



# 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)

### VIA ELECTRONIC MAIL

May 31, 2019

Kyle Richers  
Transcend Wireless  
10 Industrial Avenue, Suite 3  
Mahwah, NJ 07430

RE: **EM-SPRINT-051-190417** – Sprint notice of intent to modify an existing telecommunications facility located at 100 Reef Road, Fairfield, Connecticut.

Dear Mr. Richers:

The Connecticut Siting Council (Council) is in receipt of your correspondence of May 23, 2019 submitted in response to the Council's April 18, 2019 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman  
Executive Director

MAB/IN/emr



CONNECTICUT SITING COUNCIL

Affirmative Action / Equal Opportunity Employer

**Robidoux, Evan**

---

**From:** Kyle Richers <krichers@transcendwireless.com>  
**Sent:** Thursday, May 23, 2019 9:12 AM  
**To:** Robidoux, Evan  
**Cc:** CSC-DL Siting Council; jshappy@transcendwireless.com  
**Subject:** RE: Council Incomplete Letter for EM-SPRINT-051-190417-ReefRd-Fairfield CT03XC354  
**Attachments:** CT03XC354\_MIMO\_Structral Anlaysia\_05.09.2019.pdf

Good Morning,

Please find the attached revised structural, per the comments received on the counsel on 4/24.

**From:** Robidoux, Evan <Evan.Robidoux@ct.gov>  
**Sent:** Wednesday, April 24, 2019 9:51 AM  
**To:** 'Kyle Richers' <krichers@transcendwireless.com>  
**Cc:** CSC-DL Siting Council <Siting.Council@ct.gov>  
**Subject:** Council Incomplete Letter for EM-SPRINT-051-190417-ReefRd-Fairfield

Please see the attached correspondence.

Evan Robidoux  
Clerk Typist  
Connecticut Siting Council  
10 Franklin Square  
New Britain, CT 06051

May 9, 2019

Mike Kithcart  
Transcend Wireless  
10 Industrial Avenue, Suite 3  
Mahwah, NJ 07430

Ramaker & Associates, Inc.  
855 Community Drive  
Sauk City, WI 53583

**SUBJECT: STRUCTURAL ASSESSMENT  
145-FOOT MONOPOLE TOWER**

**CARRIER: SPRINT**

**SITE: CT03XC354  
100 REEF ROAD  
FAIRFIELD, FAIRFIELD COUNTY, CONNECTICUT 06824  
RAMAKER & ASSOCIATES PROJECT NUMBER: 39391**

**RESULTS: TOWER: 96.0% PASS  
FOUNDATION: 79.5% PASS**

Dear Mike Kithcart:


Ramaker & Associates, Inc. (RAMAKER) respectfully submits this structural assessment for the above-mentioned site. The purpose of this report is to determine the structural integrity of the existing structure with the existing and proposed loading. Engineering recommendations regarding the analysis results are provided in the following pages.

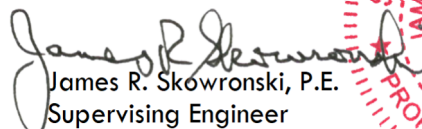
RAMAKER developed a finite element model of the tower using tnxTower analysis software. All information contained herein is valid only for the described structure configuration and loading conditions. RAMAKER reserves the right to modify our recommendations should alterations to the tower loading occur.

If you have any questions or comments, please do not hesitate to contact our office.

Sincerely,

RAMAKER & ASSOCIATES, INC.

  
Thomas E. Moore  
Project Engineer

  
James R. Skowronski, P.E.  
Supervising Engineer



**ANALYSIS CRITERIA**

State Building Code	2018 CT State Building Code
Adopted Building Code	2015 IBC
Referenced Standard	TIA-222-G
Risk Category	II
Ultimate Design Wind Speed, $V_{ult}$	125 mph (3 sec. gust)
Nominal Design Wind Speed, $V_{asd}$	97 mph (3 sec. gust)
Design Wind Speed w/ Ice	50 mph (3 sec. gust)
Ice Thickness	3/4 inch
Exposure Category	B
Topographic Feature	None

**SUPPORTING DOCUMENTATION**

- Structural analysis by Centek Engineering, job number 18000.61, dated October 8, 2018
- Structural analysis by Destek Engineering, job number 1629043, dated October 17, 2016
- Structural analysis by Destek Engineering, job number 1629043, dated August 19, 2016
- Structural analysis by Fullerton Engineering, site number CT03XC354, dated May 13, 2015
- Structural analysis by KMB Design Group, project number 332.1475, dated February 26, 2014
- Structural modification by Hudson Design Group, job number 5022.01, dated March 14, 2012
- Construction drawings by RAMAKER, project number 39391
- Site visit(s) conducted by RAMAKER
- Other pertinent data procured or assumed by RAMAKER during site due diligence activities

**TOWER LOADING**

RAMAKER understands that the loading to be used for this analysis will consist of the antenna equipment, mount, and cable configurations as shown in the following chart:

Elevation	Appurtenance	Mount	Coax	Owner	Status
143	(1) Lightning Rod	(3) T-Arm	(15) 1-1/4	Nextel	Existing
	(1) 12' Omni				
	(2) 10' Dipole				
	(9) 5' Panel Antenna				
135	(6) AIR 21 B2A/B4P	(3) T-Arm	(6) 1-5/8 Ext (6) 1-1/4 Ext (1) 7/8	T-Mobile	Existing
	(6) RFS ATMAA1412D-1A20				
	(1) 10' Dipole				
127	(3) Powerwave 7770.00	(3) T-Arm	(12) 1-5/8 (1) Fiber (2) Power  (1) Fiber Ext (4) Power Ext	AT&T	Existing
	(3) Powerwave P65-16-XLH-RR				
	(3) Ericsson RRUS-11				
	(3) Ericsson RRUS-12				
	(6) Powerwave LGP21401				
	(3) Kathrein 80010965				
	(3) CCI HPA-65R-BUU-H6				
	(3) Ericsson RRUS-32				
	(6) Ericsson 4478 B14				
	(3) Ericsson 4426 B66				
	(6) Kaelus DBCT108F1V92-1				
(3) Raycap DC6-48-60-18-8F					
110.33	(1) 12' Omni	(1) Platform w/Handrail	(1) 7/8	Sprint	Existing
	<b>(3) RFS APXVSP18-C-A20</b>		(3) Hybrid Ext  <b>(3) Hybrid Ext</b>		<b>Remove</b>
	<b>(3) Commscope NNVV-65B-R4</b>				<b>Proposed</b>
	<b>(3) Nokia AAHC</b>				
	<b>(3) ALU 800MHz 2x50W RRH</b>				
	(3) ALU 800MHz 2x50W RRH	Collar Mount	Existing		
	(3) ALU 1900MHz 4x45W RRH				
(3) RFS FIM800CAB-A1D					

**TOWER RESULTS**

The maximum tower member stress capacities under the loading conditions previously described are as follows:

<b>Component Type</b>	<b>Percent Capacity</b>	<b>Pass/Fail</b>
Section 1	63.2	Pass
Section 2	84.5	Pass
Section 3	96.0	Pass
Anchor Rod	90.2	Pass
Base Plate	58.6	Pass
<b>RATING</b>	<b>96.0</b>	<b>PASS</b>

The existing flat plate reinforcement (from 0 to 66 feet) was determined by RAMAKER to be generally ineffective. As a result, it was not considered to provide any additional strength in the tower. Tower loading was taken from the latest structural analysis.

Results of the analysis show that the existing tower will be stressed to a maximum of 96.0 percent of capacity. Therefore, the existing tower will pass the TIA-222-G analysis requirements under proposed loading conditions.

**FOUNDATION RESULTS**

The maximum foundation stress capacities are as follows:

<b>Component Type</b>	<b>Percent Capacity</b>	<b>Pass/Fail</b>
Caisson - Soil Interaction	79.5	Pass
Caisson - Structural	61.3	Pass
<b>RATING</b>	<b>79.5</b>	<b>PASS</b>

The foundation was analyzed utilizing the structural reports referenced above. Results of the analysis show that the existing foundation will be stressed to a maximum of 79.5 percent of capacity. Therefore, the existing foundation will pass the TIA-222-G analysis requirements under proposed loading conditions.

**LIMITATIONS**

The recommendations contained within this report were developed using the supporting documentation as previously described. All recommendations pertain only to the proposed antenna installation activities as described in this report. RAMAKER assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to the following:

- Missing, corroding, and/or deteriorating members
- Improper manufacturing and/or construction
- Improper maintenance

RAMAKER assumes no responsibility for modifications completed prior to or hereafter in which RAMAKER was not directly involved. These modifications include but are not limited to the following:

- Replacing or strengthening bracing members
- Reinforcing or extending vertical members
- Installing or removing antenna mounting gates or side arms
- Changing loading configurations

The tower owner is responsible for verifying that the existing loading on the structure is consistent with the loading applied to the structure within this report. If there is any information contrary to that contained herein, or if there are any defects arising from the original design, material, fabrication and erection deficiencies, this report should be disregarded and RAMAKER should be contacted immediately. RAMAKER is not liable for any representation, recommendation, or conclusion not expressly stated herein.

This analysis pertains only to the tower structure, and no analyses or conclusions were made regarding the antenna and equipment mounting structure(s). Analysis and certification of the antenna and equipment mounting structure(s) is performed and submitted separately.

**ATTACHMENTS**

- Analysis Figures
- Analysis Calculations



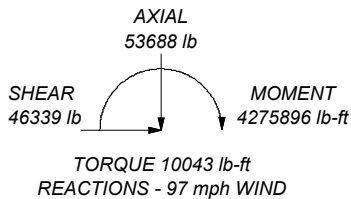
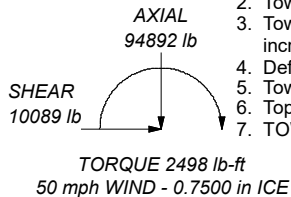
**DESIGNED APPURTENANCE LOADING**

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8x8'	143	HPA-65R-BUU-H6 w/Mount Pipe	127
10' Dipole	143	RRUS-32	127
10' Dipole	143	RRUS-32	127
12' Omni	143	RRUS-32	127
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	143	(2) RRUS-4478 B14	127
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	143	(2) RRUS-4478 B14	127
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	143	(2) RRUS-4478 B14	127
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	143	RRUS-4426 B66	127
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	143	RRUS-4426 B66	127
Side Arm Mount [SO 202-1] (Nextel)	143	RRUS-4426 B66	127
Side Arm Mount [SO 202-1] (Nextel)	143	(2) DBCT108F1V92-1	127
T-Arm Mount [TA 602-1] (Nextel)	143	(2) DBCT108F1V92-1	127
T-Arm Mount [TA 602-1] (Nextel)	143	(2) DBCT108F1V92-1	127
T-Arm Mount [TA 602-1] (Nextel)	143	DC6-48-60-18-8F	127
(2) AIR 21 B2A/B4P w/Mount Pipe	135	DC6-48-60-18-8F	127
(2) AIR 21 B2A/B4P w/Mount Pipe	135	DC6-48-60-18-8F	127
(2) AIR 21 B2A/B4P w/Mount Pipe	135	T-Arm Mount [TA 602-1] (ATT)	127
(2) ATMAA1412D-1A20	135	T-Arm Mount [TA 602-1] (ATT)	127
(2) ATMAA1412D-1A20	135	T-Arm Mount [TA 602-1] (ATT)	127
(2) ATMAA1412D-1A20	135	12' Omni	110.33
10' Dipole	135	NNVV-65B-R4 w/Mount Pipe	110.33
T-Arm Mount [TA 602-1] (TMO)	135	NNVV-65B-R4 w/Mount Pipe	110.33
T-Arm Mount [TA 602-1] (TMO)	135	NNVV-65B-R4 w/Mount Pipe	110.33
T-Arm Mount [TA 602-1] (TMO)	135	AAHC	110.33
7770.00 w/Mount Pipe	127	AAHC	110.33
7770.00 w/Mount Pipe	127	AAHC	110.33
7770.00 w/Mount Pipe	127	800MHz 2x50W RRH	110.33
P65-16-XLH-RR w/Mount Pipe	127	800MHz 2x50W RRH	110.33
P65-16-XLH-RR w/Mount Pipe	127	800MHz 2x50W RRH	110.33
P65-16-XLH-RR w/Mount Pipe	127	FIM800CAB-A1D	110.33
RRUS-11	127	FIM800CAB-A1D	110.33
RRUS-11	127	FIM800CAB-A1D	110.33
RRUS-11	127	(3) 6"x2" Pipe Mount	110.33
RRUS-12	127	(3) 6"x2" Pipe Mount	110.33
RRUS-12	127	(3) 6"x2" Pipe Mount	110.33
RRUS-12	127	(3) 6"x2" Pipe Mount	110.33
RRUS-12	127	Miscellaneous [NA 510-1] (Sprint)	110.33
RRUS-12	127	Platform Mount [LP 405-1] (Sprint)	110.33
(2) LGP214nn	127	800MHz 2x50W RRH	107
(2) LGP214nn	127	800MHz 2x50W RRH	107
80010965 w/Mount Pipe	127	800MHz 2x50W RRH	107
80010965 w/Mount Pipe	127	1900MHz 4x45W RRH	107
80010965 w/Mount Pipe	127	1900MHz 4x45W RRH	107
80010965 w/Mount Pipe	127	1900MHz 4x45W RRH	107
HPA-65R-BUU-H6 w/Mount Pipe	127	1900MHz 4x45W RRH	107
HPA-65R-BUU-H6 w/Mount Pipe	127	(3) 6"x2" Pipe Mount (Sprint)	107
HPA-65R-BUU-H6 w/Mount Pipe	127	Collar Mount (Sprint)	107

**MATERIAL STRENGTH**

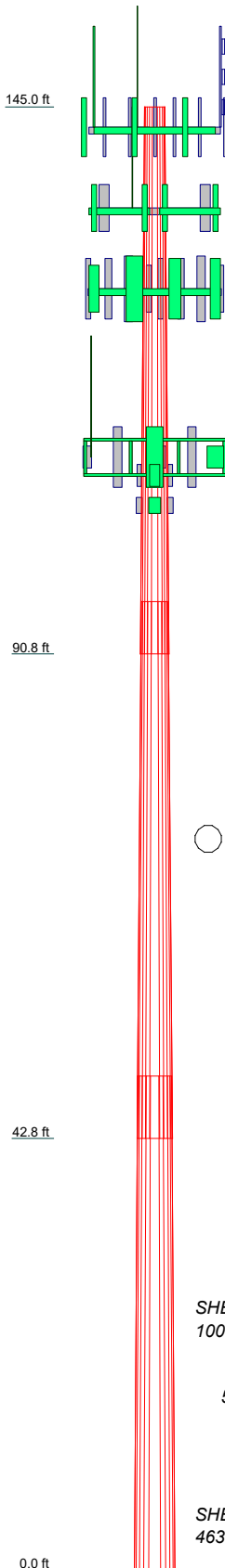
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

ALL REACTIONS ARE FACTORED



**TOWER DESIGN NOTES**

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 96%



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (lb)
1	54.17	12	0.2813	5.17	23.6100	33.4800	A572-65	4717.9
2	53.17	12	0.3750	6.17	31.9760	41.6400	A572-65	7959.0
3	49.00	12	0.4375	39.7691	48.6900		A572-65	10286.3
								22863.2

	<b>Ramaker &amp; Associates, Inc</b>			Job: <b>CT03XC354</b>
	855 Community Drive			Project: <b>39391</b>
	Sauk City, WI 53583			Client: <b>Sprint</b>
	Phone: (608) 643-4100			Drawn by: <b>TEM</b>
FAX: (608) 643-7999			Date: <b>05/09/19</b>	App'd:
			Code: <b>TIA-222-G</b>	Scale: <b>NTS</b>
			Path: <b>H:\39300\39391\Structural\tnx\39391 rev1.dwg</b>	Dwg No. <b>E-1</b>

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 1 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

## Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).

Basic wind speed of 97 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line 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>SR Members Have Cut Ends</li> <li>SR Members Are Concentric</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>Add IBC .6D+W Combination</li> <li>Sort Capacity Reports By Component</li> <li>Triangulate Diamond Inner Bracing</li> <li>Treat Feed Line Bundles As Cylinder</li> <li>Ignore KL/ry For 60 Deg. Angle Legs</li> </ul>	<ul style="list-style-type: none"> <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 Feed Line Torque</li> <li>Include Angle Block Shear Check</li> <li>Use TIA-222-G Bracing Resist. Exemption</li> <li>Use TIA-222-G Tension Splice Exemption</li> <li style="background-color: #e0e0e0;">Poles</li> <li>√ Include Shear-Torsion Interaction</li> <li>Always Use Sub-Critical Flow</li> <li>Use Top Mounted Sockets</li> <li>Pole Without Linear Attachments</li> <li>Pole With Shroud Or No Appurtenances</li> <li>Outside and Inside Corner Radii Are Known</li> </ul>
--	---	--

## Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	145.00-90.83	54.17	5.17	12	23.6100	33.4800	0.2813	1.1250	A572-65 (65 ksi)



<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 3 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

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

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C <sub>AA</sub>	Weight	
							ft <sup>2</sup> /ft	plf	
*****									
1 1/4 (Nextel)	A	No	No	Inside Pole	143.00 - 30.00	15	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
7/8 (TMO)	B	No	No	Inside Pole	135.00 - 30.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.54 0.54 0.54
*****									
1 5/8 (ATT)	A	No	No	Inside Pole	127.00 - 30.00	12	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.04 1.04 1.04
Fiber Cable (ATT)	A	No	No	Inside Pole	127.00 - 30.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.17 0.17 0.17
Power Cable (ATT)	A	No	No	Inside Pole	127.00 - 30.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.60 0.60 0.60
*****									
5/8x10 Flat Plate	C	No	No	CaAa (Out Of Face)	30.00 - 0.00	2	No Ice 1/2" Ice 1" Ice	1.67 1.78 1.89	21.27 25.41 29.90
5/8x10 Flat Plate	C	No	No	CaAa (Out Of Face)	30.00 - 0.00	4	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	21.27 25.41 29.90
5/8x10 Flat Plate	C	No	No	CaAa (Out Of Face)	47.50 - 30.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	21.27 25.41 29.90
5/8x7 Flat Plate	C	No	No	CaAa (Out Of Face)	66.50 - 47.50	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	14.89 17.86 21.18
*****									

**Feed Line/Linear Appurtenances Section Areas**

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight lb
L1	145.00-90.83	A	0.000	0.000	15.506	0.000	1110.31
		B	0.000	0.000	26.235	0.000	299.45
		C	0.000	0.000	40.834	0.000	262.64
L2	90.83-42.83	A	0.000	0.000	20.580	0.000	1263.36
		B	0.000	0.000	28.512	0.000	325.44
		C	0.000	0.000	72.288	0.000	2698.71
L3	42.83-0.00	A	0.000	0.000	5.502	0.000	337.77
		B	0.000	0.000	7.623	0.000	87.01
		C	0.000	0.000	19.327	100.000	5574.28

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

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b>	CT03XC354	<b>Page</b>	4 of 17
	<b>Project</b>	39391	<b>Date</b>	14:01:45 05/09/19
	<b>Client</b>	Sprint	<b>Designed by</b>	TEM

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_{AA}$ In Face ft <sup>2</sup>	$C_{AA}$ Out Face ft <sup>2</sup>	Weight lb
L1	145.00-90.83	A	1.702	0.000	0.000	46.370	0.000	1623.90
		B		0.000	0.000	51.586	0.000	1137.35
		C		0.000	0.000	92.520	0.000	1499.88
L2	90.83-42.83	A	1.609	0.000	0.000	61.541	0.000	1945.00
		B		0.000	0.000	56.063	0.000	1236.07
		C		0.000	0.000	166.635	0.000	6575.23
L3	42.83-0.00	A	1.438	0.000	0.000	15.914	0.000	505.44
		B		0.000	0.000	14.689	0.000	316.72
		C		0.000	0.000	43.413	121.447	9883.06

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	145.00-90.83	0.7993	1.6389	0.2391	1.6296
L2	90.83-42.83	0.6318	3.4884	-0.0830	3.3925
L3	42.83-0.00	-5.8693	4.3496	-5.4619	4.5463

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

### Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	$K_a$ No Ice	$K_a$ Ice
L1	4	1 5/8	90.83 - 135.00	1.0000	1.0000
L1	5	1 1/4	90.83 - 135.00	1.0000	1.0000
L1	11	Fiber Cable	90.83 - 127.00	1.0000	1.0000
L1	12	Power Cable	90.83 - 127.00	1.0000	1.0000
L1	14	1 1/4	90.83 - 110.33	1.0000	1.0000
L1	15	1 1/4	90.83 - 110.33	1.0000	1.0000
L1	16	7/8	90.83 - 110.33	1.0000	1.0000
L2	4	1 5/8	42.83 - 90.83	1.0000	1.0000
L2	5	1 1/4	42.83 - 90.83	1.0000	1.0000
L2	11	Fiber Cable	42.83 - 90.83	1.0000	1.0000
L2	12	Power Cable	42.83 - 90.83	1.0000	1.0000
L2	14	1 1/4	42.83 - 90.83	1.0000	1.0000
L2	15	1 1/4	42.83 - 90.83	1.0000	1.0000
L2	16	7/8	42.83 - 90.83	1.0000	1.0000

### Discrete Tower Loads

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 5 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz	Vert					
*****									
Lightning Rod 5/8x8'	A	From Face	0.00	0.0000	143.00	No Ice	0.50	0.50	8.35
			0.00			1/2" Ice	1.31	1.31	13.91
			4.00			1" Ice	2.14	2.14	24.58
10' Dipole	B	From Face	3.00	0.0000	143.00	No Ice	3.00	3.00	30.00
			6.00			1/2" Ice	4.03	4.03	51.79
			5.00			1" Ice	5.03	5.03	80.14
10' Dipole	C	From Face	3.00	0.0000	143.00	No Ice	3.00	3.00	30.00
			6.00			1/2" Ice	4.03	4.03	51.79
			5.00			1" Ice	5.03	5.03	80.14
12' Omni	C	From Leg	1.00	0.0000	143.00	No Ice	3.30	3.30	35.00
			0.00			1/2" Ice	4.53	4.53	59.18
			6.00			1" Ice	5.78	5.78	91.13
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	A	From Face	3.00	0.0000	143.00	No Ice	4.58	10.29	46.55
			2.00			1/2" Ice	5.13	11.48	113.30
			0.00			1" Ice	5.65	12.37	187.93
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	B	From Face	3.00	0.0000	143.00	No Ice	4.58	10.29	46.55
			2.00			1/2" Ice	5.13	11.48	113.30
			0.00			1" Ice	5.65	12.37	187.93
(3) LPA-80080-6CF-EDIN-X w/Mount Pipe	C	From Face	3.00	0.0000	143.00	No Ice	4.58	10.29	46.55
			2.00			1/2" Ice	5.13	11.48	113.30
			0.00			1" Ice	5.65	12.37	187.93
Side Arm Mount [SO 202-1] (Nextel)	A	From Face	3.00	0.0000	143.00	No Ice	2.96	2.53	110.00
			-6.00			1/2" Ice	4.10	3.51	133.55
			0.00			1" Ice	5.24	4.49	157.10
Side Arm Mount [SO 202-1] (Nextel)	B	From Face	3.00	0.0000	143.00	No Ice	2.96	2.53	110.00
			-6.00			1/2" Ice	4.10	3.51	133.55
			0.00			1" Ice	5.24	4.49	157.10
T-Arm Mount [TA 602-1] (Nextel)	A	From Face	3.00	0.0000	143.00	No Ice	7.28	3.02	258.10
			0.00			1/2" Ice	9.52	4.20	330.12
			0.00			1" Ice	11.76	5.38	402.14
T-Arm Mount [TA 602-1] (Nextel)	B	From Face	3.00	0.0000	143.00	No Ice	7.28	3.02	258.10
			0.00			1/2" Ice	9.52	4.20	330.12
			0.00			1" Ice	11.76	5.38	402.14
T-Arm Mount [TA 602-1] (Nextel)	C	From Face	3.00	0.0000	143.00	No Ice	7.28	3.02	258.10
			0.00			1/2" Ice	9.52	4.20	330.12
			0.00			1" Ice	11.76	5.38	402.14
*****									
(2) AIR 21 B2A/B4P w/Mount Pipe	A	From Leg	3.00	0.0000	135.00	No Ice	6.37	5.74	104.90
			0.00			1/2" Ice	6.85	6.59	162.47
			0.00			1" Ice	7.30	7.31	226.82
(2) AIR 21 B2A/B4P w/Mount Pipe	B	From Leg	3.00	0.0000	135.00	No Ice	6.37	5.74	104.90
			0.00			1/2" Ice	6.85	6.59	162.47
			0.00			1" Ice	7.30	7.31	226.82
(2) AIR 21 B2A/B4P w/Mount Pipe	C	From Leg	3.00	0.0000	135.00	No Ice	6.37	5.74	104.90
			0.00			1/2" Ice	6.85	6.59	162.47
			0.00			1" Ice	7.30	7.31	226.82
(2) ATMAA1412D-1A20	A	From Leg	3.00	0.0000	135.00	No Ice	1.00	0.41	13.00
			0.00			1/2" Ice	1.13	0.50	20.62
			1.00			1" Ice	1.26	0.59	30.11
(2) ATMAA1412D-1A20	B	From Leg	3.00	0.0000	135.00	No Ice	1.00	0.41	13.00
			0.00			1/2" Ice	1.13	0.50	20.62
			1.00			1" Ice	1.26	0.59	30.11
(2) ATMAA1412D-1A20	C	From Leg	3.00	0.0000	135.00	No Ice	1.00	0.41	13.00
			0.00			1/2" Ice	1.13	0.50	20.62
			1.00			1" Ice	1.26	0.59	30.11
10' Dipole	C	From Leg	1.50	0.0000	135.00	No Ice	3.00	3.00	30.00

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 6 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAA Front ft <sup>2</sup>	CAA Side ft <sup>2</sup>	Weight lb	
T-Arm Mount [TA 602-1] (TMO)	A	From Leg	0.00	0.0000	135.00	1/2" Ice	4.03	4.03	51.79
			5.00			1" Ice	5.03	5.03	80.14
			3.00			No Ice	7.28	3.02	258.10
			0.00			1/2" Ice	9.52	4.20	330.12
T-Arm Mount [TA 602-1] (TMO)	B	From Leg	0.00	0.0000	135.00	1" Ice	11.76	5.38	402.14
			3.00			No Ice	7.28	3.02	258.10
			0.00			1/2" Ice	9.52	4.20	330.12
			0.00			1" Ice	11.76	5.38	402.14
T-Arm Mount [TA 602-1] (TMO)	C	From Leg	3.00	0.0000	135.00	No Ice	7.28	3.02	258.10
			0.00			1/2" Ice	9.52	4.20	330.12
			0.00			1" Ice	11.76	5.38	402.14
			0.00			1" Ice	11.76	5.38	402.14
*****									
7770.00 w/Mount Pipe	A	From Face	3.00	0.0000	127.00	No Ice	5.66	4.11	30.35
			6.00			1/2" Ice	6.04	4.76	76.38
			0.00			1" Ice	6.44	5.43	128.70
7770.00 w/Mount Pipe	B	From Face	3.00	0.0000	127.00	No Ice	5.66	4.11	30.35
			6.00			1/2" Ice	6.04	4.76	76.38
			0.00			1" Ice	6.44	5.43	128.70
7770.00 w/Mount Pipe	C	From Face	3.00	0.0000	127.00	No Ice	5.66	4.11	30.35
			6.00			1/2" Ice	6.04	4.76	76.38
			0.00			1" Ice	6.44	5.43	128.70
P65-16-XLH-RR w/Mount Pipe	A	From Face	3.00	0.0000	127.00	No Ice	8.13	6.13	85.90
			-6.00			1/2" Ice	8.59	7.07	149.07
			0.00			1" Ice	9.05	7.90	219.94
P65-16-XLH-RR w/Mount Pipe	B	From Face	3.00	0.0000	127.00	No Ice	8.13	6.13	85.90
			-6.00			1/2" Ice	8.59	7.07	149.07
			0.00			1" Ice	9.05	7.90	219.94
P65-16-XLH-RR w/Mount Pipe	C	From Face	3.00	0.0000	127.00	No Ice	8.13	6.13	85.90
			-6.00			1/2" Ice	8.59	7.07	149.07
			0.00			1" Ice	9.05	7.90	219.94
RRUS-11	A	From Face	0.50	0.0000	127.00	No Ice	2.78	1.19	50.71
			0.00			1/2" Ice	2.99	1.33	71.49
			3.00			1" Ice	3.21	1.49	95.32
RRUS-11	B	From Face	0.50	0.0000	127.00	No Ice	2.78	1.19	50.71
			0.00			1/2" Ice	2.99	1.33	71.49
			3.00			1" Ice	3.21	1.49	95.32
RRUS-11	C	From Face	0.50	0.0000	127.00	No Ice	2.78	1.19	50.71
			0.00			1/2" Ice	2.99	1.33	71.49
			3.00			1" Ice	3.21	1.49	95.32
RRUS-12	A	From Face	0.50	0.0000	127.00	No Ice	3.14	1.26	57.98
			0.00			1/2" Ice	3.36	1.42	81.02
			1.00			1" Ice	3.59	1.57	107.26
RRUS-12	B	From Face	0.50	0.0000	127.00	No Ice	3.14	1.26	57.98
			0.00			1/2" Ice	3.36	1.42	81.02
			1.00			1" Ice	3.59	1.57	107.26
RRUS-12	C	From Face	0.50	0.0000	127.00	No Ice	3.14	1.26	57.98
			0.00			1/2" Ice	3.36	1.42	81.02
			1.00			1" Ice	3.59	1.57	107.26
(2) LGP214nn	A	From Face	3.00	0.0000	127.00	No Ice	1.11	0.21	14.10
			0.00			1/2" Ice	1.25	0.28	21.30
			0.00			1" Ice	1.39	0.35	30.39
(2) LGP214nn	B	From Face	3.00	0.0000	127.00	No Ice	1.11	0.21	14.10
			0.00			1/2" Ice	1.25	0.28	21.30
			0.00			1" Ice	1.39	0.35	30.39
(2) LGP214nn	C	From Face	3.00	0.0000	127.00	No Ice	1.11	0.21	14.10
			0.00			1/2" Ice	1.25	0.28	21.30
			0.00			1" Ice	1.39	0.35	30.39

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 7 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz	Vert					
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	lb
80010965 w/Mount Pipe	A	From Face	3.00	0.0000	127.00	No Ice	14.04	7.61	135.98
			2.00			1/2" Ice	14.67	8.88	232.31
			0.00			1" Ice	15.28	9.93	337.65
80010965 w/Mount Pipe	B	From Face	3.00	0.0000	127.00	No Ice	14.04	7.61	135.98
			2.00			1/2" Ice	14.67	8.88	232.31
			0.00			1" Ice	15.28	9.93	337.65
80010965 w/Mount Pipe	C	From Face	3.00	0.0000	127.00	No Ice	14.04	7.61	135.98
			2.00			1/2" Ice	14.67	8.88	232.31
			0.00			1" Ice	15.28	9.93	337.65
HPA-65R-BUU-H6 w/Mount Pipe	A	From Face	3.00	0.0000	127.00	No Ice	9.90	7.18	76.55
			-2.00			1/2" Ice	10.47	8.36	153.48
			0.00			1" Ice	11.01	9.26	238.58
HPA-65R-BUU-H6 w/Mount Pipe	B	From Face	3.00	0.0000	127.00	No Ice	9.90	7.18	76.55
			-2.00			1/2" Ice	10.47	8.36	153.48
			0.00			1" Ice	11.01	9.26	238.58
HPA-65R-BUU-H6 w/Mount Pipe	C	From Face	3.00	0.0000	127.00	No Ice	9.90	7.18	76.55
			-2.00			1/2" Ice	10.47	8.36	153.48
			0.00			1" Ice	11.01	9.26	238.58
RRUS-32	A	From Face	3.00	0.0000	127.00	No Ice	2.69	1.59	50.80
			0.00			1/2" Ice	2.91	1.78	71.33
			0.00			1" Ice	3.14	1.97	95.01
RRUS-32	B	From Face	3.00	0.0000	127.00	No Ice	2.69	1.59	50.80
			0.00			1/2" Ice	2.91	1.78	71.33
			0.00			1" Ice	3.14	1.97	95.01
RRUS-32	C	From Face	3.00	0.0000	127.00	No Ice	2.69	1.59	50.80
			0.00			1/2" Ice	2.91	1.78	71.33
			0.00			1" Ice	3.14	1.97	95.01
(2) RRUS-4478 B14	A	From Face	3.00	0.0000	127.00	No Ice	1.84	1.06	59.90
			0.00			1/2" Ice	2.01	1.20	75.78
			0.00			1" Ice	2.19	1.34	94.29
(2) RRUS-4478 B14	B	From Face	3.00	0.0000	127.00	No Ice	1.84	1.06	59.90
			0.00			1/2" Ice	2.01	1.20	75.78
			0.00			1" Ice	2.19	1.34	94.29
(2) RRUS-4478 B14	C	From Face	3.00	0.0000	127.00	No Ice	1.84	1.06	59.90
			0.00			1/2" Ice	2.01	1.20	75.78
			0.00			1" Ice	2.19	1.34	94.29
RRUS-4426 B66	A	From Face	3.00	0.0000	127.00	No Ice	1.64	0.73	48.00
			0.00			1/2" Ice	1.80	0.84	60.82
			0.00			1" Ice	1.97	0.97	76.03
RRUS-4426 B66	B	From Face	3.00	0.0000	127.00	No Ice	1.64	0.73	48.00
			0.00			1/2" Ice	1.80	0.84	60.82
			0.00			1" Ice	1.97	0.97	76.03
RRUS-4426 B66	C	From Face	3.00	0.0000	127.00	No Ice	1.64	0.73	48.00
			0.00			1/2" Ice	1.80	0.84	60.82
			0.00			1" Ice	1.97	0.97	76.03
(2) DBCT108F1V92-1	A	From Face	3.00	0.0000	127.00	No Ice	0.60	0.32	13.90
			0.00			1/2" Ice	0.71	0.40	18.96
			0.00			1" Ice	0.81	0.49	25.57
(2) DBCT108F1V92-1	B	From Face	3.00	0.0000	127.00	No Ice	0.60	0.32	13.90
			0.00			1/2" Ice	0.71	0.40	18.96
			0.00			1" Ice	0.81	0.49	25.57
(2) DBCT108F1V92-1	C	From Face	3.00	0.0000	127.00	No Ice	0.60	0.32	13.90
			0.00			1/2" Ice	0.71	0.40	18.96
			0.00			1" Ice	0.81	0.49	25.57
DC6-48-60-18-8F	A	From Face	3.00	0.0000	127.00	No Ice	0.92	0.92	32.80
			0.00			1/2" Ice	1.46	1.46	50.52
			0.00			1" Ice	1.64	1.64	70.72



<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b>	CT03XC354	<b>Page</b>	8 of 17
	<b>Project</b>	39391	<b>Date</b>	14:01:45 05/09/19
	<b>Client</b>	Sprint	<b>Designed by</b>	TEM

<i>Description</i>	<i>Face or Leg</i>	<i>Offset Type</i>	<i>Offsets: Horz Lateral Vert</i> <i>ft</i> <i>ft</i> <i>ft</i>	<i>Azimuth Adjustment</i>  <i>°</i>	<i>Placement</i>  <i>ft</i>	<i>CAA Front</i>  <i>ft²</i>	<i>CAA Side</i>  <i>ft²</i>	<i>Weight</i>  <i>lb</i>	
DC6-48-60-18-8F	B	From Face	3.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice	0.92 1.46 1.64	0.92 1.46 1.64	32.80 50.52 70.72
DC6-48-60-18-8F	C	From Face	3.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice	0.92 1.46 1.64	0.92 1.46 1.64	32.80 50.52 70.72
T-Arm Mount [TA 602-1] (ATT)	A	From Face	3.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice	7.28 9.52 11.76	3.02 4.20 5.38	258.10 330.12 402.14
T-Arm Mount [TA 602-1] (ATT)	B	From Face	3.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice	7.28 9.52 11.76	3.02 4.20 5.38	258.10 330.12 402.14
T-Arm Mount [TA 602-1] (ATT)	C	From Face	3.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice	7.28 9.52 11.76	3.02 4.20 5.38	258.10 330.12 402.14
***** 12' Omni	C	From Leg	6.00 0.00 6.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	3.30 4.53 5.78	3.30 4.53 5.78	35.00 59.18 91.13
***** NNVV-65B-R4 w/Mount Pipe	A	From Face	3.00 0.00 0.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	12.51 13.11 13.67	7.41 8.60 9.50	102.95 193.58 292.74
NNVV-65B-R4 w/Mount Pipe	B	From Face	3.00 0.00 0.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	12.51 13.11 13.67	7.41 8.60 9.50	102.95 193.58 292.74
NNVV-65B-R4 w/Mount Pipe	C	From Face	3.00 0.00 0.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	12.51 13.11 13.67	7.41 8.60 9.50	102.95 193.58 292.74
AAHC	A	From Face	3.00 -6.00 0.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	4.20 4.46 4.72	2.07 2.26 2.46	103.70 136.01 172.07
AAHC	B	From Face	3.00 -6.00 0.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	4.20 4.46 4.72	2.07 2.26 2.46	103.70 136.01 172.07
AAHC	C	From Face	3.00 -6.00 0.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	4.20 4.46 4.72	2.07 2.26 2.46	103.70 136.01 172.07
800MHz 2x50W RRH	A	From Face	3.00 -6.00 1.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.93 2.11 2.29	64.00 86.12 111.30
800MHz 2x50W RRH	B	From Face	3.00 -6.00 1.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.93 2.11 2.29	64.00 86.12 111.30
800MHz 2x50W RRH	C	From Face	3.00 -6.00 1.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.93 2.11 2.29	64.00 86.12 111.30
FIM800CAB-A1D	A	From Face	3.00 0.00 -1.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	1.22 1.36 1.51	1.04 1.17 1.31	53.00 65.42 80.18
FIM800CAB-A1D	B	From Face	3.00 0.00 -1.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	1.22 1.36 1.51	1.04 1.17 1.31	53.00 65.42 80.18
FIM800CAB-A1D	C	From Face	3.00 0.00 -1.00	0.0000	110.33	No Ice 1/2" Ice 1" Ice	1.22 1.36 1.51	1.04 1.17 1.31	53.00 65.42 80.18
(3) 6'x2" Pipe Mount	A	From Face	3.00	0.0000	110.33	No Ice	1.43	1.43	21.96

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 9 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz	Vert					
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	lb
			0.00			1/2" Ice	1.92	1.92	32.79
			0.00			1" Ice	2.29	2.29	47.67
(3) 6'x2" Pipe Mount	B	From Face	3.00		0.0000	No Ice	1.43	1.43	21.96
			0.00			1/2" Ice	1.92	1.92	32.79
			0.00			1" Ice	2.29	2.29	47.67
(3) 6'x2" Pipe Mount	C	From Face	3.00		0.0000	No Ice	1.43	1.43	21.96
			0.00			1/2" Ice	1.92	1.92	32.79
			0.00			1" Ice	2.29	2.29	47.67
Miscellaneous [NA 510-1] (Sprint)	C	None			0.0000	No Ice	6.00	6.00	255.70
						1/2" Ice	8.50	8.50	339.50
						1" Ice	11.00	11.00	423.30
Platform Mount [LP 405-1] (Sprint)	C	None			0.0000	No Ice	20.80	20.80	1800.00
						1/2" Ice	28.10	28.10	2066.00
						1" Ice	35.40	35.40	2332.00
*****									
800MHz 2x50W RRH	A	From Face	0.50		0.0000	No Ice	2.06	1.93	64.00
			0.00			1/2" Ice	2.24	2.11	86.12
			-1.50			1" Ice	2.43	2.29	111.30
800MHz 2x50W RRH	B	From Face	0.50		0.0000	No Ice	2.06	1.93	64.00
			0.00			1/2" Ice	2.24	2.11	86.12
			-1.50			1" Ice	2.43	2.29	111.30
800MHz 2x50W RRH	C	From Face	0.50		0.0000	No Ice	2.06	1.93	64.00
			0.00			1/2" Ice	2.24	2.11	86.12
			-1.50			1" Ice	2.43	2.29	111.30
1900MHz 4x45W RRH	A	From Face	0.50		0.0000	No Ice	2.32	2.24	59.50
			0.00			1/2" Ice	2.53	2.44	82.62
			1.50			1" Ice	2.74	2.65	108.98
1900MHz 4x45W RRH	B	From Face	0.50		0.0000	No Ice	2.32	2.24	59.50
			0.00			1/2" Ice	2.53	2.44	82.62
			1.50			1" Ice	2.74	2.65	108.98
1900MHz 4x45W RRH	C	From Face	0.50		0.0000	No Ice	2.32	2.24	59.50
			0.00			1/2" Ice	2.53	2.44	82.62
			1.50			1" Ice	2.74	2.65	108.98
(3) 6'x2" Pipe Mount (Sprint)	C	None			0.0000	No Ice	1.43	1.43	21.96
						1/2" Ice	1.92	1.92	32.79
						1" Ice	2.29	2.29	47.67
Collar Mount (Sprint)	C	None			0.0000	No Ice	3.00	3.00	85.00
						1/2" Ice	3.50	3.50	115.00
						1" Ice	4.00	4.00	145.00

**Force Totals**

Load Case	Vertical Forces	Sum of Forces X	Sum of Forces Z	Sum of Overturning Moments, M <sub>x</sub>	Sum of Overturning Moments, M <sub>z</sub>	Sum of Torques
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Leg Weight	22963.19					
Bracing Weight	0.00					
Total Member Self-Weight	22963.19			7480.88	12514.27	
Total Weight	44740.02			7480.88	12514.27	

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 10 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, $M_x$ lb-ft	Sum of Overturning Moments, $M_z$ lb-ft	Sum of Torques lb-ft
Wind 0 deg - No Ice		0.00	-27236.44	-2408333.93	12514.27	-5346.86
Wind 30 deg - No Ice		13622.36	-23584.39	-2084609.80	-1196199.68	-2966.37
Wind 60 deg - No Ice		23638.62	-13641.85	-1200937.89	-2081991.72	245.29
Wind 90 deg - No Ice		28961.70	0.00	7480.88	-2539283.56	3491.86
Wind 120 deg - No Ice		23898.24	13791.75	1224438.34	-2096781.17	5622.21
Wind 150 deg - No Ice		13939.01	24132.85	2145055.36	-1222459.77	6324.08
Wind 180 deg - No Ice		0.00	27236.44	2423295.68	12514.27	5346.86
Wind 210 deg - No Ice		-13622.36	23584.39	2099571.56	1221228.21	2966.37
Wind 240 deg - No Ice		-23638.62	13641.85	1215899.64	2107020.25	-245.29
Wind 270 deg - No Ice		-28961.70	0.00	7480.88	2564312.10	-3491.86
Wind 300 deg - No Ice		-23898.24	-13791.75	-1209476.58	2121809.70	-5622.21
Wind 330 deg - No Ice		-13939.01	-24132.85	-2130093.61	1247488.30	-6324.08
Member Ice	10816.92					
Total Weight Ice	85025.97			17090.24	21815.19	
Wind 0 deg - Ice		0.00	-9989.92	-923056.68	21815.19	-2151.47
Wind 30 deg - Ice		4999.59	-8653.31	-797139.60	-448795.25	-1216.73
Wind 60 deg - Ice		8694.66	-5016.26	-453444.23	-794065.77	60.28
Wind 90 deg - Ice		10089.19	0.00	17090.24	-921353.31	1335.15
Wind 120 deg - Ice		8721.99	5032.05	487966.22	-794657.28	2225.15
Wind 150 deg - Ice		5006.54	8665.34	831580.43	-448945.56	2513.15
Wind 180 deg - Ice		0.00	9989.92	957237.16	21815.19	2151.47
Wind 210 deg - Ice		-4999.59	8653.31	831320.08	492425.63	1216.73
Wind 240 deg - Ice		-8694.66	5016.26	487624.71	837696.15	-60.28
Wind 270 deg - Ice		-10089.19	0.00	17090.24	964983.69	-1335.15
Wind 300 deg - Ice		-8721.99	-5032.05	-453785.74	838287.66	-2225.15
Wind 330 deg - Ice		-5006.54	-8665.34	-797399.95	492575.94	-2513.15
Total Weight	44740.02			7480.88	12514.27	
Wind 0 deg - Service		0.00	-9324.05	-827051.75	1000.08	-1830.43
Wind 30 deg - Service		4663.44	-8073.82	-716228.88	-412787.91	-1015.50
Wind 60 deg - Service		8092.38	-4670.12	-413714.93	-716027.66	83.97
Wind 90 deg - Service		9914.67	0.00	-27.99	-872575.76	1195.39
Wind 120 deg - Service		8181.26	4721.43	416582.07	-721090.64	1924.69
Wind 150 deg - Service		4771.85	8261.58	731743.71	-421777.72	2164.97
Wind 180 deg - Service		0.00	9324.05	826995.78	1000.08	1830.43
Wind 210 deg - Service		-4663.44	8073.82	716172.91	414788.08	1015.50
Wind 240 deg - Service		-8092.38	4670.12	413658.96	718027.82	-83.97
Wind 270 deg - Service		-9914.67	0.00	-27.99	874575.93	-1195.39
Wind 300 deg - Service		-8181.26	-4721.43	-416638.04	723090.81	-1924.69
Wind 330 deg - Service		-4771.85	-8261.58	-731799.69	423777.89	-2164.97

## Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b>	CT03XC354	<b>Page</b>	11 of 17
	<b>Project</b>	39391	<b>Date</b>	14:01:45 05/09/19
	<b>Client</b>	Sprint	<b>Designed by</b>	TEM

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

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft	
L1	145 - 90.8333	Pole	Max Tension	30	0.01	1.54	0.49	
			Max. Compression	26	-40838.78	2743.41	-2376.14	
			Max. Mx	20	-16132.08	793498.95	-72.34	
			Max. My	14	-16324.51	974.00	-769842.28	
			Max. Vy	20	-27074.28	793498.95	-72.34	
			Max. Vx	14	26132.14	974.00	-769842.28	
			Max. Torque	25			2927.92	
L2	90.8333 - 42.8333	Pole	Max Tension	1	0.00	0.00	0.00	
			Max. Compression	26	-63480.12	8444.23	-8624.94	
			Max. Mx	20	-30535.88	2262867.67	-2619.01	
			Max. My	14	-30728.51	4437.42	-2163633.58	
			Max. Vy	20	-35261.10	2262867.67	-2619.01	
			Max. Vx	14	32966.67	4437.42	-2163633.58	
			Max. Torque	25			2921.41	
L3	42.8333 - 0	Pole	Max Tension	1	0.00	0.00	0.00	

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 12 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Compression	26	-94892.00	26130.16	-20169.07
			Max. M <sub>x</sub>	20	-53632.85	4275886.53	-9220.18
			Max. M <sub>y</sub>	14	-53638.94	15454.89	-4044613.50
			Max. V <sub>y</sub>	20	-46402.57	4275886.53	-9220.18
			Max. V <sub>x</sub>	14	43638.72	15454.89	-4044613.50
			Max. Torque	25			10043.44

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	35	94892.00	8694.79	-5016.34
	Max. H <sub>x</sub>	21	40266.02	46338.72	-0.00
	Max. H <sub>z</sub>	3	40266.02	0.00	43578.32
	Max. M <sub>x</sub>	2	4026160.33	0.00	43578.31
	Max. M <sub>z</sub>	8	4244994.74	-46338.71	-0.00
	Max. Torsion	25	10043.37	22302.42	38612.56
	Min. Vert	5	40266.02	-21795.78	37735.02
	Min. H <sub>x</sub>	9	40266.02	-46338.72	-0.00
	Min. H <sub>z</sub>	15	40266.02	0.00	-43578.32
	Min. M <sub>x</sub>	14	-4044613.51	0.00	-43578.31
	Min. M <sub>z</sub>	20	-4275886.53	46338.71	-0.00
	Min. Torsion	13	-10042.99	-22302.42	-38612.56

### Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear <sub>x</sub> lb	Shear <sub>z</sub> lb	Overturning Moment, M <sub>x</sub> lb-ft	Overturning Moment, M <sub>z</sub> lb-ft	Torque lb-ft
Dead Only	44740.02	-0.00	0.00	7641.48	12800.26	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	53688.03	-0.00	-43578.31	-4026160.33	15452.58	-8487.68
0.9 Dead+1.6 Wind 0 deg - No Ice	40266.02	-0.00	-43578.32	-3982394.25	11494.44	-8493.29
1.2 Dead+1.6 Wind 30 deg - No Ice	53688.03	21795.78	-37735.02	-3485412.96	-2003598.56	-4708.10
0.9 Dead+1.6 Wind 30 deg - No Ice	40266.02	21795.78	-37735.02	-3447830.87	-1984477.24	-4711.59
1.2 Dead+1.6 Wind 60 deg - No Ice	53688.03	37821.79	-21826.97	-2009294.62	-3483184.29	390.94
0.9 Dead+1.6 Wind 60 deg - No Ice	40266.02	37821.79	-21826.97	-1988590.47	-3447161.96	390.25
1.2 Dead+1.6 Wind 90 deg - No Ice	53688.03	46338.71	0.00	9218.68	-4244994.74	5542.46
0.9 Dead+1.6 Wind 90 deg - No Ice	40266.02	46338.72	0.00	6860.32	-4200631.93	5545.12
1.2 Dead+1.6 Wind 120 deg - No Ice	53688.03	38237.19	22066.80	2041759.78	-3507473.27	8925.84
0.9 Dead+1.6 Wind 120 deg - No Ice	40266.02	38237.19	22066.80	2016234.78	-3471272.89	8930.74
1.2 Dead+1.6 Wind 150 deg - No Ice	53688.03	22302.42	38612.56	3579293.01	-2047154.54	10036.87
0.9 Dead+1.6 Wind 150 deg - No Ice	40266.02	22302.42	38612.56	3536211.67	-2027581.63	10042.99
1.2 Dead+1.6 Wind 180 deg - No Ice	53688.03	-0.00	43578.31	4044613.51	15452.36	8487.43
0.9 Dead+1.6 Wind 180 deg - No Ice	40266.02	-0.00	43578.32	3996126.79	11494.32	8493.11
1.2 Dead+1.6 Wind 210 deg - No Ice	53688.03	-21795.78	37735.02	3503862.66	2034507.55	4708.18
0.9 Dead+1.6 Wind 210 deg - No Ice	40266.02	-21795.78	37735.02	3461561.24	2007469.27	4711.82
1.2 Dead+1.6 Wind 240 deg - No Ice	53688.03	-37821.79	21826.97	2027738.75	3514092.34	-390.59
0.9 Dead+1.6 Wind 240 deg - No Ice	40266.02	-37821.79	21826.97	2002316.56	3470153.87	-389.99
1.2 Dead+1.6 Wind 270 deg - No Ice	53688.03	-46338.71	0.00	9218.43	4275886.53	-5542.10
0.9 Dead+1.6 Wind 270 deg - No Ice	40266.02	-46338.72	0.00	6860.19	4223612.25	-5544.85
1.2 Dead+1.6 Wind 300 deg - No Ice	53688.03	-38237.19	-22066.80	-2023314.10	3538370.19	-8925.71
0.9 Dead+1.6 Wind 300 deg - No Ice	40266.02	-38237.19	-22066.80	-2002508.82	3494256.93	-8930.72

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 13 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Load Combination	Vertical lb	Shear <sub>x</sub> lb	Shear <sub>z</sub> lb	Overturning Moment, M <sub>x</sub> lb-ft	Overturning Moment, M <sub>z</sub> lb-ft	Torque lb-ft
1.2 Dead+1.6 Wind 330 deg - No Ice	53688.03	-22302.42	-38612.56	-3560843.39	2078051.03	-10037.17
0.9 Dead+1.6 Wind 330 deg - No Ice	40266.02	-22302.42	-38612.56	-3522482.31	2050564.20	-10043.37
1.2 Dead+1.0 Ice+1.0 Temp	94892.00	-0.02	0.02	20169.07	26130.16	-0.04
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	94892.00	-0.00	-9990.07	-1019166.04	26174.12	-2138.10
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	94892.00	4999.66	-8653.44	-879955.30	-494113.36	-1208.69
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	94892.00	8694.79	-5016.34	-499953.52	-875770.73	60.78
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	94892.00	10089.34	0.00	20204.88	-1016402.73	1327.97
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	94892.00	8722.13	5032.13	540714.61	-876379.48	2212.15
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	94892.00	5006.61	8665.48	920632.80	-494268.37	2497.78
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	94892.00	-0.00	9990.07	1059575.51	26173.67	2137.86
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	94892.00	-4999.67	8653.45	920367.09	546462.44	1208.51
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	94892.00	-8694.79	5016.34	540365.29	928122.45	-60.93
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	94892.00	-10089.35	0.00	20204.51	1068755.75	-1328.07
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	94892.00	-8722.13	-5032.12	-500307.49	928731.17	-2212.28
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	94892.00	-5006.62	-8665.48	-880225.63	546617.48	-2498.01
Dead+Wind 0 deg - Service	44740.02	-0.00	-9324.06	-850777.54	12853.28	-1827.34
Dead+Wind 30 deg - Service	44740.02	4663.44	-8073.82	-735744.01	-416661.30	-1013.40
Dead+Wind 60 deg - Service	44740.02	8092.39	-4670.12	-421729.24	-731417.34	84.50
Dead+Wind 90 deg - Service	44740.02	9914.68	0.00	7673.04	-893664.98	1194.15
Dead+Wind 120 deg - Service	44740.02	8181.27	4721.43	440069.18	-736602.61	1922.11
Dead+Wind 150 deg - Service	44740.02	4771.85	8261.58	767199.81	-425962.25	2161.61
Dead+Wind 180 deg - Service	44740.02	-0.00	9324.06	866124.20	12853.24	1827.32
Dead+Wind 210 deg - Service	44740.02	-4663.44	8073.82	751090.54	442367.99	1013.40
Dead+Wind 240 deg - Service	44740.02	-8092.39	4670.12	437075.55	757124.01	-84.50
Dead+Wind 270 deg - Service	44740.02	-9914.68	0.00	7673.00	919371.03	-1194.14
Dead+Wind 300 deg - Service	44740.02	-8181.27	-4721.43	-424722.85	762308.87	-1922.11
Dead+Wind 330 deg - Service	44740.02	-4771.85	-8261.58	-751853.30	451668.46	-2161.63

## Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.00	-44740.02	0.00	0.00	44740.02	-0.00	0.000%
2	0.00	-53688.03	-43578.31	0.00	53688.03	43578.31	0.000%
3	0.00	-40266.02	-43578.31	0.00	40266.02	43578.32	0.000%
4	21795.78	-53688.03	-37735.02	-21795.78	53688.03	37735.02	0.000%
5	21795.78	-40266.02	-37735.02	-21795.78	40266.02	37735.02	0.000%
6	37821.79	-53688.03	-21826.97	-37821.79	53688.03	21826.97	0.000%
7	37821.79	-40266.02	-21826.97	-37821.79	40266.02	21826.97	0.000%
8	46338.71	-53688.03	0.00	-46338.71	53688.03	-0.00	0.000%
9	46338.71	-40266.02	0.00	-46338.72	40266.02	-0.00	0.000%
10	38237.19	-53688.03	22066.80	-38237.19	53688.03	-22066.80	0.000%
11	38237.19	-40266.02	22066.80	-38237.19	40266.02	-22066.80	0.000%
12	22302.42	-53688.03	38612.56	-22302.42	53688.03	-38612.56	0.000%
13	22302.42	-40266.02	38612.56	-22302.42	40266.02	-38612.56	0.000%
14	0.00	-53688.03	43578.31	0.00	53688.03	-43578.31	0.000%
15	0.00	-40266.02	43578.31	0.00	40266.02	-43578.32	0.000%
16	-21795.78	-53688.03	37735.02	21795.78	53688.03	-37735.02	0.000%
17	-21795.78	-40266.02	37735.02	21795.78	40266.02	-37735.02	0.000%
18	-37821.79	-53688.03	21826.97	37821.79	53688.03	-21826.97	0.000%
19	-37821.79	-40266.02	21826.97	37821.79	40266.02	-21826.97	0.000%
20	-46338.71	-53688.03	0.00	46338.71	53688.03	-0.00	0.000%
21	-46338.71	-40266.02	0.00	46338.72	40266.02	-0.00	0.000%
22	-38237.19	-53688.03	-22066.80	38237.19	53688.03	22066.80	0.000%
23	-38237.19	-40266.02	-22066.80	38237.19	40266.02	22066.80	0.000%
24	-22302.42	-53688.03	-38612.56	22302.42	53688.03	38612.56	0.000%
25	-22302.42	-40266.02	-38612.56	22302.42	40266.02	38612.56	0.000%

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b>	CT03XC354	<b>Page</b>	14 of 17
	<b>Project</b>	39391	<b>Date</b>	14:01:45 05/09/19
	<b>Client</b>	Sprint	<b>Designed by</b>	TEM

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
26	0.00	-94892.00	0.00	0.02	94892.00	-0.02	0.000%
27	0.00	-94892.00	-9989.92	0.00	94892.00	9990.07	0.000%
28	4999.59	-94892.00	-8653.31	-4999.66	94892.00	8653.44	0.000%
29	8694.66	-94892.00	-5016.26	-8694.79	94892.00	5016.34	0.000%
30	10089.19	-94892.00	0.00	-10089.34	94892.00	-0.00	0.000%
31	8721.99	-94892.00	5032.05	-8722.13	94892.00	-5032.13	0.000%
32	5006.54	-94892.00	8665.34	-5006.61	94892.00	-8665.48	0.000%
33	0.00	-94892.00	9989.92	0.00	94892.00	-9990.07	0.000%
34	-4999.59	-94892.00	8653.31	4999.67	94892.00	-8653.45	0.000%
35	-8694.66	-94892.00	5016.26	8694.79	94892.00	-5016.34	0.000%
36	-10089.19	-94892.00	0.00	10089.35	94892.00	-0.00	0.000%
37	-8721.99	-94892.00	-5032.05	8722.13	94892.00	5032.12	0.000%
38	-5006.54	-94892.00	-8665.34	5006.62	94892.00	8665.48	0.000%
39	0.00	-44740.02	-9324.05	0.00	44740.02	9324.06	0.000%
40	4663.44	-44740.02	-8073.82	-4663.44	44740.02	8073.82	0.000%
41	8092.38	-44740.02	-4670.12	-8092.39	44740.02	4670.12	0.000%
42	9914.67	-44740.02	0.00	-9914.68	44740.02	-0.00	0.000%
43	8181.26	-44740.02	4721.43	-8181.27	44740.02	-4721.43	0.000%
44	4771.85	-44740.02	8261.58	-4771.85	44740.02	-8261.58	0.000%
45	0.00	-44740.02	9324.05	0.00	44740.02	-9324.06	0.000%
46	-4663.44	-44740.02	8073.82	4663.44	44740.02	-8073.82	0.000%
47	-8092.38	-44740.02	4670.12	8092.39	44740.02	-4670.12	0.000%
48	-9914.67	-44740.02	0.00	9914.68	44740.02	-0.00	0.000%
49	-8181.26	-44740.02	-4721.43	8181.27	44740.02	4721.43	0.000%
50	-4771.85	-44740.02	-8261.58	4771.85	44740.02	8261.58	0.000%

### Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00008000
3	Yes	4	0.00000001	0.00096852
4	Yes	6	0.00000001	0.00004849
5	Yes	5	0.00000001	0.00041936
6	Yes	6	0.00000001	0.00004941
7	Yes	5	0.00000001	0.00042741
8	Yes	5	0.00000001	0.00005472
9	Yes	4	0.00000001	0.00066767
10	Yes	6	0.00000001	0.00005261
11	Yes	5	0.00000001	0.00045473
12	Yes	6	0.00000001	0.00004862
13	Yes	5	0.00000001	0.00041909
14	Yes	5	0.00000001	0.00008016
15	Yes	4	0.00000001	0.00097019
16	Yes	6	0.00000001	0.00005138
17	Yes	5	0.00000001	0.00044362
18	Yes	6	0.00000001	0.00005041
19	Yes	5	0.00000001	0.00043493
20	Yes	5	0.00000001	0.00005487
21	Yes	4	0.00000001	0.00066938
22	Yes	5	0.00000001	0.00099775
23	Yes	5	0.00000001	0.00041317
24	Yes	6	0.00000001	0.00005411
25	Yes	5	0.00000001	0.00046705
26	Yes	4	0.00000001	0.00006877

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b>	CT03XC354	<b>Page</b>	15 of 17
	<b>Project</b>	39391	<b>Date</b>	14:01:45 05/09/19
	<b>Client</b>	Sprint	<b>Designed by</b>	TEM

27	Yes	5	0.00000001	0.00035391
28	Yes	5	0.00000001	0.00047471
29	Yes	5	0.00000001	0.00047925
30	Yes	5	0.00000001	0.00035085
31	Yes	5	0.00000001	0.00051172
32	Yes	5	0.00000001	0.00048808
33	Yes	5	0.00000001	0.00036515
34	Yes	5	0.00000001	0.00052607
35	Yes	5	0.00000001	0.00052019
36	Yes	5	0.00000001	0.00036345
37	Yes	5	0.00000001	0.00049141
38	Yes	5	0.00000001	0.00051578
39	Yes	4	0.00000001	0.00009706
40	Yes	4	0.00000001	0.00026728
41	Yes	4	0.00000001	0.00028254
42	Yes	4	0.00000001	0.00007389
43	Yes	4	0.00000001	0.00034932
44	Yes	4	0.00000001	0.00027249
45	Yes	4	0.00000001	0.00009823
46	Yes	4	0.00000001	0.00032870
47	Yes	4	0.00000001	0.00030913
48	Yes	4	0.00000001	0.00007550
49	Yes	4	0.00000001	0.00026794
50	Yes	4	0.00000001	0.00037514

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 90.8333	25.902	48	1.4370	0.0058
L2	96 - 42.8333	12.062	48	1.1514	0.0029
L3	49 - 0	3.227	48	0.5932	0.0014

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
143.00	Lightning Rod 5/8x8'	48	25.302	1.4286	0.0056	54823
135.00	(2) AIR 21 B2A/B4P w/Mount Pipe	48	22.910	1.3943	0.0051	27411
127.00	7770.00 w/Mount Pipe	48	20.545	1.3574	0.0046	15228
110.33	12' Omni	48	15.806	1.2630	0.0036	7905
107.00	800MHz 2x50W RRH	48	14.903	1.2401	0.0034	7212

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 90.8333	120.807	20	6.7090	0.0267
L2	96 - 42.8333	56.261	20	5.3811	0.0135
L3	49 - 0	15.034	20	2.7672	0.0066



<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 16 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
-------------	-----------------	------------------------	-----------------	-----------	------------

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
143.00	Lightning Rod 5/8x8'	20	118.009	6.6701	0.0261	12013
135.00	(2) AIR 21 B2A/B4P w/Mount Pipe	20	106.852	6.5116	0.0237	6005
127.00	7770.00 w/Mount Pipe	20	95.826	6.3408	0.0213	3334
110.33	12' Omni	20	73.725	5.9025	0.0168	1727
107.00	800MHz 2x50W RRH	20	69.515	5.7956	0.0160	1574

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	A in <sup>2</sup>	P <sub>u</sub> lb	φP <sub>n</sub> lb	Ratio $\frac{P_u}{\phi P_n}$
L1	145 - 90.8333 (1)	TP33.48x23.61x0.2813	54.17	0.00	0.0	29.2130	-16132.10	1940890.00	0.008
L2	90.8333 - 42.8333 (2)	TP41.64x31.976x0.375	53.17	0.00	0.0	48.4740	-30535.90	3318020.00	0.009
L3	42.8333 - 0 (3)	TP48.69x39.7691x0.4375	49.00	0.00	0.0	67.9757	-53632.80	4594960.00	0.012

### Pole Bending Design Data

Section No.	Elevation ft	Size	M <sub>ux</sub> lb-ft	φM <sub>ux</sub> lb-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M <sub>uy</sub> lb-ft	φM <sub>uy</sub> lb-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	145 - 90.8333 (1)	TP33.48x23.61x0.2813	793499.17	1274483.33	0.623	0.00	1274483.33	0.000
L2	90.8333 - 42.8333 (2)	TP41.64x31.976x0.375	2262866.67	2709800.00	0.835	0.00	2709800.00	0.000
L3	42.8333 - 0 (3)	TP48.69x39.7691x0.4375	4275900.00	4511866.67	0.948	0.00	4511866.67	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V <sub>u</sub> lb	φV <sub>n</sub> lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T <sub>u</sub> lb-ft	φT <sub>n</sub> lb-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	145 - 90.8333 (1)	TP33.48x23.61x0.2813	27074.30	970445.00	0.028	1696.19	2591883.33	0.001
L2	90.8333 - 42.8333 (2)	TP41.64x31.976x0.375	35261.10	1659010.00	0.021	1683.05	5512016.67	0.000
L3	42.8333 - 0 (3)	TP48.69x39.7691x0.4375	46402.60	2297480.00	0.020	5542.15	9176750.00	0.001

<b>tnxTower</b>  <b>Ramaker &amp; Associates, Inc</b> 855 Community Drive Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	<b>Job</b> CT03XC354	<b>Page</b> 17 of 17
	<b>Project</b> 39391	<b>Date</b> 14:01:45 05/09/19
	<b>Client</b> Sprint	<b>Designed by</b> TEM

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\frac{P_u}{\phi P_n}$	$\frac{M_{ux}}{\phi M_{nx}}$	$\frac{M_{uy}}{\phi M_{ny}}$	$\frac{V_u}{\phi V_n}$	$\frac{T_u}{\phi T_n}$			
L1	145 - 90.8333 (1)	0.008	0.623	0.000	0.028	0.001	0.632 ✓	1.000	4.8.2 ✓
L2	90.8333 - 42.8333 (2)	0.009	0.835	0.000	0.021	0.000	0.845 ✓	1.000	4.8.2 ✓
L3	42.8333 - 0 (3)	0.012	0.948	0.000	0.020	0.001	0.960 ✓	1.000	4.8.2 ✓

### Section Capacity Table

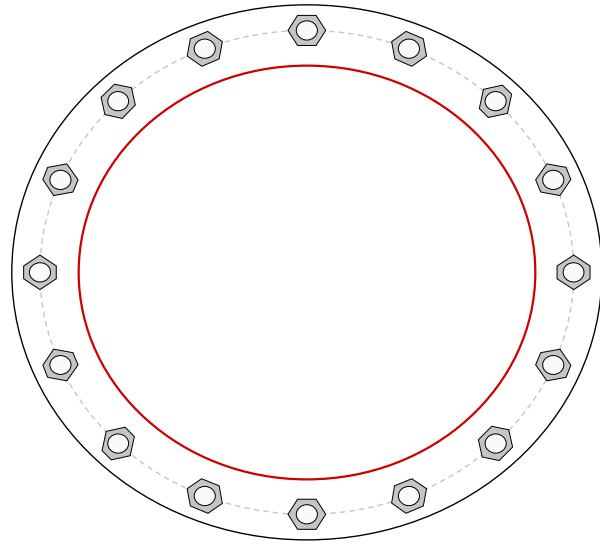
Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$\phi P_{allow}$ lb	% Capacity	Pass Fail	
L1	145 - 90.8333	Pole	TP33.48x23.61x0.2813	1	-16132.10	1940890.00	63.2	Pass	
L2	90.8333 - 42.8333	Pole	TP41.64x31.976x0.375	2	-30535.90	3318020.00	84.5	Pass	
L3	42.8333 - 0	Pole	TP48.69x39.7691x0.4375	3	-53632.80	4594960.00	96.0	Pass	
							Summary		
							Pole (L3)	96.0	Pass
							<b>RATING =</b>	<b>96.0</b>	<b>Pass</b>

# Monopole Base Plate Connection

Site Info	
BU #	39391
Site Name	CT03XC354
Order #	

Analysis Considerations	
TIA-222 Revision	G
Grout Considered:	No
$l_{ar}$ (in)	2
Eta Factor, $\eta$	0.5

Applied Loads	
Moment (kip-ft)	4275.90
Axial Force (kips)	53.63
Shear Force (kips)	46.40



Connection Properties	Analysis Results	
<b>Anchor Rod Data</b>	<b>Anchor Rod Summary</b> <span style="float: right;"><i>(units of kips, kip-in)</i></span>	
(16) 2-1/4" $\phi$ bolts (A615-75 N; $F_y=75$ ksi, $F_u=100$ ksi) on 56.91" BC	$Pu\_c = 228.61$	$\phi Pn\_t = 260$ <b>Stress Rating</b>
<b>Base Plate Data</b>	$Vu = 2.9$	$\phi Vn = n/a$ <b>90.2%</b>
62.91" OD x 2.75" Plate (A572-60; $F_y=60$ ksi, $F_u=75$ ksi)	$Mu = n/a$	$\phi Mn = n/a$ <b>Pass</b>
<b>Stiffener Data</b>	<b>Base Plate Summary</b>	
N/A	Max Stress (ksi):	31.63 (Flexural)
<b>Pole Data</b>	Allowable Stress (ksi):	54
48.69" x 0.4375" 12-sided pole (A572-65; $F_y=65$ ksi, $F_u=80$ ksi)	Stress Rating:	<b>58.6%</b> <b>Pass</b>

## Drilled Pier Foundation

Project #: 39391  
 Site Name: CT03XC354

TIA-222 Revision: G  
 Tower Type: Monopole

Applied Loads		
	Comp.	Uplift
Moment (kip-ft)	4275.89	
Axial Force (kips)	53.69	
Shear Force (kips)	46.34	

Material Properties		
Concrete Strength, f <sub>c</sub> :	3	ksi
Rebar Strength, F <sub>y</sub> :	60	ksi

Pier Design Data		
Depth	24	ft
Ext. Above Grade	1	ft
Pier Section 1		
<i>From 1' above grade to 24' below grade</i>		
Pier Diameter	6.5	ft
Rebar Quantity	34	
Rebar Size	11	
Clear Cover to Ties	3	in
Tie Size	4	

Analysis Results		
Soil Lateral Capacity	Compression	Uplift
D <sub>v=0</sub> (ft from TOC)	5.80	-
Soil Safety Factor	1.67	-
Max Moment (kip-ft)	4491.17	-
Rating	79.5%	-
Soil Vertical Capacity	Compression	Uplift
Skin Friction (kips)	0.00	-
End Bearing (kips)	289.19	-
Weight of Concrete (kips)	114.54	-
Total Capacity (kips)	289.19	-
Axial (kips)	168.23	-
Rating	58.2%	-
Reinforced Concrete Capacity	Compression	Uplift
Critical Depth (ft from TOC)	5.55	-
Critical Moment (kip-ft)	4490.58	-
Critical Moment Capacity	7327.46	-
Rating	61.3%	-
<b>Soil Interaction Rating</b>		<b>79.5%</b>
<b>Structural Foundation Rating</b>		<b>61.3%</b>

Check Limitation	
N/A	<input type="checkbox"/>
Load Z Normalization:	<input type="checkbox"/>

Soil Profile			
Groundwater Depth	10	ft	# of Layers
			10

Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ <sub>soil</sub> (pcf)	γ <sub>concrete</sub> (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	3.33	3.33	125	150		28	0.000	0.000	0.000	0.000			Cohesionless
2	3.33	10	6.67	125	150		28	0.000	0.000	0.000	0.000			Cohesionless
3	10	10.5	0.5	63	87.6		28	0.000	0.000	0.000	0.000			Cohesionless
4	10.5	24	13.5	58	87.6		32	0.000	0.000	0.000	0.000	11.62		Cohesionless
5														
6														
7														
8														
9														
10														