

August 26, 2014

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

Re: **Notice of Exempt Modification – Facility Modification  
190 Burnham Street, South Windsor, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains fifteen (15) wireless telecommunications antennas at the top of the existing 110-foot tower at 190 Burnham Street in South Windsor, Connecticut (the “Property”). The tower is owned by Crown Castle. The Council approved Cellco’s use of the existing tower in 1990 (Docket No. 137). Cellco now intends to replace three (3) of its existing antennas with two (2) model LNX-6514DS-VTM, 700 MHz antennas, and one (1) model X7C-FRO-660-V, 700 MHz antenna, all at the same level on the tower. Cellco also intends to install three (3) remote radio heads (“RRHs”) behind its new 700 MHz antennas. Included in Attachment 1 are specifications for Cellco’s replacement antennas and RRHs.

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 Matthew B. Galligan, Town Manager for the Town of South Windsor. A copy of this letter is also being sent to Abraham and Beverly Glassman, Trustees, the owners of the Property.

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

13102312-v1

# Robinson+Cole

Melanie A. Bachman  
August 26, 2014  
Page 2

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's proposed antennas will be located at the top of the 110-foot tower.
2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and the building can support Cellco's proposed modifications. (*See Structural Analysis Report is included in Attachment 3*). Please note that Table 1 – Proposed Antenna and Cable Information on page 3 of the report includes information on Cellco's 2100 MHz antenna upgrade that the Council approved earlier this year (EM-VER-132-140325). That work has not yet been completed.

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:

Matthew B. Galligan, South Windsor Town Manager  
Abraham and Beverly Glassman, Trustees  
Sandy M. Carter

# **ATTACHMENT 1**

# Product Specifications

COMMSCOPE®

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY



## Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR   Return Loss, dB	1.4   15.6	1.4   15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

## Mechanical Specifications

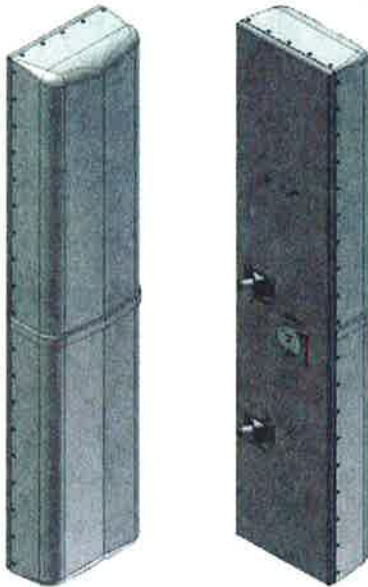
Color   Radome Material	Light gray   Fiberglass, UV resistant
Connector Interface   Location   Quantity	7-16 DIN Female   Bottom   2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h   149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm   72.7 in x 11.9 in x 7.1 in
Net Weight	17.6 kg   38.8 lb
Model with factory installed AISG 2.0 RET	LNX-6514DS-A1M





# X7C-FRO-660-V

X-Pol Antenna, 698-896MHz, Fast-Roll-Off 60° H-Beam  
RET/MET



- Designed to improve SNR
- Greatly increases LTE data rates
- Broadband radiator
- Macro Cell, high gain antenna
- Suitable for LTE/CDMA/UMTS/GSM
- AISG 2.0 RET or manual MET tilt control

## Electrical Specifications

Frequency Band, MHz	698-824	824-896
Horizontal Beamwidth, 3dB points	62	58
Gain, dBi	15.9	16.0
Vertical Beamwidth, 3dB points	12.0	10.5
Front-to-Back at 180°, dB	>28	
Upper Sidelobe Suppression, Typical, dB	<-18	
Polarization	+/-45°	
Electrical Downtilt	0-10° or 4-14°	
VSWR/Return Loss, dB, Maximum	1.5:1/14.0	
Isolation Between Ports, dB, Mimimum	-28	
Intermodulation (2x20w), IM3, dBc, Maximum	-150	
Impedance, ohms	50	
Maximum Power Per Connector, CW	500	

[www.cssantenna.com](http://www.cssantenna.com)

410-612-0080

[customerservice@cssantenna.com](mailto:customerservice@cssantenna.com)

All Specifications are subject to change.

Refer to [www.cssantenna.com](http://www.cssantenna.com) for the most current information



# X7C-FRO-660-V

X-Pol Antenna, 698-896MHz, Fast-Roll-Off 60° H-Beam  
**RET/MET**

## Mechanical Specifications

Dimensions, Length/Width/Depth	72.0/14.6/8.0 in (1829/372/204 mm)
Connector (Quantity) Type	(2) 7-16 DIN Female
Connector Torque	220-265 lbf-in (25-30 N-m)
Connector Location	Back
Antenna Weight	35.0 lbs
Bracket Weight	13.2 lbs (6.0 kg)
Standard Bracket Kit	CSS P/N 919011
Mechanical Downtilt Range	0-12°
Radome Material	Ultra High Strength Luran, UV Stabilized, ASTM D1925
Wind Survival	150 mph (241 km/h)
Front Wind Load	205.39 lbf (913.65 N) @100mph
Equivalent Flat Plate	4.09 sq-ft (c=2) @ 100mph

## RET Information

Model	CSS-RET-200
Mounting Location	Rear of Antenna
Weight	1.2 lb (0.54 kg)
Communication Standard	AISG 2.0
Control System	CSS-PCU-220



## Order Information

Model	Description
X7C-FRO-660-VR0	Antenna with manual RET adjust electrical downtilt 0-10°
X7C-FRO-660-VR4	Antenna with manual RET adjust electrical downtilt 4-14°
X7C-FRO-660-VM0	Antenna with remote MET adjust electrical downtilt 0-10°
X7C-FRO-660-VM4	Antenna with remote MET adjust electrical downtilt 4-14°

## Optional Bracket Kit

919036	Bracket Kit, 2-Point, 12 deg D-tilt, For 4.5" OD Pole
--------	---

[www.cssantenna.com](http://www.cssantenna.com)

410-612-0080

[customerservice@cssantenna.com](mailto:customerservice@cssantenna.com)

All Specifications are subject to change.

Refer to [www.cssantenna.com](http://www.cssantenna.com) for the most current information

P

## Alcatel-Lucent RRH2x40-07-U

### REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low

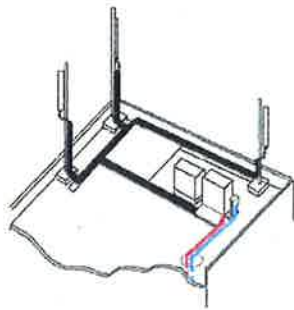
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

#### Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-07-U is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-07-U is compact and weighs less than 23 kg (50 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

## Excellent RF performance

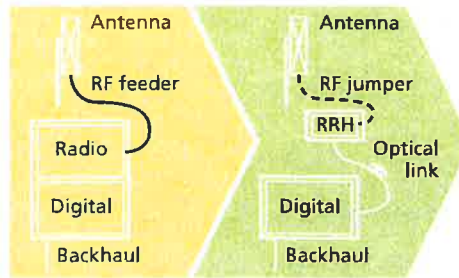
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-07-U provides more RF power while at the same time consuming less electricity.



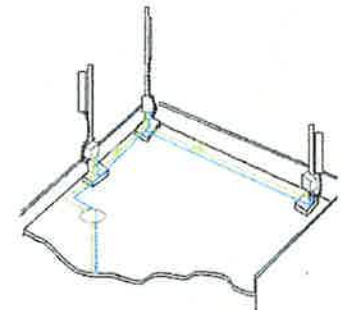
Macro

## Features

- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly reduced energy consumption



RRH for space-constrained cell sites



Distributed

## Benefits

- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning

## Technical specifications

### Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

### Power

- Power supply: -48V

### Operating environment

- Outdoor temperature range:
  - With solar load: -40°C to +50°C (-40°F to +122°F)
  - Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)

- Enclosure protection
  - IP65 (International Protection rating)

### RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - TMA
  - Remote electrical tilt (RET) support (AISG v2.0)

### Optical characteristics

#### Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - One SM fiber (9/125 μm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - Two MM fibers (50/125 μm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

### Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

### Alarms and ports

- Six external alarms
- Two optical ports to support daisy-chaining

[www.alcatel-lucent.com](http://www.alcatel-lucent.com) Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein. Copyright © 2010 Alcatel-Lucent. All rights reserved. CPG2809100913 (09)



# **ATTACHMENT 2**

Site Name: Burnham (South Windsor) Tower Height: 110ft		General		Power		Density					
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total			
*Nextel	9	100	100	0.0324	851	0.5673	5.70%				
*Clearwire	2	153	87	0.0145	2496	1.0000	1.45%				
*Clearwire	1	211	82	0.0113	11 GHz	1.0000	1.13%				
<b>Verizon</b>	<b>9</b>	<b>415</b>	<b>111</b>	<b>0.1090</b>	<b>869</b>	<b>0.5793</b>	<b>18.81%</b>				
<b>Verizon</b>	<b>11</b>	<b>458</b>	<b>111</b>	<b>0.1470</b>	<b>1970</b>	<b>1.0000</b>	<b>14.70%</b>				
<b>Verizon</b>	<b>1</b>	<b>1750</b>	<b>111</b>	<b>0.0511</b>	<b>2145</b>	<b>1.0000</b>	<b>5.11%</b>				
<b>Verizon</b>	<b>1</b>	<b>1050</b>	<b>111</b>	<b>0.0306</b>	<b>698</b>	<b>0.4653</b>	<b>6.59%</b>				
								<b>53.50%</b>			
* Source: Siting Council											

# **ATTACHMENT 3**



Date: July 14, 2014

Holly Haas  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277

SMW Engineering Group  
158 Business Center Drive  
Birmingham, AL 35244  
205.252.6985

**Subject: Structural Analysis Report**

**Carrier Designation:** Verizon Wireless Co-Locate  
**Carrier Site Number:**  
**Carrier Site Name:** Burnham Street

**Crown Castle Designation:** Crown Castle BU Number: 806375  
Crown Castle Site Name: HRT 095 943237  
Crown Castle JDE Job Number: 296957  
Crown Castle Work Order Number: 792737  
Crown Castle Application Number: 252355 Rev. 0

**Engineering Firm Designation:** SMW Engineering Group Project Number: 14-1291

**Site Data:** 190 BURNHAM ST, SOUTH WINDSOR, Hartford County, CT  
Latitude 41° 48' 0.49", Longitude -72° 36' 57.15"  
110 Foot - Monopole Tower

Dear Holly Haas,

SMW Engineering Group is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 666524, in accordance with application 252355, revision 0.

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

LC5: Existing + Reserved + Proposed Equipment **Sufficient Capacity**  
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

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

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

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

Structural analysis prepared by:

Respectfully submitted by:

Roy Smith, PE  
Project Engineer



## TABLE OF CONTENTS

### 1) INTRODUCTION

### 2) ANALYSIS CRITERIA

- Table 1 - Proposed Antenna and Cable Information
- Table 2 - Existing and Reserved Antenna and Cable Information
- Table 3 - Design Antenna and Cable Information

### 3) ANALYSIS PROCEDURE

- Table 4 - Documents Provided
- 3.1) Analysis Method
- 3.2) Assumptions

### 4) ANALYSIS RESULTS

- Table 5 - Section Capacity (Summary)
- Table 6 – Tower Components vs. Capacity
- 4.1) Recommendations

### 5) APPENDIX A

- tnxTower Output

### 6) APPENDIX B

- Base Level Drawing

### 7) APPENDIX C

- Additional Calculations

## 1) INTRODUCTION

This tower is a 110 ft Monopole tower designed by VALMONT in January of 1991. The tower was originally designed for a wind speed of 90 mph per EIA-222-D.

## 2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 28 mph with 1 inch ice thickness and 50 mph under service loads.

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

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
108.0	111.0	3	alcatel lucent	RRH-2X40W-700-MHZ	1	1-5/8	1
		3	alcatel lucent	RRH2x40-AWS			
		2	commscope	LNx-6514DS-AIM w/ Mount Pipe			
		1	css	V7C-FRO-660			
		6	kathrein	742 213 w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Notes:

1) See Appendix B for the proposed coax configuration.

**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
108.0	111.0	2	antel	LPA-80063/4CF w/ Mount Pipe	1	1-5/8	1
		4	antel	LPA-80080/4CF w/ Mount Pipe			
	108.0	1	tower mounts	Platform Mount [LP 713-1]			
97.0	97.0	9	decibel	DB844H90E-XY w/ Mount Pipe	12	7/8	1
		2	gps	GPS			
		3	tower mount database	Pipe Mount 6'x2.375"			
		1	tower mounts	Platform Mount [LP 713-1]			
86.0	87.0	3	argus technologies	LLPX310R w/ Mount Pipe	3	5/16 1/4	1
		3	samsung telecommunications	WIMAX DAP HEAD			
	86.0	3	tower mount database	Pipe Mount 6'x2.375"			
		1	tower mounts	Side Arm Mount [SO 101-3]			
	82.0	1	dragonwave	A-ANT-18G-2-C			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		1	dragonwave	HORIZON COMPACT			

1) Existing equipment is to be removed prior to installation of proposed loading and was not considered in this analysis.

**Table 3 - Design Antenna and Cable Information**

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
107	107	1	generic	LP Platform	-	-
		4	rfs celwave	PD10017		
94	94	1	generic	LP Platform	-	-
		12	rfs celwave	PD1132		

### 3) ANALYSIS PROCEDURE

**Table 4 - Documents Provided**

Document	Remarks	Reference	Source
Original Tower Drawings	Valmont, Order #: 10888-91, dated 1/24/1991	Doc ID #: 262106	Crown DMZ
Foundation Drawings	Leinweber & associates, Job #: 0132, dated 3/21/1991	Doc ID #: 262107	Crown DMZ
Geotechnical Report	EDP, Job #: 19058, dated 3/20/1991	Doc ID #: 262109	Crown DMZ
Previous Structural Analysis	Crown, Project #: 481486, dated 4/10/2012	Doc ID #: 3141278	Crown DMZ

#### 3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

#### 3.2) Assumptions

1. Tower and structures were built in accordance with the manufacturer's specifications.
2. The tower and structures have been maintained in accordance with the manufacturer's specification.
3. The configuration of antennas, transmission lines, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4. Mount sizes, weights, and manufacturers are best estimates using Crown Mount Catalog based on the provided site photos and were determined without SMW Engineering making a site visit.
5. All equipment model numbers, quantities and centerline elevations have been taken from the Crown Castle CAD package dated July 1, 2014

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

#### 4) ANALYSIS RESULTS

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

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	110 - 70	Pole	TP25.53x15.53x0.25	1	-7.20	1016.11	69.6	Pass
L2	70 - 34.083	Pole	TP34.02x24.03x0.313	2	-12.29	1698.94	77.4	Pass
L3	34.083 - 0	Pole	TP41.9x32.164x0.344	3	-19.76	2383.40	78.9	Pass
							Summary	
							Pole (L3)	78.9 Pass
							Base Plate	89.3 Pass
							Rating =	89.3 Pass

**Table 6 - Tower Component Stresses vs. Capacity - LC1**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	63.9	Pass
	Base Plate		45.9	Pass
1	Base Foundation	0	80.8	Pass
<b>Structure Rating (max from all components) =</b>				<b>89.3%</b>

Notes:

- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) Foundation capacity determined by comparing analysis reactions to original design reactions.

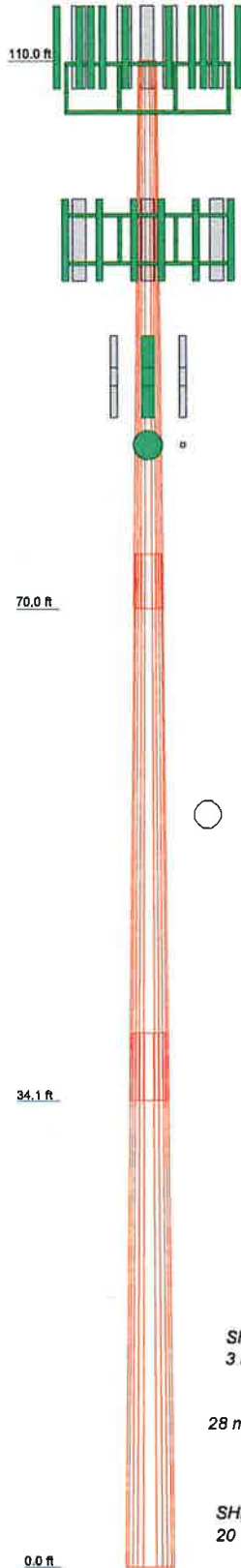
#### 4.1) Recommendations

The existing tower and its foundations are sufficient for the proposed loading and do not require modifications.



**APPENDIX A**  
**TNXTOWER OUTPUT**

Section	1	2	3	4
Length (ft)	40.00	39.92	39.00	11.5
Number of Sides	12	12	12	
Thickness (in)	0.250	0.313	0.344	
Socket Length (ft)	4.00	4.92	32.154	
Top Dia (in)	15.530	24.030	41.900	
Bot Dia (in)	25.530	34.020		
Grade		A572-65		
Weight (K)	2.2	3.9	5.4	



### DESIGNED APPURTENANCE LOADING

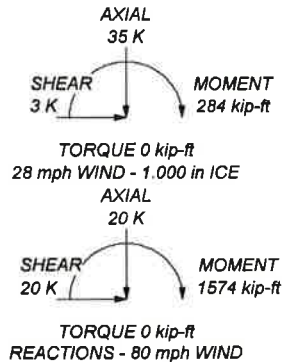
TYPE	ELEVATION	TYPE	ELEVATION
Platform Mount [LP 713-1]	108	(3) DB844H90E-XY w/ Mount Pipe	97
(2) LPA-80080/4CF w/ Mount Pipe	108	(3) DB844H90E-XY w/ Mount Pipe	97
RRH-2X40W-700-MHZ	108	GPS	97
RRH2x40-AWS	108	GPS	97
LNx-6514DS-AIM w/ Mount Pipe	108	Pipe Mount 6"x2.375"	97
(2) 742 213 w/ Mount Pipe	108	Pipe Mount 6"x2.375"	97
DB-T1-6Z-8AB-OZ	108	Pipe Mount 6"x2.375"	97
(2) LPA-80080/4CF w/ Mount Pipe	108	Side Arm Mount [SO 101-3]	86
RRH-2X40W-700-MHZ	108	LLPX310R w/ Mount Pipe	86
RRH2x40-AWS	108	LLPX310R w/ Mount Pipe	86
LNx-6514DS-AIM w/ Mount Pipe	108	LLPX310R w/ Mount Pipe	86
(2) 742 213 w/ Mount Pipe	108	WIMAX DAP HEAD	86
(2) LPA-80063/4CF w/ Mount Pipe	108	WIMAX DAP HEAD	86
RRH-2X40W-700-MHZ	108	WIMAX DAP HEAD	86
RRH2x40-AWS	108	HORIZON COMPACT	86
(2) 742 213 w/ Mount Pipe	108	Pipe Mount 6"x2.375"	86
LNx-6514DS-AIM w/ Mount Pipe	108	Pipe Mount 6"x2.375"	86
Platform Mount [LP 713-1]	97	Pipe Mount 6"x2.375"	86
(3) DB844H90E-XY w/ Mount Pipe	97	A-ANT-18G-2-C	86

### MATERIAL STRENGTH

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

### TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 26 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 89.3%



<b>SMW Engineering Group</b>			
158 Business Center Drive Birmingham, AL 35244 Phone: 205.252.6985 FAX: 205.795.7253			
Job: <b>HRT 095 943237 - BU#: 806375</b>	Project: <b>14-1291</b>	Client: <b>Crown Castle USA, Inc.</b>	Drawn by: <b>VGD</b>
Code: <b>TIA/EIA-222-F</b>	Date: <b>07/14/14</b>	Scale: <b>NTS</b>	Dwg No. <b>E-1</b>

## Tower Input Data

There is a pole section.

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

The following design criteria apply:

- 2) Tower is located in Hartford County, Connecticut.
- 3) Basic wind speed of 80 mph.
- 4) Nominal ice thickness of 1.000 in.
- 5) Ice thickness is considered to increase with height.
- 6) Ice density of 56 pcf.
- 7) A wind speed of 28 mph is used in combination with ice.
- 8) Temperature drop of 50 °F.
- 9) Deflections calculated using a wind speed of 50 mph.
- 10) A non-linear (P-delta) analysis was used.
- 11) Pressures are calculated at each section.
- 12) Stress ratio used in pole design is 1.333.
- 13) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys ✓ Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area ✓ Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. Autocalc Torque Arm Areas SR Members Have Cut Ends ✓ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Use TIA-222-G Tension Splice Capacity Exemption	Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feedline Torque Include Angle Block Shear Check Poles ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
--	--	---

## 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	110.00-70.00	40.00	4.00	12	15.530	25.530	0.250	1.000	A572-65 (65 ksi)
L2	70.00-34.08	39.92	4.92	12	24.030	34.020	0.313	1.250	A572-65 (65 ksi)
L3	34.08-0.00	39.00		12	32.164	41.900	0.344	1.374	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	16.078 26.431	12.300 20.350	366.566 1660.019	5.470 9.050	8.045 13.225	45.567 125.526	742.762 3363.648	6.054 10.016	3.492 6.172	13.968 24.688

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L2	25.914	23.866	1713.557	8.491	12.448	137.662	3472.131	11.746	5.603	17.928
	35.220	33.918	4918.939	12.067	17.622	279.131	9967.105	16.693	8.280	26.496
L3	34.570	35.196	4548.906	11.392	16.661	273.024	9217.318	17.322	7.699	22.415
	43.378	45.964	10131.773	14.877	21.704	466.812	20529.719	22.622	10.309	30.011

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft <sup>2</sup>	in					in	in
L1 110.00-70.00				1	1	1		
L2 70.00-34.08				1	1	1		
L3 34.08-0.00				1	1	1		

### Monopole Base Plate Data

#### Base Plate Data

Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.250 in
Number of bolts	12
Embedment length	96.000 in
f <sub>c</sub>	3 ksi
Grout space	2.000 in
Base plate grade	A572-50
Base plate thickness	2.500 in
Bolt circle diameter	49.880 in
Outer diameter	55.880 in
Inner diameter	24.000 in
Base plate type	Plain Plate

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

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub>		Weight
						ft <sup>2</sup> /ft	plf	
HJ7-50A(1-5/8")	A	No	Inside Pole	108.00 - 8.00	15	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
						2" Ice	0.00	1.04
						4" Ice	0.00	1.04
AL7-50(1 5/8)	A	No	CaAa (Out Of Face)	108.00 - 8.00	3	No Ice	0.00	0.52
						1/2" Ice	0.00	2.02
						1" Ice	0.00	4.14
						2" Ice	0.00	10.20
						4" Ice	0.00	29.65
HB158-1-08U8-S8J18(1-5/8)	A	No	CaAa (Out Of Face)	108.00 - 8.00	1	No Ice	0.20	1.30
						1/2" Ice	0.30	2.81
						1" Ice	0.40	4.94
						2" Ice	0.60	11.02
						4" Ice	1.00	30.52
Safety Line (3/8")	B	No	CaAa (Out Of Face)	110.00 - 8.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46
Step Pegs	B	No	CaAa (Out Of Face)	110.00 - 8.00	1	No Ice	0.08	2.72
						1/2" Ice	0.18	3.51
						1" Ice	0.28	4.92
						2" Ice	0.48	9.56

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub>		Weight plf
						ft <sup>2</sup> /ft		
LDF5-50A(7/8")	C	No	Inside Pole	97.00 - 8.00	12	4" Ice	0.88	26.18
						No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
						2" Ice	0.00	0.33
						4" Ice	0.00	0.33
2" Rigid Conduit	C	No	CaAa (Out Of Face)	86.00 - 8.00	2	No Ice	0.20	2.80
						1/2" Ice	0.30	4.33
						1" Ice	0.40	6.47
						2" Ice	0.60	12.57
						4" Ice	1.00	32.12
						No Ice	0.00	0.60
9207(5/16")	C	No	CaAa (Out Of Face)	86.00 - 8.00	3	1/2" Ice	0.00	1.11
						1" Ice	0.00	2.22
						2" Ice	0.00	6.29
						4" Ice	0.00	21.76
						No Ice	0.00	0.04
						1/2" Ice	0.00	0.53
FSJ1-50A(1/4")	C	No	CaAa (Out Of Face)	86.00 - 8.00	3	1" Ice	0.00	1.62
						2" Ice	0.00	5.64
						4" Ice	0.00	21.01
						No Ice	0.00	0.14
						1/2" Ice	0.00	0.76
						1" Ice	0.00	2.00
FSJ4-50B(1/2")	C	No	CaAa (Out Of Face)	86.00 - 8.00	1	2" Ice	0.00	6.30
						4" Ice	0.00	22.23
						No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00

### Feed Line/Linear Appurtenances Section Areas

Tower Section n	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	110.00-70.00	A	0.000	0.000	0.000	7.524	0.70
		B	0.000	0.000	0.000	4.700	0.12
		C	0.000	0.000	0.000	6.400	0.23
L2	70.00-34.08	A	0.000	0.000	0.000	7.112	0.66
		B	0.000	0.000	0.000	4.220	0.11
		C	0.000	0.000	0.000	14.367	0.42
L3	34.08-0.00	A	0.000	0.000	0.000	5.164	0.48
		B	0.000	0.000	0.000	3.065	0.08
		C	0.000	0.000	0.000	10.433	0.30

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

Tower Section n	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	110.00-70.00	A	1.126	0.000	0.000	0.000	16.081	1.37
		B		0.000	0.000	0.000	22.715	0.28
		C		0.000	0.000	0.000	13.806	0.61
L2	70.00-34.08	A	1.055	0.000	0.000	0.000	15.200	1.29
		B		0.000	0.000	0.000	20.397	0.25
		C		0.000	0.000	0.000	30.543	1.28
L3	34.08-0.00	A	1.000	0.000	0.000	0.000	10.668	0.89
		B		0.000	0.000	0.000	14.072	0.17
		C		0.000	0.000	0.000	21.441	0.85

### Feed Line Center of Pressure

Section	Elevation	CP <sub>x</sub>	CP <sub>z</sub>	CP <sub>x</sub>	CP <sub>z</sub>
	ft	in	in	Ice in	Ice in
L1	110.00-70.00	-0.067	-0.047	0.123	0.058
L2	70.00-34.08	-0.284	0.071	-0.201	0.235
L3	34.08-0.00	-0.233	0.058	-0.184	0.204

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz Lateral	Vert						ft
							ft <sup>2</sup>	ft <sup>2</sup>	K	
Platform Mount [LP 713-1]	C	None			0.0000	108.00	No Ice	31.27	31.27	1.51
							1/2" Ice	39.68	39.68	1.93
							Ice	48.09	48.09	2.35
							1" Ice	64.91	64.91	3.19
							2" Ice	98.55	98.55	4.86
(2) LPA-80080/4CF w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	2.86	7.23	0.03	
						1/2" Ice	3.22	7.92	0.08	
						Ice	3.59	8.63	0.13	
						1" Ice	4.45	10.11	0.25	
						2" Ice	6.32	13.34	0.61	
RRH-2X40W-700-MHZ	A	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	3.22	1.93	0.05	
						1/2" Ice	3.46	2.13	0.08	
						Ice	3.71	2.34	0.10	
						1" Ice	4.23	2.78	0.17	
						2" Ice	5.39	3.76	0.35	
RRH2x40-AWS	A	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	2.52	1.59	0.04	
						1/2" Ice	2.75	1.80	0.06	
						Ice	2.99	2.01	0.08	
						1" Ice	3.50	2.46	0.13	
						2" Ice	4.61	3.48	0.28	
LNX-6514DS-AIM w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	8.65	7.08	0.06	
						1/2" Ice	9.31	8.27	0.13	
						Ice	9.93	9.18	0.21	
						1" Ice	11.20	11.02	0.39	
						2" Ice	13.87	15.06	0.90	
(2) 742 213 w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	5.37	4.62	0.05	
						1/2" Ice	5.95	6.00	0.09	
						Ice	6.50	6.98	0.15	
						1" Ice	7.61	8.85	0.28	
						2" Ice	9.93	12.79	0.68	
DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	5.60	2.33	0.04	
						1/2" Ice	5.92	2.56	0.08	
						Ice	6.24	2.79	0.12	
						1" Ice	6.91	3.28	0.21	
						2" Ice	8.37	4.37	0.45	
(2) LPA-80080/4CF w/ Mount Pipe	B	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	2.86	7.23	0.03	
						1/2" Ice	3.22	7.92	0.08	
						Ice	3.59	8.63	0.13	
						1" Ice	4.45	10.11	0.25	
						2" Ice	6.32	13.34	0.61	
RRH-2X40W-700-MHZ	B	From Leg	4.00 0.00 3.00	0.0000	108.00	No Ice	3.22	1.93	0.05	
						1/2" Ice	3.46	2.13	0.08	
						Ice	3.71	2.34	0.10	
						1" Ice	4.23	2.78	0.17	
						2" Ice	5.39	3.76	0.35	

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
						2" Ice	5.39	3.76	0.35
						4" Ice			
RRH2x40-AWS	B	From Leg	4.00	0.0000	108.00	No Ice	2.52	1.59	0.04
			0.00			1/2"	2.75	1.80	0.06
			3.00			Ice	2.99	2.01	0.08
						1" Ice	3.50	2.46	0.13
						2" Ice	4.61	3.48	0.28
						4" Ice			
LNX-6514DS-AIM w/ Mount Pipe	B	From Leg	4.00	0.0000	108.00	No Ice	8.65	7.08	0.06
			0.00			1/2"	9.31	8.27	0.13
			3.00			Ice	9.93	9.18	0.21
						1" Ice	11.20	11.02	0.39
						2" Ice	13.87	15.06	0.90
						4" Ice			
(2) 742 213 w/ Mount Pipe	B	From Leg	4.00	0.0000	108.00	No Ice	5.37	4.62	0.05
			0.00			1/2"	5.95	6.00	0.09
			3.00			Ice	6.50	6.98	0.15
						1" Ice	7.61	8.85	0.28
						2" Ice	9.93	12.79	0.68
						4" Ice			
(2) LPA-80063/4CF w/ Mount Pipe	C	From Leg	4.00	0.0000	108.00	No Ice	7.25	7.26	0.04
			0.00			1/2"	7.72	7.96	0.10
			3.00			Ice	8.20	8.67	0.18
						1" Ice	9.19	10.16	0.34
						2" Ice	11.32	13.39	0.80
						4" Ice			
RRH-2X40W-700-MHZ	C	From Leg	4.00	0.0000	108.00	No Ice	3.22	1.93	0.05
			0.00			1/2"	3.46	2.13	0.08
			3.00			Ice	3.71	2.34	0.10
						1" Ice	4.23	2.78	0.17
						2" Ice	5.39	3.76	0.35
						4" Ice			
RRH2x40-AWS	C	From Leg	4.00	0.0000	108.00	No Ice	2.52	1.59	0.04
			0.00			1/2"	2.75	1.80	0.06
			3.00			Ice	2.99	2.01	0.08
						1" Ice	3.50	2.46	0.13
						2" Ice	4.61	3.48	0.28
						4" Ice			
(2) 742 213 w/ Mount Pipe	C	From Leg	4.00	0.0000	108.00	No Ice	5.37	4.62	0.05
			0.00			1/2"	5.95	6.00	0.09
			3.00			Ice	6.50	6.98	0.15
						1" Ice	7.61	8.85	0.28
						2" Ice	9.93	12.79	0.68
						4" Ice			
LNX-6514DS-AIM w/ Mount Pipe	C	From Leg	4.00	0.0000	108.00	No Ice	8.65	7.08	0.06
			0.00			1/2"	9.31	8.27	0.13
			3.00			Ice	9.93	9.18	0.21
						1" Ice	11.20	11.02	0.39
						2" Ice	13.87	15.06	0.90
						4" Ice			
Platform Mount [LP 713-1]	C	None		0.0000	97.00	No Ice	31.27	31.27	1.51
						1/2"	39.68	39.68	1.93
						Ice	48.09	48.09	2.35
						1" Ice	64.91	64.91	3.19
						2" Ice	98.55	98.55	4.86
						4" Ice			
(3) DB844H90E-XY w/ Mount Pipe	A	From Centroid-Leg	4.00	0.0000	97.00	No Ice	4.01	5.63	0.04
			0.00			1/2"	4.75	6.83	0.09
			0.00			Ice	5.46	7.88	0.14
						1" Ice	6.71	9.65	0.27
						2" Ice	9.38	13.41	0.66
						4" Ice			
(3) DB844H90E-XY w/ Mount Pipe	B	From Centroid-Leg	4.00	0.0000	97.00	No Ice	4.01	5.63	0.04
			0.00			1/2"	4.75	6.83	0.09
			0.00			Ice	5.46	7.88	0.14

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
						1" Ice	6.71	9.65	0.27
						2" Ice	9.38	13.41	0.66
						4" Ice			
(3) DB844H90E-XY w/ Mount Pipe	C	From Centroid-Leg	4.00 0.00 0.00	0.0000	97.00	No Ice	4.01	5.63	0.04
						1/2"	4.75	6.83	0.09
						Ice	5.46	7.88	0.14
						1" Ice	6.71	9.65	0.27
						2" Ice	9.38	13.41	0.66
						4" Ice			
GPS	B	From Centroid-Leg	4.00 0.00 0.00	0.0000	97.00	No Ice	0.05	0.05	0.00
						1/2"	0.09	0.09	0.00
						Ice	0.13	0.13	0.00
						1" Ice	0.25	0.25	0.01
						2" Ice	0.58	0.58	0.03
						4" Ice			
GPS	C	From Centroid-Leg	4.00 0.00 0.00	0.0000	97.00	No Ice	0.05	0.05	0.00
						1/2"	0.09	0.09	0.00
						Ice	0.13	0.13	0.00
						1" Ice	0.25	0.25	0.01
						2" Ice	0.58	0.58	0.03
						4" Ice			
Pipe Mount 6'x2.375"	A	From Centroid-Leg	4.00 0.00 0.00	0.0000	97.00	No Ice	1.43	1.43	0.03
						1/2"	1.92	1.92	0.04
						Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
Pipe Mount 6'x2.375"	B	From Centroid-Leg	4.00 0.00 0.00	0.0000	97.00	No Ice	1.43	1.43	0.03
						1/2"	1.92	1.92	0.04
						Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
Pipe Mount 6'x2.375"	C	From Centroid-Leg	4.00 0.00 0.00	0.0000	97.00	No Ice	1.43	1.43	0.03
						1/2"	1.92	1.92	0.04
						Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
Side Arm Mount [SO 101-3]	C	None		0.0000	86.00	No Ice	7.50	7.50	0.25
						1/2"	8.90	8.90	0.33
						Ice	10.30	10.30	0.41
						1" Ice	13.10	13.10	0.58
						2" Ice	18.70	18.70	0.90
						4" Ice			
LLPX310R w/ Mount Pipe	A	From Face	2.00 0.00 1.00	0.0000	86.00	No Ice	5.28	3.45	0.07
						1/2"	5.73	4.03	0.11
						Ice	6.19	4.62	0.16
						1" Ice	7.13	5.91	0.28
						2" Ice	9.20	8.90	0.62
						4" Ice			
LLPX310R w/ Mount Pipe	B	From Face	2.00 0.00 1.00	0.0000	86.00	No Ice	5.28	3.45	0.07
						1/2"	5.73	4.03	0.11
						Ice	6.19	4.62	0.16
						1" Ice	7.13	5.91	0.28
						2" Ice	9.20	8.90	0.62
						4" Ice			
LLPX310R w/ Mount Pipe	C	From Face	2.00 0.00 1.00	0.0000	86.00	No Ice	5.28	3.45	0.07
						1/2"	5.73	4.03	0.11
						Ice	6.19	4.62	0.16
						1" Ice	7.13	5.91	0.28
						2" Ice	9.20	8.90	0.62
						4" Ice			
WIMAX DAP HEAD	A	From Face	2.00 0.00	0.0000	86.00	No Ice	1.80	0.78	0.03
						1/2"	1.99	0.92	0.04



Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
			1.00			Ice 2.18	1.07	0.06
						1" Ice 2.59	1.39	0.09
						2" Ice 3.51	2.14	0.20
						4" Ice		
WIMAX DAP HEAD	B	From Face	2.00	0.0000	86.00	No Ice 1.80	0.78	0.03
			0.00			1/2" 1.99	0.92	0.04
			1.00			Ice 2.18	1.07	0.06
						1" Ice 2.59	1.39	0.09
						2" Ice 3.51	2.14	0.20
						4" Ice		
WIMAX DAP HEAD	C	From Face	2.00	0.0000	86.00	No Ice 1.80	0.78	0.03
			0.00			1/2" 1.99	0.92	0.04
			1.00			Ice 2.18	1.07	0.06
						1" Ice 2.59	1.39	0.09
						2" Ice 3.51	2.14	0.20
						4" Ice		
HORIZON COMPACT	B	From Face	2.00	0.0000	86.00	No Ice 0.84	0.43	0.01
			0.00			1/2" 0.97	0.52	0.02
			-4.00			Ice 1.10	0.63	0.03
						1" Ice 1.39	0.86	0.05
						2" Ice 2.08	1.43	0.12
						4" Ice		
Pipe Mount 6'x2.375"	A	From Face	4.00	0.0000	86.00	No Ice 1.43	1.43	0.03
			0.00			1/2" 1.92	1.92	0.04
			0.00			Ice 2.29	2.29	0.05
						1" Ice 3.06	3.06	0.09
						2" Ice 4.70	4.70	0.23
						4" Ice		
Pipe Mount 6'x2.375"	B	From Face	4.00	0.0000	86.00	No Ice 1.43	1.43	0.03
			0.00			1/2" 1.92	1.92	0.04
			0.00			Ice 2.29	2.29	0.05
						1" Ice 3.06	3.06	0.09
						2" Ice 4.70	4.70	0.23
						4" Ice		
Pipe Mount 6'x2.375"	C	From Face	4.00	0.0000	86.00	No Ice 1.43	1.43	0.03
			0.00			1/2" 1.92	1.92	0.04
			0.00			Ice 2.29	2.29	0.05
						1" Ice 3.06	3.06	0.09
						2" Ice 4.70	4.70	0.23
						4" Ice		

### Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft <sup>2</sup>	Weight K
A-ANT-18G-2-C	C	Paraboloid w/Shroud (HP)	From Face	2.00	-30.0000		86.00	2.17	No Ice 3.72	0.03
				0.00					1/2" Ice 4.01	0.06
				-4.00					1" Ice 4.31	0.10
									2" Ice 4.94	0.19
									4" Ice 6.34	0.43

### Load Combinations

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

**Maximum Tower Deflections - Service Wind**

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 70	24.692	35	2.0538	0.0030
L2	74 - 34.083	10.910	35	1.4501	0.0005
L3	39 - 0	2.926	35	0.6969	0.0002

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
108.00	Platform Mount [LP 713-1]	35	23.863	2.0233	0.0028	16279
97.00	Platform Mount [LP 713-1]	35	19.355	1.8529	0.0018	6261
86.00	Side Arm Mount [SO 101-3]	35	15.079	1.6715	0.0012	3390
82.00	A-ANT-18G-2-C	35	13.620	1.6009	0.0011	2906

**Maximum Tower Deflections - Design Wind**

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 70	63.006	10	5.2454	0.0082
L2	74 - 34.083	27.864	10	3.7044	0.0013
L3	39 - 0	7.476	10	1.7809	0.0005

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
108.00	Platform Mount [LP 713-1]	10	60.892	5.1674	0.0077	6465
97.00	Platform Mount [LP 713-1]	10	49.399	4.7326	0.0051	2485
86.00	Side Arm Mount [SO 101-3]	10	38.496	4.2696	0.0034	1344
82.00	A-ANT-18G-2-C	10	34.776	4.0896	0.0029	1151

### Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
2.500	12	2.250	124.54 131.21 0.95	127.83 217.81 0.59	44.637 37.500 1.19		Plate	1.19 ✓

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>0</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
L1	110 - 70 (1)	TP25.53x15.53x0.25	40.00	0.00	0.0	39.000	19.545	-7.20	762.27	0.009
L2	70 - 34.083 (2)	TP34.02x24.03x0.313	39.92	0.00	0.0	39.000	32.680	-12.29	1274.52	0.010
L3	34.083 - 0 (3)	TP41.9x32.164x0.344	39.00	0.00	0.0	38.900	45.964	-19.76	1788.00	0.011

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M <sub>x</sub> kip-ft	Actual f <sub>bx</sub> ksi	Allow. F <sub>bx</sub> ksi	Ratio f <sub>bx</sub> /F <sub>bx</sub>	Actual M <sub>y</sub> kip-ft	Actual f <sub>by</sub> ksi	Allow. F <sub>by</sub> ksi	Ratio f <sub>by</sub> /F <sub>by</sub>
L1	110 - 70 (1)	TP25.53x15.53x0.25	345.25	35.794	39.000	0.918	0.00	0.000	39.000	0.000
L2	70 - 34.083 (2)	TP34.02x24.03x0.313	860.60	39.869	39.000	1.022	0.00	0.000	39.000	0.000
L3	34.083 - 0 (3)	TP41.9x32.164x0.344	1573.5 0	40.449	38.900	1.040	0.00	0.000	38.900	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	110 - 70 (1)	TP25.53x15.53x0.25	13.03	0.667	26.000	0.052	0.16	0.008	26.000	0.000
L2	70 - 34.083 (2)	TP34.02x24.03x0.313	16.43	0.503	26.000	0.039	0.19	0.004	26.000	0.000
L3	34.083 - 0 (3)	TP41.9x32.164x0.344	20.15	0.438	26.000	0.034	0.21	0.003	26.000	0.000

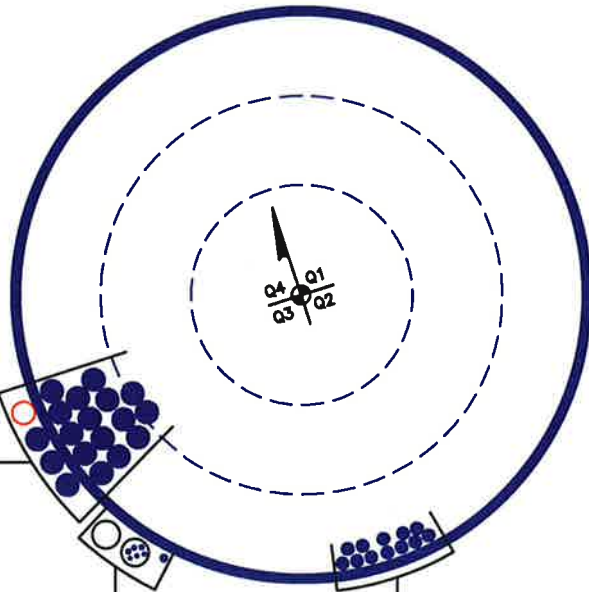
### Pole Interaction Design Data

Section No.	Elevation ft	Ratio P $P_a$	Ratio $f_{bx}$ $F_{bx}$	Ratio $f_{by}$ $F_{by}$	Ratio $f_v$ $F_v$	Ratio $f_{vt}$ $F_{vt}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	110 - 70 (1)	0.009	0.918	0.000	0.052	0.000	0.928	1.333	H1-3+VT ✓
L2	70 - 34.083 (2)	0.010	1.022	0.000	0.039	0.000	1.032	1.333	H1-3+VT ✓
L3	34.083 - 0 (3)	0.011	1.040	0.000	0.034	0.000	1.051	1.333	H1-3+VT ✓

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF \cdot P_{allow}$ K	% Capacity	Pass Fail
L1	110 - 70	Pole	TP25.53x15.53x0.25	1	-7.20	1016.11	69.6	Pass
L2	70 - 34.083	Pole	TP34.02x24.03x0.313	2	-12.29	1698.94	77.4	Pass
L3	34.083 - 0	Pole	TP41.9x32.164x0.344	3	-19.76	2383.40	78.9	Pass
Summary							ELC:	Load Case 5
Pole (L3)							78.9	Pass
Base Plate							89.3	Pass
Rating =							89.3	Pass

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



(PROPOSED)  
(1) 1-5/8" TO 108 FT LEVEL  
(INSTALLED)  
(18) 1-5/8" TO 108 FT LEVEL

(INSTALLED—BUNDLED IN CONDUIT)  
(3) 1/4" TO 86 FT LEVEL  
(3) 5/16" TO 86 FT LEVEL  
(INSTALLED)  
(1) 1/2" TO 86 FT LEVEL

(INSTALLED)  
(12) 7/8" TO 97 FT LEVEL

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

### FOUNDATION REACTION COMPARISON

BU# 806375  
WO# 792737

REACTIONS	DESIGN REACTIONS	CURRENT REACTIONS	% CAPACITY
MOMENT (kip-ft)	1947.4	1574.0	80.8%*
SHEAR (kips)	24.2	20.0	82.6%

\*Although the shear capacity is at 82.6%, the moment reaction is the governing criteria for a monopole drilled pier foundation. Therefore, the overall capacity for this foundation is 80.8%.

Design Loads from CCI Docs 262106