

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](mailto:siting.council@ct.gov)

[www.ct.gov/csc](http://www.ct.gov/csc)

November 19, 2013

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

RE: **EM-VER-029-131028** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 161 Pinney Street, Colebrook, 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 the Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Within 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration.

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated October 23, 2013. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

Melanie A. Bachman  
Acting Executive Director

MAB/CDM/jb

c: The Honorable Thomas D. McKeon, First Selectman, Town of Colebrook  
Michael Halloran, Zoning Enforcement Officer, Town of Colebrook  
Crown Castle



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

**RECEIVED**  
MAY - 7 2014  
CONNECTICUT  
SITING COUNCIL

May 5, 2014

Melanie A. Bachman  
Acting Executive Director  
Connecticut Siting Council  
10 Franklin Square  
New Britain, CT 06051

Re: **EM-VER-085-140224 – 88 Main Street, Monroe, Connecticut**  
**EM-VER-002-140129 – 401 Wakelee Avenue, Ansonia, Connecticut**  
**EM-VER-029-131028 – 161 Pinney Street, Colebrook, Connecticut**  
**EM-VER-062-131216 – 265 Benham Street, Hamden, Connecticut**  
**EM-VER-062-131101 – 890 Evergreen Avenue, Hamden, Connecticut**

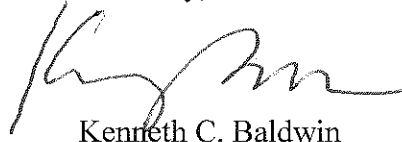
**Completion of Construction Activity**

Dear Ms. Bachman:

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



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Also admitted in Massachusetts

October 23, 2013

Melanie A. Bachman  
Acting Executive Director  
Connecticut Siting Council  
10 Franklin Square  
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap  
161 Pinney Street, Colebrook, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the 130-foot level of the existing 148-foot tower at the above-referenced address. The tower and underlying property are owned by Crown Castle. The Council approved Cellco’s shared use of this tower in 2006 (EM-VER-029-061010). Cellco now intends to replace one (1) of its existing antennas with one (1) model BXA-70063-6CF LTE antenna at the same level on the tower. Included in Attachment 1 are specifications for the replacement antenna.

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 Thomas D. McKeon, First Selectman for the Town of Colebrook.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco’s replacement antenna will be located at the 130-foot level of the 148-foot tower.

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



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# ROBINSON & COLE<sub>LLP</sub>

Melanie A. Bachman  
October 23, 2013  
Page 2

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative worst-case RF emissions calculation for Cellco's modified facility is provided in the General Power Density table included in Attachment 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support Cellco's proposed modifications. (See Structural Analysis Report included in Attachment 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:

Thomas D. McKeon, Colebrook First Selectman  
Sandy Carter



# **ATTACHMENT 1**

## BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

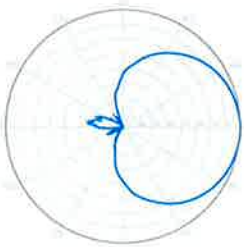
Replace 'X' with desired electrical downtilt.

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



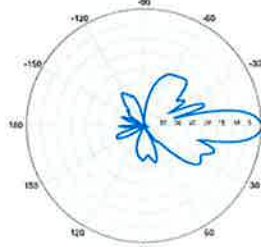
Electrical Characteristics	696-900 MHz		
Frequency bands	696-806 MHz	806-900 MHz	
Polarization	±45°		
Horizontal beamwidth	65°	63°	
Vertical beamwidth	13°	11°	
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)	
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10		
Impedance	50Ω		
VSWR	≤1.35:1		
Upper sidelobe 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 <sup>2</sup> Side: 0.24 m <sup>2</sup>	Front: 5.5 ft <sup>2</sup> Side: 2.6 ft <sup>2</sup>	
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf	
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

**BXA-70063-6CF-EDIN-X**



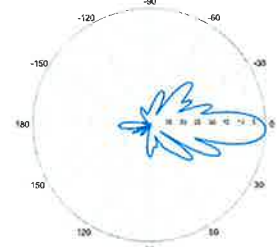
Horizontal | 750 MHz

**BXA-70063-6CF-EDIN-0**

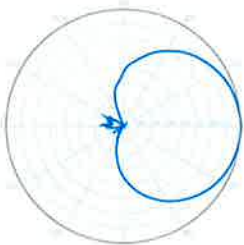


0° | Vertical | 750 MHz

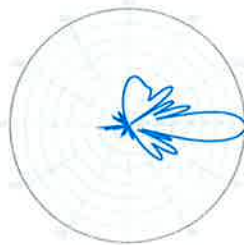
**BXA-70063-6CF-EDIN-2**



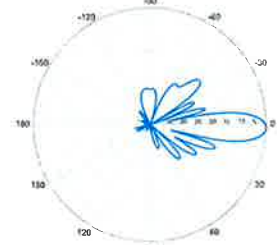
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



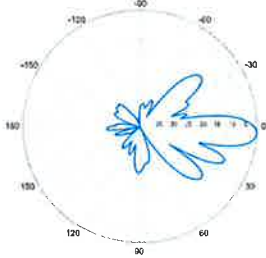
2° | Vertical | 850 MHz

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

**BXA-70063-6CF-EDIN-X**

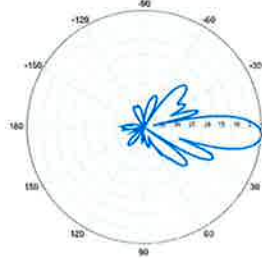
X-Pol | FET Panel | 63° | 14.5 dBd

**BXA-70063-6CF-EDIN-3**



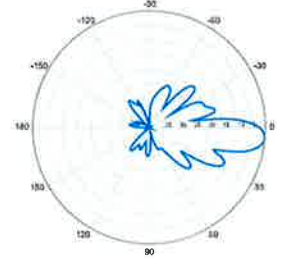
3° | Vertical | 750 MHz

**BXA-70063-6CF-EDIN-4**

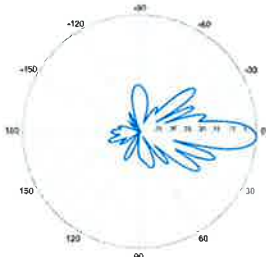


4° | Vertical | 750 MHz

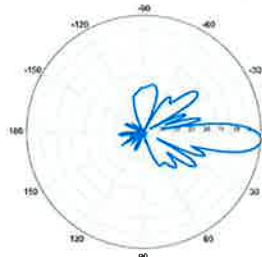
**BXA-70063-6CF-EDIN-5**



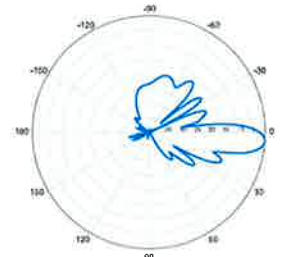
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

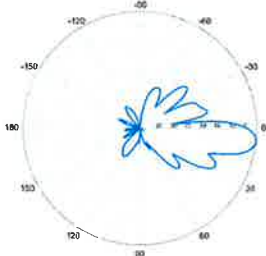


4° | Vertical | 850 MHz



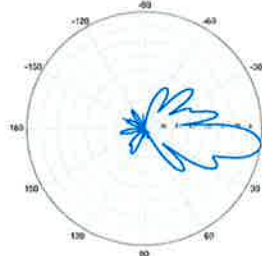
5° | Vertical | 850 MHz

**BXA-70063-6CF-EDIN-6**



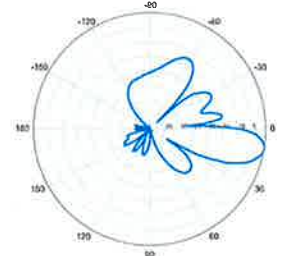
6° | Vertical | 750 MHz

**BXA-70063-6CF-EDIN-8**

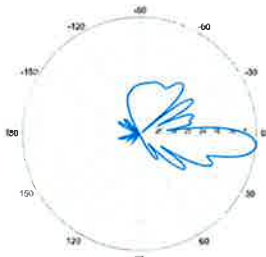


8° | Vertical | 750 MHz

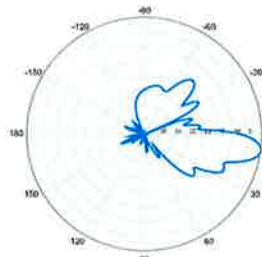
**BXA-70063-6CF-EDIN-10**



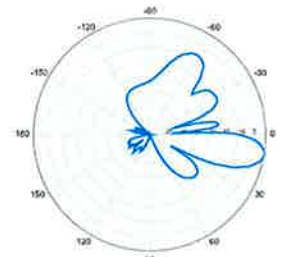
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

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.

# **ATTACHMENT 2**



		General		Power		Density							
Site Name: Colebrook SW													
Tower Height: Verizon @ 130ft													
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total					
*AT&T UMTS	2	565	140	0.0207	880	0.5867	3.53%						
*AT&T UMTS	2	875	140	0.0321	1900	1.0000	3.21%						
*AT&T GSM	1	283	140	0.0052	880	0.5867	0.88%						
*AT&T GSM	4	525	140	0.0385	1900	1.0000	3.85%						
*AT&T LTE	1	1313	140	0.0241	734	0.4893	4.92%						
*Sprint CDMA/LTE	2	778	147	0.0259	1900	1.0000	2.59%						
*Sprint CDMA/LTE	1	438	147	0.0073	850	0.5667	1.29%						
<b>Verizon PCS</b>	<b>7</b>	<b>352</b>	<b>130</b>	<b>0.0524</b>	<b>1970</b>	<b>1.0000</b>	<b>5.24%</b>						
<b>Verizon Cellular</b>	<b>9</b>	<b>362</b>	<b>130</b>	<b>0.0693</b>	<b>869</b>	<b>0.5793</b>	<b>11.97%</b>						
<b>Verizon AWS</b>	<b>1</b>	<b>1750</b>	<b>130</b>	<b>0.0372</b>	<b>2145</b>	<b>1.0000</b>	<b>3.72%</b>						
<b>Verizon 700</b>	<b>1</b>	<b>595</b>	<b>130</b>	<b>0.0127</b>	<b>698</b>	<b>0.4653</b>	<b>2.72%</b>						
								<b>43.93%</b>					
* Source: Siting Council													

# **ATTACHMENT 3**



PAUL J. FORD AND COMPANY  
STRUCTURAL ENGINEERS  
250 East Broad Street • Suite 600 • Columbus, Ohio 43215-3708

Date: **August 23, 2013**

Marianne Dunst  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277  
Phone: 704.405.6580

Paul J Ford and Company  
250 E. Broad Street Suite 600  
Columbus, OH 43215  
lgimeno@pjfweb.com  
614.221.6679

**Subject: Structural Analysis Report**

**Carrier Designation:** Verizon Wireless Co-Locate  
**Carrier Site Number:** N/A  
**Carrier Site Name:** Colebrook SW

**Crown Castle Designation:** Crown Castle BU Number: 876377  
Crown Castle Site Name: HORTON 2 /  
FREDSALL  
PROPERTY  
Crown Castle JDE Job Number: 241791  
Crown Castle Work Order Number: 642701

**Engineering Firm Designation:** Paul J Ford and Company Project Number: 37513-1921

**Site Data:** 161 Pinney Street, COLEBROOK, Litchfield County, CT  
Latitude 41° 57' 58.57", Longitude -73° 7' 19.65"  
148 Foot - Monopole Tower

Dear Marianne Dunst,

Paul J Ford and Company 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 572115, in accordance with application 196286, 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:

LC7: Existing + Reserved + Proposed Equipment


**Sufficient Capacity**

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

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 and 2005 CT State Building Code using a fastest mile wind speed of 80 mph with no ice, 28.1 mph with 1 inch ice thickness and 50 mph under service loads.

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

Structural analysis prepared by:

  
Lohengri Gimeno  
Project Engineer

tnxTower Report - version 6.1.3.1

**AUG 26 2013**



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TNXTower Output

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## 1) INTRODUCTION

This tower is a 148 ft Monopole tower designed by SUMMIT in September of 2000. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

## 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 and 2005 CT State Building Code using a fastest mile wind speed of 80 mph with no ice, 28.1 mph with 1 inch ice thickness and 50 mph under service loads.

**Table 1 - Proposed Antenna and Cable Information**

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
130.0	130.0	1	antel	BXA-70063/6CFx2 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
150.0	148.0	3	alcatel lucent	1900MHz RRH (65MHz)	3	1-1/4	2
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		9	rfs celwave	ACU-A20-N			
		3	rfs celwave	APXVSP18-C-A20 w/ Mount Pipe			
		1	tower mounts	Miscellaneous (NA507-1)			
	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-5/8	4	
	150.0	1	tower mounts	Platform Mount [LP 401-1]	-	-	1
140.0	140.0	1	kmw communications	AM-X-CD-14-65-00T-RET w/ Mount Pipe	3	3/8	2
		2	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		6	powerwave technologies	7770.00 w/ Mount Pipe	12	1-5/8	1
		6	powerwave technologies	LGP 17201			
		6	powerwave technologies	LGP21901			
		1	tower mounts	T-Arm Mount [TA 602-3]			
138.0	138.0	6	ericsson	RRUS-11	-	-	2
		1	tower mounts	Side Arm Mount [SO 102-3]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
130.0	130.0	1	antel	BXA-70080/6CF w/ Mount Pipe	-	-	3
		3	antel	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	12	1-5/8	1
		1	antel	BXA-70080-6CF-EDIN-6 w/ Mount Pipe			
		1	antel	BXA-70080/6CF w/ Mount Pipe			
		2	antel	LPA-80080-6CF-EDIN-6 w/ Mount Pipe			
		4	antel	LPA-80080/6CF w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
1	tower mounts	Platform Mount [LP 305-1]					
100.0	102.0	1	lucent	KS24019-L112A	1	1/2	1
	100.0	1	tower mounts	Side Arm Mount [SO 701-1]			

- Notes:  
 1) Existing Equipment  
 2) Reserved Equipment  
 3) Equipment to be Removed  
 4) Equipment to be removed within 6 months considered in this analysis.

### 3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	SEA Cpmsultants, 99674.03-A, 09/05/2000	1532992	CCISITES
4-POST-MODIFICATION INSPECTION	PJF, 41708-0177_Record, 02/11/2009	2385953	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	PJF/Summit, 29200-1364/11163, 09/11/2000	1629428	CCISITES
4-TOWER MANUFACTURER DRAWINGS	PJF/Summit, 29200-1364/11163, 09/11/2000	1883532	CCISITES

#### 3.1) Analysis Method

tnxTower (version 6.1.3.1), 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) Monopole was reinforced in conformance with the referenced modification drawings
- This analysis may be affected if any assumptions are not valid or have been made in error. Paul J Ford and Company should be notified to determine the effect on the structural integrity of the tower.

### 4) ANALYSIS RESULTS

**Table 4 - Section Capacity (Summary)**

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	148 - 117.25	Pole	TP27.227x22x0.1875	1	-6.76	755.23	62.8	Pass
L2	117.25 - 97.25	Pole	TP30.2515x26.2571x0.25	2	-9.49	1142.41	86.4	Pass
L3	97.25 - 80.75	Pole	TP33.056x30.2515x0.443	3	-11.66	2050.82	60.4	Pass
L4	80.75 - 40	Pole	TP39.483x31.4476x0.4385	4	-20.18	2447.21	80.7	Pass
L5	40 - 13.25	Pole	TP43.4677x37.7133x0.4502	5	-28.46	2845.67	87.9	Pass
L6	13.25 - 12.75	Pole	TP43.5526x43.4677x0.4516	6	-28.59	2827.21	88.7	Pass
L7	12.75 - 5.3333	Pole	TP44.8134x43.5526x0.4254	7	-30.38	2838.90	92.1	Pass
L8	5.3333 - 4.75	Pole	TP44.9126x44.8134x0.4467	8	-30.53	2888.05	90.9	Pass
L9	4.75 - 0	Pole	TP45.72x44.9126x0.4425	9	-31.74	2947.77	91.3	Pass
							Summary	
						Pole (L7)	92.1	Pass
						Rating =	92.1	Pass

**Table 5 - Tower Component Stresses vs. Capacity – LC7**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	96.1	Pass
1	Base Plate	0	83.3	Pass
1	Base Foundation Steel	0	97.9	Pass
1,2	Base Foundation Soil Interaction	0	100.0	Pass

<b>Structure Rating (max from all components) =</b>	<b>100.0%</b>
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Notes:

- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) According to the procedures prescribed and agreed to by the Crown Castle Engineering Foundation Committee, held in January 2010, the existing caisson foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the caisson is the greater of the geotechnical report's recommendation, the frost depth of the site or half of the caisson diameter.

## APPENDIX A

### TNXTOWER OUTPUT Tower Input Data

There is a pole section.

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

The following design criteria apply:

- 1) Tower is located in Litchfield County, Connecticut.
- 2) Basic wind speed of 80 mph.
- 3) Nominal ice thickness of 1.0000 in.
- 4) Ice thickness is considered to increase with height.
- 5) Ice density of 56 pcf.
- 6) A wind speed of 28 mph is used in combination with ice.
- 7) Temperature drop of 50 °F.
- 8) Deflections calculated using a wind speed of 50 mph.
- 9) A non-linear (P-delta) analysis was used.
- 10) Pressures are calculated at each section.
- 11) Stress ratio used in pole design is 1.333.
- 12) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

### Options

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	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 Use TIA-222-G Tension Splice Capacity Exemption	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 Poles ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
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### 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	148.0000- 117.2500	30.7500	3.50	18	22.0000	27.2270	0.1875	0.7500	A607-60 (60 ksi)
L2	117.2500- 97.2500	23.5000	0.00	18	26.2571	30.2514	0.2500	1.0000	A607-60 (60 ksi)
L3	97.2500- 80.7500	16.5000	4.25	18	30.2514	33.0560	0.4430	1.7721	Reinf 57.18 ksi (57 ksi)
L4	80.7500- 40.0000	45.0000	5.00	18	31.4476	39.4830	0.4385	1.7538	Reinf 57.63 ksi (58 ksi)
L5	40.0000- 13.2500	31.7500	0.00	18	37.7133	43.4676	0.4502	1.8009	Reinf 57.88 ksi (58 ksi)
L6	13.2500- 12.7500	0.5000	0.00	18	43.4676	43.5526	0.4516	1.8063	Reinf 57.22 ksi (57 ksi)
L7	12.7500- 5.3333	7.4167	0.00	18	43.5526	44.8134	0.4254	1.7017	Reinf 59.22 ksi (59 ksi)
L8	5.3333-4.7500	0.5833	0.00	18	44.8134	44.9126	0.4467	1.7867	Reinf 57.28 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 (57 ksi) Reinf 57.96 ksi (58 ksi)
L9	4.7500-0.0000	4.7500		18	44.9126	45.7200	0.4425	1.7699	

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
L1	22.3394	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	27.6470	16.0919	1486.4203	9.5990	13.8313	107.4677	2974.7964	8.0475	4.4620	23.797
L2	27.2662	20.6366	1763.4297	9.2325	13.3386	132.2051	3529.1798	10.3203	4.1812	16.725
	30.7181	23.8062	2707.1425	10.6505	15.3677	176.1575	5417.8471	11.9053	4.8843	19.537
L3	30.7181	41.9159	4705.3765	10.5820	15.3677	306.1854	9416.9444	20.9619	4.5445	10.258
	33.5659	45.8596	6162.3812	11.5776	16.7924	366.9734	12332.871	22.9342	5.0381	11.372
L4	32.7033	43.1535	5242.4214	11.0082	15.9754	328.1568	10491.741	21.5809	4.7631	10.863
	40.0921	54.3360	10465.156	13.8608	20.0574	521.7613	20944.082	27.1731	6.1773	14.089
L5	39.2152	53.2488	9341.2437	13.2284	19.1583	487.5809	18694.778	26.6295	5.8452	12.983
	44.1382	61.4718	14371.514	15.2712	22.0816	650.8376	28761.939	30.7418	6.8579	15.232
L6	44.1382	61.6556	14413.560	15.2707	22.0816	652.7417	28846.085	30.8336	6.8555	15.181
	44.2245	61.7774	14499.162	15.3009	22.1247	655.3371	29017.403	30.8946	6.8705	15.214
L7	44.2245	58.2353	13684.425	15.3102	22.1247	618.5124	27386.857	29.1232	6.9165	16.258
	45.5047	59.9377	14919.983	15.7577	22.7652	655.3853	29859.598	29.9746	7.1384	16.779
L8	45.5047	62.9001	15642.401	15.7502	22.7652	687.1188	31305.385	31.4560	7.1010	15.898
	45.6054	63.0406	15747.507	15.7854	22.8156	690.2087	31515.736	31.5263	7.1185	15.937
L9	45.6054	62.4552	15604.198	15.7869	22.8156	683.9274	31228.928	31.2335	7.1258	16.104
	46.4253	63.5892	16469.708	16.0735	23.2258	709.1139	32961.088	31.8006	7.2680	16.425

Tower Elevation ft	Gusset Area (per face) ft <sup>2</sup>	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 148.0000- 117.2500				1	1	1		
L2 117.2500- 97.2500				1	1	1		
L3 97.2500- 80.7500				1	1	1		
L4 80.7500- 40.0000				1	1	1		
L5 40.0000- 13.2500				1	1	1		
L6 13.2500- 12.7500				1	1	1		
L7 12.7500- 5.3333				1	1	1		
L8 5.3333- 4.7500				1	1	1		
L9 4.7500- 0.0000				1	1	1		

**Feed Line/Linear Appurtenances - Entered As Round Or Flat**

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

**Feed Line/Linear Appurtenances - Entered As Area**

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>AA</sub> ft <sup>2</sup> /ft	Weight plf		
HB114-1-0813U4-M5J(1 1/4")	C	No	Inside Pole	148.0000 - 0.0000	3	No Ice	0.0000	1.20		
						1/2" Ice	0.0000	1.20		
						1" Ice	0.0000	1.20		
						2" Ice	0.0000	1.20		
						4" Ice	0.0000	1.20		
***										
LCF158-50A(1-5/8")	C	No	Inside Pole	140.0000 - 0.0000	12	No Ice	0.0000	0.80		
						1/2" Ice	0.0000	0.80		
						1" Ice	0.0000	0.80		
						2" Ice	0.0000	0.80		
						4" Ice	0.0000	0.80		
FB-L98B-002-75000(3/8")	C	No	Inside Pole	140.0000 - 0.0000	1	No Ice	0.0000	0.06		
						1/2" Ice	0.0000	0.06		
						1" Ice	0.0000	0.06		
						2" Ice	0.0000	0.06		
						4" Ice	0.0000	0.06		
WR-VG122ST-BRDA(3/8)	C	No	CaAa (Out Of Face)	140.0000 - 0.0000	1	No Ice	0.0000	0.20		
						1/2" Ice	0.0000	0.74		
						1" Ice	0.0000	1.89		
						2" Ice	0.0000	6.03		
						4" Ice	0.0000	21.63		
WR-VG122ST-BRDA(3/8)	C	No	CaAa (Out Of Face)	140.0000 - 0.0000	1	No Ice	0.0385	0.20		
						1/2" Ice	0.1385	0.74		
						1" Ice	0.2385	1.89		
						2" Ice	0.4385	6.03		
						4" Ice	0.8385	21.63		
***										
LDF7-50A(1-5/8")	C	No	Inside Pole	130.0000 - 0.0000	12	No Ice	0.0000	0.82		
						1/2" Ice	0.0000	0.82		
						1" Ice	0.0000	0.82		
						2" Ice	0.0000	0.82		
						4" Ice	0.0000	0.82		
***										
LDF4-50A(1/2")	C	No	Inside Pole	100.0000 - 0.0000	1	No Ice	0.0000	0.15		
						1/2" Ice	0.0000	0.15		
						1" Ice	0.0000	0.15		
						2" Ice	0.0000	0.15		
						4" Ice	0.0000	0.15		
***										
LDF4-50A(1/2")	C	No	Inside Pole	8.2500 - 0.0000	1	No Ice	0.0000	0.15		
						1/2" Ice	0.0000	0.15		
						1" Ice	0.0000	0.15		
						2" Ice	0.0000	0.15		
						4" Ice	0.0000	0.15		
***										
Aero MP3-05	C	No	CaAa (Out Of Face)	99.5000 - 0.0000	1	No Ice	0.3478	0.00		
						1/2" Ice	0.4001	0.00		
						1" Ice	0.6566	0.00		
						2" Ice	0.8788	0.00		
						4" Ice	1.3232	0.00		
*****										

**Feed Line/Linear Appurtenances Section Areas**

Tower Section	Tower Elevation	Face	$A_R$	$A_F$	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
n	ft		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	K
L1	148.0000-117.2500	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	0.876	0.46
L2	117.2500-97.2500	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	1.553	0.47
L3	97.2500-80.7500	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	6.374	0.39
L4	80.7500-40.0000	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	15.742	0.96
L5	40.0000-13.2500	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	10.333	0.63
L6	13.2500-12.7500	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	0.193	0.01
L7	12.7500-5.3333	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	2.865	0.18
L8	5.3333-4.7500	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	0.225	0.01
L9	4.7500-0.0000	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	1.835	0.11

**Feed Line/Linear Appurtenances Section Areas - With Ice**

Tower Section	Tower Elevation	Face or Leg	Ice Thickness	$A_R$	$A_F$	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
n	ft		in	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	K
L1	148.0000-117.2500	A	1.181	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	6.250	0.58
L2	117.2500-97.2500	A	1.152	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	7.063	0.57
L3	97.2500-80.7500	A	1.126	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	15.648	0.46
L4	80.7500-40.0000	A	1.075	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	38.646	1.14
L5	40.0000-13.2500	A	1.000	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	24.787	0.74
L6	13.2500-12.7500	A	1.000	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	0.448	0.01
L7	12.7500-5.3333	A	1.000	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	6.638	0.20
L8	5.3333-4.7500	A	1.000	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	0.522	0.02
L9	4.7500-0.0000	A	1.000	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	4.252	0.13

### Feed Line Center of Pressure

Section	Elevation	CP <sub>x</sub>	CP <sub>z</sub>	CP <sub>x</sub> Ice	CP <sub>z</sub> Ice
	ft	in	in	in	in
L1	148.0000- 117.2500	-0.0375	0.0217	-0.2271	0.1311
L2	117.2500-97.2500	-0.1003	0.0579	-0.3770	0.2176
L3	97.2500-80.7500	-0.4377	0.2527	-0.8611	0.4972
L4	80.7500-40.0000	-0.4443	0.2565	-0.8925	0.5153
L5	40.0000-13.2500	-0.4509	0.2603	-0.9096	0.5252
L6	13.2500-12.7500	-0.4535	0.2618	-0.8994	0.5192
L7	12.7500-5.3333	-0.4542	0.2622	-0.9025	0.5210
L8	5.3333-4.7500	-0.4548	0.2626	-0.9055	0.5228
L9	4.7500-0.0000	-0.4552	0.2628	-0.9076	0.5240

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement  ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight  K	
(2) DB980H90E-M w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	148.0000	No Ice	4.0361	3.6194	0.03
						1/2" Ice	4.4987	4.4808	0.07
						Ice	4.9468	5.2186	0.11
						1" Ice	5.8700	6.7442	0.22
						2" Ice	8.0460	9.9954	0.55
(2) DB980H90E-M w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	148.0000	No Ice	4.0361	3.6194	0.03
						1/2" Ice	4.4987	4.4808	0.07
						Ice	4.9468	5.2186	0.11
						1" Ice	5.8700	6.7442	0.22
						2" Ice	8.0460	9.9954	0.55
(2) DB980H90E-M w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	148.0000	No Ice	4.0361	3.6194	0.03
						1/2" Ice	4.4987	4.4808	0.07
						Ice	4.9468	5.2186	0.11
						1" Ice	5.8700	6.7442	0.22
						2" Ice	8.0460	9.9954	0.55
Platform Mount [LP 401-1]	C	None		0.0000	150.0000	No Ice	24.3300	24.3300	1.65
						1/2" Ice	30.2200	30.2200	2.03
						Ice	36.1100	36.1100	2.41
						1" Ice	47.8900	47.8900	3.18
						2" Ice	71.4500	71.4500	4.72
*** APXVSP18-C-A20 w/ Mount Pipe	A	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice	8.4975	6.9458	0.08
						1/2" Ice	9.1490	8.1266	0.15
						Ice	9.7672	9.0212	0.23
						1" Ice	11.0311	10.8440	0.41
						2" Ice	13.6786	14.8507	0.91
APXVSP18-C-A20 w/ Mount Pipe	B	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice	8.4975	6.9458	0.08
						1/2" Ice	9.1490	8.1266	0.15
						Ice	9.7672	9.0212	0.23
						1" Ice	11.0311	10.8440	0.41
						2" Ice	13.6786	14.8507	0.91
APXVSP18-C-A20 w/ Mount Pipe	C	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice	8.4975	6.9458	0.08
						1/2" Ice	9.1490	8.1266	0.15
						Ice	9.7672	9.0212	0.23
						1" Ice	11.0311	10.8440	0.41
						2" Ice	13.6786	14.8507	0.91

Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>Front</sub>	C <sub>A</sub> A <sub>Side</sub>	Weight
			Horz	Lateral	Vert					
1900MHz RRH (65MHz)	A	From Face	4.0000	0.0000	150.0000	4" Ice	2.6979	2.7708	0.06	
			0.00			No Ice	2.9362	3.0111	0.08	
			-2.00			1/2"	3.1832	3.2600	0.11	
						Ice	3.7030	3.7837	0.18	
						1" Ice	4.8463	4.9348	0.35	
1900MHz RRH (65MHz)	B	From Face	4.0000	0.0000	150.0000	4" Ice	2.6979	2.7708	0.06	
			0.00			No Ice	2.9362	3.0111	0.08	
			-2.00			1/2"	3.1832	3.2600	0.11	
						Ice	3.7030	3.7837	0.18	
						1" Ice	4.8463	4.9348	0.35	
1900MHz RRH (65MHz)	C	From Face	4.0000	0.0000	150.0000	4" Ice	2.6979	2.7708	0.06	
			0.00			No Ice	2.9362	3.0111	0.08	
			-2.00			1/2"	3.1832	3.2600	0.11	
						Ice	3.7030	3.7837	0.18	
						1" Ice	4.8463	4.9348	0.35	
(3) ACU-A20-N	A	From Face	4.0000	0.0000	150.0000	4" Ice	0.0778	0.1361	0.00	
			0.00			No Ice	0.1210	0.1890	0.00	
			-2.00			1/2"	0.1728	0.2506	0.00	
						Ice	0.3025	0.3997	0.01	
						1" Ice	0.6654	0.8015	0.04	
(3) ACU-A20-N	B	From Face	4.0000	0.0000	150.0000	4" Ice	0.0778	0.1361	0.00	
			0.00			No Ice	0.1210	0.1890	0.00	
			-2.00			1/2"	0.1728	0.2506	0.00	
						Ice	0.3025	0.3997	0.01	
						1" Ice	0.6654	0.8015	0.04	
(3) ACU-A20-N	C	From Face	4.0000	0.0000	150.0000	4" Ice	0.0778	0.1361	0.00	
			0.00			No Ice	0.1210	0.1890	0.00	
			-2.00			1/2"	0.1728	0.2506	0.00	
						Ice	0.3025	0.3997	0.01	
						1" Ice	0.6654	0.8015	0.04	
800MHZ RRH	A	From Face	4.0000	0.0000	150.0000	4" Ice	2.4899	2.0685	0.05	
			0.00			No Ice	2.7061	2.2705	0.07	
			-2.00			1/2"	2.9310	2.4812	0.10	
						Ice	3.4068	2.9284	0.16	
						1" Ice	4.4620	3.9265	0.32	
800MHZ RRH	B	From Face	4.0000	0.0000	150.0000	4" Ice	2.4899	2.0685	0.05	
			0.00			No Ice	2.7061	2.2705	0.07	
			-2.00			1/2"	2.9310	2.4812	0.10	
						Ice	3.4068	2.9284	0.16	
						1" Ice	4.4620	3.9265	0.32	
800MHZ RRH	C	From Face	4.0000	0.0000	150.0000	4" Ice	2.4899	2.0685	0.05	
			0.00			No Ice	2.7061	2.2705	0.07	
			-2.00			1/2"	2.9310	2.4812	0.10	
						Ice	3.4068	2.9284	0.16	
						1" Ice	4.4620	3.9265	0.32	
800 EXTERNAL NOTCH FILTER	A	From Face	4.0000	0.0000	150.0000	4" Ice	0.7701	0.3747	0.01	
			0.00			No Ice	0.8898	0.4647	0.02	
			-2.00			1/2"	1.0181	0.5634	0.02	
						Ice	1.3007	0.7868	0.04	
						1" Ice	1.9696	1.3372	0.11	
800 EXTERNAL NOTCH FILTER	B	From Face	4.0000	0.0000	150.0000	4" Ice	0.7701	0.3747	0.01	
			0.00			No Ice	0.8898	0.4647	0.02	
			-2.00			1/2"	1.0181	0.5634	0.02	
						Ice	1.3007	0.7868	0.04	
						1" Ice	1.9696	1.3372	0.11	

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft		C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
800 EXTERNAL NOTCH FILTER	C	From Face	4.0000 0.00 -2.00	0.0000	150.0000	2" Ice	1.9696	1.3372	0.11
						4" Ice			
						No Ice	0.7701	0.3747	0.01
						1/2" Ice	0.8898	0.4647	0.02
						1" Ice	1.0181	0.5634	0.02
						2" Ice	1.3007	0.7868	0.04
Miscellaneous (NA507-1)	C	From Face	4.0000 0.00 -2.00	0.0000	150.0000	4" Ice	1.9696	1.3372	0.11
						No Ice	4.8000	4.8000	0.25
						1/2" Ice	6.7000	6.7000	0.29
						1" Ice	8.6000	8.6000	0.34
						2" Ice	12.4000	12.4000	0.44
						4" Ice	20.0000	20.0000	0.64
** ** ***									
(2) 7770.00 w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	6.1194	4.2543	0.06
						1/2" Ice	6.6258	5.0137	0.10
						1" Ice	7.1283	5.7109	0.16
						2" Ice	8.1643	7.1553	0.29
						4" Ice	10.3599	10.4117	0.66
						No Ice	6.1194	4.2543	0.06
(2) 7770.00 w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	6.1194	4.2543	0.06
						1/2" Ice	6.6258	5.0137	0.10
						1" Ice	7.1283	5.7109	0.16
						2" Ice	8.1643	7.1553	0.29
						4" Ice	10.3599	10.4117	0.66
						No Ice	6.1194	4.2543	0.06
(2) 7770.00 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	6.1194	4.2543	0.06
						1/2" Ice	6.6258	5.0137	0.10
						1" Ice	7.1283	5.7109	0.16
						2" Ice	8.1643	7.1553	0.29
						4" Ice	10.3599	10.4117	0.66
						No Ice	6.1194	4.2543	0.06
(2) LGP 17201	A	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	1.9460	0.5180	0.03
						1/2" Ice	2.1337	0.6396	0.04
						1" Ice	2.3301	0.7699	0.06
						2" Ice	2.7488	1.0564	0.09
						4" Ice	3.6900	1.7331	0.19
						No Ice	1.9460	0.5180	0.03
(2) LGP 17201	B	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	1.9460	0.5180	0.03
						1/2" Ice	2.1337	0.6396	0.04
						1" Ice	2.3301	0.7699	0.06
						2" Ice	2.7488	1.0564	0.09
						4" Ice	3.6900	1.7331	0.19
						No Ice	1.9460	0.5180	0.03
(2) LGP 17201	C	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	1.9460	0.5180	0.03
						1/2" Ice	2.1337	0.6396	0.04
						1" Ice	2.3301	0.7699	0.06
						2" Ice	2.7488	1.0564	0.09
						4" Ice	3.6900	1.7331	0.19
						No Ice	1.9460	0.5180	0.03
(2) LGP21901	A	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	0.2695	0.1838	0.01
						1/2" Ice	0.3432	0.2483	0.01
						1" Ice	0.4255	0.3216	0.01
						2" Ice	0.6160	0.4940	0.02
						4" Ice	1.1009	0.9425	0.07
						No Ice	0.2695	0.1838	0.01
(2) LGP21901	B	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice	0.2695	0.1838	0.01
						1/2" Ice	0.3432	0.2483	0.01
						1" Ice	0.4255	0.3216	0.01
						2" Ice	0.6160	0.4940	0.02
						4" Ice	1.1009	0.9425	0.07
						No Ice	0.2695	0.1838	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
(2) LGP21901	C	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 0.2695 1/2" 0.3432 Ice 0.4255 1" Ice 0.6160 2" Ice 1.1009 4" Ice	0.1838 0.2483 0.3216 0.4940 0.9425	0.01 0.01 0.01 0.02 0.07
T-Arm Mount [TA 602-3]	C	None		0.0000	140.0000	No Ice 11.5900 1/2" 15.4400 Ice 19.2900 1" Ice 26.9900 2" Ice 42.3900 4" Ice	11.5900 15.4400 19.2900 26.9900 42.3900	0.77 0.99 1.21 1.64 2.50
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice 8.4975 1/2" 9.1490 Ice 9.7672 1" Ice 11.0311 2" Ice 13.6786 4" Ice	6.3042 7.4790 8.3676 10.1785 14.0237	0.07 0.14 0.21 0.38 0.87
AM-X-CD-14-65-00T-RET w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice 5.7442 1/2" 6.1977 Ice 6.6606 1" Ice 7.6178 2" Ice 9.6678 4" Ice	4.0153 4.6330 5.2765 6.6779 9.7441	0.03 0.08 0.13 0.25 0.61
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice 8.4975 1/2" 9.1490 Ice 9.7672 1" Ice 11.0311 2" Ice 13.6786 4" Ice	6.3042 7.4790 8.3676 10.1785 14.0237	0.07 0.14 0.21 0.38 0.87
DC6-48-60-18-8F	B	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice 2.5667 1/2" 2.7978 Ice 3.0377 1" Ice 3.5432 2" Ice 4.6580 4" Ice	2.5667 2.7978 3.0377 3.5432 4.6580	0.02 0.04 0.07 0.13 0.30
***								
(2) RRUS-11	A	From Leg	2.0000 0.00 0.00	0.0000	138.0000	No Ice 3.2486 1/2" 3.4905 Ice 3.7411 1" Ice 4.2682 2" Ice 5.4260 4" Ice	1.3726 1.5510 1.7380 2.1381 3.0418	0.05 0.07 0.09 0.15 0.31
(2) RRUS-11	B	From Leg	2.0000 0.00 0.00	0.0000	138.0000	No Ice 3.2486 1/2" 3.4905 Ice 3.7411 1" Ice 4.2682 2" Ice 5.4260 4" Ice	1.3726 1.5510 1.7380 2.1381 3.0418	0.05 0.07 0.09 0.15 0.31
(2) RRUS-11	C	From Leg	2.0000 0.00 0.00	0.0000	138.0000	No Ice 3.2486 1/2" 3.4905 Ice 3.7411 1" Ice 4.2682 2" Ice 5.4260 4" Ice	1.3726 1.5510 1.7380 2.1381 3.0418	0.05 0.07 0.09 0.15 0.31
Side Arm Mount [SO 102-3]	C	None		0.0000	138.0000	No Ice 3.0000 1/2" 3.4800 Ice 3.9600 1" Ice 4.9200 2" Ice 6.8400 4" Ice	3.0000 3.4800 3.9600 4.9200 6.8400	0.08 0.11 0.14 0.20 0.32
***								
(2) LPA-80080/6CF w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 4.5639 1/2" 5.1051 Ice 5.6116	10.7282 11.9896 12.9683	0.05 0.11 0.19

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
(2) LPA-80080/6CF w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	6.6508	14.9795	0.36
						2" Ice	8.8342	19.2168	0.86
						4" Ice			
						No Ice	4.5639	10.7282	0.05
						1/2" Ice	5.1051	11.9896	0.11
						Ice	5.6116	12.9683	0.19
BXA-171085-12BF-EDIN-2 w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	6.6508	14.9795	0.36
						2" Ice	8.8342	19.2168	0.86
						4" Ice			
						No Ice	4.9710	5.2283	0.04
						1/2" Ice	5.5211	6.3892	0.09
						Ice	6.0361	7.2610	0.14
BXA-171085-12BF-EDIN-2 w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	7.0911	9.0462	0.27
						2" Ice	9.3593	12.8165	0.67
						4" Ice			
						No Ice	4.9710	5.2283	0.04
						1/2" Ice	5.5211	6.3892	0.09
						Ice	6.0361	7.2610	0.14
BXA-171085-12BF-EDIN-2 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	7.0911	9.0462	0.27
						2" Ice	9.3593	12.8165	0.67
						4" Ice			
						No Ice	4.9710	5.2283	0.04
						1/2" Ice	5.5211	6.3892	0.09
						Ice	6.0361	7.2610	0.14
BXA-70080/6CF w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	7.0911	9.0462	0.27
						2" Ice	9.3593	12.8165	0.67
						4" Ice			
						No Ice	6.0736	6.0983	0.04
						1/2" Ice	6.6306	7.2558	0.10
						Ice	7.1524	8.1258	0.16
BXA-70063/6CFx2 w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	8.2495	9.9156	0.31
						2" Ice	10.7781	13.7095	0.75
						4" Ice			
						No Ice	7.9686	5.3981	0.04
						1/2" Ice	8.6091	6.5465	0.10
						Ice	9.2158	7.4089	0.17
BXA-70080-6CF-EDIN-6 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	10.4591	9.1837	0.33
						2" Ice	13.0655	12.9333	0.79
						4" Ice			
						No Ice	6.0062	6.2035	0.04
						1/2" Ice	6.5619	7.3594	0.10
						Ice	7.0826	8.2293	0.16
(2) LPA-80080-6CF-EDIN-6 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	8.1672	10.0193	0.31
						2" Ice	10.6907	13.8398	0.75
						4" Ice			
						No Ice	4.5604	10.7396	0.05
						1/2" Ice	5.1019	12.0018	0.11
						Ice	5.6085	12.9809	0.19
(2) FD9R6004/2C-3L	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	6.6479	14.9930	0.36
						2" Ice	8.8318	19.2318	0.86
						4" Ice			
						No Ice	0.3665	0.0846	0.00
						1/2" Ice	0.4506	0.1362	0.01
						Ice	0.5433	0.1965	0.01
(2) FD9R6004/2C-3L	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	1" Ice	0.7546	0.3430	0.02
						2" Ice	1.2808	0.7396	0.06
						4" Ice			
						No Ice	0.3665	0.0846	0.00
						1/2" Ice	0.4506	0.1362	0.01
						Ice	0.5433	0.1965	0.01
(2) FD9R6004/2C-3L	C	From Face	4.0000 0.00	0.0000	130.0000	1" Ice	0.7546	0.3430	0.02
						2" Ice	1.2808	0.7396	0.06
						4" Ice			
						No Ice	0.3665	0.0846	0.00
						1/2" Ice	0.4506	0.1362	0.01
						Ice	0.5433	0.1965	0.01



Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
			0.00						
Platform Mount [LP 305-1]	C	None		0.0000	130.0000	Ice	0.5433	0.1965	0.01
						1" Ice	0.7546	0.3430	0.02
						2" Ice	1.2808	0.7396	0.06
						4" Ice			
						No Ice	18.0100	18.0100	1.12
						1/2"	23.3300	23.3300	1.35
						Ice	28.6500	28.6500	1.58
Side Arm Mount [SO 701-1]	A	None		0.0000	100.0000	1" Ice	39.2900	39.2900	2.05
						2" Ice	60.5700	60.5700	2.97
						4" Ice			
						No Ice	0.8500	1.6700	0.07
						1/2"	1.1400	2.3400	0.08
						Ice	1.4300	3.0100	0.09
						1" Ice	2.0100	4.3500	0.12
KS24019-L112A	A	From Face	2.0000 0.00 2.00	0.0000	100.0000	2" Ice	3.1700	7.0300	0.18
						4" Ice			
						No Ice	0.1556	0.1556	0.01
						1/2"	0.2247	0.2247	0.01
						Ice	0.3025	0.3025	0.01
						1" Ice	0.4840	0.4840	0.02
						2" Ice	0.9506	0.9506	0.06

**Tower Pressures - No Ice**

**G<sub>H</sub> = 1.690**

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L1 148.0000-117.2500	132.2079	1.487	24	63.072	A	0.000	63.072	63.072	100.00	0.000	0.000
					B	0.000	63.072	63.072	100.00	0.000	0.000
					C	0.000	63.072	63.072	100.00	0.000	0.876
L2 117.2500-97.2500	107.0516	1.4	23	47.586	A	0.000	47.586	47.586	100.00	0.000	0.000
					B	0.000	47.586	47.586	100.00	0.000	0.000
					C	0.000	47.586	47.586	100.00	0.000	1.553
L3 97.2500-80.7500	88.8782	1.327	22	43.524	A	0.000	43.524	43.524	100.00	0.000	0.000
					B	0.000	43.524	43.524	100.00	0.000	0.000
					C	0.000	43.524	43.524	100.00	0.000	6.374
L4 80.7500-40.0000	60.1817	1.187	19	121.723	A	0.000	121.723	121.723	100.00	0.000	0.000
					B	0.000	121.723	121.723	100.00	0.000	0.000
					C	0.000	121.723	121.723	100.00	0.000	15.742
L5 40.0000-13.2500	26.3617	1	16	91.493	A	0.000	91.493	91.493	100.00	0.000	0.000
					B	0.000	91.493	91.493	100.00	0.000	0.000
					C	0.000	91.493	91.493	100.00	0.000	10.333
L6 13.2500-12.7500	12.9999	1	16	1.813	A	0.000	1.813	1.813	100.00	0.000	0.000
					B	0.000	1.813	1.813	100.00	0.000	0.000
					C	0.000	1.813	1.813	100.00	0.000	0.193
L7 12.7500-5.3333	9.0240	1	16	27.308	A	0.000	27.308	27.308	100.00	0.000	0.000
					B	0.000	27.308	27.308	100.00	0.000	0.000
					C	0.000	27.308	27.308	100.00	0.000	2.865
L8 5.3333-4.7500	5.0415	1	16	2.181	A	0.000	2.181	2.181	100.00	0.000	0.000
					B	0.000	2.181	2.181	100.00	0.000	0.000
					C	0.000	2.181	2.181	100.00	0.000	0.225
L9 4.7500-0.0000	2.3679	1	16	17.938	A	0.000	17.938	17.938	100.00	0.000	0.000
					B	0.000	17.938	17.938	100.00	0.000	0.000
					C	0.000	17.938	17.938	100.00	0.000	0.000

Section Elevation	z	K <sub>Z</sub>	q <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face
ft	ft		psf	ft <sup>2</sup>	e	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
					C	0.000	17.938		100.00	0.000	1.835

### Tower Pressure - With Ice

**G<sub>H</sub> = 1.690**

Section Elevation	z	K <sub>Z</sub>	q <sub>z</sub>	l <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face
ft	ft		psf	in	ft <sup>2</sup>	e	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L1 148.0000-117.2500	132.2079	1.487	3	1.1812	69.126	A	0.000	69.126	69.126	100.00	0.000	0.000
						B	0.000	69.126		100.00	0.000	0.000
						C	0.000	69.126		100.00	0.000	6.250
L2 117.2500-97.2500	107.0516	1.4	3	1.1517	51.524	A	0.000	51.524	51.524	100.00	0.000	0.000
						B	0.000	51.524		100.00	0.000	0.000
						C	0.000	51.524		100.00	0.000	7.063
L3 97.2500-80.7500	88.8782	1.327	3	1.1262	46.621	A	0.000	46.621	46.621	100.00	0.000	0.000
						B	0.000	46.621		100.00	0.000	0.000
						C	0.000	46.621		100.00	0.000	15.648
L4 80.7500-40.0000	60.1817	1.187	2	1.0748	129.372	A	0.000	129.372	129.372	100.00	0.000	0.000
						B	0.000	129.372		100.00	0.000	0.000
						C	0.000	129.372		100.00	0.000	38.646
L5 40.0000-13.2500	26.3617	1	2	1.0000	96.285	A	0.000	96.285	96.285	100.00	0.000	0.000
						B	0.000	96.285		100.00	0.000	0.000
						C	0.000	96.285		100.00	0.000	24.787
L6 13.2500-12.7500	12.9999	1	2	1.0000	1.896	A	0.000	1.896	1.896	100.00	0.000	0.000
						B	0.000	1.896		100.00	0.000	0.000
						C	0.000	1.896		100.00	0.000	0.448
L7 12.7500-5.3333	9.0240	1	2	1.0000	28.544	A	0.000	28.544	28.544	100.00	0.000	0.000
						B	0.000	28.544		100.00	0.000	0.000
						C	0.000	28.544		100.00	0.000	6.638
L8 5.3333-4.7500	5.0415	1	2	1.0000	2.278	A	0.000	2.278	2.278	100.00	0.000	0.000
						B	0.000	2.278		100.00	0.000	0.000
						C	0.000	2.278		100.00	0.000	0.522
L9 4.7500-0.0000	2.3679	1	2	1.0000	18.729	A	0.000	18.729	18.729	100.00	0.000	0.000
						B	0.000	18.729		100.00	0.000	0.000
						C	0.000	18.729		100.00	0.000	4.252

### Tower Pressure - Service

**G<sub>H</sub> = 1.690**

Section Elevation	z	K <sub>Z</sub>	q <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face
ft	ft		psf	ft <sup>2</sup>	e	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L1 148.0000-117.2500	132.2079	1.487	10	63.072	A	0.000	63.072	63.072	100.00	0.000	0.000
					B	0.000	63.072		100.00	0.000	0.000
					C	0.000	63.072		100.00	0.000	0.876
L2 117.2500-97.2500	107.0516	1.4	9	47.586	A	0.000	47.586	47.586	100.00	0.000	0.000
					B	0.000	47.586		100.00	0.000	0.000
					C	0.000	47.586		100.00	0.000	1.553
L3 97.2500-80.7500	88.8782	1.327	8	43.524	A	0.000	43.524	43.524	100.00	0.000	0.000
					B	0.000	43.524		100.00	0.000	0.000
					C	0.000	43.524		100.00	0.000	6.374
L4 80.7500-40.0000	60.1817	1.187	8	121.72	A	0.000	121.723	121.723	100.00	0.000	0.000
			3		B	0.000	121.723		100.00	0.000	0.000
					C	0.000	121.723		100.00	0.000	15.742
L5 40.0000-13.2500	26.3617	1	6	91.493	A	0.000	91.493	91.493	100.00	0.000	0.000
					B	0.000	91.493		100.00	0.000	0.000

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>Z</sub> psf	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L6 13.2500- 12.7500	12,9999	1	6	1,813	C	0.000	91,493	1,813	100.00	0.000	10,333
					A	0.000	1,813		100.00	0.000	0.000
					B	0.000	1,813		100.00	0.000	0.000
					C	0.000	1,813		100.00	0.000	0.193
L7 12.7500- 5.3333	9.0240	1	6	27,308	A	0.000	27,308	27,308	100.00	0.000	0.000
					B	0.000	27,308		100.00	0.000	0.000
					C	0.000	27,308		100.00	0.000	2,865
					C	0.000	27,308		100.00	0.000	0.000
L8 5.3333- 4.7500	5.0415	1	6	2,181	A	0.000	2,181	2,181	100.00	0.000	0.000
					B	0.000	2,181		100.00	0.000	0.000
					C	0.000	2,181		100.00	0.000	0.225
					C	0.000	2,181		100.00	0.000	0.000
L9 4.7500- 0.0000	2.3679	1	6	17,938	A	0.000	17,938	17,938	100.00	0.000	0.000
					B	0.000	17,938		100.00	0.000	0.000
					C	0.000	17,938		100.00	0.000	0.000
					C	0.000	17,938		100.00	0.000	1,835

### Load Combinations

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

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
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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
L1	148 - 117.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-16.62	0.11	-1.87
			Max. Mx	11	-6.76	252.79	-1.74
			Max. My	8	-6.77	0.72	-253.46
			Max. Vy	11	-14.03	252.79	-1.74
			Max. Vx	8	13.98	0.72	-253.46
			Max. Torque	5			-1.25
L2	117.25 - 97.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-20.45	0.28	-1.97
			Max. Mx	11	-9.50	600.51	-3.13
			Max. My	8	-9.50	2.08	-599.89
			Max. Vy	11	-15.61	600.51	-3.13
			Max. Vx	8	15.55	2.08	-599.89
			Max. Torque	5			-1.26
L3	97.25 - 80.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-23.16	0.34	-2.01
			Max. Mx	11	-11.66	797.63	-3.85
			Max. My	8	-11.67	2.79	-796.34
			Max. Vy	11	-16.59	797.63	-3.85
			Max. Vx	8	16.54	2.79	-796.34
			Max. Torque	5			-1.27
L4	80.75 - 40	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-33.65	0.58	-2.10
			Max. Mx	11	-20.18	1522.87	-6.18
			Max. My	8	-20.18	5.09	-1519.37
			Max. Vy	11	-19.57	1522.87	-6.18
			Max. Vx	8	19.52	5.09	-1519.37
			Max. Torque	5			-1.33
L5	40 - 13.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-43.53	0.78	-2.17
			Max. Mx	11	-28.46	2176.13	-7.98
			Max. My	8	-28.46	6.89	-2170.91
			Max. Vy	11	-21.51	2176.13	-7.98
			Max. Vx	8	21.45	6.89	-2170.91
			Max. Torque	5			-1.38
L6	13.25 - 12.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-43.68	0.78	-2.17
			Max. Mx	11	-28.60	2186.89	-8.01
			Max. My	8	-28.60	6.91	-2181.63
			Max. Vy	11	-21.53	2186.89	-8.01
			Max. Vx	8	21.48	6.91	-2181.63
			Max. Torque	5			-1.38
L7	12.75 - 5.3333	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-45.78	0.83	-2.19
			Max. Mx	11	-30.38	2348.03	-8.42
			Max. My	8	-30.38	7.33	-2342.37
			Max. Vy	11	-21.94	2348.03	-8.42
			Max. Vx	8	21.89	7.33	-2342.37
			Max. Torque	5			-1.39
L8	5.3333 - 4.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-45.96	0.83	-2.19
			Max. Mx	11	-30.53	2360.83	-8.45
			Max. My	8	-30.53	7.36	-2355.15
			Max. Vy	11	-21.97	2360.83	-8.45
			Max. Vx	8	21.92	7.36	-2355.15
			Max. Torque	5			-1.39
L9	4.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-47.37	0.86	-2.20
			Max. Mx	11	-31.74	2465.79	-8.71
			Max. My	8	-31.74	7.62	-2459.85
			Max. Vy	11	-22.24	2465.79	-8.71
			Max. Vx	8	22.19	7.62	-2459.85
			Max. Torque	5			-1.40

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	47.37	-0.00	0.00
	Max. H <sub>x</sub>	11	31.75	22.23	-0.05
	Max. H <sub>z</sub>	2	31.75	-0.05	22.18
	Max. M <sub>x</sub>	2	2457.31	-0.05	22.18
	Max. M <sub>z</sub>	5	2465.43	-22.23	0.05
	Max. Torsion	11	1.40	22.23	-0.05
	Min. Vert	8	31.75	0.05	-22.18
	Min. H <sub>x</sub>	5	31.75	-22.23	0.05
	Min. H <sub>z</sub>	8	31.75	0.05	-22.18
	Min. M <sub>x</sub>	8	-2459.85	0.05	-22.18
	Min. M <sub>z</sub>	11	-2465.79	22.23	-0.05
	Min. Torsion	5	-1.40	-22.23	0.05

### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	31.75	0.00	-0.00	1.18	0.17	-0.00
Dead+Wind 0 deg - No Ice	31.75	0.05	-22.18	-2457.31	-7.27	-0.37
Dead+Wind 30 deg - No Ice	31.75	11.16	-19.23	-2131.91	-1239.15	0.37
Dead+Wind 60 deg - No Ice	31.75	19.28	-11.14	-1234.62	-2138.95	1.02
Dead+Wind 90 deg - No Ice	31.75	22.23	-0.05	-6.18	-2465.43	1.40
Dead+Wind 120 deg - No Ice	31.75	19.22	11.04	1224.28	-2131.54	1.40
Dead+Wind 150 deg - No Ice	31.75	11.07	19.18	2127.04	-1226.28	1.02
Dead+Wind 180 deg - No Ice	31.75	-0.05	22.18	2459.85	7.62	0.37
Dead+Wind 210 deg - No Ice	31.75	-11.16	19.23	2134.45	1239.51	-0.38
Dead+Wind 240 deg - No Ice	31.75	-19.28	11.14	1237.15	2139.31	-1.02
Dead+Wind 270 deg - No Ice	31.75	-22.23	0.05	8.71	2465.79	-1.40
Dead+Wind 300 deg - No Ice	31.75	-19.22	-11.04	-1221.74	2131.90	-1.40
Dead+Wind 330 deg - No Ice	31.75	-11.07	-19.18	-2124.50	1226.63	-1.02
Dead+Ice+Temp	47.37	0.00	-0.00	2.20	0.86	-0.00
Dead+Wind 0 deg+Ice+Temp	47.37	0.01	-3.63	-419.88	0.06	-0.12
Dead+Wind 30 deg+Ice+Temp	47.37	1.82	-3.15	-363.72	-211.58	0.07
Dead+Wind 60 deg+Ice+Temp	47.37	3.15	-1.82	-209.44	-366.28	0.23
Dead+Wind 90 deg+Ice+Temp	47.37	3.64	-0.01	1.63	-422.59	0.34
Dead+Wind 120 deg+Ice+Temp	47.37	3.15	1.81	212.93	-365.42	0.35
Dead+Wind 150 deg+Ice+Temp	47.37	1.81	3.14	367.84	-210.09	0.27
Dead+Wind 180 deg+Ice+Temp	47.37	-0.01	3.63	424.86	1.78	0.12
Dead+Wind 210 deg+Ice+Temp	47.37	-1.82	3.15	368.70	213.42	-0.07
Dead+Wind 240 deg+Ice+Temp	47.37	-3.15	1.82	214.42	368.12	-0.24
Dead+Wind 270 deg+Ice+Temp	47.37	-3.64	0.01	3.35	424.43	-0.34
Dead+Wind 300 deg+Ice+Temp	47.37	-3.15	-1.81	-207.95	367.26	-0.35
Dead+Wind 330 deg+Ice+Temp	47.37	-1.81	-3.14	-362.86	211.93	-0.27
Dead+Wind 0 deg - Service	31.75	0.02	-8.66	-960.26	-2.73	-0.15
Dead+Wind 30 deg - Service	31.75	4.36	-7.51	-833.10	-484.58	0.15
Dead+Wind 60 deg - Service	31.75	7.53	-4.35	-482.12	-836.50	0.40
Dead+Wind 90 deg - Service	31.75	8.68	-0.02	-1.64	-964.05	0.55

Load Combination	Vertical	Shear <sub>x</sub>	Shear <sub>z</sub>	Overturing Moment, M <sub>x</sub>	Overturing Moment, M <sub>z</sub>	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 120 deg - Service	31.75	7.51	4.31	479.65	-833.62	0.55
Dead+Wind 150 deg - Service	31.75	4.32	7.49	832.72	-479.52	0.40
Dead+Wind 180 deg - Service	31.75	-0.02	8.66	962.81	3.09	0.15
Dead+Wind 210 deg - Service	31.75	-4.36	7.51	835.63	484.92	-0.15
Dead+Wind 240 deg - Service	31.75	-7.53	4.35	484.69	836.89	-0.40
Dead+Wind 270 deg - Service	31.75	-8.68	0.02	4.19	964.41	-0.55
Dead+Wind 300 deg - Service	31.75	-7.51	-4.31	-477.07	833.95	-0.55
Dead+Wind 330 deg - Service	31.75	-4.32	-7.49	-830.19	479.89	-0.40

### 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	-31.75	0.00	-0.00	31.75	0.00	0.001%
2	0.05	-31.75	-22.18	-0.05	31.75	22.18	0.007%
3	11.16	-31.75	-19.23	-11.16	31.75	19.23	0.000%
4	19.28	-31.75	-11.14	-19.28	31.75	11.14	0.000%
5	22.23	-31.75	-0.05	-22.23	31.75	0.05	0.003%
6	19.22	-31.75	11.04	-19.22	31.75	-11.04	0.000%
7	11.07	-31.75	19.18	-11.07	31.75	-19.18	0.000%
8	-0.05	-31.75	22.18	0.05	31.75	-22.18	0.007%
9	-11.16	-31.75	19.23	11.16	31.75	-19.23	0.000%
10	-19.28	-31.75	11.14	19.28	31.75	-11.14	0.000%
11	-22.23	-31.75	0.05	22.23	31.75	-0.05	0.003%
12	-19.22	-31.75	-11.04	19.22	31.75	11.04	0.000%
13	-11.07	-31.75	-19.18	11.07	31.75	19.18	0.000%
14	0.00	-47.37	0.00	-0.00	47.37	0.00	0.003%
15	0.01	-47.37	-3.63	-0.01	47.37	3.63	0.001%
16	1.82	-47.37	-3.15	-1.82	47.37	3.15	0.001%
17	3.15	-47.37	-1.82	-3.15	47.37	1.82	0.001%
18	3.64	-47.37	-0.01	-3.64	47.37	0.01	0.001%
19	3.15	-47.37	1.81	-3.15	47.37	-1.81	0.001%
20	1.81	-47.37	3.14	-1.81	47.37	-3.14	0.001%
21	-0.01	-47.37	3.63	0.01	47.37	-3.63	0.001%
22	-1.82	-47.37	3.15	1.82	47.37	-3.15	0.001%
23	-3.15	-47.37	1.82	3.15	47.37	-1.82	0.001%
24	-3.64	-47.37	0.01	3.64	47.37	-0.01	0.001%
25	-3.15	-47.37	-1.81	3.15	47.37	1.81	0.001%
26	-1.81	-47.37	-3.14	1.81	47.37	3.14	0.001%
27	0.02	-31.75	-8.66	-0.02	31.75	8.66	0.007%
28	4.36	-31.75	-7.51	-4.36	31.75	7.51	0.001%
29	7.53	-31.75	-4.35	-7.53	31.75	4.35	0.002%
30	8.68	-31.75	-0.02	-8.68	31.75	0.02	0.007%
31	7.51	-31.75	4.31	-7.51	31.75	-4.31	0.001%
32	4.32	-31.75	7.49	-4.32	31.75	-7.49	0.002%
33	-0.02	-31.75	8.66	0.02	31.75	-8.66	0.007%
34	-4.36	-31.75	7.51	4.36	31.75	-7.51	0.002%
35	-7.53	-31.75	4.35	7.53	31.75	-4.35	0.001%
36	-8.68	-31.75	0.02	8.68	31.75	-0.02	0.007%
37	-7.51	-31.75	-4.31	7.51	31.75	4.31	0.002%
38	-4.32	-31.75	-7.49	4.32	31.75	7.49	0.001%

### Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.0000001	0.0000001
2	Yes	16	0.00006687	0.00007821
3	Yes	21	0.0000001	0.00011943
4	Yes	21	0.0000001	0.00011628
5	Yes	17	0.00003304	0.00008814
6	Yes	21	0.0000001	0.00011982
7	Yes	21	0.0000001	0.00011522
8	Yes	16	0.00006688	0.00009514
9	Yes	21	0.0000001	0.00011794
10	Yes	21	0.0000001	0.00012136
11	Yes	17	0.00003304	0.00011481
12	Yes	21	0.0000001	0.00011396
13	Yes	21	0.0000001	0.00011830
14	Yes	7	0.0000001	0.00003188
15	Yes	17	0.0000001	0.00011351
16	Yes	17	0.0000001	0.00013018
17	Yes	17	0.0000001	0.00012991
18	Yes	17	0.0000001	0.00011515
19	Yes	17	0.0000001	0.00013287
20	Yes	17	0.0000001	0.00013184
21	Yes	17	0.0000001	0.00011618
22	Yes	17	0.0000001	0.00013320
23	Yes	17	0.0000001	0.00013397
24	Yes	17	0.0000001	0.00011572
25	Yes	17	0.0000001	0.00012978
26	Yes	17	0.0000001	0.00013031
27	Yes	15	0.00013976	0.00007909
28	Yes	18	0.0000001	0.00007952
29	Yes	17	0.0000001	0.00014429
30	Yes	15	0.00013980	0.00010158
31	Yes	18	0.0000001	0.00008219
32	Yes	17	0.0000001	0.00014435
33	Yes	15	0.00013987	0.00008055
34	Yes	17	0.0000001	0.00014989
35	Yes	18	0.0000001	0.00008299
36	Yes	15	0.00013981	0.00010687
37	Yes	17	0.0000001	0.00014020
38	Yes	18	0.0000001	0.00007946

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	148 - 117.25	38.476	35	2.3219	0.0079
L2	120.75 - 97.25	25.725	35	2.0577	0.0038
L3	97.25 - 80.75	16.622	35	1.5864	0.0021
L4	85 - 40	12.785	35	1.4032	0.0016
L5	45 - 13.25	3.649	35	0.7416	0.0007
L6	13.25 - 12.75	0.314	35	0.2292	0.0002
L7	12.75 - 5.3333	0.291	35	0.2208	0.0002
L8	5.3333 - 4.75	0.050	35	0.0895	0.0001
L9	4.75 - 0	0.040	35	0.0798	0.0001

### Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.0000	Platform Mount [LP 401-1]	35	38.476	2.3219	0.0079	17506
148.0000	(2) DB980H90E-M w/ Mount Pipe	35	38.476	2.3219	0.0079	17506

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.0000	(2) 7770.00 w/ Mount Pipe	35	34.609	2.2701	0.0066	10941
138.0000	(2) RRUS-11	35	33.650	2.2554	0.0062	8753
130.0000	(2) LPA-80080/6CF w/ Mount Pipe	35	29.882	2.1830	0.0050	4862
100.0000	Side Arm Mount [SO 701-1]	35	17.567	1.6369	0.0022	2743

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	148 - 117.25	98.016	10	5.9076	0.0200
L2	120.75 - 97.25	65.599	10	5.2478	0.0096
L3	97.25 - 80.75	42.415	10	4.0487	0.0052
L4	85 - 40	32.631	10	3.5820	0.0041
L5	45 - 13.25	9.320	10	1.8942	0.0017
L6	13.25 - 12.75	0.803	10	0.5856	0.0005
L7	12.75 - 5.3333	0.743	10	0.5641	0.0004
L8	5.3333 - 4.75	0.128	10	0.2287	0.0002
L9	4.75 - 0	0.101	10	0.2038	0.0002

### Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.0000	Platform Mount [LP 401-1]	10	98.016	5.9076	0.0202	7060
148.0000	(2) DB980H90E-M w/ Mount Pipe	10	98.016	5.9076	0.0202	7060
140.0000	(2) 7770.00 w/ Mount Pipe	10	88.188	5.7807	0.0168	4412
138.0000	(2) RRUS-11	10	85.752	5.7445	0.0159	3529
130.0000	(2) LPA-80080/6CF w/ Mount Pipe	10	76.171	5.5645	0.0127	1959
100.0000	Side Arm Mount [SO 701-1]	10	44.825	4.1774	0.0055	1089

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
L1	148 - 117.25 (1)	TP27.227x22x0.1875	30.7500	0.0000	0.0	36.000	15.7378	-6.76	566.56	0.012
L2	117.25 - 97.25 (2)	TP30.2515x26.2571x0.25	23.5000	0.0000	0.0	36.000	23.8062	-9.49	857.02	0.011
L3	97.25 - 80.75 (3)	TP33.056x30.2515x0.443	16.5000	0.0000	0.0	34.308	44.8438	-11.66	1538.50	0.008
L4	80.75 - 40 (4)	TP39.483x31.4476x0.4385	45.0000	0.0000	0.0	34.578	53.0935	-20.18	1835.87	0.011
L5	40 - 13.25 (5)	TP43.4677x37.7133x0.450 2	31.7500	0.0000	0.0	34.728	61.4718	-28.46	2134.79	0.013
L6	13.25 - 12.75 (6)	TP43.5526x43.4677x0.451 6	0.5000	0.0000	0.0	34.332	61.7774	-28.59	2120.94	0.013
L7	12.75 - 5.3333 (7)	TP44.8134x43.5526x0.425 4	7.4167	0.0000	0.0	35.532	59.9377	-30.38	2129.71	0.014



Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
L8	5.3333 - 4.75 (8)	TP44.9126x44.8134x0.446 7	0.5833	0.0000	0.0	34.368	63.0406	-30.53	2166.58	0.014
L9	4.75 - 0 (9)	TP45.72x44.9126x0.4425	4.7500	0.0000	0.0	34.776	63.5892	-31.74	2211.38	0.014

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M <sub>x</sub> kip-ft	Actual f <sub>bx</sub> ksi	Allow. F <sub>bx</sub> ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M <sub>y</sub> kip-ft	Actual f <sub>by</sub> ksi	Allow. F <sub>by</sub> ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	148 - 117.25 (1)	TP27.227x22x0.1875	254.01	29.658	36.000	0.824	0.00	0.000	36.000	0.000
L2	117.25 - 97.25 (2)	TP30.2515x26.2571x0.25	602.39	41.035	36.000	1.140	0.00	0.000	36.000	0.000
L3	97.25 - 80.75 (3)	TP33.056x30.2515x0.443	799.97	27.366	34.308	0.798	0.00	0.000	34.308	0.000
L4	80.75 - 40 (4)	TP39.483x31.4476x0.438 5	1526.7 0	36.785	34.578	1.064	0.00	0.000	34.578	0.000
L5	40 - 13.25 (5)	TP43.4677x37.7133x0.45 02	2181.1 3	40.215	34.728	1.158	0.00	0.000	34.728	0.000
L6	13.25 - 12.75 (6)	TP43.5526x43.4677x0.45 16	2191.9 1	40.136	34.332	1.169	0.00	0.000	34.332	0.000
L7	12.75 - 5.3333 (7)	TP44.8134x43.5526x0.42 54	2353.3 2	43.089	35.532	1.213	0.00	0.000	35.532	0.000
L8	5.3333 - 4.75 (8)	TP44.9126x44.8134x0.44 67	2366.1 4	41.138	34.368	1.197	0.00	0.000	34.368	0.000
L9	4.75 - 0 (9)	TP45.72x44.9126x0.4425 7	2471.2 7	41.820	34.776	1.203	0.00	0.000	34.776	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	148 - 117.25 (1)	TP27.227x22x0.1875	14.05	0.893	24.000	0.074	0.56	0.032	24.000	0.001
L2	117.25 - 97.25 (2)	TP30.2515x26.2571x0.25	15.65	0.657	24.000	0.055	1.03	0.034	24.000	0.001
L3	97.25 - 80.75 (3)	TP33.056x30.2515x0.443	16.63	0.371	22.872	0.032	1.03	0.017	22.872	0.001
L4	80.75 - 40 (4)	TP39.483x31.4476x0.438 5	19.61	0.369	23.052	0.032	1.02	0.012	23.052	0.001
L5	40 - 13.25 (5)	TP43.4677x37.7133x0.45 02	21.54	0.350	23.152	0.030	1.02	0.009	23.152	0.000
L6	13.25 - 12.75 (6)	TP43.5526x43.4677x0.45 16	21.56	0.349	22.888	0.030	1.02	0.009	22.888	0.000
L7	12.75 - 5.3333 (7)	TP44.8134x43.5526x0.42 54	21.98	0.367	23.688	0.031	1.02	0.009	23.688	0.000
L8	5.3333 - 4.75 (8)	TP44.9126x44.8134x0.44 67	22.01	0.349	22.912	0.030	1.02	0.009	22.912	0.000
L9	4.75 - 0 (9)	TP45.72x44.9126x0.4425	22.28	0.350	23.184	0.030	1.02	0.008	23.184	0.000

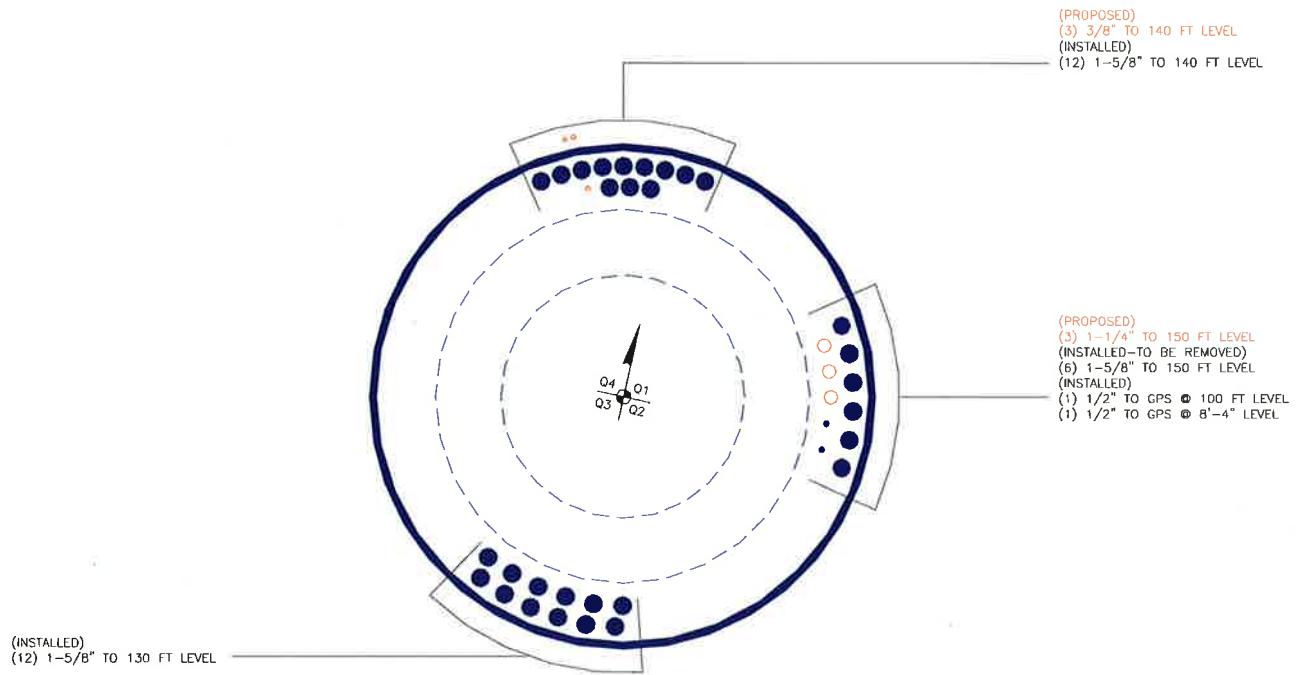
### Pole Interaction Design Data

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$P$	$f_{bx}$	$f_{by}$	$f_v$	$f_{vt}$			
		$P_a$	$F_{bx}$	$F_{by}$	$F_v$	$F_{vt}$			
L1	148 - 117.25 (1)	0.012	0.824	0.000	0.074	0.001	0.837	1.333	H1-3+VT ✓
L2	117.25 - 97.25 (2)	0.011	1.140	0.000	0.055	0.001	1.152	1.333	H1-3+VT ✓
L3	97.25 - 80.75 (3)	0.008	0.798	0.000	0.032	0.001	0.806	1.333	H1-3+VT ✓
L4	80.75 - 40 (4)	0.011	1.064	0.000	0.032	0.001	1.075	1.333	H1-3+VT ✓
L5	40 - 13.25 (5)	0.013	1.158	0.000	0.030	0.000	1.172	1.333	H1-3+VT ✓
L6	13.25 - 12.75 (6)	0.013	1.169	0.000	0.030	0.000	1.183	1.333	H1-3+VT ✓
L7	12.75 - 5.3333 (7)	0.014	1.213	0.000	0.031	0.000	1.227	1.333	H1-3+VT ✓
L8	5.3333 - 4.75 (8)	0.014	1.197	0.000	0.030	0.000	1.211	1.333	H1-3+VT ✓
L9	4.75 - 0 (9)	0.014	1.203	0.000	0.030	0.000	1.217	1.333	H1-3+VT ✓

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail	
L1	148 - 117.25	Pole	TP27.227x22x0.1875	1	-6.76	755.23	62.8	Pass	
L2	117.25 - 97.25	Pole	TP30.2515x26.2571x0.25	2	-9.49	1142.41	86.4	Pass	
L3	97.25 - 80.75	Pole	TP33.056x30.2515x0.443	3	-11.66	2050.82	60.4	Pass	
L4	80.75 - 40	Pole	TP39.483x31.4476x0.4385	4	-20.18	2447.21	80.7	Pass	
L5	40 - 13.25	Pole	TP43.4677x37.7133x0.4502	5	-28.46	2845.67	87.9	Pass	
L6	13.25 - 12.75	Pole	TP43.5526x43.4677x0.4516	6	-28.59	2827.21	88.7	Pass	
L7	12.75 - 5.3333	Pole	TP44.8134x43.5526x0.4254	7	-30.38	2838.90	92.1	Pass	
L8	5.3333 - 4.75	Pole	TP44.9126x44.8134x0.4467	8	-30.53	2888.05	90.9	Pass	
L9	4.75 - 0	Pole	TP45.72x44.9126x0.4425	9	-31.74	2947.77	91.3	Pass	
							Summary		
							Pole (L7)	92.1	Pass
							<b>RATING =</b>	<b>92.1</b>	<b>Pass</b>

### APPENDIX B BASE LEVEL DRAWING



**APPENDIX C**  
**ADDITIONAL CALCULATIONS**

## Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

- Assumptions:** 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).  
 2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)  
 3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)\*(Rod Diameter)

Site Data		
BU#:		
Site Name:		
App #:		
Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	52	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	51	in
Thick:	2.75	in
Grade:	55	ksi
Clip Distance:	8	in

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	45.72	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	2471	ft-kips
Unfactored Axial, P:	32	kips
Unfactored Shear, V:	22	kips

Anchor Rod Results		
TIA F --> Maximum Rod Tension		187.4 Kips
Allowable Tension:		195.0 Kips
Anchor Rod Stress Ratio:		96.1% <b>Pass</b>

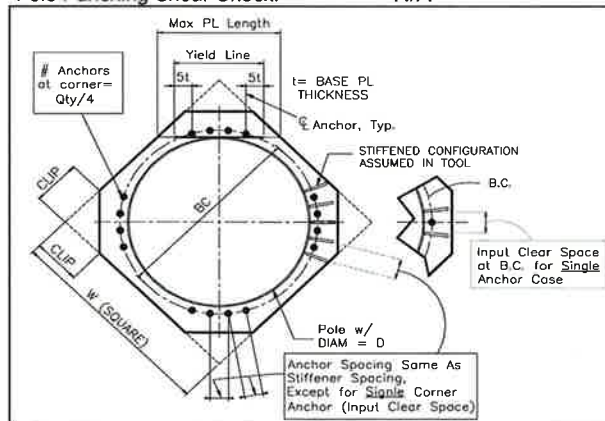
Base Plate Results		
Base Plate Stress:		45.8 ksi
Allowable PL Bending Stress:		55.0 ksi
Base Plate Stress Ratio:		83.3% <b>Pass</b>

Flexural Check

PL Ref. Data	
Yield Line (in):	26.40
Max PL Length:	26.40

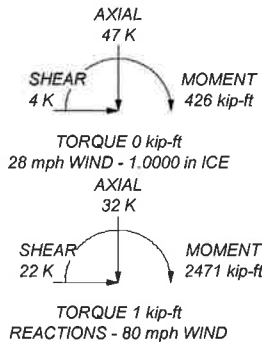
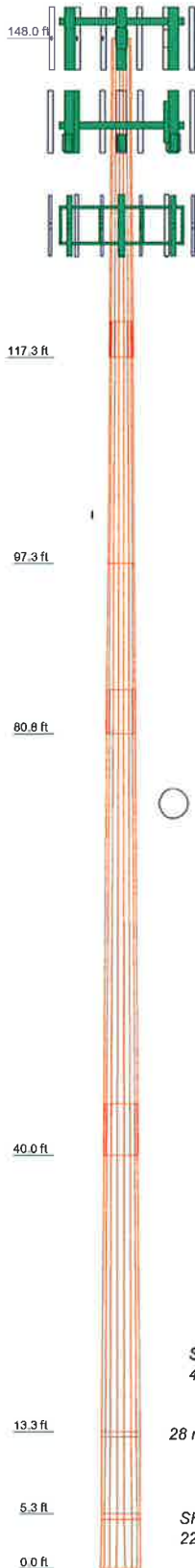
**N/A - Unstiffened**

Stiffener Results		
Horizontal Weld :		N/A
Vertical Weld:		N/A
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$ :		N/A
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$ :		N/A
Plate Comp. (AISC Bracket):		N/A
Pole Results		
Pole Punching Shear Check:		N/A



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

Section	1	2	3	4	5	6	7	8	9
Length (ft)	30.7500	23.5000	16.5000	45.0000	31.7500	4.7500	33.7	18	4.7500
Number of Sides	18	18	18	18	18	18	18	18	18
Thickness (in)	0.1675	0.2500	0.4430	0.4385	0.4602	0.4425	0.4870	0.4254	0.4116
Socket Length (ft)	3.5000		4.2500	5.0000					
Top Dia (in)	22.0000	26.2571	30.2514	31.4476	37.7133	44.9408	52.43	55.2	63.4876
Bot Dia (in)	27.2270	30.2514	33.0560	38.4630	43.4676	45.7200	48.84	51.43	55.26
Grade	A607-60								
Weight (K)	1.5	1.8	2.5	7.5	6.2	0.1	1.5	0.1	0.1
				Reinf 57.18 ksi	Reinf 57.63 ksi	Reinf 57.88 ksi	Reinf 57.22 ksi	Reinf 57.22 ksi	Reinf 57.22 ksi



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Platform Mount [LP 401-1]	150	T-Arm Mount [TA 602-3]	140
APXVSP18-C-A20 w/ Mount Pipe	150	AM-X-CD-16-65-00T-RET w/ Mount Pipe	140
APXVSP18-C-A20 w/ Mount Pipe	150	AM-X-CD-14-65-00T-RET w/ Mount Pipe	140
APXVSP18-C-A20 w/ Mount Pipe	150	AM-X-CD-16-65-00T-RET w/ Mount Pipe	140
1900MHz RRH (65MHz)	150	DC6-48-60-18-8F	140
1900MHz RRH (65MHz)	150	(2) RRUS-11	138
1900MHz RRH (65MHz)	150	(2) RRUS-11	138
(3) ACU-A20-N	150	(2) RRUS-11	138
(3) ACU-A20-N	150	Side Arm Mount [SO 102-3]	138
(3) ACU-A20-N	150	(2) LPA-80080/6CF w/ Mount Pipe	130
800MHz RRH	150	(2) LPA-80080/6CF w/ Mount Pipe	130
800MHz RRH	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800MHz RRH	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800 EXTERNAL NOTCH FILTER	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800 EXTERNAL NOTCH FILTER	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800 EXTERNAL NOTCH FILTER	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
Miscellaneous (NA507-1)	150	BXA-70080/6CF w/ Mount Pipe	130
(2) DB980H90E-M w/ Mount Pipe	148	BXA-70063/6CFx2 w/ Mount Pipe	130
(2) DB980H90E-M w/ Mount Pipe	148	BXA-70060/6CF-EDIN-6 w/ Mount Pipe	130
(2) DB980H90E-M w/ Mount Pipe	148	(2) LPA-80080-6CF-EDIN-6 w/ Mount Pipe	130
(2) 7770.00 w/ Mount Pipe	140	(2) FD9R6004/2C-3L	130
(2) 7770.00 w/ Mount Pipe	140	(2) FD9R6004/2C-3L	130
(2) 7770.00 w/ Mount Pipe	140	(2) FD9R6004/2C-3L	130
(2) LGP 17201	140	(2) LGP 17201	140
(2) LGP 17201	140	Platform Mount [LP 305-1]	130
(2) LGP 17201	140	Side Arm Mount [SO 701-1]	100
(2) LGP21901	140	KS24019-L12A	100
(2) LGP21901	140		
(2) LGP21901	140		

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-60	60 ksi	75 ksi	Reinf 57.22 ksi	57 ksi	72 ksi
Reinf 57.18 ksi	57 ksi	65 ksi	Reinf 59.22 ksi	59 ksi	75 ksi
Reinf 57.63 ksi	59 ksi	73 ksi	Reinf 57.28 ksi	57 ksi	65 ksi
Reinf 57.88 ksi	59 ksi	73 ksi	Reinf 57.96 ksi	56 ksi	73 ksi

### TOWER DESIGN NOTES

1. Tower is located in Litchfield County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 92.1%

<b>Paul J Ford and Company</b>		Job: <b>Ex. 148-ft Monopole / Horton 2 / Fredsall Property</b>	
250 E. Broad Street Suite 600		Project: <b>PJF#37513-1921/BU#876377</b>	
Columbus, OH 43215		Client: <b>Crown Castle</b>	Drawn by: <b>Lohengri Gimend</b>
Phone: 614.221.6679		Code: <b>TIA/EIA-222-F</b>	Date: <b>08/26/13</b>
FAX: 614.448.4105		Path: <b>T:\315_Crown_Castle\2013\37513-1921_BU#876377\37513-1921_Reinf.dwg</b>	Scale: <b>NTS</b>
			Dwg No: <b>E-1</b>



**DRILLED PIER SOIL AND STEEL ANALYSIS - TIA/EIA-222-F**

**Unfactored Base Reactions from RISAs**

	Comp. (+)	Tension (-)	
Moment, M =	2471.0		k-ft
Shear, V =	22.0		kips
Axial Load, P =	32.0		kips
OTM =	2482.0	0.0	k-ft @ Ground

**Safety Factors / Load Factors /  $\Phi$  Factors**

Tower Type =	Monopole DP
ACI Code =	ACI 318-02
Seismic Design Category =	D
Reference Standard =	TIA/EIA-222-F
Use 1.3 Load Factor?	Yes
Load Factor =	1.30

**Drilled Pier Parameters**

Diameter =	6	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	18.5	ft
fc' =	3	ksi
ec =	0.003	in/in
Mat Fdn. Cap Width =	10	ft
Mat Fdn. Cap Length =	10	ft
Depth Below Grade =	5	ft

	Safety Factor	$\Phi$ Factor
Soil Lateral Resistance =	2.00	0.75
Skin Friction =	2.00	0.75
End Bearing =	2.00	0.75
Concrete Wt. Resist Uplift =	1.25	

**Load Combinations Checked per TIA/EIA-222-F**

- Ult. Skin Friction/2.00 + Ult. End Bearing/2.00 + Effective Soil Wt. - Buoyant Conc. Wt.  $\geq$  Compression
- Ult. Skin Friction/2.00 + Buoyant Conc. Wt./1.25  $\geq$  Uplift
- Ult. Skin Friction/1.50 + Buoyant Conc. Wt./1.50  $\geq$  Uplift

**Steel Parameters**

Number of Bars =	16	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#5	
Side Clear Cover to Ties =	3	in

**Soil Parameters**

Water Table Depth =	11.00	ft
Depth to Ignore Soil =	3.33	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?	Ground	
Above Full Cohesion Lateral Resistance = 4(Cohesion)(Dia)(H)		
Below Full Cohesion Lateral Resistance = 8(Cohesion)(Dia)(H)		

**Direct Embed Pole Shaft Parameters**

Dia @ Grade =		in
Dia @ Depth Below Grade =		in
Number of Sides =		
Thickness =		in
Fy =		ksi
Backfill Condition =		

**Maximum Capacity Ratios**

Maximum Soil Ratio =	100.0%
Maximum Steel Ratio =	100.0%

**Define Soil Layers**

Note: Cohesion = Undrained Shear Strength = Unconfined Compressive Strength / 2

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	3	100	0	0	Sand				3
2	8	140	0	38	Sand	8000			11
3	3	140	0	38	Sand	8000			14
4	4	160	0	40	Sand	12000			18
5	6	160	0	40	Sand	12000			24
6									
7									
8									
9									
10									
11									
12									

**Soil Results: Overturning**

Depth to COR =	13.36	ft, from Grade
Bending Moment, M =	2775.83	k-ft, from COR
Resisting Moment, Ma =	2772.82	k-ft, from COR

Shear, V =	22.00	kips
Resisting Shear, Va =	21.98	kips

**MOMENT RATIO = 100% OK**

**SHEAR RATIO = 100% OK**

**Soil Results: Uplift**

Uplift, T =	0.00	kips
Allowable Uplift Cap., Ta =	101.22	kips

**UPLIFT RATIO = 0.0% OK**

**Soil Results: Compression**

Compression, C =	32.00	kips
Allowable Comp. Cap., Ca =	430.78	kips

**COMPRESSION RATIO = 7.4% OK**

**Steel Results (ACI 318-02):**

Minimum Steel Area =	13.57	sq in
Actual Steel Area =	24.96	sq in

Axial Load, P =	36.59	kips @ 5.00 ft Below Grade
Moment, M =	2554.79	k-ft @ 5.00 ft Below Grade
Allowable Moment, Ma =	2609.14	k-ft

Allowable Min Axial, Pa = -1036.80 kips, Where Ma = 0 k-ft  
 Allowable Max Axial, Pa = 4726.51 kips, Where Ma = 0 k-ft

**MOMENT RATIO = 97.9% OK**

## 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#: 876377
Site Name: Horton 2 / Fredsall Property
App #:

### Enter Load Factors Below:

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

### Pier Properties

<b>Concrete:</b>	
Pier Diameter =	6.0 ft
Concrete Area =	4071.5 in <sup>2</sup>
<b>Reinforcement:</b>	
Clear Cover to Tie =	3.00 in
Horiz. Tie Bar Size =	5
Vert. Cage Diameter =	5.28 ft
Vert. Cage Diameter =	63.34 in
<b>Vertical Bar Size =</b>	<b>11</b>
Bar Diameter =	1.41 in
Bar Area =	1.56 in <sup>2</sup>
Number of Bars =	16
As Total =	24.96 in <sup>2</sup>
A s/ Aconc, Rho:	0.0061 0.61%

ACI 10.5, ACI 21.10.4, and IBC 1810.  
 Min As for Flexural, Tension Controlled, Shafts:  
 $(3) \cdot (\sqrt{f_c}) / F_y = 0.0027$   
 $200 / F_y = 0.0033$

### Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.61%	<b>OK</b>

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	2554.79	ft-kips (* Note)
Max. Service Shaft P:	36.59	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:	3321.227 ft-kips
1.30	Pu:	47.567 kips

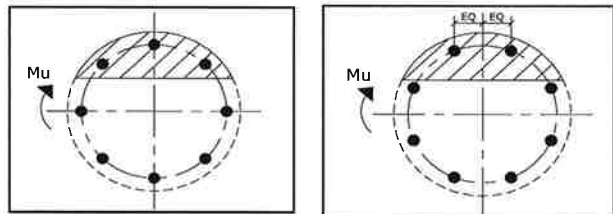
### Material Properties

Concrete Comp. strength, f <sub>c</sub> =	3000	psi
Reinforcement yield strength, F <sub>y</sub> =	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 =	D	
Seismic Risk =	High	

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

### Results:

Governing Orientation Case: 2



Case 1

Case 2

Dist. From Edge to Neutral Axis: 12.23 in  
 Extreme Steel Strain,  $\epsilon_t$ : 0.0135

**$\epsilon_t > 0.0050$ , Tension Controlled**

Reduction Factor,  $\phi$ : 0.900

Ref. Shaft Max Axial Capacities, $\phi$ Max(P <sub>n</sub> or T <sub>n</sub> ):		
Max Pu = ( $\phi=0.65$ ) P <sub>n</sub> .		
P <sub>n</sub> per ACI 318 (10-2)	6144.47	kips
at Mu=( $\phi=0.65$ )M <sub>n</sub> =	3192.16	ft-kips
Max Tu, ( $\phi=0.9$ ) T <sub>n</sub> =	1347.84	kips
at Mu= $\phi=(0.90)$ M <sub>n</sub> =	0.00	ft-kips

Output Note: Negative Pu=Tension  
 For Axial Compression,  $\phi$  P<sub>n</sub> = Pu: 47.57 kips  
 Drilled Shaft Moment Capacity,  $\phi$ M<sub>n</sub>: 3391.87 ft-kips  
 Drilled Shaft Superimposed Mu: 3321.23 ft-kips

**(Mu/ $\phi$ M<sub>n</sub>, Drilled Shaft Flexure CSR): 97.9%**