

280 Trumbull Street  
Hartford, CT 06103-3597  
Main (860) 275-8200  
Fax (860) 275-8299  
kbaldwin@rc.com  
Direct (860) 275-8345

Also admitted in Massachusetts

March 21, 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. Cellco now intends to modify its facility by replacing six (6) of its existing antennas with three (3) model 742 213V01, 1900 MHz antennas and three (3) model 742 213V01, 2100 MHz antennas, at the same level on the tower. Cellco also intends to install three (3) remote radio heads (“RRHs”) behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable attached to the outside of the monopole tower. Included in Attachment 1 are specifications for Cellco’s replacement antennas, RRHs and HYBRIFLEX™ cable.

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).



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12794499-v1

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

Melanie A. Bachman

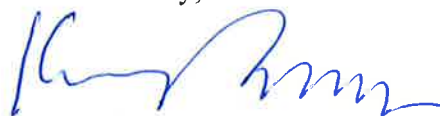
March 21, 2014

Page 2

1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be located on Cellco's existing antenna platform 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 power density table for Cellco's modified facility is included behind Attachment 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support Cellco's proposed modifications. (See Structural Analysis Report included in Attachment 3).

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

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

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



# **ATTACHMENT 1**

# KATHREIN SCALA DIVISION

742 213V01

65° Panel Antenna

Kathrein's X-polarized adjustable electrical downtilt antennas offer the wireless carrier the ability to tailor polarization diversity sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

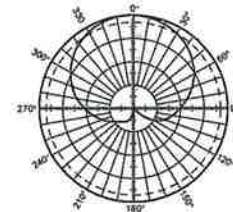
- 0-6° downtilt range.
- UV resistant pulltruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accommodate future 3G / UMTS applications.

### General specifications:

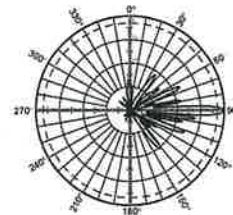
Frequency range	1710–2200 MHz	
VSWR	< 1.5:1	
Impedance	50 ohms	
Intermodulation (2x20w)	IM3: <-150 dBc	
Polarization	+45° and -45°	
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)	
Maximum input power	300 watts per input (at 50°C)	
Electrical downtilt continuously adjustable	0–6 degrees	
Connector	2 x 7-16 DIN female	
Isolation	>30 dB	
Cross polar ratio		
Main direction 0°	25 dB (typical)	
Sector ±60°	>10 dB	
Tracking, average	0.5 dB	
Squint	±2.0°	
Weight	19.8 lb (9 kg) 24.3 lb (11 kg) clamps included	
Dimensions	76.9 x 6.1 x 2.8 inches (1954 x 155 x 70 mm)	
Wind load	at 93 mph (150kph)	
Front/Side/Rear	115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N)	
Mounting category	M (Medium)	
Wind survival rating*	120 mph (200 kph)	
Shipping dimensions	88 x 6.8 x 3.6 inches (2235 x 172 x 92 mm)	
Shipping weight	28.7 lb (13 kg)	
Mounting	Fixed mounts for 2 to 4.6 inch (50 to 115 mm) OD masts are included and tilt options are available.	

See reverse for order information.

Specifications:	1710–1880 MHz				1850–1990 MHz				1920–2200 MHz			
Gain	19 dBi				19.2 dBi				19.5 dBi			
+45° and -45° polarization horizontal beamwidth	67° (half-power)				65° (half-power)				63° (half-power)			
+45° and -45° polarization vertical beamwidth	4.7° (half-power)				4.5° (half-power)				4.3° (half-power)			
Sidelobe suppression for first sidelobe above main beam	0°	2°	4°	6° T	0°	2°	4°	6° T	0°	2°	4°	6° T
	18	18	16	15 dB	18	18	17	16 dB	18	18	18	18 dB



Horizontal pattern  
±45°- polarization



Vertical pattern  
±45°- polarization  
0°–6° electrical downtilt



11271-B  
936.3740/b



\* Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

# KATHREIN SCALA DIVISION

742 213V01

65° Panel Antenna

Kathrein's X-polarized adjustable electrical downtilt antennas offer the wireless carrier the ability to tailor polarization diversity sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

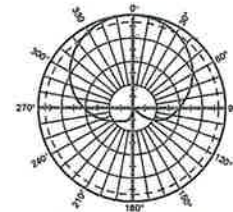
- 0-6° downtilt range.
- UV resistant pultruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accommodate future 3G / UMTS applications.

### General specifications:

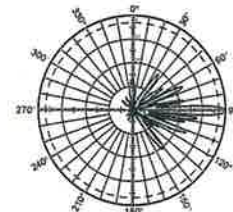
Frequency range	1710–2200 MHz	
VSWR	< 1.5:1	
Impedance	50 ohms	
Intermodulation (2x20w)	IM3: <-150 dBc	
Polarization	+45° and -45°	
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)	
Maximum input power	300 watts per input (at 50°C)	
Electrical downtilt continuously adjustable	0–6 degrees	
Connector	2 x 7-16 DIN female	
Isolation	>30 dB	
Cross polar ratio		
Main direction 0°	25 dB (typical)	
Sector ±60°	>10 dB	
Tracking, average	0.5 dB	
Squint	±2.0°	
Weight	19.8 lb (9 kg) 24.3 lb (11 kg) clamps included	
Dimensions	76.9 x 6.1 x 2.8 inches (1954 x 155 x 70 mm)	
Wind load	at 93 mph (150kph)	
Front/Side/Rear	115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N)	
Mounting category	M (Medium)	
Wind survival rating*	120 mph (200 kph)	
Shipping dimensions	88 x 6.8 x 3.6 inches (2235 x 172 x 92 mm)	
Shipping weight	28.7 lb (13 kg)	
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Sidelobe suppression for first sidelobe above main beam	0°	2°	4°	6° T	0°	2°	4°	6° T	0°	2°	4°	6° T
	18	18	16	15 dB	18	18	17	16 dB	18	18	18	18 dB



Horizontal pattern  
±45°- polarization



Vertical pattern  
±45°- polarization  
0°–6° electrical downtilt

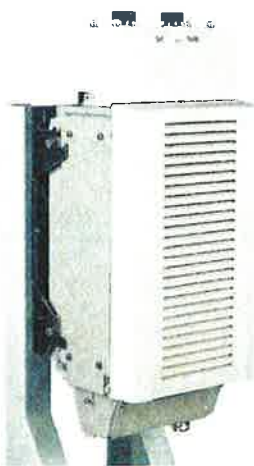


\* Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

## Alcatel-Lucent RRH2x40-AWS

### REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS 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-AWS 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-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

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

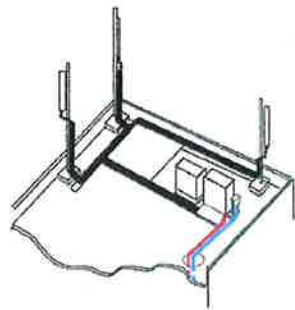
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS 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-AWS 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-AWS is compact and weighs less than 20 kg (44 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

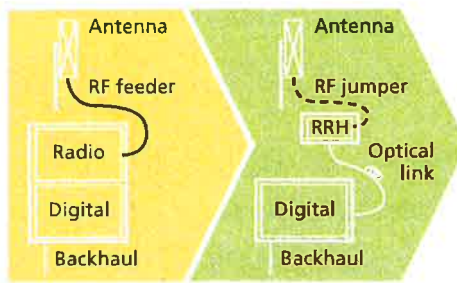
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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-AWS provides more RF power while at the same time consuming less electricity.



Macro

## Features

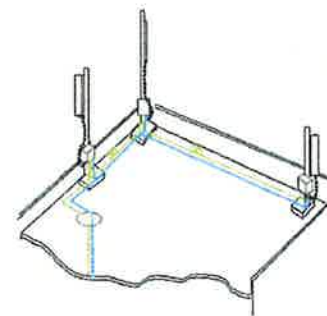
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption



RRH for space-constrained cell sites

## 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



Distributed

## Technical specifications

### Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170 mm (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

### Power

- Power supply: -48VDC

### 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: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - TMA and Remote electrical tilt (RET) support via AISG v2.0

### Optical characteristics

#### Type/number of fibers

- Single-mode variant
  - One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - Single mode dual fiber (SM/DF)
- Multi-mode variant
  - Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

### Optical fiber length

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

### Digital Ports and Alarms

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

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**HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber**

**Product Description**

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

**Features/Benefits**

- Aluminum corrugated armor with outstanding bending characteristics - minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding - Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design - Decreases tower loading
- Robust cabling - Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH - Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable - Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket - Ensures long-lasting cable protection



Figure 1: HYBRIFLEX Series

**Technical Specifications**

<b>Structure</b>			
Outer Conductor Armor	Corrugated Aluminum	(mm (in))	46.5 (1.83)
Jacket	Polyethylene, PE	(mm (in))	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
<b>Mechanical Properties</b>			
Weight, Approximate		(kg/m (lb/ft))	1.9 (1.30)
Minimum Bending Radius, Single Bending		(mm (in))	200 (8)
Minimum Bending Radius, Repeated Bending		(mm (in))	500 (20)
Recommended/Maximum Clamp Spacing		(m (ft))	1.0 / 1.2 (3.25 / 4.0)
<b>Electrical Properties</b>			
DC-Resistance Outer Conductor Armor		(Ω/km (Ω/1000ft))	068 (0.265)
DC-Resistance Power Cable, 8.4mm <sup>2</sup> (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
<b>Optical Properties</b>			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		(μm)	50/125
Primary Coating (Acrylate)		(μm)	245
Buffer Diameter, Nominal		(μm)	900
Secondary Protection, Jacket, Nominal		(mm (in))	2.0 (0.08)
Minimum Bending Radius		(mm (in))	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL34-V0, UL1666 RoHS Compliant
<b>DC Power Cable Properties</b>			
Size (Power)		(mm (AWG))	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		(mm (AWG))	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		(mm (in))	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE 1202/FT4 RoHS Compliant
<b>Environment</b>			
Installation Temperature		(°C (°F))	-40 to +65 (-40 to 149)
Operation Temperature		(°C (°F))	-40 to +65 (-40 to 149)

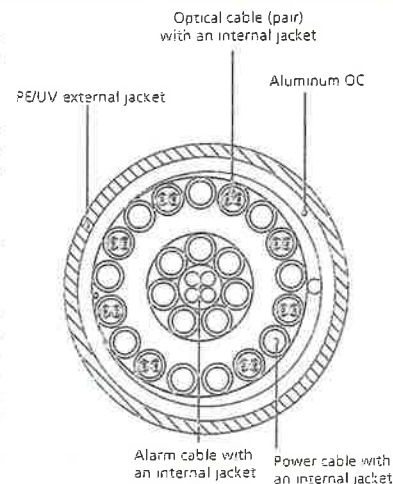


Figure 2: Construction Detail

All information contained in the present datasheet is subject to confirmation at time of ordering

\* This data is provisional and subject to change



# **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%		
Verizon	11	458	111	0.1470	1970	1.0000	14.70%		
Verizon	9	415	111	0.1090	869	0.5793	18.82%		
Verizon	1	1750	111	0.0511	2145	1.0000	5.11%		
Verizon	1	1050	111	0.0306	698	0.4653	6.59%		
									53.50%
* Source: Siting Council									

# **ATTACHMENT 3**

Date: **January 10, 2014**

Sean Dempsey  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277  
(704) 405-6565



GPD Group  
520 South Main Street, Suite 2531  
Akron, OH 44311  
(614) 859-1607  
dpalkovic@gpdgroup.com

**Subject:** **Structural Analysis Report**

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

**Crown Castle Designation:** **Crown Castle BU Number:** 806375  
**Crown Castle Site Name:** HRT 095 943237  
**Crown Castle JDE Job Number:** 255390  
**Crown Castle Work Order Number:** 696974  
**Crown Castle Application Number:** 210376 Rev. 1

**Engineering Firm Designation:** **GPD Group Project Number:** 2014777.806375.01

**Site Data:** **190 Burnham St, South Windsor, CT 06074, Hartford County**  
**Latitude 41° 48' 0.49", Longitude -72° 36' 57.15"**  
**110 Foot – Valmont Monopole Tower**

Dear Mr. Sean Dempsey,

GPD 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 607743, in accordance with application 210376, 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:

LC5: Existing + 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 based upon a wind speed of 80 mph fastest mile.

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

Respectfully submitted by:



John N. Kabak, P.E.  
Connecticut#: PEN.0028336

1/10/2014

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- 3.1) Analysis Method
- 3.2) Assumptions

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- Table 6 – Tower Components vs. Capacity
- 4.1) Recommendations

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- tnxTower Output

### 6) APPENDIX B

- Base Level Drawing

### 7) APPENDIX C

- Additional Calculations

## 1) INTRODUCTION

The existing monopole has three major sections connected by slip joints. It has 12 sides and is evenly tapered from 41.9" (flat-flat) at the base to 15.53" (flat-flat) at the top. The structure is galvanized and has no tower lighting.

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 1.0 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	RRH2x40-AWS	1	1-5/8	1
		6	Kathrein	742 213			
		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	6	Decibel	DB948F85T2E-M	18	1-5/8	1
		1	Antel	BXA-70063/6CFx2			
		2	Antel	BXA-70063/6CFx6			
		2	Antel	LPA-80063/4CF			
		4	Antel	LPA-80080/4CF			
	108.0	1		Platform Mount [LP 713-1]			
97.0	97.0	1		Platform Mount [LP 713-1]	12	7/8	
		9	Decibel	DB844H90E-XY			
		2	GPS	GPS			
86.0	87.0	3	Argus Technologies	LLPX310R	3 3 1	5/16 1/4 1/2	
		3	Samsung Telecommunications	WIMAX DAP HEAD			
	86.0	1		Side Arm Mount [SO 101-3]			
	82.0	1	Dragonwave	A-ANT-18G-2-C			
		1	Dragonwave	HORIZON COMPACT			

Notes:

- 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		LP Platform		
		4		PD10017		
94	94	1		LP Platform		
		12		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 cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
- 5) Mount sizes, weights, and manufacturers are best estimates based on site photos provided and were determined without the benefit of a site visit by GPD.
- 6) All member connections and foundation steel reinforcing are assumed designed to meet or exceed the load carrying capacity of the connected member and surrounding soils respectively unless otherwise specified in this report.
- 7) All equipment model numbers, quantities, and centerline elevations are as provided in the CCI CAD package dated 1/3/2014 with any adjustments as noted below.

This analysis may be affected if any assumptions are not valid or have been made in error. GPD 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	-7.04	1016.11	66.5	Pass
L2	70 - 34.083	Pole	TP34.02x24.03x0.313	2	-12.11	1698.94	74.7	Pass
L3	34.083 - 0	Pole	TP41.9x32.164x0.344	3	-19.55	2383.40	76.5	Pass
						Summary	ELC:	Load Case 5
						Pole (L3)	76.5	Pass
						Rating =	76.5	Pass

**Table 6 - Tower Component Stresses vs. Capacity – LC5**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	62.0	Pass
1	Base Plate	0	44.5	Pass
1, 2	Base Foundation	0	81.6	Pass

<b>Structure Rating (max from all components) =</b>	<b>81.6%</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 foundation are sufficient for the proposed loading and do not require modifications.

## 5) DISCLAIMER OF WARRANTIES

GPD GROUP has not performed a site visit to the tower to verify the member sizes or antenna/coax loading. If the existing conditions are not as represented on the tower elevation contained in this report, we should be contacted immediately to evaluate the significance of the discrepancy. This is not a condition assessment of the tower or foundation. This report does not replace a full tower inspection. The tower and foundations are assumed to have been properly fabricated, erected, maintained, in good condition, twist free, and plumb.

The engineering services rendered by GPD GROUP in connection with this Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. All tower components have been assumed to only resist dead loads when no other loads are applied. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

GPD GROUP does not analyze the fabrication of the structure (including welding). It is not possible to have all the very detailed information needed to perform a thorough analysis of every structural sub-component and connection of an existing tower. GPD GROUP provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc. The purpose of this report is to assess the feasibility of adding appurtenances usually accompanied by transmission lines to the structure.

It is the owner's responsibility to determine the amount of ice accumulation in excess of the code specified amount, if any, that should be considered in the structural analysis.

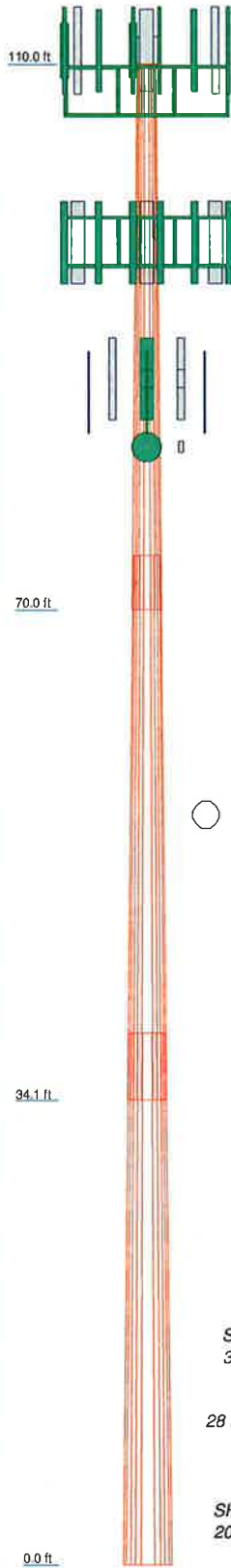
The attached sketches are a schematic representation of the analyzed tower. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions, proper fit, and clearance in the field. Any mentions of structural modifications are reasonable estimates and should not be used as a precise construction document. Precise modification drawings are obtainable from GPD GROUP, but are beyond the scope of this report.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

GPD GROUP makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD GROUP will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of GPD GROUP pursuant to this report will be limited to the total fee received for preparation of this report.

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

Section	1	2	3	
Length (ft)	40.00	39.92	39.00	
Number of Slides	12	12	12	
Thickness (in)	0.250	0.313	0.344	
Socket Length (ft)	4.00	4.92		
Top Dia (in)	15.530	24.090	32.164	
Bot Dia (in)	25.530	34.020	41.900	
Grade		A572-65		
Weight (K)	2.2	3.9	5.4	11.5



### DESIGNED APPURTENANCE LOADING

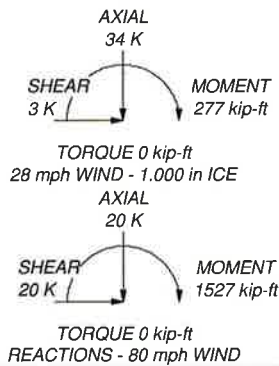
TYPE	ELEVATION	TYPE	ELEVATION
Platform Mount [LP 713-1]	108	GPS	97
BXA-70063/6CFx2 w/ Mount Pipe	108	GPS	97
BXA-70063/6CFx6 w/ Mount Pipe	108	Pipe Mount 6"x2.375"	97
BXA-70063/6CFx6 w/ Mount Pipe	108	Pipe Mount 6"x2.375"	97
(2) LPA-80080/4CF w/ Mount Pipe	108	Pipe Mount 6"x2.375"	97
(2) LPA-80080/4CF w/ Mount Pipe	108	Side Arm Mount [SO 101-3]	86
(2) LPA-80063/4CF w/ Mount Pipe	108	LLPX310R w/ Mount Pipe	86
(2) 742 213 w/ Mount Pipe	108	LLPX310R w/ Mount Pipe	86
(2) 742 213 w/ Mount Pipe	108	LLPX310R w/ Mount Pipe	86
(2) 742 213 w/ Mount Pipe	108	WIMAX DAP HEAD	86
RRH2x40-AWS	108	WIMAX DAP HEAD	86
RRH2x40-AWS	108	WIMAX DAP HEAD	86
RRH2x40-AWS	108	HORIZON COMPACT	86
DB-T1-6Z-6AB-0Z	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	Pipe Mount 6"x2.375"	86
(3) DB844H90E-XY w/ Mount Pipe	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 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 76.5%



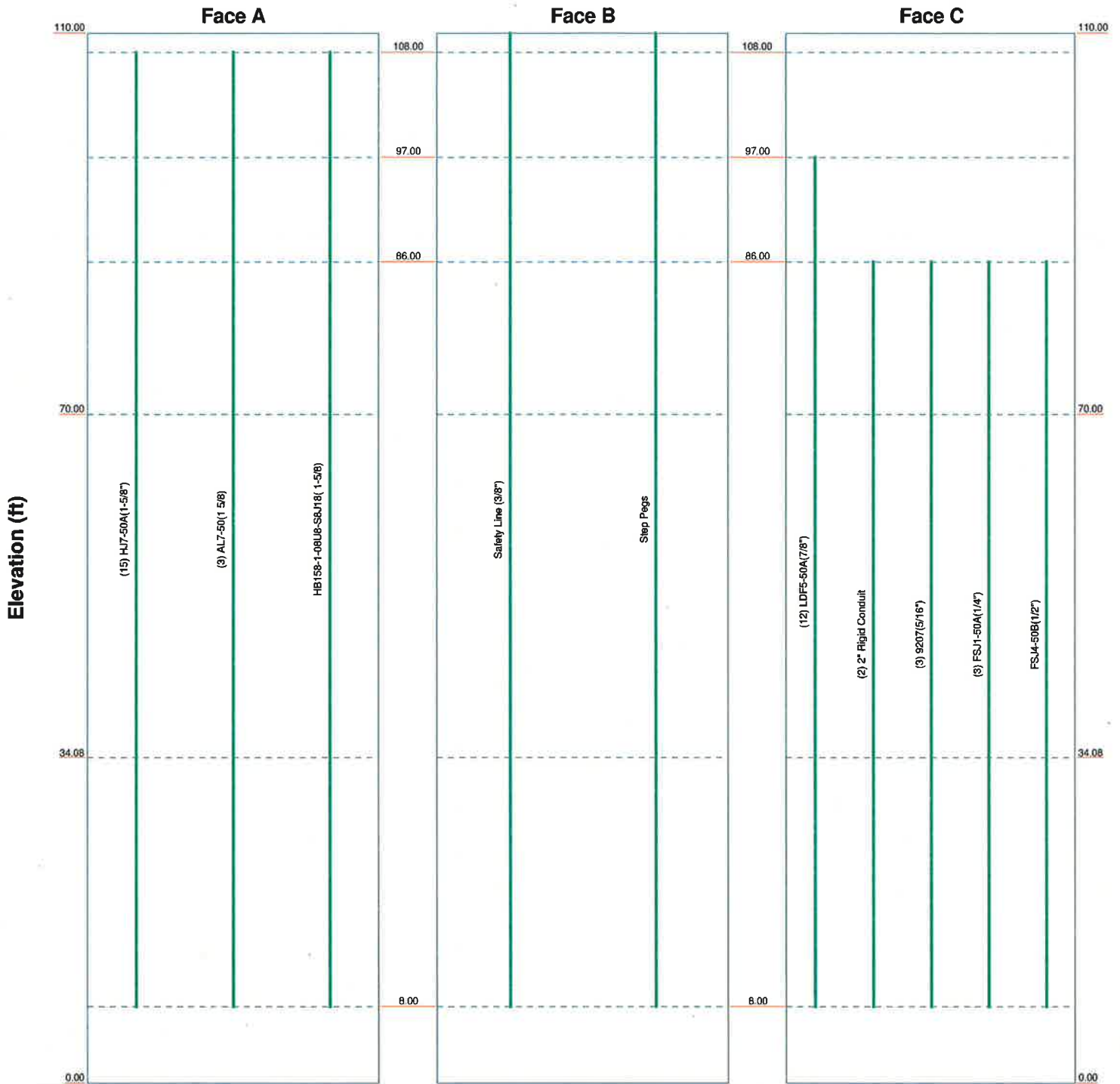
**GPD Group**  
 520 South Main Street, Suite 2531  
 Akron, OH 44311  
 Phone: (330) 573-2100  
 FAX: (330) 573-2101


Job: <b>HRT 095 943237 - BU#: 806375</b>			
Project: <b>2014777.806375.01</b>			
Client: <b>Crown Castle USA, Inc.</b>	Drawn by: <b>jhuffine</b>	App'd:	
Code: <b>TIA/EIA-222-F</b>	Date: <b>01/10/14</b>	Scale: <b>NTS</b>	
Path: <b>T:\Crown\806375\01\TNX\806375.rvt</b>			Dwg No. <b>E-1</b>

# Feed Line Distribution Chart

## 0' - 110'

— Round   
 — Flat   
 — App In Face   
 — App Out Face   
 — Truss Leg



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	Client: <b>Crown Castle USA, Inc.</b>		Code: <b>TIA/EIA-222-F</b>	
	Path: <b>T:\Crown\806375\01\TDX\806375.dwg</b>			

<b>tnxTower</b>  <b>GPD Group</b> 520 South Main Street, Suite 2531 Akron, OH 44311 Phone: (330) 573-2100 FAX: (330) 573-2101	<b>Job</b> HRT 095 943237 - BU#: 806375	<b>Page</b> 1 of 8
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	<b>Client</b> Crown Castle USA, Inc.	<b>Designed by</b> jhuffine

## Tower Input Data

There is a pole section.

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

The following design criteria apply:

Tower is located in Hartford County, Connecticut.

Basic wind speed of 80 mph.

Nominal ice thickness of 1.000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 28 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

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

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feed line 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	Use TIA-222-G Tension Splice Capacity	
	Exemption	

## 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	12.300	366.566	5.470	8.045	45.567	742.762	6.054	3.492	13.968

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	<b>Client</b> Crown Castle USA, Inc.	<b>Designed by</b> jhuffine

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	26.431	20.350	1660.019	9.050	13.225	125.526	3363.648	10.016	6.172	24.688
	25.914	23.866	1713.557	8.491	12.448	137.662	3472.131	11.746	5.603	17.928
L3	35.220	33.918	4918.939	12.067	17.622	279.131	9967.105	16.693	8.280	26.496
	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>f</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
ft	ft <sup>2</sup>	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		

### 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> ft <sup>2</sup> /ft	Weight plf
HJ7-50A(1-5/8")	A	No	Inside Pole	108.00 - 8.00	15	No Ice	1.04
						1/2" Ice	1.04
						1" Ice	1.04
						2" Ice	1.04
						4" Ice	1.04
AL7-50(1 5/8)	A	No	CaAa (Out Of Face)	108.00 - 8.00	3	No Ice	0.52
						1/2" Ice	2.02
						1" Ice	4.14
						2" Ice	10.20
						4" Ice	29.65
HB158-1-08U8-S8J18(1-5/8)	A	No	CaAa (Out Of Face)	108.00 - 8.00	1	No Ice	1.30
						1/2" Ice	2.81
						1" Ice	4.94
						2" Ice	11.02
						4" Ice	30.52
Safety Line (3/8")	B	No	CaAa (Out Of Face)	110.00 - 8.00	1	No Ice	0.22
						1/2" Ice	0.75
						1" Ice	1.28
						2" Ice	2.34
						4" Ice	4.46
Step Pegs	B	No	CaAa (Out Of Face)	110.00 - 8.00	1	No Ice	2.72
						1/2" Ice	3.51
						1" Ice	4.92
						2" Ice	9.56
						4" Ice	26.18
LDF5-50A(7/8")	C	No	Inside Pole	97.00 - 8.00	12	No Ice	0.33
						1/2" Ice	0.33
						1" Ice	0.33
						2" Ice	0.33
						4" Ice	0.33
2" Rigid Conduit	C	No	CaAa (Out Of Face)	86.00 - 8.00	2	No Ice	2.80
						1/2" Ice	4.33
						1" Ice	6.47
						2" Ice	12.57
						4" Ice	32.12
9207(5/16")	C	No	CaAa (Out Of Face)	86.00 - 8.00	3	No Ice	0.60
						1/2" Ice	1.11
						1" Ice	2.22

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>AA</sub>		Weight plf
						ft <sup>2</sup> /ft	plf	
FSJ1-50A(1/4")	C	No	CaAa (Out Of Face)	86.00 - 8.00	3	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
						1" Ice	0.00	1.62
FSJ4-50B(1/2")	C	No	CaAa (Out Of Face)	86.00 - 8.00	1	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
						2" Ice	0.00	6.30
						4" Ice	0.00	22.23

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement ft	C <sub>AA</sub>		Weight K	
			Horz ft	Lateral ft			Front ft <sup>2</sup>	Side ft <sup>2</sup>		
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
							1" Ice	48.09	48.09	2.35
							2" Ice	64.91	64.91	3.19
							4" Ice	98.55	98.55	4.86
BXA-70063/6CFx2 w/ Mount Pipe	A	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	8.00	5.42	0.04
							1/2" Ice	8.65	6.59	0.10
							1" Ice	9.26	7.46	0.17
							2" Ice	10.51	9.25	0.33
							4" Ice	13.14	13.02	0.79
BXA-70063/6CFx6 w/ Mount Pipe	B	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	8.00	5.42	0.04
							1/2" Ice	8.65	6.59	0.10
							1" Ice	9.26	7.46	0.17
							2" Ice	10.51	9.25	0.33
							4" Ice	13.14	13.02	0.79
BXA-70063/6CFx6 w/ Mount Pipe	C	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	8.00	5.42	0.04
							1/2" Ice	8.65	6.59	0.10
							1" Ice	9.26	7.46	0.17
							2" Ice	10.51	9.25	0.33
							4" Ice	13.14	13.02	0.79
(2) LPA-80080/4CF w/ Mount Pipe	A	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	2.86	7.23	0.03
							1/2" Ice	3.22	7.92	0.08
							1" Ice	3.59	8.63	0.13
							2" Ice	4.45	10.11	0.25
							4" Ice	6.32	13.34	0.61
(2) LPA-80080/4CF w/ Mount Pipe	B	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	2.86	7.23	0.03
							1/2" Ice	3.22	7.92	0.08
							1" Ice	3.59	8.63	0.13
							2" Ice	4.45	10.11	0.25
							4" Ice	6.32	13.34	0.61
(2) LPA-80063/4CF w/ Mount Pipe	C	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	7.26	7.27	0.04
							1/2" Ice	7.73	7.98	0.10
							1" Ice	8.22	8.69	0.18
							2" Ice	9.22	10.18	0.34
							4" Ice	11.36	13.42	0.80
(2) 742 213 w/ Mount Pipe	A	From Centroid-LEG	4.00	0.00	0.0000	108.00	No Ice	5.52	4.77	0.05
							1/2" Ice	6.16	6.21	0.10



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	<b>Client</b>	Crown Castle USA, Inc.	<b>Designed by</b>	jhuffine

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
		g	3.00			1" Ice 6.78	7.35	0.15
						2" Ice 7.97	9.29	0.29
						4" Ice 10.45	13.37	0.71
(2) 742 213 w/ Mount Pipe	B	From Centroid-Le	4.00 0.00	0.0000	108.00	No Ice 5.52	4.77	0.05
		g	3.00			1/2" Ice 6.16	6.21	0.10
						1" Ice 6.78	7.35	0.15
						2" Ice 7.97	9.29	0.29
						4" Ice 10.45	13.37	0.71
(2) 742 213 w/ Mount Pipe	C	From Centroid-Le	4.00 0.00	0.0000	108.00	No Ice 5.52	4.77	0.05
		g	3.00			1/2" Ice 6.16	6.21	0.10
						1" Ice 6.78	7.35	0.15
						2" Ice 7.97	9.29	0.29
						4" Ice 10.45	13.37	0.71
RRH2x40-AWS	A	From Centroid-Le	4.00 0.00	0.0000	108.00	No Ice 2.51	1.66	0.04
		g	3.00			1/2" Ice 2.75	1.87	0.06
						1" Ice 2.99	2.08	0.08
						2" Ice 3.49	2.54	0.13
						4" Ice 4.61	3.57	0.28
RRH2x40-AWS	B	From Centroid-Le	4.00 0.00	0.0000	108.00	No Ice 2.51	1.66	0.04
		g	3.00			1/2" Ice 2.75	1.87	0.06
						1" Ice 2.99	2.08	0.08
						2" Ice 3.49	2.54	0.13
						4" Ice 4.61	3.57	0.28
RRH2x40-AWS	C	From Centroid-Le	4.00 0.00	0.0000	108.00	No Ice 2.51	1.66	0.04
		g	3.00			1/2" Ice 2.75	1.87	0.06
						1" Ice 2.99	2.08	0.08
						2" Ice 3.49	2.54	0.13
						4" Ice 4.61	3.57	0.28
DB-T1-6Z-8AB-OZ	A	From Centroid-Le	4.00 0.00	0.0000	108.00	No Ice 5.60	2.33	0.04
		g	3.00			1/2" Ice 5.92	2.56	0.08
						1" Ice 6.24	2.79	0.12
						2" Ice 6.91	3.28	0.21
						4" Ice 8.37	4.37	0.45
Platform Mount [LP 713-1]	C	None		0.0000	97.00	No Ice 31.27	31.27	1.51
						1/2" Ice 39.68	39.68	1.93
						1" Ice 48.09	48.09	2.35
						2" Ice 64.91	64.91	3.19
						4" Ice 98.55	98.55	4.86
(3) DB844H90E-XY w/ Mount Pipe	A	From Centroid-Le	4.00 0.00 0.00	0.0000	97.00	No Ice 4.01	5.63	0.04
		g				1/2" Ice 4.75	6.83	0.09
						1" Ice 5.46	7.88	0.14
						2" Ice 6.71	9.65	0.27
						4" Ice 9.38	13.41	0.66
(3) DB844H90E-XY w/ Mount Pipe	B	From Centroid-Le	4.00 0.00 0.00	0.0000	97.00	No Ice 4.01	5.63	0.04
		g				1/2" Ice 4.75	6.83	0.09
						1" Ice 5.46	7.88	0.14
						2" Ice 6.71	9.65	0.27
						4" Ice 9.38	13.41	0.66
(3) DB844H90E-XY w/ Mount Pipe	C	From Centroid-Le	4.00 0.00 0.00	0.0000	97.00	No Ice 4.01	5.63	0.04
		g				1/2" Ice 4.75	6.83	0.09
						1" Ice 5.46	7.88	0.14
						2" Ice 6.71	9.65	0.27
						4" Ice 9.38	13.41	0.66
GPS	B	From Centroid-Le	4.00 0.00 0.00	0.0000	97.00	No Ice 0.05	0.05	0.00
		g				1/2" Ice 0.09	0.09	0.00
						1" Ice 0.13	0.13	0.00
						2" Ice 0.25	0.25	0.01

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	<b>Client</b>	Crown Castle USA, Inc.	<b>Designed by</b>	jhuffine

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight	
			Horz	Lateral						ft
GPS	C	From Centroid-Le g	4.00	0.00	0.0000	97.00	4" Ice	0.58	0.58	0.03
							No Ice	0.05	0.05	0.00
							1/2" Ice	0.09	0.09	0.00
							1" Ice	0.13	0.13	0.00
							2" Ice	0.25	0.25	0.01
Pipe Mount 6'x2.375"	A	From Centroid-Le g	4.00	0.00	0.0000	97.00	4" Ice	0.58	0.58	0.03
							No Ice	1.43	1.43	0.03
							1/2" Ice	1.92	1.92	0.04
							1" Ice	2.29	2.29	0.05
							2" Ice	3.06	3.06	0.09
Pipe Mount 6'x2.375"	B	From Centroid-Le g	4.00	0.00	0.0000	97.00	4" Ice	4.70	4.70	0.23
							No Ice	1.43	1.43	0.03
							1/2" Ice	1.92	1.92	0.04
							1" Ice	2.29	2.29	0.05
							2" Ice	3.06	3.06	0.09
Pipe Mount 6'x2.375"	C	From Centroid-Le g	4.00	0.00	0.0000	97.00	4" Ice	4.70	4.70	0.23
							No Ice	1.43	1.43	0.03
							1/2" Ice	1.92	1.92	0.04
							1" Ice	2.29	2.29	0.05
							2" Ice	3.06	3.06	0.09
Side Arm Mount [SO 101-3]	C	None			0.0000	86.00	4" Ice	4.70	4.70	0.23
							No Ice	7.50	7.50	0.25
							1/2" Ice	8.90	8.90	0.33
							1" Ice	10.30	10.30	0.41
							2" Ice	13.10	13.10	0.58
LLPX310R w/ Mount Pipe	A	From Face	2.00	0.00	0.0000	86.00	4" Ice	18.70	18.70	0.90
							No Ice	5.28	3.45	0.07
							1/2" Ice	5.73	4.03	0.11
							1" Ice	6.19	4.62	0.16
							2" Ice	7.13	5.91	0.28
LLPX310R w/ Mount Pipe	B	From Face	2.00	0.00	0.0000	86.00	4" Ice	9.20	8.90	0.62
							No Ice	5.28	3.45	0.07
							1/2" Ice	5.73	4.03	0.11
							1" Ice	6.19	4.62	0.16
							2" Ice	7.13	5.91	0.28
LLPX310R w/ Mount Pipe	C	From Face	2.00	0.00	0.0000	86.00	4" Ice	9.20	8.90	0.62
							No Ice	5.28	3.45	0.07
							1/2" Ice	5.73	4.03	0.11
							1" Ice	6.19	4.62	0.16
							2" Ice	7.13	5.91	0.28
WIMAX DAP HEAD	A	From Face	2.00	0.00	0.0000	86.00	4" Ice	9.20	8.90	0.62
							No Ice	1.80	0.78	0.03
							1/2" Ice	1.99	0.92	0.04
							1" Ice	2.18	1.07	0.06
							2" Ice	2.59	1.39	0.09
WIMAX DAP HEAD	B	From Face	2.00	0.00	0.0000	86.00	4" Ice	3.51	2.14	0.20
							No Ice	1.80	0.78	0.03
							1/2" Ice	1.99	0.92	0.04
							1" Ice	2.18	1.07	0.06
							2" Ice	2.59	1.39	0.09
WIMAX DAP HEAD	C	From Face	2.00	0.00	0.0000	86.00	4" Ice	3.51	2.14	0.20
							No Ice	1.80	0.78	0.03
							1/2" Ice	1.99	0.92	0.04
							1" Ice	2.18	1.07	0.06
							2" Ice	2.59	1.39	0.09
HORIZON COMPACT	B	From Face	2.00		0.0000	86.00	4" Ice	3.51	2.14	0.20
							No Ice	0.84	0.43	0.01

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	<b>Client</b>	Crown Castle USA, Inc.	<b>Designed by</b>	jhuffine

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
Pipe Mount 6'x2.375"	A	From Face	0.00	0.0000	86.00	1/2" Ice	0.97	0.52	0.02
			-4.00			1" Ice	1.10	0.63	0.03
						2" Ice	1.39	0.86	0.05
						4" Ice	2.08	1.43	0.12
			4.00			No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
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" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
			4.00			No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
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" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
			4.00			No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
	4" Ice	4.70	4.70	0.23					

### 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

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 70	23.776	35	1.9664	0.0024
L2	74 - 34.083	10.543	35	1.3976	0.0005
L3	39 - 0	2.833	35	0.6743	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	22.981	1.9379	0.0022	17155
97.00	Platform Mount [LP 713-1]	35	18.655	1.7783	0.0016	6598
86.00	Side Arm Mount [SO 101-3]	35	14.550	1.6075	0.0011	3573

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Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
82.00	A-ANT-18G-2-C	35	13.149	1.5409	0.0010	3062

### Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	110 - 70	60.682	10	5.0230	0.0068
L2	74 - 34.083	26.929	10	3.5708	0.0011
L3	39 - 0	7.242	10	1.7234	0.0005

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

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
108.00	Platform Mount [LP 713-1]	10	58.653	4.9501	0.0063	6805
97.00	Platform Mount [LP 713-1]	10	47.623	4.5427	0.0043	2616
86.00	Side Arm Mount [SO 101-3]	10	37.153	4.1069	0.0030	1415
82.00	A-ANT-18G-2-C	10	33.578	3.9366	0.0026	1212

### Compression Checks

### Pole Design Data

Section No.	Elevation	Size	L	L <sub>u</sub>	Kl/r	F <sub>a</sub>	A	Actual P	Allow. P <sub>a</sub>	Ratio P
	ft		ft	ft		ksi	in <sup>2</sup>	K	K	P <sub>a</sub>
L1	110 - 70 (1)	TP25.53x15.53x0.25	40.00	0.00	0.0	39.000	19.545	-7.04	762.27	0.009
L2	70 - 34.083 (2)	TP34.02x24.03x0.313	39.92	0.00	0.0	39.000	32.680	-12.11	1274.52	0.009
L3	34.083 - 0 (3)	TP41.9x32.164x0.344	39.00	0.00	0.0	38.900	45.964	-19.55	1788.00	0.011

### Pole Bending Design Data

Section No.	Elevation	Size	Actual M <sub>x</sub>	Actual f <sub>bx</sub>	Allow. F <sub>bx</sub>	Ratio f <sub>bx</sub> /F <sub>bx</sub>	Actual M <sub>y</sub>	Actual f <sub>by</sub>	Allow. F <sub>by</sub>	Ratio f <sub>by</sub> /F <sub>by</sub>
	ft		kip-ft	ksi	ksi		kip-ft	ksi	ksi	
L1	110 - 70 (1)	TP25.53x15.53x0.25	329.49	34.161	39.000	0.876	0.00	0.000	39.000	0.000
L2	70 - 34.083 (2)	TP34.02x24.03x0.313	830.02	38.452	39.000	0.986	0.00	0.000	39.000	0.000
L3	34.083 - 0 (3)	TP41.9x32.164x0.344	1526.95	39.252	38.900	1.009	0.00	0.000	38.900	0.000

### Pole Shear Design Data

Section No.	Elevation	Size	Actual V	Actual f <sub>v</sub>	Allow. F <sub>v</sub>	Ratio f <sub>v</sub> /F <sub>v</sub>	Actual T	Actual f <sub>vt</sub>	Allow. F <sub>vt</sub>	Ratio f <sub>vt</sub> /F <sub>vt</sub>
	ft		K	ksi	ksi		kip-ft	ksi	ksi	
L1	110 - 70 (1)	TP25.53x15.53x0.25	12.60	0.645	26.000	0.050	0.11	0.005	26.000	0.000
L2	70 - 34.083 (2)	TP34.02x24.03x0.313	16.02	0.490	26.000	0.038	0.13	0.003	26.000	0.000

<b>tnxTower</b>  <b>GPD Group</b> 520 South Main Street, Suite 2531 Akron, OH 44311 Phone: (330) 573-2100 FAX: (330) 573-2101	<b>Job</b>	HRT 095 943237 - BU#: 806375	<b>Page</b>	8 of 8
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	<b>Client</b>	Crown Castle USA, Inc.	<b>Designed by</b>	jhuffine

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio f <sub>v</sub> / F <sub>v</sub>	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio f <sub>vt</sub> / F <sub>vt</sub>
L3	34.083 - 0 (3)	TP41.9x32.164x0.344	19.75	0.430	26.000	0.034	0.16	0.002	26.000	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio P P <sub>a</sub>	Ratio f <sub>bx</sub> F <sub>bx</sub>	Ratio f <sub>by</sub> F <sub>by</sub>	Ratio f <sub>v</sub> F <sub>v</sub>	Ratio f <sub>vt</sub> F <sub>vt</sub>	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	110 - 70 (1)	0.009	0.876	0.000	0.050	0.000	0.886 ✓	1.333	H1-3+VT ✓
L2	70 - 34.083 (2)	0.009	0.986	0.000	0.038	0.000	0.996 ✓	1.333	H1-3+VT ✓
L3	34.083 - 0 (3)	0.011	1.009	0.000	0.034	0.000	1.020 ✓	1.333	H1-3+VT ✓

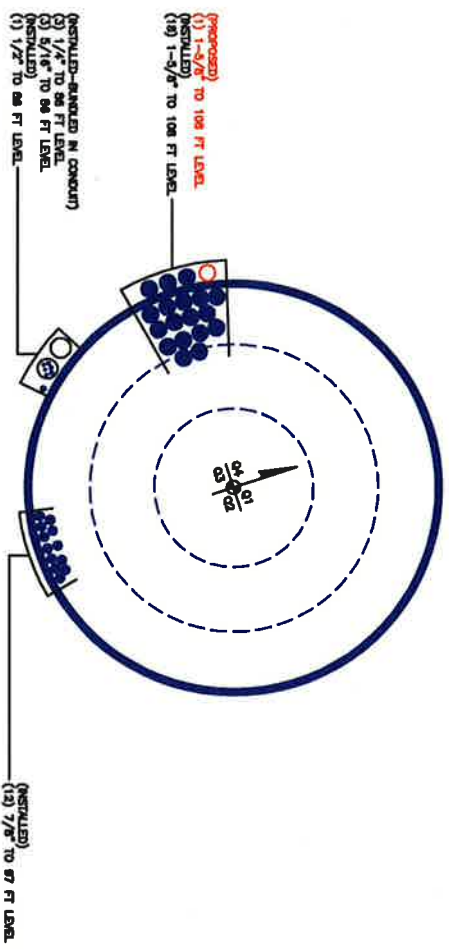
### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
L1	110 - 70	Pole	TP25.53x15.53x0.25	1	-7.04	1016.11	66.5	Pass
L2	70 - 34.083	Pole	TP34.02x24.03x0.313	2	-12.11	1698.94	74.7	Pass
L3	34.083 - 0	Pole	TP41.9x32.164x0.344	3	-19.55	2383.40	76.5	Pass
<b>Summary</b>							<b>ELC:</b>	<b>Load Case 5</b>
Pole (L3)							76.5	Pass
Rating =							76.5	Pass

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



CROWN REGION ADDRESS  
USA



(Proposed)  
 (1) 1-3/8" TO 108 FT LEVEL  
 (INSTALLED)  
 (18) 1-3/8" TO 108 FT LEVEL

(INSTALLED)  
 (12) 7/8" TO 87 FT LEVEL

(INSTALLED - RANGED IN CONDUIT)  
 (2) 1/4" TO 88 FT LEVEL  
 (2) 1/4" TO 88 FT LEVEL  
 (INSTALLED)  
 (1) 1/2" TO 88 FT LEVEL

MANAGER LARRY BOGGS TOWER IN CAMPBELL

DRAWN BY: NOMING  
 CHECKED BY:  
 APPROVED BY:  
 DRAWING DATE: 2/14/08

SITE NUMBER: \_\_\_\_\_  
 SITE NAME: \_\_\_\_\_  
 SITE VALUE: \_\_\_\_\_  
 HRT 095  
 BUSINESS UNIT NUMBER: \_\_\_\_\_  
 404375  
 SITE ADDRESS: \_\_\_\_\_  
 100 BURNHAM STREET  
 SOUTH WINDSOR, CT 06074  
 USA  
 SHEET TITLE: \_\_\_\_\_  
 BASE LEVEL: \_\_\_\_\_  
 SHEET NUMBER: \_\_\_\_\_

BASE LEVEL DRAWING

SHEET NUMBER 1

A1-0

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



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

## TIA Rev F

### Site Data

BU#: 806375
Site Name: HRT 095 943237
App #: 210376 Rev. 1
Pole Manufacturer: <i>Other</i>

Reactions		
Moment:	1527	ft-kips
Axial:	20	kips
Shear:	20	kips

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	49.88	in

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

### Anchor Rod Results

Maximum Rod Tension: 120.8 Kips  
 Allowable Tension: 195.0 Kips  
 Anchor Rod Stress Ratio: 62.0% **Pass**

Rigid
Service, ASD
Fty*ASIF

Plate Data		
Diam:	55.88	in
Thick:	2.5	in
Grade:	60	ksi
Single-Rod B-eff:	11.23	in

### Base Plate Results

Base Plate Stress: 26.7 ksi  
 Allowable Plate Stress: 60.0 ksi  
 Base Plate Stress Ratio: 44.5% **Pass**

Flexural Check

Rigid
Service ASD
0.75*Fy*ASIF
Y.L. Length: 27.06

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

n/a

### Stiffener Results

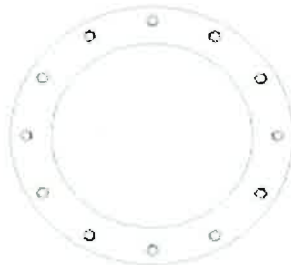
Horizontal Weld : n/a  
 Vertical Weld: n/a  
 Plate Flex+Shear, fb/Fb+(fv/Fv)^2: n/a  
 Plate Tension+Shear, ft/Ft+(fv/Fv)^2: n/a  
 Plate Comp. (AISC Bracket): n/a

### Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Diam:	41.9	in
Thick:	0.34375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	



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

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



**Client:** Crown Castle USA, Inc.  
**Project:** HRT 095 943237  
**Site ID:** 806375  
**Location:** Hartford County, CT  
**Loading Type:** Wind

**Job No.:** 2014777.806375.01  
**Sheet No.:** 1 Of 1  
**Made By:** JDH  
**Chkd By:** KD  
**Date:** 1/10/2014  
**Code:** F

**Sources**

Original Design Reactions from Valmont, Order #: 10888-91, dated 1/24/1991

**Original Design Reactions**

Moment	1947.4	k-ft	1527.0	k-ft
Shear	24.2	k	19.8	K

**FACTORED FOUNDATION CAPACITY**

$$\frac{\text{TNX Output}}{\text{Original Design}} = 81.6\%$$