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Also admitted in Massachusetts

August 5, 2013

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

Re: **Notice of Exempt Modification – Facility Modification**
570 New Park Avenue, West Hartford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 147-foot level of the existing 150-foot tower at the above-referenced address. The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 1990 (Docket No. 131). Cellco now intends to replace six (6) of its existing antennas with three (3) model BXA-700063-6CF cellular antennas and three (3) model BXA-171063-12CF AWS antennas, all at the same 147-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") on its antenna platform; six (6) new coaxial cables; and one (1) HYBRIFLEX™ antenna cable. All new antenna cables will be located inside the monopole tower. Included in Attachment 1 are the 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 Ronald Van Winkle, Town Manager for the Town of West Hartford. A copy of this letter is also being sent to 570 New Park LLC, the owner of the property on which the tower is located.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's proposed replacement antennas and RRHs will be located at the 147-foot level of the 150-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 in Attachment 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included as 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:
Ronald Van Winkle, Town Manager
570 New Park LLC
Sandy M. Carter

ATTACHMENT 1

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

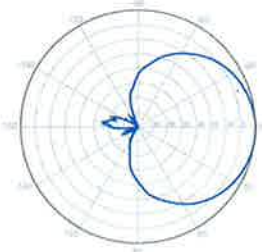
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

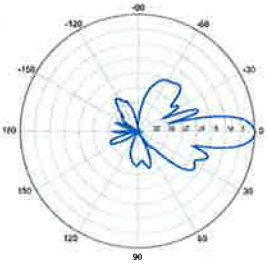
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



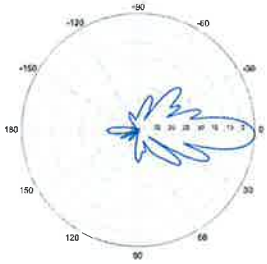
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

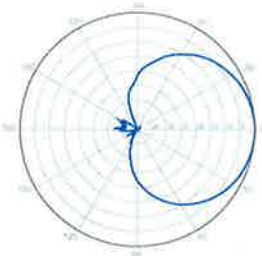


0° | Vertical | 750 MHz

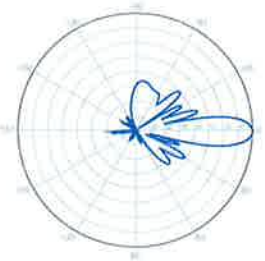
BXA-70063-6CF-EDIN-2



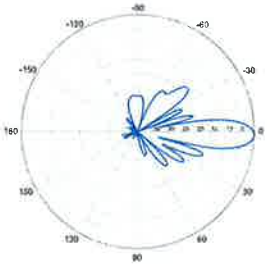
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



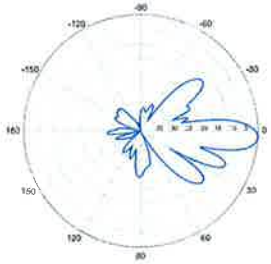
2° | Vertical | 850 MHz

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

BXA-70063-6CF-EDIN-X

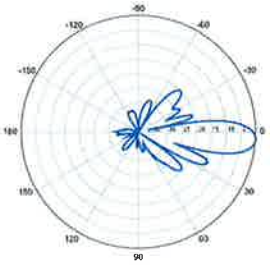
X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



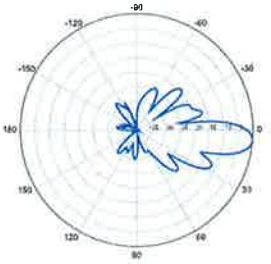
3° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-4

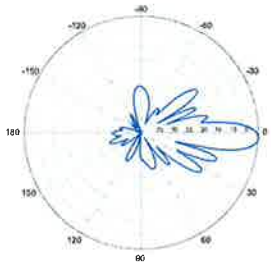


4° | Vertical | 750 MHz

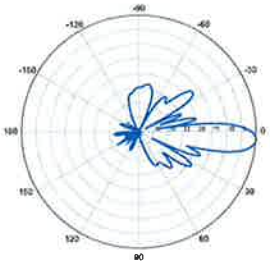
BXA-70063-6CF-EDIN-5



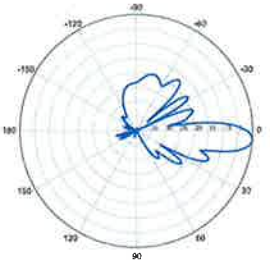
5° | Vertical | 750 MHz



3° | Vertical | 850 MHz

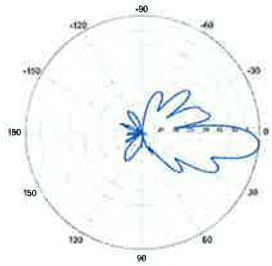


4° | Vertical | 850 MHz



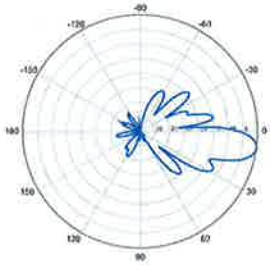
5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6



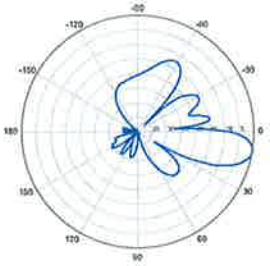
6° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-8

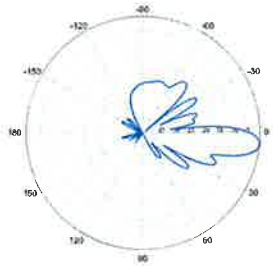


8° | Vertical | 750 MHz

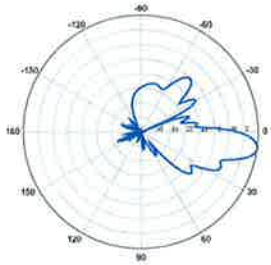
BXA-70063-6CF-EDIN-10



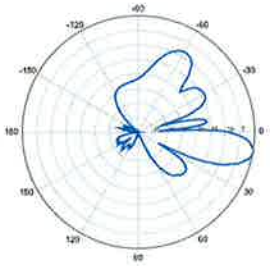
10° | Vertical | 750 MHz



6° | Vertical | 850 MHz



8° | Vertical | 850 MHz



10° | Vertical | 850 MHz

BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

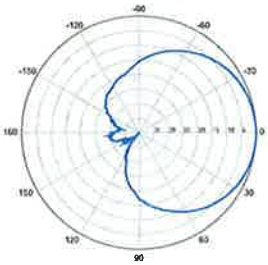
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1842 x 154 x 105 mm		72.5 x 6.1 x 4.1 in
Depth with z-brackets	133 mm		5.2 in
Weight without mounting brackets	5.8 kg		12.8 lbs
Survival wind speed	> 201 km/hr		> 125 mph
Wind area	Front: 0.28 m² Side: 0.19 m²		Front: 3.1 ft² Side: 2.1 ft²
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N		Front: 103 lbf Side: 68 lbf

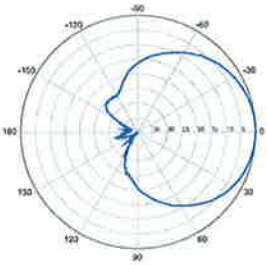
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



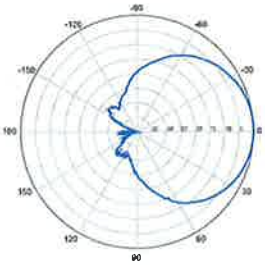
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



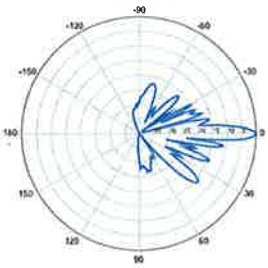
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



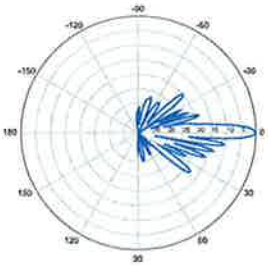
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



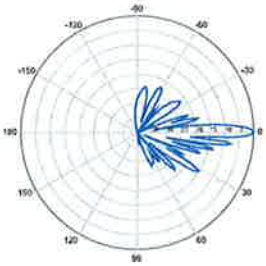
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0

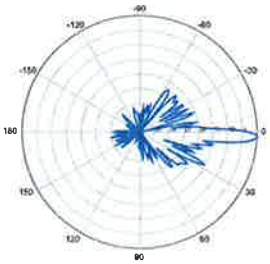


0° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-X

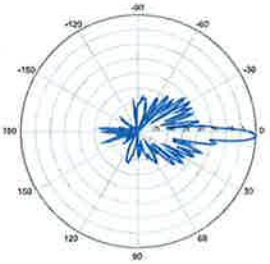
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2



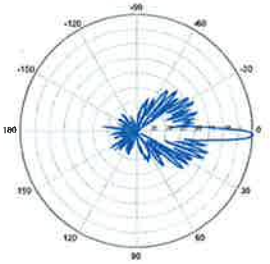
2° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2



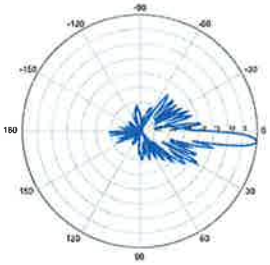
2° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



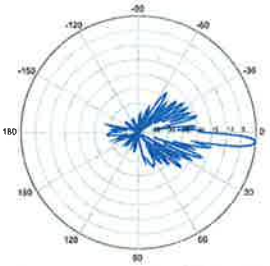
2° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-5



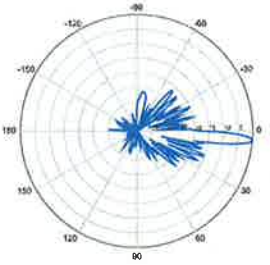
5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-5

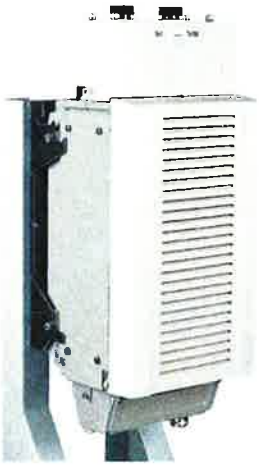


5° | Vertical | 1920-2170 MHz

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

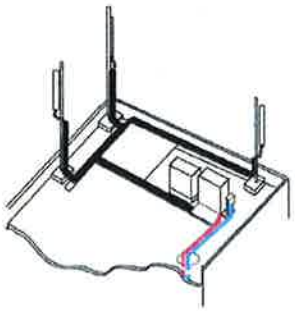
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

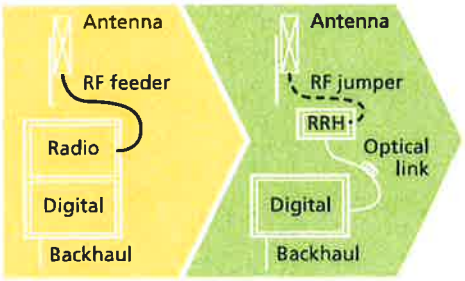
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

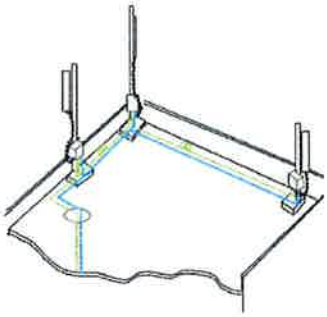
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (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

Alcatel·Lucent

ATTACHMENT 2

	General	Power	Density					
Site Name: West Hartford								
Tower Height: Verizon @ 147ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint CDMA/LTE	7	693	135	0.0957	1900	1.0000	9.57%	
*Sprint CDMA/LTE	1	390	135	0.0077	850	0.5667	1.36%	
*Sensus (CL&P)	1	200	117	0.0053	940.1125	0.6267	0.84%	
*XM Sat Radio	2	302	160	0.0085	2337.49	1.0000	0.85%	
Verizon PCS	**11**	**240**	**147**	**0.0439**	**1970**	**1.0000**	**4.39%**	
Verizon Cellular	**9**	**250**	**147**	**0.0374**	**869**	**0.5793**	**6.46%**	
Verizon AWS	**1**	**1750**	**147**	**0.0291**	**2145**	**1.0000**	**2.91%**	
Verizon 700	**1**	**823**	**147**	**0.0137**	**698**	**0.4653**	**2.94%**	
								29.33%
* Source: Siting Council								

ATTACHMENT 3

Pier Structural Engineering Corp.
55 Northfield Drive E, Suite 198
Waterloo, ON N2K 3T6
Tel: 519-885-3806
Fax: 519-886-0076
www.p-sec.ca

Specializing in Communication Tower Engineering

July 2, 2013

Veronica Harris, Tower Structural Analyst
Crown Castle USA Inc.
1200 McArthur Blvd
Mahwah, NJ 07430

Subject:	**Structural Analysis Report**	
Carrier Designation:	Carrier Co-Locate:	**Verizon Wireless**
	Carrier Site Number:	**NA**
	Carrier Site Name:	**West Hartford, CT**
Crown Castle Designation:	Crown Castle BU Number:	**806370**
	Crown Castle Site Name:	**HRT 099 943226**
	Crown Castle JDE Job Number:	**237891**
	Crown Castle WO Number:	**625361**
Engineering Firm Designation:	P-SEC Project Number:	**9184**
Site Data:	**570 NEW PARK AVENUE, WEST HARTFORD, Hartford County, CT** **Latitude *41° 44' 10.5"*, Longitude *-72° 43' 14.2"*** **150-ft Monopole**	

Dear Veronica Harris,

Pier Structural Engineering Corp. (P-SEC) 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 557843, in accordance with application 192581, 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:

LC7: 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, 2005 CT State Building Code and local code requirements based upon a wind speed of 80 mph fastest mile.

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

Structural analysis prepared by: Ryan Heska, E.I.T.

Respectfully submitted by:

Martin Piercey, P.E., P.Eng.
CT PE# 25582

tnxTower Report - version 6.0.4.0

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150-ft monopole originally designed by VALMONT in May of 1990 for a wind speed of 125 mph per EIA-222-D.

2) ANALYSIS CRITERIA

The following design parameters have been used in our analysis:

Design Standard:		TIA/EIA-222-F standard and 2005 CT Building Code
County/State:		Hartford County, CT
Wind Speeds:	*CASE 1*	80.0 mph (fastest mile)
	CASE 2	28.1 mph (fastest mile) with 1" radial solid ice *(per ASCE7 ice map)*
	CASE 3	50.0 mph (fastest mile) for Serviceability
Allowable Stress:		Increased 1/3rd

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
146	147	3	antel	BXA-171063-12CF-EDIN-2	6 1	1-1/4 1-5/8	1
		3	antel	BXA-70063-6CF-EDIN-4			
		3	alcatel lucent	RRH2x40-AWS			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Notes:
1) Proposed equipment

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
146	147	6	antel	LPA-80063/6CF	--	--	3
		3	antel	BXA-70063-6CF-EDIN-5	12	1-1/4	1
		2	antel	BXA-171063-12CF-EDIN-2			
		1	antel	BXA-171063-8BF-2			
	146	1	--	Platform Mount [LP 602-1]			
137	137	3	alcatel lucent	800MHz 2X50W RRH W/FILTER	--	--	2
		6	alcatel lucent	PCS 1900MHz 4x45W-65MHz			
		1	--	Side Arm Mount [SO 102-3]			
134	135	3	rfs celwave	APXVSPP18-C-A20	3	1-1/4	2
		3	rfs celwave	IBC1900BB-1			
		3	rfs celwave	IBC1900HG-2A			
	137	6	allgon	7185.03	6	1-5/8	1
	134	1	--	Platform Mount [LP 602-1]			
117	122	1	antel	BCD-87010	1	7/8	4
	117	1	--	Side Arm Mount [SO 701-1]			

Notes:
1) Existing equipment
2) Reserved equipment
3) Existing equipment to be replaced by proposed
4) Abandoned equipment; considered in 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)
Unknown						

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	T.E.P., Proj. No. 082233.01 dated 9/3/2008	2308053	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	T.E.P., Proj. No. 082233 dated 8/26/2003	2308022	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont dated 5/22/1990	260794	CCISITES
APPLICATION	Verizon, Revision #1 dated 6/25/2013	192581	CCISITES

3.1) Analysis Method

tnxTower (6.0.4.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) P-SEC did not analyze antenna supporting mounts as part of this analysis report and assumed they are structurally sufficient. It is the carrier's responsibility to ensure structural compliance of their existing and/or proposed antenna supporting mounts.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary) – LC7

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 96.8333	Pole	TP39.21x26.19x0.313	1	-10.17	1965.32	33.9	Pass
L2	96.8333 - 48	Pole	TP50.55x37.1963x0.406	2	-20.98	3291.40	42.9	Pass
L3	48 - 0	Pole	TP61.5x48.0228x0.5	3	-40.29	5071.45	44.3	Pass
							Summary	
						Pole (L3)	44.3	Pass
						RATING =	**44.3**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
2	Anchor Rods	--	39.2	Pass
2	Base Plate	--	29.1	Pass
2	Base Foundation – Soil	--	68.6	Pass
2	Base Foundation – Rebar	--	25.1	Pass

Structure Rating (max from all components) =	**68.6%**

Notes: 1) See full member breakdown and section capacities in Appendix A.
2) See additional documentation in Appendix C for supporting calculations.
3) Stresses up to 105% (steel) and 110% (foundations) are within engineering tolerance and considered acceptable.

4.1) Recommendations

The existing 150-ft monopole located in Hartford County (HRT 099 943226), CT **is structurally acceptable** based on the TIA/EIA-222-F standard, 2005 CT State Building Code and local building code requirements based upon a wind speed of 80 mph fastest mile.

No modifications are required for the proposed loading.

Should you have any questions, please call us anytime at 519-885-3806.

encl.
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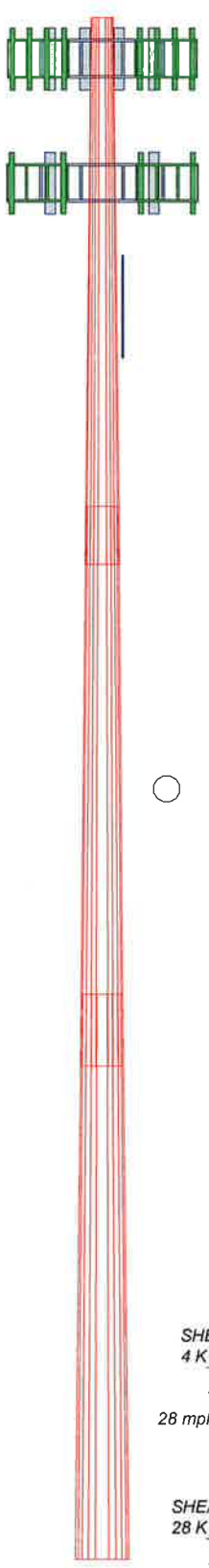
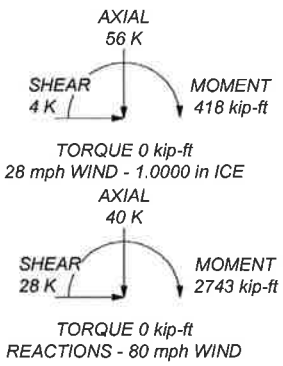
APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3
Length (ft)	53'2-1/32"	54'6"	55'
Number of Sides	12	12	12
Thickness (in)	0.3130	0.4060	0.5000
Socket Length (ft)	5'8-1/32"	7'	
Top Dia (in)	28.1900	37.1963	48.0228
Bot Dia (in)	39.2100	50.5500	61.5000
Grade		S-22	
Weight (K)	5.9	10.5	16.3





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' E)	146	800MHz 2X50W RRH W/FILTER (Carrier 137' R)	137
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' E)	146	800MHz 2X50W RRH W/FILTER (Carrier 137' R)	137
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' E)	146	800MHz 2X50W RRH W/FILTER (Carrier 137' R)	137
BXA-171063-8BF-2 w/ Mount Pipe (Carrier 146' E)	146	(2) 6' x 2" Mount Pipe (Carrier 137' R)	137
		(2) 6' x 2" Mount Pipe (Carrier 137' R)	137
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' E)	146	(2) 6' x 2" Mount Pipe (Carrier 137' R)	137
		Side Arm Mount [SO 102-3] (Carrier 137' R)	137
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' E)	146	(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	134
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (Carrier 146' P)	146		
		(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	134
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (Carrier 146' P)	146		
		(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	134
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (Carrier 146' P)	146		
		APXVSPP18-C-A20 w/ Mount Pipe (Carrier 134' R)	134
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' P)	146		
		APXVSPP18-C-A20 w/ Mount Pipe (Carrier 134' R)	134
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' P)	146		
		APXVSPP18-C-A20 w/ Mount Pipe (Carrier 134' R)	134
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' P)	146		
		IBC1900BB-1 (Carrier 134' R)	134
RRH2x40-AWS (Carrier 146' P)	146		
		IBC1900BB-1 (Carrier 134' R)	134
RRH2x40-AWS (Carrier 146' P)	146		
		IBC1900BB-1 (Carrier 134' R)	134
RRH2x40-AWS (Carrier 146' P)	146		
		IBC1900HG-2A (Carrier 134' R)	134
DB-T1-6Z-8AB-0Z (Carrier 146' P)	146		
		IBC1900HG-2A (Carrier 134' R)	134
Platform Mount [LP 602-1] (Carrier 146' E)	146		
		IBC1900HG-2A (Carrier 134' R)	134
(2) PCS 1900MHz 4x45W-65MHz (Carrier 137' R)	137		
		Platform Mount [LP 602-1] (Carrier 134' E)	134
(2) PCS 1900MHz 4x45W-65MHz (Carrier 137' R)	137		
		BCD-87010 (Carrier 117' A)	117
(2) PCS 1900MHz 4x45W-65MHz (Carrier 137' R)	137	Side Arm Mount [SO 701-1] (Carrier 117' A)	117

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
S-22	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. ----------
6. E - Existing, R/MLA - Reserved, P - Proposed
7. Proposed loading revision at 146ft elevation
8. TOWER RATING: 44.3%

Pier Structural Engineering Corp.
55 Northfield Drive E Suite 198
Waterloo, ON N2K 3T6
Phone: (519) 885-3806
FAX: (519) 886-0076

Job: PSEC 9184 (for VERIZON)			
Project: 806370 - HRT 099 943226			
Client: CROWN CASTLE	Drawn by: rheska	App'd:	
Code: TIA/EIA-222-F	Date: 07/02/13	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	PSEC 9184 (for VERIZON)	1 of 10
Pier Structural Engineering Corp. 55 Northfield Drive E Suite 198 Waterloo, ON N2K 3T6 Phone: (519) 885-3806 FAX: (519) 886-0076	Project 806370 - HRT 099 943226	Date 10:22:38 07/02/13
	Client CROWN CASTLE	Designed by rheska

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 1.0000 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.

E - Existing, R/MLA - Reserved, P - Proposed.
Proposed loading revision at 146ft elevation.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	150'-96'9-31/32"	53'2-1/32"	5'8-1/32"	12	26.1900	39.2100	0.3130	1.2520	S-22 (65 ksi)
L2	96'9-31/32"-48'	54'6"	7'	12	37.1963	50.5500	0.4060	1.6240	S-22 (65 ksi)
L3	48'-0'	55'		12	48.0228	61.5000	0.5000	2.0000	S-22 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	27.1139	26.0804	2229.0917	9.2640	13.5664	164.3095	4516.7441	12.8360	6.1801	19.745
	40.5932	39.2027	7570.6729	13.9251	20.3108	372.7416	15340.2357	19.2944	9.6694	30.893
L2	39.9459	48.0967	8309.3570	13.1709	19.2677	431.2589	16837.0101	23.6717	8.8805	21.873
	52.3332	65.5543	21038.9848	17.9516	26.1849	803.4778	42630.6872	32.2638	12.4593	30.688
L3	51.4927	76.5118	22055.6111	17.0132	24.8758	886.6280	44690.6477	37.6568	11.5301	23.06
	63.6695	98.2100	46644.5955	21.8380	31.8570	1464.1867	94514.5965	48.3360	15.1420	30.284

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150'-96'9-31/32"				1	1	1		
L2 96'9-31/32"-48'				1	1	1		
L3 48'-0'				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1-1/4" Line (Carrier 146' E+P)	B	No	Inside Pole	146' - 0'	18	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
1-5/8" Line (Carrier 146' P)	B	No	Inside Pole	146' - 0'	1	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
**								
1-5/8" Line (Carrier 134' E)	C	No	Inside Pole	134' - 0'	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
1-1/4" Line (Carrier 134' R)	C	No	Inside Pole	134' - 0'	3	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
**								
7/8" Line (Carrier 117' A)	C	No	Inside Pole	117' - 0'	1	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
****								

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' E)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice	7.97	5.80	0.04
						1/2" Ice	8.61	6.95	0.10
						1" Ice	9.22	7.82	0.17
						2" Ice	10.46	9.60	0.34
						4" Ice	13.07	13.37	0.80
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' E)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice	7.97	5.80	0.04
						1/2" Ice	8.61	6.95	0.10
						1" Ice	9.22	7.82	0.17
						2" Ice	10.46	9.60	0.34
						4" Ice	13.07	13.37	0.80
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' E)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice	7.97	5.80	0.04
						1/2" Ice	8.61	6.95	0.10
						1" Ice	9.22	7.82	0.17
						2" Ice	10.46	9.60	0.34
						4" Ice	13.07	13.37	0.80
BXA-171063-8BF-2 w/ Mount Pipe (Carrier 146' E)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice	3.18	3.35	0.03
						1/2" Ice	3.56	3.97	0.06
						1" Ice	3.96	4.60	0.10
						2" Ice	4.85	5.89	0.19
						4" Ice	6.77	8.89	0.49
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' E)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice	5.03	5.29	0.04
						1/2" Ice	5.58	6.46	0.08
						1" Ice	6.10	7.35	0.14
						2" Ice	7.17	9.15	0.27
						4" Ice	9.44	12.95	0.68
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' E)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice	5.03	5.29	0.04
						1/2" Ice	5.58	6.46	0.08
						1" Ice	6.10	7.35	0.14
						2" Ice	7.17	9.15	0.27
						4" Ice	9.44	12.95	0.68
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (Carrier 146' P)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice	7.97	5.40	0.04
						1/2" Ice	8.61	6.55	0.10
						1" Ice	9.22	7.41	0.17
						2" Ice	10.46	9.18	0.33
						4" Ice	13.07	12.93	0.79
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice	7.97	5.40	0.04
						1/2" Ice	8.61	6.55	0.10
						1" Ice	9.22	7.41	0.17
						2" Ice	10.46	9.18	0.33

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	13.07	12.93	0.79
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (Carrier 146' P)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.40 6.55 7.41 9.18 12.93	0.04 0.10 0.17 0.33 0.79
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' P)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.03 5.58 6.10 7.17 9.44	5.29 6.46 7.35 9.15 12.95	0.04 0.08 0.14 0.27 0.68
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.03 5.58 6.10 7.17 9.44	5.29 6.46 7.35 9.15 12.95	0.04 0.08 0.14 0.27 0.68
BXA-171063-12CF-EDIN-2 w/ Mount Pipe (Carrier 146' P)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.03 5.58 6.10 7.17 9.44	5.29 6.46 7.35 9.15 12.95	0.04 0.08 0.14 0.27 0.68
RRH2x40-AWS (Carrier 146' P)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.98 3.24 3.50 4.07 5.30	1.60 1.82 2.06 2.56 3.66	0.04 0.06 0.08 0.14 0.29
RRH2x40-AWS (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.98 3.24 3.50 4.07 5.30	1.60 1.82 2.06 2.56 3.66	0.04 0.06 0.08 0.14 0.29
RRH2x40-AWS (Carrier 146' P)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.98 3.24 3.50 4.07 5.30	1.60 1.82 2.06 2.56 3.66	0.04 0.06 0.08 0.14 0.29
DB-T1-6Z-8AB-0Z (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.60 5.92 6.24 6.91 8.37	2.33 2.56 2.79 3.28 4.37	0.04 0.08 0.12 0.21 0.45
Platform Mount [LP 602-1] (Carrier 146' E)	C	None		0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
**									
(2) PCS 1900MHz 4x45W-65MHz (Carrier 137' R)	A	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.71 2.95 3.20 3.72 4.86	2.61 2.85 3.09 3.61 4.74	0.06 0.08 0.11 0.17 0.35
(2) PCS 1900MHz 4x45W-65MHz (Carrier 137' R)	B	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.71 2.95 3.20 3.72 4.86	2.61 2.85 3.09 3.61 4.74	0.06 0.08 0.11 0.17 0.35

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) PCS 1900MHz 4x45W-65MHz (Carrier 137' R)	C	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.71 2.95 3.20 3.72 4.86	2.61 2.85 3.09 3.61 4.74	0.06 0.08 0.11 0.17 0.35
800MHz 2X50W RRH W/FILTER (Carrier 137' R)	A	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.40 2.61 2.83 3.30 4.34	2.25 2.46 2.68 3.13 4.15	0.06 0.09 0.11 0.17 0.34
800MHz 2X50W RRH W/FILTER (Carrier 137' R)	B	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.40 2.61 2.83 3.30 4.34	2.25 2.46 2.68 3.13 4.15	0.06 0.09 0.11 0.17 0.34
800MHz 2X50W RRH W/FILTER (Carrier 137' R)	C	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.40 2.61 2.83 3.30 4.34	2.25 2.46 2.68 3.13 4.15	0.06 0.09 0.11 0.17 0.34
(2) 6' x 2" Mount Pipe (Carrier 137' R)	A	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.20 1.80 2.17 2.93 4.57	1.20 1.80 2.17 2.93 4.57	0.02 0.03 0.04 0.08 0.22
(2) 6' x 2" Mount Pipe (Carrier 137' R)	B	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.20 1.80 2.17 2.93 4.57	1.20 1.80 2.17 2.93 4.57	0.02 0.03 0.04 0.08 0.22
(2) 6' x 2" Mount Pipe (Carrier 137' R)	C	From Leg	1.00 0' 0'	0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.20 1.80 2.17 2.93 4.57	1.20 1.80 2.17 2.93 4.57	0.02 0.03 0.04 0.08 0.22
Side Arm Mount [SO 102-3] (Carrier 137' R)	C	None		0.0000	137'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.00 3.48 3.96 4.92 6.84	3.00 3.48 3.96 4.92 6.84	0.08 0.11 0.14 0.20 0.32
**									
(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	A	From Leg	4.00 0' 3'	0.0000	134'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.21 4.59 4.99 5.82 7.64	1.86 2.36 2.87 3.95 6.48	0.03 0.05 0.09 0.17 0.44
(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	B	From Leg	4.00 0' 3'	0.0000	134'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.21 4.59 4.99 5.82 7.64	1.86 2.36 2.87 3.95 6.48	0.03 0.05 0.09 0.17 0.44
(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	C	From Leg	4.00 0' 3'	0.0000	134'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.21 4.59 4.99 5.82 7.64	1.86 2.36 2.87 3.95 6.48	0.03 0.05 0.09 0.17 0.44
APXVSPP18-C-A20 w/	A	From Leg	4.00	0.0000	134'	No Ice	8.50	6.95	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Mount Pipe			0'			1/2" Ice	9.15	8.13	0.15
(Carrier 134' R)			1'			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
APXVSPP18-C-A20 w/	B	From Leg	4.00	0.0000	134'	No Ice	8.50	6.95	0.08
Mount Pipe			0'			1/2" Ice	9.15	8.13	0.15
(Carrier 134' R)			1'			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
APXVSPP18-C-A20 w/	C	From Leg	4.00	0.0000	134'	No Ice	8.50	6.95	0.08
Mount Pipe			0'			1/2" Ice	9.15	8.13	0.15
(Carrier 134' R)			1'			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
IBC1900BB-1	A	From Leg	4.00	0.0000	134'	No Ice	1.13	0.53	0.02
(Carrier 134' R)			0'			1/2" Ice	1.27	0.65	0.03
			1'			1" Ice	1.43	0.77	0.04
						2" Ice	1.76	1.04	0.06
						4" Ice	2.53	1.69	0.15
IBC1900BB-1	B	From Leg	4.00	0.0000	134'	No Ice	1.13	0.53	0.02
(Carrier 134' R)			0'			1/2" Ice	1.27	0.65	0.03
			1'			1" Ice	1.43	0.77	0.04
						2" Ice	1.76	1.04	0.06
						4" Ice	2.53	1.69	0.15
IBC1900BB-1	C	From Leg	4.00	0.0000	134'	No Ice	1.13	0.53	0.02
(Carrier 134' R)			0'			1/2" Ice	1.27	0.65	0.03
			1'			1" Ice	1.43	0.77	0.04
						2" Ice	1.76	1.04	0.06
						4" Ice	2.53	1.69	0.15
IBC1900HG-2A	A	From Leg	4.00	0.0000	134'	No Ice	1.13	0.53	0.02
(Carrier 134' R)			0'			1/2" Ice	1.27	0.65	0.03
			1'			1" Ice	1.43	0.77	0.04
						2" Ice	1.76	1.04	0.06
						4" Ice	2.53	1.69	0.15
IBC1900HG-2A	B	From Leg	4.00	0.0000	134'	No Ice	1.13	0.53	0.02
(Carrier 134' R)			0'			1/2" Ice	1.27	0.65	0.03
			1'			1" Ice	1.43	0.77	0.04
						2" Ice	1.76	1.04	0.06
						4" Ice	2.53	1.69	0.15
IBC1900HG-2A	C	From Leg	4.00	0.0000	134'	No Ice	1.13	0.53	0.02
(Carrier 134' R)			0'			1/2" Ice	1.27	0.65	0.03
			1'			1" Ice	1.43	0.77	0.04
						2" Ice	1.76	1.04	0.06
						4" Ice	2.53	1.69	0.15
Platform Mount [LP 602-1]	C	None		0.0000	134'	No Ice	32.03	32.03	1.34
(Carrier 134' E)						1/2" Ice	38.71	38.71	1.80
						1" Ice	45.39	45.39	2.26
						2" Ice	58.75	58.75	3.17
						4" Ice	85.47	85.47	5.00
**									
BCD-87010	A	From Leg	4.00	0.0000	117'	No Ice	2.90	2.90	0.03
(Carrier 117' A)			0'			1/2" Ice	4.05	4.05	0.05
			5'			1" Ice	5.21	5.21	0.08
						2" Ice	7.01	7.01	0.16
						4" Ice	9.85	9.85	0.41
Side Arm Mount [SO 701-1]	A	From Leg	1.50	0.0000	117'	No Ice	0.85	1.67	0.07
(Carrier 117' A)			0'			1/2" Ice	1.14	2.34	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0'			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
						4" Ice	3.17	7.03	0.18
****									

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 Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	56.41	-0.00	0.00
	Max. H_x	11	40.30	28.45	0.06
	Max. H_z	2	40.30	0.06	28.35
	Max. M_x	2	2724.68	0.06	28.35
	Max. M_z	5	2738.35	-28.45	-0.06
	Max. Torsion	7	0.46	-14.28	-24.58
	Min. Vert	5	40.30	-28.45	-0.06
	Min. H_x	5	40.30	-28.45	-0.06
	Min. H_z	8	40.30	-0.06	-28.35
	Min. M_x	8	-2724.27	-0.06	-28.35
	Min. M_z	11	-2737.98	28.45	0.06
	Min. Torsion	13	-0.46	14.28	24.58

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	40.30	0.00	0.00	-0.20	-0.18	0.00
Dead+Wind 0 deg - No Ice	40.30	-0.06	-28.35	-2724.68	8.80	0.44
Dead+Wind 30 deg - No Ice	40.30	14.17	-24.52	-2355.26	-1361.54	0.30
Dead+Wind 60 deg - No Ice	40.30	24.61	-14.12	-1354.71	-2367.10	0.08
Dead+Wind 90 deg - No Ice	40.30	28.45	0.06	8.78	-2738.35	-0.16
Dead+Wind 120 deg - No Ice	40.30	24.67	14.23	1369.85	-2376.07	-0.35
Dead+Wind 150 deg - No Ice	40.30	14.28	24.58	2363.83	-1377.09	-0.46
Dead+Wind 180 deg - No Ice	40.30	0.06	28.35	2724.27	-9.16	-0.44
Dead+Wind 210 deg - No Ice	40.30	-14.17	24.52	2354.85	1361.17	-0.30
Dead+Wind 240 deg - No Ice	40.30	-24.61	14.12	1354.30	2366.73	-0.08
Dead+Wind 270 deg - No Ice	40.30	-28.45	-0.06	-9.19	2737.98	0.16
Dead+Wind 300 deg - No Ice	40.30	-24.67	-14.23	-1370.26	2375.71	0.35
Dead+Wind 330 deg - No Ice	40.30	-14.28	-24.58	-2364.24	1376.73	0.46
Dead+Ice+Temp	56.41	0.00	-0.00	-0.17	-0.62	0.00
Dead+Wind 0 deg+Ice+Temp	56.41	-0.01	-4.07	-415.14	0.55	0.07
Dead+Wind 30 deg+Ice+Temp	56.41	2.04	-3.52	-358.95	-208.02	0.02
Dead+Wind 60 deg+Ice+Temp	56.41	3.53	-2.03	-206.62	-361.02	-0.04
Dead+Wind 90 deg+Ice+Temp	56.41	4.09	0.01	1.02	-417.46	-0.08
Dead+Wind 120 deg+Ice+Temp	56.41	3.54	2.04	208.34	-362.22	-0.10
Dead+Wind 150 deg+Ice+Temp	56.41	2.05	3.53	359.79	-210.09	-0.10
Dead+Wind 180 deg+Ice+Temp	56.41	0.01	4.07	414.79	-1.85	-0.07
Dead+Wind 210 deg+Ice+Temp	56.41	-2.04	3.52	358.60	206.72	-0.02
Dead+Wind 240 deg+Ice+Temp	56.41	-3.53	2.03	206.27	359.72	0.04
Dead+Wind 270 deg+Ice+Temp	56.41	-4.09	-0.01	-1.37	416.17	0.08
Dead+Wind 300 deg+Ice+Temp	56.41	-3.54	-2.04	-208.70	360.92	0.10
Dead+Wind 330 deg+Ice+Temp	56.41	-2.05	-3.53	-360.15	208.80	0.10
Dead+Wind 0 deg - Service	40.30	-0.02	-11.07	-1064.52	3.33	0.17
Dead+Wind 30 deg - Service	40.30	5.54	-9.58	-920.17	-531.98	0.12
Dead+Wind 60 deg - Service	40.30	9.61	-5.52	-529.32	-924.79	0.03
Dead+Wind 90 deg - Service	40.30	11.11	0.02	3.30	-1069.85	-0.06
Dead+Wind 120 deg - Service	40.30	9.63	5.56	534.99	-928.30	-0.14
Dead+Wind 150 deg - Service	40.30	5.58	9.60	923.27	-538.05	-0.18
Dead+Wind 180 deg - Service	40.30	0.02	11.07	1064.11	-3.69	-0.17
Dead+Wind 210 deg - Service	40.30	-5.54	9.58	919.77	531.61	-0.12
Dead+Wind 240 deg - Service	40.30	-9.61	5.52	528.91	924.42	-0.03
Dead+Wind 270 deg - Service	40.30	-11.11	-0.02	-3.71	1069.48	0.06
Dead+Wind 300 deg - Service	40.30	-9.63	-5.56	-535.40	927.93	0.14

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 330 deg - Service	40.30	-5.58	-9.60	-923.68	537.69	0.18

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 96.8333	15.742	31	0.9017	0.0012
L2	102.5 - 48	7.436	31	0.6948	0.0003
L3	55 - 0	2.110	31	0.3503	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
146'	BXA-70063-6CF-EDIN-5 w/ Mount Pipe	31	14.994	0.8875	0.0011	74517
137'	(2) PCS 1900MHz 4x45W-65MHz	31	13.323	0.8550	0.0008	28660
134'	(2) 7185.03 w/ Mount Pipe	31	12.772	0.8437	0.0008	23286
117'	BCD-87010	31	9.764	0.7720	0.0005	11290

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	150 - 96.8333 (1)	TP39.21x26.19x0.313	53'2-1/32"	0'	0.0	39.000	37.8041	-10.17	1474.36	0.007
L2	96.8333 - 48 (2)	TP50.55x37.1963x0.406	54'6"	0'	0.0	39.000	63.3120	-20.98	2469.17	0.008
L3	48 - 0 (3)	TP61.5x48.0228x0.5	55'	0'	0.0	38.739	98.2100	-40.29	3804.54	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 96.8333 (1)	TP39.21x26.19x0.313	500.57	-17.335	39.000	0.444	0.00	0.000	39.000	0.000
L2	96.8333 - 48 (2)	TP50.55x37.1963x0.406	1370.65	-21.953	39.000	0.563	0.00	0.000	39.000	0.000
L3	48 - 0 (3)	TP61.5x48.0228x0.5	2742.67	-22.478	38.739	0.580	0.00	0.000	38.739	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 96.8333 (1)	TP39.21x26.19x0.313	0.007	0.444	0.000	0.451 ✔	1.333	H1-3 ✔
L2	96.8333 - 48 (2)	TP50.55x37.1963x0.406	0.008	0.563	0.000	0.571 ✔	1.333	H1-3 ✔
L3	48 - 0 (3)	TP61.5x48.0228x0.5	0.011	0.580	0.000	0.591 ✔	1.333	H1-3 ✔

Section Capacity Table

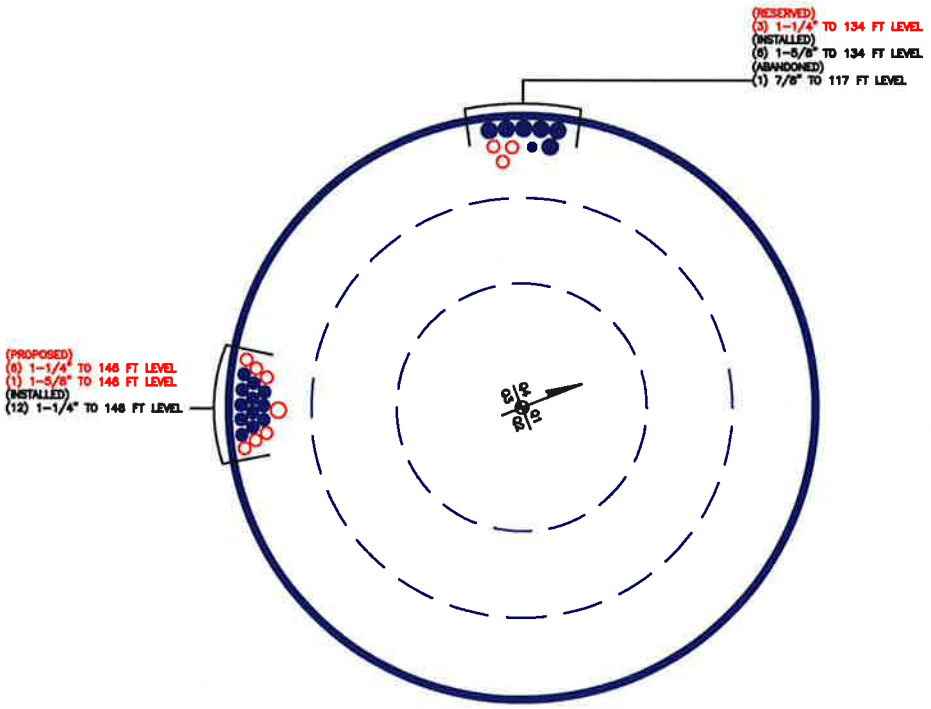
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	150 - 96.8333	Pole	TP39.21x26.19x0.313	1	-10.17	1965.32	33.9	Pass
L2	96.8333 - 48	Pole	TP50.55x37.1963x0.406	2	-20.98	3291.40	42.9	Pass
L3	48 - 0	Pole	TP61.5x48.0228x0.5	3	-40.29	5071.45	44.3	Pass
							Summary	
						Pole (L3)	44.3	Pass
						RATING =	**44.3**	**Pass**

Program Version 6.0.4.0 - 1/27/2012 File://SR1/Shared/PROJECTS/JOB 9000 - 9999/JOB 9100 - 9199/9184 - CCI - 806370 - HRT 099 943226/806370_LC7_20130702.eri

APPENDIX B

BASE LEVEL DRAWING

TX LINE LAYOUT



BUSINESS UNIT: 806370 TOWER ID: C_BASELEVEL

Client:

CROWN CASTLE

Professional Stamp

Revisions

No.	Description	Date
A	ISSUED FOR REVIEW	07.02.13

Engineering Firm

P-SEC
ph: 519-885-3806
fx: 519-886-0076
www.p-sec.ca
PIER STRUCTURAL ENGINEERING CORP
55 NORTHFIELD DR. E, SUITE 198
WATERLOO, ON N2K 3T6

PSEC Job No.

9184

Site Name

806370
HRT 099 943226

Site Design

Sheet Title

TX LINES

Drawn by	RH	Sheet
Checked by		A-1
Approved By		

APPENDIX C

ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev F

Site Data

BU#: *806370*
Site Name: *HRT 099 943226*
App #: *192581 Rev. 1*

Pole Manufacturer:	*Other*

Reactions		
Moment:	2743	ft-kips
Axial:	40	kips
Shear:	28	kips

Anchor Rod Data		
Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	70.17	in

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

Plate Data		
Diam:	76.17	in
Thick:	3	in
Grade:	60	ksi
Single-Rod B-eff:	8.24	in

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

Pole Data		
Diam:	61.5	in
Thick:	0.5	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	

Anchor Rod Results

Maximum Rod Tension:	76.5 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	39.2% Pass	Fty*ASIF

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	17.5 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	29.1% Pass	Y.L. Length: 33.79

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

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

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

CAISSON Version 10.00 10:40:24 AM July-02-13
P-SEC

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*****************************************************************************
*                                                                           *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.*
*                                                                           *
*****************************************************************************
```

*** ANALYSIS IDENTIFICATION : 108" Caisson (9')
NOTES : 806370 - HRT 099 943226

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 3.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 9.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	S	5.00	0.00	100.0		1.000	-0.00
2	S	5.00	5.00	100.0		4.070	37.27
3	S	4.00	10.00	100.0		3.670	34.87
4	S	5.00	14.00	36.0		2.460	24.96
5	S	5.00	19.00	36.0		2.440	24.75
6	S	5.00	24.00	36.0		2.430	24.64

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 2743.0 VERTICAL (k) = 40.0 SHEAR (k) = 28.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 2.00

*** CALCULATED PIER LENGTH (ft) = 21.500 <<< 25.000ft ACTUAL PIER LENGTH [OK]

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
S	0.50	5.00	100.0		1.000	33.75	3.83
S	5.50	5.00	100.0		4.070	412.09	8.28
S	10.50	3.42	100.0		3.670	396.89	12.29
S	13.92	0.58	100.0		3.670	-78.74	14.21
S	14.50	5.00	36.0		2.460	-494.83	17.05
S	19.50	2.00	36.0		2.440	-212.92	20.51

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	WITH THE ADDITIONAL SAFETY FACTOR MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	WITHOUT ADDITIONAL SAFETY FACTOR MOMENT (ft-k)
0.00	56.2	5502.9	28.1	2751.4
2.15	52.6	5621.8	26.3	2810.9
4.30	36.7	5720.0	18.4	2860.0
6.45	-34.7	5750.9	-17.3	2875.5
8.60	-200.6	5507.1	-100.3	2753.5
10.75	-414.7	4852.1	-207.3	2426.0
12.90	-656.0	3709.4	-328.0	1854.7
15.05	-656.2	2166.0	-328.1	1083.0
17.20	-448.0	977.0	-224.0	488.5
19.35	-228.6	247.6	-114.3	123.8
21.50	-0.0	-0.0	-0.0	-0.0

*** TOTAL REINFORCEMENT PCT = 0.34 REINFORCEMENT AREA (in^2) = 31.15
*** USABLE AXIAL CAP. (k) = 40.0 USABLE MOMENT CAP. (ft-k) = 6338.5

*** US Standard Re-Bars (Select one of the following):

156	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in) AT SPACING (in) =	1.97
101	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in) AT SPACING (in) =	3.05
71	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in) AT SPACING (in) =	4.34
52	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in) AT SPACING (in) =	5.92
40	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in) AT SPACING (in) =	7.70
32	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in) AT SPACING (in) =	9.62
25	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in) AT SPACING (in) =	12.32
20	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in) AT SPACING (in) =	15.39
14	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in) AT SPACING (in) =	21.99

*** WEIGHT OF CAISSON (kips) = 205.166
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 628.8

CAISSON Version 10.00 10:39:27 AM July-02-13
P-SEC

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*****************************************************************************
*                                                                           *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.*
*                                                                           *
*****************************************************************************
```

*** ANALYSIS IDENTIFICATION : 108" Caisson (9')
NOTES : 806370 - HRT 099 943226

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 3.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 9.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	S	5.00	0.00	100.0		1.000	-0.00
2	S	5.00	5.00	100.0		4.070	37.27
3	S	4.00	10.00	100.0		3.670	34.87
4	S	5.00	14.00	36.0		2.460	24.96
5	S	5.00	19.00	36.0		2.440	24.75
6	S	5.00	24.00	36.0		2.430	24.64

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 4000.0 VERTICAL (k) = 58.0 SHEAR (k) = 41.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 2.00

*** CALCULATED PIER LENGTH (ft) = 25.000

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
S	0.50	5.00	100.0		1.000	33.75	3.83
S	5.50	5.00	100.0		4.070	412.09	8.28
S	10.50	4.00	100.0		3.670	475.63	12.61
S	14.50	1.39	36.0		2.460	131.91	15.20
S	15.89	3.61	36.0		2.460	-362.92	17.72
S	19.50	5.00	36.0		2.440	-550.10	22.04
S	24.50	0.50	36.0		2.430	-58.03	24.75

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	WITH THE ADDITIONAL SAFETY FACTOR MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	WITHOUT ADDITIONAL SAFETY FACTOR MOMENT (ft-k)
0.00	82.3	8451.2	41.2	4225.6
2.50	76.9	8653.4	38.5	4326.7
5.00	55.0	8821.8	27.5	4410.9
7.50	-83.3	8820.3	-41.6	4410.2
10.00	-309.9	8343.1	-155.0	4171.6
12.50	-581.5	7236.4	-290.8	3618.2
15.00	-885.9	5391.1	-443.0	2695.6
17.50	-813.2	3127.6	-406.6	1563.8
20.00	-555.8	1413.6	-277.9	706.8
22.50	-285.2	359.3	-142.6	179.7
25.00	0.2	0.1	0.1	0.0

*** TOTAL REINFORCEMENT PCT = 0.34 REINFORCEMENT AREA (in^2) = 31.15
*** USABLE AXIAL CAP. (k) = 58.0 USABLE MOMENT CAP. (ft-k) = 6402.8

*** US Standard Re-Bars (Select one of the following):

156	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in)	AT SPACING (in) =	1.97
101	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in)	AT SPACING (in) =	3.05
71	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in)	AT SPACING (in) =	4.34
52	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in)	AT SPACING (in) =	5.92
40	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in)	AT SPACING (in) =	7.70
32	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in)	AT SPACING (in) =	9.62
25	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in)	AT SPACING (in) =	12.32
20	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in)	AT SPACING (in) =	15.39
14	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in)	AT SPACING (in) =	21.99

*** WEIGHT OF CAISSON (kips) = 238.565
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 911.7

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

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

Site Data

BU#: *806370*
Site Name: *HRT 099 943226*
App #: *192581 Rev. 1*

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

Pier Properties

Concrete:

Pier Diameter =	9.0	ft
Concrete Area =	9160.9	in^2

Reinforcement:

Clear Cover to **Tie**=	3.00	in
Horiz. **Tie** Bar Size=	3	
Vert. Cage Diameter =	8.33	ft
Vert. Cage Diameter =	99.98	in
Vertical Bar Size =	10	
Bar Diameter =	1.27	in
Bar Area =	1.27	in^2
Number of Bars =	60	
As Total=	76.2	in^2
A s/ Aconc, Rho:	0.0083	0.83%

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

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.83%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	14423.73	kips
at Mu=(ϕ=0.65)Mn=	10145.61	ft-kips
Max Tu, (φ=0.9) Tn =	4114.8	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces

TIA Revision:	F	
Max. Service Shaft M:	2875.5	ft-kips (* **Note**)
Max. Service Shaft P:	40	kips
Max Axial Force Type:	Comp.	

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

Load Factor	**Shaft Factored Loads**		
1.30	Mu:	3738.15	ft-kips
1.30	Pu:	52	kips

Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	

ACI 318 Code

Select Analysis ACI Code= 2005

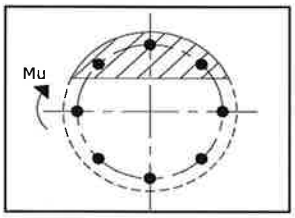
Seismic Properties

Seismic Design Category = B
Seismic Risk = **Low**

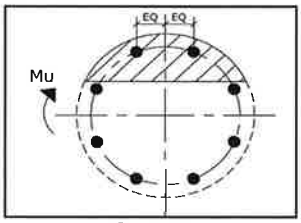
Solve (Run) <– Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**21.17**	in
Extreme Steel Strain, εt:	**0.0117**	
	εt > 0.0050, Tension Controlled	
Reduction Factor,φ:	**0.900**	

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	52.00	kips
Drilled Shaft Moment Capacity, φMn:	**14909.84**	ft-kips
Drilled Shaft Superimposed Mu:	**3738.15**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**25.1%**

Equivalent Silty Soil Parameter Tool

Note:
This tool determines the equivalent soil parameters for silty soil (having both cohesion and angle of friction), according to the CCI Foundations ongoing discussions (2010), Criteria Item DS-7 . The equivalent parameters results are to be input in the PLS-Caisson Software to account for the combined resistance of the granular and cohesive parameters simultaneously present in silty and similar soils

Site Data

BU#: *806370*
Site Name: *HRT 099 943226*
App #: *192581 Rev. 1*

Neglect Top Layer: Y Y/N
# of Layers: 6

Input the data in the "shaded" columns. If soil layer is submerged, then enter the saturated density (buoyant unit weight)

Layer:	Layer length (ft)	From (ft)	To (ft)	Unit weight of soil (pcf)	Cohesion (psf)	Internal Friction Angle (deg)	K_p	Depth to Mid-Layer (ft)	Overburden (psf)	Sand Resistance (ksf)	Clay Resistance (ksf)	P_p total (ksf)	Equivalent Parameters for PLS Caisson Input: Equivalent Cohesion (psf)	Equivalent K_p
1	5	0	5	100	300	30	3.000	2.5	250	0.000	0.00	0.000	**0**	**0.00**
2	5	5	10	100	300	30	3.000	7.5	750	6.750	2.40	9.150	**1144**	**4.07**
3	4	10	14	100	300	30	3.000	12	1200	10.800	2.40	13.200	**1650**	**3.67**
4	5	14	19	36	100	23	2.283	16.5	1490	10.203	0.80	11.003	**1375**	**2.46**
5	5	19	24	36	100	23	2.283	21.5	1670	11.436	0.80	12.236	**1529**	**2.44**
6	5	24	29	36	100	23	2.283	26.5	1850	12.669	0.80	13.469	**1684**	**2.43**

Calculation Notes:
1- Sand Resistance = 3 * Kp * Overburden ----> (Per equations used in PLS-Caisson Software)
2- Cohesion Resistance = 8 * C ----------> (Per equations used in PLS-Caisson Software, Full 8CD approach)
3- Total Resistance = Sand Resistance + Cohesion Resistance
4- Equivalent Kp= Total / Overburden / 3
5- Equivalent C= Total / 8

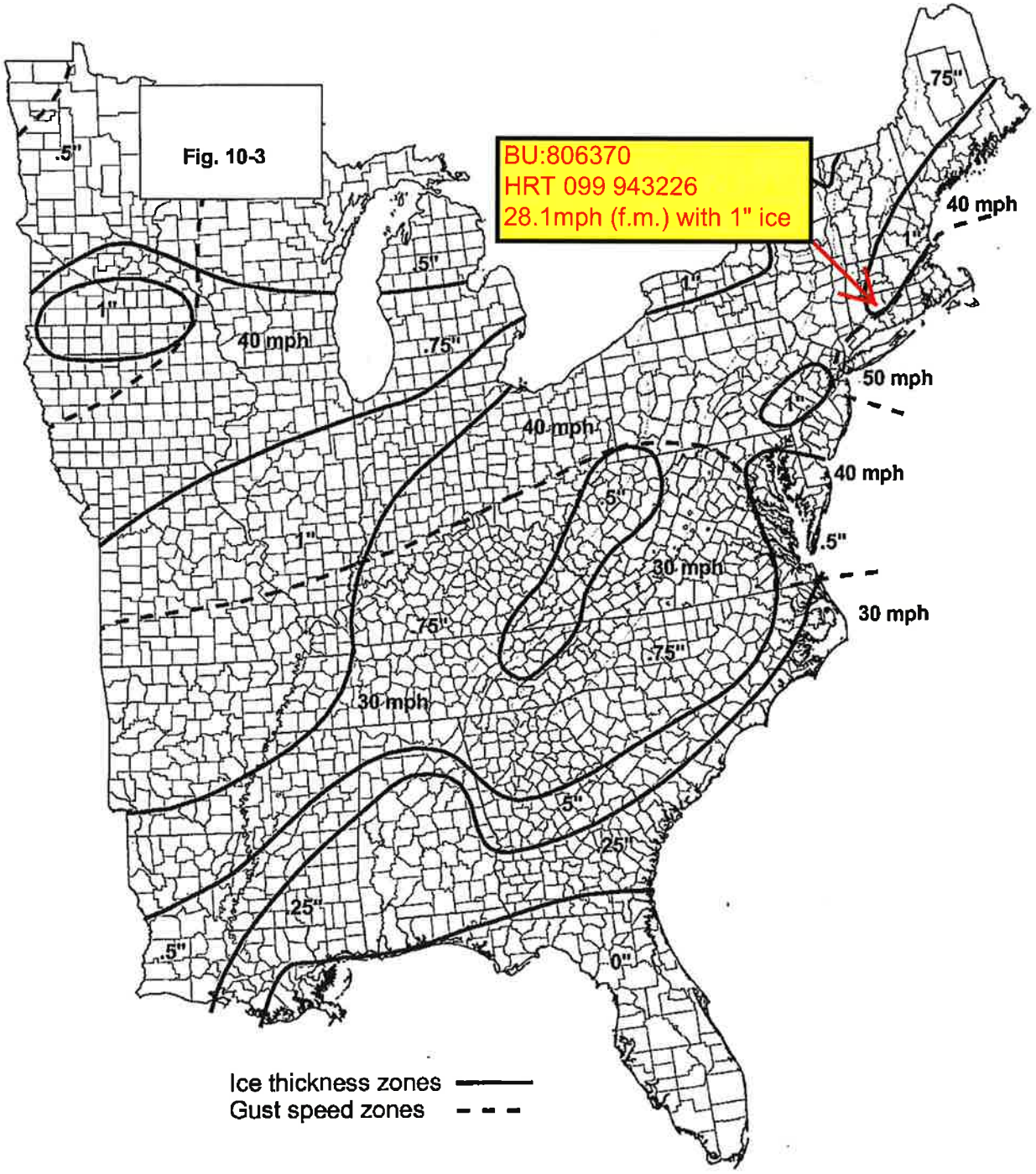


FIGURE 10-2 (continued) 50-YEAR MEAN RECURRENCE INTERVAL UNIFORM ICE THICKNESSES DUE TO FREEZING RAIN WITH CONCURRENT 3-SECOND GUST SPEEDS: CONTIGUOUS 48 STATES.