Date: **October 29, 2018**

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Subject:	**Structural Analysis Report**	
Carrier Designation:	***Sprint PCS* Co-Locate** **Carrier Site Number:**	 CT43XC805
Crown Castle Designation:	**Crown Castle BU Number:** **Crown Castle Site Name:** **Crown Castle JDE Job Number:** **Crown Castle Work Order Number:** **Crown Castle Order Number:**	806369 HRT 094 943225 519253 1646326 450703 Rev. 0
Engineering Firm Designation:	**Crown Castle Project Number:**	1646326
Site Data:	**439-455 HOMESTEAD AVE, HARTFORD, Hartford County, CT** **Latitude *41° 47' 1.61"*, Longitude *-72° 42' 13.66"*** **140 Foot - Monopole Tower**	

Dear Denice Nicholson,

Crown Castle is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower.

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: Proposed Equipment Configuration **Sufficient Capacity**

This analysis utilizes an ultimate 3-second gust wind speed of 125 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Tyler Ho, E.I.T. / RTC

Respectfully submitted by:

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TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA
- Table 1 - Proposed Equipment Configuration
- Table 2 - Other Considered Equipment

3) ANALYSIS PROCEDURE
- Table 3 - Documents Provided
- 3.1) Analysis Method
- 3.2) Assumptions

4) ANALYSIS RESULTS
- Table 4 - Section Capacity (Summary)
- Table 5 - Tower Component Stresses vs. Capacity - LC7
- 4.1) Recommendations

5) APPENDIX A
- tnxTower Output

6) APPENDIX B
- Base Level Drawing

7) APPENDIX C
- Additional Calculations

1) INTRODUCTION

This tower is a 140 ft Monopole tower designed by Valmont.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	125 mph
Exposure Category:	B
Ice Thickness:	2 in
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
103.0	105.0	3	nokia	AAHC w/ Mount Pipe	3	1-1/4
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe		
	104.0	3	rfs celwave	IBC1900BB-1		
		3	rfs celwave	IBC1900HG-2A		
	103.0	1	tower mounts	Platform Mount [LP 713-1]		

Table 2 – Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
140.0	140.0	3	alcatel lucent	RRH2x40-AWS	13	1-5/8
		3	amphenol	BXA-80063-4BF-EDIN-X w/ Mount Pipe		
		3	antel	BXA-171063-8BF-EDIN-2 w/ Mount Pipe		
		3	antel	BXA-171063/8CF-EDIN-2 w/ Mount Pipe		
		3	css	X7C-FRO-660-V w/ Mount Pipe		
		6	rfs celwave	FD9R6004/2C-3L		
		1	tower mounts	Platform Mount (LP 101-1)		
126.0	128.0	3	ericsson	AIR -32 B2A/B66AA w/ Mount Pipe	9 3 1	1-5/8 1-3/8 1-1/4
		3	ericsson	AIR 3246 B66 w/ Mount Pipe		
		3	ericsson	RADIO 4449 B12/B71		
		3	rfs celwave	APXVAARR24_43-U-NA20 w/ Mount Pipe		
	126.0	3	rfs celwave	ATMAA1412D-1A20		
		1	tower mounts	Platform Mount [LP 713-1]		

117.0	121.0	2	raycap	DC6-48-60-18-8F	12 4 2 2	1-5/8 3/4 3/8 Conduit
	120.0	1	cci antennas	TPA-65R-LCUUUU-H8 w/ Mount Pipe		
		3	ericsson	RRUS 32		
		3	ericsson	RRUS 32 B2		
		3	ericsson	RRUS-11		
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe		
		3	powerwave technologies	7770.00 w/ Mount Pipe		
		1	powerwave technologies	P65-16-XLH-RR w/ Mount Pipe		
		1	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe		
		2	quintel technology	QS66512-3 w/ Mount Pipe		
	118.0	6	cci antennas	TPX-070821		
		6	powerwave technologies	7020.00		
		6	powerwave technologies	LGP21401		
	117.0	1	tower mounts	Platform Mount [LP 712-1]		
104.0	104.0	3	alcatel lucent	PCS 1900MHz 4x45W-65MHz	-	-
		1	tower mounts	Pipe Mount [PM 601-3]		
	102.0	3	alcatel lucent	800MHz 2X50W RRH W/FILTER		
103.0	107.0	1	andrew	VHLP2-180	3 3 3 1	1/4 5/16 1/2 1-1/2
		1	andrew	VHLP2.5-11		
		2	dragonwave	Horizon Compact		
	105.0	3	argus panel antennas	LLPX310R-V1 w/ Mount Pipe		
		3	samsung telecommunications	WIMAX DAP HEAD		
93.0	93.0	3	kathrein	742 213 w/ Mount Pipe	6	1-5/8
		1	tower mounts	Side Arm Mount [SO 102-3]		
74.0	80.0	1	antel	BCD-87010	1	7/8
	74.0	1	tower mounts	Side Arm Mount [SO 701-1]		
50.0	52.0	1	lucent	KS24019-L112A	1	7/8
	50.0	1	tower mounts	Side Arm Mount [SO 701-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Tower Engineering Professionals	2294838	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Tower Engineering Professionals (Mapping)	2294380	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Tower Engineering Professionals (Mapping)	2294379	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont	823121	CCISITES

3.1) Analysis Method

tnxTower (version 8.0.4.0), 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) The existing base plate grout was not considered in this analysis.

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	140 - 86.8333	Pole	TP39.223x26.216x0.3125	1	-23.48	2525.79	37.1	Pass
L2	86.8333 - 38	Pole	TP50.56x37.2117x0.4063	2	-39.00	4253.37	48.6	Pass
L3	38 - 0	Pole	TP59.05x48.033x0.5	3	-60.27	6383.20	46.6	Pass
							Summary	
						Pole (L2)	48.6	Pass
						Rating =	48.6	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	51.2	Pass
1	Base Plate	0	21.4	Pass
1	Base Foundation	0	32.9	Pass
1	Base Foundation Soil Interaction	0	42.1	Pass

Structure Rating (max from all components) =	**51.2%**

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.