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Also admitted in Massachusetts

August 8, 2013

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

Re: **Notice of Exempt Modification – Facility Modification  
74 Goodrich Lane, Portland, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the top of an existing 160-foot tower at the above-referenced address. The tower is owned by Crown Castle. Cellco’s use of the tower was approved by the Council in 1986 (Docket No. 58). Cellco now intends to replace three (3) of its existing antennas with three (3) model BXA-70063-6CF LTE antennas, at the same 160-foot level. Included in Attachment 1 are the specifications for Cellco’s replacement antennas.

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

The planned modifications to the Cellco 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 antennas will be located at the 160-foot level on the existing 160-foot tower.



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Melanie A. Bachman  
August 8, 2013  
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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.

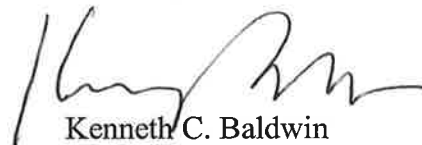
4. The operation of the modified facility will not increase radio frequency (RF) emissions to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.

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, with certain modifications, can support Cellco's proposed modifications. (*See Structural Modification 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:

Susan Bransfield, Portland First Selectwoman  
Joan Hale  
Sandy M. Carter



# **ATTACHMENT 1**

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

X-Pol | FET Panel | 63° | 14.5 dBd

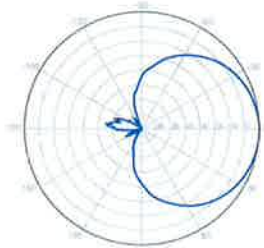
Replace "X" with desired electrical downtilt

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



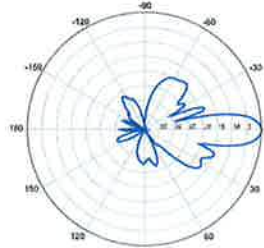
Electrical Characteristics	696-900 MHz		
Frequency bands	696-806 MHz	806-900 MHz	
Polarization	±45°		
Horizontal beamwidth	65°	63°	
Vertical beamwidth	13°	11°	
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)	
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10		
Impedance	50Ω		
VSWR	≤1.35:1		
Upper sidelobe 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



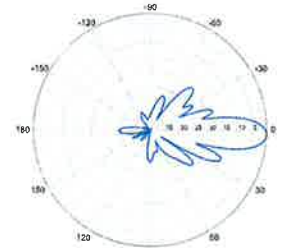
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

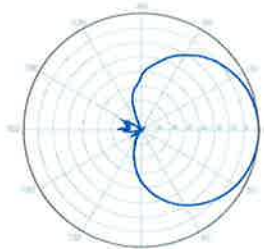


0° | Vertical | 750 MHz

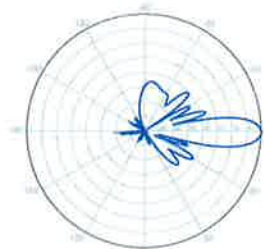
BXA-70063-6CF-EDIN-2



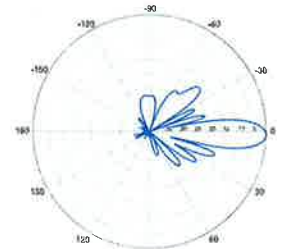
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



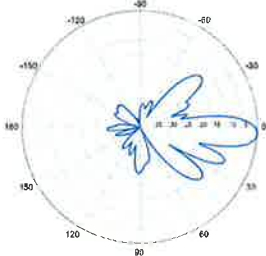
2° | Vertical | 850 MHz

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**

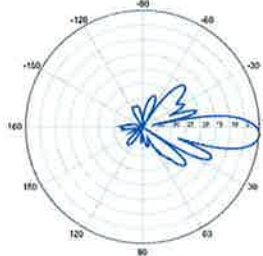
X-Pol | FET Panel | 63° | 14.5 dBd

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



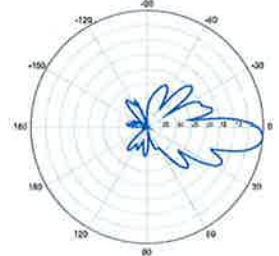
3° | Vertical | 750 MHz

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

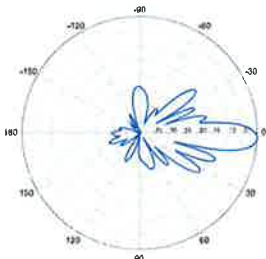


4° | Vertical | 750 MHz

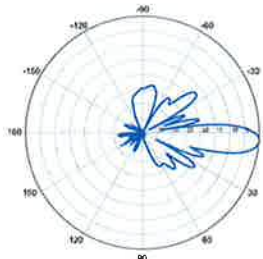
**BXA-70063-6CF-EDIN-5**



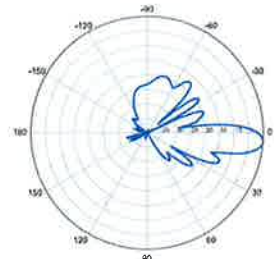
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

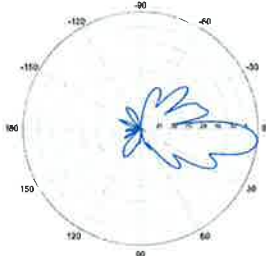


4° | Vertical | 850 MHz



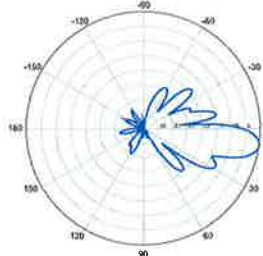
5° | Vertical | 850 MHz

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



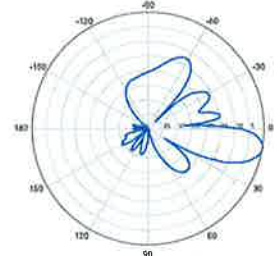
6° | Vertical | 750 MHz

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

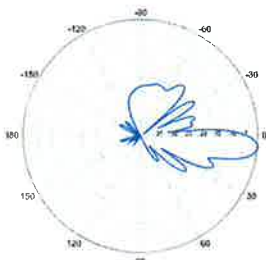


8° | Vertical | 750 MHz

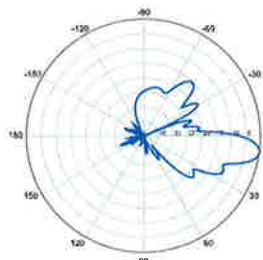
**BXA-70063-6CF-EDIN-10**



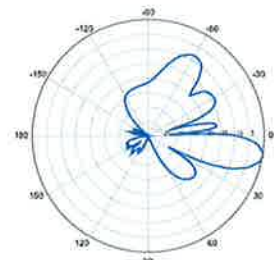
10° | Vertical | 750 MHz



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**

Site Name: Portland		General		Power		Density							
Tower Height: Verizon @ 160ft													
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total					
*AT&T UMTS	2	565	120	0.0282	880	0.5867	4.81%						
*AT&T UMTS	2	875	120	0.0437	1900	1.0000	4.37%						
*AT&T GSM	1	283	120	0.0071	880	0.5867	1.20%						
*AT&T GSM	4	525	120	0.0524	1900	1.0000	5.24%						
*AT&T LTE	1	1313	120	0.0328	734	0.4893	6.70%						
*Clearwire	2	153	142	0.0055	2469	1.0000	0.55%						
*Clearwire	1	211	142	0.0038	11 GHz	1.0000	0.38%						
*Sprint	11	122	153	0.0206	1950	1.0000	2.06%						
*Nextel	9	100	132	0.0186	850	0.5667	3.28%						
*VoiceStream	8	245	135	0.0387	1935	1.0000	3.87%						
<b>Verizon PCS</b>	<b>11</b>	<b>233</b>	<b>160</b>	<b>0.0360</b>	<b>1970</b>	<b>1.0000</b>	<b>3.60%</b>						
<b>Verizon Cellular</b>	<b>9</b>	<b>246</b>	<b>160</b>	<b>0.0311</b>	<b>869</b>	<b>0.5793</b>	<b>5.37%</b>						
<b>Verizon AWS</b>	<b>1</b>	<b>1750</b>	<b>160</b>	<b>0.0246</b>	<b>2145</b>	<b>1.0000</b>	<b>2.46%</b>						
<b>Verizon 700</b>	<b>1</b>	<b>1050</b>	<b>160</b>	<b>0.0147</b>	<b>698</b>	<b>0.4653</b>	<b>3.17%</b>						
								<b>47.05%</b>					
* Source: Siting Council													

# **ATTACHMENT 3**



May 29, 2013

Mr. Patrick Byrum  
Crown Castle  
3530 Toringdon Way, Suite 300  
Charlotte, NC 28277  
Office - 704-405-6532

B+T Group  
1717 S. Boulder, Suite 300  
Tulsa, OK 74119  
(918) 587-4630  
ctuttle@btgrp.com

**Subject:** **Structural Modification Report**

**Carrier Designation:** **Verizon Wireless Co-Locate**

**Carrier Site Number:** N/A

**Carrier Site Name:** Portland

**Crown Castle Designation:**

**Crown Castle BU Number:** 806382

**Crown Castle Site Name:** HRT 082 943274

**Crown Castle JDE Job Number:** 233695

**Crown Castle Work Order Number:** 613983

**Crown Castle Application Number:** 188079 Rev. 0

**Engineering Firm Designation:** **B+T Group Project Number:** 81363.004.01

**Site Data:** **Old Marlborough Turnpike, Portland, CT, Middlesex County**  
**Latitude 41° 36' 29.9", Longitude -72° 35' 29.56"**  
**160 Foot - Monopole**

Dear Mr. Byrum,

B+T Group is pleased to submit this "Structural Modification 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 548706, in accordance with application 188079, 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:

LC4.5: TSA specified load case with proposed modifications **Sufficient Capacity**  
Note: See Table 1 and Table 2 for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2006 International Building Code; 2003 IRC (State Building Code, 2005 CT supplement) based upon a wind speed of 85 mph fastest mile.

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

We at B+T Group 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.

Respectfully submitted by:  
B+T Engineering, Inc.

Robert M. Frazier, E.I.  
Project Engineer

Chad E. Tuttle, P.E.  
President



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## 1) INTRODUCTION

This is a 160 ft. Monopole designed by Valmont in January of 1998. The monopole 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 using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

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

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
160.0	160.0	3	Antel	BXA-70063/6CF	--	--	--

**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		
160.0	160.0	2	Andrew	LNX-6512DS-T2M	--	--	2		
		1	Andrew	LNX-6512DS-T4M					
		2	Decibel	DB846F65ZAXY	12	1 5/8	1		
		4	Decibel	DB846H80E-SX					
		3	Rymrsa Wireless	MG D3-800Tx					
		1	--	Platform Mount [LP 602-1]					
158.0	6	RFS Celwave	FD9R6004/2C-3L						
150.0	152.0	6	Decibel	DB980H90E-M	6	1 5/8	1		
	150.0	1	--	Platform Mount [LP 602-1]					
142.0	144.0	2	Radiowaves	HP3-11	2	1/2	1		
	142.0	1	--	Side Arm [SO 101-3]					
134.0	137.0	3	EMS Wireless	RR90-17-00DP	6	7/8	1		
		6	Ericsson	KRY 112 71/1					
	134.0	1	--	Curved Mount[CO 401-3]					
128.0	130.0	9	Decibel	DB844H90E-XY	9	1 1/4	1		
	128.0	1	--	Platform Mount [LP 601-1]					
116.0	120.0	3	KMW Communications	AM-X-CD-16-65-00T-RET	12	1 1/4	1		
		6	Powerwave Technologies	7770.00					
		1	Raycap	DC6-48-60-18-8F					
	116.0	3	Ericsson	RRUS-11				2	3/4
		6	Powerwave Technologies	LGP21401				1	3/8
		6	Powerwave Technologies	LGP21901					
		1	--	Platform Mount [LP 303-1]					

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
50.0	50.0	2	--	Side Arm Mount [SO 701-1]	2	1/2	1
		2	Unknown	GPS			
45.0	45.0	2	--	Side Arm Mount [SO 701-1]	--	--	1

- Notes:  
 1) Existing Equipment  
 2) Equipment to be Removed

**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)
157	157	1	--	Platform	--	--
		12	Swedcom	ALP 9212-N		
148	148	1	--	Platform	--	--
		12	Swedcom	ALP 9212-N		
138	138	1	--	Platform	--	--
		12	Swedcom	ALP 9212-N		
128	128	1	--	Platform	--	--
		12	Swedcom	ALP 9212-N		
60	60	2	--	GPS	--	--
50	50	2	--	GPS	--	--

### 3) ANALYSIS PROCEDURE

**Table 4 - Documents Provided**

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Co-locate, Rev # 0	188079	CCI Sites
Tower Manufacturer Drawings	Valmont Industries, Inc. Valmont Order # 16750-98	255193	CCI Sites
Foundation Drawings	Unknown	301226	CCI Sites
Geotechnical Reports	Timmerman Geotechnical Group, Inc. TGG # 067058	1041653	CCI Sites
Antenna Configuration	Crown CAD Package	Date:04/30/13	CCI Sites

#### 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.
- 5) Mount areas and weights are assumed based on photographs provided.

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

#### 4) ANALYSIS RESULTS

**Table 5 - Section Capacity (Summary) - LC4.5**

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	160 - 123.667	Pole	TP29.05x18.87x0.188	1	-5.894	772.705	76.4	Pass
L2	123.667 - 76.25	Pole	TP41.95x27.461x0.313	2	-16.559	2028.373	88.8	Pass
L3	76.25 - 51.033	Pole	TP48.389x39.715x0.344	3	-24.252	2548.229	97.6	Pass
L4	51.033 - 37	Pole	TP52.32x48.389x0.454	4	-26.626	2748.872	95.9	Pass
L5	37 - 0	Pole	TP62x49.451x0.406	5	-41.902	3660.071	95.1	Pass
							Summary	
							Pole (L3)	Pass
							<b>RATING =</b>	<b>Pass</b>

**Table 6 - Tower Component Stresses vs. Capacity - LC4.5**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	Base	92.7	Pass
1	Base Plate	Base	53.7	Pass
1	Base Foundation	Base	98.5	Pass

<b>Structure Rating (max from all components) =</b>	<b>98.5%</b>
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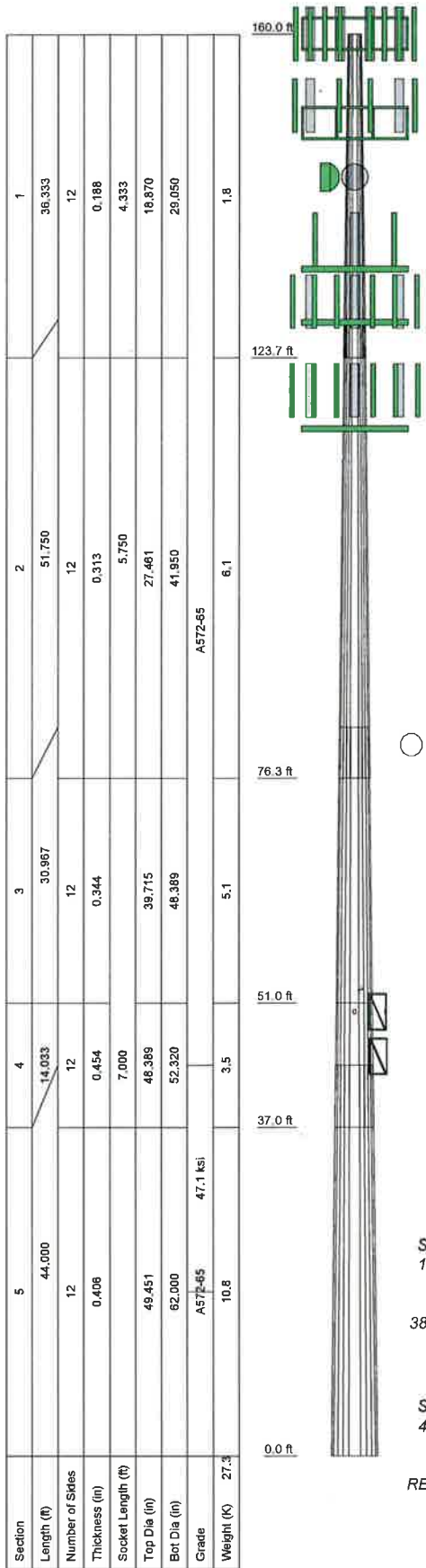
Notes:

- 1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.
- 2) The percent capacities shown above (excluding foundations) include the 1/3 increase in allowable stresses as allowed by TIA/EIA-222-F.

#### 4.1) Recommendations

- 1) All modifications proposed in this report shall be installed in accordance with the attached drawings (Appendix D) for the determined available structural capacity to be effective.

**APPENDIX A**  
**tnxTOWER OUTPUT**



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	36.333	12	0.188	4.333	18.870	29.050	A572-65	1.8
2	51.750	12	0.313	5.750	27.461	41.950	A572-65	6.1
3	30.967	12	0.344	7.000	38.715	48.389	A572-65	5.1
4	14.033	12	0.454	7.000	48.389	52.320	A572-65	3.5
5	44.000	12	0.408	49.451	62.000	47.1 ksi	A572-65	10.8

### DESIGNED APPURTENANCE LOADING

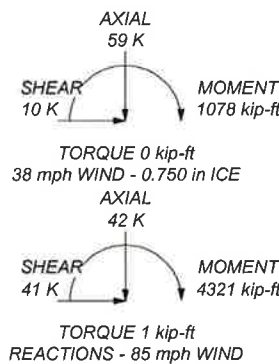
TYPE	ELEVATION	TYPE	ELEVATION
(2) DB846H80E-SX w/ Mount Pipe (E)	160	(2) KRY 112 71/1 (E)	134
(2) DB846H80E-SX w/ Mount Pipe (E)	160	Curved Mount[CO401-3] (E)	134
(2) DB846F65ZAXY w/ Mount Pipe (E)	160	RR90-17-00DP w/ Mount Pipe (E)	134
MG D3-800Tx w/ Mount Pipe (E)	160	RR90-17-00DP w/ Mount Pipe (E)	134
MG D3-800Tx w/ Mount Pipe (E)	160	(3) DB844H90E-XY w/ Mount Pipe (E)	128
MG D3-800Tx w/ Mount Pipe (E)	160	Platform Mount [LP 601-1] (E)	128
(2) FD9R6004/2C-3L (E)	160	(3) DB844H90E-XY w/ Mount Pipe (E)	128
(2) FD9R6004/2C-3L (E)	160	Platform Mount [LP 601-1] (E)	128
(2) FD9R6004/2C-3L (E)	160	(2) 7770.00 w/ Mount Pipe (E)	116
BXA-70063/6CF w/ Mount Pipe (P)	160	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	116
BXA-70063/6CF w/ Mount Pipe (P)	160	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	116
BXA-70063/6CF w/ Mount Pipe (P)	160	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	116
Platform Mount [LP 602-1] (E)	160	DC6-48-60-18-6F (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	(2) LGP21901 (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	(2) LGP21901 (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	(2) LGP21401 (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	(2) LGP21401 (E)	116
(2) 6' x 2" Mount Pipe (E)	150	(2) LGP21401 (E)	116
(2) 6' x 2" Mount Pipe (E)	150	RRUS-11 (E)	116
(2) 6' x 2" Mount Pipe (E)	150	RRUS-11 (E)	116
Platform Mount [LP 602-1] (E)	150	RRUS-11 (E)	116
(2) 6' x 2" Mount Pipe (E)	142	Platform Mount [LP 303-1] (E)	116
(2) 6' x 2" Mount Pipe (E)	142	(2) 7770.00 w/ Mount Pipe (E)	116
(2) 6' x 2" Mount Pipe (E)	142	(2) 7770.00 w/ Mount Pipe (E)	116
Side Arm Mount [SO 101-3] (E)	142	Side Arm Mount [SO 701-1] (E)	50
HP3-11 (E)	142	Side Arm Mount [SO 701-1] (E)	50
HP3-11 (E)	142	GPS (E)	50
RR90-17-00DP w/ Mount Pipe (E)	134	GPS (E)	50
(2) KRY 112 71/1 (E)	134	Side Arm Mount [SO 701-1] (E)	45
(2) KRY 112 71/1 (E)	134	Side Arm Mount [SO 701-1] (E)	45

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	47.1 ksi	47 ksi	65 ksi

### TOWER DESIGN NOTES

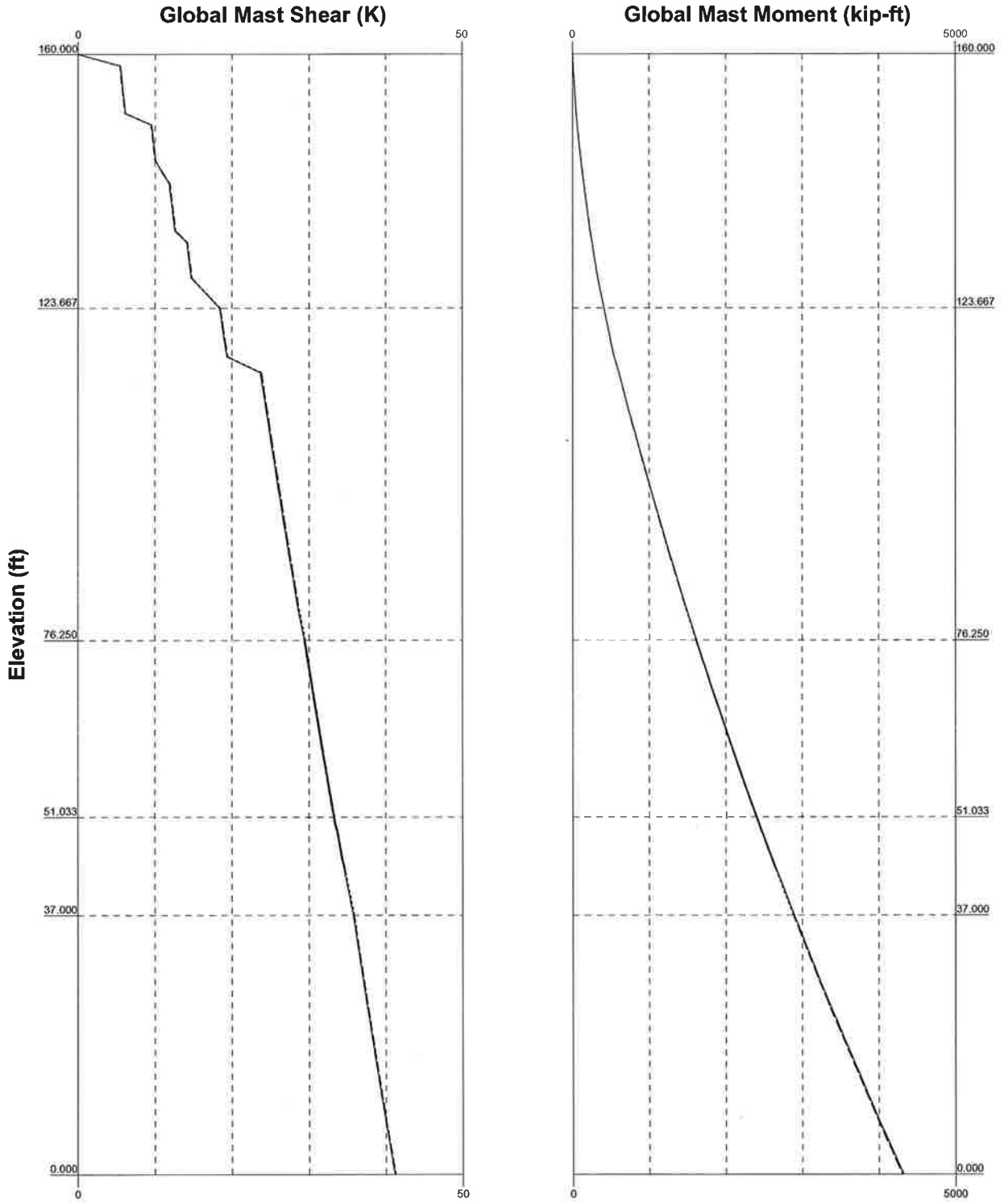
1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 97.6%



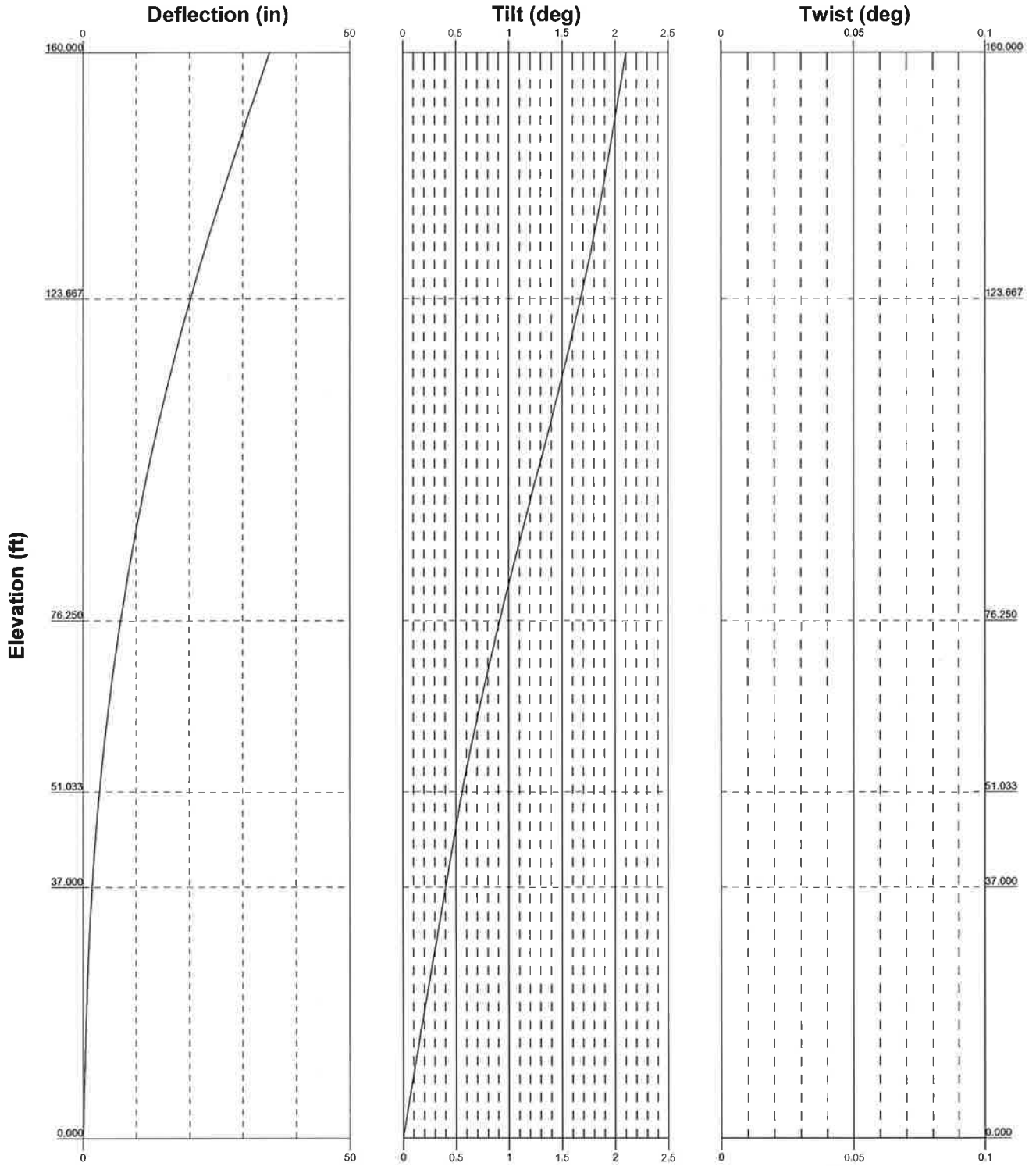
 <b>B+T Group</b> 1717 S. Boulder, Suite 300 Tulsa, OK Phone: (918) 587-4630 FAX: (918) 295-0265	<b>Job:</b> 81363.004.01 - HRT082 943274, CT (BU# 80638)
	<b>Project:</b>
	<b>Client:</b> Crown Castle
	<b>Code:</b> TIA/EIA-222-F
	<b>Path:</b>
<b>Drawn by:</b> HKarande	<b>App'd:</b>
<b>Date:</b> 05/23/13	<b>Scale:</b> NTS
<b>Dwg No:</b> E-1	

—— Vx      - - - - - Vz

—— Mx      - - - - - Mz



 <p><b>B+T Group</b> 1717 S. Boulder, Suite 300 Tulsa, OK Phone: (918) 587-4630 FAX: (918) 295-0265</p>	<b>Job: 81363.004.01 - HRT082 943274, CT (BU# 80638)</b>		
	Project:		
	Client: Crown Castle	Drawn by: HKarande	App'd:
	Code: TIA/EIA-222-F	Date: 05/23/13	Scale: NTS
	Path:	Dwg No: E-4	

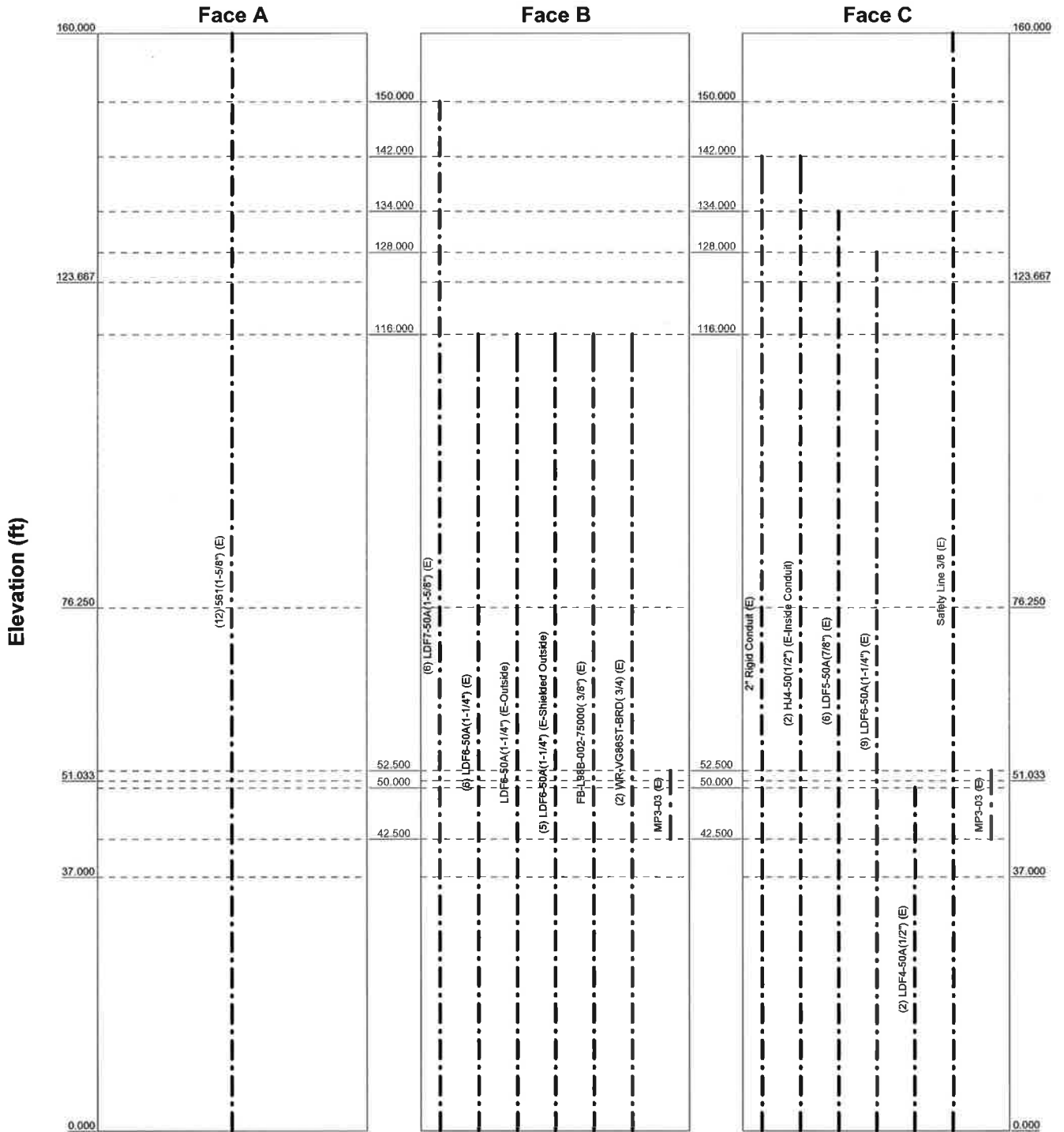


 <p><b>B+T Group</b> 1717 S. Boulder, Suite 300 Tulsa, OK Phone: (918) 587-4630 FAX: (918) 295-0265</p>	<b>Job: 81363.004.01 - HRT082 943274, CT (BU# 80638)</b>		
	Project:	Drawn by: HKarande	App'd:
	Client: Crown Castle	Date: 05/23/13	Scale: NTS
	Code: TIA/EIA-222-F	Path:	Dwg No. E-5

# Feedline Distribution Chart

0' - 160'

Round   
  Flat   
  App In Face   
  App Out Face   
  Truss Leg



 <b>B+T GRP</b>	<b>B+T Group</b>	<b>Job: 81363.004.01 - HRT082 943274, CT (BU# 80638)</b>			
	1717 S. Boulder, Suite 300		Project:		
	Tulsa, OK		Client: Crown Castle	Drawn by: HKarande	App'd:
	Phone: (918) 587-4630		Code: TIA/EIA-222-F	Date: 05/23/13	Scale: NTS
	FAX: (918) 295-0265		Path:	Dwg No. E-7	

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	<b>Project</b>	<b>Date</b> 17:15:23 05/23/13
	<b>Client</b> Crown Castle	<b>Designed by</b> HKarande

## Tower Input Data

There is a pole section.

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

The following design criteria apply:

Tower is located in Middlesex County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.750 in.

Ice thickness is considered to increase with height.

Ice density of 56.000 pcf.

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

Temperature drop of 50.000 °F.

Deflections calculated using a wind speed of 50 mph.

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

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

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

## 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	160.000-123.66 7	36.333	4.333	12	18.870	29.050	0.188	0.750	A572-65 (65 ksi)
L2	123.667-76.250	51.750	5.750	12	27.461	41.950	0.313	1.250	A572-65 (65 ksi)
L3	76.250-51.033	30.967	0.000	12	39.715	48.389	0.344	1.375	A572-65 (65 ksi)
L4	51.033-37.000	14.033	7.000	12	48.389	52.320	0.454	1.816	47.1 ksi (47 ksi)
L5	37.000-0.000	44.000		12	49.451	62.000	0.406	1.625	A572-65 (65 ksi)

## 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>	I/Q in <sup>2</sup>	w in	w/t
L1	19.536	11.280	502.514	6.688	9.775	51.410	1018.229	5.551	4.555	24.292
	30.075	17.426	1852.870	10.333	15.048	123.131	3754.417	8.576	7.283	38.842
L2	29.686	27.318	2569.965	9.719	14.225	180.668	5207.445	13.445	6.522	20.871
	43.430	41.898	9271.410	14.906	21.730	426.662	18786.390	20.621	10.405	33.296
L3	42.784	43.585	8623.571	14.095	20.572	419.181	17473.693	21.451	9.722	28.279
	50.096	53.188	15671.036	17.200	25.066	625.203	31753.768	26.177	12.047	35.04
L4	50.096	70.091	20556.482	17.161	25.066	820.111	41653.006	34.496	11.751	25.878
	54.166	75.838	26039.886	18.568	27.102	960.819	52763.869	37.325	12.805	28.198
L5	53.262	64.164	19699.845	17.558	25.616	769.057	39917.228	31.580	12.164	29.938
	64.187	80.582	39020.922	22.051	32.116	1214.999	79066.967	39.660	15.527	38.216

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Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor $A_f$	Adjust. Factor $A_r$	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
ft	ft <sup>2</sup>	in						
L1 160.000-123.6				1	1	1		
67 L2 123.667-76.25				1	1	1		
0 L3 76.250-51.033				1	1	1		
L4 51.033-37.000				1	1	1		
L5 37.000-0.000				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 klf
***										

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

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		$C_{AA}$ ft <sup>2</sup> /ft	Weight klf		
561(1-5/8") (E)	A	No	Inside Pole	160.000 - 0.000	12	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.000 0.000 0.000 0.000 0.000	0.001 0.001 0.001 0.001 0.001		
***										
LDF7-50A(1-5/8") (E)	B	No	Inside Pole	150.000 - 0.000	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.000 0.000 0.000 0.000 0.000	0.001 0.001 0.001 0.001 0.001		
***										
2" Rigid Conduit (E)	C	No	CaAa (Out Of Face)	142.000 - 0.000	1	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.200 0.300 0.400 0.600 1.000	0.003 0.004 0.006 0.013 0.032		
HJ4-50(1/2") (E-Inside Conduit)	C	No	Inside Pole	142.000 - 0.000	2	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.000 0.000 0.000 0.000 0.000	0.000 0.000 0.000 0.000 0.000		
***										
LDF5-50A(7/8") (E)	C	No	Inside Pole	134.000 - 0.000	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.000 0.000 0.000 0.000 0.000	0.000 0.000 0.000 0.000 0.000		

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight klf
***								
LDF6-50A(1-1/4") (E)	C	No	Inside Pole	128.000 - 0.000	9	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
***								
LDF6-50A(1-1/4") (E)	B	No	Inside Pole	116.000 - 0.000	6	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
LDF6-50A(1-1/4") (E-Outside)	B	No	CaAa (Out Of Face)	116.000 - 0.000	1	No Ice	0.155	0.001
						1/2" Ice	0.255	0.002
						1" Ice	0.355	0.004
						2" Ice	0.555	0.009
						4" Ice	0.955	0.028
LDF6-50A(1-1/4") (E-Shielded Outside)	B	No	CaAa (Out Of Face)	116.000 - 0.000	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.004
						2" Ice	0.000	0.009
						4" Ice	0.000	0.028
FB-L98B-002-75000(3/8") (E)	B	No	Inside Pole	116.000 - 0.000	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
WR-VG86ST-BRD(3/4) (E)	B	No	Inside Pole	116.000 - 0.000	2	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
***								
LDF4-50A(1/2") (E)	C	No	Inside Pole	50.000 - 0.000	2	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
***								
Safety Line 3/8 (E)	C	No	CaAa (Out Of Face)	160.000 - 0.000	1	No Ice	0.037	0.000
						1/2" Ice	0.137	0.001
						1" Ice	0.238	0.001
						2" Ice	0.437	0.002
						4" Ice	0.838	0.004
***								
MP3-03 (E)	C	No	CaAa (Out Of Face)	52.500 - 42.500	1	No Ice	0.262	0.000
						1/2" Ice	0.345	0.000
						1" Ice	0.428	0.000
						2" Ice	0.595	0.000
						4" Ice	0.928	0.000
MP3-03 (E)	B	No	CaAa (Out Of Face)	52.500 - 42.500	1	No Ice	0.262	0.000
						1/2" Ice	0.345	0.000
						1" Ice	0.428	0.000
						2" Ice	0.595	0.000
						4" Ice	0.928	0.000
***								

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### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight K
L1	160.000-123.667	A	0.000	0.000	0.000	0.000	0.589
		B	0.000	0.000	0.000	0.000	逾 過 遞
		C	0.000	0.000	0.000	5.029	0.115
L2	123.667-76.250	A	0.000	0.000	0.000	0.000	0.768
		B	0.000	0.000	0.000	6.161	0.597
		C	0.000	0.000	0.000	11.262	0.542
L3	76.250-51.033	A	0.000	0.000	0.000	0.000	0.409
		B	0.000	0.000	0.000	4.293	0.355
		C	0.000	0.000	0.000	6.373	0.288
L4	51.033-37.000	A	0.000	0.000	0.000	0.000	0.227
		B	0.000	0.000	0.000	4.408	0.198
		C	0.000	0.000	0.000	5.566	0.164
L5	37.000-0.000	A	0.000	0.000	0.000	0.000	0.599
		B	0.000	0.000	0.000	5.735	0.521
		C	0.000	0.000	0.000	8.788	0.434

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight K
L1	160.000-123.667	A	0.893	0.000	0.000	0.000	0.000	0.589
		B		0.000	0.000	0.000	0.000	0.130
		C		0.000	0.000	0.000	14.788	0.208
L2	123.667-76.250	A	0.856	0.000	0.000	0.000	0.000	0.768
		B		0.000	0.000	0.000	13.257	1.245
		C		0.000	0.000	0.000	28.191	0.739
L3	76.250-51.033	A	0.811	0.000	0.000	0.000	0.000	0.409
		B		0.000	0.000	0.000	8.817	0.745
		C		0.000	0.000	0.000	15.212	0.388
L4	51.033-37.000	A	0.776	0.000	0.000	0.000	0.000	0.227
		B		0.000	0.000	0.000	7.690	0.390
		C		0.000	0.000	0.000	11.026	0.214
L5	37.000-0.000	A	0.750	0.000	0.000	0.000	0.000	0.599
		B		0.000	0.000	0.000	11.479	1.027
		C		0.000	0.000	0.000	20.275	0.565

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	160.000-123.667	-0.181	0.105	-0.434	0.251
L2	123.667-76.250	-0.120	0.248	-0.295	0.491
L3	76.250-51.033	-0.096	0.286	-0.255	0.555
L4	51.033-37.000	-0.092	0.453	-0.229	0.738
L5	37.000-0.000	-0.099	0.272	-0.255	0.532

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	<b>Client</b> Crown Castle	<b>Designed by</b> HKarande

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft		C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
***\$***									
(2) DB846H80E-SX w/ Mount Pipe (E)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	5.331	7.735	0.041
						1/2" Ice	5.888	8.930	0.096
						1" Ice	6.412	9.843	0.163
						2" Ice	7.481	11.711	0.323
						4" Ice	9.828	15.894	0.782
(2) DB846H80E-SX w/ Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	5.331	7.735	0.041
						1/2" Ice	5.888	8.930	0.096
						1" Ice	6.412	9.843	0.163
						2" Ice	7.481	11.711	0.323
						4" Ice	9.828	15.894	0.782
(2) DB846F65ZAXY w/ Mount Pipe (E)	C	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	7.271	7.821	0.047
						1/2" Ice	7.877	9.010	0.111
						1" Ice	8.484	9.912	0.188
						2" Ice	9.724	11.812	0.367
						4" Ice	12.325	15.978	0.867
MG D3-800Tx w/ Mount Pipe (E)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	3.570	3.418	0.035
						1/2" Ice	3.979	4.119	0.066
						1" Ice	4.387	4.784	0.107
						2" Ice	5.325	6.164	0.208
						4" Ice	7.341	9.175	0.517
MG D3-800Tx w/ Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	3.570	3.418	0.035
						1/2" Ice	3.979	4.119	0.066
						1" Ice	4.387	4.784	0.107
						2" Ice	5.325	6.164	0.208
						4" Ice	7.341	9.175	0.517
MG D3-800Tx w/ Mount Pipe (E)	C	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	3.570	3.418	0.035
						1/2" Ice	3.979	4.119	0.066
						1" Ice	4.387	4.784	0.107
						2" Ice	5.325	6.164	0.208
						4" Ice	7.341	9.175	0.517
(2) FD9R6004/2C-3L (E)	A	From Leg	4.000 0.000 -2.000	0.000	160.000	No Ice	0.367	0.085	0.003
						1/2" Ice	0.451	0.136	0.005
						1" Ice	0.543	0.196	0.009
						2" Ice	0.755	0.343	0.020
						4" Ice	1.281	0.740	0.063
(2) FD9R6004/2C-3L (E)	B	From Leg	4.000 0.000 -2.000	0.000	160.000	No Ice	0.367	0.085	0.003
						1/2" Ice	0.451	0.136	0.005
						1" Ice	0.543	0.196	0.009
						2" Ice	0.755	0.343	0.020
						4" Ice	1.281	0.740	0.063
(2) FD9R6004/2C-3L (E)	C	From Leg	4.000 0.000 -2.000	0.000	160.000	No Ice	0.367	0.085	0.003
						1/2" Ice	0.451	0.136	0.005
						1" Ice	0.543	0.196	0.009
						2" Ice	0.755	0.343	0.020
						4" Ice	1.281	0.740	0.063
BXA-70063/6CF w/ Mount Pipe (P)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	7.979	5.407	0.042
						1/2" Ice	8.621	6.558	0.098
						1" Ice	9.228	7.422	0.166
						2" Ice	10.473	9.198	0.328
						4" Ice	13.082	12.952	0.788
BXA-70063/6CF w/ Mount Pipe (P)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice	7.979	5.407	0.042
						1/2" Ice	8.621	6.558	0.098
						1" Ice	9.228	7.422	0.166

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	<b>Client</b> Crown Castle	<b>Designed by</b> HKarande

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight						
			Horz	Lateral						ft	ft				
							ft <sup>2</sup>	ft <sup>2</sup>	K						
BXA-70063/6CF w/ Mount Pipe (P)	C	From Leg	4.000	0.000	160.000	2" Ice	10.473	9.198	0.328						
						4" Ice	13.082	12.952	0.788						
						No Ice	7.979	5.407	0.042						
						1/2" Ice	8.621	6.558	0.098						
						1" Ice	9.228	7.422	0.166						
						2" Ice	10.473	9.198	0.328						
Platform Mount [LP 602-1] (E)	C	None	0.000	0.000	160.000	4" Ice	13.082	12.952	0.788						
						No Ice	32.030	32.030	1.343						
						1/2" Ice	38.710	38.710	1.800						
						1" Ice	45.390	45.390	2.257						
						2" Ice	58.750	58.750	3.170						
						4" Ice	85.470	85.470	4.998						
***\$**															
(2) DB980H90E-M w/ Mount Pipe (E)	A	From Leg	4.000	0.000	150.000	No Ice	4.036	3.619	0.030						
						1/2" Ice	4.499	4.481	0.064						
						1" Ice	4.947	5.219	0.107						
						2" Ice	5.870	6.744	0.216						
						4" Ice	8.046	9.995	0.549						
						No Ice	4.036	3.619	0.030						
(2) DB980H90E-M w/ Mount Pipe (E)	B	From Leg	4.000	0.000	150.000	1/2" Ice	4.499	4.481	0.064						
						1" Ice	4.947	5.219	0.107						
						2" Ice	5.870	6.744	0.216						
						4" Ice	8.046	9.995	0.549						
						No Ice	4.036	3.619	0.030						
						1/2" Ice	4.499	4.481	0.064						
(2) DB980H90E-M w/ Mount Pipe (E)	C	From Leg	4.000	0.000	150.000	1" Ice	4.947	5.219	0.107						
						2" Ice	5.870	6.744	0.216						
						4" Ice	8.046	9.995	0.549						
						No Ice	4.036	3.619	0.030						
						1/2" Ice	4.499	4.481	0.064						
						1" Ice	4.947	5.219	0.107						
(2) 6' x 2" Mount Pipe (E)	A	From Leg	4.000	0.000	150.000	2" Ice	5.870	6.744	0.216						
						4" Ice	8.046	9.995	0.549						
						No Ice	1.425	1.425	0.022						
						1/2" Ice	1.925	1.925	0.033						
						1" Ice	2.294	2.294	0.048						
						2" Ice	3.060	3.060	0.090						
(2) 6' x 2" Mount Pipe (E)	B	From Leg	4.000	0.000	150.000	4" Ice	4.702	4.702	0.231						
						No Ice	1.425	1.425	0.022						
						1/2" Ice	1.925	1.925	0.033						
						1" Ice	2.294	2.294	0.048						
						2" Ice	3.060	3.060	0.090						
						4" Ice	4.702	4.702	0.231						
(2) 6' x 2" Mount Pipe (E)	C	From Leg	4.000	0.000	150.000	No Ice	1.425	1.425	0.022						
						1/2" Ice	1.925	1.925	0.033						
						1" Ice	2.294	2.294	0.048						
						2" Ice	3.060	3.060	0.090						
						4" Ice	4.702	4.702	0.231						
						No Ice	32.030	32.030	1.343						
Platform Mount [LP 602-1] (E)	C	None	0.000	0.000	150.000	1/2" Ice	38.710	38.710	1.800						
						1" Ice	45.390	45.390	2.257						
						2" Ice	58.750	58.750	3.170						
						4" Ice	85.470	85.470	4.998						
						***\$**									
						(2) 6' x 2" Mount Pipe (E)	A	From Leg	1.000	0.000	142.000	No Ice	1.425	1.425	0.022
1/2" Ice	1.925	1.925	0.033												
1" Ice	2.294	2.294	0.048												
2" Ice	3.060	3.060	0.090												
4" Ice	4.702	4.702	0.231												
No Ice	1.425	1.425	0.022												
(2) 6' x 2" Mount Pipe (E)	B	From Leg	1.000	0.000	142.000	1/2" Ice	1.925	1.925	0.033						
						1" Ice	2.294	2.294	0.048						

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	<b>Client</b> Crown Castle	<b>Designed by</b> HKarande

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	Ice Type	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
(2) 6' x 2" Mount Pipe (E)	C	From Leg	1.000 0.000 0.000	0.000	142.000	2" Ice 4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.060 4.702 1.425 1.925 2.294 3.060 4.702	3.060 4.702 1.425 1.925 2.294 3.060 4.702	0.090 0.231 0.022 0.033 0.048 0.090 0.231
Side Arm Mount [SO 101-3] (E)	C	None		0.000	142.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.500 8.900 10.300 13.100 18.700	7.500 8.900 10.300 13.100 18.700	0.252 0.333 0.414 0.576 0.900
***									
RR90-17-00DP w/ Mount Pipe (E)	A	From Leg	4.000 0.000 3.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.593 5.088 5.578 6.588 8.731	3.319 4.089 4.784 6.225 9.308	0.034 0.069 0.114 0.224 0.557
RR90-17-00DP w/ Mount Pipe (E)	B	From Leg	4.000 0.000 3.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.593 5.088 5.578 6.588 8.731	3.319 4.089 4.784 6.225 9.308	0.034 0.069 0.114 0.224 0.557
RR90-17-00DP w/ Mount Pipe (E)	C	From Leg	4.000 0.000 3.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.593 5.088 5.578 6.588 8.731	3.319 4.089 4.784 6.225 9.308	0.034 0.069 0.114 0.224 0.557
(2) KRY 112 71/1 (E)	A	From Leg	4.000 0.000 3.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.681 0.802 0.932 1.219 1.896	0.450 0.559 0.677 0.939 1.566	0.013 0.018 0.025 0.044 0.111
(2) KRY 112 71/1 (E)	B	From Leg	4.000 0.000 3.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.681 0.802 0.932 1.219 1.896	0.450 0.559 0.677 0.939 1.566	0.013 0.018 0.025 0.044 0.111
(2) KRY 112 71/1 (E)	C	From Leg	4.000 0.000 3.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.681 0.802 0.932 1.219 1.896	0.450 0.559 0.677 0.939 1.566	0.013 0.018 0.025 0.044 0.111
Curved Mount[CO401-3] (E)	C	None		0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	12.000 15.000 18.000 24.000 36.000	12.000 14.000 16.000 20.000 28.000	0.754 1.005 1.256 1.758 2.762
***									
(3) DB844H90E-XY w/ Mount Pipe (E)	A	From Leg	4.000 0.000 2.000	0.000	128.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.299 3.690 4.119 5.007 6.920	4.921 5.596 6.284 7.712 10.833	0.032 0.070 0.116 0.228 0.557
(3) DB844H90E-XY w/ Mount Pipe (E)	B	From Leg	4.000 0.000 2.000	0.000	128.000	No Ice 1/2" Ice 1" Ice	3.299 3.690 4.119	4.921 5.596 6.284	0.032 0.070 0.116

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	<b>Client</b>		Crown Castle		<b>Designed by</b>		HKarande	

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz	Lateral					
(3) DB844H90E-XY w/ Mount Pipe (E)	C	From Leg	4.000	0.000	128.000	2" Ice	5.007	7.712	0.228
						4" Ice	6.920	10.833	0.557
						No Ice	3.299	4.921	0.032
						1/2" Ice	3.690	5.596	0.070
						1" Ice	4.119	6.284	0.116
						2" Ice	5.007	7.712	0.228
Platform Mount [LP 601-1] (E)	C	None	0.000	0.000	128.000	4" Ice	6.920	10.833	0.557
						No Ice	28.470	28.470	1.122
						1/2" Ice	33.590	33.590	1.514
						1" Ice	38.710	38.710	1.905
						2" Ice	48.950	48.950	2.689
						4" Ice	69.430	69.430	4.255
***									
(2) 7770.00 w/ Mount Pipe (E)	A	From Leg	4.000	0.000	116.000	No Ice	6.119	4.254	0.055
						1/2" Ice	6.626	5.014	0.101
						1" Ice	7.128	5.711	0.155
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
						No Ice	6.119	4.254	0.055
(2) 7770.00 w/ Mount Pipe (E)	B	From Leg	4.000	0.000	116.000	1/2" Ice	6.626	5.014	0.101
						1" Ice	7.128	5.711	0.155
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
						No Ice	6.119	4.254	0.055
						1/2" Ice	6.626	5.014	0.101
(2) 7770.00 w/ Mount Pipe (E)	C	From Leg	4.000	0.000	116.000	1" Ice	7.128	5.711	0.155
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
						No Ice	6.119	4.254	0.055
						1/2" Ice	6.626	5.014	0.101
						1" Ice	7.128	5.711	0.155
AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	A	From Leg	4.000	0.000	116.000	2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
						No Ice	8.498	6.304	0.074
						1/2" Ice	9.149	7.479	0.136
						1" Ice	9.767	8.368	0.210
						2" Ice	11.031	10.179	0.385
AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	B	From Leg	4.000	0.000	116.000	4" Ice	13.679	14.024	0.874
						No Ice	8.498	6.304	0.074
						1/2" Ice	9.149	7.479	0.136
						1" Ice	9.767	8.368	0.210
						2" Ice	11.031	10.179	0.385
						4" Ice	13.679	14.024	0.874
AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	C	From Leg	4.000	0.000	116.000	No Ice	8.498	6.304	0.074
						1/2" Ice	9.149	7.479	0.136
						1" Ice	9.767	8.368	0.210
						2" Ice	11.031	10.179	0.385
						4" Ice	13.679	14.024	0.874
						No Ice	8.498	6.304	0.074
DC6-48-60-18-8F (E)	C	From Leg	4.000	0.000	116.000	1/2" Ice	2.798	4.596	0.050
						1" Ice	3.038	4.885	0.085
						2" Ice	3.543	5.488	0.167
						4" Ice	4.658	6.797	0.383
						No Ice	2.567	4.317	0.019
						1/2" Ice	2.798	4.596	0.050
(2) LGP21901 (E)	A	From Leg	4.000	0.000	116.000	1" Ice	3.038	4.885	0.085
						2" Ice	3.543	5.488	0.167
						4" Ice	4.658	6.797	0.383
						No Ice	0.270	0.184	0.006
						1/2" Ice	0.343	0.248	0.008
						1" Ice	0.425	0.322	0.011
(2) LGP21901 (E)	B	From Leg	4.000	0.000	116.000	2" Ice	0.616	0.494	0.022
						4" Ice	1.101	0.943	0.066
						No Ice	0.270	0.184	0.006
						1/2" Ice	0.343	0.248	0.008
						1" Ice	0.425	0.322	0.011
						2" Ice	0.616	0.494	0.022

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub>		Weight K
			Horz Lateral ft ft ft	Vert ft			Front ft <sup>2</sup>	Side ft <sup>2</sup>	
(2) LGP21901 (E)	C	From Leg	4.000	0.000	116.000	4" Ice	1.101	0.943	0.066
						No Ice	0.270	0.184	0.006
						1/2" Ice	0.343	0.248	0.008
						1" Ice	0.425	0.322	0.011
						2" Ice	0.616	0.494	0.022
(2) LGP21401 (E)	A	From Leg	4.000	0.000	116.000	4" Ice	1.101	0.943	0.066
						No Ice	1.288	0.233	0.014
						1/2" Ice	1.445	0.313	0.021
						1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
(2) LGP21401 (E)	B	From Leg	4.000	0.000	116.000	4" Ice	2.788	1.121	0.135
						No Ice	1.288	0.233	0.014
						1/2" Ice	1.445	0.313	0.021
						1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
(2) LGP21401 (E)	C	From Leg	4.000	0.000	116.000	4" Ice	2.788	1.121	0.135
						No Ice	1.288	0.233	0.014
						1/2" Ice	1.445	0.313	0.021
						1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
RRUS-11 (E)	A	From Leg	4.000	0.000	116.000	4" Ice	2.788	1.121	0.135
						No Ice	1.186	4.424	0.055
						1/2" Ice	1.351	4.708	0.081
						1" Ice	1.526	5.001	0.110
						2" Ice	1.900	5.613	0.179
RRUS-11 (E)	B	From Leg	4.000	0.000	116.000	4" Ice	2.753	6.911	0.368
						No Ice	1.186	4.424	0.055
						1/2" Ice	1.351	4.708	0.081
						1" Ice	1.517	5.001	0.110
						2" Ice	1.848	5.613	0.179
RRUS-11 (E)	C	From Leg	4.000	0.000	116.000	4" Ice	2.511	6.911	0.368
						No Ice	1.186	4.424	0.055
						1/2" Ice	1.351	4.708	0.081
						1" Ice	1.517	5.001	0.110
						2" Ice	1.848	5.613	0.179
Platform Mount [LP 303-1] (E)	C	None		0.000	116.000	4" Ice	2.511	6.911	0.368
						No Ice	14.660	14.660	1.250
						1/2" Ice	18.870	18.870	1.481
						1" Ice	23.080	23.080	1.713
						2" Ice	31.500	31.500	2.175
***§** GPS (E)	A	From Leg	2.000	0.000	50.000	4" Ice	48.340	48.340	3.101
						No Ice	0.175	0.175	0.000
						1/2" Ice	0.238	0.238	0.002
						1" Ice	0.309	0.309	0.005
						2" Ice	0.477	0.477	0.014
GPS (E)	B	From Leg	2.000	0.000	50.000	4" Ice	0.918	0.918	0.053
						No Ice	0.175	0.175	0.000
						1/2" Ice	0.238	0.238	0.002
						1" Ice	0.309	0.309	0.005
						2" Ice	0.477	0.477	0.014
Side Arm Mount [SO 701-1] (E)	A	From Leg	1.000	0.000	50.000	4" Ice	0.918	0.918	0.053
						No Ice	0.850	1.670	0.065
						1/2" Ice	1.140	2.340	0.079
						1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAAA Front ft <sup>2</sup>	CAAA Side ft <sup>2</sup>	Weight K	
Side Arm Mount [SO 701-1] (E)	B	From Leg	1.000	0.000	50.000	No Ice	0.850	1.670	0.065
			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
***\$**									
Side Arm Mount [SO 701-1] (E)	A	From Leg	1.000	0.000	45.000	No Ice	0.850	1.670	0.065
			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
***\$**									
Side Arm Mount [SO 701-1] (E)	B	From Leg	1.000	0.000	45.000	No Ice	0.850	1.670	0.065
			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
***\$**									

### Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft <sup>2</sup>	Weight K	
HP3-11 (E)	A	Paraboloid w/Shroud (HP)	From Leg	1.000	-42.000		142.000	3.167	No Ice	7.880	0.050
				0.000					1/2" Ice	8.300	0.050
				2.000					1" Ice	8.720	0.063
									2" Ice	9.560	0.103
									4" Ice	11.240	0.274
HP3-11 (E)	C	Paraboloid w/Shroud (HP)	From Leg	1.000	-50.000		142.000	3.167	No Ice	7.880	0.050
				0.000					1/2" Ice	8.300	0.050
				2.000					1" Ice	8.720	0.063
									2" Ice	9.560	0.103
									4" Ice	11.240	0.274
***\$**											

### 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

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Comb. No.	Description
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 123.667	34.998	28	2.105	0.003
L2	128 - 76.25	21.769	28	1.736	0.002
L3	82 - 51.033	8.283	28	1.009	0.001
L4	51.033 - 37	3.095	28	0.561	0.000
L5	44 - 0	2.328	28	0.481	0.000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.000	(2) DB846H80E-SX w/ Mount Pipe	28	34.998	2.105	0.004	20861
150.000	(2) DB980H90E-M w/ Mount Pipe	28	30.686	1.999	0.003	10430
144.000	HP3-11	28	28.147	1.932	0.003	6518
142.000	(2) 6' x 2" Mount Pipe	28	27.315	1.910	0.003	5794
134.000	RR90-17-00DP w/ Mount Pipe	28	24.076	1.814	0.002	4010
128.000	(3) DB844H90E-XY w/ Mount Pipe	28	21.769	1.736	0.002	3354
116.000	(2) 7770.00 w/ Mount Pipe	28	17.542	1.563	0.002	3379
50.000	GPS	28	2.973	0.549	0.000	3935
45.000	Side Arm Mount [SO 701-1]	28	2.428	0.492	0.000	3935

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	<b>Client</b> Crown Castle	<b>Designed by</b> HKarande

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 123.667	100.802	3	6.071	0.008
L2	128 - 76.25	62.756	2	5.007	0.005
L3	82 - 51.033	23.900	3	2.911	0.002
L4	51.033 - 37	8.933	3	1.619	0.001
L5	44 - 0	6.719	3	1.387	0.001

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.000	(2) DB846H80E-SX w/ Mount Pipe	3	100.802	6.071	0.012	7398
150.000	(2) DB980H90E-M w/ Mount Pipe	3	88.404	5.764	0.010	3698
144.000	HP3-11	3	81.101	5.573	0.009	2310
142.000	(2) 6' x 2" Mount Pipe	3	78.706	5.507	0.008	2052
134.000	RR90-17-00DP w/ Mount Pipe	2	69.391	5.231	0.007	1419
128.000	(3) DB844H90E-XY w/ Mount Pipe	2	62.756	5.007	0.006	1185
116.000	(2) 7770.00 w/ Mount Pipe	2	50.589	4.507	0.005	1189
50.000	GPS	3	8.580	1.584	0.001	1366
45.000	Side Arm Mount [SO 701-1]	3	7.007	1.420	0.001	1365

### 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	160 - 123.667 (1)	TP29.05x18.87x0.188	36.333	0.000	0.0	34.726	16.693	-5.894	579.674	0.010
L2	123.667 - 76.25 (2)	TP41.95x27.461x0.313	51.750	0.000	0.0	37.779	40.278	-16.559	1521.660	0.011
L3	76.25 - 51.033 (3)	TP48.389x39.715x0.344	30.967	0.000	0.0	35.941	53.188	-24.252	1911.650	0.013
L4	51.033 - 37 (4)	TP52.32x48.389x0.454	14.033	0.000	0.0	28.260	72.971	-26.626	2062.170	0.013
L5	37 - 0 (5)	TP62x49.451x0.406	44.000	0.000	0.0	34.074	80.582	-41.902	2745.740	0.015

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	<b>Client</b> Crown Castle	<b>Designed by</b> HKarande

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual $M_x$ kip-ft	Actual $f_{bx}$ ksi	Allow. $F_{bx}$ ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual $M_y$ kip-ft	Actual $f_{by}$ ksi	Allow. $F_{by}$ ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	160 - 123.667 (1)	TP29.05x18.87x0.188	329.367	34.990	34.726	1.008	0.000	0.000	34.726	0.000
L2	123.667 - 76.25 (2)	TP41.95x27.461x0.313	1453.74 2	44.255	37.779	1.171	0.000	0.000	37.779	0.000
L3	76.25 - 51.033 (3)	TP48.389x39.715x0.344	2410.62 5	46.269	35.941	1.287	0.000	0.000	35.941	0.000
L4	51.033 - 37 (4)	TP52.32x48.389x0.454	2649.82 5	35.759	28.260	1.265	0.000	0.000	28.260	0.000
L5	37 - 0 (5)	TP62x49.451x0.406	4321.25 0	42.679	34.074	1.253	0.000	0.000	34.074	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V$ K	Actual $f_v$ ksi	Allow. $F_v$ ksi	Ratio $\frac{f_v}{F_v}$	Actual $T$ kip-ft	Actual $f_{vt}$ ksi	Allow. $F_{vt}$ ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	160 - 123.667 (1)	TP29.05x18.87x0.188	14.850	0.890	26.000	0.070	0.907	0.046	26.000	0.002
L2	123.667 - 76.25 (2)	TP41.95x27.461x0.313	28.503	0.708	26.000	0.055	1.406	0.020	26.000	0.001
L3	76.25 - 51.033 (3)	TP48.389x39.715x0.344	33.310	0.626	26.000	0.049	1.383	0.013	26.000	0.000
L4	51.033 - 37 (4)	TP52.32x48.389x0.454	34.640	0.475	18.840	0.051	1.266	0.008	18.840	0.000
L5	37 - 0 (5)	TP62x49.451x0.406	41.303	0.513	26.000	0.040	1.133	0.005	26.000	0.000

### Pole Interaction Design Data

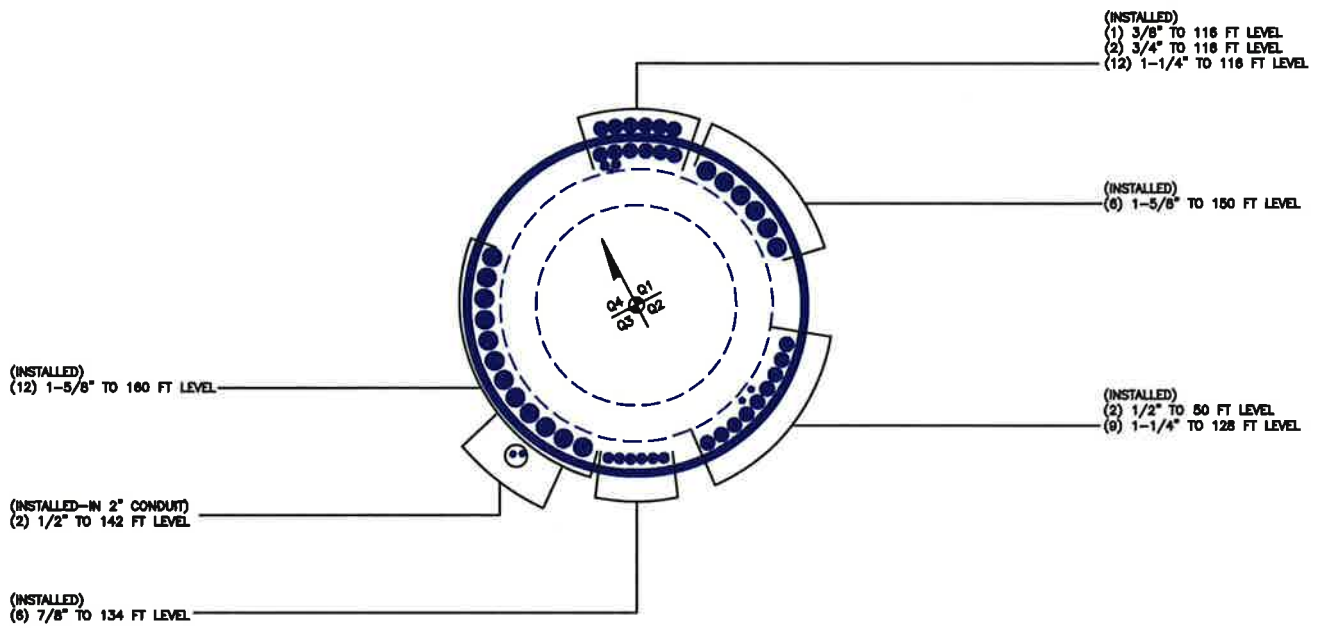
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	160 - 123.667 (1)	0.010	1.008	0.000	0.070	0.002	1.019	1.333	H1-3+VT ✓
L2	123.667 - 76.25 (2)	0.011	1.171	0.000	0.055	0.001	1.183	1.333	H1-3+VT ✓
L3	76.25 - 51.033 (3)	0.013	1.287	0.000	0.049	0.000	1.301	1.333	H1-3+VT ✓
L4	51.033 - 37 (4)	0.013	1.265	0.000	0.051	0.000	1.279	1.333	H1-3+VT ✓
L5	37 - 0 (5)	0.015	1.253	0.000	0.040	0.000	1.268	1.333	H1-3+VT ✓

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### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail	
L1	160 - 123.667	Pole	TP29.05x18.87x0.188	1	-5.894	772.705	76.4	Pass	
L2	123.667 - 76.25	Pole	TP41.95x27.461x0.313	2	-16.559	2028.373	88.8	Pass	
L3	76.25 - 51.033	Pole	TP48.389x39.715x0.344	3	-24.252	2548.229	97.6	Pass	
L4	51.033 - 37	Pole	TP52.32x48.389x0.454	4	-26.626	2748.872	95.9	Pass	
L5	37 - 0	Pole	TP62x49.451x0.406	5	-41.902	3660.071	95.1	Pass	
							Summary		
							Pole (L3)	97.6	Pass
							<b>RATING =</b>	<b>97.6</b>	<b>Pass</b>

**APPENDIX B**  
**BASE LEVEL DRAWING**



BUSINESS UNIT: 006382 TOWER ID: C\_BASELEVEL

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

# Stiffened or Unstiffened, UngROUTED, Circular Base Plate - Any Rod Material

## TIA Rev F

Site Data	
BU#:	806382
Site Name:	HRT 082 943274,CT
App #:	188079,Rev:0
Pole Manufacturer:	Other

Reactions		
Moment:	4321	ft-kips
Axial:	42	kips
Shear:	41	kips

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	70.69	in

If No stiffeners, Criteria: **AISC ASD** <-Only Applicable to Unstiffened Cases

**Anchor Rod Results**  
 Maximum Rod Tension: 180.8 Kips  
 Allowable Tension: 195.0 Kips  
 Anchor Rod Stress Ratio: 92.7% **Pass**

Rigid
Service ASD
Fty*ASIF

Plate Data		
Diam:	76.69	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	12.46	in

**Base Plate Results**  
 Base Plate Stress: 32.2 ksi  
 Allowable Plate Stress: 60.0 ksi  
 Base Plate Stress Ratio: 53.7% **Pass**

Flexural Check

Rigid
Service ASD
0.75*Fy*ASIF
Y.L. Length:
33.96

Stiffener Data (Welding at both sides)		
Config:	0	*
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

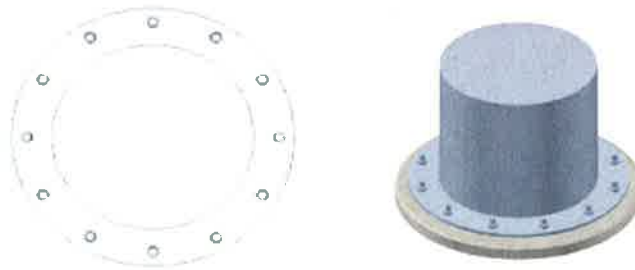
n/a

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

**Pole Results**  
 Pole Punching Shear Check: n/a

Pole Data		
Diam:	62	in
Thick:	0.4063	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor	
ASIF:	1.333



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

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

CAISSON Version 10.35 5:34:33 PM Saturday, May 25, 2013  
 B&T Engineering

\*\*\*\*\*  
 \* CAISSON - Pier Foundations Analysis and Design - Copyright Power Line Systems, Inc. 1993-2010 \*  
 \*

Project Title: 81363.004.01 - HRT082 943274, CT (BU# 806382)  
 Project Notes: 160' Valmont Monopole - 7.5' Diameter, 20.5' Depth (20' Bearing)

Calculation Method: Full 8CD

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

**Pier Properties**

Diameter (ft)	Distance of Top of Pier above Ground (ft)	Concrete Strength (ksi)	Steel Yield Strength (ksi)
7.50	0.50		

**Soil Properties**

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Sand	1.00	0.00	100.0		1.000	
2	Sand	5.00	1.00	110.0		3.537	34.00
3	Sand	3.50	6.00	115.0		4.204	38.00
4	Sand	10.50	9.50	145.0		5.828	45.00

**Design (Factored) Loads at Top of Pier**

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
4321.0	42.0	41.00	2.03

=> Soil Interaction (2/2.03)\*100 = 98.5%

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

Calculated Pier Properties

Length (ft)	Weight (kips)	End Bearing Pressure (psf)
20.500	135.849	950.7

Ultimate Resisting Forces Along Pier

Type	Distance of Top of Layer to Top of Pier (ft)	Thickness (ft)	Density (lbs/ft^3)	CU (psf)	KP (kips)	Force (kips)	Arm (ft)
Sand	0.50	1.00	100.0	1.000	1.13	1.17	
Sand	1.50	5.00	110.0	3.537	149.22	4.61	
Sand	6.50	3.50	115.0	4.204	281.80	8.39	
Sand	10.00	5.61	145.0	5.828	1074.33	13.07	
Sand	15.61	4.89	145.0	5.828	-1423.14	18.19	

Shear and Moments Along Pier

Distance below Top of Pier (ft)	Shear (with Safety Factor) (kips)	Moment (with Safety Factor) (ft-k)	Shear (without Safety Factor) (kips)	Moment (without Safety Factor) (ft-k)
0.00	83.3	8790.0	41.1	4330.1
2.05	76.5	8958.5	37.7	4413.0
4.10	31.9	9075.9	15.7	4470.9
6.15	-49.4	9064.3	-24.4	4465.2
8.20	-187.2	8832.3	-92.2	4350.9
10.25	-383.9	8263.5	-189.1	4070.7
12.30	-716.6	7149.2	-353.0	3521.8
14.35	-1129.1	5271.1	-556.2	2596.6
16.40	-1224.7	2619.8	-603.3	1290.5
18.45	-652.3	682.3	-321.3	336.1
20.50	0.0	-0.0	0.0	-0.0

Mmax = 4493.57 k-ft; Use this moment in the DSMC Sheet.

## 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#: 806382
Site Name: HRT 082 943274,CT
App #: 188079,Rev:0

### 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 =	7.5	ft
Concrete Area =	6361.7	in <sup>2</sup>
<b>Reinforcement:</b>		
Clear Cover to Tie=	4.00	in
Horiz. Tie Bar Size=	5	
Vert. Cage Diameter =	6.61	ft
Vert. Cage Diameter =	79.34	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 =	36	
As Total=	56.16	in <sup>2</sup>
A s/ Aconc, Rho:	0.0088	0.88%

ACI 10.5, ACI 21.10.4, and IBC 1810.  
Min As for Flexural, Tension Controlled, Shafts:

$$(3) * (\text{sqrt}(f_c) / F_y) = 0.0032$$

$$200 / F_y = 0.0033$$

### Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.88%	OK

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	4493.5	ft-kips (* Note)
Max. Service Shaft P:	42	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:	5841.55 ft-kips
1.30	Pu:	54.6 kips

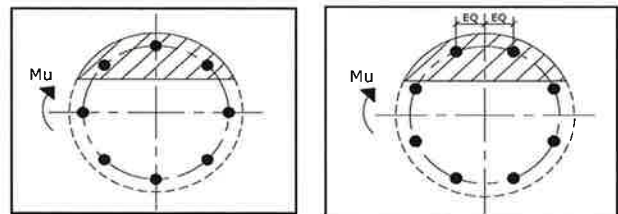
### Material Properties

Concrete Comp. strength, f <sub>c</sub> =	4000	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=	2008	
Seismic Properties		
Seismic Design Category =	B	
Seismic Risk =	Low	

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

### Results:

Governing Orientation Case: 2



Case 1

Case 2

Dist. From Edge to Neutral Axis: 15.63 in

Extreme Steel Strain,  $\epsilon_t$ : 0.0132

$\epsilon_t > 0.0050$ , Tension Controlled

Reduction Factor,  $\phi$ : 0.900

Ref. Shaft Max Axial Capacities, $\phi$ Max(P <sub>n</sub> or T <sub>n</sub> ):		
Max P <sub>u</sub> = ( $\phi=0.65$ ) P <sub>n</sub> .		
P <sub>n</sub> per ACI 318 (10-2)	12900.43	kips
at Mu=( $\phi=0.65$ )M <sub>n</sub> =	8378.42	ft-kips
Max T <sub>u</sub> , ( $\phi=0.9$ ) T <sub>n</sub> =	3032.64	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> = P<sub>u</sub>: 54.60 kips  
 Drilled Shaft Moment Capacity,  $\phi$ M<sub>n</sub>: 9345.70 ft-kips  
 Drilled Shaft Superimposed Mu: 5841.55 ft-kips

**(Mu/ $\phi$ M<sub>n</sub>, Drilled Shaft Flexure CSR): 62.5%**

**APPENDIX D**  
**TOWER MODIFICATION DRAWINGS**









**B+T GRP**  
 1715 S. SHOULDER  
 SUITE 200  
 TULSA, OK 74119  
 PH: (918) 397-6500  
 www.btgpr.com

**CROWN  
 CASTLE**

REV	DATE	DESCRIPTION
0	02/29/13	ISSUED FOR CONSTRUCTION

PROJECT NO.: 81385 004 01  
 PROJECT ENG.: ROBBIE FRAZIER  
 DRAWN BY: JULI / CRC  
 CHECKED BY: RSC

B+T ENGINEERING, INC.



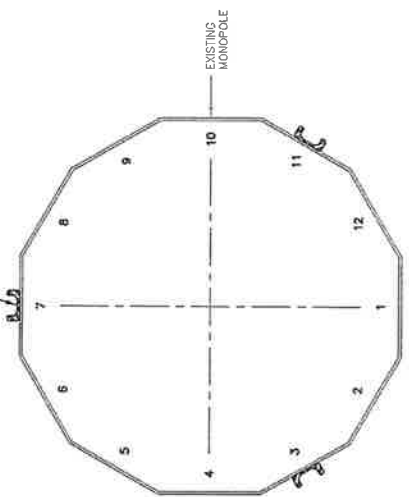
NOT A VALIDATION OF LAW FOR ANY PURPOSE,  
 INCLUDING BUT NOT LIMITED TO,  
 LIABILITY INSURANCE COVERAGE TO  
 ANYONE OTHER THAN THE ISSUING ENGINEER.

HRT 082 943274  
 806382  
 OLD MARLBOROUGH TURNPIKE,  
 PORTLAND, CT  
 EXISTING 160' MONOPOLE

SHEET TITLE  
 TOWER SECTION  
 42.5'-52.5'

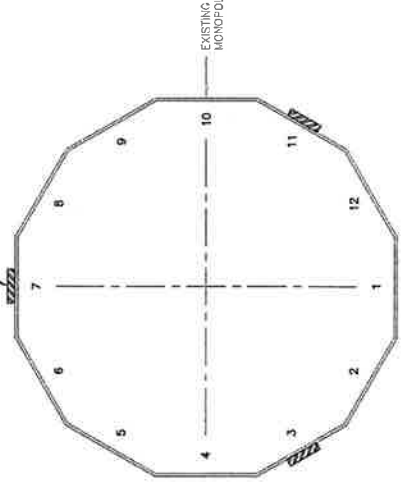
SHEET NUMBER: **S5**  
 REVISION: **0**

(3) AEROSOLUTIONS REINFORCING ELEMENTS,  
 SPACED EQUALLY



AEROSOLUTIONS

(3) FLAT PLATE REINFORCING ELEMENTS,  
 SPACED EQUALLY



CCI

1 TOWER SECTION (42.5'-52.5')  
 SCALE: N.T.S.