ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

October 24, 2012

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

Re: **EM-VER-019-120216 – 116 Grant Hill Road, Brooklyn, Connecticut**
EM-VER-020-111228 – 719 George Washington Parkway, Burlington, Connecticut
EM-VER-024-111207 – 147 Palmer Road, Chaplin, Connecticut
EM-VER-028-111219 – 856 Middletown Road, Colchester, Connecticut
EM-VER-116-120217 – 165 Elmwood Hill Road, Putnam, Connecticut
EM-VER-055-111227 – North Street, Goshen, Connecticut
EM-VER-065-120217 – 307 Center Hill Road, Hartland, Connecticut
EM-VER-068-120106 – 38 Maple Street, Kent, Connecticut

Completion of Construction Activity

Dear Ms. Roberts:

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

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

Sincerely,

Kenneth C. Baldwin

Copy to:
Sandy M. Carter

11935930-v1

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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

January 6, 2012

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

RE: **EM-VER-028-111219** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 812 Middletown Road, Colchester, 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 December 15, 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
Executive Director

LR/CDM/laf

c: The Honorable Gregg B. Schuster, First Selectman, Town of Colchester
Christopher Beauchemin, Town Planner, Town of Colchester

CONNECTICUT SITING COUNCIL

ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

December 27, 2011

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

Re: **Cellco Partnership d/b/a Verizon Wireless**
Colchester South Facility Modification

Dear Ms. Roberts:

On December 15, 2012, Cellco Partnership submitted a notice to the Council of its intent to modify its cell site at 856 Middletown Road in Colchester, Connecticut. In actuality, the tower is located on property with a street address of 812 Middletown Road. The 856 Middletown Road address is the mailing address for the landowner, Lorraine Lewis. We would appreciate it if you would make that change to the Siting Council's database.

Thank you very much for your cooperation.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Copy to:
Lorraine Lewis
Aleksey Tyurin
Sandy M. Carter

11455991-v1

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

December 20, 2011

The Honorable Gregg B. Schuster
First Selectman
Town of Colchester
Town Hall
127 Norwich Avenue
Colchester, CT 06415

RE: **EM-VER-028-111219** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 856 Middletown Road, Colchester, Connecticut.

Dear First Selectman Schuster:

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 January 4, 2012.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts

Linda Roberts
Executive Director

LR/jbw

Enclosure: Notice of Intent

c: Christopher Beauchemin, Town Planner, Town of Colchester

CSC
CONNECTICUT SITING COUNCIL

ROBINSON & COL

EM-VER-028-111219

KENNETH C. BALDWIN

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

December 15, 2011

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

Re: **Notice of Exempt Modification – Antenna Swap**
856 Middletown Road, Colchester, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the top of the existing 180-foot tower at the above-referenced address. The tower is owned by Cellco. The Council approved Cellco's use of the tower in 2002 (Docket No. 218). Cellco now intends to modify its facility by removing all of its existing antennas, replacing them with six (6) model LPA-80080/4CF cellular antennas; six (6) model LPA-171080/8CF PCS antennas; and three (3) model BXA-70063/6CF LTE antennas, for a total of fifteen antennas, all at the same 180-foot level on the tower. Cellco also intends to install six (6) additional coax cables attached to the outside of the monopole. Attached behind Tab 1 are the specifications for the proposed replacement antennas.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Gregg Schuster, First Selectman of the Town of Colchester. A copy of this letter is also being sent to Lorraine Leone, the owner of the property on which the tower is located.

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

1. The proposed modifications will not result in an increase in the overall height of the existing tower. Cellco's replacement antennas will be located at the top of 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 Report confirming that the tower and foundation can support Cellco's proposed antennas modification. (See Tab 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

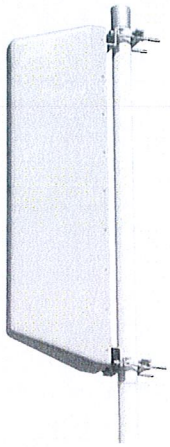
Enclosures
Copy to:
Gregg Schuster, Colchester First Selectman
Lorraine Leone
Sandy M. Carter

LPA-80080-4CF-EDIN-X

V-Pol | Log Periodic | 80° | 12.5 dBd

Replace "X" with desired electrical downtilt.

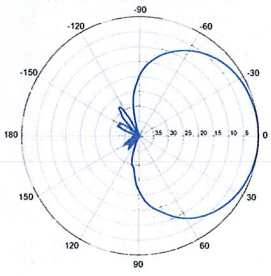
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.



Electrical Characteristics		
Frequency bands	806-960 MHz	
Polarization	Vertical	
Horizontal beamwidth	80°	
Vertical beamwidth	15°	
Gain	12.5 dBd (14.6 dBi)	
Electrical downtilt (X)	0, 2, 4, 5, 6, 8, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.4:1	
Upper sidelobe suppression (0°)	-14.2 dB	
Front-to-back ratio (+/-30°)	-34.7 dB	
Null fill	15% (-16.48 dB)	
Input power	500 W	
Lightning protection	Direct Ground	
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1200 x 140 x 335 mm	47.2 x 5.5 x 13.2 in
Depth of antenna with z-bracket	375 mm	14.8 in
Weight without mounting brackets	5.4 kg	12 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.17 m² Side: 0.40 m²	Front: 1.8 ft² Side: 4.3 ft²
Wind load @ 161 km/hr (100 mph)	Front: 254 N Side: 574 N	Front: 57 lbf Side: 129 lbf

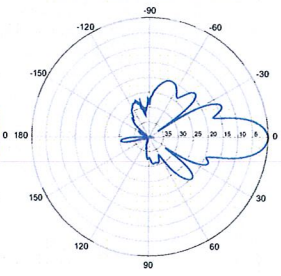
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting & Downtilt Bracket Kit (0-20°)	21699999	50-102 mm 2.0-4.0 in	5.4 kg 12 lbs
Lock-Down Brace	If the lock-down brace is used, the maximum diameter of the mounting pipe is 88.9 mm or 3.5 in.		

LPA-80080-4CF-EDIN-X



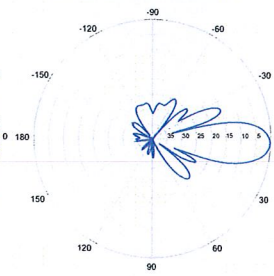
Horizontal

LPA-80080-4CF-EDIN-0



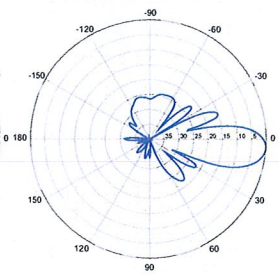
0° | Vertical

LPA-80080-4CF-EDIN-2



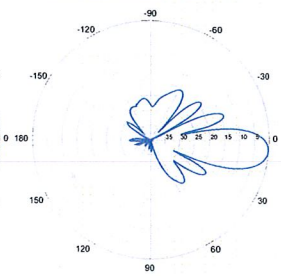
2° | Vertical

LPA-80080-4CF-EDIN-4



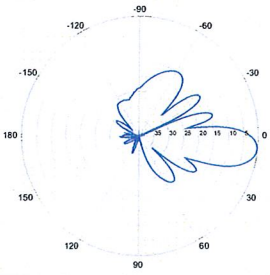
2° | Vertical

LPA-80080-4CF-EDIN-5



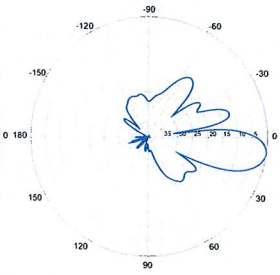
5° | Vertical

LPA-80080-4CF-EDIN-6



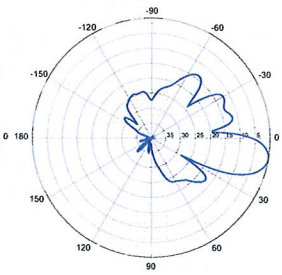
6° | Vertical

LPA-80080-4CF-EDIN-8



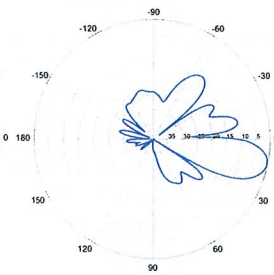
8° | Vertical

LPA-80080-4CF-EDIN-10



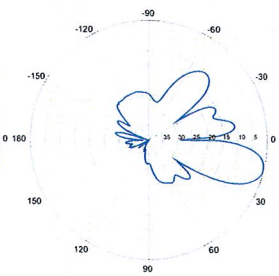
10° | Vertical

LPA-80080-4CF-EDIN-12



12° | Vertical

LPA-80080-4CF-EDIN-14



14° | Vertical

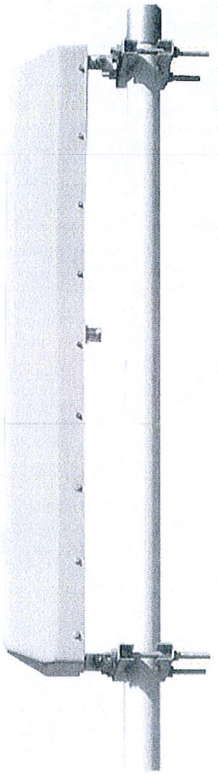
Amphenol ANTENNA SOLUTIONS

LPA-171080-8CF-EDIN-X

V-Pol | Log Periodic | 80° | 16.0-16.5 dBi

Replace "X" with desired electrical downtilt.

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

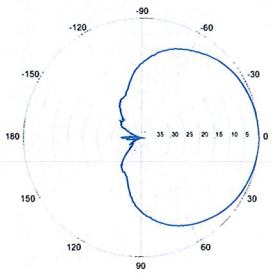


Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	Vertical		
Horizontal beamwidth	78°	80°	77°
Vertical beamwidth	6°	7°	6°
Gain	13.9 dBd (16.0 dBi)	14.4 dBd (16.5 dBi)	13.9 dBd (16.0 dBi)
Electrical downtilt (X)	0, 2		
Impedance	50Ω		
VSWR	≤ 1.5:1		
Null fill	5% (-26.02 dB)		
Input power	250 W		
Lightning protection	Direct Ground		
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)		

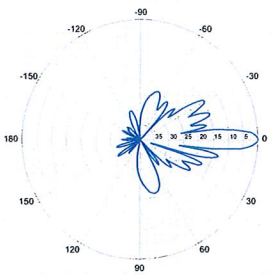
Mechanical Characteristics		
Dimensions Length x Width x Depth	1207 x 105 x 175 mm	47.5 x 4.1 x 6.9 in
Weight without mounting brackets	3.9 kg	8.5 lbs
Survival wind speed	>276 km/hr	>171 mph
Wind area	Front: 0.14 m² Side: 0.22 m²	Front: 1.5 ft² Side: 2.3 ft²
Wind load @ 161 km/hr (100 mph)	Front: 185 N Side: 317 N	Front: 42 lbf Side: 71 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 5.0 lbs
2-Point Mounting and Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	2.3 kg 5.0 lbs

1710-1880 MHz

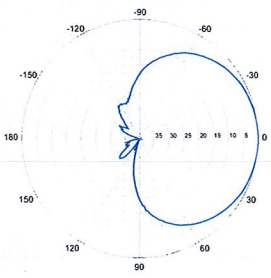


Horizontal

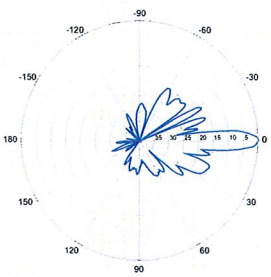


0° | Vertical

1850-1990 MHz

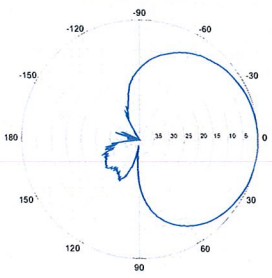


Horizontal

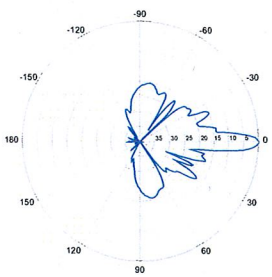


0° | Vertical

1920-2170 MHz



Horizontal

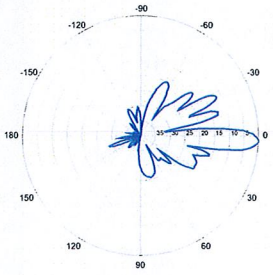


0° | Vertical

LPA-171080-8CF-EDIN-X

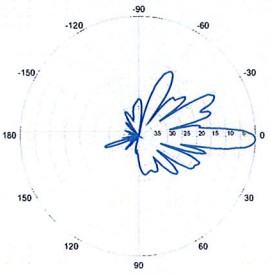
V-Pol | Log Periodic | 80° | 16.0-16.5 dBi

1710-1880 MHz



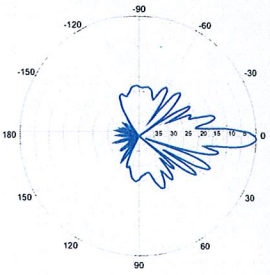
2° | Vertical

1850-1990 MHz



2° | Vertical

1920-2170 MHz



2° | Vertical

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

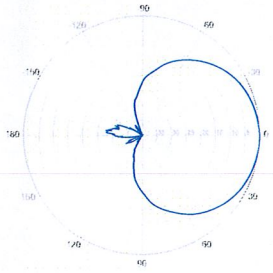
Replace "X" with desired electrical downtilt.

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

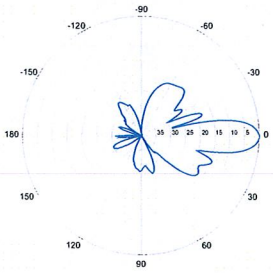
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



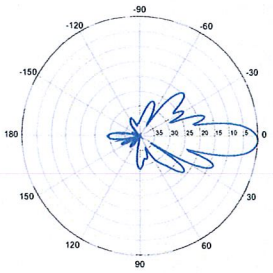
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

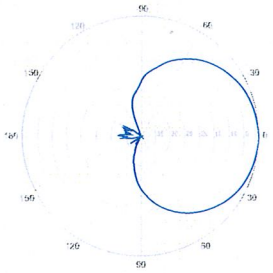


0° | Vertical | 750 MHz

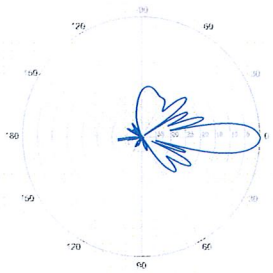
BXA-70063-6CF-EDIN-2



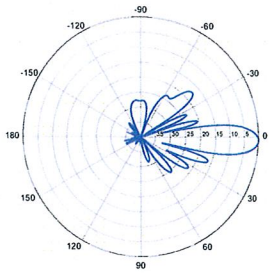
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



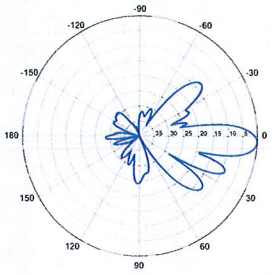
2° | Vertical | 850 MHz

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

BXA-70063-6CF-EDIN-X

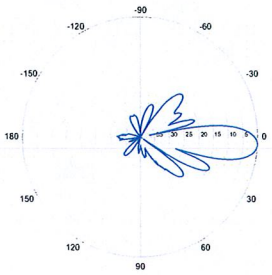
X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



3° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-4



4° | Vertical | 750 MHz

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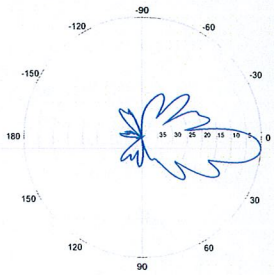
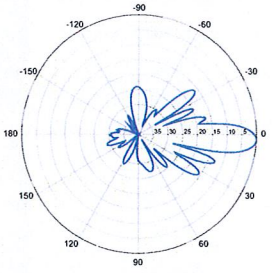
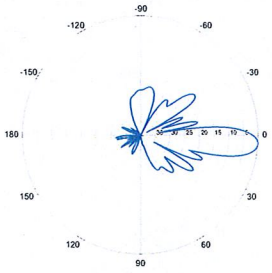


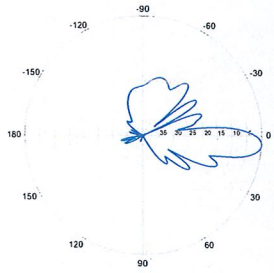
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

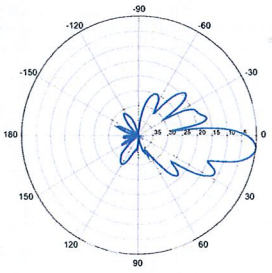


4° | Vertical | 850 MHz



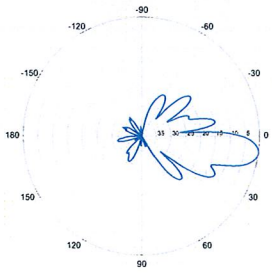
5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6



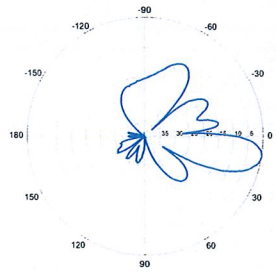
6° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-8

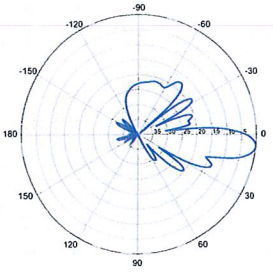


8° | Vertical | 750 MHz

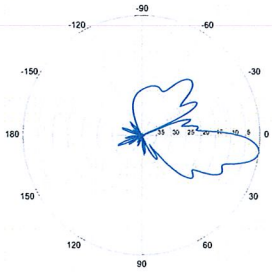
BXA-70063-6CF-EDIN-10



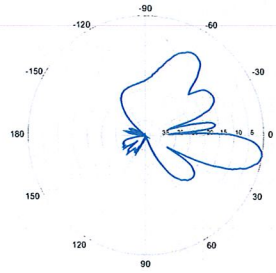
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

	General	Power	Density					
Site Name: Colchester S								
Tower Height: Verizon @ 180 ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Cingular UMTS	1	500	160	0.0070	880	0.5867	1.20%	
*Cingular	4	296	160	0.0166	880	0.5867	2.83%	
*Cingular	2	427	160	0.0120	1900	1.0000	1.20%	
Verizon PCS	**7**	**265**	**180**	**0.0206**	**1970**	**1.0000**	**2.06%**	
Verizon Cellular	**9**	**370**	**180**	**0.0370**	**869**	**0.5793**	**6.38%**	
Verizon AWS	**1**	**662**	**180**	**0.0073**	**2145**	**1.0000**	**0.73%**	
Verizon 700	**2**	**775**	**180**	**0.0172**	**698**	**0.4653**	**3.70%**	
								18.10%
* Source: Siting Council								

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Existing EEI Monopole

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Colchester South

856 Middletown Road
Colchester, CT

Centek Project No. 11074.CO23

~~Date: November 23, 2011~~
Rev 1: November 30, 2011

Prepared for:

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

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

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Introduction

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

The host tower is a 180-ft tall, five-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Incorporated (EEI job no; 11294-E01), dated November 16, 2002 The tower geometry, structure member sizes and foundation system information were obtained from a the aforementioned EEI design documents. Antenna and appurtenance information were obtained from the tower mapping and inventory report prepared by JWB Tower Services, LLC (JWB) dated September 30, 2011 and a Verizon RF data sheet.

The tower is made up of five (5) tapered vertical sections consisting of A572-65 pole sections. The bottom four (4) vertical tower sections are slip joint connected and the top vertical tower section is flange connected. The diameter of the pole (flat-flat) is 14.5-in at the top and 60.5-in at the base.

Verizon is proposing the removal of twelve (12) panel antennas and the installation of fifteen (15) panel antennas mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- AT&T (EXISTING):
  Antennas: Six (6) Powerwave 7770 panel antennas, three (3) CSS DUO1417-8686 panel antennas, six (6) Powerwave LGP21401 TMA's, six (6) Powerwave LGP21901 diplexers and three (3) Bias-T mounted on a 13-ft low profile platform with a RAD center elevation of 160-ft above existing grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- VERIZON (EXISTING TO REMAIN):
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **VERIZON (EXISTING TO REMOVE):**
  Antennas: Six (6) Andrew DB948F85T2E-M and six (6) Decibel DB844H90E-XY panel antennas mounted on a 14-ft low profile platform with a RAD center elevation of 181-ft above existing grade.
- **VERIZON (PROPOSED):**
  Antennas: Three (3) Antel BXA-70063-6CF, six (6) Antel LPA-171080-8CF and six (6) Antel LPA-80080-4CF panel antennas mounted on a 14-ft low profile platform with a RAD center elevation of 181-ft above existing grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables banded to the exterior of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

The existing tower was analyzed for 85 mph basic wind speed (fastest mile) with no ice and 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

Tower Loading

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

Basic Wind Speed:	New London; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Colchester; v = 105 mph (3 second gust) equivalent to v = 85 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA and Appendix K wind speeds are equal.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design of monopole towers.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed. This load case typically controls the design of lattice towers.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **61.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L2)	125.92'-151.00'	61.8%	**PASS**

Foundation and Anchors

The existing foundation consists of a 8.0-ft ∅ x 28.0-ft long reinforced concrete caisson. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design report; project no. 11294-E01 dated November 16, 2002. The base of the tower is connected to the foundation by means of (16) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

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

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

Location	Vector	Proposed Reactions
Base	Shear	23 kips
	Compression	38 kips
	Moment	2576 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	Proposed Loading	Result
Reinforced Concrete Caisson	Moment Capacity	39.4%	**PASS**
	Lateral Deflection	0.47 in (1)	

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

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Tension	33.0%	**PASS**
Flange Plate	Bending	44.2%	**PASS**
Anchor Bolts	Compression	57.9%	**PASS**
Base Plate	Bending	66.1%	**PASS**

Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No.16694
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, EIT
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

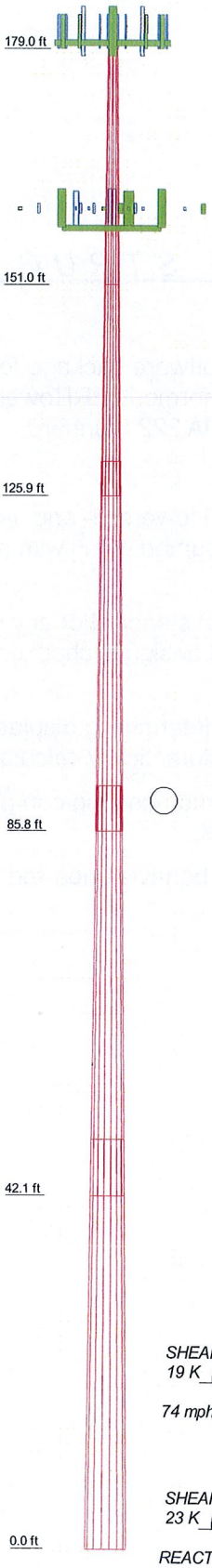
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

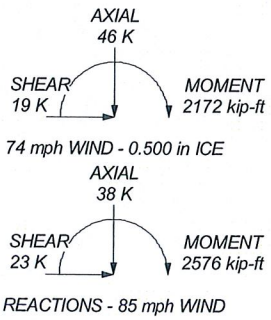
RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

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

Section	1	2	3	4	5
Length (ft)	28.000	25.080	44.290	49.080	48.882
Number of Sides	18	18	18	18	18
Thickness (in)	0.188	0.250	0.375	0.375	0.438
Socket Length (ft)		4.166	5.416	6.750	
Top Dia (in)	14.500	22.070	27.224	36.863	47.435
Bot Dia (in)	22.070	28.850	39.060	49.990	60.500
Grade	A572-65				
Weight (K)	1.0	1.7	5.9	8.6	12.4





74 mph WIND - 0.500 in ICE

REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LPA-80080-4CF (Verizon - Proposed)	181	7770.00 (ATI - Existing)	160
LPA-171080-8CF2 (Verizon - Proposed)	181	DUO1417-8686 (ATI - Existing)	160
BXA-70063/6CF (Verizon - Proposed)	181	7770.00 (ATI - Existing)	160
LPA-171080-8CF2 (Verizon - Proposed)	181	7770.00 (ATI - Existing)	160
LPA-80080-4CF (Verizon - Proposed)	181	DUO1417-8686 (ATI - Existing)	160
LPA-80080-4CF (Verizon - Proposed)	181	7770.00 (ATI - Existing)	160
LPA-171080-8CF2 (Verizon - Proposed)	181	7770.00 (ATI - Existing)	160
BXA-70063/6CF (Verizon - Proposed)	181	7770.00 (ATI - Existing)	160
LPA-171080-8CF2 (Verizon - Proposed)	181	(2) LGP21401 TMA (ATI - Existing)	160
LPA-80080-4CF (Verizon - Proposed)	181	(2) LGP21401 TMA (ATI - Existing)	160
LPA-80080-4CF (Verizon - Proposed)	181	(2) LGP21401 TMA (ATI - Existing)	160
LPA-171080-8CF2 (Verizon - Proposed)	181	(2) LGP21901 Diplexer (ATI - Existing)	160
BXA-70063/6CF (Verizon - Proposed)	181	(2) LGP21901 Diplexer (ATI - Existing)	160
LPA-171080-8CF2 (Verizon - Proposed)	181	(2) LGP21901 Diplexer (ATI - Existing)	160
LPA-80080-4CF (Verizon - Proposed)	181	Smart Bias T (ATI - Existing)	160
EEI Low Profile Platform (Verizon - Existing)	180	Smart Bias T (ATI - Existing)	160
		Smart Bias T (ATI - Existing)	160
		13' Low Profile Platform (ATI - Existing)	158

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 61.8%

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

Job: *11074.CO23 - Colchester South*			
Project: *150-ft EEI Monopole - 856 Middletown Rd., Colchester, CT*			
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 11/30/11	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

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

Basic wind speed of 85 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	179.000-151.000	28.000	0.000	18	14.500	22.070	0.188	0.750	A572-65 (65 ksi)
L2	151.000-125.920	25.080	4.166	18	22.070	28.850	0.250	1.000	A572-65 (65 ksi)
L3	125.920-85.796	44.290	5.416	18	27.224	39.060	0.375	1.500	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
L4	85.796-42.132	49.080	6.750	18	36.863	49.990	0.375	1.500	A572-65 (65 ksi)
L5	42.132-0.000	48.882		18	47.435	60.500	0.438	1.750	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	14.724	8.518	220.441	5.081	7.366	29.927	441.172	4.260	2.222	11.851
	22.410	13.023	787.837	7.768	11.212	70.270	1576.711	6.513	3.554	18.956
L2	22.410	17.314	1041.474	7.746	11.212	92.893	2084.319	8.659	3.444	13.777
	29.295	22.694	2345.214	10.153	14.656	160.020	4693.514	11.349	4.638	18.55
L3	28.774	31.957	2910.379	9.531	13.830	210.444	5824.588	15.981	4.131	11.017
	39.663	46.045	8705.695	13.733	19.842	438.740	17422.845	23.027	6.215	16.572
L4	38.902	43.429	7304.859	12.953	18.726	390.088	14619.331	21.719	5.828	15.541
	50.761	59.054	18366.002	17.613	25.395	723.216	36756.170	29.533	8.138	21.702
L5	49.998	65.261	18211.055	16.684	24.097	755.747	36446.073	32.637	7.578	17.322
	61.433	83.404	38013.044	21.322	30.734	1236.840	76076.106	41.710	9.878	22.578

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 179.000-151.000				1	1	1		
L2 151.000-125.920				1	1	1		
L3 125.920-85.796				1	1	1		
L4 85.796-42.132				1	1	1		
L5 42.132-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
1 5/8 (Verizon - Existing)	C	No	Inside Pole	179.000 - 3.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (AT&T - Existing)	C	No	Inside Pole	160.000 - 3.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (Verizon - Proposed)	C	No	CaAa (Out Of Face)	179.000 - 3.000	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (Verizon - Proposed)	C	No	CaAa (Out Of Face)	179.000 - 3.000	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	179.000-151.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	5.544	0.636
L2	151.000-125.920	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	4.966	0.782
L3	125.920-85.796	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	7.945	1.252
L4	85.796-42.132	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	8.645	1.362
L5	42.132-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	7.748	1.221

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	179.000-151.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	8.344	0.890
L2	151.000-125.920	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	7.474	1.010
L3	125.920-85.796	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	11.957	1.615
L4	85.796-42.132	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	13.012	1.758
L5	42.132-0.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	11.661	1.575

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
EEI Low Profile Platform (Verizon - Existing)	C	None		0.000	180.000	No Ice	22.500	22.500	1.500
						1/2" Ice	28.200	28.200	2.250

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
LPA-80080-4CF	A	From Face	3.500	0.000	181.000	No Ice	2.619	6.057	0.012
(Verizon - Proposed)			6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
LPA-171080-8CF2	A	From Face	3.500	0.000	181.000	No Ice	2.254	3.233	0.009
(Verizon - Proposed)			4.000			1/2" Ice	2.553	3.590	0.029
			0.000						
BXA-70063/6CF	A	From Face	3.500	0.000	181.000	No Ice	7.731	4.158	0.017
(Verizon - Proposed)			0.000			1/2" Ice	8.268	4.595	0.059
			0.000						
LPA-171080-8CF2	A	From Face	3.500	0.000	181.000	No Ice	2.254	3.233	0.009
(Verizon - Proposed)			-4.000			1/2" Ice	2.553	3.590	0.029
			0.000						
LPA-80080-4CF	A	From Face	3.500	0.000	181.000	No Ice	2.619	6.057	0.012
(Verizon - Proposed)			-6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
LPA-80080-4CF	B	From Face	3.500	0.000	181.000	No Ice	2.619	6.057	0.012
(Verizon - Proposed)			6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
LPA-171080-8CF2	B	From Face	3.500	0.000	181.000	No Ice	2.254	3.233	0.009
(Verizon - Proposed)			4.000			1/2" Ice	2.553	3.590	0.029
			0.000						
BXA-70063/6CF	B	From Face	3.500	0.000	181.000	No Ice	7.731	4.158	0.017
(Verizon - Proposed)			0.000			1/2" Ice	8.268	4.595	0.059
			0.000						
LPA-171080-8CF2	B	From Face	3.500	0.000	181.000	No Ice	2.254	3.233	0.009
(Verizon - Proposed)			-4.000			1/2" Ice	2.553	3.590	0.029
			0.000						
LPA-80080-4CF	B	From Face	3.500	0.000	181.000	No Ice	2.619	6.057	0.012
(Verizon - Proposed)			-6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
LPA-80080-4CF	C	From Face	3.500	0.000	181.000	No Ice	2.619	6.057	0.012
(Verizon - Proposed)			6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
LPA-171080-8CF2	C	From Face	3.500	0.000	181.000	No Ice	2.254	3.233	0.009
(Verizon - Proposed)			4.000			1/2" Ice	2.553	3.590	0.029
			0.000						
BXA-70063/6CF	C	From Face	3.500	0.000	181.000	No Ice	7.731	4.158	0.017
(Verizon - Proposed)			0.000			1/2" Ice	8.268	4.595	0.059
			0.000						
LPA-171080-8CF2	C	From Face	3.500	0.000	181.000	No Ice	2.254	3.233	0.009
(Verizon - Proposed)			-4.000			1/2" Ice	2.553	3.590	0.029
			0.000						
LPA-80080-4CF	C	From Face	3.500	0.000	181.000	No Ice	2.619	6.057	0.012
(Verizon - Proposed)			-6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
13' Low Profile Platform	C	None		0.000	158.000	No Ice	15.700	15.700	1.300
(AT&T - Existing)						1/2" Ice	20.100	20.100	1.765
7770.00	A	From Face	3.000	0.000	160.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			-6.000			1/2" Ice	6.314	3.273	0.068
			0.000						
DUO1417-8686	A	From Face	3.000	0.000	160.000	No Ice	6.533	4.200	0.020
(AT&T - Existing)			-2.000			1/2" Ice	6.940	4.574	0.062
			0.000						
7770.00	A	From Face	3.000	0.000	160.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			6.000			1/2" Ice	6.314	3.273	0.068
			0.000						
7770.00	B	From Face	3.000	0.000	160.000	No Ice	5.882	2.928	0.035

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T - Existing)			-6.000 0.000			1/2" Ice	6.314	3.273	0.068
DUO1417-8686	B	From Face	3.000	0.000	160.000	No Ice	6.533	4.200	0.020
(AT&T - Existing)			-2.000 0.000			1/2" Ice	6.940	4.574	0.062
7770.00	B	From Face	3.000	0.000	160.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			6.000 0.000			1/2" Ice	6.314	3.273	0.068
7770.00	C	From Face	3.000	0.000	160.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			-6.000 0.000			1/2" Ice	6.314	3.273	0.068
DUO1417-8686	C	From Face	3.000	0.000	160.000	No Ice	6.533	4.200	0.020
(AT&T - Existing)			-2.000 0.000			1/2" Ice	6.940	4.574	0.062
7770.00	C	From Face	3.000	0.000	160.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			6.000 0.000			1/2" Ice	6.314	3.273	0.068
(2) LGP21401 TMA	A	From Face	3.000	0.000	160.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			-6.000 0.000			1/2" Ice	1.093	0.480	0.023
(2) LGP21401 TMA	B	From Face	3.000	0.000	160.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			-6.000 0.000			1/2" Ice	1.093	0.480	0.023
(2) LGP21401 TMA	C	From Face	3.000	0.000	160.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			-6.000 0.000			1/2" Ice	1.093	0.480	0.023
(2) LGP21901 Diplexer	A	From Face	3.000	0.000	160.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			6.000 0.000			1/2" Ice	0.302	0.166	0.008
(2) LGP21901 Diplexer	B	From Face	3.000	0.000	160.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			6.000 0.000			1/2" Ice	0.302	0.166	0.008
(2) LGP21901 Diplexer	C	From Face	3.000	0.000	160.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			6.000 0.000			1/2" Ice	0.302	0.166	0.008
Smart Bias T	A	From Face	3.000	0.000	160.000	No Ice	0.156	0.078	0.002
(AT&T - Existing)			-2.000 0.000			1/2" Ice	0.212	0.121	0.003
Smart Bias T	B	From Face	3.000	0.000	160.000	No Ice	0.156	0.078	0.002
(AT&T - Existing)			-2.000 0.000			1/2" Ice	0.212	0.121	0.003
Smart Bias T	C	From Face	3.000	0.000	160.000	No Ice	0.156	0.078	0.002
(AT&T - Existing)			-2.000 0.000			1/2" Ice	0.212	0.121	0.003

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	164.034	1.581	0.029	42.665	A	0.000	42.665	42.665	100.00	0.000	0.000
179.000-151.0					B	0.000	42.665		100.00	0.000	0.000
00					C	0.000	42.665		100.00	0.000	5.544
L2	137.903	1.505	0.028	53.211	A	0.000	53.211	53.211	100.00	0.000	0.000
151.000-125.9					B	0.000	53.211		100.00	0.000	0.000
20					C	0.000	53.211		100.00	0.000	4.966
L3	105.065	1.392	0.026	112.677	A	0.000	112.677	112.677	100.00	0.000	0.000
125.920-85.79					B	0.000	112.677		100.00	0.000	0.000
6					C	0.000	112.677		100.00	0.000	7.945
L4	63.538	1.206	0.022	160.649	A	0.000	160.649	160.649	100.00	0.000	0.000
85.796-42.132					B	0.000	160.649		100.00	0.000	0.000
					C	0.000	160.649		100.00	0.000	8.645
L5	20.345	1	0.018	192.646	A	0.000	192.646	192.646	100.00	0.000	0.000
42.132-0.000					B	0.000	192.646		100.00	0.000	0.000
					C	0.000	192.646		100.00	0.000	7.748

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	164.034	1.581	0.022	0.500	44.998	A	0.000	44.998	44.998	100.00	0.000	0.000
179.000-151.000						B	0.000	44.998		100.00	0.000	0.000
						C	0.000	44.998		100.00	0.000	8.344
L2	137.903	1.505	0.021	0.500	55.301	A	0.000	55.301	55.301	100.00	0.000	0.000
151.000-125.920						B	0.000	55.301		100.00	0.000	0.000
						C	0.000	55.301		100.00	0.000	7.474
L3	105.065	1.392	0.019	0.500	116.020	A	0.000	116.020	116.020	100.00	0.000	0.000
125.920-85.796						B	0.000	116.020		100.00	0.000	0.000
						C	0.000	116.020		100.00	0.000	11.957
L4	63.538	1.206	0.017	0.500	164.288	A	0.000	164.288	164.288	100.00	0.000	0.000
85.796-42.132						B	0.000	164.288		100.00	0.000	0.000
						C	0.000	164.288		100.00	0.000	13.012
L5 42.132-0.000	20.345	1	0.014	0.500	196.157	A	0.000	196.157	196.157	100.00	0.000	0.000
						B	0.000	196.157		100.00	0.000	0.000
						C	0.000	196.157		100.00	0.000	11.661

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	164.034	1.581	0.010	42.665	A	0.000	42.665	42.665	100.00	0.000	0.000
179.000-151.0					B	0.000	42.665		100.00	0.000	0.000
00					C	0.000	42.665		100.00	0.000	5.544
L2	137.903	1.505	0.010	53.211	A	0.000	53.211	53.211	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
151.000-125.9					B	0.000	53.211		100.00	0.000	0.000
20					C	0.000	53.211		100.00	0.000	4.966
L3	105.065	1.392	0.009	112.677	A	0.000	112.677	112.677	100.00	0.000	0.000
125.920-85.79					B	0.000	112.677		100.00	0.000	0.000
6					C	0.000	112.677		100.00	0.000	7.945
L4	63.538	1.206	0.008	160.649	A	0.000	160.649	160.649	100.00	0.000	0.000
85.796-42.132					B	0.000	160.649		100.00	0.000	0.000
					C	0.000	160.649		100.00	0.000	8.645
L5	20.345	1	0.006	192.646	A	0.000	192.646	192.646	100.00	0.000	0.000
42.132-0.000					B	0.000	192.646		100.00	0.000	0.000
					C	0.000	192.646		100.00	0.000	7.748

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	1.645	0.059	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	1.860	0.074	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	3.527	0.088	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	4.239	0.097	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	4.156	0.099	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	1250.775 kip-ft	15.427		

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 klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	1.645	0.059	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	1.860	0.074	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	3.527	0.088	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	4.239	0.097	C
85.796-42.132			B	1	0.65	1	1	1	160.649			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	4.156	0.099	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	1250.775 kip-ft	15.427		

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 klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	1.645	0.059	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	1.860	0.074	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	3.527	0.088	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	4.239	0.097	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	4.156	0.099	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	1250.775 kip-ft	15.427		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	1.645	0.059	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	1.860	0.074	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	3.527	0.088	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	4.239	0.097	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	4.156	0.099	C
42.132-0.000			B	1	0.65	1	1	1	192.646			

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 klf	Ctrl. Face
Sum Weight:	5.254	29.533	C	1	0.65	1	1	1 OTM	192.646 1250.775 kip-ft	15.427		

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 klf	Ctrl. Face
L1	0.890	1.351	A	1	0.65	1	1	1	44.998	1.394	0.050	C
179.000-151.0			B	1	0.65	1	1	1	44.998			
00			C	1	0.65	1	1	1	44.998			
L2	1.010	2.109	A	1	0.65	1	1	1	55.301	1.532	0.061	C
151.000-125.9			B	1	0.65	1	1	1	55.301			
20			C	1	0.65	1	1	1	55.301			
L3	1.615	6.725	A	1	0.65	1	1	1	116.020	2.847	0.071	C
125.920-85.79			B	1	0.65	1	1	1	116.020			
6			C	1	0.65	1	1	1	116.020			
L4	1.758	9.761	A	1	0.65	1	1	1	164.288	3.368	0.077	C
85.796-42.132			B	1	0.65	1	1	1	164.288			
			C	1	0.65	1	1	1	164.288			
L5	1.575	13.804	A	1	0.65	1	1	1	196.157	3.263	0.077	C
42.132-0.000			B	1	0.65	1	1	1	196.157			
			C	1	0.65	1	1	1	196.157			
Sum Weight:	6.849	33.749						OTM	1019.296 kip-ft	12.403		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.890	1.351	A	1	0.65	1	1	1	44.998	1.394	0.050	C
179.000-151.0			B	1	0.65	1	1	1	44.998			
00			C	1	0.65	1	1	1	44.998			
L2	1.010	2.109	A	1	0.65	1	1	1	55.301	1.532	0.061	C
151.000-125.9			B	1	0.65	1	1	1	55.301			
20			C	1	0.65	1	1	1	55.301			
L3	1.615	6.725	A	1	0.65	1	1	1	116.020	2.847	0.071	C
125.920-85.79			B	1	0.65	1	1	1	116.020			
6			C	1	0.65	1	1	1	116.020			
L4	1.758	9.761	A	1	0.65	1	1	1	164.288	3.368	0.077	C
85.796-42.132			B	1	0.65	1	1	1	164.288			
			C	1	0.65	1	1	1	164.288			
L5	1.575	13.804	A	1	0.65	1	1	1	196.157	3.263	0.077	C
42.132-0.000			B	1	0.65	1	1	1	196.157			
			C	1	0.65	1	1	1	196.157			
Sum Weight:	6.849	33.749						OTM	1019.296 kip-ft	12.403		

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 klf	Ctrl. Face
L1	0.890	1.351	A	1	0.65	1	1	1	44.998	1.394	0.050	C
179.000-151.0			B	1	0.65	1	1	1	44.998			
00			C	1	0.65	1	1	1	44.998			
L2	1.010	2.109	A	1	0.65	1	1	1	55.301	1.532	0.061	C
151.000-125.9			B	1	0.65	1	1	1	55.301			
20			C	1	0.65	1	1	1	55.301			
L3	1.615	6.725	A	1	0.65	1	1	1	116.020	2.847	0.071	C
125.920-85.79			B	1	0.65	1	1	1	116.020			
6			C	1	0.65	1	1	1	116.020			
L4	1.758	9.761	A	1	0.65	1	1	1	164.288	3.368	0.077	C
85.796-42.132			B	1	0.65	1	1	1	164.288			
			C	1	0.65	1	1	1	164.288			
L5	1.575	13.804	A	1	0.65	1	1	1	196.157	3.263	0.077	C
42.132-0.000			B	1	0.65	1	1	1	196.157			
			C	1	0.65	1	1	1	196.157			
Sum Weight:	6.849	33.749						OTM	1019.296 kip-ft	12.403		

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 klf	Ctrl. Face
L1	0.890	1.351	A	1	0.65	1	1	1	44.998	1.394	0.050	C
179.000-151.0			B	1	0.65	1	1	1	44.998			
00			C	1	0.65	1	1	1	44.998			
L2	1.010	2.109	A	1	0.65	1	1	1	55.301	1.532	0.061	C
151.000-125.9			B	1	0.65	1	1	1	55.301			
20			C	1	0.65	1	1	1	55.301			
L3	1.615	6.725	A	1	0.65	1	1	1	116.020	2.847	0.071	C
125.920-85.79			B	1	0.65	1	1	1	116.020			
6			C	1	0.65	1	1	1	116.020			
L4	1.758	9.761	A	1	0.65	1	1	1	164.288	3.368	0.077	C
85.796-42.132			B	1	0.65	1	1	1	164.288			
			C	1	0.65	1	1	1	164.288			
L5	1.575	13.804	A	1	0.65	1	1	1	196.157	3.263	0.077	C
42.132-0.000			B	1	0.65	1	1	1	196.157			
			C	1	0.65	1	1	1	196.157			
Sum Weight:	6.849	33.749						OTM	1019.296 kip-ft	12.403		

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 klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	0.569	0.020	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	0.644	0.026	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	1.220	0.030	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	1.467	0.034	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	1.438	0.034	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	432.794 kip-ft	5.338		

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 klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	0.569	0.020	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	0.644	0.026	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	1.220	0.030	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	1.467	0.034	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	1.438	0.034	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	432.794 kip-ft	5.338		

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 klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	0.569	0.020	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	0.644	0.026	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	1.220	0.030	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	1.467	0.034	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	1.438	0.034	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	432.794 kip-ft	5.338		

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 klf	Ctrl. Face
L1	0.636	1.026	A	1	0.65	1	1	1	42.665	0.569	0.020	C
179.000-151.0			B	1	0.65	1	1	1	42.665			
00			C	1	0.65	1	1	1	42.665			
L2	0.782	1.707	A	1	0.65	1	1	1	53.211	0.644	0.026	C
151.000-125.9			B	1	0.65	1	1	1	53.211			
20			C	1	0.65	1	1	1	53.211			
L3	1.252	5.878	A	1	0.65	1	1	1	112.677	1.220	0.030	C
125.920-85.79			B	1	0.65	1	1	1	112.677			
6			C	1	0.65	1	1	1	112.677			
L4	1.362	8.558	A	1	0.65	1	1	1	160.649	1.467	0.034	C
85.796-42.132			B	1	0.65	1	1	1	160.649			
			C	1	0.65	1	1	1	160.649			
L5	1.221	12.364	A	1	0.65	1	1	1	192.646	1.438	0.034	C
42.132-0.000			B	1	0.65	1	1	1	192.646			
			C	1	0.65	1	1	1	192.646			
Sum Weight:	5.254	29.533						OTM	432.794 kip-ft	5.338		

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	29.533					
Bracing Weight	0.000					
Total Member Self-Weight	29.533			0.000	0.000	
Total Weight	38.184			0.000	0.000	
Wind 0 deg - No Ice		0.000	-22.753	-2508.687	0.000	0.000
Wind 30 deg - No Ice		11.377	-19.705	-2172.586	-1254.343	0.000

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 45 deg - No Ice		16.089	-16.089	-1773.909	-1773.909	0.000
Wind 60 deg - No Ice		19.705	-11.377	-1254.343	-2172.586	0.000
Wind 90 deg - No Ice		22.753	0.000	0.000	-2508.687	0.000
Wind 120 deg - No Ice		19.705	11.377	1254.343	-2172.586	0.000
Wind 135 deg - No Ice		16.089	16.089	1773.909	-1773.909	0.000
Wind 150 deg - No Ice		11.377	19.705	2172.586	-1254.343	0.000
Wind 180 deg - No Ice		0.000	22.753	2508.687	0.000	0.000
Wind 210 deg - No Ice		-11.377	19.705	2172.586	1254.343	0.000
Wind 225 deg - No Ice		-16.089	16.089	1773.909	1773.909	0.000
Wind 240 deg - No Ice		-19.705	11.377	1254.343	2172.586	0.000
Wind 270 deg - No Ice		-22.753	0.000	0.000	2508.687	0.000
Wind 300 deg - No Ice		-19.705	-11.377	-1254.343	2172.586	0.000
Wind 315 deg - No Ice		-16.089	-16.089	-1773.909	1773.909	0.000
Wind 330 deg - No Ice		-11.377	-19.705	-2172.586	1254.343	0.000
Member Ice	4.216					
Total Weight Ice	46.030			0.000	0.000	
Wind 0 deg - Ice		0.000	-18.662	-2093.488	0.000	0.000
Wind 30 deg - Ice		9.331	-16.162	-1813.014	-1046.744	0.000
Wind 45 deg - Ice		13.196	-13.196	-1480.320	-1480.320	0.000
Wind 60 deg - Ice		16.162	-9.331	-1046.744	-1813.014	0.000
Wind 90 deg - Ice		18.662	0.000	0.000	-2093.488	0.000
Wind 120 deg - Ice		16.162	9.331	1046.744	-1813.014	0.000
Wind 135 deg - Ice		13.196	13.196	1480.320	-1480.320	0.000
Wind 150 deg - Ice		9.331	16.162	1813.014	-1046.744	0.000
Wind 180 deg - Ice		0.000	18.662	2093.488	0.000	0.000
Wind 210 deg - Ice		-9.331	16.162	1813.014	1046.744	0.000
Wind 225 deg - Ice		-13.196	13.196	1480.320	1480.320	0.000
Wind 240 deg - Ice		-16.162	9.331	1046.744	1813.014	0.000
Wind 270 deg - Ice		-18.662	0.000	0.000	2093.488	0.000
Wind 300 deg - Ice		-16.162	-9.331	-1046.744	1813.014	0.000
Wind 315 deg - Ice		-13.196	-13.196	-1480.320	1480.320	0.000
Wind 330 deg - Ice		-9.331	-16.162	-1813.014	1046.744	0.000
Total Weight	38.184			0.000	0.000	
Wind 0 deg - Service		0.000	-7.873	-868.058	0.000	0.000
Wind 30 deg - Service		3.937	-6.818	-751.760	-434.029	0.000
Wind 45 deg - Service		5.567	-5.567	-613.809	-613.809	0.000
Wind 60 deg - Service		6.818	-3.937	-434.029	-751.760	0.000
Wind 90 deg - Service		7.873	0.000	0.000	-868.058	0.000
Wind 120 deg - Service		6.818	3.937	434.029	-751.760	0.000
Wind 135 deg - Service		5.567	5.567	613.809	-613.809	0.000
Wind 150 deg - Service		3.937	6.818	751.760	-434.029	0.000
Wind 180 deg - Service		0.000	7.873	868.058	0.000	0.000
Wind 210 deg - Service		-3.937	6.818	751.760	434.029	0.000
Wind 225 deg - Service		-5.567	5.567	613.809	613.809	0.000
Wind 240 deg - Service		-6.818	3.937	434.029	751.760	0.000
Wind 270 deg - Service		-7.873	0.000	0.000	868.058	0.000
Wind 300 deg - Service		-6.818	-3.937	-434.029	751.760	0.000
Wind 315 deg - Service		-5.567	-5.567	-613.809	613.809	0.000
Wind 330 deg - Service		-3.937	-6.818	-751.760	434.029	0.000

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 - 151	Pole	Max Tension	18	0.000	0.000	0.000
			Max. Compression	18	-7.673	0.000	0.000
			Max. Mx	6	-4.316	-179.812	0.000
			Max. My	2	-4.316	0.000	179.812
			Max. Vy	6	9.351	-179.812	0.000

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	-9.351	0.000	179.812
			Max. Torque	26			0.000
L2	151 - 125.92	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-10.234	0.000	0.000
			Max. Mx	6	-6.445	-391.077	0.000
			Max. My	2	-6.445	0.000	391.077
			Max. Vy	6	10.905	-391.077	0.000
			Max. Vx	2	-10.905	0.000	391.077
			Max. Torque	26			0.000
L3	125.92 - 85.796	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-17.951	0.000	0.000
			Max. Mx	6	-13.132	-880.737	0.000
			Max. My	2	-13.132	0.000	880.737
			Max. Vy	6	14.352	-880.737	0.000
			Max. Vx	2	-14.352	0.000	880.737
			Max. Torque	26			0.000
L4	85.796 - 42.132	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-28.840	0.000	0.000
			Max. Mx	6	-22.736	-1572.569	0.000
			Max. My	2	-22.736	0.000	1572.569
			Max. Vy	6	18.314	-1572.569	0.000
			Max. Vx	2	-18.314	0.000	1572.569
			Max. Torque	26			0.000
L5	42.132 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-46.030	0.000	0.000
			Max. Mx	6	-38.176	-2576.098	0.000
			Max. My	2	-38.176	0.000	2576.098
			Max. Vy	6	22.768	-2576.098	0.000
			Max. Vx	2	-22.768	0.000	2576.098
			Max. Torque	26			0.000

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	19	46.030	0.000	18.662
	Max. H_x	14	38.184	22.753	0.000
	Max. H_z	2	38.184	0.000	22.753
	Max. M_x	2	2576.098	0.000	22.753
	Max. M_z	6	2576.098	-22.753	0.000
	Max. Torsion	26	0.000	-9.331	-16.162
	Min. Vert	1	38.184	0.000	0.000
	Min. H_x	6	38.184	-22.753	0.000
	Min. H_z	10	38.184	0.000	-22.753
	Min. M_x	10	-2576.098	0.000	-22.753
	Min. M_z	14	-2576.098	22.753	0.000
	Min. Torsion	28	-0.000	9.331	-16.162

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	38.184	0.000	0.000	0.000	0.000	0.000
Dead+Wind 0 deg - No Ice	38.184	0.000	-22.753	-2576.098	0.000	0.000
Dead+Wind 30 deg - No Ice	38.184	11.377	-19.705	-2230.969	-1288.050	0.000
Dead+Wind 45 deg - No Ice	38.184	16.089	-16.089	-1821.578	-1821.578	0.000
Dead+Wind 60 deg - No Ice	38.184	19.705	-11.377	-1288.050	-2230.969	-0.000
Dead+Wind 90 deg - No Ice	38.184	22.753	0.000	0.000	-2576.098	0.000
Dead+Wind 120 deg - No Ice	38.184	19.705	11.377	1288.050	-2230.969	0.000
Dead+Wind 135 deg - No Ice	38.184	16.089	16.089	1821.578	-1821.578	0.000
Dead+Wind 150 deg - No Ice	38.184	11.377	19.705	2230.969	-1288.050	-0.000
Dead+Wind 180 deg - No Ice	38.184	0.000	22.753	2576.098	0.000	0.000
Dead+Wind 210 deg - No Ice	38.184	-11.377	19.705	2230.969	1288.050	0.000
Dead+Wind 225 deg - No Ice	38.184	-16.089	16.089	1821.578	1821.578	0.000
Dead+Wind 240 deg - No Ice	38.184	-19.705	11.377	1288.050	2230.969	-0.000
Dead+Wind 270 deg - No Ice	38.184	-22.753	0.000	0.000	2576.098	0.000
Dead+Wind 300 deg - No Ice	38.184	-19.705	-11.377	-1288.050	2230.969	0.000
Dead+Wind 315 deg - No Ice	38.184	-16.089	-16.089	-1821.578	1821.578	0.000
Dead+Wind 330 deg - No Ice	38.184	-11.377	-19.705	-2230.969	1288.050	-0.000
Dead+Ice+Temp	46.030	0.000	0.000	0.000	0.000	0.000
Dead+Wind 0 deg+Ice+Temp	46.030	0.000	-18.662	-2172.284	0.000	0.000
Dead+Wind 30 deg+Ice+Temp	46.030	9.331	-16.162	-1881.253	-1086.142	0.000
Dead+Wind 45 deg+Ice+Temp	46.030	13.196	-13.196	-1536.036	-1536.036	0.000
Dead+Wind 60 deg+Ice+Temp	46.030	16.162	-9.331	-1086.142	-1881.253	-0.000
Dead+Wind 90 deg+Ice+Temp	46.030	18.662	0.000	0.000	-2172.284	0.000
Dead+Wind 120 deg+Ice+Temp	46.030	16.162	9.331	1086.142	-1881.253	0.000
Dead+Wind 135 deg+Ice+Temp	46.030	13.196	13.196	1536.036	-1536.036	0.000
Dead+Wind 150 deg+Ice+Temp	46.030	9.331	16.162	1881.253	-1086.142	-0.000
Dead+Wind 180 deg+Ice+Temp	46.030	0.000	18.662	2172.284	0.000	0.000
Dead+Wind 210 deg+Ice+Temp	46.030	-9.331	16.162	1881.253	1086.142	0.000
Dead+Wind 225 deg+Ice+Temp	46.030	-13.196	13.196	1536.036	1536.036	0.000
Dead+Wind 240 deg+Ice+Temp	46.030	-16.162	9.331	1086.142	1881.253	-0.000
Dead+Wind 270 deg+Ice+Temp	46.030	-18.662	0.000	0.000	2172.284	0.000
Dead+Wind 300 deg+Ice+Temp	46.030	-16.162	-9.331	-1086.142	1881.253	0.000
Dead+Wind 315 deg+Ice+Temp	46.030	-13.196	-13.196	-1536.036	1536.036	0.000
Dead+Wind 330 deg+Ice+Temp	46.030	-9.331	-16.162	-1881.253	1086.142	-0.000
Dead+Wind 0 deg - Service	38.184	0.000	-7.873	-892.064	0.000	0.000
Dead+Wind 30 deg - Service	38.184	3.937	-6.818	-772.550	-446.032	0.000
Dead+Wind 45 deg - Service	38.184	5.567	-5.567	-630.784	-630.784	0.000
Dead+Wind 60 deg - Service	38.184	6.818	-3.937	-446.032	-772.550	-0.000
Dead+Wind 90 deg - Service	38.184	7.873	0.000	0.000	-892.064	0.000
Dead+Wind 120 deg - Service	38.184	6.818	3.937	446.032	-772.550	0.000
Dead+Wind 135 deg - Service	38.184	5.567	5.567	630.784	-630.784	0.000
Dead+Wind 150 deg - Service	38.184	3.937	6.818	772.550	-446.032	-0.000
Dead+Wind 180 deg - Service	38.184	0.000	7.873	892.064	0.000	0.000
Dead+Wind 210 deg - Service	38.184	-3.937	6.818	772.550	446.032	0.000
Dead+Wind 225 deg - Service	38.184	-5.567	5.567	630.784	630.784	0.000
Dead+Wind 240 deg - Service	38.184	-6.818	3.937	446.032	772.550	-0.000
Dead+Wind 270 deg - Service	38.184	-7.873	0.000	0.000	892.064	0.000
Dead+Wind 300 deg - Service	38.184	-6.818	-3.937	-446.032	772.550	0.000
Dead+Wind 315 deg - Service	38.184	-5.567	-5.567	-630.784	630.784	0.000
Dead+Wind 330 deg - Service	38.184	-3.937	-6.818	-772.550	446.032	-0.000

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	0.000	-38.184	0.000	0.000	38.184	0.000	0.000%
2	0.000	-38.184	-22.753	0.000	38.184	22.753	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
3	11.377	-38.184	-19.705	-11.377	38.184	19.705	0.000%
4	16.089	-38.184	-16.089	-16.089	38.184	16.089	0.000%
5	19.705	-38.184	-11.377	-19.705	38.184	11.377	0.000%
6	22.753	-38.184	0.000	-22.753	38.184	0.000	0.000%
7	19.705	-38.184	11.377	-19.705	38.184	-11.377	0.000%
8	16.089	-38.184	16.089	-16.089	38.184	-16.089	0.000%
9	11.377	-38.184	19.705	-11.377	38.184	-19.705	0.000%
10	0.000	-38.184	22.753	0.000	38.184	-22.753	0.000%
11	-11.377	-38.184	19.705	11.377	38.184	-19.705	0.000%
12	-16.089	-38.184	16.089	16.089	38.184	-16.089	0.000%
13	-19.705	-38.184	11.377	19.705	38.184	-11.377	0.000%
14	-22.753	-38.184	0.000	22.753	38.184	0.000	0.000%
15	-19.705	-38.184	-11.377	19.705	38.184	11.377	0.000%
16	-16.089	-38.184	-16.089	16.089	38.184	16.089	0.000%
17	-11.377	-38.184	-19.705	11.377	38.184	19.705	0.000%
18	0.000	-46.030	0.000	0.000	46.030	0.000	0.000%
19	0.000	-46.030	-18.662	0.000	46.030	18.662	0.000%
20	9.331	-46.030	-16.162	-9.331	46.030	16.162	0.000%
21	13.196	-46.030	-13.196	-13.196	46.030	13.196	0.000%
22	16.162	-46.030	-9.331	-16.162	46.030	9.331	0.000%
23	18.662	-46.030	0.000	-18.662	46.030	0.000	0.000%
24	16.162	-46.030	9.331	-16.162	46.030	-9.331	0.000%
25	13.196	-46.030	13.196	-13.196	46.030	-13.196	0.000%
26	9.331	-46.030	16.162	-9.331	46.030	-16.162	0.000%
27	0.000	-46.030	18.662	0.000	46.030	-18.662	0.000%
28	-9.331	-46.030	16.162	9.331	46.030	-16.162	0.000%
29	-13.196	-46.030	13.196	13.196	46.030	-13.196	0.000%
30	-16.162	-46.030	9.331	16.162	46.030	-9.331	0.000%
31	-18.662	-46.030	0.000	18.662	46.030	0.000	0.000%
32	-16.162	-46.030	-9.331	16.162	46.030	9.331	0.000%
33	-13.196	-46.030	-13.196	13.196	46.030	13.196	0.000%
34	-9.331	-46.030	-16.162	9.331	46.030	16.162	0.000%
35	0.000	-38.184	-7.873	0.000	38.184	7.873	0.000%
36	3.937	-38.184	-6.818	-3.937	38.184	6.818	0.000%
37	5.567	-38.184	-5.567	-5.567	38.184	5.567	0.000%
38	6.818	-38.184	-3.937	-6.818	38.184	3.937	0.000%
39	7.873	-38.184	0.000	-7.873	38.184	0.000	0.000%
40	6.818	-38.184	3.937	-6.818	38.184	-3.937	0.000%
41	5.567	-38.184	5.567	-5.567	38.184	-5.567	0.000%
42	3.937	-38.184	6.818	-3.937	38.184	-6.818	0.000%
43	0.000	-38.184	7.873	0.000	38.184	-7.873	0.000%
44	-3.937	-38.184	6.818	3.937	38.184	-6.818	0.000%
45	-5.567	-38.184	5.567	5.567	38.184	-5.567	0.000%
46	-6.818	-38.184	3.937	6.818	38.184	-3.937	0.000%
47	-7.873	-38.184	0.000	7.873	38.184	0.000	0.000%
48	-6.818	-38.184	-3.937	6.818	38.184	3.937	0.000%
49	-5.567	-38.184	-5.567	5.567	38.184	5.567	0.000%
50	-3.937	-38.184	-6.818	3.937	38.184	6.818	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00007626
3	Yes	5	0.00000001	0.00036908

4	Yes	5	0.00000001	0.00040805
5	Yes	5	0.00000001	0.00036908
6	Yes	4	0.00000001	0.00007626
7	Yes	5	0.00000001	0.00036908
8	Yes	5	0.00000001	0.00040805
9	Yes	5	0.00000001	0.00036908
10	Yes	4	0.00000001	0.00007626
11	Yes	5	0.00000001	0.00036908
12	Yes	5	0.00000001	0.00040805
13	Yes	5	0.00000001	0.00036908
14	Yes	4	0.00000001	0.00007626
15	Yes	5	0.00000001	0.00036908
16	Yes	5	0.00000001	0.00040805
17	Yes	5	0.00000001	0.00036908
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00019908
20	Yes	5	0.00000001	0.00084998
21	Yes	5	0.00000001	0.00096107
22	Yes	5	0.00000001	0.00084998
23	Yes	5	0.00000001	0.00019908
24	Yes	5	0.00000001	0.00084998
25	Yes	5	0.00000001	0.00096107
26	Yes	5	0.00000001	0.00084998
27	Yes	5	0.00000001	0.00019908
28	Yes	5	0.00000001	0.00084998
29	Yes	5	0.00000001	0.00096107
30	Yes	5	0.00000001	0.00084998
31	Yes	5	0.00000001	0.00019908
32	Yes	5	0.00000001	0.00084998
33	Yes	5	0.00000001	0.00096107
34	Yes	5	0.00000001	0.00084998
35	Yes	4	0.00000001	0.00003138
36	Yes	4	0.00000001	0.00071368
37	Yes	4	0.00000001	0.00082194
38	Yes	4	0.00000001	0.00071368
39	Yes	4	0.00000001	0.00003138
40	Yes	4	0.00000001	0.00071368
41	Yes	4	0.00000001	0.00082194
42	Yes	4	0.00000001	0.00071368
43	Yes	4	0.00000001	0.00003138
44	Yes	4	0.00000001	0.00071368
45	Yes	4	0.00000001	0.00082194
46	Yes	4	0.00000001	0.00071368
47	Yes	4	0.00000001	0.00003138
48	Yes	4	0.00000001	0.00071368
49	Yes	4	0.00000001	0.00082194
50	Yes	4	0.00000001	0.00071368

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	179 - 151	31.753	39	2.024	0.000
L2	151 - 125.92	20.913	39	1.595	0.000
L3	130.086 - 85.796	14.754	39	1.213	0.000
L4	91.212 - 42.132	6.709	39	0.757	0.000
L5	48.882 - 0	1.790	39	0.341	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
181.000	LPA-80080-4CF	39	31.753	2.024	0.000	13253
180.000	EEI Low Profile Platform	39	31.753	2.024	0.000	13253
160.000	7770.00	39	24.155	1.746	0.000	3487
158.000	13' Low Profile Platform	39	23.406	1.714	0.000	3154

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	179 - 151	91.545	2	5.835	0.000
L2	151 - 125.92	60.328	2	4.601	0.000
L3	130.086 - 85.796	42.573	2	3.499	0.000
L4	91.212 - 42.132	19.365	2	2.185	0.000
L5	48.882 - 0	5.168	2	0.985	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
181.000	LPA-80080-4CF	2	91.545	5.835	0.000	4676
180.000	EEI Low Profile Platform	2	91.545	5.835	0.000	4676
160.000	7770.00	2	69.664	5.034	0.000	1228
158.000	13' Low Profile Platform	2	67.507	4.942	0.000	1110

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 - 151 (1)	TP22.07x14.5x0.188	28.000	0.000	0.0	39.000	13.023	-4.316	507.890	0.008
L2	151 - 125.92 (2)	TP28.85x22.07x0.25	25.080	0.000	0.0	39.000	21.800	-6.445	850.218	0.008
L3	125.92 - 85.796 (3)	TP39.06x27.224x0.375	44.290	0.000	0.0	39.000	44.322	-13.132	1728.560	0.008
L4	85.796 - 42.132 (4)	TP49.99x36.863x0.375	49.080	0.000	0.0	39.000	56.905	-22.736	2219.310	0.010
L5	42.132 - 0 (5)	TP60.5x47.435x0.438	48.882	0.000	0.0	39.000	78.466	-34.373	3060.180	0.011

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 - 151 (1)	TP22.07x14.5x0.188	179.813	30.706	39.000	0.787	0.000	0.000	39.000	0.000
L2	151 - 125.92 (2)	TP28.85x22.07x0.25	391.077	31.792	39.000	0.815	0.000	0.000	39.000	0.000
L3	125.92 - 85.796 (3)	TP39.06x27.224x0.375	880.742	26.008	39.000	0.667	0.000	0.000	39.000	0.000
L4	85.796 - 42.132 (4)	TP49.99x36.863x0.375	1572.575	28.109	39.000	0.721	0.000	0.000	39.000	0.000
L5	42.132 - 0 (5)	TP60.5x47.435x0.438	2281.733	25.023	39.000	0.642	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	179 - 151 (1)	TP22.07x14.5x0.188	9.352	0.718	26.000	0.055	0.000	0.000	26.000	0.000
L2	151 - 125.92 (2)	TP28.85x22.07x0.25	10.906	0.500	26.000	0.038	0.000	0.000	26.000	0.000
L3	125.92 - 85.796 (3)	TP39.06x27.224x0.375	14.352	0.324	26.000	0.025	0.000	0.000	26.000	0.000
L4	85.796 - 42.132 (4)	TP49.99x36.863x0.375	18.314	0.322	26.000	0.025	0.000	0.000	26.000	0.000
L5	42.132 - 0 (5)	TP60.5x47.435x0.438	21.724	0.277	26.000	0.021	0.000	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	179 - 151 (1)	0.008	0.787	0.000	0.055	0.000	0.797 ✔	1.333	H1-3+VT ✔
L2	151 - 125.92 (2)	0.008	0.815	0.000	0.038	0.000	0.823 ✔	1.333	H1-3+VT ✔
L3	125.92 - 85.796 (3)	0.008	0.667	0.000	0.025	0.000	0.675 ✔	1.333	H1-3+VT ✔
L4	85.796 - 42.132 (4)	0.010	0.721	0.000	0.025	0.000	0.731 ✔	1.333	H1-3+VT ✔
L5	42.132 - 0 (5)	0.011	0.642	0.000	0.021	0.000	0.653 ✔	1.333	H1-3+VT ✔

RISATower	Job: 11074.CO23 - Colchester South	Page: 21 of 21
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 150-ft EEI Monopole - 856 Middletown Rd., Colchester, CT	Date: 15:49:51 11/30/11
	Client: Verizon Wireless	Designed by: TJL

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\overline{SF}*P_{allow}$ K	% Capacity	Pass Fail
L1	179 - 151	Pole	TP22.07x14.5x0.188	1	-4.316	677.017	59.8	Pass
L2	151 - 125.92	Pole	TP28.85x22.07x0.25	2	-6.445	1133.341	61.8	Pass
L3	125.92 - 85.796	Pole	TP39.06x27.224x0.375	3	-13.132	2304.170	50.6	Pass
L4	85.796 - 42.132	Pole	TP49.99x36.863x0.375	4	-22.736	2958.340	54.8	Pass
L5	42.132 - 0	Pole	TP60.5x47.435x0.438	5	-34.373	4079.220	49.0	Pass
							Summary	
						Pole (L2)	61.8	Pass
						RATING =	**61.8**	**Pass**

Program Version 5.4.1.8 - 4/8/2010 File:J:/Jobs/1107400.WI/CO23 - Verizon Colchester South - Colchester, CT/Rev (1)/Calcs/ERI Files/180' EEI Monopole_Colchester_CT.eri

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

Subject:	Flange Bolts and Flangeplate Analysis
Location:	180-ft EEI Monopole Colchester, CT
Rev. 1: 11/30/11	Prepared by: T.J.L. Checked by: C.F.C. Job No. 11074.CO23

Flange Bolt and Flange Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 179.8·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 9.4·kips	(Input From RisaTower)
Axial Force =	Axial := 7.7·kips	(Input From RisaTower)

Flange Bolt Data:

Use ASTM A325

Number of Flange Bolts =	N := 24	(User Input)
Diameter of Bolt Circle =	D_{bc} := 25.7·in	(User Input)
Bolt Ultimate Strength =	F_u := 120·ksi	(User Input)
Bolt Yield Strength =	F_y := 92·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 1.0·in	(User Input)
Threads per Inch =	n := 8	(User Input)

Flange Plate Data:

Use ASTM A572 GR. 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 1.0·in	(User Input)
Flange Plate Diameter =	D_{bp} := 29.0·in	(User Input)
Outer Pole Diameter =	D_{pole} := 22.07·in	(User Input)

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

Subject: Flange Bolts and Flangeplate Analysis

Location: 180-ft EEI Monopole
Colchester, CT

Rev. 1: 11/30/11

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 11074.CO23

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 12.85 \cdot in$

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

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

$d_1 = 3.33 \cdot in$ $d_7 = 12.41 \cdot in$

$d_2 = 6.42 \cdot in$ $d_8 = 11.13 \cdot in$

$d_3 = 9.09 \cdot in$ $d_9 = 9.09 \cdot in$

$d_4 = 11.13 \cdot in$ $d_{10} = 6.42 \cdot in$

$d_5 = 12.41 \cdot in$ $d_{11} = 3.33 \cdot in$

$d_6 = 12.85 \cdot in$ $d_{12} = 0.00 \cdot in$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 11 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 1.38 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.09 \cdot in$

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

$MA_4 = 0.09 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 1.38 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 1.81 \cdot in$ $MA_{12} = 0.00 \cdot in$

Effective Width of Flangeplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 15.1 \cdot in$

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Centered on Solutions
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P: (203) 488-0580
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Subject:	Flange Bolts and Flangeplate Analysis
Location:	180-ft EEI Monopole Colchester, CT
Rev. 1: 11/30/11	Prepared by: T.J.L. Checked by: C.F.C. Job No. 11074.CO23

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 1.981 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.606 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.22 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 13.7 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 41.5 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} = 33.0 \cdot \%$

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

Condition1 = "OK"

Flange Plate Analysis:

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

$C_1 = 3.9 \cdot kips$ $C_7 = 13.8 \cdot kips$

$C_2 = 7.3 \cdot kips$ $C_8 = 12.4 \cdot kips$

$C_3 = 10.2 \cdot kips$ $C_9 = 10.2 \cdot kips$

$C_4 = 12.4 \cdot kips$ $C_{10} = 7.3 \cdot kips$

$C_5 = 13.8 \cdot kips$ $C_{11} = 3.9 \cdot kips$

$C_6 = 14.3 \cdot kips$ $C_{12} = 0.3 \cdot kips$

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 26.5 \cdot ksi$$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 44.2 \cdot \%$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition2 = "Ok"

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

Subject:		Anchor Bolt and Baseplate Analysis
Location:		180-ft EEI Monopole Colchester, CT
Rev. 1: 11/30/11		Prepared by: T.J.L. Checked by: C.F.C. Job No. 11074.CO23

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2576·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 23·kips	(Input From RisaTower)
Axial Force =	Axial := 38·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 16	(User Input)
Diameter of Bolt Circle =	D_{bc} := 70.0·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strenght =	F_u := 100·ksi	(User Input)
Bolt Yeild Strenght =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 Mod 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.0·in	(User Input)
Base Plate Diameter =	D_{bp} := 76.0·in	(User Input)
Outer Pole Diameter =	D_{pole} := 60.5·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 35 \cdot in$

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

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

$d_1 = 13.39 \cdot in$ $d_7 = 13.39 \cdot in$

$d_2 = 24.75 \cdot in$ $d_8 = 0.00 \cdot in$

$d_3 = 32.34 \cdot in$ $d_9 = -13.39 \cdot in$

$d_4 = 35.00 \cdot in$ $d_{10} = -24.75 \cdot in$

$d_5 = 32.34 \cdot in$ $d_{11} = -32.34 \cdot in$

$d_6 = 24.75 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 30.3 \cdot in$

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

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

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

$MA_3 = 2.09 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 4.75 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 2.09 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 0.00 \cdot in$ etc

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 36.8 \cdot in$

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

Subject:	Anchor Bolt and Baseplate Analysis
Location:	180-ft EEI Monopole Colchester, CT
Rev. 1: 11/30/11	Prepared by: T.J.L. Checked by: C.F.C. Job No. 11074.CO23

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 9.8 \times 10^3 \cdot in^2$

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

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

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

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

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

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 108 \cdot kips$

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

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

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 55.5 \cdot \%$ Bolts are "upset bolts". Use net area per AISC

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

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.359 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 5.2 \cdot ksi$

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

Check Combined Stress Requirement:

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

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

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

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{l_p} + \frac{Axial}{N} = 112.8 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 34.7 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

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

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 57.9 \cdot \%$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

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

$C_1 = 44.6 \cdot kips$ $C_7 = 44.6 \cdot kips$

$C_2 = 80.4 \cdot kips$ $C_8 = 2.4 \cdot kips$

$C_3 = 104.4 \cdot kips$ $C_9 = -39.9 \cdot kips$

$C_4 = 112.8 \cdot kips$ $C_{10} = -75.7 \cdot kips$

$C_5 = 104.4 \cdot kips$ $C_{11} = -99.6 \cdot kips$

$C_6 = 80.4 \cdot kips$ etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 39.6 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 66.1 \cdot \%$

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

Condition3 = "Ok"

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

Subject:	CAISSON FOUNDATION
Location:	180-ft EEI Monopole Colchester, CT
Rev. 1: 11/30/11	Prepared by: TJL Checked by: C.F.C. Job No. 11074.CO23

Caisson Foundation:

Input Data:

Shear Force =	$S := 23k$	*USER INPUT-FROM RISATower*
Overturning Moment =	$M := 2576ft \cdot k$	*USER INPUT-FROM RISATower*
Applied Axial Load =	$A1 := 38k$	*USER INPUT-FROM RISATower*
Bending Moment =	$Mu := 2696ft \cdot k$	*USER INPUT–FROM LPILE*
Moment Capacity =	$Mn := 8981ft \cdot k$	*USER INPUT–FROM LPILE*
Foundation Diameter =	$d := 8ft$	*USER INPUT*
Overall Length of Caisson =	$L_c := 28.0ft$	*USER INPUT*
Depth From Top of Caisson to Grade =	$L_{pag} := 1.0ft$	*USER INPUT*
Number of Rebar =	$n := 27$	*USER INPUT*
Area of Rebar =	$Ar := 1.56in^2$	*USER INPUT*
Rebar Yield Strength =	$fy := 60ksi$	*USER INPUT*
Concrete Comp Strength =	$f'c := 4ksi$	*USER INPUT*

Check Foundation Depth:

Depth of Caisson Below Ground Level = $LD := L_c - L_{pag} = 27ft$ (TIA/EIA-222-F 7.2.5)

Depth Required = $$LD1 := 2.0ft + \left(\frac{S \cdot ft^2}{3k \cdot d}\right) + 2ft \cdot .5\left(\frac{M \cdot ft}{3 \cdot k \cdot d} + \frac{S \cdot ft}{2k} + \frac{S^2 ft^3}{18k^2 d^2}\right)^{.5} = 24.8ft$$

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

DepthCheck = "OK"

Note: Result not applicable. Actual soil is better than normal soil as defined in TIA/EIA 222 F. Refer to L-Pile analysis.

Check Moment Capacity:

Factor of Safety = $FS := \frac{Mn}{Mu} = 3.3$

Factor of Safety Required = $FS_{reqd} := 1.3$

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

FOSCheck = "OK"

Check Axial Capacity:

Concrete Weight = $$A2 := .150\frac{k}{ft^3} \cdot LD \cdot \pi \frac{d^2}{4} = 203.6 \cdot kips$$

Total Axial Load = $AT := A1 + A2 = 241.6 \cdot kips$

Area of Concrete = $$Ag := \pi \cdot \frac{d^2}{4} = 50.27ft^2$$

Axial Capacity = $Po := n \cdot Ar \cdot fy + (Ag - n \cdot Ar) \cdot 0.85 \cdot f'c = 26994 \cdot kips$

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

AxialCheck = "OK"

LPILE Plus for Windows, Version 5.0 (5.0.39)

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

This program is licensed to:

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Path to file locations: J:\Jobs\1107400.WI\CO23 - Verizon Colchester South - Colchester, CT\Rev (1)\Calcs\MathCad\Foundation\
Name of input data file: Colchester South Caisson Analysis.lpd
Name of output file: Colchester South Caisson Analysis.lpo
Name of plot output file: Colchester South Caisson Analysis.lpp
Name of runtime file: Colchester South Caisson Analysis.lpr

Time and Date of Analysis

Date: November 30, 2011 Time: 16:05:23

Problem Title

Verizon Wireless - Colchester South

Program Options

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

Basic Program Options:

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

Computation Options:
- 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
- Analysis includes computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No additional p-y curves to be computed at user-specified depths

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

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

Pile Structural Properties and Geometry

Pile Length = 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	Pile Diameter	Moment of Inertia	Pile Area	Modulus of Elasticity

	in	in	in**4	Sq.in	lbs/Sq.in
1	0.0000	96.00000000	4169220.	7238.2300	3605000.
2	336.0000	96.00000000	4169220.	7238.2300	3605000.

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 4 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 = 36.000 in
p-y subgrade modulus k for top of soil layer = .000 lbs/in**3
p-y subgrade modulus k for bottom of layer = .000 lbs/in**3

NOTE: Internal default values for p-y subgrade modulus will be computed for the above soil layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 36.000 in
Distance from top of pile to bottom of layer = 156.000 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

Layer 3 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 156.000 in
Distance from top of pile to bottom of layer = 228.000 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

Layer 4 is sand, p-y criteria by Reese et al., 1974
Distance from top of pile to top of layer = 228.000 in
Distance from top of pile to bottom of layer = 372.000 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 36.00 in below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 8 points

Point No.	Depth X in	Eff. Unit Weight lbs/in**3
1	12.00	.05200
2	36.00	.05200
3	36.00	.07200
4	156.00	.07200
5	156.00	.07500
6	228.00	.07500
7	228.00	.08100
8	372.00	.08100

Shear Strength of Soils

Shear strength parameters with depth defined using 8 points

Point No.	Depth X in	Cohesion c lbs/in**2	Angle of Friction Deg.	E50 or k_rm	RQD %
1	12.000	.00000	1.00	------	------
2	36.000	.00000	1.00	------	------
3	36.000	.00000	33.00	------	------
4	156.000	.00000	33.00	------	------
5	156.000	.00000	35.00	------	------
6	228.000	.00000	35.00	------	------
7	228.000	.00000	35.00	------	------
8	372.000	.00000	35.00	------	------

Notes:

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

Loading Type

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

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load Case Number 1

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Shear force at pile head = 23000.000 lbs
Bending moment at pile head = 30912000.000 in-lbs
Axial load at pile head = 38000.000 lbs

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

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Number of sections = 1

Pile Section No. 1

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

Outside Diameter = 96.0000 in

Material Properties:

Compressive Strength of Concrete	=	4.000 kip/in**2
Yield Stress of Reinforcement	=	60. kip/in**2
Modulus of Elasticity of Reinforcement	=	29000. kip/in**2
Number of Reinforcing Bars	=	27
Area of Single Bar	=	1.56000 in**2
Number of Rows of Reinforcing Bars	=	27
Area of Steel	=	42.120 in**2
Area of Shaft	=	7238.229 in**2
Percentage of Steel Reinforcement	=	.582 percent
Cover Thickness (edge to bar center)	=	4.000 in

Unfactored Axial Squash Load Capacity = 26993.97 kip

Distribution and Area of Steel Reinforcement

Row Number	Area of Reinforcement in**2	Distance to Centroidal Axis in
1	1.560	43.926
2	1.560	43.332
3	1.560	42.152
4	1.560	40.402
5	1.560	38.105
6	1.560	35.293
7	1.560	32.004
8	1.560	28.283
9	1.560	24.178
10	1.560	19.747
11	1.560	15.049
12	1.560	10.147
13	1.560	5.108
14	1.560	0.000
15	1.560	-5.108
16	1.560	-10.147
17	1.560	-15.049

18	1.560	-19.747
19	1.560	-24.178
20	1.560	-28.283
21	1.560	-32.004
22	1.560	-35.293
23	1.560	-38.105
24	1.560	-40.402
25	1.560	-42.152
26	1.560	-43.332
27	1.560	-43.926

Axial Thrust Force = 38000.00 lbs

Bending Moment in-lbs	Bending Stiffness lb-in2	Bending Curvature rad/in	Maximum Strain in/in	Neutral Axis Position inches	Max. Concrete Stress psi	Max. Steel Stress psi
10187797.	1.630047E+13	6.250000E-07	.00003150	50.40294886	111.80729	839.70420
20272501.	1.621800E+13	.00000125	.00006163	49.30608702	216.92277	1639.64717
30253123.	1.613500E+13	.00000188	.00009174	48.92915869	320.25733	2438.97527
40130106.	1.605204E+13	.00000250	.00012185	48.74056864	421.88571	3238.29425
40130106.	1.284163E+13	.00000313	.00007166	22.92985296	246.84263	6252.73586
40130106.	1.070136E+13	.00000375	.00008472	22.59124804	290.68071	7540.10631
40130106.	9.172596E+12	.00000438	.00009800	22.40000010	334.97651	8821.05528
40130106.	8.026021E+12	.00000500	.00011114	22.22825289	378.46926	10106.10938
40130106.	7.134241E+12	.00000563	.00012421	22.08214903	421.41146	11393.20625
40130106.	6.420817E+12	.00000625	.00013730	21.96783686	464.10063	12679.83713
40130106.	5.837106E+12	.00000688	.00015040	21.87666178	506.53594	13965.99888
40130106.	5.350681E+12	.00000750	.00016352	21.80285311	548.71655	15251.68852
40130106.	4.939090E+12	.00000813	.00017666	21.74241686	590.64163	16536.90286
40130106.	4.586298E+12	.00000875	.00018981	21.69249773	632.31026	17821.63929
40130106.	4.280545E+12	.00000938	.00020298	21.65100718	673.72168	19105.89377
40130106.	4.013011E+12	.00001000	.00021616	21.61637735	714.87506	20389.66267
40130106.	3.776951E+12	.00001063	.00022937	21.58740664	755.76948	21672.94319
40130106.	3.567121E+12	.00001125	.00024259	21.56315947	796.40397	22955.73284
40130106.	3.379377E+12	.00001188	.00025582	21.54290628	836.77786	24238.02602
40130106.	3.210408E+12	.00001250	.00026908	21.52605200	876.89006	25519.82128
40130106.	3.057532E+12	.00001313	.00028235	21.51212168	916.73971	26801.11457
40130106.	2.918553E+12	.00001375	.00029563	21.50072622	956.32594	28081.90206
40130106.	2.791660E+12	.00001438	.00030894	21.49154520	995.64788	29362.17949
40130106.	2.675340E+12	.00001500	.00032226	21.48430681	1034.70446	30641.94469
40799462.	2.611166E+12	.00001563	.00033561	21.47878504	1073.49469	31921.19444
42368713.	2.607305E+12	.00001625	.00034897	21.47479677	1112.01796	33199.92168
43936356.	2.603636E+12	.00001688	.00036234	21.47217321	1150.27299	34478.12565
45502385.	2.600136E+12	.00001750	.00037574	21.47077703	1188.25889	35755.80183
47066790.	2.596788E+12	.00001813	.00038915	21.47048807	1225.97465	37032.94664
48629562.	2.593577E+12	.00001875	.00040259	21.47120333	1263.41930	38309.55588
50190704.	2.590488E+12	.00001938	.00041604	21.47283697	1300.59208	39585.62317
51750187.	2.587509E+12	.00002000	.00042951	21.47530317	1337.49160	40861.14836
53308011.	2.584631E+12	.00002063	.00044299	21.47853613	1374.11700	42136.12553
54864159.	2.581843E+12	.00002125	.00045650	21.48247290	1410.46714	43410.55179
56418636.	2.579138E+12	.00002188	.00047003	21.48706484	1446.54128	44684.41971
57971422.	2.576508E+12	.00002250	.00048358	21.49226046	1482.33815	45957.72728
59522497.	2.573946E+12	.00002313	.00049714	21.49801397	1517.85647	47230.47236
61071869.	2.571447E+12	.00002375	.00051073	21.50429392	1553.09557	48502.64630
62619520.	2.569006E+12	.00002438	.00052433	21.51106310	1588.05415	49774.24676
65709616.	2.564278E+12	.00002563	.00055160	21.52595186	1657.12545	52315.70803
68792691.	2.559728E+12	.00002688	.00057895	21.54246855	1725.06124	54854.82109
71868662.	2.555330E+12	.00002813	.00060639	21.56044436	1791.85244	57391.54660
74937440.	2.551062E+12	.00002938	.00063390	21.57973909	1857.48969	59925.84530
77406753.	2.527567E+12	.00003063	.00065971	21.54171324	1917.66284	60000.00000
79420616.	2.491627E+12	.00003188	.00068419	21.46478605	1973.49580	60000.00000
81132681.	2.449288E+12	.00003313	.00070775	21.36606073	2026.14403	60000.00000
82627107.	2.403698E+12	.00003438	.00073063	21.25465822	2076.25393	60000.00000
83986208.	2.357508E+12	.00003563	.00075308	21.13916159	2124.48787	60000.00000
85201053.	2.310537E+12	.00003688	.00077506	21.01869535	2170.79481	60000.00000
86298414.	2.263565E+12	.00003813	.00079664	20.89549398	2215.37540	60000.00000
87056334.	2.210955E+12	.00003938	.00081900	20.79999876	2260.78127	60000.00000
88310732.	2.173803E+12	.00004063	.00084217	20.73045015	2306.98168	60000.00000
89130776.	2.128496E+12	.00004188	.00086228	20.59169912	2346.01542	60000.00000
89948683.	2.085767E+12	.00004313	.00088242	20.46181154	2384.40973	60000.00000
90681242.	2.043521E+12	.00004438	.00090216	20.33038759	2421.32527	60000.00000
91340567.	2.001985E+12	.00004563	.00092157	20.19883776	2456.91724	60000.00000
91997991.	1.962624E+12	.00004688	.00094102	20.07498693	2491.91014	60000.00000
92642981.	1.925049E+12	.00004813	.00096043	19.95699263	2526.19029	60000.00000
93165947.	1.886905E+12	.00004938	.00097919	19.83169413	2558.62524	60000.00000
93687240.	1.850612E+12	.00005063	.00099798	19.71316481	2590.49903	60000.00000
94206860.	1.816036E+12	.00005188	.00101680	19.60092115	2621.80911	60000.00000
94724790.	1.783055E+12	.00005313	.00103565	19.49452257	2652.55269	60000.00000
95164488.	1.750151E+12	.00005438	.00105403	19.38449621	2681.90265	60000.00000
95571576.	1.718141E+12	.00005563	.00107225	19.27631521	2710.38242	60000.00000
96156989.	1.690672E+12	.00005688	.00109200	19.20000029	2740.75740	60000.00000
96466240.	1.659634E+12	.00005813	.00111435	19.17163610	2774.50464	60000.00000
96858181.	1.631296E+12	.00005938	.00113200	19.06520605	2800.19858	60000.00000
97246883.	1.604072E+12	.00006063	.00114965	18.96335649	2825.37104	60000.00000
97547633.	1.576527E+12	.00006188	.00116661	18.85437727	2848.98577	60000.00000
97847199.	1.550055E+12	.00006313	.00118360	18.75010443	2872.14034	60000.00000

98145593.	1.524592E+12	.00006438	.00120061	18.65026903	2894.83293	60000.00000
98442785.	1.500081E+12	.00006563	.00121765	18.55461645	2917.06111	60000.00000
98738789.	1.476468E+12	.00006688	.00123471	18.46291780	2938.82305	60000.00000
99033603.	1.453704E+12	.00006813	.00125179	18.37495852	2960.11667	60000.00000
99327175.	1.431743E+12	.00006938	.00126891	18.29053259	2980.93922	60000.00000
99563544.	1.409749E+12	.00007063	.00128550	18.20171213	3000.60728	60000.00000
99786208.	1.388330E+12	.00007188	.00130199	18.11459398	3019.68137	60000.00000
1.000078E+08	1.367628E+12	.00007313	.00131850	18.03078032	3038.31707	60000.00000
1.002284E+08	1.347608E+12	.00007438	.00133504	17.95010233	3056.51203	60000.00000
1.006662E+08	1.309479E+12	.00007688	.00136819	17.79755545	3091.57228	60000.00000
1.010997E+08	1.273697E+12	.00007938	.00140143	17.65583467	3124.84556	60000.00000
1.012966E+08	1.237210E+12	.00008188	.00144100	17.59999895	3162.33870	60000.00000
1.019453E+08	1.208241E+12	.00008438	.00147562	17.48886538	3192.67006	60000.00000
1.022431E+08	1.176898E+12	.00008688	.00150630	17.33870459	3217.62304	60000.00000
1.025374E+08	1.147272E+12	.00008938	.00153706	17.19791651	3241.04497	60000.00000
1.028283E+08	1.119219E+12	.00009188	.00156792	17.06574583	3262.92191	60000.00000
1.031157E+08	1.092616E+12	.00009438	.00159886	16.94151735	3283.23971	60000.00000
1.033995E+08	1.067350E+12	.00009688	.00162989	16.82463026	3301.98422	60000.00000
1.036422E+08	1.042941E+12	.00009938	.00166037	16.70816374	3318.78498	60000.00000
1.038439E+08	1.019327E+12	.00010188	.00169031	16.59199762	3333.72757	60000.00000
1.040424E+08	9.968139E+11	.00010438	.00172033	16.48221159	3347.19093	60000.00000
1.042378E+08	9.753243E+11	.00010688	.00175044	16.37836504	3359.16145	60000.00000
1.044298E+08	9.547871E+11	.00010938	.00178063	16.28005457	3369.62520	60000.00000
1.046186E+08	9.351386E+11	.00011188	.00181091	16.18692541	3378.56852	60000.00000
1.048041E+08	9.163200E+11	.00011438	.00184128	16.09864283	3385.97700	60000.00000
1.049862E+08	8.982777E+11	.00011688	.00187174	16.01490641	3391.83619	60000.00000
1.057681E+08	8.860156E+11	.00011938	.00191000	16.00000048	3397.01895	60000.00000
1.066627E+08	8.751810E+11	.00012188	.00195000	16.00000048	3399.70675	60000.00000
1.066627E+08	8.575894E+11	.00012438	.00197891	15.91083670	3397.47898	60000.00000
1.066627E+08	8.406911E+11	.00012688	.00200682	15.81732702	3390.63195	60000.00000
1.066627E+08	8.244459E+11	.00012938	.00203482	15.72807169	3383.76304	60000.00000
1.066627E+08	8.088166E+11	.00013188	.00206290	15.64283609	3385.17571	60000.00000
1.066627E+08	7.937688E+11	.00013438	.00209106	15.56140566	3390.02043	60000.00000
1.066627E+08	7.792707E+11	.00013688	.00211932	15.48358011	3393.92295	60000.00000
1.066627E+08	7.652928E+11	.00013938	.00214765	15.40917635	3396.87224	60000.00000
1.066627E+08	7.518075E+11	.00014188	.00217608	15.33801985	3398.85691	60000.00000
1.066627E+08	7.387891E+11	.00014438	.00220460	15.26995039	3399.86539	60000.00000
1.066627E+08	7.262140E+11	.00014688	.00223329	15.20537138	3397.11471	60000.00000
1.066627E+08	7.140598E+11	.00014938	.00226214	15.14402533	3391.07707	60000.00000
1.066627E+08	7.023057E+11	.00015188	.00229106	15.08513689	3385.02186	60000.00000
1.066627E+08	6.909324E+11	.00015438	.00232004	15.02858591	3378.94910	60000.00000
1.067270E+08	6.803313E+11	.00015688	.00234868	14.97166872	3378.50156	60000.00000
1.067786E+08	6.699832E+11	.00015938	.00237659	14.91194773	3383.36907	60000.00000
1.068296E+08	6.599515E+11	.00016188	.00240456	14.85445261	3387.62620	60000.00000
1.068802E+08	6.502217E+11	.00016438	.00243260	14.79908609	3391.26661	60000.00000
1.069302E+08	6.407805E+11	.00016688	.00246070	14.74575949	3394.28390	60000.00000
1.069798E+08	6.316150E+11	.00016938	.00248886	14.69438696	3396.67144	60000.00000
1.070288E+08	6.227128E+11	.00017188	.00251709	14.64488268	3398.42240	60000.00000
1.070772E+08	6.140629E+11	.00017438	.00254538	14.59717512	3399.53003	60000.00000
1.071707E+08	5.974671E+11	.00017938	.00260232	14.50770235	3396.04981	60000.00000
1.072601E+08	5.817495E+11	.00018438	.00265968	14.42538500	3386.17782	60000.00000
1.072601E+08	5.663898E+11	.00018938	.00272700	14.39999914	3373.67456	60000.00000
1.072601E+08	5.518203E+11	.00019438	.00279900	14.39999914	3375.30202	60000.00000
1.074675E+08	5.390220E+11	.00019938	.00287100	14.39999914	3387.05715	60000.00000
1.076922E+08	5.269344E+11	.00020438	.00293142	14.34335089	3393.30972	60000.00000
1.077539E+08	5.146453E+11	.00020938	.00298824	14.27221441	3397.15149	60000.00000
1.078144E+08	5.029241E+11	.00021438	.00304529	14.20542955	3399.38845	60000.00000
1.078405E+08	4.915804E+11	.00021938	.00310032	14.13250780	3399.48486	60000.00000
1.078511E+08	4.806735E+11	.00022438	.00315694	14.06990576	3391.92358	60000.00000
1.078614E+08	4.702403E+11	.00022938	.00321367	14.01054239	3384.33143	60000.00000
1.078712E+08	4.602506E+11	.00023438	.00327052	13.95422029	3376.70778	60000.00000
1.078807E+08	4.506765E+11	.00023938	.00332749	13.90075922	3369.05200	60000.00000
1.078897E+08	4.414926E+11	.00024438	.00338459	13.84999609	3361.36327	60000.00000
1.078984E+08	4.326752E+11	.00024938	.00344182	13.80177641	3353.64107	60000.00000
1.079065E+08	4.242026E+11	.00025438	.00349917	13.75595999	3360.24407	60000.00000
1.079143E+08	4.160551E+11	.00025938	.00355666	13.71242380	3368.24491	60000.00000
1.079216E+08	4.082140E+11	.00026438	.00361428	13.67104483	3375.38955	60000.00000
1.079216E+08	4.006369E+11	.00026938	.00367368	13.63778257	3382.09576	60000.00000
1.079216E+08	3.933360E+11	.00027438	.00373331	13.60658598	3387.78857	60000.00000
1.079216E+08	3.862964E+11	.00027938	.00379312	13.57717466	3392.42757	60000.00000
1.079216E+08	3.795044E+11	.00028438	.00385313	13.54948282	3395.98781	60000.00000

Unfactored (Nominal) Moment Capacity at Concrete Strain of 0.003 = 107766.31998 in-kip

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

Pile-head boundary conditions are Shear and Moment (BC Type 1)
Specified shear force at pile head = 23000.000 lbs
Specified moment at pile head = 30912000.000 in-lbs
Specified axial load at pile head = 38000.000 lbs

Non-zero moment for this load case indicates the pile-head may rotate under

the applied pile-head loading, but is not a free-head (zero moment)condition.

Depth X 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	Es*h F/L
0.000	.472093	3.09E+07	23000.	-.002215	361.138	1.61E+13	0.000	0.000
26.880	.413262	3.15E+07	22941.	-.002163	368.278	1.61E+13	-7.663	62.307
53.760	.355844	3.21E+07	18430.	-.002109	375.089	1.61E+13	-508.740	4803.700
80.640	.299865	3.23E+07	-5764.143	-.002056	377.581	1.61E+13	-1214.603	13610.
107.520	.245332	3.17E+07	-43986.	-.002002	370.173	1.61E+13	-1587.228	21738.
134.400	.192216	2.99E+07	-88825.	-.001951	349.733	1.61E+13	-1708.594	29867.
161.280	.140436	2.69E+07	-1.33E+05	-.001903	315.261	1.62E+13	-1461.490	34967.
188.160	.089856	2.29E+07	-1.69E+05	-.001862	268.388	1.62E+13	-1152.490	43095.
215.040	.040292	1.80E+07	-1.93E+05	-.001828	212.084	1.62E+13	-614.267	51224.
241.920	-.008472	1.26E+07	-2.00E+05	-.001802	150.827	1.63E+13	147.609	58539.
268.800	-.056675	7.44E+06	-1.83E+05	-.001786	90.946	1.63E+13	1124.519	66667.
295.680	-.104545	3.07E+06	-1.37E+05	-.001777	40.574	1.63E+13	2327.242	74796.
322.560	-.152273	3.88E+05	-55835.	-.001775	9.716	1.63E+13	3758.071	82924.

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 = .47209306 in
Computed slope at pile head = -.00221460
Maximum bending moment = 32352491. lbs-in
Maximum shear force = -199926.22127 lbs
Depth of maximum bending moment = 77.28000000 in
Depth of maximum shear force = 238.56000 in
Number of iterations = 5
Number of zero deflection points = 1

Summary of Pile Response(s)

Definition of Symbols for Pile-Head Loading Conditions:

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

Load Type	Pile-Head Condition 1	Pile-Head Condition 2	Axial Load lbs	Pile-Head Deflection in	Maximum Moment in-lbs	Maximum Shear lbs
1	V= 23000.	M= 3.09E+07	38000.0000	.4720931	3.2352E+07	-199926.

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

Top y in	Shear React. lbs	Mom. React. in-lbs	K22 lbs/in	K32 in-lbs/in
.00112060	2300.00003	477046.32710	2052477.	4.257073E+08
.00337333	6923.68990	1436053.	2052477.	4.257073E+08
.00534661	10973.78886	2276089.	2052477.	4.257073E+08
.00674667	13847.37980	2872105.	2052477.	4.257073E+08
.00783459	16076.31010	3335136.	2051966.	4.256939E+08
.00872409	17897.47876	3713690.	2051501.	4.256822E+08
.00947619	19437.25492	4033767.	2051167.	4.256738E+08
.01012772	20771.06970	4311040.	2050913.	4.256674E+08
.01070242	21947.57772	4555618.	2050711.	4.256623E+08
.01121653	23000.00000	4774406.	2050546.	4.256581E+08

Top Rota. rad	Shear React. lbs	Mom. React. in-lbs	K23 lbs/rad	K33 in-lbs/rad
.00002951	12560.90566	3091200.	4.257073E+08	1.047652E+11

.00008882	37812.09320	9305439.	4.257073E+08	1.047652E+11
.00014088	59931.63536	14748772.	4.254178E+08	1.046925E+11
.00017789	75627.63907	18610878.	4.251271E+08	1.046177E+11
.00020663	87803.27694	21606561.	4.249299E+08	1.045664E+11
.00023015	97751.84085	24054211.	4.247356E+08	1.045165E+11
.00025005	106163.18585	26123671.	4.245623E+08	1.044724E+11
.00026731	113449.28956	27916318.	4.244142E+08	1.044351E+11
.00028253	119876.31735	29497544.	4.242891E+08	1.044033E+11
.00029616	125625.39978	30912000.	4.241796E+08	1.043757E+11

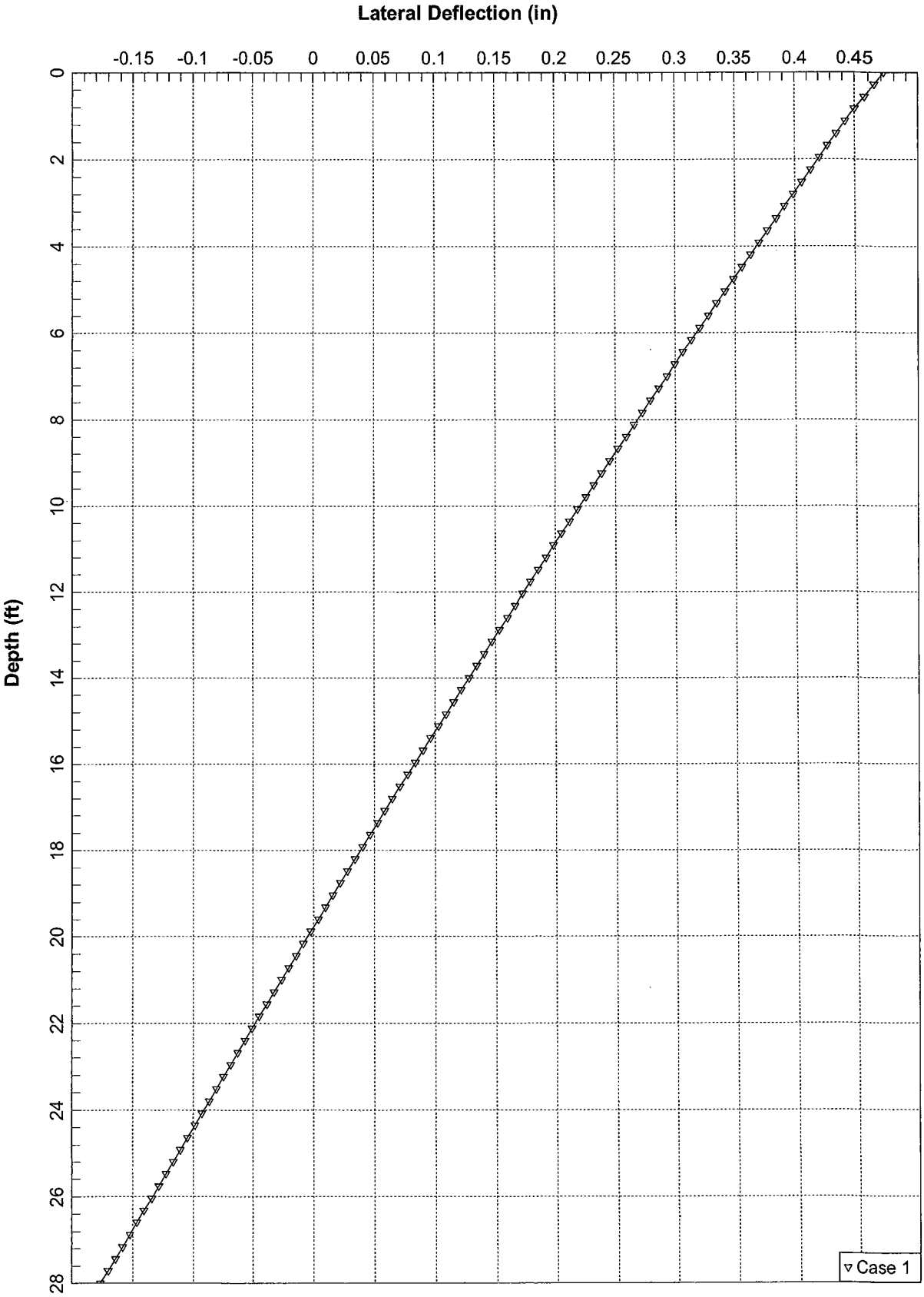
K22 = abs(Shear Reaction/Top y)
K23 = abs(Shear Reaction/Top Rotation)
K32 = abs(Moment Reaction/Top y)
K33 = abs(Moment Reaction/Top Rotation)

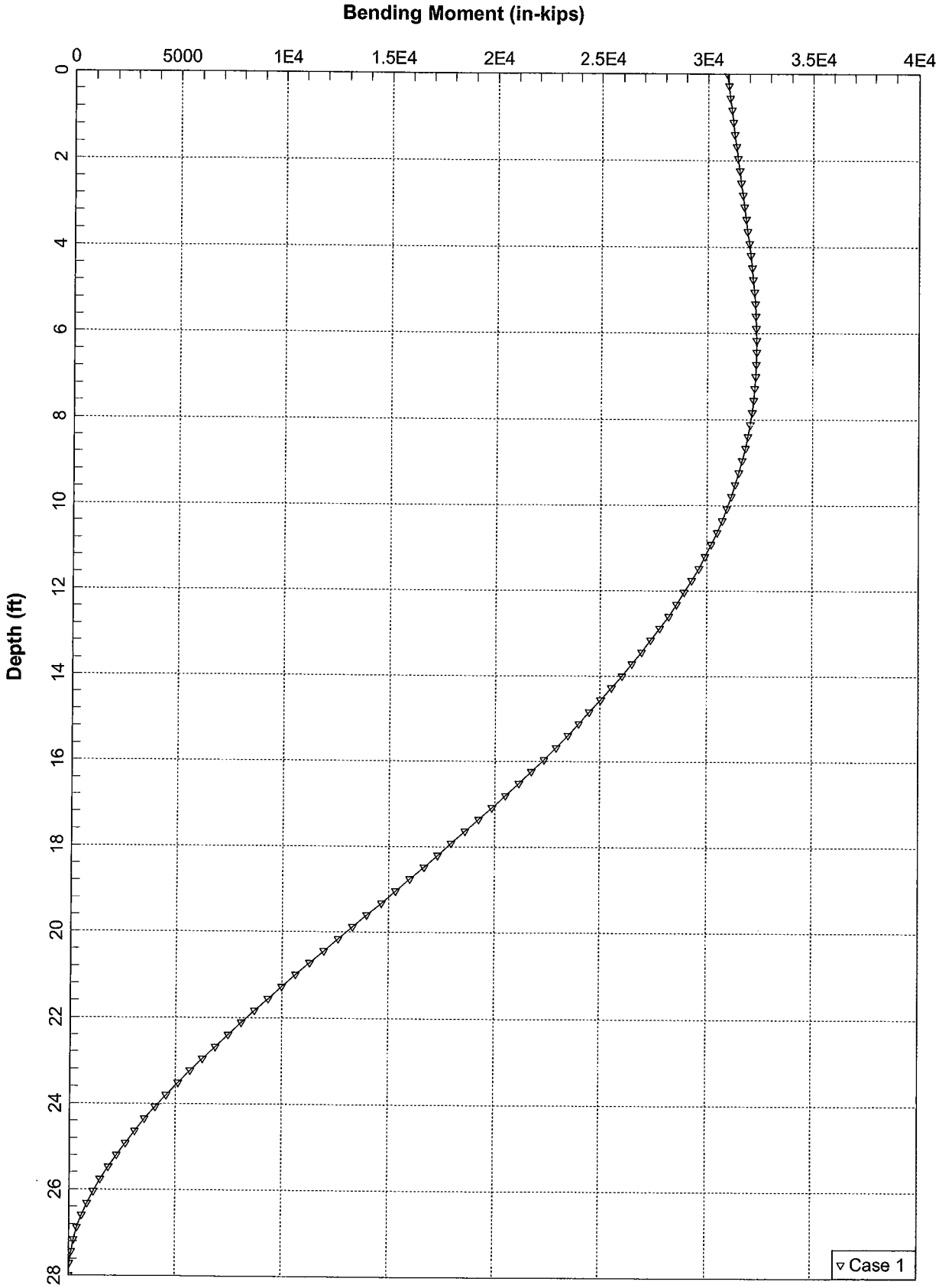
The analysis ended normally.

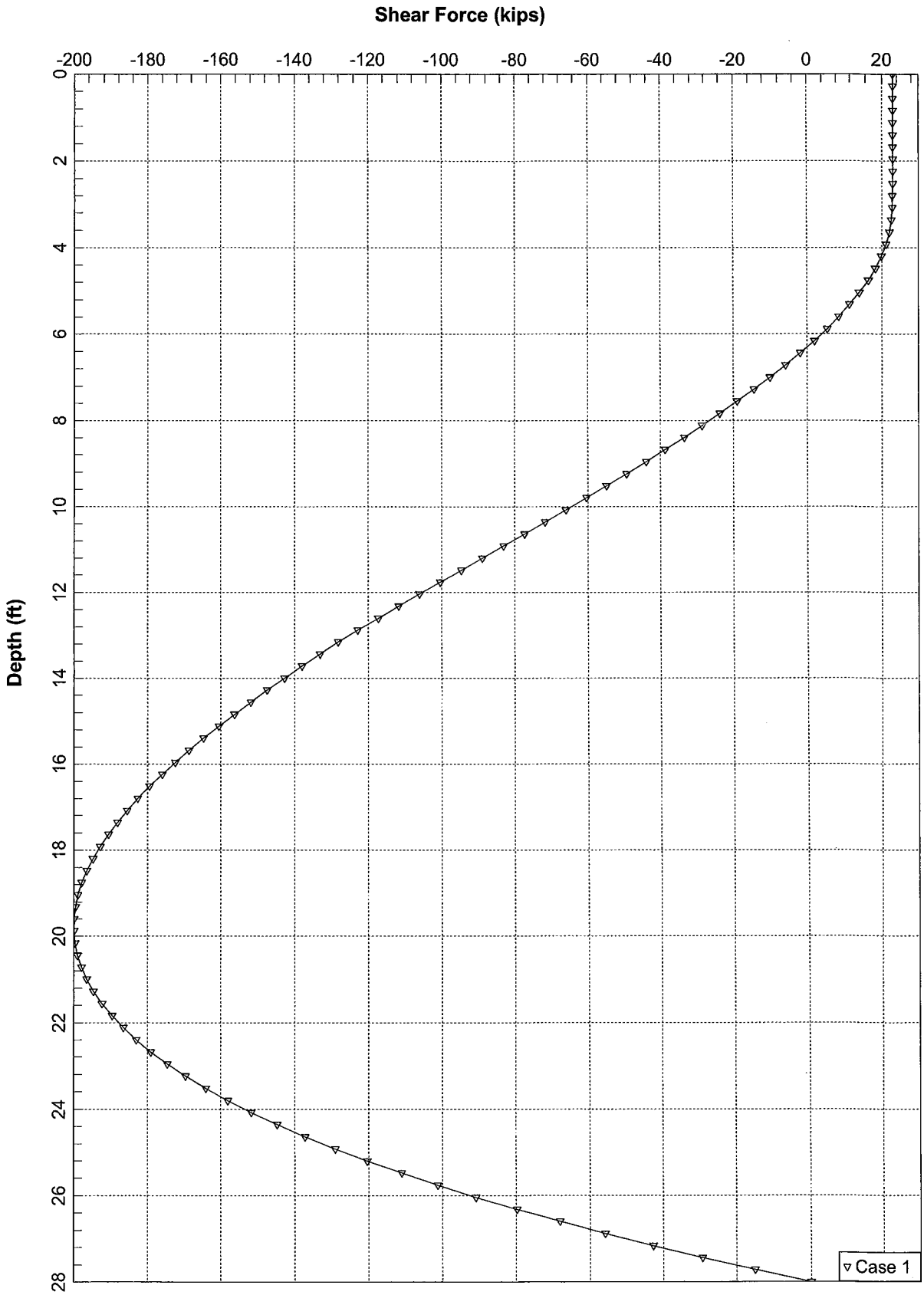
Summary of Warning Messages

**** WARNING ****

An unreasonable value was input for friction angle has been specified for a soil layer defined uisng the sand criteria. The input value is either smaller than 20 degrees or higher than 48 degrees. The input data should be checked for correctness.


Lateral Deflection (in)
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1


Bending Moment (in-kips)
0
5000
1E4
1.5E4
2E4
2.5E4
3E4
3.5E4
4E4
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1


Shear Force (kips)
-200
-180
-160
-140
-120
-100
-80
-60
-40
-20
0
20
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Case 1

SITE NAME	COLCHESTER SOUTH CT	ECP - CELL #	2	34
LATITUDE	41-33-05.88 N	LONGITUDE	72-25-32.86 W	
		SAVE BUTTON		
Additional Comments: LTE antenna add, and adding 6 main lines		STRUCTURE TYPE	MONOPOLE	

700 Mhz - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	BXA-70063-6CF_2	BXA-70063-6CF_2	BXA-70063-6CF_2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	180	180	180
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0	Cellular Modcell 4.0	Cellular Modcell 4.0
ANTENNA TYPE	DB844H90-XY	DB844H90-XY	DB844H90-XY
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	180	180	180
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

850 Celluar - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	Cellular Modcell 4.0	Cellular Modcell 4.0	Cellular Modcell 4.0
ANTENNA TYPE	LPA-80080/4CF	LPA-80080/4CF	LPA-80080/4CF
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	6	4	4
RAD CTR (FT AGL)	180	180	180
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEX WITH LTE CABLE			

1900 PCS - Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0	PCS Modcell 4.0	PCS Modcell 4.0
ANTENNA TYPE	948F85T2E-M_2	948F85T2E-M_2	948F85T2E-M_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	180	180	180
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			

1900 PCS - Future Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0	PCS Modcell 4.0	PCS Modcell 4.0
ANTENNA TYPE	LPA-171080-8CF_2	LPA-171080-8CF_2	LPA-171080-8CF_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	30	150	270
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	180	180	180
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE			

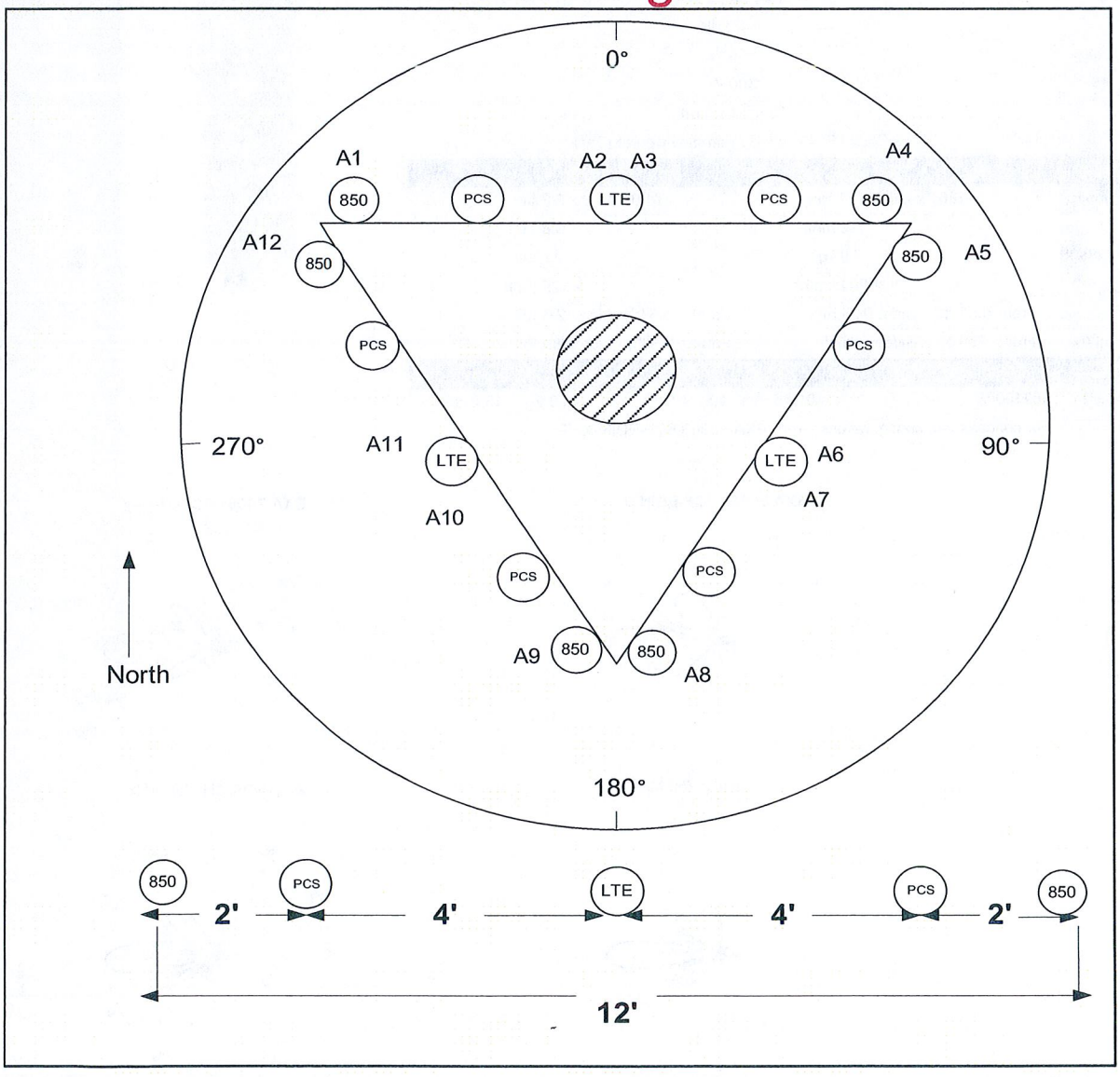
NUMBER OF CABLE'S NEEDED					ESTIMATED CABLE LENGTH			
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES		18	MAINLINE (FT)			
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS		18	TOP JUMPER (FT)			12
Equipment Cable Ordering		MAIN CABLE	12	+ 6	TOP JUMPER #	12	+	6

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F / AWS-Band	700 Mhz C - E	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-21	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-17	RX - 776-787	LTE (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By: Mark Brauer	Steve Weatherbee	MB	10/24/2011

Site Configuration



Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

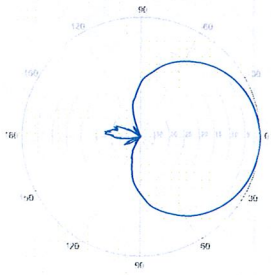
Replace 'X" with desired electrical downtilt

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

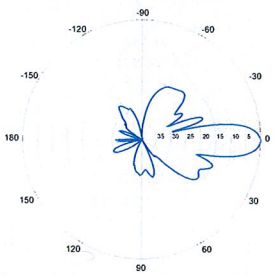
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



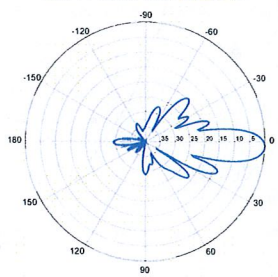
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

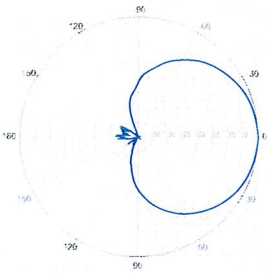


0° | Vertical | 750 MHz

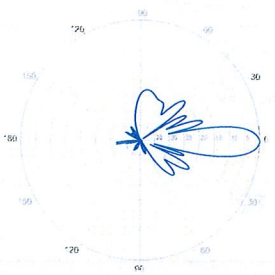
BXA-70063-6CF-EDIN-2



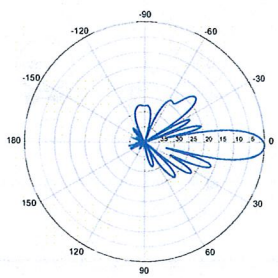
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

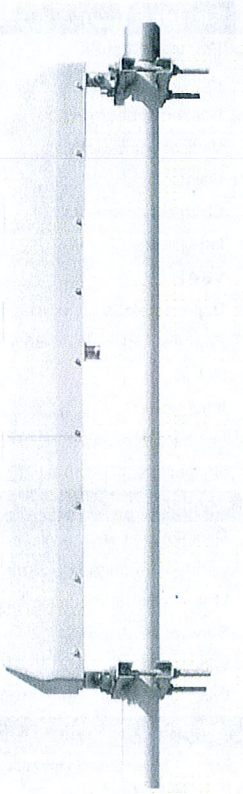
Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product.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

LPA-171080-8CF-EDIN-X

V-Pol | Log Periodic | 80° | 16.0-16.5 dBi

Replace 'X' with desired electrical downtilt.

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

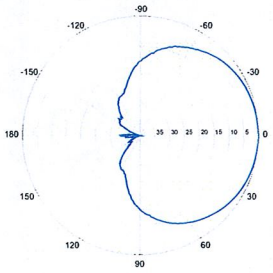


Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	Vertical		
Horizontal beamwidth	78°	80°	77°
Vertical beamwidth	6°	7°	6°
Gain	13.9 dBd (16.0 dBi)	14.4 dBd (16.5 dBi)	13.9 dBd (16.0 dBi)
Electrical downtilt (X)	0, 2		
Impedance	50Ω		
VSWR	≤ 1.5:1		
Null fill	5% (-26.02 dB)		
Input power	250 W		
Lightning protection	Direct Ground		
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)		

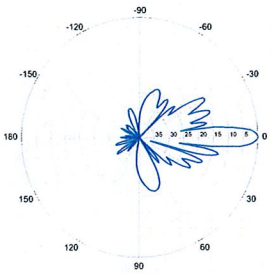
Mechanical Characteristics		
Dimensions Length x Width x Depth	1207 x 105 x 175 mm	47.5 x 4.1 x 6.9 in
Weight without mounting brackets	3.9 kg	8.5 lbs
Survival wind speed	>276 km/hr	>171 mph
Wind area	Front: 0.14 m² Side: 0.22 m²	Front: 1.5 ft² Side: 2.3 ft²
Wind load @ 161 km/hr (100 mph)	Front: 185 N Side: 317 N	Front: 42 lbf Side: 71 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 5.0 lbs
2-Point Mounting and Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	2.3 kg 5.0 lbs

1710-1880 MHz

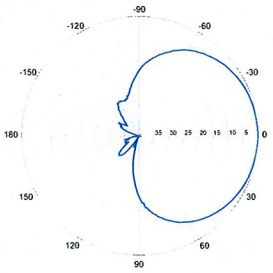


Horizontal

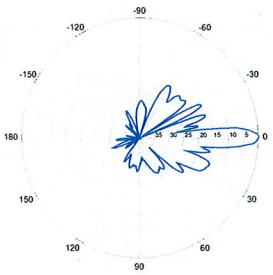


0° | Vertical

1850-1990 MHz

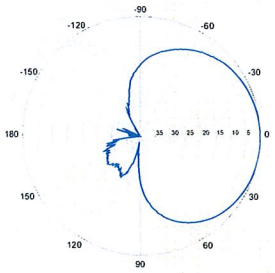


Horizontal

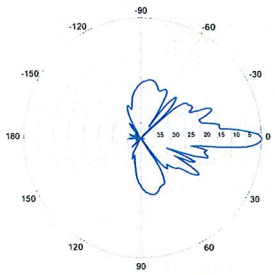


0° | Vertical

1920-2170 MHz



Horizontal



0° | Vertical

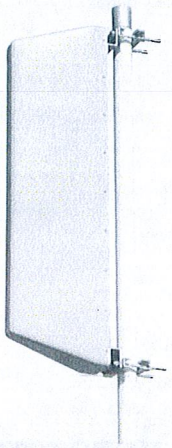
Amphenol ANTENNA SOLUTIONS

LPA-80080-4CF-EDIN-X

V-Pol | Log Periodic | 80° | 12.5 dBd

Replace "X" with desired electrical downtilt.

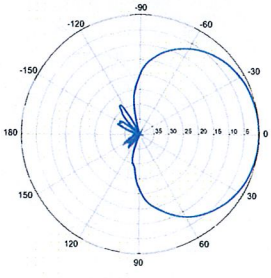
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.



Electrical Characteristics		
Frequency bands	806-960 MHz	
Polarization	Vertical	
Horizontal beamwidth	80°	
Vertical beamwidth	15°	
Gain	12.5 dBd (14.6 dBi)	
Electrical downtilt (X)	0, 2, 4, 5, 6, 8, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.4:1	
Upper sidelobe suppression (0°)	-14.2 dB	
Front-to-back ratio (+/-30°)	-34.7 dB	
Null fill	15% (-16.48 dB)	
Input power	500 W	
Lightning protection	Direct Ground	
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1200 x 140 x 335 mm	47.2 x 5.5 x 13.2 in
Depth of antenna with z-bracket	375 mm	14.8 in
Weight without mounting brackets	5.4 kg	12 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.17 m² Side: 0.40 m²	Front: 1.8 ft² Side: 4.3 ft²
Wind load @ 161 km/hr (100 mph)	Front: 254 N Side: 574 N	Front: 57 lbf Side: 129 lbf

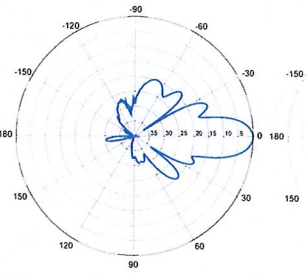
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting & Downtilt Bracket Kit (0-20°)	21699999	50-102 mm 2.0-4.0 in	5.4 kg 12 lbs
Lock-Down Brace	If the lock-down brace is used, the maximum diameter of the mounting pipe is 88.9 mm or 3.5 in.		

LPA-80080-4CF-EDIN-X



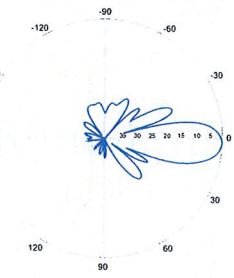
Horizontal

LPA-80080-4CF-EDIN-0



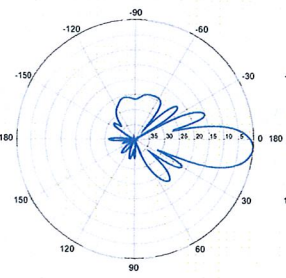
0° | Vertical

LPA-80080-4CF-EDIN-2



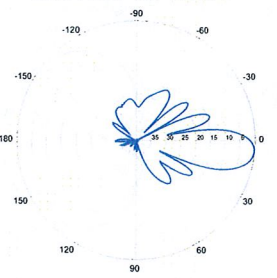
2° | Vertical

LPA-80080-4CF-EDIN-4



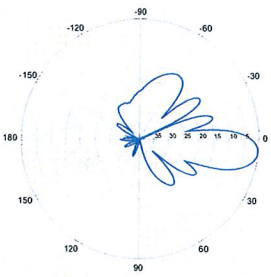
2° | Vertical

LPA-80080-4CF-EDIN-5



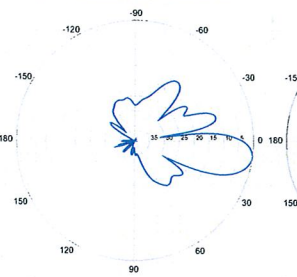
5° | Vertical

LPA-80080-4CF-EDIN-6



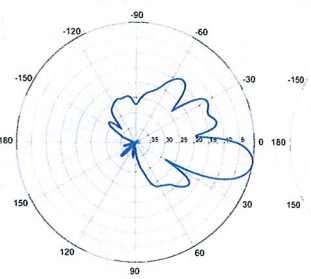
6° | Vertical

LPA-80080-4CF-EDIN-8



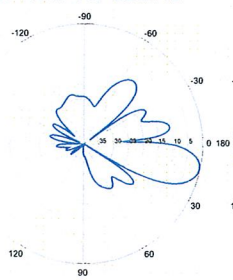
8° | Vertical

LPA-80080-4CF-EDIN-10



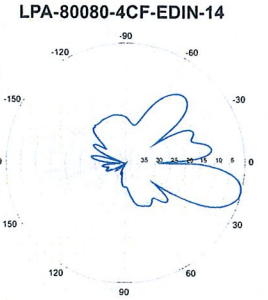
10° | Vertical

LPA-80080-4CF-EDIN-12



12° | Vertical

LPA-80080-4CF-EDIN-14



14° | Vertical

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

JWB Tower Services, LLC
148 Governor Street
New Britain, CT 06053
(800) 819-3084
(860) 256-8175 fax

Monopole Inventory
General Information

Site Name:		Colchester South
Site Number:		
FCC Number:		
Manufacturer ID #		
Street Address:		856 Middletown Road Gate marked #810
City/State/Zip Code:		Colchester, CT
County:		
Lat:	N/S	41° 33' 06"
Long:	E/W	72° 25' 33"
Performed By:		JWB
Date:		9/30/2011

Antenna Information:

CARRIER: Verizon — PIC #: 3

MOUNT

Type:	Lo-pro Plat	Manf.:	EEI				
Elev. C/L:	180'	Bottom:		Top:		Leg:	
Face Width:	14'	Height:	4"	Projection:	N/A	Azimuth/s:	

ANTENNA 1

Type:	Panel	Manf.:	Andrew/Decibel	Model:	DB844H90E-XY		
Elev. C/L:	181'	Bottom:		Top:		Leg:	
Quantity:	6	Dim: (HxWxD)				Azimuth/s:	

ANTENNA 2

Type:	Panel	Manf.:	Andrew/Decibel	Model:	948F85T2E-M		
Elev. C/L:	181'	Bottom:		Top:		Leg:	
Quantity:	6	Dim: (HxWxD)				Azimuth/s:	

TMA'S

Quantity:	N/A	Manf.:		Model:	

COAX

Inside

Quantity:	12	Size:	1 5/8"	Jumper:	1/2"	Color:	N/A

CARRIER: AT&T — PIC #: 4

MOUNT

Type:	Lo-pro Plat	Manf.:	Unknown				
Elev. C/L:	158'	Bottom:		Top:		Leg:	
Face Width:	13'	Height:	4"	Projection:	N/A	Azimuth/s:	

ANTENNA 1

Type:	Panel	Manf.:	Powerwave	Model:	7770		
Elev. C/L:	160'	Bottom:		Top:		Leg:	
Quantity:	6	Dim: (HxWxD)				Azimuth/s:	

ANTENNA 2

Type:	Panel	Manf.:	CSS	Model:	DUO1417-8686		
Elev. C/L:	160'	Bottom:		Top:		Leg:	
Quantity:	3	Dim: (HxWxD)				Azimuth/s:	

TMA'S

Quantity:	6	Manf.:	Powerwave	Model:	LGP21401

Diplexer

Quantity:	6	Manf.:	Powerwave	Model:	LGP21901

Bias T's

Quantity:	3	Manf.:	Kathrein	Model:	78210256

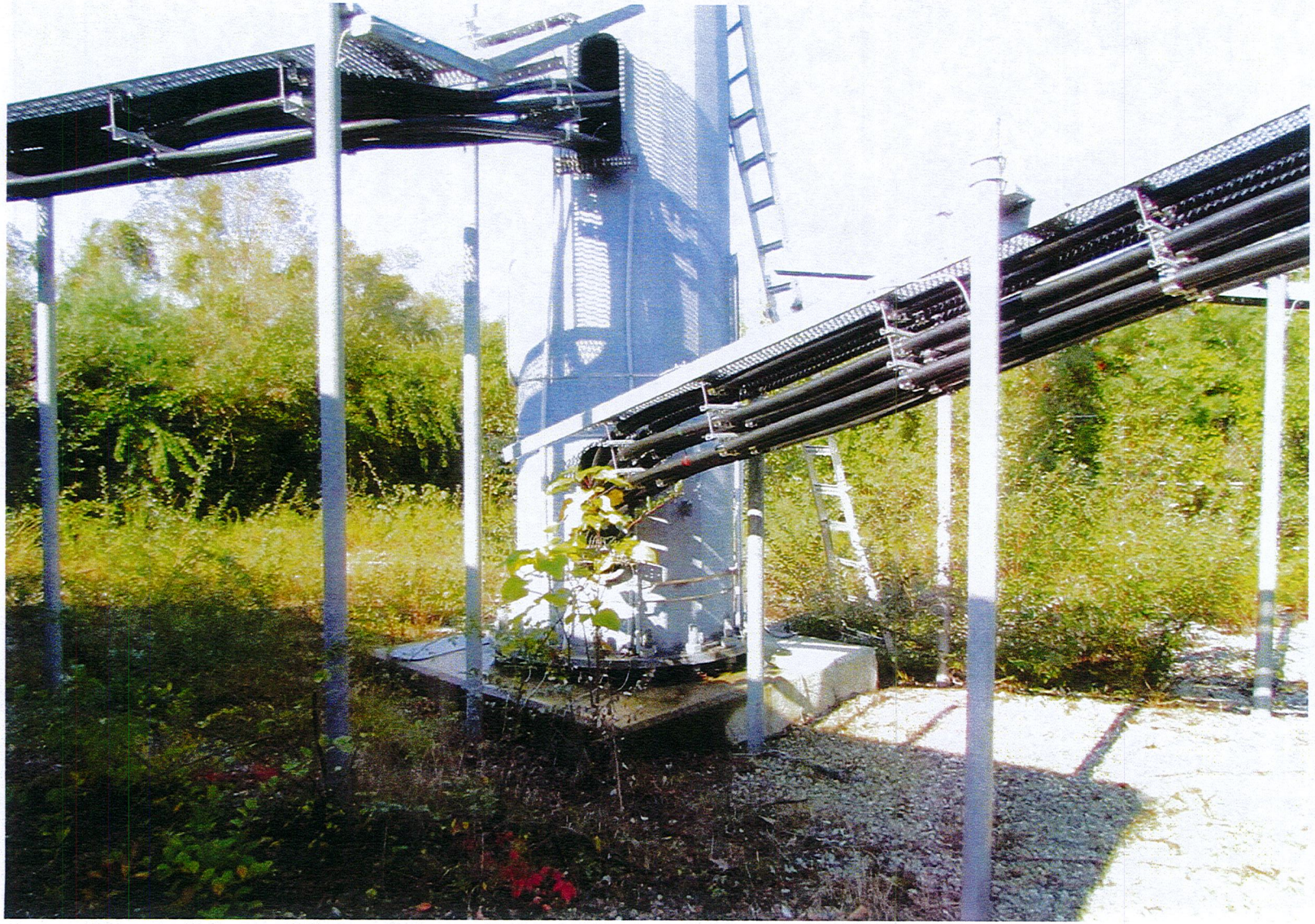
COAX

Inside

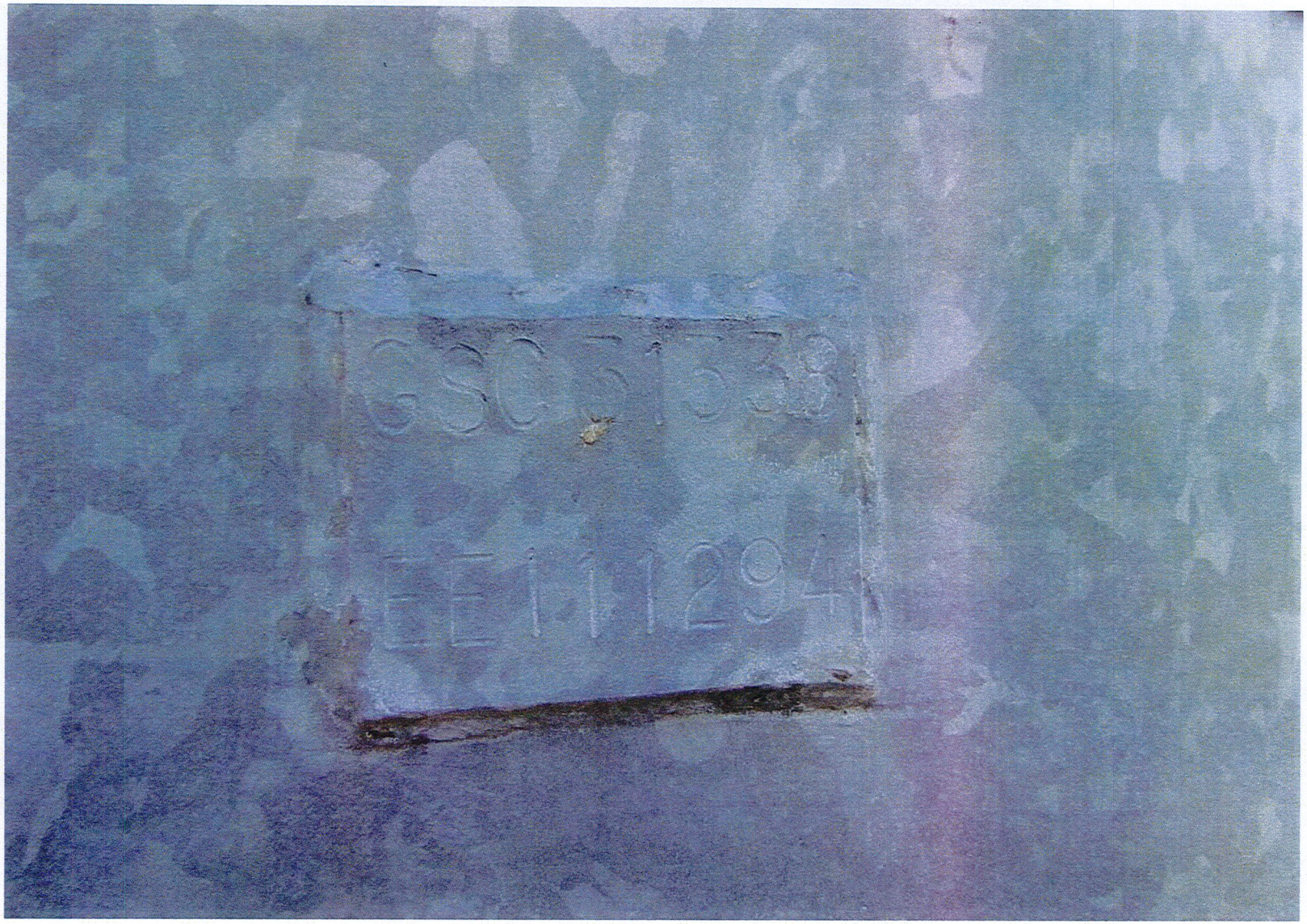
Quantity:	12	Size:	1 5/8"	Jumper:	1/2"	Color:	N/A

1.0 Elevation

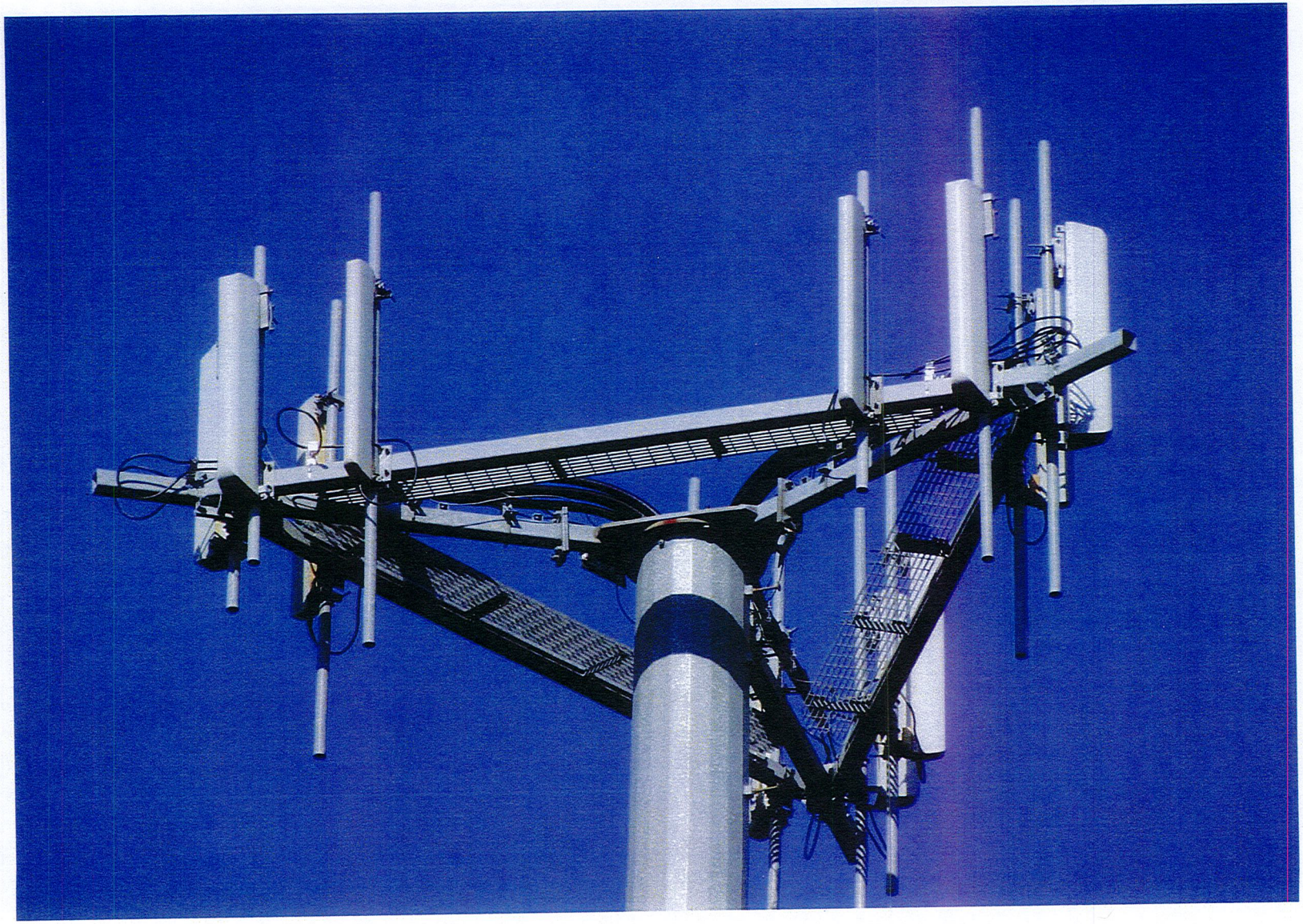
2.1 Base



2.2 Base

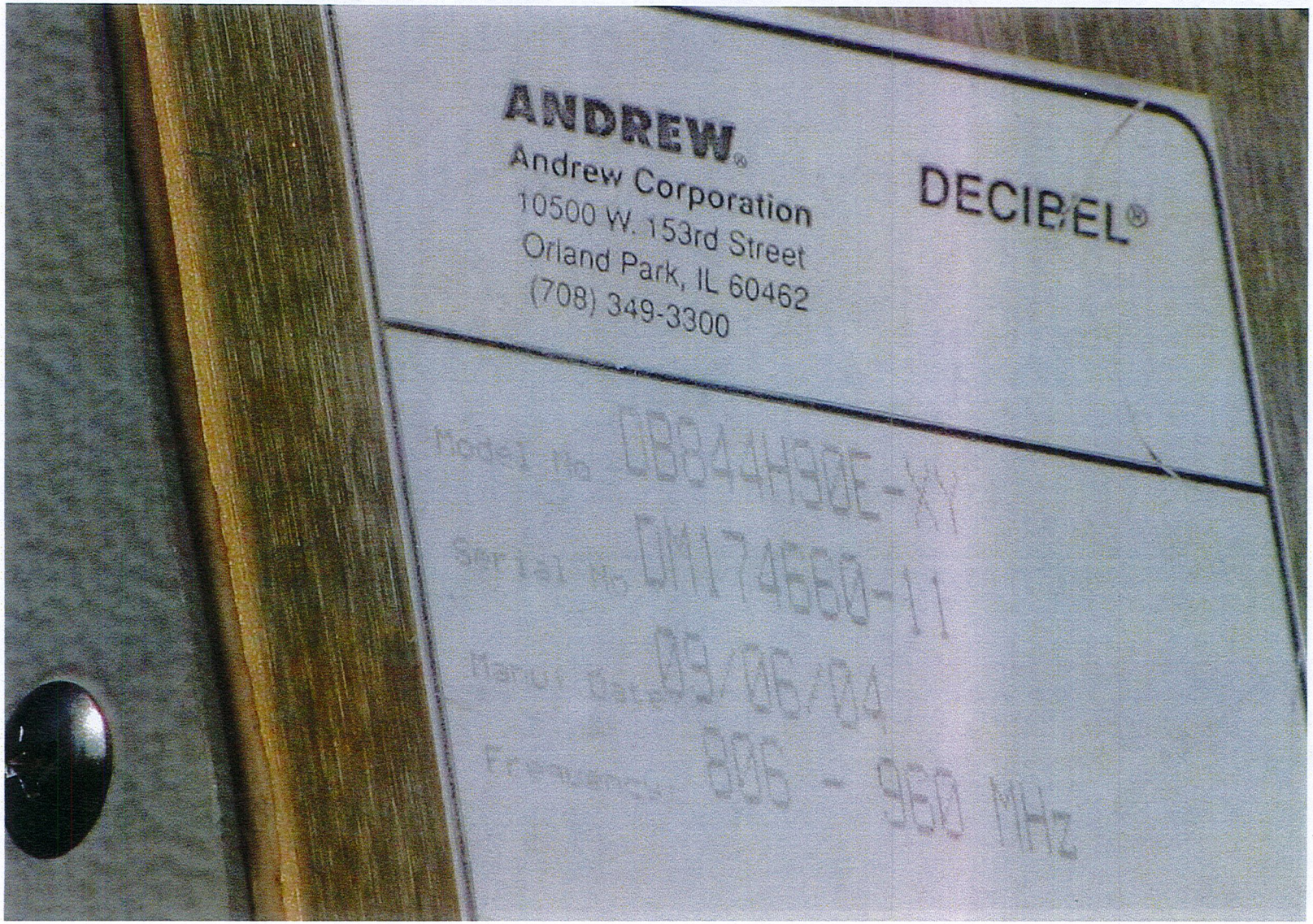


2.3 Base

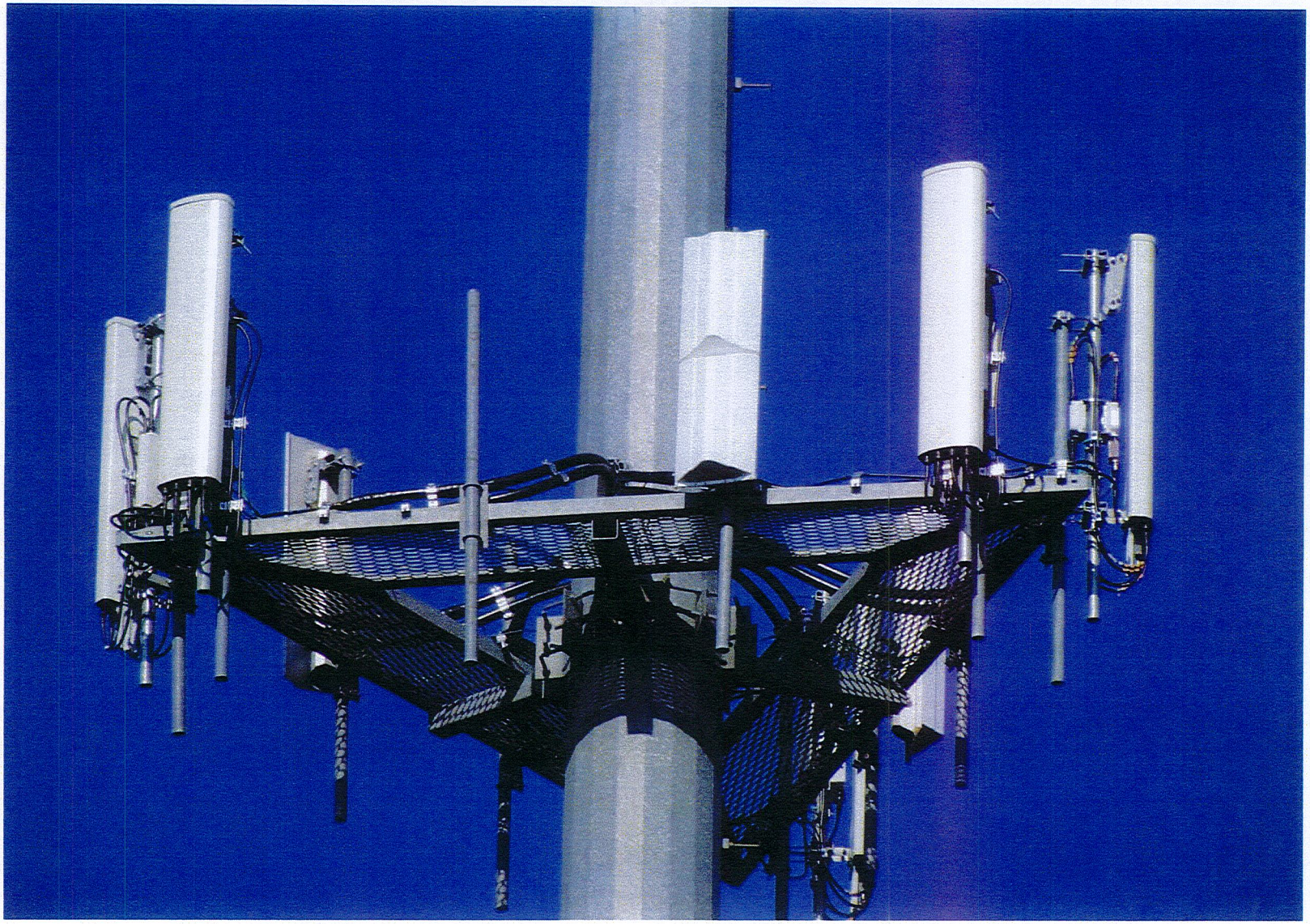


3.1 Verizon

3.2 Verizon

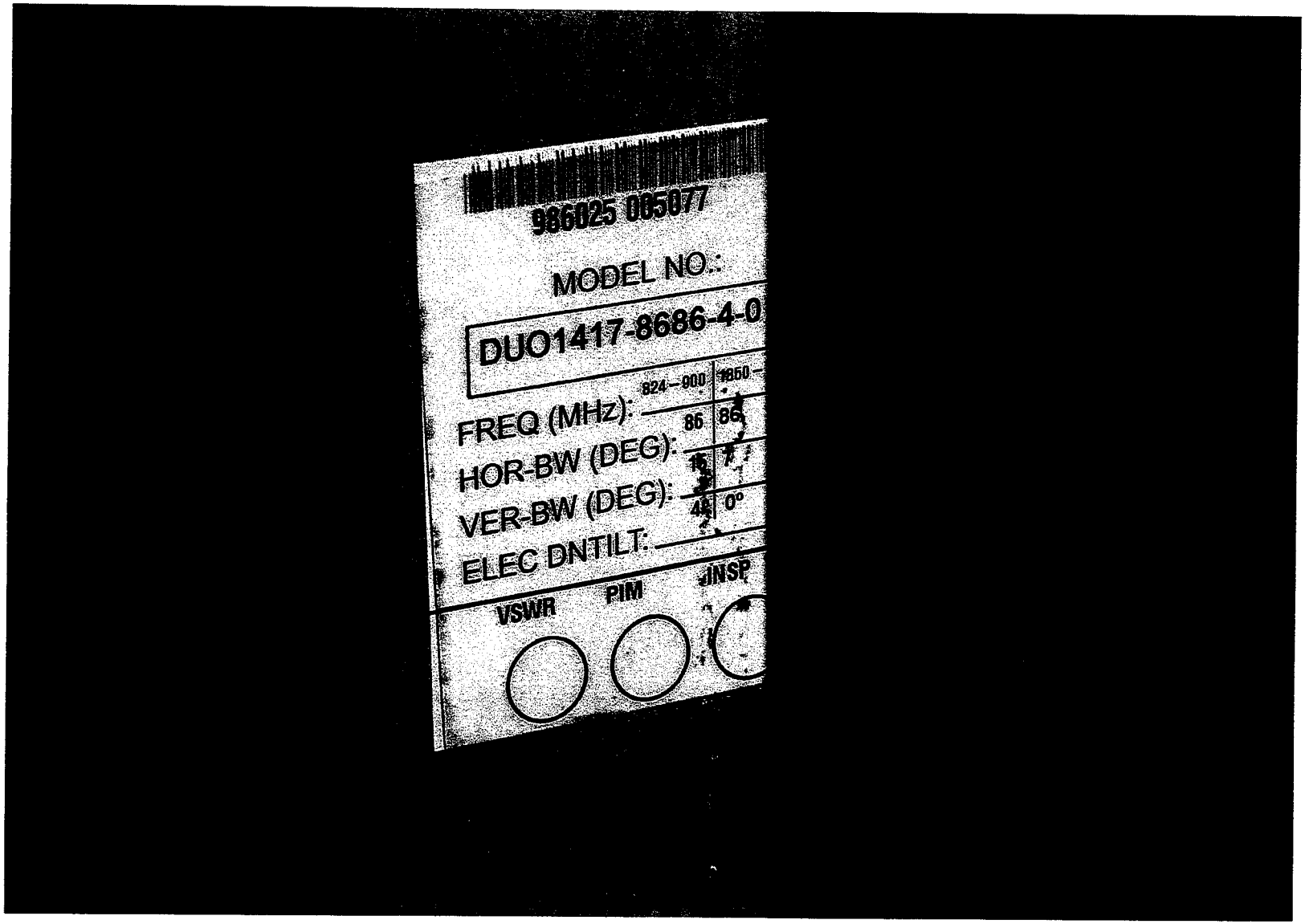

ANDREW
Andrew Corporation
10500 W. 153rd Street
Orland Park, IL 60462
(708) 349-3300
DECIBEL®
DB844H90E-XY
DM174660-11
09/06/04
806 - 960 MHz

3.3 Verizon

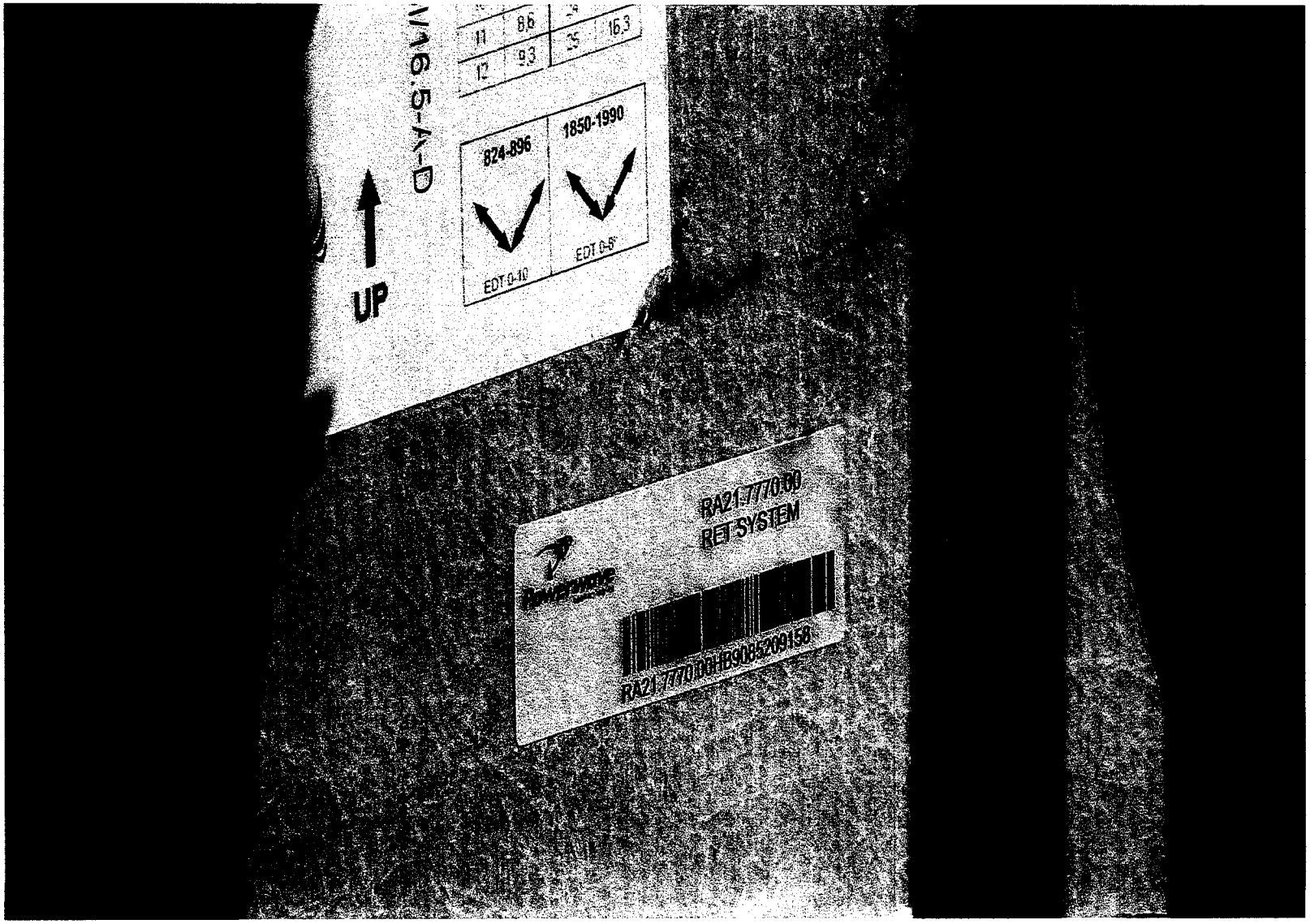


4.1 ATT

4.2 ATT


986025 005077
MODEL NO.:
DUO1417-8686-4-0
824–900
1850–
FREQ (MHz):
86
86
HOR-BW (DEG):
15
7
VER-BW (DEG):
4
0°
ELEC DNTILT:
VSWR
PIM
INSP

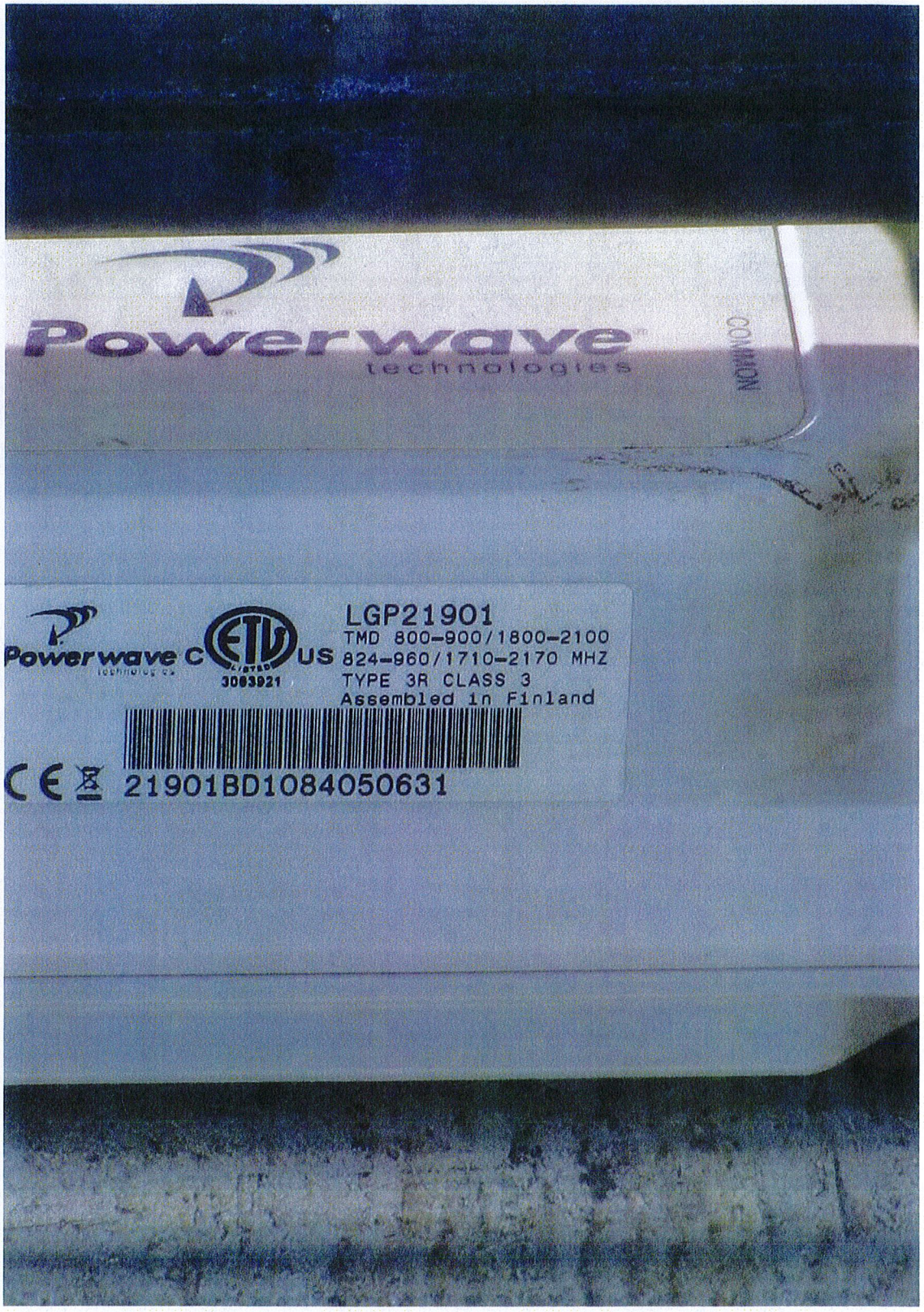
4.3 ATT



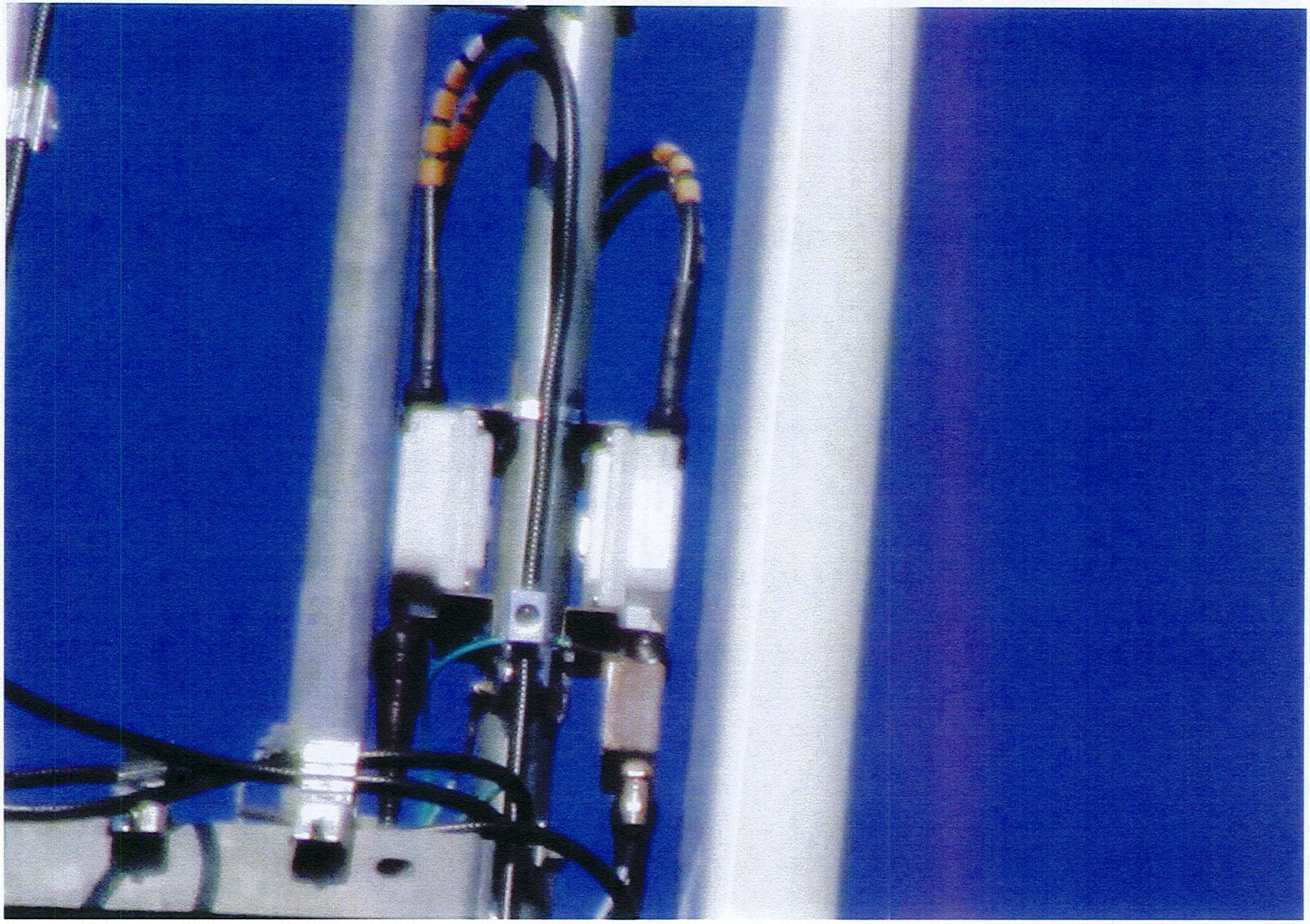
4.4 ATT

LGP21401
TMA-DDD 850/1900
824-849/1850-1910MHZ
21401FB908509510C

4.5 ATT


Powerwave
technologies
COMMON
Powerwave
3003921
LGP21901
TMD 800-900/1800-2100
824-960/1710-2170 MHZ
TYPE 3R CLASS 3
Assembled in Finland
21901BD1084050631

4.6 ATT



4.7 ATT