

Together with Nextel

**ORIGINAL**

**RECEIVED**  
DEC 10 2012

48 Spruce Street  
Oakland, NJ 07436  
Phone: (845) 499-4712  
Jennifer Palumbo

September 19, 2012

**Hand Delivered**

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

CONNECTICUT  
SITING COUNCIL

RE: Sprint Spectrum L.P. notice of intent to modify an existing telecommunications facility located at 10 Ashpohtag Road, Norfolk, CT 06058, Known to Sprint Spectrum L.P. as site CT33XC590.

Dear Ms. Roberts:

In order to accommodate technological changes, implement Code Division Multiple Access ("CDMA") and/or Long Term Evolution ("LTE") capabilities, and enhance system performance in the state of Connecticut, Sprint Spectrum L.P. plans to modify the equipment configurations at many of its existing cell sites. 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 its attachments is being sent to the chief elected official of the municipality in which affected cell site is located.

CDMA employs Spread-Spectrum technology and special coding scheme to allow multiple users to be multiplexed over the same physical channel. LTE is a new high-performance air interface for cellular mobile communications. It is designed to increase the capacity and speed of mobile telephone networks.

As part of the project the new multi-mode 800/1900 antenna will replace existing antennas. These antennas will provide more flexibility for optimization by allowing fast and easy electrical tilt adjustment from remote location and will enable the transmission of multiple technologies from a single antenna. As Sprint Nextel's network evolves to meet the demands of its customers, it is essential for Sprint Nextel to install modern equipment and antennas in order to provide reliable wireless voice and data services. The

**RADIO FREQUENCY EMISSIONS ANALYSIS REPORT  
EVALUATION OF HUMAN EXPOSURE POTENTIAL  
TO NON-IONIZING EMISSIONS**

**Sprint Existing Facility**

**Site ID: CT33XC590**

**West Norfolk  
10 Ashpohtag Road  
Norfolk, CT 06058**

**September 06, 2012**

September 6, 2012

Sprint  
Attn: RF Engineering Manager  
1 International Boulevard, Suite 800  
Mahwah, NJ 07495

Re: Emissions Values for Site **CT33XC590 – West Norfolk**

EBI Consulting was directed to analyze the proposed upgrades to the existing Sprint facility located at 10 Ashpohtag Road, Norfolk, CT, for the purpose of determining whether the emissions from the proposed Sprint equipment upgrades on this property are within specified federal limits.

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

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The general population exposure limit for the cellular band is approximately 567  $\mu\text{W}/\text{cm}^2$ , and the general population exposure limit for the PCS band is 1000  $\mu\text{W}/\text{cm}^2$ . Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

## **CALCULATIONS**

Calculations were done for the proposed upgrades to the existing Sprint Wireless antenna facility located at 10 Ashpohtag Road, Norfolk, CT, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. All calculations were performed assuming the main lobe of the antenna was focused at the base of the tower to present a worst case scenario. Actual values seen from this site will be dramatically less than those shown in this report. For this report the sample point is the top of a 6 foot person standing at the base of the tower.

For all calculations, all emissions were calculated using the following assumptions:

- 1) 2 CDMA Carriers (1900 MHz) were considered for each sector of the proposed installation.
- 2) 1 CDMA Carrier (850 MHz ) was considered for each sector of the proposed installation
- 3) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
- 4) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
- 5) The antenna used in this modeling is the RFS APXVSPP18-C-A20. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna has a 15.9 dBd gain value at its main lobe at 1900 MHz and 13.4 dBd at its main lobe for 850 MHz. All calculations were performed assuming the main lobe of the antenna was focused at the base of the tower to present a worst case scenario.

- 6) The antenna mounting height centerline of the proposed antennas is **147 feet** above ground level (AGL).
- 7) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

All calculation were done with respect to uncontrolled / general public threshold limits



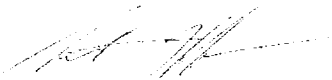
## Summary

All calculations performed for this analysis yielded results that were well within the allowable limits for general public exposure to RF Emissions.

The anticipated Maximum Composite contributions from the Sprint facility are **7.503% (3.752% from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

The anticipated composite MPE value for this site assuming all carriers present is **34.463%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions

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



**Scott Heffernan**  
RF Engineering Director

**EBI Consulting**  
21 B Street  
Burlington, MA 01803



**PASS**  
(Shaft, 100% capacity)



October 5, 2012

**Mr. Dwayne Lyerly**  
SBA Communications Corporation  
5900 Broken Sound Parkway NW  
Boca Raton, FL 33487  
(919) 557- 0555

Vertical Solutions, Inc.  
PO Box 579  
Holly Springs, NC 27540  
(888) 321-6167  
[operations@verticalsolutions-inc.com](mailto:operations@verticalsolutions-inc.com)

**Subject:**

**Rigorous Structural Analysis**

**Carrier Designation**

**Sprint/Nextel, Reconfiguration - Final**  
**Site Number: CT33XC590**  
**Site Name: West Norfolk**

**SBA Designation**

**Site Number: CT46144-A**  
**Site Name: Cammilletti Property**

CT33XC590  
Passing SA  
with mods

Vertical Solutions Project: 121779, Revision 0

Route 100, Litchfield County, CT 06058  
Coordinates: **N42° 00' 09.70" ± Longitude: W073° 13' 17.00" ±**  
**Elevation: 983 ft±, Topography Category: 1;**  
**Structure: 90-ft Self Supporting Pole Structure (Monopole)**

Analysis.

In accordance with the proposed maintenance configuration, the tower and foundation **will** satisfy the requirements of ASCE A-222-F-1996, *Structural Standards for Steel Antenna Towers and Foundations* (national standard) and the *2005 Connecticut State Building Code* (local building code).

- 80-mph fastest mile basic wind speed
- 69-mph fastest mile basic wind speed with 1/2-in radial ice

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

We trust you find our work satisfactory. Please do not hesitate to call should you have any questions.

Sincerely,

Kingsley C. Igboanugo, E.I.  
Structural Engineer-In-Training

Reviewed by: MER



Michael L. Lassiter, S.E., P.E., C.W.I.  
Structural Engineer, Civil Engineer, Certified Weld Inspector  
& President  
CT License No. 25064

NOV 15 2012



## Project History



**VSi Project #: 121779, Revision 0**  
**SBA Site Id: CT46144-A**  
**SBA Site Name: Cammilletti Property**

CT2021	5/2/2003	292280_CT2021 CAMMILLETTI PROPERTY CD-s-Site Plan 5-2-03.pdf	URS	Sprint	Construction Drawings
CT2021	8/17/2004	308122_CT2021 CAMMILLETTI PROPERTY Geotechnical Report - 08-17-2004.pdf	Geotechnical Engineering	URS	Geotechnical Investigation
CT2021	8/26/2004	308118_CT2021 CAMMILLETTI PROPERTY CD-s - Development & Management Plan 8-26-04.pdf	URS	Sprint	Construction Drawings
CT2021	8/30/2004	308120_CT2021 CAMMILLETTI PROPERTY Tower and Foundation Design Drawings - 08-30-2004.pdf	Engineered Endeavors Inc.	Sprint	Tower and Foundation Design Drawings
CT2021	8/30/2004	308121_CT2021 CAMMILLETTI PROPERTY Tower and Foundation Design Drawings - 08-30-2004 duplicate.pdf	Engineered Endeavors Inc.	Sprint	Tower and Foundation Design Drawings
CT2021	12/14/2004	308126_CT2021 CAMMILLETTI PROPERTY Height Verification.pdf		Sprint	Height Verification Report
CT2021	1/17/2006	470913_CT2021 CAMMILLETTI PROPERTY Semaan Structural Analysis Cingular Colo 01-17-206.pdf	Semaan Engineering Solutions	Sprint Sites USA	Structural Analysis Report
CT2021	2/15/2006	292282_CT2021 CAMMILLETTI PROPERTY Cingular SLA.pdf	Sprint Spectrum	New Cingular	Site Lease Agreement
CT2021	5/17/2006	470921_CT2021 Cammilletti Property AT&T Rent Commencement Letter.pdf	Cingular Wireless	Sprint Spectrum	Commencement Notice
CT2021	7/24/2006	292281_CT2021 CAMMILLETTI PROPERTY CT33XC590-02 First Amendment to Cingular SLA.pdf	Sprint Spectrum	New Cingular	Amendment SLA
CT2021	7/24/2006	308154_CT2021 CAMMILLETTI PROPERTY Semaan Structural Analysis Verizon Colo 07-24-2006.pdf	Semaan Engineering Solutions	Sprint Sites USA	Structural Analysis Report
CT2021	7/24/2006	470914_CT2021 CAMMILLETTI PROPERTY Semaan Structural Analysis Verizon Colo 07-24-2006 duplicate.pdf	Semaan Engineering Solutions	Sprint Sites USA	Structural Analysis Report
CT2021	8/3/2007	308160_CT2021 CAMMILLETTI PROPERTY CT33XC590-03 Verizon SLA.pdf	Sprint Spectrum	Verizon	Site Lease Agreement
CT2021	12/31/2007	308161_CT2021 CAMMILLETTI PROPERTY Verizon Rent Commencement Letter.pdf	Sprint	Verizon	Commencement Notice
CT2021	5/1/2008	308155_CT2021 CAMMILLETTI PROPERTY Semaan Structural Analysis Verizon Colo	Semaan	Sprint	Structural Analysis



CT2021	6/27/2012	Structural Analysis Report - Final	Vertical Solutions	TowerCo	Structural Analysis Report
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**Table Note:**

Files name format YYYYMMDD-XXX-ZZZZZZ.pdf

Where:

YYYYMMDD = Year, Month, Day published/issued

XXX=file descriptor

ZZZZZ=TowerCo Site ID

Section	1	2	3	4	5
Length (ft)	43.25	9.45	42.38	10.30	52.35
Number of Sides	18	18	18	18	18
Thickness (in)	0.1875	0.2520	0.3125	0.4053	0.3750
Socket Length (ft)		4.08		5.15	
Top Dia (in)	18.0000	27.0080	28.4883	36.5990	37.0679
Bot Dia (in)	27.0080	30.5000	36.5990	39.1600	48.0000
Grade	A572-65	A572-50	A572-65	A572-50	A572-65
Weight (K)	2.0	0.7	4.6	1.7	8.9

148.5 ft

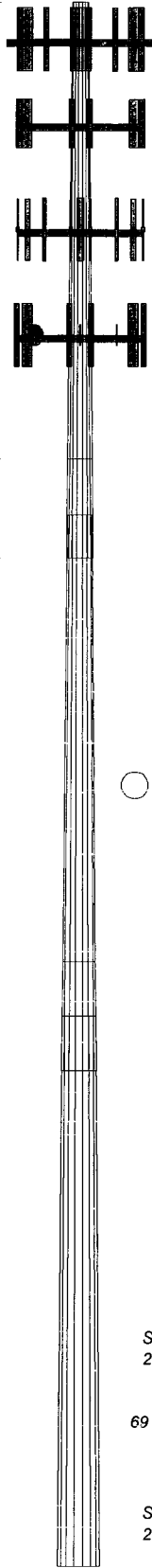
105.3 ft

95.8 ft

57.5 ft

47.2 ft

0.0 ft



### DESIGNED APPURTENANCE LOADING

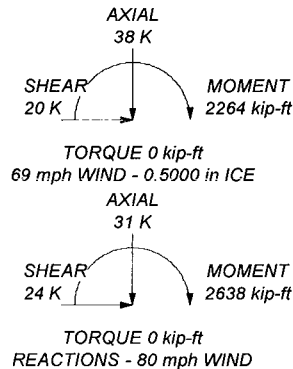
TYPE	ELEVATION	TYPE	ELEVATION
4' x 12' T-Arm (Sprint)	145	(2) 7770.00 w/ 2" Pipe (ATI)	137
4' x 12' T-Arm (Sprint)	145	(2) 7770.00 w/ 2" Pipe (ATI)	137
4' x 12' T-Arm (Sprint)	145	(4) 14" x 12" x 5" TMA (ATI)	137
(2) 76" x 14" x 7" Panel w/ Mount Pipe (Partially Shielded) (Sprint)	145	(4) 14" x 12" x 5" TMA (ATI)	137
(2) 76" x 14" x 7" Panel w/ Mount Pipe (Partially Shielded) (Sprint)	145	(4) 14" x 12" x 5" TMA (ATI)	137
(2) 76" x 14" x 7" Panel w/ Mount Pipe (Partially Shielded) (Sprint)	145	PiROD 13' Low Profile Platform (ATI)	137
(2) 76" x 14" x 7" Panel w/ Mount Pipe (Partially Shielded) (Sprint)	145	(2) FD9R6004/2C-3L (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	(2) LPA-80080/6CF w/ MP (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	(2) LPA-80080/6CF w/ MP (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	(2) LPA-80080/6CF w/ MP (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	PiROD 13' Low Profile Platform (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	Antel BXA-70080/6CF w/ MP (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	Antel BXA-70080/6CF w/ MP (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	Antel BXA-70080/6CF w/ MP (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	Antel BXA-171085/12BF with Mount Pipe (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	Antel BXA-171085/12BF with Mount Pipe (Verizon)	127
(2) RRU's 24" x 13" x 7" (60 LBs) (Fully Exposed) (Sprint)	145	Antel BXA-171085/12BF with Mount Pipe (Verizon)	127
RRU Filters 24" x 13" x 7" (53 LBs) (Partially Shielded) (Sprint)	145	Antel BXA-171085/12BF with Mount Pipe (Verizon)	127
RRU Filters 24" x 13" x 7" (53 LBs) (Partially Shielded) (Sprint)	145	(2) FD9R6004/2C-3L (Verizon)	127
RRU Filters 24" x 13" x 7" (53 LBs) (Partially Shielded) (Sprint)	145	(2) FD9R6004/2C-3L (Verizon)	127
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	(4) 72" x 12" x 6" w/ MP (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	(4) 72" x 12" x 6" w/ MP (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	(4) 72" x 12" x 6" w/ MP (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	(2) 12" x 5" x 4" (TMA/BTS/CPL) (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	(2) 12" x 6" x 4" (TMA/BTS/CPL) (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	(2) 12" x 6" x 4" (TMA/BTS/CPL) (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	GPS (Landlord Reserved)	117
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	145	GPS (Landlord Reserved)	117
GPS (Sprint)	145	PiROD 13' Low Profile Platform (Landlord Reserved)	117
(2) 7770.00 w/ 2" Pipe (ATI)	137	24" Dish (Landlord Reserved)	117

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	A572-50	50 ksi	65 ksi

### TOWER DESIGN NOTES

1. Tower is located in Litchfield County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. TOWER RATING: 100%



	<b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	Job: <b>CT46144-A</b> Project: <b>121779 (100%)</b> Client: TowerCo Code: TIA/EIA-222-F Path: L:\2012\1779_Gamwell\Property_CITask_1\Models\PSARC\CT2021-ERP.dwg	Drawn by: Kingsley Date: 10/05/12 Scale: NTS Dwg No. E-1
	Execute and Deliver		



<b>tnxTower</b>  <b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	<b>Job</b> CT46144-A	<b>Page</b> 4 of 16
	<b>Project</b> 121779 (100%)	<b>Date</b> 17:10:09 10/05/12
	<b>Client</b> TowerCo	<b>Designed by</b> Kingsley

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>1</sub> A <sub>1</sub> Front ft <sup>2</sup>	C <sub>1</sub> A <sub>1</sub> Side ft <sup>2</sup>	Weight K
4' x 12' T-Arm (Sprint)	A	None		0.0000	145.00	No Ice 7.00 1/2" Ice 9.70	7.00 9.70	0.33 0.43
4' x 12' T-Arm (Sprint)	B	None		0.0000	145.00	No Ice 7.00 1/2" Ice 9.70	7.00 9.70	0.33 0.43
4' x 12' T-Arm (Sprint)	C	None		0.0000	145.00	No Ice 7.00 1/2" Ice 9.70	7.00 9.70	0.33 0.43
****								
(2) 7770.00 w/ 2" Pipe (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	137.00	No Ice 6.22 1/2" Ice 6.77	4.35 5.20	0.06 0.10
(2) 7770.00 w/ 2" Pipe (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	137.00	No Ice 6.22 1/2" Ice 6.77	4.35 5.20	0.06 0.10
(2) 7770.00 w/ 2" Pipe (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	137.00	No Ice 6.22 1/2" Ice 6.77	4.35 5.20	0.06 0.10
(4) 14" x 12" x 5" TMA (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	137.00	No Ice 1.63 1/2" Ice 1.81	0.68 0.81	0.01 0.02
(4) 14" x 12" x 5" TMA (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	137.00	No Ice 1.63 1/2" Ice 1.81	0.68 0.81	0.01 0.02
(4) 14" x 12" x 5" TMA (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	137.00	No Ice 1.63 1/2" Ice 1.81	0.68 0.81	0.01 0.02
PiROD 13' Low Profile Platform (AT&T)	C	None		0.0000	137.00	No Ice 15.70 1/2" Ice 20.10	15.70 20.10	1.30 1.76
****								
(2) LPA-80080/6CF w/ MP (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 4.35 1/2" Ice 4.79	10.51 11.56	0.04 0.10
(2) LPA-80080/6CF w/ MP (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 4.35 1/2" Ice 4.79	10.51 11.56	0.04 0.10
(2) LPA-80080/6CF w/ MP (Verizon)	C	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 4.35 1/2" Ice 4.79	10.51 11.56	0.04 0.10
PiROD 13' Low Profile Platform (Verizon)	C	None		0.0000	127.00	No Ice 15.70 1/2" Ice 20.10	15.70 20.10	1.30 1.76
Antel BXA-70080/6CF w/ MP (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 6.03 1/2" Ice 6.59	6.22 7.39	0.04 0.10
Antel BXA-70080/6CF w/ MP (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 6.03 1/2" Ice 6.59	6.22 7.39	0.04 0.10
Antel BXA-70080/6CF w/ MP (Verizon)	C	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 6.03 1/2" Ice 6.59	6.22 7.39	0.04 0.10
Antel BXA-171085/12BF with Mount Pipe (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 4.98 1/2" Ice 5.53	5.23 6.40	0.04 0.08
Antel BXA-171085/12BF with Mount Pipe (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	127.00	No Ice 4.98 1/2" Ice 5.53	5.23 6.40	0.04 0.08

<b>tnxTower</b>  <b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	<b>Job</b>	CT46144-A	<b>Page</b>	6 of 16
	<b>Project</b>	121779 (100%)	<b>Date</b>	17:10:09 10/05/12
	<b>Client</b>	TowerCo	<b>Designed by</b>	Kingsley

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>1</sub> Front	C <sub>A</sub> A <sub>1</sub> Side	Weight	
			Horz	Vert						
			Lateral		°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
			ft	ft						
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	B	From Leg	3.00	0.00	0.0000	145.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.01 0.01
(2) Combiners 12" x 6" x 2" (10LBs) (Shielded) (Sprint)	C	From Leg	3.00	0.00	0.0000	145.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.01 0.01
(2) Combiners 12" x 6" x 2" (10LBs) (Partially Shielded) (Sprint)	A	From Leg	3.00	0.00	0.0000	145.00	No Ice 1/2" Ice	0.00 0.00	0.23 0.35	0.01 0.01
(2) Combiners 12" x 6" x 2" (10LBs) (Partially Shielded) (Sprint)	B	From Leg	3.00	0.00	0.0000	145.00	No Ice 1/2" Ice	0.00 0.00	0.23 0.35	0.01 0.01
(2) Combiners 12" x 6" x 2" (10LBs) (Partially Shielded) (Sprint)	C	From Leg	3.00	0.00	0.0000	145.00	No Ice 1/2" Ice	0.00 0.00	0.23 0.35	0.01 0.01
GPS (Sprint)	C	From Leg	3.00	0.00	0.0000	145.00	No Ice 1/2" Ice	0.20 0.29	0.20 0.29	0.01 0.01
****LRL****										
(4) 72" x 12" x 6" w/ MP (Landlord Reserved)	A	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	8.40 8.95	6.63 7.44	0.07 0.14
(4) 72" x 12" x 6" w/ MP (Landlord Reserved)	B	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	8.40 8.95	6.63 7.44	0.07 0.14
(4) 72" x 12" x 6" w/ MP (Landlord Reserved)	C	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	8.40 8.95	6.63 7.44	0.07 0.14
(2) 12" x 6" x 4" (TMA/BTS/CPL) (Landlord Reserved)	A	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	0.70 0.82	0.63 0.82	0.02 0.03
(2) 12" x 6" x 4" (TMA/BTS/CPL) (Landlord Reserved)	B	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	0.70 0.82	0.63 0.82	0.02 0.03
(2) 12" x 6" x 4" (TMA/BTS/CPL) (Landlord Reserved)	C	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	0.70 0.82	0.63 0.82	0.02 0.03
GPS (Landlord Reserved)	A	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	0.30 0.43	0.30 0.43	0.00 0.00
GPS (Landlord Reserved)	B	From Leg	3.00	0.00	0.0000	117.00	No Ice 1/2" Ice	0.30 0.43	0.30 0.43	0.00 0.00
PiROD 13' Low Profile Platform (Landlord Reserved)	A	None			0.0000	117.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1.30 1.76

<b>tnxTower</b>  <b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	Job	CT46144-A	Page	8 of 16
	Project	121779 (100%)	Date	17:10:09 10/05/12
	Client	TowerCo	Designed by	Kingsley

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L2	105.25 - 95.8	33.774	29	3.1946	0.0011
L3	99.88 - 57.5	30.294	29	2.9998	0.0009
L4	57.5 - 47.2	9.605	29	1.5724	0.0003
L5	52.35 - 0	7.987	29	1.4285	0.0003

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.00	4' x 12' T-Arm	29	65.776	4.1204	0.0019	15323
137.00	(2) 7770.00 w/ 2" Pipe	29	58.780	3.9819	0.0017	4662
127.00	(2) LPA-80080/6CF w/ MP	29	50.282	3.7875	0.0016	2492
117.00	24" Dish	29	42.268	3.5515	0.0014	1699

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	148.5 - 105.25	121.921	5	7.4062	0.0034
L2	105.25 - 95.8	59.851	4	5.6641	0.0019
L3	99.88 - 57.5	53.692	4	5.3191	0.0016
L4	57.5 - 47.2	17.039	4	2.7897	0.0006
L5	52.35 - 0	14.170	4	2.5347	0.0005

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.00	4' x 12' T-Arm	5	116.466	7.3025	0.0033	8847
137.00	(2) 7770.00 w/ 2" Pipe	5	104.091	7.0574	0.0031	2691
127.00	(2) LPA-80080/6CF w/ MP	5	89.056	6.7135	0.0028	1436
117.00	24" Dish	5	74.876	6.2958	0.0024	977

### Compression Checks

### Pole Design Data

<b>tnxTower</b>  <b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	<b>Job</b> CT46144-A	<b>Page</b> 10 of 16
	<b>Project</b> 121779 (100%)	<b>Date</b> 17:10:09 10/05/12
	<b>Client</b> TowerCo	<b>Designed by</b> Kingsley

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>
	79.6737									
	79.6737 - 77.6579					39.000	32.1652	-13.60	1254.44	0.011
	77.6579 - 75.6421					39.000	32.5479	-13.93	1269.37	0.011
	75.6421 - 73.6263					39.000	32.9305	-14.26	1284.29	0.011
	73.6263 - 71.6105					39.000	33.3131	-14.59	1299.21	0.011
	71.6105 - 69.5947					39.000	33.6958	-14.93	1314.14	0.011
	69.5947 - 67.5789					39.000	34.0784	-15.27	1329.06	0.011
	67.5789 - 65.5632					39.000	34.4611	-15.62	1343.98	0.012
	65.5632 - 63.5474					39.000	34.8437	-15.97	1358.91	0.012
	63.5474 - 61.5316					39.000	35.2264	-16.32	1373.83	0.012
	61.5316 - 59.5158					39.000	35.6090	-16.67	1388.75	0.012
L4	59.5158 - 57.5	TP39.16x36.599x0.4058	10.30	0.00	0.0	39.000	35.9917	-17.03	1403.68	0.012
	57.5 - 56.47	H1-3 (1.33 CR) - 4/5				30.000	46.9470	-17.26	1408.41	0.012
	56.47 - 55.44	H1-3 (1.33 CR) - 4/4				30.000	47.2769	-17.48	1418.31	0.012
	55.44 - 54.41	H1-3 (1.33 CR) - 4/3				30.000	47.6068	-17.70	1428.20	0.012
	54.41 - 53.38	H1-3 (1.33 CR) - 4/2				30.000	47.9366	-17.92	1438.10	0.012
	53.38 - 52.35	H1-3 (1.33 CR) - 4				30.000	48.2665	-18.14	1447.99	0.013
	52.35 - 47.2	H1-3 (1.33 CR) - 4				30.000	49.9158	-10.54	1497.47	0.007
L5	52.35 - 47.2	TP48x37.0679x0.375	52.35	0.00	0.0	39.000	44.9538	-9.44	1753.20	0.005
	47.2 - 44.7158					39.000	45.5713	-20.48	1777.28	0.012
	44.7158 - 42.2316					39.000	46.1887	-20.99	1801.36	0.012
	42.2316 - 39.7474					39.000	46.8062	-21.51	1825.44	0.012
	39.7474 - 37.2632					39.000	47.4237	-22.04	1849.52	0.012
	37.2632 - 34.7789					39.000	48.0411	-22.56	1873.60	0.012
	34.7789 - 32.2947					39.000	48.6586	-23.10	1897.69	0.012
	32.2947 - 29.8105					39.000	49.2761	-23.64	1921.77	0.012
	29.8105 - 27.3263					39.000	49.8935	-24.18	1945.85	0.012
	27.3263 - 24.8421					39.000	50.5110	-24.73	1969.93	0.013
	24.8421 - 22.3579					39.000	51.1285	-25.29	1994.01	0.013
	22.3579 - 19.8737					39.000	51.7459	-25.85	2018.09	0.013
	19.8737 - 17.3895					39.000	52.3634	-26.42	2042.17	0.013
	17.3895 - 14.9053					39.000	52.9809	-26.99	2066.25	0.013



<b>tnxTower</b>  <b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	<b>Job</b>	CT46144-A	<b>Page</b>	12 of 16
	<b>Project</b>	121779 (100%)	<b>Date</b>	17:10:09 10/05/12
	<b>Client</b>	TowerCo	<b>Designed by</b>	Kingsley

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 $\frac{f_{by}}{F_{by}}$
L2	105.25	TP30.5x27.008x0.252	459.20	-37.921	30.000	1.264	0.00	0.000	30.000	0.000
	105.25 - 104.176		478.45	-38.375	30.000	1.279	0.00	0.000	30.000	0.000
	104.176 - 103.102		497.77	-38.795	30.000	1.293	0.00	0.000	30.000	0.000
	103.102 - 102.028		517.19	-39.182	30.000	1.306	0.00	0.000	30.000	0.000
	102.028 - 100.954		536.67	-39.538	30.000	1.318	0.00	0.000	30.000	0.000
	100.954 - 99.88		287.76	-19.131	30.000	0.638	0.00	0.000	30.000	0.000
	99.88 - 95.8		323.67	-18.981	39.000	0.487	0.00	0.000	39.000	0.000
L3	95.8 - 93.7842	TP36.599x28.4883x0.3125	648.80	-37.049	39.000	0.950	0.00	0.000	39.000	0.000
	93.7842 - 91.7684		686.42	-38.181	39.000	0.979	0.00	0.000	39.000	0.000
	91.7684 - 89.7526		724.27	-39.255	39.000	1.007	0.00	0.000	39.000	0.000
	89.7526 - 87.7368		762.37	-40.276	39.000	1.033	0.00	0.000	39.000	0.000
	87.7368 - 85.7211		800.71	-41.246	39.000	1.058	0.00	0.000	39.000	0.000
	85.7211 - 83.7053		839.28	-42.168	39.000	1.081	0.00	0.000	39.000	0.000
	83.7053 - 81.6895		878.09	-43.044	39.000	1.104	0.00	0.000	39.000	0.000
	81.6895 - 79.6737		917.14	-43.877	39.000	1.125	0.00	0.000	39.000	0.000
	79.6737 - 77.6579		956.42	-44.669	39.000	1.145	0.00	0.000	39.000	0.000
	77.6579 - 75.6421		995.93	-45.422	39.000	1.165	0.00	0.000	39.000	0.000
	75.6421 - 73.6263		1035.68	-46.138	39.000	1.183	0.00	0.000	39.000	0.000
	73.6263 - 71.6105		1075.66	-46.820	39.000	1.201	0.00	0.000	39.000	0.000
	71.6105 - 69.5947		1115.87	-47.468	39.000	1.217	0.00	0.000	39.000	0.000
	69.5947 - 67.5789		1156.31	-48.085	39.000	1.233	0.00	0.000	39.000	0.000
	67.5789 - 65.5632		1196.97	-48.672	39.000	1.248	0.00	0.000	39.000	0.000
	65.5632 - 63.5474		1237.86	-49.230	39.000	1.262	0.00	0.000	39.000	0.000
	63.5474 - 61.5316		1278.97	-49.762	39.000	1.276	0.00	0.000	39.000	0.000
61.5316 - 59.5158	1320.32	-50.267	39.000	1.289	0.00	0.000	39.000	0.000		
L4	59.5158 - 57.5	TP39.16x36.599x0.4058	1361.88	-50.749	39.000	1.301	0.00	0.000	39.000	0.000
	57.5 - 56.47		1383.21	-39.437	30.000	1.315	0.00	0.000	30.000	0.000
	56.47 - 55.44		1404.59	-39.487	30.000	1.316	0.00	0.000	30.000	0.000
	55.44 - 54.41		1426.04	-39.533	30.000	1.318	0.00	0.000	30.000	0.000
	54.41 - 53.38		1447.54	-39.576	30.000	1.319	0.00	0.000	30.000	0.000
L5	53.38 - 52.35	TP48x37.0679x0.375	1469.12	-39.616	30.000	1.321	0.00	0.000	30.000	0.000
	52.35 - 47.2		847.98	-21.373	30.000	0.712	0.00	0.000	30.000	0.000
	47.2 - 44.7158		730.10	-20.955	39.000	0.537	0.00	0.000	39.000	0.000
	44.7158 - 42.2316		1631.23	-45.553	39.000	1.168	0.00	0.000	39.000	0.000
	42.2316 -		1684.69	-45.790	39.000	1.174	0.00	0.000	39.000	0.000
			1738.44	-46.007	39.000	1.180	0.00	0.000	39.000	0.000

<b>tnxTower</b>  <b>Vertical Solutions Inc</b> 2002 Production Drive Apex, NC 27539 Phone: (888) 321-6167 FAX: (919) 321-1768	<b>Job</b> CT46144-A	<b>Page</b> 14 of 16
	<b>Project</b> 121779 (100%)	<b>Date</b> 17:10:09 10/05/12
	<b>Client</b> TowerCo	<b>Designed by</b> Kingsley

Section No.	Elevation ft	Size	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
			$\frac{P}{P_a}$	$\frac{f_{bx}}{F_{bx}}$	$\frac{f_{by}}{F_{by}}$			
	131.2 - 129.037		0.009	0.420	0.000	0.428	1.333	HI-3 ✓
	129.037 - 126.875		0.011	0.476	0.000	0.487	1.333	HI-3 ✓
	126.875 - 124.713		0.011	0.562	0.000	0.574	1.333	HI-3 ✓
	124.713 - 122.55		0.011	0.643	0.000	0.654	1.333	HI-3 ✓
	122.55 - 120.388		0.011	0.717	0.000	0.729	1.333	HI-3 ✓
	120.388 - 118.225		0.011	0.787	0.000	0.798	1.333	HI-3 ✓
	118.225 - 116.063		0.015	0.868	0.000	0.883	1.333	HI-3 ✓
	116.063 - 113.9		0.015	0.962	0.000	0.977	1.333	HI-3 ✓
	113.9 - 111.738		0.015	1.050	0.000	1.065	1.333	HI-3 ✓
	111.738 - 109.575		0.015	1.132	0.000	1.147	1.333	HI-3 ✓
	109.575 - 107.412		0.015	1.209	0.000	1.224	1.333	HI-3 ✓
	107.412 - 105.25		0.015	1.281	0.000	1.295	1.333	HI-3 ✓
L2	105.25 - 104.176	TP30.5x27.008x0.252	0.014	1.264	0.000	1.278	1.333	HI-3 ✓
	104.176 - 103.102		0.014	1.279	0.000	1.294	1.333	HI-3 ✓
	103.102 - 102.028		0.014	1.293	0.000	1.308	1.333	HI-3 ✓
	102.028 - 100.954		0.014	1.306	0.000	1.320	1.333	HI-3 ✓
	100.954 - 99.88		0.014	1.318	0.000	1.332	1.333	HI-3 ✓
	99.88 - 95.8		0.007	0.638	0.000	0.645	1.333	HI-3 ✓
L3	99.88 - 95.8	TP36.599x28.4883x0.3125	0.005	0.487	0.000	0.492	1.333	HI-3 ✓
	95.8 - 93.7842		0.010	0.950	0.000	0.960	1.333	HI-3 ✓
	93.7842 - 91.7684		0.010	0.979	0.000	0.989	1.333	HI-3 ✓
	91.7684 - 89.7526		0.010	1.007	0.000	1.017	1.333	HI-3 ✓
	89.7526 - 87.7368		0.010	1.033	0.000	1.043	1.333	HI-3 ✓
	87.7368 - 85.7211		0.010	1.058	0.000	1.068	1.333	HI-3 ✓
	85.7211 - 83.7053		0.010	1.081	0.000	1.092	1.333	HI-3 ✓
	83.7053 - 81.6895		0.011	1.104	0.000	1.114	1.333	HI-3 ✓

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	<b>Project</b> 121779 (100%)	<b>Date</b> 17:10:09 10/05/12
	<b>Client</b> TowerCo	<b>Designed by</b> Kingsley

Section No.	Elevation ft	Size	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
			$\frac{P}{P_a}$	$\frac{f_{bx}}{F_{bx}}$	$\frac{f_{by}}{F_{by}}$			
	27.3263 - 24.8421		0.013	1.204	0.000	✓ 1.216	1.333	HI-3 ✓
	24.8421 - 22.3579		0.013	1.206	0.000	✓ 1.219	1.333	HI-3 ✓
	22.3579 - 19.8737		0.013	1.209	0.000	✓ 1.221	1.333	HI-3 ✓
	19.8737 - 17.3895		0.013	1.211	0.000	✓ 1.224	1.333	HI-3 ✓
	17.3895 - 14.9053		0.013	1.212	0.000	✓ 1.226	1.333	HI-3 ✓
	14.9053 - 12.4211		0.013	1.214	0.000	✓ 1.227	1.333	HI-3 ✓
	12.4211 - 9.93684		0.013	1.215	0.000	✓ 1.229	1.333	HI-3 ✓
	9.93684 - 7.45263		0.013	1.216	0.000	✓ 1.230	1.333	HI-3 ✓
	7.45263 - 4.96842		0.014	1.217	0.000	✓ 1.231	1.333	HI-3 ✓
	4.96842 - 2.48421		0.014	1.218	0.000	✓ 1.232	1.333	HI-3 ✓
	2.48421 - 0		0.014	1.218	0.000	✓ 1.232	1.333	HI-3 ✓

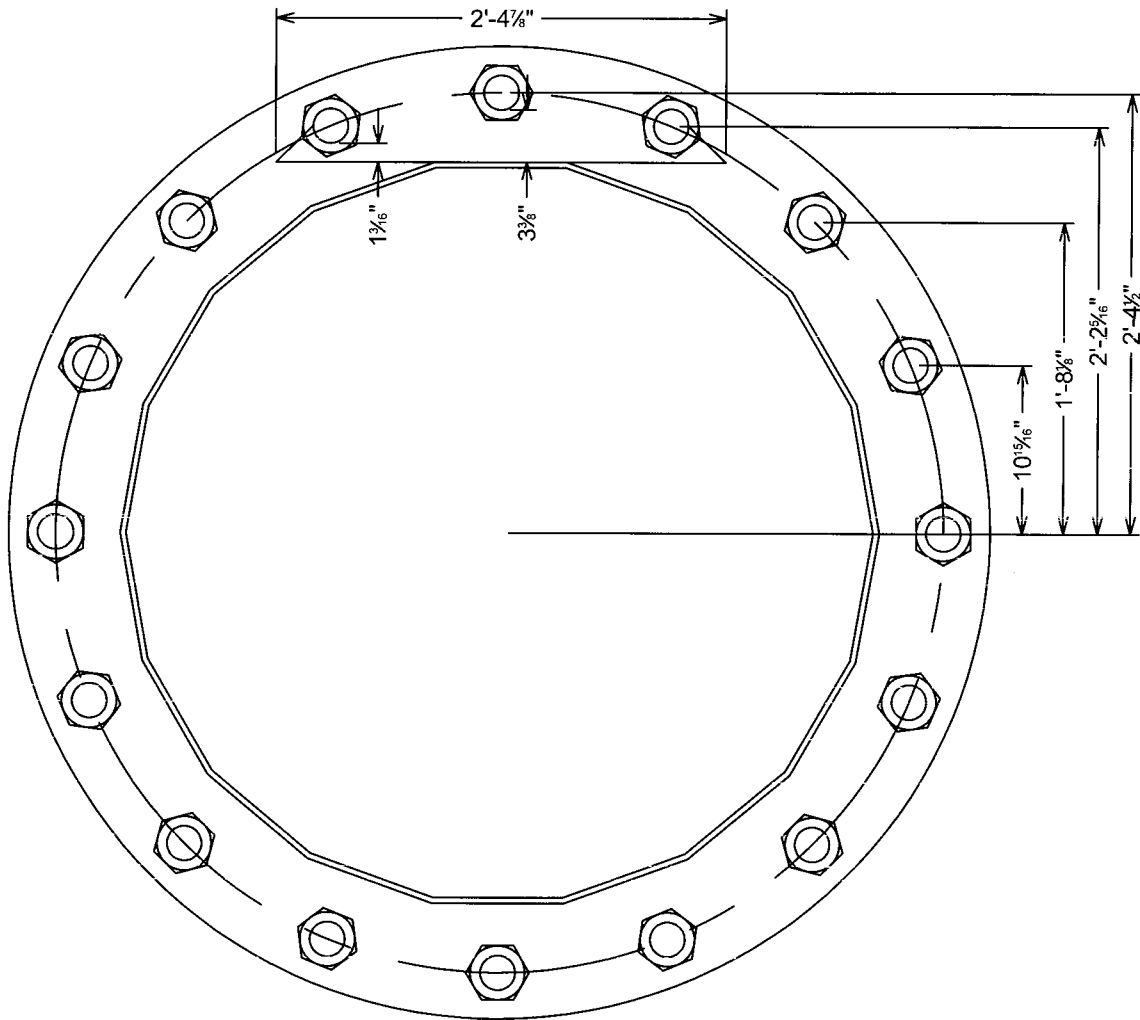
### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
L1	148.5 - 105.25	Pole	TP27.008x18x0.1875	1	-9.24	829.79	97.2	Pass
L2	105.25 - 95.8	Pole	TP30.5x27.008x0.252	2	-9.93	919.29	100.0	Pass
L3	95.8 - 57.5	Pole	TP36.599x28.4883x0.3125	3	-17.03	1871.11	98.5	Pass
L4	57.5 - 47.2	Pole	TP39.16x36.599x0.4058	4	-18.14	1930.17	100.0	Pass
L5	47.2 - 0	Pole	TP48x37.0679x0.375	5	-30.53	2946.92	92.4	Pass
Summary								
Pole (L4)							100.0	Pass
<b>RATING =</b>							<b>100.0</b>	<b>Pass</b>



SELF-SUPPORTING POLE STRUCTURE REINFORCEMENT DESIGN, TIA-222-F

Pole Geometry										CT2021	121779
Section #	Sides #	Elevation (ft)		Dia Across Flats (in)		Splice (ft)	Thickness (in)	Material Specification	Taper (in/ft)	Length (ft)	
		TOP	BOTTOM	TOP	BOTTOM						
1	18	148.5	95.8	18.00	28.99	4.08	0.1875	A572-65	0.209	52.70	
2	18	99.9	47.2	27.76	38.77	5.33	0.3125	A572-65	0.209	52.68	
3	18	52.5	0.0	37.03	48.00	0.00	0.3750	A572-65	0.209	52.53	



**Base Plate**

SCALE: 1" = 1'-0"

PROJECT INFORMATION:

**CAMMILLETTI PROPERTY  
CT46144-A**

10 ASHPOTAG RD  
NORFOLK, CT 06058  
(LITCHFIELD COUNTY)

0	10-02-12	SBA Towers
REV	DATE:	Issued For:
DRAWN BY: KCI		CHECKED BY: AVF
SHEET NUMBER: <b>BPL</b>		REVISION: 0
VSI #: 121779		

PLANS PREPARED FOR:



5900 Broken Sound Pkwy  
Boca Raton, FL 33487  
Office (919) 557-0555

PLANS PREPARED BY:



2002 Production Drive  
Apex, NC 27539  
Office: (888) 321-6167  
Fax: (919) 321-1768

$$\mathbf{m} := \begin{pmatrix} 3 + \frac{3}{8} \\ 1 + \frac{3}{16} \\ 0 \\ 0 \\ 0 \end{pmatrix} \cdot \text{in} \quad M_{PL} := \left[ \left( \frac{Q}{2} \right) \cdot R \cdot m \right]$$

$$M_{PL} = \begin{pmatrix} 39.6 \\ 25.8 \\ 0.0 \\ 0.0 \\ 0.0 \end{pmatrix} \cdot \text{kip} \cdot \text{ft} \quad \sum M_{PL} = 784.8 \cdot \text{kip} \cdot \text{in}$$

$$f_b := \frac{\sum M_{PL}}{\left( \frac{b_{\text{eff}} \cdot t^2}{6} \right)} \quad f_b = 40.8 \cdot \text{ksi}$$

$$F'_b := \text{AS1} \cdot 0.75 \cdot F_y$$

$$r_b := \frac{f_b}{F'_b}$$

$$r_b = 68\%$$

Output: Factored Reactions

$$M_u := 1.3 \cdot M \quad = \text{Overturning moment at top of pier, factored} \quad M_u = 3429 \cdot \text{k} \cdot \text{ft}$$

$$P_u := 1.3P \quad = \text{Axial load at top of pier, factored} \quad P_u = 40 \cdot \text{k}$$

$$V_u := 1.3V \quad = \text{Shear load at top of pier, factored} \quad V_u = 31 \cdot \text{k}$$

Output: Dead Loads

$$V_{\text{pier}} := \frac{\pi \cdot B_{\text{pier}}^2}{4} (z_{\text{pad}} - t_{\text{pad}} + H)$$

$$D_{\text{pier}} := V_{\text{pier}} \cdot \gamma_c \quad D_{\text{pier}} = 22.4 \cdot \text{k}$$

$$V_{\text{pad}} := B_{\text{pad}}^2 \cdot t_{\text{pad}}$$

$$D_{\text{pad}} := V_{\text{pad}} \cdot \gamma_c \quad D_{\text{pad}} = 227.8 \cdot \text{k}$$

$$V_{\text{soil}} := B_{\text{pad}}^2 (z_{\text{pad}} - t_{\text{pad}}) - V_{\text{pier}} + \frac{\pi \cdot B_{\text{pier}}^2}{4} \cdot H$$

$$D_{\text{soil}} := V_{\text{soil}} \cdot \gamma_s \quad D_{\text{soil}} = 207.0 \cdot \text{k}$$

Output: Eccentricity:

$$P_{\text{total}} := D_{\text{pier}} + D_{\text{pad}} + D_{\text{soil}} + P \quad P_{\text{total}} = 488.2 \cdot \text{k}$$

$$M_{\text{total}} := M + V \cdot (H + z_{\text{pad}}) \quad M_{\text{total}} = 2818 \cdot \text{k} \cdot \text{ft}$$

$$\text{ecc} := \frac{M_{\text{total}}}{P_{\text{total}}} \quad \text{ecc} = 5.77 \text{ ft}$$

$$\text{limit} := \frac{B_{\text{pad}}}{6} \quad \text{limit} = 3.75 \text{ ft}$$

$$X := 3 \cdot \left( \frac{B_{\text{pad}}}{2} - \text{ecc} \right) \quad X = 16.43 \text{ ft}$$

Output: Bearing pressures, unfactored (bottom)

$$q_{\text{max1}} := \frac{P_{\text{total}}}{B_{\text{pad}}^2} + \frac{M_{\text{total}}}{B_{\text{pad}}^3} \quad q_{\text{max1}} = 2449 \cdot \text{psf}$$

$$q_{\text{max2}} := \frac{2 \cdot P_{\text{total}}}{3 \cdot B_{\text{pad}}^2 \cdot \left( 0.5 - \frac{\text{ecc}}{B_{\text{pad}}} \right)} \quad q_{\text{max2}} = 2641 \cdot \text{psf}$$

$$q_{\text{max}} := \text{if} \left( \text{ecc} > \frac{B_{\text{pad}}}{6}, q_{\text{max2}}, q_{\text{max1}} \right) \quad q_{\text{max}} = 2641 \cdot \text{psf}$$

$$q_{\text{min1}} := \frac{P_{\text{total}}}{B_{\text{pad}}^2} - \frac{M_{\text{total}}}{B_{\text{pad}}^3} \quad q_{\text{min1}} = 1212 \cdot \text{psf}$$

$$M_{uR} := R_r \cdot \frac{B_{cant}}{2}$$

$$M_{uT} := \text{if} \left[ X > B_{cant}, R_t \cdot \frac{2}{3} \cdot B_{cant}, R_t \cdot \left( B_{cant} - \frac{X}{3} \right) \right]$$

$$M_{uBot} := M_{uR} + M_{uT}$$

$$M_{uBot} = 1240 \cdot \text{k} \cdot \text{ft}$$


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$$V_{uBot} := R_r + R_t$$

$$V_{uBot} = 260 \cdot \text{k}$$


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Calculate Factored Forces in Pad, Negative:

$$M_{uTop} := q_{uTop} \cdot B_{cant} \cdot B_{pad} \cdot \frac{B_{cant}}{2}$$

$$M_{uTop} = 831 \cdot \text{k} \cdot \text{ft}$$


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$$V_{uTop} := q_{uTop} \cdot B_{cant} \cdot B_{pad}$$

$$V_{uTop} = 208 \cdot \text{k}$$


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Calculate Overturning Stability:

$$OTM_{total} := M + V \cdot (H + z_{pad})$$

$$OTM_{total} = 2818 \cdot \text{k} \cdot \text{ft}$$


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$$OTM_r := P_{total} \cdot \frac{B_{pad}}{2}$$

$$OTM_r = 5492 \cdot \text{k} \cdot \text{ft}$$


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Calculate Sliding Stability:

$$H_{total} := V$$

$$H_{total} = 24 \cdot \text{k}$$


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$$H_r := (D_{pier} + D_{pad} + P) \cdot \psi$$

$$H_r = 166 \cdot \text{k}$$


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Design Checks, Soil:

$$r_{q'} := \frac{q'_{max}}{q'_{all}}$$

Net Bearing Pressure

$$r_{q'} = 30\%$$


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$$r_{OTM} := \frac{OTM_{total}}{OTM_r}$$

Overturning Stability

$$r_{OTM} = 77\%$$


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$$r_H := \frac{H_{total}}{H_r} \cdot \frac{1.5}{2.0}$$

Sliding Stability

$$r_H = 29\%$$


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Design Checks, Pier Structure:

$$r_{mPier} := \frac{M_{uPier}}{\Phi M_{nPier}}$$

$$r_{mPier} = 61\%$$


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$$r_{vPier} := \frac{V_{uPier}}{\Phi V_{cPier}}$$

$$r_{vPier} = 6\%$$


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