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

August 3, 2012

Jennifer Young Gaudet
HPC Wireless Services
46 Mill Plain Road, Floor 2
Danbury, CT 06811

RE: **EM-CING-155-120719** – New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 27-31 South Main Street, West Hartford, Connecticut.

Dear Ms. Gaudet:

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

- The proposed coax be installed in accordance with the recommendations made in the Structural Analysis Report prepared by FDH Engineering dated April 23, 2012 and stamped by Christopher Murphy; and
- Following the installation of the proposed equipment, AT&T shall provide documentation certifying that the installation complied with the engineer's recommendation.
- AT&T shall submit to the Council a Radio Frequency Exposure Report with field measurements taken in the vicinity of this facility at the top level of the parking garage within three months after the installation described in this notice of exempt modification has been completed.
- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated July 18, 2012. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has

also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

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

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/CDM/cm

c: The Honorable Scott Slifka, Mayor, Town of West Hartford
Barry M. Feldman, Town Manager, Town of West Hartford
Mila Limson, Town Planner, Town of West Hartford
Crown Castle

Date: **April 23, 2012**

Cheryl Schultz
Crown Castle USA Inc.
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
6521 Meridien Dr. Suite 107
Raleigh, NC 27616
(919) 755-1012
(919) 755-1012
info@fdh-inc.com

Subject: **Structural Analysis Report**

Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	CT5843
	Carrier Site Name:	AWE - West Hartford
Central		
Crown Castle Designation:	**Crown Castle BU Number:**	876328
	Crown Castle Site Name:	West Hartford Parking
Garage		
	Crown Castle JDE Job Number:	183530
	Crown Castle Work Order Number:	484825
	Crown Castle Application Number:	145202 Rev. 0
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number:**	12-04595E S1
Site Data:	**27-31 South Main St., WEST HARTFORD, Hartford, CT** **Latitude *41° 45' 36.41"*, Longitude *-72° 44' 35.25"*** **40.25 Foot - Self Support Tower**	

Dear Cheryl Schultz,

FDH Engineering, Inc. 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 460165, in accordance with application 145202, revision 0.

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

LC5: Existing + 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 the 2005 Connecticut Building Code based upon a wind speed of 80 mph fastest mile.

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

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

Respectfully submitted by:

Ashley Miller, E.I.
Project Engineer

STATE OF CONNECTICUT
Christopher Michael Murphy
No. 25842
LICENSED
PROFESSIONAL ENGINEER
4/23/12

Christopher M/ Murphy, PE
President
CT PE License No. 25842

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 40.25 ft Self Support tower designed by ROHN in April of 1997.

The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-E.

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, 38 mph with 1 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
94.0	94.0	1	crown mounts	Pipe Mount [PM 601-3]	1 2	3/8 3/4	---
		6	ericsson	RRU-11			
92.0	92.0	1	andrew	SBNH-1D6565C w/ Mount Pipe			
		1	crown mounts	T-Arm Mount [TA 601-3]			
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		1	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			

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
102.0	103.0	6	decibel	DB980H90E-M w/Mount Pipe	6	1 5/8	1
	102.0	1	crown mounts	Sector Mount [SM 303-3]			
92.0	92.0	3	powerwave technologies	7770.00 w/ Mount Pipe	6	7/8	1
		12	powerwave technologies	LGP2140X			
		1	crown mounts	Pipe Mount [PM 601-3]	---	---	2
75.0	77.0	1	lucent	KS24019-L112A	1	1/2	1
	75.0	1	crown mounts	Side Arm Mount [SO 203-1]			

Notes:
1) Existing equipment
2) Equipment to be removed

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)
40	40	12	decibel	db980h90	12	1 5/8
		3	generic	12' leg mounting frame		
10	10	1	generic	3' side arm	1	1 5/8
		1	generic	gps		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4 - TOWER MANUFACTURER DRAWINGS	ROHN dated April 15, 1997	1440544	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.2.0), 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.

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, Inc. 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 (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
T1	105.25 - 85.125	Leg	ROHN 2.5 STD	2	-12033.70	54963.59	21.9	Pass
		Diagonal	L1 1/2x1 1/2x1/8	10	-2501.31	3354.25	74.6 88.1 (b)	Pass
		Top Girt	L1 1/2x1 1/2x1/8	5	-224.33	1165.64	19.2	Pass
T2	85.125 - 65	Leg	ROHN 2.5 STD	38	-30304.50	50093.21	60.5	Pass
		Diagonal	L1 3/4x1 3/4x3/16	42	-2579.21	4468.38	57.7	Pass
							Summary	
						Leg (T2)	60.5	Pass
						Diagonal	88.1	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
						(T1)		
						Top Girt (T1)	19.2	Pass
						Bolt Checks	88.1	Pass
						RATING =	**88.1**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft) (AGL)	% Capacity	Pass / Fail
	Anchor Rods	65	37.4	Pass

Structure Rating (max from all components) =	**88.1%**

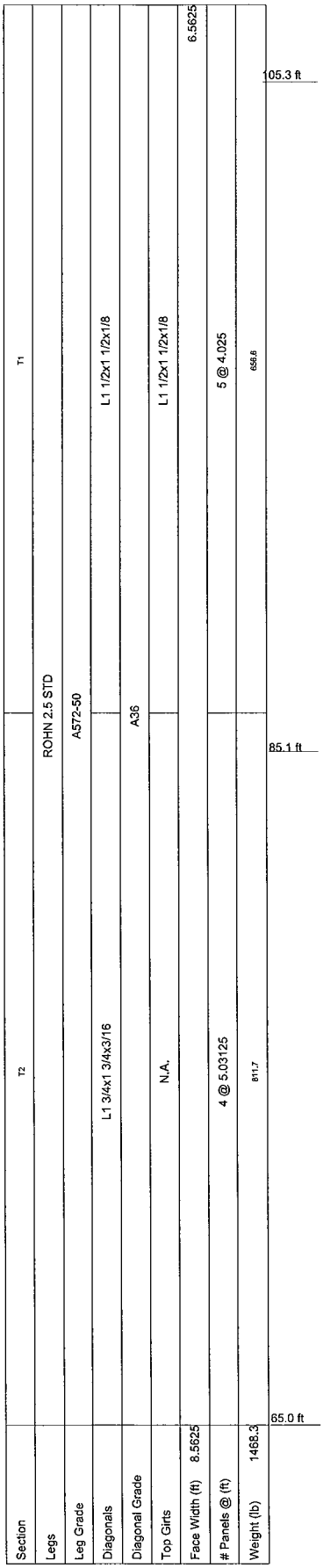
1) Tower analysis reactions are less than the original design reactions. Therefore, existing building considered to have adequate capacity to support the existing and proposed loading.

4.1) Recommendations

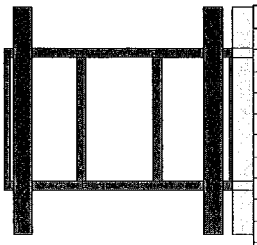
Coax must be installed as shown in Appendix B.

APPENDIX A

TNXTOWER OUTPUT



DESIGNED APPURTENANCE LOADING



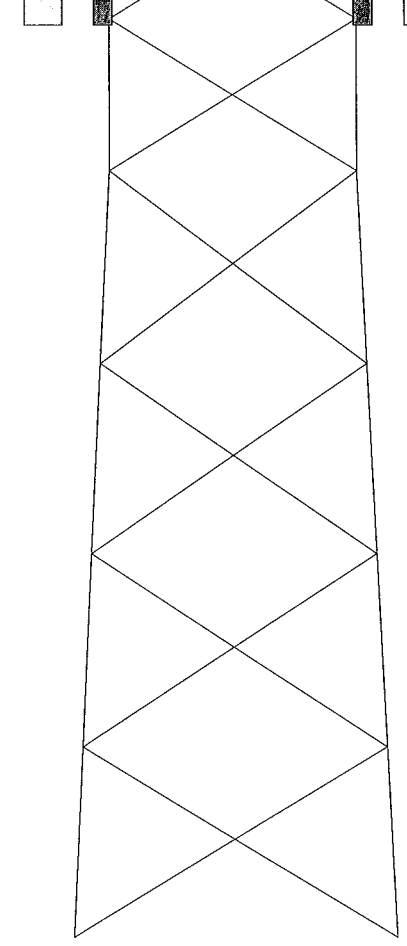
TYPE	ELEVATION	TYPE	ELEVATION
(2) DB980H90E-M w/Mount Pipe	102	(4) LGP2140X	92
(2) DB980H90E-M w/Mount Pipe	102	(4) LGP2140X	92
(2) DB980H90E-M w/Mount Pipe	102	(4) LGP2140X	92
Empty Mount Pipe	102	DC6-48-60-18-8F	92
Empty Mount Pipe	102	7770.00 w/ Mount Pipe	92
Empty Mount Pipe	102	7770.00 w/ Mount Pipe	92
Sector Mount [SM 303-3]	102	7770.00 w/ Mount Pipe	92
(2) RRU-11	94	AM-X-CD-16-65-00T-RET w/ Mount Pipe	92
(2) RRU-11	94	T-Arm Mount [TA 601-3]	92
(2) RRU-11	94	KS24019-L112A	75
Pipe Mount [PM 601-3]	94	Side Arm Mount [SO 203-1]	75
SBNH-1D6565C w/ Mount Pipe	92		
P65-17-XLH-RR w/ Mount Pipe	92		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

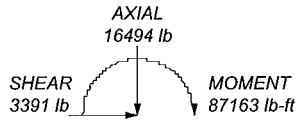
TOWER DESIGN NOTES

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 38 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: 88.1%

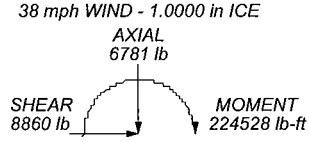


MAX. CORNER REACTIONS AT BASE:
DOWN: 32537 lb
SHEAR: 5077 lb

UPLIFT: -27299 lb
SHEAR: 4620 lb



TORQUE 864 lb-ft
38 mph WIND - 1.0000 in ICE



TORQUE 3276 lb-ft
REACTIONS - 80 mph WIND

FDH ENGINEERING
Tower Analysis
FDH Engineering, Inc.
2730 Rowland Road, Suite 100
Raleigh, NC 27615
Phone: (919) 755-1012
FAX: (919) 755-1031

Job: *West Hartford Parking Garage, CT (BU# 87632*			
Project: *12-04595E S1*			
Client: CCI	Drawn by: Ashley Miller	App'd:	
Code: TIA/EIA-222-F	Date: 04/23/12	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	West Hartford Parking Garage, CT (BU# 876328)	1 of 21
FDH Engineering, Inc. 2730 Rowland Road, Suite 100 Raleigh, NC 27615 Phone: (919) 755-1012 FAX: (919) 755-1031	**Project** 12-04595E S1	**Date** 08:14:48 04/23/12
	Client CCI	**Designed by** Ashley Miller

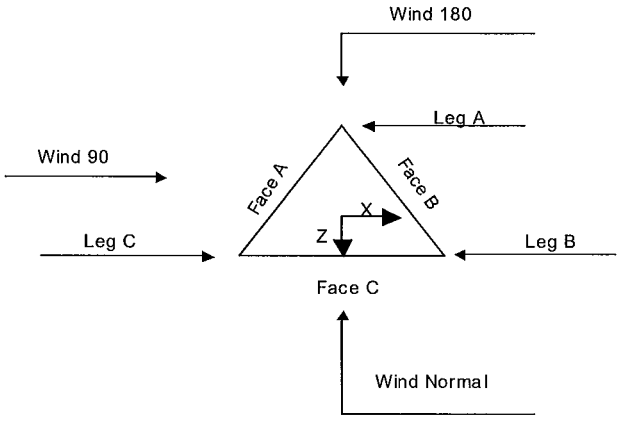
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 105.25 ft above the ground line.
The base of the tower is set at an elevation of 65.00 ft above the ground line.
The face width of the tower is 6.56 ft at the top and 8.56 ft at the base.
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 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Pressures are calculated at each section.
Stress ratio used in tower member 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		



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	105.25-85.13			6.56	1	20.13
T2	85.13-65.00			6.56	1	20.13

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	105.25-85.13	4.03	X Brace	No	No	0.0000	0.0000
T2	85.13-65.00	5.03	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 105.25-85.13	Pipe	ROHN 2.5 STD	A572-50	Equal Angle	L1 1/2x1 1/2x1/8	A36

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T2 85.13-65.00	Pipe	ROHN 2.5 STD	(50 ksi) A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	(36 ksi) A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 105.25-85.13	Equal Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

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
T1 105.25-85.13	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 85.13-65.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 105.25-85.13	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 85.13-65.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 105.25-85.13	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 85.13-65.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 105.25-85.13	Flange	0.6250 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 85.13-65.00	Flange	0.6250 A354-BC	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1-5/8"	B	Yes	Ar (CfAe)	102.00 - 65.00	0.0000	-0.3	6	6	1.0000	1.9800		1.04
1/2"	B	Yes	Ar (CfAe)	75.00 - 65.00	0.0000	-0.45	1	1	0.5800	0.5800		0.25
Feedline Ladder (Af) ***	B	Yes	Af (CfAe)	102.00 - 65.00	0.0000	-0.3	1	1	3.0000	3.0000	12.0000	8.40
7/8"	B	Yes	Ar (CfAe)	92.00 - 65.00	0.0000	0.35	6	6	1.0000	1.1100		0.54
3/4"	B	Yes	Ar (CfAe)	92.00 - 65.00	0.0000	0.35	2	2	0.9950	0.9950		0.47
3/8"	B	Yes	Ar (CfAe)	92.00 - 65.00	0.0000	0.35	1	1	0.3750	0.3750		0.18
Feedline Ladder (Af) ***	B	Yes	Af (CfAe)	92.00 - 65.00	0.0000	0.35	1	1	3.0000	3.0000	12.0000	8.40
Climbing Ladder	C	Yes	Af (CfAe)	105.00 - 65.00	0.0000	0	1	1	2.5000	2.5000	10.0000	7.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	105.25-85.13	A	0.000	0.000	0.000	0.000	0.00
		B	21.877	5.938	0.000	0.000	334.77
		C	0.000	4.141	0.000	0.000	157.01
T2	85.13-65.00	A	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
		B	35.543	10.063	0.000	0.000	553.92
		C	0.000	4.193	0.000	0.000	158.99

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	105.25-85.13	A	1.136	0.000	0.000	0.000	0.000	0.00
		B		11.302	37.072	0.000	0.000	1047.18
		C		0.000	6.648	0.000	0.000	282.51
T2	85.13-65.00	A	1.104	0.000	0.000	0.000	0.000	0.00
		B		24.610	61.017	0.000	0.000	1744.54
		C		0.000	6.661	0.000	0.000	281.45

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	105.25-85.13	A	0.000	0.000	0.000	0.000
		B	0.000	5.971	2.199	3.944
		C	0.000	0.946	0.327	0.625
T2	85.13-65.00	A	0.000	0.000	0.000	0.000
		B	0.000	7.754	3.182	6.148
		C	0.000	0.695	0.293	0.551

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	105.25-85.13	4.3658	-5.1443	2.6898	-2.5796
T2	85.13-65.00	9.1407	-4.8749	6.4448	-2.8339

Discrete Tower Loads

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 lb
(2) DB980H90E-M w/Mount	A	From Leg	3.00	0.0000	102.00	No Ice	4.27	3.86	34.05

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 lb
Pipe			0.00			1/2" Ice	4.86	4.95	69.84
			1.00			1" Ice	5.37	5.75	116.19
						2" Ice	6.42	7.39	231.29
						4" Ice	8.86	10.87	585.45
(2) DB980H90E-M w/Mount Pipe	B	From Leg	3.00	0.0000	102.00	No Ice	4.27	3.86	34.05
			0.00			1/2" Ice	4.86	4.95	69.84
			1.00			1" Ice	5.37	5.75	116.19
						2" Ice	6.42	7.39	231.29
						4" Ice	8.86	10.87	585.45
(2) DB980H90E-M w/Mount Pipe	C	From Leg	3.00	0.0000	102.00	No Ice	4.27	3.86	34.05
			0.00			1/2" Ice	4.86	4.95	69.84
			1.00			1" Ice	5.37	5.75	116.19
						2" Ice	6.42	7.39	231.29
						4" Ice	8.86	10.87	585.45
Empty Mount Pipe	A	From Leg	3.00	0.0000	102.00	No Ice	1.40	1.40	30.00
			0.00			1/2" Ice	2.13	2.13	40.92
			0.00			1" Ice	2.68	2.68	56.47
						2" Ice	3.56	3.56	102.08
						4" Ice	5.42	5.42	255.61
Empty Mount Pipe	B	From Leg	3.00	0.0000	102.00	No Ice	1.40	1.40	30.00
			0.00			1/2" Ice	2.13	2.13	40.92
			0.00			1" Ice	2.68	2.68	56.47
						2" Ice	3.56	3.56	102.08
						4" Ice	5.42	5.42	255.61
Empty Mount Pipe	C	From Leg	3.00	0.0000	102.00	No Ice	1.40	1.40	30.00
			0.00			1/2" Ice	2.13	2.13	40.92
			0.00			1" Ice	2.68	2.68	56.47
						2" Ice	3.56	3.56	102.08
						4" Ice	5.42	5.42	255.61
Sector Mount [SM 303-3]	C	None		0.0000	102.00	No Ice	43.57	43.57	1879.50
						1/2" Ice	61.82	61.82	2704.43
						1" Ice	80.07	80.07	3529.36
						2" Ice	116.57	116.57	5179.22
						4" Ice	189.57	189.57	8478.94
***									
7770.00 w/ Mount Pipe	A	From Leg	3.00	0.0000	92.00	No Ice	6.12	4.25	55.38
			0.00			1/2" Ice	6.63	5.01	100.55
			0.00			1" Ice	7.13	5.71	155.33
						2" Ice	8.16	7.16	286.50
						4" Ice	10.36	10.41	664.71
7770.00 w/ Mount Pipe	B	From Leg	3.00	0.0000	92.00	No Ice	6.12	4.25	55.38
			0.00			1/2" Ice	6.63	5.01	100.55
			0.00			1" Ice	7.13	5.71	155.33
						2" Ice	8.16	7.16	286.50
						4" Ice	10.36	10.41	664.71
7770.00 w/ Mount Pipe	C	From Leg	3.00	0.0000	92.00	No Ice	6.12	4.25	55.38
			0.00			1/2" Ice	6.63	5.01	100.55
			0.00			1" Ice	7.13	5.71	155.33
						2" Ice	8.16	7.16	286.50
						4" Ice	10.36	10.41	664.71
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	3.00	0.0000	92.00	No Ice	8.50	6.30	74.05
			0.00			1/2" Ice	9.15	7.48	136.21
			0.00			1" Ice	9.77	8.37	210.28
						2" Ice	11.03	10.18	384.86
						4" Ice	13.68	14.02	874.17
SBNH-1D6565C w/ Mount Pipe	B	From Leg	3.00	0.0000	92.00	No Ice	11.68	9.84	99.07
			0.00			1/2" Ice	12.40	11.37	185.09

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 lb
			0.00			1" Ice	13.14	12.91	286.25
						2" Ice	14.60	15.27	521.73
						4" Ice	17.87	20.14	1166.78
P65-17-XLH-RR w/ Mount Pipe	C	From Leg	3.00	0.0000	92.00	No Ice	11.70	8.94	91.85
			0.00			1/2" Ice	12.42	10.45	173.99
			0.00			1" Ice	13.15	11.99	271.15
						2" Ice	14.64	14.31	498.33
						4" Ice	17.91	19.14	1125.47
(4) LGP2140X	A	From Leg	3.00	0.0000	92.00	No Ice	1.26	0.38	14.10
			0.00			1/2" Ice	1.42	0.49	21.23
			0.00			1" Ice	1.58	0.62	30.24
						2" Ice	1.94	0.89	54.70
						4" Ice	2.75	1.54	134.81
(4) LGP2140X	B	From Leg	3.00	0.0000	92.00	No Ice	1.26	0.38	14.10
			0.00			1/2" Ice	1.42	0.49	21.23
			0.00			1" Ice	1.58	0.62	30.24
						2" Ice	1.94	0.89	54.70
						4" Ice	2.75	1.54	134.81
(4) LGP2140X	C	From Leg	3.00	0.0000	92.00	No Ice	1.26	0.38	14.10
			0.00			1/2" Ice	1.42	0.49	21.23
			0.00			1" Ice	1.58	0.62	30.24
						2" Ice	1.94	0.89	54.70
						4" Ice	2.75	1.54	134.81
DC6-48-60-18-8F	A	From Leg	0.00	0.0000	92.00	No Ice	2.57	4.32	18.90
			0.00			1/2" Ice	2.80	4.60	50.21
			0.00			1" Ice	3.04	4.88	85.17
						2" Ice	3.54	5.49	166.87
						4" Ice	4.66	6.80	382.77
(2) RRU-11	A	From Leg	0.50	0.0000	94.00	No Ice	1.91	1.47	44.00
			0.00			1/2" Ice	2.10	1.65	59.71
			0.00			1" Ice	2.30	1.83	78.03
						2" Ice	2.72	2.22	123.32
						4" Ice	3.68	3.10	253.87
(2) RRU-11	B	From Leg	0.50	0.0000	94.00	No Ice	1.91	1.47	44.00
			0.00			1/2" Ice	2.10	1.65	59.71
			0.00			1" Ice	2.30	1.83	78.03
						2" Ice	2.72	2.22	123.32
						4" Ice	3.68	3.10	253.87
(2) RRU-11	C	From Leg	0.50	0.0000	94.00	No Ice	1.91	1.47	44.00
			0.00			1/2" Ice	2.10	1.65	59.71
			0.00			1" Ice	2.30	1.83	78.03
						2" Ice	2.72	2.22	123.32
						4" Ice	3.68	3.10	253.87
Pipe Mount [PM 601-3]	C	None		0.0000	94.00	No Ice	4.39	4.39	195.00
						1/2" Ice	5.48	5.48	237.41
						1" Ice	6.57	6.57	279.82
						2" Ice	8.75	8.75	364.65
						4" Ice	13.11	13.11	534.30
T-Arm Mount [TA 601-3]	C	None		0.0000	92.00	No Ice	10.90	10.90	726.00
						1/2" Ice	14.65	14.65	925.56
						1" Ice	18.40	18.40	1125.12
						2" Ice	25.90	25.90	1524.24
						4" Ice	40.90	40.90	2322.48
***									
KS24019-L112A	A	From Leg	3.00	0.0000	75.00	No Ice	0.10	0.10	5.00
			0.00			1/2" Ice	0.18	0.18	6.50
			2.00			1" Ice	0.26	0.26	8.00

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 lb
						2" Ice	0.42	0.42	11.00
						4" Ice	0.74	0.74	17.00
Side Arm Mount [SO 203-1]	A	From Leg	0.00	0.0000	75.00	No Ice	2.96	3.36	125.00
			0.00			1/2" Ice	4.10	4.68	153.55
			0.00			1" Ice	5.24	6.00	182.10
						2" Ice	7.52	8.64	239.19
						4" Ice	12.08	13.92	353.38

Tower Pressures - No Ice

$G_H = 1.233$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	95.19	1.353	22	136.892	A	10.062	9.643	9.643	48.94	0.000	0.000
105.25-85.13					B	13.800	31.520		21.28	0.000	0.000
					C	13.875	9.643		41.00	0.000	0.000
T2 85.13-65.00	75.06	1.265	21	157.023	A	10.268	9.659	9.659	48.47	0.000	0.000
					B	17.148	45.202		15.49	0.000	0.000
					C	14.168	9.659		40.54	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.233$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 105.25-85.13	95.19	1.353	5	1.1356	140.701	A	10.062	32.496	17.261	40.56	0.000	0.000
						B	43.190	37.827		21.31	0.000	0.000
						C	16.086	31.550		36.24	0.000	0.000
T2 85.13-65.00	75.06	1.265	5	1.1036	160.729	A	10.268	30.026	17.075	42.38	0.000	0.000
						B	65.138	46.882		15.24	0.000	0.000
						C	16.378	29.331		37.36	0.000	0.000

Tower Pressure - Service

$G_H = 1.233$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face e	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	95.19	1.353	9	136.892	A	10.062	9.643	9.643	48.94	0.000	0.000
105.25-85.13					B	13.800	31.520		21.28	0.000	0.000
					C	13.875	9.643		41.00	0.000	0.000
T2 85.13-65.00	75.06	1.265	8	157.023	A	10.268	9.659	9.659	48.47	0.000	0.000
					B	17.148	45.202		15.49	0.000	0.000
					C	14.168	9.659		40.54	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	491.79	656.59	A	0.144	2.794	0.581	1	1	15.661	2032.44	100.99	B
105.25-85.13			B	0.331	2.217	0.626	1	1	33.529			
			C	0.172	2.693	0.585	1	1	19.517			
T2	712.91	811.71	A	0.127	2.858	0.578	1	1	15.853	2461.88	122.33	B
85.13-65.00			B	0.397	2.07	0.65	1	1	46.548			
			C	0.152	2.765	0.582	1	1	19.787			
Sum Weight:	1204.70	1468.30						OTM	86126.99 lb-ft	4494.32		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	491.79	656.59	A	0.144	2.794	0.581	0.8	1	13.648	1865.13	92.68	B
105.25-85.13			B	0.331	2.217	0.626	0.8	1	30.769			
			C	0.172	2.693	0.585	0.8	1	16.742			
T2	712.91	811.71	A	0.127	2.858	0.578	0.8	1	13.800	2280.49	113.32	B
85.13-65.00			B	0.397	2.07	0.65	0.8	1	43.118			
			C	0.152	2.765	0.582	0.8	1	16.954			
Sum Weight:	1204.70	1468.30						OTM	79251.11 lb-ft	4145.62		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	491.79	656.59	A	0.144	2.794	0.581	0.85	1	14.151	1906.96	94.76	B
105.25-85.13			B	0.331	2.217	0.626	0.85	1	31.459			
			C	0.172	2.693	0.585	0.85	1	17.436			
T2	712.91	811.71	A	0.127	2.858	0.578	0.85	1	14.313	2325.83	115.57	B
85.13-65.00			B	0.397	2.07	0.65	0.85	1	43.976			
			C	0.152	2.765	0.582	0.85	1	17.662			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
Sum Weight:	1204.70	1468.30						OTM	80970.08 lb-ft	4232.79		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	1329.69	2150.21	A	0.302	2.289	0.617	1	1	30.101	799.40	39.72	B
105.25-85.13			B	0.576	1.821	0.739	1	1	71.148			
			C	0.339	2.198	0.628	1	1	35.913			
T2	2025.99	2197.34	A	0.251	2.435	0.602	1	1	28.345	1059.40	52.64	B
85.13-65.00			B	0.697	1.776	0.818	1	1	103.475			
			C	0.284	2.338	0.611	1	1	34.306			
Sum Weight:	3355.68	4347.54						OTM	34792.06 lb-ft	1858.80		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	1329.69	2150.21	A	0.302	2.289	0.617	0.8	1	28.089	702.34	34.90	B
105.25-85.13			B	0.576	1.821	0.739	0.8	1	62.510			
			C	0.339	2.198	0.628	0.8	1	32.696			
T2	2025.99	2197.34	A	0.251	2.435	0.602	0.8	1	26.292	926.02	46.01	B
85.13-65.00			B	0.697	1.776	0.818	0.8	1	90.447			
			C	0.284	2.338	0.611	0.8	1	31.031			
Sum Weight:	3355.68	4347.54						OTM	30520.09 lb-ft	1628.36		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	1329.69	2150.21	A	0.302	2.289	0.617	0.85	1	28.592	726.61	36.10	B
105.25-85.13			B	0.576	1.821	0.739	0.85	1	64.670			
			C	0.339	2.198	0.628	0.85	1	33.500			
T2	2025.99	2197.34	A	0.251	2.435	0.602	0.85	1	26.805	959.37	47.67	B
85.13-65.00			B	0.697	1.776	0.818	0.85	1	93.704			
			C	0.284	2.338	0.611	0.85	1	31.850			
Sum Weight:	3355.68	4347.54						OTM	31588.09 lb-ft	1685.97		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	491.79	656.59	A	0.144	2.794	0.581	1	1	15.661	793.92	39.45	B
105.25-85.13			B	0.331	2.217	0.626	1	1	33.529			
			C	0.172	2.693	0.585	1	1	19.517			
T2	712.91	811.71	A	0.127	2.858	0.578	1	1	15.853	961.67	47.78	B
85.13-65.00			B	0.397	2.07	0.65	1	1	46.548			
			C	0.152	2.765	0.582	1	1	19.787			
Sum Weight:	1204.70	1468.30						OTM	33643.36 lb-ft	1755.59		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	491.79	656.59	A	0.144	2.794	0.581	0.8	1	13.648	728.57	36.20	B
105.25-85.13			B	0.331	2.217	0.626	0.8	1	30.769			
			C	0.172	2.693	0.585	0.8	1	16.742			
T2	712.91	811.71	A	0.127	2.858	0.578	0.8	1	13.800	890.81	44.26	B
85.13-65.00			B	0.397	2.07	0.65	0.8	1	43.118			
			C	0.152	2.765	0.582	0.8	1	16.954			
Sum Weight:	1204.70	1468.30						OTM	30957.46 lb-ft	1619.38		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1	491.79	656.59	A	0.144	2.794	0.581	0.85	1	14.151	744.91	37.01	B
105.25-85.13			B	0.331	2.217	0.626	0.85	1	31.459			
			C	0.172	2.693	0.585	0.85	1	17.436			
T2	712.91	811.71	A	0.127	2.858	0.578	0.85	1	14.313	908.53	45.14	B
85.13-65.00			B	0.397	2.07	0.65	0.85	1	43.976			
			C	0.152	2.765	0.582	0.85	1	17.662			
Sum Weight:	1204.70	1468.30						OTM	31628.94 lb-ft	1653.44		

Discrete Appurtenance Pressures - No Ice $G_H = 1.233$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
DB980H90E-M w/Mount Pipe	0.0000	68.10	0.00	-6.79	103.00	1.384	23	8.55	7.71
DB980H90E-M w/Mount Pipe	120.0000	68.10	5.88	3.39	103.00	1.384	23	8.55	7.71
DB980H90E-M w/Mount Pipe	240.0000	68.10	-5.88	3.39	103.00	1.384	23	8.55	7.71
Empty Mount Pipe	0.0000	30.00	0.00	-6.79	102.00	1.380	23	1.40	1.40
Empty Mount Pipe	120.0000	30.00	5.88	3.39	102.00	1.380	23	1.40	1.40
Empty Mount Pipe	240.0000	30.00	-5.88	3.39	102.00	1.380	23	1.40	1.40
Sector Mount [SM 303-3]	0.0000	1879.50	0.00	0.00	102.00	1.380	23	43.57	43.57
7770.00 w/ Mount Pipe	0.0000	55.38	0.00	-6.79	92.00	1.340	22	6.12	4.25
7770.00 w/ Mount Pipe	120.0000	55.38	5.88	3.39	92.00	1.340	22	6.12	4.25
7770.00 w/ Mount Pipe	240.0000	55.38	-5.88	3.39	92.00	1.340	22	6.12	4.25
AM-X-CD-16-65-00T-RET w/ Mount Pipe	0.0000	74.05	0.00	-6.79	92.00	1.340	22	8.50	6.30
SBNH-1D6565C w/ Mount Pipe	120.0000	99.07	5.88	3.39	92.00	1.340	22	11.68	9.84
P65-17-XLH-RR w/ Mount Pipe	240.0000	91.85	-5.88	3.39	92.00	1.340	22	11.70	8.94
LGP2140X	0.0000	56.40	0.00	-6.79	92.00	1.340	22	5.04	1.51
LGP2140X	120.0000	56.40	5.88	3.39	92.00	1.340	22	5.04	1.51
LGP2140X	240.0000	56.40	-5.88	3.39	92.00	1.340	22	5.04	1.51
DC6-48-60-18-8F	0.0000	18.90	0.00	-3.79	92.00	1.340	22	2.57	4.32
RRU-11	0.0000	88.00	0.00	-4.29	94.00	1.349	22	3.82	2.94
RRU-11	120.0000	88.00	3.71	2.14	94.00	1.349	22	3.82	2.94
RRU-11	240.0000	88.00	-3.71	2.14	94.00	1.349	22	3.82	2.94
Pipe Mount [PM 601-3]	0.0000	195.00	0.00	0.00	94.00	1.349	22	4.39	4.39
T-Arm Mount [TA 601-3]	0.0000	726.00	0.00	0.00	92.00	1.340	22	10.90	10.90
KS24019-L112A	0.0000	5.00	0.00	-7.37	77.00	1.274	21	0.10	0.10
Side Arm Mount [SO 203-1]	0.0000	125.00	0.00	-4.37	75.00	1.264	21	2.96	3.36
	Sum Weight:	4108.01							

Discrete Appurtenance Pressures - With Ice $G_H = 1.233$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
DB980H90E-M w/Mount Pipe	0.0000	265.76	0.00	-6.79	103.00	1.384	5	11.05	11.98	1.1450
DB980H90E-M w/Mount Pipe	120.0000	265.76	5.88	3.39	103.00	1.384	5	11.05	11.98	1.1450
DB980H90E-M w/Mount Pipe	240.0000	265.76	-5.88	3.39	103.00	1.384	5	11.05	11.98	1.1450
Empty Mount Pipe	0.0000	63.09	0.00	-6.79	102.00	1.380	5	2.81	2.81	1.1450
Empty Mount Pipe	120.0000	63.09	5.88	3.39	102.00	1.380	5	2.81	2.81	1.1450
Empty Mount Pipe	240.0000	63.09	-5.88	3.39	102.00	1.380	5	2.81	2.81	1.1450
Sector Mount [SM 303-3]	0.0000	3768.61	0.00	0.00	102.00	1.380	5	85.36	85.36	1.1450
7770.00 w/ Mount Pipe	0.0000	172.50	0.00	-6.79	92.00	1.340	5	7.26	5.90	1.1309
7770.00 w/ Mount Pipe	120.0000	172.50	5.88	3.39	92.00	1.340	5	7.26	5.90	1.1309
7770.00 w/ Mount Pipe	240.0000	172.50	-5.88	3.39	92.00	1.340	5	7.26	5.90	1.1309
AM-X-CD-16-65-00T-RET w/ Mount Pipe	0.0000	233.14	0.00	-6.79	92.00	1.340	5	9.93	8.60	1.1309
SBNH-1D6565C w/	120.0000	317.08	5.88	3.39	92.00	1.340	5	13.33	13.22	1.1309

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
Mount Pipe										
P65-17-XLH-RR w/ Mount Pipe	240.0000	300.90	-5.88	3.39	92.00	1.340	5	13.35	12.29	1.1309
LGP2140X	0.0000	133.76	0.00	-6.79	92.00	1.340	5	6.51	2.61	1.1309
LGP2140X	120.0000	133.76	5.88	3.39	92.00	1.340	5	6.51	2.61	1.1309
LGP2140X	240.0000	133.76	-5.88	3.39	92.00	1.340	5	6.51	2.61	1.1309
DC6-48-60-18-8F	0.0000	95.87	0.00	-3.79	92.00	1.340	5	3.10	4.96	1.1309
RRU-11	0.0000	168.19	0.00	-4.29	94.00	1.349	5	4.72	3.76	1.1338
RRU-11	120.0000	168.19	3.71	2.14	94.00	1.349	5	4.72	3.76	1.1338
RRU-11	240.0000	168.19	-3.71	2.14	94.00	1.349	5	4.72	3.76	1.1338
Pipe Mount [PM 601-3]	0.0000	291.18	0.00	0.00	94.00	1.349	5	6.86	6.86	1.1338
T-Arm Mount [TA 601-3]	0.0000	1177.37	0.00	0.00	92.00	1.340	5	19.38	19.38	1.1309
KS24019-L112A	0.0000	8.31	0.00	-7.37	77.00	1.274	5	0.28	0.28	1.1035
Side Arm Mount [SO 203-1]	0.0000	188.01	0.00	-4.37	75.00	1.264	5	5.48	6.27	1.1035
	Sum Weight:	8790.35								

Discrete Appurtenance Pressures - Service $G_H = 1.233$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
DB980H90E-M w/Mount Pipe	0.0000	68.10	0.00	-6.79	103.00	1.384	9	8.55	7.71
DB980H90E-M w/Mount Pipe	120.0000	68.10	5.88	3.39	103.00	1.384	9	8.55	7.71
DB980H90E-M w/Mount Pipe	240.0000	68.10	-5.88	3.39	103.00	1.384	9	8.55	7.71
Empty Mount Pipe	0.0000	30.00	0.00	-6.79	102.00	1.380	9	1.40	1.40
Empty Mount Pipe	120.0000	30.00	5.88	3.39	102.00	1.380	9	1.40	1.40
Empty Mount Pipe	240.0000	30.00	-5.88	3.39	102.00	1.380	9	1.40	1.40
Sector Mount [SM 303-3]	0.0000	1879.50	0.00	0.00	102.00	1.380	9	43.57	43.57
7770.00 w/ Mount Pipe	0.0000	55.38	0.00	-6.79	92.00	1.340	9	6.12	4.25
7770.00 w/ Mount Pipe	120.0000	55.38	5.88	3.39	92.00	1.340	9	6.12	4.25
7770.00 w/ Mount Pipe	240.0000	55.38	-5.88	3.39	92.00	1.340	9	6.12	4.25
AM-X-CD-16-65-00T-RET w/ Mount Pipe	0.0000	74.05	0.00	-6.79	92.00	1.340	9	8.50	6.30
SBNH-1D6565C w/ Mount Pipe	120.0000	99.07	5.88	3.39	92.00	1.340	9	11.68	9.84
P65-17-XLH-RR w/ Mount Pipe	240.0000	91.85	-5.88	3.39	92.00	1.340	9	11.70	8.94
LGP2140X	0.0000	56.40	0.00	-6.79	92.00	1.340	9	5.04	1.51
LGP2140X	120.0000	56.40	5.88	3.39	92.00	1.340	9	5.04	1.51
LGP2140X	240.0000	56.40	-5.88	3.39	92.00	1.340	9	5.04	1.51
DC6-48-60-18-8F	0.0000	18.90	0.00	-3.79	92.00	1.340	9	2.57	4.32
RRU-11	0.0000	88.00	0.00	-4.29	94.00	1.349	9	3.82	2.94
RRU-11	120.0000	88.00	3.71	2.14	94.00	1.349	9	3.82	2.94
RRU-11	240.0000	88.00	-3.71	2.14	94.00	1.349	9	3.82	2.94
Pipe Mount [PM 601-3]	0.0000	195.00	0.00	0.00	94.00	1.349	9	4.39	4.39
T-Arm Mount [TA 601-3]	0.0000	726.00	0.00	0.00	92.00	1.340	9	10.90	10.90
KS24019-L112A	0.0000	5.00	0.00	-7.37	77.00	1.274	8	0.10	0.10
Side Arm Mount [SO 203-1]	0.0000	125.00	0.00	-4.37	75.00	1.264	8	2.96	3.36
	Sum	4108.01							

tnxTower	Job: West Hartford Parking Garage, CT (BU# 876328)	Page: 14 of 21
FDH Engineering, Inc. 2730 Rowland Road, Suite 100 Raleigh, NC 27615 Phone: (919) 755-1012 FAX: (919) 755-1031	Project: 12-04595E S1	Date: 08:14:48 04/23/12
	Client: CCI	Designed by: Ashley Miller

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
	Weight:								

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	700.75					
Bracing Weight	767.56					
Total Member Self-Weight	1468.30			-1044.37	-1577.14	
Total Weight	6781.01			-1044.37	-1577.14	
Wind 0 deg - No Ice		10.86	-8805.54	-223871.45	-1870.24	2758.70
Wind 30 deg - No Ice		4311.71	-7404.76	-189698.81	-111397.36	1243.80
Wind 60 deg - No Ice		7381.75	-4237.82	-109273.80	-190009.56	-448.49
Wind 90 deg - No Ice		8604.62	-10.86	-1337.47	-220709.91	-2032.05
Wind 120 deg - No Ice		7672.88	4393.37	110115.34	-195671.15	-3233.60
Wind 150 deg - No Ice		4292.91	7393.91	187316.97	-110889.70	-3275.85
Wind 180 deg - No Ice		-10.86	8456.84	214906.82	-1284.05	-2559.66
Wind 210 deg - No Ice		-4311.71	7404.76	187610.07	108243.07	-1243.80
Wind 240 deg - No Ice		-7683.74	4412.17	110623.00	192809.96	474.90
Wind 270 deg - No Ice		-8604.62	10.86	-751.27	217555.62	2032.05
Wind 300 deg - No Ice		-7370.90	-4219.02	-108766.14	186562.17	3008.15
Wind 330 deg - No Ice		-4292.91	-7393.91	-189405.71	107735.41	3275.85
Member Ice	2879.24					
Total Weight Ice	16493.58			-3161.23	-4967.18	
Wind 0 deg - Ice		2.52	-3380.46	-87017.60	-5035.16	781.59
Wind 30 deg - Ice		1611.69	-2779.15	-73042.25	-45467.04	368.57
Wind 60 deg - Ice		2739.13	-1577.19	-43012.31	-74122.10	-73.50
Wind 90 deg - Ice		3219.03	-2.52	-3229.21	-85849.14	-495.30
Wind 120 deg - Ice		2936.17	1688.05	38708.08	-77753.74	-853.75
Wind 150 deg - Ice		1607.33	2776.63	66651.81	-45349.29	-863.87
Wind 180 deg - Ice		-2.52	3150.02	76423.18	-4899.20	-688.20
Wind 210 deg - Ice		-1611.69	2779.15	66719.79	35532.67	-368.57
Wind 240 deg - Ice		-2938.69	1692.41	38825.83	67887.36	72.16
Wind 270 deg - Ice		-3219.03	2.52	-3093.25	75914.78	495.30
Wind 300 deg - Ice		-2736.61	-1572.83	-42894.56	64119.75	761.71
Wind 330 deg - Ice		-1607.33	-2776.63	-72974.27	35414.93	863.87
Total Weight	6781.01			-1044.37	-1577.14	
Wind 0 deg - Service		4.24	-3439.66	-87551.16	-156.94	1077.62
Wind 30 deg - Service		1684.26	-2892.49	-74202.47	-42940.97	485.86
Wind 60 deg - Service		2883.50	-1655.40	-42786.45	-73648.86	-175.19
Wind 90 deg - Service		3361.18	-4.24	-623.82	-85641.18	-793.77
Wind 120 deg - Service		2997.22	1716.16	42912.43	-75860.42	-1263.13
Wind 150 deg - Service		1676.92	2888.25	73069.32	-42742.66	-1279.63
Wind 180 deg - Service		-4.24	3303.45	83846.60	72.04	-999.87
Wind 210 deg - Service		-1684.26	2892.49	73183.81	42856.07	-485.86
Wind 240 deg - Service		-3001.46	1723.50	43110.73	75890.01	185.51
Wind 270 deg - Service		-3361.18	4.24	-394.84	85556.29	793.77
Wind 300 deg - Service		-2879.26	-1648.05	-42588.15	73449.47	1175.06
Wind 330 deg - Service		-1676.92	-2888.25	-74087.98	42657.77	1279.63

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 Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
T1	105.25 - 85.125	Leg	Max Tension	4	8539.22	-82.39	44.71
			Max. Compression	6	-12033.72	-67.90	-55.85
			Max. Mx	11	-1649.04	-378.11	-14.16
			Max. My	2	1415.14	-58.14	-360.67
			Max. Vy	11	-601.88	200.07	-62.32
			Max. Vx	2	-615.23	5.13	235.76
		Diagonal	Max Tension	7	2446.60	0.00	0.00
			Max. Compression	13	-2501.31	0.00	0.00
			Max. Mx	18	397.21	10.99	0.22
			Max. My	5	-1096.97	1.48	1.38
			Max. Vy	18	-12.44	10.99	0.22
			Max. Vx	5	-0.36	2.63	1.38
		Top Girt	Max Tension	4	222.10	0.00	0.00
			Max. Compression	10	-224.33	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Mx	14	-47.18	-31.45	0.00
			Max. Vy	14	-19.17	0.00	0.00
T2	85.125 - 65	Leg	Max Tension	4	25238.75	0.00	-0.01
			Max. Compression	6	-30304.45	0.00	-0.05
			Max. Mx	25	1684.80	-124.26	-2.20
			Max. My	3	-2373.12	-10.57	-131.54
			Max. Vy	21	-72.52	-123.25	2.73
			Max. Vx	2	61.67	-19.81	-118.12
		Diagonal	Max Tension	7	2589.00	0.00	0.00
			Max. Compression	7	-2579.21	0.00	0.00
			Max. Mx	16	61.31	26.04	1.73
			Max. My	7	-2315.68	-2.00	3.13
			Max. Vy	16	19.49	26.04	1.73
			Max. Vx	19	-1.12	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	10	32237.36	4382.03	-2563.36
	Max. H_x	10	32237.36	4382.03	-2563.36
	Max. H_z	3	-23540.53	-3291.51	2336.39
	Min. Vert	4	-27298.64	-3986.90	2334.26
	Min. H_x	4	-27298.64	-3986.90	2334.26
	Min. H_z	10	32237.36	4382.03	-2563.36
Leg B	Max. Vert	6	32537.28	-4284.29	-2724.78
	Max. H_x	12	-26861.79	3888.12	2470.64
	Max. H_z	13	-23093.10	3124.73	2587.26
	Min. Vert	12	-26861.79	3888.12	2470.64
	Min. H_x	6	32537.28	-4284.29	-2724.78
	Min. H_z	7	27841.33	-3363.48	-2732.97
Leg A	Max. Vert	2	32450.63	188.66	5052.36
	Max. H_x	11	2361.63	1073.62	132.86
	Max. H_z	2	32450.63	188.66	5052.36
	Min. Vert	8	-26721.05	-167.50	-4583.82
	Min. H_x	5	2440.69	-1065.88	145.15
	Min. H_z	8	-26721.05	-167.50	-4583.82

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	6781.01	0.00	-0.00	-1044.24	-1577.14	0.00
Dead+Wind 0 deg - No Ice	6781.01	10.86	-8805.54	-223871.32	-1870.24	2758.70
Dead+Wind 30 deg - No Ice	6781.01	4311.71	-7404.76	-189698.69	-111397.36	1243.84
Dead+Wind 60 deg - No Ice	6781.01	7381.75	-4237.82	-109273.67	-190009.56	-448.42
Dead+Wind 90 deg - No Ice	6781.01	8604.62	-10.86	-1337.34	-220709.91	-2031.96
Dead+Wind 120 deg - No Ice	6781.01	7672.88	4393.37	110115.47	-195671.16	-3233.53
Dead+Wind 150 deg - No Ice	6781.01	4292.91	7393.91	187317.10	-110889.70	-3275.81
Dead+Wind 180 deg - No Ice	6781.01	-10.86	8456.84	214906.95	-1284.05	-2559.66
Dead+Wind 210 deg - No Ice	6781.01	-4311.71	7404.76	187610.20	108243.07	-1243.84

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Dead+Wind 240 deg - No Ice	6781.01	-7683.74	4412.17	110623.13	192809.96	474.83
Dead+Wind 270 deg - No Ice	6781.01	-8604.62	10.86	-751.15	217555.62	2031.96
Dead+Wind 300 deg - No Ice	6781.01	-7370.90	-4219.02	-108766.01	186562.17	3008.08
Dead+Wind 330 deg - No Ice	6781.01	-4292.91	-7393.91	-189405.59	107735.41	3275.81
Dead+Ice+Temp	16493.58	0.00	-0.00	-3161.04	-4967.18	0.00
Dead+Wind 0 deg+Ice+Temp	16493.58	2.52	-3380.46	-87017.42	-5035.16	781.59
Dead+Wind 30 deg+Ice+Temp	16493.58	1611.69	-2779.15	-73042.06	-45467.04	368.59
Dead+Wind 60 deg+Ice+Temp	16493.58	2739.13	-1577.19	-43012.12	-74122.10	-73.47
Dead+Wind 90 deg+Ice+Temp	16493.58	3219.03	-2.52	-3229.02	-85849.14	-495.26
Dead+Wind 120 deg+Ice+Temp	16493.58	2936.17	1688.05	38708.27	-77753.75	-853.72
Dead+Wind 150 deg+Ice+Temp	16493.58	1607.33	2776.63	66652.00	-45349.29	-863.85
Dead+Wind 180 deg+Ice+Temp	16493.58	-2.52	3150.02	76423.37	-4899.20	-688.20
Dead+Wind 210 deg+Ice+Temp	16493.58	-1611.69	2779.15	66719.98	35532.67	-368.59
Dead+Wind 240 deg+Ice+Temp	16493.58	-2938.69	1692.41	38826.02	67887.36	72.12
Dead+Wind 270 deg+Ice+Temp	16493.58	-3219.03	2.52	-3093.06	75914.78	495.26
Dead+Wind 300 deg+Ice+Temp	16493.58	-2736.61	-1572.83	-42894.37	64119.75	761.68
Dead+Wind 330 deg+Ice+Temp	16493.58	-1607.33	-2776.63	-72974.08	35414.93	863.85
Dead+Wind 0 deg - Service	6781.01	4.24	-3439.66	-88086.07	-1691.64	1077.62
Dead+Wind 30 deg - Service	6781.01	1684.26	-2892.49	-74737.39	-44475.67	485.88
Dead+Wind 60 deg - Service	6781.01	2883.50	-1655.40	-43321.36	-75183.56	-175.16
Dead+Wind 90 deg - Service	6781.01	3361.18	-4.24	-1158.73	-87175.88	-793.74
Dead+Wind 120 deg - Service	6781.01	2997.22	1716.16	42377.52	-77395.12	-1263.10
Dead+Wind 150 deg - Service	6781.01	1676.92	2888.25	72534.41	-44277.36	-1279.61
Dead+Wind 180 deg - Service	6781.01	-4.24	3303.45	83311.69	-1462.65	-999.87
Dead+Wind 210 deg - Service	6781.01	-1684.26	2892.49	72648.90	41321.38	-485.88
Dead+Wind 240 deg - Service	6781.01	-3001.46	1723.50	42575.82	74355.32	185.48
Dead+Wind 270 deg - Service	6781.01	-3361.18	4.24	-929.75	84021.59	793.74
Dead+Wind 300 deg - Service	6781.01	-2879.26	-1648.05	-43123.06	71914.78	1175.03
Dead+Wind 330 deg - Service	6781.01	-1676.92	-2888.25	-74622.89	41123.07	1279.61

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	lb	lb	lb	lb	lb	lb	
1	0.00	-6781.01	0.00	-0.00	6781.01	0.00	0.000%
2	10.86	-6781.01	-8805.54	-10.86	6781.01	8805.54	0.000%
3	4311.71	-6781.01	-7404.76	-4311.71	6781.01	7404.76	0.000%
4	7381.75	-6781.01	-4237.82	-7381.75	6781.01	4237.82	0.000%
5	8604.62	-6781.01	-10.86	-8604.62	6781.01	10.86	0.000%
6	7672.88	-6781.01	4393.37	-7672.88	6781.01	-4393.37	0.000%
7	4292.91	-6781.01	7393.91	-4292.91	6781.01	-7393.91	0.000%
8	-10.86	-6781.01	8456.84	10.86	6781.01	-8456.84	0.000%
9	-4311.71	-6781.01	7404.76	4311.71	6781.01	-7404.76	0.000%
10	-7683.74	-6781.01	4412.17	7683.74	6781.01	-4412.17	0.000%
11	-8604.62	-6781.01	10.86	8604.62	6781.01	-10.86	0.000%
12	-7370.90	-6781.01	-4219.02	7370.90	6781.01	4219.02	0.000%
13	-4292.91	-6781.01	-7393.91	4292.91	6781.01	7393.91	0.000%
14	0.00	-16493.58	0.00	-0.00	16493.58	0.00	0.000%
15	2.52	-16493.58	-3380.46	-2.52	16493.58	3380.46	0.000%
16	1611.69	-16493.58	-2779.15	-1611.69	16493.58	2779.15	0.000%
17	2739.13	-16493.58	-1577.19	-2739.13	16493.58	1577.19	0.000%
18	3219.03	-16493.58	-2.52	-3219.03	16493.58	2.52	0.000%
19	2936.17	-16493.58	1688.05	-2936.17	16493.58	-1688.05	0.000%
20	1607.33	-16493.58	2776.63	-1607.33	16493.58	-2776.63	0.000%
21	-2.52	-16493.58	3150.02	2.52	16493.58	-3150.02	0.000%
22	-1611.69	-16493.58	2779.15	1611.69	16493.58	-2779.15	0.000%
23	-2938.69	-16493.58	1692.41	2938.69	16493.58	-1692.41	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
24	-3219.03	-16493.58	2.52	3219.03	16493.58	-2.52	0.000%
25	-2736.61	-16493.58	-1572.83	2736.61	16493.58	1572.83	0.000%
26	-1607.33	-16493.58	-2776.63	1607.33	16493.58	2776.63	0.000%
27	4.24	-6781.01	-3439.66	-4.24	6781.01	3439.66	0.000%
28	1684.26	-6781.01	-2892.49	-1684.26	6781.01	2892.49	0.000%
29	2883.50	-6781.01	-1655.40	-2883.50	6781.01	1655.40	0.000%
30	3361.18	-6781.01	-4.24	-3361.18	6781.01	4.24	0.000%
31	2997.22	-6781.01	1716.16	-2997.22	6781.01	-1716.16	0.000%
32	1676.92	-6781.01	2888.25	-1676.92	6781.01	-2888.25	0.000%
33	-4.24	-6781.01	3303.45	4.24	6781.01	-3303.45	0.000%
34	-1684.26	-6781.01	2892.49	1684.26	6781.01	-2892.49	0.000%
35	-3001.46	-6781.01	1723.50	3001.46	6781.01	-1723.50	0.000%
36	-3361.18	-6781.01	4.24	3361.18	6781.01	-4.24	0.000%
37	-2879.26	-6781.01	-1648.05	2879.26	6781.01	1648.05	0.000%
38	-1676.92	-6781.01	-2888.25	1676.92	6781.01	2888.25	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	105.25 - 85.125	0.367	31	0.0536	0.0076
T2	85.125 - 65	0.125	31	0.0432	0.0047

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
102.00	(2) DB980H90E-M w/Mount Pipe	31	0.323	0.0532	0.0072	111581
94.00	(2) RRU-11	31	0.221	0.0510	0.0062	49592
92.00	7770.00 w/ Mount Pipe	31	0.197	0.0498	0.0059	42106
75.00	KS24019-L112A	31	0.051	0.0246	0.0025	55791

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	105.25 - 85.125	0.934	6	0.1363	0.0194
T2	85.125 - 65	0.319	6	0.1099	0.0121

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
102.00	(2) DB980H90E-M w/Mount Pipe	6	0.823	0.1353	0.0184	43941
94.00	(2) RRU-11	6	0.562	0.1296	0.0158	19529
92.00	7770.00 w/ Mount Pipe	6	0.501	0.1267	0.0150	16581
75.00	KS24019-L112A	6	0.131	0.0624	0.0065	21970

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	105.25	Leg	A325N	0.6250	4	2134.81	13499.00	0.158 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2446.60	2084.38	1.174 ✔	1.333	Member Block Shear
		Top Girt	A325N	0.5000	1	222.10	2084.38	0.107 ✔	1.333	Member Block Shear
T2	85.125	Leg	A354-BC	0.6250	4	6309.69	12655.30	0.499 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2589.00	3806.25	0.680 ✔	1.333	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	105.25 - 85.125	ROHN 2.5 STD	20.13	4.02	51.0 K=1.00	24.197	1.7040	-12033.70	41233.00	0.292 ✔
T2	85.125 - 65	ROHN 2.5 STD	20.16	5.04	63.8 K=1.00	22.053	1.7040	-30304.50	37579.30	0.806 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	105.25 - 85.125	L1 1/2x1 1/2x1/8	7.70	3.60	146.0 K=1.00	7.002	0.3594	-2501.31	2516.32	0.994 ✔
T2	85.125 - 65	L1 3/4x1 3/4x3/16	9.72	4.76	166.3 K=1.00	5.397	0.6211	-2579.21	3352.12	0.769 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	105.25 - 85.125	L1 1/2x1 1/2x1/8 KL/R > 200 (C) - 5	6.56	6.11	247.7 K=1.00	2.433	0.3594	-224.33	874.45	0.257 ✔

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	105.25 - 85.125	ROHN 2.5 STD	20.13	4.02	51.0	30.000	1.7040	8539.22	51121.50	0.167 ✔
T2	85.125 - 65	ROHN 2.5 STD	20.16	5.04	63.8	30.000	1.7040	25238.70	51121.50	0.494 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	105.25 - 85.125	L1 1/2x1 1/2x1/8	7.70	3.60	95.7	29.000	0.2109	2446.60	6117.19	0.400 ✔
T2	85.125 - 65	L1 3/4x1 3/4x3/16	9.72	4.76	108.7	29.000	0.3779	2589.00	10960.00	0.236 ✔

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	105.25 - 85.125	L1 1/2x1 1/2x1/8	6.56	6.11	163.1	29.000	0.2109	222.10	6117.19	0.036 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	105.25 - 85.125	Leg	ROHN 2.5 STD	2	-12033.70	54963.59	21.9	Pass
		Diagonal	L1 1/2x1 1/2x1/8	10	-2501.31	3354.25	74.6	Pass
							88.1 (b)	
		Top Girt	L1 1/2x1 1/2x1/8	5	-224.33	1165.64	19.2	Pass
T2	85.125 - 65	Leg	ROHN 2.5 STD	38	-30304.50	50093.21	60.5	Pass
		Diagonal	L1 3/4x1 3/4x3/16	42	-2579.21	4468.38	57.7	Pass
							Summary	
						Leg (T2)	60.5	Pass
						Diagonal (T1)	88.1	Pass
						Top Girt (T1)	19.2	Pass
						Bolt Checks	88.1	Pass
						RATING =	**88.1**	**Pass**

APPENDIX B

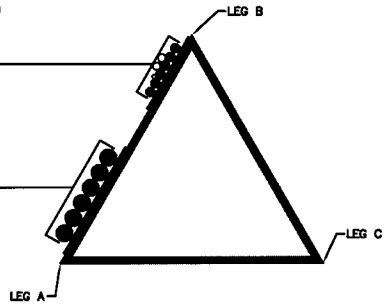
BASE LEVEL DRAWING

CROWN REGION ADDRESS

USA

(NOT INSTALLED--TO BE REMOVED)
(6) 1-5/8" TO 92 FT LEVEL
(NOT INSTALLED)
(6) 1-5/8" TO 92 FT LEVEL
(PROPOSED--IN ADDITION TO INSTALLED)
(1) 3/8" TO 92 FT LEVEL
(2) 3/4" TO 92 FT LEVEL
(INSTALLED)
(6) 7/8" TO 92 FT LEVEL

(MLA)
(9) 1-5/8" TO 102 FT LEVEL
(INSTALLED)
(1) 1/2" TO 75 FT LEVEL
(6) 1-5/8" TO 102 FT LEVEL



BUSINESS UNIT: 876328 TOWER ID: C_BASELEVEL

LEGEND: FEEDLINES

● SOLID BLUE CIRCLE DENOTES EXISTING FEEDLINE
○ OPEN RED CIRCLE DENOTES PROPOSED FEEDLINE
X BLUE "X" DENOTES LOCATION NOT GIVEN

NOTE: ASSUME FEEDLINE ATTACHMENT HEIGHT TO TOWER STEEL AT 8--FEET ABOVE FINISHED GRADE UNLESS OTHERWISE SPECIFIED

BASE LEVEL DRAWING

SCALE: N.T.S. | 1

PLOT DATE: 10/20/12 FILE NAME: 876328_BASELEVEL.dwg

RMK
RWH

18/01/08 NEW BUILD PER WORK ORDER # 189443
30/12/11 AS--BUILT INFORMATION ADDED PER WORK ORDER # 401955

DRAWN BY: RMK
CHECKED BY: LWW
DRAWING DATE: 18/1/08

SITE NUMBER:
SITE NAME:

SITE NAME

WEST HARTFORD PARKING GARAGE

BUSINESS UNIT NUMBER

876328

SITE ADDRESS

27-31 SOUTH MAIN ST
WEST HARTFORD, CT 06110
HARTFORD COUNTY
USA

SHEET TITLE

BASE LEVEL

SHEET NUMBER

A1-0

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

Date: **June 29, 2012**

Steve Tuttle
Crown Castle USA Inc.
The Piano Works, 349 West Commercial Street
East Rochester, NY 14445
585.899.3445

Paul J. Ford
250 East Broad Street, Suite 1500
Columbus, Ohio 43215
614.221.6679
kmahlum@pjfweb.com

Subject: **Structural Modification Report**

Carrier Designation:	*AT&T Mobility* **Co-Locate**	
	Carrier Site Number:	CT2030
	Carrier Site Name:	Guilford Center
Crown Castle Designation:	**Crown Castle BU Number:**	806361
	Crown Castle Site Name:	NHV 102 943127
	Crown Castle JDE Job Number:	183419
	Crown Castle Work Order Number:	503541
Engineering Firm Designation:	**Paul J. Ford Project Number:**	37512-1039_BP
Site Data:	**131 Manor Rd, GUILFORD, New Haven County, CT**	
	Latitude *41° 19' 48.09"*, Longitude *-72° 43' 18.51"*	
	150 Foot - Monopole Tower	

Dear Steve Tuttle,

Paul J. Ford is pleased to submit this **"Structural Modification Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 470698, in accordance with application 144857, revision 0.

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

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

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

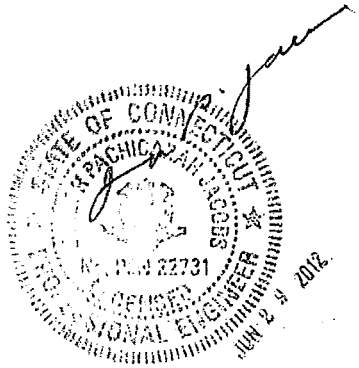
All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

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

Respectfully submitted by:

Kevin Mahlum, E.I.
Structural Engineer

tnxTower Report - version 6.0.3.0



EM-CING-155-120719

HPC Wireless Services
46 Mill Plain Rd.
Floor 2
Danbury, CT, 06811
P.: 203.797.1112

HPC WIRELESS SERVICES

ORIGINAL

July 18, 2012

RECEIVED
JUL 19 2012
CONNECTICUT
SITING COUNCIL

VIA OVERNIGHT COURIER

Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051
Attn: Ms. Linda Roberts, Executive Director

Re: New Cingular Wireless PCS, LLC – exempt modification
27 – 31 South Main Street, West Hartford, Connecticut

Dear Ms. Roberts:

This letter and attachments are submitted on behalf of New Cingular Wireless PCS, LLC ("AT&T"). AT&T is making modifications to certain existing sites in its Connecticut system in order to implement LTE technology. Please accept this letter and attachments as notification, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies ("R.S.C.A."), of construction that constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter and attachments is being sent to the Mayor of the Town of West Hartford.

AT&T plans to modify the existing rooftop tower wireless communications facility managed by Crown Castle and located at 27 – 31 South Main Street, West Hartford (coordinates 41°-45'-36.5" N, 72°-44'-35.35" W). Attached are a compound plan and elevation depicting the planned changes, and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration. Also included is a power density report reflecting the modification to AT&T's operations at the site.

The changes to the facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2).

1. AT&T will add three (3) LTE panel antennas and new T-frame mounts and relocate three (3) existing antennas to the new mounts at the existing center line (92' AGL).. Six (6) RRHs (remote radio heads) will be mounted to the tower legs behind the antennas, and a surge arrestor will be attached to a pipe on the T-arm. AT&T will also

place a DC power and fiber run from the equipment to the antennas along the existing coaxial cable run. The changes will not extend the height of the approximately 40' rooftop lattice structure.

2. AT&T will replace one (1) cabinet and add one (1) cabinet on an existing H-frame, within the existing equipment area on the top level of the garage. A new GPS antenna will be attached to the existing ice bridge. There will be no change to the existing fenced boundary.

3. The proposed changes will not increase the noise level at the existing facility by six (6) decibels or more. The incremental effect of the proposed changes will be negligible.

4. The changes to the facility will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site. As indicated on the attached report prepared by C Squared Systems, LLC, AT&T's operations at the site will result in a power density of approximately 4.05% at ground level and 16.98% at garage level; the combined site operations will result in a total power density of approximately 7.66% at ground level and 36.42% at garage level.

Please feel free to contact me by phone at (860) 798-7454 or by e-mail at jgaudet@hpcwireless.com with questions concerning this matter. Thank you for your consideration.

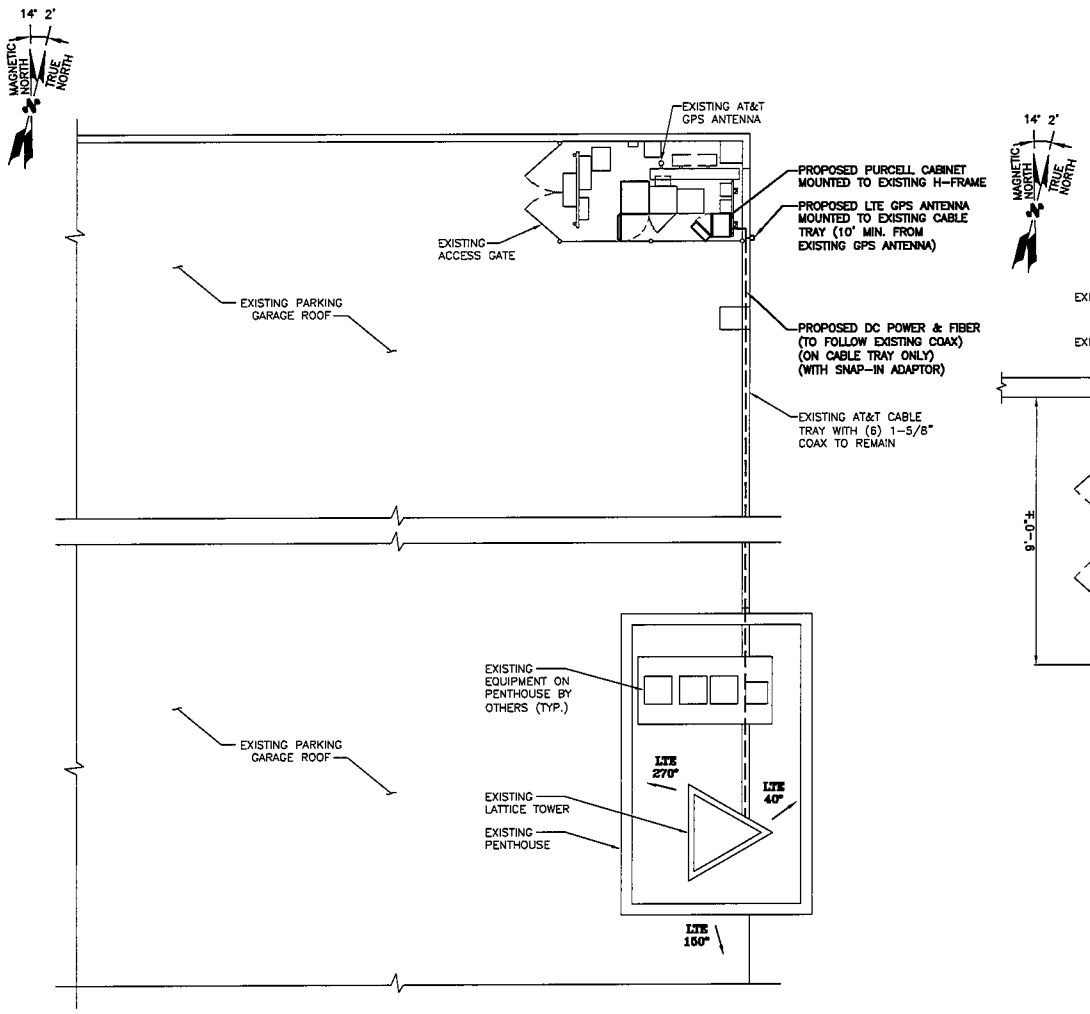
Respectfully yours,

Jennifer Young Gaudet

Jennifer Young Gaudet

Attachments

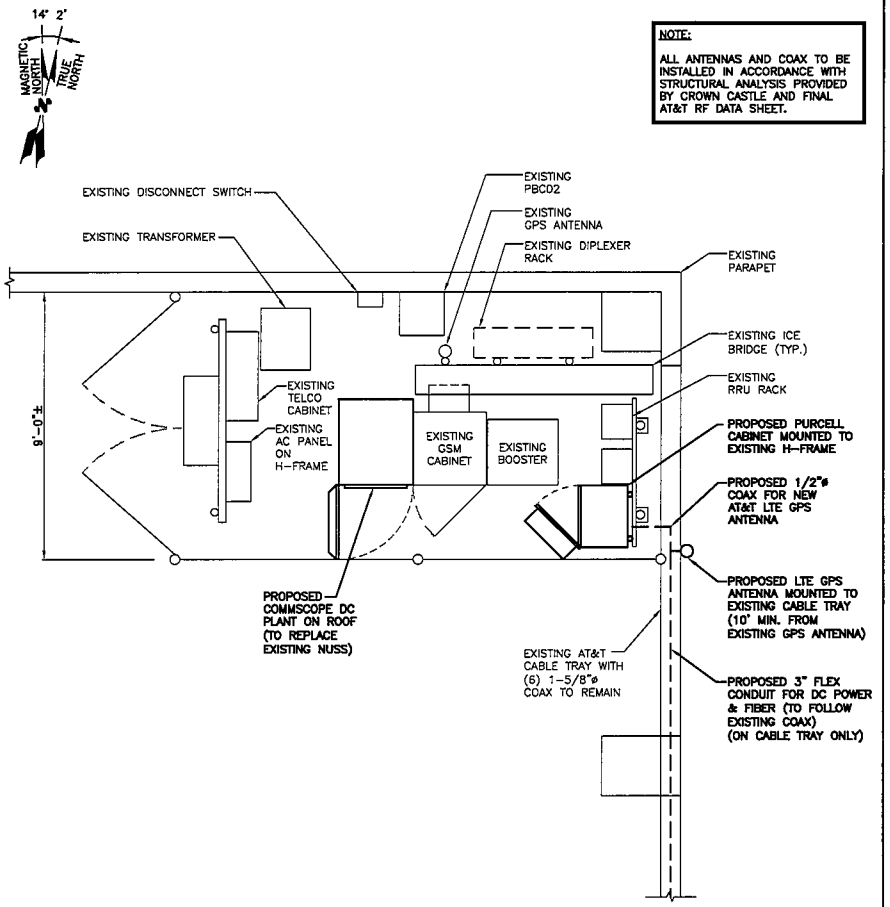
cc: Honorable Scott Slifka, Mayor, Town of West Hartford
Town Center West Associates, LLC (underlying property owner)



COMPOUND PLAN

SCALE: 1/4"= 1'-0"

0 2'-0" 4'-0" 8'-0" 12'-0"



EQUIPMENT PLAN

SCALE: 1/2"= 1'-0"

0 1'-0" 2'-0" 4'-0" 8'-0"

NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

NOTE:

ALL ANTENNAS AND COAX TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CROWN CASTLE AND FINAL AT&T RF DATA SHEET.

Hudson Design Groupllc
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5843
SITE NAME: WEST HARTFORD CENTRAL
CROWN CASTLE ID: 876328
29 SOUTH MAIN STREET
HARTFORD, CT 06107
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	07/09/12	CONSTRUCTION REVISED	DC	DPH	
1	04/26/12	ISSUED FOR CONSTRUCTION	JG	DC	DPH
0	04/05/12	ISSUED FOR REVIEW	JG	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: JG

STATE OF CONNECTICUT
DANIEL P. HAMM
No. 24178
LICENSED PROFESSIONAL ENGINEER

AT&T

COMPOUND AND EQUIPMENT PLAN (LTE)

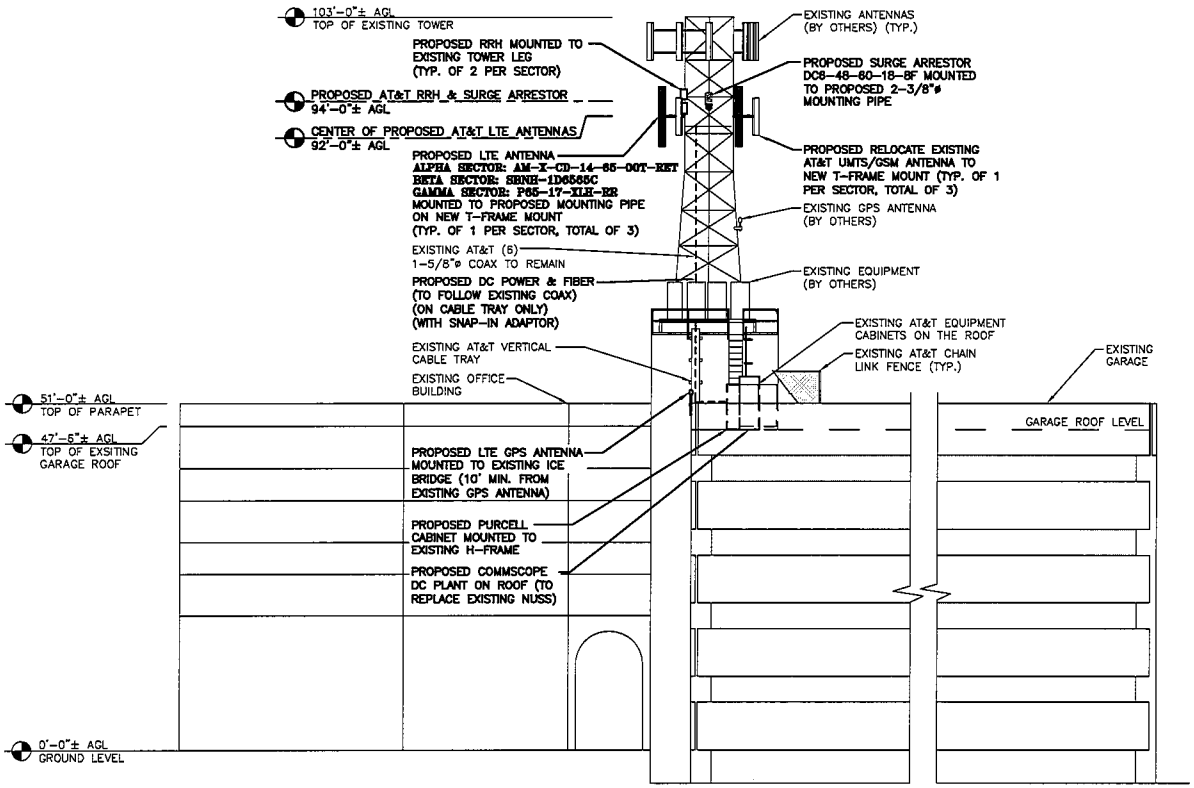
JOB NUMBER	DRAWING NUMBER	REV
5843.01	A-1	2

NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

NOTE:

ALL ANTENNAS AND COAX TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CROWN CASTLE AND FINAL AT&T RF DATA SHEET.



NORTH ELEVATION

SCALE: 1/8"=1'-0"

0 4'-0" 8'-0" 16'-0" 24'-0"

Hudson Design Groupuc
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5843
SITE NAME: WEST HARTFORD CENTRAL
CROWN CASTLE ID: 876328
29 SOUTH MAIN STREET
HARTFORD, CT 06107
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	07/09/12	CONSTRUCTION REVISED	DC	DPH	
1	04/26/12	ISSUED FOR CONSTRUCTION	DC	DPH	
0	04/05/12	ISSUED FOR REVIEW	JG	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: JG

STATE OF CONNECTICUT
DANIEL P. HAMM
No. 24178
LICENSED PROFESSIONAL ENGINEER

AT&T

ELEVATION PLAN (LTE)

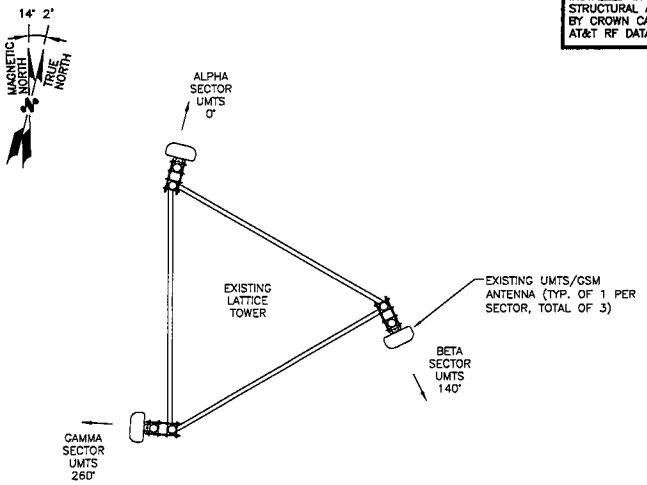
JOB NUMBER	DRAWING NUMBER	REV
5843.01	A-2	2

NOTE:

REFER TO THE FINAL RF DATA SHEET FOR FINAL ANTENNA SETTINGS.

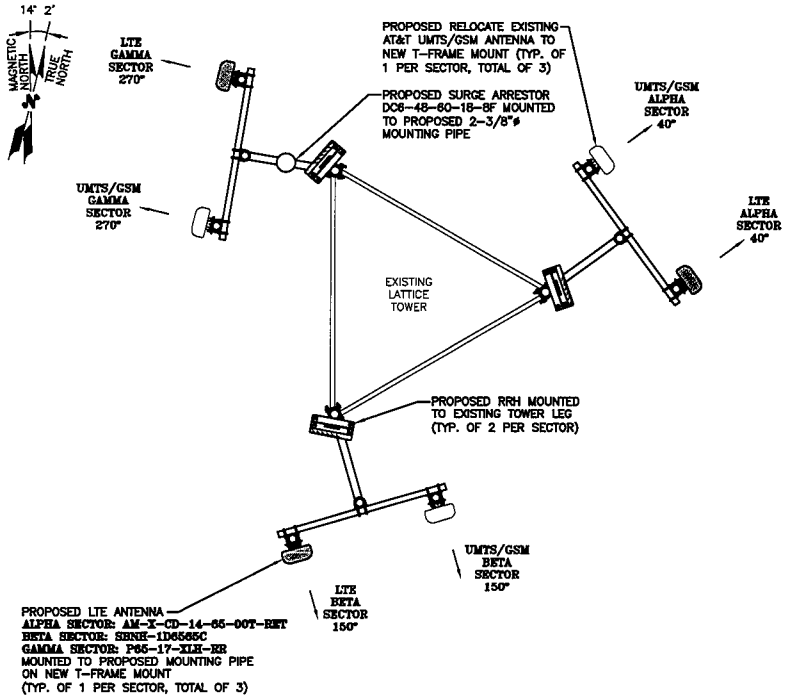
NOTE:

ALL ANTENNAS AND COAX TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CROWN CASTLE AND FINAL AT&T RF DATA SHEET.



EXISTING UMTS/GSM ANTENNA PLAN

SCALE: N.T.S.



PROPOSED LTE ANTENNA PLAN

SCALE: N.T.S.

Hudson Design Groupllc
1600 OSGOOD STREET
BUILDING 20 NORTH, SUITE 2-101
N. ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

NEXLINK GLOBAL SERVICES
a UniTek GLOBAL SERVICES company
800 MARSHALL PHELPS ROAD UNIT#: 2A
WINDSOR, CT 06095

SITE NUMBER: CT5843
SITE NAME: WEST HARTFORD CENTRAL
CROWN CASTLE ID: 876328
29 SOUTH MAIN STREET
HARTFORD, CT 06107
HARTFORD COUNTY

at&t
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CT 06067

NO.	DATE	REVISIONS	BY	CHK	APP'D
2	07/09/12	CONSTRUCTION REVISED	DC	DPH	
1	04/26/12	ISSUED FOR CONSTRUCTION	JG	DC	DPH
0	04/05/12	ISSUED FOR REVIEW	JG	DC	DPH

SCALE: AS SHOWN | DESIGNED BY: DC | DRAWN BY: JG

STATE OF CONNECTICUT
DANIEL P. HAMM
No. 24178
LICENSED PROFESSIONAL ENGINEER

AT&T

ANTENNA PLAN (LTE)

JOB NUMBER	DRAWING NUMBER	REV
5843.01	A-3	2

Date: **April 23, 2012**

Cheryl Schultz
Crown Castle USA Inc.
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
6521 Meridien Dr. Suite 107
Raleigh, NC 27616
(919) 755-1012
(919) 755-1012
info@fdh-inc.com

Subject: **Structural Analysis Report**

Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	CT5843
	Carrier Site Name:	AWE - West Hartford
Central		
Crown Castle Designation:	**Crown Castle BU Number:**	876328
	Crown Castle Site Name:	West Hartford Parking
Garage		
	Crown Castle JDE Job Number:	183530
	Crown Castle Work Order Number:	484825
	Crown Castle Application Number:	145202 Rev. 0
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number:**	12-04595E S1
Site Data:	**27-31 South Main St., WEST HARTFORD, Hartford, CT** **Latitude *41° 45' 36.41"*, Longitude *-72° 44' 35.25"*** **40.25 Foot - Self Support Tower**	

Dear Cheryl Schultz,

FDH Engineering, Inc. 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 460165, in accordance with application 145202, revision 0.

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

LC5: Existing + 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 the 2005 Connecticut Building Code based upon a wind speed of 80 mph fastest mile.

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

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

Respectfully submitted by:

Ashley Miller, E.I.
Project Engineer

STATE OF CONNECTICUT
Christopher Michael Murphy
No. 25842
LICENSED
PROFESSIONAL ENGINEER
4/23/12

Christopher M. Murphy

Christopher M/ Murphy, PE
President
CT PE License No. 25842

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 40.25 ft Self Support tower designed by ROHN in April of 1997.

The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-E.

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, 38 mph with 1 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
94.0	94.0	1	crown mounts	Pipe Mount [PM 601-3]	1 2	3/8 3/4	---
		6	ericsson	RRU-11			
92.0	92.0	1	andrew	SBNH-1D6565C w/ Mount Pipe			
		1	crown mounts	T-Arm Mount [TA 601-3]			
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		1	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			

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
102.0	103.0	6	decibel	DB980H90E-M w/Mount Pipe	6	1 5/8	1
	102.0	1	crown mounts	Sector Mount [SM 303-3]			
92.0	92.0	3	powerwave technologies	7770.00 w/ Mount Pipe	6	7/8	1
		12	powerwave technologies	LGP2140X			
		1	crown mounts	Pipe Mount [PM 601-3]	---	---	2
75.0	77.0	1	lucent	KS24019-L112A	1	1/2	1
	75.0	1	crown mounts	Side Arm Mount [SO 203-1]			

Notes:
1) Existing equipment
2) Equipment to be removed

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)
40	40	12	decibel	db980h90	12	1 5/8
		3	generic	12' leg mounting frame		
10	10	1	generic	3' side arm	1	1 5/8
		1	generic	gps		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4 - TOWER MANUFACTURER DRAWINGS	ROHN dated April 15, 1997	1440544	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.2.0), 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.

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, Inc. 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 (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
T1	105.25 - 85.125	Leg	ROHN 2.5 STD	2	-12033.70	54963.59	21.9	Pass
		Diagonal	L1 1/2x1 1/2x1/8	10	-2501.31	3354.25	74.6 88.1 (b)	Pass
		Top Girt	L1 1/2x1 1/2x1/8	5	-224.33	1165.64	19.2	Pass
T2	85.125 - 65	Leg	ROHN 2.5 STD	38	-30304.50	50093.21	60.5	Pass
		Diagonal	L1 3/4x1 3/4x3/16	42	-2579.21	4468.38	57.7	Pass
							Summary	
						Leg (T2)	60.5	Pass
						Diagonal	88.1	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
						(T1)		
						Top Girt (T1)	19.2	Pass
						Bolt Checks	88.1	Pass
						RATING =	**88.1**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft) (AGL)	% Capacity	Pass / Fail
	Anchor Rods	65	37.4	Pass

Structure Rating (max from all components) =	88.1%

1) Tower analysis reactions are less than the original design reactions. Therefore, existing building considered to have adequate capacity to support the existing and proposed loading.

4.1) Recommendations

Coax must be installed as shown in Appendix B.

C Squared Systems, LLC
65 Dartmouth Drive, Unit A3
Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

Calculated Radio Frequency Emissions

CT5843

(AWE – West Hartford)

27-31 South Main St., West Hartford, CT 06107

(a.k.a. 29 South Main St.)

June 11, 2012

Table of Contents

List of Tables

List of Figures

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing AT&T antenna arrays mounted on the lattice tower located at 27-31 South Main St., West Hartford, CT. The coordinates of the tower are 41-45-36.41 N, 72-44-35.25 W.

AT&T is proposing the following modifications:

1) Replace tower mount to accommodate two antennas per sector;
2) Install three 700 MHz LTE antennas (one per sector).

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \text{x Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and power, and that all channels are transmitting simultaneously. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the finished modifications.

4. Calculation Results

Table 1 below outlines the power density information for the site. Because the proposed AT&T antennas are directional in nature, the majority of the RF power is focused out towards the horizon. As a result, there will be less RF power directed below the antennas relative to the horizon, and consequently lower power density levels around the base of the facility. Please refer to Attachment C for the vertical pattern of the proposed AT&T antennas. The calculated results for AT&T in Table 1 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antennas.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	%MPE
Cingular UMTS	*89.7*	*1935*	*1*	*500*	*0.0223*	*1.0000*	*2.23%*
AT&T	*90*	*1945*	*4*	*250*	*0.0444*	*1.0000*	*4.44%*
Sprint	100	1960	4	250	0.0360	1.0000	3.60%
AT&T UMTS	92	880	2	565	0.0048	0.5867	0.82%
AT&T UMTS	92	1900	2	875	0.0074	1.0000	0.74%
AT&T LTE	92	734	1	1615	0.0069	0.4893	1.40%
AT&T GSM	92	880	1	283	0.0012	0.5867	0.20%
AT&T GSM	92	1900	4	525	0.0089	1.0000	0.89%
						Total	**7.66%**

Table 1: Carrier Information[1] [2]

The antenna heights listed above are in reference to ground level. Because the tower is mounted above the top of stairwell of a five-level parking facility, Table 2 below has been included to show the calculated power densities on the upper level of the parking garage. Please note that the only difference in Table 2 is with respect to the antenna height for Sprint and AT&T.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	%MPE
Sprint	43	1960	4	250	0.1945	1.0000	19.45%
AT&T UMTS	45	880	2	565	0.0201	0.5867	3.42%
AT&T UMTS	45	1900	2	875	0.0311	1.0000	3.11%
AT&T LTE	45	734	1	1615	0.0287	0.4893	5.86%
AT&T GSM	45	880	1	283	0.0050	0.5867	0.86%
AT&T GSM	45	1900	4	525	0.0373	1.0000	3.73%
						Total	**36.42%**

Table 2: Upper Parking Level %MPE

[1] The existing CSC filing for Cingular and AT&T should be removed and replaced with the updated AT&T technologies and values provided in Table 1. The power density information for carriers other than AT&T was taken directly from the CSC database dated 3/29/2012. Please note that %MPE values listed are rounded to two decimal points. The total %MPE listed is a summation of each unrounded contribution. Therefore, summing each rounded value may not reflect the total value listed in the table.

[2] In the case where antenna models are not uniform across all 3 sectors for the same frequency band, the antenna model with the highest gain was used for the calculations to present a worse-case scenario.

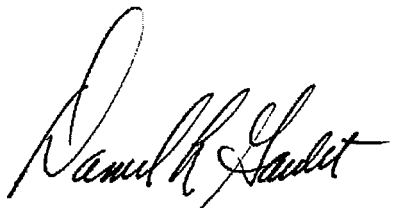
5. Conclusion

The above analysis verifies that emissions from the existing site will be below the maximum power density levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Even when using conservative methods, the cumulative power density from the proposed transmit antennas at the existing facility is well below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at ground level is **7.66% of the FCC limit**. With respect to the upper level of the parking garage, the highest expected percent of Maximum Permissible Exposure is **36.42% of the FCC limit.**

As noted previously, obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are more conservative (higher) than the actual signal levels will be from the finished modifications.

6. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.



Daniel L. Goulet
C Squared Systems, LLC

June 11, 2012
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[3]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure[4]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 3: FCC Limits for Maximum Permissible Exposure (MPE)

[3] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure

[4] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure

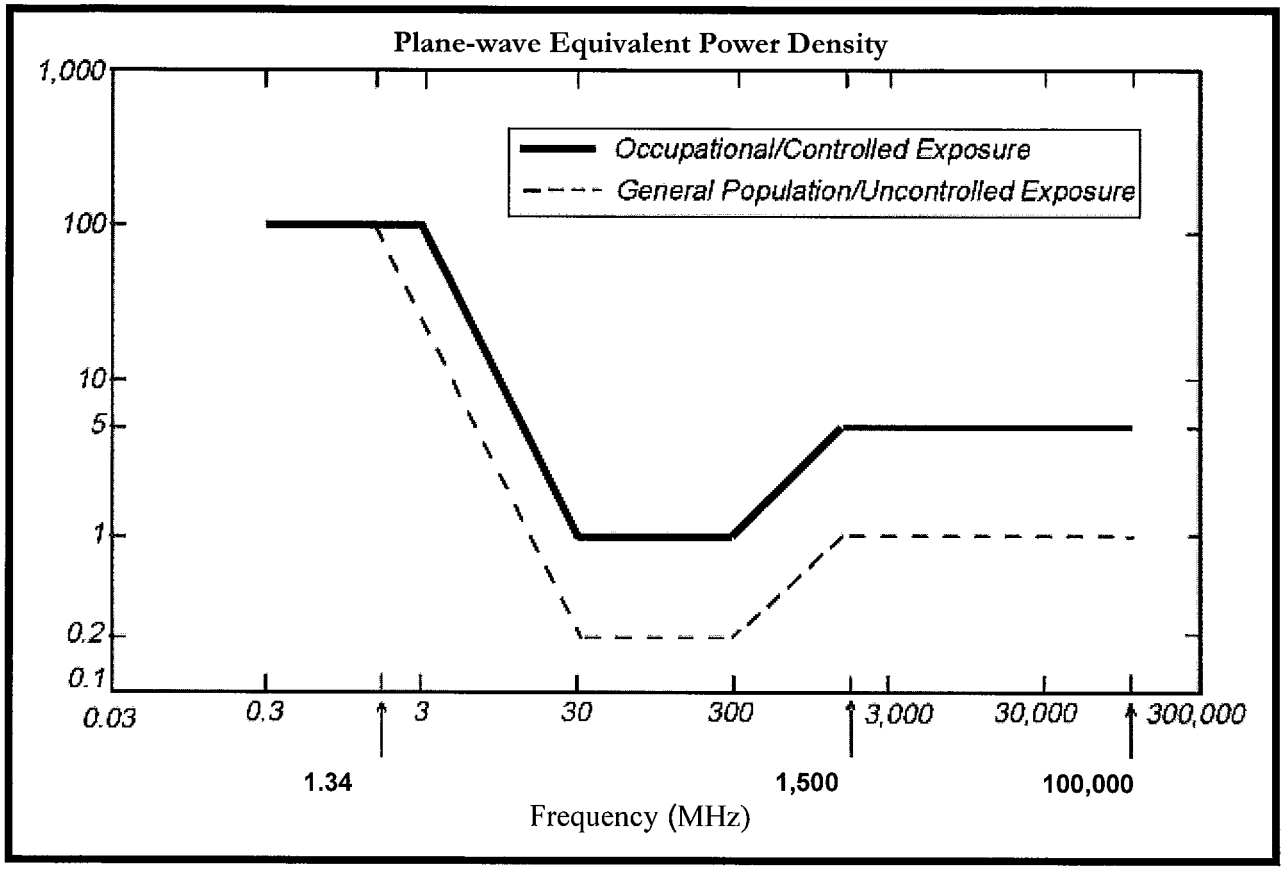
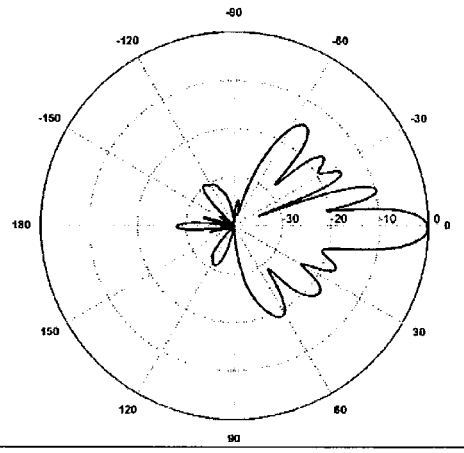


Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: AT&T Antenna Data Sheets and Electrical Patterns

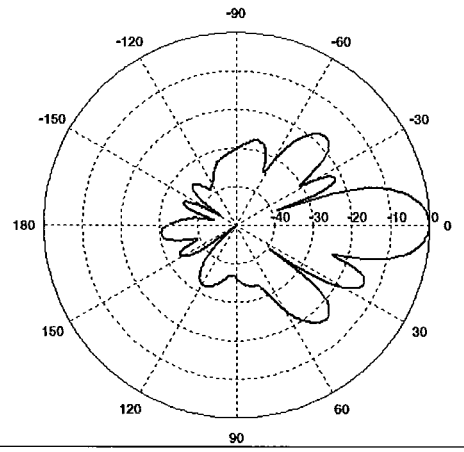
700 MHz

Manufacturer:	Powerwave
Model #:	P65-17-XLH-RR
Frequency Band:	698-806 MHz
Gain:	14.3 dBd
Vertical Beamwidth:	8.4°
Horizontal Beamwidth:	70°
Polarization:	Dual Linear ± 45°
Size L x W x D:	96.0" x 12.0" x 6.0"



850 MHz

Manufacturer:	Powerwave
Model #:	7770
Frequency Band:	824-896 MHz
Gain:	11.4 dBd
Vertical Beamwidth:	15°
Horizontal Beamwidth:	85°
Polarization:	Dual Linear ±45°
Size L x W x D:	55.4" x 11.0" x 5.0"



1900 MHz

Manufacturer:	Powerwave
Model #:	7770
Frequency Band:	1850-1990 MHz
Gain:	13.4 dBd
Vertical Beamwidth:	7°
Horizontal Beamwidth:	90°
Polarization:	Dual Linear ±45°
Size L x W x D:	55.4" x 12.0" x 5.0"