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Also admitted in Massachusetts

July 25, 2013

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

**Re: Notice of Exempt Modification – Facility Modification
1218 Cromwell Avenue, Rocky Hill, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the 150-foot level on the existing 173-foot tower at the above-referenced address. The tower is owned by Crown Castle. The Council approved Cellco’s use of this tower in 2000. Cellco now intends to replace one (1) of its existing antennas with one (1) model BXA-70063-6CF LTE antenna, at the same 150-foot level. Attached behind Tab 1 are the specifications for Cellco’s replacement antenna.



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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 Barbara R. Gilbert, Town Manager for the Town of Rocky Hill. A copy of this letter is also being sent to Tabshey Development LLC, the owner of the property on which the tower is located.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco’s replacement antenna will be located at the 150-foot level on the 173-foot tower.

ROBINSON & COLE_{LLP}

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

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.

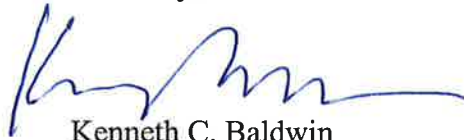
4. The operation of the modified facility will not increase radio frequency (RF) emissions to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for Cellco's modified facility is included behind Tab 2.

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 attached behind 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:

Barbara R. Gilbert, Rocky Hill Town Manager

Tabshay Development, LLC

Sandy M. Carter



TAB 1

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

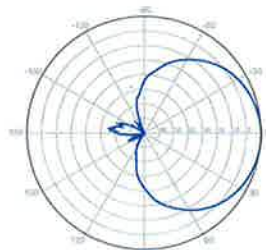
Replace 'X' with desired electrical downtilt.

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 ²	Side: 0.24 m ²	Front: 5.5 ft ²	Side: 2.6 ft ²
Wind load @ 161 km/hr (100 mph)	Front: 759 N	Side: 391 N	Front: 169 lbf	Side: 89 lbf
Mounting Options	Part Number	Fits Pipe Diameter		Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in		6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP			

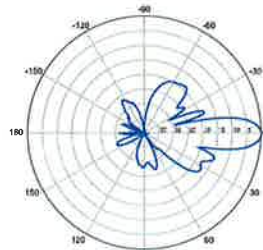


BXA-70063-6CF-EDIN-X



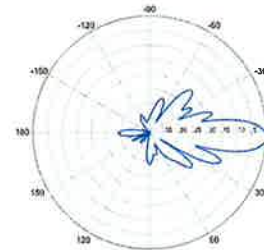
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

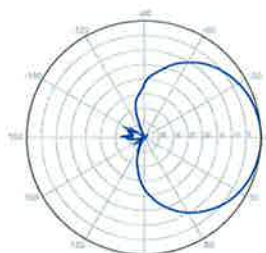


0° | Vertical | 750 MHz

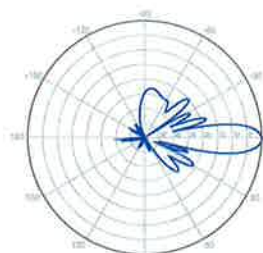
BXA-70063-6CF-EDIN-2



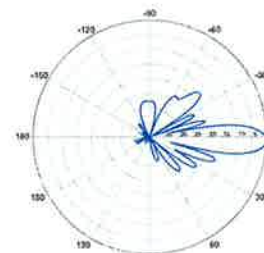
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



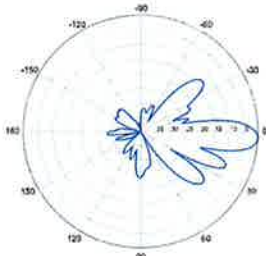
2° | Vertical | 850 MHz

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

BXA-70063-6CF-EDIN-X

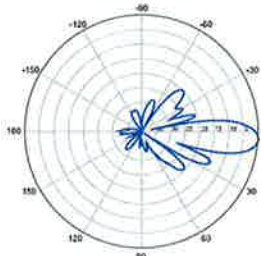
X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



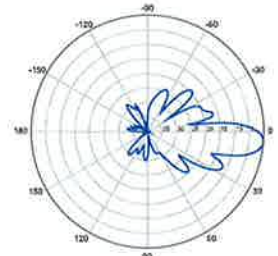
3° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-4

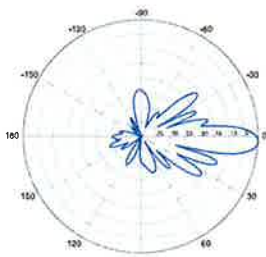


4° | Vertical | 750 MHz

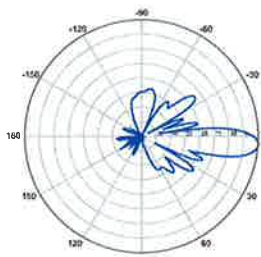
BXA-70063-6CF-EDIN-5



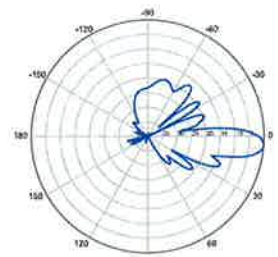
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

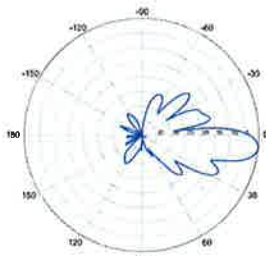


4° | Vertical | 850 MHz



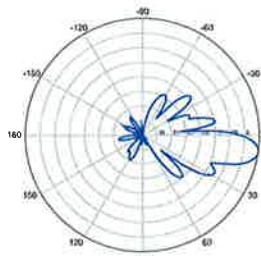
5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6



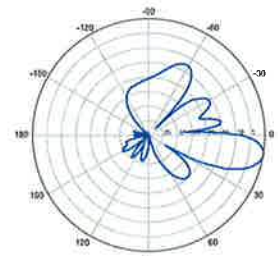
6° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-8

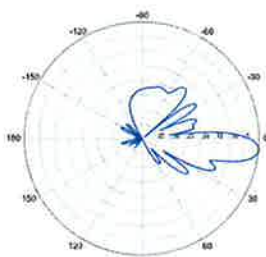


8° | Vertical | 750 MHz

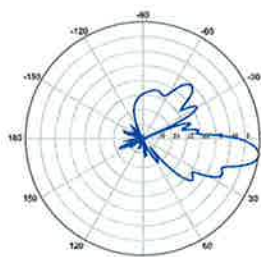
BXA-70063-6CF-EDIN-10



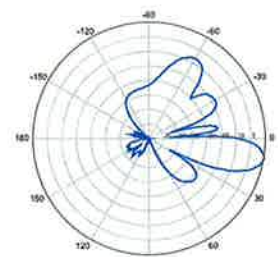
10° | Vertical | 750 MHz



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.

TAB 2

TAB 3

Date: May 09, 2013

James Williams
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277



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

Subject: Structural Analysis Report

Carrier Designation:	Verizon Wireless Co-Locate	
	Carrier Site Number:	N/A
	Carrier Site Name:	Rocky Hill CT 2
Crown Castle Designation:	Crown Castle BU Number:	801366
	Crown Castle Site Name:	ROCKY HILL 2
	Crown Castle JDE Job Number:	233694
	Crown Castle Work Order Number:	606259
	Crown Castle Application Number:	188078 Rev. 0
Engineering Firm Designation:	Crown Castle Project Number:	606259
Site Data:	1218 Cromwell Ave, Rocky Hill, Hartford County, CT	
	Latitude 41° 38' 13.3", Longitude -72° 40' 24"	
	173 Foot - Monopole Tower	

Dear James Williams,

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 606259, in accordance with application 188078, revision 0.

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:

LC5: Existing + Proposed Equipment

Sufficient Capacity

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

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment based upon a wind speed of 80 mph fastest mile.

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

We at Crown Castle 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: Drew Stephens / JGK

Respectfully submitted by:

Jamal A. Huwel, P.E.
Manager Engineering

tnxTower Report - version 6.0.4.0



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1) INTRODUCTION

This tower is a 173 ft Monopole tower designed by Summit Manufacturing, LLC in June of 2000. The tower was originally designed for a wind speed of 80 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 using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 1 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150	150	1	antel	BXA-70063-6CF-2 w/ Mount Pipe	-	-	-

Table 2 - Existing 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
174	174	1	tower mounts	Platform Mount [LP 712-1]	-	-	2
150	150	1	andrew	LNx-6514DS-T4M w/ Mount Pipe	-	-	3
		2	andrew	LNx-6514DS-T4M w/ Mount Pipe	12	1-5/8	1
		6	antel	LPA-80080/4CF w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
		3	rymsa wireless	MG D5-800Tx w/ Mount Pipe			
		1	tower mounts	Platform Mount [LP 601-1]			

Notes:

- 1) Existing Equipment
- 2) Empty Mount; considered in this analysis
- 3) Equipment to Be Removed; not considered in this analysis

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)
174	174	12	swedcom	ALP-9212-N	12	1 5/8
166	166	12	swedcom	ALP-9212-N	12	1 5/8
156	156	12	swedcom	ALP-9212-N	12	1 5/8
146	146	12	swedcom	ALP-9212-N	12	1 5/8
136	136	12	swedcom	ALP-9212-N	12	1 5/8
126	126	12	swedcom	ALP-9212-N	12	1 5/8
101	101	2	generic	GPS	2	1/2

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Rizzo Associates, Inc. / Clough, Harbour & Associates LLP	639257	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Summit Manufacturing, LLC / Paul J. Ford and Company	679665	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit Manufacturing, LLC / Paul J. Ford and Company	639263	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.4.0), 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	173 - 127	Pole	TP35.568x26x0.25	1	-6.461	1309.214	24.2	Pass
L2	127 - 86.5	Pole	TP43.493x34.132x0.313	2	-12.321	2167.591	34.8	Pass
L3	86.5 - 42.5	Pole	TP52.02x41.724x0.375	3	-21.621	3112.008	39.5	Pass
L4	42.5 - 0	Pole	TP60.11x49.918x0.438	4	-36.290	4307.789	41.1	Pass
							Summary	
						Pole (L4)	41.1	Pass
						Rating =	41.1	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	38.2	Pass
1	Base Plate	0	33.1	Pass
1, 2	Base Foundation Soil Interaction	0	42.9	Pass

Structure Rating (max from all components) =	42.9%
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Notes:

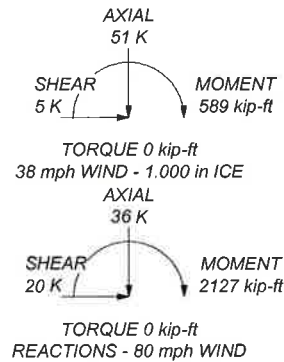
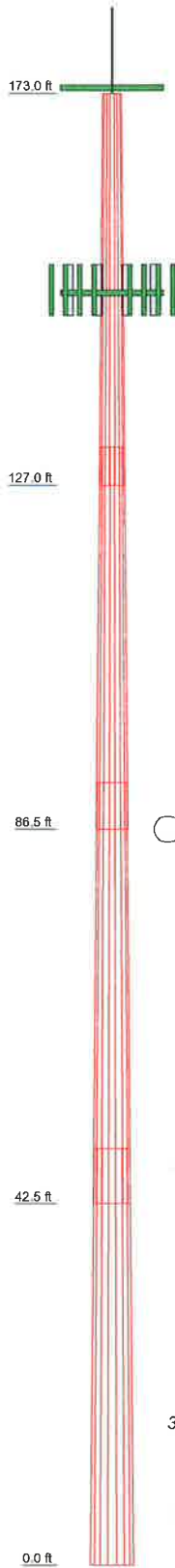
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) It is unknown whether the foundation is a drilled shaft or pier and pad. Both designs were analyzed and determined to be sufficient. The % capacity shown is the higher of the two ratings.

4.1) Recommendations

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

APPENDIX A
TNXTOWER OUTPUT

Section	1	2	3	4
Length (ft)	46'	45'	49'6"	49'
Number of Sides	18	18	18	18
Thickness (in)	0.250	0.313	0.375	0.438
Socket Length (ft)	46"	56"	66"	
Top Dia (in)	26.000	34.132	41.724	49.918
Bot Dia (in)	35.568	43.493	52.020	60.110
Grade	A607-60	A607-60	A607-65	A607-65
Weight (K)	3.8	5.8	9.3	12.6
				31.6



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 1"x10'	178	(2) LPA-80080/4CF w/ Mount Pipe	150
(4) 6' x 2" Mount Pipe	174	MG D5-800Tx w/ Mount Pipe	150
(4) 6' x 2" Mount Pipe	174	MG D5-800Tx w/ Mount Pipe	150
(4) 6' x 2" Mount Pipe	174	MG D5-800Tx w/ Mount Pipe	150
Platform Mount [LP 712-1]	174	(2) FD9R6004/2C-3L	150
LNx-6514DS-T4M w/ Mount Pipe	150	(2) FD9R6004/2C-3L	150
LNx-6514DS-T4M w/ Mount Pipe	150	(2) FD9R6004/2C-3L	150
(2) LPA-80080/4CF w/ Mount Pipe	150	BXA-70063-6CF-2 w/ Mount Pipe	150
(2) LPA-80080/4CF w/ Mount Pipe	150	Platform Mount [LP 601-1]	150

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-60	60 ksi	75 ksi	A607-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 41.1%

 Crown Castle 2000 Corporate Drive Canonsburg, PA 15317 Phone: (724) 416-2000 FAX: (724) 416-2254 We Are Solutions		Job: BU #801366			
		Project:		Client: Crown Castle	
		Code: TIA/EIA-222-F		Drawn by: JKazmierczak	
		Path: R:\USA Models - Letters\Work Area\CS\Stephens\801366\QA\801366.dwg		Date: 05/08/13	
				App'd:	
				Scale: NTS	
				Dwg No. E-1	

Tower Input Data

There is a pole section.

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

The following design criteria apply:

- 4) Tower is located in Hartford County, Connecticut.
- 5) Basic wind speed of 80 mph.
- 6) Nominal ice thickness of 1.000 in.
- 7) Ice thickness is considered to increase with height.
- 8) Ice density of 56 pcf.
- 9) A wind speed of 38 mph is used in combination with ice.
- 10) Temperature drop of 50 °F.
- 11) Deflections calculated using a wind speed of 50 mph.
- 12) A non-linear (P-delta) analysis was used.
- 13) Pressures are calculated at each section.
- 14) Stress ratio used in pole design is 1.333.
- 15) Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	173'-127'	46'	4'6"	18	26.000	35.568	0.250	1.000	A607-60 (60 ksi)
L2	127'-86'6"	45'	5'6"	18	34.132	43.493	0.313	1.250	A607-65 (65 ksi)
L3	86'6"-42'6"	49'6"	6'6"	18	41.724	52.020	0.375	1.500	A607-65 (65 ksi)
L4	42'6"-0'	49'		18	49.918	60.110	0.438	1.750	A607-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L1	26.401	20.433	1711.654	9.141	13.208	129.592	3425.561	10.218	4.136	16.544

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L2	36.117	28.025	4416.444	12.538	18.069	244.427	8838.698	14.015	5.820	23.28
	35.609	33.545	4847.256	12.006	17.339	279.557	9700.890	16.776	5.457	17.463
L3	44.164	42.830	10089.215	15.329	22.094	456.640	20191.706	21.419	7.105	22.735
	43.529	49.216	10630.821	14.679	21.196	501.555	21275.631	24.612	6.683	17.822
L4	52.822	61.470	20713.834	18.334	26.426	783.838	41454.923	30.741	8.496	22.655
	52.061	68.710	21253.196	17.566	25.358	838.115	42534.357	34.361	8.016	18.321
	61.037	82.863	37277.358	21.184	30.536	1220.772	74603.767	41.439	9.809	22.421

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _r	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1 173'-127'				1	1	1		
L2 127'-86'6"				1	1	1		
L3 86'6"-42'6"				1	1	1		
L4 42'6"-0'				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight klf
LDF7-50A(1-5/8")	C	No	Inside Pole	150' - 0'	12	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.000 0.000 0.000 0.000 0.000

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	173'-127'	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.226
L2	127'-86'6"	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.399
L3	86'6"-42'6"	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.433
L4	42'6"-0'	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.418

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 _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	173'-127'	A	1.198	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.226
L2	127'-86'6"	A	1.151	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.399
L3	86'6"-42'6"	A	1.083	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000

Tower Section n	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L4	42'6"-0"	C	1.000	0.000	0.000	0.000	0.000	0.433
		A		0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.418

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
L1	173'-127"	0.000	0.000	0.000	0.000
L2	127'-86'6"	0.000	0.000	0.000	0.000
L3	86'6"-42'6"	0.000	0.000	0.000	0.000
L4	42'6"-0"	0.000	0.000	0.000	0.000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
Lightning Rod 1"x10'	C	None		0.000	178'	No Ice 1.000 1/2" 2.017 Ice 3.050 1" Ice 5.148 2" Ice 7.684 4" Ice	1.000 2.017 3.050 5.148 7.684	0.040 0.049 0.065 0.116 0.301

(4) 6' x 2" Mount Pipe	A	From Leg	4.000 0' 0'	0.000	174'	No Ice 1.425 1/2" 1.925 Ice 2.294 1" Ice 3.060 2" Ice 4.702 4" Ice	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
(4) 6' x 2" Mount Pipe	B	From Leg	4.000 0' 0'	0.000	174'	No Ice 1.425 1/2" 1.925 Ice 2.294 1" Ice 3.060 2" Ice 4.702 4" Ice	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
(4) 6' x 2" Mount Pipe	C	From Leg	4.000 0' 0'	0.000	174'	No Ice 1.425 1/2" 1.925 Ice 2.294 1" Ice 3.060 2" Ice 4.702 4" Ice	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
Platform Mount [LP 712-1]	C	None		0.000	174'	No Ice 24.530 1/2" 29.940 Ice 35.350 1" Ice 46.170 2" Ice 67.810 4" Ice	24.530 29.940 35.350 46.170 67.810	1.335 1.646 1.956 2.577 3.820

LNx-6514DS-T4M w/ Mount Pipe	A	From Leg	4.000 0' 0'	0.000	150'	No Ice 8.568 1/2" 9.220 Ice 9.838 1" Ice 11.104 2" Ice 13.754	7.004 8.185 9.081 10.904 14.926	0.058 0.124 0.202 0.384 0.889

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
LNx-6514DS-T4M w/ Mount Pipe	C	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	8.568 9.220 9.838 11.104 13.754	7.004 8.185 9.081 10.904 14.926	0.058 0.124 0.202 0.384 0.889
(2) LPA-80080/4CF w/ Mount Pipe	A	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	2.856 3.220 3.592 4.450 6.318	7.227 7.922 8.634 10.112 13.339	0.030 0.074 0.127 0.253 0.613
(2) LPA-80080/4CF w/ Mount Pipe	B	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	2.856 3.220 3.592 4.450 6.318	7.227 7.922 8.634 10.112 13.339	0.030 0.074 0.127 0.253 0.613
(2) LPA-80080/4CF w/ Mount Pipe	C	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	2.856 3.220 3.592 4.450 6.318	7.227 7.922 8.634 10.112 13.339	0.030 0.074 0.127 0.253 0.613
MG D5-800Tx w/ Mount Pipe	A	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	3.570 3.979 4.387 5.325 7.341	3.418 4.119 4.784 6.164 9.175	0.035 0.067 0.107 0.208 0.518
MG D5-800Tx w/ Mount Pipe	B	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	3.570 3.979 4.387 5.325 7.341	3.418 4.119 4.784 6.164 9.175	0.035 0.067 0.107 0.208 0.518
MG D5-800Tx w/ Mount Pipe	C	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	3.570 3.979 4.387 5.325 7.341	3.418 4.119 4.784 6.164 9.175	0.035 0.067 0.107 0.208 0.518
(2) FD9R6004/2C-3L	A	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	0.367 0.451 0.543 0.755 1.281	0.085 0.136 0.196 0.343 0.740	0.003 0.005 0.009 0.020 0.063
(2) FD9R6004/2C-3L	B	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	0.367 0.451 0.543 0.755 1.281	0.085 0.136 0.196 0.343 0.740	0.003 0.005 0.009 0.020 0.063
(2) FD9R6004/2C-3L	C	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice	0.367 0.451 0.543 0.755 1.281	0.085 0.136 0.196 0.343 0.740	0.003 0.005 0.009 0.020 0.063
BXA-70063-6CF-2 w/ Mount Pipe	B	From Leg	4.000 0' 0'	0.000	150'	4" Ice No Ice 1/2" Ice 1" Ice	7.969 8.609 9.216 10.459	5.801 6.953 7.819 9.601	0.042 0.100 0.170 0.335

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
Platform Mount [LP 601-1]	C	None		0.000	150'	2" Ice	13.066	0.803
						4" Ice		
						No Ice	28.470	1.122
						1/2" Ice	33.590	1.514
						1" Ice	38.710	1.905
						2" Ice	48.950	2.689
						4" Ice	69.430	4.255

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	173 - 127	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-12.493	0.160	0.093
			Max. Mx	11	-6.461	219.168	0.252
			Max. My	2	-6.462	0.281	218.891
			Max. Vy	11	-9.032	219.168	0.252
			Max. Vx	2	-9.019	0.281	218.891
L2	127 - 86.5	Pole	Max. Torque	9			-0.269
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-20.821	0.160	0.093
			Max. Mx	11	-12.321	640.287	0.707
			Max. My	2	-12.322	0.738	639.488
			Max. Vy	11	-12.317	640.287	0.707
L3	86.5 - 42.5	Pole	Max. Vx	2	-12.304	0.738	639.488
			Max. Torque	9			-0.269
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-33.121	0.160	0.093
			Max. Mx	11	-21.621	1249.162	1.202
			Max. My	2	-21.621	1.234	1247.793
L4	42.5 - 0	Pole	Max. Vy	11	-15.962	1249.162	1.202
			Max. Vx	2	-15.949	1.234	1247.793
			Max. Torque	9			-0.269
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-51.432	0.160	0.093
			Max. Mx	11	-36.290	2125.502	1.758
			Max. My	2	-36.290	1.790	2123.492
			Max. Vy	11	-19.795	2125.502	1.758
			Max. Vx	2	-19.782	1.790	2123.492
			Max. Torque	9			-0.269

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	51.432	0.000	0.000
	Max. H _x	11	36.296	19.784	0.011
	Max. H _z	2	36.296	0.011	19.771
	Max. M _x	2	2123.492	0.011	19.771
	Max. M _z	5	2125.350	-19.784	-0.011
	Max. Torsion	3	0.269	-9.882	17.116
	Min. Vert	1	36.296	0.000	0.000
	Min. H _x	5	36.296	-19.784	-0.011
	Min. H _z	8	36.296	-0.011	-19.771
	Min. M _x	8	-2123.404	-0.011	-19.771
	Min. M _z	11	-2125.502	19.784	0.011
	Min. Torsion	9	-0.269	9.882	-17.116

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	36.296	0.000	0.000	-0.042	0.073	0.000
Dead+Wind 0 deg - No Ice	36.296	-0.011	-19.771	-2123.492	1.790	-0.233
Dead+Wind 30 deg - No Ice	36.296	9.882	-17.116	-1838.148	-1061.154	-0.269
Dead+Wind 60 deg - No Ice	36.296	17.128	-9.876	-1060.284	-1839.742	-0.233
Dead+Wind 90 deg - No Ice	36.296	19.784	0.011	1.670	-2125.350	-0.135
Dead+Wind 120 deg - No Ice	36.296	17.139	9.895	1063.164	-1841.454	0.000
Dead+Wind 150 deg - No Ice	36.296	9.902	17.128	1839.773	-1064.122	0.135
Dead+Wind 180 deg - No Ice	36.296	0.011	19.771	2123.404	-1.638	0.233
Dead+Wind 210 deg - No Ice	36.296	-9.882	17.116	1838.061	1061.306	0.269

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead+Wind 240 deg - No Ice	36.296	-17.128	9.876	1060.197	1839.893	0.233
Dead+Wind 270 deg - No Ice	36.296	-19.784	-0.011	-1.758	2125.502	0.134
Dead+Wind 300 deg - No Ice	36.296	-17.139	-9.895	-1063.252	1841.606	0.000
Dead+Wind 330 deg - No Ice	36.296	-9.902	-17.128	-1839.861	1064.274	-0.134
Dead+Ice+Temp	51.432	0.000	0.000	-0.093	0.160	0.000
Dead+Wind 0	51.432	-0.003	-5.109	-588.470	0.580	-0.054
deg+Ice+Temp						
Dead+Wind 30	51.432	2.554	-4.423	-509.439	-293.896	-0.062
deg+Ice+Temp						
Dead+Wind 60	51.432	4.426	-2.552	-293.931	-509.577	-0.054
deg+Ice+Temp						
Dead+Wind 90	51.432	5.112	0.003	0.310	-588.672	-0.031
deg+Ice+Temp						
Dead+Wind 120	51.432	4.429	2.557	294.441	-509.986	0.000
deg+Ice+Temp						
Dead+Wind 150	51.432	2.558	4.426	509.650	-294.604	0.031
deg+Ice+Temp						
Dead+Wind 180	51.432	0.003	5.109	588.272	-0.237	0.054
deg+Ice+Temp						
Dead+Wind 210	51.432	-2.554	4.423	509.241	294.239	0.062
deg+Ice+Temp						
Dead+Wind 240	51.432	-4.426	2.552	293.733	509.921	0.054
deg+Ice+Temp						
Dead+Wind 270	51.432	-5.112	-0.003	-0.508	589.015	0.031
deg+Ice+Temp						
Dead+Wind 300	51.432	-4.429	-2.557	-294.639	510.329	0.000
deg+Ice+Temp						
Dead+Wind 330	51.432	-2.558	-4.426	-509.848	294.947	-0.031
deg+Ice+Temp						
Dead+Wind 0 deg - Service	36.296	-0.004	-7.723	-829.697	0.746	-0.091
Dead+Wind 30 deg - Service	36.296	3.860	-6.686	-718.210	-414.557	-0.105
Dead+Wind 60 deg - Service	36.296	6.690	-3.858	-414.290	-718.759	-0.091
Dead+Wind 90 deg - Service	36.296	7.728	0.004	0.626	-830.350	-0.053
Dead+Wind 120 deg - Service	36.296	6.695	3.865	415.362	-719.429	0.000
Dead+Wind 150 deg - Service	36.296	3.868	6.690	718.791	-415.717	0.053
Dead+Wind 180 deg - Service	36.296	0.004	7.723	829.609	-0.594	0.091
Dead+Wind 210 deg - Service	36.296	-3.860	6.686	718.122	414.709	0.105
Dead+Wind 240 deg - Service	36.296	-6.690	3.858	414.203	718.912	0.091
Dead+Wind 270 deg - Service	36.296	-7.728	-0.004	-0.714	830.502	0.053
Dead+Wind 300 deg - Service	36.296	-6.695	-3.865	-415.450	719.581	0.000
Dead+Wind 330 deg - Service	36.296	-3.868	-6.690	-718.879	415.869	-0.053

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	0.000	-36.296	0.000	0.000	36.296	0.000	0.000%
2	-0.011	-36.296	-19.771	0.011	36.296	19.771	0.000%
3	9.882	-36.296	-17.116	-9.882	36.296	17.116	0.000%
4	17.128	-36.296	-9.876	-17.128	36.296	9.876	0.000%
5	19.784	-36.296	0.011	-19.784	36.296	-0.011	0.000%
6	17.139	-36.296	9.895	-17.139	36.296	-9.895	0.000%
7	9.902	-36.296	17.128	-9.902	36.296	-17.128	0.000%
8	0.011	-36.296	19.771	-0.011	36.296	-19.771	0.000%
9	-9.882	-36.296	17.116	9.882	36.296	-17.116	0.000%
10	-17.128	-36.296	9.876	17.128	36.296	-9.876	0.000%
11	-19.784	-36.296	-0.011	19.784	36.296	0.011	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
12	-17.139	-36.296	-9.895	17.139	36.296	9.895	0.000%
13	-9.902	-36.296	-17.128	9.902	36.296	17.128	0.000%
14	0.000	-51.432	0.000	0.000	51.432	0.000	0.000%
15	-0.003	-51.432	-5.109	0.003	51.432	5.109	0.000%
16	2.554	-51.432	-4.423	-2.554	51.432	4.423	0.000%
17	4.426	-51.432	-2.552	-4.426	51.432	2.552	0.000%
18	5.112	-51.432	0.003	-5.112	51.432	-0.003	0.000%
19	4.429	-51.432	2.557	-4.429	51.432	-2.557	0.000%
20	2.558	-51.432	4.426	-2.558	51.432	-4.426	0.000%
21	0.003	-51.432	5.109	-0.003	51.432	-5.109	0.000%
22	-2.554	-51.432	4.423	2.554	51.432	-4.423	0.000%
23	-4.426	-51.432	2.552	4.426	51.432	-2.552	0.000%
24	-5.112	-51.432	-0.003	5.112	51.432	0.003	0.000%
25	-4.429	-51.432	-2.557	4.429	51.432	2.557	0.000%
26	-2.558	-51.432	-4.426	2.558	51.432	4.426	0.000%
27	-0.004	-36.296	-7.723	0.004	36.296	7.723	0.000%
28	3.860	-36.296	-6.686	-3.860	36.296	6.686	0.000%
29	6.690	-36.296	-3.858	-6.690	36.296	3.858	0.000%
30	7.728	-36.296	0.004	-7.728	36.296	-0.004	0.000%
31	6.695	-36.296	3.865	-6.695	36.296	-3.865	0.000%
32	3.868	-36.296	6.690	-3.868	36.296	-6.690	0.000%
33	0.004	-36.296	7.723	-0.004	36.296	-7.723	0.000%
34	-3.860	-36.296	6.686	3.860	36.296	-6.686	0.000%
35	-6.690	-36.296	3.858	6.690	36.296	-3.858	0.000%
36	-7.728	-36.296	-0.004	7.728	36.296	0.004	0.000%
37	-6.695	-36.296	-3.865	6.695	36.296	3.865	0.000%
38	-3.868	-36.296	-6.690	3.868	36.296	6.690	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00003992
3	Yes	5	0.00000001	0.00002761
4	Yes	5	0.00000001	0.00002840
5	Yes	4	0.00000001	0.00002923
6	Yes	5	0.00000001	0.00002816
7	Yes	5	0.00000001	0.00002795
8	Yes	4	0.00000001	0.00003649
9	Yes	5	0.00000001	0.00002845
10	Yes	5	0.00000001	0.00002767
11	Yes	4	0.00000001	0.00003172
12	Yes	5	0.00000001	0.00002818
13	Yes	5	0.00000001	0.00002838
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00069499
16	Yes	4	0.00000001	0.00074003
17	Yes	4	0.00000001	0.00074052
18	Yes	4	0.00000001	0.00069487
19	Yes	4	0.00000001	0.00074112
20	Yes	4	0.00000001	0.00074079
21	Yes	4	0.00000001	0.00069447
22	Yes	4	0.00000001	0.00074059
23	Yes	4	0.00000001	0.00074066
24	Yes	4	0.00000001	0.00069578
25	Yes	4	0.00000001	0.00074238
26	Yes	4	0.00000001	0.00074216
27	Yes	4	0.00000001	0.00001331
28	Yes	4	0.00000001	0.00008575
29	Yes	4	0.00000001	0.00009085
30	Yes	4	0.00000001	0.00001250
31	Yes	4	0.00000001	0.00008879
32	Yes	4	0.00000001	0.00008743
33	Yes	4	0.00000001	0.00001318

34	Yes	4	0.00000001	0.00009124
35	Yes	4	0.00000001	0.00008614
36	Yes	4	0.00000001	0.00001259
37	Yes	4	0.00000001	0.00008892
38	Yes	4	0.00000001	0.00009029

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	173 - 127	19.555	37	0.948	0.001
L2	131.5 - 86.5	11.632	37	0.834	0.000
L3	92 - 42.5	5.659	37	0.584	0.000
L4	49 - 0	1.606	37	0.297	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178'	Lightning Rod 1"x10'	37	19.555	0.948	0.001	87554
174'	(4) 6' x 2" Mount Pipe	37	19.555	0.948	0.001	87554
150'	LNx-6514DS-T4M w/ Mount Pipe	37	15.039	0.900	0.000	19033

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	173 - 127	50.020	12	2.426	0.002
L2	131.5 - 86.5	29.759	12	2.133	0.001
L3	92 - 42.5	14.479	12	1.494	0.000
L4	49 - 0	4.110	12	0.760	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178'	Lightning Rod 1"x10'	12	50.020	2.426	0.002	34361
174'	(4) 6' x 2" Mount Pipe	12	50.020	2.426	0.002	34361
150'	LNx-6514DS-T4M w/ Mount Pipe	12	38.471	2.302	0.001	7468

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
L1	173 - 127 (1)	TP35.568x26x0.25	46'	0'	0.0	36.000	27.282	-6.461	982.156	0.007
L2	127 - 86.5 (2)	TP43.493x34.132x0.313	45'	0'	0.0	39.000	41.695	-12.321	1626.100	0.008
L3	86.5 - 42.5 (3)	TP52.02x41.724x0.375	49'6"	0'	0.0	39.000	59.861	-21.621	2334.590	0.009
L4	42.5 - 0 (4)	TP60.11x49.918x0.438	49'	0'	0.0	39.000	82.863	-36.290	3231.650	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio f _{bx} F _{bx}	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio f _{by} F _{by}
L1	173 - 127 (1)	TP35.568x26x0.25	219.30 3	11.363	36.000	0.316	0.000	0.000	36.000	0.000
L2	127 - 86.5 (2)	TP43.493x34.132x0.313	640.68 3	17.769	39.000	0.456	0.000	0.000	39.000	0.000
L3	86.5 - 42.5 (3)	TP52.02x41.724x0.375	1249.8 42	20.181	39.000	0.517	0.000	0.000	39.000	0.000
L4	42.5 - 0 (4)	TP60.11x49.918x0.438	2126.5 00	20.903	39.000	0.536	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f _v ksi	Allow. F _v ksi	Ratio f _v F _v	Actual T kip-ft	Actual f _{vt} ksi	Allow. F _{vt} ksi	Ratio f _{vt} F _{vt}
L1	173 - 127 (1)	TP35.568x26x0.25	9.039	0.331	24.000	0.028	0.000	0.000	24.000	0.000
L2	127 - 86.5 (2)	TP43.493x34.132x0.313	12.324	0.296	26.000	0.023	0.000	0.000	26.000	0.000
L3	86.5 - 42.5 (3)	TP52.02x41.724x0.375	15.969	0.267	26.000	0.021	0.000	0.000	26.000	0.000
L4	42.5 - 0 (4)	TP60.11x49.918x0.438	19.802	0.239	26.000	0.018	0.000	0.000	26.000	0.000

Pole Interaction Design Data

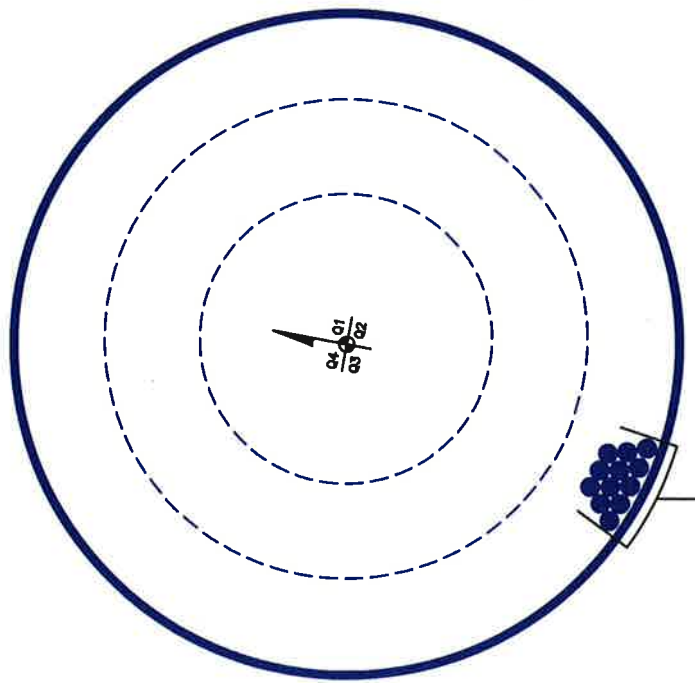
Section No.	Elevation ft	Ratio P P _a	Ratio f _{bx} F _{bx}	Ratio f _{by} F _{by}	Ratio f _v F _v	Ratio f _{vt} F _{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	173 - 127 (1)	0.007	0.316	0.000	0.028	0.000	0.322	1.333	H1-3+VT ✓
L2	127 - 86.5 (2)	0.008	0.456	0.000	0.023	0.000	0.463	1.333	H1-3+VT ✓
L3	86.5 - 42.5 (3)	0.009	0.517	0.000	0.021	0.000	0.527	1.333	H1-3+VT ✓
L4	42.5 - 0 (4)	0.011	0.536	0.000	0.018	0.000	0.547	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	173 - 127	Pole	TP35.568x26x0.25	1	-6.461	1309.214	24.2	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P _{allow} K	% Capacity	Pass Fail
L2	127 - 86.5	Pole	TP43.493x34.132x0.313	2	-12.321	2167.591	34.8	Pass
L3	86.5 - 42.5	Pole	TP52.02x41.724x0.375	3	-21.621	3112.008	39.5	Pass
L4	42.5 - 0	Pole	TP60.11x49.918x0.438	4	-36.290	4307.789	41.1	Pass
							Summary	
							Pole (L4)	41.1 Pass
							RATING =	41.1 Pass

APPENDIX B
BASE LEVEL DRAWING



(12) 1-3/8" TO 150 FT LEVEL

BUSINESS UNIT: 801386 TOWER ID: C_BASELEVEL

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#: 801366
 Site Name: ROCKY HILL 2
 App #: 188078, Rev. 0

Anchor Rod Data

Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	67	in
Anchor Spacing:	6	in

Plate Data

W=Side:	66	in
Thick:	3	in
Grade:	55	ksi
Clip Distance:	16	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:	60.11	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor

ASD ASIF:	1.333
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Base Reactions

TIA Revision:	F	
Unfactored Moment, M:	2127	ft-kips
Unfactored Axial, P:	36	kips
Unfactored Shear, V:	20	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension: 74.4 Kips
 Allowable Tension: 195.0 Kips
 Anchor Rod Stress Ratio: 38.2% **Pass**

Base Plate Results

Base Plate Stress: 18.2 ksi
 Allowable PL Bending Stress: 55.0 ksi
 Base Plate Stress Ratio: 33.1% **Pass**

Flexural Check

PL Ref. Data

Yield Line (in):	33.23
Max PL Length:	33.23

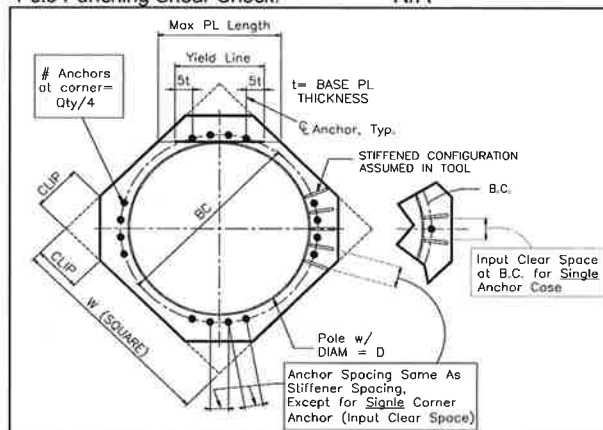
N/A - Unstiffened

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

Maximum Allowable Moment of a Circular Pier

Axial Load (Negative for Compression) = kips

Pier Properties		Material Properties	
Concrete:		Concrete compressive strength =	3000 psi
Pier Diameter =	8.0 ft	Reinforcement yield strength =	60000 psi
Concrete Area =	7238.2 in ²	Modulus of elasticity =	29000 ksi
Reinforcement:		Reinforcement yield strain =	0.00207
Clear Cover =	3.00 in	Limiting compressive strain =	0.003
Cage Diameter =	7.38 ft	Seismic Properties	
Bar Size =	11	Seismic Zone =	1
Bar Diameter =	1.41 in		
Bar Area =	1.56 in ²		
Number of Bars =	40		

Minimum Area of Steel

Required area of steel = 36.19 in²

Provided area of steel = 62.40 in²

OK

Axial Loading

Load factor =

Reduction factor = 0.9

Factored axial load = -52 kips

Neutral Axis

Distance from extreme edge to neutral axis = 18.12 in

Equivalent compression zone factor = 0.85

Distance from extreme edge to equivalent compression zone factor = 15.40 in

Distance from centroid to neutral axis = 29.88 in

Compression Zone

Area of steel in compression zone = 14.04 in²

Angle from centroid of pier to intersection of equivalent compression zone and edge of pier = 47.22 deg

Area of concrete in compression = 750.31 in²

Force in concrete = $0.85 \cdot f'_c \cdot A_{cc}$ = 1913.30 kips

Total reinforcement forces = -1861.30 kips

Factored axial load = -52.00 kips

Force in concrete = -1913.30 kips

Sum of the forces in concrete = 0.00 kips OK

Maximum Moment

First moment of the concrete

area in compression about the centroid = 29152.42 in³

Distance between centroid of concrete

in compression and centroid of pier = 38.85 in

Moment of concrete in compression = 74338.67 in-kips

Total reinforcement moment = 72518.92 in-kips

Nominal moment strength of column = 146857.58 in-kips

Factored moment strength of column = 101670.63 in-kips

Maximum Allowable Moment = ft-kips

Individual Bars

Bar #	Angle from first bar (deg)	Distance to centroid (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in ²)	Stress (ksi)	Axial force (kips)
1	0.00	0.00	-29.88	-32.60	-0.004948	0.00	-60.00	-93.60
2	9.00	6.93	-22.95	-25.67	-0.003801	0.00	-60.00	-93.60
3	18.00	13.69	-16.20	-18.91	-0.002682	0.00	-60.00	-93.60
4	27.00	20.11	-9.77	-12.49	-0.001618	0.00	-46.93	-73.22
5	36.00	26.04	-3.85	-6.56	-0.000637	0.00	-18.47	-28.82
6	45.00	31.32	1.44	-1.28	0.0002382	0.00	6.91	10.77
7	54.00	35.84	5.95	3.23	0.0009857	1.56	28.58	40.61
8	63.00	39.47	9.58	6.87	0.001587	1.56	46.02	67.82
9	72.00	42.13	12.24	9.53	0.0020275	1.56	58.80	87.75
10	81.00	43.75	13.87	11.15	0.0022962	1.56	60.00	89.62
11	90.00	44.30	14.41	11.69	0.0023865	1.56	60.00	89.62
12	99.00	43.75	13.87	11.15	0.0022962	1.56	60.00	89.62
13	108.00	42.13	12.24	9.53	0.0020275	1.56	58.80	87.75
14	117.00	39.47	9.58	6.87	0.001587	1.56	46.02	67.82
15	126.00	35.84	5.95	3.23	0.0009857	1.56	28.58	40.61
16	135.00	31.32	1.44	-1.28	0.0002382	0.00	6.91	10.77
17	144.00	26.04	-3.85	-6.56	-0.000637	0.00	-18.47	-28.82
18	153.00	20.11	-9.77	-12.49	-0.001618	0.00	-46.93	-73.22
19	162.00	13.69	-16.20	-18.91	-0.002682	0.00	-60.00	-93.60
20	171.00	6.93	-22.95	-25.67	-0.003801	0.00	-60.00	-93.60
21	180.00	0.00	-29.88	-32.60	-0.004948	0.00	-60.00	-93.60
22	189.00	-6.93	-36.81	-39.53	-0.006096	0.00	-60.00	-93.60
23	198.00	-13.69	-43.57	-46.29	-0.007215	0.00	-60.00	-93.60
24	207.00	-20.11	-49.99	-52.71	-0.008278	0.00	-60.00	-93.60
25	216.00	-26.04	-55.92	-58.64	-0.00926	0.00	-60.00	-93.60
26	225.00	-31.32	-61.20	-63.92	-0.010135	0.00	-60.00	-93.60
27	234.00	-35.84	-65.72	-68.44	-0.010882	0.00	-60.00	-93.60
28	243.00	-39.47	-69.35	-72.07	-0.011484	0.00	-60.00	-93.60
29	252.00	-42.13	-72.01	-74.73	-0.011924	0.00	-60.00	-93.60
30	261.00	-43.75	-73.63	-76.35	-0.012193	0.00	-60.00	-93.60
31	270.00	-44.30	-74.18	-76.90	-0.012283	0.00	-60.00	-93.60
32	279.00	-43.75	-73.63	-76.35	-0.012193	0.00	-60.00	-93.60
33	288.00	-42.13	-72.01	-74.73	-0.011924	0.00	-60.00	-93.60
34	297.00	-39.47	-69.35	-72.07	-0.011484	0.00	-60.00	-93.60
35	306.00	-35.84	-65.72	-68.44	-0.010882	0.00	-60.00	-93.60
36	315.00	-31.32	-61.20	-63.92	-0.010135	0.00	-60.00	-93.60
37	324.00	-26.04	-55.92	-58.64	-0.00926	0.00	-60.00	-93.60
38	333.00	-20.11	-49.99	-52.71	-0.008278	0.00	-60.00	-93.60
39	342.00	-13.69	-43.57	-46.29	-0.007215	0.00	-60.00	-93.60
40	351.00	-6.93	-36.81	-39.53	-0.006096	0.00	-60.00	-93.60

Monopole Pier and Pad Foundation

BU # : 801366

Site Name: ROCKY HILL 2

App. Number: 188078, Rev. 0

TIA-222 Revision: F



Design Reactions		
Shear, S:	20	kips
Moment, M:	2127	ft-kips
Tower Height, H:	173	ft
Tower Weight, Wt:	36	kips
Base Diameter, BD:	5.01	ft

Foundation Dimensions		
Depth, D:	8	ft
Pad Width, W:	26	ft
Neglected Depth, N:	4	ft
Thickness, T:	3.50	ft
Pier Diameter, Pd:	8.00	ft
Ext. Above Grade, E:	0.50	ft
BP Dist. Above Pier:	3	in.
Clear Cover, Cc:	3.0	in

Soil Properties		
Soil Unit Weight, γ:	0.120	kcf
Ult. Bearing Capacity, Bc:	9.0	ksf
Angle of Friction, Φ:	33	deg
Cohesion, Co:	0.000	ksf
Passive Pressure, Pp:	0.000	ksf
Base Friction, μ:	0.30	

Material Properties		
Rebar Yield Strength, Fy:	60000	psi
Concrete Strength, F'c:	3000	psi
Concrete Unit Weight, δc:	0.150	kcf
Seismic Zone, z:	1	

Rebar Properties		
Pier Rebar Size, Sp:	11	
Pier Rebar Quantity, mp:	40	24
Pad Rebar Size, Spad:	11	
Pad Rebar Quantity, mpad:	31	8
Pier Tie Size, St:	5	4
Tie Quantity, mt:	10	6

Design Checks			
	Capacity/ Availability	Demand/ Limits	Check
<i>Req'd Pier Diam.(ft)</i>	8	7.0092	OK
<i>Overturning (ft-kips)</i>	6108.44	2127.00	34.8%
<i>Shear Capacity (kips)</i>	128.21	20.00	15.6%
<i>Bearing (ksf)</i>	6.75	2.06	30.5%
<i>Pad Shear - 1-way (kips)</i>	981.63	367.80	37.5%
<i>Pad Shear - 2-way (kips)</i>	2654.81	130.12	4.9%
<i>Pad Moment Capacity (k-ft)</i>	7936.92	898.60	11.3%
<i>Pier Moment Capacity (k-ft)</i>	8472.55	2227.00	26.3%

CCI Foundation Tool Suite - Monopole Pier - Beta Release

CCI Foundation Tool Suite - v1.0

Date: 5/8/2013

BU: 801366
 Site Name: ROCKY HILL 2
 App Number: 188078, Rev. 0
 Work Order: 606259



Monopole Drilled Pier

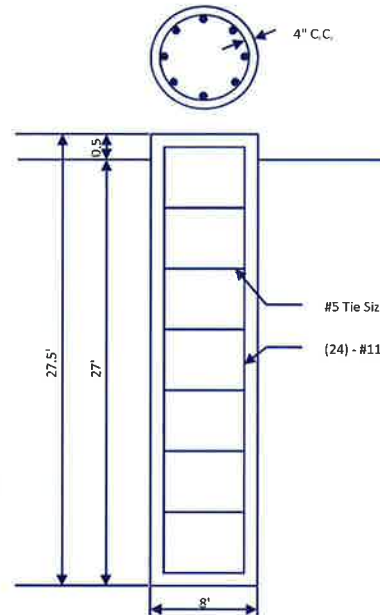
Input

Criteria
 TIA Revision: F
 ACI 318 Revision: 2002
 Seismic Category: B

Forces
 Compression: 36 kips
 Shear: 20 kips
 Moment: 2127 k-ft
 Swelling Force: 0 kips

Foundation Dimensions
 Pier Diameter: 8 ft
 Ext. above grade: 0.5 ft
 Depth below grade: 27 ft

Material Properties
 Number of Rebar: 24
 Rebar Size: 11
 Tie Size: 5
 Rebar tensile strength: 60 ksi
 Concrete Strength: 3000 psi
 Ultimate Concrete Strain: 0.003 in/in
 Clear Cover to Ties: 4 in



Soil Profile: soil

Layer	Thickness (ft)	From (ft)	To (ft)	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (deg)	Ultimate Uplift Skin Friction (ksf)	Ultimate Comp. Skin Friction (ksf)	Ultimate Bearing Capacity (ksf)	SPT 'N' Counts
1	4	0	4	120			0	0	0	
2	6	4	10	120		33	0	0	0	
3	3.5	10	13.5	60		33	0	0	0	
4	10	13.5	23.5	60		32	0	0	0	
5	3.5	23.5	27	55	1000		0	0	6	

Analysis Results

Soil Lateral Capacity
 Depth to Zero Shear: 5.82 ft
 Max Moment, Mu: 2250.58 k-ft
 Soil Safety Factor: 4.66
 Safety Factor Req'd: 2
 RATING: 42.87%

Soil Axial Capacity
 Skin Friction (k): 0.00 kips
 End Bearing (k): 150.80 kips
 Comp. Capacity (k), ϕC_n : 150.80 kips
 Comp. (k), Cu: 36.00 kips
 RATING: 23.87%

Concrete/Steel Check

Mu (from soil analysis) 2925.76 k-ft
 ϕMn 6855.53 k-ft
 RATING: 42.68%

rho provided 0.52
 rho required 0.33 OK

Rebar Spacing 9.76
 Spacing required 22.56 OK

Dev. Length required 20.85
 Dev. Length provided 61.78 OK

Overall Foundation Rating: 42.87%