ORIGINAL

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KENNETH C. BALDWIN

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Also admitted in Massachusetts

June 14, 2013

David Martin
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Cellco Partnership d/b/a Verizon Wireless**
EM-VER-025-121004 – 1119 Summit Road, Cheshire, CT
EM-VER-165-120924 – 55 King Road, Suffield, CT
EM-VER-004-121106 – 324 Montevideo Road, Avon, CT

Dear Mr. Martin:

As a condition of the acknowledgement for each of the above-referenced exempt modification filings, Cellco was required to provide the Council with a letter stating that the recommendations specified in the structural report were implemented. Attached are Tower Modification Certification Letters verifying that these conditions have been satisfied. All construction associated with these modifications has now been completed.

If you have any questions please do not hesitate to contact me or Rachel Mayo.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Sandy M. Carter
Brian Ragozzine
Mark Gauger

CENTEK engineering

Centered on Solutions℠

June 12, 2013

Mr. Mark Gauger
Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Re: Existing Telecommunications Facility Tower Modification Certification Letter

Project:	**Verizon ~ Cheshire 2** 1119 Summit Road Cheshire, CT
Tower Owner:	**Crown Castle USA Inc.** 349 West Commercial Street Suite 2630 East Rochester, NY 14445
Engineer:	**Paul J. Ford and Company** 250 E. Broad Street, Suite 1500, Columbus, OH 43215

Centek Project No.: 13008.017

Dear Mr. Gauger,

We are providing this "Existing Telecommunications Facility Tower Modification Certification Letter" with regard to the antenna upgrade by Verizon Wireless at the above referenced project.

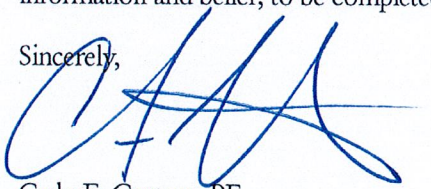
The following are the basis for substantiating compliance with the tower modification documents prepared by Paul J. Ford and Company (Paul J. Ford and Company Project Number: 37512-1657BP SabreR1):

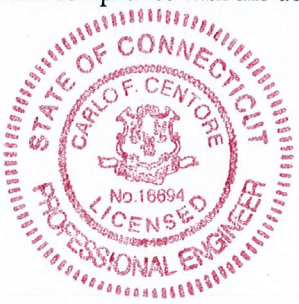
- Review of the Paul J. Ford and Company Structural Analysis dated 07/31/2012.
- Review of the Paul J. Ford and Company Modification Drawings S-1B, S-2B, S-3B, S-4B, and S-5B, dated 06/19/2012.
- Review of the Tower Engineering Professionals Modification Inspection Report dated 05/20/2013.
- Field observations by Centek Engineering personnel on 06/04/2013 of the completed modifications.

With the completed modifications, the tower and foundation do not exceed 100 percent of their post-construction structural rating.

The work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in general compliance with the documents referenced above.

Sincerely,





Carlo F. Centore, PE
Principal ~Structural Engineer

CC: Rachel Mayo, Tim Parks, Aleksey Tyurin

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

November 8, 2012

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

RE: **EM-VER-025-121004**- Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 1119 Summit Road, Cheshire, Connecticut.

Dear Attorney Baldwin:

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

- Prior to antenna installation, the tower shall be reinforced in accordance with the modifications identified in the Structural Modification Report prepared by Paul J. Ford and Company dated July 31, 2012, and stamped by Joseph Jacobs;
- Not more than 45 days following completion of the antenna installation, a signed letter from a Professional Engineer duly licensed in the State of Connecticut shall be submitted to the Council to certify that the recommended modifications have been completed and the tower and foundation will not exceed 100 percent of the post-construction structural rating;
- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated October 3, 2012. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

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

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/CDM/jbw

c: The Honorable Timothy Slocum, Council Chairman, Town of Cheshire
Michael A. Milone, Town Manager, Town of Cheshire
William S. Voelker, AICP, Town Planner, Town of Cheshire
Crown Castle

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

October 5, 2012

The Honorable Timothy Slocum
Council Chairman
Cheshire Town Hall
84 South Main Street
Cheshire, CT 06410

RE: **EM-VER-025-121004**- Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 1119 Summit Road, Cheshire, Connecticut.

Dear Council Chairman Slocum:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

If you have any questions or comments regarding this proposal, please call me or inform the Council by October 19, 2012.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts NAB

Linda Roberts
Executive Director

LR/laf

Enclosure: Notice of Intent

c: Michael A. Milone, Town Manager, Town of Cheshire
William S. Voelker, AICP, Town Planner, Town of Cheshire

ROBINSON & COLE LLP

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EM-VER-025-121004

October 3, 2012

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

Re: **Notice of Exempt Modification – Antenna Swap**
1119 Summit Road, Cheshire, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the top of the existing 167-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 2001 (Docket No. 199). Cellco now intends to replace six (6) of its existing antennas with three (3) model LPA-171063-8CF PCS antennas; and three (3) model BXA-70063-6CF LTE antennas, all at the same level on the tower. Cellco also intends to install six (6) additional coax cables inside the monopole tower. Attached behind Tab 1 are the specifications for the 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 Michael A. Milone, Town Manager of the Town of Cheshire. A copy of this letter is also being sent to Thomas and Joanne M. DiDomizio, the owners of the property on which the tower is located.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas will be located at the top of the existing tower.

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility 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 behind Tab 2.

Also attached is a Structural Modification Report confirming that the tower and foundation, with certain modifications, can support Cellco's proposed modifications. (See Tab 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Michael A. Milone, Cheshire Town Manager
Thomas and Joanne M. DiDomizio
Sandy M. Carter

Amphenol ANTENNA SOLUTIONS

BXA-171063-8CF-EDIN-X

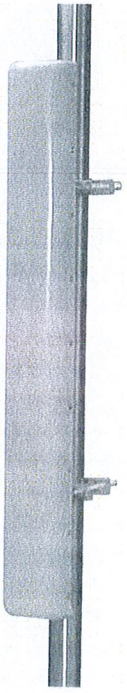
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 17.4 dBi

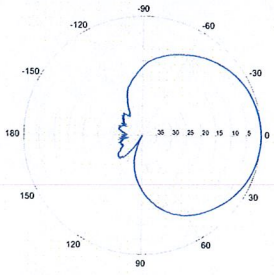
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1232 x 154 x 105 mm	48.5 x 6.1 x 4.1 in
Depth with t-brackets	133 mm	5.2 in
Weight without mounting brackets	4.8 kg	10.5 lbs
Survival wind speed	296 km/hr	184 mph
Wind area	Front: 0.19 m² Side: 0.14 m²	Front: 2.0 ft² Side: 1.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 lbf

Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-8CF-EDIN-X-FP		

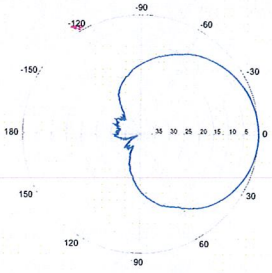


BXA-171063-8CF-EDIN-X



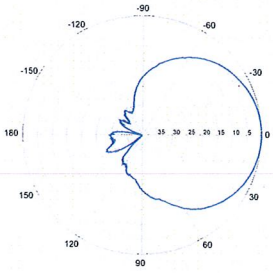
Horizontal | 1710-1880 MHz

BXA-171063-8CF-EDIN-X



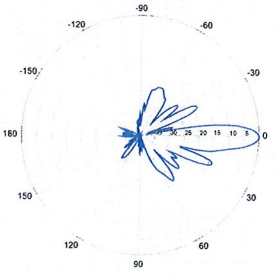
Horizontal | 1850-1990 MHz

BXA-171063-8CF-EDIN-X



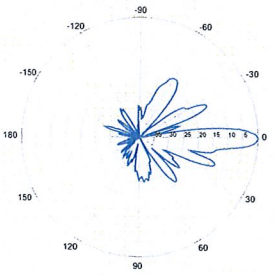
Horizontal | 1920-2170 MHz

BXA-171063-8CF-EDIN-0



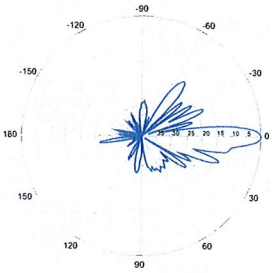
0° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-0

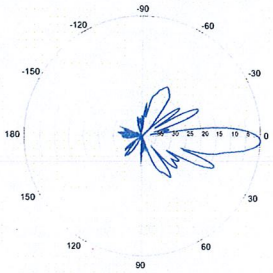


0° | Vertical | 1920-2170 MHz

BXA-171063-8CF-EDIN-X

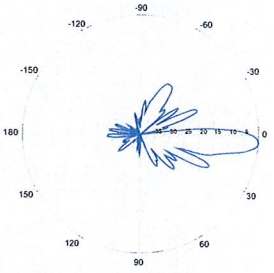
X-Pol | FET Panel | 63° | 17.4 dBi

BXA-171063-8CF-EDIN-2



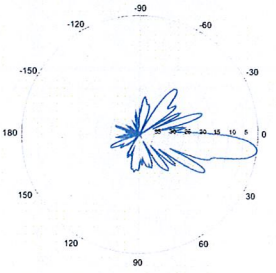
2° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-4



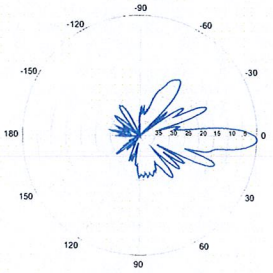
4° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-8



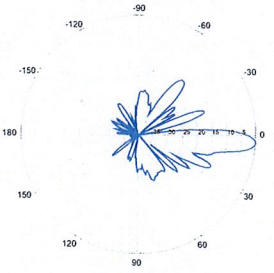
8° | Vertical | 1710-1880 MHz

BXA-171063-8CF-EDIN-2



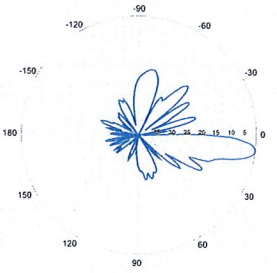
2° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-4



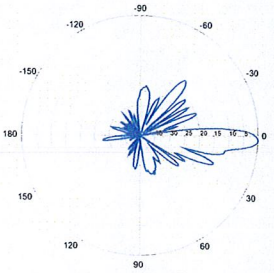
4° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-8



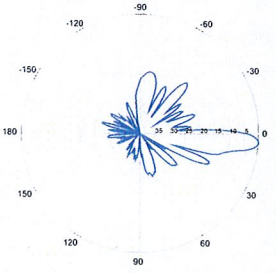
8° | Vertical | 1850-1990 MHz

BXA-171063-8CF-EDIN-2



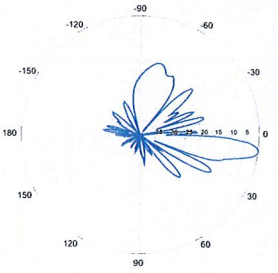
2° | Vertical | 1920-2170 MHz

BXA-171063-8CF-EDIN-4



4° | Vertical | 1920-2170 MHz

BXA-171063-8CF-EDIN-8



8° | Vertical | 1920-2170 MHz

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt.

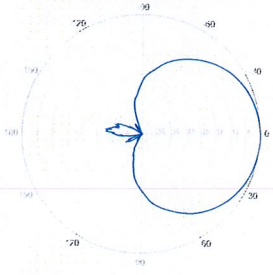
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	

Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

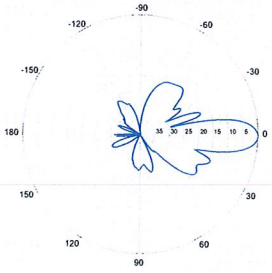
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



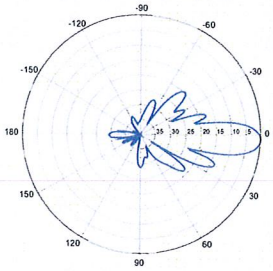
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

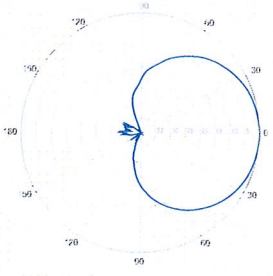


0° | Vertical | 750 MHz

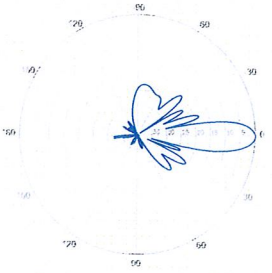
BXA-70063-6CF-EDIN-2



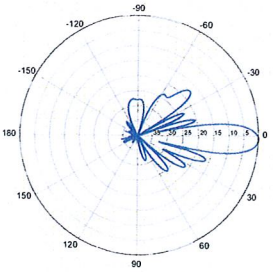
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz

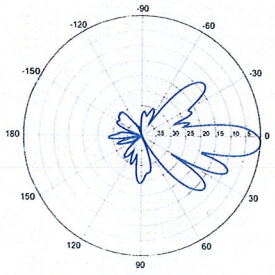


2° | Vertical | 850 MHz

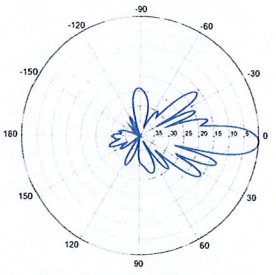
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

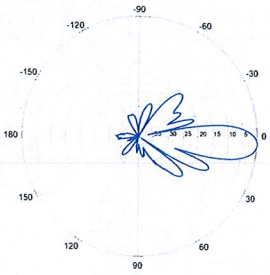


3° | Vertical | 750 MHz

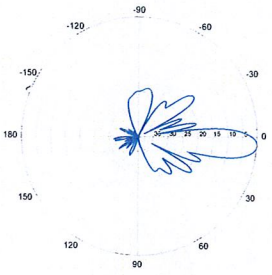


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

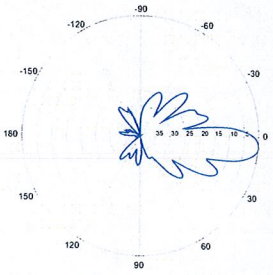


4° | Vertical | 750 MHz

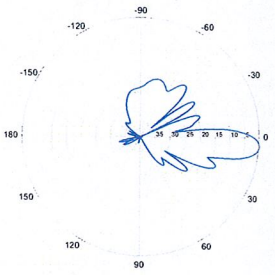


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

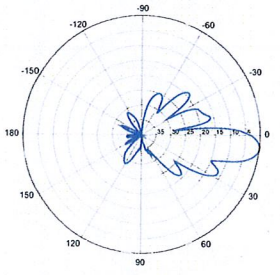


5° | Vertical | 750 MHz

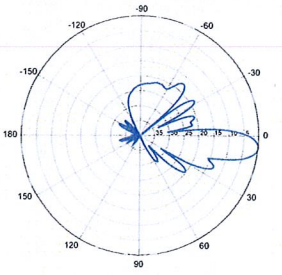


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

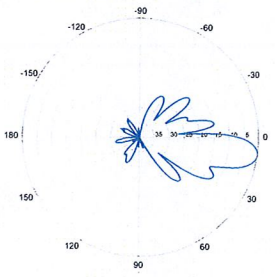


6° | Vertical | 750 MHz

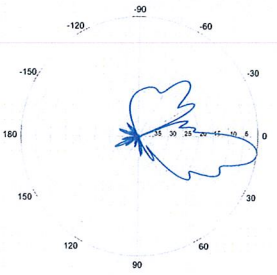


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

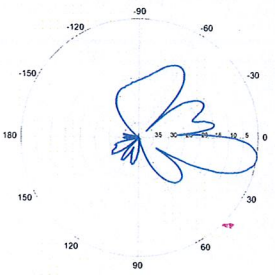


8° | Vertical | 750 MHz

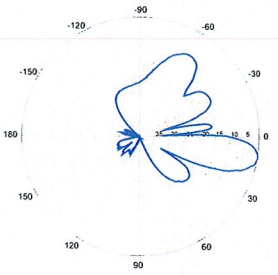


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

	General	Power	Density					
Site Name: Cheshire 2								
Tower Height: Verizon @ 168Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*T-Mobile GSM	8	170	139	0.0253	1945	1.0000	2.53%	
*T-Mobile UMTS	2	711	139	0.0265	2100	1.0000	2.65%	
*Pocket	3	631	118	0.0489	2130	1.0000	4.89%	
*Sprint	11	477.09	147.5	0.0867	1962.5	1.0000	8.67%	
*AT&T UMTS	2	565	160	0.0159	880	0.5867	2.71%	
*AT&T UMTS	2	875	160	0.0246	1900	1.0000	2.46%	
*AT&T GSM	1	283	160	0.0040	880	0.5867	0.68%	
*AT&T GSM	4	525	160	0.0295	1900	1.0000	2.95%	
*AT&T LTE	1	1375	160	0.0193	734	0.4893	3.95%	
*Nextel	12	100	128	0.0263	851	0.5673	4.64%	
Verizon PCS	**7**	**228**	**168**	**0.0203**	**1970**	**1.0000**	**2.03%**	
Verizon Cellular	**9**	**243**	**168**	**0.0279**	**869**	**0.5793**	**4.81%**	
Verizon AWS	**1**	**555**	**168**	**0.0071**	**2145**	**1.0000**	**0.71%**	
Verizon 700	**1**	**801**	**168**	**0.0102**	**698**	**0.4653**	**2.19%**	
								45.86%
* Source: Siting Council								

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 1500 • Columbus, Ohio 43215-3708

Date: **July 31, 2012**

Andrew Bazinet
Crown Castle USA Inc.
349 West Commercial Street Suite 2630
East Rochester, NY 14445

Paul J Ford and Company
250 E. Broad Street Suite 1500
Columbus, OH 43215
614.221.6679
jwoolley@pjfweb.com

Subject: **Structural Modification Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	NHV 2075
	Carrier Site Name:	Cheshire 2
Crown Castle Designation:	**Crown Castle BU Number:**	801367
	Crown Castle Site Name:	CT NHV-2075 CAC 801367
	Crown Castle JDE Job Number:	193192
	Crown Castle Work Order Number:	515695
Engineering Firm Designation:	**Paul J Ford and Company Project Number:** 37512-1657BP SabreR1	
Site Data:	**1121 Summit Road, Cheshire, New Haven County, CT** **Latitude *41° 32' 11.2"*, Longitude *-72° 57' 26.3"*** **167 Foot - Monopole Tower**	

Dear Andrew Bazinet,

Paul J Ford and Company 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 478743, in accordance with application 153580, revision 1.

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

LC4.7: Modified Structure w/ Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 CT state building code using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

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

Respectfully submitted by:

John J Woolley, EIT
Structural Engineer BKK

STATE OF CONNECTICUT
JOSEPH PACHICARAH JACOBS
No. PEN 22731
LICENSED PROFESSIONAL ENGINEER

AUG 0 6 2012

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1) INTRODUCTION

This tower is a 167 ft Monopole tower designed by SUMMIT in June of 2001. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 CT state building code using a fastest mile wind speed of 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
167.0	168.0	3	antel	BXA-171063/8CFx2 w/ Mount Pipe	6	1-5/8	-
		3	antel	BXA-70063-6CF-EDIN-2 w/ Mount Pipe			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
167.0	172.0	1	decibel	DB222-A	-	-	1
	171.0	1	gps	GPS_A			
	168.0	6	antel	LPA-185063/8CF	-	-	3
		6	antel	LPA-80063-6CF-EDIN w/ Mount Pipe	1	1/2	1
	167.0	1	tower mounts	Platform Mount [LP 712-1]	12	1-5/8	
158.0	160.0	6	powerwave technologies	7770.00 w/ Mount Pipe	12	1-5/8	1
		6	powerwave technologies	LGP13519			
		6	powerwave technologies	LGP21401			
		3	Andrew	SBNH-1D6565C w/ mount pipe	1	3/8	2
		1	raycap	DC6-48-60-18-8F	2	3/4	
	158.0	1	tower mounts	Platform Mount [LP 712-1]	-	-	1
156.0	156.0	1	tower mounts	Side Arm Mount [SO 102-3]	-	-	2
		6	ericsson	RRUS-11	6	1-5/8	1
148.0	147.0	6	decibel	DB980F65T4E-M w/ Mount Pipe			
	148.0	1	tower mounts	Platform Mount [LP 712-1]			
		3	ericsson	KRY 112 134/1			
		3	ericsson	KRY 112 89/5			
138.0	139.0	6	remec	S20057A-1	18	1-5/8	1
		3	rfs celwave	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe			
		3	rfs celwave	APX16PV-16PVL-E w/ Mount Pipe			
	138.0	1	tower mounts	Platform Mount [LP 712-1]			
128.0	128.0	12	decibel	DB846G90A-XY w/ Mount Pipe	12	1-1/4	1
		1	tower mounts	Platform Mount [LP 712-1]			
120.0	119.0	3	rfs celwave	APXV18-206517S-C w/ Mount Pipe	6	1-5/8	1
	120.0	1	tower mounts	Pipe Mount [PM 601-3]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be removed.

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Original Tower Drawings	Summit, 14620, 6/12/2001	799210	CCISITES
Foundation Drawings	PJF, 29201-0692, 6/6/2001	842573	CCISITES
Geotechnical Report	CHA, 8961.07.08, 5/15/2001	445076	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	PJF, 37512-1657 BP Sabre, 6/19/2012	3245562	CCISITES
Structural Analysis	PJF, 37512-1657, 7/20/2012	3273540	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.3.0), 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) Monopole will be reinforced in conformance with referenced modification design.
5) This analysis analyzes both foundation options in the manufacturer's drawings as it is not clear which was installed.

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	167 - 118.25	Pole	TP35.36x24x0.25	1	-12.36	1405.09	75.7	Pass
L2	118.25 - 89	Pole	TP41.6779x33.8114x0.3125	2	-19.91	2132.99	97.4	Pass
L3	89 - 77.75	Pole	TP44.3x41.6779x0.4567	3	-21.56	2554.11	87.8	Pass
L4	77.75 - 51	Pole	TP49.9016x42.1046x0.375	4	-31.40	3064.58	98.7	Pass
L5	51 - 45	Pole	TP51.2985x49.9016x0.4947	5	-33.51	3314.52	95.6	Pass
L6	45 - 0	Pole	TP61.04x51.2985x0.4375	6	-49.29	4374.92	93.1	Pass
							Summary	
						Pole (L4)	98.7	Pass
						RATING =	98.7	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	89.5	Pass
1	Base Plate	0	76.7	Pass
1, 2	Base Foundation	0	96.3	Pass
1, 2	Base Foundation Soil Interaction	0	87.4	Pass
1, 3	Base Foundation Structural Steel	0	61.2	Pass
1, 3	Base Foundation Soil Interation	0	87.0	Pass

Structure Rating (max from all components) =	98.7%

Notes:

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

4.1) Recommendations

See attached modification drawings for reference.

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

1) Tower is located in New Haven County, Connecticut.
2) Basic wind speed of 85.00 mph.
3) Nominal ice thickness of 0.7500 in.
4) Ice thickness is considered to increase with height.
5) Ice density of 56.00 pcf.
6) A wind speed of 37.60 mph is used in combination with ice.
7) Temperature drop of 50.00 °F.
8) Deflections calculated using a wind speed of 50.00 mph.
9) A non-linear (P-delta) analysis was used.
10) Pressures are calculated at each section.
11) Stress ratio used in pole design is 1.333.
12) Local bending stresses due to climbing loads, 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	167.0000-118.2500	48.7500	4.50	18	24.0000	35.3600	0.2500	1.0000	A607-65 (65 ksi)
L2	118.2500-89.0000	33.7500	0.00	18	33.8114	41.6778	0.3125	1.2500	A607-65 (65 ksi)
L3	89.0000-77.7500	11.2500	5.50	18	41.6778	44.3000	0.4567	1.8268	Reinf 51.76 ksi (52 ksi)
L4	77.7500-51.0000	32.2500	0.00	18	42.1046	49.9016	0.3750	1.5000	A607-65 (65 ksi)
L5	51.0000-45.0000	6.0000	0.00	18	49.9016	51.2985	0.4947	1.9788	Reinf 51.95 ksi (52 ksi)
L6	45.0000-0.0000	45.0000		18	51.2985	61.0400	0.4375	1.7500	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	24.3702	18.8456	1342.9976	8.4313	12.1920	110.1540	2687.7623	9.4246	3.7840	15.136
	35.9055	27.8598	4338.8723	12.4641	17.9629	241.5466	8683.4538	13.9325	5.7834	23.133
L2	35.3980	33.2267	4710.6979	11.8921	17.1762	274.2576	9427.5943	16.6165	5.4008	17.283
	42.3208	41.0293	8869.6096	14.6847	21.1723	418.9242	17750.890 0	20.5185	6.7853	21.713
L3	42.3208	59.7541	12827.584 6	14.6335	21.1723	605.8650	25672.048 1	29.8827	6.5315	14.301
	44.9834	63.5551	15434.561 7	15.5644	22.5044	685.8464	30889.432 6	31.7836	6.9930	15.312
L4	44.1044	49.6687	10927.208 8	14.8140	21.3892	510.8762	21868.795 9	24.8391	6.7504	18.001
	50.6714	58.9490	18267.952 3	17.5819	25.3500	720.6296	36559.942 1	29.4801	8.1227	21.66
L5	50.6714	77.5791	23925.239 6	17.5394	25.3500	943.7969	47881.960 6	38.7969	7.9120	15.993
	52.0898	79.7725	26012.532 1	18.0353	26.0596	998.1930	52059.292 1	39.8939	8.1578	16.49
L6	52.0898	70.6268	23082.154 6	18.0556	26.0596	885.7440	46194.681 3	35.3201	8.2585	18.877
	61.9816	84.1541	39047.573 5	21.5139	31.0083	1259.2612	78146.526 7	42.0851	9.9730	22.796

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 167.0000-118.2500				1	1	1		
L2 118.2500-89.0000				1	1	1		
L3 89.0000-77.7500				1	1	1		
L4 77.7500-51.0000				1	1	1		
L5 51.0000-45.0000				1	1	1		
L6 45.0000-0.0000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
HJ7-50A(1-5/8")	C	No	Inside Pole	167.0000 - 0.0000	6	No Ice	0.0000	1.04
						1/2" Ice	0.0000	1.04
						1" Ice	0.0000	1.04
						2" Ice	0.0000	1.04
						4" Ice	0.0000	1.04
LDF7-50A(1-5/8")	C	No	Inside Pole	167.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
LDF4-50A(1/2")	C	No	Inside Pole	167.0000 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
LDF5-50A(7/8")	C	No	Inside Pole	167.0000 - 0.0000	1	No Ice	0.0000	0.33
						1/2" Ice	0.0000	0.33
						1" Ice	0.0000	0.33

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						2" Ice	0.0000	0.33
						4" Ice	0.0000	0.33
561(1-5/8")	C	No	CaAa (Out Of Face)	167.0000 - 138.0000	1	No Ice	0.1625	1.35
						1/2" Ice	0.2625	2.65
						1" Ice	0.3625	4.56
						2" Ice	0.5625	10.21
						4" Ice	0.9625	28.84
561(1-5/8")	C	No	CaAa (Out Of Face)	167.0000 - 0.0000	5	No Ice	0.0000	1.35
						1/2" Ice	0.0000	2.65
						1" Ice	0.0000	4.56
						2" Ice	0.0000	10.21
						4" Ice	0.0000	28.84
561(1-5/8")	C	No	CaAa (Out Of Face)	138.0000 - 0.0000	1	No Ice	0.0000	1.35
						1/2" Ice	0.0000	2.65
						1" Ice	0.0000	4.56
						2" Ice	0.0000	10.21
						4" Ice	0.0000	28.84
***								
LDF7-50A(1-5/8")	C	No	Inside Pole	158.0000 - 0.0000	12	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
FB-L98B-002-75000(3/8")	C	No	CaAa (Out Of Face)	158.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.60
						1" Ice	0.0000	1.76
						2" Ice	0.0000	5.91
						4" Ice	0.0000	21.53
WR-VG86ST-BRD(3/4)	C	No	CaAa (Out Of Face)	158.0000 - 0.0000	1	No Ice	0.0000	0.59
						1/2" Ice	0.0000	1.37
						1" Ice	0.0000	2.76
						2" Ice	0.0000	7.37
						4" Ice	0.0000	23.92
WR-VG86ST-BRD(3/4)	C	No	CaAa (Out Of Face)	158.0000 - 0.0000	1	No Ice	0.0774	0.59
						1/2" Ice	0.1774	1.37
						1" Ice	0.2774	2.76
						2" Ice	0.4774	7.37
						4" Ice	0.8774	23.92
***								
LDF7-50A(1-5/8")	C	No	Inside Pole	148.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
***								
FLC 158-50J(1-5/8")	C	No	Inside Pole	138.0000 - 0.0000	14	No Ice	0.0000	0.92
						1/2" Ice	0.0000	0.92
						1" Ice	0.0000	0.92
						2" Ice	0.0000	0.92
						4" Ice	0.0000	0.92
FLC 158-50J(1-5/8")	C	No	CaAa (Out Of Face)	138.0000 - 0.0000	2	No Ice	0.0000	0.92
						1/2" Ice	0.0000	2.46
						1" Ice	0.0000	4.60
						2" Ice	0.0000	10.73
						4" Ice	0.0000	30.31
FLC 158-50J(1-5/8")	C	No	CaAa (Out Of Face)	138.0000 - 0.0000	2	No Ice	0.2015	0.92
						1/2" Ice	0.3015	2.46
						1" Ice	0.4015	4.60
						2" Ice	0.6015	10.73
						4" Ice	1.0015	30.31
LDF6-50A(1-1/4")	C	No	Inside Pole	128.0000 - 0.0000	12	No Ice	0.0000	0.66
						1/2" Ice	0.0000	0.66
						1" Ice	0.0000	0.66
						2" Ice	0.0000	0.66
						4" Ice	0.0000	0.66
LCF158-50JL(1-5/8")	C	No	CaAa (Out Of Face)	120.0000 - 0.0000	6	No Ice	0.0000	0.52
						1/2" Ice	0.0000	2.03
						1" Ice	0.0000	4.16
						2" Ice	0.0000	10.24

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
**********						4" Ice	0.0000	29.74
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	53.0000 - 43.0000	1	No Ice	0.1667	0.00
						1/2" Ice	0.2778	0.00
						1" Ice	0.3889	0.00
						2" Ice	0.6111	0.00
						4" Ice	1.0556	0.00
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	91.0000 - 81.0000	1	No Ice	0.1667	0.00
						1/2" Ice	0.2778	0.00
						1" Ice	0.3889	0.00
						2" Ice	0.6111	0.00
						4" Ice	1.0556	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	167.0000-118.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	15.749	1.96
L2	118.2500-89.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	14.385	1.85
L3	89.0000-77.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.738	0.71
L4	77.7500-51.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	13.184	1.69
L5	51.0000-45.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	3.882	0.38
L6	45.0000-0.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	21.952	2.85

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	167.0000-118.2500	A	0.893	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	35.083	3.27
L2	118.2500-89.0000	A	0.860	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	30.455	3.43
L3	89.0000-77.7500	A	0.838	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	13.885	1.27
L4	77.7500-51.0000	A	0.812	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	27.009	3.03
L5	51.0000-45.0000	A	0.784	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	7.752	0.66
L6	45.0000-0.0000	A	0.750	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	42.534	4.81

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	167.0000-118.2500	-0.3865	0.2231	-0.7176	0.4143
L2	118.2500-89.0000	-0.5546	0.3202	-0.9870	0.5698
L3	89.0000-77.7500	-0.6654	0.3842	-1.1568	0.6679
L4	77.7500-51.0000	-0.5692	0.3286	-1.0141	0.5855
L5	51.0000-45.0000	-0.7287	0.4207	-1.2550	0.7246
L6	45.0000-0.0000	-0.5732	0.3309	-0.9981	0.5762

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Lightning Rod 5/8x4'	C	From Face	0.0000 0.00 2.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2500 0.6635 0.9732 1.4936 2.6833	0.2500 0.6635 0.9732 1.4936 2.6833	0.03 0.03 0.04 0.06 0.14
****									
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.7445 11.4117 12.0450 13.3414 16.0541	10.7001 11.9672 12.9479 14.9632 19.2085	0.05 0.14 0.25 0.48 1.09
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.7445 11.4117 12.0450 13.3414 16.0541	10.7001 11.9672 12.9479 14.9632 19.2085	0.05 0.14 0.25 0.48 1.09
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.7445 11.4117 12.0450 13.3414 16.0541	10.7001 11.9672 12.9479 14.9632 19.2085	0.05 0.14 0.25 0.48 1.09
DB222-A	A	From Leg	4.0000 0.00 5.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.6000 2.8800 4.1600 6.7200 11.8400	1.6000 2.8800 4.1600 6.7200 11.8400	0.02 0.02 0.03 0.04 0.05
GPS_A	A	From Leg	4.0000 0.00 4.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2975 0.3739 0.4589 0.6549 1.1506	0.2975 0.3739 0.4589 0.6549 1.1506	0.00 0.00 0.01 0.02 0.08
BXA-171063/8CFx2 w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.1396 3.5152 3.9152 4.8036 6.7148	3.5101 4.1303 4.7565 6.0591 9.0948	0.03 0.06 0.10 0.20 0.49

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
BXA-171063/8CFx2 w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.1396 3.5152 3.9152 4.8036 6.7148	3.5101 4.1303 4.7565 6.0591 9.0948	0.03 0.06 0.10 0.20 0.49
BXA-171063/8CFx2 w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.1396 3.5152 3.9152 4.8036 6.7148	3.5101 4.1303 4.7565 6.0591 9.0948	0.03 0.06 0.10 0.20 0.49
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.9686 8.6091 9.2158 10.4591 13.0655	5.8008 6.9529 7.8191 9.6015 13.3662	0.04 0.10 0.17 0.34 0.80
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.9686 8.6091 9.2158 10.4591 13.0655	5.8008 6.9529 7.8191 9.6015 13.3662	0.04 0.10 0.17 0.34 0.80
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.9686 8.6091 9.2158 10.4591 13.0655	5.8008 6.9529 7.8191 9.6015 13.3662	0.04 0.10 0.17 0.34 0.80
Platform Mount [LP 712-1]	C	None		0.0000	167.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	24.5300 29.9400 35.3500 46.1700 67.8100	24.5300 29.9400 35.3500 46.1700 67.8100	1.34 1.65 1.96 2.58 3.82
***									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	158.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.1194 6.6258 7.1283 8.1643 10.3599	4.2543 5.0137 5.7109 7.1553 10.4117	0.06 0.10 0.16 0.29 0.66
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.0000	158.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.1194 6.6258 7.1283 8.1643 10.3599	4.2543 5.0137 5.7109 7.1553 10.4117	0.06 0.10 0.16 0.29 0.66
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.0000	158.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.1194 6.6258 7.1283 8.1643 10.3599	4.2543 5.0137 5.7109 7.1553 10.4117	0.06 0.10 0.16 0.29 0.66
(2) LGP13519	A	From Leg	4.0000 0.00 2.00	0.0000	158.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3379 0.4220 0.5147 0.7260 1.2523	0.2074 0.2804 0.3621 0.5513 1.0335	0.01 0.01 0.01 0.02 0.07
(2) LGP13519	B	From Leg	4.0000 0.00 2.00	0.0000	158.0000	No Ice 1/2" Ice 1" Ice	0.3379 0.4220 0.5147 0.7260	0.2074 0.2804 0.3621 0.5513	0.01 0.01 0.01 0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
							2" Ice	1.2523	1.0335	0.07
							4" Ice			
(2) LGP13519	C	From Leg	4.0000	0.0000	158.0000		No Ice	0.3379	0.2074	0.01
			0.00				1/2" Ice	0.4220	0.2804	0.01
			2.00					0.5147	0.3621	0.01
							1" Ice	0.7260	0.5513	0.02
							2" Ice	1.2523	1.0335	0.07
							4" Ice			
(2) LGP21401	A	From Leg	4.0000	0.0000	158.0000		No Ice	1.2880	0.2326	0.01
			0.00				1/2" Ice	1.4453	0.3134	0.02
			2.00					1.6112	0.4028	0.03
							1" Ice	1.9690	0.6076	0.05
							2" Ice	2.7882	1.1210	0.14
							4" Ice			
(2) LGP21401	B	From Leg	4.0000	0.0000	158.0000		No Ice	1.2880	0.2326	0.01
			0.00				1/2" Ice	1.4453	0.3134	0.02
			2.00					1.6112	0.4028	0.03
							1" Ice	1.9690	0.6076	0.05
							2" Ice	2.7882	1.1210	0.14
							4" Ice			
(2) LGP21401	C	From Leg	4.0000	0.0000	158.0000		No Ice	1.2880	0.2326	0.01
			0.00				1/2" Ice	1.4453	0.3134	0.02
			2.00					1.6112	0.4028	0.03
							1" Ice	1.9690	0.6076	0.05
							2" Ice	2.7882	1.1210	0.14
							4" Ice			
SBNH-1D6565C w/ Mount Pipe	A	From Leg	4.0000	0.0000	158.0000		No Ice	11.5561	9.7151	0.09
			0.00				1/2" Ice	12.2227	11.1857	0.18
			2.00					12.8929	12.5942	0.28
							1" Ice	14.2911	14.8689	0.51
							2" Ice	17.4280	19.6184	1.14
							4" Ice			
SBNH-1D6565C w/ Mount Pipe	B	From Leg	4.0000	0.0000	158.0000		No Ice	11.5561	9.7151	0.09
			0.00				1/2" Ice	12.2227	11.1857	0.18
			2.00					12.8929	12.5942	0.28
							1" Ice	14.2911	14.8689	0.51
							2" Ice	17.4280	19.6184	1.14
							4" Ice			
SBNH-1D6565C w/ Mount Pipe	C	From Leg	4.0000	0.0000	158.0000		No Ice	11.5561	9.7151	0.09
			0.00				1/2" Ice	12.2227	11.1857	0.18
			2.00					12.8929	12.5942	0.28
							1" Ice	14.2911	14.8689	0.51
							2" Ice	17.4280	19.6184	1.14
							4" Ice			
(2) RRUS-11	A	From Leg	4.0000	0.0000	156.0000		No Ice	4.4236	1.1855	0.05
			0.00				1/2" Ice	4.7079	1.3512	0.07
			0.00					5.0009	1.5256	0.10
							1" Ice	5.6127	1.9002	0.17
							2" Ice	6.9402	2.7532	0.36
							4" Ice			
(2) RRUS-11	B	From Leg	4.0000	0.0000	156.0000		No Ice	4.4236	1.1855	0.05
			0.00				1/2" Ice	4.7079	1.3512	0.07
			0.00					5.0009	1.5256	0.10
							1" Ice	5.6127	1.9002	0.17
							2" Ice	6.9402	2.7532	0.36
							4" Ice			
(2) RRUS-11	C	From Leg	4.0000	0.0000	156.0000		No Ice	4.4236	1.1855	0.05
			0.00				1/2" Ice	4.7079	1.3512	0.07
			0.00					5.0009	1.5256	0.10
							1" Ice	5.6127	1.9002	0.17
							2" Ice	6.9402	2.7532	0.36
							4" Ice			
DC6-48-60-18-8F	A	From Leg	4.0000	0.0000	158.0000		No Ice	2.5667	2.5667	0.02
			0.00				1/2" Ice	2.7978	2.7978	0.04
			2.00					3.0377	3.0377	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
							1" Ice	3.5432	3.5432	0.13
							2" Ice	4.6580	4.6580	0.30
							4" Ice			
Platform Mount [LP 712-1]	C	None			0.0000	158.0000	No Ice	24.5300	24.5300	1.34
							1/2" Ice	29.9400	29.9400	1.65
							1" Ice	35.3500	35.3500	1.96
							2" Ice	46.1700	46.1700	2.58
							4" Ice	67.8100	67.8100	3.82
6' x 2" Mount Pipe	B	From Leg	4.0000		0.0000	158.0000	No Ice	1.4250	1.4250	0.02
			0.00				1/2" Ice	1.9250	1.9250	0.03
			1.00				1" Ice	2.2939	2.2939	0.05
							2" Ice	3.0596	3.0596	0.09
							4" Ice	4.7022	4.7022	0.23
6' x 2" Mount Pipe	B	From Leg	4.0000		0.0000	158.0000	No Ice	1.4250	1.4250	0.02
			0.00				1/2" Ice	1.9250	1.9250	0.03
			1.00				1" Ice	2.2939	2.2939	0.05
							2" Ice	3.0596	3.0596	0.09
							4" Ice	4.7022	4.7022	0.23
6' x 2" Mount Pipe	C	From Leg	4.0000		0.0000	158.0000	No Ice	1.4250	1.4250	0.02
			0.00				1/2" Ice	1.9250	1.9250	0.03
			1.00				1" Ice	2.2939	2.2939	0.05
							2" Ice	3.0596	3.0596	0.09
							4" Ice	4.7022	4.7022	0.23
****										
(2) DB980F65T4E-M w/ Mount Pipe	A	From Leg	4.0000		0.0000	148.0000	No Ice	4.1333	3.7167	0.03
			0.00				1/2" Ice	4.5970	4.5791	0.06
			-1.00				1" Ice	5.0462	5.3180	0.11
							2" Ice	5.9730	6.8458	0.22
							4" Ice	8.1730	10.1012	0.56
(2) DB980F65T4E-M w/ Mount Pipe	B	From Leg	4.0000		0.0000	148.0000	No Ice	4.1333	3.7167	0.03
			0.00				1/2" Ice	4.5970	4.5791	0.06
			-1.00				1" Ice	5.0462	5.3180	0.11
							2" Ice	5.9730	6.8458	0.22
							4" Ice	8.1730	10.1012	0.56
(2) DB980F65T4E-M w/ Mount Pipe	C	From Leg	4.0000		0.0000	148.0000	No Ice	4.1333	3.7167	0.03
			0.00				1/2" Ice	4.5970	4.5791	0.06
			-1.00				1" Ice	5.0462	5.3180	0.11
							2" Ice	5.9730	6.8458	0.22
							4" Ice	8.1730	10.1012	0.56
Platform Mount [LP 712-1]	C	None			0.0000	148.0000	No Ice	24.5300	24.5300	1.34
							1/2" Ice	29.9400	29.9400	1.65
							1" Ice	35.3500	35.3500	1.96
							2" Ice	46.1700	46.1700	2.58
							4" Ice	67.8100	67.8100	3.82
****										
APX16PV-16PVL-E w/ Mount Pipe	A	From Leg	4.0000		0.0000	138.0000	No Ice	6.9361	3.2893	0.06
			0.00				1/2" Ice	7.4389	3.9953	0.10
			1.00				1" Ice	7.9415	4.6615	0.16
							2" Ice	8.9779	6.0439	0.28
							4" Ice	11.1750	9.0230	0.65
APX16PV-16PVL-E w/ Mount Pipe	B	From Leg	4.0000		0.0000	138.0000	No Ice	6.9361	3.2893	0.06
			0.00				1/2" Ice	7.4389	3.9953	0.10
			1.00				1" Ice	7.9415	4.6615	0.16
							2" Ice	8.9779	6.0439	0.28
							4" Ice	11.1750	9.0230	0.65

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APX16PV-16PVL-E w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.9361 7.4389 7.9415 8.9779 11.1750	3.2893 3.9953 4.6615 6.0439 9.0230	0.06 0.10 0.16 0.28 0.65
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.4657 7.9944 8.5176 9.5949 11.8728	3.4938 4.2631 4.9598 6.4031 9.4897	0.06 0.11 0.16 0.30 0.68
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.4657 7.9944 8.5176 9.5949 11.8728	3.4938 4.2631 4.9598 6.4031 9.4897	0.06 0.11 0.16 0.30 0.68
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.4657 7.9944 8.5176 9.5949 11.8728	3.4938 4.2631 4.9598 6.4031 9.4897	0.06 0.11 0.16 0.30 0.68
KRY 112 134/1	A	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.0082 1.1488 1.2980 1.6223 2.3747	0.4869 0.6009 0.7236 0.9950 1.6413	0.01 0.02 0.03 0.05 0.13
KRY 112 134/1	B	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.0082 1.1488 1.2980 1.6223 2.3747	0.4869 0.6009 0.7236 0.9950 1.6413	0.01 0.02 0.03 0.05 0.13
KRY 112 134/1	C	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.0082 1.1488 1.2980 1.6223 2.3747	0.4869 0.6009 0.7236 0.9950 1.6413	0.01 0.02 0.03 0.05 0.13
KRY 112 89/5	A	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2333 0.3025 0.3802 0.5617 1.0284	0.4278 0.5293 0.6395 0.8858 1.4821	0.02 0.02 0.03 0.05 0.11
KRY 112 89/5	B	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2333 0.3025 0.3802 0.5617 1.0284	0.4278 0.5293 0.6395 0.8858 1.4821	0.02 0.02 0.03 0.05 0.11
KRY 112 89/5	C	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2333 0.3025 0.3802 0.5617 1.0284	0.4278 0.5293 0.6395 0.8858 1.4821	0.02 0.02 0.03 0.05 0.11
(2) S20057A-1	A	From Leg	4.0000 0.00 1.00	0.0000	138.0000	No Ice 1/2" Ice 1" Ice 2" Ice	0.8286 0.9610 1.1019 1.4098 2.1292	0.3942 0.5048 0.6242 0.8887 1.5216	0.01 0.01 0.02 0.04 0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) S20057A-1	B	From Leg	4.0000 0.00 1.00	0.0000	138.0000	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.8286 0.9610 1.1019 1.4098 2.1292	0.3942 0.5048 0.6242 0.8887 1.5216	0.01 0.01 0.02 0.04 0.11
(2) S20057A-1	C	From Leg	4.0000 0.00 1.00	0.0000	138.0000	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.8286 0.9610 1.1019 1.4098 2.1292	0.3942 0.5048 0.6242 0.8887 1.5216	0.01 0.01 0.02 0.04 0.11
Platform Mount [LP 712-1]	C	None		0.0000	138.0000	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	24.5300 29.9400 35.3500 46.1700 67.8100	24.5300 29.9400 35.3500 46.1700 67.8100	1.34 1.65 1.96 2.58 3.82
6' x 2" Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	138.0000	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	138.0000	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	138.0000	4" Ice No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.02 0.03 0.05 0.09 0.23
****									
(4) DB846G90A-XY w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	128.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.2292 5.7831 6.3025 7.3652 9.6937	7.5292 8.7153 9.6153 11.4489 15.6025	0.04 0.09 0.16 0.32 0.77
(4) DB846G90A-XY w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	128.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.2292 5.7831 6.3025 7.3652 9.6937	7.5292 8.7153 9.6153 11.4489 15.6025	0.04 0.09 0.16 0.32 0.77
(4) DB846G90A-XY w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	128.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.2292 5.7831 6.3025 7.3652 9.6937	7.5292 8.7153 9.6153 11.4489 15.6025	0.04 0.09 0.16 0.32 0.77
Platform Mount [LP 712-1]	C	None		0.0000	128.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	24.5300 29.9400 35.3500 46.1700 67.8100	24.5300 29.9400 35.3500 46.1700 67.8100	1.34 1.65 1.96 2.58 3.82
****									
APXV18-206517S-C w/ Mount Pipe	A	From Leg	1.0000 0.00	0.0000	120.0000	No Ice 1/2"	5.4042 5.9597	4.7000 5.8600	0.05 0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
				-1.00			Ice	6.4808	6.7338	0.15
							1" Ice	7.5467	8.5150	0.28
							2" Ice	9.9193	12.2774	0.68
							4" Ice			
APXV18-206517S-C w/ Mount Pipe	B	From Leg	1.0000		0.0000	120.0000	No Ice	5.4042	4.7000	0.05
			0.00				1/2"	5.9597	5.8600	0.09
			-1.00				Ice	6.4808	6.7338	0.15
							1" Ice	7.5467	8.5150	0.28
							2" Ice	9.9193	12.2774	0.68
							4" Ice			
APXV18-206517S-C w/ Mount Pipe	C	From Leg	1.0000		0.0000	120.0000	No Ice	5.4042	4.7000	0.05
			0.00				1/2"	5.9597	5.8600	0.09
			-1.00				Ice	6.4808	6.7338	0.15
							1" Ice	7.5467	8.5150	0.28
							2" Ice	9.9193	12.2774	0.68
							4" Ice			
Pipe Mount [PM 601-3]	C	None			0.0000	120.0000	No Ice	4.3900	4.3900	0.20
							1/2"	5.4800	5.4800	0.24
							Ice	6.5700	6.5700	0.28
							1" Ice	8.7500	8.7500	0.36
							2" Ice	13.1100	13.1100	0.53
							4" Ice			
***										
Side Arm Mount [SO 102-3]	C	None			0.0000	156.0000	No Ice	3.0000	3.0000	0.08
							1/2"	3.4800	3.4800	0.11
							Ice	3.9600	3.9600	0.14
							1" Ice	4.9200	4.9200	0.20
							2" Ice	6.8400	6.8400	0.32
							4" Ice			

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	1.96	3.87	A	1	0.65	1	1	1	120.575	4.45	91.33	C
			B	1	0.65	1	1	1	120.575			
			C	1	0.65	1	1	1	120.575			
L2 118.2500-89.0000	1.85	4.26	A	1	0.65	1	1	1	93.281	3.25	111.04	C
			B	1	0.65	1	1	1	93.281			
			C	1	0.65	1	1	1	93.281			
L3 89.0000-77.7500	0.71	2.36	A	1	0.65	1	1	1	40.302	1.34	119.23	C
			B	1	0.65	1	1	1	40.302			
			C	1	0.65	1	1	1	40.302			
L4 77.7500-51.0000	1.69	5.96	A	1	0.65	1	1	1	104.031	3.05	114.13	C
			B	1	0.65	1	1	1	104.031			
			C	1	0.65	1	1	1	104.031			
L5 51.0000-45.0000	0.38	1.61	A	1	0.65	1	1	1	25.300	0.71	117.86	C
			B	1	0.65	1	1	1	25.300			
			C	1	0.65	1	1	1	25.300			
L6 45.0000-0.0000	2.85	11.85	A	1	0.65	1	1	1	210.635	4.98	110.61	C
			B	1	0.65	1	1	1	210.635			
			C	1	0.65	1	1	1	210.635			
Sum Weight:	9.45	29.91						OTM	1414.74 kip-ft	17.78		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	1.96	3.87	A	1	0.65	1	1	1	120.575	4.45	91.33	C
			B	1	0.65	1	1	1	120.575			
			C	1	0.65	1	1	1	120.575			
L2 118.2500-89.0000	1.85	4.26	A	1	0.65	1	1	1	93.281	3.25	111.04	C
			B	1	0.65	1	1	1	93.281			
			C	1	0.65	1	1	1	93.281			
L3 89.0000-77.7500	0.71	2.36	A	1	0.65	1	1	1	40.302	1.34	119.23	C
			B	1	0.65	1	1	1	40.302			
			C	1	0.65	1	1	1	40.302			
L4 77.7500-51.0000	1.69	5.96	A	1	0.65	1	1	1	104.031	3.05	114.13	C
			B	1	0.65	1	1	1	104.031			
			C	1	0.65	1	1	1	104.031			
L5 51.0000-45.0000	0.38	1.61	A	1	0.65	1	1	1	25.300	0.71	117.86	C
			B	1	0.65	1	1	1	25.300			
			C	1	0.65	1	1	1	25.300			
L6 45.0000-0.0000	2.85	11.85	A	1	0.65	1	1	1	210.635	4.98	110.61	C
			B	1	0.65	1	1	1	210.635			
			C	1	0.65	1	1	1	210.635			
Sum Weight:	9.45	29.91						OTM	1414.74 kip-ft	17.78		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	1.96	3.87	A	1	0.65	1	1	1	120.575	4.45	91.33	C
			B	1	0.65	1	1	1	120.575			
			C	1	0.65	1	1	1	120.575			
L2 118.2500-89.0000	1.85	4.26	A	1	0.65	1	1	1	93.281	3.25	111.04	C
			B	1	0.65	1	1	1	93.281			
			C	1	0.65	1	1	1	93.281			
L3 89.0000-77.7500	0.71	2.36	A	1	0.65	1	1	1	40.302	1.34	119.23	C
			B	1	0.65	1	1	1	40.302			
			C	1	0.65	1	1	1	40.302			
L4 77.7500-51.0000	1.69	5.96	A	1	0.65	1	1	1	104.031	3.05	114.13	C
			B	1	0.65	1	1	1	104.031			
			C	1	0.65	1	1	1	104.031			
L5 51.0000-45.0000	0.38	1.61	A	1	0.65	1	1	1	25.300	0.71	117.86	C
			B	1	0.65	1	1	1	25.300			
			C	1	0.65	1	1	1	25.300			
L6 45.0000-0.0000	2.85	11.85	A	1	0.65	1	1	1	210.635	4.98	110.61	C
			B	1	0.65	1	1	1	210.635			
			C	1	0.65	1	1	1	210.635			
Sum Weight:	9.45	29.91						OTM	1414.74 kip-ft	17.78		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	3.27	5.52	A	1	0.65	1	1	1	127.831	1.09	22.44	C
			B	1	0.65	1	1	1	127.831			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	127.831			
L2 118.2500-89.0000	3.43	5.48	A	1	0.65	1	1	1	97.634	0.80	27.20	C
			B	1	0.65	1	1	1	97.634			
			C	1	0.65	1	1	1	97.634			
L3 89.0000-77.7500	1.27	2.87	A	1	0.65	1	1	1	41.874	0.33	29.12	C
			B	1	0.65	1	1	1	41.874			
			C	1	0.65	1	1	1	41.874			
L4 77.7500-51.0000	3.03	7.23	A	1	0.65	1	1	1	107.767	0.72	26.82	C
			B	1	0.65	1	1	1	107.767			
			C	1	0.65	1	1	1	107.767			
L5 51.0000-45.0000	0.66	1.90	A	1	0.65	1	1	1	26.084	0.17	28.03	C
			B	1	0.65	1	1	1	26.084			
			C	1	0.65	1	1	1	26.084			
L6 45.0000-0.0000	4.81	14.22	A	1	0.65	1	1	1	216.260	1.12	24.95	C
			B	1	0.65	1	1	1	216.260			
			C	1	0.65	1	1	1	216.260			
Sum Weight:	16.47	37.23						OTM	342.63 kip-ft	4.23		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	3.27	5.52	A	1	0.65	1	1	1	127.831	1.09	22.44	C
			B	1	0.65	1	1	1	127.831			
			C	1	0.65	1	1	1	127.831			
L2 118.2500-89.0000	3.43	5.48	A	1	0.65	1	1	1	97.634	0.80	27.20	C
			B	1	0.65	1	1	1	97.634			
			C	1	0.65	1	1	1	97.634			
L3 89.0000-77.7500	1.27	2.87	A	1	0.65	1	1	1	41.874	0.33	29.12	C
			B	1	0.65	1	1	1	41.874			
			C	1	0.65	1	1	1	41.874			
L4 77.7500-51.0000	3.03	7.23	A	1	0.65	1	1	1	107.767	0.72	26.82	C
			B	1	0.65	1	1	1	107.767			
			C	1	0.65	1	1	1	107.767			
L5 51.0000-45.0000	0.66	1.90	A	1	0.65	1	1	1	26.084	0.17	28.03	C
			B	1	0.65	1	1	1	26.084			
			C	1	0.65	1	1	1	26.084			
L6 45.0000-0.0000	4.81	14.22	A	1	0.65	1	1	1	216.260	1.12	24.95	C
			B	1	0.65	1	1	1	216.260			
			C	1	0.65	1	1	1	216.260			
Sum Weight:	16.47	37.23						OTM	342.63 kip-ft	4.23		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	3.27	5.52	A	1	0.65	1	1	1	127.831	1.09	22.44	C
			B	1	0.65	1	1	1	127.831			
			C	1	0.65	1	1	1	127.831			
L2 118.2500-89.0000	3.43	5.48	A	1	0.65	1	1	1	97.634	0.80	27.20	C
			B	1	0.65	1	1	1	97.634			
			C	1	0.65	1	1	1	97.634			
L3 89.0000-77.7500	1.27	2.87	A	1	0.65	1	1	1	41.874	0.33	29.12	C
			B	1	0.65	1	1	1	41.874			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	41.874			
L4 77.7500-51.0000	3.03	7.23	A	1	0.65	1	1	1	107.767	0.72	26.82	C
			B	1	0.65	1	1	1	107.767			
			C	1	0.65	1	1	1	107.767			
L5 51.0000-45.0000	0.66	1.90	A	1	0.65	1	1	1	26.084	0.17	28.03	C
			B	1	0.65	1	1	1	26.084			
			C	1	0.65	1	1	1	26.084			
L6 45.0000-0.0000	4.81	14.22	A	1	0.65	1	1	1	216.260	1.12	24.95	C
			B	1	0.65	1	1	1	216.260			
			C	1	0.65	1	1	1	216.260			
Sum Weight:	16.47	37.23						OTM	342.63 kip-ft	4.23		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	1.96	3.87	A	1	0.65	1	1	1	120.575	1.54	31.60	C
			B	1	0.65	1	1	1	120.575			
			C	1	0.65	1	1	1	120.575			
L2 118.2500-89.0000	1.85	4.26	A	1	0.65	1	1	1	93.281	1.12	38.42	C
			B	1	0.65	1	1	1	93.281			
			C	1	0.65	1	1	1	93.281			
L3 89.0000-77.7500	0.71	2.36	A	1	0.65	1	1	1	40.302	0.46	41.26	C
			B	1	0.65	1	1	1	40.302			
			C	1	0.65	1	1	1	40.302			
L4 77.7500-51.0000	1.69	5.96	A	1	0.65	1	1	1	104.031	1.06	39.49	C
			B	1	0.65	1	1	1	104.031			
			C	1	0.65	1	1	1	104.031			
L5 51.0000-45.0000	0.38	1.61	A	1	0.65	1	1	1	25.300	0.24	40.78	C
			B	1	0.65	1	1	1	25.300			
			C	1	0.65	1	1	1	25.300			
L6 45.0000-0.0000	2.85	11.85	A	1	0.65	1	1	1	210.635	1.72	38.28	C
			B	1	0.65	1	1	1	210.635			
			C	1	0.65	1	1	1	210.635			
Sum Weight:	9.45	29.91						OTM	489.53 kip-ft	6.15		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	1.96	3.87	A	1	0.65	1	1	1	120.575	1.54	31.60	C
			B	1	0.65	1	1	1	120.575			
			C	1	0.65	1	1	1	120.575			
L2 118.2500-89.0000	1.85	4.26	A	1	0.65	1	1	1	93.281	1.12	38.42	C
			B	1	0.65	1	1	1	93.281			
			C	1	0.65	1	1	1	93.281			
L3 89.0000-77.7500	0.71	2.36	A	1	0.65	1	1	1	40.302	0.46	41.26	C
			B	1	0.65	1	1	1	40.302			
			C	1	0.65	1	1	1	40.302			
L4 77.7500-51.0000	1.69	5.96	A	1	0.65	1	1	1	104.031	1.06	39.49	C
			B	1	0.65	1	1	1	104.031			
			C	1	0.65	1	1	1	104.031			
L5 51.0000-45.0000	0.38	1.61	A	1	0.65	1	1	1	25.300	0.24	40.78	C
			B	1	0.65	1	1	1	25.300			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.65	1	1	1	25.300			
L6 45.0000-0.0000	2.85	11.85	A	1	0.65	1	1	1	210.635	1.72	38.28	C
			B	1	0.65	1	1	1	210.635			
			C	1	0.65	1	1	1	210.635			
Sum Weight:	9.45	29.91						OTM	489.53 kip-ft	6.15		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 167.0000-118.2500	1.96	3.87	A	1	0.65	1	1	1	120.575	1.54	31.60	C
			B	1	0.65	1	1	1	120.575			
			C	1	0.65	1	1	1	120.575			
L2 118.2500-89.0000	1.85	4.26	A	1	0.65	1	1	1	93.281	1.12	38.42	C
			B	1	0.65	1	1	1	93.281			
			C	1	0.65	1	1	1	93.281			
L3 89.0000-77.7500	0.71	2.36	A	1	0.65	1	1	1	40.302	0.46	41.26	C
			B	1	0.65	1	1	1	40.302			
			C	1	0.65	1	1	1	40.302			
L4 77.7500-51.0000	1.69	5.96	A	1	0.65	1	1	1	104.031	1.06	39.49	C
			B	1	0.65	1	1	1	104.031			
			C	1	0.65	1	1	1	104.031			
L5 51.0000-45.0000	0.38	1.61	A	1	0.65	1	1	1	25.300	0.24	40.78	C
			B	1	0.65	1	1	1	25.300			
			C	1	0.65	1	1	1	25.300			
L6 45.0000-0.0000	2.85	11.85	A	1	0.65	1	1	1	210.635	1.72	38.28	C
			B	1	0.65	1	1	1	210.635			
			C	1	0.65	1	1	1	210.635			
Sum Weight:	9.45	29.91						OTM	489.53 kip-ft	6.15		

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

Comb. No.	Description
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	167 - 118.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-25.96	1.84	-1.07
			Max. Mx	11	-12.36	735.90	-0.34
			Max. My	8	-12.36	0.47	-735.76
			Max. Vy	11	-27.34	735.90	-0.34
			Max. Vx	8	27.34	0.47	-735.76
			Max. Torque	6			0.63
L2	118.25 - 89	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-36.61	5.11	-2.96
			Max. Mx	11	-19.91	1749.78	-0.75
			Max. My	8	-19.91	1.20	-1749.33
			Max. Vy	11	-32.00	1749.78	-0.75
			Max. Vx	8	32.00	1.20	-1749.33
			Max. Torque	6			0.51
L3	89 - 77.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-38.71	5.74	-3.32
			Max. Mx	11	-21.56	1935.82	-0.84
			Max. My	8	-21.56	1.35	-1935.31
			Max. Vy	11	-32.68	1935.82	-0.84
			Max. Vx	8	32.68	1.35	-1935.31
			Max. Torque	5			0.40
L4	77.75 - 51	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-51.28	9.50	-5.49
			Max. Mx	11	-31.40	3048.85	-1.35
			Max. My	8	-31.40	2.24	-3047.96
			Max. Vy	11	-36.17	3048.85	-1.35
			Max. Vx	8	36.17	2.24	-3047.96
			Max. Torque	5			0.36
L5	51 - 45	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-53.84	10.21	-5.91
			Max. Mx	11	-33.51	3267.89	-1.45
			Max. My	8	-33.51	2.42	-3266.93
			Max. Vy	11	-36.81	3267.89	-1.45
			Max. Vx	8	36.81	2.42	-3266.93
			Max. Torque	4			0.34
L6	45 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-72.87	15.67	-9.06
			Max. Mx	11	-49.29	5014.06	-2.31
			Max. My	8	-49.29	3.91	-5012.47
			Max. Vy	11	-40.78	5014.06	-2.31
			Max. Vx	8	40.78	3.91	-5012.47
			Max. Torque	8			-0.48

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	24	72.87	9.95	-0.00
	Max. H_x	11	49.32	40.75	0.00
	Max. H_z	2	49.32	0.00	40.75
	Max. M_x	2	5007.87	0.00	40.75
	Max. M_z	5	5006.27	-40.75	0.00
	Max. Torsion	2	0.48	0.00	40.75
	Min. Vert	1	49.32	0.00	0.00
	Min. H_x	5	49.32	-40.75	0.00
	Min. H_z	8	49.32	0.00	-40.75
	Min. M_x	8	-5012.47	0.00	-40.75
	Min. M_z	11	-5014.06	40.75	0.00
	Min. Torsion	8	-0.48	0.00	-40.75

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	49.32	0.00	0.00	2.24	3.79	0.00
Dead+Wind 0 deg - No Ice	49.32	-0.00	-40.75	-5007.87	3.91	-0.48
Dead+Wind 30 deg - No Ice	49.32	20.37	-35.29	-4336.64	-2501.19	-0.47
Dead+Wind 60 deg - No Ice	49.32	35.29	-20.37	-2502.78	-4335.04	-0.34
Dead+Wind 90 deg - No Ice	49.32	40.75	0.00	2.31	-5006.27	-0.11
Dead+Wind 120 deg - No Ice	49.32	35.29	20.37	2507.40	-4335.03	0.14
Dead+Wind 150 deg - No Ice	49.32	20.37	35.29	4341.25	-2501.18	0.36
Dead+Wind 180 deg - No Ice	49.32	-0.00	40.75	5012.47	3.91	0.48
Dead+Wind 210 deg - No Ice	49.32	-20.37	35.29	4341.24	2508.99	0.47
Dead+Wind 240 deg - No Ice	49.32	-35.29	20.37	2507.39	4342.83	0.34
Dead+Wind 270 deg - No Ice	49.32	-40.75	0.00	2.31	5014.06	0.11
Dead+Wind 300 deg - No Ice	49.32	-35.29	-20.37	-2502.77	4342.84	-0.14
Dead+Wind 330 deg - No Ice	49.32	-20.37	-35.29	-4336.63	2509.00	-0.36
Dead+Ice+Temp	72.87	-0.00	0.00	9.06	15.67	0.00
Dead+Wind 0 deg+Ice+Temp	72.87	-0.00	-9.95	-1260.35	15.77	-0.24
Dead+Wind 30 deg+Ice+Temp	72.87	4.97	-8.62	-1090.27	-618.96	-0.21
Dead+Wind 60 deg+Ice+Temp	72.87	8.62	-4.97	-625.62	-1083.62	-0.12
Dead+Wind 90 deg+Ice+Temp	72.87	9.95	0.00	9.12	-1253.69	0.00
Dead+Wind 120 deg+Ice+Temp	72.87	8.62	4.97	643.85	-1083.62	0.12
Dead+Wind 150 deg+Ice+Temp	72.87	4.97	8.62	1108.51	-618.96	0.21
Dead+Wind 180 deg+Ice+Temp	72.87	-0.00	9.95	1278.58	15.77	0.24
Dead+Wind 210 deg+Ice+Temp	72.87	-4.97	8.62	1108.50	650.50	0.21
Dead+Wind 240 deg+Ice+Temp	72.87	-8.62	4.97	643.85	1115.16	0.12
Dead+Wind 270 deg+Ice+Temp	72.87	-9.95	0.00	9.12	1285.23	0.00
Dead+Wind 300 deg+Ice+Temp	72.87	-8.62	-4.97	-625.61	1115.16	-0.12
Dead+Wind 330 deg+Ice+Temp	72.87	-4.97	-8.62	-1090.27	650.51	-0.21
Dead+Wind 0 deg - Service	49.32	-0.00	-14.10	-1734.15	3.92	-0.17
Dead+Wind 30 deg - Service	49.32	7.05	-12.21	-1501.51	-864.31	-0.16
Dead+Wind 60 deg - Service	49.32	12.21	-7.05	-865.92	-1499.90	-0.12
Dead+Wind 90 deg - Service	49.32	14.10	0.00	2.31	-1732.54	-0.04
Dead+Wind 120 deg - Service	49.32	12.21	7.05	870.54	-1499.90	0.05

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 150 deg - Service	49.32	7.05	12.21	1506.13	-864.31	0.12
Dead+Wind 180 deg - Service	49.32	-0.00	14.10	1738.77	3.92	0.17
Dead+Wind 210 deg - Service	49.32	-7.05	12.21	1506.13	872.15	0.16
Dead+Wind 240 deg - Service	49.32	-12.21	7.05	870.54	1507.73	0.12
Dead+Wind 270 deg - Service	49.32	-14.10	0.00	2.31	1740.37	0.04
Dead+Wind 300 deg - Service	49.32	-12.21	-7.05	-865.92	1507.74	-0.05
Dead+Wind 330 deg - Service	49.32	-7.05	-12.21	-1501.51	872.15	-0.12

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-49.32	0.00	0.00	49.32	0.00	0.000%
2	0.00	-49.32	-40.75	0.00	49.32	40.75	0.000%
3	20.37	-49.32	-35.29	-20.37	49.32	35.29	0.000%
4	35.29	-49.32	-20.37	-35.29	49.32	20.37	0.000%
5	40.75	-49.32	0.00	-40.75	49.32	0.00	0.000%
6	35.29	-49.32	20.37	-35.29	49.32	-20.37	0.000%
7	20.37	-49.32	35.29	-20.37	49.32	-35.29	0.000%
8	0.00	-49.32	40.75	0.00	49.32	-40.75	0.000%
9	-20.37	-49.32	35.29	20.37	49.32	-35.29	0.000%
10	-35.29	-49.32	20.37	35.29	49.32	-20.37	0.000%
11	-40.75	-49.32	0.00	40.75	49.32	0.00	0.000%
12	-35.29	-49.32	-20.37	35.29	49.32	20.37	0.000%
13	-20.37	-49.32	-35.29	20.37	49.32	35.29	0.000%
14	0.00	-72.87	0.00	0.00	72.87	-0.00	0.000%
15	0.00	-72.87	-9.95	0.00	72.87	9.95	0.000%
16	4.97	-72.87	-8.62	-4.97	72.87	8.62	0.000%
17	8.62	-72.87	-4.97	-8.62	72.87	4.97	0.000%
18	9.95	-72.87	0.00	-9.95	72.87	-0.00	0.000%
19	8.62	-72.87	4.97	-8.62	72.87	-4.97	0.000%
20	4.97	-72.87	8.62	-4.97	72.87	-8.62	0.000%
21	0.00	-72.87	9.95	0.00	72.87	-9.95	0.000%
22	-4.97	-72.87	8.62	4.97	72.87	-8.62	0.000%
23	-8.62	-72.87	4.97	8.62	72.87	-4.97	0.000%
24	-9.95	-72.87	0.00	9.95	72.87	-0.00	0.000%
25	-8.62	-72.87	-4.97	8.62	72.87	4.97	0.000%
26	-4.97	-72.87	-8.62	4.97	72.87	8.62	0.000%
27	0.00	-49.32	-14.10	0.00	49.32	14.10	0.000%
28	7.05	-49.32	-12.21	-7.05	49.32	12.21	0.000%
29	12.21	-49.32	-7.05	-12.21	49.32	7.05	0.000%
30	14.10	-49.32	0.00	-14.10	49.32	0.00	0.000%
31	12.21	-49.32	7.05	-12.21	49.32	-7.05	0.000%
32	7.05	-49.32	12.21	-7.05	49.32	-12.21	0.000%
33	0.00	-49.32	14.10	0.00	49.32	-14.10	0.000%
34	-7.05	-49.32	12.21	7.05	49.32	-12.21	0.000%
35	-12.21	-49.32	7.05	12.21	49.32	-7.05	0.000%
36	-14.10	-49.32	0.00	14.10	49.32	0.00	0.000%
37	-12.21	-49.32	-7.05	12.21	49.32	7.05	0.000%
38	-7.05	-49.32	-12.21	7.05	49.32	12.21	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	0.00040529
3	Yes	6	0.00000001	0.00004294
4	Yes	6	0.00000001	0.00004326
5	Yes	4	0.00000001	0.00039768
6	Yes	6	0.00000001	0.00004304
7	Yes	6	0.00000001	0.00004313
8	Yes	4	0.00000001	0.00040552
9	Yes	6	0.00000001	0.00004336
10	Yes	6	0.00000001	0.00004304
11	Yes	4	0.00000001	0.00039802
12	Yes	6	0.00000001	0.00004325
13	Yes	6	0.00000001	0.00004316
14	Yes	4	0.00000001	0.00009889
15	Yes	5	0.00000001	0.00050314
16	Yes	5	0.00000001	0.00059370
17	Yes	5	0.00000001	0.00059450
18	Yes	5	0.00000001	0.00050056
19	Yes	5	0.00000001	0.00060200
20	Yes	5	0.00000001	0.00060197
21	Yes	5	0.00000001	0.00050992
22	Yes	5	0.00000001	0.00061655
23	Yes	5	0.00000001	0.00061565
24	Yes	5	0.00000001	0.00051227
25	Yes	5	0.00000001	0.00060805
26	Yes	5	0.00000001	0.00060811
27	Yes	4	0.00000001	0.00020842
28	Yes	5	0.00000001	0.00010562
29	Yes	5	0.00000001	0.00010714
30	Yes	4	0.00000001	0.00020781
31	Yes	5	0.00000001	0.00010655
32	Yes	5	0.00000001	0.00010684
33	Yes	4	0.00000001	0.00020894
34	Yes	5	0.00000001	0.00010854
35	Yes	5	0.00000001	0.00010703
36	Yes	4	0.00000001	0.00020866
37	Yes	5	0.00000001	0.00010762
38	Yes	5	0.00000001	0.00010731

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	167 - 118.25	42.180	35	2.2748	0.0017
L2	122.75 - 89	22.524	35	1.8321	0.0004
L3	89 - 77.75	11.444	35	1.2528	0.0002
L4	83.25 - 51	9.983	35	1.1749	0.0002
L5	51 - 45	3.595	35	0.6772	0.0001
L6	45 - 0	2.791	35	0.6022	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.0000	Lightning Rod 5/8x4'	35	42.180	2.2748	0.0017	29420
158.0000	(2) 7770.00 w/ Mount Pipe	35	37.952	2.2086	0.0014	16344
156.0000	(2) RRUS-11	35	37.019	2.1933	0.0013	13372
148.0000	(2) DB980F65T4E-M w/ Mount Pipe	35	33.327	2.1276	0.0011	7741
138.0000	APX16PV-16PVL-E w/ Mount	35	28.857	2.0304	0.0008	5071

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
	Pipe					
128.0000	(4) DB846G90A-XY w/ Mount Pipe	35	24.624	1.9087	0.0005	3770
120.0000	APXV18-206517S-C w/ Mount Pipe	35	21.463	1.7880	0.0004	3307

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	167 - 118.25	121.223	11	6.5413	0.0049
L2	122.75 - 89	64.782	11	5.2705	0.0012
L3	89 - 77.75	32.935	11	3.6056	0.0005
L4	83.25 - 51	28.730	11	3.3818	0.0005
L5	51 - 45	10.351	10	1.9499	0.0002
L6	45 - 0	8.037	10	1.7339	0.0002

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.0000	Lightning Rod 5/8x4'	11	121.223	6.5413	0.0049	10459
158.0000	(2) 7770.00 w/ Mount Pipe	11	109.085	6.3515	0.0040	5809
156.0000	(2) RRUS-11	11	106.405	6.3076	0.0038	4753
148.0000	(2) DB980F65T4E-M w/ Mount Pipe	11	95.806	6.1190	0.0031	2749
138.0000	APX16PV-16PVL-E w/ Mount Pipe	11	82.971	5.8401	0.0022	1799
128.0000	(4) DB846G90A-XY w/ Mount Pipe	11	70.814	5.4906	0.0015	1335
120.0000	APXV18-206517S-C w/ Mount Pipe	11	61.734	5.1439	0.0011	1168

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 $\frac{P}{P_a}$
L1	167 - 118.25 (1)	TP35.36x24x0.25	48.7500	0.0000	0.0	39.000	27.0277	-12.36	1054.08	0.012
L2	118.25 - 89 (2)	TP41.6779x33.8114x0.3125	33.7500	0.0000	0.0	39.000	41.0293	-19.91	1600.14	0.012
L3	89 - 77.75 (3)	TP44.3x41.6779x0.4567	11.2500	0.0000	0.0	31.056	61.6968	-21.56	1916.06	0.011
L4	77.75 - 51 (4)	TP49.9016x42.1046x0.375	32.2500	0.0000	0.0	39.000	58.9490	-31.40	2299.01	0.014
L5	51 - 45 (5)	TP51.2985x49.9016x0.4947	6.0000	0.0000	0.0	31.170	79.7725	-33.51	2486.51	0.013
L6	45 - 0 (6)	TP61.04x51.2985x0.4375	45.0000	0.0000	0.0	39.000	84.1541	-49.29	3282.01	0.015

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	167 - 118.25 (1)	TP35.36x24x0.25	736.00	38.859	39.000	0.996	0.00	0.000	39.000	0.000
L2	118.25 - 89 (2)	TP41.6779x33.8114x0.3125	1749.99	50.128	39.000	1.285	0.00	0.000	39.000	0.000
L3	89 - 77.75 (3)	TP44.3x41.6779x0.4567	1936.06	35.957	31.056	1.158	0.00	0.000	31.056	0.000
L4	77.75 - 51 (4)	TP49.9016x42.1046x0.375	3049.22	50.776	39.000	1.302	0.00	0.000	39.000	0.000
L5	51 - 45 (5)	TP51.2985x49.9016x0.4947	3268.30	39.291	31.170	1.261	0.00	0.000	31.170	0.000
L6	45 - 0 (6)	TP61.04x51.2985x0.4375	5014.70	47.787	39.000	1.225	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	167 - 118.25 (1)	TP35.36x24x0.25	27.34	1.011	26.000	0.078	0.34	0.009	26.000	0.000
L2	118.25 - 89 (2)	TP41.6779x33.8114x0.3125	32.00	0.780	26.000	0.060	0.34	0.005	26.000	0.000
L3	89 - 77.75 (3)	TP44.3x41.6779x0.4567	32.68	0.530	20.704	0.051	0.34	0.003	20.704	0.000
L4	77.75 - 51 (4)	TP49.9016x42.1046x0.375	36.17	0.614	26.000	0.047	0.34	0.003	26.000	0.000
L5	51 - 45 (5)	TP51.2985x49.9016x0.4947	36.81	0.461	20.780	0.044	0.34	0.002	20.780	0.000
L6	45 - 0 (6)	TP61.04x51.2985x0.4375	40.78	0.485	26.000	0.037	0.34	0.002	26.000	0.000

Pole Interaction Design Data

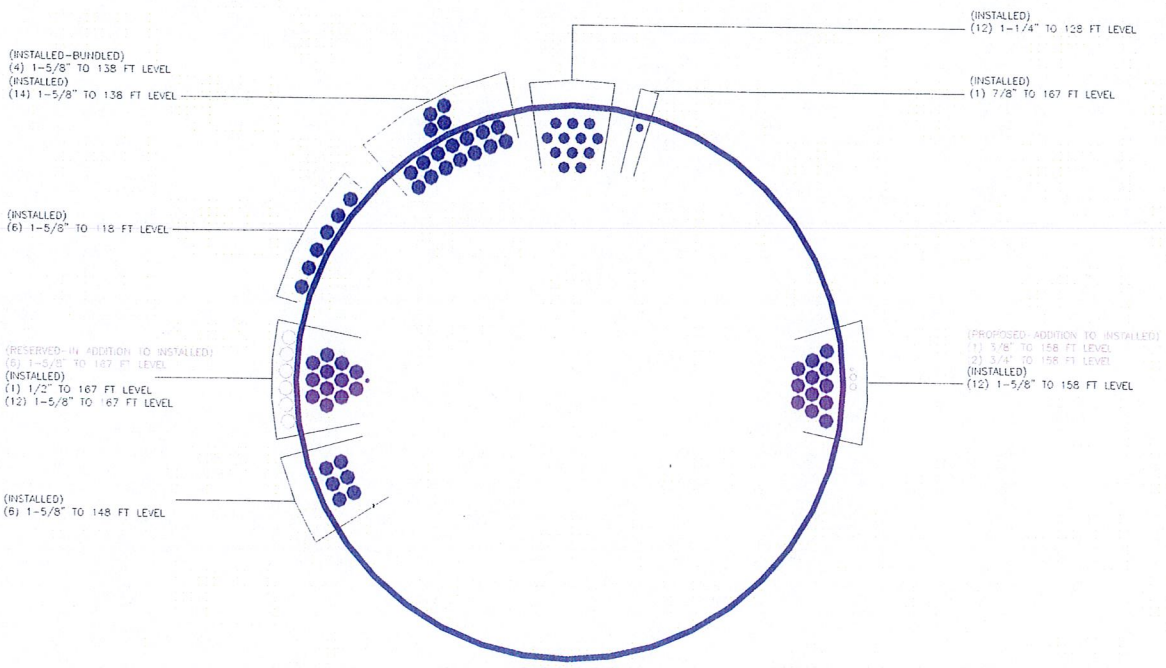
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	167 - 118.25 (1)	0.012	0.996	0.000	0.078	0.000	1.010 ✔	1.333	H1-3+VT ✔
L2	118.25 - 89 (2)	0.012	1.285	0.000	0.060	0.000	1.299 ✔	1.333	H1-3+VT ✔
L3	89 - 77.75 (3)	0.011	1.158	0.000	0.051	0.000	1.170 ✔	1.333	H1-3+VT ✔
L4	77.75 - 51 (4)	0.014	1.302	0.000	0.047	0.000	1.316 ✔	1.333	H1-3+VT ✔
L5	51 - 45 (5)	0.013	1.261	0.000	0.044	0.000	1.275 ✔	1.333	H1-3+VT ✔
L6	45 - 0 (6)	0.015	1.225	0.000	0.037	0.000	1.241 ✔	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	167 - 118.25	Pole	TP35.36x24x0.25	1	-12.36	1405.09	75.7	Pass
L2	118.25 - 89	Pole	TP41.6779x33.8114x0.3125	2	-19.91	2132.99	97.4	Pass
L3	89 - 77.75	Pole	TP44.3x41.6779x0.4567	3	-21.56	2554.11	87.8	Pass
L4	77.75 - 51	Pole	TP49.9016x42.1046x0.375	4	-31.40	3064.58	98.7	Pass
L5	51 - 45	Pole	TP51.2985x49.9016x0.4947	5	-33.51	3314.52	95.6	Pass
L6	45 - 0	Pole	TP61.04x51.2985x0.4375	6	-49.29	4374.92	93.1	Pass
							Summary	
						Pole (L4)	98.7	Pass
						RATING =	**98.7**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

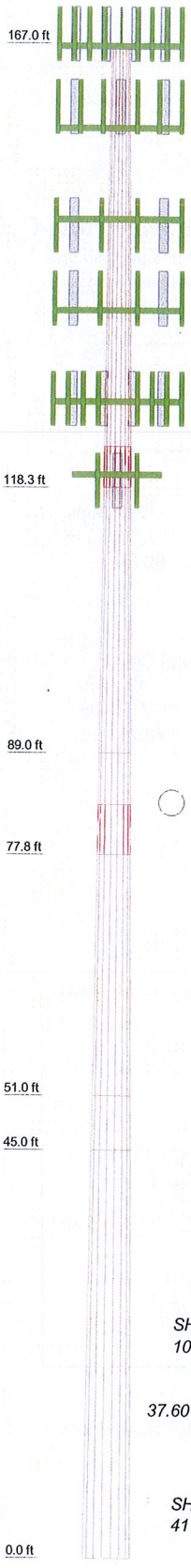

(INSTALLED)
(12) 1-1/4" TO 128 FT LEVEL
(INSTALLED-BUNDLED)
(4) 1-5/8" TO 138 FT LEVEL
(INSTALLED)
(14) 1-5/8" TO 138 FT LEVEL
(INSTALLED)
(1) 7/8" TO 167 FT LEVEL
(INSTALLED)
(6) 1-5/8" TO 118 FT LEVEL
(RESERVED-IN ADDITION TO INSTALLED)
(6) 1-5/8" TO 167 FT LEVEL
(INSTALLED)
(1) 1/2" TO 167 FT LEVEL
(12) 1-5/8" TO 167 FT LEVEL
(PROPOSED-ADDITION TO INSTALLED)
(1) 5/8" TO 158 FT LEVEL
(2) 3/4" TO 158 FT LEVEL
(INSTALLED)
(12) 1-5/8" TO 158 FT LEVEL
(INSTALLED)
(6) 1-5/8" TO 148 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Program Version 6.0.3.0 - 12/7/2011 File:G:/TOWER/375_Crown_Castle/2012/37512-1657 BU 801367/37512-1657 BP R1 WO 515695 BU 801367/SABRE/37512-1657 SABRE Reinforced.eri

Program Version 6.0.3.0 - 12/7/2011 File:G:/TOWER/375_Crown_Castle/2012/37512-1657 BU 801367/37512-1657 BP R1 WO 515695 BU 801367/SABRE/37512-1657 SABRE Reinforced.eri



Section	1	2	3	4	5	6
Length (ft)	48.7500	33.7500	11.2500	32.2500	6.0000	45.0000
Number of Sides	18	18	18	18	18	18
Thickness (in)	0.2500	0.3125	0.4567	0.3750	0.4947	0.4375
Socket Length (ft)	4.5000		5.5000			
Top Dia (in)	24.0000	33.8114	41.6778	42.1046	49.9016	51.2985
Bot Dia (in)	35.3600	41.6778	44.3000	49.9016	51.2985	61.0400
Grade	A607-65		A607-65	Reinf 51.76 ksi	A607-65	Reinf 51.95 ksi
Weight (K)	3.9	4.3	2.4	6.0	1.6	11.9

Total Weight (K) 29.9

DESIGNED APPURTENANCE LOADING

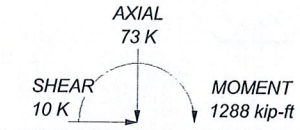
TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8x4'	167	(2) RRUS-11	156
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	167	(2) RRUS-11	156
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	167	Side Arm Mount [SO 102-3]	156
(2) LPA-80063-6CF-EDIN w/ Mount Pipe	167	(2) DB980F65T4E-M w/ Mount Pipe	148
DB222-A	167	(2) DB980F65T4E-M w/ Mount Pipe	148
GPS_A	167	Platform Mount [LP 712-1]	148
BXA-171063/8CFx2 w/ Mount Pipe	167	(2) DB980F65T4E-M w/ Mount Pipe	148
BXA-171063/8CFx2 w/ Mount Pipe	167	APX16PV-16PVL-E w/ Mount Pipe	138
BXA-171063/8CFx2 w/ Mount Pipe	167	APX16PV-16PVL-E w/ Mount Pipe	138
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	167	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	138
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	167	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	138
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	167	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe	138
Platform Mount [LP 712-1]	167	KRY 112 134/1	138
(2) 7770.00 w/ Mount Pipe	158	KRY 112 134/1	138
(2) 7770.00 w/ Mount Pipe	158	KRY 112 134/1	138
(2) 7770.00 w/ Mount Pipe	158	KRY 112 89/5	138
(2) LGP13519	158	KRY 112 89/5	138
(2) LGP13519	158	KRY 112 89/5	138
(2) LGP13519	158	(2) S20057A-1	138
(2) LGP21401	158	(2) S20057A-1	138
(2) LGP21401	158	(2) S20057A-1	138
(2) LGP21401	158	Platform Mount [LP 712-1]	138
SBNH-1D6565C w/ Mount Pipe	158	6' x 2" Mount Pipe	138
SBNH-1D6565C w/ Mount Pipe	158	6' x 2" Mount Pipe	138
SBNH-1D6565C w/ Mount Pipe	158	6' x 2" Mount Pipe	138
DC6-48-60-18-8F	158	APX16PV-16PVL-E w/ Mount Pipe	138
Platform Mount [LP 712-1]	158	(4) DB846G90A-XY w/ Mount Pipe	128
6' x 2" Mount Pipe	158	(4) DB846G90A-XY w/ Mount Pipe	128
6' x 2" Mount Pipe	158	Platform Mount [LP 712-1]	128
6' x 2" Mount Pipe	158	(4) DB846G90A-XY w/ Mount Pipe	128
(2) RRUS-11	156	APXV18-206517S-C w/ Mount Pipe	120
		APXV18-206517S-C w/ Mount Pipe	120
		Pipe Mount [PM 601-3]	120
		APXV18-206517S-C w/ Mount Pipe	120

MATERIAL STRENGTH

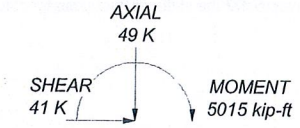
GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi	Reinf 51.95 ksi	52 ksi	65 ksi
Reinf 51.76 ksi	52 ksi	65 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85.00 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 37.60 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50.00 mph wind.
5. TOWER RATING: 98.7%



TORQUE 0 kip-ft
37.60 mph WIND - 0.7500 in ICE



TORQUE 0 kip-ft
REACTIONS - 85.00 mph WIND

Paul J Ford and Company
250 E. Broad Street Suite 1500
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.4105

Job: *Ex. 167-ft Monopole / Cheshire, CT*		
Project: *BU# 801367 / PJF# 37512-1657*		
Client: Crown Castle	Drawn by: John J Woolley	App'd:
Code: TIA/EIA-222-F	Date: 08/06/12	Scale: NTS
Path: G:\TOWER\375 Crown Castle\2012\37512-1657 BU 801367\37512-1657 BP R1 WO 515695 BU 801367\SABRE\37512-1657 SABRE Reinforced.eri		Dwg No. E-1

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

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

Site Data

BU#:
Site Name:
App #:

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	5015	ft-kips
Unfactored Axial, P:	49	kips
Unfactored Shear, V:	41	kips

Anchor Rod Data		
Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	68	in
Anchor Spacing:	6	in

Anchor Rod Results

TIA F --> Maximum Rod Tension	174.6 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	89.5% Pass

Plate Data		
W=Side:	67	in
Thick:	3	in
Grade:	55	ksi
Clip Distance:	14	in

Base Plate Results Flexural Check

Base Plate Stress:	42.2 ksi
Allowable PL Bending Stress:	55.0 ksi
Base Plate Stress Ratio:	76.7% Pass

PL Ref. Data
Yield Line (in):
33.71
Max PL Length:
33.71

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

N/A - Unstiffened

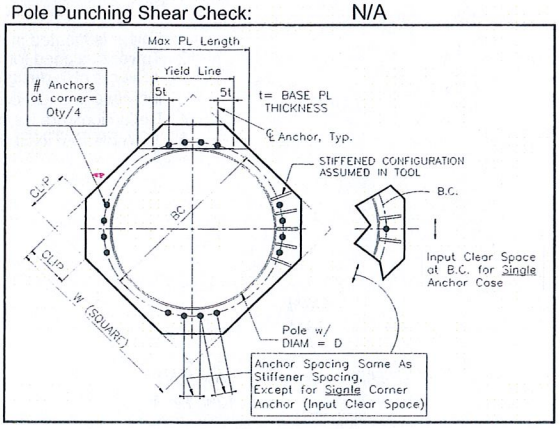
Stiffener Results

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:	61.04	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round



Stress Increase Factor		
ASD ASIF:	1.333	

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

PJF job no. **37512-1657** Project name **BU 801367**

Foundation Loads:

Pole weight or tower leg compression =	**49**	(kips)
Horizontal load at top of pier =	**41**	(kips)
Overturning moment at top of pier=	**5015**	(ft-kips)

Design criteria:

Safety factor against overturning =	**1.5**	

Soil Properties:

Soil density =	**100**	(pcf)
Allowable soil bearing =	**8**	(ksf)
Depth to water table =	**99**	(ft)

Dimensions:

Pier shape (round or square)	**R**	("R" or "S")
Pier width =	**8**	(ft)
Pier height above grade =	**0.5**	(ft)
depth to bottom of footing =	**7**	(ft)
Footing thickness =	**4**	(ft)
Footing width =	**26**	(ft)
Footing length =	**26**	(ft)

Concrete:

Concrete strength =	**3**	(ksi)
Rebar strength =	**60**	(ksi)
ultimate load factor =	**1.3**	

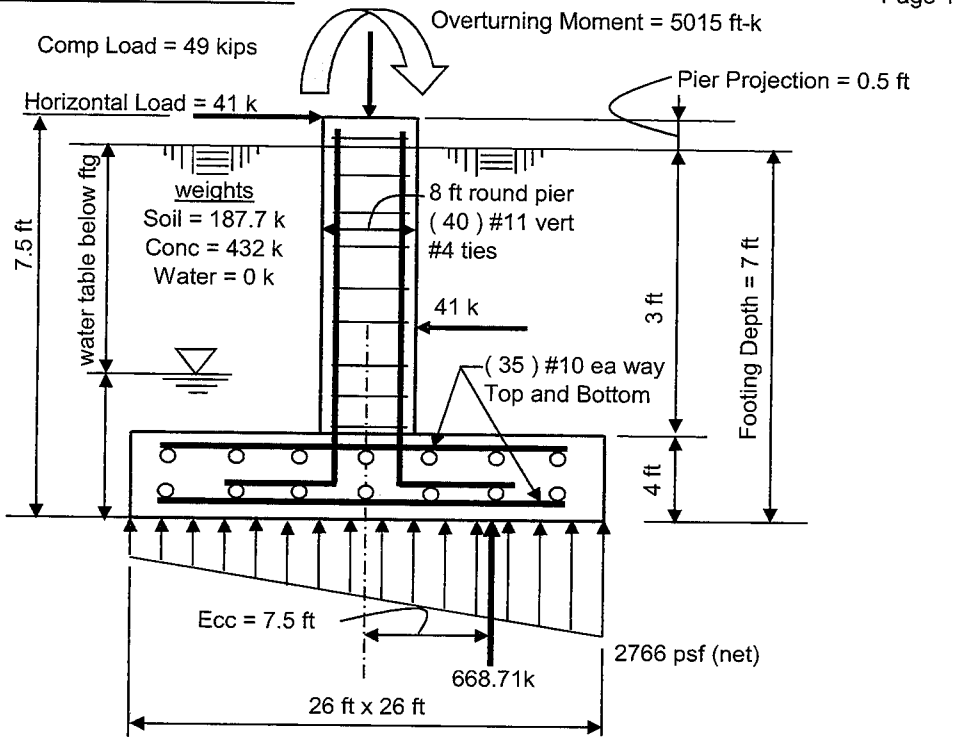
Reinforcing Steel:

	Pad	
minimum cover over rebar =	**3**	inches
size of pad rebar =	**#10**	bar
quantity of pad rebar =	**35**	(ea direction)

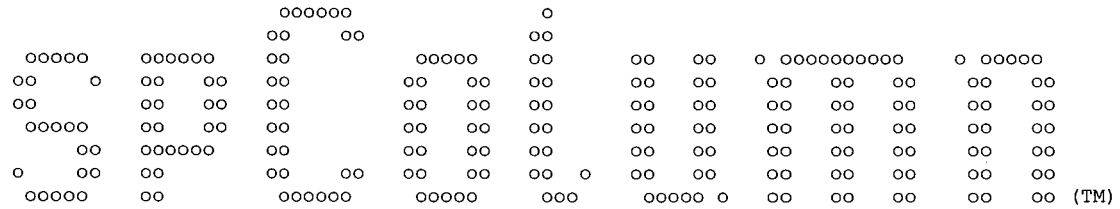
Reinforcing Steel:

	Pier	
size of vert rebar in pier=	**#11**	bar
vertical rebar quantity =	**40**	
size of pier ties =	**#4**	bar
minimum cover over rebar =	**3**	inches

Total volume of concrete = #### cu yd



Summary of analysis results	
Maximum Net Soil Bearing = 2.766 ksf Allowable Net Soil Bearing = 8 ksf **Soil Bearing Stress Ratio = 0.35 Okay**	Ult Bending Shear Capacity = 110 psi Ult Bending Shear Stress = 33 psi **Bending Shear Stress Ratio = 0.3 Okay**
Ftg Overturning Resistance = 8693 ft-kips Overturning Moment = 5015 ft-kips Required Overturning Safety Factor = 1.5 Overturning Safety Factor = 1.733 **Ratio = 0.87 Okay**	Pad Bending Moment Capacity= 8291 ft-k Pad Bending Moment = 2259 ft-k **Bending Moment Stress Ratio = 0.27 OK**



spColumn v4.80 (TM)
Computer program for the Strength Design of Reinforced Concrete Sections

General Information:
==========

File Name: G:\TOWER\375_Crown_Castle\2012\37512-1657 BU 801367\37512-1657 BP...\37512-1657 Sabre.col
Project:
Column:
Code: ACI 318-02
Engineer:
Units: English

Run Option: Investigation
Run Axis: X-axis
Slenderness: Not considered
Column Type: Structural

Material Properties:
==========

f'c = 3 ksi
Ec = 3122.02 ksi
fy = 60 ksi
Es = 29000 ksi
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:
==========

Circular: Diameter = 96 in

Gross section area, Ag = 7238.23 in^2
Ix = 4.16922e+006 in^4
Iy = 4.16922e+006 in^4
rx = 24 in
ry = 24 in
Xo = 0 in
Yo = 0 in

Reinforcement:
==========

Bar Set: ASTM A615

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 3	0.38	0.11	# 4	0.50	0.20	# 5	0.63	0.31
# 6	0.75	0.44	# 7	0.88	0.60	# 8	1.00	0.79
# 9	1.13	1.00	# 10	1.27	1.27	# 11	1.41	1.56
# 14	1.69	2.25	# 18	2.26	4.00			

Confinement: Tied; #4 ties with #10 bars, #4 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Layout: Circular
Pattern: All Sides Equal (Cover to transverse reinforcement)
Total steel area: As = 62.40 in^2 at rho = 0.86% (Note: rho < 1.0%)
Minimum clear spacing = 5.46 in

40 #11 Cover = 3 in

Factored Loads and Moments with Corresponding Capacities:
==========

No.	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	49.00	6706.05	10952.04	1.633	18.27	91.79	0.01207	0.900

*** End of output ***

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 1500 • Columbus, Ohio 43215-3708
Phone 614-221-6679 • Fax 614-448-4105 • www.PJFweb.com

Job Number:	37512-1657BPR1 SABRE	**Page:**	1
Site Number:	801367	**By:**	JJW
Site Name:	CT NHV-2075 CAC 801367	**Date:**	8/6/2012

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

Unfactored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, M =	5015.0		k-ft
Shear, V =	41.0		kips
Axial Load, P =	49.0		kips
OTM =	5035.5	0.0	k-ft @ Ground

Safety Factors / Load Factors / Φ Factors

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

Drilled Pier Parameters

Diameter =	8	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	23	ft
fc' =	3	ksi
εc =	0.003	in/in
Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

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

Load Combinations Checked per TIA/EIA-222-F

1. Ult. Skin Friction/2.00 + Ult. End Bearing/2.00
+ Effective Soil Wt. - Buoyant Conc. Wt. ≥ Compression
2. Ult. Skin Friction/2.00 + Buoyant Conc. Wt./1.25 ≥ Uplift
3. Ult. Skin Friction/1.50 + Buoyant Conc. Wt./1.50 ≥ Uplift

Steel Parameters

Number of Bars =	24	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#5	
Side Clear Cover to Ties =	4	in

Soil Parameters

Water Table Depth =	99.00	ft
Depth to Ignore Soil =	4.00	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?	Ground	

Above Full Cohesion Lateral Resistance = 4(Cohesion)(Dia)(H)
Below Full Cohesion Lateral Resistance = 8(Cohesion)(Dia)(H)

Direct Embed Pole Shaft Parameters

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

Maximum Capacity Ratios

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

Define Soil Layers

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

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	13.5	135	0	35	Sand				13.5
2	15.5	150	0	35	Sand	80000			29
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	16.86	ft, from Grade	Shear, V =	41.00	kips
Bending Moment, M =	5726.58	k-ft, from COR	Resisting Shear, Va =	46.93	kips
Resisting Moment, Ma =	6554.77	k-ft, from COR			

MOMENT RATIO = 87.4% OK

SHEAR RATIO = 87.4% OK

Soil Results: Uplift

Uplift, T =	0.00	kips
Allowable Uplift Cap., Ta =	141.75	kips

UPLIFT RATIO = 0.0% OK

Soil Results: Compression

Compression, C =	49.00	kips
Allowable Comp. Cap., Ca =	1996.67	kips

COMPRESSION RATIO = 2.5% OK

Steel Results (ACI 318-02):

Minimum Steel Area =	24.13	sq in
Actual Steel Area =	37.44	sq in
Allowable Min Axial, Pa =	-1555.20	kips, Where Ma = 0 k-ft
Allowable Max Axial, Pa =	8243.37	kips, Where Ma = 0 k-ft

Axial Load, P =	88.58	kips @ 4.75 ft Below Grade
Moment, M =	5224.01	k-ft @ 4.75 ft Below Grade
Allowable Moment, Ma =	5425.30	k-ft

MOMENT RATIO = 96.3% OK

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

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

Site Data

BU#: *801367*
Site Name: *CT NHV-2075 CAC 801367*
App #:

Enter Load Factors Below:		
For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Pier Properties		
Concrete:		
Pier Diameter =	8.0	ft
Concrete Area =	7238.2	in^2
Reinforcement:		
Clear Cover to **Tie**=	4.00	in
Horiz. **Tie** Bar Size=	5	
Vert. Cage Diameter =	7.11	ft
Vert. Cage Diameter =	85.34	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	24	
As Total=	37.44	in^2
A s/ Aconc, Rho:	0.0052	0.52%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.52%	**OK**

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	10716.37	kips
at Mu=(ϕ=0.65)Mn=	7467.49	ft-kips
Max Tu, (φ=0.9) Tn =	2021.76	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	5224.01	ft-kips (* **Note**)
Max. Service Shaft P:	88.58	kips
Max Axial Force Type:	Comp.	

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

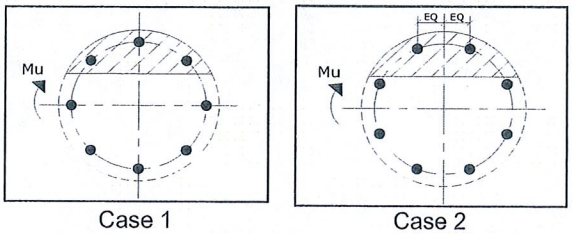
Load Factor	Shaft Factored Loads		
1.30	Mu:	6791.213	ft-kips
1.30	Pu:	115.154	kips

Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	**High**	

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

Results:

Governing Orientation Case: **2**



Case 1 Case 2

Dist. From Edge to Neutral Axis: **15.07** in
Extreme Steel Strain, εt: **0.0150**
εt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	115.15	kips
Drilled Shaft Moment Capacity, φMn:	**7052.88**	ft-kips
Drilled Shaft Superimposed Mu:	**6791.21**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**96.3%**

CROWN CASTLE PROJECT: BU #801367; CT NHV-2075 CAC 801367; CHESHIRE, CT
MONOPOLE RETROFIT PROJECT MASTER NOTES DOCUMENT (REV. 2, 1/22/2009)

UPON THE SUCCESSFUL AND COMPLETE INSTALLATION OF THE REINFORCING SYSTEM SPECIFIED IN THESE PLANS, THE REINFORCED POLE MEETS THE WIND DESIGN RECOMMENDATIONS OF THE TIA/EIA-222-F-1996 STANDARD FOR WIND SPEEDS OF 85 MPH AND 13.6 MPH + 3/4" RADIAL ICE

A. GENERAL NOTES

1. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS PRIOR TO FABRICATION AND CONSTRUCTION. THESE DRAWINGS WERE PREPARED FROM INFORMATION AND DOCUMENTS PROVIDED TO PAUL J. FORD & COMPANY BY CROWN CASTLE. THIS INFORMATION PROVIDED HAS NOT BEEN FIELD VERIFIED BY PAUL J. FORD & COMPANY FOR ACCURACY AND THEREFORE DISCREPANCIES BETWEEN THESE DRAWINGS AND ACTUAL SITE CONDITIONS SHOULD BE ANTICIPATED. ANY DISCREPANCIES AND/OR CHANGES BETWEEN THE INFORMATION CONTAINED IN THESE DRAWINGS AND THE ACTUAL VERIFIED SITE CONDITIONS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF CROWN CASTLE AND PAUL J. FORD & COMPANY SO THAT ANY CHANGES AND/OR ADJUSTMENTS, IF NECESSARY, CAN BE MADE TO THE DESIGN AND DRAWINGS.
2. THE EXISTING UNREINFORCED MONOPOLE STRUCTURE DOES NOT HAVE THE STRUCTURAL CAPACITY TO CARRY ALL OF THE ANTENNA AND PLATFORM LOADS SHOWN ON THESE DRAWINGS AT THE REQUIRED MINIMUM TIA/EIA-222-F BASIC WIND SPEEDS. DO NOT INSTALL ANY ADDITIONAL OR NEW ANTENNA AND PLATFORM LOADS UNTIL THE MONOPOLE REINFORCING SYSTEM IS COMPLETELY AND SUCCESSFULLY INSTALLED.
3. IF MATERIALS, QUANTITIES, STRENGTHS OR SIZES INDICATED BY THE DRAWINGS OR SPECIFICATIONS ARE NOT IN AGREEMENT WITH THESE NOTES, THE BETTER QUALITY AND/OR GREATER QUANTITY, STRENGTH OR SIZE INDICATED, SPECIFIED OR NOTED SHALL BE PROVIDED.
4. THIS STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE INSTALLATION OF THE REINFORCING REPAIR SYSTEM HAS BEEN PROPERLY AND ADEQUATELY COMPLETED. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO INSURE THE SAFETY AND STABILITY OF THE MONOPOLE AND ITS COMPONENT PARTS DURING FIELD MODIFICATIONS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE DOWNS THAT MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER THE COMPLETION OF THE PROJECT. IMPORTANT CUTTING, WELDING AND SAFETY GUIDELINES: THE CONTRACTOR SHALL FOLLOW ALL CROWN CASTLE CUTTING, WELDING, FIRE PREVENTION AND SAFETY GUIDELINES. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A COPY OF THE CURRENT CROWN CASTLE GUIDELINES FROM CROWN CASTLE. PER THE 12-01-2005 CROWN CASTLE DIRECTIVE: "ALL CUTTING AND WELDING ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH CROWN CASTLE POLICY 'CUTTING AND WELDING PLAN' [DOC # ENG-PLN-10015] ON AN ONGOING BASIS THROUGHOUT THE ENTIRE LIFE OF THE PROJECT".
5. THE STRUCTURAL CONTRACT DOCUMENTS DO NOT INDICATE THE METHOD OR MEANS OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE OWNER AND/OR THE ENGINEER SHALL NOT INCLUDE INSPECTIONS OF THE PROTECTIVE MEASURES OR THE CONSTRUCTION PROCEDURES.
6. ANY SUPPORT SERVICES PERFORMED BY THE ENGINEER DURING CONSTRUCTION SHALL BE DISTINGUISHED FROM CONTINUOUS AND DETAILED INSPECTION SERVICES WHICH ARE FURNISHED BY THE INSPECTION/TESTING AGENCY. THESE SUPPORT SERVICES PERFORMED BY THE ENGINEER ARE SOLELY FOR THE PURPOSE OF ASSISTING IN QUALITY CONTROL AND IN ACHIEVING CONFORMANCE WITH CONTRACT DOCUMENTS. THEY DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
7. ALL MATERIALS AND EQUIPMENT FURNISHED WILL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF MATERIALS AND EQUIPMENT BEING SUBSTITUTED.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE TO INSURE THAT THIS PROJECT AND RELATED WORK COMPLIES WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK AS WELL AS CROWN CASTLE SAFETY GUIDELINES.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING AND NEW COAXIAL CABLES AND OTHER EQUIPMENT DURING CONSTRUCTION.
10. ANY EXISTING ATTACHMENTS AND/OR PROJECTIONS ON THE POLE THAT MAY INTERFERE WITH THE INSTALLATION OF THE REINFORCING SYSTEM WILL HAVE TO BE REMOVED, AND/OR RELOCATED, AND/OR REPLACED AND RE-INSTALLED AFTER THE REINFORCING IS SUCCESSFULLY COMPLETED. THE CONTRACTOR SHALL IDENTIFY AND COORDINATE THESE ITEMS PRIOR TO CONSTRUCTION WITH THE OWNER, TESTING AGENCY, AND ENGINEER.
11. ANY AND ALL EXISTING PLATFORMS THAT ARE LOCATED IN AREAS OF THE POLE SHAFT WHERE SHAFT REINFORCING MUST BE APPLIED SHALL BE TEMPORARILY REMOVED OR OTHERWISE SUPPORTED TO PERMIT NEW CONTINUOUS REINFORCEMENT TO BE ATTACHED. AFTER THE CONTRACTOR HAS SUCCESSFULLY INSTALLED THE MONOPOLE REINFORCEMENT SYSTEM, THE CONTRACTOR SHALL RE-INSTALL THE PLATFORMS. IN NO CASE SHALL ANY NEW AND/OR ADDITIONAL PLATFORMS AND/OR ANTENNAS AND/OR COAX CABLES AND/OR OTHER EQUIPMENT BE INSTALLED ON THE MONOPOLE UNTIL THE CONTRACTOR HAS SUCCESSFULLY COMPLETED THE INSTALLATION OF ALL OF THE REQUIRED STRUCTURAL REINFORCING SYSTEM COMPONENTS.

B. "LOW HEAT" WELDING PROCEDURES - (NOT REQUIRED)

C. SPECIAL INSPECTION AND TESTING

1. ALL WORK SHALL BE SUBJECT TO REVIEW AND OBSERVATION BY THE OWNER'S REPRESENTATIVE AND THE OWNER'S AUTHORIZED INDEPENDENT INSPECTION AND TESTING AGENCY. REFER TO CROWN CASTLE DOCUMENT ENG-SOW-10066 FOR SPECIFICATION.
2. ANY SUPPORT SERVICES PERFORMED BY THE ENGINEER DURING CONSTRUCTION SHALL BE DISTINGUISHED FROM CONTINUOUS AND DETAILED INSPECTION SERVICES WHICH ARE FURNISHED BY OTHERS. THESE SUPPORT SERVICES PERFORMED BY THE ENGINEER ARE PERFORMED SOLELY FOR THE PURPOSE OF ASSISTING IN QUALITY CONTROL AND IN ACHIEVING CONFORMANCE WITH CONTRACT DOCUMENTS. THEY DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
3. OBSERVED DISCREPANCIES BETWEEN THE WORK AND THE CONTRACT DOCUMENTS SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST.
4. AN INDEPENDENT QUALIFIED INSPECTION/TESTING AGENCY SHALL BE SELECTED, RETAINED AND PAID FOR BY THE OWNER FOR THE SOLE PURPOSE OF INSPECTING, TESTING, DOCUMENTING, AND APPROVING ALL WELDING AND FIELD WORK PERFORMED BY THE CONTRACTOR.
   (A.) ACCESS TO ANY PLACE WHERE WORK IS BEING DONE SHALL BE PERMITTED AT ALL TIMES.
   (B.) THE INSPECTION AGENCY SHALL SO SCHEDULE THIS WORK AS TO CAUSE A MINIMUM OF INTERRUPTION TO, AND COORDINATE WITH, THE WORK IN PROGRESS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE WORK SCHEDULE WITH THE TESTING AGENCY. THE CONTRACTOR SHALL ALLOW FOR ADEQUATE TIME AND ACCESS FOR THE TESTING AGENCY TO PERFORM THEIR DUTIES.
5. THE INSPECTION AND TESTING AGENCY SHALL BE RESPONSIBLE TO PERFORM THE FOLLOWING SERVICES FOR THE OWNER. THE TESTING AGENCY SHALL INSPECT THE FOLLOWING ITEMS IN ACCORDANCE WITH THE CONSTRUCTION DRAWINGS. THE TESTING AGENCY SHALL INSPECT ITEMS ON THIS LIST AND OTHER ITEMS AS NECESSARY TO FULFILL THEIR RESPONSIBILITY. THE TESTING AGENCY SHALL UTILIZE EXPERIENCED, TRAINED INSPECTORS INCLUDING AWS CERTIFIED WELDING INSPECTORS (CWI). INSPECTORS SHALL HAVE THE TRAINING, CREDENTIALS, AND EXPERIENCE APPROPRIATE FOR AND COMMENSURATE WITH THE SCOPE AND TYPE OF INSPECTION WORK TO BE PERFORMED.
   A. GENERAL:
      (1.) PERFORM CONTINUOUS ON-SITE OBSERVATION, INSPECTION, VERIFICATION, AND TESTING DURING THE TIME THE CONTRACTOR IS WORKING ON-SITE. AGENCY SHALL NOTIFY OWNER IMMEDIATELY WHEN FIELD PROBLEMS OR DISCREPANCIES OCCUR.
   B. FOUNDATIONS, CONCRETE, AND SOIL PREPARATION - (NOT REQUIRED)
   C. CONCRETE TESTING PER ACI - (NOT REQUIRED)
   D. STRUCTURAL STEEL
      (1.) CHECK THE STEEL ON THE JOB WITH THE PLANS.
      (2.) CHECK MILL CERTIFICATIONS.
      (3.) CHECK GRADE OF STEEL MEMBERS, AND BOLTS FOR CONFORMANCE WITH DRAWINGS.
      (4.) INSPECT STEEL MEMBERS FOR DISTORTION, EXCESSIVE RUST, FLAWS AND BURNED HOLES.
      (5.) CALL FOR LABORATORY TEST REPORTS WHEN IN DOUBT.
      (6.) CHECK STEEL MEMBERS FOR SIZES, SWEEP AND DIMENSIONAL TOLERANCES.
      (7.) CHECK FOR SURFACE FINISH SPECIFIED, GALVANIZED.
      (8.) CHECK BOLT TIGHTENING ACCORDING TO AISC "TURN OF THE NUT" METHOD.
   E. WELDING:
      (1.) VERIFY FIELD WELDING PROCEDURES, WELDERS, AND WELDING OPERATORS, NOT DEEMED PREQUALIFIED, IN ACCORDANCE WITH AWS D1.1.
      (2.) INSPECT FIELD WELDED CONNECTIONS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED AND IN ACCORDANCE WITH AWS D1.1.
      (3.) APPROVE FIELD WELDING SEQUENCE.
         (A.) A PROGRAM OF THE APPROVED SEQUENCES SHALL BE SUBMITTED TO THE OWNER BEFORE WELDING BEGINS. NO CHANGE IN APPROVED SEQUENCES MAY BE MADE WITHOUT PERMISSION FROM THE OWNER.
      (4.) INSPECT WELDED CONNECTIONS AS FOLLOWS AND IN ACCORDANCE WITH AWS D1.1:
         (A.) INSPECT WELDING EQUIPMENT FOR CAPACITY, MAINTENANCE AND WORKING CONDITIONS.
         (B.) VERIFY SPECIFIED ELECTRODES AND HANDLING AND STORAGE OF ELECTRODES FOR CONFORMANCE TO SPECIFICATIONS.
         (C.) INSPECT PREHEATING AND INTERPASS TEMPERATURES FOR CONFORMANCE WITH AWS D1.1.
         (D.) VISUALLY INSPECT ALL WELDS AND VERIFY THAT QUALITY OF WELDS MEETS THE REQUIREMENTS OF AWS D1.1.
         (E.) SPOT TEST AT LEAST ONE FILLET WELD OF EACH MEMBER USING MAGNETIC PARTICLE OR DYE PENETRANT.
         (F.) INSPECT FOR SIZE, SPACING, TYPE AND LOCATION AS PER APPROVED PLANS.
         (G.) VERIFY THAT THE BASE METAL CONFORMS TO THE DRAWINGS.
         (H.) REVIEW THE REPORTS BY TESTING LABS.
         (I.) CHECK TO SEE THAT WELDS ARE CLEAN AND FREE FROM SLAG.
         (J.) INSPECT RUST PROTECTION OF WELDS AS PER SPECIFICATIONS.
         (K.) CHECK THAT DEFECTIVE WELDS ARE CLEARLY MARKED AND HAVE BEEN ADEQUATELY REPAIRED.
   F. SPECIAL INSPECTION OF EXISTING SHAFT-TO-FLANGE WELD CONNECTIONS - (NOT REQUIRED)
   G. REPORTS:
      (1.) COMPILE AND PERIODICALLY SUBMIT DAILY INSPECTION REPORTS TO THE OWNER.
6. THE INSPECTION PLAN OUTLINED HEREIN IS INTENDED AS A DESCRIPTION OF GENERAL AND SPECIFIC ITEMS OF CONCERN. IT IS NOT INTENDED TO BE ALL-INCLUSIVE. IT DOES NOT LIMIT THE TESTING AND INSPECTION AGENCY TO THE ITEMS LISTED. ADDITIONAL TESTING, INSPECTION, AND CHECKING MAY BE REQUIRED AND SHOULD BE ANTICIPATED. THE TESTING AGENCY SHALL USE THEIR PROFESSIONAL JUDGMENT AND KNOWLEDGE OF THE JOB SITE CONDITIONS AND THE CONTRACTOR'S PERFORMANCE TO DECIDE WHAT OTHER ITEMS REQUIRE ADDITIONAL ATTENTION. THE TESTING AGENCY'S JUDGMENT MUST PREVAIL ON ITEMS NOT SPECIFICALLY COVERED. ANY DISCREPANCIES AND PROBLEMS SHALL BE BROUGHT IMMEDIATELY TO THE OWNER'S ATTENTION. RESOLUTIONS ARE NOT TO BE MADE WITHOUT THE OWNER'S REVIEW AND SPECIFIC WRITTEN CONSENT. THE OWNER RESERVES THE RIGHT TO DETERMINE WHAT IS AN ACCEPTABLE RESOLUTION OF DISCREPANCIES AND PROBLEMS.
7. AFTER EACH INSPECTION, THE TESTING AGENCY WILL PREPARE A WRITTEN ACCEPTANCE OR REJECTION WHICH WILL BE GIVEN TO THE CONTRACTOR AND FILED AS DAILY REPORTS TO THE OWNER. THIS WRITTEN ACTION WILL GIVE THE CONTRACTOR A LIST OF ITEMS TO BE CORRECTED, PRIOR TO CONTINUING CONSTRUCTION, AND/OR LOADING OF STRUCTURAL ITEMS.
8. RESPONSIBILITY: THE TESTING AGENCY DOES NOT RELIEVE THE CONTRACTOR'S CONTRACTUAL OR STATUTORY OBLIGATIONS. THE CONTRACTOR HAS THE SOLE RESPONSIBILITY FOR ANY DEVIATIONS FROM THE OFFICIAL CONTRACT DOCUMENTS. THE TESTING AGENCY WILL NOT REPLACE THE CONTRACTOR'S QUALITY CONTROL PERSONNEL.

SABRE SHAFT REINFORCING OPTION

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BU #801367; CT NHV-2075 CAC 801367
CHESHIRE, CT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT No: 37512-1657	ISSUE DATE OF PERMIT: 6-19-2012
DRAWN BY: B.M.S.	
CHECKED BY: K.A.T.	
APPROVED BY:	S-1B
DATE: 6-19-2012	

D. STRUCTURAL STEEL

1. STRUCTURAL STEEL MATERIALS, FABRICATION, DETAILING, AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING REFERENCE STANDARDS:

A. BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC):
   (A.) "SPECIFICATION FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS."
   (B.) "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS," AS APPROVED BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS OF THE ENGINEERING FOUNDATION.
   (C.) "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" (PARAGRAPH 4.2.1 SPECIFICALLY EXCLUDED).

B. BY THE AMERICAN WELDING SOCIETY (AWS):
   (A.) "STRUCTURAL WELDING CODE - STEEL D1.1."
   (B.) "SYMBOLS FOR WELDING AND NON-DESTRUCTIVE TESTING"

2. ANY MATERIAL OR WORKMANSHIP WHICH IS OBSERVED TO BE DEFECTIVE OR INCONSISTENT WITH THE CONTRACT DOCUMENTS SHALL BE CORRECTED, MODIFIED, OR REPLACED AT THE CONTRACTOR'S EXPENSE.
3. TIGHTEN ALL STRUCTURAL BOLTS, INCLUDING THE AJAX M20 BOLTS WITH SHEAR SLEEVES, ACCORDING TO THE REQUIREMENTS OF THE AISC "TURN OF THE NUT" METHOD. TIGHTEN BOLTS 1/3 TURN PAST THE SNUG TIGHT CONDITION AS DEFINED BY AISC.
4. WELDED CONNECTIONS SHALL CONFORM TO THE LATEST REVISED CODE OF THE AMERICAN WELDING SOCIETY, AWS D1.1. ALL WELD ELECTRODES SHALL BE E80XX UNLESS NOTED OTHERWISE ON THE DRAWINGS.
5. ALL WELDED CONNECTIONS SHALL BE MADE BY WELDERS CERTIFIED BY AWS. CONTRACTOR SHALL SUBMIT WELDERS' CERTIFICATION AND QUALIFICATION DOCUMENTATION TO THE OWNER'S TESTING AGENCY FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
6. STRUCTURAL STEEL PLATES SHALL CONFORM TO ASTM A572 GRADE 65 (FY = 65 KSI MIN.) UNLESS NOTED OTHERWISE ON THE DRAWINGS.
7. SURFACES OF EXISTING STEEL SHALL BE PREPARED AS REQUIRED FOR FIELD WELDING PER AWS. SEE SECTION I NOTES REGARDING TOUCH-UP OF GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS FIELD WELDING.
8. UNLESS OTHERWISE NOTED, ALL STEEL MEMBERS SHALL BE HOT-DIP GALVANIZED, AFTER FABRICATION, IN ACCORDANCE WITH ASTM A123. SEE SECTION J FOR FURTHER NOTES AND FOR EXCEPTIONS (IF ANY).
9. ALL WELDS SHALL BE VISUALLY INSPECTED BY THE OWNER'S APPROVED TESTING AGENCY. OTHER TESTS MAY ALSO BE PERFORMED ON THE WELDS BY THE TESTING AGENCY IN ORDER FOR THEM TO PERFORM THEIR DUTIES FOR THIS PROJECT. THE CONTRACTOR SHALL COOPERATE WITH THE TESTING AGENCY IN THEIR TESTING EFFORTS.
10. NO WELDING SHALL BE DONE TO THE EXISTING STRUCTURE WITHOUT THE PRIOR APPROVAL AND SUPERVISION OF THE TESTING AGENCY.
11. FIELD CUTTING OF STEEL:
   (A.) PRIOR TO ANY FIELD CUTTING, THE CONTRACTOR SHALL MARK THE CUT OUTLINES ON THE STEEL AND THE INSPECTION/TESTING AGENCY SHALL VERIFY PROPOSED LAYOUT, LOCATION, AND DIMENSIONS.
   (B.) ANY REQUIRED CUTS IN THE STEEL SHALL BE CAREFULLY CUT BY MECHANICAL METHODS SUCH AS DRILLING, SAW CUTTING, AND GRINDING. THE CONTRACTOR IS RESPONSIBLE TO PREVENT ANY DAMAGE TO THE COAX CABLES, AND/OR OTHER EQUIPMENT AND/OR THE STRUCTURE, DURING THE CUTTING WORK. ANY DAMAGE TO THE COAX CABLES, AND/OR OTHER EQUIPMENT AND/OR THE STRUCTURE, RESULTING FROM THE CONTRACTOR'S ACTIVITIES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. THE INSPECTION/TESTING AGENCY SHALL CLOSELY AND CONTINUOUSLY MONITOR THIS ACTIVITY.
   (C.) ALL REQUIRED CUTS SHALL BE CUT WITHIN THE DIMENSIONS SHOWN ON THE DRAWINGS. NO CUTS SHALL EXTEND BEYOND THE OUTLINE OF THE DIMENSIONS SHOWN ON THE DRAWINGS. ALL CUT EDGES SHALL BE GROUND SMOOTH AND DE-BURRED. CUT EDGES THAT ARE TO BE FIELD WELDED SHALL BE PREPARED FOR FIELD WELDING PER AWS D1.1 AND AS SHOWN ON THE DRAWINGS. IT MAY BE NECESSARY TO DRILL STARTER HOLES AS REQUIRED TO MAKE THE CUTS. THE INSPECTION/TESTING AGENCY SHALL CLOSELY AND CONTINUOUSLY MONITOR THIS ACTIVITY.

E. BASE PLATE GROUT - (NOT REQUIRED)

F. FOUNDATION WORK - (NOT REQUIRED)

G. CAST-IN-PLACE CONCRETE - (NOT REQUIRED)

H. EPOXY GROUTED REINFORCING ANCHOR RODS - (NOT REQUIRED)

I. TOUCH UP OF GALVANIZING

1. THE CONTRACTOR SHALL TOUCH UP ANY AND/OR ALL AREAS OF GALVANIZING ON THE EXISTING STRUCTURE OR NEW COMPONENTS THAT ARE DAMAGED OR ABRADED DURING CONSTRUCTION. **GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS ANY AND ALL ABRASIONS, CUTS, FIELD DRILLING, AND ALL FIELD WELDING SHALL BE TOUCHED UP WITH TWO (2) COATS OF ZRC-BRAND ZINC-RICH COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE: WET 3.0 MILS; DRY 1.5 MILS. APPLY PER ZRC (MANUFACTURER) RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.**
2. CONTRACTOR SHALL CLEAN AND PREPARE ALL FIELD WELDS ON GALVANIZED AND PRIME PAINTED SURFACES FOR TOUCH-UP COATING IN ACCORDANCE WITH AWS D1.1. THE OWNER'S TESTING AGENCY SHALL VERIFY THE PREPARED SURFACE PRIOR TO APPLICATION OF THE TOUCH-UP COATING.
3. THE OWNER'S TESTING AGENCY SHALL TEST AND VERIFY THE COATING THICKNESS AFTER THE CONTRACTOR HAS APPLIED THE ZRC COLD GALVANIZING COMPOUND AND IT HAS SUFFICIENTLY DRIED. AREAS FOUND TO BE INADEQUATELY COATED, SHALL BE RE-COATED BY THE CONTRACTOR AND RE-TESTED BY THE TESTING AGENCY.

J. HOT DIP GALVANIZING

1. HOT-DIP GALVANIZE ALL STRUCTURAL STEEL MEMBERS AND ALL STEEL ACCESSORIES, BOLTS, WASHERS, ETC. PER ASTM A123 OR PER ASTM A153, AS APPROPRIATE.
2. PROPERLY PREPARE STEEL ITEMS FOR GALVANIZING.
3. DRILL OR PUNCH WEEP AND/OR DRAINAGE HOLES AS REQUIRED.
4. ALL GALVANIZING SHALL BE DONE AFTER FABRICATION IS COMPLETED AND PRIOR TO FIELD INSTALLATION.

K. PERPETUAL INSPECTION AND MAINTENANCE BY THE OWNER

1. AFTER THE CONTRACTOR HAS SUCCESSFULLY COMPLETED THE INSTALLATION OF THE MONOPOLE REINFORCING SYSTEM AND THE WORK HAS BEEN ACCEPTED BY THE OWNER, THE OWNER WILL BE RESPONSIBLE FOR THE LONG TERM AND PERPETUAL INSPECTION AND MAINTENANCE OF THE POLE AND REINFORCING SYSTEM.
2. THE MONOPOLE REINFORCING SYSTEM INDICATED IN THESE DOCUMENTS USES REINFORCING COMPONENTS THAT INVOLVE FIELD WELDING STEEL MEMBERS TO THE EXISTING GALVANIZED STEEL POLE STRUCTURE. THESE FIELD WELDED CONNECTIONS ARE SUBJECT TO CORROSION DAMAGE AND DETERIORATION IF THEY ARE NOT PROPERLY MAINTAINED AND COVERED WITH CORROSION PREVENTIVE COATING SUCH AS THE ZRC GALVANIZING COMPOUND SPECIFIED PREVIOUSLY. THE STRUCTURAL LOAD CARRYING CAPACITY OF THE REINFORCED POLE SYSTEM IS DEPENDENT UPON THE INSTALLED SIZE AND QUALITY, MAINTAINED SOUND CONDITION AND STRENGTH OF THESE FIELD WELDED CONNECTIONS. **ANY CORROSION OF, DAMAGE TO, FATIGUE, FRACTURE, AND/OR DETERIORATION OF THESE WELDS AND/OR THE CONNECTED COMPONENTS WILL RESULT IN THE LOSS OF STRUCTURAL LOAD CARRYING CAPACITY AND MAY LEAD TO FAILURE OF THE STRUCTURAL SYSTEM. THEREFORE, IT IS IMPERATIVE THAT THE OWNER REGULARLY INSPECTS, MAINTAINS, AND REPAIRS AS NECESSARY, ALL OF THESE WELDS, CONNECTIONS, AND COMPONENTS FOR THE LIFE OF THE STRUCTURE.**
3. THE OWNER SHALL REFER TO TIA/EIA-222-F-1996, SECTION 14 AND ANNEX E FOR RECOMMENDATIONS FOR MAINTENANCE AND INSPECTION. THE FREQUENCY OF THE INSPECTION AND MAINTENANCE INTERVALS IS TO BE DETERMINED BY THE OWNER BASED UPON ACTUAL SITE AND ENVIRONMENTAL CONDITIONS. **PAUL J. FORD & COMPANY RECOMMENDS THAT A COMPLETE AND THOROUGH INSPECTION OF THE ENTIRE REINFORCED MONOPOLE STRUCTURAL SYSTEM BE PERFORMED YEARLY AND/OR AS FREQUENTLY AS CONDITIONS WARRANT.** ACCORDING TO TIA/EIA-222-F-1996 SECTION 14.1, NOTE 1: "IT IS RECOMMENDED THAT THE STRUCTURE BE INSPECTED AFTER SEVERE WIND AND/OR ICE STORMS OR OTHER EXTREME LOADING CONDITIONS".

SABRE SHAFT REINFORCING OPTION

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MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT No: 37512-1657	ISSUE DATE OF PERMIT: 6-19-2012
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CHECKED BY: K.A.T.	
APPROVED BY:	S-2B
DATE: 6-19-2012	

AJAX BOLT NOTE SHEET: REV. 1.2, 01-23-2012

NOTES: 1. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.

2. ALL STRUCTURAL BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.

3. ALL AJAX M20 BOLTS WITH SHEAR SLEEVES SHALL BE PRETENSIONED AND TIGHTENED UNTIL THE DIRECT TENSION INDICATOR (DTI) WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED. SEE NOTES AND DETAIL BELOW FOR THE USE OF DIRECT TENSION INDICATOR (DTI) WASHERS WITH THE AJAX M20 BOLTS.

4. ALL AJAX BOLTS SHALL BE INSTALLED USING DIRECT TENSION INDICATORS (DTI'S) AND HARDENED WASHERS. DTI'S SHALL BE THE SQUIRTER® STYLE, MADE TO ASTM F959 LATEST REVISION; AND HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A HARDNESS OF RC 38 OR HIGHER.

NOTES FOR AJAX M20 'ONE-SIDE' BOLTS WITH DIRECT TENSION INDICATORS (DTI'S):

DTI'S REQUIRED: DTI'S SHALL BE "SELF-INDICATING" SQUIRTER® STYLE DTI'S MADE WITH SILICONE EMBEDDED IN THEM, INSPECTED BY MEANS OF THE VISUAL EJECTION OF SILICONE AS THE DTI PROTRUSIONS COMPRESS. SQUIRTER® DTI'S SHALL BE CALIBRATED PER MANUFACTURER'S INSTRUCTIONS PRIOR TO USE.

THE DIRECT TENSION INDICATOR (DTI) WASHERS SHALL BE THE "SQUIRTER® STYLE" AS MANUFACTURED BY:

APPLIED BOLTING TECHNOLOGY PRODUCTS, INC.
1413 ROCKINGHAM ROAD BELLOWS FALLS, VERMONT, USA 05101
PHONE 1-800-552-1999
WEBSITE: WWW.APPLIEDBOLTING.COM

DISTRIBUTORS OF SQUIRTER® DTI'S:
HTTP://WWW.APPLIEDBOLTING.COM/APPLIED-BOLTING-DISTRIBUTORS.HTML

DTI: USE DIRECT TENSION INDICATOR (DTI) WASHERS COMPATIBLE WITH 3/4" NOMINAL A325 BOLTS FOR THE AJAX M20 BOLTS. DTI'S SHALL NOT BE HOT-DIP GALVANIZED. DTI'S SHALL BE MECHANICALLY GALVANIZED (MG) BY THE COLD MECHANICAL PROCESS ONLY AS PROVIDED BY THE DTI MANUFACTURER.

HARDENED WASHERS REQUIRED: USE A HARDENED WASHER FOR A 3/4" NOMINAL BOLT BETWEEN THE TOP OF THE DIRECT TENSION INDICATOR (DTI) WASHER AND THE NUT OF THE AJAX M20 BOLTS. HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A MINIMUM HARDNESS OF RC 38 OR HIGHER. THE HARDENED WASHERS SHALL BE MECHANICALLY GALVANIZED BY THE COLD MECHANICAL PROCESS. ALTERNATIVELY, CORRECTLY MADE HOT DIP GALVANIZED HARDENED FLAT WASHERS HAVING A MINIMUM HARDNESS OF RC 38 CAN BE USED; CONTRACTOR SHALL PROVIDE DOCUMENTATION OF WASHER SPECIFICATION AND HARDNESS.

NUT LUBRICATION REQUIRED: PROPERLY LUBRICATE THE THREADS OF THE NUT OF THE AJAX BOLT SO THAT IT CAN BE PROPERLY TIGHTENED WITHOUT GALLING AND/OR LOCKING UP ON THE BOLT THREADS. CONTRACTOR SHALL FOLLOW DTI MANUFACTURER INSTRUCTIONS FOR PROPER LUBRICATION AND TIGHTENING.

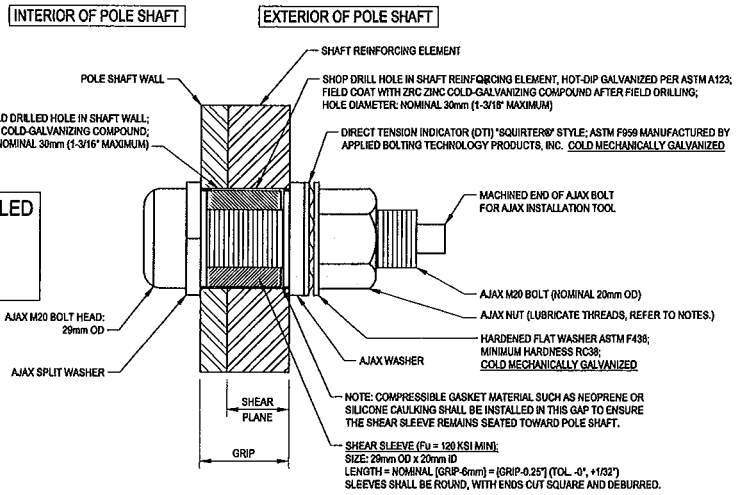
NOTE: COMPLETELY COMPRESSED DTI'S SHOWING NO VISIBLE REMAINING GAP ARE ACCEPTABLE. DTI WASHERS SHALL BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE DTI BUMPS FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND THE AJAX NUT. THE DTI BUMPS SHALL BEAR AGAINST THE UNDERSIDE OF A HARDENED FLAT WASHER, NEVER DIRECTLY AGAINST THE NUT.

CONTRACTOR SHALL FOLLOW DTI MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION, LUBRICATION, TIGHTENING AND INSPECTION.

INSPECTION REQUIRED: ALL AJAX BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009, BY A QUALIFIED BOLT INSPECTOR. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENT: THE SHOP-DRILLED AND FIELD-DRILLED HOLE SIZES; THE INSTALLATION OF THE AJAX BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION; AND THE CONTRACTOR'S TENSIONING PROCEDURE. IN ADDITION, ALL AJAX BOLTS AND DTI'S SHALL BE VISUALLY INSPECTED ACCORDING TO THE DTI MANUFACTURER'S INSTRUCTIONS. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE PHOTO DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THE CONDITION OF THE DTI'S.

NOTE: ALL SHOP AND FIELD DRILLED HOLES SHALL BE NOMINAL 30MM DIAMETER. THE MAXIMUM HOLE DIAMETER PERMITTED IS 1-3/16".

NOTE: ALL AJAX BOLTS, AJAX SPLIT WASHERS, AJAX WASHERS, AJAX NUTS, AND SHEAR SLEEVES SHALL BE HOT DIP GALVANIZED PER ASTM A123.



TYPICAL AJAX BOLT DETAIL 1/S-3B

SABRE SHAFT REINFORCING OPTION

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BU #801367; CT NHV-2075 CAC 801367
CHESHIRE, CT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT No: 37512-1657	ISSUE DATE OF PERMIT: 6-19-2012
DRAWN BY: B.M.S.	
CHECKED BY: K.A.T.	
APPROVED BY:	S-3B
DATE: 6-19-2012	

37512-1657 PERMIT.DWG

NOTE: NO DETAILED INFORMATION REGARDING INTERFERENCES WAS PROVIDED. THEREFORE, CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS BEFORE PROCEEDING WITH THE WORK. REPORT ANY AND ALL DISCREPANCIES TO PAUL J. FORD AND COMPANY AND CROWN CASTLE FIELD PERSONNEL IMMEDIATELY.

THIS POLE REINFORCEMENT DRAWING IS FOR THE POLE DESIGN AND ANTENNA LOADING DOCUMENTED IN THE PJF CO-LOCATION ANALYSIS FOR THIS SITE (PJF#37512-1657), DATED 6-19-2012.

POLE SPECIFICATIONS	
POLE SHAPE TYPE:	18-SIDED POLYGON
TAPER:	0.233024 IN/FT
SHAFT STEEL:	ASTM A607 GRADE 65
BASE PL STEEL:	ASTM A572 GR 55 (55 KSI)
ANCHOR RODS:	2 1/4"Ø #18J ASTM A615 GRADE 75

SHAFT SECTION DATA

SHAFT SECTION	SECTION LENGTH (FT)	PLATE THICKNESS (IN)	LAP SPLICE (IN)	DIAMETER ACROSS FLATS (IN)	
				@ TOP	@ BOTTOM
1	48.75	0.2500	54.00	24.000	35.360
2	45.00	0.3125	66.00	33.811	44.300
3	45.00	0.3750	81.00	42.393	52.870
4	45.00	0.4375		50.549	61.040

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

NOTES:

1. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.

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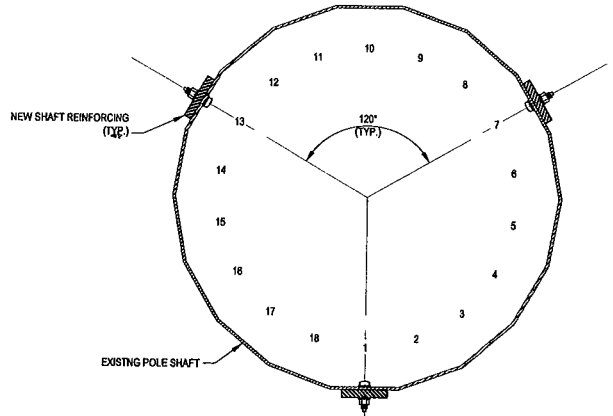
3. * ALL AJAX M20 BOLTS WITH SHEAR SLEEVES SHALL BE PRETENSIONED AND TIGHTENED UNTIL THE DIRECT TENSION INDICATOR (DTI) WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED. SEE NOTES AND DETAIL ON SHEET S-3 FOR THE USE OF DIRECT TENSION INDICATOR (DTI) WASHERS WITH THE AJAX M20 BOLTS.

4. DTIS REQUIRED: * ALL AJAX BOLTS SHALL BE INSTALLED USING DIRECT TENSION INDICATORS (DTI'S) AND HARDENED WASHERS. DTIS SHALL BE THE SQUIRTER® STYLE, MADE TO ASTM F959 LATEST REVISION; AND HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A HARDNESS OF RC 38 OR HIGHER.

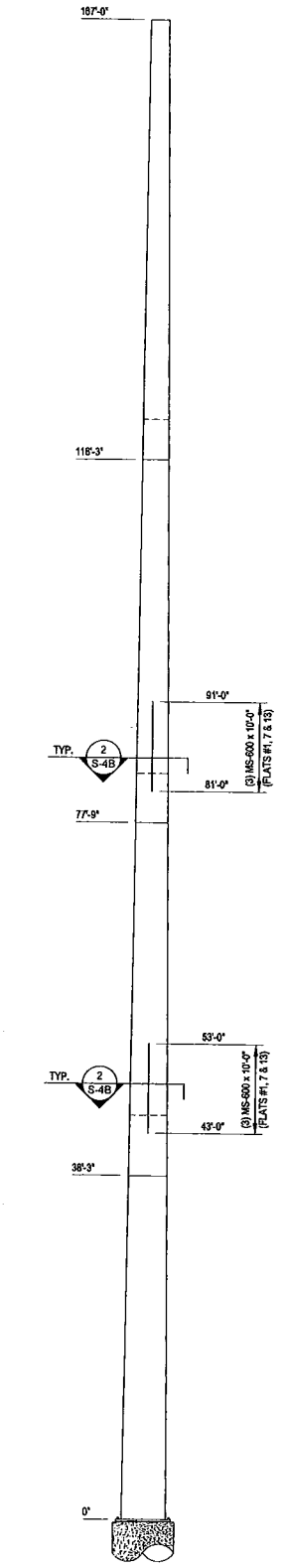
5. NUT LUBRICATION REQUIRED: * PROPERLY LUBRICATE THE THREADS OF THE NUT OF THE AJAX BOLT SO THAT IT CAN BE PROPERLY TIGHTENED WITHOUT GALLING AND/OR LOCKING UP ON THE BOLT THREADS. CONTRACTOR SHALL FOLLOW DTI MANUFACTURER INSTRUCTIONS FOR PROPER LUBRICATION AND TIGHTENING. REFER TO SHEET S-3.

6. AJAX BOLT HOLE SIZE: ALL SHOP- AND FIELD-DRILLED HOLES SHALL BE NOMINAL 30MM DIAMETER. THE MAXIMUM HOLE DIAMETER PERMITTED IS 1-3/16". REFER TO SHEET S-3.

* AS OF 5/30/2012, UNTIL FURTHER NOTICE, CROWN CASTLE WILL ACCEPT AJAX BOLTS TIGHTENED USING AISC "TURN-OF-THE-NUT" METHODOLOGY. INSTALLERS SHALL FOLLOW CROWN GUIDELINES FOR AISC "TURN-OF-THE-NUT" METHOD AND ALSO PROVIDE COMPLETE INSPECTION DOCUMENTATION IN THE PMI.



SECTION 2 / S-4B



POLE ELEVATION 1 / S-4B

SABRE SHAFT REINFORCING OPTION

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MODIFICATION INSPECTION NOTES:

GENERAL
THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, NOR DOES THE MI INSPECTOR TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.

ALL MI'S SHALL BE CONDUCTED BY A CROWN ENGINEERING VENDOR (AEV) OR ENGINEERING SERVICE VENDOR (AESV) THAT IS APPROVED TO PERFORM ELEVATED WORK FOR CROWN. SEE ENG-BUL-10173 LIST OF APPROVED MI VENDORS..

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PO IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN, CONTACT YOUR CROWN POINT OF CONTACT (POC).

REFER TO ENG-SOW-10007 : MODIFICATION INSPECTION SOW FOR FURTHER DETAILS AND REQUIREMENTS.

MI INSPECTOR
THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS

THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GENERAL CONTRACTOR (GC) INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO CROWN.

GENERAL CONTRACTOR
THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE MI INSPECTOR TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS
- BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS

THE GC SHALL PERFORM AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST AN DENG-SOW-10007.

RECOMMENDATIONS
THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING A MI REPORT:

- IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLE 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS
- IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE FOUNDATION INSPECTIONS TO ALLOW FOUNDATION AND MI INSPECTION(S) TO COMMENCE WITH ONE SITE VISIT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE.

CANCELLATION OR DELAYS IN SCHEDULED MI
IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, CROWN SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF CROWN CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

CORRECTION OF FAILING MI'S
IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI ("FAILED MI"), THE GC SHALL WORK WITH CROWN TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:

- CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI.
- OR, WITH CROWN'S APPROVAL, THE GC MAY WORK WITH THE EOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION

MI VERIFICATION INSPECTIONS
CROWN RESERVES THE RIGHT TO CONDUCT A MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTION(S) ON TOWER MODIFICATION PROJECTS.

ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS AND IN ACCORDANCE WITH ENG-SOW-10007.

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT AEV/AESV FIRM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "PASSING MI" OR "PASS AS NOTED MI" REPORT FOR THE ORIGINAL PROJECT.

PHOTOGRAPHS
BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

- PRE-CONSTRUCTION GENERAL SITE CONDITION
- PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION
  - RAW MATERIALS
  - PHOTOS OF ALL CRITICAL DETAILS
  - FOUNDATION MODIFICATIONS
  - WELD PREPARATION
  - BOLT INSTALLATION AND TORQUE
  - FINAL INSTALLED CONDITION
  - SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
  - FINAL INFIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.

THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS, PLEASE REFER TO ENG-SOW-10007.

MI CHECKLIST

CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
	PRE-CONSTRUCTION
X	MI CHECKLIST DRAWINGS
X	EOR APPROVED SHOP DRAWINGS
X	FABRICATION INSPECTION
NA	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
NA	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
	CONSTRUCTION
X	CONSTRUCTION INSPECTIONS
NA	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
NA	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
NA	CONTRACTOR'S CERTIFIED WELD INSPECTION
NA	EARTHWORK: LIFT AND DENSITY
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
X	INSPECTION OF BOLT PRETENSION PER AISC BOLT SPEC.
X	INSPECTION OF AJAX BOLTS AND DTIS PER REQUIREMENTS ON SHEET S-3
ADDITIONAL TESTING AND INSPECTIONS:	
	POST-CONSTRUCTION
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
NA	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	

NOTE: X DENOTES A DOCUMENT NEEDED FOR THE PMI REPORT NA DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE PMI REPORT

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