3	-35.76	3619.24	97.0	Pass
							Summary	
						Pole (L3)	97.0	Pass
						Rating =	97.0	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	91.4	Pass
1	Base Plate	0	62.2	Pass
1	Base Foundation Soil Interaction	0	74.1	Pass

Structure Rating (max from all components) =	97%

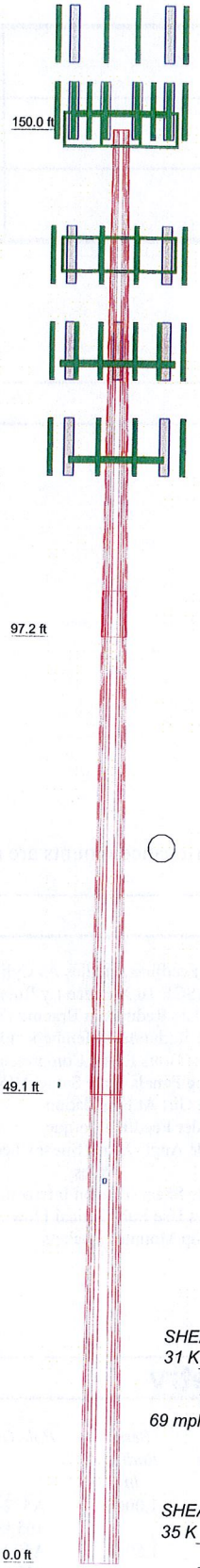
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The tower and foundation are sufficient to carry the existing, reserved and proposed loading. No modifications are required at this time.

APPENDIX A

RISA TOWER OUTPUT



Section	1	2	3
Length (ft)	52'9-31/32"	52'11-1/32"	55'
Number of Sides	12	12	12
Thickness (in)	0.2500	0.3750	0.4380
Lap Splice (ft)	4'9-31/32"	5'11-1/32"	
Top Dia (in)	20.3000	29.6392	38.5268
Bot Dia (in)	31.1300	40.4900	49.8000
Grade		A572-65	
Weight (K)	3.7	7.5	11.5

Total Weight: 22.8 K

AXIAL 49 K
SHEAR 31 K
MOMENT 3153 kip-ft
TORQUE 2 kip-ft
69 mph WIND - 0.5000 in ICE

AXIAL 36 K
SHEAR 35 K
MOMENT 3491 kip-ft
TORQUE 2 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) 7770.00 w/ Mount Pipe	152	Platform Mount [LP 713-1]	137
(2) LGP13519	152	(3) ALP 9212-N w/ Mount Pipe	126
(2) LGP21401	152	(3) ALP 9212-N w/ Mount Pipe	126
(2) 7770.00 w/ Mount Pipe	152	(3) ALP 9212-N w/ Mount Pipe	126
(2) LGP13519	152	T-Arm Mount [TA 602-3]	126
(2) LGP21401	152	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
(2) 7770.00 w/ Mount Pipe	152	DR65-18-02DPL2Q w/ Mount Pipe	116
(2) LGP13519	152	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
(2) LGP21401	152	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
Side Arm Mount [SO 701-3]	152	DR65-18-02DPL2Q w/ Mount Pipe	116
BXA-185063/8CF w/ Mount Pipe	150	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
BXA-70063/6CFx6 w/ Mount Pipe	150	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
(2) LPA-80063/4CF w/ Mount Pipe	150	DR65-18-02DPL2Q w/ Mount Pipe	116
BXA-185090/8CFx2 w/ Mount Pipe	150	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
BXA-70063/6CFx4 w/ Mount Pipe	150	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
(2) LPA-80080/4CF w/ Mount Pipe	150	DR65-18-02DPL2Q w/ Mount Pipe	116
BXA-185090/8CFx2 w/ Mount Pipe	150	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
BXA-70063/6CFx4 w/ Mount Pipe	150	Side Arm Mount [SO 701-3]	116
(2) LPA-80080/4CF w/ Mount Pipe	150	58532A	50
Platform Mount [LP 713-1]	150	GPS	40
(2) DB980H90E-M w/ Mount Pipe	137		
(2) DB980H90E-M w/ Mount Pipe	137		
(2) DB980H90E-M w/ Mount Pipe	137		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 97%

CROWN CASTLE
Shaping the Wireless World

Crown Castle USA, Inc.
2000 Corporate Drive
Canonsburg, PA 15317
Phone: (724) 416-2000
FAX: (724) 416-2254

Job: **BU# 806373**			
Project:			
Client: Crown Castle USA, Inc.	Drawn by: jarroyomonroy	App'd:	
Code: TIA/EIA-222-F	Date: 12/17/09	Scale: NTS	
Path: R:\SA Models - Letters\Work Area\JMonroy\806373\806373.eri		Dwg No. E-1	

RISATower	Job	Page
	BU# 806373	1 of 12
Crown Castle USA, Inc. 2000 Corporate Drive Canonsburg, PA 15317 Phone: (724) 416-2000 FAX: (724) 416-2254	**Project**	**Date** 11:14:55 12/17/09
	Client Crown Castle USA, Inc.	**Designed by** jarroyomonroy

Tower Input Data

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

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 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	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	150'-97'2-1/32"	52'9-31/32"	4'9-31/32"	12	20.3000	31.1300	0.2500	1.0000	A572-65 (65 ksi)
L2	97'2-1/32"-49'31/32"	52'11-1/32"	5'11-1/32"	12	29.6392	40.4900	0.3750	1.5000	A572-65 (65 ksi)
L3	49'31/32"-0'	55'		12	38.5268	49.8000	0.4380	1.7520	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in²	I in⁴	r in	C in	I/C in³	J in⁴	It/Q in²	w in	w/t
L1	21.0161	16.1403	828.1804	7.1779	10.5154	78.7588	1678.1181	7.9437	4.7704	19.082
	32.2281	24.8584	3025.6153	11.0550	16.1253	187.6311	6130.7169	12.2345	7.6728	30.691
L2	31.7109	35.3366	3862.6466	10.4766	15.3531	251.5869	7826.7692	17.3916	6.9383	18.502
	41.9183	48.4389	9949.3218	14.3612	20.9738	474.3686	20160.0234	23.8401	9.8463	26.257
L3	41.1414	53.7189	9947.3326	13.6358	19.9569	498.4417	20155.9927	26.4388	9.1513	20.893
	51.5568	69.6182	21651.8084	17.6716	25.7964	839.3345	43872.4339	34.2640	12.1726	27.791

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150'-97'2-1/32"				1	1	1		
L2 97'2-1/32"-49'3 1/32"				1	1	1		
L3 49'31/32"-0'				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft²/ft	Weight plf
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	150' - 0'	13	No Ice	0.00	0.82
						1/2" Ice	0.00	2.33
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	150' - 0'	5	No Ice	0.20	0.82
						1/2" Ice	0.30	2.33
LDF7-50A(1-5/8")	C	No	Inside Pole	150' - 0'	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
HJ7-50A(1-5/8")	A	No	Inside Pole	150' - 0'	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
LDF7-50A(1-5/8")	A	No	Inside Pole	137' - 0'	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
LDF6-50A(1-1/4")	B	No	CaAa (Out Of Face)	126' - 0'	3	No Ice	0.16	0.66
						1/2" Ice	0.25	1.91
LDF6-50A(1-1/4")	B	No	CaAa (Out Of Face)	126' - 0'	9	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91
AL7-50(1 5/8")	A	No	CaAa (Out Of Face)	116' - 0'	2	No Ice	0.00	0.52
						1/2" Ice	0.00	2.02
LDF6-50A(1-1/4")	A	No	CaAa (Out Of Face)	116' - 0'	6	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91
FLC 12-50J(1/2")	A	No	Inside Pole	50' - 0'	1	No Ice	0.00	0.17
						1/2" Ice	0.00	0.17
LDF4-50A(1/2")	A	No	Inside Pole	40' - 0'	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150'-97'2-1/32"	A	0.000	0.000	0.000	0.000	0.95
		B	0.000	0.000	0.000	13.408	0.23
		C	0.000	0.000	0.000	52.305	1.04
L2	97'2-1/32"-49'31/32"	A	0.000	0.000	0.000	0.000	1.08
		B	0.000	0.000	0.000	22.359	0.38
		C	0.000	0.000	0.000	47.603	0.95
L3	49'31/32"-0'	A	0.000	0.000	0.000	0.000	1.11
		B	0.000	0.000	0.000	22.824	0.39
		C	0.000	0.000	0.000	48.592	0.97

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150'-97'2-1/32"	A	0.500	0.000	0.000	0.000	0.000	1.15
		B		0.000	0.000	0.000	22.057	0.66
		C		0.000	0.000	0.000	78.721	2.48
L2	97'2-1/32"-49'31/32"	A	0.500	0.000	0.000	0.000	0.000	1.58
		B		0.000	0.000	0.000	36.784	1.10
		C		0.000	0.000	0.000	71.643	2.26
L3	49'31/32"-0'	A	0.500	0.000	0.000	0.000	0.000	1.63
		B		0.000	0.000	0.000	37.549	1.13
		C		0.000	0.000	0.000	73.133	2.30

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	150'-97'2-1/32"	-0.5852	0.6018	-0.6953	0.7572
L2	97'2-1/32"-49'31/32"	-0.4574	0.7319	-0.5264	0.9453
L3	49'31/32"-0'	-0.4906	0.7851	-0.5789	1.0396

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	6.12 6.63	4.25 5.01	0.06 0.10
(2) LGP13519	A	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	0.34 0.42	0.21 0.28	0.01 0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) LGP21401	A	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	1.29 1.45	0.23 0.31	0.01 0.02
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	6.12 6.63	4.25 5.01	0.06 0.10
(2) LGP13519	B	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	0.34 0.42	0.21 0.28	0.01 0.01
(2) LGP21401	B	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	1.29 1.45	0.23 0.31	0.01 0.02
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	6.12 6.63	4.25 5.01	0.06 0.10
(2) LGP13519	C	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	0.34 0.42	0.21 0.28	0.01 0.01
(2) LGP21401	C	From Leg	4.00 0' 8'	0.0000	152'	No Ice 1/2" Ice	1.29 1.45	0.23 0.31	0.01 0.02
Side Arm Mount [SO 701-3]	C	None		0.0000	152'	No Ice 1/2" Ice	2.83 3.92	2.83 3.92	0.20 0.24
**									
BXA-185063/8CF w/ Mount Pipe	A	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	3.18 3.56	3.00 3.61	0.03 0.06
BXA-70063/6CFx6 w/ Mount Pipe	A	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	7.97 8.61	5.40 6.55	0.03 0.08
(2) LPA-80063/4CF w/ Mount Pipe	A	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	7.25 7.72	7.26 7.96	0.04 0.10
BXA-185090/8CFx2 w/ Mount Pipe	B	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	3.16 3.53	3.33 3.94	0.03 0.06
BXA-70063/6CFx4 w/ Mount Pipe	B	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	7.97 8.61	5.40 6.55	0.04 0.10
(2) LPA-80080/4CF w/ Mount Pipe	B	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	2.86 3.22	7.23 7.92	0.03 0.07
BXA-185090/8CFx2 w/ Mount Pipe	C	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	3.16 3.53	3.33 3.94	0.03 0.06
BXA-70063/6CFx4 w/ Mount Pipe	C	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	7.97 8.61	5.40 6.55	0.04 0.10
(2) LPA-80080/4CF w/ Mount Pipe	C	From Leg	4.00 0' 2'	0.0000	150'	No Ice 1/2" Ice	2.86 3.22	7.23 7.92	0.03 0.07
Platform Mount [LP 713-1]	C	None		0.0000	150'	No Ice 1/2" Ice	31.27 39.68	31.27 39.68	1.51 1.93
**									
(2) DB980H90E-M w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	137'	No Ice 1/2" Ice	4.04 4.50	3.62 4.48	0.03 0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	137'	No Ice 1/2" Ice	4.04 4.50	3.62 4.48	0.03 0.06
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	137'	No Ice 1/2" Ice	4.04 4.50	3.62 4.48	0.03 0.06
Platform Mount [LP 713-1]	C	None		0.0000	137'	No Ice 1/2" Ice	31.27 39.68	31.27 39.68	1.51 1.93
**									
(3) ALP 9212-N w/ Mount Pipe	A	From Leg	4.00 0' 1'	0.0000	126'	No Ice 1/2" Ice	6.02 6.51	7.05 7.83	0.04 0.09
(3) ALP 9212-N w/ Mount Pipe	B	From Leg	4.00 0' 1'	0.0000	126'	No Ice 1/2" Ice	6.02 6.51	7.05 7.83	0.04 0.09
(3) ALP 9212-N w/ Mount Pipe	C	From Leg	4.00 0' 1'	0.0000	126'	No Ice 1/2" Ice	6.02 6.51	7.05 7.83	0.04 0.09
T-Arm Mount [TA 602-3]	C	None		0.0000	126'	No Ice 1/2" Ice	11.59 15.44	11.59 15.44	0.77 0.99
**									
(2) ONEBASE TWIN DUAL DUPLEX TMA	A	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	0.67 0.79	0.31 0.39	0.01 0.02
DR65-18-02DPL2Q w/ Mount Pipe	A	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	6.54 7.04	3.73 4.46	0.04 0.09
APX16DWV-16DWV-S-E-A CU w/ Mount Pipe	A	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	6.94 7.44	3.29 4.00	0.06 0.10
(2) ONEBASE TWIN DUAL DUPLEX TMA	B	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	0.67 0.79	0.31 0.39	0.01 0.02
DR65-18-02DPL2Q w/ Mount Pipe	B	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	6.54 7.04	3.73 4.46	0.04 0.09
APX16DWV-16DWV-S-E-A CU w/ Mount Pipe	B	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	6.94 7.44	3.29 4.00	0.06 0.10
(2) ONEBASE TWIN DUAL DUPLEX TMA	C	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	0.67 0.79	0.31 0.39	0.01 0.02
DR65-18-02DPL2Q w/ Mount Pipe	C	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	6.54 7.04	3.73 4.46	0.04 0.09
APX16DWV-16DWV-S-E-A CU w/ Mount Pipe	C	From Leg	4.00 0' 1'	0.0000	116'	No Ice 1/2" Ice	6.94 7.44	3.29 4.00	0.06 0.10
Side Arm Mount [SO 701-3]	C	None		0.0000	116'	No Ice 1/2" Ice	2.83 3.92	2.83 3.92	0.20 0.24
**									
58532A	C	From Leg	4.00 0' 0'	0.0000	50'	No Ice 1/2" Ice	0.22 0.29	0.22 0.29	0.00 0.00
**									
**									
GPS	A	From Leg	4.00	0.0000	40'	No Ice	0.17	0.17	0.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0' 0'			1/2" Ice	0.24	0.24	0.00

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	150 - 97.1667	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-16.91	1.35	-1.00
			Max. Mx	11	-9.57	645.09	-0.36
			Max. My	8	-9.50	0.46	-665.02
			Max. Vy	11	-19.66	645.09	-0.36
			Max. Vx	8	20.07	0.46	-665.02
			Max. Torque	19			-0.52
L2	97.1667 - 49.0833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-29.65	2.59	-2.24
			Max. Mx	11	-19.35	1741.02	-0.82
			Max. My	8	-19.31	0.90	-1780.11
			Max. Vy	11	-26.92	1741.02	-0.82
			Max. Vx	8	27.33	0.90	-1780.11
			Max. Torque	19			-1.10
L3	49.0833 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-49.37	4.26	-3.94
			Max. Mx	11	-35.76	3429.96	-1.47
			Max. My	8	-35.76	1.51	-3491.06
			Max. Vy	11	-34.36	3429.96	-1.47
			Max. Vx	8	34.75	1.51	-3491.06
			Max. Torque	19			-1.82

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	21	49.37	0.00	-30.79
	Max. H_x	11	35.80	34.32	-0.00
	Max. H_z	2	35.80	0.00	34.71
	Max. M_x	2	3488.13	0.00	34.71
	Max. M_z	5	3426.95	-34.32	-0.00
	Max. Torsion	25	1.80	26.41	15.40
	Min. Vert	1	35.80	0.00	0.00
	Min. H_x	5	35.80	-34.32	-0.00
	Min. H_z	8	35.80	0.00	-34.71
	Min. M_x	8	-3491.06	0.00	-34.71
	Min. M_z	11	-3429.96	34.32	-0.00
	Min. Torsion	19	-1.82	-26.41	-15.40

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	35.80	0.00	0.00	1.42	1.46	0.00
Dead+Wind 0 deg - No Ice	35.80	-0.00	-34.71	-3488.13	1.51	-0.96
Dead+Wind 30 deg - No Ice	35.80	17.16	-30.06	-3020.69	-1712.61	-0.18
Dead+Wind 60 deg - No Ice	35.80	29.72	-17.36	-1743.45	-2967.56	0.66
Dead+Wind 90 deg - No Ice	35.80	34.32	0.00	1.47	-3426.95	1.33
Dead+Wind 120 deg - No Ice	35.80	29.72	17.36	1746.38	-2967.56	1.65
Dead+Wind 150 deg - No Ice	35.80	17.16	30.06	3023.62	-1712.61	1.51

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 180 deg - No Ice	35.80	-0.00	34.71	3491.06	1.51	0.96
Dead+Wind 210 deg - No Ice	35.80	-17.16	30.06	3023.61	1715.62	0.16
Dead+Wind 240 deg - No Ice	35.80	-29.72	17.36	1746.38	2970.58	-0.68
Dead+Wind 270 deg - No Ice	35.80	-34.32	0.00	1.47	3429.96	-1.33
Dead+Wind 300 deg - No Ice	35.80	-29.72	-17.36	-1743.45	2970.58	-1.62
Dead+Wind 330 deg - No Ice	35.80	-17.16	-30.06	-3020.68	1715.62	-1.49
Dead+Ice+Temp	49.37	-0.00	0.00	3.94	4.26	0.00
Dead+Wind 0 deg+Ice+Temp	49.37	-0.00	-30.79	-3144.66	4.32	-1.01
Dead+Wind 30 deg+Ice+Temp	49.37	15.25	-26.67	-2722.87	-1545.98	-0.14
Dead+Wind 60 deg+Ice+Temp	49.37	26.41	-15.40	-1570.41	-2680.96	0.78
Dead+Wind 90 deg+Ice+Temp	49.37	30.49	0.00	4.00	-3096.42	1.50
Dead+Wind 120 deg+Ice+Temp	49.37	26.41	15.40	1578.40	-2680.96	1.82
Dead+Wind 150 deg+Ice+Temp	49.37	15.25	26.67	2730.85	-1545.97	1.64
Dead+Wind 180 deg+Ice+Temp	49.37	-0.00	30.79	3152.64	4.32	1.01
Dead+Wind 210 deg+Ice+Temp	49.37	-15.25	26.67	2730.84	1554.61	0.12
Dead+Wind 240 deg+Ice+Temp	49.37	-26.41	15.40	1578.39	2689.59	-0.80
Dead+Wind 270 deg+Ice+Temp	49.37	-30.49	0.00	4.00	3105.05	-1.50
Dead+Wind 300 deg+Ice+Temp	49.37	-26.41	-15.40	-1570.41	2689.59	-1.80
Dead+Wind 330 deg+Ice+Temp	49.37	-15.25	-26.67	-2722.86	1554.62	-1.62
Dead+Wind 0 deg - Service	35.80	-0.00	-13.56	-1363.91	1.52	-0.38
Dead+Wind 30 deg - Service	35.80	6.70	-11.74	-1180.99	-669.15	-0.07
Dead+Wind 60 deg - Service	35.80	11.61	-6.78	-681.23	-1160.12	0.26
Dead+Wind 90 deg - Service	35.80	13.41	0.00	1.47	-1339.83	0.52
Dead+Wind 120 deg - Service	35.80	11.61	6.78	684.17	-1160.12	0.64
Dead+Wind 150 deg - Service	35.80	6.70	11.74	1183.94	-669.15	0.59
Dead+Wind 180 deg - Service	35.80	-0.00	13.56	1366.86	1.52	0.38
Dead+Wind 210 deg - Service	35.80	-6.70	11.74	1183.94	672.18	0.07
Dead+Wind 240 deg - Service	35.80	-11.61	6.78	684.17	1163.15	-0.26
Dead+Wind 270 deg - Service	35.80	-13.41	0.00	1.47	1342.86	-0.52
Dead+Wind 300 deg - Service	35.80	-11.61	-6.78	-681.22	1163.15	-0.64
Dead+Wind 330 deg - Service	35.80	-6.70	-11.74	-1180.99	672.18	-0.59

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	-35.80	0.00	0.00	35.80	0.00	0.000%
2	0.00	-35.80	-34.71	0.00	35.80	34.71	0.000%
3	17.16	-35.80	-30.06	-17.16	35.80	30.06	0.000%
4	29.72	-35.80	-17.36	-29.72	35.80	17.36	0.000%
5	34.32	-35.80	0.00	-34.32	35.80	-0.00	0.000%
6	29.72	-35.80	17.36	-29.72	35.80	-17.36	0.000%
7	17.16	-35.80	30.06	-17.16	35.80	-30.06	0.000%
8	0.00	-35.80	34.71	0.00	35.80	-34.71	0.000%
9	-17.16	-35.80	30.06	17.16	35.80	-30.06	0.000%
10	-29.72	-35.80	17.36	29.72	35.80	-17.36	0.000%
11	-34.32	-35.80	0.00	34.32	35.80	-0.00	0.000%
12	-29.72	-35.80	-17.36	29.72	35.80	17.36	0.000%
13	-17.16	-35.80	-30.06	17.16	35.80	30.06	0.000%
14	0.00	-49.37	0.00	0.00	49.37	-0.00	0.000%
15	0.00	-49.37	-30.79	0.00	49.37	30.79	0.000%
16	15.25	-49.37	-26.67	-15.25	49.37	26.67	0.000%
17	26.41	-49.37	-15.40	-26.41	49.37	15.40	0.000%
18	30.49	-49.37	0.00	-30.49	49.37	-0.00	0.000%
19	26.41	-49.37	15.40	-26.41	49.37	-15.40	0.000%
20	15.25	-49.37	26.67	-15.25	49.37	-26.67	0.000%
21	0.00	-49.37	30.79	0.00	49.37	-30.79	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
22	-15.25	-49.37	26.67	15.25	49.37	-26.67	0.000%
23	-26.41	-49.37	15.40	26.41	49.37	-15.40	0.000%
24	-30.49	-49.37	0.00	30.49	49.37	-0.00	0.000%
25	-26.41	-49.37	-15.40	26.41	49.37	15.40	0.000%
26	-15.25	-49.37	-26.67	15.25	49.37	26.67	0.000%
27	0.00	-35.80	-13.56	0.00	35.80	13.56	0.000%
28	6.70	-35.80	-11.74	-6.70	35.80	11.74	0.000%
29	11.61	-35.80	-6.78	-11.61	35.80	6.78	0.000%
30	13.41	-35.80	0.00	-13.41	35.80	-0.00	0.000%
31	11.61	-35.80	6.78	-11.61	35.80	-6.78	0.000%
32	6.70	-35.80	11.74	-6.70	35.80	-11.74	0.000%
33	0.00	-35.80	13.56	0.00	35.80	-13.56	0.000%
34	-6.70	-35.80	11.74	6.70	35.80	-11.74	0.000%
35	-11.61	-35.80	6.78	11.61	35.80	-6.78	0.000%
36	-13.41	-35.80	0.00	13.41	35.80	-0.00	0.000%
37	-11.61	-35.80	-6.78	11.61	35.80	6.78	0.000%
38	-6.70	-35.80	-11.74	6.70	35.80	11.74	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	0.00025515
3	Yes	5	0.00000001	0.00044495
4	Yes	5	0.00000001	0.00044122
5	Yes	4	0.00000001	0.00029396
6	Yes	5	0.00000001	0.00045044
7	Yes	5	0.00000001	0.00044030
8	Yes	4	0.00000001	0.00025531
9	Yes	5	0.00000001	0.00044785
10	Yes	5	0.00000001	0.00044721
11	Yes	4	0.00000001	0.00029418
12	Yes	5	0.00000001	0.00043819
13	Yes	5	0.00000001	0.00045269
14	Yes	4	0.00000001	0.00001057
15	Yes	5	0.00000001	0.00021719
16	Yes	6	0.00000001	0.00007422
17	Yes	6	0.00000001	0.00007375
18	Yes	5	0.00000001	0.00021633
19	Yes	6	0.00000001	0.00007542
20	Yes	6	0.00000001	0.00007368
21	Yes	5	0.00000001	0.00021755
22	Yes	6	0.00000001	0.00007511
23	Yes	6	0.00000001	0.00007516
24	Yes	5	0.00000001	0.00021679
25	Yes	6	0.00000001	0.00007352
26	Yes	6	0.00000001	0.00007568
27	Yes	4	0.00000001	0.00007563
28	Yes	5	0.00000001	0.00005709
29	Yes	5	0.00000001	0.00005609
30	Yes	4	0.00000001	0.00008217
31	Yes	5	0.00000001	0.00005848
32	Yes	5	0.00000001	0.00005613
33	Yes	4	0.00000001	0.00007589
34	Yes	5	0.00000001	0.00005814

35	Yes	5	0.00000001	0.00005785
36	Yes	4	0.00000001	0.00008247
37	Yes	5	0.00000001	0.00005555
38	Yes	5	0.00000001	0.00005918

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 97.1667	45.265	33	2.7433	0.0021
L2	102 - 49.0833	20.677	33	1.9535	0.0014
L3	55 - 0	5.905	33	0.9937	0.0006

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
152'	(2) 7770.00 w/ Mount Pipe	33	45.265	2.7433	0.0026	22964
150'	BXA-185063/8CF w/ Mount Pipe	33	45.265	2.7433	0.0026	22964
137'	(2) DB980H90E-M w/ Mount Pipe	33	38.121	2.5574	0.0023	8832
126'	(3) ALP 9212-N w/ Mount Pipe	33	32.246	2.3902	0.0020	4783
116'	(2) ONEBASE TWIN DUAL DUPLEX TMA	33	27.166	2.2232	0.0018	3375
50'	58532A	33	4.976	0.9406	0.0006	2680
40'	GPS	33	3.444	0.8784	0.0006	3350

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 97.1667	115.316	8	6.9929	0.0050
L2	102 - 49.0833	52.737	8	4.9826	0.0037
L3	55 - 0	15.074	8	2.5366	0.0018

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
152'	(2) 7770.00 w/ Mount Pipe	8	115.316	6.9929	0.0075	9217
150'	BXA-185063/8CF w/ Mount Pipe	8	115.316	6.9929	0.0075	9217
137'	(2) DB980H90E-M w/ Mount Pipe	8	97.138	6.4991	0.0065	3543
126'	(3) ALP 9212-N w/ Mount Pipe	8	82.190	6.0634	0.0056	1916
116'	(2) ONEBASE TWIN DUAL	8	69.261	5.6401	0.0050	1350

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
	DUPLEX TMA					
50'	58532A	8	12.704	2.3306	0.0017	1052
40'	GPS	8	8.792	1.9730	0.0014	1314

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	150 - 97.1667 (1)	TP31.13x20.3x0.25	52'9-31/32"	0'	0.0	39.000	24.0608	-9.50	938.37	0.010
L2	97.1667 - 49.0833 (2)	TP40.49x29.6392x0.375	52'11-1/32"	0'	0.0	39.000	46.9739	-19.31	1831.98	0.011
L3	49.0833 - 0 (3)	TP49.8x38.5268x0.438	55'	0'	0.0	39.000	69.6182	-35.76	2715.11	0.013

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 97.1667 (1)	TP31.13x20.3x0.25	665.02	45.410	39.000	1.164	0.00	0.000	39.000	0.000
L2	97.1667 - 49.0833 (2)	TP40.49x29.6392x0.375	1780.11	47.897	39.000	1.228	0.00	0.000	39.000	0.000
L3	49.0833 - 0 (3)	TP49.8x38.5268x0.438	3491.06	49.912	39.000	1.280	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	150 - 97.1667 (1)	TP31.13x20.3x0.25	20.07	0.834	26.000	0.065	0.32	0.010	26.000	0.000
L2	97.1667 - 49.0833 (2)	TP40.49x29.6392x0.375	27.33	0.582	26.000	0.045	0.60	0.008	26.000	0.000
L3	49.0833 - 0 (3)	TP49.8x38.5268x0.438	34.75	0.499	26.000	0.039	0.96	0.007	26.000	0.000

Pole Interaction Design Data

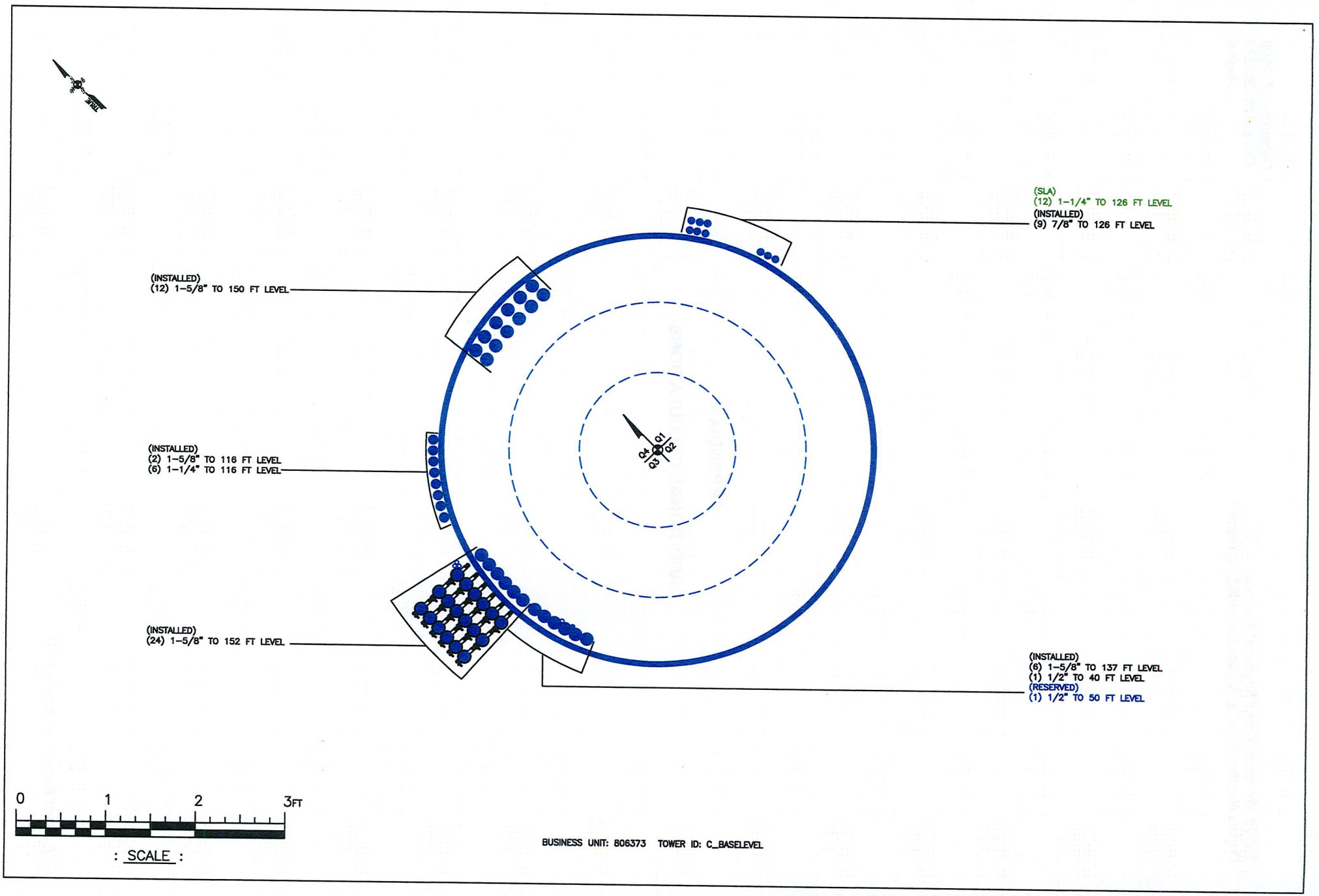
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 97.1667 (1)	0.010	1.164	0.000	0.065	0.000	1.176 ✓	1.333	H1-3+VT ✓
L2	97.1667 - 49.0833 (2)	0.011	1.228	0.000	0.045	0.000	1.239 ✓	1.333	H1-3+VT ✓
L3	49.0833 - 0 (3)	0.013	1.280	0.000	0.039	0.000	1.293 ✓	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	150 - 97.1667	Pole	TP31.13x20.3x0.25	1	-9.50	1250.85	88.2	Pass
L2	97.1667 - 49.0833	Pole	TP40.49x29.6392x0.375	2	-19.31	2442.03	93.0	Pass
L3	49.0833 - 0	Pole	TP49.8x38.5268x0.438	3	-35.76	3619.24	97.0	Pass
							Summary	
						Pole (L3)	97.0	Pass
						RATING =	**97.0**	**Pass**

APPENDIX B

BASE LEVEL DRAWING


(SLA)
(12) 1-1/4" TO 126 FT LEVEL
(INSTALLED)
(9) 7/8" TO 126 FT LEVEL
(INSTALLED)
(12) 1-5/8" TO 150 FT LEVEL
(INSTALLED)
(2) 1-5/8" TO 116 FT LEVEL
(6) 1-1/4" TO 116 FT LEVEL
(INSTALLED)
(24) 1-5/8" TO 152 FT LEVEL
(INSTALLED)
(6) 1-5/8" TO 137 FT LEVEL
(1) 1/2" TO 40 FT LEVEL
(RESERVED)
(1) 1/2" TO 50 FT LEVEL
Q1
Q2
Q3
Q4
0
1
2
3FT
: SCALE :
BUSINESS UNIT: 806373 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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

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

Site Data

BU#: *806373*
Site Name: *HRT 101 943232*
App #: *91605*

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	3826.127	ft-kips (* Note)
Max. Service Shaft P:	36	kips
Max Axial Force Type:	Comp.	

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

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

Load Factor	Shaft Factored Loads		
1.30	Mu:	4973.965	ft-kips
1.30	Pu:	46.8	kips

Pier Properties

Concrete:

Pier Diameter = 7.0 ft
Concrete Area = 5541.8 in^2

Reinforcement:

Clear Cover to **Tie**= 3.00 in
Horiz. **Tie** Bar Size= 4
Vert. Cage Diameter = 6.30 ft
Vert. Cage Diameter = 75.59 in
Vertical Bar Size = 11
Bar Diameter = 1.41 in
Bar Area = 1.56 in^2
Number of Bars = 36
As Total= 56.16 in^2
A s/ Aconc, Rho: 0.0101 1.01%

Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	B	
Seismic Risk =	**Low**	

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

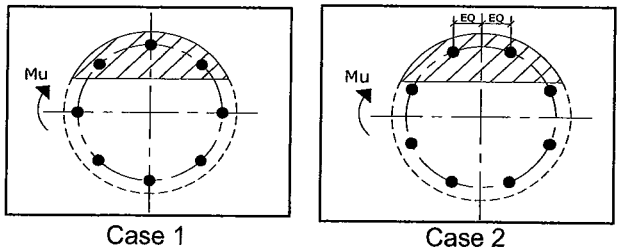
ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tesnion Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033
IBC 1810.1.2: None SDC A or B
Governing: 0.0033 **0.33%**

ACI 10.8 and 10.9
Min As for Columns, Comp. Controlled, Shafts:
Min As: 0.0050 **0.50%**

Minimum Rho Check:
Actual Req'd Min. Rho: 0.33% Flexural
Provided Rho: 1.01% **OK**

Results:

Governing Orientation Case: **2**



Case 1 Case 2

Dist. From Edge to Neutral Axis: **17.36** in
Extreme Steel Strain, ϵt: **0.0108**
ϵt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

<-- Comment Box

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	9026.11	kips
at Mu=(ϕ=0.65)Mn=	5472.88	ft-kips
Max Tu, (φ=0.9) Tn =	3032.64	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Output Note: Negative Pu=Tension
For Axial Compression, φ Pn = Pu: 46.80 kips
Drilled Shaft Moment Capacity, φMn: **8422.23** ft-kips
Drilled Shaft Superimposed Mu: **4973.96** ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR: 59.06%

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material
TIA Rev F

Site Data

BU#: *806373*
Site Name: *HRT 101 943232*
App #: *91605*

Pole Manufacturer:	*Other*

Reactions		
Moment:	3491	ft-kips
Axial:	36	kips
Shear:	35	kips

If No stiffeners, Criteria:	AISC ASD	<-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	58.06	in

Plate Data		
Diam:	64.06	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	10.01	in

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:	Both	
Groove Depth:	0.25	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	49.8	in
Thick:	0.438	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Anchor Rod Results

Maximum Rod Tension:	178.1 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	91.4% **Pass**	Fty*ASIF

Base Plate Results Flexural Check

Base Plate Stress:	37.3 ksi	Rigid
Allowable Plate Stress:	60.0 ksi	Service ASD
Base Plate Stress Ratio:	62.2% **Pass**	0.75*Fy*ASIF
		Y.L. Length: 29.85

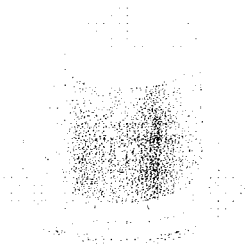
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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

Monopole Drilled Pier

Checks capacity of a single drilled shaft foundation for a monopole

BU#: 806373
Site Name: *HRT 101 943232*
App Number: *91605*

ACI 318 Version:	2002

Design Reactions		
Shear, **S**:	35.00	kips
Moment, **Mt**:	3491.00	ft-kips
Tower Weight, **Wt**:	36.00	kips
Tower Height, **H**:	150	ft
Base Diameter, **BD**:	49.8	in

Foundation Dimensions		
Caisson Diameter, **CD**:	7.0	ft
Ext. Above Grade, **E**:	1.0	ft
Depth Below Grade, **L**:	24.5	ft
Neglected Depth, **N**:	3.5	ft
Rebar Size, **Sp**:	11	
Rebar Quantity, **mp**:	36	
Tie Size, **tp**:	4	

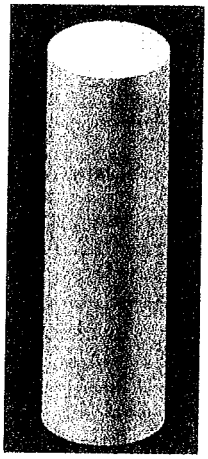
Material Properties		
Rebar Tensile, **Fy**:	60	ksi
Concrete Strength, **F'c**:	3000	psi
Concrete Density, **δx**:	150	pcf
Clear Cover, **cc**:	3	in

Soil Properties		
Soil Unit Weight, **γ**:	100	pcf
Allowable Bearing, **Bc**:	26.000	ksf
Seismic Design Cat, **z**:	B	

Caisson Analysis		
Depth to Zero Shear	6.0	ft
Max Factored Moment	4973.96	ft-kips
Overturning FOS	2.7	

Depth		Shear		Moment	
2.3	ft	35.3	kips	3694.4	ft-kips
4.6	ft	34.3	kips	3775.7	ft-kips
6.9	ft	-21	kips	3799.9	ft-kips

Design Checks	*Capacity/ Availability*	*Demand/ Limits*	*Check*
Minimum Req'd Dia. 1 (ft):	7.00	1.33	OK
Minimum Req'd Dia. 2 (ft):	7.00	5.65	OK
Bearing (ksf):	26.00	0.94	OK
Rebar Area (in²):	56.16	18.47	OK
Pier moment capacity (k-ft):	8422.23	4973.96	OK
Rebar spacing (in):	5.40	2 < Bs <18	OK
Development Length (in)	218.68	12.00	OK
Soil moment capacity(FOS):	2.70	2.00	OK



Bearing: 3.6%

Steel: 59.1%

Soil: 74.1%

CAISSON Version 10.00 11:17:36 AM Thursday, December 17, 2009
Crown Castle USA

```
*****************************************************************************
*                                                                           *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.*
*                                                                           *
*****************************************************************************
```

*** ANALYSIS IDENTIFICATION : BU# 806373
NOTES :

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 3.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 7.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 1.00

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	C	3.50	0.00	100.0	0.0		
2	S	0.50	3.50	100.0		2.770	28.00
3	S	1.00	4.00	125.0		5.045	42.00
4	S	26.50	5.00	65.0		5.045	42.00

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 3491.0 VERTICAL (k) = 36.0 SHEAR (k) = 35.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 2.70

*** CALCULATED PIER LENGTH (ft) = 25.500

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
C	1.00	3.50	100.0	0.0		0.00	2.75
S	4.50	0.50	100.0		2.770	10.91	4.76
S	5.00	1.00	125.0		5.045	49.00	5.52
S	6.00	12.37	65.0		5.045	1214.62	13.08
S	18.37	7.13	65.0		5.045	-1179.28	22.11

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	MOMENT (ft-k)
0.00	95.2	9867.4	35.3	3654.6
2.55	95.2	10110.3	35.3	3744.5
5.10	80.0	10349.2	29.6	3833.0
7.65	-65.8	10379.3	-24.4	3844.2
10.20	-259.0	9974.7	-95.9	3694.3
12.75	-497.0	9020.3	-184.1	3340.9
15.30	-779.7	7402.0	-288.8	2741.5
17.85	-1107.3	5005.6	-410.1	1853.9
20.40	-879.0	2317.5	-325.5	858.3
22.95	-461.9	598.4	-171.1	221.6
25.50	0.0	0.0	0.0	0.0

*** TOTAL REINFORCEMENT PCT = 0.46 REINFORCEMENT AREA (in^2) = 25.49
*** USABLE AXIAL CAP. (k) = 36.0 USABLE MOMENT CAP. (ft-k) = 3903.8

*** US Standard Re-Bars (Select one of the following):

128	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in) AT SPACING (in) =	1.82
83	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in) AT SPACING (in) =	2.80
58	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in) AT SPACING (in) =	4.01
43	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in) AT SPACING (in) =	5.41
33	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in) AT SPACING (in) =	7.04
26	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in) AT SPACING (in) =	8.94
21	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in) AT SPACING (in) =	11.07
17	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in) AT SPACING (in) =	13.68
12	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in) AT SPACING (in) =	19.37

*** WEIGHT OF CAISSON (kips) = 147.203
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 935.4

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

ORIGINAL

August 23, 2010

Michael Perrone
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-049-100114 – Cellco Partnership d/b/a Verizon Wireless**
Oliver Street, Enfield, Connecticut

Dear Mr. Perrone:

On March 8, 2010, the Siting Council acknowledged receipt of Cellco's notice of intent to modify the above-referenced telecommunications facility. This modification involved the replacement of twelve (12) existing antennas with six (6) newer model cellular antennas, three (3) newer model PCS antennas, and three (3) LTE antennas.

In addition to these antenna modifications, Cellco now intends to install six (6) antenna cable diplexers on its antenna mounting platform. Attached to this letter is a Structural Analysis Report verifying that the tower can support the previously approved antenna modifications and the installation of the diplexers.

If you have any questions regarding any of these materials, please do not hesitate to contact me or Rachel Mayo.

Sincerely,

Kenneth C. Baldwin

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

10584044-v1

Date: **July 06, 2010**

Veronica Harris
Crown Castle USA Inc.
1200 McArthur Blvd
Mahwah, NJ 07430

Crown Castle USA Inc.
2000 Corporate Drive
Canonsburg, PA 15317
(724) 416-2126

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate** **Carrier Site Name:**	 Enfield
Crown Castle Designation:	**Crown Castle BU Number:** **Crown Castle Site Name:** **Crown Castle JDE Job Number:** **Crown Castle Work Order Number:**	806373 HRT 101 943232 138389 344114
Engineering Firm Designation:	**Crown Castle USA Inc. Project Number:**	344114
Site Data:	**OFF OLIVER ST., ENFIELD, Hartford County, CT** **Latitude *41° 57' 36.2"*, Longitude *-72° 35' 32.3"*** **150 Foot - Monopole Tower**	

Dear Veronica Harris,

Crown Castle USA Inc. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 104061, in accordance with application 104061, revision 2.

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

LC1: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and local code requirements based upon a wind speed of 80 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

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

Structural analysis prepared by: Daryoush Hooshyar, Eng. II

Respectfully submitted by:

Kenton C. Weber, P.E.
Engineering Supervisor

STATE OF CONNECTICUT
KENTON C. WEBER
No. 27263
LICENSED PROFESSIONAL ENGINEER

7/6/10

RISA Tower Report - version 5.4.1.8

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150 ft Monopole tower designed by VALMONT in November of 1991. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-E.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 1 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150	152	1	antel	BXA-185063/8CF w/ Mount Pipe			
		2	antel	BXA-185090/8CFx2 w/ Mount Pipe			
		2	antel	BXA-70063/6CFx4 w/ Mount Pipe			
		1	antel	BXA-70063/6CFx6 w/ Mount Pipe			
		2	antel	LPA-80063/4CF w/ Mount Pipe			
		4	antel	LPA-80080/4CF w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
160	160	1	tower mounts	Side Arm Mount [SO 701-3]	12	1-5/8	1
152		6	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP13519			
		6	powerwave technologies	LGP21401			
150	152	6	decibel	DB948F85T2E-M w/ Mount Pipe	-	-	4
		6	swedcom	ALP 9212-N w/ Mount Pipe			
	150	1	tower mounts	Platform Mount [LP 713-1]	12	1-5/8	1

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
137	139	2	andrew	VHLP2.5-11	6	5/16	2
		2	dragonwave	HORIZON COMPACT			
	137	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Platform Mount [LP 713-1]			
	135	3	kathrein	840 10054 w/ Mount Pipe	3	1/2	2
		1	motorola	TIMING 2000			
		3	samsung telecommunications	WIMAX DAP HEAD			
126	127	9	swedcom	ALP 9212-N w/ Mount Pipe	9	7/8	1
	126	-	-	-	12	1-1/4	3
		1	tower mounts	T-Arm Mount [TA 602-3]	-	-	1
116	117	3	ems wireless	DR65-18-02DPL2Q w/ Mount Pipe	6 6	1-5/8 1-1/4	1
		3	rfs celwave	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe			
	116	6	andrew	ONEBASE TWIN DUAL DUPLEX TMA			
		1	tower mounts	Side Arm Mount [SO 701-3]			
50	50	1	symmetricom	58532A	1	1/2	2
		1	tower mounts	Side Arm Mount [SO 701-1]			
40	40	1	tower mounts	Side Arm Mount [SO 701-1]	1	1/2	1
		1	unknown	GPS			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) SLA feed lines control; were considered in this analysis
4) Equipment to be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
147	147	4	-	PD10017	-	-
140	140	12	-	PD1132	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH	821582	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Valmont	821581	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont	822743	CCISITES

3.1) Analysis Method

RISATower (version 5.4.1.8), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) The base plate grout was not considered in the analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. Crown Castle USA Inc. should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 97.1667	Pole	TP31.13x20.3x0.25	1	-9.40	1250.85	93.9	Pass
L2	97.1667 - 49.0833	Pole	TP40.49x29.6392x0.375	2	-18.98	2442.03	96.3	Pass
L3	49.0833 - 0	Pole	TP49.8x38.5268x0.438	3	-35.22	3619.24	98.6	Pass
							Summary	
						Pole (L3)	98.6	Pass
						Rating =	98.6	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	92.9	Pass
1	Base Plate	0	63.2	Pass
1	Base Foundation Soil Interaction	0	95.2	Pass

Structure Rating (max from all components) =	98.6%

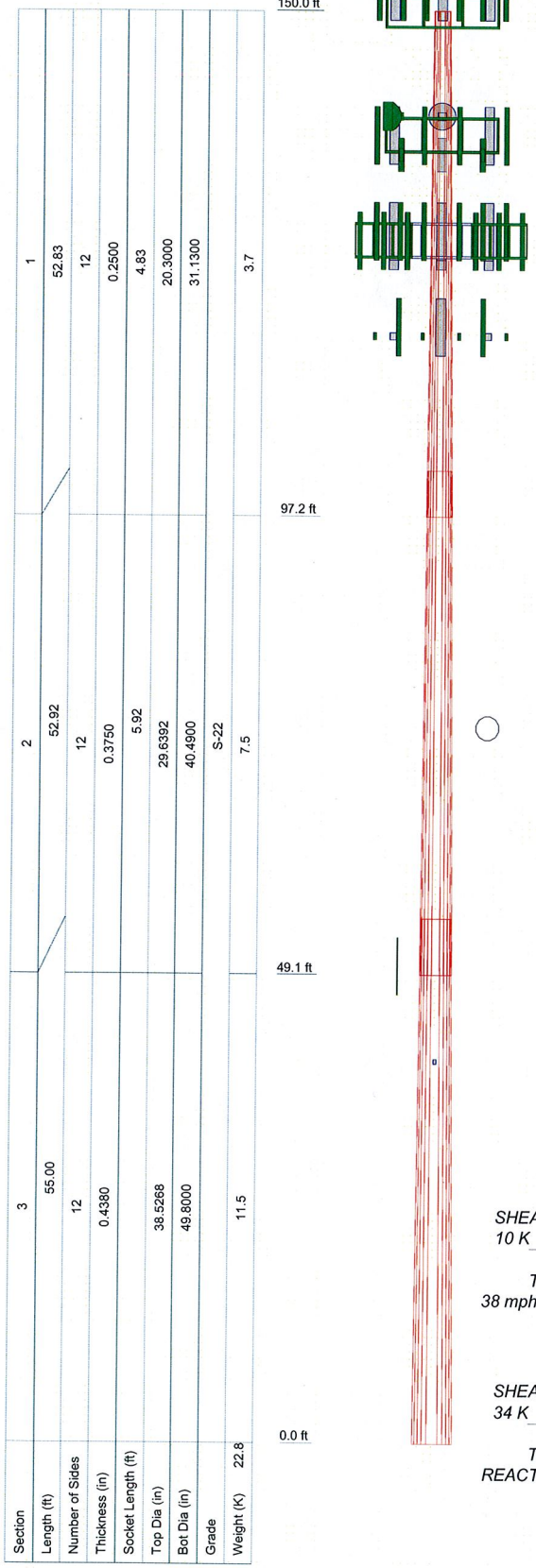
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The tower and foundation are sufficient to carry the existing, reserved and proposed loading. No modifications are required at this time.

APPENDIX A

RISA TOWER OUTPUT



Section	1	2	3
Length (ft)	52.83	52.92	55.00
Number of Sides	12	12	12
Thickness (in)	0.2500	0.3750	0.4380
Socket Length (ft)	4.83	5.92	
Top Dia (in)	20.3000	29.6392	38.5268
Bot Dia (in)	31.1300	40.4900	49.8000
Grade		S-22	
Weight (K)	3.7	7.5	11.5

22.8

DESIGNED APPURTENANCE LOADING

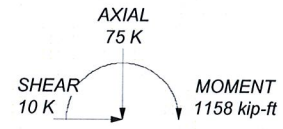
TYPE	ELEVATION	TYPE	ELEVATION
Side Arm Mount [SO 701-3]	160	840 10054 w/ Mount Pipe	137
10'6"x4" Pipe Mount	155	WIMAX DAP HEAD	137
(2) LGP21401	152	Platform Mount [LP 713-1]	137
(2) 7770.00 w/ Mount Pipe	152	(2) DB980H90E-M w/ Mount Pipe	137
(2) LGP13519	152	HORIZON COMPACT	137
(2) LGP21401	152	840 10054 w/ Mount Pipe	137
(2) 7770.00 w/ Mount Pipe	152	VHLP2.5-11	137
(2) LGP13519	152	VHLP2.5-11	137
(2) LGP21401	152	(3) ALP 9212-N w/ Mount Pipe	126
(2) 7770.00 w/ Mount Pipe	152	(3) ALP 9212-N w/ Mount Pipe	126
(2) LGP13519	152	(3) ALP 9212-N w/ Mount Pipe	126
BXA-185063/8CF w/ Mount Pipe	150	T-Arm Mount [TA 602-3]	126
BXA-70063/6CFx6 w/ Mount Pipe	150	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
(2) LPA-80063/4CF w/ Mount Pipe	150	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
BXA-185090/8CFx2 w/ Mount Pipe	150	DR65-18-02DPL2Q w/ Mount Pipe	116
BXA-70063/6CFx4 w/ Mount Pipe	150	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
(2) LPA-80080/4CF w/ Mount Pipe	150	Side Arm Mount [SO 701-3]	116
BXA-185090/8CFx2 w/ Mount Pipe	150	DR65-18-02DPL2Q w/ Mount Pipe	116
BXA-70063/6CFx4 w/ Mount Pipe	150	APX16DWV-16DWV-S-E-ACU w/ Mount Pipe	116
(2) LPA-80080/4CF w/ Mount Pipe	150	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
Platform Mount [LP 713-1]	150	DR65-18-02DPL2Q w/ Mount Pipe	116
(2) FD9R6004/2C-3L	150	(2) ONEBASE TWIN DUAL DUPLEX TMA	116
(2) FD9R6004/2C-3L	150	Side Arm Mount [SO 701-1]	50
(2) FD9R6004/2C-3L	150	58532A	50
TIMING 2000	137	Side Arm Mount [SO 701-1]	40
WIMAX DAP HEAD	137	GPS	40
(2) DB980H90E-M w/ Mount Pipe	137		
840 10054 w/ Mount Pipe	137		
WIMAX DAP HEAD	137		
(2) DB980H90E-M w/ Mount Pipe	137		
HORIZON COMPACT	137		

MATERIAL STRENGTH

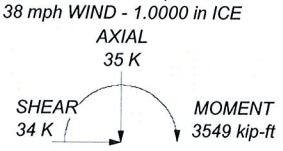
GRADE	Fy	Fu	GRADE	Fy	Fu
S-22	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 98.6%



TORQUE 1 kip-ft
38 mph WIND - 1.0000 in ICE



TORQUE 2 kip-ft
REACTIONS - 80 mph WIND

CROWN CASTLE
Shaping the Wireless World

Crown Castle USA Inc.
2000 Corporate Drive
Canonsburg, PA 15317
Phone: (724) 416-2126
FAX: (724) 416-4126

Job: *BU# 806373*			
Project:			
Client: Crown Castle	Drawn by: DHooshyar		App'd:
Code: TIA/EIA-222-F	Date: 07/01/10		Scale: NTS
Path: R:\SA Models - Letters\Work Area\DHooshyar\806373\806373.eri			Dwg No. E-1

Tower Input Data

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

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 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	150.00-97.17	52.83	4.83	12	20.3000	31.1300	0.2500	1.0000	S-22 (65 ksi)
L2	97.17-49.08	52.92	5.92	12	29.6392	40.4900	0.3750	1.5000	S-22 (65 ksi)
L3	49.08-0.00	55.00		12	38.5268	49.8000	0.4380	1.7520	S-22 (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	21.0161	16.1403	828.1804	7.1779	10.5154	78.7588	1678.1181	7.9437	4.7704	19.082
	32.2281	24.8584	3025.6153	11.0550	16.1253	187.6311	6130.7169	12.2345	7.6728	30.691
L2	31.7109	35.3366	3862.6466	10.4766	15.3531	251.5869	7826.7691	17.3916	6.9383	18.502
	41.9183	48.4389	9949.3218	14.3612	20.9738	474.3686	20160.0234	23.8401	9.8463	26.257
L3	41.1413	53.7189	9947.3324	13.6358	19.9569	498.4416	20155.9923	26.4388	9.1513	20.893
	51.5568	69.6182	21651.8084	17.6716	25.7964	839.3345	43872.4339	34.2640	12.1726	27.791

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150.00-97.17				1	1	1		
L2 97.17-49.08				1	1	1		
L3 49.08-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	150.00 - 0.00	3	No Ice	0.20	0.82
						1/2" Ice	0.30	2.33
						1" Ice	0.40	4.46
						2" Ice	0.60	10.54
						4" Ice	1.00	30.04
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	150.00 - 0.00	9	No Ice	0.00	0.82
						1/2" Ice	0.00	2.33
						1" Ice	0.00	4.46
						2" Ice	0.00	10.54
						4" Ice	0.00	30.04
** HJ7-50A(1-5/8")	A	No	Inside Pole	150.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
						2" Ice	0.00	1.04
						4" Ice	0.00	1.04
** LDF7-50A(1-5/8")	C	No	Inside Pole	137.00 - 0.00	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
ATCB-B01-005(5/16)	C	No	CaAa (Out Of Face)	137.00 - 0.00	6	No Ice	0.00	0.07
						1/2" Ice	0.00	0.57
						1" Ice	0.00	1.68
						2" Ice	0.00	5.73
						4" Ice	0.00	21.16
FSJ4-50B(1/2")	C	No	CaAa (Out Of Face)	137.00 - 0.00	3	No Ice	0.00	0.14
						1/2" Ice	0.00	0.76
						1" Ice	0.00	2.00
						2" Ice	0.00	6.30

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						4" Ice	0.00	22.23
**								
LDF6-50A(1-1/4")	A	No	CaAa (Out Of Face)	126.00 - 0.00	3	No Ice	0.16	0.66
						1/2" Ice	0.25	1.91
						1" Ice	0.35	3.78
						2" Ice	0.55	9.33
						4" Ice	0.95	27.78
LDF6-50A(1-1/4")	A	No	CaAa (Out Of Face)	126.00 - 0.00	9	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91
						1" Ice	0.00	3.78
						2" Ice	0.00	9.33
						4" Ice	0.00	27.78
**								
AL7-50(1 5/8")	C	No	CaAa (Out Of Face)	116.00 - 0.00	6	No Ice	0.00	0.52
						1/2" Ice	0.00	2.02
						1" Ice	0.00	4.14
						2" Ice	0.00	10.20
						4" Ice	0.00	29.65
LDF6-50A(1-1/4")	C	No	CaAa (Out Of Face)	116.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91
						1" Ice	0.00	3.78
						2" Ice	0.00	9.33
						4" Ice	0.00	27.78
**								
FLC 12-50J(1/2")	A	No	CaAa (Out Of Face)	50.00 - 0.00	1	No Ice	0.00	0.17
						1/2" Ice	0.00	0.87
						1" Ice	0.00	2.17
						2" Ice	0.00	6.62
						4" Ice	0.00	22.85
**								
LDF4-50A(1/2")	C	No	Inside Pole	40.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	150.00-97.17	A	0.000	0.000	0.000	13.408	0.89
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	31.383	0.88
L2	97.17-49.08	A	0.000	0.000	0.000	22.359	0.98
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	28.562	1.09
L3	49.08-0.00	A	0.000	0.000	0.000	22.824	1.01
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	29.155	1.12

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150.00-97.17	A	1.170	0.000	0.000	0.000	33.649	2.29
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	68.473	5.69
L2	97.17-49.08	A	1.099	0.000	0.000	0.000	56.114	3.33
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	62.317	7.34
L3	49.08-0.00	A	1.000	0.000	0.000	0.000	55.195	3.29
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	61.528	6.87

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	150.00-97.17	-0.5529	0.0204	-0.8448	-0.0375
L2	97.17-49.08	-0.5685	-0.1857	-0.8875	-0.4104
L3	49.08-0.00	-0.6010	-0.1963	-0.9655	-0.4427

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) LGP13519	A	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.34 0.42 0.51 0.73 1.25	0.21 0.28 0.36 0.55 1.03	0.01 0.01 0.01 0.02 0.07
(2) LGP21401	A	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.23 0.31 0.40 0.61 1.12	0.01 0.02 0.03 0.05 0.14
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) LGP13519	B	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.34 0.42 0.51 0.73	0.21 0.28 0.36 0.55	0.01 0.01 0.01 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
						4" Ice	1.25	1.03	0.07
(2) LGP21401	B	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.23 0.31 0.40 0.61 1.12	0.01 0.02 0.03 0.05 0.14
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) LGP13519	C	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.34 0.42 0.51 0.73 1.25	0.21 0.28 0.36 0.55 1.03	0.01 0.01 0.01 0.02 0.07
(2) LGP21401	C	From Leg	4.00 0.00 8.00	0.0000	152.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.23 0.31 0.40 0.61 1.12	0.01 0.02 0.03 0.05 0.14
Side Arm Mount [SO 701-3]	C	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.83 3.92 5.01 7.19 11.55	2.83 3.92 5.01 7.19 11.55	0.20 0.24 0.28 0.36 0.53
10'6"x4" Pipe Mount	C	From Leg	1.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.62 6.25 7.55 10.27	4.72 5.62 6.25 7.55 10.27	0.11 0.15 0.19 0.29 0.58
**									
BXA-185063/8CF w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.18 3.56 3.96 4.86 6.77	3.00 3.61 4.24 5.53 8.42	0.03 0.06 0.09 0.19 0.47
BXA-70063/6CFx6 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.40 6.55 7.41 9.18 12.93	0.03 0.08 0.15 0.31 0.77
(2) LPA-80063/4CF w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.25 7.72 8.20 9.19 11.32	7.26 7.96 8.67 10.16 13.39	0.04 0.10 0.18 0.34 0.80
BXA-185090/8CFx2 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.16 3.53 3.94 4.83 6.73	3.33 3.94 4.56 5.86 8.84	0.03 0.06 0.10 0.19 0.49
BXA-70063/6CFx4 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.40 6.55 7.41 9.18 12.93	0.04 0.10 0.17 0.33 0.79

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) LPA-80080/4CF w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.86 3.22 3.59 4.45 6.32	7.23 7.92 8.63 10.11 13.34	0.03 0.07 0.13 0.25 0.61
BXA-185090/8CFx2 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.16 3.53 3.94 4.83 6.73	3.33 3.94 4.56 5.86 8.84	0.03 0.06 0.10 0.19 0.49
BXA-70063/6CFx4 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.40 6.55 7.41 9.18 12.93	0.04 0.10 0.17 0.33 0.79
(2) LPA-80080/4CF w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.86 3.22 3.59 4.45 6.32	7.23 7.92 8.63 10.11 13.34	0.03 0.07 0.13 0.25 0.61
Platform Mount [LP 713-1]	C	None		0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	31.27 39.68 48.09 64.91 98.55	31.27 39.68 48.09 64.91 98.55	1.51 1.93 2.35 3.19 4.86
**									
(2) DB980H90E-M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.06 0.11 0.22 0.55
HORIZON COMPACT	A	From Leg	4.00 0.00 2.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.84 0.97 1.10 1.39 2.08	0.43 0.52 0.63 0.86 1.43	0.01 0.02 0.03 0.05 0.12
840 10054 w/ Mount Pipe	A	From Leg	4.00 0.00 -2.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.41 5.83 6.26 7.16 9.09	2.39 2.92 3.47 4.61 7.32	0.05 0.09 0.13 0.23 0.53
TIMING 2000	A	From Leg	4.00 0.00 -2.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.13 0.18 0.24 0.38 0.78	0.13 0.18 0.24 0.38 0.78	0.00 0.00 0.01 0.01 0.05
WIMAX DAP HEAD	A	From Leg	4.00 0.00 -2.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.80 1.99 2.18 2.59 3.51	0.78 0.92 1.07 1.39 2.14	0.03 0.04 0.06 0.09 0.20
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.06 0.11 0.22 0.55
840 10054 w/ Mount Pipe	B	From Leg	4.00	0.0000	137.00	No Ice	5.41	2.39	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1/2" Ice	5.83	2.92	0.09
			-2.00			1" Ice	6.26	3.47	0.13
						2" Ice	7.16	4.61	0.23
						4" Ice	9.09	7.32	0.53
WIMAX DAP HEAD	B	From Leg	4.00	0.0000	137.00	No Ice	1.80	0.78	0.03
			0.00			1/2" Ice	1.99	0.92	0.04
			-2.00			1" Ice	2.18	1.07	0.06
						2" Ice	2.59	1.39	0.09
						4" Ice	3.51	2.14	0.20
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.00	0.0000	137.00	No Ice	4.04	3.62	0.03
			0.00			1/2" Ice	4.50	4.48	0.06
			0.00			1" Ice	4.95	5.22	0.11
						2" Ice	5.87	6.74	0.22
						4" Ice	8.05	10.00	0.55
HORIZON COMPACT	C	From Leg	4.00	0.0000	137.00	No Ice	0.84	0.43	0.01
			0.00			1/2" Ice	0.97	0.52	0.02
			2.00			1" Ice	1.10	0.63	0.03
						2" Ice	1.39	0.86	0.05
						4" Ice	2.08	1.43	0.12
840 10054 w/ Mount Pipe	C	From Leg	4.00	0.0000	137.00	No Ice	5.41	2.39	0.05
			0.00			1/2" Ice	5.83	2.92	0.09
			-2.00			1" Ice	6.26	3.47	0.13
						2" Ice	7.16	4.61	0.23
						4" Ice	9.09	7.32	0.53
WIMAX DAP HEAD	C	From Leg	4.00	0.0000	137.00	No Ice	1.80	0.78	0.03
			0.00			1/2" Ice	1.99	0.92	0.04
			-2.00			1" Ice	2.18	1.07	0.06
						2" Ice	2.59	1.39	0.09
						4" Ice	3.51	2.14	0.20
Platform Mount [LP 713-1]	C	None		0.0000	137.00	No Ice	31.27	31.27	1.51
						1/2" Ice	39.68	39.68	1.93
						1" Ice	48.09	48.09	2.35
						2" Ice	64.91	64.91	3.19
						4" Ice	98.55	98.55	4.86
**									
(3) ALP 9212-N w/ Mount Pipe	A	From Leg	4.00	0.0000	126.00	No Ice	6.02	7.05	0.04
			0.00			1/2" Ice	6.51	7.83	0.09
			1.00			1" Ice	6.99	8.59	0.16
						2" Ice	7.99	10.15	0.32
						4" Ice	10.13	13.50	0.75
(3) ALP 9212-N w/ Mount Pipe	B	From Leg	4.00	0.0000	126.00	No Ice	6.02	7.05	0.04
			0.00			1/2" Ice	6.51	7.83	0.09
			1.00			1" Ice	6.99	8.59	0.16
						2" Ice	7.99	10.15	0.32
						4" Ice	10.13	13.50	0.75
(3) ALP 9212-N w/ Mount Pipe	C	From Leg	4.00	0.0000	126.00	No Ice	6.02	7.05	0.04
			0.00			1/2" Ice	6.51	7.83	0.09
			1.00			1" Ice	6.99	8.59	0.16
						2" Ice	7.99	10.15	0.32
						4" Ice	10.13	13.50	0.75
T-Arm Mount [TA 602-3]	C	None		0.0000	126.00	No Ice	11.59	11.59	0.77
						1/2" Ice	15.44	15.44	0.99
						1" Ice	19.29	19.29	1.21
						2" Ice	26.99	26.99	1.64
						4" Ice	42.39	42.39	2.50
**									
(2) ONEBASE TWIN DUAL	A	From Leg	4.00	0.0000	116.00	No Ice	0.67	0.31	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
DUPLEX TMA			0.00 0.00			1/2" Ice	0.79	0.39	0.02
						1" Ice	0.91	0.49	0.02
						2" Ice	1.18	0.70	0.04
						4" Ice	1.82	1.23	0.10
DR65-18-02DPL2Q w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	116.00	No Ice	6.54	3.73	0.04
						1/2" Ice	7.04	4.46	0.09
						1" Ice	7.54	5.14	0.14
						2" Ice	8.58	6.56	0.27
						4" Ice	10.78	9.66	0.64
APX16DWV-16DWV-S-E-A CU w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	116.00	No Ice	6.94	3.29	0.06
						1/2" Ice	7.44	4.00	0.10
						1" Ice	7.94	4.66	0.16
						2" Ice	8.98	6.04	0.28
						4" Ice	11.17	9.02	0.65
(2) ONEBASE TWIN DUAL DUPLEX TMA	B	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice	0.67	0.31	0.01
						1/2" Ice	0.79	0.39	0.02
						1" Ice	0.91	0.49	0.02
						2" Ice	1.18	0.70	0.04
						4" Ice	1.82	1.23	0.10
DR65-18-02DPL2Q w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	116.00	No Ice	6.54	3.73	0.04
						1/2" Ice	7.04	4.46	0.09
						1" Ice	7.54	5.14	0.14
						2" Ice	8.58	6.56	0.27
						4" Ice	10.78	9.66	0.64
APX16DWV-16DWV-S-E-A CU w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	116.00	No Ice	6.94	3.29	0.06
						1/2" Ice	7.44	4.00	0.10
						1" Ice	7.94	4.66	0.16
						2" Ice	8.98	6.04	0.28
						4" Ice	11.17	9.02	0.65
(2) ONEBASE TWIN DUAL DUPLEX TMA	C	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice	0.67	0.31	0.01
						1/2" Ice	0.79	0.39	0.02
						1" Ice	0.91	0.49	0.02
						2" Ice	1.18	0.70	0.04
						4" Ice	1.82	1.23	0.10
DR65-18-02DPL2Q w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	116.00	No Ice	6.54	3.73	0.04
						1/2" Ice	7.04	4.46	0.09
						1" Ice	7.54	5.14	0.14
						2" Ice	8.58	6.56	0.27
						4" Ice	10.78	9.66	0.64
APX16DWV-16DWV-S-E-A CU w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	116.00	No Ice	6.94	3.29	0.06
						1/2" Ice	7.44	4.00	0.10
						1" Ice	7.94	4.66	0.16
						2" Ice	8.98	6.04	0.28
						4" Ice	11.17	9.02	0.65
Side Arm Mount [SO 701-3]	C	None		0.0000	116.00	No Ice	2.83	2.83	0.20
						1/2" Ice	3.92	3.92	0.24
						1" Ice	5.01	5.01	0.28
						2" Ice	7.19	7.19	0.36
						4" Ice	11.55	11.55	0.53
** 58532A	C	From Leg	3.00 0.00 0.00	0.0000	50.00	No Ice	0.22	0.22	0.00
						1/2" Ice	0.29	0.29	0.00
						1" Ice	0.37	0.37	0.01
						2" Ice	0.55	0.55	0.02
						4" Ice	1.01	1.01	0.06
Side Arm Mount [SO 701-1]	C	None		0.0000	50.00	No Ice	0.85	1.67	0.07
						1/2" Ice	1.14	2.34	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
						4" Ice	3.17	7.03	0.18
** GPS	A	From Leg	3.00 0.00 0.00	0.0000	40.00	No Ice	0.17	0.17	0.00
						1/2" Ice	0.24	0.24	0.00
						1" Ice	0.31	0.31	0.00
						2" Ice	0.48	0.48	0.01
						4" Ice	0.92	0.92	0.05
Side Arm Mount [SO 701-1]	A	None		0.0000	40.00	No Ice	0.85	1.67	0.07
						1/2" Ice	1.14	2.34	0.08
						1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
						4" Ice	3.17	7.03	0.18
(2) FD9R6004/2C-3L	A	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice	0.37	0.08	0.00
						1/2" Ice	0.45	0.14	0.01
						1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06
(2) FD9R6004/2C-3L	B	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice	0.37	0.08	0.00
						1/2" Ice	0.45	0.14	0.01
						1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06
(2) FD9R6004/2C-3L	C	From Leg	4.00 0.00 2.00	0.0000	150.00	No Ice	0.37	0.08	0.00
						1/2" Ice	0.45	0.14	0.01
						1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
VHLP2.5-11	A	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 2.00	0.0000		137.00	2.92	No Ice	6.68	0.03
									1/2" Ice	7.07	0.04
									1" Ice	7.46	0.05
									2" Ice	8.23	0.07
									4" Ice	9.78	0.11
VHLP2.5-11	C	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 2.00	0.0000		137.00	2.92	No Ice	6.68	0.03
									1/2" Ice	7.07	0.04
									1" Ice	7.46	0.05
									2" Ice	8.23	0.07
									4" Ice	9.78	0.11

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	150 - 97.1667	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-27.36	6.30	-0.61
			Max. Mx	5	-9.49	-684.68	5.73
			Max. My	8	-9.40	5.50	-708.26
			Max. Vy	5	20.40	-684.68	5.73
			Max. Vx	8	20.87	5.50	-708.26
			Max. Torque	8			-1.34
L2	97.1667 - 49.0833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-46.99	15.75	-1.90
			Max. Mx	5	-19.03	-1797.56	13.05
			Max. My	8	-18.98	12.42	-1844.62

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	5	26.98	-1797.56	13.05
			Max. Vx	8	27.45	12.42	-1844.62
			Max. Torque	8			-1.64
L3	49.0833 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-74.62	28.14	-3.29
			Max. Mx	5	-35.22	-3474.37	21.44
			Max. My	8	-35.22	20.66	-3548.76
			Max. Vy	5	33.88	-3474.37	21.44
			Max. Vx	8	34.33	20.66	-3548.76
			Max. Torque	8			-2.05

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	22	74.62	5.16	-9.03
	Max. H_x	11	35.26	33.77	-0.07
	Max. H_z	2	35.26	-0.18	34.24
	Max. M_x	2	3540.74	-0.18	34.24
	Max. M_z	5	3474.37	-33.84	0.15
	Max. Torsion	2	1.90	-0.18	34.24
	Min. Vert	1	35.26	0.00	0.00
	Min. H_x	5	35.26	-33.84	0.15
	Min. H_z	8	35.26	0.12	-34.30
	Min. M_x	8	-3548.76	0.12	-34.30
	Min. M_z	11	-3471.65	33.77	-0.07
	Min. Torsion	8	-2.05	0.12	-34.30

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	35.26	0.00	0.00	0.21	3.56	-0.00
Dead+Wind 0 deg - No Ice	35.26	0.18	-34.24	-3540.74	-22.98	-1.90
Dead+Wind 30 deg - No Ice	35.26	16.99	-29.72	-3075.00	-1744.67	-1.80
Dead+Wind 60 deg - No Ice	35.26	29.31	-17.25	-1788.94	-3008.00	-1.39
Dead+Wind 90 deg - No Ice	35.26	33.84	-0.15	-21.44	-3474.37	-0.66
Dead+Wind 120 deg - No Ice	35.26	29.25	17.08	1765.40	-3000.54	0.68
Dead+Wind 150 deg - No Ice	35.26	16.79	29.72	3076.07	-1716.50	1.82
Dead+Wind 180 deg - No Ice	35.26	-0.12	34.30	3548.76	20.66	2.05
Dead+Wind 210 deg - No Ice	35.26	-16.95	29.74	3078.49	1746.61	1.77
Dead+Wind 240 deg - No Ice	35.26	-29.23	17.28	1793.86	3003.89	1.23
Dead+Wind 270 deg - No Ice	35.26	-33.77	0.07	10.01	3471.65	0.68
Dead+Wind 300 deg - No Ice	35.26	-29.23	-17.07	-1762.71	3003.90	-0.65
Dead+Wind 330 deg - No Ice	35.26	-16.83	-29.62	-3061.08	1729.04	-1.82
Dead+Ice+Temp	74.62	-0.00	0.00	3.29	28.14	0.00
Dead+Wind 0 deg+Ice+Temp	74.62	0.05	-10.40	-1137.83	21.08	-0.72
Dead+Wind 30 deg+Ice+Temp	74.62	5.17	-9.02	-987.25	-537.06	-0.72
Dead+Wind 60 deg+Ice+Temp	74.62	8.92	-5.23	-572.23	-946.41	-0.58
Dead+Wind 90 deg+Ice+Temp	74.62	10.31	-0.04	-2.48	-1097.27	-0.29
Dead+Wind 120 deg+Ice+Temp	74.62	8.91	5.19	572.41	-944.39	0.19

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 150 deg+Ice+Temp	74.62	5.12	9.02	994.00	-529.53	0.62
Dead+Wind 180 deg+Ice+Temp	74.62	-0.03	10.41	1146.45	32.73	0.77
Dead+Wind 210 deg+Ice+Temp	74.62	-5.16	9.03	994.65	592.01	0.72
Dead+Wind 240 deg+Ice+Temp	74.62	-8.90	5.24	580.01	999.72	0.53
Dead+Wind 270 deg+Ice+Temp	74.62	-10.29	0.02	5.92	1150.94	0.29
Dead+Wind 300 deg+Ice+Temp	74.62	-8.90	-5.19	-565.20	999.70	-0.19
Dead+Wind 330 deg+Ice+Temp	74.62	-5.13	-9.00	-983.50	587.30	-0.62
Dead+Wind 0 deg - Service	35.26	0.07	-13.38	-1385.50	-6.77	-0.75
Dead+Wind 30 deg - Service	35.26	6.64	-11.61	-1203.23	-680.51	-0.71
Dead+Wind 60 deg - Service	35.26	11.45	-6.74	-699.92	-1174.84	-0.55
Dead+Wind 90 deg - Service	35.26	13.22	-0.06	-8.26	-1357.29	-0.27
Dead+Wind 120 deg - Service	35.26	11.43	6.67	690.95	-1171.90	0.26
Dead+Wind 150 deg - Service	35.26	6.56	11.61	1203.89	-669.48	0.72
Dead+Wind 180 deg - Service	35.26	-0.05	13.40	1388.91	10.32	0.81
Dead+Wind 210 deg - Service	35.26	-6.62	11.62	1204.85	685.73	0.70
Dead+Wind 240 deg - Service	35.26	-11.42	6.75	702.10	1177.68	0.48
Dead+Wind 270 deg - Service	35.26	-13.19	0.03	4.05	1360.67	0.27
Dead+Wind 300 deg - Service	35.26	-11.42	-6.67	-689.63	1177.66	-0.26
Dead+Wind 330 deg - Service	35.26	-6.57	-11.57	-1197.75	678.83	-0.72

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-35.26	0.00	0.00	35.26	0.00	0.000%
2	0.18	-35.26	-34.24	-0.18	35.26	34.24	0.000%
3	16.99	-35.26	-29.72	-16.99	35.26	29.72	0.000%
4	29.31	-35.26	-17.25	-29.31	35.26	17.25	0.000%
5	33.84	-35.26	-0.15	-33.84	35.26	0.15	0.000%
6	29.25	-35.26	17.08	-29.25	35.26	-17.08	0.000%
7	16.79	-35.26	29.72	-16.79	35.26	-29.72	0.000%
8	-0.12	-35.26	34.30	0.12	35.26	-34.30	0.000%
9	-16.95	-35.26	29.74	16.95	35.26	-29.74	0.000%
10	-29.23	-35.26	17.28	29.23	35.26	-17.28	0.000%
11	-33.77	-35.26	0.07	33.77	35.26	-0.07	0.000%
12	-29.23	-35.26	-17.07	29.23	35.26	17.07	0.000%
13	-16.83	-35.26	-29.62	16.83	35.26	29.62	0.000%
14	0.00	-74.62	0.00	0.00	74.62	-0.00	0.000%
15	0.05	-74.62	-10.40	-0.05	74.62	10.40	0.000%
16	5.17	-74.62	-9.02	-5.17	74.62	9.02	0.000%
17	8.92	-74.62	-5.23	-8.92	74.62	5.23	0.000%
18	10.31	-74.62	-0.04	-10.31	74.62	0.04	0.000%
19	8.91	-74.62	5.19	-8.91	74.62	-5.19	0.000%
20	5.12	-74.62	9.02	-5.12	74.62	-9.02	0.000%
21	-0.03	-74.62	10.41	0.03	74.62	-10.41	0.000%
22	-5.16	-74.62	9.03	5.16	74.62	-9.03	0.000%
23	-8.90	-74.62	5.24	8.90	74.62	-5.24	0.000%
24	-10.29	-74.62	0.02	10.29	74.62	-0.02	0.000%
25	-8.90	-74.62	-5.19	8.90	74.62	5.19	0.000%
26	-5.13	-74.62	-9.00	5.13	74.62	9.00	0.000%
27	0.07	-35.26	-13.38	-0.07	35.26	13.38	0.000%
28	6.64	-35.26	-11.61	-6.64	35.26	11.61	0.000%
29	11.45	-35.26	-6.74	-11.45	35.26	6.74	0.000%
30	13.22	-35.26	-0.06	-13.22	35.26	0.06	0.000%
31	11.43	-35.26	6.67	-11.43	35.26	-6.67	0.000%
32	6.56	-35.26	11.61	-6.56	35.26	-11.61	0.000%
33	-0.05	-35.26	13.40	0.05	35.26	-13.40	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
34	-6.62	-35.26	11.62	6.62	35.26	-11.62	0.000%
35	-11.42	-35.26	6.75	11.42	35.26	-6.75	0.000%
36	-13.19	-35.26	0.03	13.19	35.26	-0.03	0.000%
37	-11.42	-35.26	-6.67	11.42	35.26	6.67	0.000%
38	-6.57	-35.26	-11.57	6.57	35.26	11.57	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	0.00030696
3	Yes	5	0.00000001	0.00047996
4	Yes	5	0.00000001	0.00049696
5	Yes	4	0.00000001	0.00045004
6	Yes	5	0.00000001	0.00048809
7	Yes	5	0.00000001	0.00047290
8	Yes	4	0.00000001	0.00080091
9	Yes	5	0.00000001	0.00050280
10	Yes	5	0.00000001	0.00048343
11	Yes	4	0.00000001	0.00020077
12	Yes	5	0.00000001	0.00047965
13	Yes	5	0.00000001	0.00049908
14	Yes	4	0.00000001	0.00007396
15	Yes	5	0.00000001	0.00029596
16	Yes	5	0.00000001	0.00046011
17	Yes	5	0.00000001	0.00047102
18	Yes	5	0.00000001	0.00028217
19	Yes	5	0.00000001	0.00046707
20	Yes	5	0.00000001	0.00045774
21	Yes	5	0.00000001	0.00029993
22	Yes	5	0.00000001	0.00051423
23	Yes	5	0.00000001	0.00049823
24	Yes	5	0.00000001	0.00029639
25	Yes	5	0.00000001	0.00048913
26	Yes	5	0.00000001	0.00050414
27	Yes	4	0.00000001	0.00012601
28	Yes	5	0.00000001	0.00006378
29	Yes	5	0.00000001	0.00006774
30	Yes	4	0.00000001	0.00009339
31	Yes	5	0.00000001	0.00006544
32	Yes	5	0.00000001	0.00006200
33	Yes	4	0.00000001	0.00018456
34	Yes	5	0.00000001	0.00006999
35	Yes	5	0.00000001	0.00006486
36	Yes	4	0.00000001	0.00007271
37	Yes	5	0.00000001	0.00006376
38	Yes	5	0.00000001	0.00006891

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 97.1667	46.922	33	2.8694	0.0067
L2	102 - 49.0833	21.270	33	2.0245	0.0025
L3	55 - 0	6.035	33	1.0184	0.0009

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	Side Arm Mount [SO 701-3]	33	46.922	2.8694	0.0069	21460
155.00	10'6"x4" Pipe Mount	33	46.922	2.8694	0.0069	21460
152.00	(2) 7770.00 w/ Mount Pipe	33	46.922	2.8694	0.0069	21460
150.00	BXA-185063/8CF w/ Mount Pipe	33	46.922	2.8694	0.0069	21460
139.00	VHLP2.5-11	33	40.594	2.6883	0.0057	9754
137.00	(2) DB980H90E-M w/ Mount Pipe	33	39.455	2.6550	0.0055	8253
126.00	(3) ALP 9212-N w/ Mount Pipe	33	33.320	2.4685	0.0044	4469
116.00	(2) ONEBASE TWIN DUAL DUPLEX TMA	33	28.022	2.2912	0.0035	3154
50.00	58532A	33	5.083	0.9163	0.0008	2607
40.00	GPS	33	3.514	0.7200	0.0007	3258

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 97.1667	119.563	8	7.3163	0.0168
L2	102 - 49.0833	54.266	8	5.1654	0.0062
L3	55 - 0	15.410	8	2.6004	0.0023

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	Side Arm Mount [SO 701-3]	8	119.563	7.3163	0.0186	8627
155.00	10'6"x4" Pipe Mount	8	119.563	7.3163	0.0186	8627
152.00	(2) 7770.00 w/ Mount Pipe	8	119.563	7.3163	0.0186	8627
150.00	BXA-185063/8CF w/ Mount Pipe	8	119.563	7.3163	0.0186	8627
139.00	VHLP2.5-11	8	103.461	6.8553	0.0154	3920
137.00	(2) DB980H90E-M w/ Mount Pipe	8	100.563	6.7707	0.0148	3316
126.00	(3) ALP 9212-N w/ Mount Pipe	8	84.949	6.2960	0.0118	1793
116.00	(2) ONEBASE TWIN DUAL DUPLEX TMA	8	71.461	5.8447	0.0093	1263
50.00	58532A	8	12.981	2.3399	0.0021	1023
40.00	GPS	8	8.974	1.8389	0.0017	1278

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	150 - 97.1667 (1)	TP31.13x20.3x0.25	52.83	0.00	0.0	39.000	24.0608	-9.40	938.37	0.010
L2	97.1667 - 49.0833 (2)	TP40.49x29.6392x0.375	52.92	0.00	0.0	39.000	46.9739	-18.98	1831.98	0.010
L3	49.0833 - 0 (3)	TP49.8x38.5268x0.438	55.00	0.00	0.0	39.000	69.6182	-35.22	2715.11	0.013

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 97.1667 (1)	TP31.13x20.3x0.25	708.28	48.364	39.000	1.240	0.00	0.000	39.000	0.000
L2	97.1667 - 49.0833 (2)	TP40.49x29.6392x0.375	1844.66	49.634	39.000	1.273	0.00	0.000	39.000	0.000
L3	49.0833 - 0 (3)	TP49.8x38.5268x0.438	3548.82	50.738	39.000	1.301	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	150 - 97.1667 (1)	TP31.13x20.3x0.25	20.87	0.868	26.000	0.068	1.34	0.043	26.000	0.002
L2	97.1667 - 49.0833 (2)	TP40.49x29.6392x0.375	27.45	0.584	26.000	0.046	1.64	0.021	26.000	0.001
L3	49.0833 - 0 (3)	TP49.8x38.5268x0.438	34.33	0.493	26.000	0.039	2.05	0.014	26.000	0.001

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	150 - 97.1667 (1)	0.010	1.240	0.000	0.068	0.002	1.251 ✓	1.333	H1-3+VT ✓
L2	97.1667 - 49.0833 (2)	0.010	1.273	0.000	0.046	0.001	1.284 ✓	1.333	H1-3+VT ✓

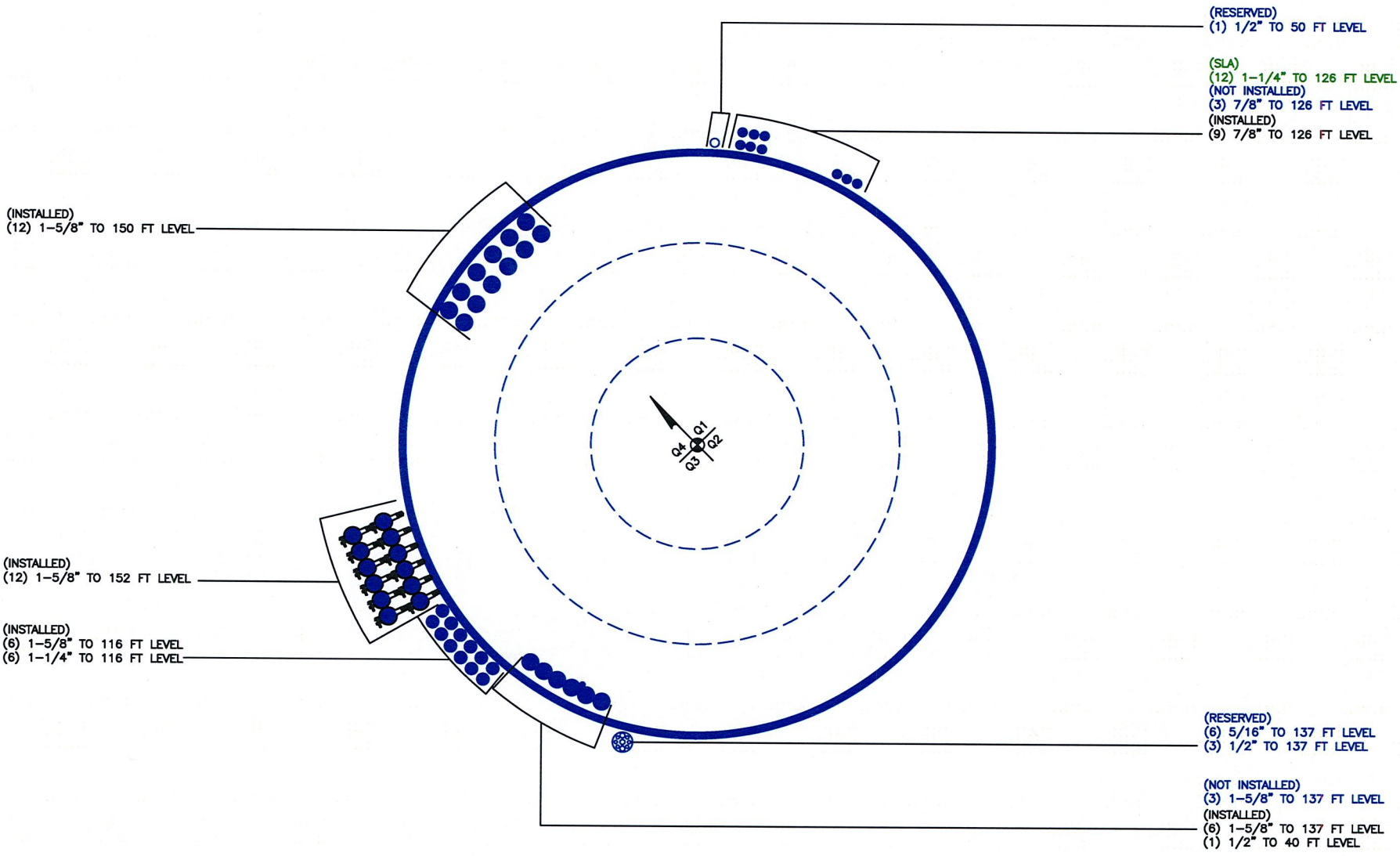
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	49.0833 - 0 (3)	0.013	1.301	0.000	0.039	0.001	1.314 ✓	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	150 - 97.1667	Pole	TP31.13x20.3x0.25	1	-9.40	1250.85	93.9	Pass
L2	97.1667 - 49.0833	Pole	TP40.49x29.6392x0.375	2	-18.98	2442.03	96.3	Pass
L3	49.0833 - 0	Pole	TP49.8x38.5268x0.438	3	-35.22	3619.24	98.6	Pass
							Summary	
						Pole (L3)	98.6	Pass
						RATING =	**98.6**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 806373 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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

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

Site Data

BU#: *806373*
Site Name: *HRT 101 943232*
App #: *104061 Rev 2*

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

Pier Properties

Concrete:

Pier Diameter = 7.0 ft
Concrete Area = 5541.8 in^2

Reinforcement:

Clear Cover to **Tie**= 4.00 in
Horiz. **Tie** Bar Size= 4
Vert. Cage Diameter = 6.13 ft
Vert. Cage Diameter = 73.59 in
Vertical Bar Size = 11
Bar Diameter = 1.41 in
Bar Area = 1.56 in^2
Number of Bars = 36
As Total= 56.16 in^2
A s/ Aconc, Rho: 0.0101 1.01%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tesnion Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033
IBC 1810.1.2: None SDC A or B
Governing: 0.0033 **0.33%**

ACI 10.8 and 10.9
Min As for Columns, Comp. Controlled, Shafts:
Min As: 0.0050 **0.50%**

Minimum Rho Check:
Actual Req'd Min. Rho: 0.33% Flexural
Provided Rho: 1.01% **OK**

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	3962.165	ft-kips (* **Note**)
Max. Service Shaft P:	35	kips
Max Axial Force Type:	Comp.	

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

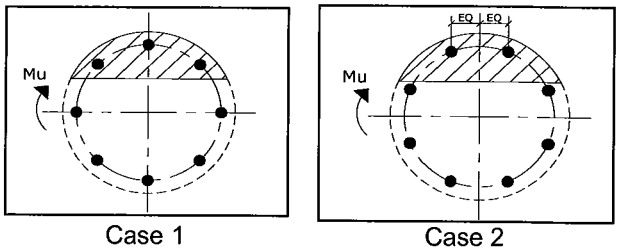
Load Factor	Shaft Factored Loads		
1.30	Mu:	5150.815	ft-kips
1.30	Pu:	45.5	kips

Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	B	
Seismic Risk =	**Low**	

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

Results:

Governing Orientation Case: **2**



Case 1 Case 2

Dist. From Edge to Neutral Axis: **17.67** in
Extreme Steel Strain, εt: **0.0104**
εt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

<-- Comment Box

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	9026.11	kips
at Mu=(ϕ=0.65)Mn=	5415.68	ft-kips
Max Tu, (φ=0.9) Tn =	3032.64	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Output Note: Negative Pu=Tension
For Axial Compression, φ Pn = Pu: 45.50 kips
Drilled Shaft Moment Capacity, φMn: **8292.02** ft-kips
Drilled Shaft Superimposed Mu: **5150.81** ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR: 62.12%

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material
TIA Rev F

Site Data

BU#: *806373*
Site Name: *HRT 101 943232*
App #: *104061 Rev 2*

Pole Manufacturer:	*Other*

Reactions		
Moment:	3549	ft-kips
Axial:	35	kips
Shear:	34	kips

If No stiffeners, Criteria:	AISC ASD	<-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	58.0625	in

Anchor Rod Results

Maximum Rod Tension:	181.2 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	92.9% **Pass**	Fty*ASIF

Plate Data		
Diam:	64.0625	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	10.01	in

Base Plate Results Flexural Check

Base Plate Stress:	37.9 ksi	Rigid
Allowable Plate Stress:	60.0 ksi	Service ASD
Base Plate Stress Ratio:	63.2% **Pass**	0.75*Fy*ASIF
		Y.L. Length: 29.85

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:	Both	
Groove Depth:	0.25	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

n/a

Stiffener Results

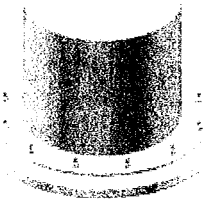
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Diam:	49.8	in
Thick:	0.438	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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

Monopole Drilled Pier

Checks capacity of a single drilled shaft foundation for a monopole

BU#: 806373
Site Name: *HRT 101 943232*
App Number: *104061 Rev 2*

CROWN CASTLE

ACI 318 Version:	2002

Design Reactions		
Shear, **S**:	34.00	kips
Moment, **Mt**:	3549.00	ft-kips
Tower Weight, **Wt**:	35.00	kips
Tower Height, **H**:	150	ft
Base Diameter, **BD**:	49.8	in

Foundation Dimensions		
Caisson Diameter, **CD**:	7.0	ft
Ext. Above Grade, **E**:	1.0	ft
Depth Below Grade, **L**:	24.5	ft
Neglected Depth, **N**:	3.5	ft
Rebar Size, **Sp**:	11	
Rebar Quantity, **mp**:	36	
Tie Size, **tp**:	4	

Material Properties		
Rebar Tensile, **Fy**:	60	ksi
Concrete Strength, **F'c**:	3000	psi
Concrete Density, **δx**:	150	pcf
Clear Cover, **cc**:	4	in

Soil Properties		
Soil Unit Weight, **γ**:	100	pcf
Allowable Bearing, **Bc**:	39.000	ksf
Seismic Design Cat, **z**:	B	

Caisson Analysis		
Depth to Zero Shear	6.6	ft
Max Factored Moment	5150.81	ft-kips
Overturning FOS	2.1	

Depth		Shear		Moment	
2.55	ft	34.4	kips	3826.3	ft-kips
5.1	ft	27.6	kips	3912.1	ft-kips
7.65	ft	-19.7	kips	3925.4	ft-kips

Design Checks	*Capacity/ Availability*	*Demand/ Limits*	*Check*
Minimum Req'd Dia. 1 (ft):	7.00	1.07	**OK**
Minimum Req'd Dia. 2 (ft):	7.00	5.65	**OK**
Bearing (ksf):	39.00	0.91	**OK**
Rebar Area (in²):	56.16	18.47	**OK**
Pier moment capacity (k-ft):	8292.02	5150.81	**OK**
Rebar spacing (in):	5.22	2 < Bs <18	**OK**
Development Length (in)	210.94	12.00	**OK**
Soil moment capacity(FOS):	2.10	2.00	**OK**

Bearing: 2.3%

Steel: 62.1%

Soil: 95.2%

CAISSON Version 10.40 1:51:21 PM Thursday, July 01, 2010
Crown Castle USA

Project Title: BU 806373
Project Notes: WO 344114

Calculation Method: Full 8CD

******* I N P U T D A T A

Pier Properties

Diameter (ft)	Distance of Top of Pier above Ground (ft)	Concrete Strength (ksi)	Steel Yield Strength (ksi)
7.00	1.00	3.00	60.00

Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Clay	3.50	0.00	100.0			
2	Sand	0.50	3.50	100.0		2.770	28.00
3	Sand	6.00	4.00	60.0		3.850	35.99
4	Sand	14.50	10.00	65.0		4.599	40.00

Design (Factored) Loads at Top of Pier

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
3549.0	35.0	34.00	2.10

******* R E S U L T S

Calculated Pier Properties

Length (ft)	Weight (kips)	End Bearing Pressure (psf)
25.500	147.203	909.5

Ultimate Resisting Forces Along Pier

Type	Distance of Top of Layer to Top of Pier (ft)	Thickness (ft)	Density (lbs/ft^3)	CU (psf)	KP	Force (kips)	Arm (ft)
Clay	1.00	3.50	100.0			0.00	2.75
Sand	4.50	0.50	100.0		2.770	10.91	4.76
Sand	5.00	6.00	60.0		3.850	281.36	8.31
Sand	11.00	7.71	65.0		4.599	752.09	15.17
Sand	18.71	6.79	65.0		4.599	-972.15	22.27

Shear and Moments Along Pier

Distance below Top of Pier (ft)	Shear (with Safety Factor) (kips)	Moment (with Safety Factor) (ft-k)	Shear (without Safety Factor) (kips)	Moment (without Safety Factor) (ft-k)
0.00	72.2	7851.2	34.4	3738.7
2.55	72.2	8035.3	34.4	3826.3
5.10	58.0	8215.5	27.6	3912.1
7.65	-41.4	8243.4	-19.7	3925.4
10.20	-172.5	7977.4	-82.1	3798.8
12.75	-358.1	7317.5	-170.5	3484.5
15.30	-593.7	6112.6	-282.7	2910.7
17.85	-870.1	4254.8	-414.3	2026.1
20.40	-756.9	1999.6	-360.4	952.2
22.95	-398.9	517.2	-189.9	246.3
25.50	0.0	-0.0	0.0	-0.0

Reinforcement and Capacity

Total Reinforcement Percent	Reinforcement Area (in^2)	Usable Axial Capacity (kips)	Usable Moment Capacity (ft-k)
0.48	26.60	35.0	4051.0

US Standard Re-Bars (Select one of the following)

Quantity	Name	Area (in^2)	Diameter (in)	Spacing (in)
134	#4	0.20	0.500	1.73
86	#5	0.31	0.625	2.70
61	#6	0.44	0.750	3.81
45	#7	0.60	0.875	5.17
34	#8	0.79	1.000	6.84
27	#9	1.00	1.128	8.61
21	#10	1.27	1.270	11.07
18	#11	1.56	1.410	12.92
12	#14	2.25	1.693	19.37

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

March 7, 2011

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

Re: **Notice of Completion of Construction Activity**
EM-VER-049-100114– Oliver Street, Enfield, Connecticut
EM-VER-119-100917 – 52 New Britain Avenue, Rocky Hill, Connecticut

Dear Ms. Roberts:

The purpose of this letter is to notify you that construction activity associated with the above-referenced facility modifications has been completed.

If you have any questions or need any additional information regarding any of these facilities, please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Copy to:
Sandy M. Carter

10948151-v1