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CONNECTICUT
SITING COUNCIL

ORIGINAL

June 3, 2011

KENNETH C. BALDWIN

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Direct (860) 275-8345

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

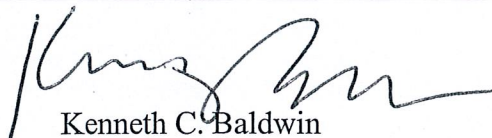
Re: **Notice of Completion of Construction Activity**
EM-VER-101-100119 – 15 Dwight Street, North Haven, Connecticut
EM-VER-014-101108 – 850 West Main Street, Branford, Connecticut
EM-VER-083-101118 – 213 Court Street, Middletown, Connecticut
EM-VER-045-110224 – 93 Roxbury Road, Niantic (East Lyme), Connecticut

Dear Ms. Roberts:

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

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

Sincerely,


Kenneth C. Baldwin

Copy to:
Sandy M. Carter



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Daniel F. Caruso
Chairman

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: siting.council@ct.gov

Internet: ct.gov/csc

November 29, 2010

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

RE: **EM-VER-014-101108** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 850 West Main Street, Branford, Connecticut.

Dear Attorney Baldwin:

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

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

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated November 8, 2010. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such

notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,



Linda Roberts

Executive Director

LR/CDM/laf

- c: The Honorable Anthony "Unk" DaRos, First Selectman, Town of Branford
- Diana Ross, Inland Wetland Enforcement Officer, Town of Branford
- Justine K. Gillen, Zoning Enforcement Officer, Town of Branford
- Crown Castle USA, Inc.



STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

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Daniel F. Caruso
Chairman

November 9, 2010

The Honorable Anthony "Unk" DaRos
First Selectman
Town of Branford
Town Hall
1019 Main Street
P. O. Box 150
Branford, CT 06405-0150

RE: **EM-VER-014-101108** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 850 West Main Street, Branford, Connecticut.

Dear First Selectman DaRos:

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 November 23, 2010.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts
Executive Director

LR/jbw

Enclosure: Notice of Intent

c: Diana Ross, Inland Wetland Enforcement Officer, Town of Branford
Justine K. Gillen, Zoning Enforcement Officer, Town of Branford

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Hartford, CT 06103-3597
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ORIGINAL

November 8, 2010

Via Hand Delivery

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



Re: **Notice of Exempt Modification – Antenna Swap
850 West Main Street, Branford, Connecticut**

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the 110-foot level on the existing 130-foot tower at the above-referenced address. The tower is owned by Crown Castle. The Connecticut Siting Council (“Council”) approved Cellco’s use of this tower in 2000. Cellco intends to remove all of its existing antennas and replace them with six (6) model APL868013-42T0 cellular antennas; three (3) model MG D3-800T0 PCS antennas; and three (3) model APX75-866512T0 LTE antennas, all at the same 110-foot level on the tower. Cellco will also install six (6) coax cable diplexers on its existing antenna platform. Attached behind Tab 1 of this filing are the specifications for each of 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 Anthony DaRos, First Selectman for the Town of Branford. A copy of this letter is also being sent to the Tartaglia Family, the owners of the property on which the tower is located.

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

1. The proposed modifications will not result in any increase in the overall height of the existing tower. Cellco’s replacement antennas and diplexers will be located at the 110-foot level on the 130-foot tower.



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Linda Roberts
November 8, 2010
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2. The proposed modifications will not involve any modifications to ground-mounted equipment and, therefore, will not require the extension of the site boundaries.

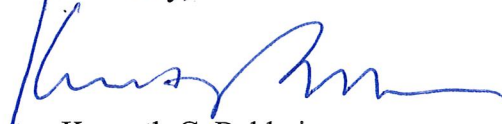
3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative General Power Density table for the 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 modifications. (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:

Anthony DaRos, Branford First Selectman
Tartaglia Family
Sandy M. Carter





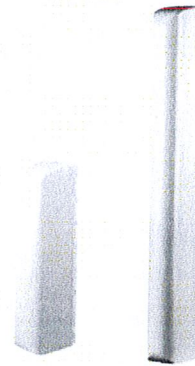
Maximizer® Log Periodic Antenna, 806-894, 80deg, 14.1dBi, 1.2m, FET, 0deg

Product Description

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

Features/Benefits

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



Technical Specifications

Electrical Specifications

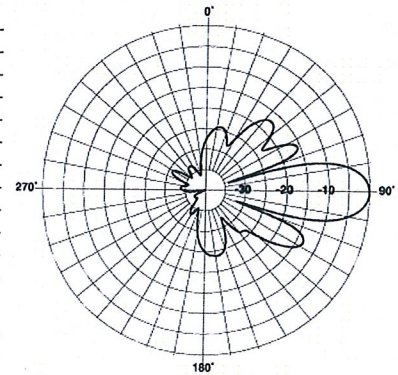
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	15
Electrical Downtilt, deg	0
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
Polarization	Vertical
VSWR	< 1.5:1
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Direct Ground
Connector Type	7-16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

Mechanical Specifications

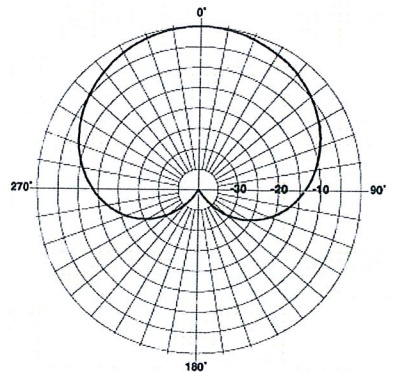
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Weight w/o Mtg Hardware, kg (lb)	2.8 (6.32)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m ² (ft ²)	0.307 (3.3)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Wind Load - Side @ Rated Wind, N (lbf)	743 (167)
Radome Material	UV Stabilized High Impact ABS
Shipping Weight, kg (lb)	7.9 (17.5)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)

Ordering Information

Mounting Hardware	APM21-3
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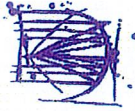
Vertical Pattern



Horizontal Pattern

Other Documentation

All information contained in the present datasheet is subject to confirmation at time of ordering



SINGLE-BAND PANEL ANTENNA

BROADBAND 1700-2170 MHz

MGD3-800TX

1710-1880	1850-1990	1920-2170
H66° V7.2°	H64° V6.6°	H63° V6.3°
Fixed Tilt 0°, 2°, 4°, 6°	Fixed Tilt 0°, 2°, 4°, 6°	Fixed Tilt 0°, 2°, 4°, 6°

ELECTRICAL SPECIFICATIONS

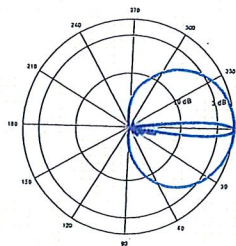
Antenna Model	BROADBAND 1710-2170 MHz		
	1710 - 1880	1850 - 1990	1920 - 2170
Polarization	MGD3-800TX ± 45°		
Frequency	1710 - 1880	1850 - 1990	1920 - 2170
Horizontal Beamwidth	66°	64°	63°
Vertical Beamwidth	7.2°	6.6°	6.3°
Gain (dBi)	17.9	18	18.5
Vertical Electrical Tilt	FIXED 0°, 2°, 4°, 6°	FIXED 0°, 2°, 4°, 6°	FIXED 0°, 2°, 4°, 6°
Upper Sidelobe Suppression for the 1 st lobe above main beam (dB)	20	20	20
Front-to-Back Ratio /Cpol @ ± 20° (dB)	> 30	> 30	> 30
VSWR	< 1.4 : 1	< 1.4 : 1	< 1.4 : 1
Cross Polar Ratio @ ± 60° (dB)	> 10	> 10	> 10
Isolation Between Ports (dB)	> 30	> 30	> 30
Maximum Power Per Input (W)		250	
Intermodulation (dBc)		< -150	
Impedance (Ω)		50	

MECHANICAL SPECIFICATIONS

Connectors	2 X 7/16 Female
Connector Position	Bottom
Survival Wind Speed mph (km/h)	124 (200)
Front Windload lbs (N) @ 160 km/h	83 (370)
Lateral Windload lbs (N) @ 160 km/h	38 (170)
Radome Color	Grey, paintable
Temperature Range F (°C)	-67° to 140° (-55° to +60°)
Humidity	100%
Antenna Weight lbs (kg)	15.43 (7)
Antenna Dimension in (mm) H X W X D	53 X 6.29 X 3.54 (1340 X 160 X 90)



H&V Pattern



RYMSA Telecom Group (Headquarters)

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TELECOM GROUP
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+ 1 8 0 0 2 2 2 2



Optimizer® Dual Polarized Antenna, 698-896, 65deg, 14.1dBi, 1.3m, FET, 0deg

Product Description

Wideband antenna for dense networks where site aspect is essential.

Features/Benefits

- Wideband performance 698-896 MHz
- High sidelobe suppression
- Null fill
- Dual polarization
- High front-to-back ratio



Technical Specifications

Electrical Specifications

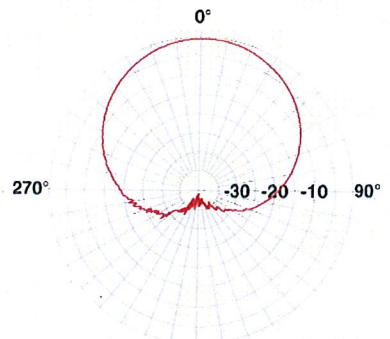
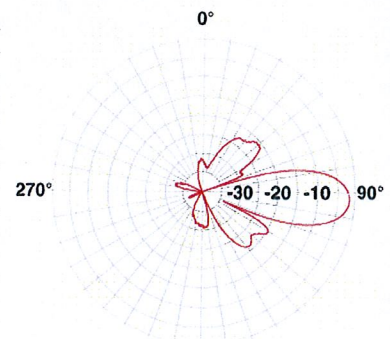
Frequency Range, MHz	698-896
Horizontal Beamwidth, deg	66 +/-5
Vertical Beamwidth, deg	15-19
Electrical Downtilt, deg	0
Gain, dBi (dBd)	14.1 (12)
1st Upper Sidelobe Suppression, dB	>18
Upper Sidelobe Suppression, dB	>18
Front-To-Back Ratio, dB	>30
Polarization	Slant +/-45 degrees
VSWR	1.40:1
Isolation between Ports, dB	>30
3rd Order IMP @ 2 x 43 dBm, dBc	>150
Impedance, Ohms	50
Maximum Power Input, W	500
Lightning Protection	Chassis Ground
Connector Type	(2) 7-16 Long Neck DIN Female

Mechanical Specifications

Dimensions - HxWxD, mm (in)	1320.8 x 311.2 x 120.7 (52 x 12.25 x 4.75)
Weight w/o Mtg Hardware, kg (lb)	9.0 (19.8)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m ² (ft ²)	0.41 (4.39)
Radome Material	ASA Plastic
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum

Ordering Information

Mounting Hardware	APM40-2
Mounting Pipe Diameter, mm (in)	60-120 (2.36-4.72)
Mounting Hardware Weight, kg (lb)	3.4 (7.5)



Other Documentation

- APM40 Series Datasheet
- APM40 Series Installation Instructions

All information contained in the present datasheet is subject to confirmation at time of ordering

General		Power	Density					
Site Name: Branford SW Tower Height: Verizon @ 110Ft.								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*Sprint CDMA	11	411	120	0.1129	1962.5	1.0000	11.29%	
*Sprint WiMAX	3	562	120	0.0421	2657	1.0000	4.21%	
*Sprint microwave	2	4.42	120	0.0002	22500	1.0000	0.02%	
*Clearwire	2	153	120	0.0076	2496	1.0000	0.76%	
*Clearwire	1	211	124	0.0049	11 GHZ	1.0000	0.49%	
*T-Mobile	8	122	130	0.0208	1935	1.0000	2.08%	
Verizon	3	334	110	0.0298	1970	1.0000	2.98%	
Verizon	9	287	110	0.0768	869	0.5793	13.25%	
Verizon	1	594	110	0.0177	757	0.4973	3.55%	
								38.63%
* Source: Siting Council								

Date: October 06, 2010

Eva Morales
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277



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

Subject: Structural Analysis Report

Carrier Designation: Verizon Wireless Co-Locate

Crown Castle Designation:

Crown Castle BU Number:	876322
Crown Castle Site Name:	TARTAGLIA PROPERTY
Crown Castle JDE Job Number:	142280
Crown Castle Work Order Number:	360695

Engineering Firm Designation: Crown Castle Project Number: 360695

Site Data: 850 West Main Street, BRANFORD, New Haven County, CT
Latitude 41° 16' 40.188", Longitude -72° 50' 12.696"
130 Foot - Monopole Tower

Dear Eva Morales,

Crown Castle is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 360695, in accordance with application 108180, revision 1.

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

LC1: Existing + Reserved + Proposed Equipment

Sufficient Capacity

Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and local code requirements based upon a wind speed of 85 mph fastest mile.

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

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

Structural analysis prepared by: Daryoush Hooshyar, Eng. II

Respectfully submitted by:

A handwritten signature in black ink, appearing to read 'ACP'.

Aaron C. Poot, P.E.
Engineering Supervisor

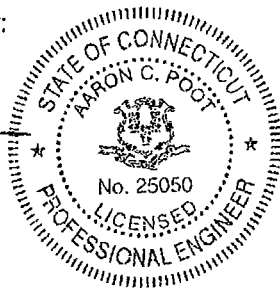


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1) INTRODUCTION

This tower is a 130 ft Monopole tower designed by PJF/SUMMIT in July of 1998. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F. The tower was extended per modifications designed by Global Signal in December 2006.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
110	111	6	rfs celwave	APL868013-42T0 w/ Mount Pipe	-	-	-
		3	rfs celwave	APX75-866512-CT2 w/ Mount Pipe			
		6	rfs celwave	FD9R6004/1C-3L			
		3	rymsa wireless	MG D3-800Tx w/ Mount Pipe			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note			
128	130	12	generic	TMA	12	1-5/8	3			
		6	rfs celwave	APX16PV-16PVL-E w/ Mount Pipe						
		3	rfs celwave	ATMAA1412D-1A20						
		3	rfs celwave	APX16DWV-16DWV-S-E-A20 w/Mount Pipe				-	-	2
		3	rfs celwave	ATMPP1412D-1CWA						
		3	rfs celwave	APXV18-209014-C w/ Mount Pipe				6	1-5/8	1
118	128	1	tower mounts	Platform Mount [LP 305-1]	-	-				
	124	2	andrew	VHLP2-11	2	1/2	1			
	122	6	andrew	HBX-9014DS-R2M w/ Mount Pipe	6	1 5/8	2			
		2	communication components inc.	TMA-CE-1819-200MC						
	120	3	argus technologies	LLPX310R w/ Mount Pipe	6	5/16	1			
		3	samsung telecommunications	FDD_R6_RRH						
	118	1	tower mounts	Platform Mount [LP 712-1]						

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (In)	Note
110	114	1	kathrein	OG-860/1920/GPS-A	1	1/2	1
	111	6	decibel	DB844H90E-XY w/ Mount Pipe	-	-	4
		6	decibel	DB948H90E-M w/ Mount Pipe			
	110	1	tower mounts	Platform Mount [LP 712-1]	12	1 5/8	1
50	52	1	kathrein	OG-860/1920/GPS-A	1	5/16	1
	50	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:

- 1) Existing Equipment
- 2) Reserved Equipment
- 3) SLA equipment controlling
- 4) Equipment to be Removed, coax to remain

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (In)
130	130	6	RFS	APX16PV-16PVL-E	-	-
		12	Remec	TMA		
120	120	9	Decibel	DB980H90	-	-
110	110	12	Swedcom	ALP901	-	-
100	100	12	Allgon	7250	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Goodkind & O'Dea, Inc.	1614542	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Summit Manufacturing Inc.	1613605	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit Manufacturing Inc.	1529811	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	Tower Engineering Professionals	2483868	CCISITES
4-POST-MODIFICATION INSPECTION	Tower Engineering Professionals	1956410	CCISITES

3.1) Analysis Method

RISATower (version 5.4.2.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

- 1) Tower and structures were built in accordance with the manufacturer's specifications.
- 2) The tower and structures have been maintained in accordance with the manufacturer's specification.
- 3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail	
L1	130 - 120.5	Pole	TP18.5x18.5x0.375	1	-2.15	597.73	12.2	Pass	
L2	120.5 - 120	Pole	TP22x18.5x0.375	2	-2.15	597.73	12.2	Pass	
L3	120 - 77	Pole	TP29.742x22x0.25	3	-9.02	1205.97	68.1	Pass	
L4	77 - 37.75	Pole	TP36.308x28.5668x0.3125	4	-15.24	1840.62	84.2	Pass	
L5	37.75 - 0	Pole	TP42.48x34.8729x0.375	5	-24.35	2643.11	86.9	Pass	
							Summary		
							Pole (L5)	86.9	Pass
							Rating =	86.9	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	53.7	Pass
1	Base Plate	0	63.4	Pass
1	Base Foundation Soil Interaction	0	42.1	Pass
1	Ext Flange Bolts Stress Ratio	120	19.7	Pass
1	Ext Flange Plate Stress Ratio	120	12.8	Pass

Structure Rating (max from all components) =	86.9%
---	--------------

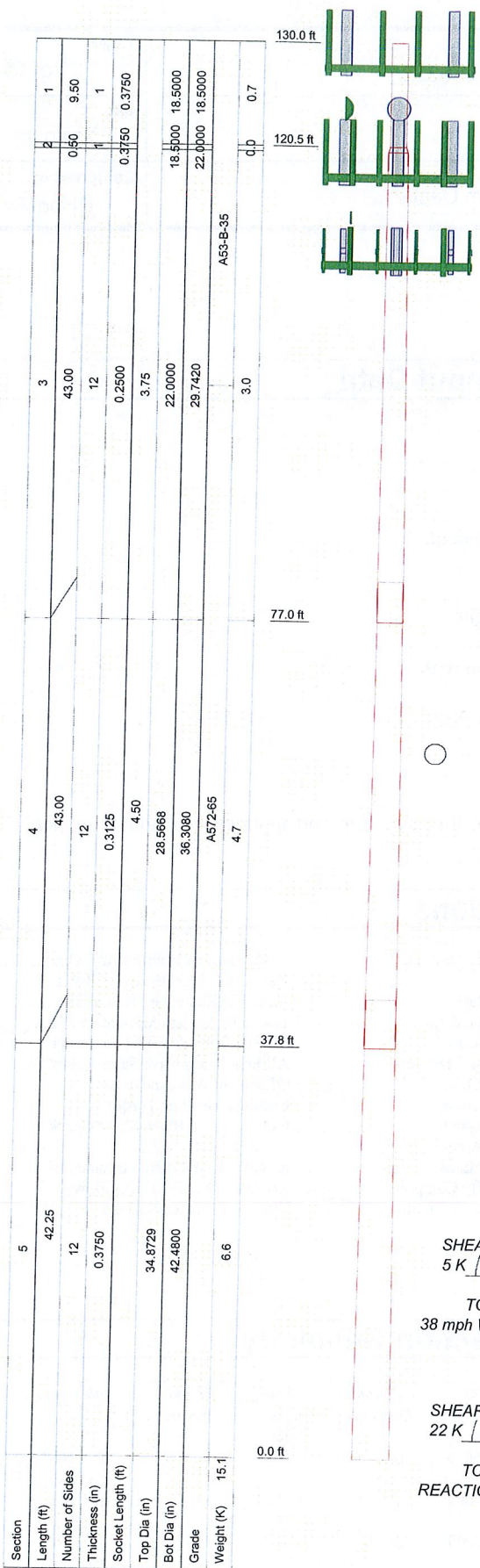
Notes:

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

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing and reserved loading. No modifications are required at this time.

APPENDIX A
RISA TOWER OUTPUT



DESIGNED APPURTENANCE LOADING

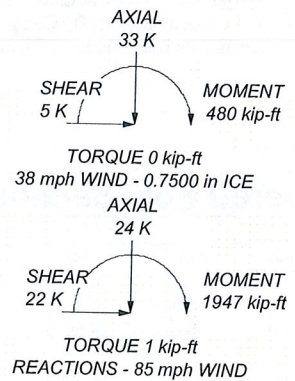
TYPE	ELEVATION	TYPE	ELEVATION
(2) APX16PV-16PVL-E w/ Mount Pipe	128	TMA-CE-1819-200MC	118
(4) TMA	128	Platform Mount [LP 712-1]	118
(2) APX16PV-16PVL-E w/ Mount Pipe	128	VHLP2-11	118
(4) TMA	128	VHLP2-11	118
(2) APX16PV-16PVL-E w/ Mount Pipe	128	APX75-866512-CT2 w/ Mount Pipe	110
(4) TMA	128	(2) FD9R6004/1C-3L	110
(2) APX16PV-16PVL-E w/ Mount Pipe	128	MG D3-800Tx w/ Mount Pipe	110
(4) TMA	128	(2) APL868013-42T0 w/ Mount Pipe	110
6' x 2" Mount Pipe	128	APX75-866512-CT2 w/ Mount Pipe	110
6' x 2" Mount Pipe	128	APX75-866512-CT2 w/ Mount Pipe	110
Platform Mount [LP 305-1]	128	(2) FD9R6004/1C-3L	110
LLPX310R w/ Mount Pipe	118	MG D3-800Tx w/ Mount Pipe	110
FDD_R6_RRH	118	(2) APL868013-42T0 w/ Mount Pipe	110
(2) HBX-9014DS-R2M w/ Mount Pipe	118	APX75-866512-CT2 w/ Mount Pipe	110
LLPX310R w/ Mount Pipe	118	APX75-866512-CT2 w/ Mount Pipe	110
FDD_R6_RRH	118	(2) FD9R6004/1C-3L	110
(2) HBX-9014DS-R2M w/ Mount Pipe	118	MG D3-800Tx w/ Mount Pipe	110
TMA-CE-1819-200MC	118	Platform Mount [LP 712-1]	110
LLPX310R w/ Mount Pipe	118	OG-860/1920/GPS-A	110
FDD_R6_RRH	118	(2) APL868013-42T0 w/ Mount Pipe	110
(2) HBX-9014DS-R2M w/ Mount Pipe	118	OG-860/1920/GPS-A	50
		Side Arm Mount [SO 701-1]	50

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 86.9%



<p>Crown Castle 2000 Corporate Drive Canonsburg, PA 15317 Shaping the Wireless World Phone: (724) 416-2126 FAX: (724) 416-4126</p>	<p>Job: BU# 876322</p>
	<p>Project:</p>
	<p>Client: Crown Castle Drawn by: DHooshyar App'd:</p>
	<p>Code: TIA/EIA-222-F Date: 10/05/10 Scale: NTS</p>
	<p>Path: R:\ISA Models - Letter\Work Area\DHooshyar\876322\876322.dwg Dwg No. E-1</p>

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Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in New Haven County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 38 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

<ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys √ Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination 	<ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. Autocalc Torque Arm Areas SR Members Have Cut Ends √ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing 	<ul style="list-style-type: none"> Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feedline Torque Include Angle Block Shear Check <li style="text-align: center;">Poles √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
--	--	---

Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	130.00-120.50	9.50	0.00	Round	18.5000	18.5000	0.3750		A53-B-35 (35 ksi)
L2	120.50-120.00	0.50	0.00	Round	18.5000	22.0000	0.3750		A53-B-35 (35 ksi)
L3	120.00-77.00	43.00	3.75	12	22.0000	29.7420	0.2500	1.0000	A572-65 (65 ksi)
L4	77.00-37.75	43.00	4.50	12	28.5668	36.3080	0.3125	1.2500	A572-65 (65 ksi)
L5	37.75-0.00	42.25		12	34.8729	42.4800	0.3750	1.5000	A572-65

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

Tapered Pole Properties

Section	Tip Dia.	Area	I	r	C	I/C	J	I/Q	w	w/t
	in	in ²	in ⁴	in	in	in ³	in ⁴	in ²	in	
L1	18.5000	21.3530	877.5217	6.4162	9.2500	94.8672	1752.6528	10.6701	0.0000	0
	18.5000	21.3530	877.5217	6.4162	9.2500	94.8672	1752.6528	10.6701	0.0000	0
L2	18.5000	21.3530	877.5217	6.4162	9.2500	94.8672	1752.6528	10.6701	0.0000	0
	22.0000	25.4764	1490.3634	7.6552	11.0000	135.4876	2976.6666	12.7306	0.0000	0
L3	22.7761	17.5087	1057.2060	7.7865	11.3960	92.7699	2142.1860	8.6173	5.2260	20.904
	30.7912	23.7411	2635.6911	10.5581	15.4064	171.0782	5340.6247	11.6846	7.3009	29.203
L4	30.2735	28.4309	2896.9880	10.1150	14.7976	195.7740	5870.0831	13.9928	6.8184	21.819
	37.5888	36.2205	5990.1331	12.8864	18.8075	318.4963	12137.6337	17.8266	8.8930	28.458
L5	36.9419	41.6562	6327.7629	12.3502	18.0642	350.2940	12821.7632	20.5019	8.3409	22.242
	43.9785	50.8418	11504.6684	15.0736	22.0046	522.8292	23311.5772	25.0228	10.3796	27.679

Tower Elevation	Gusset Area	Gusset Thickness	Gusset Grade	Adjust. Factor	Adjust. Factor	Weight Mult.	Double Angle	Double Angle
ft	ft ²	in		A _f	A _r		Stitch Bolt Spacing	Stitch Bolt Spacing
							Diagonals	Horizontal
							in	in
L1				1	1	1		
130.00-120.50				1	1	1		
L2				1	1	1		
120.50-120.00				1	1	1		
L3				1	1	1		
120.00-77.00				1	1	1		
L4 77.00-37.75				1	1	1		
L5 37.75-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	Number Per Row	Clear Spacing	Width or Diameter	Perimeter	Weight
				ft			in	in	in	plf

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C _A A _A	Weight
				ft		ft ² /ft	plf
LDF7-50A(1-5/8")	A	No	Inside Pole	128.00 - 5.00	12		
						No Ice	0.00
						1/2" Ice	0.00
						1" Ice	0.00
						2" Ice	0.00
						4" Ice	0.00

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _{AA}		Weight plf
						In Face ft ²	Out Face ft ²	
7983A(1/2")	C	No	Inside Pole	120.00 - 5.00	2	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
						2" Ice	0.00	0.08
						4" Ice	0.00	0.08
9207(5/16")	C	No	Inside Pole	120.00 - 5.00	6	No Ice	0.00	0.60
						1/2" Ice	0.00	0.60
						1" Ice	0.00	0.60
						2" Ice	0.00	0.60
						4" Ice	0.00	0.60
FLC 158-50J(1-5/8")	C	No	Inside Pole	118.00 - 5.00	6	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92
						2" Ice	0.00	0.92
						4" Ice	0.00	0.92
2" Rigid Conduit	C	No	Inside Pole	120.00 - 5.00	2	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
						2" Ice	0.00	2.80
						4" Ice	0.00	2.80

LDF4-50A(1/2")	B	No	Inside Pole	110.00 - 5.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
LDF7-50A(1-5/8")	B	No	Inside Pole	110.00 - 5.00	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82

860 10000(5/16")	B	No	Inside Pole	50.00 - 5.00	1	No Ice	0.00	0.04
						1/2" Ice	0.00	0.04
						1" Ice	0.00	0.04
						2" Ice	0.00	0.04
						4" Ice	0.00	0.04

Safety Line 3/8	C	No	CaAa (Out Of Face)	130.00 - 0.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA}		Weight K
					In Face ft ²	Out Face ft ²	
L1	130.00-120.50	A	0.000	0.000	0.000	0.000	0.07
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.356	0.00
L2	120.50-120.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.019	0.00
L3	120.00-77.00	A	0.000	0.000	0.000	0.000	0.42
		B	0.000	0.000	0.000	0.000	0.33

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Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L4	77.00-37.75	C	0.000	0.000	0.000	1.613	0.64
		A	0.000	0.000	0.000	0.000	0.39
		B	0.000	0.000	0.000	0.000	0.39
L5	37.75-0.00	C	0.000	0.000	0.000	1.472	0.59
		A	0.000	0.000	0.000	0.000	0.32
		B	0.000	0.000	0.000	0.000	0.33
		C	0.000	0.000	0.000	1.416	0.50

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	130.00-120.50	A	0.880	0.000	0.000	0.000	0.000	0.07
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	2.029	0.01
L2	120.50-120.00	A	0.876	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.106	0.00
L3	120.00-77.00	A	0.854	0.000	0.000	0.000	0.000	0.42
		B		0.000	0.000	0.000	0.000	0.33
		C		0.000	0.000	0.000	8.960	0.68
L4	77.00-37.75	A	0.801	0.000	0.000	0.000	0.000	0.39
		B		0.000	0.000	0.000	0.000	0.39
		C		0.000	0.000	0.000	8.179	0.63
L5	37.75-0.00	A	0.750	0.000	0.000	0.000	0.000	0.32
		B		0.000	0.000	0.000	0.000	0.33
		C		0.000	0.000	0.000	7.464	0.53

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
L1	130.00-120.50	-0.0476	0.0275	-0.2249	0.1298
L2	120.50-120.00	-0.0477	0.0275	-0.2279	0.1315
L3	120.00-77.00	-0.0479	0.0276	-0.2328	0.1344
L4	77.00-37.75	-0.0481	0.0277	-0.2399	0.1385
L5	37.75-0.00	-0.0482	0.0278	-0.2331	0.1346

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
			ft					
			ft					
			ft					

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA}		Weight
			Horz	Lateral			Front	Side	
			ft	ft	°	ft	ft ²	ft ²	K
(2) APX16PV-16PVL-E w/ Mount Pipe	A	From Leg	4.00	0.0000	128.00	No Ice	6.94	3.29	0.06
			0.00			1/2" Ice	7.44	4.00	0.10
			2.00			1" Ice	7.94	4.66	0.16
						2" Ice	8.98	6.04	0.28
						4" Ice	11.17	9.02	0.65
(4) TMA	A	From Leg	0.00	0.0000	128.00	No Ice	0.68	0.45	0.01
			0.00			1/2" Ice	0.80	0.56	0.02
			2.00			1" Ice	0.93	0.68	0.03
						2" Ice	1.22	0.94	0.04
						4" Ice	1.90	1.57	0.11
(2) APX16PV-16PVL-E w/ Mount Pipe	B	From Leg	4.00	0.0000	128.00	No Ice	6.94	3.29	0.06
			0.00			1/2" Ice	7.44	4.00	0.10
			2.00			1" Ice	7.94	4.66	0.16
						2" Ice	8.98	6.04	0.28
						4" Ice	11.17	9.02	0.65
(4) TMA	B	From Leg	0.00	0.0000	128.00	No Ice	0.68	0.45	0.01
			0.00			1/2" Ice	0.80	0.56	0.02
			2.00			1" Ice	0.93	0.68	0.03
						2" Ice	1.22	0.94	0.04
						4" Ice	1.90	1.57	0.11
(2) APX16PV-16PVL-E w/ Mount Pipe	C	From Leg	4.00	0.0000	128.00	No Ice	6.94	3.29	0.06
			0.00			1/2" Ice	7.44	4.00	0.10
			2.00			1" Ice	7.94	4.66	0.16
						2" Ice	8.98	6.04	0.28
						4" Ice	11.17	9.02	0.65
(4) TMA	C	From Leg	0.00	0.0000	128.00	No Ice	0.68	0.45	0.01
			0.00			1/2" Ice	0.80	0.56	0.02
			2.00			1" Ice	0.93	0.68	0.03
						2" Ice	1.22	0.94	0.04
						4" Ice	1.90	1.57	0.11
6' x 2" Mount Pipe	A	From Leg	4.00	0.0000	128.00	No Ice	1.43	1.43	0.02
			0.00			1/2" Ice	1.92	1.92	0.03
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
6' x 2" Mount Pipe	B	From Leg	4.00	0.0000	128.00	No Ice	1.43	1.43	0.02
			0.00			1/2" Ice	1.92	1.92	0.03
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	128.00	No Ice	1.43	1.43	0.02
			0.00			1/2" Ice	1.92	1.92	0.03
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
Platform Mount [LP 305-1]	C	None		0.0000	128.00	No Ice	18.01	18.01	1.12
						1/2" Ice	23.33	23.33	1.35
						1" Ice	28.65	28.65	1.58
						2" Ice	39.29	39.29	2.05
						4" Ice	60.57	60.57	2.97

LLPX310R w/ Mount Pipe	A	From Leg	4.00	0.0000	118.00	No Ice	5.07	2.98	0.05
			0.00			1/2" Ice	5.48	3.53	0.08
			2.00			1" Ice	5.91	4.09	0.13
						2" Ice	6.79	5.31	0.23
						4" Ice	8.70	8.13	0.54
FDD_R6_RRH	A	From Leg	4.00	0.0000	118.00	No Ice	1.79	0.78	0.03

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz Lateral	Vert					
				0.00					
				2.00		1/2" Ice	1.97	0.92	0.04
						1" Ice	2.16	1.07	0.06
						2" Ice	2.57	1.39	0.09
						4" Ice	3.49	2.14	0.20
(2) HBX-9014DS-R2M w/ Mount Pipe	A	From Leg	4.00	0.0000	118.00	No Ice	3.59	3.37	0.03
			0.00			1/2" Ice	4.00	4.02	0.06
			4.00			1" Ice	4.45	4.66	0.10
						2" Ice	5.37	5.99	0.20
						4" Ice	7.34	8.99	0.51
LLPX310R w/ Mount Pipe	B	From Leg	4.00	0.0000	118.00	No Ice	5.07	2.98	0.05
			0.00			1/2" Ice	5.48	3.53	0.08
			2.00			1" Ice	5.91	4.09	0.13
						2" Ice	6.79	5.31	0.23
						4" Ice	8.70	8.13	0.54
FDD_R6_RRH	B	From Leg	4.00	0.0000	118.00	No Ice	1.79	0.78	0.03
			0.00			1/2" Ice	1.97	0.92	0.04
			2.00			1" Ice	2.16	1.07	0.06
						2" Ice	2.57	1.39	0.09
						4" Ice	3.49	2.14	0.20
(2) HBX-9014DS-R2M w/ Mount Pipe	B	From Leg	4.00	0.0000	118.00	No Ice	3.59	3.37	0.03
			0.00			1/2" Ice	4.00	4.02	0.06
			4.00			1" Ice	4.45	4.66	0.10
						2" Ice	5.37	5.99	0.20
						4" Ice	7.34	8.99	0.51
TMA-CE-1819-200MC	B	From Leg	4.00	0.0000	118.00	No Ice	1.17	0.44	0.01
			0.00			1/2" Ice	1.32	0.56	0.02
			4.00			1" Ice	1.48	0.69	0.03
						2" Ice	1.83	0.97	0.05
						4" Ice	2.62	1.63	0.13
LLPX310R w/ Mount Pipe	C	From Leg	4.00	0.0000	118.00	No Ice	5.07	2.98	0.05
			0.00			1/2" Ice	5.48	3.53	0.08
			2.00			1" Ice	5.91	4.09	0.13
						2" Ice	6.79	5.31	0.23
						4" Ice	8.70	8.13	0.54
FDD_R6_RRH	C	From Leg	4.00	0.0000	118.00	No Ice	1.79	0.78	0.03
			0.00			1/2" Ice	1.97	0.92	0.04
			2.00			1" Ice	2.16	1.07	0.06
						2" Ice	2.57	1.39	0.09
						4" Ice	3.49	2.14	0.20
(2) HBX-9014DS-R2M w/ Mount Pipe	C	From Leg	4.00	0.0000	118.00	No Ice	3.59	3.37	0.03
			0.00			1/2" Ice	4.00	4.02	0.06
			4.00			1" Ice	4.45	4.66	0.10
						2" Ice	5.37	5.99	0.20
						4" Ice	7.34	8.99	0.51
TMA-CE-1819-200MC	C	From Leg	4.00	0.0000	118.00	No Ice	1.17	0.44	0.01
			0.00			1/2" Ice	1.32	0.56	0.02
			4.00			1" Ice	1.48	0.69	0.03
						2" Ice	1.83	0.97	0.05
						4" Ice	2.62	1.63	0.13
Platform Mount [LP 712-1]	C	None		0.0000	118.00	No Ice	24.53	24.53	1.34
						1/2" Ice	29.94	29.94	1.65
						1" Ice	35.35	35.35	1.96
						2" Ice	46.17	46.17	2.58
						4" Ice	67.81	67.81	3.82

OG-860/1920/GPS-A	C	From Leg	4.00	0.0000	110.00	No Ice	0.33	0.40	0.00
			0.00			1/2" Ice	0.43	0.51	0.01

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz	Lateral					
				4.00					
						1" Ice	0.55	0.63	0.01
						2" Ice	0.80	0.89	0.03
						4" Ice	1.41	1.52	0.08
(2) APL868013-42T0 w/ Mount Pipe	A	From Leg	4.00	0.0000	110.00	No Ice	3.10	4.92	0.02
			0.00			1/2" Ice	3.48	5.60	0.06
			1.00			1" Ice	3.88	6.28	0.11
						2" Ice	4.76	7.71	0.22
						4" Ice	6.66	10.83	0.54
APX75-866512-CT2 w/ Mount Pipe	A	From Leg	4.00	0.0000	110.00	No Ice	6.43	3.89	0.04
			0.00			1/2" Ice	6.92	4.59	0.08
			1.00			1" Ice	7.41	5.25	0.14
						2" Ice	8.43	6.63	0.27
						4" Ice	10.58	9.77	0.64
(2) FD9R6004/1C-3L	A	From Leg	4.00	0.0000	110.00	No Ice	0.37	0.08	0.00
			0.00			1/2" Ice	0.45	0.14	0.01
			1.00			1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06
MG D3-800Tx w/ Mount Pipe	A	From Leg	4.00	0.0000	110.00	No Ice	3.57	3.42	0.03
			0.00			1/2" Ice	3.98	4.12	0.07
			1.00			1" Ice	4.39	4.78	0.11
						2" Ice	5.33	6.16	0.21
						4" Ice	7.34	9.18	0.52
(2) APL868013-42T0 w/ Mount Pipe	B	From Leg	4.00	0.0000	110.00	No Ice	3.10	4.92	0.02
			0.00			1/2" Ice	3.48	5.60	0.06
			1.00			1" Ice	3.88	6.28	0.11
						2" Ice	4.76	7.71	0.22
						4" Ice	6.66	10.83	0.54
APX75-866512-CT2 w/ Mount Pipe	B	From Leg	4.00	0.0000	110.00	No Ice	6.43	3.89	0.04
			0.00			1/2" Ice	6.92	4.59	0.08
			1.00			1" Ice	7.41	5.25	0.14
						2" Ice	8.43	6.63	0.27
						4" Ice	10.58	9.77	0.64
(2) FD9R6004/1C-3L	B	From Leg	4.00	0.0000	110.00	No Ice	0.37	0.08	0.00
			0.00			1/2" Ice	0.45	0.14	0.01
			1.00			1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06
MG D3-800Tx w/ Mount Pipe	B	From Leg	4.00	0.0000	110.00	No Ice	3.57	3.42	0.03
			0.00			1/2" Ice	3.98	4.12	0.07
			1.00			1" Ice	4.39	4.78	0.11
						2" Ice	5.33	6.16	0.21
						4" Ice	7.34	9.18	0.52
(2) APL868013-42T0 w/ Mount Pipe	C	From Leg	4.00	0.0000	110.00	No Ice	3.10	4.92	0.02
			0.00			1/2" Ice	3.48	5.60	0.06
			1.00			1" Ice	3.88	6.28	0.11
						2" Ice	4.76	7.71	0.22
						4" Ice	6.66	10.83	0.54
APX75-866512-CT2 w/ Mount Pipe	C	From Leg	4.00	0.0000	110.00	No Ice	6.43	3.89	0.04
			0.00			1/2" Ice	6.92	4.59	0.08
			1.00			1" Ice	7.41	5.25	0.14
						2" Ice	8.43	6.63	0.27
						4" Ice	10.58	9.77	0.64
(2) FD9R6004/1C-3L	C	From Leg	4.00	0.0000	110.00	No Ice	0.37	0.08	0.00
			0.00			1/2" Ice	0.45	0.14	0.01
			1.00			1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz Lateral	Vert					
			ft	ft	°	ft	ft ²	ft ²	K
MG D3-800Tx w/ Mount Pipe	C	From Leg	4.00	0.0000	110.00	4" Ice	1.28	0.74	0.06
			0.00			No Ice	3.57	3.42	0.03
			1.00			1/2" Ice	3.98	4.12	0.07
						1" Ice	4.39	4.78	0.11
						2" Ice	5.33	6.16	0.21
Platform Mount [LP 712-1]	C	None		0.0000	110.00	4" Ice	7.34	9.18	0.52
						No Ice	24.53	24.53	1.34
						1/2" Ice	29.94	29.94	1.65
						1" Ice	35.35	35.35	1.96
						2" Ice	46.17	46.17	2.58
** OG-860/1920/GPS-A	A	From Leg	2.00	0.0000	50.00	4" Ice	67.81	67.81	3.82
			0.00			No Ice	0.33	0.40	0.00
			2.00			1/2" Ice	0.43	0.51	0.01
						1" Ice	0.55	0.63	0.01
						2" Ice	0.80	0.89	0.03
Side Arm Mount [SO 701-1]	A	From Leg	1.00	0.0000	50.00	4" Ice	1.41	1.52	0.08
			0.00			No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
						1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
		4" Ice	3.17	7.03	0.18				

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				Horz Lateral	Vert						
			ft	ft	°	°	ft	ft	ft ²	K	
VHLP2-11	A	Paraboloid w/o Radome	From Leg	4.00	0.0000	118.00	2.17	No Ice	3.72	0.03	
				0.00				1/2" Ice	4.01	0.05	
				6.00				1" Ice	4.30	0.07	
								2" Ice	4.88	0.11	
								4" Ice	6.04	0.19	
VHLP2-11	C	Paraboloid w/o Radome	From Leg	4.00	0.0000	118.00	2.17	No Ice	3.72	0.03	
				0.00				1/2" Ice	4.01	0.05	
				6.00				1" Ice	4.30	0.07	
								2" Ice	4.88	0.11	
								4" Ice	6.04	0.19	

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	130 - 120.5	Pole	Max Tension	27	0.00	-0.00	-0.00
			Max. Compression	14	-3.91	0.28	0.15
			Max. Mx	5	-2.16	-28.37	0.54
			Max. My	2	-2.15	-0.69	28.82
			Max. Vy	5	3.67	-28.37	0.54
			Max. Vx	8	3.75	0.19	-28.73
			Max. Torque	8			-0.42
			L2	120.5 - 120	Pole	Max Tension	1
Max. Compression	14	-3.96				0.28	0.15
Max. Mx	5	-2.20				-30.21	0.61
Max. My	2	-2.19				-0.80	30.69
Max. Vy	5	3.70				-30.21	0.61
Max. Vx	8	3.78				0.21	-30.61
Max. Torque	8						-0.42
L3	120 - 77	Pole				Max Tension	1
			Max. Compression	14	-15.27	0.36	-0.04
			Max. Mx	5	-9.03	-472.89	6.22
			Max. My	8	-9.02	1.37	-475.49

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L4	77 - 37.75	Pole	Max. Vy	5	14.10	-472.89	6.22
			Max. Vx	8	14.16	1.37	-475.49
			Max. Torque	7			-0.51
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-22.62	0.41	0.18
			Max. Mx	5	-15.24	-1091.86	11.91
			Max. My	8	-15.24	2.48	-1096.21
L5	37.75 - 0	Pole	Max. Vy	5	18.05	-1091.86	11.91
			Max. Vx	8	18.07	2.48	-1096.21
			Max. Torque	7			-0.53
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-32.89	0.47	0.14
			Max. Mx	5	-24.35	-1937.93	17.84
			Max. My	8	-24.35	3.66	-1943.29
			Max. Vy	5	22.00	-1937.93	17.84
			Max. Vx	8	22.03	3.66	-1943.29
			Max. Torque	8			-0.54

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	21	32.89	0.01	-5.16
	Max. H _x	11	24.37	21.90	-0.00
	Max. H _z	2	24.37	-0.22	21.99
	Max. M _x	2	1941.74	-0.22	21.99
	Max. M _z	5	1937.93	-21.98	0.14
	Max. Torsion	4	0.49	-19.10	11.03
	Min. Vert	1	24.37	0.00	0.00
	Min. H _x	5	24.37	-21.98	0.14
	Min. H _z	8	24.37	0.03	-22.01
	Min. M _x	8	-1943.29	0.03	-22.01
	Min. M _z	11	-1928.14	21.90	-0.00
	Min. Torsion	8	-0.54	0.03	-22.01

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	24.37	0.00	0.00	-0.16	0.17	0.00
Dead+Wind 0 deg - No Ice	24.37	0.22	-21.99	-1941.74	-28.21	-0.30
Dead+Wind 30 deg - No Ice	24.37	11.15	-19.00	-1675.29	-988.72	-0.43
Dead+Wind 60 deg - No Ice	24.37	19.10	-11.03	-974.91	-1685.80	-0.49
Dead+Wind 90 deg - No Ice	24.37	21.98	-0.14	-17.83	-1937.93	-0.38
Dead+Wind 120 deg - No Ice	24.37	19.10	11.00	970.53	-1685.78	0.04
Dead+Wind 150 deg - No Ice	24.37	10.87	19.05	1682.47	-953.58	0.45
Dead+Wind 180 deg - No Ice	24.37	-0.03	22.01	1943.29	3.66	0.54
Dead+Wind 210 deg - No Ice	24.37	-10.92	19.12	1691.48	960.45	0.44
Dead+Wind 240 deg - No Ice	24.37	-18.99	11.19	995.19	1672.08	0.26
Dead+Wind 270 deg - No Ice	24.37	-21.90	0.00	0.46	1928.14	-0.01
Dead+Wind 300 deg - No Ice	24.37	-18.98	-10.93	-961.95	1670.68	-0.05

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Load Combination	Vertical	Shear _x	Shear _y	Overturing Moment, M _x	Overturing Moment, M _y	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 330 deg - No Ice	24.37	-10.95	-18.92	-1665.50	963.62	-0.07
Dead+Ice+Temp	32.89	0.00	0.00	-0.14	0.47	0.00
Dead+Wind 0 deg+Ice+Temp	32.89	0.05	-5.15	-478.81	-5.94	-0.11
Dead+Wind 30 deg+Ice+Temp	32.89	2.61	-4.45	-413.25	-243.00	-0.13
Dead+Wind 60 deg+Ice+Temp	32.89	4.48	-2.58	-240.38	-415.16	-0.12
Dead+Wind 90 deg+Ice+Temp	32.89	5.15	-0.03	-4.17	-477.48	-0.07
Dead+Wind 120 deg+Ice+Temp	32.89	4.48	2.58	239.17	-415.15	0.05
Dead+Wind 150 deg+Ice+Temp	32.89	2.55	4.46	414.65	-235.00	0.15
Dead+Wind 180 deg+Ice+Temp	32.89	-0.01	5.16	478.95	1.31	0.17
Dead+Wind 210 deg+Ice+Temp	32.89	-2.56	4.48	416.71	237.52	0.13
Dead+Wind 240 deg+Ice+Temp	32.89	-4.45	2.62	244.78	412.99	0.06
Dead+Wind 270 deg+Ice+Temp	32.89	-5.14	0.00	-0.00	476.20	-0.02
Dead+Wind 300 deg+Ice+Temp	32.89	-4.45	-2.56	-237.42	412.66	-0.05
Dead+Wind 330 deg+Ice+Temp	32.89	-2.57	-4.43	-411.00	238.23	-0.07
Dead+Wind 0 deg - Service	24.37	0.08	-7.61	-672.81	-9.66	-0.10
Dead+Wind 30 deg - Service	24.37	3.86	-6.57	-580.50	-342.42	-0.15
Dead+Wind 60 deg - Service	24.37	6.61	-3.82	-337.86	-583.92	-0.17
Dead+Wind 90 deg - Service	24.37	7.61	-0.05	-6.29	-671.25	-0.13
Dead+Wind 120 deg - Service	24.37	6.61	3.80	336.12	-583.91	0.02
Dead+Wind 150 deg - Service	24.37	3.76	6.59	582.76	-330.23	0.16
Dead+Wind 180 deg - Service	24.37	-0.01	7.61	673.13	1.39	0.19
Dead+Wind 210 deg - Service	24.37	-3.78	6.62	585.89	332.86	0.15
Dead+Wind 240 deg - Service	24.37	-6.57	3.87	344.67	579.40	0.09
Dead+Wind 270 deg - Service	24.37	-7.58	0.00	0.05	668.09	-0.00
Dead+Wind 300 deg - Service	24.37	-6.57	-3.78	-333.36	578.90	-0.02
Dead+Wind 330 deg - Service	24.37	-3.79	-6.55	-577.09	333.95	-0.02

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-24.37	0.00	0.00	24.37	0.00	0.000%
2	0.22	-24.37	-21.99	-0.22	24.37	21.99	0.000%
3	11.15	-24.37	-19.00	-11.15	24.37	19.00	0.000%
4	19.10	-24.37	-11.03	-19.10	24.37	11.03	0.000%
5	21.98	-24.37	-0.14	-21.98	24.37	0.14	0.000%
6	19.10	-24.37	11.00	-19.10	24.37	-11.00	0.000%
7	10.87	-24.37	19.05	-10.87	24.37	-19.05	0.000%
8	-0.03	-24.37	22.01	0.03	24.37	-22.01	0.000%
9	-10.92	-24.37	19.12	10.92	24.37	-19.12	0.000%
10	-18.99	-24.37	11.19	18.99	24.37	-11.19	0.000%
11	-21.90	-24.37	0.00	21.90	24.37	-0.00	0.000%
12	-18.98	-24.37	-10.93	18.98	24.37	10.93	0.000%
13	-10.95	-24.37	-18.92	10.95	24.37	18.92	0.000%
14	0.00	-32.89	0.00	0.00	32.89	0.00	0.000%
15	0.05	-32.89	-5.15	-0.05	32.89	5.15	0.000%
16	2.61	-32.89	-4.45	-2.61	32.89	4.45	0.000%
17	4.48	-32.89	-2.58	-4.48	32.89	2.58	0.000%
18	5.15	-32.89	-0.03	-5.15	32.89	0.03	0.000%
19	4.48	-32.89	2.58	-4.48	32.89	-2.58	0.000%
20	2.55	-32.89	4.46	-2.55	32.89	-4.46	0.000%
21	-0.01	-32.89	5.16	0.01	32.89	-5.16	0.000%
22	-2.56	-32.89	4.48	2.56	32.89	-4.48	0.000%
23	-4.45	-32.89	2.62	4.45	32.89	-2.62	0.000%
24	-5.14	-32.89	0.00	5.14	32.89	-0.00	0.000%
25	-4.45	-32.89	-2.56	4.45	32.89	2.56	0.000%
26	-2.57	-32.89	-4.43	2.57	32.89	4.43	0.000%

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	Crown Castle	DHooshyar

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
27	0.08	-24.37	-7.61	-0.08	24.37	7.61	0.000%
28	3.86	-24.37	-6.57	-3.86	24.37	6.57	0.000%
29	6.61	-24.37	-3.82	-6.61	24.37	3.82	0.000%
30	7.61	-24.37	-0.05	-7.61	24.37	0.05	0.000%
31	6.61	-24.37	3.80	-6.61	24.37	-3.80	0.000%
32	3.76	-24.37	6.59	-3.76	24.37	-6.59	0.000%
33	-0.01	-24.37	7.61	0.01	24.37	-7.61	0.000%
34	-3.78	-24.37	6.62	3.78	24.37	-6.62	0.000%
35	-6.57	-24.37	3.87	6.57	24.37	-3.87	0.000%
36	-7.58	-24.37	0.00	7.58	24.37	-0.00	0.000%
37	-6.57	-24.37	-3.78	6.57	24.37	3.78	0.000%
38	-3.79	-24.37	-6.55	3.79	24.37	6.55	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.0000001	0.0000001
2	Yes	5	0.0000001	0.00005271
3	Yes	6	0.0000001	0.00007777
4	Yes	6	0.0000001	0.00007991
5	Yes	5	0.0000001	0.00009456
6	Yes	6	0.0000001	0.00007877
7	Yes	6	0.0000001	0.00007533
8	Yes	5	0.0000001	0.00008684
9	Yes	6	0.0000001	0.00007933
10	Yes	6	0.0000001	0.00007871
11	Yes	5	0.0000001	0.00002299
12	Yes	6	0.0000001	0.00007649
13	Yes	6	0.0000001	0.00007719
14	Yes	4	0.0000001	0.0000001
15	Yes	6	0.0000001	0.00001685
16	Yes	6	0.0000001	0.00002674
17	Yes	6	0.0000001	0.00002698
18	Yes	6	0.0000001	0.00001678
19	Yes	6	0.0000001	0.00002681
20	Yes	6	0.0000001	0.00002596
21	Yes	6	0.0000001	0.00001692
22	Yes	6	0.0000001	0.00002693
23	Yes	6	0.0000001	0.00002710
24	Yes	6	0.0000001	0.00001674
25	Yes	6	0.0000001	0.00002626
26	Yes	6	0.0000001	0.00002644
27	Yes	4	0.0000001	0.00006949
28	Yes	6	0.0000001	0.00000697
29	Yes	6	0.0000001	0.00000738
30	Yes	5	0.0000001	0.00001197
31	Yes	6	0.0000001	0.00000716
32	Yes	6	0.0000001	0.00000655
33	Yes	5	0.0000001	0.00001629
34	Yes	6	0.0000001	0.00000728
35	Yes	6	0.0000001	0.00000715
36	Yes	5	0.0000001	0.0000001
37	Yes	6	0.0000001	0.00000678
38	Yes	6	0.0000001	0.00000691

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Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	130 - 120.5	29.006	29	1.8489	0.0026
L2	120.5 - 120	25.337	29	1.8356	0.0024
L3	120 - 77	25.145	29	1.8347	0.0023
L4	80.75 - 37.75	11.568	29	1.3585	0.0009
L5	42.25 - 0	3.154	29	0.6836	0.0003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
128.00	(2) APX16PV-16PVL-E w/ Mount Pipe	29	28.232	1.8466	0.0025	38342
124.00	VHLP2-11	29	26.686	1.8414	0.0025	30666
118.00	LLPX310R w/ Mount Pipe	29	24.380	1.8289	0.0023	10031
110.00	OG-860/1920/GPS-A	29	21.374	1.7790	0.0020	6834
50.00	OG-860/1920/GPS-A	29	4.358	0.8169	0.0004	2786

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	130 - 120.5	83.563	4	5.3318	0.0073
L2	120.5 - 120	73.002	4	5.2940	0.0067
L3	120 - 77	72.449	4	5.2911	0.0066
L4	80.75 - 37.75	33.357	4	3.9188	0.0026
L5	42.25 - 0	9.100	4	1.9727	0.0009

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
128.00	(2) APX16PV-16PVL-E w/ Mount Pipe	4	81.334	5.3252	0.0072	13575
124.00	VHLP2-11	4	76.883	5.3105	0.0070	10857
118.00	LLPX310R w/ Mount Pipe	4	70.246	5.2748	0.0064	3554
110.00	OG-860/1920/GPS-A	4	61.593	5.1313	0.0056	2414
50.00	OG-860/1920/GPS-A	4	12.573	2.3572	0.0011	969

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Compression Checks

Pole Design Data

Section No.	Elevation <i>ft</i>	Size	L <i>ft</i>	L _u <i>ft</i>	Kl/r	F _a <i>ksi</i>	A <i>in²</i>	Actual P K	Allow. P _a K	Ratio P P _a
L1	130 - 120.5 (1)	TP18.5x18.5x0.375	9.50	0.00	0.0	21.000	21.3530	-2.15	448.41	0.005
L2	120.5 - 120 (2)	TP22x18.5x0.375	0.50	0.00	0.0	21.000	21.3530	-2.15	448.41	0.005
L3	120 - 77 (3)	TP29.742x22x0.25	43.00	0.00	0.0	39.000	23.1975	-9.02	904.70	0.010
L4	77 - 37.75 (4)	TP36.308x28.5668x0.3125	43.00	0.00	0.0	39.000	35.4053	-15.24	1380.81	0.011
L5	37.75 - 0 (5)	TP42.48x34.8729x0.375	42.25	0.00	0.0	39.000	50.8418	-24.35	1982.83	0.012

Pole Bending Design Data

Section No.	Elevation <i>ft</i>	Size	Actual M _x <i>kip-ft</i>	Actual f _{bx} <i>ksi</i>	Allow. F _{bx} <i>ksi</i>	Ratio f _{bx} F _{bx}	Actual M _y <i>kip-ft</i>	Actual f _{by} <i>ksi</i>	Allow. F _{by} <i>ksi</i>	Ratio f _{by} F _{by}
L1	130 - 120.5 (1)	TP18.5x18.5x0.375	28.83	3.647	23.100	0.158	0.00	0.000	23.100	0.000
L2	120.5 - 120 (2)	TP22x18.5x0.375	28.83	3.647	23.100	0.158	0.00	0.000	23.100	0.000
L3	120 - 77 (3)	TP29.742x22x0.25	476.35	35.004	39.000	0.898	0.00	0.000	39.000	0.000
L4	77 - 37.75 (4)	TP36.308x28.5668x0.3125	1098.39	43.320	39.000	1.111	0.00	0.000	39.000	0.000
L5	37.75 - 0 (5)	TP42.48x34.8729x0.375	1947.40	44.697	39.000	1.146	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation <i>ft</i>	Size	Actual V K	Actual f _v <i>ksi</i>	Allow. F _v <i>ksi</i>	Ratio f _v F _v	Actual T <i>kip-ft</i>	Actual f _{vt} <i>ksi</i>	Allow. F _{vt} <i>ksi</i>	Ratio f _{vt} F _{vt}
L1	130 - 120.5 (1)	TP18.5x18.5x0.375	3.75	0.175	14.000	0.025	0.16	0.010	14.000	0.001
L2	120.5 - 120 (2)	TP22x18.5x0.375	3.77	0.177	14.000	0.021	0.16	0.010	14.000	0.001
L3	120 - 77 (3)	TP29.742x22x0.25	14.18	0.611	26.000	0.048	0.32	0.011	26.000	0.000
L4	77 - 37.75 (4)	TP36.308x28.5668x0.3125	18.12	0.512	26.000	0.040	0.49	0.009	26.000	0.000
L5	37.75 - 0 (5)	TP42.48x34.8729x0.375	22.07	0.434	26.000	0.034	0.49	0.005	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation <i>ft</i>	Ratio P P _a	Ratio f _{bx} F _{bx}	Ratio f _{by} F _{by}	Ratio f _v F _v	Ratio f _{vt} F _{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	130 - 120.5 (1)	0.005	0.158	0.000	0.025	0.001	0.163	1.333	H1-3+VT ✓
L2	120.5 - 120 (2)	0.005	0.158	0.000	0.021	0.001	0.163	1.333	H1-3+VT ✓

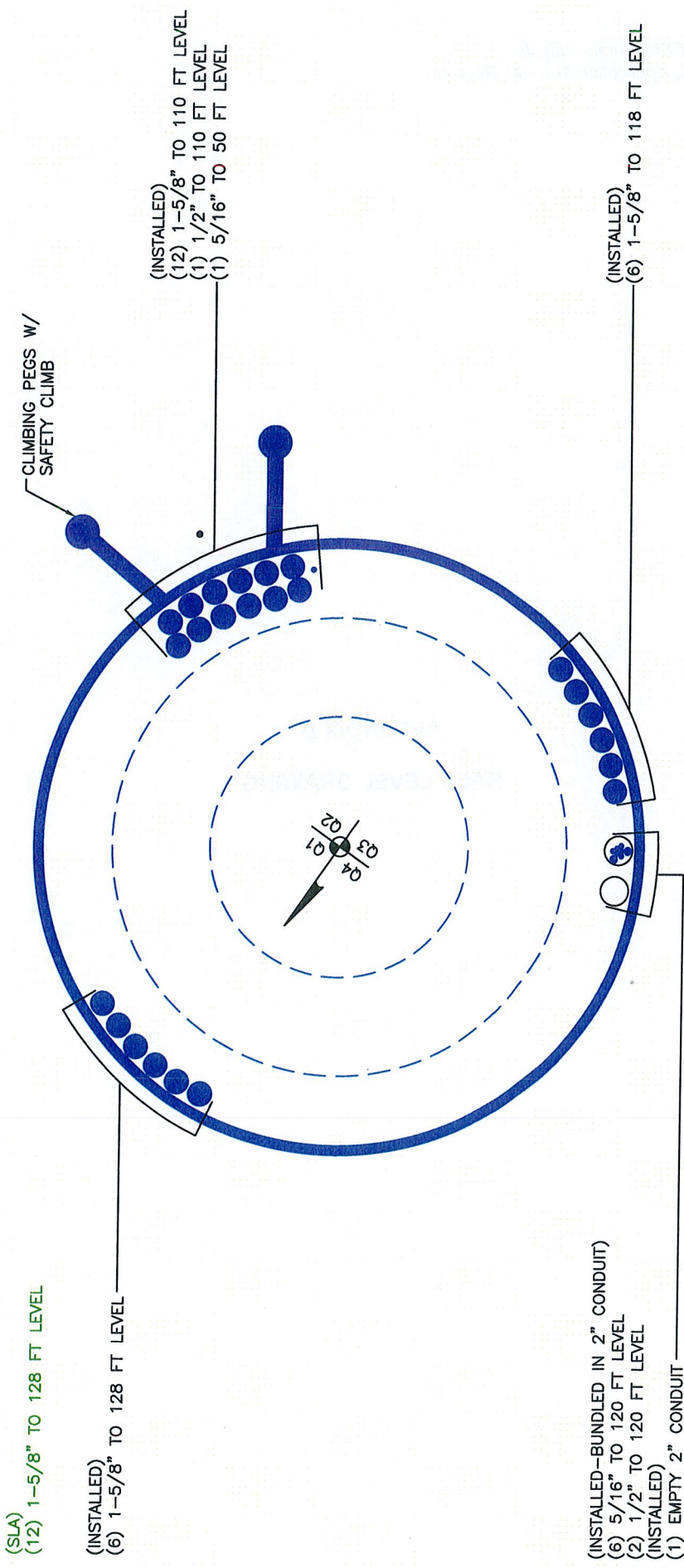
RISATower Crown Castle 2000 Corporate Drive Canonsburg, PA 15317 Phone: (724) 416-2126 FAX: (724) 416-4126	Job BU# 876322	Page 15 of 15
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	Client Crown Castle	Designed by DHooshyar

Section No.	Elevation ft	Ratio P	Ratio f_{bx}	Ratio f_{by}	Ratio f_v	Ratio f_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	120 - 77 (3)	0.010	0.898	0.000	0.048	0.000	0.908	1.333	H1-3+VT ✓
L4	77 - 37.75 (4)	0.011	1.111	0.000	0.040	0.000	1.122	1.333	H1-3+VT ✓
L5	37.75 - 0 (5)	0.012	1.146	0.000	0.034	0.000	1.159	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P _{allow} K	% Capacity	Pass Fail
L1	130 - 120.5	Pole	TP18.5x18.5x0.375	1	-2.15	597.73	12.2	Pass
L2	120.5 - 120	Pole	TP22x18.5x0.375	2	-2.15	597.73	12.2	Pass
L3	120 - 77	Pole	TP29.742x22x0.25	3	-9.02	1205.97	68.1	Pass
L4	77 - 37.75	Pole	TP36.308x28.5668x0.3125	4	-15.24	1840.62	84.2	Pass
L5	37.75 - 0	Pole	TP42.48x34.8729x0.375	5	-24.35	2643.11	86.9	Pass
Summary								
Pole (L5)							86.9	Pass
RATING =							86.9	Pass

APPENDIX B
BASE LEVEL DRAWING



(SLA) 1-5/8" TO 128 FT LEVEL
 (12) 1-5/8" TO 128 FT LEVEL

(INSTALLED)
 (6) 1-5/8" TO 128 FT LEVEL

(INSTALLED)
 (12) 1-5/8" TO 110 FT LEVEL
 (1) 1/2" TO 110 FT LEVEL
 (1) 5/16" TO 50 FT LEVEL

(INSTALLED-BUNDLED IN 2" CONDUIT)
 (6) 5/16" TO 120 FT LEVEL
 (2) 1/2" TO 120 FT LEVEL
 (INSTALLED)
 (1) EMPTY 2" CONDUIT

(INSTALLED)
 (6) 1-5/8" TO 118 FT LEVEL

BUSINESS UNIT: 876322 TOWER ID: C_BASELEVEL

APPENDIX C
ADDITIONAL CALCULATIONS

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

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

Site Data

BU#: 876322
 Site Name: TARTAGLIA PROPERTY
 App #: 108180, rev.1

Enter Load Factors Below:

For M (WL)	1.3	<--- Enter Factor
For P (DL)	1.3	<--- Enter Factor

Pier Properties

Concrete:

Pier Diameter = 7.0 ft
 Concrete Area = 5541.8 in²

Reinforcement:

Clear Cover to Tie = 4.00 in
 Horiz. Tie Bar Size = 5
 Vert. Cage Diameter = 6.11 ft
 Vert. Cage Diameter = 73.34 in
Vertical Bar Size = 11
 Bar Diameter = 1.41 in
 Bar Area = 1.56 in²
 Number of Bars = 32
 As Total = 49.92 in²
 A s/ Aconc, Rho: 0.0090 0.90%

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	2162.346	ft-kips (* Note)
Max. Service Shaft P:	24	kips
Max Axial Force Type:	Comp.	

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

Load Factor	Shaft Factored Loads	
1.30	Mu:	2811.049 ft-kips
1.30	Pu:	31.2 kips

Material Properties

Concrete Comp. strength, f_c = 3000 psi
 Reinforcement yield strength, F_y = 60 ksi
 Reinforcing Modulus of Elasticity, E = 29000 ksi
 Reinforcement yield strain = 0.00207
 Limiting compressive strain = 0.003

ACI 318 Code

Select Analysis ACI Code = 2002

Seismic Properties

Seismic Design Category = B
 Seismic Risk = Low

Solve
(Run)

<-- Press Upon Completing All Input

ACI 10.5, ACI 21.10.4, and IBC 1810.

Min As for Flexural, Tension Controlled, Shafts:

(3)*(Sqrt(f_c)/F_y): 0.0027
 200 / F_y: 0.0033

IBC 1810.1.2: None SDC A or B
 Governing: 0.0033 0.33%

ACI 10.8 and 10.9

Min As for Columns, Comp. Controlled, Shafts:

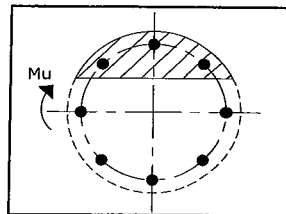
Min As: 0.0050 0.50%

Minimum Rho Check:

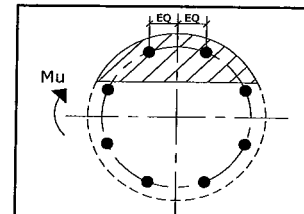
Actual Req'd Min. Rho: 0.33% Flexural
 Provided Rho: 0.90% OK

Results:

Governing Orientation Case: 2



Case 1



Case 2

Dist. From Edge to Neutral Axis: 16.78 in

Extreme Steel Strain, ε_t: 0.0110

ε_t > 0.0050, Tension Controlled

Reduction Factor, φ: 0.900

<-- Comment Box

Ref. Shaft Max Axial Capacities, φ Max(P_n or T_n):

Max P _u = (φ=0.65) P _n		
P _n per ACI 318 (10-2)	8839.70	kips
at Mu=(φ=0.65)M _n =	5309.39	ft-kips
Max T _u , (φ=0.9) T _n =	2695.68	kips
at Mu=φ=(0.90)M _n =	0.00	ft-kips

Output Note: Negative Pu=Tension

For Axial Compression, φ P_n = P_u: 31.20 kips
 Drilled Shaft Moment Capacity, φ M_n: 7432.61 ft-kips
 Drilled Shaft Superimposed Mu: 2811.05 ft-kips

(Mu/φM_n, Drilled Shaft Flexure CSR: 37.82%

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev F

Site Data

BU#: 876322	
Site Name: TARTAGLIA PROPERTY	
App #: 106890, rev.3	
Connection Type:	Butt
Pole Manufacturer:	Other

Reactions		
Moment:	28.83	ft-kips
Axial:	2.15	kips
Shear:	3.77	kips
Elevation:	120	feet

Bolt Data			
Qty:	8		
Diameter (in.):	0.875	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	75	<-- Disregard	Bolt Fty:
N/A:	55	<-- Disregard	44.00
Circle (in.):	24		

If No stiffeners, Criteria:	AISC ASD	<-Only Applicable to Unstiffened Cases
Flange Bolt Results		
Bolt Tension Capacity, B:	35.27 kips	Rigid
Max Bolt <u>directly</u> applied T:	6.94 Kips	Service, ASD
Min. PL "tc" for B cap. w/o Pry:	1.161 in	Fty*ASIF
Min PL "treq" for actual T w/ Pry:	0.376 in	
Min PL "t1" for actual T w/o Pry:	0.515 in	

Plate Data		
Diam:	26.25	in
Thick, t:	1.25	in
Grade (Fy):	50	ksi
Strength, Fu:	65	ksi
Single-Rod B-eff:	7.26	in

T allowable w/o Prying: 35.27 kips $\alpha < 0$ case
 Prying Force, Q: 0.00 kips
 Total Bolt Tension=T+Q: 6.94 kips
 Non-Prying Bolt Stress Ratio, T/B: 19.7% **Pass**

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.25	in
Fillet V. Weld:	0.25	in
Width:	3	in
Height:	8	in
Thick:	0.5	in
Notch:	0.375	in
Grade:	36	ksi
Weld str.:	70	ksi

Exterior Flange Plate Results Flexural Check
 Compression Side Plate Stress: 6.4 ksi
 Allowable Plate Stress: 50.0 ksi
 Compression Plate Stress Ratio: 12.8% **Pass**
No Prying
 Tension Side Stress Ratio, (treq/t)^2: 9.1% **Pass**

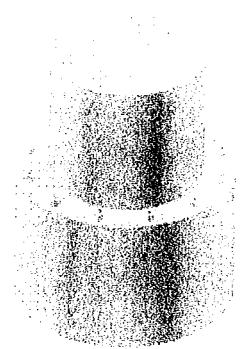
Rigid
Service, ASD
Fty*ASIF
Rigid
Service ASD
0.75*Fy*ASIF
Comp. Y.L. Length:
15.29

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

Pole Results
 Pole Punching Shear Check: n/a

Pole Data		
Diam:	18.5	in
Thick:	0.375	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor	
ASIF:	1.333



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

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

Square, Unstiffened Base Plate, Any Rod Material - Rev. F

Assumptions: Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48.
Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)

Site Data

BU#: 876322
Site Name: TARTAGLIA PROPEL
App #: 108180, rev.1

Reactions

Moment:	1947	ft-kips
Axial:	24	kips
Shear:	22	kips

Connection Type: *Butt*

Anchor Rod Data

Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Grade(Fy):	75	ksi
Bolt Circle:	55	in
Anchor Spacing:	6	in

Anchor Rod Results

Maximum Rod Tension: 104.7 Kips
Allowable Tension: 195.0 Kips
Anchor Rod Stress Ratio: 53.7% **Pass**

Plate Data

W=Side:	55	in
Thick:	3.5	in
Grade:	50	ksi
B effective	35.30	in

Base Plate Results

Base Plate Stress: 31.7 ksi
Allowable Plate Stress: 50.0 ksi
Base Plate Stress Ratio: 63.4% **Pass**

PL Ref. Data

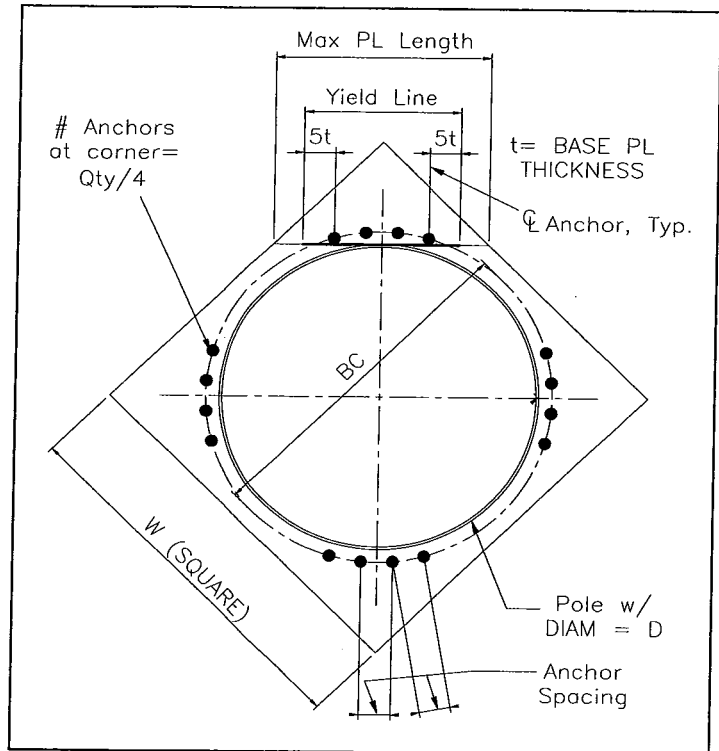
Yield Line (in):	35.30
Max PL Length:	35.30

Pole Data

Diam:	42.48	in
Thick:	0.375	in
Grade:	65	ksi

Stress Increase Factor

ASIF:	1.333
-------	-------



Monopole Drilled Pier

Checks capacity of a single drilled shaft foundation for a monopole

BU#: 876322

Site Name: TARTAGLIA PROPERTY

App Number: 108180, rev. 1



ACI 318 Version: 2002

Design Reactions		
Shear, S:	22.00	kips
Moment, Mt:	1947.00	ft-kips
Tower Weight, Wt:	24.00	kips
Tower Height, H:	130	ft
Base Diameter, BD:	42.5	in

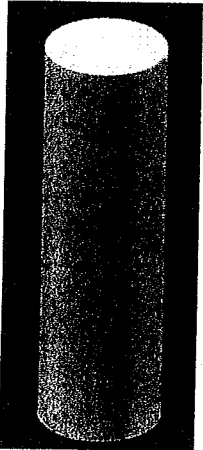
Design Checks			
	Capacity/Availability	Demand/Limits	Check
Minimum Req'd Dia. 1 (ft):	7.00	1.75	OK
Minimum Req'd Dia. 2 (ft):	7.00	5.04	OK
Bearing (ksf):	10.00	0.62	OK
Rebar Area (in ²):	49.92	18.47	OK
Pier moment capacity (k-ft):	7432.61	2811.05	OK
Rebar spacing (in):	6.05	2 < Bs < 18	OK
Development Length (in):	195.34	12.00	OK
Soil moment capacity(FOS):	4.75	2.00	OK

Foundation Dimensions		
Caisson Diameter, CD:	7.0	ft
Ext. Above Grade, E:	0.5	ft
Depth Below Grade, L:	24.0	ft
Neglected Depth, N:	5.0	ft
Rebar Size, Sp:	11	
Rebar Quantity, mp:	32	
Tie Size, tp:	5	

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

Soil Properties		
Soil Unit Weight, γ:	120	pcf
Allowable Bearing, Bc:	10.000	ksf
Seismic Design Cat, z:	B	

Caisson Analysis		
Depth to Zero Shear	7.4	ft
Max Factored Moment	2811.05	ft-kips
Overtuning FOS	4.75	



Bearing: 6.2%

Steel: 37.8%

Soil: 42.1%

Depth	Shear	Moment
4.9 ft	22 kips	2126.6 ft-kips
7.35 ft	0.6 kips	2161.8 ft-kips
9.8 ft	-38.1 kips	2118.2 ft-kips

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Project Title: BU#876322
 Project Notes: WO: 360695
 Calculation Method: Full 8CD

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

Pier Properties

Diameter (ft)	Distance of Top of Pier above Ground (ft)	Concrete Strength (ksi)	Steel Yield Strength (ksi)
7.00	0.50	3.00	60.00

Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft ³)	CU (psf)	KP	PHI (deg)
1	Clay	5.00	0.00	120.0			
2	Sand	5.00	5.00	120.0		3.690	35.00
3	Sand	10.00	10.00	60.0		4.599	40.00
4	Sand	4.00	20.00	63.0		5.289	43.00

Design (Factored) Loads at Top of Pier

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
1947.0	24.0	22.00	4.75

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

Calculated Pier Properties

Length (ft)	Weight (kips)	End Bearing Pressure (psf)
24.500	141.431	623.6

Ultimate Resisting Forces Along Pier

Type	Distance of Top of Layer to Top of Pier (ft)	Thickness (ft)	Density (lbs/ft ³)	CU (psf)	KP	Force (kips)	Arm (ft)
Clay	0.50	5.00	120.0			0.00	3.00
Sand	5.50	5.00	120.0		3.690	348.70	8.28
Sand	10.50	7.49	60.0		4.599	1030.18	14.44
Sand	17.99	2.51	60.0		4.599	-418.50	19.26
Sand	20.50	4.00	63.0		5.289	-855.68	22.54

Shear and Moments Along Pier

Distance below Top of Pier (ft)	Shear (with Safety Factor) (kips)	Moment (with Safety Factor) (ft-k)	Shear (without Safety Factor) (kips)	Moment (without Safety Factor) (ft-k)
0.00	104.7	9588.5	22.0	2018.6
2.45	104.7	9845.0	22.0	2072.6
4.90	104.7	10101.5	22.0	2126.6
7.35	2.8	10268.7	0.6	2161.8
9.80	-181.2	10061.5	-38.1	2118.2
12.25	-455.7	9303.3	-95.9	1958.6
14.70	-781.9	7794.4	-164.6	1640.9
17.15	-1142.8	5443.8	-240.6	1146.1
19.60	-1009.8	2588.5	-212.6	544.9
22.05	-537.4	666.9	-113.1	140.4
24.50	-0.0	0.0	-0.0	0.0

Reinforcement and Capacity

Total Reinforcement Percent	Reinforcement Area (in ²)	Usable Axial Capacity (kips)	Usable Moment Capacity (ft-k)
0.32	17.73	24.0	2797.1

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

Quantity	Name	Area (in ²)	Diameter (in)	Spacing (in)
89	#4	0.20	0.500	2.61
58	#5	0.31	0.625	4.01
41	#6	0.44	0.750	5.67
30	#7	0.60	0.875	7.75
23	#8	0.79	1.000	10.11
18	#9	1.00	1.128	12.92
14	#10	1.27	1.270	16.61
12	#11	1.56	1.410	19.37
8	#14	2.25	1.693	29.06