Date: **December 23, 2016**

Timothy Howell
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

Jacobs Engineering Group. Inc.
5449 Bells Ferry Road
Acworth, GA 30102
770-701-2500

Subject:	**Structural Analysis Report**	
Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	ME5022
	Carrier Site Name:	East Deering
Crown Castle Designation:	**Crown Castle BU Number:**	878783
	Crown Castle Site Name:	PORTLAND NORTH
	Crown Castle JDE Job Number:	400313
	Crown Castle Work Order Number:	1341150
	Crown Castle Application Number:	364306 Rev. 0
Engineering Firm Designation:	**Jacobs Engineering Group Inc. Project Number:**	1341150
Site Data:	**517 Presumpscot Street, Portland, Cumberland County, ME**	
	Latitude *43° 41' 58.53"*, Longitude *-70° 15' 30.64"*	
	178 Foot - Monopole Tower	

Dear Timothy Howell,

Jacobs Engineering Group Inc. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 984324, in accordance with application 364306, 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:

LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA-222-G standard and 2009 International Building Code based upon a wind speed of 100 mph 3-second gust, exposure category C

All modifications and 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 *Jacobs Engineering Group Inc.* 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:

Dustin Virgil M. Daulo
Structural Engineer

Reviewed By:

Walter M. Prather, P.E.
Vice President of Engineering

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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.

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-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.

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
160.0	160.0	1	cci antennas	HPA-65R-BUU-H6 w/ Mount Pipe	2 1	3/4 3/8	-
		2	cci antennas	HPA-65R-BUU-H8 w/ Mount Pipe			
		3	ericsson	RRUS12/RRUS A2			
		3	powerwave technologies	1001983			
		1	raycap	DC6-48-60-18-8F			

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 w/ Mount Pipe	6	1-5/8	1
		4	decibel	DB978H65E-M w/ Mount Pipe			
		1	tower mounts	Miscellaneous [NA 510-1]			
	178.0	1	tower mounts	Platform Mount [LP 1201-1]			
168.0	171.0	3	ericsson	KRY 112 144/1	12	1-5/8	1
		3	rfs celwave	APX16DWV-16DWV-S-E-A20 w/Mount Pipe			
	170.0	6	ericsson	KRY 112 71			
		6	rfs celwave	APXV18-206517-C w/Mount Pipe			
	168.0	1	tower mounts	Platform Mount [LP 305-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
160.0	160.0	1	andrew	SBNH-1D6565C w/ Mount Pipe	12 1 2	1-5/8 3/8 3/4	1
		3	ericsson	RRUS 11 B4			
		3	ericsson	RRUS-11			
		6	kathrein	782 10254			
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		6	powerwave technologies	7020.00			
		3	powerwave technologies	7770.00 w/Mount Pipe			
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21903			
		1	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		1	tower mounts	T-Arm Mount [TA 602-3]			
		3	powerwave technologies	7391.00 w/ Mount Pipe	-	-	2
		3	powerwave technologies	7770.00 w/Mount Pipe			
149.0	151.0	1	alcatel lucent	RRH2X40-AWS	19	1-5/8	1
		1	andrew	HBX-6517DS-T2M w/ Mount Pipe			
		2	andrew	LNX-6514DS-VTM w/ Mount Pipe			
		1	commscope	HBX-6516DS-A1M w/ Mount Pipe			
		1	commscope	LNX-6514DS-VTM w/ Mount Pipe			
	150.0	2	alcatel lucent	RRH2X40-AWS			
		2	andrew	HBX-6517DS-T2M w/ Mount Pipe			
		2	commscope	LNX-6514DS-VTM w/ Mount Pipe			
		1	andrew	LNX-6514DS-VTM w/ Mount Pipe			
		2	commscope	HBX-6516DS-A1M w/ Mount Pipe			
		1	rfs celwave	DB-B1-6C-12AB-0Z			
	149.0	1	tower mounts	Platform Mount [LP 1201-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
134.0	135.0	3	kmw communications	AM-X-CD-17-65-00T-RET w/ Mount Pipe	-	-	3
		6	antel	BSA-185065/10CF w/ Mount Pipe	6	1-5/8	1
		3	ericsson	KRC 115 032/2	6	7/8	
	134.0	1	tower mounts	Platform Mount [LP 403-1]			

Notes:
1) Existing Equipment
2) Equipment to be removed; Not Considered in this Analysis
3) Reserved Equipment

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)
180.0	180.0	12	Generic	4 SQ. FT.	-	-
170.0	170.0	2	Generic	6' DISHES	-	-
160.0	160.0	12	Generic	4 SQ. FT.	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH Velocitel	1620506	CCISITES
4-POST-MODIFICATION INSPECTION	TEP	3455671	CCISITES
4-POST-MODIFICATION INSPECTION	PSG	3630219	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Pittsburg	1620582	CCISITES
4-REINFORCEMENT DESIGN/DRAWINGS/DATA	PSG	2415719	CCISITES
4-REINFORCEMENT DESIGN/DRAWINGS/DATA	FDH	3175691	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Pittsburg	3633205	CCISITES

3.1) Analysis Method

tnxTower (version 7.0.7.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

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) 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. Jacobs Engineering Group Inc. should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	178 - 140	Pole	P24x1/2	1	-16.59	1162.78	70.9	Pass
L2	140 - 100	Pole	P36x1/2	2	-30.79	1756.54	103.9	Pass[2]
L3	100 - 60	Pole	P48x5/8	3	-48.99	2930.15	85.8	Pass
L4	60 - 20	Pole	P54x5/8	4	-69.38	3301.25	104.1	Pass[2]
L5	20 - 0	Pole	P60x5/8	5	-80.57	3649.51	101.0	Pass[2]
							Summary	
						Pole (L4)	104.1	Pass[2]
						Rating =	104.1	Pass[2]

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	95.3	Pass
1	Base Plate	0	39.9	Pass
1	Base Foundation Structural	0	15.8	Pass
1	Base Foundation Soil Interaction	0	94.2	Pass
1	Bolts	20	102.8	Pass[2]
	Top Flange Plate		23.8	Pass
	Bottom Flange Plate		31.3	Pass
1	Bolts	60	90.0	Pass
	Top Flange Plate		25.3	Pass
	Bottom Flange Plate		33.3	Pass
1	Bolts	100	94.5	Pass
	Top Flange Plate		49.1	Pass
	Bottom Flange Plate		69.0	Pass
1	Bolts	140	88.9	Pass
	Top Flange Plate		50.7	Pass
	Bottom Flange Plate		73.3	Pass

Structure Rating (max from all components) =	104.1[2]%

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.

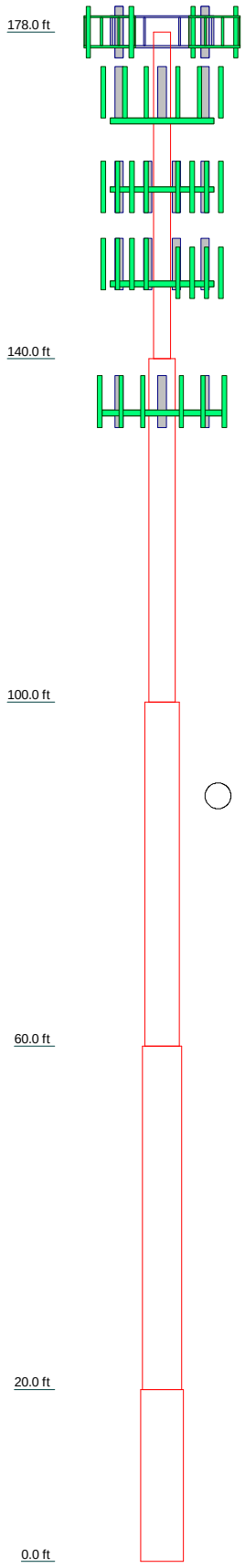
4.1) Recommendations

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

APPENDIX A

TNXTOWER OUTPUT

Section	Size	Length (ft)	Grade	Weight (K)
1	P24x1/2	38.0000	A53-B-35	4.8
2	P36x1/2	40.0000		7.6
3	P48x5/8	40.0000		12.7
4	P54x5/8	40.0000		14.3
5	P60x5/8	20.0000		7.9
				47.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Top Hat 2' 3" x 31.83"	179	RRUS-11	160
Lighting Rod 5/8" x 8'	178	RRUS 11 B4	160
(2) DB978H65E-M w/ Mount Pipe	178	RRUS 11 B4	160
(2) DB978G30E-M w/ Mount Pipe	178	RRUS 11 B4	160
(2) DB978H65E-M w/ Mount Pipe	178	(2) LGP21903	160
(2) 4' x 2" Pipe Mount	178	(2) LGP21903	160
(2) 4' x 2" Pipe Mount	178	(2) LGP21903	160
(2) 4' x 2" Pipe Mount	178	(2) 782 10254	160
6' x 2" Horiz. Pipe	178	(2) 782 10254	160
6' x 2" Horiz. Pipe	178	(2) 782 10254	160
6' x 2" Horiz. Pipe	178	1001983	160
Miscellaneous [NA 510-1]	178	1001983	160
Platform Mount [LP 1201-1]	178	1001983	160
APX16DWV-16DWV-S-E-A20 w/Mount Pipe	168	RRUS12/RRUS A2	160
		RRUS12/RRUS A2	160
APX16DWV-16DWV-S-E-A20 w/Mount Pipe	168	RRUS12/RRUS A2	160
APX16DWV-16DWV-S-E-A20 w/Mount Pipe	168	T-Arm Mount [TA 602-3]	160
		(2) LNX-6514DS-VTM w/ Mount Pipe	149
(2) APXV18-206517-C w/Mount Pipe	168	(2) LNX-6514DS-VTM w/ Mount Pipe	149
(2) APXV18-206517-C w/Mount Pipe	168	LNX-6514DS-VTM w/ Mount Pipe	149
(2) APXV18-206517-C w/Mount Pipe	168	LNX-6514DS-VTM w/ Mount Pipe	149
(2) KRY 112 71	168	HBX-6517DS-T2M w/ Mount Pipe	149
(2) KRY 112 71	168	HBX-6517DS-T2M w/ Mount Pipe	149
(2) KRY 112 71	168	HBX-6517DS-T2M w/ Mount Pipe	149
KRY 112 144/1	168	HBX-6516DS-A1M w/ Mount Pipe	149
KRY 112 144/1	168	HBX-6516DS-A1M w/ Mount Pipe	149
KRY 112 144/1	168	HBX-6516DS-A1M w/ Mount Pipe	149
Platform Mount [LP 305-1]	168	DB-B1-6C-12AB-0Z	149
HPA-65R-BUU-H6 w/ Mount Pipe	160	RRH2X40-AWS	149
HPA-65R-BUU-H8 w/ Mount Pipe	160	RRH2X40-AWS	149
HPA-65R-BUU-H8 w/ Mount Pipe	160	RRH2X40-AWS	149
7770.00 w/Mount Pipe	160	6' x 2" Horiz. Pipe	149
7770.00 w/Mount Pipe	160	6' x 2" Horiz. Pipe	149
7770.00 w/Mount Pipe	160	6' x 2" Horiz. Pipe	149
AM-X-CD-16-65-00T-RET w/ Mount Pipe	160	Platform Mount [LP 1201-1]	149
		Miscellaneous [NA 510-1]	149
P65-17-XLH-RR w/ Mount Pipe	160	AM-X-CD-17-65-00T-RET w/ Mount Pipe	134
SBNH-1D6565C w/ Mount Pipe	160		
(2) 7020.00	160	AM-X-CD-17-65-00T-RET w/ Mount Pipe	134
(2) 7020.00	160		
(2) 7020.00	160	AM-X-CD-17-65-00T-RET w/ Mount Pipe	134
(2) LGP21401	160	(2) BSA-185065/10CF w/ Mount Pipe	134
(2) LGP21401	160	(2) BSA-185065/10CF w/ Mount Pipe	134
(2) LGP21401	160	(2) BSA-185065/10CF w/ Mount Pipe	134
DC6-48-60-18-8F	160	KRC 115 032/2	134
DC6-48-60-18-8F	160	KRC 115 032/2	134
RRUS-11	160	KRC 115 032/2	134
RRUS-11	160	Platform Mount [LP 403-1]	134

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi			

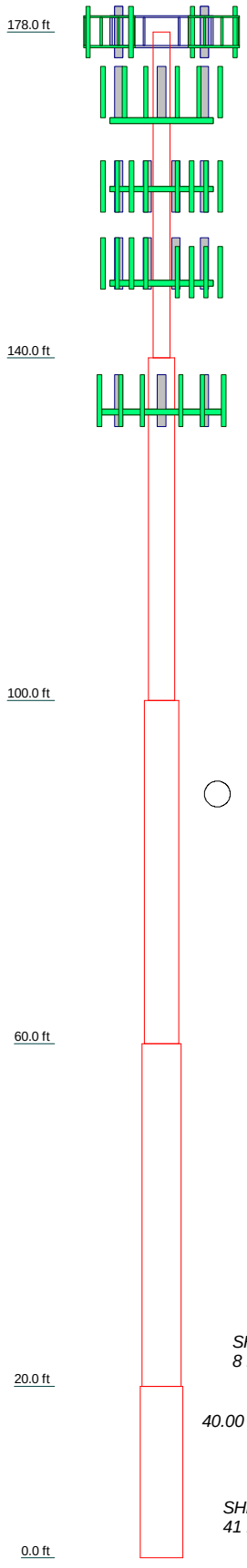
TOWER DESIGN NOTES

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 100.00 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40.00 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60.00 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.0000 ft

Jacobs Engineering Group Inc.
5449 Bells Ferry Road
Acworth, GA 30102
Phone: 770-701-2500
FAX: 770-701-2501

Job: ***PORTLAND NORTH***			
Project: ***BU878783 WO1341150***			
Client: Crown Castle	Drawn by: Dustin Daulo	App'd:	
Code: TIA-222-G	Date: 12/23/16	Scale: NTS	
Path:		Dwg No. E-1	

Section	Size	Length (ft)	Grade	Weight (K)
1	P24x1/2	38.0000	A53-B-35	4.8
2	P36x1/2	40.0000		7.6
3	P48x5/8	40.0000		12.7
4	P54x5/8	40.0000		14.3
5	P60x5/8	20.0000		7.9
				47.2



MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi			

TOWER DESIGN NOTES

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 100.00 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40.00 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60.00 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.0000 ft
8. TOWER RATING: 104.1%

Jacobs Engineering Group Inc.
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Phone: 770-701-2500
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Job: ***PORTLAND NORTH***			
Project: ***BU878783 WO1341150***			
Client: Crown Castle	Drawn by: Dustin Daulo	App'd:	
Code: TIA-222-G	Date: 12/23/16	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

There is a pole section.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

1) Tower is located in Cumberland County, Maine.
2) Basic wind speed of 100.00 mph.
3) Structure Class II.
4) Exposure Category C.
5) Topographic Category 1.
6) Crest Height 0.0000 ft.
7) Nominal ice thickness of 1.0000 in.
8) Ice thickness is considered to increase with height.
9) Ice density of 56.00 pcf.
10) A wind speed of 40.00 mph is used in combination with ice.
11) Temperature drop of 50.00 °F.
12) Deflections calculated using a wind speed of 60.00 mph.
13) A non-linear (P-delta) analysis was used.
14) Pressures are calculated at each section.
15) Stress ratio used in pole design is 1.
16) 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		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Horizontals		Assume Legs Pinned		Calculate Redundant Bracing Forces
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Use Moment Magnification	√	Use Clear Spans For Wind Area		SR Leg Bolts Resist Compression
√	Use Code Stress Ratios		Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		Offset Girt At Foundation
	Escalate Ice	√	Bypass Mast Stability Checks	√	Consider Feed Line Torque
	Always Use Max Kz	√	Use Azimuth Dish Coefficients		Include Angle Block Shear Check
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Use TIA-222-G Bracing Resist. Exemption
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-G Tension Splice Exemption
	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination		Poles
	Secondary Horizontal Braces Leg		Sort Capacity Reports By Component	√	Include Shear-Torsion Interaction
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Always Use Sub-Critical Flow
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Use Top Mounted Sockets
	SR Members Are Concentric				

Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Pole Size*	*Pole Grade*	*Socket Length* *ft*
L1	178.0000-140.0000	38.0000	P24x1/2	A53-B-35 (35 ksi)	
L2	140.0000-100.0000	40.0000	P36x1/2	A53-B-35 (35 ksi)	
L3	100.0000-60.0000	40.0000	P48x5/8	A53-B-35 (35 ksi)	
L4	60.0000-20.0000	40.0000	P54x5/8	A53-B-35 (35 ksi)	
L5	20.0000-0.0000	20.0000	P60x5/8	A53-B-35 (35 ksi)	

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	Double Angle Stitch Bolt Spacing Redundants in
L1 178.0000-140.0000				1	1	1			
L2 140.0000-100.0000				1	1	1			
L3 100.0000-60.0000				1	1	1			
L4 60.0000-20.0000				1	1	1			
L5 20.0000-0.0000				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 plf
**									
T-Brackets (Af)	C	Surface Af (CaAa)	178.0000 - 3.0000	1	1	0.200 0.200	1.0000	4.0000	8.40
Safety Line 3/8	C	Surface Ar (CaAa)	178.0000 - 3.0000	1	1	0.000 0.000	0.3750		0.22
**									
HB158-1-08U8-S8J18(1-5/8)	B	Surface Ar (CaAa)	149.0000 - 0.0000	1	1	0.170 0.170	1.9800		1.30

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
**								
***								
LDF7-50A(1-5/8)	A	No	Inside Pole	178.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
LDF7-50A(1-5/8)	C	No	Inside Pole	168.0000 - 0.0000	12	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
AL7-50(1-5/8)	A	No	Inside Pole	160.0000 - 0.0000	12	No Ice	0.0000	0.52
						1/2" Ice	0.0000	0.52
						1" Ice	0.0000	0.52
FB-L98B-002-75000(3/8)	A	No	Inside Pole	160.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.06
						1" Ice	0.0000	0.06
WR-VG86ST-BRD(3/4)	A	No	Inside Pole	160.0000 - 0.0000	2	No Ice	0.0000	0.58
						1/2" Ice	0.0000	0.58
						1" Ice	0.0000	0.58
FB-L98B-034-XXX(3/8)	A	No	Inside Pole	160.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.06
						1" Ice	0.0000	0.06
WR-VG86ST-BRD(3/4)	A	No	Inside Pole	160.0000 - 0.0000	2	No Ice	0.0000	0.58
						1/2" Ice	0.0000	0.58
						1" Ice	0.0000	0.58
LDF7-50A(1-5/8)	B	No	Inside Pole	149.0000 - 0.0000	18	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
LDF5-50A(7/8)	C	No	Inside Pole	134.0000 - 0.0000	6	No Ice	0.0000	0.33
						1/2" Ice	0.0000	0.33

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF7-50A(1-5/8)	C	No	Inside Pole	134.0000 - 0.0000	6	1" Ice	0.0000	0.33
						No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82

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
L1	178.0000-	A	0.000	0.000	0.000	0.000	0.36
	140.0000	B	0.000	0.000	1.782	0.000	0.14
		C	0.000	0.000	7.758	0.000	0.60
L2	140.0000-	A	0.000	0.000	0.000	0.000	0.54
	100.0000	B	0.000	0.000	7.920	0.000	0.64
		C	0.000	0.000	8.167	0.000	0.97
L3	100.0000-	A	0.000	0.000	0.000	0.000	0.54
	60.0000	B	0.000	0.000	7.920	0.000	0.64
		C	0.000	0.000	8.167	0.000	1.01
L4	60.0000-20.0000	A	0.000	0.000	0.000	0.000	0.54
		B	0.000	0.000	7.920	0.000	0.64
		C	0.000	0.000	8.167	0.000	1.01
L5	20.0000-0.0000	A	0.000	0.000	0.000	0.000	0.27
		B	0.000	0.000	3.960	0.000	0.32
		C	0.000	0.000	3.471	0.000	0.48

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
L1	178.0000-	A	2.341	0.000	0.000	0.000	0.000	0.36
	140.0000	B		0.000	0.000	5.995	0.000	0.26
		C		0.000	0.000	43.337	0.000	1.34
L2	140.0000-	A	2.276	0.000	0.000	0.000	0.000	0.54
	100.0000	B		0.000	0.000	26.127	0.000	1.12
		C		0.000	0.000	44.582	0.000	1.71
L3	100.0000-	A	2.186	0.000	0.000	0.000	0.000	0.54
	60.0000	B		0.000	0.000	25.407	0.000	1.09
		C		0.000	0.000	43.141	0.000	1.71
L4	60.0000-20.0000	A	2.042	0.000	0.000	0.000	0.000	0.54
		B		0.000	0.000	24.253	0.000	1.04
		C		0.000	0.000	40.832	0.000	1.63
L5	20.0000-0.0000	A	1.775	0.000	0.000	0.000	0.000	0.27
		B		0.000	0.000	11.060	0.000	0.48
		C		0.000	0.000	15.540	0.000	0.69

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	178.0000-140.0000	-0.1086	0.2147	-0.2705	0.8019
L2	140.0000-100.0000	0.0997	0.1752	0.1681	0.7568
L3	100.0000-60.0000	0.0997	0.1795	0.1784	0.8223
L4	60.0000-20.0000	0.0997	0.1811	0.1789	0.8199
L5	20.0000-0.0000	0.1275	0.1487	0.2466	0.6567

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	2	T-Brackets (Af)	140.00 - 178.00	1.0000	1.0000
L1	3	Safety Line 3/8	140.00 - 178.00	1.0000	1.0000
L1	14	HB158-1-08U8-S8J18(1-5/8)	140.00 - 149.00	1.0000	1.0000
L2	2	T-Brackets (Af)	100.00 - 140.00	1.0000	1.0000
L2	3	Safety Line 3/8	100.00 - 140.00	1.0000	1.0000
L2	14	HB158-1-08U8-S8J18(1-5/8)	100.00 - 140.00	1.0000	1.0000
L3	2	T-Brackets (Af)	60.00 - 100.00	1.0000	1.0000
L3	3	Safety Line 3/8	60.00 - 100.00	1.0000	1.0000
L3	14	HB158-1-08U8-S8J18(1-5/8)	60.00 - 100.00	1.0000	1.0000
L4	2	T-Brackets (Af)	20.00 - 60.00	1.0000	1.0000
L4	3	Safety Line 3/8	20.00 - 60.00	1.0000	1.0000
L4	14	HB158-1-08U8-S8J18(1-5/8)	20.00 - 60.00	1.0000	1.0000
L5	2	T-Brackets (Af)	3.00 - 20.00	1.0000	1.0000
L5	3	Safety Line 3/8	3.00 - 20.00	1.0000	1.0000
L5	14	HB158-1-08U8-S8J18(1-5/8)	0.00 - 20.00	1.0000	1.0000

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
Lighting Rod 5/8" x 8'	C	From Leg	0.0000 0.00 4.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.5000 1.3135 2.1437	0.5000 1.3135 2.1437	0.03 0.04 0.05
Top Hat 2' 3" x 31.83"	C	None		0.0000	179.0000	No Ice 1/2" Ice 1" Ice	2.9841 4.4685 4.7691	2.9841 4.4685 4.7691	0.10 0.17 0.25
178									
(2) DB978H65E-M w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	3.1431 3.5154 3.8856	2.8097 3.4107 4.0226	0.03 0.05 0.09
(2) DB978G30E-M w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice	6.0537 6.4678 6.8840	4.3281 5.0073 5.6680	0.04 0.09 0.14

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
						1" Ice			
(2) DB978H65E-M w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	3.1431 3.5154 3.8856	2.8097 3.4107 4.0226	0.03 0.05 0.09
(2) 4' x 2" Pipe Mount	A	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.7852 1.0284 1.2809	0.7852 1.0284 1.2809	0.03 0.04 0.04
(2) 4' x 2" Pipe Mount	B	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.7852 1.0284 1.2809	0.7852 1.0284 1.2809	0.03 0.04 0.04
(2) 4' x 2" Pipe Mount	C	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.7852 1.0284 1.2809	0.7852 1.0284 1.2809	0.03 0.04 0.04
6' x 2" Horiz. Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.5938 1.1977 1.5738	0.5938 1.1977 1.5738	0.02 0.17 0.32
6' x 2" Horiz. Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.5938 1.1977 1.5738	0.5938 1.1977 1.5738	0.02 0.17 0.32
6' x 2" Horiz. Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	0.5938 1.1977 1.5738	0.5938 1.1977 1.5738	0.02 0.17 0.32
Miscellaneous [NA 510-1]	C	From Leg	4.0000 0.00 2.00	0.0000	178.0000	No Ice 1/2" Ice 1" Ice	6.0000 8.5000 8.6000	6.0000 8.5000 8.6000	0.26 0.34 0.34
Platform Mount [LP 1201-1]	C	None		0.0000	178.0000	No Ice 1/2" Ice 1" Ice	23.1000 26.8000 30.5000	23.1000 26.8000 30.5000	2.10 2.50 2.90
168									
APX16DWV-16DWV-S-E-A20 w/Mount Pipe	A	From Leg	4.0000 0.00 3.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	6.6275 7.0134 7.4067	3.2856 3.9182 4.5675	0.06 0.10 0.16
APX16DWV-16DWV-S-E-A20 w/Mount Pipe	B	From Leg	4.0000 0.00 3.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	6.6275 7.0134 7.4067	3.2856 3.9182 4.5675	0.06 0.10 0.16
APX16DWV-16DWV-S-E-A20 w/Mount Pipe	C	From Leg	4.0000 0.00 3.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	6.6275 7.0134 7.4067	3.2856 3.9182 4.5675	0.06 0.10 0.16
(2) APXV18-206517-C w/Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	5.2062 5.6723 6.1415	4.5021 5.4702 6.2880	0.02 0.07 0.12
(2) APXV18-206517-C w/Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	5.2062 5.6723 6.1415	4.5021 5.4702 6.2880	0.02 0.07 0.12
(2) APXV18-206517-C w/Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	5.2062 5.6723 6.1415	4.5021 5.4702 6.2880	0.02 0.07 0.12
(2) KRY 112 71	A	From Leg	4.0000 0.00 2.00	0.0000	168.0000	No Ice 1/2" Ice	0.5833 0.6876 0.7993	0.3980 0.4883 0.5856	0.01 0.02 0.03

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
						1" Ice			
(2) KRY 112 71	B	From Leg	4.0000 0.00 2.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	0.5833 0.6876 0.7993	0.3980 0.4883 0.5856	0.01 0.02 0.03
(2) KRY 112 71	C	From Leg	4.0000 0.00 2.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	0.5833 0.6876 0.7993	0.3980 0.4883 0.5856	0.01 0.02 0.03
KRY 112 144/1	A	From Leg	4.0000 0.00 3.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	0.3523 0.4284 0.5119	0.1617 0.2195 0.2846	0.01 0.01 0.02
KRY 112 144/1	B	From Leg	4.0000 0.00 3.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	0.3523 0.4284 0.5119	0.1617 0.2195 0.2846	0.01 0.01 0.02
KRY 112 144/1	C	From Leg	4.0000 0.00 3.00	0.0000	168.0000	No Ice 1/2" Ice 1" Ice	0.3523 0.4284 0.5119	0.1617 0.2195 0.2846	0.01 0.01 0.02
Platform Mount [LP 305-1]	C	None		0.0000	168.0000	No Ice 1/2" Ice 1" Ice	18.0100 23.3300 28.6500	18.0100 23.3300 28.6500	1.12 1.35 1.58
160									
HPA-65R-BUU-H6 w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	9.8953 10.4700 11.0098	8.1125 9.3041 10.2095	0.08 0.16 0.25
HPA-65R-BUU-H8 w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	13.5881 14.1897 14.7983	10.7958 12.1244 13.1669	0.08 0.18 0.29
HPA-65R-BUU-H8 w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	13.5881 14.1897 14.7983	10.7958 12.1244 13.1669	0.08 0.18 0.29
7770.00 w/Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	5.5473 5.9163 6.2926	4.0355 4.6682 5.3175	0.05 0.10 0.15
7770.00 w/Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	5.5473 5.9163 6.2926	4.0355 4.6682 5.3175	0.05 0.10 0.15
7770.00 w/Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	5.5473 5.9163 6.2926	4.0355 4.6682 5.3175	0.05 0.10 0.15
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	8.2619 8.8215 9.3462	6.3042 7.4790 8.3676	0.07 0.14 0.21
P65-17-XLH-RR w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	11.7042 12.4240 13.1530	8.9375 10.4499 11.9863	0.09 0.18 0.27
SBNH-1D6565C w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	11.6828 12.4043 13.1351	9.8418 11.3657 12.9138	0.10 0.19 0.29
(2) 7020.00	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice	0.1021 0.1469 0.1991	0.1750 0.2393 0.3109	0.00 0.01 0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment ° °	Placement ft ft		C_AA_A Front ft^2 ft^2	C_AA_A Side ft^2 ft^2	Weight K K
						1" Ice			
(2) 7020.00	B	From Leg	4.0000	0.0000	160.0000	No Ice	0.1021	0.1750	0.00
			0.00			1/2" Ice	0.1469	0.2393	0.01
			0.00			1" Ice	0.1991	0.3109	0.01
(2) 7020.00	C	From Leg	4.0000	0.0000	160.0000	No Ice	0.1021	0.1750	0.00
			0.00			1/2" Ice	0.1469	0.2393	0.01
			0.00			1" Ice	0.1991	0.3109	0.01
(2) LGP21401	A	From Leg	4.0000	0.0000	160.0000	No Ice	1.1040	0.2070	0.01
			0.00			1/2" Ice	1.2388	0.2738	0.02
			0.00			1" Ice	1.3810	0.3475	0.03
(2) LGP21401	B	From Leg	4.0000	0.0000	160.0000	No Ice	1.1040	0.2070	0.01
			0.00			1/2" Ice	1.2388	0.2738	0.02
			0.00			1" Ice	1.3810	0.3475	0.03
(2) LGP21401	C	From Leg	4.0000	0.0000	160.0000	No Ice	1.1040	0.2070	0.01
			0.00			1/2" Ice	1.2388	0.2738	0.02
			0.00			1" Ice	1.3810	0.3475	0.03
DC6-48-60-18-8F	B	From Leg	4.0000	0.0000	160.0000	No Ice	0.9167	0.9167	0.03
			0.00			1/2" Ice	1.4583	1.4583	0.05
			0.00			1" Ice	1.6431	1.6431	0.07
DC6-48-60-18-8F	B	From Leg	4.0000	0.0000	160.0000	No Ice	0.9167	0.9167	0.03
			0.00			1/2" Ice	1.4583	1.4583	0.05
			0.00			1" Ice	1.6431	1.6431	0.07
RRUS-11	A	From Leg	4.0000	0.0000	160.0000	No Ice	2.5217	1.0680	0.06
			0.00			1/2" Ice	2.7187	1.2106	0.07
			0.00			1" Ice	2.9231	1.3606	0.10
RRUS-11	B	From Leg	4.0000	0.0000	160.0000	No Ice	2.5217	1.0680	0.06
			0.00			1/2" Ice	2.7187	1.2106	0.07
			0.00			1" Ice	2.9231	1.3606	0.10
RRUS-11	C	From Leg	4.0000	0.0000	160.0000	No Ice	2.5217	1.0680	0.06
			0.00			1/2" Ice	2.7187	1.2106	0.07
			0.00			1" Ice	2.9231	1.3606	0.10
RRUS 11 B4	A	From Leg	4.0000	0.0000	160.0000	No Ice	2.8333	1.1821	0.05
			0.00			1/2" Ice	3.0426	1.3299	0.07
			0.00			1" Ice	3.2593	1.4848	0.10
RRUS 11 B4	B	From Leg	4.0000	0.0000	160.0000	No Ice	2.8333	1.1821	0.05
			0.00			1/2" Ice	3.0426	1.3299	0.07
			0.00			1" Ice	3.2593	1.4848	0.10
RRUS 11 B4	C	From Leg	4.0000	0.0000	160.0000	No Ice	2.8333	1.1821	0.05
			0.00			1/2" Ice	3.0426	1.3299	0.07
			0.00			1" Ice	3.2593	1.4848	0.10
(2) LGP21903	A	From Leg	4.0000	0.0000	160.0000	No Ice	0.2310	0.1575	0.01
			0.00			1/2" Ice	0.2941	0.2129	0.01
			0.00			1" Ice	0.3647	0.2756	0.02
(2) LGP21903	B	From Leg	4.0000	0.0000	160.0000	No Ice	0.2310	0.1575	0.01
			0.00			1/2" Ice	0.2941	0.2129	0.01
			0.00			1" Ice	0.3647	0.2756	0.02
(2) LGP21903	C	From Leg	4.0000	0.0000	160.0000	No Ice	0.2310	0.1575	0.01
			0.00			1/2" Ice	0.2941	0.2129	0.01
			0.00			1" Ice	0.3647	0.2756	0.02

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) 782 10254	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	0.1421 0.1936 0.2525	0.0800 0.1221 0.1727	0.00 0.00 0.01
(2) 782 10254	B	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	0.1421 0.1936 0.2525	0.0800 0.1221 0.1727	0.00 0.00 0.01
(2) 782 10254	C	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	0.1421 0.1936 0.2525	0.0800 0.1221 0.1727	0.00 0.00 0.01
1001983	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	0.1758 0.2317 0.2950	0.0833 0.1264 0.1778	0.00 0.00 0.01
1001983	B	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	0.1758 0.2317 0.2950	0.0833 0.1264 0.1778	0.00 0.00 0.01
1001983	C	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	0.1758 0.2317 0.2950	0.0833 0.1264 0.1778	0.00 0.00 0.01
RRUS12/RRUS A2	A	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	3.1435 3.3632 3.5904	1.8351 2.0121 2.1965	0.07 0.10 0.13
RRUS12/RRUS A2	B	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	3.1435 3.3632 3.5904	1.8351 2.0121 2.1965	0.07 0.10 0.13
RRUS12/RRUS A2	C	From Leg	4.0000 0.00 0.00	0.0000	160.0000	No Ice 1/2" Ice 1" Ice	3.1435 3.3632 3.5904	1.8351 2.0121 2.1965	0.07 0.10 0.13
T-Arm Mount [TA 602-3]	C	None		0.0000	160.0000	No Ice 1/2" Ice 1" Ice	11.5900 15.4400 19.2900	11.5900 15.4400 19.2900	0.26 0.33 0.42
149									
(2) LNX-6514DS-VTM w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	8.4106 8.9745 9.5048	7.0817 8.2729 9.1847	0.06 0.13 0.21
(2) LNX-6514DS-VTM w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	8.3164 8.8765 9.4016	7.0042 8.1855 9.0806	0.06 0.13 0.20
LNX-6514DS-VTM w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	8.3164 8.8765 9.4016	7.0042 8.1855 9.0806	0.06 0.13 0.20
LNX-6514DS-VTM w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	8.3164 8.8765 9.4016	7.0042 8.1855 9.0806	0.06 0.13 0.20
HBX-6517DS-T2M w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	5.4805 6.0509 6.5922	5.0210 6.2225 7.1672	0.04 0.08 0.14
HBX-6517DS-T2M w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	5.4805 6.0509 6.5922	5.0210 6.2225 7.1672	0.04 0.08 0.14

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
HBX-6517DS-T2M w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	5.4805 6.0509 6.5922	5.0210 6.2225 7.1672	0.04 0.08 0.14
HBX-6516DS-A1M w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	3.5559 3.9559 4.3492	3.2406 3.9135 4.5638	0.03 0.06 0.10
HBX-6516DS-A1M w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	3.5559 3.9559 4.3492	3.2406 3.9135 4.5638	0.03 0.06 0.10
HBX-6516DS-A1M w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	3.5559 3.9559 4.3492	3.2406 3.9135 4.5638	0.03 0.06 0.10
DB-B1-6C-12AB-0Z	B	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	3.3636 3.5972 3.8383	2.1921 2.3950 2.6056	0.02 0.05 0.08
RRH2X40-AWS	A	From Leg	4.0000 0.00 2.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	2.1614 2.3597 2.5655	1.4199 1.5903 1.7676	0.04 0.06 0.08
RRH2X40-AWS	B	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	2.1614 2.3597 2.5655	1.4199 1.5903 1.7676	0.04 0.06 0.08
RRH2X40-AWS	C	From Leg	4.0000 0.00 1.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	2.1614 2.3597 2.5655	1.4199 1.5903 1.7676	0.04 0.06 0.08
6' x 2" Horiz. Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	0.5938 1.1977 1.5738	0.5938 1.1977 1.5738	0.02 0.17 0.32
6' x 2" Horiz. Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	0.5938 1.1977 1.5738	0.5938 1.1977 1.5738	0.02 0.17 0.32
6' x 2" Horiz. Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	149.0000	No Ice 1/2" Ice 1" Ice	0.5938 1.1977 1.5738	0.5938 1.1977 1.5738	0.02 0.17 0.32
Platform Mount [LP 1201-1]	C	None		0.0000	149.0000	No Ice 1/2" Ice 1" Ice	23.1000 26.8000 30.5000	23.1000 26.8000 30.5000	2.10 2.50 2.90
Miscellaneous [NA 510-1]	C	None		0.0000	149.0000	No Ice 1/2" Ice 1" Ice	6.0000 8.5000 8.6000	6.0000 8.5000 8.6000	0.26 0.34 0.34
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AM-X-CD-17-65-00T-RET w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	11.5486 12.2673 12.9953	8.9375 10.4499 11.9863	0.09 0.18 0.27
AM-X-CD-17-65-00T-RET w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	11.5486 12.2673 12.9953	8.9375 10.4499 11.9863	0.09 0.18 0.27
AM-X-CD-17-65-00T-RET w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	11.5486 12.2673 12.9953	8.9375 10.4499 11.9863	0.09 0.18 0.27

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) BSA-185065/10CF w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	4.1491 4.6143 5.0646	3.1012 4.1051 4.8407	0.03 0.07 0.11
(2) BSA-185065/10CF w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	4.1491 4.6143 5.0646	3.1012 4.1051 4.8407	0.03 0.07 0.11
(2) BSA-185065/10CF w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	4.1491 4.6143 5.0646	3.1012 4.1051 4.8407	0.03 0.07 0.11
KRC 115 032/2	A	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	0.1633 0.2176 0.2793	0.1176 0.1664 0.2226	0.00 0.00 0.01
KRC 115 032/2	B	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	0.1633 0.2176 0.2793	0.1176 0.1664 0.2226	0.00 0.00 0.01
KRC 115 032/2	C	From Leg	4.0000 0.00 1.00	0.0000	134.0000	No Ice 1/2" Ice 1" Ice	0.1633 0.2176 0.2793	0.1176 0.1664 0.2226	0.00 0.00 0.01
Platform Mount [LP 403-1]	C	None		0.0000	134.0000	No Ice 1/2" Ice 1" Ice	18.8500 24.3000 29.7500	18.8500 24.3000 29.7500	1.50 1.80 2.09
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Load Combinations

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	178 - 140	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-48.26	-0.12	-5.81
			Max. Mx	20	-16.59	501.44	2.27
			Max. My	14	-16.62	-2.50	-496.81
			Max. Vy	20	-22.46	501.44	2.27
			Max. Vx	14	22.28	-2.50	-496.81
			Max. Torque	8			-3.27
L2	140 - 100	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-72.09	0.05	-7.67
			Max. Mx	20	-30.79	1614.72	6.61
			Max. My	14	-30.81	-7.03	-1602.76
			Max. Vy	20	-30.29	1614.72	6.61
			Max. Vx	14	30.11	-7.03	-1602.76
			Max. Torque	8			-3.27
L3	100 - 60	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-96.42	0.30	-9.60
			Max. Mx	20	-49.00	2929.27	10.85
			Max. My	14	-49.01	-11.43	-2910.01
			Max. Vy	20	-35.23	2929.27	10.85
			Max. Vx	14	35.04	-11.43	-2910.01
			Max. Torque	8			-3.26
L4	60 - 20	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-122.78	0.60	-11.33
			Max. Mx	20	-69.38	4425.02	14.98
			Max. My	14	-69.39	-15.71	-4398.58
			Max. Vy	20	-39.26	4425.02	14.98
			Max. Vx	14	39.08	-15.71	-4398.58
			Max. Torque	8			-3.26
L5	20 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-136.64	0.68	-12.02
			Max. Mx	20	-80.57	5225.58	17.02
			Max. My	14	-80.57	-17.82	-5195.64
			Max. Vy	20	-40.78	5225.58	17.02
			Max. Vx	14	40.60	-17.82	-5195.64
			Max. Torque	8			-3.26

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	136.64	0.00	-0.00
	Max. H_x	21	60.44	40.76	0.12
	Max. H_z	2	80.58	0.12	40.58
	Max. M_x	2	5187.94	0.12	40.58
	Max. M_z	8	5219.51	-40.76	-0.12
	Max. Torsion	20	3.23	40.76	0.12
	Min. Vert	5	60.44	-20.28	35.08
	Min. H_x	9	60.44	-40.76	-0.12
	Min. H_z	14	80.58	-0.12	-40.58
	Min. M_x	14	-5195.64	-0.12	-40.58
	Min. M_z	20	-5225.58	40.76	0.12
	Min. Torsion	8	-3.25	-40.76	-0.12

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	67.15	0.00	0.00	3.08	2.42	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	80.58	-0.12	-40.58	-5187.94	23.90	-0.30
0.9 Dead+1.6 Wind 0 deg - No Ice	60.44	-0.12	-40.58	-5135.95	22.86	-0.27
1.2 Dead+1.6 Wind 30 deg - No Ice	80.58	20.28	-35.08	-4481.99	-2590.21	1.37
0.9 Dead+1.6 Wind 30 deg - No Ice	60.44	20.28	-35.08	-4437.20	-2564.53	1.39
1.2 Dead+1.6 Wind 60 deg - No Ice	80.58	35.24	-20.19	-2574.00	-4509.44	2.68
0.9 Dead+1.6 Wind 60 deg - No Ice	60.44	35.24	-20.19	-2548.71	-4464.13	2.68
1.2 Dead+1.6 Wind 90 deg - No Ice	80.58	40.76	0.12	24.70	-5219.51	3.25
0.9 Dead+1.6 Wind 90 deg - No Ice	60.44	40.76	0.12	23.45	-5166.93	3.24
1.2 Dead+1.6 Wind 120 deg - No Ice	80.58	35.35	20.39	2617.77	-4530.24	2.95
0.9 Dead+1.6 Wind 120 deg - No Ice	60.44	35.35	20.39	2590.05	-4484.69	2.93
1.2 Dead+1.6 Wind 150 deg - No Ice	80.58	20.48	35.20	4510.47	-2626.31	1.86
0.9 Dead+1.6 Wind 150 deg - No Ice	60.44	20.48	35.20	4463.44	-2600.21	1.83
1.2 Dead+1.6 Wind 180 deg - No Ice	80.58	0.12	40.58	5195.64	-17.82	0.28
0.9 Dead+1.6 Wind 180 deg - No Ice	60.44	0.12	40.58	5141.64	-18.37	0.25
1.2 Dead+1.6 Wind 210 deg - No Ice	80.58	-20.28	35.08	4489.68	2596.30	-1.37
0.9 Dead+1.6 Wind 210 deg - No Ice	60.44	-20.28	35.08	4442.89	2569.03	-1.39
1.2 Dead+1.6 Wind 240 deg - No Ice	80.58	-35.24	20.19	2581.67	4515.52	-2.65
0.9 Dead+1.6 Wind 240 deg - No Ice	60.44	-35.24	20.19	2554.38	4468.63	-2.66

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
1.2 Dead+1.6 Wind 270 deg - No Ice	80.58	-40.76	-0.12	-17.02	5225.58	-3.23
0.9 Dead+1.6 Wind 270 deg - No Ice	60.44	-40.76	-0.12	-17.78	5171.41	-3.22
1.2 Dead+1.6 Wind 300 deg - No Ice	80.58	-35.35	-20.39	-2610.08	4536.29	-2.95
0.9 Dead+1.6 Wind 300 deg - No Ice	60.44	-35.35	-20.39	-2584.37	4489.17	-2.93
1.2 Dead+1.6 Wind 330 deg - No Ice	80.58	-20.48	-35.20	-4502.77	2632.37	-1.88
0.9 Dead+1.6 Wind 330 deg - No Ice	60.44	-20.48	-35.20	-4457.74	2604.69	-1.85
1.2 Dead+1.0 Ice+1.0 Temp	136.64	-0.00	0.00	12.02	0.68	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	136.64	-0.01	-8.04	-1045.09	2.99	-0.19
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	136.64	4.02	-6.96	-902.27	-527.19	0.12
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	136.64	6.97	-4.01	-514.36	-915.92	0.40
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	136.64	8.05	0.01	14.69	-1059.05	0.57
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	136.64	6.98	4.03	543.12	-918.22	0.59
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	136.64	4.04	6.97	929.35	-531.16	0.45
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	136.64	0.01	8.04	1069.88	-1.60	0.19
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	136.64	-4.02	6.96	927.06	528.59	-0.12
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	136.64	-6.97	4.01	539.15	917.32	-0.40
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	136.64	-8.05	-0.01	10.10	1060.45	-0.57
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	136.64	-6.98	-4.03	-518.34	919.61	-0.59
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	136.64	-4.04	-6.97	-904.56	532.56	-0.45
Dead+Wind 0 deg - Service	67.15	-0.02	-8.17	-1035.75	6.68	-0.05
Dead+Wind 30 deg - Service	67.15	4.08	-7.06	-894.47	-516.43	0.28
Dead+Wind 60 deg - Service	67.15	7.09	-4.06	-512.67	-900.49	0.54
Dead+Wind 90 deg - Service	67.15	8.20	0.02	7.36	-1042.59	0.66
Dead+Wind 120 deg - Service	67.15	7.12	4.11	526.27	-904.66	0.60
Dead+Wind 150 deg - Service	67.15	4.12	7.09	905.02	-523.65	0.37
Dead+Wind 180 deg - Service	67.15	0.02	8.17	1042.13	-1.66	0.05
Dead+Wind 210 deg - Service	67.15	-4.08	7.06	900.85	521.45	-0.28
Dead+Wind 240 deg - Service	67.15	-7.09	4.06	519.05	905.51	-0.54
Dead+Wind 270 deg - Service	67.15	-8.20	-0.02	-0.98	1047.61	-0.66
Dead+Wind 300 deg - Service	67.15	-7.12	-4.11	-519.89	909.68	-0.60
Dead+Wind 330 deg - Service	67.15	-4.12	-7.09	-898.64	528.67	-0.38

Solution Summary

Load Comb.	Sum of Applied Forces PX	PY	PZ	Sum of Reactions PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-67.15	0.00	0.00	67.15	0.00	0.000%
2	-0.12	-80.58	-40.58	0.12	80.58	40.58	0.000%
3	-0.12	-60.44	-40.58	0.12	60.44	40.58	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	20.28	-80.58	-35.08	-20.28	80.58	35.08	0.000%
5	20.28	-60.44	-35.08	-20.28	60.44	35.08	0.000%
6	35.24	-80.58	-20.19	-35.24	80.58	20.19	0.000%
7	35.24	-60.44	-20.19	-35.24	60.44	20.19	0.000%
8	40.76	-80.58	0.12	-40.76	80.58	-0.12	0.000%
9	40.76	-60.44	0.12	-40.76	60.44	-0.12	0.000%
10	35.35	-80.58	20.39	-35.35	80.58	-20.39	0.000%
11	35.35	-60.44	20.39	-35.35	60.44	-20.39	0.000%
12	20.48	-80.58	35.20	-20.48	80.58	-35.20	0.000%
13	20.48	-60.44	35.20	-20.48	60.44	-35.20	0.000%
14	0.12	-80.58	40.58	-0.12	80.58	-40.58	0.000%
15	0.12	-60.44	40.58	-0.12	60.44	-40.58	0.000%
16	-20.28	-80.58	35.08	20.28	80.58	-35.08	0.000%
17	-20.28	-60.44	35.08	20.28	60.44	-35.08	0.000%
18	-35.24	-80.58	20.19	35.24	80.58	-20.19	0.000%
19	-35.24	-60.44	20.19	35.24	60.44	-20.19	0.000%
20	-40.76	-80.58	-0.12	40.76	80.58	0.12	0.000%
21	-40.76	-60.44	-0.12	40.76	60.44	0.12	0.000%
22	-35.35	-80.58	-20.39	35.35	80.58	20.39	0.000%
23	-35.35	-60.44	-20.39	35.35	60.44	20.39	0.000%
24	-20.48	-80.58	-35.20	20.48	80.58	35.20	0.000%
25	-20.48	-60.44	-35.20	20.48	60.44	35.20	0.000%
26	0.00	-136.64	0.00	0.00	136.64	-0.00	0.000%
27	-0.01	-136.64	-8.04	0.01	136.64	8.04	0.000%
28	4.02	-136.64	-6.96	-4.02	136.64	6.96	0.000%
29	6.97	-136.64	-4.01	-6.97	136.64	4.01	0.000%
30	8.05	-136.64	0.01	-8.05	136.64	-0.01	0.000%
31	6.98	-136.64	4.03	-6.98	136.64	-4.03	0.000%
32	4.04	-136.64	6.97	-4.04	136.64	-6.97	0.000%
33	0.01	-136.64	8.04	-0.01	136.64	-8.04	0.000%
34	-4.02	-136.64	6.96	4.02	136.64	-6.96	0.000%
35	-6.97	-136.64	4.01	6.97	136.64	-4.01	0.000%
36	-8.05	-136.64	-0.01	8.05	136.64	0.01	0.000%
37	-6.98	-136.64	-4.03	6.98	136.64	4.03	0.000%
38	-4.04	-136.64	-6.97	4.04	136.64	6.97	0.000%
39	-0.02	-67.15	-8.17	0.02	67.15	8.17	0.000%
40	4.08	-67.15	-7.06	-4.08	67.15	7.06	0.000%
41	7.09	-67.15	-4.06	-7.09	67.15	4.06	0.000%
42	8.20	-67.15	0.02	-8.20	67.15	-0.02	0.000%
43	7.12	-67.15	4.11	-7.12	67.15	-4.11	0.000%
44	4.12	-67.15	7.09	-4.12	67.15	-7.09	0.000%
45	0.02	-67.15	8.17	-0.02	67.15	-8.17	0.000%
46	-4.08	-67.15	7.06	4.08	67.15	-7.06	0.000%
47	-7.09	-67.15	4.06	7.09	67.15	-4.06	0.000%
48	-8.20	-67.15	-0.02	8.20	67.15	0.02	0.000%
49	-7.12	-67.15	-4.11	7.12	67.15	4.11	0.000%
50	-4.12	-67.15	-7.09	4.12	67.15	7.09	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	0.00042580
3	Yes	4	0.00000001	0.00023035
4	Yes	5	0.00000001	0.00060147
5	Yes	5	0.00000001	0.00028387
6	Yes	5	0.00000001	0.00057033
7	Yes	5	0.00000001	0.00026786
8	Yes	5	0.00000001	0.00006237
9	Yes	4	0.00000001	0.00086382
10	Yes	5	0.00000001	0.00063582
11	Yes	5	0.00000001	0.00029921
12	Yes	5	0.00000001	0.00059206
13	Yes	5	0.00000001	0.00027753

14	Yes	4	0.00000001	0.00031727
15	Yes	4	0.00000001	0.00014665
16	Yes	5	0.00000001	0.00058429
17	Yes	5	0.00000001	0.00027417
18	Yes	5	0.00000001	0.00062041
19	Yes	5	0.00000001	0.00029238
20	Yes	5	0.00000001	0.00004939
21	Yes	4	0.00000001	0.00068424
22	Yes	5	0.00000001	0.00058479
23	Yes	5	0.00000001	0.00027377
24	Yes	5	0.00000001	0.00062360
25	Yes	5	0.00000001	0.00029327
26	Yes	4	0.00000001	0.00006537
27	Yes	5	0.00000001	0.00042239
28	Yes	5	0.00000001	0.00044912
29	Yes	5	0.00000001	0.00045130
30	Yes	5	0.00000001	0.00043242
31	Yes	5	0.00000001	0.00046761
32	Yes	5	0.00000001	0.00046763
33	Yes	5	0.00000001	0.00043968
34	Yes	5	0.00000001	0.00046585
35	Yes	5	0.00000001	0.00046511
36	Yes	5	0.00000001	0.00043286
37	Yes	5	0.00000001	0.00045418
38	Yes	5	0.00000001	0.00045265
39	Yes	4	0.00000001	0.00004545
40	Yes	4	0.00000001	0.00014034
41	Yes	4	0.00000001	0.00012117
42	Yes	4	0.00000001	0.00006728
43	Yes	4	0.00000001	0.00016062
44	Yes	4	0.00000001	0.00012867
45	Yes	4	0.00000001	0.00004557
46	Yes	4	0.00000001	0.00012933
47	Yes	4	0.00000001	0.00015631
48	Yes	4	0.00000001	0.00006602
49	Yes	4	0.00000001	0.00012569
50	Yes	4	0.00000001	0.00015027

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	178 - 140	18.802	48	0.9548	0.0043
L2	140 - 100	11.556	48	0.7968	0.0018
L3	100 - 60	5.804	49	0.5277	0.0007
L4	60 - 20	2.128	49	0.3308	0.0004
L5	20 - 0	0.230	49	0.1070	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
179.0000	Top Hat 2' 3" x 31.83"	48	18.802	0.9548	0.0044	156263
178.0000	Lighting Rod 5/8" x 8'	48	18.802	0.9548	0.0044	156263
168.0000	APX16DWV-16DWV-S-E-A20 w/Mount Pipe	48	16.809	0.9208	0.0036	31252
160.0000	HPA-65R-BUU-H6 w/ Mount Pipe	48	15.240	0.8914	0.0030	17362
149.0000	(2) LNX-6514DS-VTM w/ Mount Pipe	48	13.160	0.8441	0.0023	10776
134.0000	AM-X-CD-17-65-00T-RET w/ Mount Pipe	48	10.549	0.7600	0.0015	8325

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	178 - 140	93.843	22	4.7583	0.0212
L2	140 - 100	57.738	22	3.9831	0.0089
L3	100 - 60	29.011	22	2.6390	0.0036
L4	60 - 20	10.637	22	1.6538	0.0017
L5	20 - 0	1.151	22	0.5349	0.0005

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
179.0000	Top Hat 2' 3" x 31.83"	22	93.843	4.7583	0.0218	31977
178.0000	Lighting Rod 5/8" x 8'	22	93.843	4.7583	0.0218	31977
168.0000	APX16DWV-16DWV-S-E-A20 w/Mount Pipe	22	83.917	4.5930	0.0180	6394
160.0000	HPA-65R-BUU-H6 w/ Mount Pipe	22	76.104	4.4491	0.0151	3551
149.0000	(2) LNX-6514DS-VTM w/ Mount Pipe	22	65.737	4.2170	0.0115	2202
134.0000	AM-X-CD-17-65-00T-RET w/ Mount Pipe	22	52.714	3.8001	0.0077	1695

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 - 176.1	P24x1/2	38.0000	0.0000	0.0	36.9137	-3.52	1162.78	0.003
	176.1 - 174.2					36.9137	-3.86	1162.78	0.003
	174.2 - 172.3					36.9137	-4.21	1162.78	0.004
	172.3 - 170.4					36.9137	-4.55	1162.78	0.004
	170.4 - 168.5					36.9137	-4.89	1162.78	0.004
	168.5 - 166.6					36.9137	-6.76	1162.78	0.006
	166.6 - 164.7					36.9137	-7.09	1162.78	0.006
	164.7 - 162.8					36.9137	-7.44	1162.78	0.006
	162.8 - 160.9					36.9137	-7.78	1162.78	0.007
	160.9 - 159					36.9137	-9.66	1162.78	0.008
	159 - 157.1					36.9137	-10.00	1162.78	0.009

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	157.1 - 155.2					36.9137	-10.36	1162.78	0.009
	155.2 - 153.3					36.9137	-10.71	1162.78	0.009
	153.3 - 151.4					36.9137	-11.06	1162.78	0.010
	151.4 - 149.5					36.9137	-11.42	1162.78	0.010
	149.5 - 147.6					36.9137	-15.09	1162.78	0.013
	147.6 - 145.7					36.9137	-15.46	1162.78	0.013
	145.7 - 143.8					36.9137	-15.83	1162.78	0.014
	143.8 - 141.9					36.9137	-16.21	1162.78	0.014
	141.9 - 140					36.9137	-16.59	1162.78	0.014
L2	140 - 138	P36x1/2	40.0000	0.0000	0.0	55.7633	-17.18	1756.54	0.010
	138 - 136	4.8.2 (1.04 CR) - 2/19				55.7633	-17.77	1756.54	0.010
	136 - 134	4.8.2 (1.04 CR) - 2/18				55.7633	-18.35	1756.54	0.010
	134 - 132	4.8.2 (1.04 CR) - 2/17				55.7633	-21.04	1756.54	0.012
	132 - 130	4.8.2 (1.04 CR) - 2/16				55.7633	-21.63	1756.54	0.012
	130 - 128	4.8.2 (1.04 CR) - 2/15				55.7633	-22.23	1756.54	0.013
	128 - 126	4.8.2 (1.04 CR) - 2/14				55.7633	-22.82	1756.54	0.013
	126 - 124	4.8.2 (1.04 CR) - 2/13				55.7633	-23.42	1756.54	0.013
	124 - 122	4.8.2 (1.04 CR) - 2/12				55.7633	-24.02	1756.54	0.014
	122 - 120	4.8.2 (1.04 CR) - 2/11				55.7633	-24.62	1756.54	0.014
	120 - 118	4.8.2 (1.04 CR) - 2/10				55.7633	-25.23	1756.54	0.014
	118 - 116	4.8.2 (1.04 CR) - 2/9				55.7633	-25.84	1756.54	0.015
	116 - 114	4.8.2 (1.04 CR) - 2/8				55.7633	-26.44	1756.54	0.015
	114 - 112	4.8.2 (1.04 CR) - 2/7				55.7633	-27.06	1756.54	0.015
	112 - 110	4.8.2 (1.04 CR) - 2/6				55.7633	-27.67	1756.54	0.016
	110 - 108	4.8.2 (1.04 CR) - 2/5				55.7633	-28.29	1756.54	0.016
	108 - 106	4.8.2 (1.04 CR) - 2/4				55.7633	-28.91	1756.54	0.016
		4.8.2 (1.04 CR) - 2/3							

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	106 - 104					55.7633	-29.53	1756.54	0.017
	104 - 102	4.8.2 (1.04 CR) - 2/2				55.7633	-30.16	1756.54	0.017
	102 - 100	4.8.2 (1.04 CR) - 2				55.7633	-30.79	1756.54	0.018
L3	100 - 98	4.8.2 (1.04 CR) - 2 P48x5/8	40.0000	0.0000	0.0	93.0206	-31.70	2930.15	0.011
	98 - 96					93.0206	-32.60	2930.15	0.011
	96 - 94					93.0206	-33.50	2930.15	0.011
	94 - 92					93.0206	-34.40	2930.15	0.012
	92 - 90					93.0206	-35.30	2930.15	0.012
	90 - 88					93.0206	-36.21	2930.15	0.012
	88 - 86					93.0206	-37.11	2930.15	0.013
	86 - 84					93.0206	-38.02	2930.15	0.013
	84 - 82					93.0206	-38.92	2930.15	0.013
	82 - 80					93.0206	-39.83	2930.15	0.014
	80 - 78					93.0206	-40.74	2930.15	0.014
	78 - 76					93.0206	-41.65	2930.15	0.014
	76 - 74					93.0206	-42.57	2930.15	0.015
	74 - 72					93.0206	-43.48	2930.15	0.015
	72 - 70					93.0206	-44.40	2930.15	0.015
	70 - 68					93.0206	-45.31	2930.15	0.015
	68 - 66					93.0206	-46.23	2930.15	0.016
	66 - 64					93.0206	-47.15	2930.15	0.016
	64 - 62					93.0206	-48.07	2930.15	0.016
	62 - 60					93.0206	-48.99	2930.15	0.017
L4	60 - 58	P54x5/8	40.0000	0.0000	0.0	104.8020	-50.01	3301.25	0.015
	58 - 56	4.8.2 (1.04 CR) - 4/19				104.8020	-51.02	3301.25	0.015
	56 - 54	4.8.2 (1.04 CR) - 4/18				104.8020	-52.03	3301.25	0.016
	54 - 52	4.8.2 (1.04 CR) - 4/17				104.8020	-53.04	3301.25	0.016
	52 - 50	4.8.2 (1.04 CR) - 4/16				104.8020	-54.05	3301.25	0.016
	50 - 48	4.8.2 (1.04 CR) - 4/15				104.8020	-55.06	3301.25	0.017
	48 - 46	4.8.2 (1.04 CR) - 4/14				104.8020	-56.08	3301.25	0.017

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	46 - 44	4.8.2 (1.04 CR) - 4/13				104.8020	-57.09	3301.25	0.017
	44 - 42	4.8.2 (1.04 CR) - 4/12				104.8020	-58.11	3301.25	0.018
	42 - 40	4.8.2 (1.04 CR) - 4/11				104.8020	-59.13	3301.25	0.018
	40 - 38	4.8.2 (1.04 CR) - 4/10				104.8020	-60.15	3301.25	0.018
	38 - 36	4.8.2 (1.04 CR) - 4/9				104.8020	-61.17	3301.25	0.019
	36 - 34	4.8.2 (1.04 CR) - 4/8				104.8020	-62.19	3301.25	0.019
	34 - 32	4.8.2 (1.04 CR) - 4/7				104.8020	-63.22	3301.25	0.019
	32 - 30	4.8.2 (1.04 CR) - 4/6				104.8020	-64.24	3301.25	0.019
	30 - 28	4.8.2 (1.04 CR) - 4/5				104.8020	-65.27	3301.25	0.020
	28 - 26	4.8.2 (1.04 CR) - 4/4				104.8020	-66.29	3301.25	0.020
	26 - 24	4.8.2 (1.04 CR) - 4/3				104.8020	-67.32	3301.25	0.020
	24 - 22	4.8.2 (1.04 CR) - 4/2				104.8020	-68.35	3301.25	0.021
	22 - 20	4.8.2 (1.04 CR) - 4				104.8020	-69.38	3301.25	0.021
L5	20 - 19	4.8.2 (1.04 CR) - 4 P60x5/8	20.0000	0.0000	0.0	116.5830	-69.95	3649.51	0.019
	19 - 18	4.8.2 (1.01 CR) - 5/19				116.5830	-70.51	3649.51	0.019
	18 - 17	4.8.2 (1.01 CR) - 5/18				116.5830	-71.07	3649.51	0.019
	17 - 16	4.8.2 (1.01 CR) - 5/17				116.5830	-71.63	3649.51	0.020
	16 - 15	4.8.2 (1.01 CR) - 5/16				116.5830	-72.18	3649.51	0.020
	15 - 14	4.8.2 (1.01 CR) - 5/15				116.5830	-72.74	3649.51	0.020
	14 - 13	4.8.2 (1.01 CR) - 5/14				116.5830	-73.30	3649.51	0.020
	13 - 12	4.8.2 (1.01 CR) - 5/13				116.5830	-73.86	3649.51	0.020
	12 - 11	4.8.2 (1.01 CR) - 5/12				116.5830	-74.41	3649.51	0.020
	11 - 10	4.8.2 (1.01 CR) - 5/11				116.5830	-74.97	3649.51	0.021

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	10 - 9	4.8.2 (1.01 CR) - 5/10				116.5830	-75.53	3649.51	0.021
	9 - 8	4.8.2 (1.01 CR) - 5/9				116.5830	-76.09	3649.51	0.021
	8 - 7	4.8.2 (1.01 CR) - 5/8				116.5830	-76.65	3649.51	0.021
	7 - 6	4.8.2 (1.01 CR) - 5/7				116.5830	-77.21	3649.51	0.021
	6 - 5	4.8.2 (1.01 CR) - 5/6				116.5830	-77.77	3649.51	0.021
	5 - 4	4.8.2 (1.01 CR) - 5/5				116.5830	-78.33	3649.51	0.021
	4 - 3	4.8.2 (1.01 CR) - 5/4				116.5830	-78.89	3649.51	0.022
	3 - 2	4.8.2 (1.01 CR) - 5/3				116.5830	-79.45	3649.51	0.022
	2 - 1	4.8.2 (1.01 CR) - 5/2				116.5830	-80.01	3649.51	0.022
	1 - 0	4.8.2 (1.01 CR) - 5				116.5830	-80.57	3649.51	0.022

Pole Bending Design Data

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 $\frac{M_{uy}}{\phi M_{ny}}$
L1	178 - 176.1	P24x1/2	13.62	724.94	0.019	0.00	724.94	0.000
	176.1 - 174.2		21.86	724.94	0.030	0.00	724.94	0.000
	174.2 - 172.3		30.41	724.94	0.042	0.00	724.94	0.000
	172.3 - 170.4		39.28	724.94	0.054	0.00	724.94	0.000
	170.4 - 168.5		48.47	724.94	0.067	0.00	724.94	0.000
	168.5 - 166.6		68.29	724.94	0.094	0.00	724.94	0.000
	166.6 - 164.7		84.84	724.94	0.117	0.00	724.94	0.000
	164.7 - 162.8		101.76	724.94	0.140	0.00	724.94	0.000
	162.8 - 160.9		118.98	724.94	0.164	0.00	724.94	0.000
	160.9 - 159		141.97	724.94	0.196	0.00	724.94	0.000
	159 - 157.1		170.89	724.94	0.236	0.00	724.94	0.000
	157.1 - 155.2		200.11	724.94	0.276	0.00	724.94	0.000
	155.2 - 153.3		229.63	724.94	0.317	0.00	724.94	0.000
	153.3 - 151.4		259.44	724.94	0.358	0.00	724.94	0.000
	151.4 - 149.5		289.54	724.94	0.399	0.00	724.94	0.000
	149.5 - 147.6		333.39	724.94	0.460	0.00	724.94	0.000
	147.6 - 145.7		375.26	724.94	0.518	0.00	724.94	0.000
	145.7 - 143.8		417.40	724.94	0.576	0.00	724.94	0.000
	143.8 - 141.9		459.79	724.94	0.634	0.00	724.94	0.000
	141.9 - 140		502.43	724.94	0.693	0.00	724.94	0.000
L2	140 - 138	P36x1/2	547.69	1586.55	0.345	0.00	1586.55	0.000
	138 - 136		593.41	1586.55	0.374	0.00	1586.55	0.000
	136 - 134		639.61	1586.55	0.403	0.00	1586.55	0.000
	134 - 132		696.06	1586.55	0.439	0.00	1586.55	0.000
	132 - 130		750.53	1586.55	0.473	0.00	1586.55	0.000
	130 - 128		805.45	1586.55	0.508	0.00	1586.55	0.000
	128 - 126		860.81	1586.55	0.543	0.00	1586.55	0.000
	126 - 124		916.61	1586.55	0.578	0.00	1586.55	0.000

Section No.	Elevation	Size	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft		kip-ft	kip-ft		kip-ft	kip-ft	
	124 - 122		972.84	1586.55	0.613	0.00	1586.55	0.000
	122 - 120		1029.50	1586.55	0.649	0.00	1586.55	0.000
	120 - 118		1086.58	1586.55	0.685	0.00	1586.55	0.000
	118 - 116		1144.07	1586.55	0.721	0.00	1586.55	0.000
	116 - 114		1201.96	1586.55	0.758	0.00	1586.55	0.000
	114 - 112		1260.24	1586.55	0.794	0.00	1586.55	0.000
	112 - 110		1318.92	1586.55	0.831	0.00	1586.55	0.000
	110 - 108		1377.97	1586.55	0.869	0.00	1586.55	0.000
	108 - 106		1437.40	1586.55	0.906	0.00	1586.55	0.000
	106 - 104		1497.19	1586.55	0.944	0.00	1586.55	0.000
	104 - 102		1557.33	1586.55	0.982	0.00	1586.55	0.000
	102 - 100		1617.83	1586.55	1.020	0.00	1586.55	0.000
L3	100 - 98	P48x5/8	1678.76	3492.39	0.481	0.00	3492.39	0.000
	98 - 96		1740.25	3492.39	0.498	0.00	3492.39	0.000
	96 - 94		1802.29	3492.39	0.516	0.00	3492.39	0.000
	94 - 92		1864.87	3492.39	0.534	0.00	3492.39	0.000
	92 - 90		1927.98	3492.39	0.552	0.00	3492.39	0.000
	90 - 88		1991.63	3492.39	0.570	0.00	3492.39	0.000
	88 - 86		2055.80	3492.39	0.589	0.00	3492.39	0.000
	86 - 84		2120.48	3492.39	0.607	0.00	3492.39	0.000
	84 - 82		2185.68	3492.39	0.626	0.00	3492.39	0.000
	82 - 80		2251.37	3492.39	0.645	0.00	3492.39	0.000
	80 - 78		2317.57	3492.39	0.664	0.00	3492.39	0.000
	78 - 76		2384.24	3492.39	0.683	0.00	3492.39	0.000
	76 - 74		2451.41	3492.39	0.702	0.00	3492.39	0.000
	74 - 72		2519.04	3492.39	0.721	0.00	3492.39	0.000
	72 - 70		2587.15	3492.39	0.741	0.00	3492.39	0.000
	70 - 68		2655.71	3492.39	0.760	0.00	3492.39	0.000
	68 - 66		2724.72	3492.39	0.780	0.00	3492.39	0.000
	66 - 64		2794.18	3492.39	0.800	0.00	3492.39	0.000
	64 - 62		2864.07	3492.39	0.820	0.00	3492.39	0.000
	62 - 60		2934.38	3492.39	0.840	0.00	3492.39	0.000
L4	60 - 58	P54x5/8	3005.16	4349.32	0.691	0.00	4349.32	0.000
	58 - 56		3076.43	4349.32	0.707	0.00	4349.32	0.000
	56 - 54		3148.18	4349.32	0.724	0.00	4349.32	0.000
	54 - 52		3220.39	4349.32	0.740	0.00	4349.32	0.000
	52 - 50		3293.07	4349.32	0.757	0.00	4349.32	0.000
	50 - 48		3366.21	4349.32	0.774	0.00	4349.32	0.000
	48 - 46		3439.78	4349.32	0.791	0.00	4349.32	0.000
	46 - 44		3513.79	4349.32	0.808	0.00	4349.32	0.000
	44 - 42		3588.23	4349.32	0.825	0.00	4349.32	0.000
	42 - 40		3663.08	4349.32	0.842	0.00	4349.32	0.000
	40 - 38		3738.33	4349.32	0.860	0.00	4349.32	0.000
	38 - 36		3813.98	4349.32	0.877	0.00	4349.32	0.000
	36 - 34		3890.02	4349.32	0.894	0.00	4349.32	0.000
	34 - 32		3966.42	4349.32	0.912	0.00	4349.32	0.000
	32 - 30		4043.18	4349.32	0.930	0.00	4349.32	0.000
	30 - 28		4120.31	4349.32	0.947	0.00	4349.32	0.000
	28 - 26		4197.77	4349.32	0.965	0.00	4349.32	0.000
	26 - 24		4275.56	4349.32	0.983	0.00	4349.32	0.000
	24 - 22		4353.67	4349.32	1.001	0.00	4349.32	0.000
	22 - 20		4432.08	4349.32	1.019	0.00	4349.32	0.000
L5	20 - 19	P60x5/8	4471.40	5299.02	0.844	0.00	5299.02	0.000
	19 - 18		4510.81	5299.02	0.851	0.00	5299.02	0.000
	18 - 17		4550.30	5299.02	0.859	0.00	5299.02	0.000
	17 - 16		4589.88	5299.02	0.866	0.00	5299.02	0.000
	16 - 15		4629.53	5299.02	0.874	0.00	5299.02	0.000
	15 - 14		4669.27	5299.02	0.881	0.00	5299.02	0.000
	14 - 13		4709.08	5299.02	0.889	0.00	5299.02	0.000
	13 - 12		4748.98	5299.02	0.896	0.00	5299.02	0.000
	12 - 11		4788.95	5299.02	0.904	0.00	5299.02	0.000
	11 - 10		4829.00	5299.02	0.911	0.00	5299.02	0.000
	10 - 9		4869.13	5299.02	0.919	0.00	5299.02	0.000
	9 - 8		4909.33	5299.02	0.926	0.00	5299.02	0.000
	8 - 7		4949.61	5299.02	0.934	0.00	5299.02	0.000
	7 - 6		4989.96	5299.02	0.942	0.00	5299.02	0.000
	6 - 5		5030.38	5299.02	0.949	0.00	5299.02	0.000
	5 - 4		5070.88	5299.02	0.957	0.00	5299.02	0.000
	4 - 3		5111.46	5299.02	0.965	0.00	5299.02	0.000

Section No.	Elevation	Size	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft		kip-ft	kip-ft		kip-ft	kip-ft	
	3 - 2		5152.10	5299.02	0.972	0.00	5299.02	0.000
	2 - 1		5192.81	5299.02	0.980	0.00	5299.02	0.000
	1 - 0		5233.59	5299.02	0.988	0.00	5299.02	0.000

Pole Shear Design Data

Section No.	Elevation	Size	Actual V_u	ϕV_n	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u	ϕT_n	Ratio $\frac{T_u}{\phi T_n}$
	ft		K	K		kip-ft	kip-ft	
L1	178 - 176.1	P24x1/2	4.25	581.39	0.007	1.46	1115.34	0.001
	176.1 - 174.2		4.41	581.39	0.008	1.46	1115.34	0.001
	174.2 - 172.3		4.58	581.39	0.008	1.46	1115.34	0.001
	172.3 - 170.4		4.75	581.39	0.008	1.46	1115.34	0.001
	170.4 - 168.5		4.91	581.39	0.008	1.46	1115.34	0.001
	168.5 - 166.6		8.61	581.39	0.015	1.46	1115.34	0.001
	166.6 - 164.7		8.82	581.39	0.015	1.73	1115.34	0.002
	164.7 - 162.8		8.99	581.39	0.015	1.73	1115.34	0.002
	162.8 - 160.9		9.15	581.39	0.016	1.73	1115.34	0.002
	160.9 - 159		15.15	581.39	0.026	3.00	1115.34	0.003
	159 - 157.1		15.30	581.39	0.026	3.00	1115.34	0.003
	157.1 - 155.2		15.46	581.39	0.027	3.00	1115.34	0.003
	155.2 - 153.3		15.62	581.39	0.027	3.00	1115.34	0.003
	153.3 - 151.4		15.77	581.39	0.027	3.00	1115.34	0.003
	151.4 - 149.5		15.92	581.39	0.027	3.00	1115.34	0.003
	149.5 - 147.6		21.98	581.39	0.038	3.00	1115.34	0.003
	147.6 - 145.7		22.12	581.39	0.038	2.97	1115.34	0.003
	145.7 - 143.8		22.26	581.39	0.038	2.97	1115.34	0.003
	143.8 - 141.9		22.39	581.39	0.039	2.97	1115.34	0.003
	141.9 - 140		22.52	581.39	0.039	2.97	1115.34	0.003
L2	140 - 138	P36x1/2	22.75	878.27	0.026	2.97	2562.64	0.001
	138 - 136		22.99	878.27	0.026	2.97	2562.64	0.001
	136 - 134		23.22	878.27	0.026	2.97	2562.64	0.001
	134 - 132		27.13	878.27	0.031	2.96	2562.64	0.001
	132 - 130		27.36	878.27	0.031	2.96	2562.64	0.001
	130 - 128		27.58	878.27	0.031	2.96	2562.64	0.001
	128 - 126		27.80	878.27	0.032	2.96	2562.64	0.001
	126 - 124		28.02	878.27	0.032	2.96	2562.64	0.001
	124 - 122		28.24	878.27	0.032	2.96	2562.64	0.001
	122 - 120		28.45	878.27	0.032	2.96	2562.64	0.001
	120 - 118		28.66	878.27	0.033	2.96	2562.64	0.001
	118 - 116		28.86	878.27	0.033	2.96	2562.64	0.001
	116 - 114		29.06	878.27	0.033	2.96	2562.64	0.001
	114 - 112		29.26	878.27	0.033	2.96	2562.64	0.001
	112 - 110		29.45	878.27	0.034	2.96	2562.64	0.001
	110 - 108		29.64	878.27	0.034	2.96	2562.64	0.001
	108 - 106		29.83	878.27	0.034	2.96	2562.64	0.001
	106 - 104		30.01	878.27	0.034	2.96	2562.64	0.001
	104 - 102		30.18	878.27	0.034	2.96	2562.64	0.001
	102 - 100		30.36	878.27	0.035	2.96	2562.64	0.001
L3	100 - 98	P48x5/8	30.62	1465.07	0.021	2.96	5709.67	0.001
	98 - 96		30.89	1465.07	0.021	2.96	5709.67	0.001
	96 - 94		31.17	1465.07	0.021	2.96	5709.67	0.001
	94 - 92		31.44	1465.07	0.021	2.96	5709.67	0.001
	92 - 90		31.70	1465.07	0.022	2.96	5709.67	0.001
	90 - 88		31.97	1465.07	0.022	2.96	5709.67	0.001
	88 - 86		32.23	1465.07	0.022	2.96	5709.67	0.001
	86 - 84		32.48	1465.07	0.022	2.96	5709.67	0.001
	84 - 82		32.74	1465.07	0.022	2.96	5709.67	0.001
	82 - 80		32.99	1465.07	0.023	2.96	5709.67	0.001
	80 - 78		33.24	1465.07	0.023	2.96	5709.67	0.001
	78 - 76		33.48	1465.07	0.023	2.96	5709.67	0.001
	76 - 74		33.72	1465.07	0.023	2.96	5709.67	0.001
	74 - 72		33.95	1465.07	0.023	2.96	5709.67	0.001
	72 - 70		34.19	1465.07	0.023	2.96	5709.67	0.001
	70 - 68		34.41	1465.07	0.023	2.96	5709.67	0.001

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 $\frac{T_u}{\phi T_n}$
	68 - 66		34.64	1465.07	0.024	2.96	5709.67	0.001
	66 - 64		34.86	1465.07	0.024	2.96	5709.67	0.001
	64 - 62		35.08	1465.07	0.024	2.96	5709.67	0.001
	62 - 60		35.29	1465.07	0.024	2.96	5709.67	0.001
L4	60 - 58	P54x5/8	35.53	1650.62	0.022	2.96	7257.86	0.000
	58 - 56		35.77	1650.62	0.022	2.96	7257.86	0.000
	56 - 54		36.01	1650.62	0.022	2.96	7257.86	0.000
	54 - 52		36.25	1650.62	0.022	2.96	7257.86	0.000
	52 - 50		36.48	1650.62	0.022	2.96	7257.86	0.000
	50 - 48		36.70	1650.62	0.022	2.96	7257.86	0.000
	48 - 46		36.92	1650.62	0.022	2.95	7257.86	0.000
	46 - 44		37.14	1650.62	0.022	2.95	7257.86	0.000
	44 - 42		37.35	1650.62	0.023	2.95	7257.86	0.000
	42 - 40		37.55	1650.62	0.023	2.95	7257.86	0.000
	40 - 38		37.75	1650.62	0.023	2.95	7257.86	0.000
	38 - 36		37.95	1650.62	0.023	2.95	7257.86	0.000
	36 - 34		38.14	1650.62	0.023	2.95	7257.86	0.000
	34 - 32		38.32	1650.62	0.023	2.95	7257.86	0.000
	32 - 30		38.50	1650.62	0.023	2.95	7257.86	0.000
	30 - 28		38.68	1650.62	0.023	2.95	7257.86	0.000
	28 - 26		38.85	1650.62	0.024	2.95	7257.86	0.000
	26 - 24		39.01	1650.62	0.024	2.95	7257.86	0.000
	24 - 22		39.17	1650.62	0.024	2.95	7257.86	0.000
	22 - 20		39.32	1650.62	0.024	2.95	7257.86	0.000
L5	20 - 19	P60x5/8	39.38	1824.75	0.022	2.95	8935.67	0.000
	19 - 18		39.46	1824.75	0.022	2.95	8935.67	0.000
	18 - 17		39.55	1824.75	0.022	2.95	8935.67	0.000
	17 - 16		39.63	1824.75	0.022	2.95	8935.67	0.000
	16 - 15		39.71	1824.75	0.022	2.95	8935.67	0.000
	15 - 14		39.79	1824.75	0.022	2.95	8935.67	0.000
	14 - 13		39.87	1824.75	0.022	2.95	8935.67	0.000
	13 - 12		39.95	1824.75	0.022	2.95	8935.67	0.000
	12 - 11		40.03	1824.75	0.022	2.95	8935.67	0.000
	11 - 10		40.10	1824.75	0.022	2.95	8935.67	0.000
	10 - 9		40.18	1824.75	0.022	2.95	8935.67	0.000
	9 - 8		40.26	1824.75	0.022	2.95	8935.67	0.000
	8 - 7		40.33	1824.75	0.022	2.95	8935.67	0.000
	7 - 6		40.41	1824.75	0.022	2.95	8935.67	0.000
	6 - 5		40.48	1824.75	0.022	2.95	8935.67	0.000
	5 - 4		40.55	1824.75	0.022	2.95	8935.67	0.000
	4 - 3		40.62	1824.75	0.022	2.95	8935.67	0.000
	3 - 2		40.69	1824.75	0.022	2.95	8935.67	0.000
	2 - 1		40.76	1824.75	0.022	2.95	8935.67	0.000
	1 - 0		40.83	1824.75	0.022	2.95	8935.67	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 - 176.1	0.003	0.019	0.000	0.007	0.001	0.022 ✔	1.000	4.8.2 ✔
	176.1 - 174.2	0.003	0.030	0.000	0.008	0.001	0.034 ✔	1.000	4.8.2 ✔
	174.2 - 172.3	0.004	0.042	0.000	0.008	0.001	0.046 ✔	1.000	4.8.2 ✔
	172.3 - 170.4	0.004	0.054	0.000	0.008	0.001	0.058 ✔	1.000	4.8.2 ✔
	170.4 - 168.5	0.004	0.067	0.000	0.008	0.001	0.071 ✔	1.000	4.8.2 ✔
	168.5 - 166.6	0.006	0.094	0.000	0.015	0.001	0.100 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $P_u/\phi P_n$	Ratio $M_{ux}/\phi M_{nx}$	Ratio $M_{uy}/\phi M_{ny}$	Ratio $V_u/\phi V_n$	Ratio $T_u/\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	166.6 - 164.7	0.006	0.117	0.000	0.015	0.002	0.123	1.000	4.8.2
	164.7 - 162.8	0.006	0.140	0.000	0.015	0.002	0.147	1.000	4.8.2
	162.8 - 160.9	0.007	0.164	0.000	0.016	0.002	0.171	1.000	4.8.2
	160.9 - 159	0.008	0.196	0.000	0.026	0.003	0.205	1.000	4.8.2
	159 - 157.1	0.009	0.236	0.000	0.026	0.003	0.245	1.000	4.8.2
	157.1 - 155.2	0.009	0.276	0.000	0.027	0.003	0.286	1.000	4.8.2
	155.2 - 153.3	0.009	0.317	0.000	0.027	0.003	0.327	1.000	4.8.2
	153.3 - 151.4	0.010	0.358	0.000	0.027	0.003	0.368	1.000	4.8.2
	151.4 - 149.5	0.010	0.399	0.000	0.027	0.003	0.410	1.000	4.8.2
	149.5 - 147.6	0.013	0.460	0.000	0.038	0.003	0.475	1.000	4.8.2
	147.6 - 145.7	0.013	0.518	0.000	0.038	0.003	0.533	1.000	4.8.2
	145.7 - 143.8	0.014	0.576	0.000	0.038	0.003	0.591	1.000	4.8.2
	143.8 - 141.9	0.014	0.634	0.000	0.039	0.003	0.650	1.000	4.8.2
	141.9 - 140	0.014	0.693	0.000	0.039	0.003	0.709	1.000	4.8.2
L2	140 - 138	0.010	0.345	0.000	0.026	0.001	0.356	1.000	4.8.2
	138 - 136	0.010	0.374	0.000	0.026	0.001	0.385	1.000	4.8.2
	136 - 134	0.010	0.403	0.000	0.026	0.001	0.414	1.000	4.8.2
	134 - 132	0.012	0.439	0.000	0.031	0.001	0.452	1.000	4.8.2
	132 - 130	0.012	0.473	0.000	0.031	0.001	0.486	1.000	4.8.2
	130 - 128	0.013	0.508	0.000	0.031	0.001	0.521	1.000	4.8.2
	128 - 126	0.013	0.543	0.000	0.032	0.001	0.557	1.000	4.8.2
	126 - 124	0.013	0.578	0.000	0.032	0.001	0.592	1.000	4.8.2
	124 - 122	0.014	0.613	0.000	0.032	0.001	0.628	1.000	4.8.2
	122 - 120	0.014	0.649	0.000	0.032	0.001	0.664	1.000	4.8.2
	120 - 118	0.014	0.685	0.000	0.033	0.001	0.700	1.000	4.8.2
	118 - 116	0.015	0.721	0.000	0.033	0.001	0.737	1.000	4.8.2
	116 - 114	0.015	0.758	0.000	0.033	0.001	0.774	1.000	4.8.2
	114 - 112	0.015	0.794	0.000	0.033	0.001	0.811	1.000	4.8.2
	112 - 110	0.016	0.831	0.000	0.034	0.001	0.848	1.000	4.8.2

Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	110 - 108	0.016	0.869	0.000	0.034	0.001	0.886 ✔	1.000	4.8.2 ✔
	108 - 106	0.016	0.906	0.000	0.034	0.001	0.924 ✔	1.000	4.8.2 ✔
	106 - 104	0.017	0.944	0.000	0.034	0.001	0.962 ✔	1.000	4.8.2 ✔
	104 - 102	0.017	0.982	0.000	0.034	0.001	1.000 ✔	1.000	4.8.2 ✔
	102 - 100	0.018	1.020	0.000	0.035	0.001	1.039 ✔	1.000	4.8.2 ✔
L3	100 - 98	0.011	0.481	0.000	0.021	0.001	0.492 ✔	1.000	4.8.2 ✔
	98 - 96	0.011	0.498	0.000	0.021	0.001	0.510 ✔	1.000	4.8.2 ✔
	96 - 94	0.011	0.516	0.000	0.021	0.001	0.528 ✔	1.000	4.8.2 ✔
	94 - 92	0.012	0.534	0.000	0.021	0.001	0.546 ✔	1.000	4.8.2 ✔
	92 - 90	0.012	0.552	0.000	0.022	0.001	0.565 ✔	1.000	4.8.2 ✔
	90 - 88	0.012	0.570	0.000	0.022	0.001	0.583 ✔	1.000	4.8.2 ✔
	88 - 86	0.013	0.589	0.000	0.022	0.001	0.602 ✔	1.000	4.8.2 ✔
	86 - 84	0.013	0.607	0.000	0.022	0.001	0.621 ✔	1.000	4.8.2 ✔
	84 - 82	0.013	0.626	0.000	0.022	0.001	0.640 ✔	1.000	4.8.2 ✔
	82 - 80	0.014	0.645	0.000	0.023	0.001	0.659 ✔	1.000	4.8.2 ✔
	80 - 78	0.014	0.664	0.000	0.023	0.001	0.678 ✔	1.000	4.8.2 ✔
	78 - 76	0.014	0.683	0.000	0.023	0.001	0.697 ✔	1.000	4.8.2 ✔
	76 - 74	0.015	0.702	0.000	0.023	0.001	0.717 ✔	1.000	4.8.2 ✔
	74 - 72	0.015	0.721	0.000	0.023	0.001	0.737 ✔	1.000	4.8.2 ✔
	72 - 70	0.015	0.741	0.000	0.023	0.001	0.757 ✔	1.000	4.8.2 ✔
	70 - 68	0.015	0.760	0.000	0.023	0.001	0.776 ✔	1.000	4.8.2 ✔
	68 - 66	0.016	0.780	0.000	0.024	0.001	0.797 ✔	1.000	4.8.2 ✔
	66 - 64	0.016	0.800	0.000	0.024	0.001	0.817 ✔	1.000	4.8.2 ✔
	64 - 62	0.016	0.820	0.000	0.024	0.001	0.837 ✔	1.000	4.8.2 ✔
	62 - 60	0.017	0.840	0.000	0.024	0.001	0.858 ✔	1.000	4.8.2 ✔
L4	60 - 58	0.015	0.691	0.000	0.022	0.000	0.707 ✔	1.000	4.8.2 ✔
	58 - 56	0.015	0.707	0.000	0.022	0.000	0.723 ✔	1.000	4.8.2 ✔
	56 - 54	0.016	0.724	0.000	0.022	0.000	0.740 ✔	1.000	4.8.2 ✔
	54 - 52	0.016	0.740	0.000	0.022	0.000	0.757 ✔	1.000	4.8.2 ✔
	52 - 50	0.016	0.757	0.000	0.022	0.000	0.774 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	50 - 48	0.017	0.774	0.000	0.022	0.000	0.791 ✔	1.000	4.8.2 ✔
	48 - 46	0.017	0.791	0.000	0.022	0.000	0.808 ✔	1.000	4.8.2 ✔
	46 - 44	0.017	0.808	0.000	0.022	0.000	0.826 ✔	1.000	4.8.2 ✔
	44 - 42	0.018	0.825	0.000	0.023	0.000	0.843 ✔	1.000	4.8.2 ✔
	42 - 40	0.018	0.842	0.000	0.023	0.000	0.861 ✔	1.000	4.8.2 ✔
	40 - 38	0.018	0.860	0.000	0.023	0.000	0.878 ✔	1.000	4.8.2 ✔
	38 - 36	0.019	0.877	0.000	0.023	0.000	0.896 ✔	1.000	4.8.2 ✔
	36 - 34	0.019	0.894	0.000	0.023	0.000	0.914 ✔	1.000	4.8.2 ✔
	34 - 32	0.019	0.912	0.000	0.023	0.000	0.932 ✔	1.000	4.8.2 ✔
	32 - 30	0.019	0.930	0.000	0.023	0.000	0.950 ✔	1.000	4.8.2 ✔
	30 - 28	0.020	0.947	0.000	0.023	0.000	0.968 ✔	1.000	4.8.2 ✔
	28 - 26	0.020	0.965	0.000	0.024	0.000	0.986 ✔	1.000	4.8.2 ✔
	26 - 24	0.020	0.983	0.000	0.024	0.000	1.004 ✔	1.000	4.8.2 ✔
	24 - 22	0.021	1.001	0.000	0.024	0.000	1.022 ✔	1.000	4.8.2 ✔
	22 - 20	0.021	1.019	0.000	0.024	0.000	1.041 ✔	1.000	4.8.2 ✔
L5	20 - 19	0.019	0.844	0.000	0.022	0.000	0.863 ✔	1.000	4.8.2 ✔
	19 - 18	0.019	0.851	0.000	0.022	0.000	0.871 ✔	1.000	4.8.2 ✔
	18 - 17	0.019	0.859	0.000	0.022	0.000	0.879 ✔	1.000	4.8.2 ✔
	17 - 16	0.020	0.866	0.000	0.022	0.000	0.886 ✔	1.000	4.8.2 ✔
	16 - 15	0.020	0.874	0.000	0.022	0.000	0.894 ✔	1.000	4.8.2 ✔
	15 - 14	0.020	0.881	0.000	0.022	0.000	0.902 ✔	1.000	4.8.2 ✔
	14 - 13	0.020	0.889	0.000	0.022	0.000	0.909 ✔	1.000	4.8.2 ✔
	13 - 12	0.020	0.896	0.000	0.022	0.000	0.917 ✔	1.000	4.8.2 ✔
	12 - 11	0.020	0.904	0.000	0.022	0.000	0.925 ✔	1.000	4.8.2 ✔
	11 - 10	0.021	0.911	0.000	0.022	0.000	0.932 ✔	1.000	4.8.2 ✔
	10 - 9	0.021	0.919	0.000	0.022	0.000	0.940 ✔	1.000	4.8.2 ✔
	9 - 8	0.021	0.926	0.000	0.022	0.000	0.948 ✔	1.000	4.8.2 ✔
	8 - 7	0.021	0.934	0.000	0.022	0.000	0.956 ✔	1.000	4.8.2 ✔
	7 - 6	0.021	0.942	0.000	0.022	0.000	0.963 ✔	1.000	4.8.2 ✔
	6 - 5	0.021	0.949	0.000	0.022	0.000	0.971 ✔	1.000	4.8.2 ✔

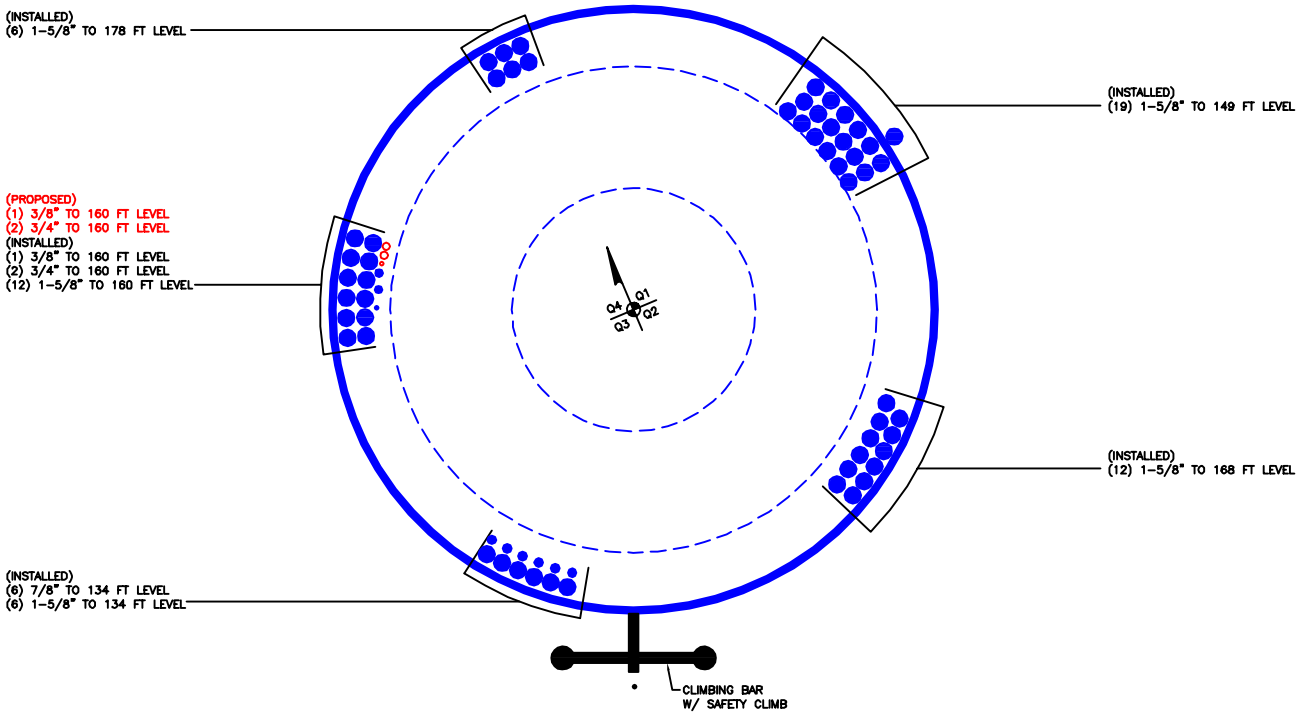
Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	5 - 4	0.021	0.957	0.000	0.022	0.000	0.979 ✔	1.000	4.8.2 ✔
	4 - 3	0.022	0.965	0.000	0.022	0.000	0.987 ✔	1.000	4.8.2 ✔
	3 - 2	0.022	0.972	0.000	0.022	0.000	0.995 ✔	1.000	4.8.2 ✔
	2 - 1	0.022	0.980	0.000	0.022	0.000	1.002 ✔	1.000	4.8.2 ✔
	1 - 0	0.022	0.988	0.000	0.022	0.000	1.010 ✔	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	-16.59	1162.78	70.9	Pass
L2	140 - 100	Pole	P36x1/2	2	-30.79	1756.54	103.9	Pass[2]
L3	100 - 60	Pole	P48x5/8	3	-48.99	2930.15	85.8	Pass
L4	60 - 20	Pole	P54x5/8	4	-69.38	3301.25	104.1	Pass[2]
L5	20 - 0	Pole	P60x5/8	5	-80.57	3649.51	101.0	Pass[2]
							Summary	
						Pole (L4)	104.1	Pass[2]
						RATING =	**104.1**	**Pass[2]**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 878783 TOWER ID: C_BASELEVEL

BASE LEVEL DRAWING

SCALE: 1" = 1'-0"

1

CROWN REGION ADDRESS

USA

11/11/2015	UPDATED PER WORK ORDER 1151344	BMH
16/03/16	UPDATED PER WORK ORDER 1151303	AMH
16/03/16	UPDATED PER WORK ORDER 1258711	AMH
30/03/16	UPDATED PER WORK ORDER 1258821	BMH
11/05/16	UPDATED PER WORK ORDER 1219084	CC
17/05/16	UPDATED PER WORK ORDER 1233111	SS
11/07/16	UPDATED PER WORK ORDER 1258285	SJT
03/12/16	UPDATED PER WORK ORDER 1257813	MK
19/12/16	UPDATED PER WORK ORDER 1322145	JHW
	UPDATED PER WORK ORDER 1339607	

DRAWN BY: DJA
CHECKED BY: BBF
DRAWING DATE: 13/08/07

SITE NUMBER:
SITE NAME:

SITE NAME

PORTLAND NORTH

BUSINESS UNIT NUMBER

878783

SITE ADDRESS

527 PERSUMPSCOT
PORTLAND, ME 04101
CUMBERLAND COUNTY
USA

SHEET TITLE

BASE LEVEL

SHEET NUMBER

A1-0

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 #: *364306 Rev 0*

Reactions		
Mu	502.43	ft-kips
Axial, Pu:	16.59	kips
Shear, Vu:	22.52	kips
Elevation:	140	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
27.34

Pole Manufacturer:	Other

If No stiffeners, Criteria:	TIA G	<-Only Applcable to Unstiffened Cases

Bolt Data				
Qty:	24			
Diameter (in.):	0.75	Bolt Fu:	150	
Bolt Material:	Other	Bolt Fy:	130	
Strength (Fu):	150	ksi		
Yield (Fy):	130	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:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		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

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	37.58	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	37.55	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	33.37	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	1.474	in	
Min PL "treq" for actual **T w/ Pry**:	1.275	in	
Min PL "t1" for actual **T w/o Pry**:	1.390	in	
T allowable w/o Prying:	37.58	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	33.37	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	88.9%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	16.4	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	50.7%	**Pass**	Comp. Y.L. Length:
No Prying			17.15
Tension Side Stress Ratio, (treq/t)^2:	46.2%	**Pass**	

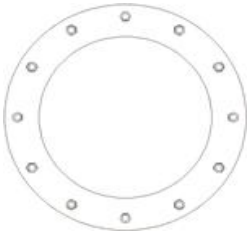
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878783*
Site Name: *PORTLAND NORTH*
App #: *364306 Rev 0*

Manufacturer:	Other

Reactions		
Moment:	502.43	ft-kips
Axial:	16.59	kips
Shear:	22.52	kips
Exterior Flange Run, T+q:	33.37	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
27.34

Elevation: 140 feet

Bolt Data				
Qty:	24			
Diam:	0.75	Bolt Fu:	150	
Bolt Material:	Other	Bolt Fy:	130	
Strength (Fu):	150	ksi		
Yield (Fy):	130	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:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		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

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	33.4	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty)	37.6	Kips
Bolt Stress Ratio:	88.9%	**Pass**

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	34.8	Kips, Ext. Cu=Interior Cu
Plate Stress:	23.7	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	73.3%	**Pass**

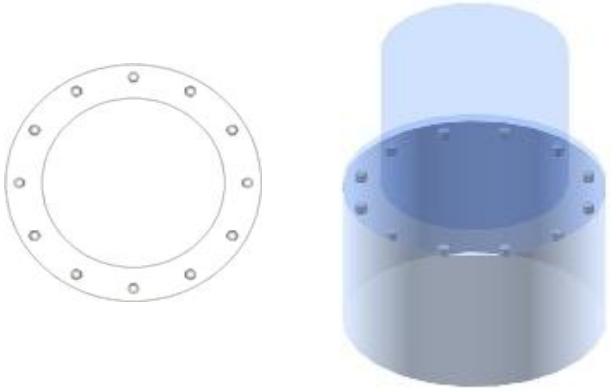
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878783*
Site Name: *PORTLAND NORTH*
App #: *364306 Rev 0*

Reactions		
Mu	1617.82	ft-kips
Axial, Pu:	30.79	kips
Shear, Vu:	30.36	kips
Elevation:	100	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
27.34

Pole Manufacturer:	Other

If No stiffeners, Criteria:	TIA G	<-Only Applcable to Unstiffened Cases

Bolt Data				
Qty:	52			
Diameter (in.):	0.75	Bolt Fu:	150	
Bolt Material:	Other	Bolt Fy:	130	
Strength (Fu):	150	ksi		
Yield (Fy):	130	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:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		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

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	37.58	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	37.57	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	35.50	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	1.749	in	
Min PL "treq" for actual **T w/ Pry**:	1.636	in	
Min PL "t1" for actual **T w/o Pry**:	1.700	in	
T allowable w/o Prying:	37.58	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	35.50	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	94.5%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	15.9	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	49.1%	**Pass**	Comp. Y.L. Length:
No Prying			20.39
Tension Side Stress Ratio, (treq/t)^2:	42.8%	**Pass**	

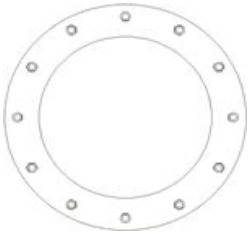
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878783*
Site Name: *PORTLAND NORTH*
App #: *364306 Rev 0*

Manufacturer:	Other

Reactions		
Moment:	1617.82	ft-kips
Axial:	30.79	kips
Shear:	30.36	kips
Exterior Flange Run, T+q:	35.50	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
27.34

Elevation: 100 feet

Bolt Data				
Qty:	52			
Diam:	0.75		Bolt Fu:	150
Bolt Material:	Other		Bolt Fy:	130
Strength (Fu):	150	ksi		
Yield (Fy):	130	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:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		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

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	35.5	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty)	37.6	Kips
Bolt Stress Ratio:	94.5%	**Pass**

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	36.7	Kips, Ext. Cu=Interior Cu
Plate Stress:	22.3	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	69.0%	**Pass**

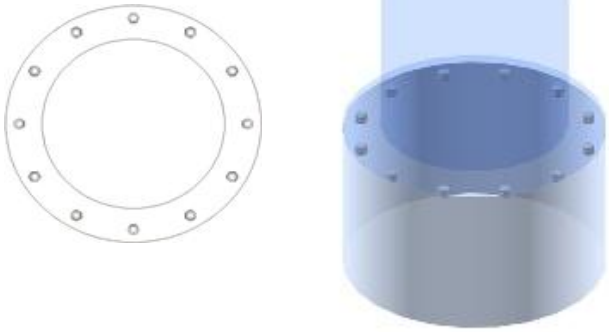
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878783*
Site Name: *PORTLAND NORTH*
App #: *364306 Rev 0*

Reactions		
Mu	2934.38	ft-kips
Axial, Pu:	48.99	kips
Shear, Vu:	35.29	kips
Elevation:	60	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
38.88

Pole Manufacturer:	Other

If No stiffeners, Criteria: TIA G <-Only Applcable to Unstiffened Cases

Bolt Data				
Qty:	56			
Diameter (in.):	1	Bolt Fu:	120	
Bolt Material:	A325	Bolt Fy:	92	
N/A:	100	<-- Disregard		
N/A:	75	<-- Disregard		
Circle (in.):	50.375			

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

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		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

Flange Bolt Results

			Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	54.54	kips	φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	54.53	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	49.05	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	1.032	in	
Min PL "treq" for actual **T w/ Pry**:	0.846	in	
Min PL "t1" for actual **T w/o Pry**:	0.979	in	
T allowable w/o Prying:	54.54	kips	α'<0 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	49.05	kips	
Non-Prying Bolt Stress Ratio, Tu/B:	90.0%	**Pass**	

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	8.2	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	25.3%	**Pass**	Comp. Y.L. Length:
No Prying			15.29
Tension Side Stress Ratio, (treq/t)^2:	9.5%	**Pass**	

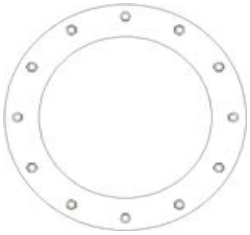
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878783*
Site Name: *PORTLAND NORTH*
App #: *364306 Rev 0*

Manufacturer:	Other

Reactions		
Moment:	2934.38	ft-kips
Axial:	48.99	kips
Shear:	35.29	kips
Exterior Flange Run, T+q:	49.05	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
38.88

Elevation: 60 feet

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	

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	49.1	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty)	54.5	Kips
Bolt Stress Ratio:	90.0%	**Pass**

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

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	50.8	Kips, Ext. Cu=Interior Cu
Plate Stress:	10.8	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	33.3%	**Pass**

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

n/a

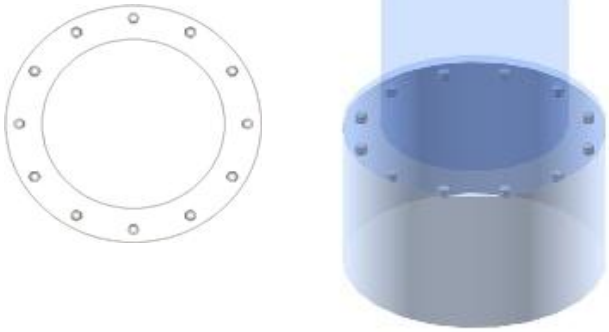
Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a

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



* 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 #: *364306 Rev 0*

Reactions		
Mu	4432.08	ft-kips
Axial, Pu:	69.38	kips
Shear, Vu:	39.32	kips
Elevation:	20	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
43.05

Pole Manufacturer:	Other

If No stiffeners, Criteria: TIA G <-Only Applcable to Unstiffened Cases

Bolt Data			
Qty:	60		
Diameter (in.):	1.125	Bolt Fu:	105
Bolt Material:	A325	Bolt Fy:	81
N/A:	100	<-- Disregard	
N/A:	75	<-- 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:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		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

Flange Bolt Results

				Rigid
Bolt Tension Capacity, φ*Tn,**B1**:	60.09	kips		φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	60.08	kips		φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	61.74	Kips		
Min. PL "tc" for **B** cap. **w/o** Pry: ˇu>B	N/A	in		
Min PL "treq" for actual **T w/ Pry**:	1.022	in		
Min PL "t1" for actual **T w/o Pry**: ˇu>B	N/A	in		
T allowable w/o Prying:	60.09	kips		
Prying Force, q:	0.00	kips	T>B	Case
Total Bolt Tension=Tu+q:	61.74	kips		
Non-Prying Bolt Stress Ratio, Tu/B:	102.8%	**Pass**		

Exterior Flange Plate Results Flexural Check

			Rigid
Compression Side Plate Stress:	7.7	ksi	TIA G
Allowable Plate Stress:	32.4	ksi	φ*Fy
Compression Plate Stress Ratio:	23.8%	**Pass**	Comp. Y.L. Length:
No Prying Check for Tu>B			16.19
Tension Side Stress Ratio, (treq/t)^2:	10.7%	**Pass**	

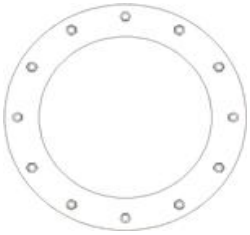
n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a



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

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

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

Site Data

BU#: *878783*
Site Name: *PORTLAND NORTH*
App #: *364306 Rev 0*

Manufacturer:	Other

Reactions		
Moment:	4432.08	ft-kips
Axial:	69.38	kips
Shear:	39.32	kips
Exterior Flange Run, T+q:	61.74	kips

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
43.05

Elevation: 20 feet

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

Interior Flange Bolt Results

Maximum Bolt Tension, Tu:	61.7	Kips, Ext. Tu=Interior Tu
Adjusted φ*Tn (due to Vu=Vu/Qty)	60.1	Kips
Bolt Stress Ratio:	102.8%	**Pass**

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

Interior Flange Plate Results Flexural Check

Controlling Bolt Axial Force:	64.1	Kips, Ext. Cu=Interior Cu
Plate Stress:	10.1	ksi
Allowable Plate Stress, φ*Fy:	32.4	ksi
Plate Stress Ratio:	31.3%	**Pass**

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

n/a

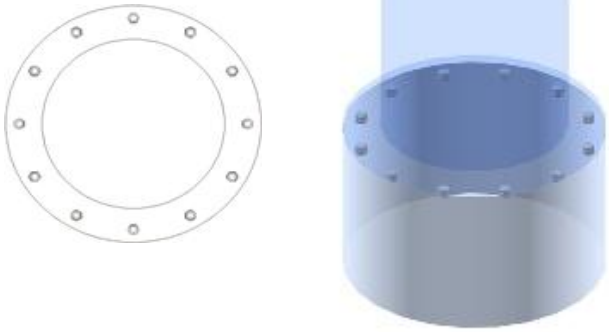
Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Pole OuterDiam:	60	in
Thick:	0.625	in
Pole Inner Diam:	58.75	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi



* 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

Project Name:	Portland North	JACOBS® Jacobs Engineering Group, Inc.	Created On: 6/17/2014
Project Number:	BU#878783		Checked By: SMR
Job Number:	WO#1341150		Revised On: 9/16/2016
Date:	12/23/2016		Revision No.: 2.5

Monopole Additional Anchor Rod and Bracket Checks

New Design?	No	
Code:	G	
Moment (M)	5234	kip-ft
Axial (P)	81	kips
Shear (V)	41	kips

Existing Rods		
Number of Rods	32	
Rod Circle	66	in
y	33	in
Moment of Inertia (I)	43560	in^4
Rod Grade	A36	
Thread Type	Non-Upset	
Diameter (d)	2	in
Ag	3.14	in^2
Ae	2.5	in^2
Fy	36	ksi
Fu	58	ksi
Tension per Rod	110.59	kips
Shear per Rod	1.28	kips
Allowable	116.0	kips
% Capacity	95.3%	%
	Pass	

New Rods		
Number of Rods	3	
Rod Circle	77	in
y	38.5	in
Moment of Inertia (I)	5,558	in^4
Rod Grade	A615-75	
Thread Type	Non-Upset	
Diameter (d)	2	
Ag	3.14	in^2
Ae	2.50	in^2
Fy	75	ksi
Fu	100	ksi
Tension per Rod	123.08	kips
Shear per Rod	0.00	kips
Allowable	200.0	kips
% Capacity	61.5%	%
	Pass	

Total Moment of Inertia	49118.44	in^4

Horizontal and Vertical Weld to Pole Checks		
Pole Grade		
Fy	35	ksi
Fu	60	ksi
Base Plate Grade		
Fy	36	ksi
Fu	58	ksi
Bracket Plate Grade		
Fy	65	ksi
Fu	80	ksi
Bracket plate thickness	1.25	in
Bracket Plate width	6.875	in
Height of vertical weld from base plate	18	in
Notch	0.75	in
Gap between Base Plate and Pipe	0.875	in
Vertical fillet weld size (bracket to pole)	8	x/16 in
Weld Material Grade	70	ksi

Pipe/HSS Checks		
Pipe/HSS	Pipe	
Diameter Pipe/Width HSS	3.5	in
thickness of pipe	0.6	in
inner diameter of pipe	2.3	in
Pipe Fy	50	ksi
Length of Pipe	26	in
Pipe Area	5.17	in^2
MOI of pipe	5.79	in^4
r pipe	1.06	in
Allowable Bearing	348.98	k
% Capacity	35.3%	%
	Pass	
Fa	27.80	ksi
Fe	474.2	ksi
kl/r	24.57	
4.71*√(E/Fy)	113.43	
Fcr	47.84	ksi
øPn	232.65	k
% Capacity	52.9%	%
	Pass	

Case 1: Vertical Fillet Weld Controls		
Check extreme fiber 1		
ra1	15.58	ksi
Rnweld	31.50	ksi
Cap1	49.4%	%
	Pass	
Check extreme fiber 2		
ra2	14.61	ksi
Fu	58.00	ksi
Rnplate	26.10	ksi
Cap2	56.0%	%
	Pass	

Case 2: Vertical Fillet Base Material Controls		
Check extreme fiber 1		
ra1	12.34	ksi
Rnweld	27.00	ksi
Cap3	45.7%	%
	Pass	
Check extreme fiber 2		
ra2	12.57	ksi
Fu	58.00	ksi
Rnplate	26.10	ksi
Cap4	48.2%	%
	Pass	

Vertical Weld to Pipe Checks		
length of vertical weld to pipe	18	in
Vertical fillet weld size (bracket to pipe)	6	x/16 in
Weld Material Grade	70	ksi
C1	1	
ex	1.75	in
a	0.10	
C	3.72	
Allowable	301.30	k
% Capacity	40.8%	%
	Pass	

Bracket Plate Check		
ΦFv	35.1	ksi
ΦVn	789.75	k
Vn	123.1	k
bracket plate welded to base plate?	No	
Elastic Section Modulus	67.5	in^3
Plastic Section Modulus	101.3	in^3
ΦMn	5923.1	k-in
M_u	1061.5	k-in
% Capacity	17.9%	%
	Pass	

New Anchor Rods Reinforce Foundation	No

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

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

Site Data

BU#:	*878783*
Site Name:	*PORTLAND NORTH*
App #:	*364306 Rev 0*
Pole Manufacturer:	*Other*

Reactions		
Mu:	4650	ft-kips
Axial, Pu:	81	kips
Shear, Vu:	41	kips
Eta Factor, η	0.55	TIA G (Fig. 4-4)

If No stiffeners, Criteria:	AISC LRFD	<-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	32	
Diam:	2	in
Rod Material:	A615-5	
Strength (Fu):	58	ksi
Yield (Fy):	36	ksi
Bolt Circle:	66	in

Anchor Rod Results

		Rigid
Max Rod (Cu+ Vu/ń):	110.5 Kips	AISC LRFD
Allowable Axial, Φ*Fu*Anet:	116.0 Kips	φ*Tn
Anchor Rod Stress Ratio:	95.3% **Pass**	

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

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	12.9 ksi	AISC LRFD
Allowable Plate Stress:	32.4 ksi	φ*Fy
Base Plate Stress Ratio:	39.9% **Pass**	Y.L. Length:
		27.50

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

n/a

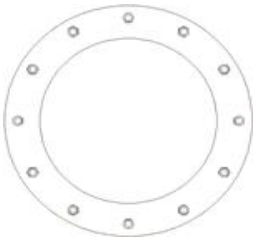
Stiffener Results

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

Pole Results

Pole Punching Shear Check:	n/a

Pole Data		
Diam:	60	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

Project Name:	PORTLAND NORTH	JACOBS® Jacobs Engineering Group, Inc.	Created On: 9/4/2014
Project Number:	BU#878783		Checked By: JTE
Job Number:	WO#1341150		Revised On: 10/6/2014
Date:	12/23/2016		Revision No.: 1.5

Single Pad Stability Checks

Foundation Properties		
Foundation Type:	Single Pad	
Length (Short Side):	25	ft
Width (Long Side):	28	ft
Thickness:	5	ft
Bearing Depth:	4.5	ft

Reactions	
Code:	G
Axial:	81
Shear:	41
Moment:	5234

Factored Loads	
0.9 Axial:	60.75
1.2 Axial:	81
Shear:	41
Moment:	5234

Soil Properties		
Unit Weight:	105	pcf
Friction Angle:	28	
Cohesion:	0	psf
Friction Coefficient (μ):	0.3	
Ultimate Bearing Strength:	7	ksf
Water Table:	99	ft

Calculate Bearing Length

Overturning Check		
Orthogonal Direction		
Eccentricity:	10.69	ft
Allowable Moment:	5554.9	kip-ft
Moment Capacity:	94.2%	Pass
Diagonal Direction:		
Eccentricity:	9.0	ft
Allowable Moment:	6306.1	kip-ft
Moment Capacity:	83.0%	Pass

Sliding Resistance:		
K_p:	2.76983	
Friction Resistance:	159.98	kip
Passive Resistance:	82.45	kip
Total Resistance:	242.43	kip
Sliding Capacity:	16.9%	Pass

Bearing Check		
Orthogonal Direction		
Compressive Force:	711.0	kip
Eccentricity:	7.56	ft
q_{max}:	3.429	ksf
Bearing Capacity:	65.3%	Pass
Diagonal Direction		
Compressive Force:	711.0	kip
Eccentricity:	5.64	ft
q_{max}:	3.101	ksf
Bearing Capacity:	59.1%	Pass

Project Name:	PORTLAND NORTH	JACOBS® Jacobs Engineering Group, Inc.	Created On: 9/4/2014
Project Number:	BU#878783		Checked By: JTE
Job Number:	WO#1341150		Revised On: 10/6/2014
Date:	12/23/2016		Revision No.: 1.5

Single Pad Structural Checks

Structural Properties		
f'_c:	4000	psi
Concrete Density:	150	pcf
Clear Cover:	3	in
Flexual Rebar Strength:	60	ksi
Tie Strength:	40	ksi

Pad Reinforcement:		
Rebar Size:	10	
Rebar Quantity:	22	

Anchor Bolt Properties		
Anchor Bolt Circle	66	in

Factored Pad Reactions		
Max Shear:	204.7	kip
Max Moment:	402.5	kip-ft

Pad Beam Shear		
d_{pad}:	55.095	in
V_c:	2090.7	kip
φV_n:	1568.0	kip
Beam Shear Capacity:	13.1%	Pass

Punching Shear		
q_{comp}:	1.016	ksf
Punching Force:	629.8	kip
b_o:	380.4	in
Vc:	5302.5	kip
φV_n:	3976.9	kip
Punching Shear Capacity:	15.8%	Pass

Pad Flexural Strength		
β_1:	0.85	
c:	1.934	in
a:	1.644	in
M_n:	7582.0	kip-ft
φM_n:	6823.8	kip-ft
Flexural Capacity:	5.9%	Pass