



February 10, 2014

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Subject: **Structural Analysis Report**

Carrier Designation: **Verizon Wireless Co-Locate**
Carrier Site Number: n/a
Carrier Site Name: Falmouth, ME

Crown Castle Designation: **Crown Castle BU Number:** 878783
Crown Castle Site Name: PORTLAND NORTH
Crown Castle JDE Job Number: 258473
Crown Castle Work Order Number: 707679
Crown Castle Application Number: 214017 Rev. 0

Engineering Firm Designation: **B+T Group Project Number:** 82822.005.01

Site Data: **527 Persumpscot, Portland, Cumberland County, ME**
Latitude 43° 41' 58.53", Longitude -70° 15' 30.64"
178 Foot - Monopole Tower

Dear Sean Dempsey,

B+T Group 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 614621, in accordance with application 214017, revision 0.

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

LC5: Existing + Proposed Equipment

Sufficient Capacity

Note: See Table 1 and Table 2 for the proposed and existing loading, respectively.

The analysis has been performed in accordance with the TIA-222-G standard and IBC 2009 based upon a wind speed of 100 mph 3-second gust, exposure category C with topographic category 1 and crest height of 0 feet.

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

We at B+T Group 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.

Respectfully submitted by:
B+T Engineering, Inc.

Shardul Kadam, E.I.
Project Engineer

Chad E. Tuttle, P.E.
President

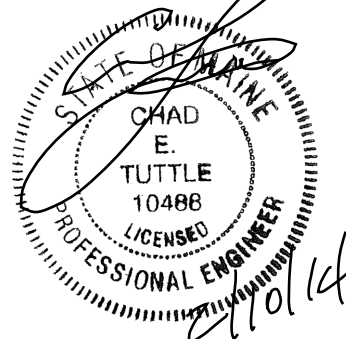


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1) INTRODUCTION

This tower is a 178 ft Monopole tower designed by Pittsburg Monopole in December of 1996. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. This tower has been modified multiple times to accommodate additional loading and these modification were considered in this analysis.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 100 mph with no ice, 40 mph with 1 inch ice thickness and 60 mph under service loads, exposure category C with topographic category 1 and crest height of 0 feet.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
149.0	151.0	1	Alcatel Lucent	RRH2X40-AWS	1	1 5/8	--
		1	Commscope	HBX-6516DS-A1M			
		1	Commscope	LNK-6514DS-VTM			
	150.0	2	Alcatel Lucent	RRH2X40-AWS			
		2	Commscope	HBX-6516DS-A1M			
		2	Commscope	LNK-6514DS-VTM			
		1	Rfs Celwave	DB-B1-6C-12AB-0Z			

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
178.0	180.0	2	Decibel	DB978G30E-M	6	1 5/8	1
		4	Decibel	DB978H65E-M			
	178.0	1	--	Platform Mount [LP 713-1]			
168.0	171.0	3	Ericsson	KRY 112 144/1	12	1 5/8	1
		3	Rfs Celwave	APX16DWV-16DWV-S-E-A20			
	170.0	6	Ericsson	KRY 112 71			
		6	Rfs Celwave	APXV18-206517-C			
	168.0	1	--	Platform Mount [LP 305-1]			
162.0	162.0	1	--	Side Arm Mount [SO 701-3]	--	--	1
160.0	160.0	6	Ericsson	RRUS-11	12 2 1	1 5/8 3/4 3/8	1
		1	Andrew	SBNH-1D6565C			
		1	Kmw Communications	AM-X-CD-16-65-00T-RET			
		6	Powerwave	7020.00			
		3	Powerwave	7391.00			
		6	Powerwave	7770.00			
		6	Powerwave	LGP21401			
		6	Powerwave	LGP21903			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		1	Powerwave	P65-17-XLH-RR			
		1	Raycap	DC6-48-60-18-8F			
		1	--	T-Arm Mount [TA 602-3]			
149.0	151.0	2	Andrew	DB846F65ZAXY	--	--	2
		1	Andrew	HBX-6517DS-T2M	18	1 5/8	1
		2	Andrew	LNx-6514DS-VTM			
	150.0	2	Andrew	DB846F65ZAXY	--	--	2
		2	Decibel	DB846F65ZAXY			
		2	Andrew	HBX-6517DS-T2M	--	--	1
		1	Andrew	LNx-6514DS-VTM			
	149.0	1	--	Platform Mount [LP 713-1]			
134.0	135.0	6	Antel	BSA-185065/10CF	12 1	7/8 3/8	1
		3	Ericsson	KRC 115 032/2			
		3	Powerwave	P65-17-XL-R			
	134.0	1	--	Platform Mount [LP 403-1]			

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)
180	180	12	Generic	4 sq. ft.	--	--
		1	Generic	Platform		
170	170	2	Generic	6' Dishes	--	--
160	160	12	Generic	4 sq. ft.	--	--
		1	Generic	Platform		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Co-Locate, Revision# 0	214017	CCI Sites
Tower Manufacturer Drawings	Pittsburg, Date: 12/18/1996	1619399	CCI Sites
Tower Modification Drawings	PSG Engineering, Inc. Date: 08/28/2008	2415719	CCI Sites
Post Modification Inspection	PSG Engineering, Project No. 0801F197-A040180	3630219	CCI Sites
Tower Modification Drawings	FDH Engineering, Project No. 12-03730E S2	3175691	CCI Sites
Post Modification Inspection	TEP, Project No. 127900	3455671	CCI Sites
Foundation Drawings	Pittsburg, Date: 12/18/1996	1620582	CCI Sites

Document	Remarks	Reference	Source
Geotech Report	Gemini Geotechnical Associates, Date: 09/30/1996	1620506	CCI Sites
Antenna Configuration	Crown CAD Package	Date: 02/03/2014	CCI Sites

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) Mount areas and weights are assumed based on photographs provided.
- 5) The existing base plate grout was not considered in this analysis.

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

3) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	178 - 140	Pole	P24x1/2	1	-14.756	1162.780	71.7	Pass
L2	140 - 100	Pole	P36x1/2	2	-28.370	1756.540	104.8	Pass Note:2
L3	100 - 60	Pole	P48x5/8	3	-45.592	2930.150	86.5	Pass
L4	60 - 20	Pole	P54x5/8	4	-65.404	3301.250	104.9	Pass Note:2
L5	20 - 0	Pole	P60x5/8	5	-76.335	3649.510	101.8	Pass Note:2
							Summary	
						Pole (L4)	104.9	Pass Note:2
						RATING =	104.9	Pass Note:2

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Flange	140	90.4	Pass
1	Flange	100	95.7	Pass
1	Flange	60	91.0	Pass
1,2	Flange	20	103.8	Pass
1	Anchor Rods	Base	98.3	Pass
1	Base Plate	Base	41.2	Pass
1	Base Foundation	Base	98.5	Pass

Structure Rating (max from all components) =	104.9%
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Notes:

- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) Capacities up to 105% are considered acceptable based on analysis methods used.

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

ALL REACTIONS ARE FACTORED

AXIAL 125 K

SHEAR 8 K

MOM 1097 k

TORQUE 0 kip-ft

40 mph WIND - 1,000 in ICE

AXIAL 76 K

SHEAR 41 K

MOM 5282 k

TORQUE 2 kip-ft

REACTIONS - 100 mph WIND

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8" x 8' (E)	178	(2) LGP21903 (E)	160
5' x 2" Pipe Mount (E)	178	(2) 7020.00 (E)	160
(2) DB978G30E-M w/ Mount Pipe (E)	178	(2) 7020.00 (E)	160
(2) DB978H65E-M w/ Mount Pipe (E)	178	(2) 7020.00 (E)	160
(2) DB978H65E-M w/ Mount Pipe (E)	178	P65-17-XLH-RR w/ Mount Pipe (E)	160
(2) 5' x 2" Pipe Mount (E)	178	SBNH-1D6565C w/ Mount Pipe (E)	160
(2) 5' x 2" Pipe Mount (E)	178	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	160
(2) 5' x 2" Pipe Mount (E)	178		
Platform Mount [LP 713-1] (E)	178	DC6-48-60-18-8F (E)	160
(2) APXV18-206517-C w/ Mount Pipe (E)	168	T-Arm Mount [TA 602-3] (E)	160
		7391.00 w/ Mount Pipe (E)	160
(2) APXV18-206517-C w/ Mount Pipe (E)	168	HBX-6517DS-T2M w/ Mount Pipe (E)	149
		HBX-6517DS-T2M w/ Mount Pipe (E)	149
(2) APXV18-206517-C w/ Mount Pipe (E)	168	HBX-6517DS-T2M w/ Mount Pipe (E)	149
		LNx-6514DS-VTM w/ Mount Pipe (E)	149
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (E)	168	LNx-6514DS-VTM w/ Mount Pipe (E)	149
		LNx-6514DS-VTM w/ Mount Pipe (E)	149
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (E)	168	LNx-6514DS-VTM w/ Mount Pipe (E)	149
		LNx-6514DS-VTM w/ Mount Pipe (E)	149
APX16DWV-16DWV-S-E-A20 w/ Mount Pipe (E)	168	LNx-6514DS-VTM w/ Mount Pipe (P)	149
		LNx-6514DS-VTM w/ Mount Pipe (P)	149
KRY 112 144/1 (E)	168	HBX-6516DS-A1M w/ Mount Pipe (P)	149
KRY 112 144/1 (E)	168	HBX-6516DS-A1M w/ Mount Pipe (P)	149
KRY 112 144/1 (E)	168	HBX-6516DS-A1M w/ Mount Pipe (P)	149
(2) KRY 112 71 (E)	168	RRH2X40-AWS (P)	149
(2) KRY 112 71 (E)	168	RRH2X40-AWS (P)	149
(2) KRY 112 71 (E)	168	RRH2X40-AWS (P)	149
Platform Mount [LP 305-1] (E)	168	DB-B1-6C-12AB-0Z (P)	149
Side Arm Mount [SO 701-3] (E)	162	Platform Mount [LP 713-1] (E)	149
7391.00 w/ Mount Pipe (E)	160	(2) BSA-185065/10CF w/ Mount Pipe (E)	134
7391.00 w/ Mount Pipe (E)	160		
(2) 7770.00 w/ Mount Pipe (E)	160	(2) BSA-185065/10CF w/ Mount Pipe (E)	134
(2) 7770.00 w/ Mount Pipe (E)	160		
(2) 7770.00 w/ Mount Pipe (E)	160	(2) BSA-185065/10CF w/ Mount Pipe (E)	134
(2) RRUS-11 (E)	160		
(2) RRUS-11 (E)	160	P65-17-XL-R w/ Mount Pipe (E)	134
(2) RRUS-11 (E)	160	P65-17-XL-R w/ Mount Pipe (E)	134
(2) LGP21401 (E)	160	P65-17-XL-R w/ Mount Pipe (E)	134
(2) LGP21401 (E)	160	KRC 115 032/2 (E)	134
(2) LGP21401 (E)	160	KRC 115 032/2 (E)	134
(2) LGP21401 (E)	160	KRC 115 032/2 (E)	134
(2) LGP21903 (E)	160		
(2) LGP21903 (E)	160	Platform Mount [LP 403-1] (E)	134

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi			

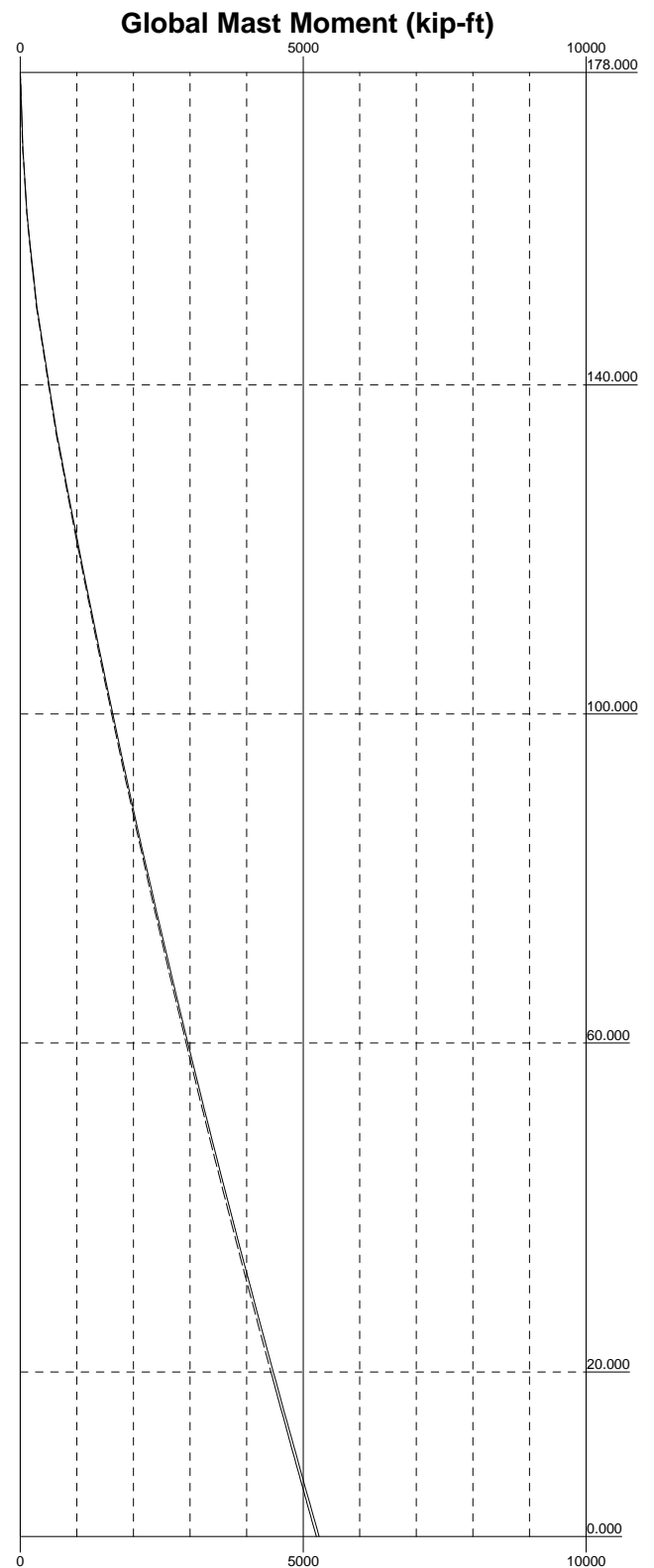
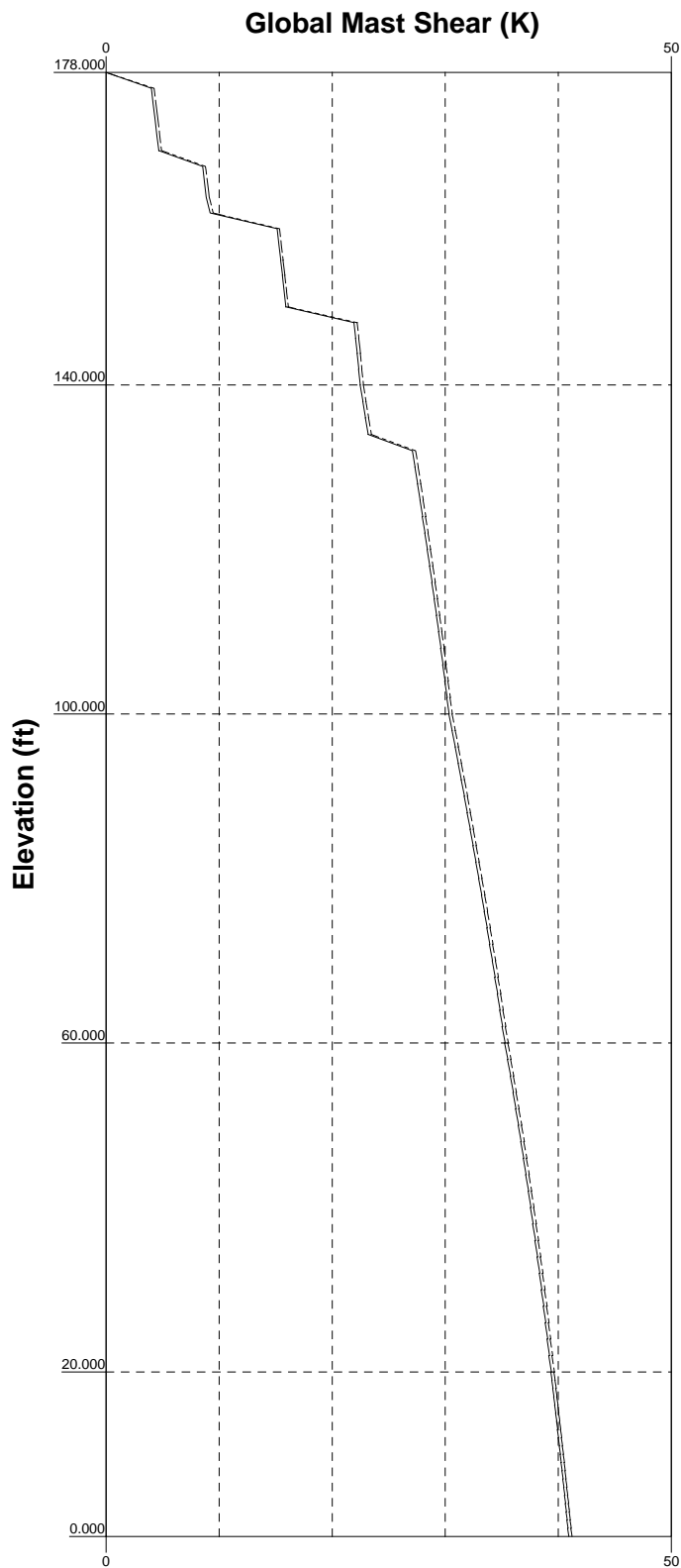
1. Tower is located in Cumberland County, Maine.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 100 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 104.9%

Vx

Vz

Mx

Mz

**B+T Group**

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Job: **82822.005.01 - Portland North, ME (BU# 878783)**

Project:

Client: Crown Castle

Drawn by: skadam

App'd:

Code: TIA-222-G

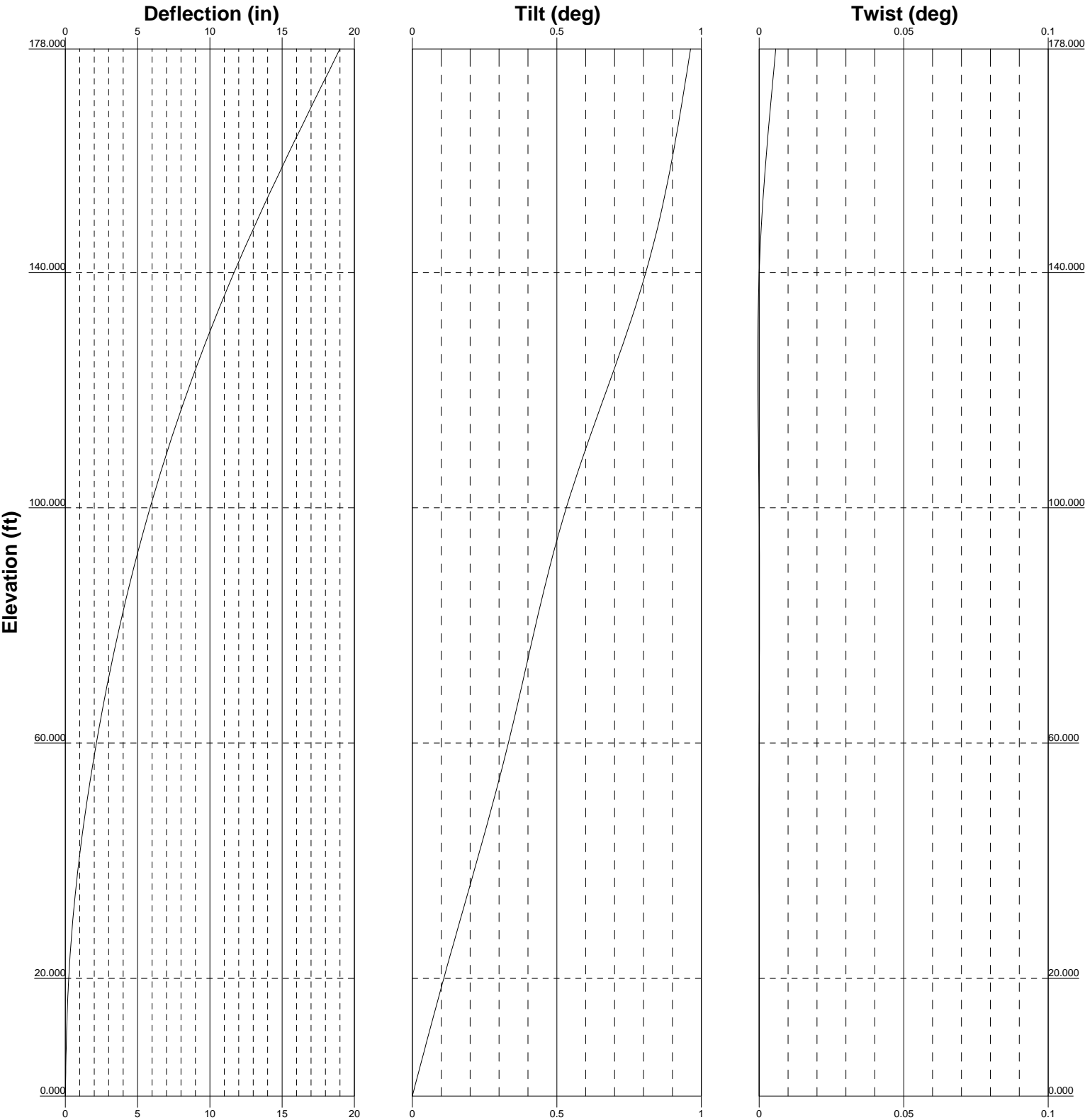
Date: 02/10/14

Scale: NTS

Path:

Dwg No. E-4

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Job: 82822.005.01 - Portland North, ME (BU# 878783)		
Project:		
Client: Crown Castle	Drawn by: skadam	App'd:
Code: TIA-222-G	Date: 02/10/14	Scale: NTS
Path:	Dwg No. E-5	

Feed Line Distribution Chart

0' - 178'

Round

Flat

App In Face

App Out Face

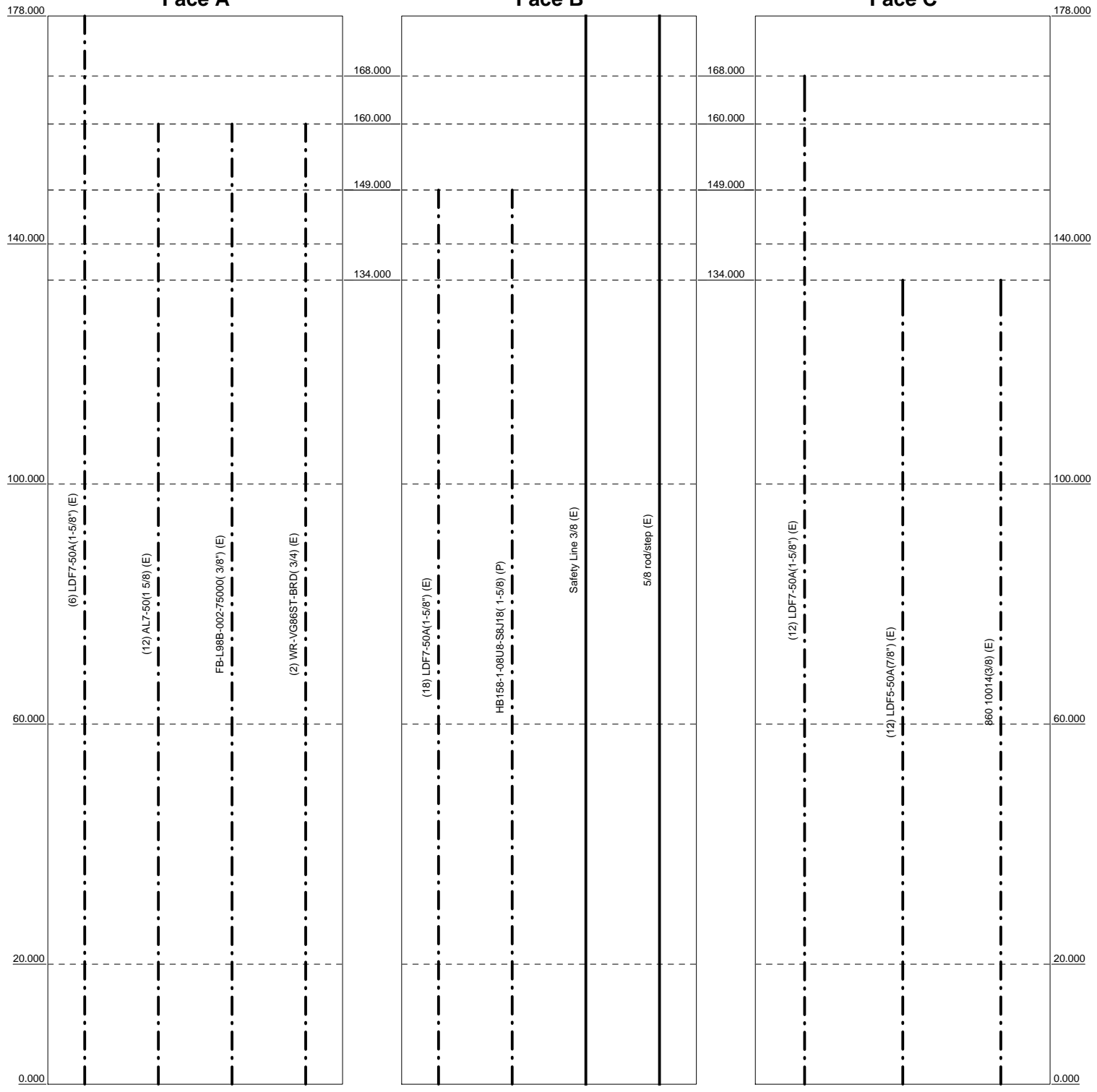
Truss Leg

Face A

Face B

Face C

Elevation (ft)



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Project:		
Client: Crown Castle	Drawn by: skadam	App'd:
Code: TIA-222-G	Date: 02/10/14	Scale: NTS
Path:	Dwg No. E-7	

\\Projects\Crown Castle\82822_878783_Portland North\Engineering\Auto Calculations\Working\BUSA878783 PORTLAND NORTH.dwg

<i>tnxTower</i> <i>B+T Group</i> 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job 82822.005.01 - Portland North, ME (BU# 878783)	Page 1 of 16
	Project	Date 11:10:48 02/10/14
	Client Crown Castle	Designed by skadam

Tower Input Data

There is a pole section.

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

The following design criteria apply:

Tower is located in Cumberland County, Maine.

Basic wind speed of 100 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.000 ft.

Nominal ice thickness of 1.000 in.

Ice thickness is considered to increase with height.

Ice density of 56.000 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50.000 °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

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	Retention 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	

Pole Section Geometry

Section	Elevation	Section Length	Pole Size	Pole Grade	Socket Length
	ft	ft			ft
L1	178.000-140.000	38.000	P24x1/2	A53-B-35 (35 ksi)	
L2	140.000-100.000	40.000	P36x1/2	A53-B-35 (35 ksi)	
L3	100.000-60.000	40.000	P48x5/8	A53-B-35	

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	82822.005.01 - Portland North, ME (BU# 878783)	2 of 16
	Project	Date
	Client	Designed by
	Crown Castle	skadam

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L4	60.000-20.000	40.000	P54x5/8	(35 ksi) A53-B-35	
L5	20.000-0.000	20.000	P60x5/8	(35 ksi) A53-B-35	

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
L1 178.000-140.000				1	1	1		
L2 140.000-100.000				1	1	1		
L3 100.000-60.000				1	1	0.973174		
L4 60.000-20.000				1	1	1		
L5 20.000-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight klf
*** Safety Line 3/8 (E)	B	Surface Ar (CaAa)	178.000 - 0.000	1	1	0.140 0.140	0.375		0.000
5/8 rod/step (E) *** ***	B	Surface Ar (CaAa)	178.000 - 0.000	1	1	0.140 0.150	0.200		0.000

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight klf
LDF7-50A(1-5/8") (E) ***	A	No	Inside Pole	178.000 - 0.000	6	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000
LDF7-50A(1-5/8") (E) ***	C	No	Inside Pole	168.000 - 0.000	12	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000
AL7-50(1 5/8) ***	A	No	Inside Pole	160.000 - 0.000	12	No Ice	0.000

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	Project	Date
	Client	11:10:48 02/10/14
	Crown Castle	Designed by
		skadam

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight klf
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
FB-L98B-002-75000(3/8")	A	No	Inside Pole	160.000 - 0.000	1	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
WR-VG86ST-BRD(3/4)	A	No	Inside Pole	160.000 - 0.000	2	1" Ice	0.000	0.000
(E)						No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
*/**/*								
LDF7-50A(1-5/8")	B	No	Inside Pole	149.000 - 0.000	18	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
HB158-1-08U8-S8J18(1-5/8)	B	No	Inside Pole	149.000 - 0.000	1	No Ice	0.000	0.001
(P)						1/2" Ice	0.000	0.001
*/**/*						1" Ice	0.000	0.001
LDF5-50A(7/8")	C	No	Inside Pole	134.000 - 0.000	12	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
860 10014(3/8)	C	No	Inside Pole	134.000 - 0.000	1	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
*/**/*								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	178.000-140.000	A	0.000	0.000	0.000	0.000	0.337
		B	0.000	0.000	2.185	0.000	0.163
		C	0.000	0.000	0.000	0.000	0.276
L2	140.000-100.000	A	0.000	0.000	0.000	0.000	0.496
		B	0.000	0.000	2.300	0.000	0.662
		C	0.000	0.000	0.000	0.000	0.528
L3	100.000-60.000	A	0.000	0.000	0.000	0.000	0.496
		B	0.000	0.000	2.300	0.000	0.662
		C	0.000	0.000	0.000	0.000	0.552
L4	60.000-20.000	A	0.000	0.000	0.000	0.000	0.496
		B	0.000	0.000	2.300	0.000	0.662
		C	0.000	0.000	0.000	0.000	0.552
L5	20.000-0.000	A	0.000	0.000	0.000	0.000	0.248
		B	0.000	0.000	1.150	0.000	0.331
		C	0.000	0.000	0.000	0.000	0.276

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 _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	178.000-140.000	A	2.341	0.000	0.000	0.000	0.000	0.337
		B		0.000	0.000	37.764	0.000	0.735
		C		0.000	0.000	0.000	0.000	0.276
L2	140.000-100.000	A	2.276	0.000	0.000	0.000	0.000	0.496
		B		0.000	0.000	38.715	0.000	1.232

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	Crown Castle	Designed by
		skadam

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft ²	A_F ft ²	C_{AA} In Face ft ²	C_{AA} Out Face ft ²	Weight K
L3	100.000-60.000	C	2.186	0.000	0.000	0.000	0.000	0.528
		A		0.000	0.000	0.000	0.000	0.496
		B		0.000	0.000	37.274	0.000	1.191
L4	60.000-20.000	C	2.042	0.000	0.000	0.000	0.000	0.552
		A		0.000	0.000	0.000	0.000	0.496
		B		0.000	0.000	34.965	0.000	1.127
L5	20.000-0.000	C	1.775	0.000	0.000	0.000	0.000	0.552
		A		0.000	0.000	0.000	0.000	0.248
		B		0.000	0.000	15.349	0.000	0.510
		C		0.000	0.000	0.000	0.000	0.276

Feed Line Center of Pressure

Section	Elevation ft	CP_x in	CP_z in	CP_x Ice in	CP_z Ice in
L1	178.000-140.000	0.083	-0.019	0.869	-0.199
L2	140.000-100.000	0.083	-0.019	0.984	-0.226
L3	100.000-60.000	0.083	-0.019	1.035	-0.237
L4	60.000-20.000	0.083	-0.019	1.012	-0.232
L5	20.000-0.000	0.084	-0.019	0.930	-0.213

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	16	Safety Line 3/8	140.00 - 178.00	1.0000	1.0000
L1	17	5/8 rod/step	140.00 - 178.00	1.0000	1.0000
L2	16	Safety Line 3/8	100.00 - 140.00	1.0000	1.0000
L2	17	5/8 rod/step	100.00 - 140.00	1.0000	1.0000
L3	16	Safety Line 3/8	60.00 - 100.00	1.0000	1.0000
L3	17	5/8 rod/step	60.00 - 100.00	1.0000	1.0000
L4	16	Safety Line 3/8	20.00 - 60.00	1.0000	1.0000
L4	17	5/8 rod/step	20.00 - 60.00	1.0000	1.0000
L5	16	Safety Line 3/8	0.00 - 20.00	1.0000	1.0000
L5	17	5/8 rod/step	0.00 - 20.00	1.0000	1.0000

Discrete Tower Loads

<i>tnxTower</i> <i>B+T Group</i> 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job 82822.005.01 - Portland North, ME (BU# 878783)		Page 5 of 16
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	Client Crown Castle		Designed by skadam

<i>Description</i>	<i>Face or Leg</i>	<i>Offset Type</i>	<i>Offsets: Horz Lateral Vert ft ft ft</i>	<i>Azimuth Adjustment °</i>	<i>Placement ft</i>	<i>C_AA_A Front ft²</i>	<i>C_AA_A Side ft²</i>	<i>Weight K</i>
Lightning Rod 5/8" x 8' (E)	A	From Leg	0.000 0.000 4.000	0.000	178.000	No Ice 0.500 1/2" Ice 1.314 1" Ice 2.144	0.500 1.314 2.144	0.031 0.037 0.047
5' x 2" Pipe Mount (E)	A	From Leg	0.000 0.000 2.500	0.000	178.000	No Ice 1.000 1/2" Ice 1.393 1" Ice 1.703	1.000 1.393 1.703	0.029 0.037 0.048
*/**								
(2) DB978G30E-M w/ Mount Pipe (E)	A	From Leg	4.000 0.000 2.000	0.000	178.000	No Ice 6.683 1/2" Ice 7.169 1" Ice 7.659	4.328 5.007 5.668	0.037 0.087 0.143
(2) DB978H65E-M w/ Mount Pipe (E)	B	From Leg	4.000 0.000 2.000	0.000	178.000	No Ice 3.143 1/2" Ice 3.515 1" Ice 3.927	2.810 3.411 4.023	0.025 0.055 0.090
(2) DB978H65E-M w/ Mount Pipe (E)	C	From Leg	4.000 0.000 2.000	0.000	178.000	No Ice 3.143 1/2" Ice 3.515 1" Ice 3.927	2.810 3.411 4.023	0.025 0.055 0.090
(2) 5' x 2" Pipe Mount (E)	A	From Leg	4.000 0.000 2.000	0.000	178.000	No Ice 1.000 1/2" Ice 1.393 1" Ice 1.703	1.000 1.393 1.703	0.029 0.037 0.048
(2) 5' x 2" Pipe Mount (E)	B	From Leg	4.000 0.000 2.000	0.000	178.000	No Ice 1.000 1/2" Ice 1.393 1" Ice 1.703	1.000 1.393 1.703	0.029 0.037 0.048
(2) 5' x 2" Pipe Mount (E)	C	From Leg	4.000 0.000 2.000	0.000	178.000	No Ice 1.000 1/2" Ice 1.393 1" Ice 1.703	1.000 1.393 1.703	0.029 0.037 0.048
Platform Mount [LP 713-1] (E)	C	None		0.000	178.000	No Ice 31.270 1/2" Ice 39.680 1" Ice 48.090	31.270 39.680 48.090	1.510 1.929 2.348
*/**								
*/**								
(2) APXV18-206517-C w/ Mount Pipe (E)	A	From Leg	4.000 0.000 2.000	0.000	168.000	No Ice 5.404 1/2" Ice 5.960 1" Ice 6.481	4.700 5.860 6.734	0.052 0.097 0.150
(2) APXV18-206517-C w/ Mount Pipe (E)	B	From Leg	4.000 0.000 2.000	0.000	168.000	No Ice 5.404 1/2" Ice 5.960 1" Ice 6.481	4.700 5.860 6.734	0.052 0.097 0.150
(2) APXV18-206517-C w/ Mount Pipe (E)	C	From Leg	4.000 0.000 2.000	0.000	168.000	No Ice 5.404 1/2" Ice 5.960 1" Ice 6.481	4.700 5.860 6.734	0.052 0.097 0.150
APX16DWV-16DWV-S-E-A 20 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 3.000	0.000	168.000	No Ice 7.466 1/2" Ice 7.994 1" Ice 8.518	3.494 4.263 4.960	0.061 0.110 0.165
APX16DWV-16DWV-S-E-A 20 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 3.000	0.000	168.000	No Ice 7.466 1/2" Ice 7.994 1" Ice 8.518	3.494 4.263 4.960	0.061 0.110 0.165
APX16DWV-16DWV-S-E-A 20 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 3.000	0.000	168.000	No Ice 7.466 1/2" Ice 7.994 1" Ice 8.518	3.494 4.263 4.960	0.061 0.110 0.165
KRY 112 144/1 (E)	A	From Leg	4.000 0.000 3.000	0.000	168.000	No Ice 0.408 1/2" Ice 0.497 1" Ice 0.594	0.204 0.273 0.351	0.011 0.014 0.019
KRY 112 144/1 (E)	B	From Leg	4.000 0.000 3.000	0.000	168.000	No Ice 0.408 1/2" Ice 0.497 1" Ice 0.594	0.204 0.273 0.351	0.011 0.014 0.019
KRY 112 144/1 (E)	C	From Leg	4.000 0.000 3.000	0.000	168.000	No Ice 0.408 1/2" Ice 0.497 1" Ice 0.594	0.204 0.273 0.351	0.011 0.014 0.019

<i>tnxTower</i> <i>B+T Group</i> 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job	82822.005.01 - Portland North, ME (BU# 878783)	Page	6 of 16
	Project		Date	11:10:48 02/10/14
	Client	Crown Castle	Designed by	skadam

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
(2) KRY 112 71 (E)	A	From Leg	4.000 0.000 2.000	0.000	168.000	No Ice 1/2" Ice 1" Ice	0.681 0.802 0.932	0.450 0.559 0.677	0.013 0.018 0.025
(2) KRY 112 71 (E)	B	From Leg	4.000 0.000 2.000	0.000	168.000	No Ice 1/2" Ice 1" Ice	0.681 0.802 0.932	0.450 0.559 0.677	0.013 0.018 0.025
(2) KRY 112 71 (E)	C	From Leg	4.000 0.000 2.000	0.000	168.000	No Ice 1/2" Ice 1" Ice	0.681 0.802 0.932	0.450 0.559 0.677	0.013 0.018 0.025
Platform Mount [LP 305-1] (E)	C	None		0.000	168.000	No Ice 1/2" Ice 1" Ice	18.010 23.330 28.650	18.010 23.330 28.650	1.121 1.352 1.584
/									
7391.00 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	5.906 6.395 6.885	4.084 4.800 5.476	0.036 0.082 0.134
7391.00 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	5.906 6.395 6.885	4.084 4.800 5.476	0.036 0.082 0.134
7391.00 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	5.906 6.395 6.885	4.084 4.800 5.476	0.036 0.082 0.134
(2) 7770.00 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	6.119 6.626 7.128	4.254 5.014 5.711	0.055 0.103 0.157
(2) 7770.00 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	6.119 6.626 7.128	4.254 5.014 5.711	0.055 0.103 0.157
(2) 7770.00 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	6.119 6.626 7.128	4.254 5.014 5.711	0.055 0.103 0.157
(2) RRUS-11 (E)	A	From Leg	1.000 0.000 2.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	4.424 4.708 5.001	1.186 1.351 1.526	0.055 0.081 0.110
(2) RRUS-11 (E)	B	From Leg	1.000 0.000 2.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	4.424 4.708 5.001	1.186 1.351 1.526	0.055 0.081 0.110
(2) RRUS-11 (E)	C	From Leg	1.000 0.000 2.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	4.424 4.708 5.001	1.186 1.351 1.526	0.055 0.081 0.110
(2) LGP21401 (E)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	1.288 1.445 1.611	0.233 0.313 0.403	0.014 0.021 0.030
(2) LGP21401 (E)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	1.288 1.445 1.611	0.233 0.313 0.403	0.014 0.021 0.030
(2) LGP21401 (E)	C	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	1.288 1.445 1.611	0.233 0.313 0.403	0.014 0.021 0.030
(2) LGP21903 (E)	A	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	0.270 0.343 0.425	0.184 0.248 0.322	0.011 0.013 0.017
(2) LGP21903 (E)	B	From Leg	4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice	0.270 0.343 0.425	0.184 0.248 0.322	0.011 0.013 0.017
(2) LGP21903 (E)	C	From Leg	4.000 0.000	0.000	160.000	No Ice 1/2" Ice	0.270 0.343	0.184 0.248	0.011 0.013

<i>tnxTower</i> <i>B+T Group</i> 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job 82822.005.01 - Portland North, ME (BU# 878783)	Page 7 of 16
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	Client Crown Castle	Designed by skadam

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
(2) 7020.00 (E)	A	From Leg	0.000 4.000 0.000 0.000	0.000	160.000	1" Ice No Ice 1/2" Ice 1" Ice	0.425 0.119 0.171 0.232	0.322 0.204 0.279 0.363	0.017 0.002 0.005 0.009
(2) 7020.00 (E)	B	From Leg	0.000 4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	0.119 0.171 0.232 0.232	0.204 0.279 0.363 0.363	0.002 0.005 0.009 0.009
(2) 7020.00 (E)	C	From Leg	0.000 4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	0.119 0.171 0.232 0.232	0.204 0.279 0.363 0.363	0.002 0.005 0.009 0.009
P65-17-XLH-RR w/ Mount Pipe (E)	A	From Leg	0.000 4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	11.704 12.424 13.153 13.153	8.938 10.450 11.986 11.986	0.092 0.178 0.273 0.273
SBNH-1D6565C w/ Mount Pipe (E)	B	From Leg	0.000 4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	11.644 12.365 13.095 13.095	9.842 11.366 12.914 12.914	0.094 0.183 0.283 0.283
AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	C	From Leg	0.000 4.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.498 9.149 9.767 9.767	6.304 7.479 8.368 8.368	0.074 0.139 0.212 0.212
DC6-48-60-18-8F (E)	A	From Leg	1.000 0.000 0.000 0.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	2.567 2.798 3.038 3.038	4.317 4.596 4.885 4.885	0.019 0.050 0.085 0.085
T-Arm Mount [TA 602-3] (E)	C	None		0.000	160.000	No Ice 1/2" Ice 1" Ice 1" Ice	11.590 15.440 19.290 19.290	11.590 15.440 19.290 19.290	0.774 0.990 1.206 1.206
Side Arm Mount [SO 701-3] (E)	C	None		0.000	162.000	No Ice 1/2" Ice 1" Ice 1" Ice	2.830 3.920 5.010 5.010	2.830 3.920 5.010 5.010	0.195 0.237 0.279 0.279
*/**/*									
HBX-6517DS-T2M w/ Mount Pipe (E)	A	From Leg	4.000 0.000 1.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	5.481 6.051 6.592 6.592	5.021 6.223 7.167 7.167	0.039 0.085 0.139 0.139
HBX-6517DS-T2M w/ Mount Pipe (E)	B	From Leg	4.000 0.000 1.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	5.481 6.051 6.592 6.592	5.021 6.223 7.167 7.167	0.039 0.085 0.139 0.139
HBX-6517DS-T2M w/ Mount Pipe (E)	C	From Leg	4.000 0.000 2.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	5.481 6.051 6.592 6.592	5.021 6.223 7.167 7.167	0.039 0.085 0.139 0.139
LNx-6514DS-VTM w/ Mount Pipe (E)	A	From Leg	4.000 0.000 1.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.568 9.220 9.838 9.838	7.004 8.185 9.081 9.081	0.059 0.127 0.204 0.204
LNx-6514DS-VTM w/ Mount Pipe (E)	B	From Leg	4.000 0.000 2.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.568 9.220 9.838 9.838	7.004 8.185 9.081 9.081	0.059 0.127 0.204 0.204
LNx-6514DS-VTM w/ Mount Pipe (E)	C	From Leg	4.000 0.000 2.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.568 9.220 9.838 9.838	7.004 8.185 9.081 9.081	0.059 0.127 0.204 0.204
LNx-6514DS-VTM w/ Mount Pipe (P)	A	From Leg	4.000 0.000 1.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.648 9.305 9.930 9.930	7.082 8.273 9.185 9.185	0.065 0.134 0.211 0.211
LNx-6514DS-VTM w/ Mount Pipe (P)	B	From Leg	4.000 0.000 1.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.648 9.305 9.930 9.930	7.082 8.273 9.185 9.185	0.065 0.134 0.211 0.211
LNx-6514DS-VTM w/ Mount Pipe (P)	C	From Leg	4.000 0.000 2.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	8.648 9.305 9.930 9.930	7.082 8.273 9.185 9.185	0.065 0.134 0.211 0.211
HBX-6516DS-A1M w/ (P)	A	From Leg	4.000 0.000 2.000 0.000	0.000	149.000	No Ice 1/2" Ice 1" Ice 1" Ice	3.556 9.305 9.930 9.930	3.241 8.273 9.185 9.185	0.030 0.134 0.211 0.211

<i>tnxTower</i> <i>B+T Group</i> 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job 82822.005.01 - Portland North, ME (BU# 878783)	Page 9 of 16
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Load Combinations

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

Maximum Member Forces

<i>tnxTower</i> <i>B+T Group</i> 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job	82822.005.01 - Portland North, ME (BU# 878783)	Page	10 of 16
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	Client	Crown Castle	Designed by	skadam

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	178 - 140	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-41.458	-1.395	3.445
			Max. Mx	8	-14.794	-499.596	0.583
			Max. My	2	-14.755	-0.334	509.676
			Max. Vy	8	22.488	-499.596	0.583
			Max. Vx	2	-22.765	-0.334	509.676
			Max. Torque	22			-2.324
L2	140 - 100	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-64.042	-2.408	3.832
			Max. Mx	8	-28.398	-1614.193	1.009
			Max. My	2	-28.370	-0.739	1635.440
			Max. Vy	8	30.351	-1614.193	1.009
			Max. Vx	2	-30.630	-0.739	1635.440
			Max. Torque	22			-2.323
L3	100 - 60	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-86.769	-3.491	4.081
			Max. Mx	8	-45.611	-2930.662	1.400
			Max. My	2	-45.592	-1.143	2963.057
			Max. Vy	8	35.298	-2930.662	1.400
			Max. Vx	2	-35.576	-1.143	2963.057
			Max. Torque	22			-2.317
L4	60 - 20	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-111.995	-4.567	4.327
			Max. Mx	8	-65.411	-4429.774	1.763
			Max. My	2	-65.404	-1.540	4473.157
			Max. Vy	8	39.391	-4429.774	1.763
			Max. Vx	2	-39.662	-1.540	4473.157
			Max. Torque	22			-2.314
L5	20 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-125.400	-5.034	4.434
			Max. Mx	8	-76.335	-5233.066	1.932
			Max. My	2	-76.335	-1.734	5281.796
			Max. Vy	8	40.942	-5233.066	1.932
			Max. Vx	2	-41.207	-1.734	5281.796
			Max. Torque	22			-2.313

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	125.400	-0.000	0.000
	Max. H _x	20	76.345	40.923	-0.008
	Max. H _z	2	76.345	-0.008	41.188
	Max. M _x	2	5281.796	-0.008	41.188
	Max. M _z	8	5233.066	-40.923	0.008
	Max. Torsion	10	2.277	-35.436	-20.587
	Min. Vert	11	57.259	-35.436	-20.587
	Min. H _x	8	76.345	-40.923	0.008
	Min. H _z	14	76.345	0.008	-41.188
	Min. M _x	14	-5280.777	0.008	-41.188
	Min. M _z	20	-5232.462	40.923	-0.008
	Min. Torsion	22	-2.312	35.436	20.587

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Tower Mast Reaction Summary

<i>Load Combination</i>	<i>Vertical</i>	<i>Shear_x</i>	<i>Shear_z</i>	<i>Overturning Moment, M_x</i>	<i>Overturning Moment, M_z</i>	<i>Torque</i>
	<i>K</i>	<i>K</i>	<i>K</i>	<i>kip-ft</i>	<i>kip-ft</i>	<i>kip-ft</i>
Dead Only	63.621	0.000	0.000	-0.398	-0.241	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	76.345	0.008	-41.188	-5281.796	-1.734	0.717
0.9 Dead+1.6 Wind 0 deg - No Ice	57.259	0.008	-41.188	-5231.996	-1.641	0.718
1.2 Dead+1.6 Wind 30 deg - No Ice	76.345	20.468	-35.674	-4574.989	-2617.893	-0.514
0.9 Dead+1.6 Wind 30 deg - No Ice	57.259	20.468	-35.674	-4531.827	-2593.232	-0.511
1.2 Dead+1.6 Wind 60 deg - No Ice	76.345	35.444	-20.601	-2642.438	-4532.717	-1.594
0.9 Dead+1.6 Wind 60 deg - No Ice	57.259	35.444	-20.601	-2617.453	-4490.073	-1.590
1.2 Dead+1.6 Wind 90 deg - No Ice	76.345	40.923	-0.008	-1.932	-5233.066	-2.234
0.9 Dead+1.6 Wind 90 deg - No Ice	57.259	40.923	-0.008	-1.786	-5183.856	-2.232
1.2 Dead+1.6 Wind 120 deg - No Ice	76.345	35.436	20.587	2638.955	-4531.273	-2.277
0.9 Dead+1.6 Wind 120 deg - No Ice	57.259	35.436	20.587	2614.259	-4488.647	-2.275
1.2 Dead+1.6 Wind 150 deg - No Ice	76.345	20.454	35.666	4572.546	-2615.396	-1.722
0.9 Dead+1.6 Wind 150 deg - No Ice	57.259	20.454	35.666	4529.665	-2590.764	-1.722
1.2 Dead+1.6 Wind 180 deg - No Ice	76.345	-0.008	41.188	5280.777	1.138	-0.719
0.9 Dead+1.6 Wind 180 deg - No Ice	57.259	-0.008	41.188	5231.245	1.200	-0.720
1.2 Dead+1.6 Wind 210 deg - No Ice	76.345	-20.468	35.674	4573.974	2617.283	0.478
0.9 Dead+1.6 Wind 210 deg - No Ice	57.259	-20.468	35.674	4531.079	2592.780	0.476
1.2 Dead+1.6 Wind 240 deg - No Ice	76.345	-35.444	20.601	2641.436	4532.102	1.560
0.9 Dead+1.6 Wind 240 deg - No Ice	57.259	-35.444	20.601	2616.715	4489.617	1.557
1.2 Dead+1.6 Wind 270 deg - No Ice	76.345	-40.923	0.008	0.941	5232.462	2.236
0.9 Dead+1.6 Wind 270 deg - No Ice	57.259	-40.923	0.008	1.056	5183.408	2.233
1.2 Dead+1.6 Wind 300 deg - No Ice	76.345	-35.436	-20.587	-2639.949	4530.683	2.312
0.9 Dead+1.6 Wind 300 deg - No Ice	57.259	-35.436	-20.587	-2614.992	4488.210	2.310
1.2 Dead+1.6 Wind 330 deg - No Ice	76.345	-20.454	-35.666	-4573.554	2614.810	1.756
0.9 Dead+1.6 Wind 330 deg - No Ice	57.259	-20.454	-35.666	-4530.408	2590.330	1.755
1.2 Dead+1.0 Ice+1.0 Temp	125.400	0.000	-0.000	-4.434	-5.034	-0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	125.400	0.003	-8.292	-1095.310	-5.889	0.102
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	125.400	4.137	-7.183	-949.492	-548.795	-0.090
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	125.400	7.162	-4.149	-550.521	-946.072	-0.257

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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
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	125.400	8.268	-0.003	-5.301	-1091.269	-0.355
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	125.400	7.159	4.143	540.077	-945.482	-0.358
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	125.400	4.131	7.179	939.479	-547.774	-0.266
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	125.400	-0.003	8.292	1085.886	-4.711	-0.102
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	125.400	-4.137	7.183	940.068	538.195	0.088
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	125.400	-7.162	4.149	541.098	935.472	0.256
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	125.400	-8.268	0.003	-4.123	1080.670	0.355
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	125.400	-7.159	-4.143	-549.501	934.883	0.358
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	125.400	-4.131	-7.179	-948.903	537.175	0.266
Dead+Wind 0 deg - Service	63.621	0.002	-8.292	-1057.887	-0.538	0.146
Dead+Wind 30 deg - Service	63.621	4.121	-7.182	-916.357	-524.367	-0.101
Dead+Wind 60 deg - Service	63.621	7.135	-4.147	-529.404	-907.760	-0.320
Dead+Wind 90 deg - Service	63.621	8.238	-0.002	-0.709	-1047.986	-0.453
Dead+Wind 120 deg - Service	63.621	7.134	4.144	528.062	-907.472	-0.465
Dead+Wind 150 deg - Service	63.621	4.118	7.180	915.226	-523.869	-0.352
Dead+Wind 180 deg - Service	63.621	-0.002	8.292	1057.043	0.036	-0.146
Dead+Wind 210 deg - Service	63.621	-4.121	7.182	915.513	523.865	0.100
Dead+Wind 240 deg - Service	63.621	-7.135	4.147	528.560	907.257	0.319
Dead+Wind 270 deg - Service	63.621	-8.238	0.002	-0.134	1047.484	0.453
Dead+Wind 300 deg - Service	63.621	-7.134	-4.144	-528.906	906.970	0.466
Dead+Wind 330 deg - Service	63.621	-4.118	-7.180	-916.070	523.367	0.354

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.000	-63.621	0.000	0.000	63.621	0.000	0.000%
2	0.008	-76.345	-41.188	-0.008	76.345	41.188	0.000%
3	0.008	-57.259	-41.188	-0.008	57.259	41.188	0.000%
4	20.468	-76.345	-35.674	-20.468	76.345	35.674	0.000%
5	20.468	-57.259	-35.674	-20.468	57.259	35.674	0.000%
6	35.444	-76.345	-20.601	-35.444	76.345	20.601	0.000%
7	35.444	-57.259	-20.601	-35.444	57.259	20.601	0.000%
8	40.923	-76.345	-0.008	-40.923	76.345	0.008	0.000%
9	40.923	-57.259	-0.008	-40.923	57.259	0.008	0.000%
10	35.436	-76.345	20.587	-35.436	76.345	-20.587	0.000%
11	35.436	-57.259	20.587	-35.436	57.259	-20.587	0.000%
12	20.454	-76.345	35.666	-20.454	76.345	-35.666	0.000%
13	20.454	-57.259	35.666	-20.454	57.259	-35.666	0.000%
14	-0.008	-76.345	41.188	0.008	76.345	-41.188	0.000%
15	-0.008	-57.259	41.188	0.008	57.259	-41.188	0.000%
16	-20.468	-76.345	35.674	20.468	76.345	-35.674	0.000%
17	-20.468	-57.259	35.674	20.468	57.259	-35.674	0.000%
18	-35.444	-76.345	20.601	35.444	76.345	-20.601	0.000%
19	-35.444	-57.259	20.601	35.444	57.259	-20.601	0.000%
20	-40.923	-76.345	0.008	40.923	76.345	-0.008	0.000%
21	-40.923	-57.259	0.008	40.923	57.259	-0.008	0.000%
22	-35.436	-76.345	-20.587	35.436	76.345	20.587	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
23	-35.436	-57.259	-20.587	35.436	57.259	20.587	0.000%
24	-20.454	-76.345	-35.666	20.454	76.345	35.666	0.000%
25	-20.454	-57.259	-35.666	20.454	57.259	35.666	0.000%
26	0.000	-125.400	0.000	-0.000	125.400	0.000	0.000%
27	0.003	-125.400	-8.292	-0.003	125.400	8.292	0.000%
28	4.137	-125.400	-7.183	-4.137	125.400	7.183	0.000%
29	7.162	-125.400	-4.149	-7.162	125.400	4.149	0.000%
30	8.268	-125.400	-0.003	-8.268	125.400	0.003	0.000%
31	7.159	-125.400	4.143	-7.159	125.400	-4.143	0.000%
32	4.131	-125.400	7.179	-4.131	125.400	-7.179	0.000%
33	-0.003	-125.400	8.292	0.003	125.400	-8.292	0.000%
34	-4.137	-125.400	7.183	4.137	125.400	-7.183	0.000%
35	-7.162	-125.400	4.149	7.162	125.400	-4.149	0.000%
36	-8.268	-125.400	0.003	8.268	125.400	-0.003	0.000%
37	-7.159	-125.400	-4.143	7.159	125.400	4.143	0.000%
38	-4.131	-125.400	-7.179	4.131	125.400	7.179	0.000%
39	0.002	-63.621	-8.292	-0.002	63.621	8.292	0.000%
40	4.121	-63.621	-7.182	-4.121	63.621	7.182	0.000%
41	7.135	-63.621	-4.147	-7.135	63.621	4.147	0.000%
42	8.238	-63.621	-0.002	-8.238	63.621	0.002	0.000%
43	7.134	-63.621	4.144	-7.134	63.621	-4.144	0.000%
44	4.118	-63.621	7.180	-4.118	63.621	-7.180	0.000%
45	-0.002	-63.621	8.292	0.002	63.621	-8.292	0.000%
46	-4.121	-63.621	7.182	4.121	63.621	-7.182	0.000%
47	-7.135	-63.621	4.147	7.135	63.621	-4.147	0.000%
48	-8.238	-63.621	0.002	8.238	63.621	-0.002	0.000%
49	-7.134	-63.621	-4.144	7.134	63.621	4.144	0.000%
50	-4.118	-63.621	-7.180	4.118	63.621	7.180	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	0.00033097
3	Yes	4	0.00000001	0.00018390
4	Yes	5	0.00000001	0.00048119
5	Yes	5	0.00000001	0.00022201
6	Yes	5	0.00000001	0.00049320
7	Yes	5	0.00000001	0.00022826
8	Yes	4	0.00000001	0.00071261
9	Yes	4	0.00000001	0.00045570
10	Yes	5	0.00000001	0.00046729
11	Yes	5	0.00000001	0.00021548
12	Yes	5	0.00000001	0.00049559
13	Yes	5	0.00000001	0.00022933
14	Yes	4	0.00000001	0.00032021
15	Yes	4	0.00000001	0.00017565
16	Yes	5	0.00000001	0.00048736
17	Yes	5	0.00000001	0.00022517
18	Yes	5	0.00000001	0.00047214
19	Yes	5	0.00000001	0.00021786
20	Yes	4	0.00000001	0.00069765
21	Yes	4	0.00000001	0.00044573
22	Yes	5	0.00000001	0.00049740
23	Yes	5	0.00000001	0.00023046

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24	Yes	5	0.00000001	0.00047229
25	Yes	5	0.00000001	0.00021767
26	Yes	4	0.00000001	0.00002832
27	Yes	5	0.00000001	0.00033976
28	Yes	5	0.00000001	0.00036337
29	Yes	5	0.00000001	0.00036271
30	Yes	5	0.00000001	0.00033717
31	Yes	5	0.00000001	0.00035720
32	Yes	5	0.00000001	0.00035740
33	Yes	5	0.00000001	0.00033362
34	Yes	5	0.00000001	0.00035446
35	Yes	5	0.00000001	0.00035351
36	Yes	5	0.00000001	0.00033280
37	Yes	5	0.00000001	0.00035816
38	Yes	5	0.00000001	0.00035959
39	Yes	4	0.00000001	0.00004002
40	Yes	4	0.00000001	0.00012121
41	Yes	4	0.00000001	0.00013273
42	Yes	4	0.00000001	0.00004822
43	Yes	4	0.00000001	0.00011376
44	Yes	4	0.00000001	0.00013420
45	Yes	4	0.00000001	0.00003992
46	Yes	4	0.00000001	0.00012600
47	Yes	4	0.00000001	0.00011581
48	Yes	4	0.00000001	0.00004811
49	Yes	4	0.00000001	0.00013747
50	Yes	4	0.00000001	0.00011568

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	178 - 140	18.998	39	0.963	0.003
L2	140 - 100	11.676	39	0.806	0.001
L3	100 - 60	5.863	39	0.533	0.001
L4	60 - 20	2.149	39	0.334	0.000
L5	20 - 0	0.233	39	0.108	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178.000	Lightning Rod 5/8" x 8'	39	18.998	0.963	0.003	61954
168.000	(2) APXV18-206517-C w/ Mount Pipe	39	16.985	0.930	0.002	30977
162.000	Side Arm Mount [SO 701-3]	39	15.793	0.908	0.002	19360
160.000	7391.00 w/ Mount Pipe	39	15.400	0.900	0.002	17209
149.000	HBX-6517DS-T2M w/ Mount Pipe	39	13.298	0.853	0.002	10681
134.000	(2) BSA-185065/10CF w/ Mount Pipe	39	10.659	0.768	0.001	8248

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Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	178 - 140	94.847	2	4.809	0.014
L2	140 - 100	58.321	2	4.025	0.006
L3	100 - 60	29.289	2	2.665	0.003
L4	60 - 20	10.736	2	1.669	0.001
L5	20 - 0	1.162	2	0.540	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178.000	Lightning Rod 5/8" x 8'	2	94.847	4.809	0.015	12595
168.000	(2) APXV18-206517-C w/ Mount Pipe	2	84.803	4.642	0.012	6296
162.000	Side Arm Mount [SO 701-3]	2	78.857	4.534	0.011	3934
160.000	7391.00 w/ Mount Pipe	2	76.898	4.496	0.011	3497
149.000	HBX-6517DS-T2M w/ Mount Pipe	2	66.410	4.261	0.008	2168
134.000	(2) BSA-185065/10CF w/ Mount Pipe	2	53.241	3.840	0.006	1670

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L1	178 - 140 (1)	P24x1/2	38.000	0.000	0.0	36.914	-14.756	1162.780	0.013
L2	140 - 100 (2)	P36x1/2	40.000	0.000	0.0	55.763	-28.370	1756.540	0.016
		4.8.2 (1.05 CR) - 2							
L3	100 - 60 (3)	P48x5/8	40.000	0.000	0.0	93.021	-45.592	2930.150	0.016
L4	60 - 20 (4)	P54x5/8	40.000	0.000	0.0	104.802	-65.404	3301.250	0.020
		4.8.2 (1.05 CR) - 4							
L5	20 - 0 (5)	P60x5/8	20.000	0.000	0.0	116.583	-76.335	3649.510	0.021
		4.8.2 (1.02 CR) - 5							

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	178 - 140 (1)	P24x1/2	509.676	724.938	0.703	0.000	724.938	0.000

tnxTower B+T Group 1717 S.Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job	82822.005.01 - Portland North, ME (BU# 878783)	Page	16 of 16
	Project		Date	11:10:48 02/10/14
	Client	Crown Castle	Designed by	skadam

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L2	140 - 100 (2)	P36x1/2	1635.442	1586.550	1.031	0.000	1586.550	0.000
L3	100 - 60 (3)	P48x5/8	2963.058	3492.392	0.848	0.000	3492.392	0.000
L4	60 - 20 (4)	P54x5/8	4473.158	4349.317	1.028	0.000	4349.317	0.000
L5	20 - 0 (5)	P60x5/8	5281.800	5299.025	0.997	0.000	5299.025	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	178 - 140 (1)	P24x1/2	22.765	581.391	0.039	0.720	1115.342	0.001
L2	140 - 100 (2)	P36x1/2	30.631	878.272	0.035	0.718	2562.642	0.000
L3	100 - 60 (3)	P48x5/8	35.576	1465.070	0.024	0.717	5709.675	0.000
L4	60 - 20 (4)	P54x5/8	39.662	1650.620	0.024	0.717	7257.858	0.000
L5	20 - 0 (5)	P60x5/8	41.207	1824.750	0.023	0.717	8935.667	0.000

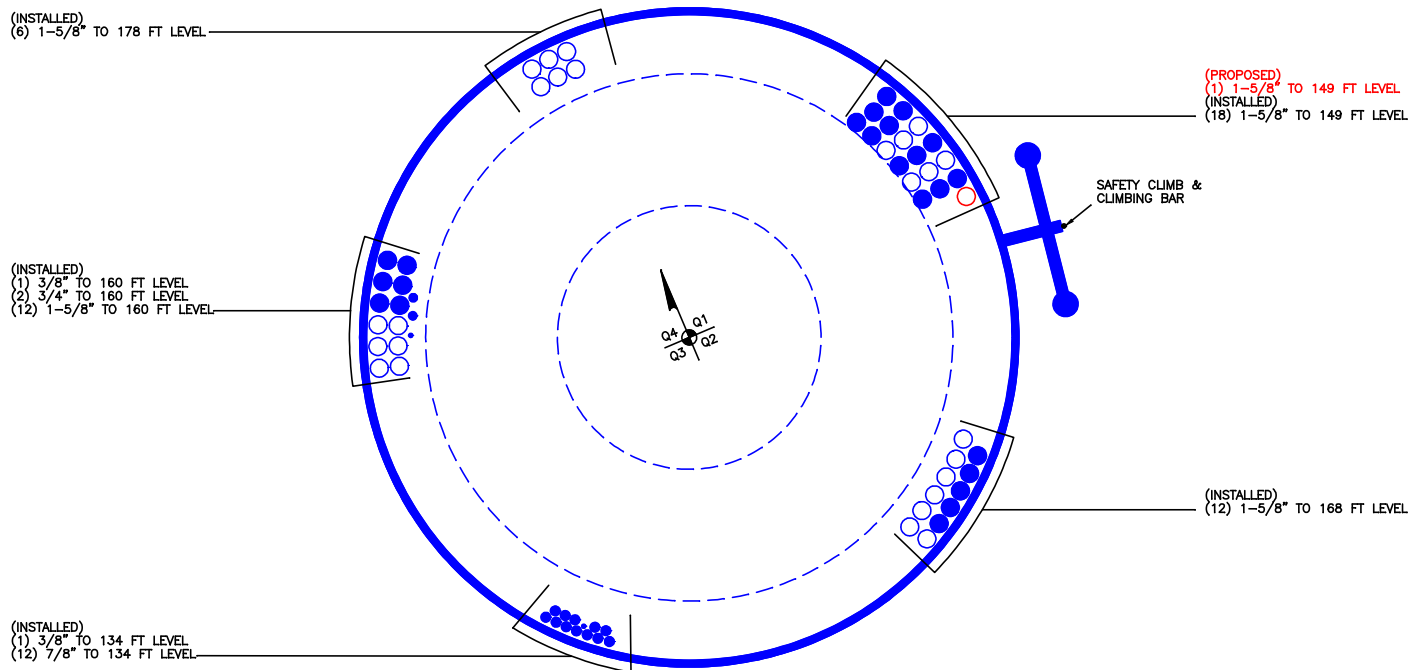
Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	178 - 140 (1)	0.013	0.703	0.000	0.039	0.001	0.717	1.000	4.8.2 ✓
L2	140 - 100 (2)	0.016	1.031	0.000	0.035	0.000	1.048	1.000	4.8.2 ✗
L3	100 - 60 (3)	0.016	0.848	0.000	0.024	0.000	0.865	1.000	4.8.2 ✓
L4	60 - 20 (4)	0.020	1.028	0.000	0.024	0.000	1.049	1.000	4.8.2 ✗
L5	20 - 0 (5)	0.021	0.997	0.000	0.023	0.000	1.018	1.000	4.8.2 ✗

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	178 - 140	Pole	P24x1/2	1	-14.756	1162.780	71.7	Pass
L2	140 - 100	Pole	P36x1/2	2	-28.370	1756.540	104.8	Pass
L3	100 - 60	Pole	P48x5/8	3	-45.592	2930.150	86.5	Pass
L4	60 - 20	Pole	P54x5/8	4	-65.404	3301.250	104.9	Pass
L5	20 - 0	Pole	P60x5/8	5	-76.335	3649.510	101.8	Pass
Summary								
						Pole (L4)	104.9	Pass
						RATING =	104.9	Pass

APPENDIX B
BASE LEVEL DRAWING



BUSINESS UNIT: 878783

APPENDIX C
ADDITIONAL CALCULATIONS

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

Site Data

BU#: 878783

Site Name: PORTLAND NORTH

App #: 214017, Rev: 0

Pole Manufacturer: Other

Bolt Data

Qty:	24	
Diameter (in.):	0.75	Bolt Fu: 150
Bolt Material:	Other	Bolt Fy: 113
Strength (Fu):	150	ksi
Yield (Fy):	113	ksi
Circle (in.):	29.5	

Plate Data

Diam:	34.75	in
Thick, t:	1.875	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	3.14	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Diam:	24	in
Thick:	0.5	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions

Mu	509.7	ft-kips
Axial, Pu:	14.8	kips
Shear, Vu:	22.8	kips
Elevation:	140	feet

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
27.34

If No stiffeners, Criteria: TIA G

<-Only Applicable to Unstiffened Cases

Flange Bolt Results

Bolt Tension Capacity, $\phi^*T_n, B1$:	37.58 kips
Adjusted ϕ^*T_n (due to $V_u = V_u/Q_t$), B:	37.55 kips
Max Bolt directly applied T_u :	33.94 Kips
Min. PL "tc" for B cap. w/o Pry:	1.474 in
Min PL "treq" for actual T w/ Pry:	1.304 in
Min PL "t1" for actual T w/o Pry:	1.401 in
T allowable w/o Prying:	37.58 kips $\alpha < 0$ case
Prying Force, q:	0.00 kips
Total Bolt Tension = $T_u + q$:	33.94 kips
Non-Prying Bolt Stress Ratio, T_u/B :	90.4% Pass

Exterior Flange Plate Results

Compression Side Plate Stress:	19.7 ksi
Allowable Plate Stress:	32.4 ksi
Compression Plate Stress Ratio:	60.8% Pass
No Prying	

Tension Side Stress Ratio, $(treq/t)^2$: 48.4% Pass

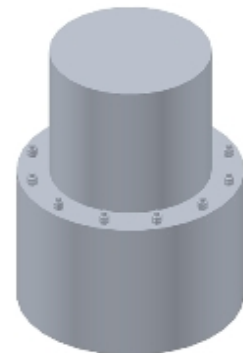
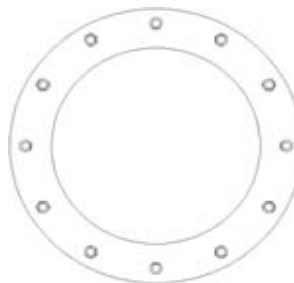
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Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$:	n/a
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
Site Name: PORTLAND NORTH
App #: 214017, Rev: 0

Manufacturer: Other

Bolt Data

Qty:	24	Bolt Fu:	150
Diam:	0.75	Bolt Fy:	113
Bolt Material:	Other		
Strength (Fu):	150	ksi	
Yield (Fy):	113	ksi	
Circle:	29.5	in	

Plate Data

Plate Outer Diam:	35	in
Plate Inner Diam:	24.25	in (Hole @ Ctr)
Thick:	1.875	in
Grade:	36	ksi
Effective Width:	4.58	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.375	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Pole OuterDiam:	36	in
Thick:	0.5	in
Pole Inner Diam:	35	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi

Reactions

Moment:	509.7	ft-kips
Axial:	14.8	kips
Shear:	22.8	kips
Exterior Flange Run, T+q:	33.94	kips

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
27.34

Elevation: 140 feet

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 33.9 Kips, Ext. Flange Tu+q
Adjusted ϕT_n (due to $V_u = V_u / Q_t$): 37.6 Kips
Bolt Stress Ratio: 90.4% **Pass**

Interior Flange Plate Results

Controlling Bolt Axial Force: 35.2 Kips, Ext. Cu=Interior Cu
Plate Stress: 24.0 ksi
Allowable Plate Stress, ϕF_y : 32.4 ksi
Plate Stress Ratio: 74.1% **Pass**

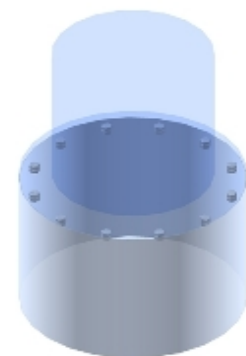
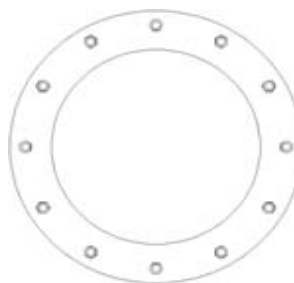
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Stiffener Results

Horizontal Weld : n/a
Vertical Weld: n/a
Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: 878783

Site Name: PORTLAND NORTH

App #: 214017, Rev: 0

Pole Manufacturer: Other

Bolt Data

Qty:	52	
Diameter (in.):	0.75	Bolt Fu: 150
Bolt Material:	Other	Bolt Fy: 113
Strength (Fu):	150	ksi
Yield (Fy):	113	ksi
Circle (in.):	41.375	

Plate Data

Diam:	46.5	in
Thick, t:	2.5	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	2.17	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Diam:	36	in
Thick:	0.5	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions

Mu	1635.4	ft-kips
Axial, Pu:	28.4	kips
Shear, Vu:	30.6	kips
Elevation:	100	feet

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
27.34

If No stiffeners, Criteria: TIA G

<-Only Applicable to Unstiffened Cases

Flange Bolt Results

Bolt Tension Capacity, $\phi^*T_n, B1$:	37.58 kips
Adjusted ϕ^*T_n (due to $V_u = V_u/Qty$), B :	37.57 kips
Max Bolt <u>directly</u> applied T_u :	35.94 Kips
Min. PL "tc" for B cap. w/o Pry:	1.749 in
Min PL "treq" for actual T w/ Pry :	1.660 in
Min PL "t1" for actual T w/o Pry :	1.710 in
T allowable w/o Prying:	37.58 kips $\alpha < 0$ case
Prying Force, q:	0.00 kips
Total Bolt Tension = $T_u + q$:	35.94 kips
Non-Prying Bolt Stress Ratio, T_u/B :	95.7% Pass

Exterior Flange Plate Results

Compression Side Plate Stress:	17.3 ksi
Allowable Plate Stress:	32.4 ksi
Compression Plate Stress Ratio:	53.3% Pass
No Prying	
Tension Side Stress Ratio, $(treq/t)^2$:	44.1% Pass

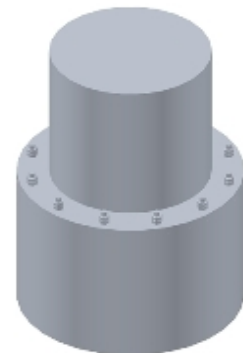
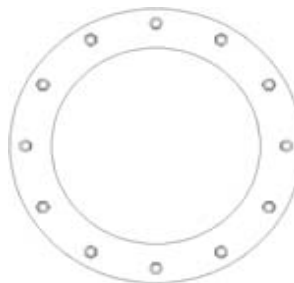
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$:	n/a
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check:	n/a
----------------------------	-----



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

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

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
Site Name: PORTLAND NORTH
App #: 214017, Rev: 0

Manufacturer: Other

Bolt Data

Qty:	52	Bolt Fu:	150
Diam:	0.75	Bolt Fy:	113
Bolt Material:	Other		
Strength (Fu):	150	ksi	
Yield (Fy):	113	ksi	
Circle:	41.375	in	

Plate Data

Plate Outer Diam:	46.75	in
Plate Inner Diam:	36.25	in (Hole @ Ctr)
Thick:	2.5	in
Grade:	36	ksi
Effective Width:	2.82	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.375	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Pole OuterDiam:	48	in
Thick:	0.625	in
Pole Inner Diam:	46.75	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi

Reactions

Moment:	1635.4	ft-kips
Axial:	28.4	kips
Shear:	30.6	kips
Exterior Flange Run, T+q:	35.94	kips

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi^* V_n$ (kips):
27.34

Elevation: 100 feet

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 35.9 Kips, Ext. Flange Tu+q
Adjusted $\phi^* T_n$ (due to $V_u = V_u / Q_t$): 37.6 Kips
Bolt Stress Ratio: 95.7% **Pass**

Interior Flange Plate Results

Controlling Bolt Axial Force: 37.0 Kips, Ext. Cu=Interior Cu
Plate Stress: 22.6 ksi
Allowable Plate Stress, $\phi^* F_y$: 32.4 ksi
Plate Stress Ratio: 69.6% **Pass**

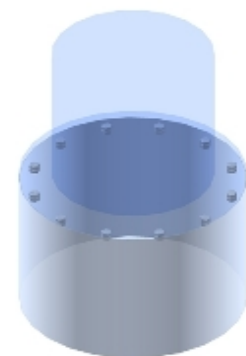
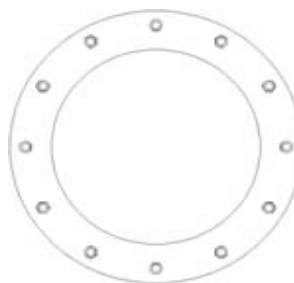
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Stiffener Results

Horizontal Weld : n/a
Vertical Weld: n/a
Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: 878783

Site Name: PORTLAND NORTH

App #: 214017, Rev: 0

Reactions

Mu	2963.1	ft-kips
Axial, Pu:	45.6	kips
Shear, Vu:	35.6	kips
Elevation:	60	feet

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
38.88

Pole Manufacturer: Other

If No stiffeners, Criteria: TIA G

<-Only Applicable to Unstiffened Cases

Bolt Data

Qty:	56	
Diameter (in.):	1	Bolt Fu: 120
Bolt Material:	A325	Bolt Fy: 92
N/A:	75	<-- Disregard
N/A:	55	<-- Disregard
Circle (in.):	50.375	

Flange Bolt Results

Bolt Tension Capacity, $\phi^*T_n, B1$:	54.54 kips
Adjusted ϕ^*T_n (due to $V_u = V_u/Qty$), B :	54.53 kips
Max Bolt <u>directly</u> applied T_u :	49.60 Kips
Min. PL "tc" for B cap. w/o Pry:	1.032 in
Min PL "treq" for actual T w/ Pry :	0.866 in
Min PL "t1" for actual T w/o Pry :	0.985 in
T allowable w/o Prying:	54.54 kips $\alpha < 0$ case
Prying Force, q:	0.00 kips
Total Bolt Tension = $T_u + q$:	49.60 kips
Non-Prying Bolt Stress Ratio, T_u/B :	91.0% Pass

Rigid
ϕ^*T_n
$\phi T_n [(1 - (V_u/\phi V_n)^2)^{0.5}]$

Plate Data

Diam:	52.5	in
Thick, t:	2.75	in
Grade (Fy):	36	ksi
Strength, F_u :	58	ksi
Single-Rod B-eff:	2.69	in

Exterior Flange Plate Results

Compression Side Plate Stress:	7.7 ksi
Allowable Plate Stress:	32.4 ksi
Compression Plate Stress Ratio:	23.7% Pass
No Prying	

Flexural Check

Rigid
TIA G
ϕ^*F_y
Comp. Y.L. Length:
15.29

Tension Side Stress Ratio, $(treq/t)^2$: 9.9% **Pass**

n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$:	n/a
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

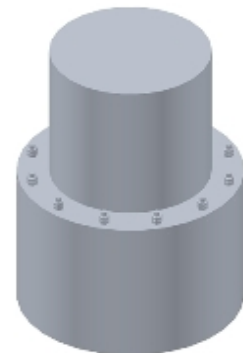
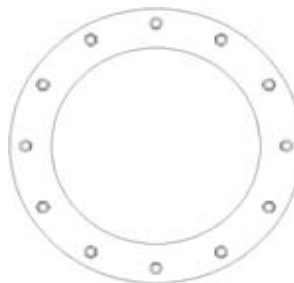
Pole Punching Shear Check: n/a

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Diam:	48	in
Thick:	0.625	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi
Reinf. Fillet Weld	0	"0" if None



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

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

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
Site Name: PORTLAND NORTH
App #: 214017, Rev: 0

Manufacturer: Other

Bolt Data

Qty:	56	
Diam:	1	Bolt Fu: 120
Bolt Material:	A325	Bolt Fy: 92
N/A:	100	<-- Disregard
N/A:	75	<-- Disregard
Circle:	50.375	in

Plate Data

Plate Outer Diam:	52.75	in
Plate Inner Diam:	48.25	in (Hole @ Ctr)
Thick:	2.75	in
Grade:	36	ksi
Effective Width:	2.96	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.375	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Pole OuterDiam:	54	in
Thick:	0.625	in
Pole Inner Diam:	52.75	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi

Reactions

Moment:	2963.1	ft-kips
Axial:	45.6	kips
Shear:	35.6	kips
Exterior Flange Run, T+q:	49.6	kips

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi^* V_n$ (kips):
38.88

Elevation: 60 feet

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 49.6 Kips, Ext. Tu=Interior Tu
Adjusted $\phi^* T_n$ (due to $V_u = V_u / Q_t$): 54.5 Kips
Bolt Stress Ratio: 91.0% **Pass**

Interior Flange Plate Results

Controlling Bolt Axial Force: 51.2 Kips, Ext. Cu=Interior Cu
Plate Stress: 10.9 ksi
Allowable Plate Stress, $\phi^* F_y$: 32.4 ksi
Plate Stress Ratio: 33.6% **Pass**

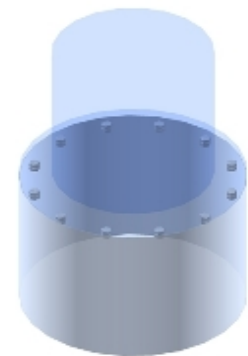
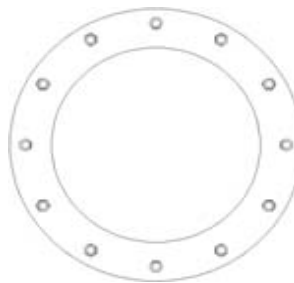
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Stiffener Results

Horizontal Weld : n/a
Vertical Weld: n/a
Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: 878783

Site Name: PORTLAND NORTH

App #: 214017, Rev: 0

Pole Manufacturer: Other

Bolt Data

Qty:	60	
Diameter (in.):	1.125	Bolt Fu: 105
Bolt Material:	A325	Bolt Fy: 81
N/A:	75	<-- Disregard
N/A:	55	<-- Disregard
Circle (in.):	56.375	

Plate Data

Diam:	58.5	in
Thick, t:	3.125	in
Grade (Fy):	36	ksi
Strength, Fu:	58	ksi
Single-Rod B-eff:	2.83	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Diam:	54	in
Thick:	0.625	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions

Mu	4473.2	ft-kips
Axial, Pu:	65.4	kips
Shear, Vu:	39.7	kips
Elevation:	20	feet

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
43.05

If No stiffeners, Criteria: TIA G

<-Only Applicable to Unstiffened Cases

Flange Bolt Results

Bolt Tension Capacity, $\phi^*T_n, B1$:	60.09 kips
Adjusted ϕ^*T_n (due to $V_u = V_u/Qty$), B :	60.08 kips
Max Bolt directly applied T_u :	62.39 Kips
Min. PL "tc" for B cap. w/o Pry:	Tu>B N/A in
Min PL "treq" for actual T w/ Pry :	1.027 in
Min PL "t1" for actual T w/o Pry :	Tu>B N/A in
T allowable w/o Prying:	60.09 kips
Prying Force, q:	0.00 kips T>B Case
Total Bolt Tension= $T_u + q$:	62.39 kips
Non-Prying Bolt Stress Ratio, T_u/B :	103.8% Pass

Exterior Flange Plate Results

Flexural Check	
Compression Side Plate Stress:	7.2 ksi
Allowable Plate Stress:	32.4 ksi
Compression Plate Stress Ratio:	22.2% Pass
No Prying Check for $T_u > B$	
Tension Side Stress Ratio, $(treq/t)^2$:	10.8% Pass

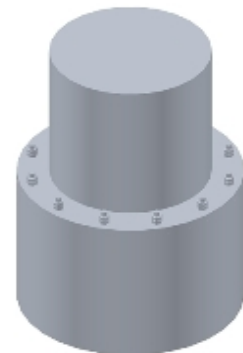
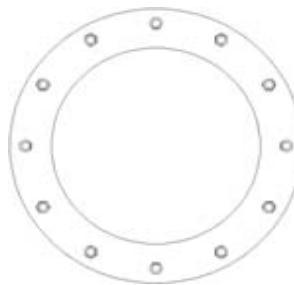
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$:	n/a
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check:	n/a
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* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
Site Name: PORTLAND NORTH
App #: 214017, Rev: 0

Manufacturer: Other

Bolt Data

Qty:	60	Bolt Fu:	105
Diam:	1.125	Bolt Fy:	81
Bolt Material:	A325		
N/A:	100	<-- Disregard	
N/A:	75	<-- Disregard	
Circle:	56.375	in	

Plate Data

Plate Outer Diam:	58.75	in
Plate Inner Diam:	54.25	in (Hole @ Ctr)
Thick:	3.125	in
Grade:	36	ksi
Effective Width:	3.08	in

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.375	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	3	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data

Pole OuterDiam:	60	in
Thick:	0.625	in
Pole Inner Diam:	58.75	in
Grade:	36	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi

Reactions

Moment:	4473.2	ft-kips
Axial:	65.4	kips
Shear:	39.7	kips
Exterior Flange Run, T+q:	62.39	kips

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
43.05

Elevation: 20 feet

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 62.4 Kips, Ext. Flange Tu+q
Adjusted ϕT_n (due to $V_u = V_u / Q_t$): 60.1 Kips
Bolt Stress Ratio: 103.8% **Pass**

Interior Flange Plate Results

Controlling Bolt Axial Force: 64.6 Kips, Ext. Cu=Interior Cu
Plate Stress: 10.2 ksi
Allowable Plate Stress, ϕF_y : 32.4 ksi
Plate Stress Ratio: 31.5% **Pass**

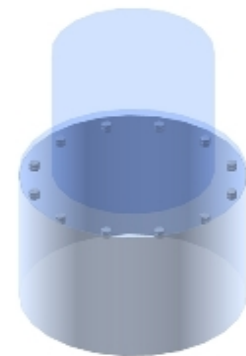
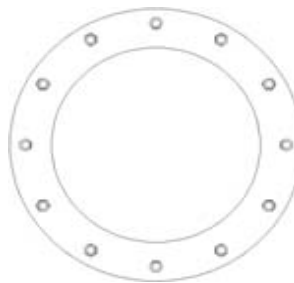
n/a

Stiffener Results

Horizontal Weld : n/a
Vertical Weld: n/a
Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

Base Plate Anchor Rods - Rev. F & G

Site Data

BU#: 878783
 Site Name: *PORTLAND NORTH*
 App #: 214017 Revision # 0

Base Plate Type: *Circular*

Original Anchor Rod Data

Qty:	32	
Diam:	2	in
Rod Material:	A36	
Circle:	66	in
Bolt Spacing, D:		in

Adding Anchor Rod Data

Qty:	3	
Diam:	1.75	in
Rod Material:	#18J	
Circle:	77	in

Additional Anchor Rod Data

Qty:		
Diam:		in
Rod Material:		
Circle:		in

Shaft Analysis

ASIF Code:	G	
ASIF Increase:	1.00	
Failure:	105%	

Reactions

Moment:	5281.796	ft-kips
Axial:	76.3345	kips
Shear:	41.2074	kips



Original Anchor Rod Results

Maximum Rod Tension: 110.1 Kips
 Allowable Tension: 115.9 Kips
Anchor Rod Stress Ratio: 95.0% Pass

Adding Anchor Rod Results

Maximum Rod Tension: 98.3 Kips
 Allowable Tension: 152.0 Kips
Anchor Rod Stress Ratio: 64.7% Pass

Additional Anchor Rod Results

Maximum Rod Tension: 0.0 Kips
 Allowable Tension: 0.0 Kips
Anchor Rod Stress Ratio: 0.0% Pass

Reactions Seen By Original Anchor Rods

Moment: 4812 ft-kips
Axial: 71 kips
Shear: 38 kips

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Materi

TIA Rev G Assumption: Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(F

Site Data

BU#:	878783
Site Name:	PORTLAND NORTH
App #:	214017 Revision # 0
Pole Manufacturer:	Other

Anchor Rod Data

Qty:	32	
Diam:	2	in
Rod Material:	Other	
Strength (Fu):	58	ksi
Yield (Fy):	36	ksi
Bolt Circle:	66	in

Plate Data

Diam:	72	in
Thick:	3.25	in
Grade:	36	ksi
Single-Rod B-eff:	5.89	in

Stiffener Data (Welding at both sides)

Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data

Diam:	60	in
Thick:	0.625	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	50	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions

Mu:	4811.7069	ft-kips
Axial, Pu:	71.222349	kips
Shear, Vu:	38.447725	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

If No stiffeners, Criteria: AISC LRFD <-Only Applicable to Unstiffene

Anchor Rod Results

Max Rod (Cu+ Vu/ η): 114.0 Kips
 Allowable Axial, $\Phi \cdot F_u \cdot A_{net}$: 116.0 Kips
 Anchor Rod Stress Ratio: 98.3% **Pass**

Base Plate Results

Base Plate Stress: 13.3 ksi
 Allowable Plate Stress: 32.4 ksi
 Base Plate Stress Ratio: 41.2% **Pass**

Flexural Check

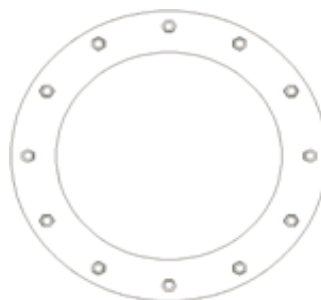
n/a

Stiffener Results

Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$: n/a
 Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)

Site Data

BU#: 878783

Site Name: PORTLAND NORTH, ME

App #: 214017, Rev: 0

Loads Already Factored

For P (DL)	1.2	<----Disregard
For P,V, and M (WL)	1.35	<----Disregard

Pad & Pier Data

Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	6	in
Pad Bearing Depth, D:	4.5	ft
Pad Thickness, T:	5	ft
Pad Width=Length, L:	26.5	ft
Pier Cross Section Shape:	Round	<--Pull Down
Enter Pier Diameter:	0	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	0.00	ft^2
Pier Height:	0.00	ft
Soil (above pad) Height:	-0.50	ft

Soil Parameters

Unit Weight, γ :	125.0	pcf
Ultimate Bearing Capacity, q_n :	6.00	ksf
Strength Reduct. factor, ϕ :	0.75	
Angle of Friction, Φ :	30.0	degrees
Undrained Shear Strength, C_u :	0.00	ksf
Allowable Bearing: $\phi*q_n$:	4.50	ksf
Passive Pres. Coeff., K_p :	3.00	

Forces/Moments due to Wind and Lateral Soil

Minimum of (ϕ *Ultimate Pad Passive Force, V_u):	41.0	kips
Pad Force Location Above D:	1.46	ft
ϕ (Passive Pressure Moment):	59.79	ft-kips
Factored O.T. M(WL), "1.6W":	5487.0	ft-kips
Factored OT (MW-Msoil), M1	5427.21	ft-kips

Resistance due to Foundation Gravity

Soil Wedge Projection grade, a:	-0.29	ft
Sum of Soil Wedges Wt:	0.63	kips
Soil Wedges ecc, K1:	6.29	ft
Ftg+Soil above Pad wt:	482.8	kips
Unfactored (Total ftg-soil Wt):	483.43	kips
1.2D. No Soil Wedges.	655.36	kips
0.9D. With Soil Wedges	492.09	kips

Resistance due to Cohesion (Vertical)

$\phi*(1/2*C_u)$ (Total Vert. Planes)	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Monopole Base Reaction Forces

TIA Revision:	G	<--Pull Down
Factored DL Axial, PDu:	76	kips
Factored WL Axial, PWu:	0	kips
Factored WL Shear, V_u :	41	kips
Factored WL Moment, Mu:	5282	ft-kips

Load Factor Shaft Factored Loads

1.00	1.2D+1.6W, Pu:	76	kips
0.90	0.9D+1.6W, Pu:	57	kips
1.00	V_u :	41	kips
	Mu:	5282	ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(No Soil Wedges) [Reaction+Conc+Soil]	655.36	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	5427.21	ft-kips

Orthogonal Direction:

$$\begin{aligned} ecc1 = M1/P1 &= 8.28 \text{ ft} \\ \text{Orthogonal } qu &= 2.49 \text{ ksf} \\ qu/\phi*q_n \text{ Ratio} &= 55.30\% \text{ Pass} \end{aligned}$$

Diagonal Direction:

$$\begin{aligned} ecc2 = (0.707M1)/P1 &= 5.85 \text{ ft} \\ \text{Diagonal } qu &= 3.00 \text{ ksf} \\ qu/\phi*q_n \text{ Ratio} &= 66.58\% \text{ Pass} \end{aligned}$$

Run

<-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(w/ Soil Wedges) [Reaction+Conc+Soil]	492.09	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	5423.62	ft-kips

$$\begin{aligned} \text{Orthogonal } ecc3 = M2/P2 &= 11.02 \text{ ft} \\ \text{Ortho Non Bearing Length, NBL} &= 22.04 \text{ ft} \\ \text{Orthogonal } qu &= 4.17 \text{ ksf} \\ \text{Diagonal } qu &= 4.13 \text{ ksf} \end{aligned}$$

Max Reaction Moment (ft-kips) so that $qu=\phi*q_n = 100\%$ Capacity Rating

Actual M:	5282.00		
M Orthogonal:	5363.23	98.49%	Pass
M Diagonal:	5363.23	98.49%	Pass