

# 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](mailto:siting.council@ct.gov)

[www.ct.gov/csc](http://www.ct.gov/csc)

April 21, 2011

Jennifer Young Gaudet  
HPC Development LLC  
46 Mill Plain Road, 2<sup>nd</sup> Floor  
Danbury, CT 06811

RE: **EM-SPRINT-035-110329** – Sprint Spectrum L.P. notice of intent to modify an existing telecommunications facility located at 126 Ledge Road, Darien, 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:

- 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 March 28, 2011. 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,

Linda Roberts  
Executive Director

LR/CDM/laf

c: The Honorable David M. Campbell, First Selectman, Town of Darien  
John Crary, Town Administrator, Town of Darien  
David J. Keating, Zoning Enforcement Officer, Town of Darien  
Crown Castle USA, Inc.



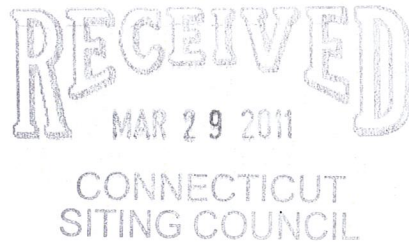


EM-SPRINT-035-110329

March 28, 2011

VIA OVERNIGHT DELIVERY

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



Re: Sprint Spectrum LP – exempt modification  
126 Ledge Road, Darien, Connecticut

Dear Ms. Roberts:

This letter and attachments are submitted on behalf of Sprint Spectrum LP (“Sprint”). Sprint is making modifications to certain existing sites in its Connecticut system in order to enhance system performance. Please accept this letter and attachments as notification, pursuant to R.C.S.A. Section 16-50j-73, of construction which 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 First Selectman of the Town of Darien.

Sprint plans to modify the existing wireless communications facility located at 126 Ledge Road in the Town of Darien (coordinates 41-04-20.79 N, 73-28-41.34 W) owned by Crown. 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 calculation reflecting the modification to Sprint’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. Sprint will add three (3) TMAs to its existing antennas at the top of the tower. Concurrently, Sprint will remove three (3) existing antennas at the 68’ centerline; this change represents the final action associated with the extension of the tower to 120’ and placement of Sprint’s antennas at the top of the extended tower as approved in Petition No. 803. The proposed modifications will not extend the height of the structure with attachments.

Ms. Linda Roberts

March 28, 2011

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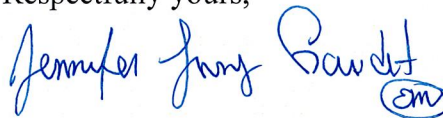
2. The proposed changes will not extend the site boundaries. Sprint will install one additional cabinet on its existing concrete pad within the existing compound. Thus, there will be no effect on the site boundaries.

3. The proposed changes will not increase the noise level at the existing facility by six 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 power density calculation, Sprint's operations at the site will result in a power density of 2.30%; the combined site operations will result in a total power density of 84.20%

Please feel free to call me at (860) 798-7454 with questions concerning this matter. Thank you for your consideration.

Respectfully yours,



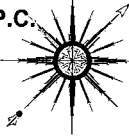
Jennifer Young Gaudet

cc: Honorable David Campbell, First Selectman, Town of Darien  
(also underlying property owner)

Attachments

**ALL-POINTS TECHNOLOGY CORPORATION, P.C.**

3 SADDELBROOK DRIVE  
KILLINGWORTH, CT. 06419  
PHONE: (860)-663-1697  
FAX: (860)-663-0935  
www.allpointstech.com



**APT FILING NUMBER: NY-241-300**

LE-1

SCALE: AS NOTED

DRAWN BY: RCB

DATE: 10/11/10

CHECKED BY: SMC



Together with NEXTEL  
1 INTERNATIONAL BLVD.  
SUITE 800  
MAHWAH, N.J. 07495

**SPRINT / NEXTEL  
SITE NUMBER: CT03XC357**

**DARIEN  
126 LEDGE ROAD  
DARIEN, CT 06820**

**APPROVALS:**

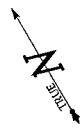
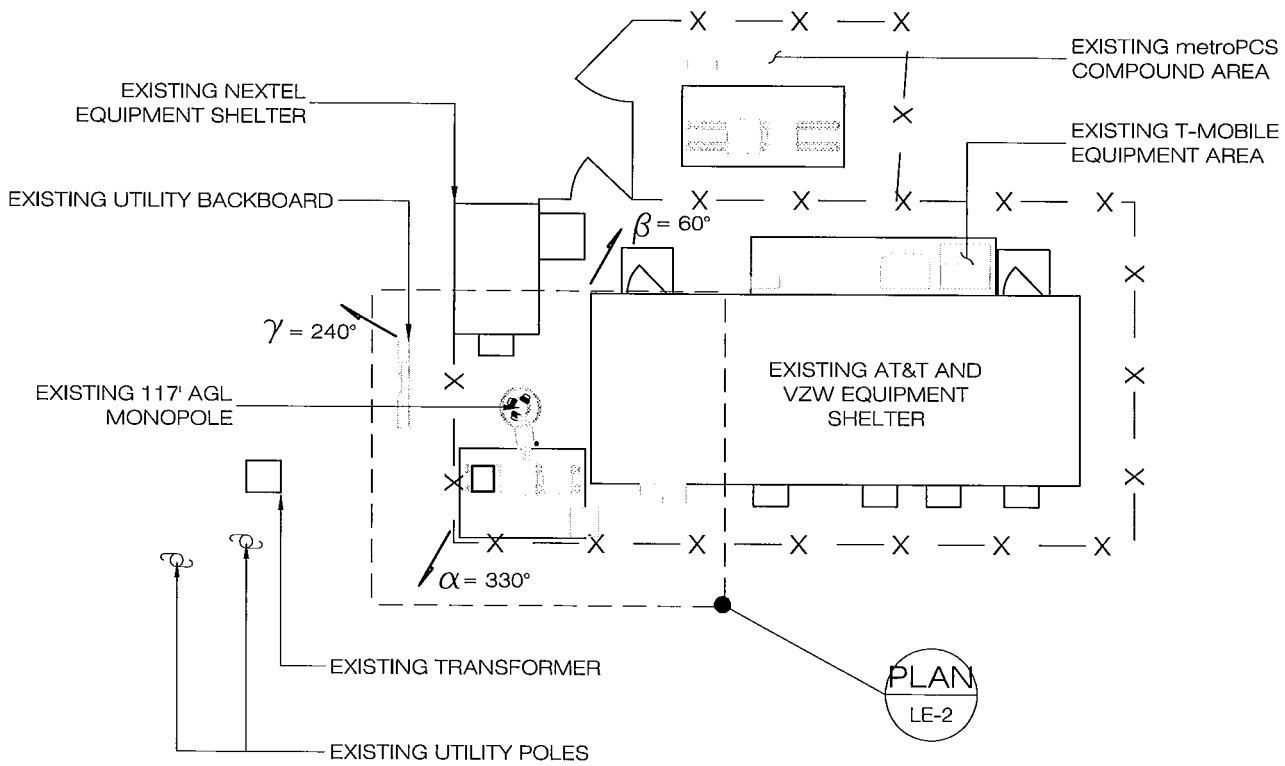
LANDLORD \_\_\_\_\_ DATE: \_\_\_\_\_  
RF ENGINEER \_\_\_\_\_ DATE: \_\_\_\_\_  
OPERATIONS \_\_\_\_\_ DATE: \_\_\_\_\_  
PROJECT MGR \_\_\_\_\_ DATE: \_\_\_\_\_

**TOTALS:**

- (3) PANELS & (1) GPS ANTENNA
- SCOPE: ABANDON EXISTING THREE SPRINT ANTENNAS @ 68' & RERUN COAXIAL CABLE TO EXISTING SPRINT ANTENNAS @ 120'. ADD (3) TMAs AND (1) MCPA OUTDOOR CABINET
- SQUARE FOOTAGE OF EXISTING LEASE AREA = 88 SF±

**NOTICE:**

THIS IS A REPRESENTATION OF THE EXISTING STRUCTURE AND PROPOSED MODIFICATIONS. ALL SCALED DIMENSIONS SHOWN ARE NO BETTER THAN APPROXIMATE. FINAL LOCATIONS PENDING FURTHER ENGINEERING ANALYSIS AND DESIGN.



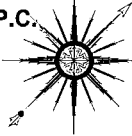
**SITE PLAN**

SCALE: 1/16" = 1'-0"



**ALL-POINTS TECHNOLOGY CORPORATION, P.C.**

3 SADDLEBROOK DRIVE  
KILLINGWORTH, CT. 06419  
PHONE: (860)-663-1697  
FAX: (860)-663-0935  
www.allpointstech.com



**APT FILING NUMBER: NY-241-300**

LE-2

SCALE: AS NOTED

DRAWN BY: RCB

DATE: 10/11/10

CHECKED BY: SMC



**SPRINT / NEXTEL  
SITE NUMBER: CT03XC357**

**DARIEN  
126 LEDGE ROAD  
DARIEN, CT 06820**

**APPROVALS:**

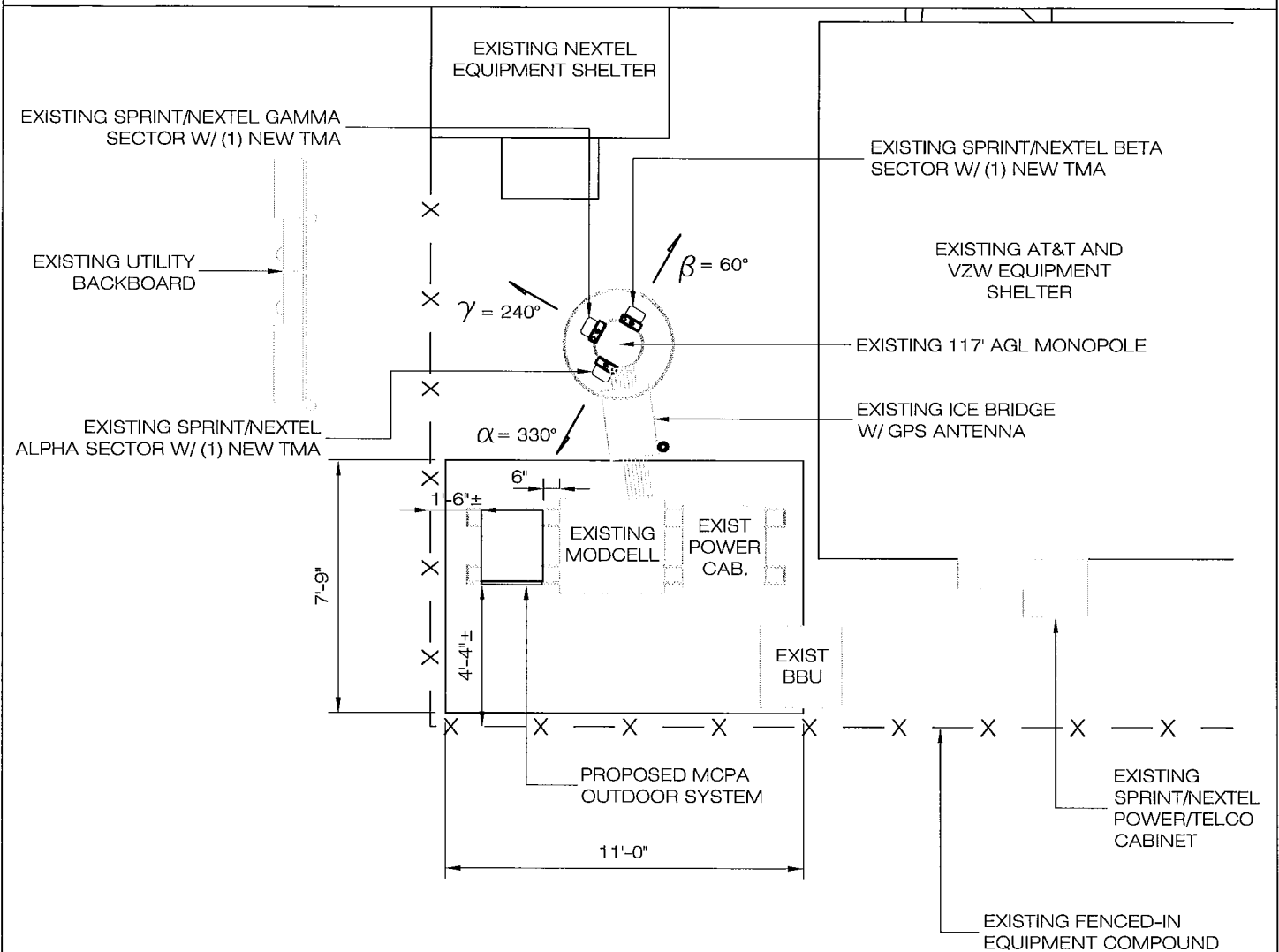
LANDLORD \_\_\_\_\_ DATE: \_\_\_\_\_  
RF ENGINEER \_\_\_\_\_ DATE: \_\_\_\_\_  
OPERATIONS \_\_\_\_\_ DATE: \_\_\_\_\_  
PROJECT MGR \_\_\_\_\_ DATE: \_\_\_\_\_

**TOTALS:**

- (3) PANELS & (1) GPS ANTENNA
- SCOPE: ABANDON EXISTING THREE SPRINT ANTENNAS @ 68' & RERUN COAXIAL CABLE TO EXISTING SPRINT ANTENNAS @ 120'. ADD (3) TMAs AND (1) MCPA OUTDOOR CABINET
- SQUARE FOOTAGE OF EXISTING LEASE AREA = 88 SF±

**NOTICE:**

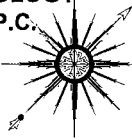
THIS IS A REPRESENTATION OF THE EXISTING STRUCTURE AND PROPOSED MODIFICATIONS. ALL SCALED DIMENSIONS SHOWN ARE NO BETTER THAN APPROXIMATE. FINAL LOCATIONS PENDING FURTHER ENGINEERING ANALYSIS AND DESIGN.



**COMPOUND PLAN**

SCALE: 1" = 5'-0"

**ALL-POINTS TECHNOLOGY CORPORATION, P.C.**  
 3 SADELBROOK DRIVE  
 KILLINGWORTH, CT. 06419  
 PHONE: (860)-663-1697  
 FAX: (860)-663-0935  
 www.allpointstech.com



**APT FILING NUMBER: NY-241-300**

LE-3

SCALE: AS NOTED

DRAWN BY: RCB

DATE: 10/11/10

CHECKED BY: SMC

**Sprint**  
 Together with NEXTEL  
 1 INTERNATIONAL BLVD.  
 SUITE 800  
 MAHWAH, NJ. 07495

**SPRINT / NEXTEL  
 SITE NUMBER: CT03XC357**

**DARIEN  
 126 LEDGE ROAD  
 DARIEN, CT 06820**

**APPROVALS:**

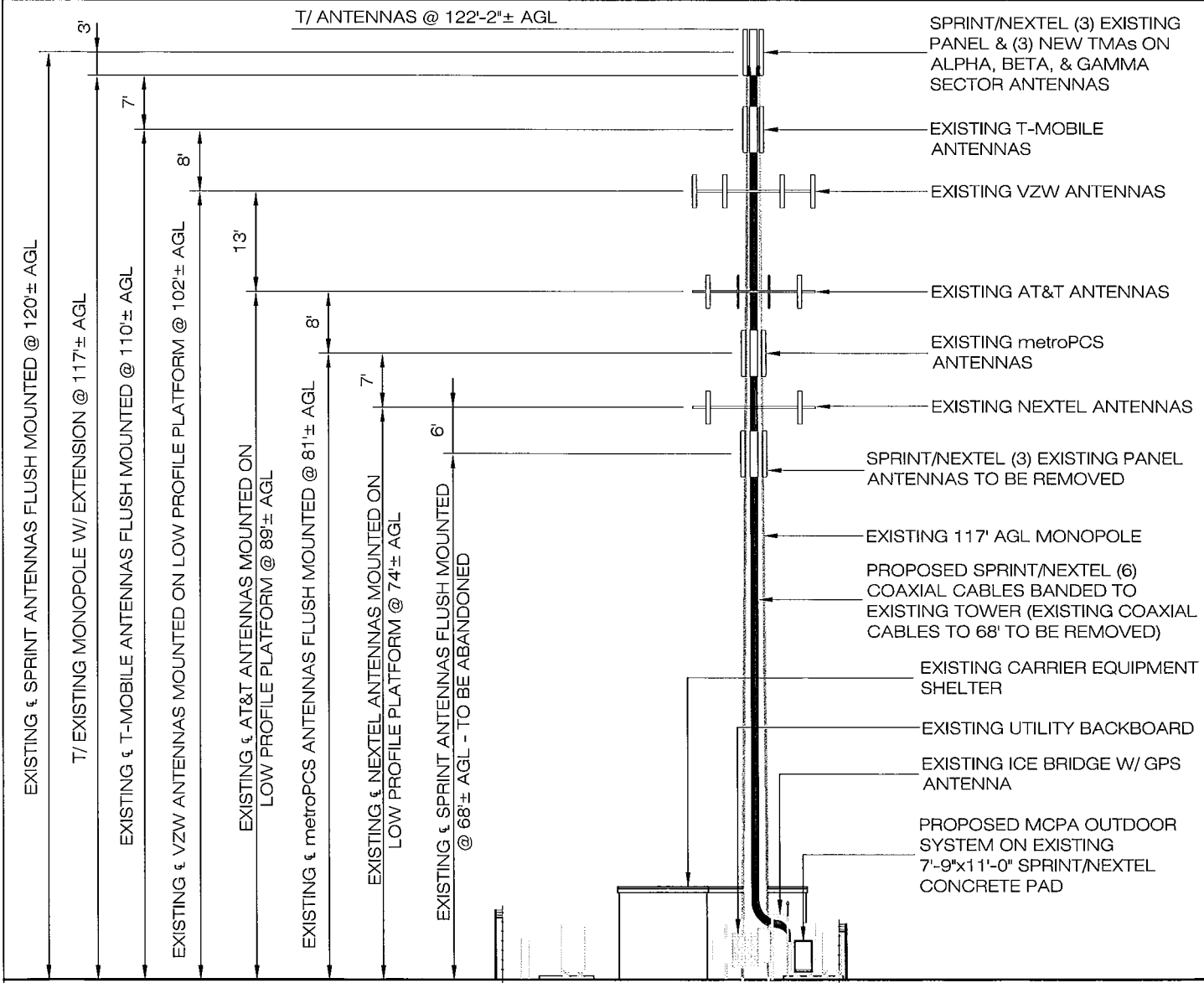
LANDLORD \_\_\_\_\_ DATE: \_\_\_\_\_  
 RF ENGINEER \_\_\_\_\_ DATE: \_\_\_\_\_  
 OPERATIONS \_\_\_\_\_ DATE: \_\_\_\_\_  
 PROJECT MGR \_\_\_\_\_ DATE: \_\_\_\_\_

**TOTALS:**

- (3) PANELS & (1) GPS ANTENNA
- SCOPE: ABANDON EXISTING THREE SPRINT ANTENNAS @ 68' & RERUN COAXIAL CABLE TO EXISTING SPRINT ANTENNAS @ 120'. ADD (3) TMAs AND (1) MCPA OUTDOOR CABINET
- SQUARE FOOTAGE OF EXISTING LEASE AREA = 88 SF±

**NOTICE:**

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**NORTHWESTERN ELEVATION**

SCALE : 1" = 20'-0"

Date: **February 25, 2011**

Mr. Joshua Mostow  
Crown Castle USA Inc.  
1200 MacArthur Boulevard, Suite 200  
Mahwah, NJ 07430  
(201) 236-9059



Tower Engineering Professionals, Inc.  
3703 Junction Boulevard  
Raleigh, NC 27603  
(919) 661-6351  
[Crown@tepgroup.net](mailto:Crown@tepgroup.net)

**Subject: Structural Analysis Report**

**Carrier Designation:** *Sprint* Co-Locate  
**Carrier Site Number:** CT03XC357  
**Carrier Site Name:** Darien

**Crown Castle Designation:** **Crown Castle BU Number:** 806352  
**Crown Castle Site Name:** BRG 302 943052  
**Crown Castle JDE Job Number:** 143117

**Engineering Firm Designation:** TEP Project Number: 102000.39

**Site Data:** 126 Ledge Road, Darien, Fairfield County, CT 06820  
Latitude 41° 4' 20.75", Longitude -73° 28' 41.4"  
117 Foot – Monopole Tower

Dear Mr. Mostow,

*Tower Engineering Professionals, 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 terms of Crown Castle Purchase Order Number 405719, in accordance with application 108173, revision 2.

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:

LC1: Existing Structure w/ Existing + Reserved + Proposed **Sufficient Capacity**  
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

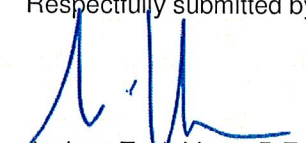
The analysis has been performed in accordance with the TIA-222-F standard, ASCE7-05 Minimum Design Loads for Buildings and Other Structures, and the 2003 International Building Code (State Building Code, 2005 CT supplement) based upon a wind speed of 85 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Tables 1 and 2 for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals, 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.

Analysis prepared by: Brad Roberson, E.I.

Respectfully submitted by:

  
Andrew T. Valdane, P.E.



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**1) INTRODUCTION**

This tower is a 117 ft monopole tower designed by Valmont in January of 1993. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-E. The tower was extended to 117 ft by Valmont in July of 2007 and reinforced by Sabre in November of 2010.

**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 and the ASCE7-05 Minimum Design Loads for Buildings and Other Structures using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch ice (ice is considered to increase with height), 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
117	120	3	Comm. Comp. Inc.	DTMA-1819-VG-12A	-	-	1

Notes:

- 1) Proposed equipment to reuse existing feed lines.

**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
117	120	3	Decibel	932LG65VTE-B w/ Mount Pipe	6	1-5/8	1
	117	1	Tower Mounts	Side Arm Mount [SO 102-3]			
110	110	3	Andrew	ETW190VS12UB	12	1-1/4	1
		3	RFS Celwave	APX16PV-16PVL-E w/ Mount Pipe			
		3	RFS Celwave	ATMAA1412D-1A20			
		1	Tower Mounts	Side Arm Mount [SO 102-3]			
100	102	3	Andrew	LNx-6514DS-T4M w/ Mount Pipe	12	7/8	2
		4	Decibel	DB844G65ZAXY w/ Mount Pipe			
		2	Decibel	DB846F65ZAXY w/ Mount Pipe			
		6	RFS Celwave	FD9R6004			
		3	Ryma Wireless	MG D3-800TV w/ Mount Pipe			
	100	1	Tower Mounts	Platform Mount [LP 713-1]			1
95	95	2	Andrew	VHLP1-23	4	1/2	2
		1	Andrew	VHLP2-11			
		1	Andrew	VHLP2.5-11			
		4	Tower Mounts	Pipe Mount [PM 501-1]			



Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
87	89	6	Unknown	TMA	3 9	1-1/4 1-5/8	3
		3	Unknown	Diplexer			
		6	Powerwave Technologies	7770.00 w/ Mount Pipe			
	87	1	Tower Mounts	Platform Mount [LP 713-1]			
81	81	3	Kathrein	800 10504 w/ Mount Pipe	6	1-5/8	1
		1	Tower Mounts	Side Arm Mount [SO 102-3]			
72	74	3	Argus Technologies	LLPX310R w/ Mount Pipe	6	5/16	2
		3	Samsung Telecommunications	FDD_R6_RRH			
		6	Decibel	DB844H90E-XY w/ Mount Pipe			
	72	1	Tower Mounts	Platform Mount [LP 713-1]	9	7/8	1
68	68	3	EMS Wireless	RV90-17-00DP w/ Mount Pipe	6	1-1/4	4
		1	Tower Mounts	Side Arm Mount [SO 102-3]	-	-	1
50	50	1	Tower Mounts	Side Arm Mount [SO 701-1]	1	1/2	1
		1	Unknown	GPS			

- Notes:  
 1) Existing equipment  
 2) Reserved equipment  
 3) SLA equipment controlling  
 4) 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)
97	97	2	Celwave	PD100	-	-
		6	Sinclair	SRL410C4R105		
84	84	2	Celwave	PD100	-	-
		6	Sinclair	SRL410C4R105		

### 3) ANALYSIS PROCEDURE

**Table 4 – Documents Provided**

Document	Remarks	Reference	Source
Geotechnical Report	Dr. Clarence Welti, P.E., P.C., dated January 13, 1993	217769	CCI
Tower Foundation Drawings	SAC Engineering, dated February 1993	217771	CCI
Tower Manufacturer Drawings	Valmont, dated January 28, 1993	217772	CCI
Tower Extension Drawings	Valmont, dated July 24, 2007	217772	CCI
Previous Structural Analysis	Crown Castle, dated June 2, 2010	-	Sabre

#### 3.1) Analysis Method

RISATower (version 5.4.2.0), 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.

For analysis of monopole shaft reinforcements, the reinforcing plates are modeled as linear appurtenances along the exterior of the pole. The loads calculated from RISATower are then exported to a proprietary calculation sheet created by *Tower Engineering Professionals, Inc.* that analyzes each reinforcing element along each critical axis and presents percent capacities for each element and the pole shaft. Selected output from the calculations is included in Appendix C. The actual percent capacity of the tower structure including the reinforcing elements is reported in Table 5 – Section Capacity (Summary).

#### 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 the standard.
- 5) Serviceability with respect to antenna twist, tilt, roll, or lateral translation is not checked and is left to the carrier or tower owner to ensure conformance.

This analysis may be affected if any assumptions are not valid or have been made in error. *Tower Engineering Professionals, 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 (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	117 - 110	Pole	TP15.94x14.36x0.1875	1	-0.37	494.43	6.4	Pass
L2	110 - 100	Pole	TP18.2x15.94x0.1875	2	-1.02	565.36	18.8	Pass
L3-L4	100 - 47.4167	Pole	TP30.09x18.2x0.25	Note 1	Note 1	Note 1	91.1	Pass
M1	65 - 47.4167	Plate Reinforcement	(3) PL1x4.5 by Sabre	Note 1	Note 1	Note 1	90.5	Pass
L5-L6	47.4167 - 0	Pole	TP40.3x28.5536x0.3438	Note 1	Note 1	Note 1	75.5	Pass
M2	47.4167 - 35	Plate Reinforcement	(3) PL1x4.5 by Sabre	Note 1	Note 1	Note 1	93.8	Pass
M3	0-35	Plate Reinforcement	(3) PL1x6 by Sabre	Note 1	Note 1	Note 1	93.1	Pass
							Summary	
						Pole (M2)	93.8	Pass
						<b>RATING =</b>	<b>93.8</b>	<b>Pass</b>

**Table 6 - Tower Component Stresses vs. Capacity – LC1**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	83.8	Pass
1	Base Plate	0	61.4	Pass
1	Base Foundation	0	98.2	Pass
1	Exterior Flange Connection	100	20.9	Pass
1	Exterior Flange Connection	110	4.7	Pass

<b>Structure Rating (max from all components) =</b>	<b>98.2%</b>
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Notes:

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

**4.1) Recommendations**

- 1) If the load differs from that described in Tables 1 and 2 of this report or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
- 2) It should be noted that in order for the tower to pass for the current load scenario the proposed and reserved coax must be configured as shown in "Appendix B – Base Level Drawing".
- 3) The modifications depicted in "Appendix D – Structural Modification Drawings" must be installed and, upon completion, inspected.

**APPENDIX A**  
**RISA TOWER OUTPUT**

Section	1	2	3	4	5	6
Length (ft)	7.00	10.00	36.50	16.08	17.00	35.00
Number of Sides	12	12	12	12	12	12
Thickness (in)	0.1875	0.1875	0.2500	0.4076	0.4896	0.4958
Socket Length (ft)				4.58		
Top Dia (in)	14.3600	15.9400	18.2000	27.0200	28.3987	32.3900
Bot Dia (in)	15.9400	18.2000	27.0200	30.0900	32.3900	40.3000
Grade			A572-65		A572-65 (60% Density)	A572-65 (50% Density)
Weight (K)	0.2	0.3	2.2	1.2	1.9	4.7



### DESIGNED APPURTENANCE LOADING

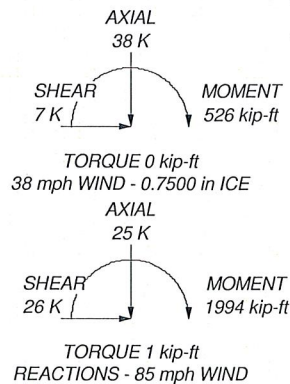
TYPE	ELEVATION	TYPE	ELEVATION
932LG65VTE-B w/ Mount Pipe (Installed)	117	Platform Mount [LP 713-1]	100
DTMA-1819-VG-12A (Installed)	117	Pipe Mount [PM 501-1]	95
932LG65VTE-B w/ Mount Pipe (Installed)	117	Pipe Mount [PM 501-3]	95
DTMA-1819-VG-12A (Installed)	117	VHLP2-11 (Proposed)	95
932LG65VTE-B w/ Mount Pipe (Installed)	117	VHLP1-23 (Proposed)	95
DTMA-1819-VG-12A (Installed)	117	VHLP1-23 (Proposed)	95
932LG65VTE-B w/ Mount Pipe (Installed)	117	VHLP2.5-11 (Proposed)	95
DTMA-1819-VG-12A (Installed)	117	(2) TMA (Installed)	87
Side Arm Mount [SO 102-3]	117	diplexer (SLA)	87
APX16PV-16PVL-E w/ Mount Pipe (Installed)	110	(2) 7770.00 w/ Mount Pipe (Installed)	87
ETW190VS12UB (Installed)	110	(2) TMA (Installed)	87
ATMAA1412D-1A20 (Installed)	110	diplexer (SLA)	87
APX16PV-16PVL-E w/ Mount Pipe (Installed)	110	(2) 2.4" x 5-ft Mount Pipe	87
ETW190VS12UB (Installed)	110	(2) 2.4" x 5-ft Mount Pipe	87
ATMAA1412D-1A20 (Installed)	110	Platform Mount [LP 713-1]	87
APX16PV-16PVL-E w/ Mount Pipe (Installed)	110	(2) 7770.00 w/ Mount Pipe (Installed)	87
ETW190VS12UB (Installed)	110	(2) TMA (Installed)	87
ATMAA1412D-1A20 (Installed)	110	diplexer (SLA)	87
Side Arm Mount [SO 102-3]	110	(2) 7770.00 w/ Mount Pipe (Installed)	87
(2) DB844G65ZAXY w/ Mount Pipe (Reserved)	100	800 10504 w/ Mount Pipe (Installed)	81
(2) FD9R6004 (Reserved)	100	800 10504 w/ Mount Pipe (Installed)	81
MG D3-800TV w/ Mount Pipe (Reserved)	100	800 10504 w/ Mount Pipe (Installed)	81
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	100	Side Arm Mount [SO 102-3]	81
(2) DB846F65ZAXY w/ Mount Pipe (Reserved)	100	DB844H90E-XY w/ Mount Pipe (Installed)	72
MG D3-800TV w/ Mount Pipe (Reserved)	100	DB844H90E-XY w/ Mount Pipe (Installed)	72
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	100	LLPX310R w/ Mount Pipe (Proposed)	72
(2) DB846F65ZAXY w/ Mount Pipe (Reserved)	100	FDD_R6_RRH (Proposed)	72
MG D3-800TV w/ Mount Pipe (Reserved)	100	DB844H90E-XY w/ Mount Pipe (Installed)	72
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	100	DB844H90E-XY w/ Mount Pipe (Installed)	72
(2) DB846F65ZAXY w/ Mount Pipe (Reserved)	100	LLPX310R w/ Mount Pipe (Proposed)	72
MG D3-800TV w/ Mount Pipe (Reserved)	100	FDD_R6_RRH (Proposed)	72
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	100	Platform Mount [LP 713-1]	72
(2) DB846F65ZAXY w/ Mount Pipe (Reserved)	100	DB844H90E-XY w/ Mount Pipe (Installed)	72
MG D3-800TV w/ Mount Pipe (Reserved)	100	DB844H90E-XY w/ Mount Pipe (Installed)	72
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	100	LLPX310R w/ Mount Pipe (Proposed)	72
(2) 2.4" x 5-ft Mount Pipe	100	FDD_R6_RRH (Proposed)	72
(2) 2.4" x 5-ft Mount Pipe	100	Side Arm Mount [SO 102-3]	68
(2) 2.4" x 5-ft Mount Pipe	100	Side Arm Mount [SO 701-1]	50
		GPS (Installed)	50

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	A572-65 (50% Density)	65 ksi	80 ksi

### TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.



**Tower Engineering Professionals, Inc.**  
 3703 Junction Boulevard  
 Raleigh, NC 27603  
 Phone: (919) 661-6351  
 FAX: (919) 661-6350

Job: **BRG 302 943052 (BU# 806352)**  
 Project: **TEP No. 102000.39**  
 Client: Crown Castle USA, Inc. Drawn by: broberson App'd:  
 Code: TIA/EIA-222-F Date: 02/25/11 Scale: NTS  
 Path: Dwg No. E-



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

## Tower Input Data

There is a pole section.

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

The following design criteria apply:

- 1) Tower is located in Fairfield County, Connecticut.
- 2) Basic wind speed of 85 mph.
- 3) Nominal ice thickness of 0.7500 in.
- 4) Ice thickness is considered to increase with height.
- 5) Ice density of 56 pcf.
- 6) A wind speed of 38 mph is used in combination with ice.
- 7) Temperature drop of 50 °F.
- 8) Deflections calculated using a wind speed of 50 mph.
- 9) A non-linear (P-delta) analysis was used.
- 10) Pressures are calculated at each section.
- 11) Stress ratio used in pole design is 1.333.
- 12) Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

## Options

<ul style="list-style-type: none"> <li>Consider Moments - Legs</li> <li>Consider Moments - Horizontals</li> <li>Consider Moments - Diagonals</li> <li>Use Moment Magnification</li> <li>√ Use Code Stress Ratios</li> <li>√ Use Code Safety Factors - Guys</li> <li>√ Escalate Ice</li> <li>Always Use Max Kz</li> <li>Use Special Wind Profile</li> <li>Include Bolts In Member Capacity</li> <li>Leg Bolts Are At Top Of Section</li> <li>Secondary Horizontal Braces Leg</li> <li>Use Diamond Inner Bracing (4 Sided)</li> <li>Add IBC .6D+W Combination</li> </ul>	<ul style="list-style-type: none"> <li>Distribute Leg Loads As Uniform</li> <li>Assume Legs Pinned</li> <li>√ Assume Rigid Index Plate</li> <li>√ Use Clear Spans For Wind Area</li> <li>Use Clear Spans For KL/r</li> <li>Retension Guys To Initial Tension</li> <li>√ Bypass Mast Stability Checks</li> <li>√ Use Azimuth Dish Coefficients</li> <li>√ Project Wind Area of Appurt.</li> <li>Autocalc Torque Arm Areas</li> <li>SR Members Have Cut Ends</li> <li>Sort Capacity Reports By Component</li> <li>Triangulate Diamond Inner Bracing</li> </ul>	<ul style="list-style-type: none"> <li>Treat Feedline Bundles As Cylinder</li> <li>Use ASCE 10 X-Brace Ly Rules</li> <li>Calculate Redundant Bracing Forces</li> <li>Ignore Redundant Members in FEA</li> <li>SR Leg Bolts Resist Compression</li> <li>All Leg Panels Have Same Allowable</li> <li>Offset Girt At Foundation</li> <li>√ Consider Feedline Torque</li> <li>Include Angle Block Shear Check</li> <li style="padding-left: 20px;">Poles</li> <li>√ Include Shear-Torsion Interaction</li> <li>Always Use Sub-Critical Flow</li> <li>Use Top Mounted Sockets</li> </ul>
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## Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	117.00-110.00	7.00	0.00	12	14.3600	15.9400	0.1875	0.7500	A572-65 (65 ksi)
L2	110.00-100.00	10.00	0.00	12	15.9400	18.2000	0.1875	0.7500	A572-65 (65 ksi)
L3	100.00-63.50	36.50	0.00	12	18.2000	27.0200	0.2500	1.0000	A572-65 (65 ksi)
L4	63.50-47.42	16.08	4.58	12	27.0200	30.0900	0.4076	1.6304	A572-65 (50% Density) (65 ksi)
L5	47.42-35.00	17.00	0.00	12	28.3997	32.3900	0.4896	1.9584	A572-65

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

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade (65 ksi) A572-65 (50% Density) (65 ksi)
L6	35.00-0.00	35.00		12	32.3900	40.3000	0.4958	1.9832	

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	14.8666	8.5566	219.3727	5.0738	7.4385	29.4916	444.5085	4.2113	3.3460	17.845
	16.5023	9.5106	301.2254	5.6394	8.2569	36.4816	610.3643	4.6808	3.7694	20.104
L2	16.5023	9.5106	301.2254	5.6394	8.2569	36.4816	610.3643	4.6808	3.7694	20.104
	18.8420	10.8750	450.3655	6.4485	9.4276	47.7710	912.5625	5.3524	4.3751	23.334
L3	18.8420	14.4498	594.2582	6.4261	9.4276	63.0339	1204.1282	7.1117	4.2076	16.83
	27.9732	21.5498	1971.1830	9.5837	13.9964	140.8354	3994.1512	10.6062	6.5714	26.285
L4	27.9732	34.9280	3157.3892	9.5272	13.9964	225.5865	6397.7266	17.1905	6.1490	15.086
	31.1515	38.9573	4380.9978	10.6263	15.5866	281.0743	8877.0893	19.1736	6.9718	17.104
L5	30.5153	44.0007	4374.9153	9.9918	14.7111	297.3893	8864.7645	21.6558	6.2990	12.866
	33.5326	50.2914	6532.3827	11.4203	16.7780	389.3417	13236.3783	24.7519	7.3684	15.05
L6	33.5326	50.9183	6611.2485	11.4181	16.7780	394.0422	13396.1819	25.0605	7.3518	14.828
	41.7216	63.5465	12850.9444	14.2499	20.8754	615.6023	26039.4974	31.2756	9.4717	19.104

Tower Elevation ft	Gusset Area (per face) ft <sup>2</sup>	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>f</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 117.00-110.00				1	1	1		
L2 110.00-100.00				1	1	1		
L3 100.00-63.50				1	1	1		
L4 63.50-47.42				1	1	1.232		
L5 47.42-35.00				1	1	0.704		
L6 35.00-0.00				1	1	1.39		

### Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
*****										

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>AA</sub> ft <sup>2</sup> /ft	Weight plf
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<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b> BRG 302 943052 (BU# 806352)	<b>Page</b> 3 of 21
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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
*****								
HJ7-50A(1-5/8") (Installed)	B	No	CaAa (Out Of Face)	117.00 - 0.00	2	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.20 0.30 0.40 0.60 1.00	1.04 2.55 4.68 10.76 30.26
HJ7-50A(1-5/8") (Installed)	B	No	CaAa (Out Of Face)	117.00 - 0.00	4	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	1.04 2.55 4.68 10.76 30.26
LDF6-50A(1-1/4") (Installed)	B	No	Inside Pole	110.00 - 0.00	12	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.66 0.66 0.66 0.66 0.66
LDF4-50A(1/2") (Installed)	B	No	CaAa (Out Of Face)	50.00 - 0.00	1	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.15 0.84 2.14 6.58 22.78
AVA7-50(1-5/8") (Installed)	B	No	CaAa (Out Of Face)	81.00 - 0.00	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.72 2.23 4.36 10.44 29.94
***								
LDF5-50A(7/8") (Installed)	C	No	Inside Pole	100.00 - 0.00	12	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.33 0.33 0.33 0.33 0.33
***								
7983A(1/2") (Proposed)	A	No	Inside Pole	95.00 - 0.00	4	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.08 0.08 0.08 0.08 0.08
LDF5-50A(7/8") (Installed)	A	No	Inside Pole	72.00 - 0.00	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.33 0.33 0.33 0.33 0.33
9207(5/16") (Proposed)	A	No	Inside Pole	72.00 - 0.00	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.60 0.60 0.60 0.60 0.60
LDF6-50A(1-1/4") (SLA)	A	No	Inside Pole	87.00 - 0.00	3	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.66 0.66 0.66 0.66 0.66
LDF7-50A(1-5/8") (SLA)	A	No	Inside Pole	87.00 - 0.00	9	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.82 0.82 0.82 0.82 0.82
***								
Step Pegs (3/4" SR) 7-in w/15" step	A	No	CaAa (Out Of Face)	117.00 - 0.00	1	No Ice 1/2" Ice	0.03 0.14	0.33 0.85



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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub>		Weight
						ft <sup>2</sup> /ft	plf	
Safety Line 3/8	A	No	CaAa (Out Of Face)	117.00 - 0.00	1	1" Ice	0.23	1.98
						2" Ice	0.43	6.08
						4" Ice	0.83	21.59
						No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
4" Ice	0.84	4.46						
*****								
*SABRE Mods*								
PL1" x 6"	A	No	CaAa (Out Of Face)	35.00 - 0.00	1	No Ice	0.17	20.42
						1/2" Ice	0.28	21.37
						1" Ice	0.39	22.67
						2" Ice	0.61	26.30
						4" Ice	1.06	37.70
PL1" x 6"	B	No	CaAa (Out Of Face)	35.00 - 0.00	1	No Ice	0.00	20.42
						1/2" Ice	0.00	21.37
						1" Ice	0.00	22.67
						2" Ice	0.00	26.30
						4" Ice	0.00	37.70
PL1" x 6"	C	No	CaAa (Out Of Face)	35.00 - 0.00	1	No Ice	0.00	20.42
						1/2" Ice	0.00	21.37
						1" Ice	0.00	22.67
						2" Ice	0.00	26.30
						4" Ice	0.00	37.70
PL1" x 4.5"	A	No	CaAa (Out Of Face)	65.00 - 35.00	1	No Ice	0.17	15.31
						1/2" Ice	0.28	16.16
						1" Ice	0.39	17.36
						2" Ice	0.61	20.80
						4" Ice	1.06	31.82
PL1" x 4.5"	B	No	CaAa (Out Of Face)	65.00 - 35.00	1	No Ice	0.00	15.31
						1/2" Ice	0.00	16.16
						1" Ice	0.00	17.36
						2" Ice	0.00	20.80
						4" Ice	0.00	31.82
PL1" x 4.5"	C	No	CaAa (Out Of Face)	65.00 - 35.00	1	No Ice	0.00	15.31
						1/2" Ice	0.00	16.16
						1" Ice	0.00	17.36
						2" Ice	0.00	20.80
						4" Ice	0.00	31.82

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A <sub>R</sub>	A <sub>F</sub>	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face	Weight K
			ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	
L1	117.00-110.00	A	0.000	0.000	0.000	0.507	0.00
		B	0.000	0.000	0.000	2.772	0.04
		C	0.000	0.000	0.000	0.000	0.00
L2	110.00-100.00	A	0.000	0.000	0.000	0.725	0.01
		B	0.000	0.000	0.000	3.960	0.14
		C	0.000	0.000	0.000	0.000	0.00
L3	100.00-63.50	A	0.000	0.000	0.000	2.896	0.32
		B	0.000	0.000	0.000	14.454	0.62
		C	0.000	0.000	0.000	0.000	0.17
L4	63.50-47.42	A	0.000	0.000	0.000	3.846	0.50
		B	0.000	0.000	0.000	6.368	0.54
		C	0.000	0.000	0.000	0.000	0.31

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Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L5	47.42-35.00	A	0.000	0.000	0.000	2.970	0.39
		B	0.000	0.000	0.000	4.917	0.42
		C	0.000	0.000	0.000	0.000	0.24
L6	35.00-0.00	A	0.000	0.000	0.000	8.372	1.27
		B	0.000	0.000	0.000	13.861	1.37
		C	0.000	0.000	0.000	0.000	0.85

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	117.00-110.00	A	0.870	0.000	0.000	0.000	2.943	0.02
		B		0.000	0.000	0.000	5.207	0.17
		C		0.000	0.000	0.000	0.000	0.00
L2	110.00-100.00	A	0.862	0.000	0.000	0.000	4.172	0.03
		B		0.000	0.000	0.000	7.407	0.32
		C		0.000	0.000	0.000	0.000	0.00
L3	100.00-63.50	A	0.835	0.000	0.000	0.000	15.368	0.40
		B		0.000	0.000	0.000	26.647	1.57
		C		0.000	0.000	0.000	0.000	0.17
L4	63.50-47.42	A	0.798	0.000	0.000	0.000	11.830	0.56
		B		0.000	0.000	0.000	11.500	1.11
		C		0.000	0.000	0.000	0.000	0.34
L5	47.42-35.00	A	0.770	0.000	0.000	0.000	9.135	0.43
		B		0.000	0.000	0.000	8.880	0.87
		C		0.000	0.000	0.000	0.000	0.26
L6	35.00-0.00	A	0.750	0.000	0.000	0.000	24.706	1.39
		B		0.000	0.000	0.000	24.362	2.55
		C		0.000	0.000	0.000	0.000	0.91

### Feed Line Center of Pressure

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L1	117.00-110.00	0.3752	0.1373	0.4744	-0.0357
L2	110.00-100.00	0.3870	0.1416	0.5025	-0.0367
L3	100.00-63.50	0.4108	0.1406	0.5629	-0.0523
L4	63.50-47.42	0.4060	-0.0487	0.5578	-0.3405
L5	47.42-35.00	0.4127	-0.0495	0.5755	-0.3513
L6	35.00-0.00	0.4252	-0.0510	0.6011	-0.3568

### Discrete Tower Loads



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

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
932LG65VTE-B w/ Mount Pipe (Installed)	A	From Leg	1.00	-25.0000	117.00	No Ice	4.27	4.72	0.04
			0.00			1/2" Ice	4.71	5.38	0.08
			3.00			1" Ice	5.15	6.09	0.13
						2" Ice	6.07	7.55	0.25
						4" Ice	8.03	10.73	0.60
DTMA-1819-VG-12A (Installed)	A	From Leg	1.00	-25.0000	117.00	No Ice	0.71	0.41	0.01
			0.00			1/2" Ice	0.83	0.52	0.02
			3.00			1" Ice	0.97	0.64	0.03
						2" Ice	1.26	0.90	0.04
						4" Ice	1.95	1.54	0.11
932LG65VTE-B w/ Mount Pipe (Installed)	B	From Leg	1.00	-25.0000	117.00	No Ice	4.27	4.72	0.04
			0.00			1/2" Ice	4.71	5.38	0.08
			3.00			1" Ice	5.15	6.09	0.13
						2" Ice	6.07	7.55	0.25
						4" Ice	8.03	10.73	0.60
DTMA-1819-VG-12A (Installed)	B	From Leg	1.00	-25.0000	117.00	No Ice	0.71	0.41	0.01
			0.00			1/2" Ice	0.83	0.52	0.02
			3.00			1" Ice	0.97	0.64	0.03
						2" Ice	1.26	0.90	0.04
						4" Ice	1.95	1.54	0.11
932LG65VTE-B w/ Mount Pipe (Installed)	C	From Leg	1.00	-25.0000	117.00	No Ice	4.27	4.72	0.04
			0.00			1/2" Ice	4.71	5.38	0.08
			3.00			1" Ice	5.15	6.09	0.13
						2" Ice	6.07	7.55	0.25
						4" Ice	8.03	10.73	0.60
DTMA-1819-VG-12A (Installed)	C	From Leg	1.00	-25.0000	117.00	No Ice	0.71	0.41	0.01
			0.00			1/2" Ice	0.83	0.52	0.02
			3.00			1" Ice	0.97	0.64	0.03
						2" Ice	1.26	0.90	0.04
						4" Ice	1.95	1.54	0.11
Side Arm Mount [SO 102-3]	C	None		0.0000	117.00	No Ice	3.00	3.00	0.08
						1/2" Ice	3.48	3.48	0.11
						1" Ice	3.96	3.96	0.14
						2" Ice	4.92	4.92	0.20
						4" Ice	6.84	6.84	0.32
***									
APX16PV-16PVL-E w/Mount Pipe (Installed)	A	From Leg	1.00	25.0000	110.00	No Ice	6.74	3.05	0.06
			0.00			1/2" Ice	7.18	3.66	0.10
			0.00			1" Ice	7.63	4.27	0.15
						2" Ice	8.56	5.56	0.27
						4" Ice	10.53	8.44	0.62
ETW190VS12UB (Installed)	A	From Leg	1.00	25.0000	110.00	No Ice	0.35	0.76	0.01
			0.00			1/2" Ice	0.44	0.88	0.02
			0.00			1" Ice	0.54	1.01	0.02
						2" Ice	0.77	1.30	0.04
						4" Ice	1.33	1.97	0.11
ATMAA1412D-1A20 (Installed)	A	From Leg	1.00	25.0000	110.00	No Ice	1.17	0.47	0.01
			0.00			1/2" Ice	1.31	0.57	0.02
			0.00			1" Ice	1.47	0.69	0.03
						2" Ice	1.81	0.95	0.06
						4" Ice	2.58	1.57	0.14
APX16PV-16PVL-E w/Mount Pipe (Installed)	B	From Leg	1.00	25.0000	110.00	No Ice	6.74	3.05	0.06
			0.00			1/2" Ice	7.18	3.66	0.10
			0.00			1" Ice	7.63	4.27	0.15
						2" Ice	8.56	5.56	0.27
						4" Ice	10.53	8.44	0.62
ETW190VS12UB	B	From Leg	1.00	25.0000	110.00	No Ice	0.35	0.76	0.01

<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b>		BRG 302 943052 (BU# 806352)		<b>Page</b>		7 of 21	
	<b>Project</b>		TEP No. 102000.39		<b>Date</b>		14:31:53 02/25/11	
	<b>Client</b>		Crown Castle USA, Inc.		<b>Designed by</b>		broberson	

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
(Installed)			0.00 0.00			1/2" Ice 0.44 1" Ice 0.54 2" Ice 0.77 4" Ice 1.33	0.88 1.01 1.30 1.97	0.02 0.02 0.04 0.11
ATMAA1412D-1A20 (Installed)	B	From Leg	1.00 0.00 0.00	25.0000	110.00	No Ice 1.17 1/2" Ice 1.31 1" Ice 1.47 2" Ice 1.81	0.47 0.57 0.69 0.95	0.01 0.02 0.03 0.06
APX16PV-16PVL-E w/Mount Pipe (Installed)	C	From Leg	1.00 0.00 0.00	35.0000	110.00	4" Ice 2.58 No Ice 6.74 1/2" Ice 7.18 1" Ice 7.63 2" Ice 8.56 4" Ice 10.53	1.57 3.05 3.66 4.27 5.56 8.44	0.14 0.06 0.10 0.15 0.27 0.62
ETW190VS12UB (Installed)	C	From Leg	1.00 0.00 0.00	35.0000	110.00	No Ice 0.35 1/2" Ice 0.44 1" Ice 0.54 2" Ice 0.77 4" Ice 1.33	0.76 0.88 1.01 1.30 1.97	0.01 0.02 0.02 0.04 0.11
ATMAA1412D-1A20 (Installed)	C	From Leg	1.00 0.00 0.00	35.0000	110.00	No Ice 1.17 1/2" Ice 1.31 1" Ice 1.47 2" Ice 1.81 4" Ice 2.58	0.47 0.57 0.69 0.95 1.57	0.01 0.02 0.03 0.06 0.14
Side Arm Mount [SO 102-3)	C	None		0.0000	110.00	No Ice 3.00 1/2" Ice 3.48 1" Ice 3.96 2" Ice 4.92 4" Ice 6.84	3.00 3.48 3.96 4.92 6.84	0.08 0.11 0.14 0.20 0.32
***								
(2) DB844G65ZAXY w/Mount Pipe (Reserved)	A	From Leg	4.00 0.00 2.00	5.0000	100.00	No Ice 5.38 1/2" Ice 6.07 1" Ice 6.65 2" Ice 7.83 4" Ice 10.34	5.40 6.49 7.30 8.96 12.49	0.04 0.09 0.15 0.29 0.69
(2) FD9R6004 (Reserved)	A	From Leg	4.00 0.00 2.00	5.0000	100.00	No Ice 0.09 1/2" Ice 0.15 1" Ice 0.22 2" Ice 0.37 4" Ice 0.79	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
MG D3-800TV w/ Mount Pipe (Reserved)	A	From Leg	4.00 -4.00 2.00	5.0000	100.00	No Ice 3.57 1/2" Ice 3.98 1" Ice 4.39 2" Ice 5.33 4" Ice 7.34	3.42 4.12 4.78 6.16 9.18	0.04 0.07 0.11 0.21 0.52
LNx-6514DS-T4M w/ Mount Pipe (Reserved)	A	From Leg	4.00 4.00 2.00	5.0000	100.00	No Ice 8.57 1/2" Ice 9.22 1" Ice 9.84 2" Ice 11.10 4" Ice 13.75	7.00 8.19 9.08 10.90 14.93	0.06 0.12 0.20 0.38 0.89
(2) DB846F65ZAXY w/Mount Pipe (Reserved)	B	From Leg	4.00 0.00 2.00	5.0000	100.00	No Ice 7.27 1/2" Ice 7.88 1" Ice 8.48 2" Ice 9.72 4" Ice 12.33	7.82 9.01 9.91 11.81 15.98	0.05 0.11 0.19 0.37 0.87
(2) FD9R6004 (Reserved)	B	From Leg	4.00 0.00	5.0000	100.00	No Ice 0.09 1/2" Ice 0.15	0.08 0.14	0.00 0.01

<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b>	BRG 302 943052 (BU# 806352)	<b>Page</b>	8 of 21
	<b>Project</b>	TEP No. 102000.39	<b>Date</b>	14:31:53 02/25/11
	<b>Client</b>	Crown Castle USA, Inc.	<b>Designed by</b>	broberson

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz	Lateral						°
				2.00						
						1" Ice	0.22	0.20	0.01	
						2" Ice	0.37	0.34	0.02	
						4" Ice	0.79	0.74	0.06	
						No Ice	3.57	3.42	0.04	
MG D3-800TV w/ Mount Pipe (Reserved)	B	From Leg	4.00	-4.00	5.0000	100.00	1/2" Ice	3.98	4.12	0.07
				2.00			1" Ice	4.39	4.78	0.11
							2" Ice	5.33	6.16	0.21
							4" Ice	7.34	9.18	0.52
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	B	From Leg	4.00	4.00	5.0000	100.00	No Ice	8.57	7.00	0.06
				2.00			1/2" Ice	9.22	8.19	0.12
							1" Ice	9.84	9.08	0.20
							2" Ice	11.10	10.90	0.38
							4" Ice	13.75	14.93	0.89
(2) DB844G65ZAXY w/ Mount Pipe (Reserved)	C	From Leg	4.00	0.00	5.0000	100.00	No Ice	5.38	5.40	0.04
				2.00			1/2" Ice	6.07	6.49	0.09
							1" Ice	6.65	7.30	0.15
							2" Ice	7.83	8.96	0.29
							4" Ice	10.34	12.49	0.69
(2) FD9R6004 (Reserved)	C	From Leg	4.00	0.00	5.0000	100.00	No Ice	0.09	0.08	0.00
				2.00			1/2" Ice	0.15	0.14	0.01
							1" Ice	0.22	0.20	0.01
							2" Ice	0.37	0.34	0.02
							4" Ice	0.79	0.74	0.06
MG D3-800TV w/ Mount Pipe (Reserved)	C	From Leg	4.00	-4.00	5.0000	100.00	No Ice	3.57	3.42	0.04
				2.00			1/2" Ice	3.98	4.12	0.07
							1" Ice	4.39	4.78	0.11
							2" Ice	5.33	6.16	0.21
							4" Ice	7.34	9.18	0.52
LNX-6514DS-T4M w/ Mount Pipe (Reserved)	C	From Leg	4.00	4.00	5.0000	100.00	No Ice	8.57	7.00	0.06
				2.00			1/2" Ice	9.22	8.19	0.12
							1" Ice	9.84	9.08	0.20
							2" Ice	11.10	10.90	0.38
							4" Ice	13.75	14.93	0.89
(2) 2.4" x 5-ft Mount Pipe	A	From Leg	4.00	0.00	5.0000	100.00	No Ice	1.20	1.20	0.00
				2.00			1/2" Ice	1.50	1.50	0.01
							1" Ice	1.81	1.81	0.03
							2" Ice	2.47	2.47	0.06
							4" Ice	3.93	3.93	0.18
(2) 2.4" x 5-ft Mount Pipe	B	From Leg	4.00	0.00	5.0000	100.00	No Ice	1.20	1.20	0.00
				2.00			1/2" Ice	1.50	1.50	0.01
							1" Ice	1.81	1.81	0.03
							2" Ice	2.47	2.47	0.06
							4" Ice	3.93	3.93	0.18
(2) 2.4" x 5-ft Mount Pipe	C	From Leg	4.00	0.00	5.0000	100.00	No Ice	1.20	1.20	0.00
				2.00			1/2" Ice	1.50	1.50	0.01
							1" Ice	1.81	1.81	0.03
							2" Ice	2.47	2.47	0.06
							4" Ice	3.93	3.93	0.18
Platform Mount [LP 713-1]	C	None			0.0000	100.00	No Ice	31.27	31.27	1.51
							1/2" Ice	39.68	39.68	1.93
							1" Ice	48.09	48.09	2.35
							2" Ice	64.91	64.91	3.19
							4" Ice	98.55	98.55	4.86
***										
Pipe Mount [PM 501-1]	C	None			0.0000	95.00	No Ice	3.47	1.67	0.05
							1/2" Ice	4.45	2.10	0.06
							1" Ice	5.43	2.53	0.07



<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b> BRG 302 943052 (BU# 806352)	<b>Page</b> 9 of 21
	<b>Project</b> TEP No. 102000.39	<b>Date</b> 14:31:53 02/25/11
	<b>Client</b> Crown Castle USA, Inc.	<b>Designed by</b> broberson

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Lateral					
Pipe Mount [PM 501-3]	C	None			0.0000	95.00	2" Ice 7.39 4" Ice 11.31 No Ice 5.78 1/2" Ice 7.37 1" Ice 8.96 2" Ice 12.14 4" Ice 18.50	3.39 5.11 5.78 7.37 8.96 12.14 18.50	0.08 0.11 0.16 0.18 0.20 0.24 0.32
***									
(2) 7770.00 w/ Mount Pipe (Installed)	A	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 6.12 1/2" Ice 6.63 1" Ice 7.13 2" Ice 8.16 4" Ice 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) TMA (Installed)	A	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00 2" Ice 0.00 4" Ice 0.00	0.45 0.56 0.68 0.94 1.57	0.01 0.02 0.03 0.04 0.11
diplexer (SLA)	A	From Leg	4.00 6.00 2.00		-3.0000	87.00	No Ice 0.68 1/2" Ice 0.80 1" Ice 0.93 2" Ice 1.22 4" Ice 1.90	0.45 0.56 0.68 0.94 1.57	0.01 0.02 0.03 0.04 0.11
(2) 7770.00 w/ Mount Pipe (Installed)	B	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 6.12 1/2" Ice 6.63 1" Ice 7.13 2" Ice 8.16 4" Ice 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) TMA (Installed)	B	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00 2" Ice 0.00 4" Ice 0.00	0.45 0.56 0.68 0.94 1.57	0.01 0.02 0.03 0.04 0.11
diplexer (SLA)	B	From Leg	4.00 6.00 2.00		-3.0000	87.00	No Ice 0.68 1/2" Ice 0.80 1" Ice 0.93 2" Ice 1.22 4" Ice 1.90	0.45 0.56 0.68 0.94 1.57	0.01 0.02 0.03 0.04 0.11
(2) 7770.00 w/ Mount Pipe (Installed)	C	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 6.12 1/2" Ice 6.63 1" Ice 7.13 2" Ice 8.16 4" Ice 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) TMA (Installed)	C	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00 2" Ice 0.00 4" Ice 0.00	0.45 0.56 0.68 0.94 1.57	0.01 0.02 0.03 0.04 0.11
diplexer (SLA)	C	From Leg	4.00 6.00 2.00		-3.0000	87.00	No Ice 0.68 1/2" Ice 0.80 1" Ice 0.93 2" Ice 1.22 4" Ice 1.90	0.45 0.56 0.68 0.94 1.57	0.01 0.02 0.03 0.04 0.11
(2) 2.4" x 5-ft Mount Pipe	A	From Leg	4.00 0.00 2.00		-3.0000	87.00	No Ice 1.20 1/2" Ice 1.50 1" Ice 1.81 2" Ice 2.47	1.20 1.50 1.81 2.47	0.00 0.01 0.03 0.06





<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b>	BRG 302 943052 (BU# 806352)	<b>Page</b>	11 of 21
	<b>Project</b>	TEP No. 102000.39	<b>Date</b>	14:31:53 02/25/11
	<b>Client</b>	Crown Castle USA, Inc.	<b>Designed by</b>	broberson

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz	Lateral					
DB844H90E-XY w/ Mount Pipe (Installed)	B	From Leg	4.00	5.0000	72.00	4" Ice	3.49	2.14	0.20
						No Ice	3.30	4.92	0.03
						1/2" Ice	3.69	5.60	0.07
						1" Ice	4.12	6.28	0.12
						2" Ice	5.01	7.71	0.23
DB844H90E-XY w/ Mount Pipe (Installed)	B	From Leg	4.00	5.0000	72.00	4" Ice	6.92	10.83	0.56
						No Ice	3.30	4.92	0.03
						1/2" Ice	3.69	5.60	0.07
						1" Ice	4.12	6.28	0.12
						2" Ice	5.01	7.71	0.23
LLPX310R w/ Mount Pipe (Proposed)	B	From Leg	4.00	10.0000	72.00	4" Ice	6.92	10.83	0.56
						No Ice	4.98	2.87	0.04
						1/2" Ice	5.38	3.40	0.08
						1" Ice	5.78	3.94	0.12
						2" Ice	6.62	5.12	0.23
FDD_R6_RRH (Proposed)	B	From Leg	4.00	10.0000	72.00	4" Ice	8.44	7.89	0.53
						No Ice	1.79	0.78	0.03
						1/2" Ice	1.97	0.92	0.04
						1" Ice	2.16	1.07	0.06
						2" Ice	2.57	1.39	0.09
DB844H90E-XY w/ Mount Pipe (Installed)	C	From Leg	4.00	5.0000	72.00	4" Ice	3.49	2.14	0.20
						No Ice	3.30	4.92	0.03
						1/2" Ice	3.69	5.60	0.07
						1" Ice	4.12	6.28	0.12
						2" Ice	5.01	7.71	0.23
DB844H90E-XY w/ Mount Pipe (Installed)	C	From Leg	4.00	5.0000	72.00	4" Ice	6.92	10.83	0.56
						No Ice	3.30	4.92	0.03
						1/2" Ice	3.69	5.60	0.07
						1" Ice	4.12	6.28	0.12
						2" Ice	5.01	7.71	0.23
LLPX310R w/ Mount Pipe (Proposed)	C	From Leg	4.00	10.0000	72.00	4" Ice	6.92	10.83	0.56
						No Ice	4.98	2.87	0.04
						1/2" Ice	5.38	3.40	0.08
						1" Ice	5.78	3.94	0.12
						2" Ice	6.62	5.12	0.23
FDD_R6_RRH (Proposed)	C	From Leg	4.00	10.0000	72.00	4" Ice	8.44	7.89	0.53
						No Ice	1.79	0.78	0.03
						1/2" Ice	1.97	0.92	0.04
						1" Ice	2.16	1.07	0.06
						2" Ice	2.57	1.39	0.09
Platform Mount [LP 713-1]	C	None		0.0000	72.00	4" Ice	3.49	2.14	0.20
						No Ice	31.27	31.27	1.51
						1/2" Ice	39.68	39.68	1.93
						1" Ice	48.09	48.09	2.35
						2" Ice	64.91	64.91	3.19
*** Side Arm Mount [SO 102-3]	C	None		0.0000	68.00	4" Ice	98.55	98.55	4.86
						No Ice	3.00	3.00	0.08
						1/2" Ice	3.48	3.48	0.11
						1" Ice	3.96	3.96	0.14
						2" Ice	4.92	4.92	0.20
*** GPS (Installed)	A	From Leg	3.00	-25.0000	50.00	4" Ice	6.84	6.84	0.32
						No Ice	0.17	0.17	0.00
						1/2" Ice	0.24	0.24	0.00
						1" Ice	0.31	0.31	0.00
						2" Ice	0.48	0.48	0.01

<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b> BRG 302 943052 (BU# 806352)	<b>Page</b> 12 of 21
	<b>Project</b> TEP No. 102000.39	<b>Date</b> 14:31:53 02/25/11
	<b>Client</b> Crown Castle USA, Inc.	<b>Designed by</b> broberson

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
Side Arm Mount [SO 701-1]	A	From Leg	1.50 0.00 0.00	-25.0000	50.00	4" Ice 0.92 No Ice 0.85 1/2" Ice 1.14 1" Ice 1.43 2" Ice 2.01 4" Ice 3.17	0.92 1.67 2.34 3.01 4.35 7.03	0.05 0.07 0.08 0.09 0.12 0.18
***								

### Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft <sup>2</sup>	Weight K
VHLP2-11 (Proposed)	A	Paraboloid w/o Radome	From Leg	1.00 -1.00 0.00	23.0000		95.00	2.17	No Ice 3.72 1/2" Ice 4.01 1" Ice 4.30 2" Ice 4.88 4" Ice 6.04	0.03 0.05 0.07 0.11 0.19
VHLP1-23 (Proposed)	B	Paraboloid w/Radome	From Face	1.00 -1.00 0.00	-17.0000		95.00	1.07	No Ice 0.89 1/2" Ice 1.04 1" Ice 1.18 2" Ice 1.47 4" Ice 2.05	0.02 0.03 0.03 0.04 0.06
VHLP1-23 (Proposed)	C	Paraboloid w/Radome	From Face	1.00 -1.00 0.00	13.0000		95.00	1.07	No Ice 0.89 1/2" Ice 1.04 1" Ice 1.18 2" Ice 1.47 4" Ice 2.05	0.02 0.03 0.03 0.04 0.06
VHLP2.5-11 (Proposed)	C	Paraboloid w/Shroud (HP)	From Leg	1.00 -2.00 0.00	-27.0000		95.00	2.92	No Ice 6.68 1/2" Ice 7.07 1" Ice 7.46 2" Ice 8.23 4" Ice 9.78	0.05 0.08 0.12 0.19 0.34

### 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

<b>RISATower</b>  <b>Tower Engineering Professionals, Inc.</b> 3703 Junction Boulevard Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	<b>Job</b> BRG 302 943052 (BU# 806352)	<b>Page</b> 13 of 21
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Comb. No.	Description
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	117 - 110	24.412	33	1.8315	0.0069
L2	110 - 100	21.736	33	1.8168	0.0068
L3	100 - 63.5	17.988	34	1.7566	0.0067
L4	63.5 - 47.42	6.843	34	1.0399	0.0016
L5	52.0033 - 35.0033	4.588	34	0.8293	0.0011
L6	35.0033 - 0	2.049	34	0.5696	0.0007

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
117.00	932LG65VTE-B w/ Mount Pipe	33	24.412	1.8315	0.0069	25609
110.00	APX16PV-16PVL-E w/Mount Pipe	33	21.736	1.8168	0.0068	17324
100.00	(2) DB844G65ZAXY w/Mount Pipe	34	17.988	1.7566	0.0067	5610
95.00	VHLP2-11	34	16.185	1.6946	0.0063	4499
87.00	(2) 7770.00 w/ Mount Pipe	34	13.442	1.5555	0.0053	3489
81.00	800 10504 w/ Mount Pipe	34	11.527	1.4294	0.0042	2984
72.00	DB844H90E-XY w/ Mount Pipe	34	8.931	1.2256	0.0027	2451



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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
68.00	Side Arm Mount [SO 102-3]	34	7.901	1.1358	0.0021	2271
50.00	GPS	34	4.240	0.7967	0.0011	4449

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	117 - 110	70.329	9	5.2780	0.0198
L2	110 - 100	62.636	9	5.2358	0.0198
L3	100 - 63.5	51.850	9	5.0637	0.0194
L4	63.5 - 47.42	19.747	9	3.0011	0.0047
L5	52.0033 - 35.0033	13.243	9	2.3937	0.0032
L6	35.0033 - 0	5.916	9	1.6446	0.0019

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
117.00	932LG65VTE-B w/ Mount Pipe	9	70.329	5.2780	0.0198	9065
110.00	APX16PV-16PVL-E w/Mount Pipe	9	62.636	5.2358	0.0198	6136
100.00	(2) DB844G65ZAXY w/Mount Pipe	9	51.850	5.0637	0.0194	1989
95.00	VHLP2-11	9	46.658	4.8860	0.0183	1588
87.00	(2) 7770.00 w/ Mount Pipe	9	38.762	4.4861	0.0152	1226
81.00	800 10504 w/ Mount Pipe	9	33.245	4.1232	0.0122	1047
72.00	DB844H90E-XY w/ Mount Pipe	9	25.767	3.5362	0.0078	858
68.00	Side Arm Mount [SO 102-3]	9	22.797	3.2776	0.0062	794
50.00	GPS	9	12.238	2.3000	0.0030	1547

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
L1	117 - 116	TP15.94x14.36x0.1875	7.00	0.00	0.0	39.000	8.6929	-0.18	339.02	0.001
	116 - 115					39.000	8.8292	-0.21	344.34	0.001
	115 - 114					39.000	8.9655	-0.24	349.65	0.001
	114 - 113					39.000	9.1018	-0.27	354.97	0.001
	113 - 112					39.000	9.2380	-0.31	360.28	0.001
	112 - 111					39.000	9.3743	-0.34	365.60	0.001
L2	111 - 110	TP18.2x15.94x0.1875	10.00	0.00	0.0	39.000	9.5106	-0.37	370.91	0.001
	110 - 109					39.000	9.6470	-0.64	376.23	0.002
	109 - 108					39.000	9.7835	-0.68	381.56	0.002

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

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
	108 - 107					39.000	9.9199	-0.72	386.88	0.002
	107 - 106					39.000	10.0564	-0.76	392.20	0.002
	106 - 105					39.000	10.1928	-0.81	397.52	0.002
	105 - 104					39.000	10.3293	-0.85	402.84	0.002
	104 - 103					39.000	10.4657	-0.89	408.16	0.002
	103 - 102					39.000	10.6022	-0.94	413.48	0.002
	102 - 101					39.000	10.7386	-0.98	418.81	0.002
	101 - 100					39.000	10.8750	-1.02	424.13	0.002
L3	100 - 98.175	TP27.02x18.2x0.25	36.50	0.00	0.0	39.000	14.8048	-2.85	577.38	0.005
	98.175 - 96.35					39.000	15.1598	-2.99	591.23	0.005
	96.35 - 94.525					39.000	15.5148	-3.39	605.08	0.006
	94.525 - 92.7					39.000	15.8698	-3.54	618.92	0.006
	92.7 - 90.875					39.000	16.2248	-3.68	632.77	0.006
	90.875 - 89.05					39.000	16.5798	-3.84	646.61	0.006
	89.05 - 87.225					39.000	16.9348	-4.00	660.46	0.006
	87.225 - 85.4					39.000	17.2898	-5.90	674.30	0.009
	85.4 - 83.575					39.000	17.6448	-6.07	688.15	0.009
	83.575 - 81.75					39.000	17.9998	-6.24	701.99	0.009
	81.75 - 79.925					39.000	18.3548	-6.53	715.84	0.009
	79.925 - 78.1					39.000	18.7098	-6.72	729.68	0.009
	78.1 - 76.275					39.000	19.0648	-6.91	743.53	0.009
	76.275 - 74.45					39.000	19.4198	-7.10	757.37	0.009
	74.45 - 72.625					39.000	19.7748	-7.30	771.22	0.009
	72.625 - 70.8					39.000	20.1298	-9.22	785.06	0.012
	70.8 - 68.975					39.000	20.4848	-9.43	798.91	0.012
	68.975 - 67.15					39.000	20.8398	-9.72	812.75	0.012
	67.15 - 65.325					39.000	21.1948	-9.94	826.60	0.012
	65.325 - 63.5					39.000	21.5499	-10.17	840.44	0.012
L4	63.5 - 62.4548	TP30.09x27.02x0.4076	16.08	0.00	0.0	39.000	35.1899	-10.36	1372.41	0.008
	62.4548 - 61.4097					39.000	35.4518	-10.54	1382.62	0.008
	61.4097 - 60.3645					39.000	35.7137	-10.72	1392.83	0.008
	60.3645 - 59.3194					39.000	35.9756	-10.90	1403.05	0.008
	59.3194 - 58.2742					39.000	36.2375	-11.08	1413.26	0.008
	58.2742 - 57.2291					39.000	36.4994	-11.26	1423.48	0.008
	57.2291 - 56.1839					39.000	36.7613	-11.44	1433.69	0.008
	56.1839 - 55.1388					39.000	37.0232	-11.62	1443.90	0.008
	55.1388 - 54.0936					39.000	37.2851	-11.81	1454.12	0.008
	54.0936 - 53.0485					39.000	37.5469	-11.99	1464.33	0.008
	53.0485 - 52.0033					39.000	37.8088	-12.18	1474.54	0.008
	52.0033 - 47.42					39.000	38.9573	-6.32	1519.34	0.004
L5	52.0033 - 47.42	TP32.39x28.3997x0.4896	17.00	0.00	0.0	39.000	45.6967	-7.17	1782.17	0.004
	47.42 - 46.3853					39.000	46.0796	-13.73	1797.10	0.008
	46.3853 - 45.3506					39.000	46.4625	-13.94	1812.04	0.008
	45.3506 - 44.3158					39.000	46.8454	-14.16	1826.97	0.008
	44.3158 - 43.2811					39.000	47.2283	-14.38	1841.90	0.008
	43.2811 - 42.2464					39.000	47.6111	-14.60	1856.83	0.008



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

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
	42.2464 -					39.000	47.9940	-14.82	1871.77	0.008
	41.2117									
	41.2117 -					39.000	48.3769	-15.05	1886.70	0.008
	40.1769									
	40.1769 -					39.000	48.7598	-15.27	1901.63	0.008
	39.1422									
	39.1422 -					39.000	49.1427	-15.49	1916.57	0.008
	38.1075									
	38.1075 -					39.000	49.5256	-15.72	1931.50	0.008
	37.0728									
	37.0728 -					39.000	49.9085	-15.95	1946.43	0.008
	36.0381									
	36.0381 -					39.000	50.2914	-16.17	1961.36	0.008
	35.0033									
L6	35.0033 -	TP40.3x32.39x0.4958	35.00	0.00	0.0	39.000	51.5497	-16.58	2010.44	0.008
	33.2532									
	33.2532 -					39.000	52.1811	-17.00	2035.06	0.008
	31.503									
	31.503 -					39.000	52.8125	-17.42	2059.69	0.008
	29.7528									
	29.7528 -					39.000	53.4440	-17.85	2084.31	0.009
	28.0027									
	28.0027 -					39.000	54.0754	-18.27	2108.94	0.009
	26.2525									
	26.2525 -					39.000	54.7068	-18.70	2133.56	0.009
	24.5023									
	24.5023 -					39.000	55.3382	-19.14	2158.19	0.009
	22.7522									
	22.7522 -					39.000	55.9696	-19.57	2182.81	0.009
	21.002									
	21.002 -					39.000	56.6010	-20.01	2207.44	0.009
	19.2518									
	19.2518 -					39.000	57.2324	-20.45	2232.06	0.009
	17.5017									
	17.5017 -					39.000	57.8638	-20.90	2256.69	0.009
	15.7515									
	15.7515 -					39.000	58.4952	-21.34	2281.31	0.009
	14.0013									
	14.0013 -					39.000	59.1266	-21.80	2305.94	0.009
	12.2512									
	12.2512 -					39.000	59.7580	-22.25	2330.56	0.010
	10.501									
	10.501 -					39.000	60.3894	-22.71	2355.19	0.010
	8.75083									
	8.75083 -					39.000	61.0208	-23.16	2379.81	0.010
	7.00067									
	7.00067 -					39.000	61.6522	-23.63	2404.44	0.010
	5.2505									
	5.2505 -					39.000	62.2836	-24.09	2429.06	0.010
	3.50033									
	3.50033 -					39.000	62.9150	-24.56	2453.69	0.010
	1.75017									
	1.75017 - 0					39.000	63.5465	-25.03	2478.31	0.010

**Pole Bending Design Data**

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

Section No.	Elevation ft	Size	Actual $M_x$ kip-ft	Actual $f_{bx}$ ksi	Allow. $F_{bx}$ ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual $M_y$ kip-ft	Actual $f_{by}$ ksi	Allow. $F_{by}$ ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	117 - 116	TP15.94x14.36x0.1875	2.94	1.158	39.000	0.030	0.00	0.000	39.000	0.000
	116 - 115		3.90	1.489	39.000	0.038	0.00	0.000	39.000	0.000
	115 - 114		4.94	1.828	39.000	0.047	0.00	0.000	39.000	0.000
	114 - 113		6.06	2.176	39.000	0.056	0.00	0.000	39.000	0.000
	113 - 112		7.26	2.532	39.000	0.065	0.00	0.000	39.000	0.000
	112 - 111		8.55	2.894	39.000	0.074	0.00	0.000	39.000	0.000
	111 - 110		9.92	3.262	39.000	0.084	0.00	0.000	39.000	0.000
L2	110 - 109	TP18.2x15.94x0.1875	12.38	3.959	39.000	0.102	0.00	0.000	39.000	0.000
	109 - 108		14.94	4.641	39.000	0.119	0.00	0.000	39.000	0.000
	108 - 107		17.57	5.310	39.000	0.136	0.00	0.000	39.000	0.000
	107 - 106		20.29	5.967	39.000	0.153	0.00	0.000	39.000	0.000
	106 - 105		23.10	6.611	39.000	0.170	0.00	0.000	39.000	0.000
	105 - 104		26.00	7.243	39.000	0.186	0.00	0.000	39.000	0.000
	104 - 103		28.99	7.865	39.000	0.202	0.00	0.000	39.000	0.000
	103 - 102		32.06	8.476	39.000	0.217	0.00	0.000	39.000	0.000
	102 - 101		35.23	9.077	39.000	0.233	0.00	0.000	39.000	0.000
	101 - 100		38.49	9.668	39.000	0.248	0.00	0.000	39.000	0.000
L3	100 - 98.175	TP27.02x18.2x0.25	60.36	10.943	39.000	0.281	0.00	0.000	39.000	0.000
	98.175 - 96.35		75.73	13.090	39.000	0.336	0.00	0.000	39.000	0.000
	96.35 - 94.525		91.86	15.155	39.000	0.389	0.00	0.000	39.000	0.000
	94.525 - 92.7		109.36	17.239	39.000	0.442	0.00	0.000	39.000	0.000
	92.7 - 90.875		127.34	19.199	39.000	0.492	0.00	0.000	39.000	0.000
	90.875 - 89.05		145.67	21.026	39.000	0.539	0.00	0.000	39.000	0.000
	89.05 - 87.225		164.31	22.728	39.000	0.583	0.00	0.000	39.000	0.000
	87.225 - 85.4		191.74	25.438	39.000	0.652	0.00	0.000	39.000	0.000
	85.4 - 83.575		216.80	27.610	39.000	0.708	0.00	0.000	39.000	0.000
	83.575 - 81.75		242.22	29.637	39.000	0.760	0.00	0.000	39.000	0.000
	81.75 - 79.925		268.45	31.581	39.000	0.810	0.00	0.000	39.000	0.000
	79.925 - 78.1		295.34	33.431	39.000	0.857	0.00	0.000	39.000	0.000
	78.1 - 76.275		322.56	35.158	39.000	0.901	0.00	0.000	39.000	0.000
	76.275 - 74.45		350.11	36.772	39.000	0.943	0.00	0.000	39.000	0.000
	74.45 - 72.625		378.00	38.281	39.000	0.982	0.00	0.000	39.000	0.000
	72.625 - 70.8		412.84	40.341	39.000	1.034	0.00	0.000	39.000	0.000
	70.8 - 68.975		446.71	42.143	39.000	1.081	0.00	0.000	39.000	0.000
	68.975 - 67.15		481.01	43.839	39.000	1.124	0.00	0.000	39.000	0.000
	67.15 - 65.325		515.76	45.438	39.000	1.165	0.00	0.000	39.000	0.000
	65.325 - 63.5		550.86	46.936	39.000	1.203	0.00	0.000	39.000	0.000
L4	63.5 - 62.4548	TP30.09x27.02x0.4076	571.11	29.926	39.000	0.767	0.00	0.000	39.000	0.000
	62.4548 - 61.4097		591.48	30.534	39.000	0.783	0.00	0.000	39.000	0.000
	61.4097 - 60.3645		611.96	31.126	39.000	0.798	0.00	0.000	39.000	0.000
	60.3645 - 59.3194		632.56	31.704	39.000	0.813	0.00	0.000	39.000	0.000
	59.3194 - 58.2742		653.28	32.267	39.000	0.827	0.00	0.000	39.000	0.000
	58.2742 - 57.2291		674.11	32.817	39.000	0.841	0.00	0.000	39.000	0.000
	57.2291 - 56.1839		695.07	33.353	39.000	0.855	0.00	0.000	39.000	0.000
	56.1839 - 55.1388		716.13	33.876	39.000	0.869	0.00	0.000	39.000	0.000
	55.1388 - 54.0936		737.32	34.387	39.000	0.882	0.00	0.000	39.000	0.000
	54.0936 - 53.0485		758.63	34.885	39.000	0.894	0.00	0.000	39.000	0.000
	53.0485 - 52.0033		780.05	35.371	39.000	0.907	0.00	0.000	39.000	0.000
	52.0033 - 47.42		415.86	17.755	39.000	0.455	0.00	0.000	39.000	0.000

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

Section No.	Elevation ft	Size	Actual $M_x$ kip-ft	Actual $f_{bx}$ ksi	Allow. $F_{bx}$ ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual $M_y$ kip-ft	Actual $f_{by}$ ksi	Allow. $F_{by}$ ksi	Ratio $\frac{f_{by}}{F_{by}}$		
L5	52.0033 - 47.42	TP32.39x28.3997x0.4896	459.67	17.186	39.000	0.441	0.00	0.000	39.000	0.000		
	47.42 - 46.3853		897.49	32.995	39.000	0.846	0.00	0.000	39.000	0.000		
	46.3853 - 45.3506		919.56	33.247	39.000	0.852	0.00	0.000	39.000	0.000		
	45.3506 - 44.3158		941.73	33.490	39.000	0.859	0.00	0.000	39.000	0.000		
	44.3158 - 43.2811		964.01	33.724	39.000	0.865	0.00	0.000	39.000	0.000		
	43.2811 - 42.2464		986.40	33.950	39.000	0.871	0.00	0.000	39.000	0.000		
	42.2464 - 41.2117		1008.90	34.169	39.000	0.876	0.00	0.000	39.000	0.000		
	41.2117 - 40.1769		1031.52	34.379	39.000	0.882	0.00	0.000	39.000	0.000		
	40.1769 - 39.1422		1054.23	34.583	39.000	0.887	0.00	0.000	39.000	0.000		
	39.1422 - 38.1075		1077.08	34.779	39.000	0.892	0.00	0.000	39.000	0.000		
	38.1075 - 37.0728		1100.02	34.969	39.000	0.897	0.00	0.000	39.000	0.000		
	37.0728 - 36.0381		1123.08	35.152	39.000	0.901	0.00	0.000	39.000	0.000		
	36.0381 - 35.0033		1146.25	35.329	39.000	0.906	0.00	0.000	39.000	0.000		
	L6		35.0033 - 33.2532	TP40.3x32.39x0.4958	1185.69	35.223	39.000	0.903	0.00	0.000	39.000	0.000
			33.2532 - 31.503		1225.43	35.521	39.000	0.911	0.00	0.000	39.000	0.000
			31.503 - 29.7528		1265.47	35.804	39.000	0.918	0.00	0.000	39.000	0.000
			29.7528 - 28.0027		1305.82	36.071	39.000	0.925	0.00	0.000	39.000	0.000
			28.0027 - 26.2525		1346.46	36.324	39.000	0.931	0.00	0.000	39.000	0.000
			26.2525 - 24.5023		1387.42	36.564	39.000	0.938	0.00	0.000	39.000	0.000
			24.5023 - 22.7522		1428.68	36.791	39.000	0.943	0.00	0.000	39.000	0.000
22.7522 - 21.002		1470.26	37.006		39.000	0.949	0.00	0.000	39.000	0.000		
21.002 - 19.2518		1512.15	37.211		39.000	0.954	0.00	0.000	39.000	0.000		
19.2518 - 17.5017		1554.36	37.404		39.000	0.959	0.00	0.000	39.000	0.000		
17.5017 - 15.7515		1596.88	37.588		39.000	0.964	0.00	0.000	39.000	0.000		
15.7515 - 14.0013		1639.72	37.762		39.000	0.968	0.00	0.000	39.000	0.000		
14.0013 - 12.2512		1682.89	37.928		39.000	0.973	0.00	0.000	39.000	0.000		
12.2512 - 10.501		1726.38	38.084		39.000	0.977	0.00	0.000	39.000	0.000		
10.501 - 8.75083		1770.21	38.234		39.000	0.980	0.00	0.000	39.000	0.000		
8.75083 - 7.00067		1814.35	38.375		39.000	0.984	0.00	0.000	39.000	0.000		
7.00067 - 5.2505		1858.83	38.510		39.000	0.987	0.00	0.000	39.000	0.000		



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Section No.	Elevation ft	Size	Actual $M_x$ kip-ft	Actual $f_{bx}$ ksi	Allow. $F_{bx}$ ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual $M_y$ kip-ft	Actual $f_{by}$ ksi	Allow. $F_{by}$ ksi	Ratio $\frac{f_{by}}{F_{by}}$
	5.2505 - 3.50033		1903.64	38.638	39.000	0.991	0.00	0.000	39.000	0.000
	3.50033 - 1.75017		1948.78	38.759	39.000	0.994	0.00	0.000	39.000	0.000
	1.75017 - 0		1994.27	38.874	39.000	0.997	0.00	0.000	39.000	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V$ K	Actual $f_v$ ksi	Allow. $F_v$ ksi	Ratio $\frac{f_v}{F_v}$	Actual $T$ kip-ft	Actual $f_{vt}$ ksi	Allow. $F_{vt}$ ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	117 - 116	TP15.94x14.36x0.1875	0.92	0.105	26.000	0.008	0.00	0.000	26.000	0.000
	116 - 115		1.00	0.113	26.000	0.009	0.00	0.000	26.000	0.000
	115 - 114		1.08	0.120	26.000	0.009	0.00	0.000	26.000	0.000
	114 - 113		1.16	0.127	26.000	0.010	0.00	0.000	26.000	0.000
	113 - 112		1.24	0.134	26.000	0.010	0.00	0.001	26.000	0.000
	112 - 111		1.32	0.141	26.000	0.011	0.00	0.001	26.000	0.000
	111 - 110		1.41	0.148	26.000	0.012	0.00	0.001	26.000	0.000
L2	110 - 109	TP18.2x15.94x0.1875	2.51	0.260	26.000	0.020	0.05	0.007	26.000	0.000
	109 - 108		2.59	0.265	26.000	0.021	0.05	0.007	26.000	0.000
	108 - 107		2.67	0.270	26.000	0.021	0.05	0.006	26.000	0.000
	107 - 106		2.76	0.275	26.000	0.021	0.04	0.006	26.000	0.000
	106 - 105		2.85	0.279	26.000	0.022	0.04	0.006	26.000	0.000
	105 - 104		2.94	0.284	26.000	0.022	0.04	0.006	26.000	0.000
	104 - 103		3.03	0.289	26.000	0.023	0.04	0.006	26.000	0.000
	103 - 102		3.12	0.294	26.000	0.023	0.04	0.005	26.000	0.000
	102 - 101		3.21	0.299	26.000	0.023	0.04	0.005	26.000	0.000
	101 - 100		3.30	0.304	26.000	0.024	0.04	0.005	26.000	0.000
L3	100 - 98.175	TP27.02x18.2x0.25	8.34	0.563	26.000	0.044	0.48	0.041	26.000	0.002
	98.175 - 96.35		8.50	0.561	26.000	0.044	0.49	0.039	26.000	0.002
	96.35 - 94.525		9.50	0.613	26.000	0.048	0.49	0.038	26.000	0.001
	94.525 - 92.7		9.67	0.609	26.000	0.048	0.15	0.011	26.000	0.000
	92.7 - 90.875		9.96	0.614	26.000	0.048	0.60	0.042	26.000	0.002
	90.875 - 89.05		10.13	0.611	26.000	0.048	0.60	0.041	26.000	0.002
	89.05 - 87.225		10.30	0.608	26.000	0.048	0.61	0.040	26.000	0.002
	87.225 - 85.4		13.63	0.789	26.000	0.062	0.62	0.038	26.000	0.001
	85.4 - 83.575		13.85	0.785	26.000	0.061	1.00	0.060	26.000	0.002
	83.575 - 81.75		14.03	0.779	26.000	0.061	1.01	0.058	26.000	0.002
	81.75 - 79.925		14.65	0.798	26.000	0.062	1.01	0.056	26.000	0.002
	79.925 - 78.1		14.83	0.793	26.000	0.062	1.02	0.054	26.000	0.002
	78.1 - 76.275		15.01	0.788	26.000	0.062	1.03	0.053	26.000	0.002
	76.275 - 74.45		15.20	0.783	26.000	0.061	1.03	0.051	26.000	0.002
	74.45 - 72.625		15.38	0.778	26.000	0.061	1.04	0.050	26.000	0.002
	72.625 - 70.8		18.47	0.918	26.000	0.072	1.10	0.051	26.000	0.002
	70.8 - 68.975		18.66	0.911	26.000	0.071	1.11	0.049	26.000	0.002
	68.975 - 67.15		18.96	0.910	26.000	0.071	1.11	0.048	26.000	0.002
	67.15 - 65.325		19.15	0.903	26.000	0.071	1.12	0.047	26.000	0.002
	65.325 - 63.5		19.34	0.897	26.000	0.070	1.13	0.045	26.000	0.002
L4	63.5 - 62.4548	TP30.09x27.02x0.4076	19.44	0.552	26.000	0.043	1.13	0.028	26.000	0.001
	62.4548 - 61.4097		19.55	0.551	26.000	0.043	1.13	0.027	26.000	0.001
	61.4097 - 60.3645		19.66	0.551	26.000	0.043	1.14	0.027	26.000	0.001
	60.3645 - 59.3194		19.77	0.550	26.000	0.043	1.14	0.027	26.000	0.001
	59.3194 -		19.88	0.549	26.000	0.043	1.14	0.027	26.000	0.001

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

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio f <sub>v</sub> / F <sub>v</sub>	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio f <sub>vt</sub> / F <sub>vt</sub>
	58.2742									
	58.2742 -		20.00	0.548	26.000	0.043	1.15	0.026	26.000	0.001
	57.2291									
	57.2291 -		20.11	0.547	26.000	0.043	1.15	0.026	26.000	0.001
	56.1839									
	56.1839 -		20.22	0.546	26.000	0.043	1.15	0.026	26.000	0.001
	55.1388									
	55.1388 -		20.33	0.545	26.000	0.043	1.16	0.025	26.000	0.001
	54.0936									
	54.0936 -		20.45	0.545	26.000	0.043	1.16	0.025	26.000	0.001
	53.0485									
	53.0485 -		20.56	0.544	26.000	0.043	1.16	0.025	26.000	0.001
	52.0033									
	52.0033 -		10.24	0.263	26.000	0.021	0.58	0.012	26.000	0.000
	47.42									
L5	52.0033 -	TP32.39x28.3997x0.4896	10.94	0.239	26.000	0.019	0.58	0.010	26.000	0.000
	47.42									
	47.42 -		21.28	0.462	26.000	0.036	1.07	0.018	26.000	0.001
	46.3853									
	46.3853 -		21.38	0.460	26.000	0.036	1.07	0.018	26.000	0.001
	45.3506									
	45.3506 -		21.49	0.459	26.000	0.036	1.07	0.018	26.000	0.001
	44.3158									
	44.3158 -		21.59	0.457	26.000	0.036	1.08	0.018	26.000	0.001
	43.2811									
	43.2811 -		21.70	0.456	26.000	0.036	1.08	0.017	26.000	0.001
	42.2464									
	42.2464 -		21.81	0.454	26.000	0.036	1.08	0.017	26.000	0.001
	41.2117									
	41.2117 -		21.91	0.453	26.000	0.035	1.09	0.017	26.000	0.001
	40.1769									
	40.1769 -		22.02	0.452	26.000	0.035	1.09	0.017	26.000	0.001
	39.1422									
	39.1422 -		22.13	0.450	26.000	0.035	1.09	0.017	26.000	0.001
	38.1075									
	38.1075 -		22.24	0.449	26.000	0.035	1.10	0.016	26.000	0.001
	37.0728									
	37.0728 -		22.35	0.448	26.000	0.035	1.10	0.016	26.000	0.001
	36.0381									
	36.0381 -		22.46	0.447	26.000	0.035	1.10	0.016	26.000	0.001
	35.0033									
L6	35.0033 -	TP40.3x32.39x0.4958	22.63	0.439	26.000	0.034	1.11	0.015	26.000	0.001
	33.2532									
	33.2532 -		22.81	0.437	26.000	0.034	1.11	0.015	26.000	0.001
	31.503									
	31.503 -		22.98	0.435	26.000	0.034	1.12	0.015	26.000	0.001
	29.7528									
	29.7528 -		23.15	0.433	26.000	0.034	1.12	0.015	26.000	0.001
	28.0027									
	28.0027 -		23.33	0.431	26.000	0.034	1.13	0.014	26.000	0.001
	26.2525									
	26.2525 -		23.50	0.430	26.000	0.034	1.13	0.014	26.000	0.001
	24.5023									
	24.5023 -		23.68	0.428	26.000	0.033	1.14	0.014	26.000	0.001
	22.7522									
	22.7522 -		23.86	0.426	26.000	0.033	1.15	0.014	26.000	0.001
	21.002									
	21.002 -		24.04	0.425	26.000	0.033	1.15	0.013	26.000	0.001
	19.2518									
	19.2518 -		24.22	0.423	26.000	0.033	1.16	0.013	26.000	0.001



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Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
	17.5017									
	17.5017 - 15.7515		24.40	0.422	26.000	0.033	1.16	0.013	26.000	0.000
	15.7515 - 14.0013		24.59	0.420	26.000	0.033	1.17	0.013	26.000	0.000
	14.0013 - 12.2512		24.77	0.419	26.000	0.033	1.17	0.012	26.000	0.000
	12.2512 - 10.501		24.96	0.418	26.000	0.033	1.18	0.012	26.000	0.000
	10.501 - 8.75083		25.15	0.416	26.000	0.033	1.19	0.012	26.000	0.000
	8.75083 - 7.00067		25.34	0.415	26.000	0.032	1.19	0.012	26.000	0.000
	7.00067 - 5.2505		25.53	0.414	26.000	0.032	1.20	0.012	26.000	0.000
	5.2505 - 3.50033		25.72	0.413	26.000	0.032	1.21	0.012	26.000	0.000
	3.50033 - 1.75017		25.91	0.412	26.000	0.032	1.21	0.011	26.000	0.000
	1.75017 - 0		26.10	0.411	26.000	0.032	1.22	0.011	26.000	0.000

### Section Capacity Table

L1	117 - 110	Pole	TP15.94x14.36x0.1875	1	-0.37	494.43	6.4	Pass	
L2	110 - 100	Pole	TP18.2x15.94x0.1875	2	-1.02	565.36	18.8	Pass	
L3-L4	100 - 47.4167	Pole	TP30.09x18.2x0.25	Note 1	Note 1	Note 1	91.1	Pass	
M1	65 - 47.4167	Plate Reinforcement	(3) PL1x4.5 by Sabre	Note 1	Note 1	Note 1	90.5	Pass	
L5-L6	47.4167 - 0	Pole	TP40.3x28.5536x0.3438	Note 1	Note 1	Note 1	75.5	Pass	
M2	47.4167 - 35	Plate Reinforcement	(3) PL1x4.5 by Sabre	Note 1	Note 1	Note 1	93.8	Pass	
M3	0-35	Plate Reinforcement	(3) PL1x6 by Sabre	Note 1	Note 1	Note 1	93.1	Pass	
							Summary		
							Pole (M2)	93.8	Pass
							<b>RATING =</b>	<b>93.8</b>	<b>Pass</b>

Notes:

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

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



- (SLA) (3) 1-1/4" TO 87 FT LEVEL
- (9) 1-5/8" TO 87 FT LEVEL
- (INSTALLED)
- (12) 1-1/4" TO 87 FT LEVEL (AT&T MOBILITY)

- (INSTALLED)
- (9) 7/8" TO 72 FT LEVEL (NEXTEL)

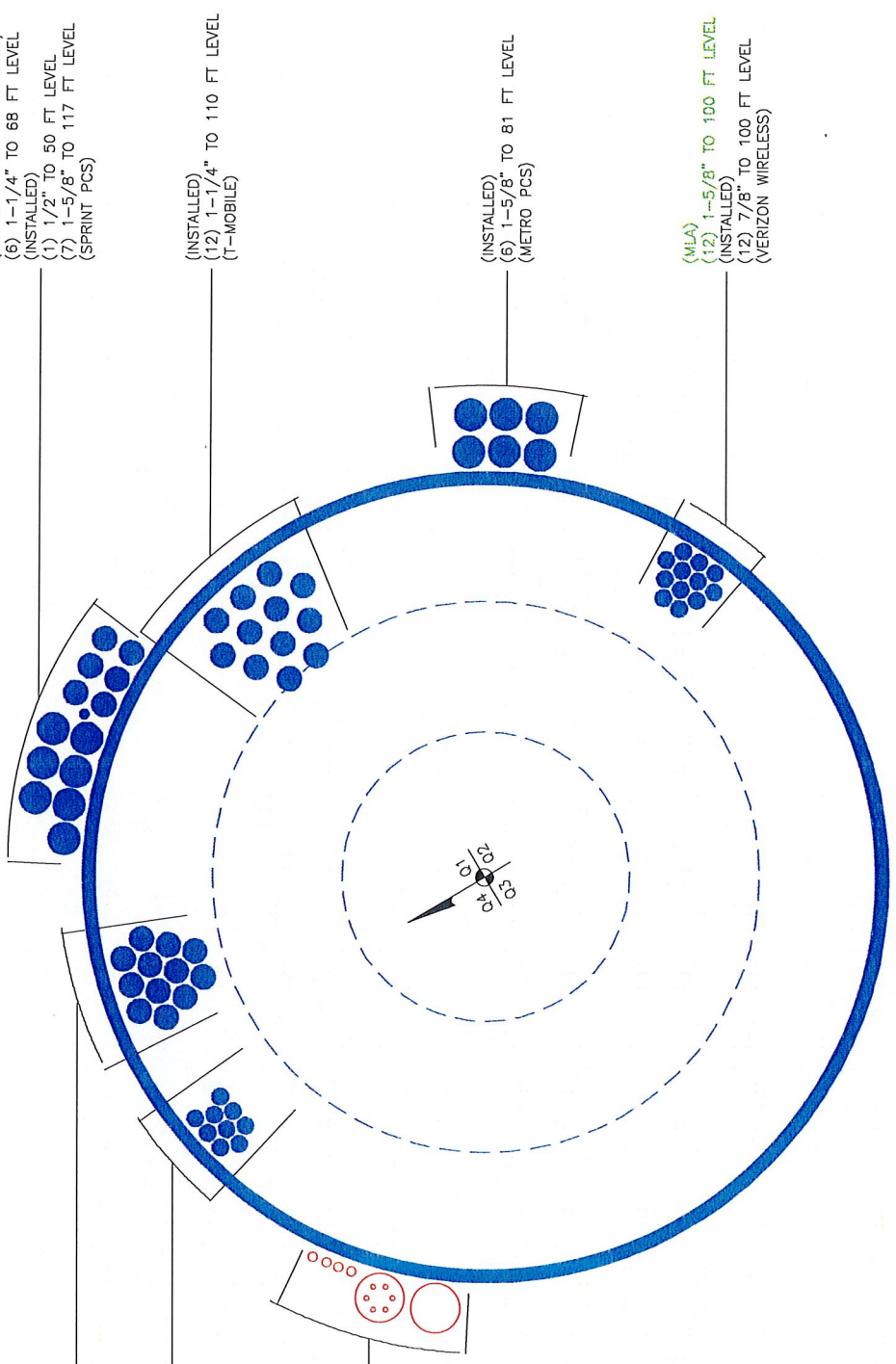
- (PROPOSED-BUNDLED IN 2-1/2" CONDUITS)
- (6) 5/16" TO 72 FT LEVEL (PROPOSED)
- (4) 1/2" TO 95 FT LEVEL (CLEARWIRE CORP)

- (INSTALLED-T-O BE REMOVED)
- (6) 1-1/4" TO 68 FT LEVEL
- (INSTALLED)
- (1) 1/2" TO 50 FT LEVEL
- (7) 1-5/8" TO 117 FT LEVEL (SPRINT PCS)

- (INSTALLED)
- (12) 1-1/4" TO 110 FT LEVEL (T-MOBILE)

- (INSTALLED)
- (6) 1-5/8" TO 81 FT LEVEL (METRO PCS)

- (MLA)
- (12) 1-5/8" TO 100 FT LEVEL
- (INSTALLED)
- (12) 7/8" TO 100 FT LEVEL (VERIZON WIRELESS)



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



12 - Sided Monopole Plate Modification:  
 Job #: 102000.39

TIA Code Revision: F

Section Elevation:  
 63.5

63.5 Feet Above Base of Pole

Quick Check: PASS 91.14%

Pole % of Allowable w/ Mods: 91.14%  
 Pole % of Allowable w/ Mods: 91.14%

Section Properties:

Pole Type: 12  
 No. of Sides Used: 12  
 Diameter Across Flats: 27.02 in  
 Thickness: 0.250 in  
 Inside Bend Radius: 1.00 in  
 Yield Stress: 65.00 ksi  
 Moment of Inertia: 1970.20 in<sup>4</sup>  
 Area: 21.52 in<sup>2</sup>  
 J: 3847.09 in<sup>4</sup>  
 C Flats: 13.51 in  
 C Points: 13.98427 in  
 W/T = 26.28  
 D/T = 108.06  
 Width of Flat: 6.57 in  
 Allow. Stress Increase: 1.33  
 Allow. Stress Factor: 0.60 TIA - F (Table 5)

Modifications:

Modification 1:  
 Plate Fy: 65 ksi  
 Drill Hole: 1.25 in  
 Stitch Bolt Capacity: 30 kips  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Modification 2:  
 Plate Fy: \_\_\_\_\_ ksi  
 Drill Hole: \_\_\_\_\_ in  
 Stitch Bolt Capacity: \_\_\_\_\_ kips  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Modification 3:  
 Plate Fy: \_\_\_\_\_ ksi  
 Drill Hole: \_\_\_\_\_ in  
 Stitch Bolt Capacity: \_\_\_\_\_ kips  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Modification 4:  
 Plate Fy: \_\_\_\_\_ ksi  
 Drill Hole: \_\_\_\_\_ in  
 Stitch Bolt Capacity: \_\_\_\_\_ kips  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Flats  
 c: \_\_\_\_\_ in  
 c\_offset: \_\_\_\_\_ in  
 Stitch Bolt Spacing: \_\_\_\_\_ in  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Flats  
 c: \_\_\_\_\_ in  
 c\_offset: \_\_\_\_\_ in  
 Stitch Bolt Spacing: \_\_\_\_\_ in  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Flats  
 c: \_\_\_\_\_ in  
 c\_offset: \_\_\_\_\_ in  
 Stitch Bolt Spacing: \_\_\_\_\_ in  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

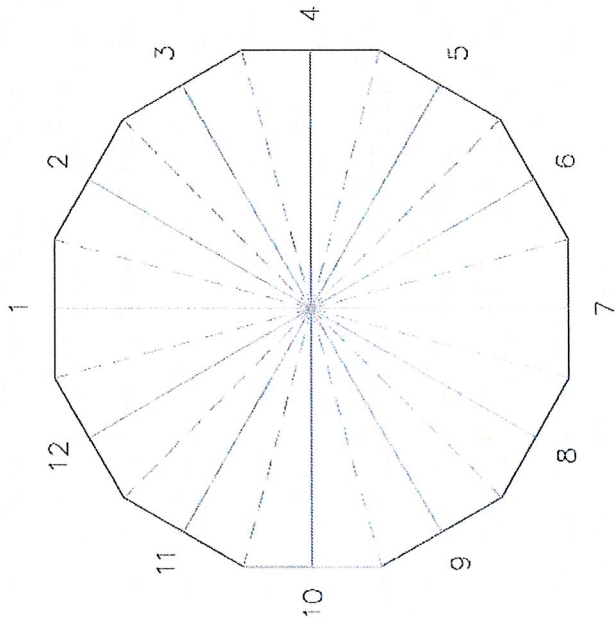
Flats  
 c: \_\_\_\_\_ in  
 c\_offset: \_\_\_\_\_ in  
 Stitch Bolt Spacing: \_\_\_\_\_ in  
 Stitch Bolt Spacing (override): \_\_\_\_\_ in

Area: \_\_\_\_\_ in<sup>2</sup>  
 Plate Thickness: \_\_\_\_\_ in  
 r\_min: \_\_\_\_\_ in  
 Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
 Mod % of Allowable: \_\_\_\_\_

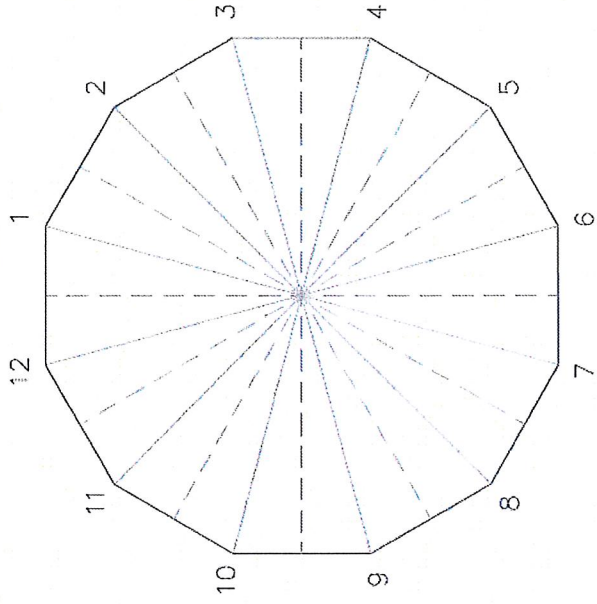
Area: \_\_\_\_\_ in<sup>2</sup>  
 Plate Thickness: \_\_\_\_\_ in  
 r\_min: \_\_\_\_\_ in  
 Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
 Mod % of Allowable: \_\_\_\_\_

Area: \_\_\_\_\_ in<sup>2</sup>  
 Plate Thickness: \_\_\_\_\_ in  
 r\_min: \_\_\_\_\_ in  
 Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
 Mod % of Allowable: \_\_\_\_\_

Area: \_\_\_\_\_ in<sup>2</sup>  
 Plate Thickness: \_\_\_\_\_ in  
 r\_min: \_\_\_\_\_ in  
 Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
 Mod % of Allowable: \_\_\_\_\_



Flats



Points

12 - Sided Monopole Plate Modification:  
 Job #: 102000.39

TIA Code Revision: F

Section Elevation: 63.5

63.5 Feet Above Base of Pole

Quick Check: PASS

91.14%

Loads:

\*x\* axis  
 Axial: 10.170 K  
 Moment: 550.860 (K-FT)  
 Shear: 19.340 K  
 Torque: NA K

\*y\* axis

Moment: 0.000 (K-FT)

Pole % of Allowable w/o Mods: 91.14%  
 Pole % of Allowable w/ Mods: 91.14%

Resultant  
 Axial: 10.17 K  
 Moment: 550.86 (K-FT)  
 Shear: 19.34 K  
 Torque: NA K

Stresses without Reinforcement:

Allowable Stress on the Pole  
 Total: 52.00 ksi

Stress on Pole  
 Pole, P/A: 0.47 ksi  
 Pole, M/S: 46.92 ksi  
 Total: 47.39 ksi  
 Pole % of Allowable: 91.14% %

Stresses with Reinforcement:

Allowable Stress on the Plates  
 Compression (ksi) Tension (ksi)  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Stress on Pole  
 Pole, P/A: 0.47 ksi  
 Pole, M/S: 46.92 ksi  
 Total: 47.39 ksi  
 Pole % of Allowable: 91.14% %

Allowable Load on the Plates

Compression (kips) Tension (kips)  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Stress on Plates  
 Compression (kips) Tension (kips)  
 Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Actual Load on the Plates

Compression (kips) Tension (kips)  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Plate % of Allowable

Compression Tension  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Stitch Bolt Connection

0.00%

12 - Sided Monopole Plate Modification:  
Job #: 102000.39

TIA Code Revision: F

Section Elevation:

52.0033 Feet Above Base of Pole

Quick Check: PASS

90.53%

Pole % of Allowable w/ Mods: 105.78%  
Pole % of Allowable w/ Mods: 65.94%

Section Properties:

Pole Type: 12  
No. of Sides Used: 12  
Diameter Across Flats: 29.79 in  
Thickness: 0.250 in  
Inside Bend Radius: 1.00 in  
Yield Stress: 65.00 ksi  
Moment of Inertia: 2649.18 in<sup>4</sup>  
Area: 23.75 in<sup>2</sup>  
J: 5172.90 in<sup>4</sup>  
C Flats: 14.90 in  
C Points: 15.42159 in  
W / T = 29.25  
D / T = 119.17  
Width of Flat: 7.31 in  
Allow. Stress Increase: 1.33  
Allow. Stress Factor: 0.60 TIA - F (Table 5)

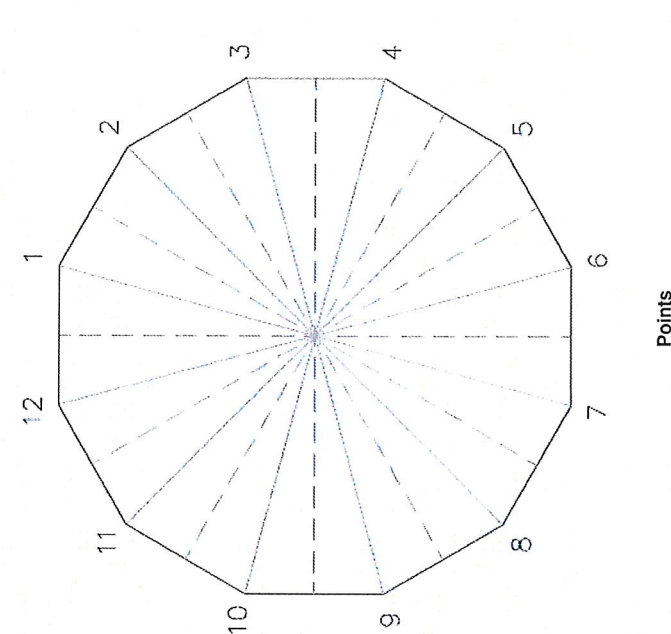
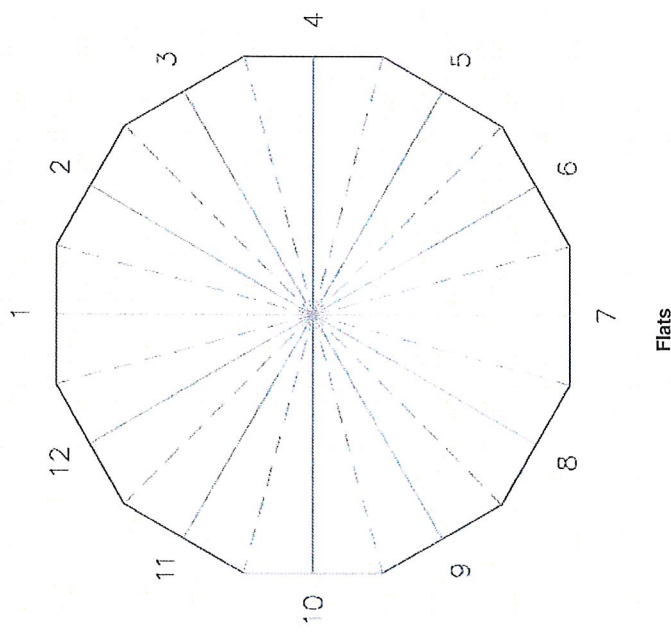
Modifications:

Modification 1: Sabro\_PL1 x 4.5 on  
Plate Fy: 65 ksi  
Drill Hole: 1.25 in  
Stitch Bolt Capacity: 30 kips  
Stitch Bolt Spacing (override):  
Modification 2: on  
Plate Fy: ksi  
Drill Hole: in  
Stitch Bolt Capacity: kips  
Stitch Bolt Spacing (override):  
Modification 3: on  
Plate Fy: ksi  
Drill Hole: in  
Stitch Bolt Capacity: kips  
Stitch Bolt Spacing (override):  
Modification 4: on  
Plate Fy: ksi  
Drill Hole: in  
Stitch Bolt Capacity: kips  
Stitch Bolt Spacing (override):

Flats: 1 5 9  
c: 0.5 in  
c\_offset: in  
Stitch Bolt Spacing: 20.625 in  
Stitch Bolt Spacing (override): in  
Flats: in  
c: in  
c\_offset: in  
Stitch Bolt Spacing: in  
Stitch Bolt Spacing (override): in  
Flats: in  
c: in  
c\_offset: in  
Stitch Bolt Spacing: in  
Stitch Bolt Spacing (override): in  
Flats: in  
c: in  
c\_offset: in  
Stitch Bolt Spacing: in  
Stitch Bolt Spacing (override): in

Area: 4.50 in<sup>2</sup>  
Plate Thickness: 1.00 in  
Net Area of Plate: 0.289 in<sup>2</sup>  
Mod % of Allowable: 90.53%  
Area: in<sup>2</sup>  
Plate Thickness: in  
Net Area of Plate: in<sup>2</sup>  
Mod % of Allowable: in<sup>2</sup>  
Area: in<sup>2</sup>  
Plate Thickness: in  
Net Area of Plate: in<sup>2</sup>  
Mod % of Allowable: in<sup>2</sup>  
Area: in<sup>2</sup>  
Plate Thickness: in  
Net Area of Plate: in<sup>2</sup>  
Mod % of Allowable: in<sup>2</sup>

Composite I<sub>y</sub>: 4250.33 in<sup>4</sup>  
Modifications I<sub>y</sub>: 1601.15 in<sup>4</sup>  
Flange Jump Check: NO



12 - Sided Monopole Plate Modification:  
 Job #: 102000.39

TIA Code Revision: F

Section Elevation: 52

52.0033 Feet Above Base of Pole

Quick Check: PASS

90.53%

Pole % of Allowable w/o Mods: 105.78%  
 Pole % of Allowable w/ Mods: 65.94%

Loads:  
 "x" axis  
 Axial: 12.18 K  
 Moment: 780.050 (K-FT)  
 Shear: 20.56 K  
 Torque: NA K

"y" axis  
 Moment: 0.000 (K-FT)

Resultant  
 Axial: 12.18 K  
 Moment: 780.05 (K-FT)  
 Shear: 20.56 K  
 Torque: NA K

Stresses without Reinforcement:

Allowable Stress on the Pole  
 Total: 52.00 ksi

Stress on Pole  
 Pole, P/A: 0.51 ksi  
 Pole, M/S: 54.49 ksi  
 Total: 55.00 ksi  
 Pole % of Allowable: 105.78%

Stresses with Reinforcement:

Allowable Stress on the Plates  
 Compression (ksi) Tension (ksi)  
 Total: 37.81 52.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Stress on Pole  
 Pole, P/A: 0.33 ksi  
 Pole, M/S: 33.96 ksi  
 Total: 34.29 ksi  
 Pole % of Allowable: 65.94%

Allowable Load on the Plates  
 Compression (kips) Tension (kips)  
 Total: 170.16 170.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Stress on Plates  
 Compression (kips) Tension (kips)  
 Plate, P/A: 0.33 0.00  
 Plate, M/S: 33.91 33.91  
 Total: 34.23 33.91

Actual Load on the Plates  
 Compression (kips) Tension (kips)  
 Total: 154.05 152.58  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Plate % of Allowable  
 Compression Tension  
 Total: 90.53% 89.75%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Slitch Bolt Connection  
 23.04%



12 - Sided Monopole Plate Modification:  
 Job #: 102000.39

TIA Code Revision: F

Section Elevation:

35  
 35.0033 Feet Above Base of Pole

Outlet Check: PASS

93.83%

Pole % of Allowable w/o Mods: 96.24%  
 Pole % of Allowable w/ Mods: 68.52%

Section Properties:

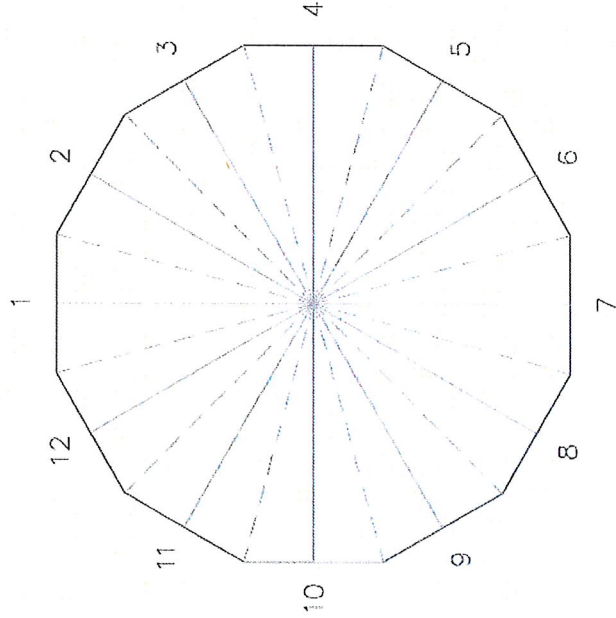
Pole Type: 12  
 No. of Sides Used: 12  
 Diameter Across Flats: 32.39 in  
 Thickness: 0.344 in  
 Inside Bend Radius: 1.38 in  
 Yield Stress: 65.00 ksi  
 Moment of Inertia: 4650.92 in<sup>4</sup>  
 Area: 35.42 in<sup>2</sup>  
 J: 9081.59 in<sup>4</sup>  
 C Flats: 16.20 in  
 C Points: 16.76786 in  
 W/T = 22.57  
 D/T = 94.23  
 Width of Flat: 7.76 in  
 Allow. Stress Increase: 1.33  
 Allow. Stress Factor: 0.60 TIA - F (Table 5)

Modifications:

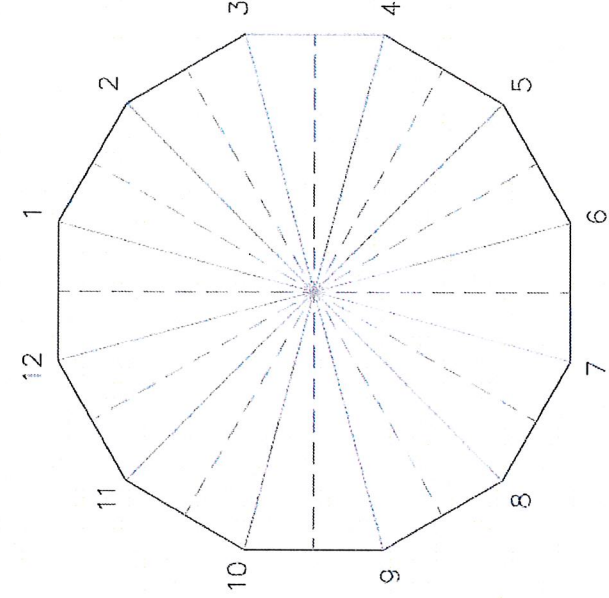
Modification 1: Sabre\_PL1 x 4.5  
 Plate Fy: 65 ksi  
 Drill Hole: 1.25 in  
 Stitch Bolt Capacity: 30 kips  
 on Flats  
 Stich Bolt Spacing (override): 20.625 in  
 Stich Bolt Spacing: 20.625 in  
 Modification 2:  
 Plate Fy: ksi  
 Drill Hole: in  
 Stich Bolt Capacity: kips  
 on Flats  
 Stich Bolt Spacing (override): in  
 Stich Bolt Spacing: in  
 Modification 3:  
 Plate Fy: ksi  
 Drill Hole: in  
 Stich Bolt Capacity: kips  
 on Flats  
 Stich Bolt Spacing (override): in  
 Stich Bolt Spacing: in  
 Modification 4:  
 Plate Fy: ksi  
 Drill Hole: in  
 Stich Bolt Capacity: kips  
 on Flats  
 Stich Bolt Spacing (override): in  
 Stich Bolt Spacing: in

Area: 4.50 in<sup>2</sup>  
 Plate Thickness: 1.00 in  
 r<sub>min</sub>: 0.289 in  
 Net Area of Plate: 3.19 in<sup>2</sup>  
 Mod % of Allowable: 93.83%  
 Area: in<sup>2</sup>  
 Plate Thickness: in  
 r<sub>min</sub>: in  
 Net Area of Plate: in<sup>2</sup>  
 Mod % of Allowable: in  
 Area: in<sup>2</sup>  
 Plate Thickness: in  
 r<sub>min</sub>: in  
 Net Area of Plate: in<sup>2</sup>  
 Mod % of Allowable: in  
 Area: in<sup>2</sup>  
 Plate Thickness: in  
 r<sub>min</sub>: in  
 Net Area of Plate: in<sup>2</sup>  
 Mod % of Allowable: in

Composite I<sub>y</sub>: 6633.77 in<sup>4</sup>  
 Modifications I<sub>y</sub>: 1882.85 in<sup>4</sup>  
 Flange Jump Check: NO



Flats



Points

12 - Sided Monopole Plate Modification:  
 Job #: 102000.39

TIA Code Revision: F

Section Elevation: 35

35.0033 Feet Above Base of Pole

Quick Check: PASS

93.83%

Pole % of Allowable w/o Mods: 96.24%  
 Pole % of Allowable w/ Mods: 68.52%

**Loads:**

"x" axis  
 Axial: 16.170 K  
 Moment: 1146.250 (K-FT)  
 Shear: 22.460 K  
 Torque: NA K

"y" axis

Moment: 0.000 (K-FT)

**Stresses without Reinforcement:**

Allowable Stress on the Pole  
 Total: 52.00 ksi

**Stresses with Reinforcement:**

Allowable Stress on the Plates  
 Compression (ksi) Tension (ksi)  
 Total: 37.81 52.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Actual Load on the Plates  
 Compression (kips) Tension (kips)  
 Total: 170.16 170.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Plate % of Allowable  
 Compression Tension  
 Total: 93.83% 93.04%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%

Resultant  
 Axial: 16.17 K  
 Moment: 1146.25 (K-FT)  
 Shear: 22.46 K  
 Torque: NA K

Stress on Pole  
 Pole, P/A: 0.46 ksi  
 Pole, M/S: 49.59 ksi  
 Total: 50.05 ksi  
 Pole % of Allowable: 96.24%

Stress on Pole  
 Pole, P/A: 0.33 ksi  
 Pole, M/S: 35.30 ksi  
 Total: 35.63 ksi  
 Pole % of Allowable: 68.52%

Stress on Plates  
 Compression (kips) Tension (kips)  
 Plate, P/A: 0.33 0.00  
 Plate, M/S: 35.15 35.15  
 Total: 35.48 35.15

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Slitch Bolt Connection  
 17.76%

12 - Sided Monopole Plate Modification:  
Job #: 102000.39

TIA Code Revision: F

Section Elevation:

0 Feet Above Base of Pole

Quick Check: PASS

93.10%

Pole % of Allowable w/o Mods: 107.62%  
Pole % of Allowable w/ Mods: 75.48%

Section Properties:

Pole Type: 12  
No. of Sides Used: 12  
Diameter Across Flats: 40.30 in  
Thickness: 0.344 in  
Inside Bend Radius: 1.38 in  
Yield Stress: 65.00 ksi  
Moment of Inertia: 9012.36 in<sup>4</sup>  
Area: 44.16 in<sup>2</sup>  
J: 17597.92 in<sup>4</sup>  
C Flats: 20.15 in  
C Points: 20.86082 in  
W/T = 28.73  
D/T = 117.24  
Width of Flat: 9.88 in  
Allow. Stress Increase: 1.33  
Allow. Stress Factor: 0.60 TIA - F (Table 5)

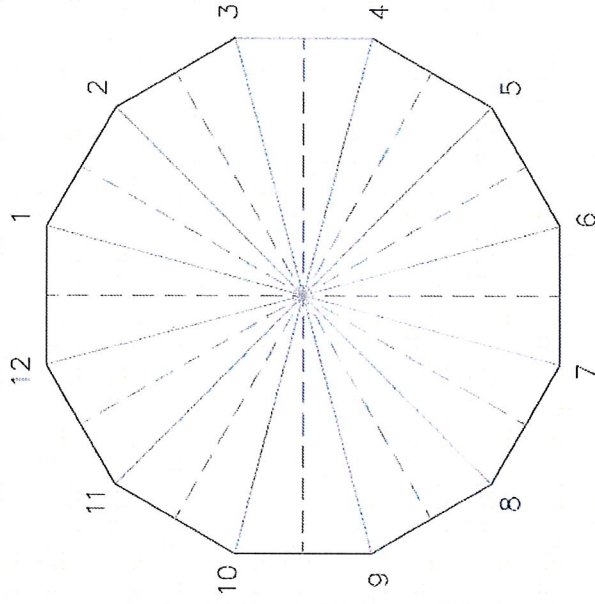
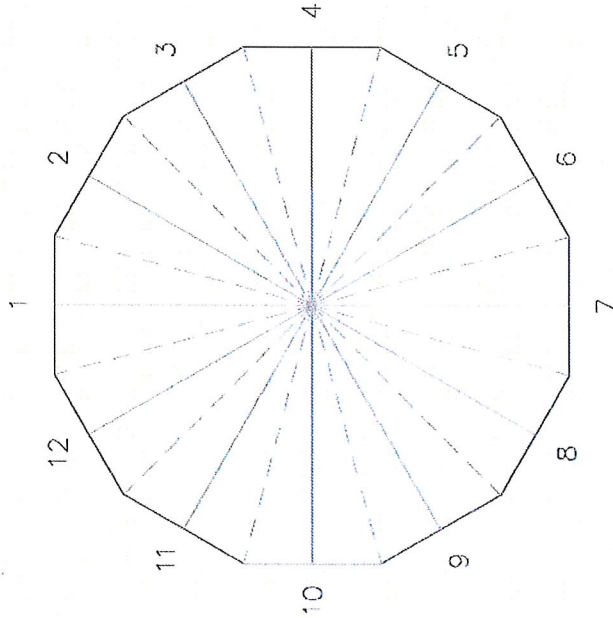
Modifications:

Modification 1: Sabre\_PL1 x 6 on Flats  
Plate Fy: 65 ksi  
Drill Hole: 1.25 in  
Stitch Bolt Capacity: 30 kips  
Stitch Bolt Spacing (override):  
Stitch Bolt Spacing (override):  
Modification 2:  
Plate Fy: \_\_\_\_\_ ksi  
Drill Hole: \_\_\_\_\_ in  
Stitch Bolt Capacity: \_\_\_\_\_ kips  
Stitch Bolt Spacing (override):  
Modification 3:  
Plate Fy: \_\_\_\_\_ ksi  
Drill Hole: \_\_\_\_\_ in  
Stitch Bolt Capacity: \_\_\_\_\_ kips  
Stitch Bolt Spacing (override):  
Modification 4:  
Plate Fy: \_\_\_\_\_ ksi  
Drill Hole: \_\_\_\_\_ in  
Stitch Bolt Capacity: \_\_\_\_\_ kips  
Stitch Bolt Spacing (override):

Flats: 1 5 9  
c: 0.5 in  
c\_offset: \_\_\_\_\_ in  
Stitch Bolt Spacing: 16.375 in  
Stitch Bolt Spacing (override):  
Flats: \_\_\_\_\_  
c: \_\_\_\_\_ in  
c\_offset: \_\_\_\_\_ in  
Stitch Bolt Spacing: \_\_\_\_\_ in  
Stitch Bolt Spacing (override):  
Flats: \_\_\_\_\_  
c: \_\_\_\_\_ in  
c\_offset: \_\_\_\_\_ in  
Stitch Bolt Spacing: \_\_\_\_\_ in  
Stitch Bolt Spacing (override):  
Flats: \_\_\_\_\_  
c: \_\_\_\_\_ in  
c\_offset: \_\_\_\_\_ in  
Stitch Bolt Spacing: \_\_\_\_\_ in  
Stitch Bolt Spacing (override):

Area: 6.00 in<sup>2</sup>  
Plate Thickness: 1.00 in  
r\_min: 0.289 in  
Net Area of Plate: 4.69 in<sup>2</sup>  
Mod % of Allowable: 93.10%  
Area: \_\_\_\_\_ in<sup>2</sup>  
Plate Thickness: \_\_\_\_\_ in  
r\_min: \_\_\_\_\_ in  
Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
Mod % of Allowable: \_\_\_\_\_  
Area: \_\_\_\_\_ in<sup>2</sup>  
Plate Thickness: \_\_\_\_\_ in  
r\_min: \_\_\_\_\_ in  
Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
Mod % of Allowable: \_\_\_\_\_  
Area: \_\_\_\_\_ in<sup>2</sup>  
Plate Thickness: \_\_\_\_\_ in  
r\_min: \_\_\_\_\_ in  
Net Area of Plate: \_\_\_\_\_ in<sup>2</sup>  
Mod % of Allowable: \_\_\_\_\_

Composite I<sub>y</sub>: 12851.67 in<sup>4</sup>  
Modifications I<sub>y</sub>: 3839.30 in<sup>4</sup>  
Flange Jump Check: NO



12 - Sided Monopole Plate Modification:  
 Job #: 102000.39

TIA Code Revision: F

Section Elevation: 0

0 Feet Above Base of Pole

Quick Check: PASS

93.10%

Pole % of Allowable w/o Mods: 107.62%  
 Pole % of Allowable w/ Mods: 75.48%

Loads:

"x" axis  
 Axial: 25.03 K  
 Moment: 1994.27 (K-FT)  
 Shear: 26.10 K  
 Torque: NA K

"y" axis

Axial: 25.03 K  
 Moment: 1994.27 (K-FT)  
 Shear: 26.10 K  
 Torque: NA K

Stresses without Reinforcement:

Allowable Stress on the Pole  
 Total: 52.00 ksi

Resultant  
 Axial: 25.03 K  
 Moment: 1994.27 (K-FT)  
 Shear: 26.10 K  
 Torque: NA K

Stress on Pole  
 Pole, P/A: 0.57 ksi  
 Pole, M/S: 55.39 ksi  
 Total: 55.96 ksi  
 Pole % of Allowable: 107.62%

Stresses with Reinforcement:

Allowable Stress on the Plates  
 Compression (ksi) Tension (ksi)  
 Total: 41.73 52.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Stress on Pole  
 Pole, P/A: 0.40 ksi  
 Pole, M/S: 38.85 ksi  
 Total: 39.25 ksi  
 Pole % of Allowable: 75.48%

Allowable Load on the Plates  
 Compression (kips) Tension (kips)  
 Total: 250.40 250.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Stress on Plates  
 Compression (kips) Tension (kips)  
 Plate, P/A: 0.40 0.00  
 Plate, M/S: 38.45 38.45  
 Total: 38.86 38.45

Actual Load on the Plates  
 Compression (kips) Tension (kips)  
 Total: 233.13 230.72  
 Total: 0.00 0.00  
 Total: 0.00 0.00  
 Total: 0.00 0.00

Plate % of Allowable  
 Compression Tension  
 Plate, P/A: 0.00 0.00  
 Plate, M/S: 0.00 0.00  
 Total: 0.00 0.00

Plate % of Allowable  
 Compression Tension  
 Total: 93.10% 92.29%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%  
 Total: 0.00% 0.00%

Stitch Bolt Connection  
 Total: 13.73%



# Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev F

## Site Data

BU#: 806352  
 Site Name: BRG 302 943052  
 App #:

Pole Manufacturer: Other

## Bolt Data

Qty:	12	Bolt Fu:	120
Diameter (in.):	1	Bolt Fy:	92
Bolt Material:	A325	Bolt Fty:	44.00
N/A:	75	<-- Disregard	
N/A:	55	<-- Disregard	
Circle (in.):	22		

## Plate Data

Diam:	28	in
Thick, t:	1.25	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	4.17	in

## Stiffener Data (Welding at Both Sides)

Config:	1	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.1875	in
Fillet V. Weld:	0.1875	in
Width:	6	in
Height:	12	in
Thick:	1	in
Notch:	1	in
Grade:	36	ksi
Weld str.:	70	ksi

## Pole Data

Diam:	15.94	in
Thick:	0.1875	in
Grade:	65	ksi
# of Sides:	0	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

## Stress Increase Factor

ASIF:	1.333
-------	-------

## Reactions

Moment:	9.92	ft-kips
Axial:	0.37	kips
Shear:	1.41	kips
Elevation:	110	feet

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

## Flange Bolt Results

Bolt Tension Capacity, B:	46.07 kips	Stiffened
Max Bolt directly applied T:	1.77 Kips	Service, ASD
Min. PL "tc" for B cap. w/o Pry:	Stiffened in	Fty*ASIF
Min PL "treq" for actual T w/ Pry:	Stiffened in	
Min PL "t1" for actual T w/o Pry:	Stiffened in	
T allowable	46.07 kips	<-- B, Stiffened
Prying Force, Q:	0.00 kips	Stiffened
Total Bolt Tension=T+Q:	1.77 kips	
Non-Prying Bolt Stress Ratio, T/B:	3.8% Pass	

## Exterior Flange Plate Results Flexural Check

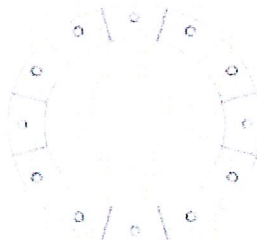
Compression Side Plate Stress:	1.0 ksi	Stiffened
Allowable Plate Stress:	36.0 ksi	Service, ASD
Compression Plate Stress Ratio:	2.7% Pass	0.75*Fy*ASIF
Tension Side Stress Ratio, (treq/t)^2:	N/A	Comp. Y.L. Length: N/A, Roark

## Stiffener Results

Horizontal Weld :	4.7% Pass
Vertical Weld:	2.5% Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	0.4% Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	1.1% Pass
Plate Comp. (AISC Bracket):	1.6% Pass

## Pole Results

Pole Punching Shear Check:	0.9% Pass
----------------------------	-----------



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

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

# Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev F

## Site Data

BU#: 806352  
 Site Name: BRG 302 943052  
 App #:

Pole Manufacturer: Other

## Bolt Data

Qty:	12	Bolt Fu:	120
Diameter (in.):	1	Bolt Fy:	92
Bolt Material:	A325		
N/A:	75	<-- Disregard	
N/A:	55	<-- Disregard	
Circle (in.):	22		

## Plate Data

Diam:	28	in
Thick, t:	1.25	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	4.76	in

## Stiffener Data (Welding at Both Sides)

Config:	1	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.1875	in
Fillet V. Weld:	0.1875	in
Width:	6	in
Height:	12	in
Thick:	1	in
Notch:	1	in
Grade:	36	ksi
Weld str.:	70	ksi

## Pole Data

Diam:	18.2	in
Thick:	0.1875	in
Grade:	65	ksi
# of Sides:	0	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

## Stress Increase Factor

ASIF:	1.333
-------	-------

## Reactions

Moment:	38.49	ft-kips
Axial:	1.02	kips
Shear:	3.3	kips
Elevation:	100	feet

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

## Flange Bolt Results

Bolt Tension Capacity, B: 46.07 kips  
 Max Bolt directly applied T: 6.91 Kips  
 Min. PL "tc" for B cap. w/o Pry: Stiffened in  
 Min PL "treq" for actual T w/ Pry: Stiffened in  
 Min PL "t1" for actual T w/o Pry: Stiffened in  
 T allowable: 46.07 kips <-- B, Stiffened  
 Prying Force, Q: 0.00 kips Stiffened  
 Total Bolt Tension=T+Q: 6.91 kips  
 Non-Prying Bolt Stress Ratio, T/B: 15.0% **Pass**

Stiffened
Service, ASD
Fty*ASIF

## Exterior Flange Plate Results

Flexural Check: Stiffened  
 Compression Side Plate Stress: 4.6 ksi  
 Allowable Plate Stress: 36.0 ksi  
 Compression Plate Stress Ratio: 12.7% **Pass**  
 Stiffened  
 Tension Side Stress Ratio, (treq/t)^2: N/A

Stiffened
Service, ASD
0.75*Fy*ASIF
Comp. Y.L. Length: N/A, Roark

## Stiffener Results

Horizontal Weld : 20.9% **Pass**  
 Vertical Weld: 8.4% **Pass**  
 Plate Flex+Shear, fb/Fb+(fv/Fv)^2: 1.3% **Pass**  
 Plate Tension+Shear, ft/Ft+(fv/Fv)^2: 5.1% **Pass**  
 Plate Comp. (AISC Bracket): 5.7% **Pass**

## Pole Results

Pole Punching Shear Check: 2.7% **Pass**



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

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



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

## TIA Rev F

### Site Data

BU#: 806352	
Site Name: BRG 302943052	
App #:	
Pole Manufacturer:	Other

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	48.22	in

Plate Data		
Diam:	54.22	in
Thick:	2.5	in
Grade:	60	ksi
Single-Rod B-eff:	10.80	in

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:	Both	
Groove Depth:	0.25	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	40.3	in
Thick:	0.34375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Reactions		
Moment:	1994	ft-kips
Axial:	25	kips
Shear:	26	kips

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

### Anchor Rod Results

Maximum Rod Tension: 163.3 Kips  
 Allowable Tension: 195.0 Kips  
 Anchor Rod Stress Ratio: 83.8% **Pass**

Rigid
Service, ASD
Fty*ASIF

### Base Plate Results

Base Plate Stress: 36.8 ksi  
 Allowable Plate Stress: 60.0 ksi  
 Base Plate Stress Ratio: 61.4% **Pass**

### Flexural Check

Rigid
Service ASD
0.75*Fy*ASIF
Y.L. Length:
26.48

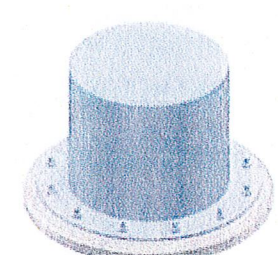
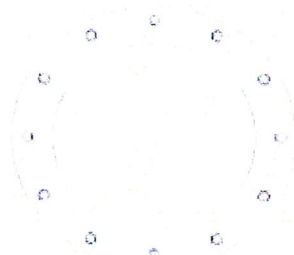
n/a

### Stiffener Results

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

### Pole Results

Pole Punching Shear Check: n/a



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

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

JOB: 102000.39  
 SHEET NUMBER: 1 OF 2  
 CALCULATED BY: BRR DATE 2/24/2011  
 CHECKED BY: DATE

**Pad and Pier Foundation for Monopole - TIA-222-F**

Q <sub>a</sub> , ALLOWABLE SOIL PRESS. (ksf)	6
NET or GROSS	NET
SOIL DENSITY (pcf)	134

F'c (ksi)	3
F'y (ksi)	60

**Base Reactions LC1: Maximum Wind**

M, MOMENT (k-ft)	1994.0
P <sub>t</sub> , TOTAL DOWNLOAD (k)	25.0
H, HORIZONTAL SHEAR (k)	26.0

**Base Reaction LC 2: Ice Wind + Ice**

M (k-ft)	526.0
P <sub>t</sub> (k)	38.0
H (k)	7.0

Try:

L (ft.)	B (ft.)	t (ft.)	Soil depth to TOP of mat (ft.)	Soil depth to BOT. of mat (ft.)	Pier dia./width (ft.)	Pier Height, h (cu.ft.)	Pier Shape
20	20	5	0	5	5.00	0.67	Round

W <sub>m</sub> , Weight of Mat (k)	300.0
W <sub>p</sub> , Weight of Pier (k)	2.0
W <sub>s</sub> , WEIGHT OF SOIL (k)	0.0

Concrete Vol. (cu ft) 74.56

**CHECK DESIGN CRITERIA**

**CHECK STABILITY:**

	LC1	LC2
Mst = P * (L/2) + (Vf+s * L/2) =	3269.7 k-ft	3399.7 k-ft
Mot = M + H*(t+h) =	2141.4 k-ft	566 k-ft
SF = Mot/Mst =	1.53 > 1.5	6.01 > 1.5

**Capacity:** 98.2%

**CHECK BEARING PRESSURE**

	LC1	LC2
P = P <sub>t</sub> + W <sub>f</sub> + W <sub>s</sub> =	327.0 k	340.0 k
e = M / P =	6.55 ft	1.66 ft
L/6 =	3.33 ft	3.33 ft
Width of Wedge, L' =	10.35 ft	20.00 ft
0 Deg Wind: Q <sub>max</sub> =	2.49 ksf	0.60 ksf
45 Deg Wind: Q <sub>max</sub> =	3.61 ksf	0.78 ksf

**Capacity:** 60.1%



JOB: 102000.39  
 SHEET NUMBER: 2 OF 2  
 CALCULATED BY: BRR DATE 2/24/2011  
 CHECKED BY: DATE

**CHECK ONE WAY SHEAR**

$V_u = 256.2 \text{ k}$   
 $V_c = 1109.1 \text{ k}$

**Capacity:** 23.10%

**CHECK TWO WAY SHEAR: PUNCHING + UNBALANCED MOMENT**

$V_u = 11.4 \text{ psi}$   
 $\phi V_c = 164.3 \text{ psi}$

**Capacity:** 6.96%

**CALCULATE REINFORCING REQUIRED**

$F'_c = 3.0 \text{ ksi}$        $F_y = 60.0 \text{ ksi}$

Temp & Shrinkage reinforcing,  $A_{s,temp} = 0.40 \text{ in}^2/\text{ft}$  (ACI 318 Sec. 10.5.4)

**BOTTOM REINFORCING**

Bar Size = 6  
 Bar Spacing, c-c: 15.0  
 d = 55.9 in.

$M_u = 723.0 \text{ in-k/ft}$

$\phi M_n = 0.9 \cdot A_s \cdot F_y \cdot d (1 - 0.59 \cdot A_s \cdot F_y / (b \cdot d \cdot F'_c))$

Solution:  $A_{s,req} = 0.24 \text{ in}^2/\text{ft}$

Check,  $A_s = 0.35 \text{ in}^2/\text{ft}$

**Capacity:** 113.64%  
 $A_{s,temp}$  controls

**TOP REINFORCING**

Bar Size = 11  
 Bar Spacing, c-c: 15.0  
 d = 54.9 in.

$M_u = 329.1 \text{ in-k/ft}$

$\phi M_n = 0.9 \cdot A_s \cdot F_y \cdot d (1 - 0.59 \cdot A_s \cdot F_y / (b \cdot d \cdot F'_c))$

Solution:  $A_{s,req} = 0.11 \text{ in}^2/\text{ft}$

**$A_{s,req} < A_{s,t}$ , Use  $A_{s,t}$**

Bar Spacing, c-c:

Check,  $A_s = 0.35 \text{ in}^2/\text{ft}$

**Top Reinforcing N.G.**

**Capacity:** 113.64%  
 $A_{s,temp}$  controls



C Squared Systems, LLC  
920 Candia Road  
Manchester, NH 03109  
Phone: (603) 657 9702  
[support@csquaredsystems.com](mailto:support@csquaredsystems.com)

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Calculated Radio Frequency Emissions



CT03XC357

126 Ledge Road, Darien, CT 06820

(a.k.a. 55 Ledge Road & 130 Ledge Road)

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February 28, 2011

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## 1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing Sprint CDMA antenna arrays mounted on the monopole tower located at 126 Ledge Road in Darien, CT. Sprint-Nextel, Verizon Wireless, AT&T, MetroPCS, T-Mobile, & Clearwire all have antennas mounted or proposed on the tower. The coordinates of the tower are 41-04-20.75 N, 73-28-41.4 W.

Sprint is proposing the following modifications:

- 1) Remove 3 panel antennas from the 68' mounting level;
- 2) Install one tower-mounted amplifier per sector at the 120' mounting level, 3 total;
- 3) Install a multi-carrier power amplifier (MCPA) system on the existing Sprint equipment pad.

## 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 ( $\text{mW}/\text{cm}^2$ ). 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:

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

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 determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and power, and that all antenna 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. All information for carriers other than Sprint CDMA comes directly from the current CSC database<sup>1</sup>. Because the Sprint CDMA 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 tower. Please refer to Attachment C for the vertical pattern of the Sprint CDMA antennas. The calculated results for Sprint CDMA 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 <sup>2</sup> )	Limit	%MPE
AT&T	89	850	11	40	0.0200	0.5667	3.52%
AT&T GSM	89	880	5	296	0.0672	0.5867	11.45%
AT&T GSM	89	1930	1	427	0.0194	1.0000	1.94%
Verizon	102	869	9	437	0.0240	0.5793	4.14%
Verizon	102	1970	3	608	0.0111	1.0000	1.11%
Verizon	102	757	1	959	0.0058	0.5047	1.15%
Clearwire	75	2496	2	153	0.0196	1.0000	1.96%
Clearwire	75	18 GHz	1	211	0.0135	1.0000	1.35%
Sprint/Nextel iDEN	74	851	12	100	0.0788	0.5673	13.89%
Sprint/Nextel WiMAX*	74	2657	0	562	0.0000	1.0000	0.00%
MetroPCS	81	2130	7	882	0.3384	1.0000	33.84%
T-Mobile UMTS	110	2100	2	679	0.0404	1.0000	4.04%
T-Mobile	110	1945	8	148	0.0352	1.0000	3.52%
<b>Sprint CDMA</b>	<b>120</b>	<b>1900</b>	<b>11</b>	<b>839</b>	<b>0.0230</b>	<b>1.0000</b>	<b>2.30%</b>
						<b>Total</b>	<b>84.20%</b>

Table 1: Carrier Information<sup>2</sup>

The Sprint/Nextel WiMAX antennas shown in Table 1 above are a duplication of the Clearwire 2496 MHz panel antennas and have been removed from the calculations. Their removal is reflected in the reduction of “Number of Transmitters” to “0” and the associated % MPE from 11.07% to 0%. We recommend that the CSC database be updated accordingly.

<sup>1</sup> Antenna heights in Table 1 for AT&T and MetroPCS differ slightly from values listed in the current CSC database. The heights used in this report are based upon Table 2 of the structural analysis performed by Tower Engineering Professionals, Inc dated February 25, 2011 (Attachment D).

<sup>2</sup> Calculated values for Sprint CDMA include a -10 dB off-beam loss factor (see Attachment C).



## 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 transmit antennas at the facility is below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at the base of the tower is 84.20% of the FCC limit.

As noted in the introduction, 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

February 28, 2011

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<sup>3</sup>

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f <sup>2</sup> )*	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<sup>4</sup>

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	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 2: FCC Limits for Maximum Permissible Exposure (MPE)**

<sup>3</sup> 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

<sup>4</sup> 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

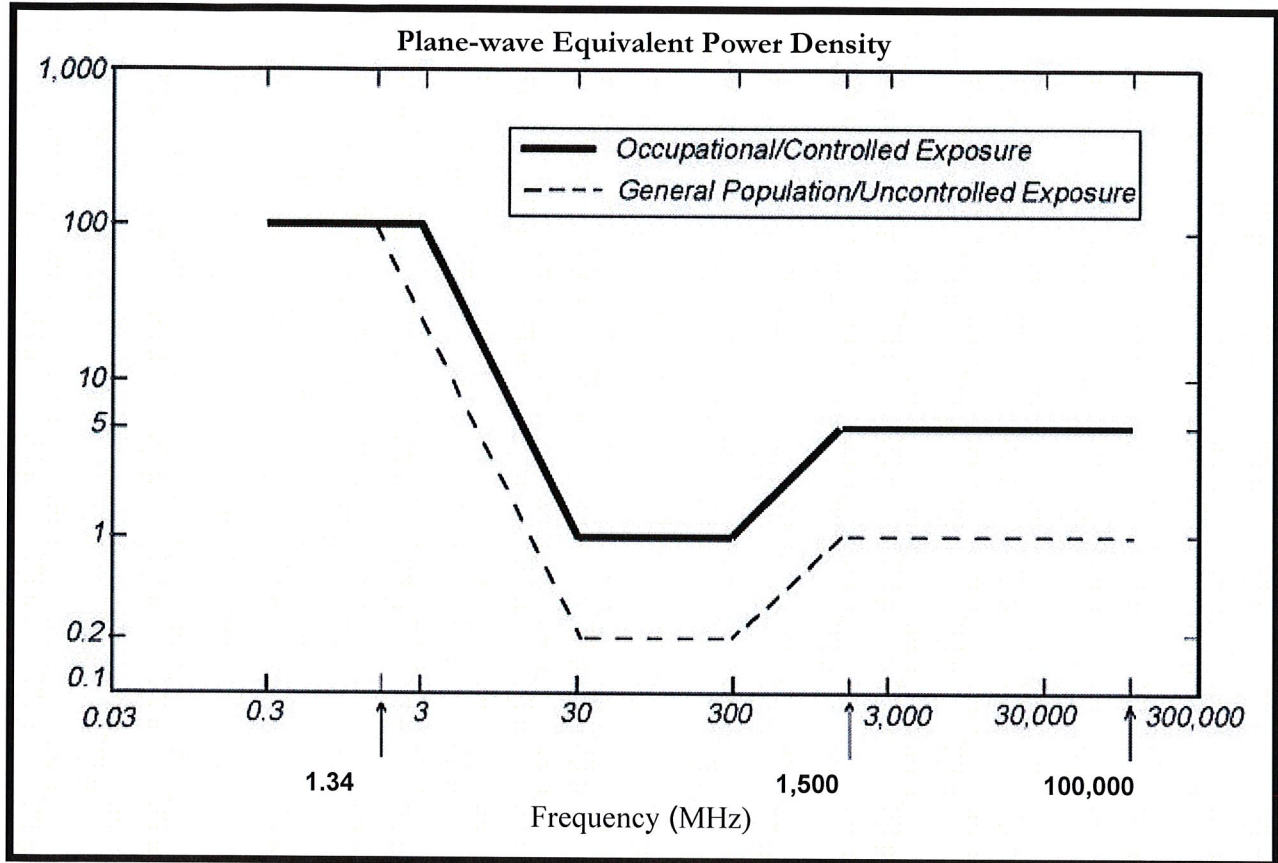
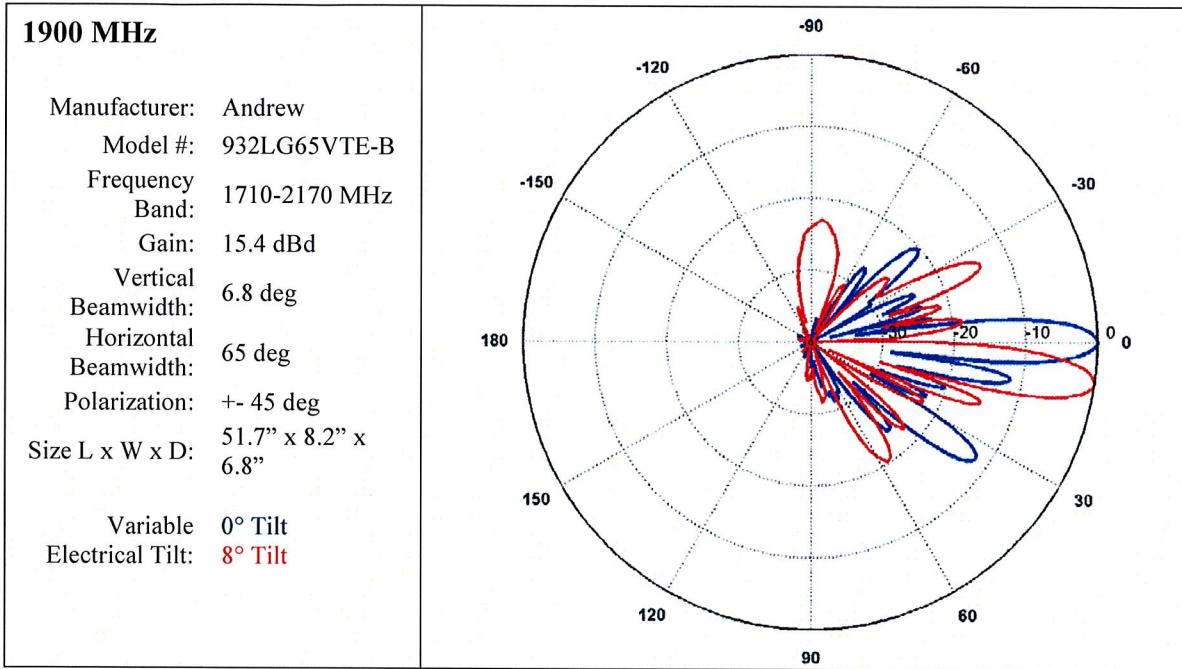


Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

## Attachment C: Sprint's CDMA Antenna Model Data Sheet and Electrical Patterns





Attachment D: Excerpt from Table 2 of Tower Engineering Professionals, Inc. Structural Analysis

117 Ft Monopole Structural Analysis  
 Project Number 102000.39, Application 108173, Revision 2

February 25, 2011  
 CCI BU No 806352  
 Page 4

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
87	89	6	Unknown	TMA	3 9	1-1/4 1-5/8	3
		3	Unknown	Diplexer			
		6	Powerwave Technologies	7770.00 w/ Mount Pipe			
	87	1	Tower Mounts	Platform Mount [LP 713-1]			
81	81	3	Kathrein	800 10504 w/ Mount Pipe	6	1-5/8	1
		1	Tower Mounts	Side Arm Mount [SO 102-3]			
72	74	3	Argus Technologies	LLPX310R w/ Mount Pipe	6	5/16	2
		3	Samsung Telecommunications	FDD_R6_RRH			
		6	Decibel	DB844H90E-XY w/ Mount Pipe			
	72	1	Tower Mounts	Platform Mount [LP 713-1]	9	7/8	1
68	68	3	EMS Wireless	RV90-17-00DP w/ Mount Pipe	6	1-1/4	4
		1	Tower Mounts	Side Arm Mount [SO 102-3]			
50	50	1	Tower Mounts	Side Arm Mount [SO 701-1]	1	1/2	1
		1	Unknown	GPS			

- Notes:  
 1) Existing equipment  
 2) Reserved equipment  
 3) SLA equipment controlling  
 4) Equipment to be removed