Aaron Meyers, Site Acquisition Consultant
c/o New Cingular Wireless, PCS LLC (AT&T)
Centerline Communications, LLC
95 Ryan Drive, Suite 1
Raynham, MA 02767
Mobile: (774) 420-4202
ameyers@clinellc.com

DATE: 10/31/2017

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

RE: Notice of Exempt Modification // Site Number: CT5843
29 South Main St.
West Hartford, CT 06107 (Site Name: West Hartford)
N 41.760190 // W 72.743190

Dear Ms. Bachman:

New Cingular Wireless, PCS, LLC ("AT&T") currently maintains nine (9) antennas at the 89' foot level of the existing 103' foot lattice tower at 29 South Main Street. The tower is owned by Crown Castle. The property is owned by Town Center West Associates, LLC. AT&T now intends to swap six (6) antennas for its LTE upgrade. These antennas would be installed at the 89' foot level of the tower. AT&T also intends to install twelve (12) remote radio units, one (1) splitter, and two (2) DC power lines.

The current proposal involves an antenna swap only (3); three (3) antennas will be added.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Shari Cantor, Mayor of West Hartford, CT, as well as the tower owner, Crown Castle and the ground owner, Town Center West Associates, LLC.

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

Attached to accommodate this filing are construction drawings dated 9/5/17 by Hudson Design Group, LLC, a structural analysis dated 8/15/2017 by GPD Engineering and Architecture Professional Corporation and an Emissions Analysis Report dated 10/4/17 by Centerline Communications, LLC.

1. The proposed modifications will not result in an increase in the height of the existing structure.

2. The proposed modifications will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.

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

6. The existing structure and its foundation can support the proposed loading as shown in the attached structural analysis by GPD Engineering and Architecture Professional Corporation, dated August 15, 2017.

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

Sincerely,

Aaron Meyers, Site Acquisition Consultant
c/o New Cingular Wireless, PCS LLC (AT&T)
Centerline Communications, LLC
95 Ryan Drive, Suite 1
Raynham, MA 02767
Mobile: (774) 420-4202
ameyers@clinellc.com

Attachments

cc: Shari Cantor - as elected official
Crown Castle - as tower owner
Town Center West Associates, LLC - as property owner

Radio Frequency Emissions Analysis Report

AT&T Existing Facility

Site ID: CT5843

West Hartford Parking Garage
27-31 South Main Street
West Hartford, CT 6107

October 4, 2017

Centerline Communications Project Number: 950012-006

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit **(Ground Level)**:	**15.90 %**
Site total MPE% of FCC general population allowable limit **(Rooftop Level)**:	**15.90 %**

October 4, 2017

AT&T Mobility – New England
Attn: John Benedetto, RF Manager
550 Cochituate Road
Suite 550 – 13&14
Framingham, MA 06040

Emissions Analysis for Site: **CT5843 – West Hartford Parking Garage**

Centerline Communications, LLC ("Centerline") was directed to analyze the proposed AT&T facility located at **27-31 South Main Street, West Hartford, CT**, for the purpose of determining whether the emissions from the Proposed AT&T Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general population may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general population would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications facility that exposes persons in a nearby residential area.

Population exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 700 and 850 MHz Bands are approximately 467 $\mu W/cm^2$ and 567 $\mu W/cm^2$ respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 2300 MHz (WCS) bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were performed for the proposed AT&T Wireless antenna facility located at **27-31 South Main Street, West Hartford, CT**, using the equipment information listed below. Calculations were performed at both the Ground Level as well as the Rooftop Walking Surface Level. All calculations were performed per the specifications under FCC OET 65. Since AT&T is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the facility. For this report the sample point is the top of a 6-foot person standing at the base of the facility as well as on the Rooftop Walking Surface.

Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. All power values expressed and analyzed are maximum power levels expected to be used on all radios.

All emissions values for additional carriers were taken from the Connecticut Siting Council (CSC) active MPE database. Values in this database are provided by the individual carriers themselves

For each sector the following channel counts, frequency bands and power levels were utilized as shown in *Table 1*:

Technology	Frequency Band	Channel Count	Transmit Power per Channel (W)
UMTS	850 MHz	2	30
UMTS	1900 MHz (PCS)	2	30
LTE	700 MHz	4	60
LTE	850 MHz	2	60
LTE	1900 MHz (PCS)	2	60
LTE	2300 MHz (WCS)	2	60
LTE	2100 MHz (AWS)	2	60

Table 1: Channel Data Table

The following antennas listed in *Table 2* were used in the modeling for transmission in the 700 MHz, 850 MHz, 1900 MHz (PCS) and 2300 MHz (WCS) frequency bands. This is based on feedback from the carrier with regards to anticipated antenna selection. Maximum gain values for all antennas are listed in the Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

Sector	Antenna Number	Antenna Make / Model	Duplexer / Combiner Losses (dB)	Antenna Centerline from Ground Level (ft)	Antenna Centerline from Rooftop Level (ft)
A	1	Powerwave 7770	3	89	38
A	2	CCI OPA-65R-LCUU-H8	3	89	38
A	3	CCI TPA-65R-LCUUUU-H8	3	89	38
B	1	Powerwave 7770	3	89	38
B	2	CCI OPA-65R-LCUU-H8	3	89	38
B	3	CCI TPA-65R-LCUUUU-H8	3	89	38
C	1	Powerwave 7770	3	89	38
C	2	CCI OPA-65R-LCUU-H8	3	89	38
C	3	CCI TPA-65R-LCUUUU-H8	3	89	38

Table 2: Antenna Data

All calculations were done with respect to uncontrolled / general population threshold limits.

RESULTS FOR GROUND LEVEL CALCULATIONS

Per the calculations completed for the proposed AT&T configurations *Table 3a* shows resulting emissions power levels and percentages of the FCC's allowable general population limit at ground level.

Antenna ID	Antenna Make / Model	Frequency Bands	Antenna Gain (dBd)	Channel Count	Total TX Power (W)	Duplexer / Combiner Losses (dB)	ERP (W)	MPE %
Antenna A1	Powerwave 7770	850 MHz / 1900 MHz (PCS)	11.4 / 13.4	4	120	3	1,072.99	0.73
Antenna A2	CCI OPA-65R-LCUU-H8	700 MHz / 850 MHz / 1900 MHz (PCS)	12.55 / 13.35 / 14.85	6	360	3	4,219.90	3.36
Antenna A3	CCI TPA-65R-LCUUUU-H8	700 MHz / 2300 MHz (WCS) / 2100 MHz (AWS)	12.95 / 14.45 / 14.25	6	360	3	4,462.13	3.04
							Sector A Composite MPE%	**7.13**
Antenna B1	Powerwave 7770	850 MHz / 1900 MHz (PCS)	11.4 / 13.4	4	120	3	1,072.99	0.73
Antenna B2	CCI OPA-65R-LCUU-H8	700 MHz / 850 MHz / 1900 MHz (PCS)	12.55 / 13.35 / 14.85	6	360	3	4,219.90	3.36
Antenna B3	CCI TPA-65R-LCUUUU-H8	700 MHz / 2300 MHz (WCS) / 2100 MHz (AWS)	12.95 / 14.45 / 14.25	6	360	3	4,462.13	3.04
							Sector B Composite MPE%	**7.13**
Antenna C1	Powerwave 7770	850 MHz / 1900 MHz (PCS)	11.4 / 13.4	4	120	3	1,072.99	0.73
Antenna C2	CCI OPA-65R-LCUU-H8	700 MHz / 850 MHz / 1900 MHz (PCS)	12.55 / 13.35 / 14.85	6	360	3	4,219.90	3.36
Antenna C3	CCI TPA-65R-LCUUUU-H8	700 MHz / 2300 MHz (WCS) / 2100 MHz (AWS)	12.95 / 14.45 / 14.25	6	360	3	4,462.13	3.04
							Sector C Composite MPE%	**7.13**

Table 3a: AT&T Emissions Levels at Ground Level

The Following table (*table 4a*) shows all additional carriers on site and their MPE% as recorded in the CSC active MPE database for this facility along with the newly calculated maximum AT&T MPE contributions per this report calculated at ground level. FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. For this site, all three sectors have the same configuration yielding the same results on all three sectors. *Table 5a* below shows a summary for each AT&T Sector as well as the composite MPE value for the site at ground level.

Site Composite MPE% (Ground Level)	
Carrier	**MPE%**
AT&T – Max Sector Value	**7.13 %**
Sprint	8.77 %
Site Total MPE %:	**15.90 %**

Table 4a: All Carrier MPE Contributions at Ground Level

AT&T Sector A Total:	7.13 %
AT&T Sector B Total:	7.13 %
AT&T Sector C Total:	7.13 %
Site Total:	15.90 %

Table 5a: Site MPE Summary at Ground Level

FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. *Table 6a* below details a breakdown by frequency band and technology for the MPE power values for the maximum calculated AT&T sector(s) at ground level. For this site, all three sectors have the same configuration yielding the same results on all three sectors at ground level.

AT&T _ Frequency Band / Technology (All Sectors at Ground Level)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
AT&T 850 MHz UMTS – Antenna 1	2	207.55	89	2.17	850 MHz	567	0.38%
AT&T 1900 MHz (PCS) UMTS – Antenna 1	2	328.94	89	3.43	1900 MHz (PCS)	1000	0.34%
AT&T 700 MHz LTE – Antenna 2	2	540.94	89	5.65	700 MHz	467	1.21%
AT&T 850 MHz LTE – Antenna 2	2	650.36	89	6.79	850 MHz	567	1.20%
AT&T 1900 MHz (PCS) LTE – Antenna 2	2	918.65	89	9.59	1900 MHz (PCS)	1000	0.96%
AT&T 700 MHz LTE – Antenna 3	2	593.13	89	6.19	700 MHz	467	1.33%
AT&T 2300 MHz (WCS) LTE – Antenna 3	2	837.82	89	8.74	2300 MHz (WCS)	1000	0.87%
AT&T 2100 MHz (AWS) LTE – Antenna 3	2	800.11	89	8.35	2100 MHz (AWS)	1000	0.84%
						Total:	**7.13%**

Table 6a: AT&T Maximum Sector MPE Power Values at Ground Level

RESULTS FOR ROOFTOP LEVEL CALCULATIONS

Per the calculations completed for the proposed AT&T configurations *Table 3b* shows resulting emissions power levels and percentages of the FCC's allowable general population limit on the parking garage rooftop walking surface.

Antenna ID	Antenna Make / Model	Frequency Bands	Antenna Gain (dBd)	Channel Count	Total TX Power (W)	Duplexer / Combiner Losses (dB)	ERP (W)	MPE %
Antenna A1	Powerwave 7770	850 MHz / 1900 MHz (PCS)	11.4 / 13.4	4	120	3	1,072.99	6.58
Antenna A2	CCI OPA-65R-LCUU-H8	700 MHz / 850 MHz / 1900 MHz (PCS)	12.55 / 13.35 / 14.85	6	360	3	4,219.90	20.24
Antenna A3	CCI TPA-65R-LCUUUU-H8	700 MHz / 2300 MHz (WCS) / 2100 MHz (AWS)	12.95 / 14.45 / 14.25	6	360	3	4,462.13	20.91
							Sector A Composite MPE%	**47.73**
Antenna B1	Powerwave 7770	850 MHz / 1900 MHz (PCS)	11.4 / 13.4	4	120	3	1,072.99	6.58
Antenna B2	CCI OPA-65R-LCUU-H8	700 MHz / 850 MHz / 1900 MHz (PCS)	12.55 / 13.35 / 14.85	6	360	3	4,219.90	20.24
Antenna B3	CCI TPA-65R-LCUUUU-H8	700 MHz / 2300 MHz (WCS) / 2100 MHz (AWS)	12.95 / 14.45 / 14.25	6	360	3	4,462.13	20.91
							Sector B Composite MPE%	**47.73**
Antenna C1	Powerwave 7770	850 MHz / 1900 MHz (PCS)	11.4 / 13.4	4	120	3	1,072.99	6.58
Antenna C2	CCI OPA-65R-LCUU-H8	700 MHz / 850 MHz / 1900 MHz (PCS)	12.55 / 13.35 / 14.85	6	360	3	4,219.90	20.24
Antenna C3	CCI TPA-65R-LCUUUU-H8	700 MHz / 2300 MHz (WCS) / 2100 MHz (AWS)	12.95 / 14.45 / 14.25	6	360	3	4,462.13	20.91
							Sector C Composite MPE%	**47.73**

Table 3b: AT&T Emissions Levels at the Rooftop Walking Surface

The Following table (*table 4b*) shows all additional carriers on site and their MPE% as recorded in the CSC active MPE database for this facility along with the newly calculated maximum AT&T MPE contributions on the parking garage rooftop walking surface per this report. FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. For this site, all three sectors have the same configuration yielding the same results on all three sectors. *Table 5b* below shows a summary for each AT&T Sector as well as the composite MPE value for the site on the parking garage rooftop walking surface.

Site Composite MPE%	
Carrier	**MPE%**
AT&T – Max Sector Value	**47.73 %**
Sprint	37.75 %
Site Total MPE %:	**85.48 %**

Table 4b: All Carrier MPE Contributions at the Rooftop Walking Surface

AT&T Sector A Total:	47.73 %
AT&T Sector B Total:	47.73 %
AT&T Sector C Total:	47.73 %
Site Total MPE %:	**85.48 %**

Table 5b: Site MPE Summary at the Rooftop Walking Surface

FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. *Table 6b* below details a breakdown by frequency band and technology for the MPE power values for the maximum calculated AT&T sector(s). For this site, all three sectors have the same configuration yielding the same results on all three sectors on the parking garage rooftop walking surface.

AT&T _ Frequency Band / Technology (All Sectors at Rooftop Walking Surface Level)	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
AT&T 850 MHz UMTS – Antenna 1	2	276.77	38	19.43	850 MHz	567	3.43%
AT&T 1900 MHz (PCS) UMTS – Antenna 1	2	448.87	38	31.52	1900 MHz (PCS)	1000	3.15%
AT&T 700 MHz LTE – Antenna 2	2	471.14	38	33.08	700 MHz	467	7.08%
AT&T 850 MHz LTE – Antenna 2	2	553.54	38	38.87	850 MHz	567	6.85%
AT&T 1900 MHz (PCS) LTE – Antenna 2	2	897.74	38	63.04	1900 MHz (PCS)	1000	6.30%
AT&T 700 MHz LTE – Antenna 3	2	471.14	38	33.08	700 MHz	467	7.08%
AT&T 2300 MHz (WCS) LTE – Antenna 3	2	1,007.28	38	70.73	2300 MHz (WCS)	1000	7.07%
AT&T 2100 MHz (AWS) LTE – Antenna 3	2	961.95	38	67.54	2100 MHz (AWS)	1000	6.75%
						Total:	**47.73%**

Table 6b: AT&T Maximum Sector MPE Power Values at the Rooftop Walking Surface

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general population exposure to RF Emissions at both the Ground Level and Rooftop Walking Surfaces.

The anticipated maximum composite contributions from the AT&T facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general population exposure to RF Emissions are shown here for both the Ground Level and Rooftop Walking Surfaces:

AT&T Sector (Ground Level)	Power Density Value (%)
Sector A:	7.13 %
Sector B:	7.13 %
Sector C:	7.13 %
AT&T Maximum Total (per sector):	7.13 %
Site Total:	**15.90 %**
Site Compliance Status:	**COMPLIANT**

AT&T Sector (Rooftop Walking Surface)	Power Density Value (%)
Sector A:	47.73 %
Sector B:	47.73 %
Sector C:	47.73 %
AT&T Maximum Total (per sector):	47.73 %
Site Total:	**85.48%**
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **15.90 %** of the allowable FCC established general population limit sampled at the Ground Level and **85.48 %** at the Rooftop Walking Surface. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.

Scott Heffernan
RF Engineering Director
Centerline Communications, LLC
95 Ryan Drive, Suite 1
Raynham, MA 02767

Date: **August 15, 2017**

GPD Engineering and Architecture
Professional Corporation

Marianne Dunst
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277
(704) 405-6580

520 South Main Street, Suite 2531
Akron, Ohio 44311
(216) 927-8663
dpalkovic@gpdgroup.com

Subject:	**Structural Analysis Report**	
Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	CT5843
	Carrier Site Name:	West Hartford
Crown Castle Designation:	**Crown Castle BU Number:**	876328
	Crown Castle Site Name:	WEST HARTFORD PARKING GARAGE
	Crown Castle JDE Job Number:	448330
	Crown Castle Work Order Number:	1443101
	Crown Castle Application Number:	397668 Rev. 0
Engineering Firm Designation:	**GPD Project Number:**	2017777.876328.17
Site Data:	**27-31 South Main St., West Hartford, Hartford County, CT 06110**	
	Latitude *41° 45' 36.41"*, Longitude *-72° 44' 35.25"*	
	40.25 Foot - Self Support and Modified Parking Garage Structural Analysis	

Dear Marianne Dunst,

We are 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 1068988, in accordance with application 397668, 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:

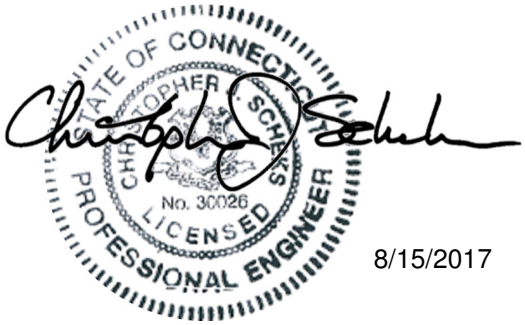
LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon a nominal 3-second gust wind speed of 100 mph per the guidelines within Appendix R. Exposure Category B with a maximum topographic factor, K_{zt}, of 1.0 and Risk Category II were used in this analysis.

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

Structural analysis prepared by: Benjamin Darkow

Respectfully submitted by:



Christopher J. Scheks, P.E.
Connecticut #: 0030026

8/15/2017

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. The tower base connects to an I-Beam frame that is anchored to the parking garage deck. The base of the tower frame is 65' above grade.

The tower is supported on three legs and has two major sections. It has a triangular cross section made of bolted connections, with an "X" frame configuration. The tower is fabricated with pipe legs and angle diagonals. The tower is galvanized and has no aviation lightning.

Modifications designed by GPD (Project #: 2015777.876328.08, dated 6/3/2015) consist of installing extension plates to the tower base frame connections and extension plates to the existing stair well walls at varying elevations. These modifications have been installed and were considered in this analysis.

2) ANALYSIS CRITERIA

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon a nominal 3-second gust wind speed of 100 mph per the guidelines within Appendix R. Additionally, 50 mph with 1 inch ice thickness and 60 mph under service loads, exposure category B with topographic category 1 and crest height of 0 feet.

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
92.0	89.0	3	CCI Antennas	OPA-65R-LCUU-H8	2	3/4	1
		3	CCI Antennas	DTMABP7819VG12A			
		3	Ericsson	RRUS 12			
		3	Ericsson	RRUS 32 B2			
		3	Ericsson	RRUS E2 B29			
		3	Ericsson	RRUS 32 B66			
		1	Raycap	DC6-48-60-18-8F			

Notes:
1) See Appendix B for the proposed feed line layout

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	3	RFS/Celwave	APXVTM14-C-120	1	5/8	1
		3	Alcatel Lucent	TD-RRH8x20-25			
		2	RFS/Celwave	APXVSPP18-C-A20	3	1-1/4	
		1	RFS/Celwave	APXV9ERR18-C-A20			
		3	Alcatel Lucent	1900MHz RRH (65MHz)			
	102.0	3	Alcatel Lucent	800MHz 2X50W RRH W/FILTER			
		1		Sector Mount [SM 502-3]			
92.0	92.0	3	Ericsson	RRUS-11	2 4 6	3/8 3/4 1-5/8	
		3	Sabre	C10857011 12' V-Boom			
	89.0	3	Powerwave Technologies	7770.00			
		3	CCI Antennas	TPA-65R-LCUUUU-H8			
		3	Powerwave Technologies	7020.00			
		3	Ericsson	RRUS 32 B30			
		2	Raycap	DC6-48-60-18-8F			
		1	Powerwave Technologies	P65-15-XLH-RR			2
		1	Andrew	SBNH-1D6565C			
		1	Powerwave Technologies	P65E-17-XLH-RR			
		6	Powerwave Technologies	LGP2140X			
75.0	77.0	1	Lucent	KS24019-L112A	1	1/2	
	75.0	1		Side Arm Mount [SO 302-1]			

Notes:
1) Reserved equipment; considered in this analysis
2) Existing equipment to be removed; not considered in this analysis

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
105.0	105.0	12	Decibel	DB980H90	12	1-5/8
		3		12' Leg Mounting Frame		
75.0	75.0	1		GPS Antenna	1	1-5/8
		1		3' Side Arm		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Tower Manufacturer Drawings	Rohn Eng. File#: 345895W, Dated: 4/15/1997	1440544	CCISITES
Tower Mapping Report	GPD Project #: 2014777.876328.03, Dated: 3/04/2014	1440544	CCISITES
Base Frame Design	Greiner Project #: F101508.60, Dated: 2/20/1997	5460756	CCISITES
Parking Garage Design	Unistress Project: Towne Center Garage, Rev. 4, Dated: 10/31/1988	5460756	CCISITES
Parking Garage Modifications	GPD Project #: 2015777.876328.08, Dated: 6/3/2015	5735691	CCISITES
Modifications Passing Analysis	GPD Project #: 2015777.876328.08, Dated: 6/3/2015	5735731	CCISITES
Post Modification Inspection	GPD Project #: 2015777.876328.10, Dated 1/27/2016	6076906	CCISITES

3.1) Analysis Method

tnxTower (version 7.0.7.0), 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.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	105.25 - 85.125	Leg	ROHN 2.5 STD	3	-15.06	63.41	23.7	Pass
T2	85.125 - 65	Leg	ROHN 2.5 STD	38	-39.11	57.07	68.5	Pass
T1	105.25 - 85.125	Diagonal	L1-1/2x1-1/2x1/8	9	-3.40	3.81	89.4	Pass
T2	85.125 - 65	Diagonal	L1-3/4x1-3/4x3/16	46	-3.12	5.09	61.3	Pass
T1	105.25 - 85.125	Top Girt	L2x2x1/8	4	-0.35	3.21	11.0	Pass
T2	85.125 - 65	Top Girt	L2x2x1/8	41	-0.15	3.21	4.8	Pass
							Summary	
						Leg (T2)	68.5	Pass
						Diagonal (T1)	89.4	Pass
						Top Girt (T1)	11.0	Pass
						Bolt Checks	87.9	Pass
						Rating =	89.4	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1, 2	Base Frame & Parking Garage	65	59.7	Pass

Structure Rating (max from all components) =	89.4%

Notes:
1) See additional documentation in “Appendix C - Additional Calculations” for calculations supporting the % capacity consumed.
2) The base frame and parking garage capacity was determined based on reaction comparison from the previous modification design passing analysis (GPD Project #: 2015777.876328.08, dated 6/3/2015). See Appendix C for the reaction comparison.

4.1) Recommendations

The tower and modified parking garage have sufficient capacity to carry the proposed loading configuration. Modifications will not be required to bring them into compliance with the TIA-222-G standard for the proposed loading configuration.

5) DISCLAIMER OF WARRANTIES

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

The engineering services rendered by GPD in connection with this Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

This analysis is limited to the designated maximum wind and seismic conditions per the governing tower standards and code. Wind forces resulting in tower vibrations near the structure's resonant frequencies were not considered in this analysis and are outside the scope of this analysis. Lateral loading from any dynamic response was not evaluated under a time-domain based fatigue analysis.

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

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

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

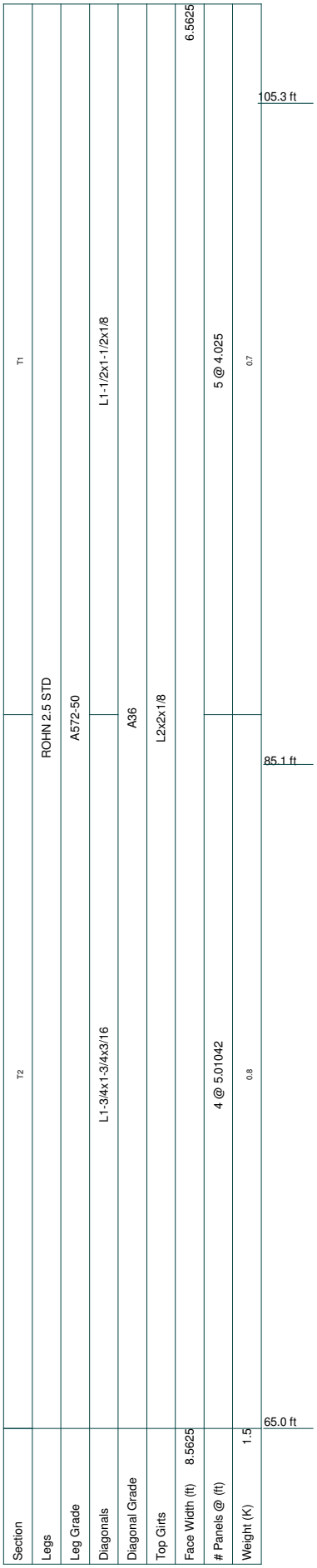
Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

Towers are designed to carry gravity, wind, and ice loads. All members, legs, diagonals, struts, and redundant members provide structural stability to the tower with little redundancy. Absence or removal of a member can trigger catastrophic failure unless a substitute is provided before any removal. Legs carry axial loads and derive their strength from shorter unbraced lengths by the presence of redundant members and their connection to the diagonals with bolts or welds. If the bolts or welds are removed without providing any substitute to the frame, the leg is subjected to a higher unbraced length that immediately reduces its load carrying capacity. If a diagonal is also removed in addition to the connection, the unbraced length of the leg is greatly increased, jeopardizing its load carrying capacity. Failure of one leg can result in a tower collapse because there is no redundancy. Redundant members and diagonals are critical to the stability of the tower.

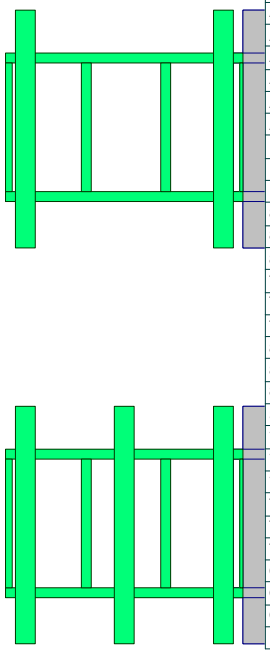
GPD makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm,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

APPENDIX A

TNXTOWER OUTPUT



DESIGNED APPURTENANCE LOADING



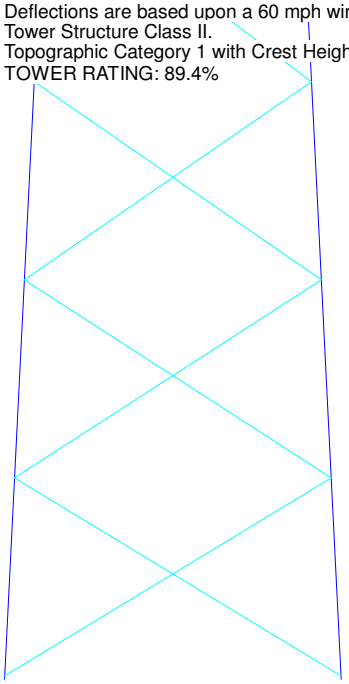
TYPE	ELEVATION	TYPE	ELEVATION
APXVSPP18-C-A20 w/ Mount Pipe	102	DTMABP7819VG12A	92
APXVSPP18-C-A20 w/ Mount Pipe	102	DTMABP7819VG12A	92
APXV9ERR18-C-A20 w/ Mount Pipe	102	7020.00	92
APXVTM14-C-120 w/ Mount Pipe	102	7020.00	92
APXVTM14-C-120 w/ Mount Pipe	102	7020.00	92
APXVTM14-C-120 w/ Mount Pipe	102	RRUS-11	92
1900MHz RRH (65MHz)	102	RRUS-11	92
1900MHz RRH (65MHz)	102	RRUS-11	92
1900MHz RRH (65MHz)	102	RRUS 12	92
800MHz 2X50W RRH W/FILTER	102	RRUS 12	92
800MHz 2X50W RRH W/FILTER	102	RRUS 12	92
800MHz 2X50W RRH W/FILTER	102	RRUS 32 B2	92
TD-RRH8x20-25	102	RRUS 32 B2	92
TD-RRH8x20-25	102	RRUS 32 B2	92
TD-RRH8x20-25	102	RRUS 32 B30	92
8' x 2" Mount Pipe	102	RRUS 32 B30	92
8' x 2" Mount Pipe	102	RRUS 32 B30	92
8' x 2" Mount Pipe	102	(2) RRUS E2 B29	92
Sector Mount [SM 502-3]	102	RRUS E2 B29	92
7770.00 w/ Mount Pipe	92	RRUS 32 B66	92
7770.00 w/ Mount Pipe	92	(2) RRUS 32 B66	92
7770.00 w/ Mount Pipe	92	(2) DC6-48-60-18-8F Surge Suppression Unit	92
TPA-65R-LCUUUU-H8 w/ Mount Pipe	92	DC6-48-60-18-8F Surge Suppression Unit	92
TPA-65R-LCUUUU-H8 w/ Mount Pipe	92	(3) C10857011 12' V-Boom	92
TPA-65R-LCUUUU-H8 w/ Mount Pipe	92	KS24019-L112A	75
OPA-65R-LCUU-H8 w/ Mount Pipe	92	Side Arm Mount [SO 302-1]	75
OPA-65R-LCUU-H8 w/ Mount Pipe	92		
OPA-65R-LCUU-H8 w/ Mount Pipe	92		
DTMABP7819VG12A	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 Exposure B to the TIA-222-G Standard.
3. Tower designed for a 100 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 89.4%



ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 42 K
SHEAR: 6 K

UPLIFT: -35 K
SHEAR: 6 K

AXIAL
39 K

SHEAR
3 K

MOMENT
103 kip-ft

TORQUE 0 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL
11 K

SHEAR
11 K

MOMENT
284 kip-ft

TORQUE 1 kip-ft
REACTIONS - 100 mph WIND

GPD Group
520 South Main Street, Suite 2531
Akron, Ohio 44311
Phone: (330) 572-2100
FAX: (330) 572-2101
GPD Group

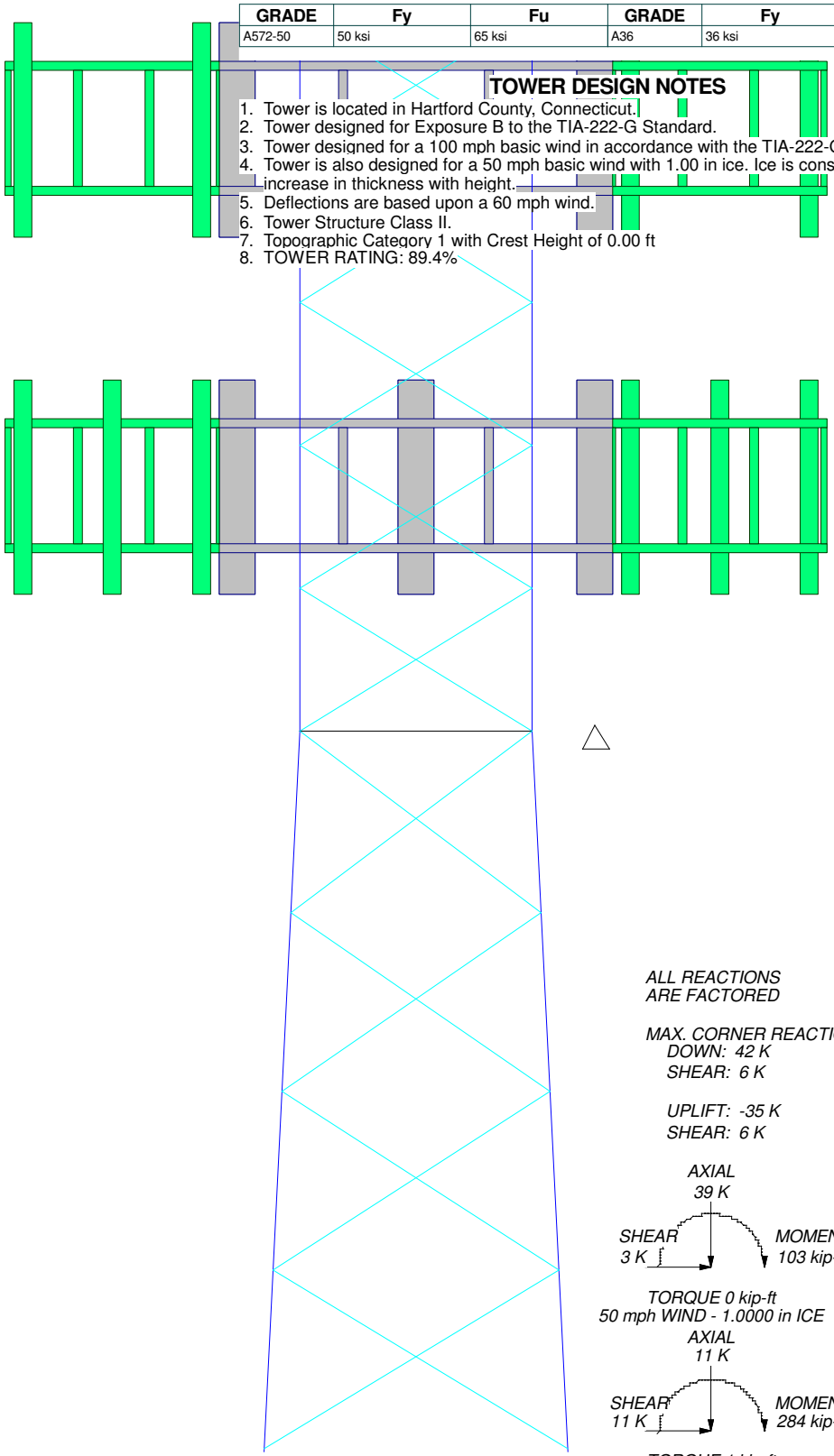
Job: **BU #: 876328, WEST HARTFORD PARKING GARAGE**			
Project: ***2017777.876328.17***			
Client: Crown Castle International, Inc.	Drawn by: B Darkow	App'd:	
Code: TIA-222-G	Date: 08/15/17	Scale: NTS	
Path: \\AKRN05.gpdco.com\TELECOM\Crown\876328\17\Rev. 0\tnx\876328.eri		Dwg No. E-1	

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 Exposure B to the TIA-222-G Standard.
3. Tower designed for a 100 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 89.4%



Section	T1	T2					
Legs	ROHN 2.5 STD						
Leg Grade	A572-50						
Diagonals		L1-3/4x1-3/4x3/16	L1-1/2x1-1/2x1/8				
Diagonal Grade			A36				
Top Girts				L2x2x1/8			
Face Width (ft)	6.5625				8.5625		
# Panels @ (ft)	5 @ 4.025				4 @ 5.01042		
Weight (K)	0.7				0.8		1.5

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 42 K
SHEAR: 6 K

UPLIFT: -35 K
SHEAR: 6 K

TORQUE 0 kip-ft
50 mph WIND - 1.0000 in ICE

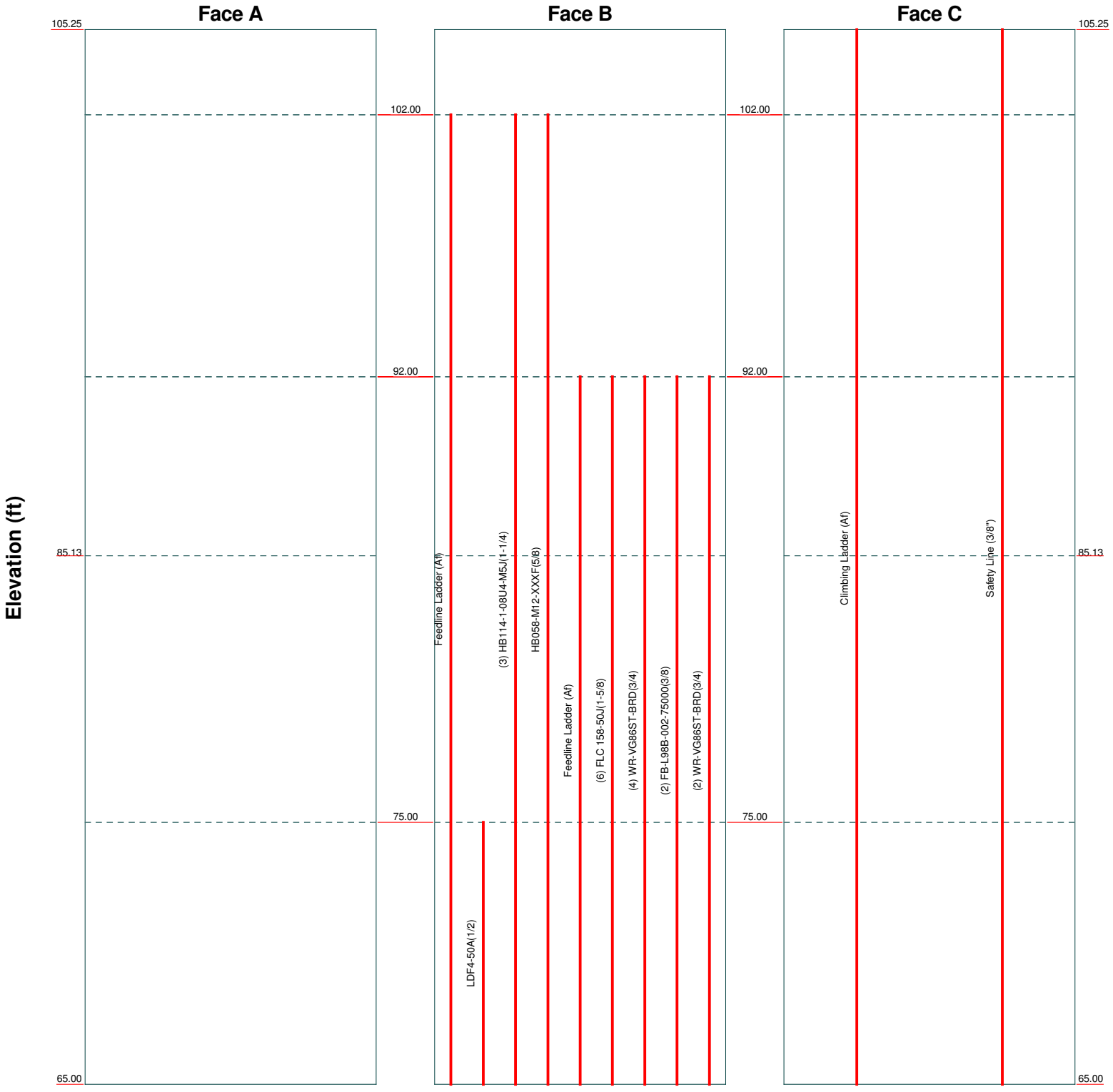
TORQUE 1 kip-ft
REACTIONS - 100 mph WIND

GPD Group
520 South Main Street, Suite 2531
Akron, Ohio 44311
Phone: (330) 572-2100
FAX: (330) 572-2101

Job: **BU #: 876328, WEST HARTFORD PARKING GARAGE**			
Project: **2017777.876328.17**			
Client: Crown Castle International, Inc.	Drawn by: B Darkow	App'd:	
Code: TIA-222-G	Date: 08/15/17	Scale: NTS	
Path: \\AKRN05.gpdco.com\TELECOM\Crown\876328\17\Rev. 0\tnx\876328.eri		Dwg No. E-1	

Feed Line Distribution Chart
65' - 105'3"

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



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Path: \\AKRN05.gpdco.com\TELECOM\Crown\876328\17\Rev. 0\tnx\876328.eri		Dwg No. E-7	

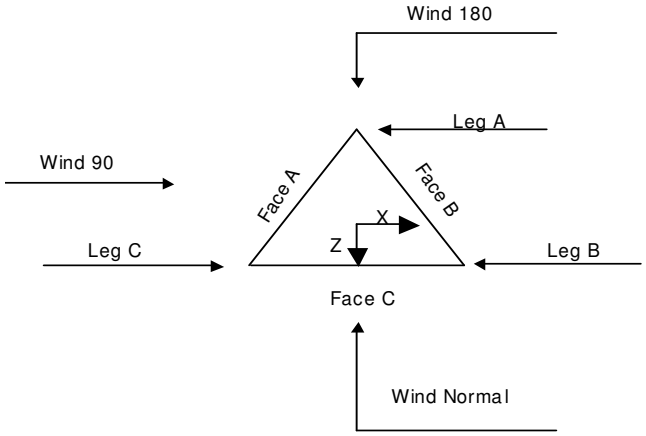
Tower Input Data

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-222-G standard.
The following design criteria apply:

1) Tower is located in Hartford County, Connecticut.
2) Basic wind speed of 100 mph.
3) Structure Class II.
4) Exposure Category B.
5) Topographic Category 1.
6) Crest Height 0.00 ft.
7) Nominal ice thickness of 1.0000 in.
8) Ice thickness is considered to increase with height.
9) Ice density of 56 pcf.
10) A wind speed of 50 mph is used in combination with ice.
11) Temperature drop of 50 °F.
12) Deflections calculated using a wind speed of 60 mph.
13) A non-linear (P-delta) analysis was used.
14) Pressures are calculated at each section.
15) Stress ratio used in tower member design is 1.
16) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



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	5.01	X Brace	No	No	0.0000	1.0000

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 (50 ksi)	Equal Angle	L1-1/2x1-1/2x1/8	A36 (36 ksi)
T2 85.13-65.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1-3/4x1-3/4x3/16	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	L2x2x1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T2 85.13-65.00	Equal Angle	L2x2x1/8	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	Double Angle Stitch Bolt Spacing Redundants in
T1 105.25-85.13	0.00	0.0000	A36 (36 ksi)	1	1	1	0.0000	0.0000	0.0000
T2 85.13-65.00	0.00	0.0000	A36 (36 ksi)	1	1	1	0.0000	0.0000	0.0000

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	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 85.13-65.00	Yes	Yes	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	1	0.0000	1	0.0000	1	0.0000	1
T2 85.13-65.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	1	0.0000	1	0.0000	1	0.0000	1

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 A325X	1	0.5000 A325X	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0
T2 85.13-65.00	Flange	0.0000 A325N	0	0.5000 A325X	1	0.5000 A325X	1	0.0000 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.0000 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
Climbing Ladder (Af)	C	No	Af (CaAa)	105.25 - 65.00	-3.0000	0	1	1	3.8400	3.8400		4.81
Safety Line (3/8")	C	No	Ar (CaAa)	105.25 - 65.00	-3.0000	0	1	1	0.3750	0.3750		0.22
Feedline Ladder (Af)	B	No	Af (CaAa)	102.00 - 65.00	0.0000	-0.1	1	1	3.0000	3.0000		8.40
LDF4-50A(1/2)	B	No	Ar (CaAa)	75.00 - 65.00	0.0000	-0.15	1	1	0.6250	0.6250		0.15
HB114-1-08U4-M5J(1-1/4)	B	No	Ar (CaAa)	102.00 - 65.00	0.0000	-0.1	3	3	1.0000	1.5400		1.08
HB058-M12-XXXF(5/8)	B	No	Ar (CaAa)	102.00 - 65.00	0.0000	-0.025	1	1	0.8400	0.8400		0.24
Feedline Ladder (Af)	B	No	Af (CaAa)	92.00 - 65.00	0.0000	0.35	1	1	3.0000	3.0000		8.40
FLC 158-50J(1-5/8)	B	No	Ar (CaAa)	92.00 - 65.00	0.0000	0.35	6	3	1.0000	2.0150		0.92
WR-VG86ST-BRD(3/4)	B	No	Ar (CaAa)	92.00 - 65.00	0.0000	0.425	4	2	0.7950	0.7950		0.58
FB-L98B-002-75000(3/8)	B	No	Ar (CaAa)	92.00 - 65.00	3.5000	0.425	2	2	0.3937	0.3937		0.06
WR-VG86ST-BRD(3/4)	B	No	Ar (CaAa)	92.00 - 65.00	0.0000	0.45	2	1	0.7950	0.7950		0.58

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 K
T1	105.25-85.13	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	33.221	0.000	0.32
		C	0.000	0.000	13.635	0.000	0.10
T2	85.13-65.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	67.254	0.000	0.59
		C	0.000	0.000	13.635	0.000	0.10

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 K
T1	105.25-85.13	A	2.223	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	93.458	0.000	1.75
		C		0.000	0.000	31.534	0.000	0.66
T2	85.13-65.00	A	2.171	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	186.910	0.000	3.39
		C		0.000	0.000	31.114	0.000	0.64

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	2.8747	0.3671	2.2143	0.4753
T2	85.13-65.00	5.1685	1.1013	3.9486	0.8385

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	8.02 8.48 8.94	6.71 7.66 8.49	0.08 0.14 0.22
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	8.02 8.48 8.94	6.71 7.66 8.49	0.08 0.14 0.22
APXV9ERR18-C-A20 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	8.50 9.16 9.79	7.18 8.46 9.60	0.08 0.15 0.23
APXVTM14-C-120 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	6.58 7.03 7.47	4.96 5.75 6.47	0.08 0.13 0.19
APXVTM14-C-120 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	6.58 7.03 7.47	4.96 5.75 6.47	0.08 0.13 0.19
APXVTM14-C-120 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	6.58 7.03 7.47	4.96 5.75 6.47	0.08 0.13 0.19
1900MHz RRH (65MHz)	A	From Leg	2.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.06 0.08 0.11
1900MHz RRH (65MHz)	B	From Leg	2.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.06 0.08 0.11
1900MHz RRH (65MHz)	C	From Leg	2.00 0.00 1.00	0.0000	102.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.06 0.08 0.11
800MHz 2X50W RRH	A	From Leg	2.00	0.0000	102.00	No Ice	2.06	1.93	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
W/FILTER			0.00			1/2"	2.24	2.11	0.09
			0.00			Ice	2.43	2.29	0.11
						1" Ice			
800MHz 2X50W RRH W/FILTER	B	From Leg	2.00	0.0000	102.00	No Ice	2.06	1.93	0.06
			0.00			1/2"	2.24	2.11	0.09
			0.00			Ice	2.43	2.29	0.11
						1" Ice			
800MHz 2X50W RRH W/FILTER	C	From Leg	2.00	0.0000	102.00	No Ice	2.06	1.93	0.06
			0.00			1/2"	2.24	2.11	0.09
			0.00			Ice	2.43	2.29	0.11
						1" Ice			
TD-RRH8x20-25	A	From Leg	4.00	0.0000	102.00	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			1.00			Ice	4.56	1.90	0.13
						1" Ice			
TD-RRH8x20-25	B	From Leg	4.00	0.0000	102.00	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			1.00			Ice	4.56	1.90	0.13
						1" Ice			
TD-RRH8x20-25	C	From Leg	4.00	0.0000	102.00	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			1.00			Ice	4.56	1.90	0.13
						1" Ice			
8' x 2" Mount Pipe	A	From Leg	4.00	0.0000	102.00	No Ice	1.90	1.90	0.04
			0.00			1/2"	2.73	2.73	0.05
			0.00			Ice	3.40	3.40	0.07
						1" Ice			
8' x 2" Mount Pipe	B	From Leg	4.00	0.0000	102.00	No Ice	1.90	1.90	0.04
			0.00			1/2"	2.73	2.73	0.05
			0.00			Ice	3.40	3.40	0.07
						1" Ice			
8' x 2" Mount Pipe	C	From Leg	4.00	0.0000	102.00	No Ice	1.90	1.90	0.04
			0.00			1/2"	2.73	2.73	0.05
			0.00			Ice	3.40	3.40	0.07
						1" Ice			
Sector Mount [SM 502-3]	B	None		0.0000	102.00	No Ice	33.02	33.02	1.67
						1/2"	47.36	47.36	2.22
						Ice	61.70	61.70	2.77
						1" Ice			
7770.00 w/ Mount Pipe	A	From Leg	4.00	0.0000	92.00	No Ice	5.84	4.35	0.06
			0.00			1/2"	6.32	5.20	0.11
			-3.00			Ice	6.77	5.92	0.16
						1" Ice			
7770.00 w/ Mount Pipe	B	From Leg	4.00	0.0000	92.00	No Ice	5.84	4.35	0.06
			0.00			1/2"	6.32	5.20	0.11
			-3.00			Ice	6.77	5.92	0.16
						1" Ice			
7770.00 w/ Mount Pipe	C	From Leg	4.00	0.0000	92.00	No Ice	5.84	4.35	0.06
			0.00			1/2"	6.32	5.20	0.11
			-3.00			Ice	6.77	5.92	0.16
						1" Ice			
TPA-65R-LCUUUU-H8 w/ Mount Pipe	A	From Leg	4.00	0.0000	92.00	No Ice	13.54	10.96	0.11
			0.00			1/2"	14.24	12.49	0.22
			-3.00			Ice	14.95	14.04	0.33
						1" Ice			
TPA-65R-LCUUUU-H8 w/ Mount Pipe	B	From Leg	4.00	0.0000	92.00	No Ice	13.54	10.96	0.11
			0.00			1/2"	14.24	12.49	0.22
			-3.00			Ice	14.95	14.04	0.33
						1" Ice			
TPA-65R-LCUUUU-H8 w/ Mount Pipe	C	From Leg	4.00	0.0000	92.00	No Ice	13.54	10.96	0.11
			0.00			1/2"	14.24	12.49	0.22
			-3.00			Ice	14.95	14.04	0.33
						1" Ice			
OPA-65R-LCUU-H8 w/ Mount Pipe	A	From Leg	4.00	0.0000	92.00	No Ice	12.98	9.32	0.12
			0.00			1/2"	13.67	10.79	0.21
			-3.00			Ice	14.36	12.24	0.32

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice			
OPA-65R-LCUU-H8 w/ Mount Pipe	B	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	12.98 13.67 14.36	9.32 10.79 12.24	0.12 0.21 0.32
OPA-65R-LCUU-H8 w/ Mount Pipe	C	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	12.98 13.67 14.36	9.32 10.79 12.24	0.12 0.21 0.32
DTMABP7819VG12A	A	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.98 1.10 1.23	0.34 0.42 0.51	0.02 0.03 0.04
DTMABP7819VG12A	B	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.98 1.10 1.23	0.34 0.42 0.51	0.02 0.03 0.04
DTMABP7819VG12A	C	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.98 1.10 1.23	0.34 0.42 0.51	0.02 0.03 0.04
7020.00	A	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.10 0.15 0.20	0.17 0.24 0.31	0.00 0.01 0.01
7020.00	B	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.10 0.15 0.20	0.17 0.24 0.31	0.00 0.01 0.01
7020.00	C	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.10 0.15 0.20	0.17 0.24 0.31	0.00 0.01 0.01
RRUS-11	A	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.09
RRUS-11	B	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.09
RRUS-11	C	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.09
RRUS 12	A	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
RRUS 12	B	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
RRUS 12	C	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
RRUS 32 B2	A	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	2.73 2.95 3.18	1.67 1.86 2.05	0.05 0.07 0.10
RRUS 32 B2	B	From Leg	4.00 0.00 -3.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	2.73 2.95 3.18	1.67 1.86 2.05	0.05 0.07 0.10
RRUS 32 B2	C	From Leg	4.00	0.0000	92.00	No Ice	2.73	1.67	0.05

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 K
			0.00			1/2" Ice	2.95	1.86	0.07
			-3.00			1" Ice	3.18	2.05	0.10
RRUS 32 B30	A	From Leg	4.00	0.0000	92.00	No Ice	2.69	1.57	0.06
			0.00			1/2" Ice	2.91	1.76	0.08
			-3.00			1" Ice	3.14	1.95	0.10
RRUS 32 B30	B	From Leg	4.00	0.0000	92.00	No Ice	2.69	1.57	0.06
			0.00			1/2" Ice	2.91	1.76	0.08
			-3.00			1" Ice	3.14	1.95	0.10
RRUS 32 B30	C	From Leg	4.00	0.0000	92.00	No Ice	2.69	1.57	0.06
			0.00			1/2" Ice	2.91	1.76	0.08
			-3.00			1" Ice	3.14	1.95	0.10
(2) RRUS E2 B29	A	From Leg	4.00	0.0000	92.00	No Ice	3.15	1.29	0.06
			0.00			1/2" Ice	3.36	1.44	0.08
			-3.00			1" Ice	3.59	1.60	0.11
RRUS E2 B29	B	From Leg	4.00	0.0000	92.00	No Ice	3.15	1.29	0.06
			0.00			1/2" Ice	3.36	1.44	0.08
			-3.00			1" Ice	3.59	1.60	0.11
RRUS 32 B66	B	From Leg	4.00	0.0000	92.00	No Ice	2.74	1.67	0.05
			0.00			1/2" Ice	2.96	1.86	0.07
			-3.00			1" Ice	3.19	2.05	0.10
(2) RRUS 32 B66	C	From Leg	4.00	0.0000	92.00	No Ice	2.74	1.67	0.05
			0.00			1/2" Ice	2.96	1.86	0.07
			-3.00			1" Ice	3.19	2.05	0.10
(2) DC6-48-60-18-8F Surge Suppression Unit	A	From Leg	4.00	0.0000	92.00	No Ice	0.92	0.92	0.02
			0.00			1/2" Ice	1.46	1.46	0.04
			-3.00			1" Ice	1.64	1.64	0.06
DC6-48-60-18-8F Surge Suppression Unit	A	From Leg	4.00	0.0000	92.00	No Ice	0.92	0.92	0.02
			0.00			1/2" Ice	1.46	1.46	0.04
			-3.00			1" Ice	1.64	1.64	0.06
(3) C10857011 12' V-Boom	B	None		0.0000	92.00	No Ice	33.64	33.64	1.50
						1/2" Ice	48.17	48.17	2.00
						1" Ice	62.70	62.70	2.51
KS24019-L112A	A	From Leg	4.00	0.0000	75.00	No Ice	0.14	0.14	0.01
			0.00			1/2" Ice	0.20	0.20	0.01
			2.00			1" Ice	0.26	0.26	0.01
Side Arm Mount [SO 302-1]	A	From Leg	2.00	0.0000	75.00	No Ice	1.67	3.27	0.06
			0.00			1/2" Ice	2.51	4.99	0.09
			0.00			1" Ice	3.35	6.71	0.12

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	105.25 - 85.125	0.268	43	0.0387	0.0015
T2	85.125 - 65	0.093	43	0.0316	0.0011

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
102.00	APXVSPP18-C-A20 w/ Mount Pipe	43	0.237	0.0385	0.0014	155732
92.00	7770.00 w/ Mount Pipe	43	0.145	0.0363	0.0013	58767
75.00	KS24019-L112A	43	0.038	0.0180	0.0006	77866

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	105.25 - 85.125	1.175	10	0.1687	0.0065
T2	85.125 - 65	0.406	10	0.1379	0.0048

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
102.00	APXVSPP18-C-A20 w/ Mount Pipe	10	1.037	0.1679	0.0064	35884
92.00	7770.00 w/ Mount Pipe	10	0.635	0.1584	0.0057	13541
75.00	KS24019-L112A	10	0.168	0.0785	0.0027	17942

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	105.25	Leg	A325N	0.6250	4	2.44	20.71	0.118	1	Bolt Tension
		Diagonal	A325X	0.5000	1	3.35	3.81	0.879	1	Member Block Shear
		Top Girt	A325X	0.5000	1	0.35	4.13	0.084	1	Member Bearing
T2	85.125	Diagonal	A325X	0.5000	1	3.09	6.20	0.498	1	Member Bearing
		Top Girt	A325X	0.5000	1	0.19	4.13	0.047	1	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	105.25 - 85.125	ROHN 2.5 STD	20.13	4.02	51.0 K=1.00	1.7040	-15.06	63.41	0.237 [1]
T2	85.125 - 65	ROHN 2.5 STD	20.16	5.02	63.6 K=1.00	1.7040	-39.11	57.07	0.685 [1]

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	105.25 - 85.125	L1-1/2x1-1/2x1/8	7.70	3.60	146.0 K=1.00	0.3594	-3.40	3.81	0.894 [1]
T2	85.125 - 65	L1-3/4x1-3/4x3/16	9.70	4.75	166.0 K=1.00	0.6211	-3.12	5.09	0.613 [1]

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	105.25 - 85.125	L2x2x1/8	6.56	6.11	184.6 K=1.00	0.4844	-0.35	3.21	0.110 [1]
T2	85.125 - 65	L2x2x1/8	6.56	6.11	184.6 K=1.00	0.4844	-0.15	3.21	0.048 [1]

[1] $P_u / \phi P_n$ controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	105.25 - 85.125	ROHN 2.5 STD	20.13	4.02	51.0	1.7040	9.74	76.68	0.127 [1]
T2	85.125 - 65	ROHN 2.5 STD	20.16	0.08	1.1	1.7040	34.99	76.68	0.456 [1]

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	105.25 - 85.125	L1-1/2x1-1/2x1/8	7.70	3.60	95.7	0.2109	3.35	9.18	0.365 [1]
T2	85.125 - 65	L1-3/4x1-3/4x3/16	9.70	4.75	108.5	0.3779	3.09	16.44	0.188 [1]

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	105.25 - 85.125	L2x2x1/8	6.56	6.11	121.2	0.3047	0.35	13.25	0.026 [1]
T2	85.125 - 65	L2x2x1/8	6.56	6.11	121.2	0.3047	0.19	13.25	0.015 [1]

[1] $P_u / \phi P_n$ controls

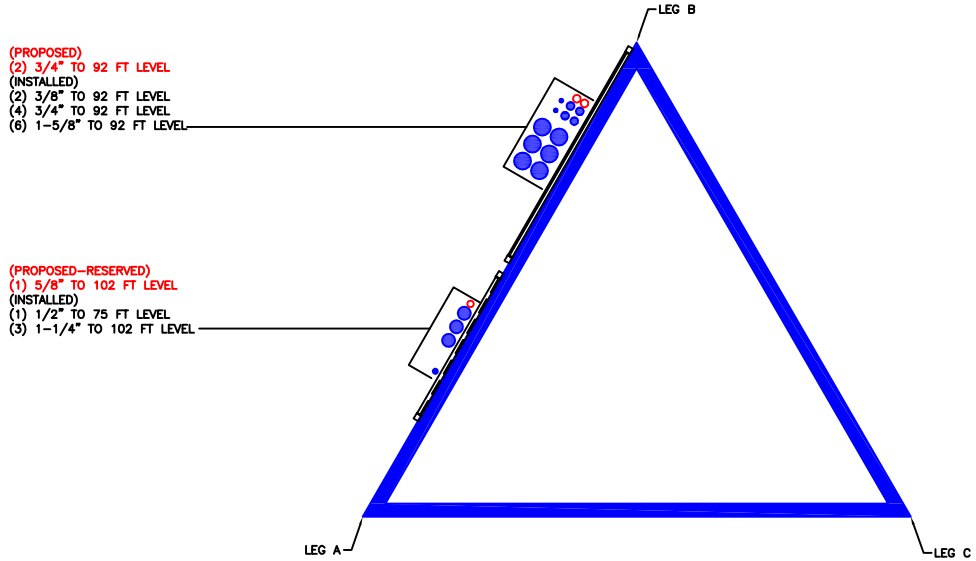
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	105.25 - 85.125	Leg	ROHN 2.5 STD	3	-15.06	63.41	23.7	Pass
T2	85.125 - 65	Leg	ROHN 2.5 STD	38	-39.11	57.07	68.5	Pass
T1	105.25 - 85.125	Diagonal	L1-1/2x1-1/2x1/8	9	-3.40	3.81	89.4	Pass
T2	85.125 - 65	Diagonal	L1-3/4x1-3/4x3/16	46	-3.12	5.09	61.3	Pass
T1	105.25 - 85.125	Top Girt	L2x2x1/8	4	-0.35	3.21	11.0	Pass
T2	85.125 - 65	Top Girt	L2x2x1/8	41	-0.15	3.21	4.8	Pass

Summary	ELC:	Load Case 7
Leg (T2)	68.5	Pass
Diagonal (T1)	89.4	Pass
Top Girt (T1)	11.0	Pass
Bolt Checks	87.9	Pass
Rating =	89.4	Pass

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 876328 TOWER ID: C_BASELEVEL

CROWN REGION ADDRESS

USA

22/01/14	UPDATED PER WORK ORDER # 686541	ADJ
11/02/14	UPDATED PER WORK ORDER # 711452	TDG
15/08/14	UPDATED PER WORK ORDER # 913577	BDH
4/1/2016	UPDATED PER WORK ORDER 1173169	BMH
10/02/16	UPDATED PER WORK ORDER 1193295	SKT
17/03/16	UPDATED PER WORK ORDER 1210485	AMT
14/04/16	UPDATED PER WORK ORDER 1222686	ANR
18/12/16	UPDATED PER WORK ORDER 1331320	BM
10/08/17	UPDATED PER WORK ORDER 1443067	CJR

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

BASE LEVEL DRAWING

SCALE: N.T.S.

1

PLOT DATE: 4/27/2016 FILE NAME: 876328_BASELEVEL.dwg

Xref R:\TEMPLATES\TYPICAL BLOCKS FOR TEMPLATES\TITLE BLOCK STD-VER 5.1.dwg

APPENDIX C

ADDITIONAL CALCULATIONS

GPD GROUP

FOUNDATION ANALYSIS WORKSHEET

Client:	Crown Castle International, Inc.	Job No.:	2017777.876328.17		
Site Name:	WEST HARTFORD PARKING GARAGE	Sheet No:	1	Of	1
Site BU #:	876328	Made By:	BD2	Date:	8/15/2017
Location:	Hartford County, Connecticut				
Loading Type:	Wind	Code:	G		

Sources

The modified tnxTower design reactions were obtained from the design by GPD (Project #: 2015777.876328.08, dated 6/3/2015)

Modified tnxTower Design Reactions (F-Code)		
Uplift:	44.01	K
Compression:	52.04	K
Shear	7.94	K

G-Code Conversion Factor:	1.35

Modified tnxTower Design Reactions (Converted to G-Code)		
Uplift:	59.41	K
Compression:	70.26	K
Shear	10.72	K

TNX Output Reactions (G-Code)		
Uplift:	34.71	K
Compression:	41.96	K
Shear	6.35	K

FOUNDATION CAPACITY

Uplift Capacity =	TNX Output / Modified Design Reactions	=	58.4%
Compression Capacity =	TNX Output / Modified Design Reactions	=	59.7%
Shear Capacity =	TNX Output / Modified Design Reactions	=	59.2%

PROJECT INFORMATION

SCOPE OF WORK:

ITEMS TO BE MOUNTED ON THE EXISTING LATTICE TOWER:

- (1) AT&T ANTENNA (OPA-65R-LCUU-H8) @ POSITION 2 (TYP. OF 1 FOR ALPHA & BETA SECTOR, TOTAL OF 2).
- (1) AT&T ANTENNA (OPA-65R-LCUU-H8) @ POSITION 1 (TOTAL OF 1 FOR GAMMA SECTOR)
- (1) AT&T RRUS-E2 (700) (TYP. OF 1 PER SECTOR, TOTAL OF 3).
- (1) AT&T RRUS-12 (850) (TYP. OF 1 PER SECTOR, TOTAL OF 3).
- (1) AT&T RRUS-32 B66 (AWS) (TYP. OF 1 PER SECTOR, TOTAL OF 3).
- INSTALL (1) DC6-48-60-18-8F SQUID ALONG WITH (2) DC TRUNKS, (1) FIBER AND (1) ALARM CABLE.
- NEW JUMPER CABLES: COAX JUMPERS (6) PER SECTOR FROM EACH RRU (TOTAL OF 18).
- NEW FIBER JUMPERS: FIBER JUMPERS (3) FROM THE SQUID TO EACH RRU (TOTAL OF 9).

ITEMS TO BE MOUNTED INSIDE EXISTING EQUIPMENT:

- INSTALL (1) FIBER MANAGEMENT BOX AND (1) OUTDOOR RATED DC6 ON ICE BRIDGE POST.
- REPLACE EXISTING BBU WITH (2) 5216-IDL2 AND ADD (2) XMU's IN EXISTING PURCELL CABINET.
- INSTALL (1) FIBER TRAY IN EXISTING PURCELL.
- INSTALL (6) 25AMP BREAKERS AND (3) 30AMP BREAKERS TO OUTDOOR POWER PLANT.

ITEMS TO REMAIN:

- (6) ANTENNAS, (9) RRU'S, (6) COAX CABLES, (4) DC POWER CABLES, (1) FIBER RUNS & (2) SURGE ARRESTOR.

1. THE 1ST SQUID INSTALLED WILL BE ALARMED TO THE LOWEST BAND (OR FIRST INSTALLED) RRH/RRU ON THE ALPHA SECTOR. IN THE EVENT THE ALARM CABLE CANNOT BE CONNECTED TO ALPHA IT WILL BE ACCEPTABLE TO ALARM TO THE CLOSEST PHYSICAL SECTOR ON AN EXCEPTION BASIS.
2. 2ND SQUID INSTALLED WILL BE ALARMED TO THE LOWEST BAND (OR FIRST INSTALLED) RRH/RRU ON THE BETA SECTOR.
3. 3RD SQUID INSTALLED WILL BE ALARMED TO THE LOWEST BAND (OR FIRST INSTALLED) RRH/RRU ON THE GAMMA SECTOR.

SITE ADDRESS:	29 SOUTH MAIN STREET WEST HARTFORD, CT 06107
LATITUDE:	41.760190° N 41° 45' 36.7" N
LONGITUDE:	72.743190° W 72° 44' 35.5" W
TYPE OF SITE:	LATTICE TOWER/OUTDOOR EQUIPMENT
TOWER HEIGHT:	103'-0"±
RAD CENTER:	89'-0"±
CURRENT USE:	TELECOMMUNICATIONS FACILITY
PROPOSED USE:	TELECOMMUNICATIONS FACILITY

DRAWING INDEX

SHEET NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	1
GN-1	GENERAL NOTES	1
A-1	ROOF & EQUIPMENT PLAN	1
A-2	ANTENNA LAYOUTS	1
A-3	ELEVATION	1
A-4	DETAILS	1
A-5	SCHEMATIC AND NOTES	1
RF-1	PLUMBING DIAGRAM	1
G-1	GROUNDING DETAILS	1

CROWN CASTLE SITE NAME: WEST HARTFORD PARKING GARAGE
CROWN CASTLE SITE #: 876328

SITE NUMBER: CT5843

SITE NAME: WEST HARTFORD

PROJECT: LTE 4C,5C,6C 2018 UPGRADE

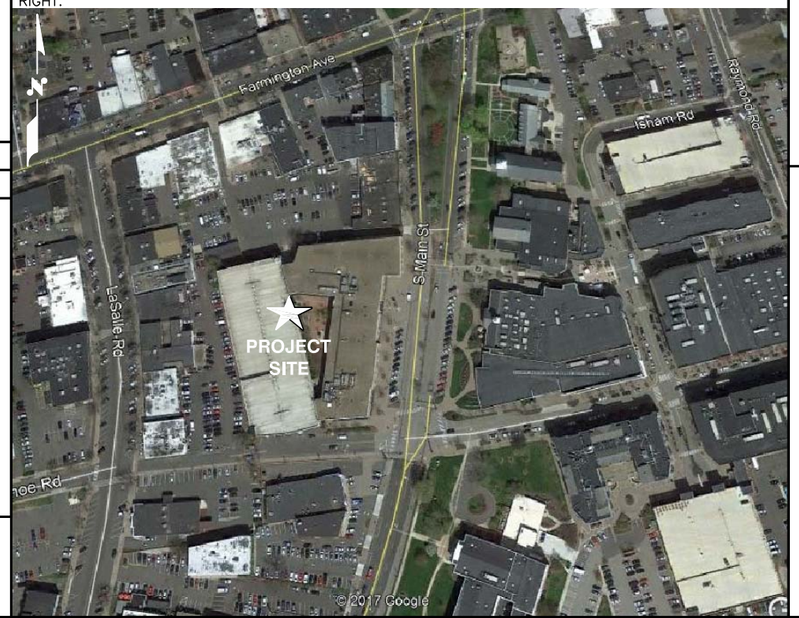
BU# 876328 - WEST HARTFORD PARKING GARAGE

NOTE:

ALL CONSTRUCTION ACTIVITIES ARE TO BE COMPLETED DIRECTLY THROUGH CROWN. CONTRACTOR MUST HAVE CONSTRUCTION PO AND NTP FROM CROWN DIRECT IN ORDER TO BEGIN. PLEASE CONTACT THE CROWN CONSTRUCTION MANAGER: TAMMY NOSEK 518-860-7063

VICINITY MAP

DIRECTIONS TO SITE:
START OUT GOING NORTHEAST ON ENTERPRISE DR TOWARD CAPITAL BLVD. THEN 0.36 MILES. TURN LEFT ONTO CAPITAL BLVD. THEN 0.27 MILES. TURN LEFT ONTO WEST ST. THEN 0.16 MILES. MERGE ONTO I-91 N VIA THE RAMP ON THE LEFT TOWARD HARTFORD. THEN 8.79 MILES. MERGE ONTO I-84 W/US-6 W VIA EXIT 32A ON THE LEFT TOWARD WATERBURY. THEN 4.77 MILES. TAKE THE PARK ROAD EXIT, EXIT 43, TOWARD W HARTFORD CENTER. THEN 0.50 MILES. TURN RIGHT ONTO PARK RD. THEN 0.05 MILES. TAKE THE 1ST LEFT ONTO TROUT BROOK DR. THEN 0.60 MILES TAKE THE 3RD LEFT ONTO FARMINGTON AVE. 0.22 MILES. TURN LEFT ONTO S MAIN ST. SITE WILL BE LOCATED ON THE RIGHT.



GENERAL NOTES

1. THIS DOCUMENT IS THE CREATION, DESIGN, PROPERTY AND COPYRIGHTED WORK OF AT&T. ANY DUPLICATION OR USE WITHOUT EXPRESS WRITTEN CONSENT IS STRICTLY PROHIBITED. DUPLICATION AND USE BY GOVERNMENT AGENCIES FOR THE PURPOSES OF CONDUCTING THEIR LAWFULLY AUTHORIZED REGULATORY AND ADMINISTRATIVE FUNCTIONS IS SPECIFICALLY ALLOWED.
2. THE FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE AT&T REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

72 HOURS

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OR CALL 811

UNDERGROUND SERVICE ALERT

HUDSON Design Group LLC
45 BEECHWOOD DRIVE
NORTH ANDOVER, MA 01845
TEL: (978) 557-5553
FAX: (978) 336-5586

CROWN CASTLE
500 CUMMINGS PARK DR. #3600
WOBURN, MA 01801

SITE NUMBER: CT5843
SITE NAME: WEST HARTFORD
CCI SITE # 876328
29 SOUTH MAIN STREET
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HARTFORD COUNTY

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

NO.	DATE	REVISIONS	BY	CHK	APP'D
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0	10/10/17	ISSUED FOR REVIEW	SG	AT	DJC
A	09/05/17	ISSUED FOR REVIEW	SG	AT	DJC

SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: SG

STATE OF CONNECTICUT · DEREK J. CREASEY · No. 23557 · LICENSED PROFESSIONAL ENGINEER

AT&T

TITLE SHEET
(LTE-4C,5C,6C)

SITE NUMBER	DRAWING NUMBER	REV
CT5843	T-1	1

GROUNDING NOTES

1. THE SUBCONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE SUBCONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE CONTRACTOR FOR RESOLUTION.

2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.

3. THE SUBCONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR NEW GROUND ELECTRODE SYSTEMS. THE SUBCONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS.

4. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.

5. EACH BTS CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, 6 AWG STRANDED COPPER OR LARGER FOR INDOOR BTS 2 AWG STRANDED COPPER FOR OUTDOOR BTS.

6. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.

7. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.

8. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO GROUND BAR.

9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.

10. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.

11. METAL CONDUIT SHALL BE MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH 6 AWS COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.

12. ALL NEW STRUCTURES WITH A FOUNDATION AND/OR FOOTING HAVING 20 FT. OR MORE OF 1/2 IN. OR GREATER ELECTRICALLY CONDUCTIVE REINFORCING STEEL MUST HAVE IT BONDED TO THE GROUND RING USING AN EXOTHERMIC WELD CONNECTION USING #2 AWG SOLID BARE TINNED COPPER GROUND WIRE, PER NEC 250.50

GENERAL NOTES

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:

   CONTRACTOR – CROWN CASTLE
   SUBCONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)
   OWNER – AT&T MOBILITY

2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF CONTRACTOR.

3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. SUBCONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.

4. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.

5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.

6. "KITTING LIST" SUPPLIED WITH THE BID PACKAGE IDENTIFIES ITEMS THAT WILL BE SUPPLIED BY CONTRACTOR. ITEMS NOT INCLUDED IN THE BILL OF MATERIALS AND KITTING LIST SHALL BE SUPPLIED BY THE SUBCONTRACTOR.

7. THE SUBCONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.

8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE SUBCONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE CONTRACTOR.

9. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.

10. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.

11. SUBCONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.

12. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.

13. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.

14. ANY NEW CONCRETE NEEDED FOR THE CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.

15. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.

16. CONSTRUCTION SHALL COMPLY WITH SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF AT&T SITES."

17. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.

18. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.

19. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.

20. APPLICABLE BUILDING CODES:
    SUBCONTRACTOR'S WORK SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES AS ADOPTED BY THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) FOR THE LOCATION. THE EDITION OF THE AHJ ADOPTED CODES AND STANDARDS IN EFFECT ON THE DATE OF CONTRACT AWARD SHALL GOVERN THE DESIGN.
    BUILDING CODE: IBC 2012 WITH 2016 CT BUILDING CODE AMENDMENTS
    ELECTRICAL CODE: REFER TO ELECTRICAL DRAWINGS
    LIGHTENING CODE: REFER TO ELECTRICAL DRAWINGS

    SUBCONTRACTOR'S WORK SHALL COMPLY WITH THE LATEST EDITION OF THE FOLLOWING STANDARDS:

    AMERICAN CONCRETE INSTITUTE (ACI) 318; BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE;

    AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

    MANUAL OF STEEL CONSTRUCTION, ASD, FOURTEENTH EDITION;

    TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) 222-G, STRUCTURAL STANDARDS FOR STEEL

    EQUIPMENT AND ANTENNA SUPPORTING STRUCTURES; REFER TO ELECTRICAL DRAWINGS FOR SPECIFIC ELECTRICAL STANDARDS.

FOR ANY CONFLICTS BETWEEN SECTIONS OF LISTED CODES AND STANDARDS REGARDING MATERIAL, METHODS OF CONSTRUCTION, OR OTHER REQUIREMENTS, THE MOST RESTRICTIVE REQUIREMENT SHALL GOVERN. WHERE THERE IS CONFLICT BETWEEN A GENERAL REQUIREMENT AND A SPECIFIC REQUIREMENT, THE SPECIFIC REQUIREMENT SHALL GOVERN.

ABBREVIATIONS

AGL	ABOVE GRADE LEVEL	EQ	EQUAL	REQ	REQUIRED
AWG	AMERICAN WIRE GAUGE	GC	GENERAL CONTRACTOR	RF	RADIO FREQUENCY
BBU	BATTERY BACKUP UNIT	GRC	GALVANIZED RIGID CONDUIT	TBD	TO BE DETERMINED
BTCW	BARE TINNED SOLID COPPER WIRE	MGB	MASTER GROUND BAR	TBR	TO BE REMOVED
BGR	BURIED GROUND RING	MIN	MINIMUM	TBRR	TO BE REMOVED AND REPLACED
BTS	BASE TRANSCEIVER STATION	P	PROPOSED	TYP	TYPICAL
E	EXISTING	NTS	NOT TO SCALE	UG	UNDER GROUND
EGB	EQUIPMENT GROUND BAR	RAD	RADIATION CENTER LINE (ANTENNA)	VIF	VERIFY IN FIELD
EGR	EQUIPMENT GROUND RING	REF	REFERENCE		

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FAX: (978) 336-5586

CROWN CASTLE
500 CUMMINGS PARK DR. #3600
WOBURN, MA 01801

SITE NUMBER: CT5843
SITE NAME: WEST HARTFORD
CCI SITE # 876328
29 SOUTH MAIN STREET
WEST HARTFORD, CT 06107
HARTFORD COUNTY

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

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0	10/10/17	ISSUED FOR REVIEW	SG	AT	DJC
A	09/05/17	ISSUED FOR REVIEW	SG	AT	DJC

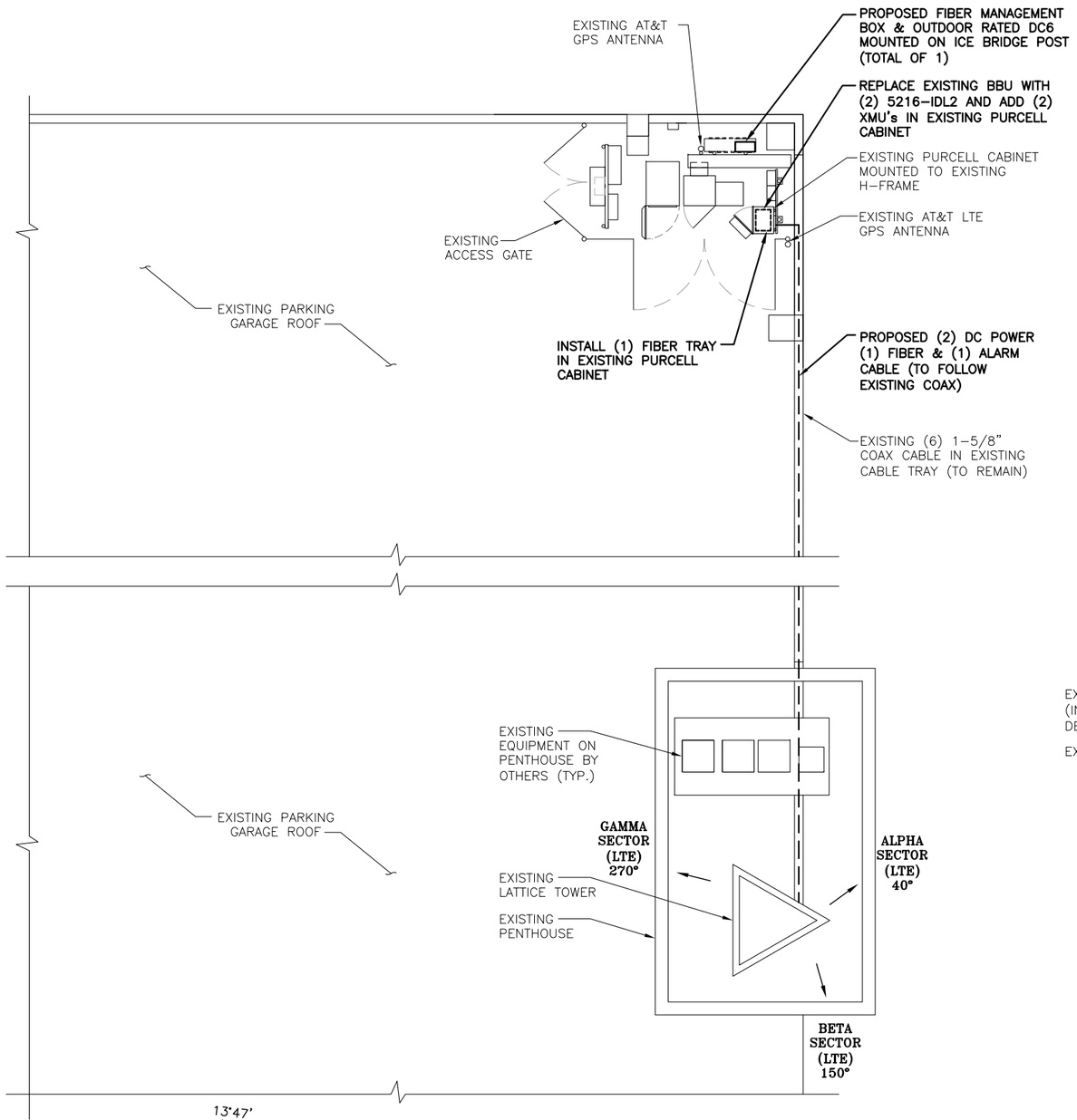
SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: SG

STATE OF CONNECTICUT
DEREK J. CREASEY
No. 25571
LICENSED PROFESSIONAL ENGINEER

AT&T

GENERAL NOTES
(LTE-4C,5C,6C)

SITE NUMBER	DRAWING NUMBER	REV
CT5843	GN-1	1



ROOF PLAN

22x34 SCALE: 3/16"=1'–0" (1 / A–1)
11x17 SCALE: 3/32"=1'–0"

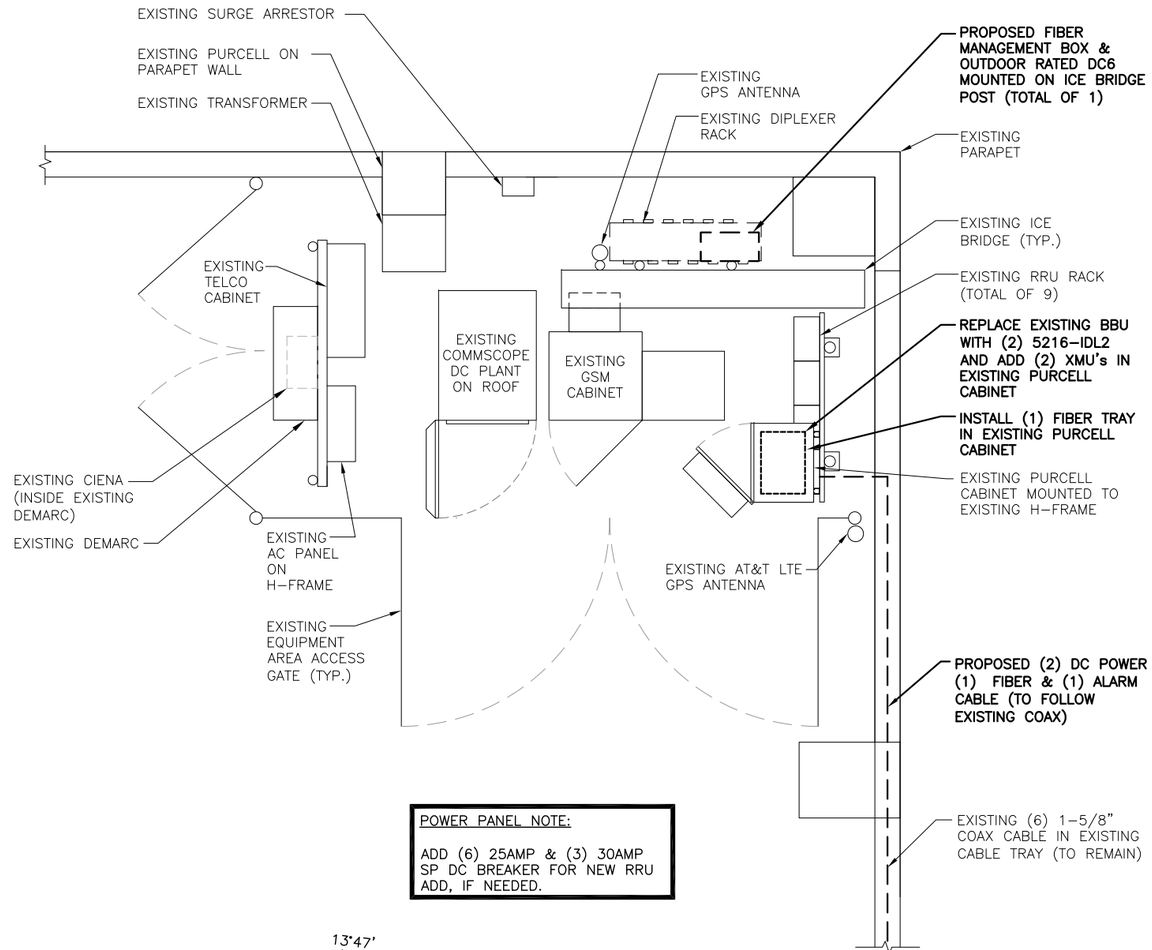
0 2'–8" 5'–4" 10'–8" 16'–0"

NOTE:

REFER TO STRUCTURAL ANALYSIS BY: GPD ENGINEERING CORP AUGUST 15, 2017, FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT.

NOTE:

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



POWER PANEL NOTE:

ADD (6) 25AMP & (3) 30AMP SP DC BREAKER FOR NEW RRU ADD, IF NEEDED.

EQUIPMENT PLAN

22x34 SCALE: 1/2"=1'–0" (2 / A–1)
11x17 SCALE: 1/4"=1'–0"

0 1'–0" 2'–0" 4'–0" 6'–0"

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CROWN CASTLE
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SITE NUMBER: CT5843
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29 SOUTH MAIN STREET
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at&t
500 ENTERPRISE DRIVE, SUITE 3A
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A	09/05/17	ISSUED FOR REVIEW	SG	AT	DJC

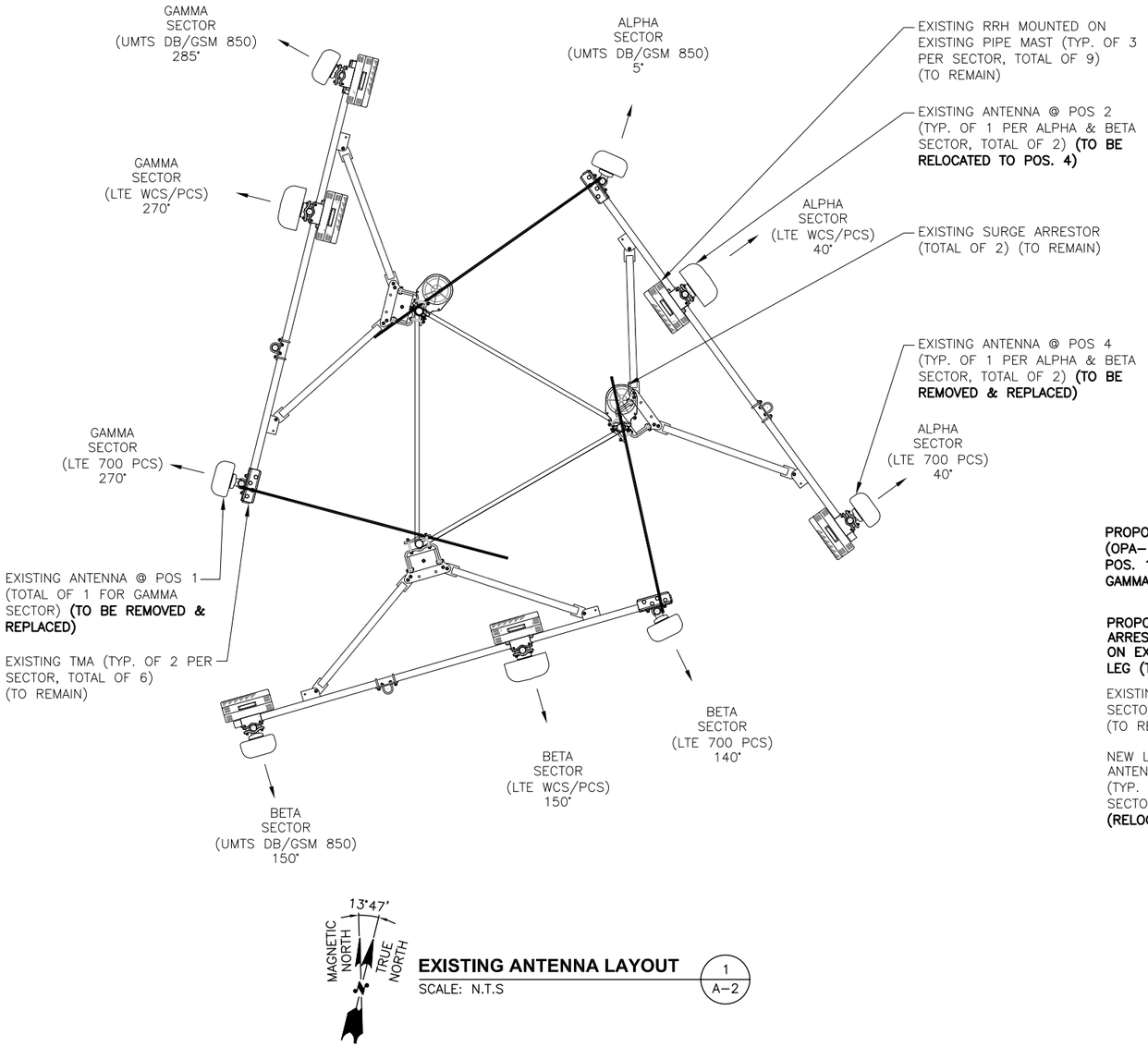
SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: SG

DEREK J. CREASEY — STATE OF CONNECTICUT — No. 25551 — LICENSED PROFESSIONAL ENGINEER

AT&T

ROOF & EQUIPMENT PLAN
(LTE–4C,5C,6C)

SITE NUMBER	DRAWING NUMBER	REV
CT5843	A–1	1



EXISTING ANTENNA LAYOUT (1 / A–2)

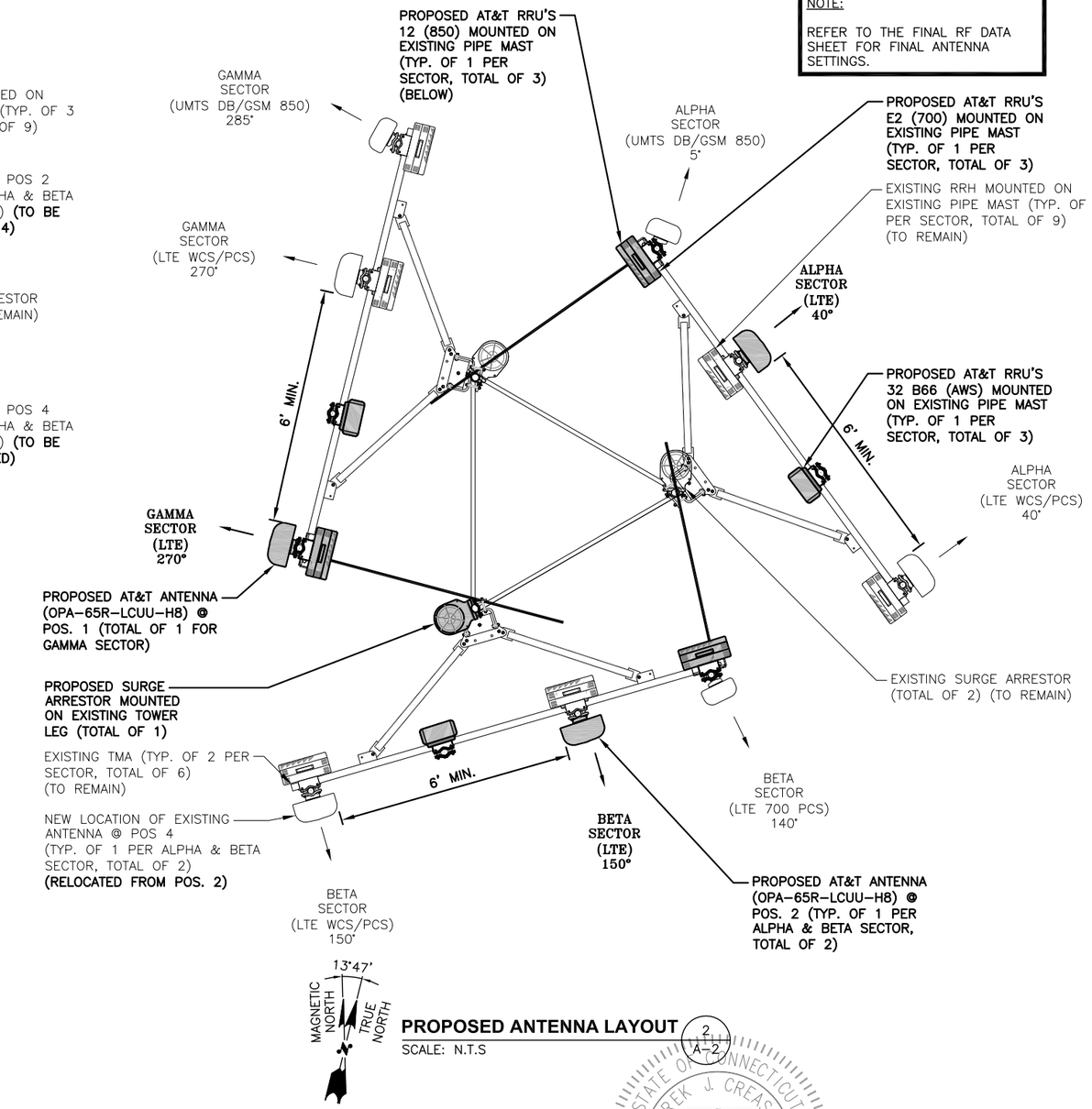
SCALE: N.T.S

NOTE:

REFER TO STRUCTURAL ANALYSIS BY: GPD ENGINEERING CORP AUGUST 15, 2017, FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT.

NOTE:

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



PROPOSED ANTENNA LAYOUT (2 / A–2)

SCALE: N.T.S

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TEL: (978) 557-5553
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CROWN CASTLE
500 CUMMINGS PARK DR. #3600
WOBURN, MA 01801

SITE NUMBER: CT5843
SITE NAME: WEST HARTFORD
CCI SITE # 876328
29 SOUTH MAIN STREET
WEST HARTFORD, CT 06107
HARTFORD COUNTY

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

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0	10/10/17	ISSUED FOR REVIEW	SG	AT	DJC
A	09/05/17	ISSUED FOR REVIEW	SG	AT	DJC

SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: SG

DEREK J. CREASEY — No. 21351 — STATE OF CONNECTICUT — LICENSED PROFESSIONAL ENGINEER

AT&T

ANTENNA LAYOUTS (LTE–4C,5C,6C)

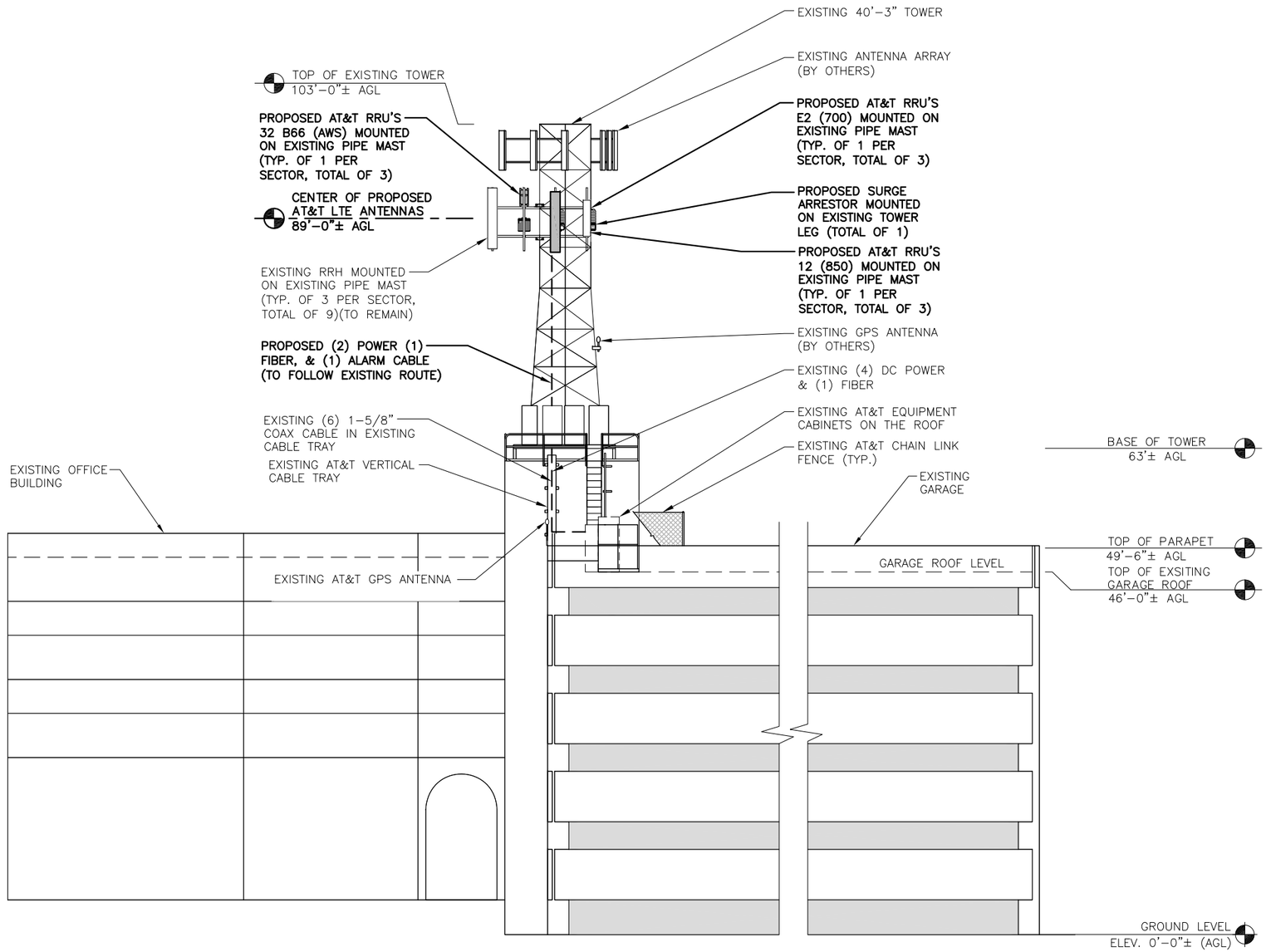
SITE NUMBER	DRAWING NUMBER	REV
CT5843	A–2	1

NOTE:

REFER TO STRUCTURAL ANALYSIS BY: GPD ENGINEERING CORP AUGUST 15, 2017, FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT.

NOTE:

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



NORTH ELEVATION (1 / A-3)

22x34 SCALE: 1/8"=1'-0"
11x17 SCALE: 1/16"=1'-0"

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

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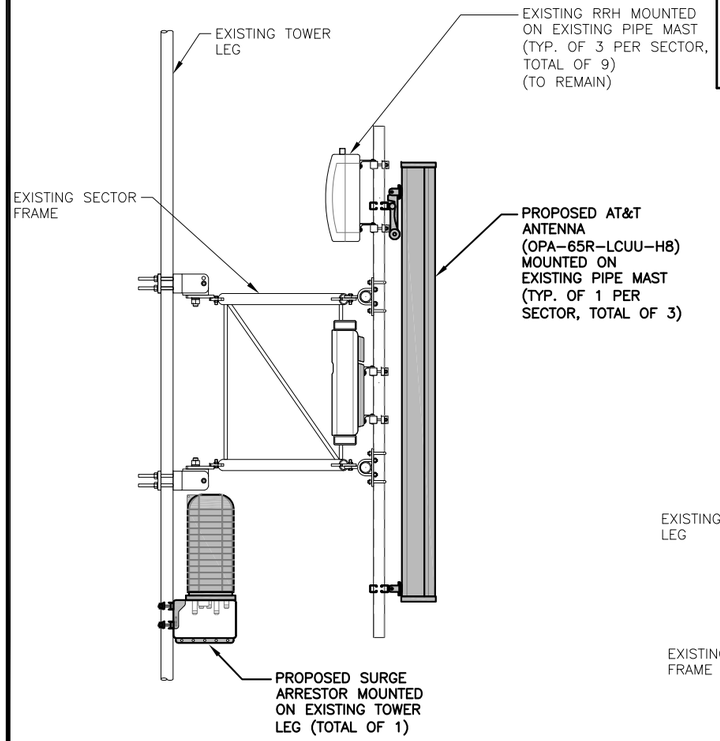
ELEVATION
(LTE-4C,5C,6C)

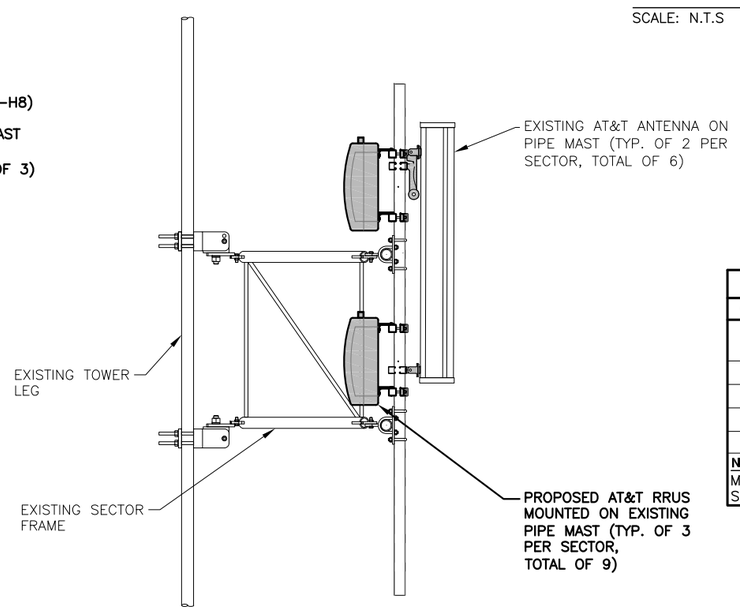
SITE NUMBER	DRAWING NUMBER	REV
CT5843	A-3	1

FINAL ANTENNA SCHEDULE

SECTOR	BAND	ANTENNA		SIZE (INCHES) (L X W X D)	RAD CENTER	AZIMUTH	TMA'S		RRU'S		SIZE (INCHES) (L X W X D)	COAX JUMPERS	FIBER JUMPERS
ALPHA	850 MHZ/1900 MHZ	EXISTING	7770.00	55X11X5	89'-0"±	5°	EXISTING	(2)LGP21401	–	–	–	–	–
	700 MHZ/1900 MHZ	PROPOSED	OPA-65R-LCUU-H8	92.4X14.8X7.4	89'-0"±	40°	–	–	PROPOSED PROPOSED EXISTING	RRUS-E2(700) RRUS-12(850) RRUS-32B2 (PCS)	20.4X18.5X7.5 20.4X18.5X7.5 –	2* 2* –	1** 1** –
	–	–	–	–	–	–	–	–	–	–	–	–	–
	700 MHZ/1900 MHZ	EXISTING	TPA-65R-LCUUUU-H8	92.7X14.4X7	89'-0"±	40°	–	–	EXISTING PROPOSED EXISTING	RRUS-11(700) RRUS-32B66(AWS) RRUS-32(WCS)	– 27.2X12.1X7 27.2X12.1X7	– 2* –	– 1** –
BETA	850 MHZ/1900 MHZ	EXISTING	7770.00	55X11X5	89'-0"±	140°	EXISTING	(2)LGP21401	–	–	–	–	–
	700 MHZ/1900 MHZ	PROPOSED	OPA-65R-LCUU-H8	92.4X14.8X7.4	89'-0"±	150°	–	–	PROPOSED PROPOSED EXISTING	RRUS-E2(700) RRUS-12(850) RRUS-32B2 (PCS)	20.4X18.5X7.5 20.4X18.5X7.5 –	2* 2* –	1** 1** –
	–	–	–	–	–	–	–	–	–	–	–	–	–
	850 MHZ/1900 MHZ	EXISTING	TPA-65R-LCUUUU-H8	92.7X14.4X7	89'-0"±	150°	–	–	EXISTING PROPOSED EXISTING	RRUS-11(700) RRUS-32B66(AWS) RRUS-32(WCS)	– 27.2X12.1X7 27.2X12.1X7	– 2* –	– 1** –
GAMMA	700 MHZ/1900 MHZ	PROPOSED	OPA-65R-LCUU-H8	92.4X14.8X7.4	89'-0"±	270°	EXISTING	(2)LGP21401	–	–	–	–	–
	–	–	–	–	–	–	–	–	–	–	–	–	–
	700 MHZ/1900 MHZ	EXISTING	TPA-65R-LCUUUU-H8	92.4X14.8X7.4	89'-0"±	270°	–	–	PROPOSED PROPOSED EXISTING	RRUS-E2(700) RRUS-12(850) RRUS-32B2 (PCS)	20.4X18.5X7.5 20.4X18.5X7.5 –	2* 2* –	1** 1** –
	850 MHZ/1900 MHZ	EXISTING	7770.00	55X11X5	89'-0"±	285°	–	–	EXISTING PROPOSED EXISTING	RRUS-11(700) RRUS-32B66(AWS) RRUS-32(WCS)	– 27.2X12.1X7 –	– 2* –	– 1** –



PROPOSED ANTENNA & SURGE ARRESTOR MOUNTING DETAIL (1 / A-4)
22x34 SCALE: 1"=1'-0"
11x17 SCALE: 1/2"=1'-0"
0 0'-6" 1'-0" 2'-0" 3'-0"



PROPOSED ANTENNA & SURGE ARRESTOR MOUNTING DETAIL (2 / A-4)
22x34 SCALE: 1"=1'-0"
11x17 SCALE: 1/2"=1'-0"
0 0'-6" 1'-0" 2'-0" 3'-0"

FINAL ANTENNA CONFIGURATION TABLE (5 / A-4)
SCALE: N.T.S

***COAX JUMPER NOTE:**
COAX JUMPERS (6) PER SECTOR FROM THE RRU, TOTAL OF 18

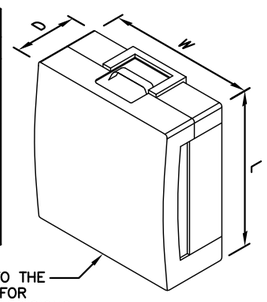
****FIBER JUMPER NOTE:**
FIBER JUMPERS (3) PER SECTOR SECTOR, TOTAL OF 9 TO RRU. SINGLE PAIR POWER CABLE #12 SIZE FROM SQUID TO EACH RRU.

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

NOTE:
REFER TO STRUCTURAL ANALYSIS BY: GPD ENGINEERING CORP AUGUST 15, 2017, FOR THE CAPACITY OF THE EXISTING STRUCTURES TO SUPPORT THE PROPOSED EQUIPMENT.

RRU CHART				
QUANTITY	MODEL	L	W	D
3(E)	RRUS-11	19.7"	17.0"	7.2"
3(P)	RRUS-12	20.4"	18.5"	7.5"
3(P),6(E)	RRUS-32	27.2"	12.1"	7.0"
3(P)	RRUS-E2	20.4"	18.5"	7.5"
–	LTE-A2	16.4"	15.2"	3.4"

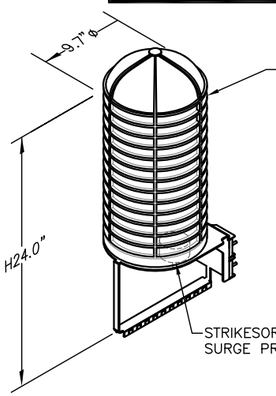
NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS



PROPOSED RRU REFER TO THE FINAL RFDS AND CHART FOR QUANTITY, MODEL AND DIMENSIONS

NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

PROPOSED RRH DETAIL (3 / A-4)
SCALE: N.T.S



NOTE:
MOUNT PER MANUFACTURER'S SPECIFICATIONS.

PROPOSED SURGE SUPPRESSOR (4 / A-4)
SCALE: N.T.S

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SCALE: AS SHOWN | DESIGNED BY: AT | DRAWN BY: SG

STATE OF CONNECTICUT · DEPARTMENT OF CONSUMER PROTECTION · LICENSED PROFESSIONAL ENGINEER · No. 25056

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DETAILS
(LTE-4C,5C,6C)

SITE NUMBER	DRAWING NUMBER	REV
CT5843	A-4	1

COAX COLOR CODING AND IDENTIFICATION NOTES

1. SECTOR ORIENTATION/AZIMUTH WILL VARY FROM REGION TO REGION AND IS SITE SPECIFIC. REFER TO RF REPORT FOR EACH SITE TO DETERMINE THE ANTENNA LOCATION AND FUNCTION OF EACH TOWER SECTOR FACE.

2. THE ANTENNA SYSTEM COAX SHALL BE LABELED WITH VINYL TAPE EXCEPT IN LOCATIONS WHERE ENVIRONMENTAL CONDITIONS CAUSE PHYSICAL DAMAGE, THE PHYSICAL TAGS ARE PREFERRED.

3. THE STANDARD IS BASED ON 8 COLORED TAPES–RED, BLUE, GREEN, YELLOW, ORANGE, BROWN, WHITE, AND VIOLET. THESE TAPES MUST BE 3/4" WIDE & UV RESISTANT SUCH AS SCOTCH 35 VINYL ELECTRICAL COLOR CODING TAPE AND SHOULD BE READILY AVAILABLE TO THE ELECTRICIAN OR SUBCONTRACTOR ON SITE.

4. USING COLOR BANDS ON THE CABLES, MARK ALL RF CABLE BY SECTOR AND CABLE NUMBER AS SHOWN ON "CABLE MARKING COLOR CONVENTION TABLE".

5. WHEN AN EXISTING COAXIAL LINE THAT IS INTENDED TO BE A SHARED LINE BETWEEN GSM/3G AND IS–136/TDMA IS ENCOUNTERED, THE SUBCONTRACTOR SHALL REMOVE THE EXISTING COLOR CODING SCHEME AND REPLACE IT WITH THE COLOR CODING AND TAGGING STANDARD THAT IS OUTLINED IN THE CURRENT VERSION OF ND–00027. IN THE ABSENCE OF AN EXISTING COLOR CODING AND TAGGING SCHEME, OR WHEN INSTALLING PROPOSED COAXIAL CABLES, THE GUIDELINE SHALL BE IMPLEMENTED AT THE SITE REGARDLESS OF TECHNOLOGY.

6. ALL COLOR CODE TAPE SHALL BE 3M–35 AND SHALL BE INSTALLED USING A MINIMUM OF 3 WRAPS OF TAPE AND SHALL BE NEATLY TRIMMED AND SMOOTHED OUT SO AS TO AVOID UNRAVELING.

7. ALL COLOR BANDS INSTALLED AT THE TOP OF THE TOWER SHALL BE A MINIMUM OF 3" WIDE, AND SHALL HAVE A MINIMUM OF 3/4" OF SPACE BETWEEN EACH COLOR.

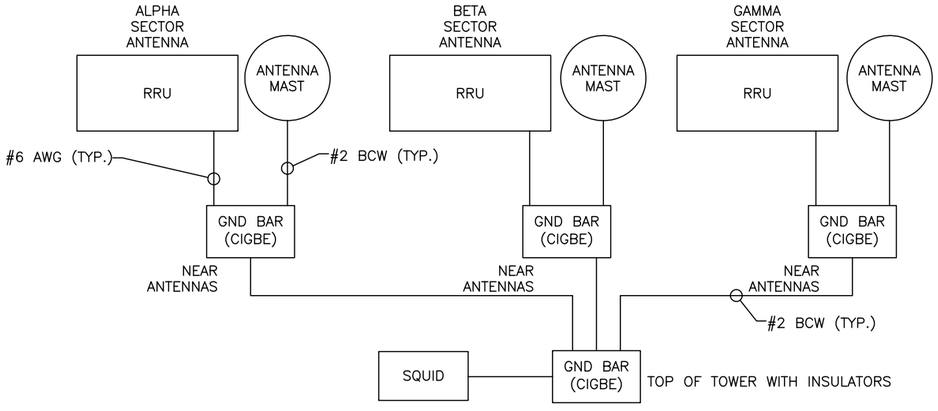
8. ALL COLOR CODES SHALL BE INSTALLED SO AS TO ALIGN NEATLY WITH ONE ANOTHER FROM SIDE TO SIDE.

9. IF EXISTING CABLES AT THE SITE ALREADY HAVE A COLOR CODING SCHEME AND THEY ARE NOT INTENDED TO BE REUSED OR SHARED WITH THE GSM TECHNOLOGY, THE EXISTING COLOR CODING SCHEME SHALL REMAIN UNTOUCHED.

CABLE MARKING TAGS

WHEN USING THE ALTERNATIVE LABELING METHOD, EACH RF CABLE SHALL BE IDENTIFIED WITH A METAL ID TAG MADE OF STAINLESS STEEL OR BRASS, THE TAG SHALL BE 1 1/2" IN DIAMETER WITH 1/4" STAMPED LETTERS AND NUMBERS INDICATING THE SECTOR, ANTENNA POSITION, AND CABLE NUMBER. THE ID MARKING LOCATIONS SHOULD BE AS PER CABLING MARKING LOCATIONS TABLE. THE TAG SHOULD BE ATTACHED WITH CORROSION PROOF WIRE AROUND THE CABLE AT THE SAME LOCATION AS DEFINED ABOVE. THE TAG SHOULD BE LABELED AS SHOWN ON THE GSM AND UMTS LINE TAG DETAIL.

CABLE MARKING LOCATIONS TABLE	
NO.	LOCATIONS
1	EACH TOP JUMPER SHALL BE COLOR CODED WITH 1 SET OF 3" WIDE BANDS
2	EACH MAIN COAX SHALL BE COLORED RED WITH 1 SET OF 3" WIDE BANDS NEAR THE TOP JUMPER CONNECTION AND WITH 1 SET OF 3/4" WIDE COLOR BANDS. JUST PRIOR TO ENTERING THE BTS FOR THE TRANSMITTER BUILDING.
3	CABLE ENTRY PORT ON THE INTERIOR OF THE SHELTER.
4	ALL BOTTOM JUMPERS SHALL BE COLORED WITH 1 SET OF 3/4" WIDE BANDS ON EACH END OF THE BOTTOM JUMPERS.
5	ALL BOTTOM JUMPERS SHALL BE COLORED WITH 1 SET OF 3/4" WIDE BANDS ON EACH END OF THE BOTTOM JUMPERS.



NOTE:
TOWER GROUNDED, GROUND BAR TO HAVE INSULATORS.

SCHEMATIC DIAGRAM GROUNDING SYSTEM

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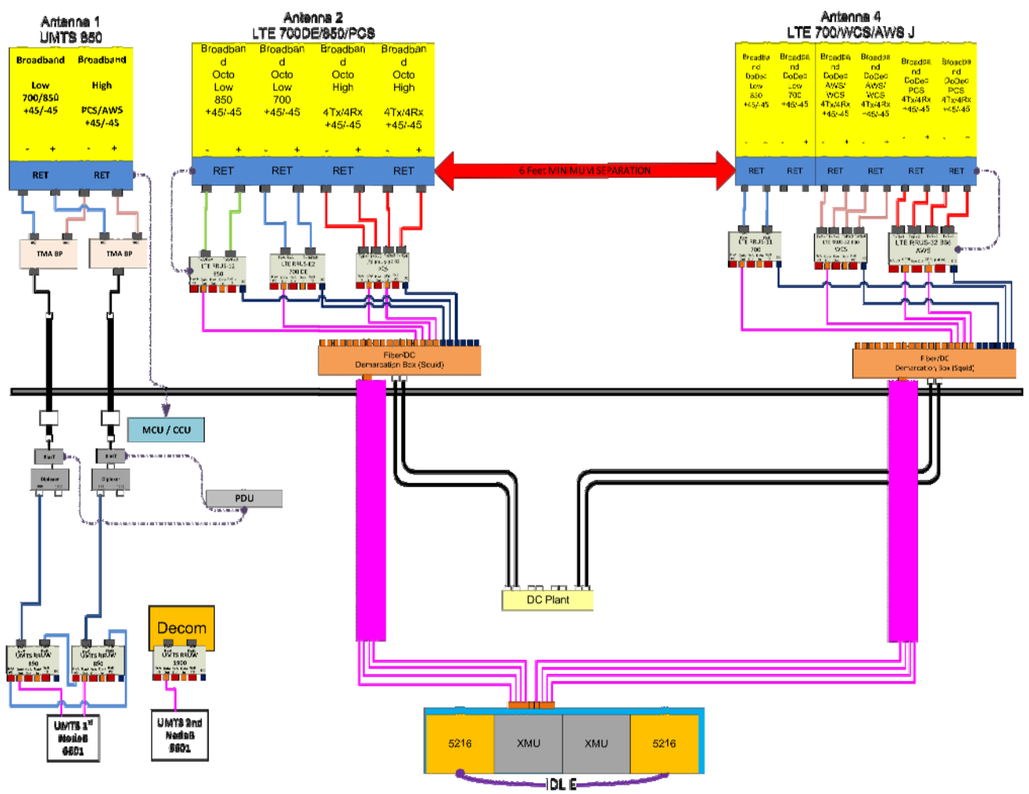
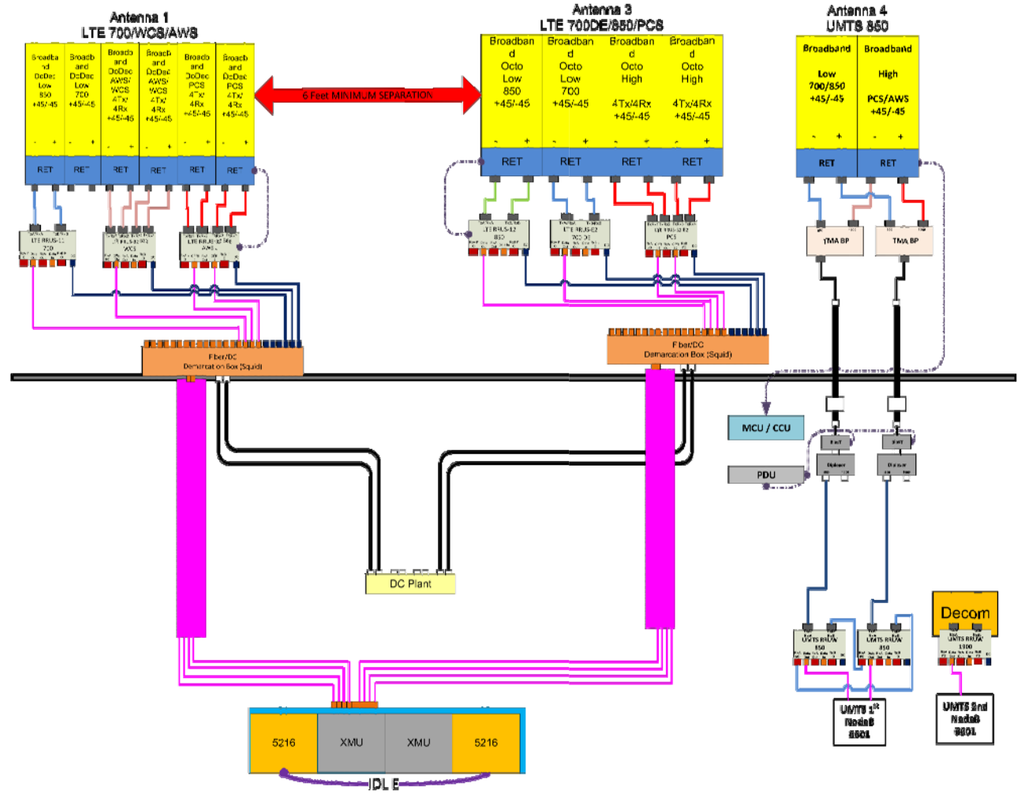
SCHEMATIC AND NOTES
(LTE–4C,5C,6C)

SITE NUMBER	DRAWING NUMBER	REV
CT5843	A–5	1



ALPHA & BETA SECTOR



GAMMA SECTOR

NOTES:

1. CONTRACTOR TO CONFIRM ALL PARTS.
2. INSTALL ALL EQUIPMENT TO MANUFACTURER'S RECOMMENDATIONS.

NOTE:

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PLUMBING DIAGRAM (1 / RF–1)
SCALE: N.T.S

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PLUMBING DIAGRAM
(LTE–4C,5C,6C)

SITE NUMBER	DRAWING NUMBER	REV
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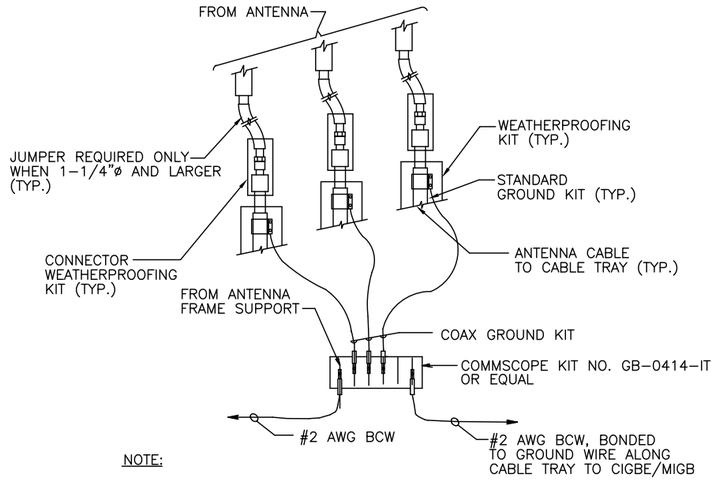


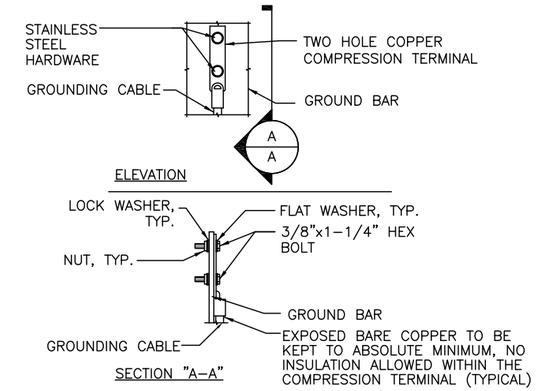
NOTE:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO CIGBE.

GROUND WIRE TO GROUND BAR CONNECTION DETAIL

SCALE: N.T.S

2 / G-1



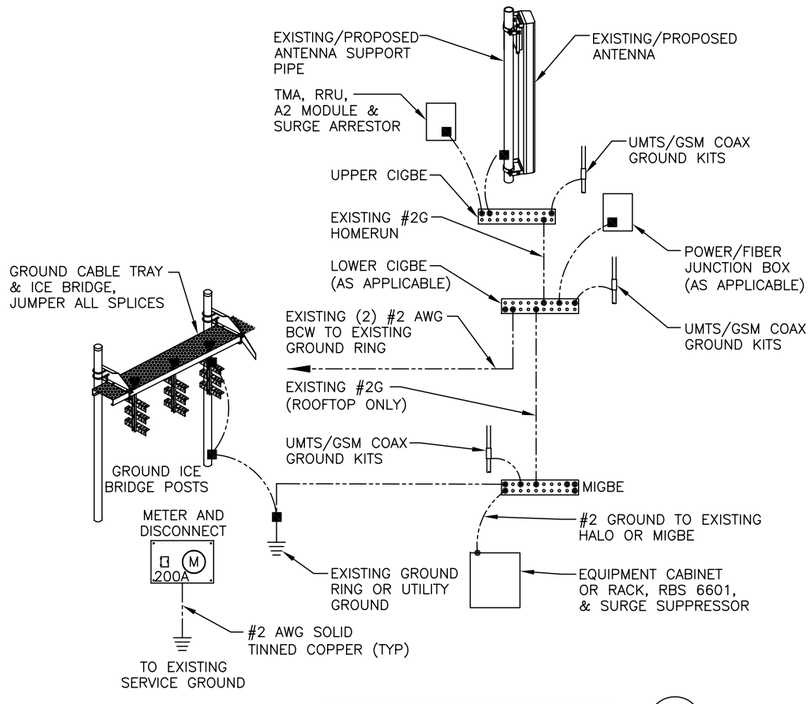
NOTE:

1. "DOUBLING UP" OR "STACKING" OF CONNECTION IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATION.
3. CADWELD DOWNLEADS FROM UPPER EGB, LOWER EGB, AND MGB

TYPICAL GROUND BAR CONNECTION DETAIL

SCALE: N.T.S

3 / G-1



GROUNDING RISER DIAGRAM

SCALE: N.T.S

1 / G-1

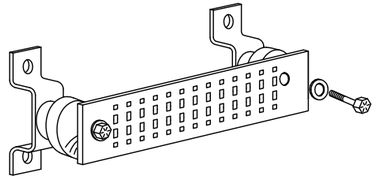
EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR SHALL HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION.

SECTION "P" – SURGE PRODUCERS

CABLE ENTRY PORTS (HATCH PLATES) (#2)
GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
TELCO GROUND BAR
COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
+24V POWER SUPPLY RETURN BAR (#2)
-48V POWER SUPPLY RETURN BAR (#2)
RECTIFIER FRAMES.

SECTION "A" – SURGE ABSORBERS

INTERIOR GROUND RING (#2)
EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
BUILDING STEEL (IF AVAILABLE) (#2)



GROUND BAR - DETAIL

SCALE: N.T.S

4 / G-1

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GROUNDING DETAILS
(LTE-4C,5C,6C)

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