Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

February 6, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
83 Reeds Gap Road, North Branford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the top of the existing 92-foot tower at 83 Reeds Gap Road in North Branford (the "Property"). The tower is owned by Crown Castle. Cellco's shared use of this tower was approved by the Council in 1986 (Docket No. 56). Cellco now intends to modify its facility by replacing three (3) of its existing antennas with two (2) model LNX-6514DS-VTM and one (1) model BXA-70063-6CF, 700 MHz antennas at the same level on the tower. Included in Attachment 1 are specifications for Cellco's replacement antennas.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Michael T. Paulhus, Town Manager for the Town of North Branford. A copy of this letter is also being sent to David Tamulevich, the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas will be installed on its existing antenna platform at the top of the 92-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

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

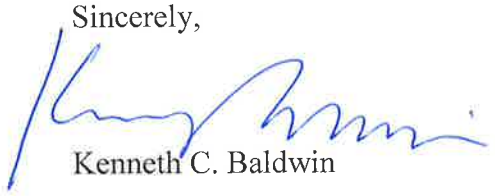
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions from the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

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

Sincerely,



Kenneth C. Baldwin

Enclosures
Copy to:
Michael T. Paulhus, North Branford Town Manager
David Tamulevich
Sandy M. Carter

ATTACHMENT 1

Product Specifications

COMMSCOPE®

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	17.6 kg | 38.8 lb
Model with factory installed AISG 2.0 RET	LNX-6514DS-A1M

©2014 CommScope, Inc. All rights reserved. All trademarks identified by ® or ™ are registered trademarks, respectively, of CommScope.
All specifications are subject to change without notice. See www.commscope.com for the most current information. Revised: June 11, 2014

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

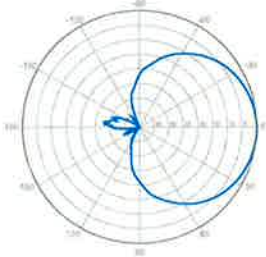
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
IM3 (2x20W carriers)	< -153 dBc	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

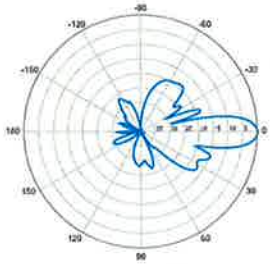
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



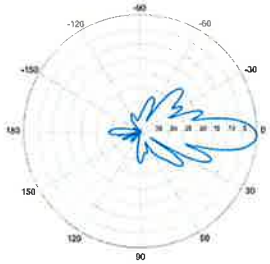
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

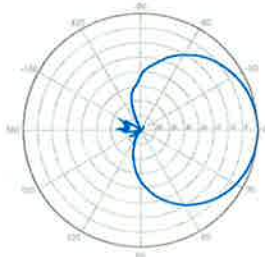


0° | Vertical | 750 MHz

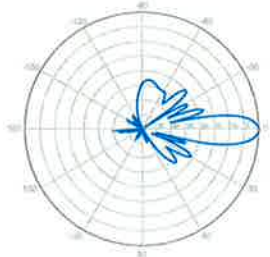
BXA-70063-6CF-EDIN-2



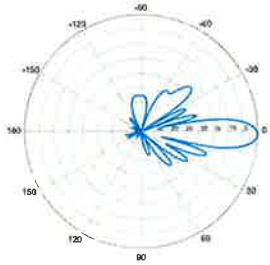
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



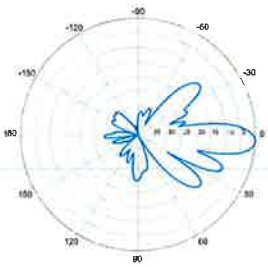
2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

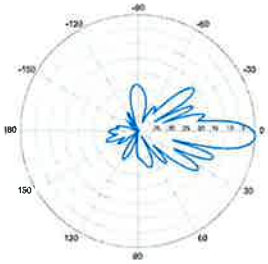
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

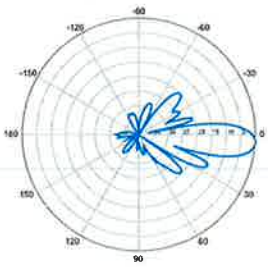


3° | Vertical | 750 MHz

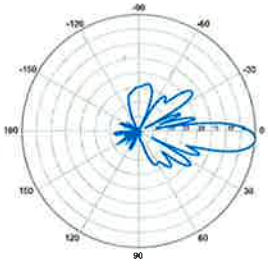


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

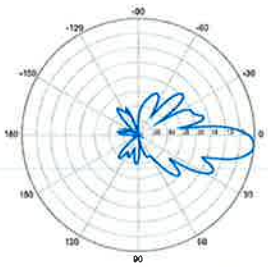


4° | Vertical | 750 MHz

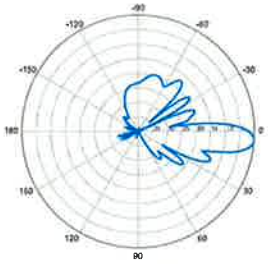


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

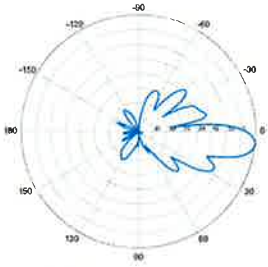


5° | Vertical | 750 MHz

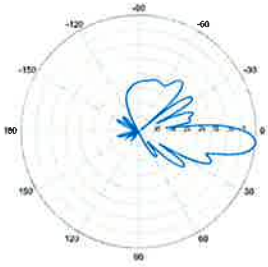


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

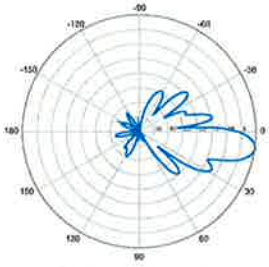


6° | Vertical | 750 MHz

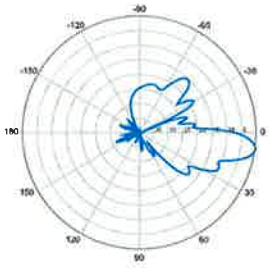


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

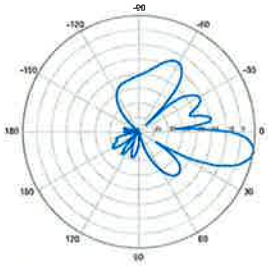


8° | Vertical | 750 MHz

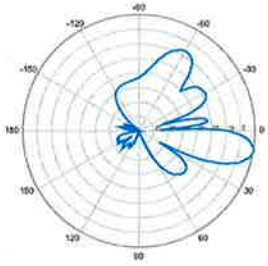


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

ATTACHMENT 2

	General	Power	Density					
Site Name: North Branford								
Tower Height: 92ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	66	0.0933	880	0.5867	1.59%	
*AT&T UMTS	2	875	66	0.1445	1900	1.0000	1.44%	
*AT&T GSM	1	283	66	0.0234	880	0.5867	0.40%	
*AT&T GSM	4	525	66	0.1733	1900	1.0000	1.73%	
*AT&T LTE	1	1313	66	0.1084	734	0.4893	2.21%	
*NB Police Dept	receive only		50		159	0.2000	0.00%	
*NB Police Dept	receive only		50		458	0.3053	0.00%	
*Nextel	9	100	80	0.0506	851	0.5673	8.91%	
Verizon PCS	**7**	**316**	**90**	**0.0982**	**1970**	**1.0000**	**9.82%**	
Verizon Cellular	**9**	**415**	**90**	**0.1658**	**869**	**0.5793**	**28.62%**	
Verizon 700	**1**	**868**	**90**	**0.0385**	**746**	**0.4973**	**7.75%**	
								62.48%
* Source: Siting Council								

ATTACHMENT 3

Date: **December 09, 2014**

Holly Haas
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

AW Solutions
300 Crown Oak Centre Drive
Longwood, FL, 32750
(407) 260-0231

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	117661
	Carrier Site Name:	North Branford CT
Crown Castle Designation:	**Crown Castle BU Number:**	806386
	Crown Castle Site Name:	NHV 106 943628
	Crown Castle JDE Job Number:	317090
	Crown Castle Work Order Number:	976342
	Crown Castle Application Number:	275464 Rev. 1
Engineering Firm Designation:	**AW Solutions Project Number:**	806386
Site Data:	**83 REEDS GAP ROAD, NORTH BRANFORD, New Haven County, CT** **Latitude *41° 24' 12.47"*, Longitude *-72° 44' 38.9"*** **92 Foot - Self Support Tower**	

Dear Holly Haas,

AW Solutions is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 736487, in accordance with application 275464, revision 1.

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

LC5: Installed + Proposed Equipment **Sufficient Capacity**

Note: See Table I and Table II for the proposed and existing loading, respectively.

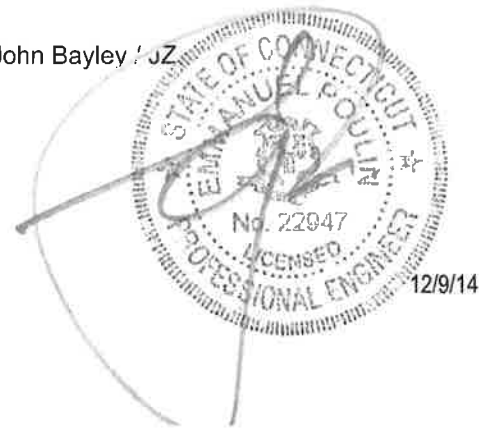
***The structure has sufficient capacity once the loading changes described in the Recommendations section of this report are completed.**

The analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 Connecticut State Building Code based upon a wind speed of 85 mph fastest mile.

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

Structural analysis prepared by: John Bayley / JZ

Respectfully submitted by:



Emmanuel Poulin, PE
VP of Engineering

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 92 ft Self Support tower designed by ROHN in September of 1986. The tower was originally designed for a wind speed of 0 mph per EIA-222-C. The tower has been modified multiple times in the past to accommodate additional loading.

2) ANALYSIS CRITERIA

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

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
90.0	90.0	2	andrew	LNX-6514DS-A1M w/ Mount Pipe	-	-	-
		1	antel	BXA-70063-6CF-2 w/ Mount Pipe			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
91.0	100.0	1	sinclair	SD212D-HF2P4SNM(D00B)	1 3	1/2 7/8	1
	96.0	1	sinclair	SD310-HF2P4SNM			
	91.0	2	tower mounts	Side Arm Mount [SO 304-1]			
90.0	90.0	3	antel	BXA-171063-8BF-2 w/ Mount Pipe	12	1-5/8	1
		1	antel	BXA-70063-6CF-2 w/ Mount Pipe	1 1	1/2 7/8	2
		1	antel	BXA-70063-6CF-EDIN-5 w/ Mount Pipe			
		1	antel	BXA-70063/4CF w/ Mount Pipe			
		2	antel	LPA-80063/6CF w/ Mount Pipe	-	-	1
		4	decibel	DB844G65ZAXY w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
		1	tower mounts	Sector Mount [SM 506-3]			
77.0	77.0	12	allgon	7130.16 w/ Mount Pipe	12	7/8	2
		1	tower mounts	Sector Mount [SM 510-3]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
65.0	66.0	3	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe	1 2 12	3/8 7/16 7/8	1
		6	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21901			
	65.0	1	tower mounts	Sector Mount [SM 502-3]			
63.0	64.0	1	ericsson	RRUS-11	-	-	1
		1	raycap	DC6-48-60-18-8F			
	63.0	2	ericsson	RRUS-11			
		2	tower mounts	Pipe Mount [PM 601-1]			
59.0	60.0	1	gps	GPS_A	-	-	1
	59.0	1	tower mounts	Side Arm Mount [SO 301-1]			

Notes:
1) Existing Equipment
2) Equipment To Be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
-						

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	JGI Eastern, Inc.	1069632	CCISITES
4-POST-MODIFICATION INSPECTION	Vertical Structures	1285457	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Rohn, Drawing #A861168-1	962042	CCISITES
4-TOWER STRUCTURAL ANALYSIS REPORTS	Vertical Structures	2251339	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	Vertical Structures	1093271	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	APT Corp	962041	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	TEP	3841012	CCISITES

3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	92 - 80	Leg	ROHN 2 STD	1	-7.38	32.30	22.9	Pass
T2	80 - 75	Leg	ROHN 2.5 STD	25	-10.65	50.25	21.2	Pass
T3	75 - 70	Leg	ROHN 2.5 STD	34	-14.86	50.25	29.6	Pass
T4	70 - 65	Leg	ROHN 2.5 STD	43	-18.41	50.25	36.6	Pass
T5	65 - 60	Leg	ROHN 2.5 STD	54	-24.39	50.25	48.5	Pass
T6	60 - 40	Leg	ROHN 2.5 X-STR	66	-45.72	75.42	60.6	Pass
T7	40 - 20	Leg	ROHN 3 X-STR	96	-66.33	105.87	62.7	Pass
T8	20 - 13.3333	Leg	ROHN 3.5 X-STR	126	-72.85	132.23	55.1	Pass
T9	13.3333 - 6.66667	Leg	ROHN 3.5 X-STR	138	-79.52	132.26	60.1	Pass
T10	6.66667 - 1e-006	Leg	ROHN 3.5 X-STR	150	-85.83	132.28	64.9	Pass
T1	92 - 80	Diagonal	L1 1/2x1 1/2x1/8	12	-2.03	3.32	61.1 73.1 (b)	Pass
T2	80 - 75	Diagonal	L1 3/4x1 3/4x1/8	32	-2.24	4.12	54.5 62.7 (b)	Pass
T3	75 - 70	Diagonal	L2x2x1/4	41	-2.25	10.56	21.3 41.4 (b)	Pass
T4	70 - 65	Diagonal	L1 3/4x1 3/4x3/16	50	-2.39	4.91	48.6	Pass
T5	65 - 60	Diagonal	L2x2x1/4	62	-3.49	8.78	39.8 47.4 (b)	Pass
T6	60 - 40	Diagonal	L2x2x1/4	71	-3.91	5.19	75.3	Pass
T7	40 - 20	Diagonal	L2 1/2x2 1/2x3/16	102	-4.08	6.20	65.9 74.4 (b)	Pass
T8	20 - 13.3333	Diagonal	L2 1/2x2 1/2x3/16	131	-4.18	5.73	72.9 76.0 (b)	Pass
T9	13.3333 - 6.66667	Diagonal	L2 1/2x2 1/2x3/8	144	-4.32	9.80	44.1 55.0 (b)	Pass
T10	6.66667 - 1e-006	Diagonal	L2 1/2x2 1/2x3/8	155	-4.42	9.04	48.9 56.3 (b)	Pass
T6	60 - 40	Secondary Horizontal	L2 1/2x2 1/2x1/4	74	-0.79	15.77	5.0 14.4 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T7	40 - 20	Secondary Horizontal	L2x2x1/4	104	-1.15	5.51	20.9	Pass
T8	20 - 13.3333	Secondary Horizontal	L2x2x1/4	134	-1.26	4.97	25.4	Pass
T9	13.3333 - 6.66667	Secondary Horizontal	L2x2x1/4	147	-1.38	4.47	30.9	Pass
T10	6.66667 - 1e-006	Secondary Horizontal	L2x2x1/4	158	-1.49	4.04	36.9	Pass
T1	92 - 80	Top Girt	L2x2x1/8	5	-0.09	2.83	3.0	Pass
T5	65 - 60	Top Girt	L2 1/2x2 1/2x1/4	55	-0.19	6.84	2.8 3.3 (b)	Pass
							Summary	
						Leg (T10)	64.9	Pass
						Diagonal (T8)	76.0	Pass
						Secondary Horizontal (T10)	36.9	Pass
						Top Girt (T5)	3.3	Pass
						Bolt Checks	76.0	Pass
						Rating =	76.0	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
-	Anchor Rods	0	57.6	Pass
1	Base Foundation Soil Interaction	0	51.7	Pass

Structure Rating (max from all components) =	76%

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

4.1) Recommendations

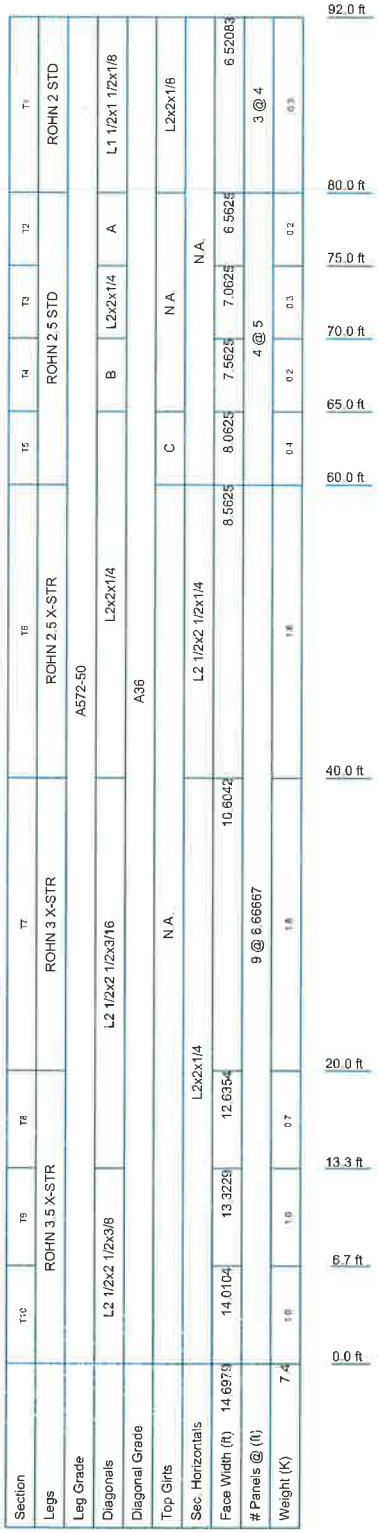
The tower and foundation have sufficient capacity to carry the existing and proposed loading. In order for the results of this analysis to be considered valid the loading modification listed below must be completed.
Loading Changes:

1.) Removal of the abandoned antennas, feed lines and mounts at the 77 ft level

No structural modifications are required at this time, provided that the above listed changes are implemented.

APPENDIX A

TNXTOWER OUTPUT



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
SD310-HF2P4SNM	91	(2) LGP21401	65
SD212D-HF2P4SNM(D00B)	91	(2) LGP21401	65
Side Arm Mount [SO 304-1]	91	(2) LGP21901	65
Side Arm Mount [SO 304-1]	91	(2) LGP21901	65
BXA-171063-8BF-2 w/ Mount Pipe	90	(2) LGP21901	65
BXA-171063-8BF-2 w/ Mount Pipe	90	AM-X-CD-16-65-00T-RET w/ Mount Pipe	65
BXA-171063-8BF-2 w/ Mount Pipe	90	AM-X-CD-16-65-00T-RET w/ Mount Pipe	65
(2) DB844G65ZAXY w/ Mount Pipe	90	AM-X-CD-16-65-00T-RET w/ Mount Pipe	65
(2) DB844G65ZAXY w/ Mount Pipe	90	Sector Mount [SM 502-3]	65
(2) LPA-80063/6CF w/ Mount Pipe	90	RRUS-11	63
(2) FD9R6004/2C-3L	90	RRUS-11	63
(2) FD9R6004/2C-3L	90	DC6-48-60-18-8F	63
(2) FD9R6004/2C-3L	90	Pipe Mount [PM 601-1]	63
Sector Mount [SM 506-3]	90	Pipe Mount [PM 601-1]	63
LNX-6514DS-A1M w/ Mount Pipe	90	RRUS-11	63
BXA-70063-6CF-2 w/ Mount Pipe	90	GPS_A	59
LNX-6514DS-A1M w/ Mount Pipe	90	Side Arm Mount [SO 301-1]	59
(2) 7770.00 w/ Mount Pipe	65		
(2) 7770.00 w/ Mount Pipe	65		
(2) 7770.00 w/ Mount Pipe	65		
(2) LGP21401	65		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	L1 3/4x1 3/4x1/8	C	L2 1/2x2 1/2x1/4
B	L1 3/4x1 3/4x3/16		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 76%

△

MAX. CORNER REACTIONS AT BASE:
DOWN: 89 K
SHEAR: 11 K

UPLIFT: -76 K
SHEAR: 10 K

AXIAL
31 K
SHEAR 5 K *MOMENT 317 kip-ft*

TORQUE 1 kip-ft
38 mph WIND - 0.7500 in ICE

AXIAL
15 K
SHEAR 19 K *MOMENT 1069 kip-ft*

TORQUE 7 kip-ft
REACTIONS - 85 mph WIND

AW Solutions
300 Crown Oak Centre Drive
Longwood, FL, 32750
Phone: (407) 260-0231
FAX: (407) 260-0749

Job: **BU 806386**			
Project: **WO 796342**			
Client: Crown Castle	Drawn by: John.Bayley	App'd:	
Code: TIA/EIA-222-F	Date: 12/09/14	Scale: NTS	
Path:		Dwg No. E-1	

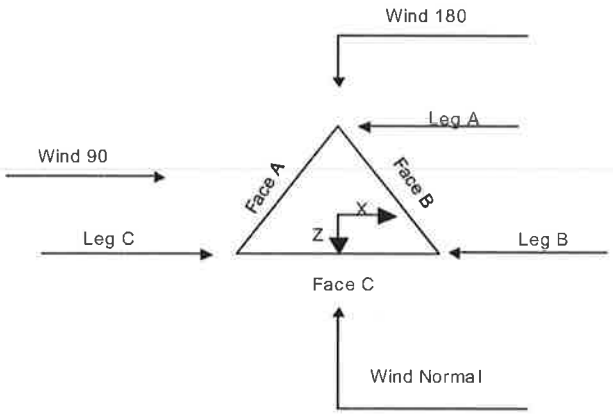
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 92.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 6.52 ft at the top and 14.70 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

3) Tower is located in New Haven County, Connecticut.
4) Basic wind speed of 85 mph.
5) Nominal ice thickness of 0.7500 in.
6) Ice thickness is considered to increase with height.
7) Ice density of 56.00 pcf.
8) A wind speed of 38 mph is used in combination with ice.
9) Temperature drop of 50 °F.
10) Deflections calculated using a wind speed of 50 mph.
11) A non-linear (P-delta) analysis was used.
12) Pressures are calculated at each section.
13) Stress ratio used in tower member design is 1.333.
14) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	92.00-80.00			6.52	1	12.00
T2	80.00-75.00			6.56	1	5.00
T3	75.00-70.00			7.06	1	5.00
T4	70.00-65.00			7.56	1	5.00
T5	65.00-60.00			8.06	1	5.00
T6	60.00-40.00			8.56	1	20.00
T7	40.00-20.00			10.60	1	20.00
T8	20.00-13.33			12.64	1	6.67
T9	13.33-6.67			13.32	1	6.67
T10	6.67-0.00			14.01	1	6.67

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	92.00-80.00	4.00	X Brace	No	No	0.0000	0.0000
T2	80.00-75.00	5.00	X Brace	No	No	0.0000	0.0000
T3	75.00-70.00	5.00	X Brace	No	No	0.0000	0.0000
T4	70.00-65.00	5.00	X Brace	No	No	0.0000	0.0000
T5	65.00-60.00	5.00	X Brace	No	No	0.0000	0.0000
T6	60.00-40.00	6.67	X Brace	No	Yes	0.0000	0.0000
T7	40.00-20.00	6.67	X Brace	No	Yes	0.0000	0.0000
T8	20.00-13.33	6.67	X Brace	No	Yes	0.0000	0.0000
T9	13.33-6.67	6.67	X Brace	No	Yes	0.0000	0.0000
T10	6.67-0.00	6.67	X Brace	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 92.00-80.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Equal Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T2 80.00-75.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x1/8	A36 (36 ksi)
T3 75.00-70.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T4 70.00-65.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T5 65.00-60.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T6 60.00-40.00	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T7 40.00-20.00	Pipe	ROHN 3 X-STR	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 20.00-13.33	Pipe	ROHN 3.5 X-STR	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 13.33-6.67	Pipe	ROHN 3.5 X-STR	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/8	A36 (36 ksi)
T10 6.67-0.00	Pipe	ROHN 3.5 X-STR	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/8	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 92.00-80.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Pipe		A36 (36 ksi)
T5 65.00-60.00	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Pipe		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T6 60.00-40.00	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)	Pipe		A36 (36 ksi)
T7 40.00-20.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Pipe		A36 (36 ksi)
T8 20.00-13.33	Equal Angle	L2x2x1/4	A36 (36 ksi)	Pipe		A36 (36 ksi)
T9 13.33-6.67	Equal Angle	L2x2x1/4	A36 (36 ksi)	Pipe		A36 (36 ksi)
T10 6.67-0.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Pipe		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 92.00-80.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T2 80.00-75.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T3 75.00-70.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T4 70.00-65.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T5 65.00-60.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T6 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T7 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T8 20.00-13.33	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T9 13.33-6.67	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000
T10 6.67-0.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 92.00-80.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 80.00-75.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 75.00-70.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 70.00-65.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 65.00-60.00	Yes	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 60.00-40.00	No	No	1	1 1	1 1	1 1	1 1	1 1	0.5 0.5	1 1
T7 40.00-20.00	No	No	1	1 1	1 1	1 1	1 1	1 1	0.5 0.5	1 1
T8 20.00-13.33	No	No	1	1 1	1 1	1 1	1 1	1 1	0.5 0.5	1 1
T9 13.33-6.67	No	No	1	1 1	1 1	1 1	1 1	1 1	0.5 0.5	1 1
T10 6.67-0.00	No	No	1	1 1	1 1	1 1	1 1	1 1	0.5 0.5	1 1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 92.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 80.00-75.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 75.00-70.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 70.00-65.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 65.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 20.00-13.33	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 13.33-6.67	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 6.67-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 92.00-80.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0
T2 80.00-75.00	Flange	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0
T3 75.00-70.00	Flange	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0
T4 70.00-65.00	Flange	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0
T5 65.00-60.00	Flange	0.6250 A325N	4	0.5000 A325X	1	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	0
T6 60.00-40.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	1
T7 40.00-20.00	Flange	0.8750 A325N	4	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1
T8 20.00-13.33	Flange	0.8750 A449	0	0.5000 A325N	1	0.5000 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1
T9 13.33-6.67	Flange	0.8750 A449	0	0.5000 A325X	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1
T10 6.67-0.00	Flange	0.8750 A449	4	0.5000 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
LDF5-50A(7/8")	A	Yes	Ar (CfAe)	91.00 - 7.00	-1.0000	-0.05	3	3	0.4000	1.0900		0.00
LCF12-50J(1/2")	A	Yes	Ar (CfAe)	91.00 - 7.00	-1.0000	-0.05	1	1	0.3000	0.6400		0.00

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
*												
LDF7-50A(1-5/8")	A	Yes	Ar (CfAe)	90.00 - 7.00	0.0000	0.05	12	12	0.5000	1.9800		0.00
Feedline Ladder (Af)	A	Yes	Af (CfAe)	90.00 - 7.00	-0.5000	0.05	2	1	3.0000	3.0000	12.0000	0.01
*												
*												
AVA5-50(7/8")	C	Yes	Ar (CfAe)	65.00 - 7.00	0.0000	-0.35	12	8	0.4000	1.1020		0.00
FB-L98B-002-75000(3/8")	C	Yes	Ar (CfAe)	65.00 - 7.00	0.0000	-0.31	1	1	0.3000	0.0000		0.00
Feedline Ladder (Af)	C	Yes	Af (CfAe)	68.00 - 7.00	0.0000	-0.35	1	1	3.0000	3.0000	12.0000	0.01
*												
*												
*												
WR-VG122ST-BRDA(7/16)	C	Yes	Ar (CfAe)	65.00 - 7.00	0.9000	-0.33	2	2	0.3000	0.3000		0.00
*												
1 1/4" Rigid Conduit	C	Yes	Ar (CfAe)	65.00 - 7.00	0.0000	-0.31	1	1	1.2500	1.2500		0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	92.00-80.00	A	23.384	2.500	0.000	0.000	0.28
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	80.00-75.00	A	11.529	1.250	0.000	0.000	0.14
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T3	75.00-70.00	A	11.529	1.250	0.000	0.000	0.14
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T4	70.00-65.00	A	11.529	1.250	0.000	0.000	0.14
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.750	0.000	0.000	0.03
T5	65.00-60.00	A	11.529	1.250	0.000	0.000	0.14
		B	0.000	0.000	0.000	0.000	0.00
		C	4.444	1.250	0.000	0.000	0.07
T6	60.00-40.00	A	46.117	5.000	0.000	0.000	0.56
		B	0.000	0.000	0.000	0.000	0.00
		C	17.777	5.000	0.000	0.000	0.26
T7	40.00-20.00	A	46.117	5.000	0.000	0.000	0.56
		B	0.000	0.000	0.000	0.000	0.00
		C	17.777	5.000	0.000	0.000	0.26
T8	20.00-13.33	A	15.372	1.667	0.000	0.000	0.19
		B	0.000	0.000	0.000	0.000	0.00
		C	5.926	1.667	0.000	0.000	0.09
T9	13.33-6.67	A	14.604	1.583	0.000	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	5.629	1.583	0.000	0.000	0.08
T10	6.67-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	92.00-80.00	A	0.841	7.723	28.900	0.000	0.000	0.73
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	80.00-75.00	A	0.831	3.623	14.320	0.000	0.000	0.36
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	75.00-70.00	A	0.824	3.607	14.316	0.000	0.000	0.36
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T4	70.00-65.00	A	0.817	3.589	14.312	0.000	0.000	0.36
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	1.022	0.000	0.000	0.04
T5	65.00-60.00	A	0.810	3.570	14.308	0.000	0.000	0.35
		B		0.000	0.000	0.000	0.000	0.00
		C		3.804	6.331	0.000	0.000	0.18
T6	60.00-40.00	A	0.788	14.067	57.185	0.000	0.000	1.39
		B		0.000	0.000	0.000	0.000	0.00
		C		14.931	25.275	0.000	0.000	0.69
T7	40.00-20.00	A	0.750	13.683	57.100	0.000	0.000	1.36
		B		0.000	0.000	0.000	0.000	0.00
		C		14.420	25.190	0.000	0.000	0.67
T8	20.00-13.33	A	0.750	4.561	19.033	0.000	0.000	0.45
		B		0.000	0.000	0.000	0.000	0.00
		C		4.807	8.397	0.000	0.000	0.22
T9	13.33-6.67	A	0.750	4.333	18.082	0.000	0.000	0.43
		B		0.000	0.000	0.000	0.000	0.00
		C		4.566	7.977	0.000	0.000	0.21
T10	6.67-0.00	A	0.750	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	92.00-80.00	A	0.000	3.482	2.256	3.232
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T2	80.00-75.00	A	0.000	1.249	0.925	1.315
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	75.00-70.00	A	0.000	1.208	1.032	1.466
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T4	70.00-65.00	A	0.000	1.173	0.885	1.255
		B	0.000	0.000	0.000	0.000
		C	0.000	0.075	0.052	0.080
T5	65.00-60.00	A	0.000	1.629	1.527	2.163
		B	0.000	0.000	0.000	0.000
		C	0.000	0.932	0.680	1.238
T6	60.00-40.00	A	0.000	4.890	4.715	6.653
		B	0.000	0.000	0.000	0.000
		C	0.000	2.785	2.101	3.790
T7	40.00-20.00	A	0.000	4.441	4.964	6.955
		B	0.000	0.000	0.000	0.000
		C	0.000	2.508	2.212	3.927
T8	20.00-13.33	A	0.000	1.454	1.623	2.274
		B	0.000	0.000	0.000	0.000
		C	0.000	0.821	0.723	1.284
T9	13.33-6.67	A	0.000	1.371	1.530	2.144
		B	0.000	0.000	0.000	0.000
		C	0.000	0.774	0.682	1.211
T10	6.67-0.00	A	0.000	0.000	0.000	0.000

Section	Elevation	Face	A_R	A_R Ice	A_F	A_F Ice
	ft		ft^2	ft^2	ft^2	ft^2
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	92.00-80.00	-7.5485	-5.6766	-4.7321	-3.5432
T2	80.00-75.00	-8.6990	-6.5913	-6.0465	-4.5554
T3	75.00-70.00	-8.7797	-6.6557	-6.1774	-4.6582
T4	70.00-65.00	-8.6168	-6.4427	-5.9518	-4.4108
T5	65.00-60.00	-2.4285	-1.3313	-1.1279	-0.4232
T6	60.00-40.00	-2.9328	-1.6338	-1.4074	-0.5297
T7	40.00-20.00	-3.0701	-1.7422	-1.5463	-0.6217
T8	20.00-13.33	-3.1971	-1.8308	-1.6172	-0.6593
T9	13.33-6.67	-3.1870	-1.8320	-1.6065	-0.6589
T10	6.67-0.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
SD310-HF2P4SNM	B	From Leg	2.00 0.00 5.00	0.0000	91.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.65 2.31 3.97 7.29 13.93	0.65 2.31 3.97 7.29 13.93	0.01 0.01 0.01 0.01 0.01
SD212D-HF2P4SNM(D00B)	C	From Leg	2.00 0.00 9.00	0.0000	91.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.92 7.60 10.28 15.64 26.36	4.92 7.60 10.28 15.64 26.36	0.08 0.09 0.10 0.11 0.15
Side Arm Mount [SO 304-1]	B	From Leg	1.00 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.63 1.00 1.37 2.11 3.59	0.94 1.45 1.96 2.98 5.02	0.02 0.03 0.04 0.06 0.09
Side Arm Mount [SO 304-1] *	C	From Leg	1.00 0.00 0.00	0.0000	91.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.63 1.00 1.37 2.11 3.59	0.94 1.45 1.96 2.98 5.02	0.02 0.03 0.04 0.06 0.09
BXA-171063-8BF-2 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.18 3.56 3.96 4.85 6.77	3.35 3.97 4.60 5.89 8.89	0.03 0.06 0.10 0.19 0.49
BXA-171063-8BF-2 w/ Mount Pipe	B	From Leg	4.00 0.00	0.0000	90.00	No Ice 1/2"	3.18 3.56	3.35 3.97	0.03 0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			Ice	3.96	4.60	0.10
						1" Ice	4.85	5.89	0.19
						2" Ice	6.77	8.89	0.49
						4" Ice			
BXA-171063-8BF-2 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.18 3.56 3.96 4.85 6.77	3.35 3.97 4.60 5.89 8.89	0.03 0.06 0.10 0.19 0.49
(2) DB844G65ZAXY w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.90 5.35 5.80 6.73 8.73	4.92 5.60 6.28 7.71 10.83	0.03 0.08 0.13 0.26 0.62
(2) DB844G65ZAXY w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.90 5.35 5.80 6.73 8.73	4.92 5.60 6.28 7.71 10.83	0.03 0.08 0.13 0.26 0.62
(2) LPA-80063/6CF w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.58 11.24 11.87 13.16 15.87	10.67 11.93 12.91 14.92 19.16	0.05 0.14 0.25 0.48 1.09
(2) FD9R6004/2C-3L	A	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	B	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	C	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
Sector Mount [SM 506-3]	C	None		0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	35.47 50.60 65.73 95.99 156.51	35.47 50.60 65.73 95.99 156.51	1.74 2.35 2.95 4.16 6.59
LNX-6514DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
BXA-70063-6CF-2 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
LNX-6514DS-A1M w/	C	From Leg	4.00	0.0000	90.00	No Ice	8.65	7.08	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Mount Pipe			0.00				1/2" Ice	9.31	8.27	0.13
			0.00				1" Ice	9.93	9.18	0.21
							2" Ice	11.20	11.02	0.39
							4" Ice	13.87	15.06	0.90
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00		0.0000	65.00	No Ice	6.35	4.43	0.06
			0.00				1/2" Ice	6.95	5.37	0.11
			1.00				1" Ice	7.51	6.12	0.17
							2" Ice	8.65	7.66	0.30
							4" Ice	11.06	11.10	0.70
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00		0.0000	65.00	No Ice	6.35	4.43	0.06
			0.00				1/2" Ice	6.95	5.37	0.11
			1.00				1" Ice	7.51	6.12	0.17
							2" Ice	8.65	7.66	0.30
							4" Ice	11.06	11.10	0.70
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00		0.0000	65.00	No Ice	6.35	4.43	0.06
			0.00				1/2" Ice	6.95	5.37	0.11
			1.00				1" Ice	7.51	6.12	0.17
							2" Ice	8.65	7.66	0.30
							4" Ice	11.06	11.10	0.70
(2) LGP21401	A	From Leg	4.00		0.0000	65.00	No Ice	1.29	0.23	0.01
			0.00				1/2" Ice	1.45	0.31	0.02
			1.00				1" Ice	1.61	0.40	0.03
							2" Ice	1.97	0.61	0.05
							4" Ice	2.79	1.12	0.14
(2) LGP21401	B	From Leg	4.00		0.0000	65.00	No Ice	1.29	0.23	0.01
			0.00				1/2" Ice	1.45	0.31	0.02
			1.00				1" Ice	1.61	0.40	0.03
							2" Ice	1.97	0.61	0.05
							4" Ice	2.79	1.12	0.14
(2) LGP21401	C	From Leg	4.00		0.0000	65.00	No Ice	1.29	0.23	0.01
			0.00				1/2" Ice	1.45	0.31	0.02
			1.00				1" Ice	1.61	0.40	0.03
							2" Ice	1.97	0.61	0.05
							4" Ice	2.79	1.12	0.14
(2) LGP21901	A	From Leg	4.00		0.0000	65.00	No Ice	0.27	0.18	0.01
			0.00				1/2" Ice	0.34	0.25	0.01
			1.00				1" Ice	0.43	0.32	0.01
							2" Ice	0.62	0.49	0.02
							4" Ice	1.10	0.94	0.07
(2) LGP21901	B	From Leg	4.00		0.0000	65.00	No Ice	0.27	0.18	0.01
			0.00				1/2" Ice	0.34	0.25	0.01
			1.00				1" Ice	0.43	0.32	0.01
							2" Ice	0.62	0.49	0.02
							4" Ice	1.10	0.94	0.07
(2) LGP21901	C	From Leg	4.00		0.0000	65.00	No Ice	0.27	0.18	0.01
			0.00				1/2" Ice	0.34	0.25	0.01
			1.00				1" Ice	0.43	0.32	0.01
							2" Ice	0.62	0.49	0.02
							4" Ice	1.10	0.94	0.07
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00		0.0000	65.00	No Ice	8.50	6.30	0.07
			0.00				1/2" Ice	9.15	7.48	0.14
			1.00				1" Ice	9.77	8.37	0.21
							2" Ice	11.03	10.18	0.38

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice 4" Ice	13.68	14.02	0.87
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	65.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	65.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
RRUS-11	A	From Leg	4.00 0.00 1.00	0.0000	63.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.25 3.49 3.74 4.27 5.43	1.37 1.55 1.74 2.14 3.04	0.05 0.07 0.09 0.15 0.31
RRUS-11	A	From Leg	4.00 0.00 0.00	0.0000	63.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.25 3.49 3.74 4.27 5.43	1.37 1.55 1.74 2.14 3.04	0.05 0.07 0.09 0.15 0.31
RRUS-11	B	From Leg	4.00 0.00 0.00	0.0000	63.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.25 3.49 3.74 4.27 5.43	1.37 1.55 1.74 2.14 3.04	0.05 0.07 0.09 0.15 0.31
DC6-48-60-18-8F	B	From Leg	4.00 0.00 1.00	0.0000	63.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.27 1.46 1.66 2.09 3.10	1.27 1.46 1.66 2.09 3.10	0.02 0.04 0.05 0.10 0.21
Pipe Mount [PM 601-1]	A	None		0.0000	63.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.00 3.74 4.48 5.96 8.92	0.90 1.12 1.34 1.78 2.66	0.07 0.08 0.09 0.12 0.18
Pipe Mount [PM 601-1]	B	None		0.0000	63.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.00 3.74 4.48 5.96 8.92	0.90 1.12 1.34 1.78 2.66	0.07 0.08 0.09 0.12 0.18
Sector Mount [SM 502-3]	C	None		0.0000	65.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	33.02 47.36 61.70 90.38 147.74	33.02 47.36 61.70 90.38 147.74	1.67 2.22 2.77 3.88 6.08
GPS_A	C	From Leg	0.50 0.00 1.00	0.0000	59.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.30 0.37 0.46 0.65 1.15	0.30 0.37 0.46 0.65 1.15	0.00 0.00 0.01 0.02 0.08
Side Arm Mount [SO 301-1]	C	From Leg	1.00 0.00	0.0000	59.00	No Ice 1/2"	1.00 1.39	0.90 1.42	0.02 0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				Ice	1.78	1.94	0.04
							1" Ice	2.56	2.98	0.06
							2" Ice	4.12	5.06	0.10
							4" Ice			

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	92 - 80	Leg	Max Tension	12	5.42	-0.07	0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	10	-7.38	0.07	-0.01
			Max. Mx	6	-1.30	-0.88	-0.09
			Max. My	13	-0.99	0.00	-1.14
			Max. Vy	12	0.67	-0.46	0.09
			Max. Vx	13	-0.84	0.00	0.52
		Diagonal	Max Tension	9	2.03	0.00	0.00
			Max. Compression	9	-2.03	0.00	0.00
			Max. Mx	24	0.22	0.01	0.00
			Max. My	8	-1.85	0.00	-0.00
			Max. Vy	24	-0.01	0.01	0.00
			Max. Vx	8	0.00	0.00	0.00
		Top Girt	Max Tension	12	0.09	0.00	0.00
			Max. Compression	10	-0.09	0.00	0.00
			Max. Mx	14	-0.00	-0.03	0.00
			Max. My	26	-0.00	0.00	0.00
			Max. Vy	14	0.02	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T2	80 - 75	Leg	Max Tension	12	8.55	-0.04	-0.00
			Max. Compression	10	-10.65	0.04	-0.02
			Max. Mx	6	-10.28	0.07	-0.01
			Max. My	2	3.49	-0.02	0.06
			Max. Vy	8	-0.02	-0.07	-0.02
			Max. Vx	10	0.04	-0.02	-0.06
		Diagonal	Max Tension	8	2.12	0.00	0.00
			Max. Compression	2	-2.24	0.00	0.00
			Max. Mx	25	0.32	0.01	0.00
			Max. My	2	-2.24	0.00	0.00
			Max. Vy	25	0.01	0.01	0.00
			Max. Vx	2	-0.00	0.00	0.00
T3	75 - 70	Leg	Max Tension	12	12.36	-0.00	0.00
			Max. Compression	10	-14.86	-0.01	-0.01
			Max. Mx	6	-14.46	0.04	0.00
			Max. My	2	5.36	-0.02	0.06
			Max. Vy	6	0.03	0.04	0.00
			Max. Vx	10	-0.04	-0.02	-0.06
		Diagonal	Max Tension	3	2.28	0.00	0.00
			Max. Compression	3	-2.25	0.00	0.00
			Max. Mx	23	0.52	0.02	-0.00
			Max. My	8	-2.14	0.00	-0.00
			Max. Vy	25	0.02	0.02	-0.00
			Max. Vx	8	0.00	0.00	0.00
T4	70 - 65	Leg	Max Tension	12	15.66	-0.11	-0.02
			Max. Compression	10	-18.41	0.12	-0.02
			Max. Mx	2	-18.30	0.13	-0.01
			Max. My	10	7.15	-0.00	-0.05
			Max. Vy	6	-0.04	0.13	0.02
			Max. Vx	10	-0.04	-0.00	-0.05
		Diagonal	Max Tension	3	2.33	0.00	0.00
			Max. Compression	2	-2.39	0.00	0.00
			Max. Mx	23	0.47	0.01	0.00
			Max. My	8	1.36	0.01	-0.00
			Max. Vy	24	0.01	0.01	-0.00
			Max. Vx	26	-0.00	0.00	0.00
T5	65 - 60	Leg	Max Tension	12	19.54	-0.11	-0.02
			Max. Compression	2	-24.39	0.01	-0.01
			Max. Mx	2	-24.15	0.13	-0.01
			Max. My	11	-2.53	-0.02	-0.19
			Max. Vy	2	0.12	0.13	-0.01
			Max. Vx	11	0.10	-0.02	-0.19
		Diagonal	Max Tension	9	3.44	0.00	0.00
			Max. Compression	3	-3.49	0.00	0.00
			Max. Mx	11	1.69	0.02	0.00
			Max. My	9	-3.44	-0.00	-0.01
			Max. Vy	24	0.02	0.02	0.00
			Max. Vx	9	0.00	0.00	0.00
		Top Girt	Max Tension	19	0.22	0.00	0.00
			Max. Compression	8	-0.19	0.00	0.00
			Max. Mx	14	0.16	-0.07	0.00
			Max. My	15	0.14	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	14	0.03	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
T6	60 - 40	Leg	Max Tension	12	38.67	0.06	-0.00
			Max. Compression	2	-45.72	-0.13	0.01
			Max. Mx	2	-45.69	0.22	-0.00
			Max. My	11	-3.07	-0.02	-0.23
			Max. Vy	2	-0.12	0.22	-0.00
			Max. Vx	13	0.12	-0.02	0.23
		Diagonal	Max Tension	9	3.86	0.00	0.00
			Max. Compression	3	-3.91	0.00	0.00
			Max. Mx	15	0.56	0.03	0.00
			Max. My	9	-3.83	0.00	-0.01
			Max. Vy	25	0.02	0.03	-0.00
			Max. Vx	21	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	2	0.79	0.00	0.00
			Max. Compression	2	-0.79	0.00	0.00
			Max. Mx	14	0.12	-0.11	0.00
			Max. My	15	0.34	0.00	0.00
			Max. Vy	14	0.04	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
T7	40 - 20	Leg	Max Tension	12	56.75	0.10	-0.00
			Max. Compression	2	-66.33	-0.23	0.00
			Max. Mx	2	-66.29	0.37	-0.00
			Max. My	13	-4.07	-0.05	0.41
			Max. Vy	2	0.19	0.37	-0.00
			Max. Vx	13	-0.19	-0.05	0.41
		Diagonal	Max Tension	9	4.05	0.00	0.00
			Max. Compression	9	-4.08	0.00	0.00
			Max. Mx	15	0.54	0.06	0.01
			Max. My	21	-1.24	0.05	-0.01
			Max. Vy	25	0.03	0.06	0.01
			Max. Vx	21	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	2	1.15	0.00	0.00
			Max. Compression	2	-1.15	0.00	0.00
			Max. Mx	14	0.14	-0.12	0.00
			Max. My	15	0.46	0.00	0.00
			Max. Vy	14	-0.04	0.00	0.00
			Max. Vx	15	-0.00	0.00	0.00
T8	20 - 13.3333	Leg	Max Tension	12	62.40	0.11	-0.00
			Max. Compression	2	-72.85	-0.07	0.02
			Max. Mx	23	-29.49	-0.69	-0.00
			Max. My	13	-4.22	-0.05	0.41
			Max. Vy	15	0.29	0.30	0.00
			Max. Vx	11	-0.19	-0.05	-0.41
		Diagonal	Max Tension	9	4.09	0.00	0.00
			Max. Compression	3	-4.18	0.00	0.00
			Max. Mx	2	2.84	0.04	0.00
			Max. My	15	1.18	0.03	0.01
			Max. Vy	25	0.03	0.03	0.01
			Max. Vx	15	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	2	1.26	0.00	0.00
			Max. Compression	2	-1.26	0.00	0.00
			Max. Mx	14	0.16	-0.14	0.00
			Max. My	15	0.51	0.00	0.00
			Max. Vy	14	0.04	0.00	0.00
			Max. Vx	15	-0.00	0.00	0.00
T9	13.3333 - 6.66667	Leg	Max Tension	12	68.03	0.02	0.00
			Max. Compression	2	-79.52	-0.34	-0.00
			Max. Mx	25	12.07	0.72	-0.00
			Max. My	13	-4.71	-0.06	0.68
			Max. Vy	2	0.27	0.53	-0.00
			Max. Vx	13	-0.27	-0.06	0.68
		Diagonal	Max Tension	9	4.22	0.00	0.00
			Max. Compression	9	-4.32	0.00	0.00
			Max. Mx	25	0.07	0.11	0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	9	-4.29	0.02	-0.01
			Max. Vy	25	0.05	0.11	0.01
			Max. Vx	22	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	2	1.38	0.00	0.00
			Max. Compression	2	-1.38	0.00	0.00
			Max. Mx	14	0.16	-0.15	0.00
			Max. My	15	0.54	0.00	0.00
			Max. Vy	14	0.04	0.00	0.00
			Max. Vx	15	-0.00	0.00	0.00
T10	6.66667 - 1e-006	Leg	Max Tension	12	73.25	0.16	-0.00
			Max. Compression	2	-85.83	-0.00	-0.00
			Max. Mx	25	11.78	0.72	-0.00
			Max. My	13	-4.97	-0.06	0.68
			Max. Vy	25	0.26	-0.12	-0.00
			Max. Vx	13	0.29	-0.06	0.68
		Diagonal	Max Tension	9	4.33	0.00	0.00
			Max. Compression	3	-4.42	0.00	0.00
			Max. Mx	2	3.65	0.08	-0.01
			Max. My	15	1.87	0.03	0.01
			Max. Vy	26	0.04	0.03	0.01
			Max. Vx	15	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	2	1.49	0.00	0.00
			Max. Compression	2	-1.49	0.00	0.00
			Max. Mx	14	0.19	-0.17	0.00
			Max. My	14	0.19	0.00	0.01
			Max. Vy	14	0.05	0.00	0.00
			Max. Vx	14	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	10	88.68	9.79	-5.88
	Max. H_x	10	88.68	9.79	-5.88
	Max. H_z	3	-65.17	-7.09	5.22
	Min. Vert	4	-75.32	-8.60	5.17
	Min. H_x	4	-75.32	-8.60	5.17
	Min. H_z	10	88.68	9.79	-5.88
Leg B	Max. Vert	6	88.60	-9.95	-5.64
	Max. H_x	12	-75.97	8.77	4.96
	Max. H_z	12	-75.97	8.77	4.96
	Min. Vert	12	-75.97	8.77	4.96
	Min. H_x	6	88.60	-9.95	-5.64
	Min. H_z	6	88.60	-9.95	-5.64
Leg A	Max. Vert	2	89.13	-0.28	11.46
	Max. H_x	10	-36.48	1.49	-5.08
	Max. H_z	2	89.13	-0.28	11.46
	Min. Vert	8	-75.72	0.27	-10.08
	Min. H_x	5	5.13	-1.49	0.40
	Min. H_z	8	-75.72	0.27	-10.08

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	15.47	0.00	0.00	-1.75	2.69	0.00

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 0 deg - No Ice	15.47	-0.03	-18.82	-1068.91	4.83	-7.22
Dead+Wind 30 deg - No Ice	15.47	9.00	-15.69	-901.58	-513.15	-6.74
Dead+Wind 60 deg - No Ice	15.47	15.43	-8.93	-515.56	-885.15	-4.58
Dead+Wind 90 deg - No Ice	15.47	18.06	0.03	0.36	-1032.70	-1.32
Dead+Wind 120 deg - No Ice	15.47	16.25	9.44	533.66	-918.34	2.34
Dead+Wind 150 deg - No Ice	15.47	9.06	15.72	900.18	-516.82	5.40
Dead+Wind 180 deg - No Ice	15.47	0.03	17.90	1029.51	0.60	6.94
Dead+Wind 210 deg - No Ice	15.47	-9.00	15.69	898.05	518.58	6.74
Dead+Wind 240 deg - No Ice	15.47	-16.22	9.39	529.98	921.63	4.87
Dead+Wind 270 deg - No Ice	15.47	-18.06	-0.03	-3.88	1038.09	1.32
Dead+Wind 300 deg - No Ice	15.47	-15.46	-8.98	-519.22	892.67	-2.36
Dead+Wind 330 deg - No Ice	15.47	-9.06	-15.72	-903.68	522.24	-5.40
Dead+Ice+Temp	30.70	0.00	0.00	-3.42	7.00	-0.00
Dead+Wind 0 deg+Ice+Temp	30.70	-0.01	-5.48	-316.71	7.67	-1.47
Dead+Wind 30 deg+Ice+Temp	30.70	2.52	-4.39	-258.16	-138.99	-1.19
Dead+Wind 60 deg+Ice+Temp	30.70	4.26	-2.46	-146.98	-241.12	-0.64
Dead+Wind 90 deg+Ice+Temp	30.70	5.06	0.01	-2.76	-286.14	0.02
Dead+Wind 120 deg+Ice+Temp	30.70	4.73	2.75	153.80	-263.45	0.71
Dead+Wind 150 deg+Ice+Temp	30.70	2.54	4.40	251.97	-140.13	1.21
Dead+Wind 180 deg+Ice+Temp	30.70	0.01	4.94	284.85	6.35	1.36
Dead+Wind 210 deg+Ice+Temp	30.70	-2.52	4.39	251.31	153.02	1.19
Dead+Wind 240 deg+Ice+Temp	30.70	-4.72	2.73	152.65	276.82	0.76
Dead+Wind 270 deg+Ice+Temp	30.70	-5.06	-0.01	-4.08	300.17	-0.02
Dead+Wind 300 deg+Ice+Temp	30.70	-4.27	-2.48	-148.13	255.81	-0.72
Dead+Wind 330 deg+Ice+Temp	30.70	-2.54	-4.40	-258.81	154.16	-1.21
Dead+Wind 0 deg - Service	15.47	-0.01	-6.51	-371.01	3.43	-2.50
Dead+Wind 30 deg - Service	15.47	3.12	-5.43	-313.11	-175.80	-2.33
Dead+Wind 60 deg - Service	15.47	5.34	-3.09	-179.54	-304.51	-1.58
Dead+Wind 90 deg - Service	15.47	6.25	0.01	-1.02	-355.57	-0.46
Dead+Wind 120 deg - Service	15.47	5.62	3.27	183.51	-316.00	0.81
Dead+Wind 150 deg - Service	15.47	3.13	5.44	310.33	-177.07	1.87
Dead+Wind 180 deg - Service	15.47	0.01	6.20	355.08	1.97	2.40
Dead+Wind 210 deg - Service	15.47	-3.12	5.43	309.60	181.20	2.33
Dead+Wind 240 deg - Service	15.47	-5.61	3.25	182.24	320.67	1.69
Dead+Wind 270 deg - Service	15.47	-6.25	-0.01	-2.49	360.97	0.46
Dead+Wind 300 deg - Service	15.47	-5.35	-3.11	-180.81	310.65	-0.82
Dead+Wind 330 deg - Service	15.47	-3.13	-5.44	-313.84	182.47	-1.87

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-15.47	0.00	0.00	15.47	0.00	0.000%
2	-0.03	-15.47	-18.82	0.03	15.47	18.82	0.000%
3	9.00	-15.47	-15.69	-9.00	15.47	15.69	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
4	15.43	-15.47	-8.93	-15.43	15.47	8.93	0.000%
5	18.06	-15.47	0.03	-18.06	15.47	-0.03	0.000%
6	16.25	-15.47	9.44	-16.25	15.47	-9.44	0.000%
7	9.06	-15.47	15.72	-9.06	15.47	-15.72	0.000%
8	0.03	-15.47	17.90	-0.03	15.47	-17.90	0.000%
9	-9.00	-15.47	15.69	9.00	15.47	-15.69	0.000%
10	-16.22	-15.47	9.39	16.22	15.47	-9.39	0.000%
11	-18.06	-15.47	-0.03	18.06	15.47	0.03	0.000%
12	-15.46	-15.47	-8.98	15.46	15.47	8.98	0.000%
13	-9.06	-15.47	-15.72	9.06	15.47	15.72	0.000%
14	0.00	-30.70	0.00	0.00	30.70	0.00	0.000%
15	-0.01	-30.70	-5.48	0.01	30.70	5.48	0.000%
16	2.52	-30.70	-4.39	-2.52	30.70	4.39	0.000%
17	4.26	-30.70	-2.46	-4.26	30.70	2.46	0.000%
18	5.06	-30.70	0.01	-5.06	30.70	-0.01	0.000%
19	4.73	-30.70	2.75	-4.73	30.70	-2.75	0.000%
20	2.54	-30.70	4.40	-2.54	30.70	-4.40	0.000%
21	0.01	-30.70	4.94	-0.01	30.70	-4.94	0.000%
22	-2.52	-30.70	4.39	2.52	30.70	-4.39	0.000%
23	-4.72	-30.70	2.73	4.72	30.70	-2.73	0.000%
24	-5.06	-30.70	-0.01	5.06	30.70	0.01	0.000%
25	-4.27	-30.70	-2.48	4.27	30.70	2.48	0.000%
26	-2.54	-30.70	-4.40	2.54	30.70	4.40	0.000%
27	-0.01	-15.47	-6.51	0.01	15.47	6.51	0.000%
28	3.12	-15.47	-5.43	-3.12	15.47	5.43	0.000%
29	5.34	-15.47	-3.09	-5.34	15.47	3.09	0.000%
30	6.25	-15.47	0.01	-6.25	15.47	-0.01	0.000%
31	5.62	-15.47	3.27	-5.62	15.47	-3.27	0.000%
32	3.13	-15.47	5.44	-3.13	15.47	-5.44	0.000%
33	0.01	-15.47	6.20	-0.01	15.47	-6.20	0.000%
34	-3.12	-15.47	5.43	3.12	15.47	-5.43	0.000%
35	-5.61	-15.47	3.25	5.61	15.47	-3.25	0.000%
36	-6.25	-15.47	-0.01	6.25	15.47	0.01	0.000%
37	-5.35	-15.47	-3.11	5.35	15.47	3.11	0.000%
38	-3.13	-15.47	-5.44	3.13	15.47	5.44	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	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00000001
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000001
23	Yes	4	0.00000001	0.00000001
24	Yes	4	0.00000001	0.00000001
25	Yes	4	0.00000001	0.00000001

26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	92 - 80	1.665	27	0.1441	0.0289
T2	80 - 75	1.296	27	0.1366	0.0202
T3	75 - 70	1.148	27	0.1322	0.0163
T4	70 - 65	1.009	27	0.1259	0.0146
T5	65 - 60	0.877	27	0.1186	0.0121
T6	60 - 40	0.751	27	0.1095	0.0107
T7	40 - 20	0.345	27	0.0714	0.0060
T8	20 - 13.3333	0.094	27	0.0346	0.0022
T9	13.3333 - 6.66667	0.044	27	0.0236	0.0011
T10	6.66667 - 1e-006	0.012	27	0.0119	0.0005

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
91.00	SD310-HF2P4SNM	27	1.634	0.1435	0.0282	163686
90.00	BXA-171063-8BF-2 w/ Mount Pipe	27	1.603	0.1430	0.0276	163686
65.00	(2) 7770.00 w/ Mount Pipe	27	0.877	0.1186	0.0121	51329
63.00	RRUS-11	27	0.826	0.1151	0.0114	41605
59.00	GPS_A	27	0.727	0.1076	0.0105	29742

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	92 - 80	4.788	2	0.4112	0.0835
T2	80 - 75	3.727	2	0.3926	0.0585
T3	75 - 70	3.302	2	0.3797	0.0472
T4	70 - 65	2.904	2	0.3616	0.0423
T5	65 - 60	2.524	2	0.3407	0.0351
T6	60 - 40	2.162	2	0.3147	0.0309
T7	40 - 20	0.994	2	0.2055	0.0174
T8	20 - 13.3333	0.270	2	0.0996	0.0064
T9	13.3333 - 6.66667	0.127	2	0.0679	0.0032
T10	6.66667 - 1e-006	0.034	2	0.0342	0.0015

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
91.00	SD310-HF2P4SNM	2	4.699	0.4099	0.0816	63046
90.00	BXA-171063-8BF-2 w/ Mount Pipe	2	4.610	0.4086	0.0797	63046
65.00	(2) 7770.00 w/ Mount Pipe	2	2.524	0.3407	0.0351	18022
63.00	RRUS-11	2	2.377	0.3308	0.0330	14542
59.00	GPS_A	2	2.092	0.3092	0.0302	10404

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	92	Leg	A325N	0.6250	4	1.35	13.50	0.100 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2.03	2.08	0.974 ✔	1.333	Member Block Shear
		Top Girt	A325N	0.5000	1	0.09	2.72	0.032 ✔	1.333	Member Bearing
T2	80	Diagonal	A325N	0.5000	1	2.12	2.54	0.836 ✔	1.333	Member Block Shear
T3	75	Diagonal	A325N	0.5000	1	2.28	4.12	0.552 ✔	1.333	Bolt Shear
T4	70	Diagonal	A325N	0.5000	1	2.33	3.81	0.612 ✔	1.333	Member Block Shear
T5	65	Leg	A325N	0.6250	4	4.89	13.50	0.362 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.5000	1	3.44	5.44	0.632 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	0.18	4.12	0.045 ✔	1	Bolt Shear
T6	60	Leg	A325N	0.7500	4	9.65	19.44	0.496 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.91	4.12	0.947 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.5000	1	0.79	4.12	0.192 ✔	1.333	Bolt Shear
T7	40	Leg	A325N	0.8750	4	14.17	26.46	0.535 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4.05	4.08	0.992 ✔	1.333	Member Bearing
		Secondary Horizontal	A325N	0.6250	1	1.15	6.44	0.179 ✔	1.333	Bolt Shear
T8	20	Diagonal	A325N	0.5000	1	4.18	4.12	1.013 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.6250	1	1.26	6.44	0.196 ✔	1.333	Bolt Shear
T9	13.3333	Diagonal	A325X	0.5000	1	4.32	5.89	0.733 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.6250	1	1.38	6.44	0.214 ✔	1.333	Bolt Shear
T10	6.66667	Leg	A449	0.8750	4	18.29	23.81	0.768 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.5000	1	4.42	5.89	0.751 ✔	1.333	Bolt Shear
		Secondary Horizontal	A325N	0.6250	1	1.49	6.44	0.231 ✔	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	92 - 80	ROHN 2 STD	12.00	4.00	61.0 K=1.00	22.549	1.0745	-7.38	24.23	0.305 ✔
T2	80 - 75	ROHN 2.5 STD	5.01	5.01	63.4 K=1.00	22.122	1.7040	-10.65	37.70	0.283 ✔
T3	75 - 70	ROHN 2.5 STD	5.01	5.01	63.4 K=1.00	22.122	1.7040	-14.86	37.70	0.394 ✔
T4	70 - 65	ROHN 2.5 STD	5.01	5.01	63.4 K=1.00	22.122	1.7040	-18.41	37.70	0.488 ✔
T5	65 - 60	ROHN 2.5 STD	5.01	5.01	63.4 K=1.00	22.122	1.7040	-24.39	37.70	0.647 ✔
T6	60 - 40	ROHN 2.5 X-STR	20.03	3.47	45.0 K=1.00	25.108	2.2535	-45.72	56.58	0.808 ✔
T7	40 - 20	ROHN 3 X-STR	20.03	3.44	36.4 K=1.00	26.333	3.0159	-66.33	79.42	0.835 ✔
T8	20 - 13.3333	ROHN 3.5 X-STR	6.68	3.43	31.5 K=1.00	26.968	3.6784	-72.85	99.20	0.734 ✔
T9	13.3333 - 6.66667	ROHN 3.5 X-STR	6.68	3.42	31.4 K=1.00	26.973	3.6784	-79.52	99.22	0.801 ✔
T10	6.66667 - 1e-006	ROHN 3.5 X-STR	6.68	3.42	31.4 K=1.00	26.978	3.6784	-85.83	99.24	0.865 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	92 - 80	L1 1/2x1 1/2x1/8	7.68	3.62	146.8 K=1.00	6.928	0.3594	-2.03	2.49	0.814 ✔
T2	80 - 75	L1 3/4x1 3/4x1/8	8.45	4.13	142.8 K=1.00	7.319	0.4219	-2.24	3.09	0.727 ✔
T3	75 - 70	L2x2x1/4	8.86	4.33	133.0 K=1.00	8.448	0.9380	-2.25	7.92	0.283 ✔
T4	70 - 65	L1 3/4x1 3/4x3/16	9.28	4.54	158.6 K=1.00	5.934	0.6211	-2.39	3.69	0.648 ✔
T5	65 - 60	L2x2x1/4	9.70	4.75	145.9 K=1.00	7.019	0.9380	-3.49	6.58	0.530 ✔
T6	60 - 40	L2x2x1/4	12.24	6.18	189.7 K=1.00	4.151	0.9380	-3.91	3.89	1.003 ✔
T7	40 - 20	L2 1/2x2 1/2x3/16	13.99	7.02	170.2 K=1.00	5.154	0.9020	-4.08	4.65	0.879 ✔
T8	20 - 13.3333	L2 1/2x2 1/2x3/16	14.59	7.30	177.0 K=1.00	4.765	0.9020	-4.18	4.30	0.972 ✔
T9	13.3333 - 6.66667	L2 1/2x2 1/2x3/8	15.21	7.61	187.5 K=1.00	4.248	1.7300	-4.32	7.35	0.587 ✔
T10	6.66667 - 1e-006	L2 1/2x2 1/2x3/8	15.83	7.92	195.1 K=1.00	3.921	1.7300	-4.42	6.78	0.652 ✔

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T6	60 - 40	L2 1/2x2 1/2x1/4	10.25	10.01	122.4 K=0.50	9.942	1.1900	-0.79	11.83	0.067 ✔
T7	40 - 20	L2x2x1/4	12.29	12.00	184.1 K=0.50	4.407	0.9380	-1.15	4.13	0.278 ✔
T8	20 - 13.3333	L2x2x1/4	12.97	12.64	193.9 K=0.50	3.971	0.9380	-1.26	3.73	0.339 ✔
T9	13.3333 - 6.66667	L2x2x1/4	13.66	13.32	204.5 K=0.50	3.572	0.9380	-1.38	3.35	0.412 ✔
T10	6.66667 - 1e-006	L2x2x1/4	14.35	14.01	215.0 K=0.50	3.230	0.9380	-1.49	3.03	0.491 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	92 - 80	L2x2x1/8	6.52	6.11	184.6 K=1.00	4.384	0.4844	-0.09	2.12	0.040 ✔
T5	65 - 60	L2 1/2x2 1/2x1/4	8.06	7.61	186.1 K=1.00	4.312	1.1900	-0.19	5.13	0.037 ✔

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	92 - 80	ROHN 2 STD	12.00	4.00	61.0	30.000	1.0745	5.42	32.24	0.168 ✔
T2	80 - 75	ROHN 2.5 STD	5.01	5.01	63.4	30.000	1.7040	8.55	51.12	0.167 ✔
T3	75 - 70	ROHN 2.5 STD	5.01	5.01	63.4	30.000	1.7040	12.36	51.12	0.242 ✔
T4	70 - 65	ROHN 2.5 STD	5.01	5.01	63.4	30.000	1.7040	15.66	51.12	0.306 ✔
T5	65 - 60	ROHN 2.5 STD	5.01	5.01	63.4	30.000	1.7040	19.55	51.12	0.382 ✔
T6	60 - 40	ROHN 2.5 X-STR	20.03	3.47	45.0	30.000	2.2535	38.67	67.61	0.572 ✔
T7	40 - 20	ROHN 3 X-STR	20.03	3.44	36.4	30.000	3.0159	56.75	90.48	0.627 ✔
T8	20 - 13.3333	ROHN 3.5 X-STR	6.68	3.43	31.5	30.000	3.6784	62.40	110.35	0.565 ✔
T9	13.3333 - 6.66667	ROHN 3.5 X-STR	6.68	3.42	31.4	30.000	3.6784	68.03	110.35	0.616 ✔
T10	6.66667 - 1e-006	ROHN 3.5 X-STR	6.68	3.42	31.4	30.000	3.6784	73.25	110.35	0.664 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	92 - 80	L1 1/2x1 1/2x1/8	7.67	3.62	96.0	29.000	0.2109	2.03	6.12	0.332 ✔
T2	80 - 75	L1 3/4x1 3/4x1/8	8.45	4.13	93.1	29.000	0.2578	2.12	7.48	0.284 ✔
T3	75 - 70	L2x2x1/4	8.86	4.33	87.4	29.000	0.5863	2.28	17.00	0.134 ✔
T4	70 - 65	L1 3/4x1 3/4x3/16	9.28	4.54	103.8	29.000	0.3779	2.33	10.96	0.212 ✔
T5	65 - 60	L2x2x1/4	9.70	4.75	95.7	29.000	0.5863	3.44	17.00	0.202 ✔
T6	60 - 40	L2x2x1/4	12.24	6.18	121.8	29.000	0.5863	3.86	17.00	0.227 ✔
T7	40 - 20	L2 1/2x2 1/2x3/16	13.99	7.02	108.3	29.000	0.5886	4.05	17.07	0.237 ✔
T8	20 - 13.3333	L2 1/2x2 1/2x3/16	14.59	7.30	112.6	29.000	0.5886	4.09	17.07	0.239 ✔
T9	13.3333 - 6.66667	L2 1/2x2 1/2x3/8	15.21	7.61	121.3	29.000	1.1217	4.22	32.53	0.130 ✔
T10	6.66667 - 1e-006	L2 1/2x2 1/2x3/8	15.83	7.92	126.2	29.000	1.1217	4.33	32.53	0.133 ✔

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T6	60 - 40	L2 1/2x2 1/2x1/4	10.25	10.01	156.3	29.000	0.7753	0.79	22.48	0.035 ✔
T7	40 - 20	L2x2x1/4	12.29	12.00	236.4	29.000	0.5629	1.15	16.32	0.070 ✔
T8	20 - 13.3333	L2x2x1/4	12.97	12.64	249.0	29.000	0.5629	1.26	16.32	0.077 ✔
T9	13.3333 - 6.66667	L2x2x1/4	13.66	13.32	262.6	29.000	0.5629	1.38	16.32	0.084 ✔
T10	6.66667 - 1e-006	L2x2x1/4	14.35	14.01	276.1	29.000	0.5629	1.49	16.32	0.091 ✔

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	92 - 80	L2x2x1/8	6.52	6.11	121.2	29.000	0.3047	0.09	8.84	0.010 ✔
T5	65 - 60	L2 1/2x2 1/2x1/4	8.06	7.61	122.1	29.000	0.7753	0.18	22.48	0.008 ✔ *

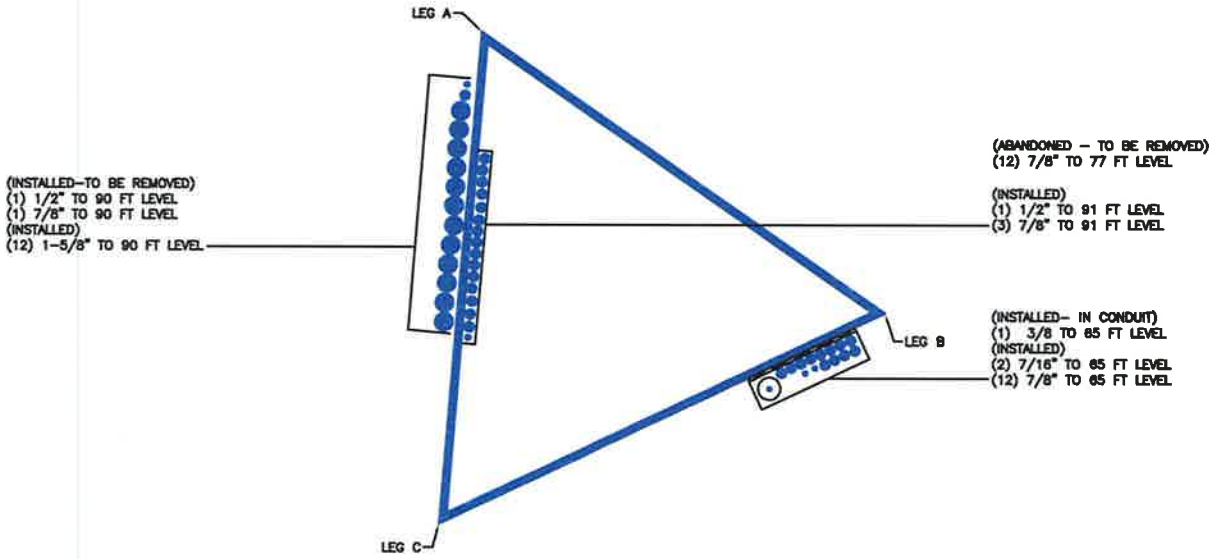
* DL controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	92 - 80	Leg	ROHN 2 STD	1	-7.38	32.30	22.9	Pass
T2	80 - 75	Leg	ROHN 2.5 STD	25	-10.65	50.25	21.2	Pass
T3	75 - 70	Leg	ROHN 2.5 STD	34	-14.86	50.25	29.6	Pass
T4	70 - 65	Leg	ROHN 2.5 STD	43	-18.41	50.25	36.6	Pass
T5	65 - 60	Leg	ROHN 2.5 STD	54	-24.39	50.25	48.5	Pass
T6	60 - 40	Leg	ROHN 2.5 X-STR	66	-45.72	75.42	60.6	Pass
T7	40 - 20	Leg	ROHN 3 X-STR	96	-66.33	105.87	62.7	Pass
T8	20 - 13.3333	Leg	ROHN 3.5 X-STR	126	-72.85	132.23	55.1	Pass
T9	13.3333 - 6.66667	Leg	ROHN 3.5 X-STR	138	-79.52	132.26	60.1	Pass
T10	6.66667 - 1e-006	Leg	ROHN 3.5 X-STR	150	-85.83	132.28	64.9	Pass
T1	92 - 80	Diagonal	L1 1/2x1 1/2x1/8	12	-2.03	3.32	61.1 73.1 (b)	Pass
T2	80 - 75	Diagonal	L1 3/4x1 3/4x1/8	32	-2.24	4.12	54.5 62.7 (b)	Pass
T3	75 - 70	Diagonal	L2x2x1/4	41	-2.25	10.56	21.3 41.4 (b)	Pass
T4	70 - 65	Diagonal	L1 3/4x1 3/4x3/16	50	-2.39	4.91	48.6	Pass
T5	65 - 60	Diagonal	L2x2x1/4	62	-3.49	8.78	39.8 47.4 (b)	Pass
T6	60 - 40	Diagonal	L2x2x1/4	71	-3.91	5.19	75.3	Pass
T7	40 - 20	Diagonal	L2 1/2x2 1/2x3/16	102	-4.08	6.20	65.9 74.4 (b)	Pass
T8	20 - 13.3333	Diagonal	L2 1/2x2 1/2x3/16	131	-4.18	5.73	72.9 76.0 (b)	Pass
T9	13.3333 - 6.66667	Diagonal	L2 1/2x2 1/2x3/8	144	-4.32	9.80	44.1 55.0 (b)	Pass
T10	6.66667 - 1e-006	Diagonal	L2 1/2x2 1/2x3/8	155	-4.42	9.04	48.9 56.3 (b)	Pass
T6	60 - 40	Secondary Horizontal	L2 1/2x2 1/2x1/4	74	-0.79	15.77	5.0 14.4 (b)	Pass
T7	40 - 20	Secondary Horizontal	L2x2x1/4	104	-1.15	5.51	20.9	Pass
T8	20 - 13.3333	Secondary Horizontal	L2x2x1/4	134	-1.26	4.97	25.4	Pass
T9	13.3333 - 6.66667	Secondary Horizontal	L2x2x1/4	147	-1.38	4.47	30.9	Pass
T10	6.66667 - 1e-006	Secondary Horizontal	L2x2x1/4	158	-1.49	4.04	36.9	Pass
T1	92 - 80	Top Girt	L2x2x1/8	5	-0.09	2.83	3.0	Pass
T5	65 - 60	Top Girt	L2 1/2x2 1/2x1/4	55	-0.19	6.84	2.8 3.3 (b)	Pass
							Summary	
						Leg (T10)	64.9	Pass
						Diagonal (T8)	76.0	Pass
						Secondary Horizontal (T10)	36.9	Pass
						Top Girt (T5)	3.3	Pass
						Bolt Checks	76.0	Pass
						RATING =	**76.0**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 806366 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Version 3.2
Rev. Date: 02.18.2014

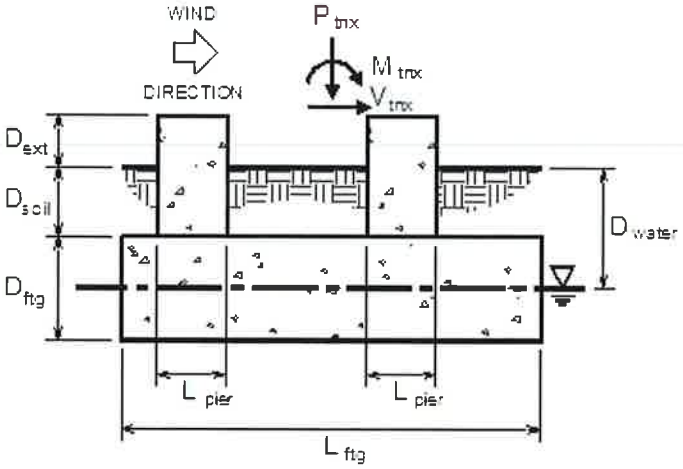
Project: BU806386
Site: NHV 106 943628

SST - SQUARE PIER AND PAD - MAT FOUNDATION ANALYSIS
TIA-222-F

Designed by: JFB
Checked by :EP
Date:11.09.14

1.0 FOUNDATION GEOMETRY & MATERIALS:

L_{ftg}= Length of footing (parallel to wind direction)
L_{pier}= Length/Diameter of pier
L_{tower}= Centerline distance between tower legs
D_{ftg}= Depth of footing
D_{soil}= Depth of soil above footing
D_{ext}= Height of pier above soil grade line
B_{ftg}= Width of footing (perpendicular to wind direction)
ρ_{conc}= Concrete density
A_{ftg} = Bearing area of spread footing
V_{ftg} = Volume of spread footing (does not include piers)
D_{pier} = Depth (height) of pier
A_{pier} = Cross-sectional area of pier



SECTION

$L_{ftg} := 19.0\,ft$ $\quad B_{ftg} := L_{ftg} = 19\,ft$ $\quad L_{pier} := 0\,ft$

$D_{ext} := 0\,ft$ $\quad L_{tower} := 27\,ft$

○ Square Pier
◉ Round Pier

$D_{soil} := 3.5\,ft$

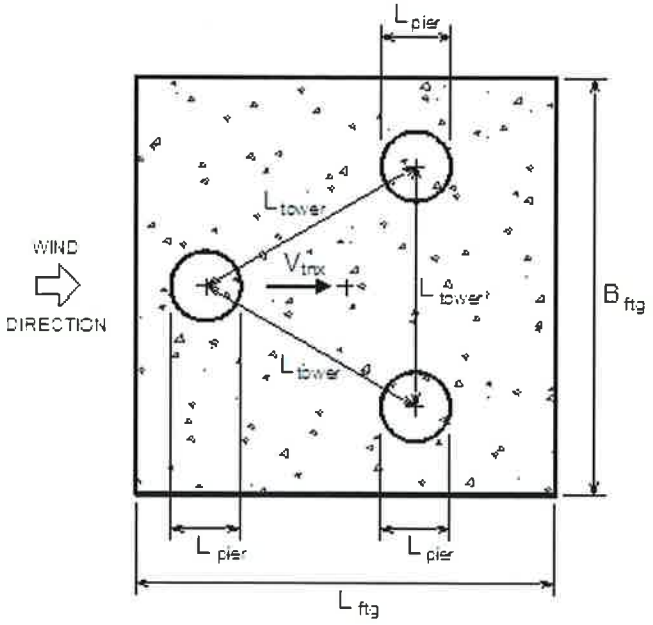
$D_{ftg} := 3.5\,ft$ $\quad \rho_{conc} := 150\,pcf$

$A_{ftg} := L_{ftg} \cdot B_{ftg} = 361\,ft^2$

$D_{pier} := D_{soil} + D_{ext} = 3.5\,ft$

$V_{ftg} := A_{ftg} \cdot D_{ftg} = 1263.5\,ft^3$

$$A_{pier} := \begin{cases} (L_{pier})^2 & \text{if } R = 1 \\ \dfrac{\pi \cdot (L_{pier})^2}{4} & \text{otherwise} \end{cases} \quad = 0$$



PLAN

2.0 SOIL PARAMETERS:

Data obtained from Geotechnical report

D_{water}= Depth of water table below soil grade line
$D_{neglect}$= Depth of soil below grade line that is neglected
γ_{soil}= Moist density of soil
ϕ= Angle of friction of soil
K_p = Passive earth pressure coefficient
q_{brg_allow}= Allowable gross bearing capacity of soil
FOS_{coh}= Factor of Safety for cohesion
FOS_{lat}= Factor of Safety for lateral bearing
μ= Coefficient of friction - concrete & soil (sand)
c= Cohesion (clay)

$D_{water} := 99\,ft$ ☑ Check here if Groundwater is not present

$\phi := 0\,deg$

$$K_p := \left(\tan\left(45 \cdot deg + \frac{\phi}{2}\right)\right)^2 = 1.00$$

$FOS_{lat} := 2.0$

$\mu := 0.2$

$\gamma_{soil} := 100\,pcf$

$c := 1000\,psf$ c is unknown, use 0

$q_{brg\_allow} := 15000\,psf$

$FOS_{coh} := 2.0$

3.0 LOADS:

Load combinations based on TIA-222-F (1.0D + 1.0W):

P= Unfactored global axial load from tnxTower (1.0D)
V= Unfactored global shear load from tnxTower (1.0W)
M= Unfactored global moment from tnxTower (1.0W)
T = Unfactored global torsion from tnx Tower (1.0W)

P_{pier} = Unfactored pier axial down load from tnxTower (1.0D)
V_{pier} = Unfactored pier shear load from tnxTower (1.0W)
M_{pier} = Unfactored pier moment from tnxTower (1.0W)

$P := 15 \cdot kip$

$V := 19 \cdot kip$

$M := 1069 \cdot kip \cdot ft$

$T := 7 \cdot kip \cdot ft$

$P_{pier} := 89 \cdot kip$

$V_{pier} := 11 \cdot kip$

ρ'_{conc_pier}= Density of concrete pier considering ground water depth
ρ'_{conc_ftg}= Density of concrete footing considering ground water depth
WT_{ftg}= Weight of footing, including piers

$\rho'_{conc\_pier} = 150 \cdot pcf$

$\rho'_{conc\_ftg} = 150 \cdot pcf$

$WT_{ftg} := \rho_{conc} \cdot 3A_{pier} \cdot D_{ext} + \rho'_{conc\_pier} \cdot 3A_{pier} \cdot D_{soil} + \rho'_{conc\_ftg} \cdot V_{ftg} = 189.52 \cdot kip$

4.0 ANALYSIS

4.1 BEARING CHECK:

Considering 1.0D+1.0W TIA-222-F Load Combination:

M_{over}= Overturning moment due to wind
P_{tot}= Axial dead load, self-weight of footing, and weight of soil directly above footing
e_{brg}= Eccentricity in the direction of the wind (L_{ftg})
q_{min}= Minimum bearing pressure due to applied loads
q_{max}= Maximum bearing pressure due to applied loads

$M_{over} := M + V \cdot (D_{pier} + D_{ftg}) = 1202 \cdot kip \cdot ft$

$P_{tot} := P + \left[WT_{ftg} + \gamma'_{soil} \cdot (A_{ftg} - 3 \cdot A_{pier}) D_{soil}\right] = 330.88 \cdot kip$

$e_{brg} := \frac{M_{over}}{P_{tot}} = 3.63\,ft \qquad \frac{L_{ftg}}{6} = 3.17\,ft \qquad \frac{L_{ftg}}{2} = 9.5\,ft$

$q_{min} := if\left(e_{brg} \le \frac{L_{ftg}}{6}, \frac{P_{tot}}{L_{ftg} \cdot B_{ftg}} - \frac{6 \cdot M_{over}}{B_{ftg} \cdot L_{ftg}^2}, if\left(e_{brg} \ge \frac{L_{ftg}}{2}, "NO\ GOOD", 0 \cdot psf\right)\right) = 0 \cdot psf$

$q_{max} := if\left[e_{brg} \le \frac{L_{ftg}}{6}, \frac{P_{tot}}{L_{ftg} \cdot B_{ftg}} + \frac{6 \cdot M_{over}}{B_{ftg} \cdot L_{ftg}^2}, if\left[e_{brg} \ge \frac{L_{ftg}}{2}, "NO\ GOOD", \frac{2 \cdot P_{tot}}{3 \cdot B_{ftg} \cdot \left(\frac{L_{ftg}}{2} - e_{brg}\right)}\right]\right] = 1979 \cdot psf$

$q_{brg\_allow} = 15000 \cdot psf$

$if(1.10 \cdot q_{brg\_allow} > q_{max}, "OK", "NO\ GOOD") = "OK"$

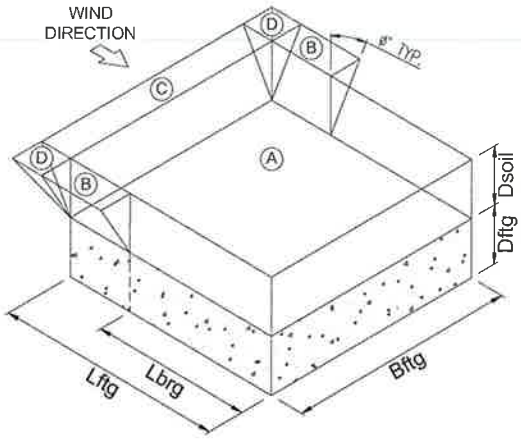
$\frac{q_{max}}{q_{brg\_allow}} = 13.2\%$

4.2 OVERTURNING CHECK:

Considering 1.0D+1.0W Load Combination with Factor of Safety (FS) = 1.5 per TIA-222-F, Sect. 7.2.4.5:

L_{brg} = Length of soil bearing area due to applied factored loads
γ'_{soil} = Density of soil above top of footing considering ground water depth
WT_{soil1} = Weight of soil centered over centroid of footing (A)
WT_{soil2} = Weight of soil extending beyond sides of the half of the footing in uplift "tension" (B)
WT_{soil3} = Weight of soil extending beyond back edge of footing (C + D)
V_{coh} = Vertical shear resistance due to soil cohesion above "non-bearing" portion of footing
M_{resist} = Resisting moment due to axial dead load, footing self-weight and weight of soil above footing and extending beyond top of footing at $\phi°$
e_{OT} = Eccentricity in the direction of the wind (L_{ftg})

$e_{OT} := e_{brg} = 3.63\ ft$



$L_{ftg} = 19\ ft$

$\frac{L_{ftg}}{6} = 3.17\ ft$

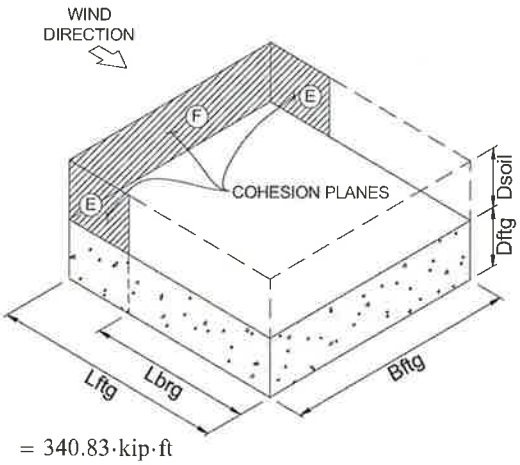
$L_{brg} := \begin{cases} L_{ftg} & \text{if } e_{OT} < \frac{L_{ftg}}{6} \\ 3\cdot\left(\frac{L_{ftg}}{2} - e_{OT}\right) & \text{otherwise} \end{cases} = 17.6\cdot ft$

$q_{min} = 0\cdot psf$

$q_{max} = 1979\cdot psf$

$\gamma'_{soil} = 100\cdot pcf$

$WT_{soil_1} := \gamma'_{soil}\cdot\left(A_{ftg} - 3\cdot A_{pier}\right)D_{soil} = 126.35\cdot kip$ (A)



$WT_{soil_2} := \begin{cases} 0\cdot kip & \text{if } \left(L_{ftg} - L_{brg}\right) \le 0\cdot ft \\ \gamma'_{soil}\cdot\left[\left(L_{ftg} - L_{brg}\right)\cdot D_{soil}^{2}\cdot\tan(\phi)\right] & \text{otherwise} \end{cases} = 0\cdot kip$ (B x 2)

$WT_{soil_3} := \begin{cases} 0\cdot kip & \text{if } \left(L_{ftg} - L_{brg}\right) \le 0\cdot ft \\ \gamma'_{soil}\cdot\left(\frac{B_{ftg}}{2}\cdot D_{soil}^{2}\cdot\tan(\phi) + \frac{2}{3}\cdot D_{soil}^{3}\cdot\tan(\phi)^{2}\right) & \text{otherwise} \end{cases} = 0\cdot kip$ (C; D x 2)

$V_{coh} := \begin{cases} 0\cdot kip\cdot ft & \text{if } \left(L_{ftg} - L_{brg}\right) \le 0\cdot ft \\ \left(\frac{c}{2\cdot FOS_{coh}}\right)\cdot\left[2\cdot\left(L_{ftg} - L_{brg}\right)\cdot\left(L_{ftg} - \frac{L_{brg}}{2}\right) + B_{ftg}\cdot L_{ftg}\right]\cdot D_{soil} & \text{otherwise} \end{cases} = 340.83\cdot kip\cdot ft$ (E x 2; F)

$M_{resist} := \left[P + \left(WT_{soil_1} + WT_{ftg}\right)\right]\cdot\frac{L_{ftg}}{2} + \left(WT_{soil_2}\right)\cdot\left(\frac{L_{ftg} + L_{brg}}{2}\right) + \left(WT_{soil_3}\right)\cdot\left(L_{ftg} + \frac{D_{soil}\cdot\tan(\phi)}{3}\right) + V_{coh} = 3484\cdot kip\cdot ft$

$M_{over} = 1202\cdot kip\cdot ft$

$\frac{M_{resist}}{M_{over}} = 2.90$

$\text{if}\left(1.10\cdot\frac{M_{resist}}{M_{over}} > 1.5, \text{"OK"}, \text{"NO GOOD"}\right) = \text{"OK"}$

$\frac{1.5\cdot M_{over}}{M_{resist}} = 51.7\cdot\%$

4.3 SLIDING RESISTANCE CHECK:

Considering 1.0D+1.0W Load Combination with Factor of Safety (FS) = 1.5 per TIA-222-F:

q_{lat_allow} = Allowable lateral bearing capacity of soil
$R_{s\_lat\_brg}$ = Nominal soil resistance to bearing
$R_{s\_lat\_sliding}$ = Nominal soil resistance to sliding
R_s = Total nominal soil resistance to resist sliding (bearing + sliding)
R_{s_allow} = Allowable strength of soil to resist sliding

$$q_{lat\_allow\_pier} := \frac{K_p \cdot \gamma'_{soil\_pier}}{FOS_{lat}} = 50 \cdot \frac{psf}{ft} \qquad q_{lat\_allow\_ftg} := \frac{K_p \cdot \gamma'_{soil\_ftg}}{FOS_{lat}} = 50 \cdot \frac{psf}{ft}$$

$$R_{s\_lat\_brg} := \underbrace{q_{lat\_allow\_pier} \cdot \left(\frac{3}{2} \cdot D_{soil}^{2} \cdot L_{pier}\right) + q_{lat\_allow\_ftg} \cdot \left[\left(D_{soil} + \frac{D_{ftg}}{2}\right) \cdot D_{ftg} \cdot B_{ftg}\right]}_{\text{Lateral Bearing - Soil Pressure (sand)}} + \underbrace{\left(2 \cdot c \cdot \sqrt{K_p}\right) \cdot \left(3 \cdot D_{soil} \cdot L_{pier} + D_{ftg} \cdot B_{ftg}\right)}_{\text{Lateral Bearing - Cohesion (clay)}} = 150.5 \cdot kip$$

$$R_{s\_lat\_sliding} := \underbrace{(\mu) \cdot \left(P + WT_{soil_1}\right)}_{\substack{\text{Lateral Sliding} \\ \text{Friction (sand)}}} + \underbrace{c \cdot \left[A_{ftg} + 2 \cdot \left(D_{ftg} \cdot L_{ftg}\right)\right]}_{\substack{\text{Lateral Sliding} \\ \text{Cohesion (clay)}}} = 522.3 \cdot kip$$

$$R_{s\_allow} := R_{s\_lat\_brg} + R_{s\_lat\_sliding} = 672.73 \cdot kip$$

$$V = 19 \cdot kip$$

$$\frac{R_{s\_allow}}{V} = 35.41$$

$$\text{if}\left(1.10 \cdot \frac{R_{s\_allow}}{V} > 1.5, \text{"OK"}, \text{"NO GOOD"}\right) = \text{"OK"}$$

$$\frac{1.5 \cdot V}{R_{s\_allow}} = 4.2 \cdot \%$$

4.4 TORSION RESISTANCE CHECK:

Considering 1.0D+1.0W Load Combination with Factor of Safety (FS) = 1.5 per TIA-222-F:

T_{s_allow} = Allowable strength of soil to resist torsion

$$T_{s\_allow} := q_{lat\_allow\_ftg} \cdot \left(D_{soil} + \frac{D_{ftg}}{2}\right) \cdot \left[2 \cdot \left(0.1 \cdot L_{ftg}\right) \cdot D_{ftg} \cdot \left(0.45 \cdot L_{ftg}\right) + 2 \cdot \left(0.1 \cdot B_{ftg}\right) \cdot D_{ftg} \cdot \left(0.45 B_{ftg}\right)\right] = 59.7 \cdot kip \cdot ft$$

(Assume that 10% of the face of the footing is resisting the torsion force)

$$T = 7 \cdot kip \cdot ft$$

$$\frac{T_{s\_allow}}{T} = 8.53$$

$$\text{if}\left(1.10 \cdot \frac{T_{s\_allow}}{T} > 1.5, \text{"OK"}, \text{"NO GOOD"}\right) = \text{"OK"}$$

$$\frac{1.5 \cdot T}{T_{s\_allow}} = 17.6 \cdot \%$$

Version 3.2
Rev. Date: 02.18.2014

Project: BU806386
Site: NHV 106 943628

SST - SQUARE PIER AND PAD - MAT FOUNDATION ANALYSIS TIA-222-F

Designed by: JFB
Checked by : EP
Date:12.09.14

1.0 FOUNDATION GEOMETRY & MATERIALS:

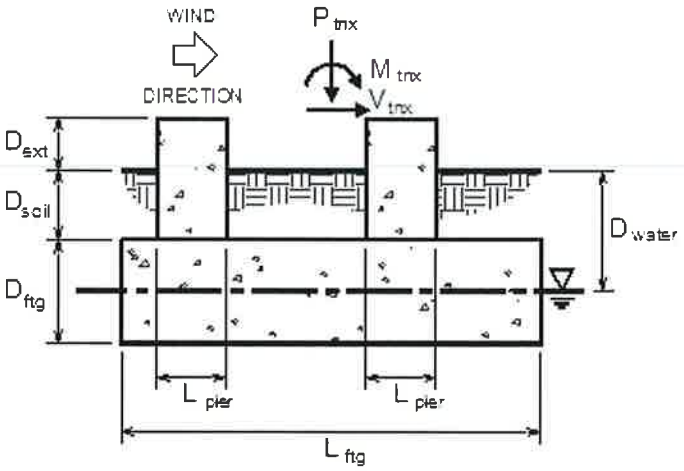
$L_{ftg} = 19\,ft$ $B_{ftg} = 19\,ft$ $L_{pier} = 0$

$D_{ftg} = 3.5\,ft$ $D_{soil} = 3.5\,ft$ $D_{ext} = 0$

$L_{tower} = 27\,ft$ Pier = "Round"

$d = 0 \cdot in$ No_rebar = 0 Size_rebar = 0

$f_y = 60000 \cdot psi$ $f_c = 3000 \cdot psi$



SECTION

2.0 SOIL PARAMETERS:

$\phi = 0 \cdot deg$ $K_p = 1.00$

$\gamma_{soil} = 100 \cdot pcf$ $\mu = 0.2$ $c = 1000 \cdot psf$

Groundwater = "Not Present"

$q_{brg\_allow} = 15000 \cdot psf$

3.0 LOADS:

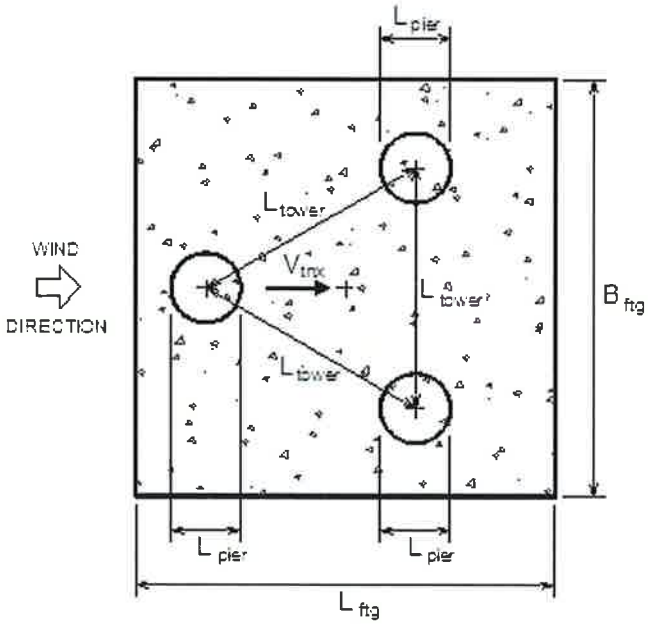
Load combinations based on TIA-222-F (1.0D + 1.0W):

$P = 15 \cdot kip$ $P_{pier} = 89 \cdot kip$

$V = 19 \cdot kip$ $V_{pier} = 11 \cdot kip$

$M = 1069 \cdot kip \cdot ft$

$T = 7\,ft \cdot kip$



PLAN

4.0 ANALYSIS RESULTS:

		APPLIED	ALLOWABLE	CHECK
4.1	BEARING:	$B_{app} = 1979 \cdot psf$	$B_{cap} = 15000 \cdot psf$	B% = 13.2·%
4.2	OVERTURNING:	$M_{app} = 1202 \cdot kip \cdot ft$	$M_{cap} = 2323 \cdot kip \cdot ft$	M% = 51.7·%
4.3	SLIDING:	$V_{app} = 19 \cdot kip$	$V_{cap} = 448 \cdot kip$	V% = 4.2·%
4.4	TORSION:			T% = 17.6·%