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

December 20, 2011

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

RE: **EM-VER-020-111202** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 719 George Washington Turnpike, Burlington, Connecticut.

Dear Attorney Baldwin:

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

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- 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 November 30, 2011. 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

Linda Roberts
Executive Director

LR/CDM/laf

c: The Honorable Catherine R. Bergstrom, First Selectman, Town of Burlington
Robert J. Coates, Planning and Zoning Chairman, Town of Burlington

CSC
CONNECTICUT SITING COUNCIL

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www.ct.gov/csc

December 6, 2011

The Honorable Catherine R. Bergstrom
First Selectman
Town of Burlington
200 Spielman Highway
Burlington, CT 06013

RE: **EM-VER-020-111202** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 719 George Washington Turnpike, Burlington, Connecticut.

Dear First Selectman Bergstrom:

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 December 20, 2011.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts
Executive Director

LR/jbw

Enclosure: Notice of Intent

c: Robert J. Coates, Planning and Zoning Chairman, Town of Burlington

ROBINSON & COLE

EM-VER-020-111202

KENNETH C. BALDWIN

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Hartford, CT 06103-3597
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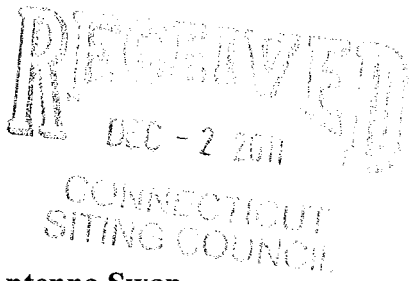
kbaldwin@rc.com
Direct (860) 275-8345

November 30, 2011



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

Re: **Notice of Exempt Modification – Antenna Swap**
719 George Washington Turnpike, Burlington, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 160-foot level on the existing 180-foot tower at the above-referenced address. The tower and underlying property are owned by the Town of Burlington. The Council approved Cellco's shared use of the existing tower in 1997. Cellco now intends to modify its installation by replacing all of its existing antennas with two (2) model APL866513 cellular antennas; four (4) model APL868013 cellular antennas; three (3) model BXA-171085-8BF PCS antennas; and three (3) model BXA-70063/6CF LTE antennas, all at the same 160-foot level on the tower. Cellco also intends to install six coax cable diplexers on its antenna platform. Attached behind Tab 1 are the specifications for the proposed replacement antennas and cable diplexers.

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 Catherine Bergstrom, First Selectwoman of the Town of Burlington.

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

1. The proposed modifications will not result in an increase in the overall height of the existing tower. Cellco's antennas and diplexers will be located at the 160-foot level on the existing 180-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site 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 cumulative power density table for Cellco's modified facility is included behind Tab 2.

Also attached is a Structural Analysis 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

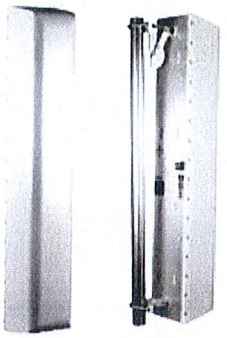
Enclosures
Copy to:
Catherine Bergstrom, Burlington First Selectwoman
Sandy M. Carter

Product Data Sheet **APL866513-42T0**

Maximizer® Log Periodic Antenna, 806-894, 65deg, 15.1dBi, 1.2m, FET, 0deg

Product Description

The Celwave® Maximizer series is a log periodic dipole array which uses a patented design to achieve a front-to-back ratio of 45 dB, the highest front-to-back ratio in the industry. Maximizers are available to cover ESMR, AMPS, PCS and DCS frequency ranges. They use RFS's patented monolithic CELlite® technology, which eliminates cable and soldered joints to reduce the possibility of inter-modulation products. The CELlite technology assures high reliability and excellent repeatability of electrical characteristics. The cellular Maximizers are available in 65°, 80° and 90° horizontal beamwidths and the PCS/DCS Maximizers are available in 65° and 90° horizontal beamwidths. Patent number 6,133,889.



FRONT BACK

Features/Benefits

- **45 dB front-to-back ratio reduces co-channel interference.• Monolithic construction reduces IM.• No solder joints, high reliability.• Surface treated components prevent galvanic corrosion.• UV stabilized radome assures long life without radome deterioration due to UV exposure.**

Technical Specifications

Electrical Specifications

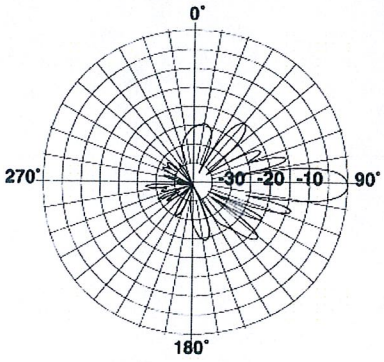
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	15.1 (13)
1st Upper Sidelobe Suppression, dB	>20
Upper Sidelobe Suppression, dB	>20
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16 DIN Female

Mechanical Specifications

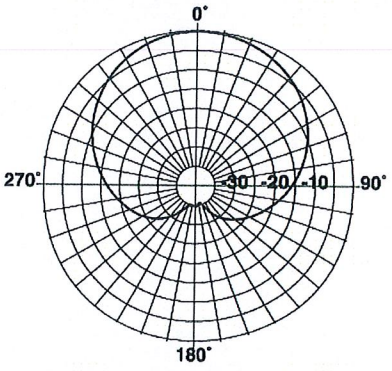
Dimensions - HxWxD, mm (in)	1219 x 234 x 203 (48 x 9.2 x 8)
Weight w/o Mtg Hardware, kg (lb)	7 (15.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	180 (112)
Max Wind Loading Area, m² (ft²)	0.376 (4.05)
Maximum Thrust @ Rated Wind, N (lbf)	903 (203)
Wind Load - Side @ Rated Wind, N (lbf)	594 (133.5)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	9.1 (20)
Packing Dimensions, HxWxD, mm (in)	1594 x 343 x 349 (62.75 x 13.5 x 13.75)

Ordering Information

Mounting Hardware	APM21-3



Vertical Pattern



Horizontal Pattern

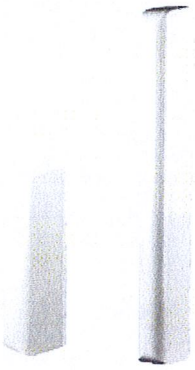
Other Documentation

Product Data Sheet **APL868013-42T0**

Maximizer® Log Periodic Antenna, 806-894, 80deg, 14.1dBi, 1.2m, FET, 0deg

Product Description

The Celwave® Maximizer series is a log periodic dipole array which uses a patented design to achieve a front-to-back ratio of 45 dB, the highest front-to-back ratio in the industry. Maximizers are available to cover ESMR, AMPS, PCS and DCS frequency ranges. They use RFS's patented monolithic CELlite® technology, which eliminates cable and soldered joints to reduce the possibility of inter-modulation products. The CELlite technology assures high reliability and excellent repeatability of electrical characteristics. The cellular Maximizers are available in 65°, 80° and 90° horizontal beamwidths and the PCS/DCS Maximizers are available in 65° and 90° horizontal beamwidths. Patent number 6,133,889.



Features/Benefits

• 45 dB front-to-back ratio reduces co-channel interference.• Monolithic construction reduces IM.• No solder joints, high reliability.• Surface treated components prevent galvanic corrosion.• UV stabilized radome assures long life without radome deterioration due to UV exposure.

Technical Specifications

Electrical Specifications

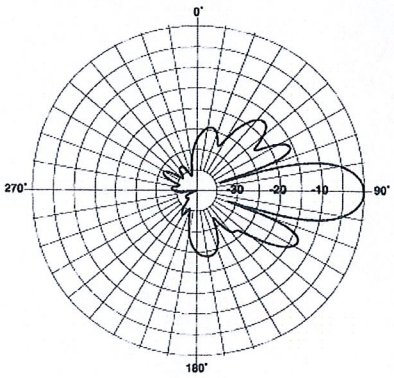
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16 DIN Female

Mechanical Specifications

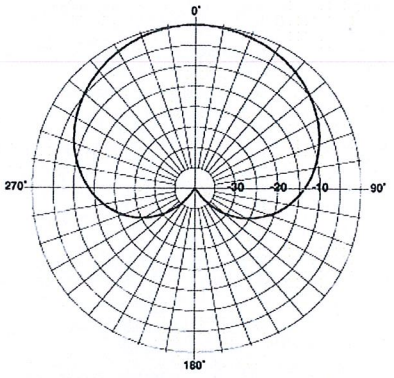
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Weight w/o Mtg Hardware, kg (lb)	2.8 (6.32)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Wind Load - Side @ Rated Wind, N (lbf)	743 (167)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	7.9 (17.5)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)

Ordering Information

Mounting Hardware	APM21-3



Vertical Pattern



Horizontal Pattern

Other Documentation

Amphenol ANTENNA SOLUTIONS

BXA-171085-8BF-EDIN-X

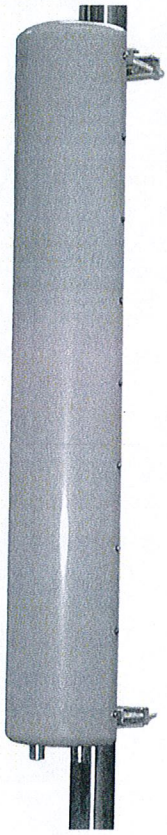
Replace 'X' with desired electrical downtilt.

X-Pol | FET Panel | 85° | 16.4 dBi

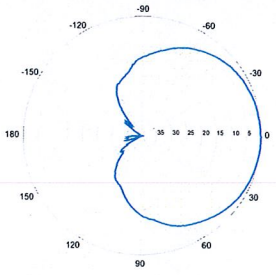
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	88°	85°	80°
Vertical beamwidth	7°	7°	7°
Gain	13.5 dBd / 15.6 dBi	13.9 dBd / 16.0 dBi	14.3 dBd / 16.4 dBi
Electrical downtilt (X)	0, 2, 4		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1232 x 154 x 105 mm	48.5 x 6.1 x 4.1 in
Depth with t-brackets	133 mm	5.2 in
Weight without mounting brackets	4.8 kg	10.5 lbs
Survival wind speed	296 km/hr	184 mph
Wind area	Front: 0.19 m² Side: 0.14 m²	Front: 2.0 ft² Side: 1.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 lbf

Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171085-8BF-EDIN-X-FP		

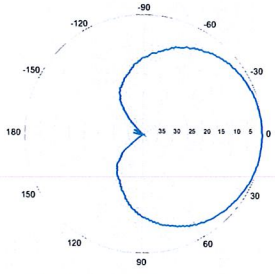


BXA-171085-8BF-EDIN-X



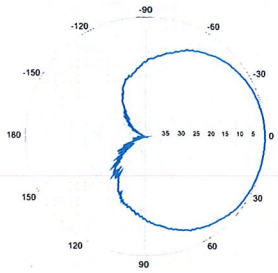
Horizontal | 1710-1880 MHz

BXA-171085-8BF-EDIN-X



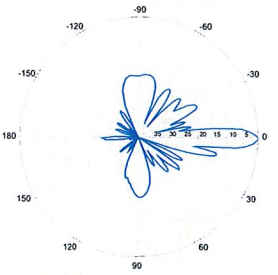
Horizontal | 1850-1990 MHz

BXA-171085-8BF-EDIN-X



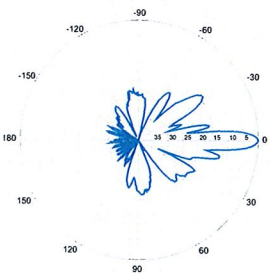
Horizontal | 1920-2170 MHz

BXA-171085-8BF-EDIN-0



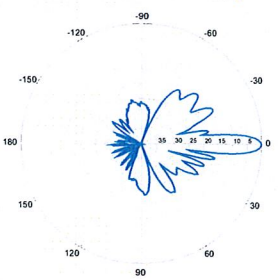
0° | Vertical | 1710-1880 MHz

BXA-171085-8BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171085-8BF-EDIN-0

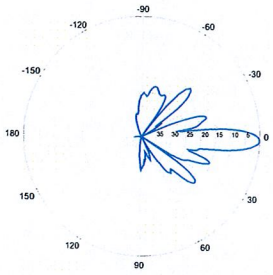


0° | Vertical | 1920-2170 MHz

BXA-171085-8BF-EDIN-X

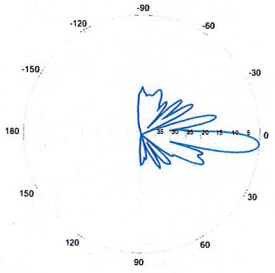
X-Pol | FET Panel | 85° | 16.4 dBi

BXA-171085-8BF-EDIN-2



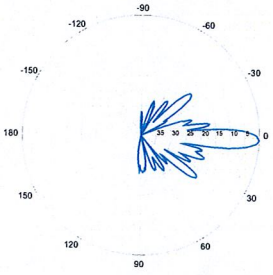
2° | Vertical | 1710-1880 MHz

BXA-171085-8BF-EDIN-4



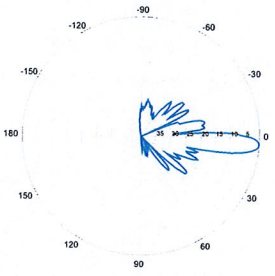
4° | Vertical | 1710-1880 MHz

BXA-171085-8BF-EDIN-2



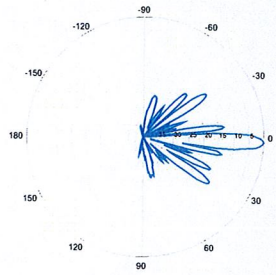
2° | Vertical | 1850-1990 MHz

BXA-171085-8BF-EDIN-4



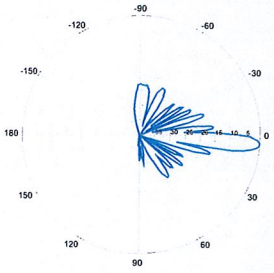
4° | Vertical | 1850-1990 MHz

BXA-171085-8BF-EDIN-2



2° | Vertical | 1920-2170 MHz

BXA-171085-8BF-EDIN-4



4° | Vertical | 1920-2170 MHz

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt

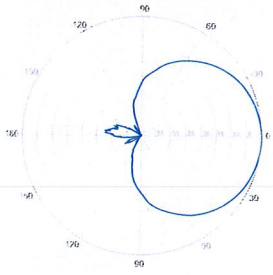
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	

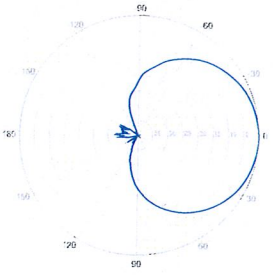
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

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

BXA-70063-6CF-EDIN-X

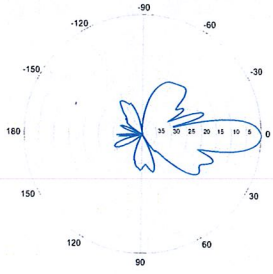


Horizontal | 750 MHz

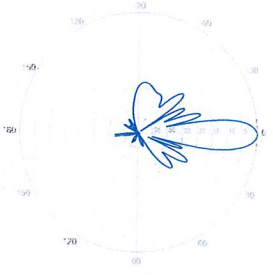


Horizontal | 850 MHz

BXA-70063-6CF-EDIN-0

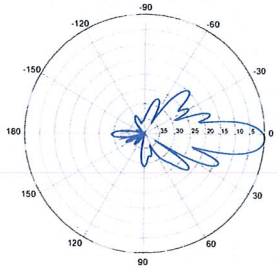


0° | Vertical | 750 MHz

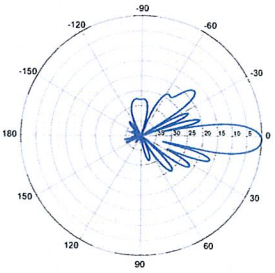


0° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-2



2° | Vertical | 750 MHz



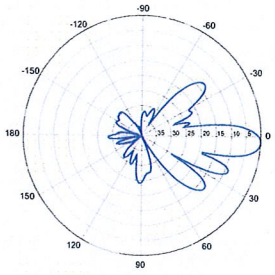
2° | Vertical | 850 MHz

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

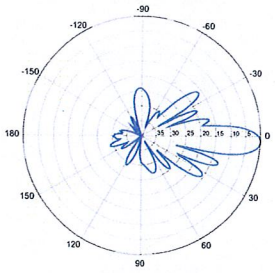
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

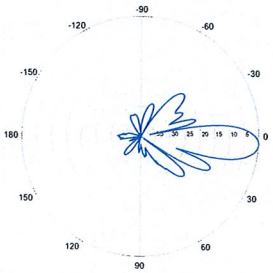


3° | Vertical | 750 MHz

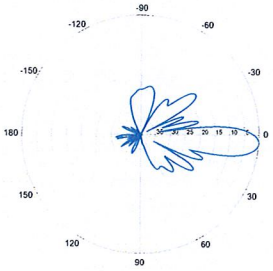


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

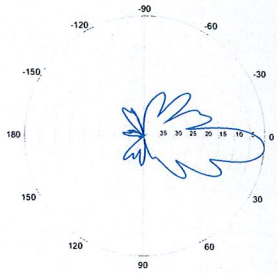


4° | Vertical | 750 MHz

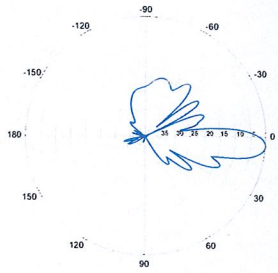


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

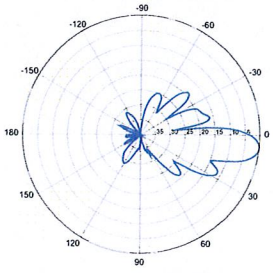


5° | Vertical | 750 MHz

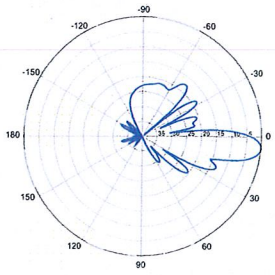


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

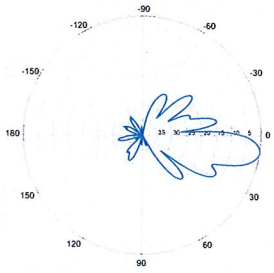


6° | Vertical | 750 MHz

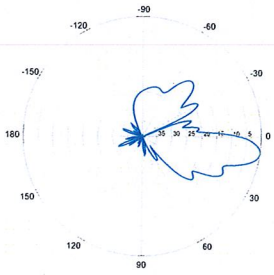


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

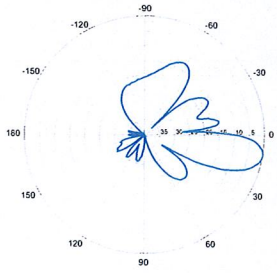


8° | Vertical | 750 MHz



8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz

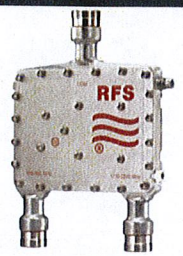
10° | Vertical | 850 MHz

Product Data Sheet FD9R6004/2C-3L

ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Product Description

The ShareLite FD9R6004 Series of diplexers are designed to enable feeder sharing between systems in the 698-960 MHz range and in the 1710-2200 MHz range. The diplexer is equipped with in-line connector placement so it can be installed in the BTS cabinet or at the tower top. This is especially valuable in crowded sites or when the feeders are not easily accessible. Due to its wideband design, the FD9R6004 Series can accommodate many combining solutions between 698-960 MHz and 1710-2200 MHz systems such as LTE 700 MHz, Cellular 800 MHz with PCS, GSM900 with GSM1800, or GSM900 with UMTS. This diplexer features a highly selective filter. It provides a high level of isolation between ports, while keeping the insertion loss on both paths at an extremely low level. The FD9R6004 diplexers are available with various DC pass options, helpful in configurations with or without the Tower Mount Amplifiers installed.



Features/Benefits

- **LTE ready design**
- **Extremely Low Insertion Loss**
- **High level of Rejection between bands – Protection against interferences**
- **Extremely High Power Handling Capability**
- **Integrated DC block/bypass versions available**
- **Very compact & small size design – Easy installation and reduced tower load**
- **In-line long-neck connectors for easy connection & waterproofing**
- **Exceptional reliability & environmental protection (IP 67)**
- **Equipped with 1 * Breathable Vent – Prevent any humidity inside the product**
- **Mounting hardware for Wall and Pole mount provided (P/N SEM2-1A)**
- **Grounding already provided through the mounting bracket**
- **Kit available for easy dual mount**

Technical Specifications

Product Type	Diplexer/Cross Band Coupler
Frequency Range 1, MHz	698-960
Frequency Range 2, MHz	1710-2200
Application	LTE700, GSM900, UMTS, GSM1800, Cellular 800, PCS
Configuration	Sharelite Single diplexer, outdoor, DC pass in the 1710-2170MHz path, with mounting hardware SEM2-1A
Mounting	Wall Mounting: With 4 screws (maximum 6mm diameter); Pole Mounting: With included clamp set 40-110mm (1.57-4.33)
Return Loss All Ports Min/Typ, dB	19/23
Power Handling Continuous, Max, W	1250 at common port; 750 in low frequency path & 500 in high frequency path
Power Handling Peak, Max, W	15000 in low frequency path & 8000 in high frequency path
Impedance, Ohms	50
Insertion Loss, Path 1, dB	0.07 typ.
Insertion Loss, Path 2, dB	0.13 typ.
Rejection Between Bands Min/Typ, dB	58/64@698-960MHz; 60/70@1710-2200MHz
IMP Level at the COM Port, Typ, dBm	-112 @ 2x43
DC Pass in Low Frequency Path	No
DC Pass in High Frequency Path	Yes
Temperature Range, °C (°F)	-40 to +60 (-40 to +140)
Environmental	ETSI 300-019-2-4 Class 4.1E
Ingress Protection	IP 67
Lightning Protection	EN/IEC61000-4-5 Level 4
Connectors	In-line long-neck 7-16-Female
Weight, kg (lb)	1.2 (2.6)
Shipping Weight, kg (lb)	3.2 (7) for 2 * single units in 1 * box, 9.8 (21.6) for 6 * units = 3 * Boxes in 1 * overwrap
Dimensions, H x W x D, mm (in)	147 x 164 x 37 (5.8 x 6.5 x 1.5)
Shipping Dimensions, H x W x D, mm (in)	254 x 406 x 82 (10 x 16 x 3.2) for 2 * Single Units in 1 * box, 280 x 406 x 241 (11 x 16 x 9.5) for 6 * units = 3 * Boxes in 1 * overwrap
Volume, L	0.43
Housing	Aluminum

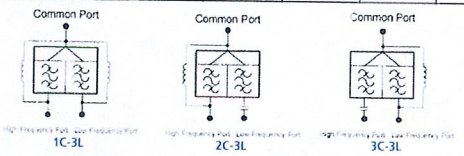
Notes

ShareLite Wideband Diplexer – In-line 698-960 MHz/1710-2200 MHz, DC pass in high frequency path

Other Documentation

FD9R6004/2C-3L Installation Instructions: Wideband_Diplexer_Installation_Rev5.pdf

Selection Guide Diplexer 698-960 / 1710-2200MHz					
	Model Number	Full DC Pass	DC Pass High Band	DC Pass Low Band	Mounting Hardware Included
Single	FD9R6004/1C-3L				X
	FD9R6004/2C-3L				X
	FD9R6004/3C-3L				X
Dual	KIT-FD9R6004/1C-DL				X
	KIT-FD9R6004/2C-DL				X
	KIT-FD9R6004/3C-DL				X



The FD9R6004 Series is upgradeable to a Dual Diplexer kit by means of 2 diplexers and mounting hardware kits SEM2-1A and SEM2-3

Mounting Hardware and Ground Cable Ordering Information		
Model Number	Description	
SEM2-1A	Mounting Hardware, Pole mount ø40-110mm (Included with the Single and Dual Diplexer) Wall Screws M6 (Not included with the product)	
SEM2-3	Assembly kit for 2 pcs of FD9R6004/xC-3L (Can be ordered separately but included with the Dual Diplexer Kit)	
CA020-2	Ground Cable, 2m, includes lugs (Optional)	
CA030-2	Ground Cable, 2m, includes lugs (Optional)	
SEM6	Mounting Hardware for 6 Diplexers, Tower Base (Optional)	

	General	Power	Density					
Site Name: Burlington								
Tower Height: Verizon @ 160ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Cingular	6	296	170	0.0221	880	0.5867	3.77%	
*Cingular	3	427	170	0.0159	1930	1.0000	1.59%	
*Public Safety	1	60	188	0.0006	159.225	0.2000	0.31%	
*Public Safety	1	75	188	0.0008	154.725	0.2000	0.38%	
*Public Safety	1	75	188	0.0008	155.745	0.2000	0.38%	
*Public Safety	1	40	144	0.0007	155.345	0.2000	0.35%	
*Public Safety	receive only		134					
*Public Safety	1	100	113	0.0028	33.5	0.2000	1.41%	
*Public Safety	6	50	106	0.0096	155	0.2000	4.80%	
*Pocket	3	631	175	0.0222	2130	1.0000	2.22%	
Verizon PCS	**7**	**262**	**160**	**0.0258**	**1970**	**1.0000**	**2.58%**	
Verizon Cellular	**9**	**260**	**160**	**0.0329**	**869**	**0.5793**	**5.67%**	
Verizon AWS	**1**	**654**	**160**	**0.0092**	**2145**	**1.0000**	**0.92%**	
Verizon 700	**2**	**770**	**160**	**0.0216**	**698**	**0.4653**	**4.65%**	
								29.02%
* Source: Siting Council								

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF 180' MONOPOLE FOR NEW ANTENNA ARRANGEMENT

Site Name: **Burlington CT**
Address: **719 George Washington Turnpike**
Burlington, Connecticut

prepared for

Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

prepared by

URS CORPORATION
500 ENTERPRISE DRIVE, SUITE 3B
ROCKY HILL, CT 06067
TEL. 860-529-8882

36922256.00000
VZ5-098

November 7, 2011

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the 180' monopole located at 719 George Washington Turnpike in Burlington, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code and the TIA/EIA-222-F standard for a wind velocity of 80 mph (fastest mile) and 69 mph (fastest mile) concurrent with ½" ice. The antenna loading considered in the analysis consists of all existing and proposed antennas, transmission lines, and ancillary items as outlined in the Introduction Section of this report. The proposed Verizon Wireless modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove: **(6) 5'Hx4"Wx8"D (approx.) Panel Antennas** **(6) 5'Hx12"Wx8"D (approx.) Panel Antennas**	**Verizon (Existing)**	**@ 160'**
Install: **(3) BXA-70063/6CF (One per Sector)** **(2) APL866513 (Alpha Sector)** **(4) APL868013 (2 Beta & 2 Gamma)** **(3) BXA-171085/8BF (One per Sector)** **(6) Diplexers**	**Verizon (Proposed)**	

Note: Twelve existing 1-5/8" diameter coaxial cables located within monopole to remain.

The results of the analysis indicate that the existing tower structure is in compliance with the proposed loading conditions. **The tower and foundation are considered structurally adequate under the wind load specified above and the existing, future, and proposed antenna loadings.**

This analysis is based on:

1) The tower structure's theoretical capacity not including any assessment of the condition of the tower.

2) Tower geometry, member sizes and foundation taken from manufacturers drawings and calculations prepared by Engineered Endeavors Incorporated, job number 13628-E01, signed and sealed September 15, 2005.

3) Existing inventory taken from previous structural analysis performed by Malouf Engineering Intl., Inc. for Pocket Communication, project ID CT01342M-08V0, signed and sealed September 24, 2008.

4) Construction drawings prepared by URS Corporation for Pocket Wireless, project number PC1041 / 36923961, signed and sealed September 19, 2008.

5) Construction drawings prepared by Dewberry Goodkind Inc., project number 3752-17, signed and sealed July 1, 2005.

6) Antenna and mount configuration as specified on the following page of this report.

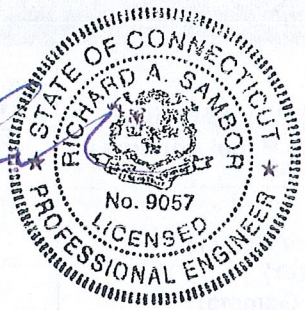
1. EXECUTIVE SUMMARY *(continued)*

This report is only valid as per the assumptions and data utilized in this report for antenna inventory, mounts and associated cables. The user of this report shall field verify the assumption of the antenna and mount configuration as well as the physical condition of the tower. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

URS Corporation AES



Richard A. Sambor, P.E.
Senior Structural Engineer

RAS/kab

2. INTRODUCTION

The subject tower is located at 719 George Washington Turnpike in Burlington, Connecticut. The structure is a 180' monopole manufactured by Engineered Endeavors Incorporated.

The tower geometry and structure member sizes were taken from the original construction drawings (Job Number 13625-E01) prepared by Engineered Endeavors Incorporated, signed and sealed September 15, 2005.

The inventory is summarized in the table below:

Antenna Type	***Carrier***	***Mount***	***Centerline Elevation***	***Cable***
(3) 15' Omnidirectional Antennas	Burlington FD (existing)	12' EEI Low Profile Platform	178.5' Mount El	(3) 1-5/8"
(3) APXV 18-206517S-C	Pocket (existing)	Shared with Above	175'	(6) 1-5/8"
(6) 5.5'x12"x8" Panel Antennas (12) TMAs	AT&T (existing)	12' EEI Low Profile Platform	170'	(12) 1-5/8"
(3) BXA-70063/6CF (2) APL866513 (4) APL868013 (3) BXA-171085/8BF (6) Diplexers	**Verizon (proposed)**	Existing 12' EEI Low Profile Platform	160'	(12) 1-5/8" (existing)
(1) 20' 4-Bay Dipole (1) 10' Omni	Burlington FD (existing)	(2) 3' Stand-Offs	126'	(2) 7/8"
(1) 10' Dipole	Burlington FD (existing)	(1) 3' Stand-Off	108'	(1) 7/8"

This structural analysis of the communications tower was performed by URS Corporation (URS) for Verizon Wireless. The purpose of this analysis was to investigate the structural integrity of the existing tower with its existing and proposed antenna loads. This analysis was conducted to evaluate stress on the tower and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

The structural analysis was done in accordance with the 2005 Connecticut State Building Code, TIA/EIA-222-F—Structural Standard for Steel Antenna Towers and Antenna Supporting Structures, and the American Institute of Steel Construction (AISC) Manual of Steel Construction—Allowable Stress Design (ASD).

The analysis was conducted using RISA Tower 5.3. Two load conditions were evaluated as shown below which were compared to allowable stresses according to AISC and TIA/EIA.

Load Condition 1 = 80 mph (fastest mile) Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 69 mph (fastest mile Wind Load (with ice) + Ice Load + Tower Dead Load

Please note that wind pressure is a function of velocity squared. Under Load Condition 2, a 25 percent reduction in wind pressure is allowed by code to account for the unlikelihood of the full wind pressure and ice load occurring at the same time. The same results may be achieved by utilizing a lower wind pressure without taking the 25 percent reduction, as shown above.

The TIA/EIA standard permits a one-third increase in allowable stresses for towers and monopoles less than 700 feet tall. For the purposes of this analysis, in computing the load capacity the allowable stresses of the tower members were increased by one-third.

4. FINDINGS AND EVALUATION

Combined axial and bending stresses on the monopole structure were evaluated to compare with allowable stresses in accordance with AISC. The calculated stresses under the proposed loading were below the allowable stresses. Detailed analysis and calculations for the proposed load condition are provided in section 6 of this report. Additionally, the anchor bolts, base plate, and foundation were found to be structurally adequate.

Component / Section No.	*Existing Component Size*	*Controlling Elevation*	*Stress (% Capacity)*	*Pass/Fail*
L2	TP37.5377x26.8041x0.25	93.4'-139.5'	90.8	Pass
Anchor Bolt	2.25" dia	Compression & Bending	60	Pass
Base Plate	71" dia x 2" Thick	Flexure	65	Pass
Caisson Foundation	7.5' dia x 28' Long	Pile Head Deflection	71.1	Pass

Note: Pile head deflection limited to ¾"

5. CONCLUSIONS

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the TIA/EIA-222-F wind load classification specified above and all the existing and proposed antenna loading.**

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report.
2. Tower is properly installed and maintained.
3. All members are as specified in the original design documents and are in good condition.
4. All required members are in place.
5. All bolts are in place and are properly tightened.
6. Tower is in plumb condition.
7. All member protective coatings are in good condition.
8. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9. Foundations were properly constructed to support original design loads as specified in the original design documents.
10. All coaxial cable is installed within the monopole unless specified otherwise.

URS is not responsible for any modifications completed prior to or hereafter in which URS is not or was not directly involved. Modifications include but are not limited to:

A. Adding antennas
B. Removing/replacing antennas
C. Adding coaxial cables

URS hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact URS. URS disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

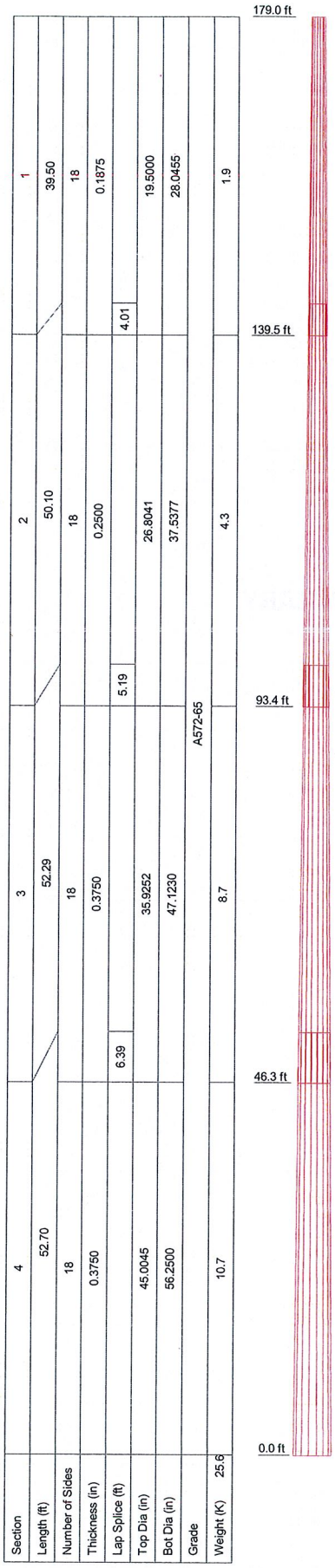
Ongoing and Periodic Inspection and Maintenance:

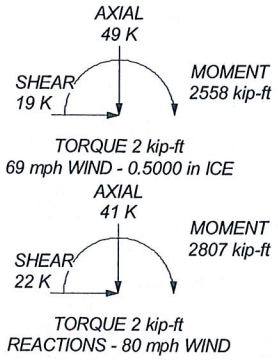
After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire tower structural system be performed at least yearly and more frequently as conditions warrant. According to TIA/EIA-222-F section 14.1, Note 1: It is recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading conditions

6. DRAWINGS AND DATA

RISA TOWER INPUT / OUTPUT SUMMARY





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2" Dia 16' Omni (Burlington FD)	178.5	BXA-70063/6CF (Verizon)	160
2" Dia 16' Omni (Burlington FD)	178.5	BXA-70063/6CF (Verizon)	160
2" Dia 16' Omni (Burlington FD)	178.5	(2) APL866513 (Verizon)	160
EEI 12' Low Profile Platform w Univeral Bracket (Tower)	178.5	(2) APL868013 (Verizon)	160
		(2) APL868013 (Verizon)	160
APXV18-206517S-C w/ mounting hardware (Pocket)	175	(2) Diplexer (Verizon)	160
		(2) Diplexer (Verizon)	160
APXV18-206517S-C w/ mounting hardware (Pocket)	175	(2) Diplexer (Verizon)	160
		BXA-171085-8CF-EDIN (Verizon)	160
APXV18-206517S-C w/ mounting hardware (Pocket)	175	BXA-171085-8CF-EDIN (Verizon)	160
		BXA-171085-8CF-EDIN (Verizon)	160
(2) 6' Panel Antenna (ATI)	170	EEI 12' Low Profile Platform w Univeral Bracket (Verizon)	160
(2) 6' Panel Antenna (ATI)	170		
(2) 6' Panel Antenna (ATI)	170	20' 4-Bay Dipole (Burlington FD)	126
(4) TMA (ATI)	170	3' Stand-off (Burlington FD)	126
(4) TMA (ATI)	170	1.5" x 10' Omni (Burlington FD)	126
(4) TMA (ATI)	170	3' Stand-off (Burlington FD)	126
EEI 12' Low Profile Platform w Univeral Bracket (ATI)	170	10' Dipole (Burlington FD)	108
BXA-70063/6CF (Verizon)	160	3' Stand-off (Burlington FD)	108

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 90.8%

URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Phone: (860) 529-8882
FAX: (860) 529-3991

Job: ***180' EEI Monopole***			
Project: ***Burlington, CT***			
Client: Verizon Wireless	Drawn by: Kevin Barker	App'd:	
Code: TIA/EIA-222-F	Date: 11/07/11	Scale: NTS	
Path: P:\08\ERI Files\180' EEI Monopole - Burlington, CT.eri		Dwg No. E-1	

RISA TOWER DETAILED OUTPUT

Tower Input Data

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

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 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation	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	179.00-139.50	39.50	4.01	18	19.5000	28.0455	0.1875	0.7500	A572-65 (65 ksi)
L2	139.50-93.40	50.10	5.19	18	26.8041	37.5377	0.2500	1.0000	A572-65 (65 ksi)

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
L3	93.40-46.30	52.29	6.39	18	35.9252	47.1230	0.3750	1.5000	A572-65 (65 ksi)
L4	46.30-0.00	52.70		18	45.0045	56.2500	0.3750	1.5000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	19.8008	11.4934	541.5782	6.8559	9.9060	54.6717	1083.8689	5.7478	3.1020	16.544
	28.4781	16.5790	1625.5317	9.8896	14.2471	114.0955	3253.2023	8.2911	4.6060	24.565
L2	28.0889	21.0707	1877.0568	9.4267	13.6165	137.8520	3756.5835	10.5373	4.2775	17.11
	38.1168	29.5878	5197.3405	13.2371	19.0692	272.5523	10401.5198	14.7967	6.1666	24.667
L3	37.6085	42.3136	6756.1716	12.6203	18.2500	370.2015	13521.2332	21.1608	5.6628	15.101
	47.8499	55.6418	15362.6008	16.5955	23.9385	641.7533	30745.4162	27.8262	7.6336	20.356
L4	47.0836	53.1203	13367.2422	15.8435	22.8623	584.6852	26752.0733	26.5652	7.2608	19.362
	57.1177	66.5052	26231.8094	19.8356	28.5750	917.9986	52498.1354	33.2589	9.2400	24.64

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 179.00-139.50				1	1	1		
L2 139.50-93.40				1	1	1		
L3 93.40-46.30				1	1	1		
L4 46.30-0.00				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
1 5/8 (Burlington FD)	A	No	Inside Pole	178.50 - 0.00	3	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Pocket)	A	No	Inside Pole	175.00 - 0.00	6	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (AT&T)	B	No	Inside Pole	170.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Verizon)	C	No	Inside Pole	160.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
7/8 (Burlington FD)	A	No	Inside Pole	126.00 - 0.00	2	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
7/8 (Burlington FD)	A	No	Inside Pole	108.00 - 0.00	1	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54

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	179.00-139.50	A	0.000	0.000	0.000	0.000	0.34
		B	0.000	0.000	0.000	0.000	0.38
		C	0.000	0.000	0.000	0.000	0.26
L2	139.50-93.40	A	0.000	0.000	0.000	0.000	0.47
		B	0.000	0.000	0.000	0.000	0.58
		C	0.000	0.000	0.000	0.000	0.58
L3	93.40-46.30	A	0.000	0.000	0.000	0.000	0.52
		B	0.000	0.000	0.000	0.000	0.59
		C	0.000	0.000	0.000	0.000	0.59
L4	46.30-0.00	A	0.000	0.000	0.000	0.000	0.51
		B	0.000	0.000	0.000	0.000	0.58
		C	0.000	0.000	0.000	0.000	0.58

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	179.00-139.50	A	0.500	0.000	0.000	0.000	0.000	0.34
		B		0.000	0.000	0.000	0.000	0.38
		C		0.000	0.000	0.000	0.000	0.26
L2	139.50-93.40	A	0.500	0.000	0.000	0.000	0.000	0.47
		B		0.000	0.000	0.000	0.000	0.58
		C		0.000	0.000	0.000	0.000	0.58
L3	93.40-46.30	A	0.500	0.000	0.000	0.000	0.000	0.52
		B		0.000	0.000	0.000	0.000	0.59
		C		0.000	0.000	0.000	0.000	0.59
L4	46.30-0.00	A	0.500	0.000	0.000	0.000	0.000	0.51
		B		0.000	0.000	0.000	0.000	0.58
		C		0.000	0.000	0.000	0.000	0.58

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
2" Dia 16' Omni (Burlington FD)	A	From Leg	3.00 0.00 7.50	0.0000	178.50	No Ice 1/2" Ice	3.20 4.83	3.20 4.83	0.04 0.06
2" Dia 16' Omni (Burlington FD)	B	From Leg	3.00 0.00 7.50	0.0000	178.50	No Ice 1/2" Ice	3.20 4.83	3.20 4.83	0.04 0.06
2" Dia 16' Omni (Burlington FD)	C	From Leg	3.00 0.00 7.50	0.0000	178.50	No Ice 1/2" Ice	3.20 4.83	3.20 4.83	0.04 0.06
APXV18-206517S-C w/ mounting hardware (Pocket)	A	From Leg	3.00 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice	5.08 5.53	4.46 5.39	0.05 0.09
APXV18-206517S-C w/	B	From Leg	3.00	0.0000	175.00	No Ice	5.08	4.46	0.05

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
mounting hardware			0.00			1/2" Ice	5.53	5.39	0.09
(Pocket)			0.00						
APXV18-206517S-C w/	C	From Leg	3.00	0.0000	175.00	No Ice	5.08	4.46	0.05
mounting hardware			0.00			1/2" Ice	5.53	5.39	0.09
(Pocket)			0.00						
EEI 12' Low Profile Platform	C	None		0.0000	178.50	No Ice	25.00	25.00	2.50
w Univeral Bracket						1/2" Ice	38.00	38.00	3.50
(Tower)									
(2) 6' Panel Antenna	A	From Leg	3.00	0.0000	170.00	No Ice	8.40	6.79	0.10
(AT&T)			0.00			1/2" Ice	8.95	7.60	0.18
			0.00						
(2) 6' Panel Antenna	B	From Leg	3.00	0.0000	170.00	No Ice	8.40	6.79	0.10
(AT&T)			0.00			1/2" Ice	8.95	7.60	0.18
			0.00						
(2) 6' Panel Antenna	C	From Leg	3.00	0.0000	170.00	No Ice	8.40	6.79	0.10
(AT&T)			0.00			1/2" Ice	8.95	7.60	0.18
			0.00						
(4) TMA	A	From Leg	3.00	0.0000	170.00	No Ice	2.18	0.37	0.02
(AT&T)			0.00			1/2" Ice	2.38	0.49	0.03
			0.00						
(4) TMA	A	From Leg	3.00	0.0000	170.00	No Ice	2.18	0.37	0.02
(AT&T)			0.00			1/2" Ice	2.38	0.49	0.03
			0.00						
(4) TMA	C	From Leg	3.00	0.0000	170.00	No Ice	2.18	0.37	0.02
(AT&T)			0.00			1/2" Ice	2.38	0.49	0.03
			0.00						
EEI 12' Low Profile Platform	C	None		0.0000	170.00	No Ice	25.00	25.00	2.50
w Univeral Bracket						1/2" Ice	38.00	38.00	3.50
(AT&T)									
BXA-70063/6CF	A	From Leg	3.00	0.0000	160.00	No Ice	5.50	2.20	0.04
(Verizon)			0.00			1/2" Ice	6.50	3.20	0.09
			0.00						
BXA-70063/6CF	B	From Leg	3.00	0.0000	160.00	No Ice	5.50	2.20	0.04
(Verizon)			0.00			1/2" Ice	6.50	3.20	0.09
			0.00						
BXA-70063/6CF	C	From Leg	3.00	0.0000	160.00	No Ice	5.50	2.20	0.04
(Verizon)			0.00			1/2" Ice	6.50	3.20	0.09
			0.00						
(2) APL866513	A	From Leg	3.00	0.0000	160.00	No Ice	4.29	3.73	0.02
(Verizon)			0.00			1/2" Ice	4.67	4.10	0.05
			0.00						
(2) APL868013	B	From Leg	3.00	0.0000	160.00	No Ice	2.87	3.73	0.01
(Verizon)			0.00			1/2" Ice	3.18	4.10	0.03
			0.00						
(2) APL868013	C	From Leg	3.00	0.0000	160.00	No Ice	2.87	3.73	0.01
(Verizon)			0.00			1/2" Ice	3.18	4.10	0.03
			0.00						
(2) Diplexer	A	From Leg	3.00	0.0000	160.00	No Ice	0.52	0.14	0.02
(Verizon)			0.00			1/2" Ice	0.62	0.20	0.02
			0.00						
(2) Diplexer	B	From Leg	3.00	0.0000	160.00	No Ice	0.52	0.14	0.02
(Verizon)			0.00			1/2" Ice	0.62	0.20	0.02
			0.00						
(2) Diplexer	C	From Leg	3.00	0.0000	160.00	No Ice	0.52	0.14	0.02
(Verizon)			0.00			1/2" Ice	0.62	0.20	0.02
			0.00						
BXA-171085-8CF-EDIN	A	From Leg	3.00	0.0000	160.00	No Ice	2.00	1.50	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
(Verizon)			4.00 0.00			1/2" Ice	2.30	1.80	0.03
BXA-171085-8CF-EDIN (Verizon)	B	From Leg	3.00 4.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.00 2.30	1.50 1.80	0.01 0.03
BXA-171085-8CF-EDIN (Verizon)	C	From Leg	3.00 4.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.00 2.30	1.50 1.80	0.01 0.03
EEI 12' Low Profile Platform w Univeral Bracket (Verizon)	C	None		0.0000	160.00	No Ice 1/2" Ice	25.00 38.00	25.00 38.00	2.50 3.50
20' 4-Bay Dipole (Burlington FD)	A	From Leg	3.00 0.00 10.00	0.0000	126.00	No Ice 1/2" Ice	4.00 6.00	4.00 6.00	0.06 0.10
3' Stand-off (Burlington FD)	A	From Leg	1.50 0.00 0.00	0.0000	126.00	No Ice 1/2" Ice	1.00 1.20	2.00 2.70	0.05 0.07
1.5" x 10' Omni (Burlington FD)	B	From Leg	3.00 0.00 5.00	0.0000	126.00	No Ice 1/2" Ice	1.50 2.52	1.50 2.52	0.06 0.07
3' Stand-off (Burlington FD)	B	From Leg	1.50 0.00 0.00	0.0000	126.00	No Ice 1/2" Ice	1.00 1.20	2.00 2.70	0.05 0.07
10' Dipole (Burlington FD)	A	From Leg	3.00 0.00 5.00	0.0000	108.00	No Ice 1/2" Ice	4.00 6.00	4.00 6.00	0.05 0.07
3' Stand-off (Burlington FD)	A	From Leg	1.50 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice	1.00 1.20	2.00 2.70	0.05 0.07

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 179.00-139.50	158.24	1.565	26	78.257	A B C	0.000 0.000 0.000	78.257 78.257 78.257	78.257	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L2 139.50-93.40	115.61	1.431	23	125.221	A B C	0.000 0.000 0.000	125.221 125.221 125.221	125.221	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L3 93.40-46.30	69.49	1.237	20	165.160	A B C	0.000 0.000 0.000	165.160 165.160 165.160	165.160	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L4 46.30-0.00	22.48	1	16	197.988	A B C	0.000 0.000 0.000	197.988 197.988 197.988	197.988	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	158.24	1.565	19	0.5000	81.549	A	0.000	81.549	81.549	100.00	0.000	0.000
179.00-139.50						B	0.000	81.549		100.00	0.000	0.000
						C	0.000	81.549		100.00	0.000	0.000
L2 139.50-93.40	115.61	1.431	18	0.5000	129.062	A	0.000	129.062	129.062	100.00	0.000	0.000
						B	0.000	129.062		100.00	0.000	0.000
						C	0.000	129.062		100.00	0.000	0.000
L3 93.40-46.30	69.49	1.237	15	0.5000	169.085	A	0.000	169.085	169.085	100.00	0.000	0.000
						B	0.000	169.085		100.00	0.000	0.000
						C	0.000	169.085		100.00	0.000	0.000
L4 46.30-0.00	22.48	1	12	0.5000	201.847	A	0.000	201.847	201.847	100.00	0.000	0.000
						B	0.000	201.847		100.00	0.000	0.000
						C	0.000	201.847		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	158.24	1.565	14	78.257	A	0.000	78.257	78.257	100.00	0.000	0.000
179.00-139.50					B	0.000	78.257		100.00	0.000	0.000
					C	0.000	78.257		100.00	0.000	0.000
L2	115.61	1.431	13	125.221	A	0.000	125.221	125.221	100.00	0.000	0.000
139.50-93.40					B	0.000	125.221		100.00	0.000	0.000
					C	0.000	125.221		100.00	0.000	0.000
L3 93.40-46.30	69.49	1.237	11	165.160	A	0.000	165.160	165.160	100.00	0.000	0.000
					B	0.000	165.160		100.00	0.000	0.000
					C	0.000	165.160		100.00	0.000	0.000
L4 46.30-0.00	22.48	1	9	197.988	A	0.000	197.988	197.988	100.00	0.000	0.000
					B	0.000	197.988		100.00	0.000	0.000
					C	0.000	197.988		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	2.20	55.76	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	3.22	69.83	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	3.66	77.66	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	3.59	77.43	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	1055.44 kip-ft	12.66		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	2.20	55.76	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	3.22	69.83	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	3.66	77.66	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	3.59	77.43	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	1055.44 kip-ft	12.66		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	2.20	55.76	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	3.22	69.83	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	3.66	77.66	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	3.59	77.43	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	1055.44	12.66		

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
									kip-ft			

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	2.20	55.76	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	3.22	69.83	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	3.66	77.66	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	3.59	77.43	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	1055.44 kip-ft	12.66		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	2.48	A	1	0.65	1	1	1	81.549	1.72	43.58	C
179.00-139.50			B	1	0.65	1	1	1	81.549			
			C	1	0.65	1	1	1	81.549			
L2	1.63	5.26	A	1	0.65	1	1	1	129.062	2.49	53.98	C
139.50-93.40			B	1	0.65	1	1	1	129.062			
			C	1	0.65	1	1	1	129.062			
L3	1.69	9.95	A	1	0.65	1	1	1	169.085	2.81	59.63	C
93.40-46.30			B	1	0.65	1	1	1	169.085			
			C	1	0.65	1	1	1	169.085			
L4 46.30-0.00	1.66	12.21	A	1	0.65	1	1	1	201.847	2.74	59.21	C
			B	1	0.65	1	1	1	201.847			
			C	1	0.65	1	1	1	201.847			
Sum Weight:	5.96	29.90						OTM	816.85 kip-ft	9.76		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	2.48	A	1	0.65	1	1	1	81.549	1.72	43.58	C
179.00-139.50			B	1	0.65	1	1	1	81.549			
			C	1	0.65	1	1	1	81.549			
L2	1.63	5.26	A	1	0.65	1	1	1	129.062	2.49	53.98	C
139.50-93.40			B	1	0.65	1	1	1	129.062			
			C	1	0.65	1	1	1	129.062			
L3	1.69	9.95	A	1	0.65	1	1	1	169.085	2.81	59.63	C
93.40-46.30			B	1	0.65	1	1	1	169.085			
			C	1	0.65	1	1	1	169.085			
L4 46.30-0.00	1.66	12.21	A	1	0.65	1	1	1	201.847	2.74	59.21	C
			B	1	0.65	1	1	1	201.847			
			C	1	0.65	1	1	1	201.847			
Sum Weight:	5.96	29.90						OTM	816.85 kip-ft	9.76		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	2.48	A	1	0.65	1	1	1	81.549	1.72	43.58	C
179.00-139.50			B	1	0.65	1	1	1	81.549			
			C	1	0.65	1	1	1	81.549			
L2	1.63	5.26	A	1	0.65	1	1	1	129.062	2.49	53.98	C
139.50-93.40			B	1	0.65	1	1	1	129.062			
			C	1	0.65	1	1	1	129.062			
L3	1.69	9.95	A	1	0.65	1	1	1	169.085	2.81	59.63	C
93.40-46.30			B	1	0.65	1	1	1	169.085			
			C	1	0.65	1	1	1	169.085			
L4 46.30-0.00	1.66	12.21	A	1	0.65	1	1	1	201.847	2.74	59.21	C
			B	1	0.65	1	1	1	201.847			
			C	1	0.65	1	1	1	201.847			
Sum Weight:	5.96	29.90						OTM	816.85 kip-ft	9.76		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	2.48	A	1	0.65	1	1	1	81.549	1.72	43.58	C
179.00-139.50			B	1	0.65	1	1	1	81.549			
			C	1	0.65	1	1	1	81.549			
L2	1.63	5.26	A	1	0.65	1	1	1	129.062	2.49	53.98	C
139.50-93.40			B	1	0.65	1	1	1	129.062			
			C	1	0.65	1	1	1	129.062			
L3	1.69	9.95	A	1	0.65	1	1	1	169.085	2.81	59.63	C
93.40-46.30			B	1	0.65	1	1	1	169.085			
			C	1	0.65	1	1	1	169.085			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L4 46.30-0.00	1.66	12.21	A	1	0.65	1	1	1	201.847	2.74	59.21	C
			B	1	0.65	1	1	1	201.847			
			C	1	0.65	1	1	1	201.847			
Sum Weight:	5.96	29.90						OTM	816.85 kip-ft	9.76		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	1.24	31.37	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	1.81	39.28	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	2.06	43.68	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	2.02	43.56	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	593.69 kip-ft	7.12		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	1.24	31.37	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	1.81	39.28	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	2.06	43.68	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	2.02	43.56	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	593.69 kip-ft	7.12		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	1.24	31.37	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	1.81	39.28	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	2.06	43.68	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	2.02	43.56	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	593.69 kip-ft	7.12		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.98	1.89	A	1	0.65	1	1	1	78.257	1.24	31.37	C
179.00-139.50			B	1	0.65	1	1	1	78.257			
			C	1	0.65	1	1	1	78.257			
L2	1.63	4.32	A	1	0.65	1	1	1	125.221	1.81	39.28	C
139.50-93.40			B	1	0.65	1	1	1	125.221			
			C	1	0.65	1	1	1	125.221			
L3	1.69	8.71	A	1	0.65	1	1	1	165.160	2.06	43.68	C
93.40-46.30			B	1	0.65	1	1	1	165.160			
			C	1	0.65	1	1	1	165.160			
L4 46.30-0.00	1.66	10.73	A	1	0.65	1	1	1	197.988	2.02	43.56	C
			B	1	0.65	1	1	1	197.988			
			C	1	0.65	1	1	1	197.988			
Sum Weight:	5.96	25.64						OTM	593.69 kip-ft	7.12		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	25.64					
Bracing Weight	0.00					
Total Member Self-Weight	25.64			-1.12	-0.07	
Total Weight	40.86			-1.12	-0.07	
Wind 0 deg - No Ice		0.16	-22.32	-2664.54	-25.84	0.20
Wind 30 deg - No Ice		11.02	-19.41	-2320.59	-1306.76	-0.82

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 45 deg - No Ice		15.51	-15.89	-1902.66	-1834.67	-1.27
Wind 60 deg - No Ice		18.94	-11.30	-1355.14	-2237.55	-1.63
Wind 90 deg - No Ice		21.78	-0.16	-26.89	-2568.82	-2.00
Wind 120 deg - No Ice		18.78	11.03	1308.27	-2211.79	-1.83
Wind 135 deg - No Ice		15.29	15.67	1863.98	-1798.23	-1.56
Wind 150 deg - No Ice		10.75	19.25	2292.58	-1262.13	-1.17
Wind 180 deg - No Ice		-0.16	22.32	2662.30	25.69	-0.20
Wind 210 deg - No Ice		-11.02	19.41	2318.35	1306.61	0.82
Wind 225 deg - No Ice		-15.51	15.89	1900.42	1834.52	1.27
Wind 240 deg - No Ice		-18.94	11.30	1352.90	2237.41	1.63
Wind 270 deg - No Ice		-21.78	0.16	24.65	2568.67	2.00
Wind 300 deg - No Ice		-18.78	-11.03	-1310.52	2211.64	1.83
Wind 315 deg - No Ice		-15.29	-15.67	-1866.22	1798.08	1.56
Wind 330 deg - No Ice		-10.75	-19.25	-2294.82	1261.98	1.17
Member Ice	4.25					
Total Weight Ice	49.39			-1.70	-0.05	
Wind 0 deg - Ice		0.13	-19.13	-2378.99	-20.94	0.26
Wind 30 deg - Ice		9.47	-16.63	-2070.94	-1170.94	-0.84
Wind 45 deg - Ice		13.33	-13.62	-1697.47	-1645.12	-1.33
Wind 60 deg - Ice		16.28	-9.68	-1208.44	-2007.19	-1.72
Wind 90 deg - Ice		18.73	-0.13	-22.59	-2305.64	-2.14
Wind 120 deg - Ice		16.15	9.46	1168.85	-1986.30	-1.99
Wind 135 deg - Ice		13.15	13.44	1664.52	-1615.57	-1.70
Wind 150 deg - Ice		9.25	16.50	2046.64	-1134.75	-1.30
Wind 180 deg - Ice		-0.13	19.13	2375.59	20.84	-0.26
Wind 210 deg - Ice		-9.47	16.63	2067.54	1170.84	0.84
Wind 225 deg - Ice		-13.33	13.62	1694.07	1645.02	1.33
Wind 240 deg - Ice		-16.28	9.68	1205.03	2007.09	1.72
Wind 270 deg - Ice		-18.73	0.13	19.19	2305.54	2.14
Wind 300 deg - Ice		-16.15	-9.46	-1172.25	1986.20	1.99
Wind 315 deg - Ice		-13.15	-13.44	-1667.93	1615.48	1.70
Wind 330 deg - Ice		-9.25	-16.50	-2050.05	1134.65	1.30
Total Weight	40.86			-1.12	-0.07	
Wind 0 deg - Service		0.09	-12.56	-1499.29	-14.57	0.11
Wind 30 deg - Service		6.20	-10.92	-1305.82	-735.08	-0.46
Wind 45 deg - Service		8.72	-8.94	-1070.74	-1032.03	-0.71
Wind 60 deg - Service		10.65	-6.35	-762.76	-1258.65	-0.92
Wind 90 deg - Service		12.25	-0.09	-15.61	-1444.99	-1.12
Wind 120 deg - Service		10.56	6.20	735.41	-1244.16	-1.03
Wind 135 deg - Service		8.60	8.82	1048.00	-1011.54	-0.88
Wind 150 deg - Service		6.05	10.83	1289.09	-709.98	-0.66
Wind 180 deg - Service		-0.09	12.56	1497.05	14.42	-0.11
Wind 210 deg - Service		-6.20	10.92	1303.58	734.94	0.46
Wind 225 deg - Service		-8.72	8.94	1068.50	1031.89	0.71
Wind 240 deg - Service		-10.65	6.35	760.52	1258.51	0.92
Wind 270 deg - Service		-12.25	0.09	13.37	1444.85	1.12
Wind 300 deg - Service		-10.56	-6.20	-737.66	1244.02	1.03
Wind 315 deg - Service		-8.60	-8.82	-1050.24	1011.39	0.88
Wind 330 deg - Service		-6.05	-10.83	-1291.33	709.83	0.66

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	179 - 139.497	Pole	Max Tension	18	0.00	-0.00	-0.00
			Max. Compression	18	-16.14	0.39	0.84
			Max. Mx	31	-15.20	277.83	-2.40
			Max. My	2	-10.35	-3.75	293.77
			Max. Vy	14	-11.49	277.54	-3.39

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	2	-12.13	-3.75	293.77
			Max. Torque	22			0.45
L2	139.497 - 93.4037	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-23.06	-0.04	1.77
			Max. Mx	6	-16.56	-874.51	12.40
			Max. My	2	-16.49	-11.31	919.65
			Max. Vy	6	15.07	-874.51	12.40
			Max. Vx	2	-15.66	-11.31	919.65
			Max. Torque	23			2.17
L3	93.4037 - 46.3048	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-33.91	-0.05	1.71
			Max. Mx	6	-26.54	-1644.16	20.07
			Max. My	2	-26.50	-18.93	1715.96
			Max. Vy	6	18.43	-1644.16	20.07
			Max. Vx	2	-19.00	-18.93	1715.96
			Max. Torque	23			2.17
L4	46.3048 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-49.39	-0.06	1.65
			Max. Mx	6	-40.85	-2705.42	28.56
			Max. My	2	-40.85	-27.41	2806.85
			Max. Vy	6	21.80	-2705.42	28.56
			Max. Vx	2	-22.34	-27.41	2806.85
			Max. Torque	23			2.17

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	49.39	-0.00	-0.00
	Max. H_x	14	40.86	21.77	-0.16
	Max. H_z	2	40.86	-0.16	22.32
	Max. M_x	2	2806.85	-0.16	22.32
	Max. M_z	6	2705.42	-21.77	0.16
	Max. Torsion	23	2.16	-18.72	0.13
	Min. Vert	2	40.86	-0.16	22.32
	Min. H_x	6	40.86	-21.77	0.16
	Min. H_z	10	40.86	0.16	-22.32
	Min. M_x	10	-2804.39	0.16	-22.32
	Min. M_z	14	-2705.28	21.77	-0.16
	Min. Torsion	31	-2.16	18.72	-0.13

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	40.86	0.00	0.00	-1.11	-0.08	0.00
Dead+Wind 0 deg - No Ice	40.86	0.16	-22.32	-2806.85	-27.41	0.22
Dead+Wind 30 deg - No Ice	40.86	11.02	-19.41	-2445.02	-1376.45	-0.81
Dead+Wind 45 deg - No Ice	40.86	15.51	-15.89	-2004.81	-1932.47	-1.26

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 60 deg - No Ice	40.86	18.94	-11.30	-1428.03	-2356.86	-1.63
Dead+Wind 90 deg - No Ice	40.86	21.77	-0.16	-28.56	-2705.42	-2.00
Dead+Wind 120 deg - No Ice	40.86	18.78	11.02	1378.32	-2329.65	-1.84
Dead+Wind 135 deg - No Ice	40.86	15.29	15.67	1963.84	-1893.93	-1.56
Dead+Wind 150 deg - No Ice	40.86	10.75	19.25	2415.38	-1329.17	-1.18
Dead+Wind 180 deg - No Ice	40.86	-0.16	22.32	2804.39	27.27	-0.21
Dead+Wind 210 deg - No Ice	40.86	-11.02	19.41	2442.57	1376.30	0.81
Dead+Wind 225 deg - No Ice	40.86	-15.51	15.89	2002.36	1932.32	1.26
Dead+Wind 240 deg - No Ice	40.86	-18.94	11.30	1425.59	2356.70	1.62
Dead+Wind 270 deg - No Ice	40.86	-21.77	0.16	26.13	2705.28	2.00
Dead+Wind 300 deg - No Ice	40.86	-18.78	-11.02	-1380.76	2329.52	1.84
Dead+Wind 315 deg - No Ice	40.86	-15.29	-15.67	-1966.28	1893.80	1.57
Dead+Wind 330 deg - No Ice	40.86	-10.75	-19.25	-2417.83	1329.04	1.19
Dead+Ice+Temp	49.39	0.00	0.00	-1.65	-0.06	0.00
Dead+Wind 0 deg+Ice+Temp	49.39	0.13	-19.13	-2558.19	-22.68	0.28
Dead+Wind 30 deg+Ice+Temp	49.39	9.47	-16.63	-2227.33	-1258.92	-0.84
Dead+Wind 45 deg+Ice+Temp	49.39	13.33	-13.62	-1825.77	-1768.68	-1.33
Dead+Wind 60 deg+Ice+Temp	49.39	16.28	-9.68	-1299.91	-2157.96	-1.73
Dead+Wind 90 deg+Ice+Temp	49.39	18.72	-0.13	-24.56	-2478.52	-2.16
Dead+Wind 120 deg+Ice+Temp	49.39	16.15	9.46	1256.91	-2135.41	-2.01
Dead+Wind 135 deg+Ice+Temp	49.39	13.15	13.44	1790.00	-1736.74	-1.72
Dead+Wind 150 deg+Ice+Temp	49.39	9.25	16.50	2200.94	-1219.74	-1.32
Dead+Wind 180 deg+Ice+Temp	49.39	-0.13	19.13	2554.32	22.60	-0.28
Dead+Wind 210 deg+Ice+Temp	49.39	-9.47	16.63	2223.46	1258.82	0.84
Dead+Wind 225 deg+Ice+Temp	49.39	-13.33	13.62	1821.91	1768.58	1.33
Dead+Wind 240 deg+Ice+Temp	49.39	-16.28	9.68	1296.06	2157.86	1.73
Dead+Wind 270 deg+Ice+Temp	49.39	-18.72	0.13	20.73	2478.44	2.16
Dead+Wind 300 deg+Ice+Temp	49.39	-16.15	-9.46	-1260.75	2135.34	2.01
Dead+Wind 315 deg+Ice+Temp	49.39	-13.15	-13.44	-1793.85	1736.69	1.73
Dead+Wind 330 deg+Ice+Temp	49.39	-9.25	-16.50	-2204.80	1219.69	1.33
Dead+Wind 0 deg - Service	40.86	0.09	-12.55	-1581.17	-15.47	0.12
Dead+Wind 30 deg - Service	40.86	6.20	-10.92	-1377.32	-775.09	-0.46
Dead+Wind 45 deg - Service	40.86	8.72	-8.94	-1129.42	-1088.16	-0.72
Dead+Wind 60 deg - Service	40.86	10.65	-6.35	-804.63	-1327.08	-0.92
Dead+Wind 90 deg - Service	40.86	12.25	-0.09	-16.63	-1523.38	-1.13
Dead+Wind 120 deg - Service	40.86	10.56	6.20	775.50	-1311.70	-1.04
Dead+Wind 135 deg - Service	40.86	8.60	8.82	1105.19	-1066.40	-0.89
Dead+Wind 150 deg - Service	40.86	6.05	10.83	1359.47	-748.43	-0.67
Dead+Wind 180 deg - Service	40.86	-0.09	12.55	1578.70	15.33	-0.12
Dead+Wind 210 deg - Service	40.86	-6.20	10.92	1374.84	774.95	0.46
Dead+Wind 225 deg - Service	40.86	-8.72	8.94	1126.94	1088.01	0.71
Dead+Wind 240 deg - Service	40.86	-10.65	6.35	802.16	1326.93	0.92
Dead+Wind 270 deg - Service	40.86	-12.25	0.09	14.16	1523.23	1.13
Dead+Wind 300 deg - Service	40.86	-10.56	-6.20	-777.97	1311.56	1.04
Dead+Wind 315 deg - Service	40.86	-8.60	-8.82	-1107.66	1066.26	0.89
Dead+Wind 330 deg - Service	40.86	-6.05	-10.83	-1361.95	748.29	0.67

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-40.86	0.00	-0.00	40.86	-0.00	0.001%
2	0.16	-40.86	-22.32	-0.16	40.86	22.32	0.006%
3	11.02	-40.86	-19.41	-11.02	40.86	19.41	0.000%
4	15.51	-40.86	-15.89	-15.51	40.86	15.89	0.000%
5	18.94	-40.86	-11.30	-18.94	40.86	11.30	0.000%
6	21.78	-40.86	-0.16	-21.77	40.86	0.16	0.006%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
7	18.78	-40.86	11.03	-18.78	40.86	-11.02	0.000%
8	15.29	-40.86	15.67	-15.29	40.86	-15.67	0.000%
9	10.75	-40.86	19.25	-10.75	40.86	-19.25	0.000%
10	-0.16	-40.86	22.32	0.16	40.86	-22.32	0.006%
11	-11.02	-40.86	19.41	11.02	40.86	-19.41	0.000%
12	-15.51	-40.86	15.89	15.51	40.86	-15.89	0.000%
13	-18.94	-40.86	11.30	18.94	40.86	-11.30	0.000%
14	-21.78	-40.86	0.16	21.77	40.86	-0.16	0.006%
15	-18.78	-40.86	-11.03	18.78	40.86	11.02	0.000%
16	-15.29	-40.86	-15.67	15.29	40.86	15.67	0.000%
17	-10.75	-40.86	-19.25	10.75	40.86	19.25	0.000%
18	0.00	-49.39	0.00	-0.00	49.39	-0.00	0.002%
19	0.13	-49.39	-19.13	-0.13	49.39	19.13	0.004%
20	9.47	-49.39	-16.63	-9.47	49.39	16.63	0.001%
21	13.33	-49.39	-13.62	-13.33	49.39	13.62	0.001%
22	16.28	-49.39	-9.68	-16.28	49.39	9.68	0.001%
23	18.73	-49.39	-0.13	-18.72	49.39	0.13	0.004%
24	16.15	-49.39	9.46	-16.15	49.39	-9.46	0.001%
25	13.15	-49.39	13.44	-13.15	49.39	-13.44	0.001%
26	9.25	-49.39	16.50	-9.25	49.39	-16.50	0.001%
27	-0.13	-49.39	19.13	0.13	49.39	-19.13	0.004%
28	-9.47	-49.39	16.63	9.47	49.39	-16.63	0.001%
29	-13.33	-49.39	13.62	13.33	49.39	-13.62	0.001%
30	-16.28	-49.39	9.68	16.28	49.39	-9.68	0.001%
31	-18.73	-49.39	0.13	18.72	49.39	-0.13	0.004%
32	-16.15	-49.39	-9.46	16.15	49.39	9.46	0.001%
33	-13.15	-49.39	-13.44	13.15	49.39	13.44	0.001%
34	-9.25	-49.39	-16.50	9.25	49.39	16.50	0.001%
35	0.09	-40.86	-12.56	-0.09	40.86	12.55	0.004%
36	6.20	-40.86	-10.92	-6.20	40.86	10.92	0.002%
37	8.72	-40.86	-8.94	-8.72	40.86	8.94	0.002%
38	10.65	-40.86	-6.35	-10.65	40.86	6.35	0.002%
39	12.25	-40.86	-0.09	-12.25	40.86	0.09	0.004%
40	10.56	-40.86	6.20	-10.56	40.86	-6.20	0.002%
41	8.60	-40.86	8.82	-8.60	40.86	-8.82	0.002%
42	6.05	-40.86	10.83	-6.05	40.86	-10.83	0.002%
43	-0.09	-40.86	12.56	0.09	40.86	-12.55	0.004%
44	-6.20	-40.86	10.92	6.20	40.86	-10.92	0.002%
45	-8.72	-40.86	8.94	8.72	40.86	-8.94	0.002%
46	-10.65	-40.86	6.35	10.65	40.86	-6.35	0.002%
47	-12.25	-40.86	0.09	12.25	40.86	-0.09	0.004%
48	-10.56	-40.86	-6.20	10.56	40.86	6.20	0.002%
49	-8.60	-40.86	-8.82	8.60	40.86	8.82	0.002%
50	-6.05	-40.86	-10.83	6.05	40.86	10.83	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	17	0.00008248	0.00008600
3	Yes	21	0.00000001	0.00008616
4	Yes	21	0.00000001	0.00009853
5	Yes	21	0.00000001	0.00008752
6	Yes	17	0.00008289	0.00011716
7	Yes	21	0.00000001	0.00007794

8	Yes	21	0.00000001	0.00009266
9	Yes	21	0.00000001	0.00008290
10	Yes	17	0.00008249	0.00008383
11	Yes	21	0.00000001	0.00008814
12	Yes	21	0.00000001	0.00009846
13	Yes	21	0.00000001	0.00008352
14	Yes	17	0.00008289	0.00008352
15	Yes	21	0.00000001	0.00008232
16	Yes	21	0.00000001	0.00009273
17	Yes	21	0.00000001	0.00008043
18	Yes	6	0.00000001	0.00001559
19	Yes	18	0.00007268	0.00010404
20	Yes	21	0.00000001	0.00012259
21	Yes	21	0.00000001	0.00014068
22	Yes	21	0.00000001	0.00012485
23	Yes	18	0.00007294	0.00011640
24	Yes	21	0.00000001	0.00011255
25	Yes	21	0.00000001	0.00013326
26	Yes	21	0.00000001	0.00011856
27	Yes	18	0.00007269	0.00010275
28	Yes	21	0.00000001	0.00012476
29	Yes	21	0.00000001	0.00014022
30	Yes	21	0.00000001	0.00011936
31	Yes	18	0.00007294	0.00010348
32	Yes	21	0.00000001	0.00011869
33	Yes	21	0.00000001	0.00013379
34	Yes	21	0.00000001	0.00011558
35	Yes	17	0.00008619	0.00005253
36	Yes	18	0.00004443	0.00011902
37	Yes	18	0.00004432	0.00013734
38	Yes	18	0.00004443	0.00012384
39	Yes	17	0.00008623	0.00005726
40	Yes	18	0.00004448	0.00010407
41	Yes	18	0.00004437	0.00012767
42	Yes	18	0.00004447	0.00011646
43	Yes	17	0.00008617	0.00005211
44	Yes	18	0.00004443	0.00012439
45	Yes	18	0.00004432	0.00013712
46	Yes	18	0.00004444	0.00011298
47	Yes	17	0.00008624	0.00005260
48	Yes	18	0.00004448	0.00011595
49	Yes	18	0.00004437	0.00012790
50	Yes	18	0.00004448	0.00010979

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	179 - 139.497	68.477	35	3.6933	0.0075
L2	143.503 - 93.4037	42.375	35	3.1254	0.0056
L3	98.5964 - 46.3048	18.661	35	1.8369	0.0029
L4	52.6954 - 0	5.268	35	0.9260	0.0011

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
178.50	2" Dia 16' Omni	35	68.091	3.6870	0.0075	13570
175.00	APXV18-206517S-C w/ mounting hardware	35	65.389	3.6423	0.0073	13570
170.00	(2) 6' Panel Antenna	35	61.545	3.5770	0.0071	7538
160.00	BXA-70063/6CF	35	54.000	3.4339	0.0065	3569
126.00	20' 4-Bay Dipole	35	31.756	2.6620	0.0046	2065
108.00	10' Dipole	35	22.697	2.1147	0.0035	2257

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	179 - 139.497	121.285	2	6.5410	0.0139
L2	143.503 - 93.4037	75.110	2	5.5386	0.0106
L3	98.5964 - 46.3048	33.102	2	3.2578	0.0056
L4	52.6954 - 0	9.348	2	1.6432	0.0021

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
178.50	2" Dia 16' Omni	2	120.602	6.5299	0.0138	7805
175.00	APXV18-206517S-C w/ mounting hardware	2	115.822	6.4519	0.0135	7805
170.00	(2) 6' Panel Antenna	2	109.024	6.3377	0.0131	4335
160.00	BXA-70063/6CF	2	95.678	6.0863	0.0122	2051
126.00	20' 4-Bay Dipole	2	56.308	4.7098	0.0087	1178
108.00	10' Dipole	2	40.256	3.7403	0.0066	1282

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		ksi	in^2	K	K	
L1	179 - 139.497 (1)	TP28.0455x19.5x0.1875	39.50	179.00	224.2	2.972	16.0634	-15.11	47.73	0.317
L2	139.497 - 93.4037 (2)	TP37.5377x26.8041x0.25	50.10	179.00	167.3	5.338	28.7050	-16.49	153.22	0.108
L3	93.4037 - 46.3048 (3)	TP47.123x35.9252x0.375	52.29	179.00	133.3	8.400	54.0130	-26.50	453.69	0.058
L4	46.3048 - 0 (4)	TP56.25x45.0045x0.375	52.70	179.00	108.3	12.734	66.5052	-40.85	846.90	0.048

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 $\frac{P}{P_a}$

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	179 - 139.497 (1)	TP28.0455x19.5x0.1875	291.20	-32.632	39.000	0.837	0.00	0.000	39.000	0.000
L2	139.497 - 93.4037 (2)	TP37.5377x26.8041x0.25	919.72	-43.031	39.000	1.103	0.00	0.000	39.000	0.000
L3	93.4037 - 46.3048 (3)	TP47.123x35.9252x0.375	1716.07	-34.061	39.000	0.873	0.00	0.000	39.000	0.000
L4	46.3048 - 0 (4)	TP56.25x45.0045x0.375	2806.98	-36.693	39.000	0.941	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	179 - 139.497 (1)	TP28.0455x19.5x0.1875	0.317	0.837	0.000	1.153 ✓	1.333	H1-3 ✓
L2	139.497 - 93.4037 (2)	TP37.5377x26.8041x0.25	0.108	1.103	0.000	1.211 ✓	1.333	H1-3 ✓
L3	93.4037 - 46.3048 (3)	TP47.123x35.9252x0.375	0.058	0.873	0.000	0.932 ✓	1.333	H1-3 ✓
L4	46.3048 - 0 (4)	TP56.25x45.0045x0.375	0.048	0.941	0.000	0.989 ✓	1.333	H1-3 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	179 - 139.497	Pole	TP28.0455x19.5x0.1875	1	-15.11	63.63	86.5	Pass
L2	139.497 - 93.4037	Pole	TP37.5377x26.8041x0.25	2	-16.49	204.24	90.8	Pass
L3	93.4037 - 46.3048	Pole	TP47.123x35.9252x0.375	3	-26.50	604.76	69.9	Pass
L4	46.3048 - 0	Pole	TP56.25x45.0045x0.375	4	-40.85	1128.91	74.2	Pass
							Summary	
						Pole (L2)	90.8	Pass
						RATING =	**90.8**	**Pass**

ANCHOR BOLT AND BASE PLATE ANALYSIS

URS

Job	180' EEI Monopole - Burlington, CT	Project No.	VZ5-098	Page	of
Description	Anchor Bolt and Base Plate Analysis	Computed by	KAB	Sheet 1	of 6
		Checked by		Date 11/07/11	
				Date	

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 2807 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 22 \cdot kips$	*user input*
Axial Force:	$Axial := 41 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A615 Grade 75		*user input*
Number of Anchor Bolts = N	$N := 18$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 65in$	*user input*
Bolt "Column" Distance:	$l := 3.0in$	*user input*
Bolt Ultimate Strength:	$F_u := 100 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 75 \cdot ksi$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*
Anchor Bolt Diameter	$D := 2.25in$	*user input*
Threads per Inch:	$n := 4.5$	*user input*

Base Plate Data:

Use ASTM A572 Grade 60		*user input*
Plate Yield Strength:	$Fy_{bp} := 60 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 2 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 71 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 56.25in$	*user input*

Geometric Layout Data:

Distance from the center of gravity of the group to bolt in question = d(i)

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

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

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

$d_1 = 11.12 \cdot in$ $d_7 = 20.89 \cdot in$

$d_2 = 20.89 \cdot in$ $d_8 = 11.12 \cdot in$

$d_3 = 28.15 \cdot in$ $d_9 = 0.00 \cdot in$

$d_4 = 32.01 \cdot in$ $d_{10} = -11.12 \cdot in$

$d_5 = 32.01 \cdot in$ $d_{11} = -20.89 \cdot in$

$d_6 = 28.15 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 28.13 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 0.02 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 3.88 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 3.88 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 0.02 \cdot in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2} \right)^2 - \left(\frac{D_{pole}}{2} \right)^2}$ $EffectiveWidth = 34.66 \cdot in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 9.506 \times 10^3 \cdot in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 3.976 \cdot in^2$$

Net Area of Bolt:

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

Net Diameter:

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 2.03 \cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.51 \cdot in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi \cdot D_n^{\,3}}{32} \qquad S_x = 0.826 \cdot in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.306 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 4.4 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 60.0 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 174.9 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$F_{net.area} := 1.333 \cdot (0.60 \cdot A_n \cdot Fy)$ $F_{net.area} = 194.8 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N} \qquad MaxTension = 112.9 \cdot kips$$

Check Stresses:

Note: Bolts supplied are "upset bolts." Use net area for checking per AISC.

$$\frac{MaxTension}{F_{net.area}} = 0.58$$

$$Condition := if\left(\frac{MaxTension}{F_{net.area}} \le 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

Check Compression & Combined Stresses (if required):

Check to see if a complete combined stress analysis is required:

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

Set the clear space between the plate and bolt to zero and remove bending stresses if a combined stress analysis is not required:

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0.00\text{in} & \text{otherwise} \end{cases} \qquad l = 0.00 \cdot \text{in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0.0\text{ksi} & \text{otherwise} \end{cases} \qquad f_{bx} = 0.0 \cdot \text{ksi}$$

Allowable Compressive Force:

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{Fy}} \qquad C_c = 87.36$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot Fy}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} \qquad F_a = 45.0 \cdot \text{ksi}$$

$$F_a := 1.333 \cdot F_a \quad \text{Note: 1.333 increase allowed per TIA/EIA} \qquad F_a = 60.0 \cdot \text{ksi}$$

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 117.4 \cdot \text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 36.2 \cdot \text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.60$$

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

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 41.7 \cdot kips$ $C_7 = 76.3 \cdot kips$

$C_2 = 76.3 \cdot kips$ $C_8 = 41.7 \cdot kips$

$C_3 = 102.0 \cdot kips$ $C_9 = 2.3 \cdot kips$

$C_4 = 115.7 \cdot kips$ $C_{10} = -37.1 \cdot kips$

$C_5 = 115.7 \cdot kips$ $C_{11} = -71.7 \cdot kips$

$C_6 = 102.0 \cdot kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2}$$

$f_{bp} = 39.0 \cdot ksi$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} = 0.65$$

$$Condition := if\left(\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

FOUNDATION ANALYSIS

URS

Job	180' EEI Monopole - Burlington, CT	Project No.	VZ5-098	Page	of
Description	Caisson Foundation Evaluation	Computed by	KAB	Sheet 1	of 2
		Checked by		Date 11/07/11	Date

Check Foundation Depth TIA/EIA-222-F 7.2.5

Shear Force: $S := 22k$ *USER INPUT*

Overturning Moment: $M := 2807ft \cdot k$ *USER INPUT*

Foundation Diameter: $d := 7.5ft$ *USER INPUT*

Overall Length of Caisson: $L_c := 28ft$ *USER INPUT*

Depth From Top of Caisson to Grade: $L_{pag} := 1ft$ *USER INPUT*

Depth of Caisson Below Ground Level: $LD := L_c - L_{pag}$ $LD = 27.0\,ft$ *USER INPUT*

Depth Required:

$$LD1 := 2.0ft + \left(\frac{S \cdot ft^2}{3k \cdot d}\right) + 2ft \cdot .5\left(\frac{M \cdot ft}{3 \cdot k d} + \frac{S \cdot ft}{2k} + \frac{S^2 ft^3}{18k^2 d^2}\right)^{.5} \qquad LD1 = 26.3\,ft$$

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

Moment Capacity:

Bending Moment: $Mu := 2872ft \cdot k$ *USER INPUT--FROM LPILE*

Moment Capacity: $Mn := 7484ft \cdot k$ *USER INPUT--FROM LPILE*

Factor of Safety: $FS := \frac{Mn}{Mu}$ $FS = 2.6$

Factor of Safety Required $FS_{reqd} := 1.3$ $FOSCheck := if(FS \ge FS_{reqd}, "OK", "NO GOOD")$ $FOSCheck = "OK"$

Factor of Safety Ratio: $FS_{ratio} := \left(\frac{FS_{reqd}}{FS}\right) = 0.50$

URS

Job	180' EEI Monopole - Burlington, CT	Project No.	VZ5-098	Page	of
Description	Caisson Foundation Evaluation	Computed by	KAB	Sheet 2	of 2
		Checked by		Date 11/07/11	Date

Axial Capacity:

Applied Axial Load: $A1 := 49k$ *USER INPUT*

Concrete Weight: $A2 := .150\frac{k}{ft^3} \cdot LD \cdot \pi \frac{d^2}{4}$ $A2 = 178.9 \cdot k$

Total Axial Load: $AT := A1 + A2$ $AT = 227.9 \cdot k$

Number of Rebar: $n := 24$ *USER INPUT*

Area of Rebar: $Ar := 1.56in^2$ *USER INPUT* #11

Rebar Yield Strength: $fy := 60ksi$ *USER INPUT*

Area of Concrete: $Ag := \pi \cdot \frac{d^2}{4}$ $Ag = 44.2ft^{2.0}$

Concrete Comp Strength: $f'c := 4ksi$ *USER INPUT*

Axial Capacity: $Po := n \cdot Ar \cdot fy + (Ag - n \cdot Ar) \cdot 0.85 \cdot f'c$ $Po = 23749.0 \cdot k$

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

LPILE Plus for Windows, Version 4

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

This program is licensed to:

Software Coordinator

URS Corp

Name of input data file: P:\08\L-Pile\Burlington FD.lpd

Name of output file: P:\08\L-Pile\Burlington FD.lpo

Name of plot output file: P:\08\L-Pile\Burlington FD.lpp

Name of runtime file: P:\08\L-Pile\Burlington FD.lpr

Time and Date of Analysis

Date: November 7, 2011 Time: 12:29:59

Problem Title

Burlington FD

Program Options

Units Used in Computations - US Customary Units, inches, pounds

Basic Program Options:

Analysis Type 3:
- Computations of Ultimate Bending Moment Capacity and Pile Response
  Using Nonlinear EI

Computation Options:
- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers
  (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip

- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

Solution Control Parameters:

- Number of pile increments	=	100
- Deflection tolerance for closure	=	1.0000E-05 in
- Maximum number of iterations allowed	=	100
- Maximum allowable deflection	=	1.0000E+02 in

Printing Options:
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (spacing of output points) = 1

Pile Structural Properties and Geometry

Pile Length	=	336.00 in
Depth of ground surface below top of pile	=	12.00 in
Slope angle of ground surface	=	.00 deg.

Structural properties of pile defined using 2 points

Point	Depth X in	Pile Diameter in	Moment of Inertia in**4	Pile Area Sq.in	Modulus of Elasticity lbs/Sq.in
1	.000	90.000	3.2206E+06	6.3620E+03	3.0000E+06
2	336.000	90.000	3.2206E+06	6.3620E+03	3.0000E+06

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

Soil and Rock Layering Information

The soil profile is modelled using 1 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	12.000 in
Distance from top of pile to bottom of layer	=	336.000 in
p-y subgrade modulus k for top of soil layer	=	90.000 lbs/in**3
p-y subgrade modulus k for bottom of layer	=	90.000 lbs/in**3

(Depth of lowest layer extends .00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Distribution of effective unit weight of soil with depth is defined using 2 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	.00	.07500
2	336.00	.07500

Shear Strength of Soils

Distribution of shear strength parameters with depth
defined using 2 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50/k_rm	RQD %
1	.000	.00000	34.00	------	------
2	336.000	.00000	34.00	------	------

Notes:

(1) Cohesion = uniaxial compressive strength for rock materials.
(2) E50 is reported for clay strata.
(3) k_rm is reported for rock strata.
(4) RQD is input and reported only for rock materials.
(5) Internal default values for E50 will be generated when input value is 0.

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

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Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 2

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 19000.000 lbs
Bending moment at pile head = 30696000.000 in-lbs
Axial load at pile head = 49000.000 lbs

(Non-zero moment for this load indicates pile-head is free to rotate
under the applied pile-head load)

Load Case Number 2

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 22000.000 lbs
Bending moment at pile head = 33684000.000 in-lbs
Axial load at pile head = 41000.000 lbs

(Non-zero moment for this load indicates pile-head is free to rotate
under the applied pile-head load)

Computations of Ultimate Moment Capacity and Nonlinear Bending Stiffness

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Pile Description:

The pile shape is a circular solid pile.

Outside Diameter = 90.000 In

Material Properties:

Compressive Strength of Concrete	=	4. Kip/In**2
Yield stress for rebar	=	60. Kip/In**2
Modulus of elasticity of steel	=	29000. Kip/In**2
Number of reinforcing bars	=	24
Area of single rebar	=	1.56000 In**2
Number of rows of reinforcing bars	=	13
Cover Thickness	=	4.000 In

Ultimate squash load capacity = 23748.97 Kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement In**2	Distance to Centroidal Axis In
1	1.560000	41.0000
2	3.120000	39.6030
3	3.120000	35.5070
4	3.120000	28.9914
5	3.120000	20.5000
6	3.120000	10.6116
7	3.120000	.0000
8	3.120000	-10.6116
9	3.120000	-20.5000
10	3.120000	-28.9914
11	3.120000	-35.5070
12	3.120000	-39.6030
13	1.560000	-41.0000

Axial Thrust Force = 45.000 Kip

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches
1.256E+07	1.256E+13	.00000100	.00004704	47.041
1.257E+07	2.512E+12	.00000500	.00010694	21.389
1.902E+07	2.113E+12	.00000900	.00018638	20.709
2.687E+07	2.067E+12	.00001300	.00026591	20.455
3.468E+07	2.040E+12	.00001700	.00034608	20.357
4.244E+07	2.021E+12	.00002100	.00042689	20.328
5.015E+07	2.006E+12	.00002500	.00050841	20.336
5.780E+07	1.993E+12	.00002900	.00059064	20.367
6.482E+07	1.964E+12	.00003300	.00067142	20.346
6.910E+07	1.867E+12	.00003700	.00074254	20.069
7.205E+07	1.757E+12	.00004100	.00080848	19.719
7.463E+07	1.658E+12	.00004500	.00087643	19.476
7.622E+07	1.555E+12	.00004900	.00093453	19.072
7.779E+07	1.468E+12	.00005300	.00099293	18.735
8.406E+07	1.013E+12	.00008300	.00139295	16.782

8.705E+07	7.704E+11	.00011300	.00176071	15.582
8.827E+07	6.173E+11	.00014300	.00210994	14.755
8.909E+07	5.150E+11	.00017300	.00243795	14.092
8.966E+07	4.417E+11	.00020300	.00276767	13.634
8.990E+07	3.858E+11	.00023300	.00313717	13.464
8.995E+07	3.420E+11	.00026300	.00344963	13.116
9.004E+07	3.070E+11	.00029300	.00378227	12.909
8.995E+07	2.785E+11	.00032300	.00412917	12.784

Ultimate moment capacity at concrete strain of 0.003 = 8.981E+07 In-lb

Axial Thrust Force = 37.000 Kip

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches
1.256E+07	1.256E+13	.00000100	.00004670	46.699
1.257E+07	2.512E+12	.00000500	.00010535	21.070
1.881E+07	2.090E+12	.00000900	.00018462	20.513
2.667E+07	2.051E+12	.00001300	.00026413	20.317
3.448E+07	2.028E+12	.00001700	.00034426	20.251
4.224E+07	2.011E+12	.00002100	.00042506	20.241
4.995E+07	1.998E+12	.00002500	.00050653	20.261
5.760E+07	1.986E+12	.00002900	.00058873	20.301
6.460E+07	1.958E+12	.00003300	.00066943	20.286
6.887E+07	1.861E+12	.00003700	.00074047	20.013
7.182E+07	1.752E+12	.00004100	.00080635	19.667
7.438E+07	1.653E+12	.00004500	.00087396	19.421
7.597E+07	1.550E+12	.00004900	.00093204	19.021
7.754E+07	1.463E+12	.00005300	.00099040	18.687
8.380E+07	1.010E+12	.00008300	.00138973	16.744
8.678E+07	7.680E+11	.00011300	.00175652	15.544
8.800E+07	6.154E+11	.00014300	.00210449	14.717
8.882E+07	5.134E+11	.00017300	.00243219	14.059
8.938E+07	4.403E+11	.00020300	.00276112	13.602
8.963E+07	3.847E+11	.00023300	.00312685	13.420
8.968E+07	3.410E+11	.00026300	.00343898	13.076
8.977E+07	3.061E+11	.00029300	.00376939	12.865
8.968E+07	2.776E+11	.00032300	.00411508	12.740

Ultimate moment capacity at concrete strain of 0.003 = 8.954E+07 In-lb

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

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 19000.000 lbs
Specified bending moment at pile head = 30696000.000 in-lbs
Specified axial load at pile head = 49000.000 lbs

(Non-zero moment for this load does not indicate free-head conditions)

Depth X	Deflect. y	Moment M	Shear V	Slope S	Total Stress	Flx. Rig. EI	Soil Res p

in	in	lbs-in	lbs	Rad.	lbs/in**2	lbs-in**2	lbs/in
0.000	.480367	3.07E+07	19000.0	-.003775	436.6	2.04E+12	0.000
3.360	.467768	3.08E+07	19000.0	-.003724	437.5	2.04E+12	0.000
6.720	.455340	3.08E+07	19000.0	-.003673	438.4	2.04E+12	0.000
10.080	.443083	3.09E+07	19000.0	-.003623	439.3	2.04E+12	0.000
13.440	.430997	3.10E+07	18906.2	-.003572	440.2	2.04E+12	-55.857
16.800	.419082	3.10E+07	18508.2	-.003521	441.1	2.04E+12	-181.043
20.160	.407339	3.11E+07	17701.4	-.003469	442.0	2.04E+12	-299.149
23.520	.395768	3.11E+07	16509.5	-.003418	442.8	2.04E+12	-410.332
26.880	.384369	3.12E+07	14955.4	-.003367	443.5	2.04E+12	-514.747
30.240	.373144	3.12E+07	13061.5	-.003315	444.2	2.04E+12	-612.552
33.600	.362091	3.13E+07	10849.9	-.003264	444.8	2.04E+12	-703.905
36.960	.351212	3.13E+07	8341.9	-.003212	445.2	2.04E+12	-788.962
40.320	.340506	3.13E+07	5558.4	-.003160	445.6	2.04E+12	-867.882
43.680	.329974	3.14E+07	2519.7	-.003109	445.8	2.04E+12	-940.822
47.040	.319616	3.14E+07	-754.2	-.003057	445.8	2.04E+12	-1007.940
50.400	.309431	3.13E+07	-4244.1	-.003005	445.7	2.04E+12	-1069.394
53.760	.299420	3.13E+07	-7931.3	-.002954	445.4	2.04E+12	-1125.341
57.120	.289583	3.13E+07	-11797.4	-.002902	445.0	2.04E+12	-1175.938
60.480	.279919	3.12E+07	-15824.8	-.002850	444.3	2.04E+12	-1221.343
63.840	.270428	3.12E+07	-19996.4	-.002799	443.5	2.04E+12	-1261.710
67.200	.261110	3.11E+07	-24295.3	-.002748	442.5	2.04E+12	-1297.196
70.560	.251965	3.10E+07	-28705.6	-.002696	441.2	2.04E+12	-1327.955
73.920	.242991	3.09E+07	-33211.5	-.002645	439.8	2.04E+12	-1354.141
77.280	.234189	3.08E+07	-37798.0	-.002594	438.1	2.04E+12	-1375.905
80.640	.225557	3.07E+07	-42450.4	-.002544	436.2	2.04E+12	-1393.399
84.000	.217095	3.05E+07	-47154.7	-.002493	434.2	2.04E+12	-1406.774
87.360	.208802	3.04E+07	-51897.3	-.002443	431.8	2.04E+12	-1416.175
90.720	.200676	3.02E+07	-56665.0	-.002393	429.3	2.04E+12	-1421.752
94.080	.192718	3.00E+07	-61445.2	-.002344	426.5	2.04E+12	-1423.647
97.440	.184926	2.98E+07	-66225.9	-.002295	423.5	2.04E+12	-1422.003
100.800	.177298	2.95E+07	-70995.4	-.002246	420.3	2.04E+12	-1416.962
104.160	.169833	2.93E+07	-75742.4	-.002198	416.9	2.04E+12	-1408.661
107.520	.162530	2.90E+07	-80456.4	-.002150	413.2	2.04E+12	-1397.236
110.880	.155387	2.87E+07	-85126.9	-.002102	409.3	2.05E+12	-1382.821
114.240	.148403	2.85E+07	-89744.1	-.002055	405.2	2.05E+12	-1365.546
117.600	.141576	2.81E+07	-94298.7	-.002009	400.9	2.05E+12	-1345.539
120.960	.134904	2.78E+07	-98781.8	-.001963	396.4	2.05E+12	-1322.925
124.320	.128386	2.75E+07	-103184.6	-.001917	391.6	2.05E+12	-1297.826
127.680	.122019	2.71E+07	-107499.2	-.001873	386.7	2.05E+12	-1270.362
131.040	.115801	2.68E+07	-111717.7	-.001829	381.6	2.05E+12	-1240.647
134.400	.109731	2.64E+07	-115832.7	-.001785	376.2	2.05E+12	-1208.794
137.760	.103805	2.60E+07	-119837.3	-.001742	370.7	2.05E+12	-1174.911
141.120	.098023	2.56E+07	-123724.9	-.001700	365.0	2.06E+12	-1139.104
144.480	.092381	2.51E+07	-127489.1	-.001659	359.1	2.06E+12	-1101.473
147.840	.086876	2.47E+07	-131123.9	-.001618	353.0	2.06E+12	-1062.115
151.200	.081507	2.43E+07	-134623.7	-.001578	346.8	2.06E+12	-1021.124
154.560	.076271	2.38E+07	-137983.3	-.001539	340.4	2.07E+12	-978.590
157.920	.071165	2.33E+07	-141197.4	-.001501	333.8	2.07E+12	-934.599
161.280	.066187	2.29E+07	-144261.4	-.001463	327.1	2.07E+12	-889.231
164.640	.061333	2.24E+07	-147170.9	-.001426	320.3	2.07E+12	-842.565
168.000	.056601	2.19E+07	-149921.4	-.001391	313.3	2.08E+12	-794.674
171.360	.051988	2.14E+07	-152509.1	-.001356	306.2	2.08E+12	-745.629
174.720	.047491	2.08E+07	-154930.2	-.001322	299.0	2.08E+12	-695.493
178.080	.043107	2.03E+07	-157181.1	-.001288	291.7	2.08E+12	-644.329
181.440	.038833	1.98E+07	-159258.5	-.001256	284.3	2.09E+12	-592.194
184.800	.034667	1.93E+07	-161159.1	-.001225	276.7	2.09E+12	-539.140
188.160	.030605	1.87E+07	-162880.0	-.001194	269.1	2.10E+12	-485.218
191.520	.026643	1.82E+07	-164418.4	-.001165	261.4	2.13E+12	-430.465
194.880	.022777	1.76E+07	-165771.4	-.001137	253.7	2.17E+12	-374.898
198.240	.019003	1.70E+07	-166936.4	-.001110	245.9	2.21E+12	-318.527
201.600	.015316	1.65E+07	-167910.6	-.001085	238.0	2.25E+12	-261.360

204.960	.011712	1.59E+07	-168691.4	-.001061	230.1	2.29E+12	-203.401
208.320	.008187	1.54E+07	-169276.1	-.001038	222.2	2.32E+12	-144.652
211.680	.004736	1.48E+07	-169662.1	-.001017	214.2	2.36E+12	-85.110
215.040	.001356	1.42E+07	-169846.7	-9.96E-04	206.3	2.40E+12	-24.773
218.400	-.001958	1.36E+07	-169827.2	-9.77E-04	198.3	2.44E+12	36.368
221.760	-.005208	1.31E+07	-169600.9	-9.58E-04	190.3	2.48E+12	98.321
225.120	-.008399	1.25E+07	-169165.1	-9.48E-04	182.4	1.26E+13	161.098
228.480	-.011578	1.19E+07	-168515.5	-9.45E-04	174.4	1.26E+13	225.585
231.840	-.014747	1.14E+07	-167646.3	-9.42E-04	166.6	1.26E+13	291.784
235.200	-.017906	1.08E+07	-166551.8	-9.39E-04	158.7	1.26E+13	359.693
238.560	-.021055	1.03E+07	-165226.3	-9.36E-04	150.9	1.26E+13	429.315
241.920	-.024194	9.70E+06	-163663.9	-9.33E-04	143.2	1.26E+13	500.650
245.280	-.027325	9.15E+06	-161859.0	-9.31E-04	135.6	1.26E+13	573.701
248.640	-.030448	8.61E+06	-159805.8	-9.28E-04	128.0	1.26E+13	648.471
252.000	-.033563	8.08E+06	-157498.4	-9.26E-04	120.6	1.26E+13	724.962
255.360	-.036671	7.55E+06	-154931.1	-9.24E-04	113.2	1.26E+13	803.178
258.720	-.039772	7.04E+06	-152098.2	-9.22E-04	106.0	1.26E+13	883.123
262.080	-.042866	6.53E+06	-148993.7	-9.20E-04	98.9452	1.26E+13	964.800
265.440	-.045955	6.04E+06	-145611.8	-9.18E-04	92.0285	1.26E+13	1048.216
268.800	-.049038	5.55E+06	-141946.7	-9.17E-04	85.2772	1.26E+13	1133.374
272.160	-.052117	5.08E+06	-137992.6	-9.15E-04	78.7047	1.26E+13	1220.280
275.520	-.055190	4.63E+06	-133743.5	-9.14E-04	72.3246	1.26E+13	1308.940
278.880	-.058260	4.18E+06	-129193.5	-9.13E-04	66.1511	1.26E+13	1399.358
282.240	-.061326	3.76E+06	-124336.8	-9.12E-04	60.1982	1.26E+13	1491.542
285.600	-.064388	3.35E+06	-119167.4	-9.11E-04	54.4807	1.26E+13	1585.497
288.960	-.067448	2.96E+06	-113679.3	-9.10E-04	49.0132	1.26E+13	1681.229
292.320	-.070505	2.58E+06	-107866.6	-9.09E-04	43.8110	1.26E+13	1778.744
295.680	-.073559	2.23E+06	-101723.1	-9.09E-04	38.8893	1.26E+13	1878.049
299.040	-.076611	1.90E+06	-95243.0	-9.08E-04	34.2639	1.26E+13	1979.149
302.400	-.079662	1.59E+06	-88420.2	-9.08E-04	29.9506	1.26E+13	2082.051
305.760	-.082711	1.31E+06	-81248.6	-9.07E-04	25.9658	1.26E+13	2186.759
309.120	-.085760	1.05E+06	-73722.2	-9.07E-04	22.3260	1.26E+13	2293.281
312.480	-.088807	812018.1	-65834.7	-9.07E-04	19.0479	1.26E+13	2401.621
315.840	-.091853	604519.4	-57580.2	-9.07E-04	16.1486	1.26E+13	2511.783
319.200	-.094899	425377.6	-48952.5	-9.06E-04	13.6455	1.26E+13	2623.774
322.560	-.097945	275857.2	-39945.4	-9.06E-04	11.5564	1.26E+13	2737.595
325.920	-.100990	157243.1	-30552.8	-9.06E-04	9.8991	1.26E+13	2853.252
329.280	-.104035	70841.2	-20768.4	-9.06E-04	8.6918	1.26E+13	2970.746
332.640	-.107080	17977.7	-10586.2	-9.06E-04	7.9532	1.26E+13	3090.081
336.000	-.110125	0.0	0.0	-9.06E-04	7.7020	1.26E+13	3211.256

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 1:

Pile-head deflection	=	.4804 in
Computed slope at pile head	=	-3.7748E-03
Maximum bending moment	=	31355318.907 lbs-in
Maximum shear force	=	-169846.693 lbs
Depth of maximum bending moment	=	47.040 in
Depth of maximum shear force	=	215.040 in
Number of iterations	=	6
Number of zero deflection points	=	1

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

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 22000.000 lbs
Specified bending moment at pile head = 33684000.000 in-lbs
Specified axial load at pile head = 41000.000 lbs

(Non-zero moment for this load does not indicate free-head conditions)

Depth X in	Deflect. y in	Moment M lbs-in	Shear V lbs	Slope S Rad.	Total Stress lbs/in**2	Flx. Rig. EI lbs-in**2	Soil Res p lbs/in
0.000	.533297	3.37E+07	22000.0	-.004185	477.1	2.03E+12	0.000
3.360	.519328	3.38E+07	22000.0	-.004130	478.1	2.03E+12	0.000
6.720	.505546	3.38E+07	22000.0	-.004074	479.2	2.03E+12	0.000
10.080	.491953	3.39E+07	22000.0	-.004018	480.2	2.03E+12	0.000
13.440	.478548	3.40E+07	21895.8	-.003961	481.3	2.03E+12	-62.020
16.800	.465333	3.41E+07	21453.9	-.003905	482.3	2.03E+12	-201.024
20.160	.452307	3.41E+07	20558.1	-.003849	483.3	2.03E+12	-332.174
23.520	.439470	3.42E+07	19234.6	-.003792	484.2	2.03E+12	-455.643
26.880	.426824	3.43E+07	17508.8	-.003735	485.1	2.03E+12	-571.603
30.240	.414369	3.43E+07	15405.7	-.003679	485.9	2.03E+12	-680.228
33.600	.402105	3.44E+07	12949.7	-.003622	486.6	2.03E+12	-781.691
36.960	.390032	3.44E+07	10164.5	-.003565	487.1	2.03E+12	-876.167
40.320	.378150	3.44E+07	7073.3	-.003508	487.5	2.03E+12	-963.829
43.680	.366460	3.45E+07	3698.7	-.003451	487.8	2.03E+12	-1044.851
47.040	.354962	3.45E+07	62.7843	-.003394	487.9	2.03E+12	-1119.408
50.400	.343656	3.45E+07	-3813.1	-.003336	487.8	2.03E+12	-1187.674
53.760	.332541	3.44E+07	-7908.1	-.003279	487.5	2.03E+12	-1249.822
57.120	.321618	3.44E+07	-12201.9	-.003222	487.1	2.03E+12	-1306.027
60.480	.310887	3.44E+07	-16674.9	-.003165	486.4	2.03E+12	-1356.461
63.840	.300347	3.43E+07	-21307.9	-.003109	485.5	2.03E+12	-1401.297
67.200	.289997	3.42E+07	-26082.5	-.003052	484.4	2.03E+12	-1440.706
70.560	.279838	3.41E+07	-30980.7	-.002995	483.1	2.03E+12	-1474.860
73.920	.269869	3.40E+07	-35985.0	-.002939	481.5	2.03E+12	-1503.926
77.280	.260089	3.39E+07	-41078.8	-.002883	479.7	2.03E+12	-1528.075
80.640	.250497	3.37E+07	-46245.7	-.002827	477.7	2.03E+12	-1547.473
84.000	.241093	3.36E+07	-51470.1	-.002771	475.4	2.03E+12	-1562.285
87.360	.231876	3.34E+07	-56736.8	-.002716	472.9	2.03E+12	-1572.675
90.720	.222844	3.32E+07	-62031.3	-.002661	470.1	2.03E+12	-1578.805
94.080	.213996	3.30E+07	-67339.5	-.002606	467.0	2.03E+12	-1580.834
97.440	.205332	3.27E+07	-72647.9	-.002552	463.8	2.03E+12	-1578.920
100.800	.196849	3.25E+07	-77943.5	-.002498	460.2	2.03E+12	-1573.218
104.160	.188547	3.22E+07	-83213.8	-.002444	456.5	2.03E+12	-1563.882
107.520	.180423	3.19E+07	-88446.9	-.002391	452.4	2.04E+12	-1551.060
110.880	.172476	3.16E+07	-93631.3	-.002339	448.2	2.04E+12	-1534.900
114.240	.164705	3.13E+07	-98756.1	-.002287	443.6	2.04E+12	-1515.547
117.600	.157107	3.10E+07	-103810.7	-.002236	438.9	2.04E+12	-1493.142
120.960	.149680	3.06E+07	-108785.1	-.002185	433.9	2.04E+12	-1467.822
124.320	.142423	3.02E+07	-113669.8	-.002135	428.7	2.04E+12	-1439.722
127.680	.135333	2.98E+07	-118455.6	-.002086	423.2	2.04E+12	-1408.974
131.040	.128407	2.94E+07	-123133.8	-.002037	417.6	2.04E+12	-1375.704
134.400	.121645	2.90E+07	-127696.3	-.001989	411.7	2.04E+12	-1340.038
137.760	.115042	2.86E+07	-132135.1	-.001942	405.6	2.05E+12	-1302.094
141.120	.108597	2.81E+07	-136442.7	-.001895	399.3	2.05E+12	-1261.989
144.480	.102308	2.77E+07	-140612.2	-.001849	392.8	2.05E+12	-1219.835

147.840	.096170	2.72E+07	-144636.8	-.001804	386.1	2.05E+12	-1175.741
151.200	.090183	2.67E+07	-148510.1	-.001760	379.2	2.05E+12	-1129.809
154.560	.084342	2.62E+07	-152226.2	-.001717	372.2	2.05E+12	-1082.140
157.920	.078645	2.57E+07	-155779.3	-.001675	364.9	2.06E+12	-1032.828
161.280	.073089	2.51E+07	-159164.2	-.001633	357.5	2.06E+12	-981.963
164.640	.067671	2.46E+07	-162375.6	-.001593	350.0	2.06E+12	-929.631
168.000	.062387	2.40E+07	-165409.0	-.001553	342.3	2.06E+12	-875.912
171.360	.057235	2.35E+07	-168259.6	-.001514	334.5	2.07E+12	-820.883
174.720	.052211	2.29E+07	-170923.2	-.001477	326.5	2.07E+12	-764.615
178.080	.047312	2.23E+07	-173395.8	-.001440	318.4	2.07E+12	-707.177
181.440	.042534	2.17E+07	-175673.6	-.001404	310.2	2.08E+12	-648.629
184.800	.037875	2.11E+07	-177752.8	-.001370	301.9	2.08E+12	-589.032
188.160	.033331	2.05E+07	-179630.2	-.001336	293.5	2.08E+12	-528.438
191.520	.028898	1.99E+07	-181302.4	-.001303	285.1	2.08E+12	-466.896
194.880	.024573	1.93E+07	-182766.2	-.001272	276.5	2.09E+12	-404.450
198.240	.020353	1.87E+07	-184018.8	-.001241	267.9	2.10E+12	-341.141
201.600	.016233	1.81E+07	-185057.3	-.001212	259.3	2.14E+12	-276.998
204.960	.012209	1.75E+07	-185878.8	-.001184	250.5	2.18E+12	-212.023
208.320	.008275	1.68E+07	-186480.7	-.001158	241.8	2.22E+12	-146.212
211.680	.004427	1.62E+07	-186860.0	-.001133	233.0	2.27E+12	-79.559
215.040	6.60E-04	1.56E+07	-187013.9	-.001110	224.3	2.31E+12	-12.056
218.400	-.003031	1.50E+07	-186939.5	-.001088	215.5	2.35E+12	56.310
221.760	-.006650	1.43E+07	-186634.0	-.001067	206.7	2.39E+12	125.551
225.120	-.010202	1.37E+07	-186094.3	-.001048	198.0	2.43E+12	195.683
228.480	-.013690	1.31E+07	-185317.5	-.001029	189.2	2.48E+12	266.725
231.840	-.017118	1.25E+07	-184300.4	-.001019	180.6	1.26E+13	338.698
235.200	-.020536	1.18E+07	-183038.3	-.001015	171.9	1.26E+13	412.518
238.560	-.023942	1.12E+07	-181525.2	-.001012	163.4	1.26E+13	488.188
241.920	-.027338	1.06E+07	-179754.6	-.001009	154.9	1.26E+13	565.710
245.280	-.030725	1.00E+07	-177720.5	-.001007	146.5	1.26E+13	645.085
248.640	-.034103	9.43E+06	-175416.5	-.001004	138.2	1.26E+13	726.316
252.000	-.037473	8.85E+06	-172836.5	-.001002	130.0	1.26E+13	809.407
255.360	-.040834	8.27E+06	-169974.2	-9.99E-04	122.0	1.26E+13	894.362
258.720	-.044188	7.70E+06	-166823.2	-9.97E-04	114.1	1.26E+13	981.185
262.080	-.047535	7.15E+06	-163377.5	-9.95E-04	106.3	1.26E+13	1069.881
265.440	-.050876	6.61E+06	-159630.5	-9.93E-04	98.7545	1.26E+13	1160.454
268.800	-.054210	6.08E+06	-155576.0	-9.92E-04	91.3537	1.26E+13	1252.910
272.160	-.057540	5.56E+06	-151207.8	-9.90E-04	84.1505	1.26E+13	1347.255
275.520	-.060864	5.06E+06	-146519.3	-9.89E-04	77.1598	1.26E+13	1443.495
278.880	-.064184	4.58E+06	-141504.3	-9.87E-04	70.3969	1.26E+13	1541.636
282.240	-.067499	4.11E+06	-136156.3	-9.86E-04	63.8771	1.26E+13	1641.685
285.600	-.070811	3.66E+06	-130468.9	-9.85E-04	57.6163	1.26E+13	1743.649
288.960	-.074120	3.23E+06	-124435.8	-9.84E-04	51.6305	1.26E+13	1847.533
292.320	-.077425	2.83E+06	-118050.3	-9.83E-04	45.9362	1.26E+13	1953.345
295.680	-.080728	2.44E+06	-111306.0	-9.83E-04	40.5500	1.26E+13	2061.091
299.040	-.084029	2.08E+06	-104196.5	-9.82E-04	35.4889	1.26E+13	2170.779
302.400	-.087328	1.74E+06	-96715.1	-9.82E-04	30.7703	1.26E+13	2282.413
305.760	-.090626	1.43E+06	-88855.4	-9.81E-04	26.4116	1.26E+13	2396.002
309.120	-.093922	1.14E+06	-80610.7	-9.81E-04	22.4310	1.26E+13	2511.551
312.480	-.097217	887602.2	-71974.5	-9.81E-04	18.8465	1.26E+13	2629.066
315.840	-.100512	660743.6	-62940.1	-9.80E-04	15.6767	1.26E+13	2748.551
319.200	-.103805	464915.1	-53500.9	-9.80E-04	12.9405	1.26E+13	2870.013
322.560	-.107099	301487.8	-43650.3	-9.80E-04	10.6570	1.26E+13	2993.455
325.920	-.110392	171855.4	-33381.5	-9.80E-04	8.8458	1.26E+13	3118.881
329.280	-.113685	77433.9	-22688.0	-9.80E-04	7.5265	1.26E+13	3246.295
332.640	-.116978	19661.8	-11563.1	-9.80E-04	6.7192	1.26E+13	3375.698
336.000	-.120271	0.0	0.0	-9.80E-04	6.4445	1.26E+13	3507.092

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

Output Verification:

Computed forces and moments are within specified convergence limits.

Output Summary for Load Case No. 2:

Pile-head deflection	=	.5333	in
Computed slope at pile head	=	-4.1854E-03	
Maximum bending moment	=	34457105.961	lbs-in
Maximum shear force	=	-187013.882	lbs
Depth of maximum bending moment	=	47.040	in
Depth of maximum shear force	=	215.040	in
Number of iterations	=	6	
Number of zero deflection points	=	1	

Summary of Pile-head Response

Definition of symbols for pile-head boundary conditions:

y = pile-head displacment, in
M = pile-head moment, lbs-in
V = pile-head shear force, lbs
S = pile-head slope, radians
R = rotational stiffness of pile-head, in-lbs/rad

BC Type	Boundary Condition 1	Boundary Condition 2	Axial Load lbs	Pile Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 19000.000	M= 3.07E+07	49000.0000	.4804	3.136E+07	-1.698E+05
1	V= 22000.000	M= 3.37E+07	41000.0000	.5333	3.446E+07	-1.870E+05

The analysis ended normally.