STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Web Site: portal.ct.gov/csc

VIA ELECTRONIC MAIL

May 24, 2024

Jeffrey Barbadora
Permitting Specialist
Crown Castle
1800 West Park Drive
Westborough, MA 01581
Jeff.Barbadora@crowncastle.com

RE: **TS-T-MOBILE-064-240328** - T-Mobile request for an order to approve tower sharing at an existing telecommunications facility located at 235-H Brainard Road, Hartford, Connecticut. **Request for Project Change.**

Dear Jeffrey Barbadora:

The Connecticut Siting Council (Council) is in receipt of your correspondence of May 7, 2024 and associated documents including a revised Structural Analysis performed by Crown Castle dated April 30, 2024 and stamped and signed by Sudarshan C. Kasera associated with the above-referenced tower share request approved by the Council on April 25, 2024. Submission of the revised Structural Analysis eliminates the requirements included in Condition Nos. 2 and 3.

The Council hereby acknowledges the revised document.

This approval applies only to the project change in the correspondence dated May 7, 2024.

Thank you for your attention and cooperation.

Sincerely,

Melanie Bachman
Executive Director

MAB/ANM/laf

c: The Honorable Arunan Arulampalam, Mayor, City of Hartford (arunan.arulampalam@hartford.gov)

From: Barbadora, Jeff <Jeff.Barbadora@crowncastle.com>
Sent: Tuesday, May 7, 2024 2:00 PM
To: Fontaine, Lisa <Lisa.Fontaine@ct.gov>
Cc: CSC-DL Siting Council <Siting.Council@ct.gov>; arunan.arulampalam@hartford.gov
Subject: RE: Council Decision - TS-T-MOBILE-064-240328 (T-Mobile/Brainard Road/Hartford)

Good afternoon,

We were able to rerun the structural analysis so that tower modifications are not required.

Please see let me know if you have any questions and I will forward a hard copy to your office.

Thanks,

Jeffrey Barbadora
Permitting Specialist
781-970-0053

Crown Castle
1800 W. Park Drive, Suite 250
Westborough, MA 01581

Date: **April 30, 2024**

Crown Castle
2000 Corporate Drive
Canonsburg, PA 15317
(724) 416-2000

Subject:	**Structural Analysis Report**	
Carrier Designation:	***T-Mobile* Co-Locate Site Number:**	CT11845A
Crown Castle Designation:	**BU Number:**	842861
	Site Name:	EAST HARTFORD HOCHANUM
	JDE Job Number:	751349
	Work Order Number:	2287395
	Order Number:	654558 Rev. 3
Engineering Firm Designation:	**Crown Castle Project Number**	2287395
Site Data:	**223 Brainard Road, Hartford, Hartford County, CT** **Latitude: *41° 43' 58.72"* Longitude: *-72° 39' 43.47"*** **96.8 ft - Monopole Tower**	

Crown Castle is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above-mentioned tower.

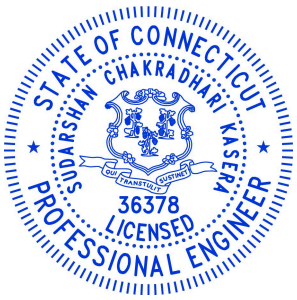
The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC7: Proposed Equipment Configuration **Sufficient - 99.6% Capacity**

This analysis has been performed in accordance with the 2022 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 118 mph. Applicable Standard references and design criteria are listed in Section 2 – Analysis Criteria.

Structural analysis prepared by: Steven Hu

Respectfully submitted by:



Sudarshan C Kasera, P.E.
Senior Project Engineer

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1) INTRODUCTION

This tower is a 96.8 ft Monopole Tower designed by Unknown.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	118 mph
Exposure Category:	C
Topographic Factor:	1
Ice Thickness:	1.50 in
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
78	78	3	commscope	VV-65A-R1_TMO w/ Mount Pipe	3	1-5/8
		3	ericsson	AIR 6419 B41_TMO_CCIV2 w/ Mount Pipe		
		3	ericsson	RADIO 4460 B2/B25 B66_TMO		
		3	ericsson	Radio 4480_TMOV2		
		3	rfs celwave	APXVAALL24_43-U-NA20_TMO w/ Mount Pipe		
		1	sitepro1	Site Pro 1 RMQP-496-HK		

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
103	103	3	ericsson	AIR 6419 B77G w/ Mount Pipe	1 6	3/8 1-1/4
		3	ericsson	AIR 6449 N77 w/ Mount Pipe		
		3	ericsson	RRUS 4449 B5/B12		
		3	kathrein	80010965 w/ Mount Pipe		
		1	raycap	DC9-48-60-24-8C-EV		
		1	tower mounts	Platform Mount [LP 1201-1_KCKR-HR-1]		
	102	3	cci antennas	DMP65R-BU6e w/ Mount Pipe		
		3	ericsson	RRUS 32 B2		
		3	ericsson	RRUS 32 B30		
		3	ericsson	RRUS 32 B66		
		3	ericsson	RRUS 4478 B14		
98	102	2	raycap	DC6-48-60-18-8F	1	3/8
	98	1	tower mounts	Side Arm Mount [SO 102-3]		

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
86	90	3	commscope	NHH-65B-R2B w/ Mount Pipe	6	1-5/8
		3	commscope	NHHSS-65B-R2BT4 w/ Mount Pipe		
		2	raycap	RVZDC-3315-PF-48		
		3	samsung telecommunications	MT6413-77A w/ Mount Pipe		
		3	samsung telecommunications	RF4439D-25A		
		3	samsung telecommunications	RF4461D-13A		
		3	samsung telecommunications	RT4423-48A/B		
	88	1	antel	BXA-70063/4CF w/ Mount Pipe		
		2	swedcom	SCCP 2X6015 w/ Mount Pipe		
	86	1	tower mounts	Platform Mount [LP 303-1_KCKR-HR-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
4-GEOTECHNICAL REPORTS	6049468	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	6049752	CCISITES
4-TOWER MANUFACTURER DRAWINGS	5210316	CCISITES

3.1) Analysis Method

tnxTower (version 8.2.4.3), 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. When applicable, Crown Castle has calculated and provided the effective area for panel antennas using approved methods following the intent of the TIA-222 standard.

3.2) Assumptions

1) Tower and structures were maintained in accordance with the TIA-222 Standard.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass/ Fail
L1	96.83 - 76.5	Pole	TP28.875x25.75x0.1875	1	-10.53	1028.68	36.6	Pass
L2	76.5 - 39.91	Pole	TP33.375x27.9528x0.2188	2	-19.47	1390.33	91.8	Pass
L3	39.91 - 0	Pole	TP39x32.3811x0.2813	3	-28.18	2123.08	99.6	Pass
							Summary	
						Pole (L3)	99.6	Pass
						RATING =	99.6	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	97.1	Pass
1	Base Plate	0	66.1	Pass
1	Base Foundation (Structural)	0	39.4	Pass
1	Base Foundation (Soil)	0	49.7	Pass

Structure Rating (max from all components) =	99.6%

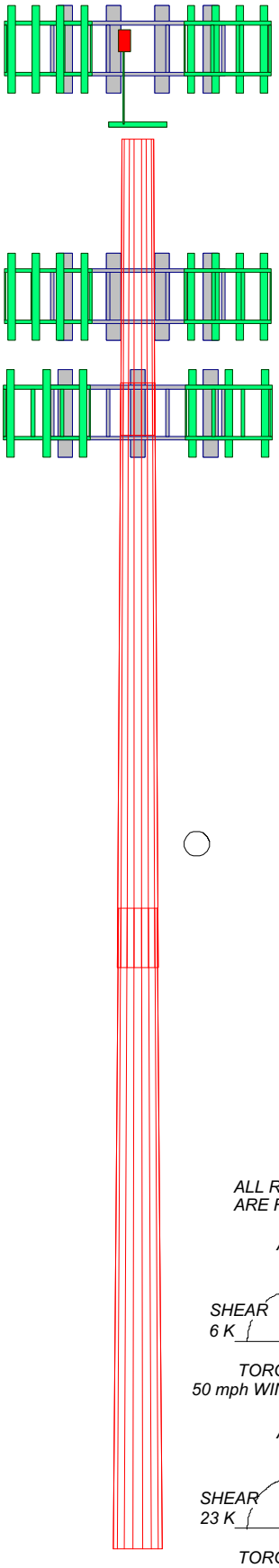
Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity consumed

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the considered equipment configuration. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	20.33	18	0.1875	3.56	25.7500	28.8750	A572-65	1.1
2	40.15	18	0.2188	4.12	27.9528	33.3750		2.9
3	44.03	18	0.2812		32.3811	39.0000		4.7
								8.7

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-H Standard.
3. Tower designed for a 118 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 99.6%

ALL REACTIONS ARE FACTORED

AXIAL 51 K

SHEAR 6 K *MOMENT 537 kip-ft*

TORQUE 2 kip-ft
50 mph WIND - 1.5000 in ICE

AXIAL 28 K

SHEAR 23 K *MOMENT 1882 kip-ft*

TORQUE 9 kip-ft
REACTIONS - 118 mph WIND

CROWN CASTLE
The Pathway to Possible

Crown Castle
2000 Corporate Drive
Canonsburg, PA 15317
Phone: (724) 416-2000
FAX:

Job: **842861**		
Project:		
Client: Crown Castle	Drawn by: SHu	App'd:
Code: TIA-222-H	Date: 04/30/24	Scale: NTS
Path: C:\SAPI Work Area\842861\WO 2287395 - SA\Prod\842861.eri		Dwg No. E-1

Tower Input Data

The tower is a monopole.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

Tower is located in Hartford County, Connecticut.
Tower base elevation above sea level: 10.00 ft.
Basic wind speed of 118 mph.
Risk Category II.
Exposure Category C.
Simplified Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Category: 1.
Crest Height: 0.00 ft.
Nominal ice thickness of 1.5000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Tower analysis based on target reliabilities in accordance with Annex S.
Load Modification Factors used: $K_{es}(F_w) = 0.95$, $K_{es}(t_i) = 0.85$.
Maximum demand-capacity ratio is: 1.05.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Assume Legs Pinned		Calculate Redundant Bracing Forces
	Consider Moments - Horizontals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Consider Moments - Diagonals	√	Use Clear Spans For Wind Area		SR Leg Bolts Resist Compression
	Use Moment Magnification		Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
√	Use Code Stress Ratios		Retension Guys To Initial Tension		Offset Girt At Foundation
√	Use Code Safety Factors - Guys	√	Bypass Mast Stability Checks	√	Consider Feed Line Torque
	Escalate Ice	√	Use Azimuth Dish Coefficients		Include Angle Block Shear Check
	Always Use Max Kz	√	Project Wind Area of Appurtenances		Use TIA-222-H Bracing Resist. Exemption
	Use Special Wind Profile		Alternative Appurt. EPA Calculation		Use TIA-222-H Tension Splice Exemption
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Poles
	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination	√	Include Shear-Torsion Interaction
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component		Always Use Sub-Critical Flow
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Use Top Mounted Sockets
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Pole Without Linear Attachments
	SR Members Are Concentric		Ignore KL/ry For 60 Deg. Angle Legs		Pole With Shroud Or No Appurtenances
	Distribute Leg Loads As Uniform		Use ASCE 10 X-Brace Ly Rules		Outside and Inside Corner Radii Are Known

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	96.83-76.50	20.33	3.56	18	25.7500	28.8750	0.1875	0.7500	A572-65 (65 ksi)
L2	76.50-39.91	40.15	4.12	18	27.9528	33.3750	0.2188	0.8750	A572-65 (65 ksi)
L3	39.91-0.00	44.03		18	32.3811	39.0000	0.2812	1.1250	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	26.1183	15.2129	1255.9016	9.0747	13.0810	96.0096	2513.4558	7.6079	4.2020	22.411
	29.2915	17.0726	1775.1038	10.1841	14.6685	121.0147	3552.5433	8.5379	4.7520	25.344
L2	28.8384	19.2561	1871.2479	9.8456	14.2000	131.7779	3744.9581	9.6299	4.5347	20.73
	33.8561	23.0208	3197.3387	11.7705	16.9545	188.5835	6398.8846	11.5126	5.4890	25.093
L3	33.4661	28.6551	3730.3178	11.3954	16.4496	226.7726	7465.5440	14.3303	5.2041	18.503
	39.5583	34.5637	6546.3751	13.7452	19.8120	330.4247	13101.3641	17.2852	6.3690	22.645

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 96.83-76.50				1	1	1			
L2 76.50-39.91				1	1	1			
L3 39.91-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
86 HB158-21U6S12-XXXM-01(1-5/8) ***	B	No	Surface Ar (CaAa)	86.00 - 0.00	4	4	-0.330 -0.330	1.9900		1.90

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1/2'' Cable (Lights)	C	No	No	Inside Pole	96.83 - 0.00	1	No Ice	0.00	0.40
							1/2'' Ice	0.00	0.40
							1'' Ice	0.00	0.40
							2'' Ice	0.00	0.40
103 FB-L98B-034-XXX(3/8)	C	No	No	Inside Pole	96.83 - 0.00	1	No Ice	0.00	0.06
							1/2'' Ice	0.00	0.06

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
							1'' Ice	0.00	0.06
							2'' Ice	0.00	0.06
PWRT-606-S(7/8)	C	No	No	Inside Pole	96.83 - 0.00	2	No Ice	0.00	0.89
							1/2'' Ice	0.00	0.89
							1'' Ice	0.00	0.89
							2'' Ice	0.00	0.89
LDF6-50A(1-1/4)	C	No	No	Inside Pole	96.83 - 0.00	6	No Ice	0.00	0.60
							1/2'' Ice	0.00	0.60
							1'' Ice	0.00	0.60
							2'' Ice	0.00	0.60
2'' Flexible Conduit	C	No	No	Inside Pole	96.83 - 0.00	1	No Ice	0.00	0.34
							1/2'' Ice	0.00	0.34
							1'' Ice	0.00	0.34
							2'' Ice	0.00	0.34
98									
FB-L98B-235-XXX(3/8)	C	No	No	Inside Pole	96.83 - 0.00	1	No Ice	0.00	0.06
							1/2'' Ice	0.00	0.06
							1'' Ice	0.00	0.06
							2'' Ice	0.00	0.06
FB-L98B-034-XXX(3/8)	C	No	No	Inside Pole	96.83 - 0.00	1	No Ice	0.00	0.06
							1/2'' Ice	0.00	0.06
							1'' Ice	0.00	0.06
							2'' Ice	0.00	0.06
PWRT-606-S(7/8)	C	No	No	Inside Pole	96.83 - 0.00	4	No Ice	0.00	0.89
							1/2'' Ice	0.00	0.89
							1'' Ice	0.00	0.89
							2'' Ice	0.00	0.89
LDF7-50A(1-5/8)	B	No	No	Inside Pole	86.00 - 0.00	4	No Ice	0.00	0.82
							1/2'' Ice	0.00	0.82
							1'' Ice	0.00	0.82
							2'' Ice	0.00	0.82
78									
HB158-21U6S24-xxM_TMO(1-5/8)	B	No	No	Inside Pole	78.00 - 0.00	3	No Ice	0.00	2.50
							1/2'' Ice	0.00	2.50
							1'' Ice	0.00	2.50
							2'' Ice	0.00	2.50
***									

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	96.83-76.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	7.562	0.000	0.11
		C	0.000	0.000	0.000	0.000	0.20
L2	76.50-39.91	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	29.126	0.000	0.67
		C	0.000	0.000	0.000	0.000	0.36
L3	39.91-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	31.768	0.000	0.73
		C	0.000	0.000	0.000	0.000	0.39

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	96.83-76.50	A	1.404	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	12.787	0.000	0.24
		C		0.000	0.000	0.000	0.000	0.20
L2	76.50-39.91	A	1.349	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	49.250	0.000	1.16
		C		0.000	0.000	0.000	0.000	0.36
L3	39.91-0.00	A	1.213	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	53.170	0.000	1.24
		C		0.000	0.000	0.000	0.000	0.39

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	96.83-76.50	0.9496	-2.5533	0.8341	-2.2428
L2	76.50-39.91	1.6883	-4.5398	1.4423	-3.8782
L3	39.91-0.00	1.7468	-4.6971	1.5177	-4.0810

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

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	14	HB158-21U6S12-XXXM-01(1-5/8)	76.50 - 86.00	1.0000	1.0000
L2	14	HB158-21U6S12-XXXM-01(1-5/8)	39.91 - 76.50	1.0000	1.0000
L3	14	HB158-21U6S12-XXXM-01(1-5/8)	0.00 - 39.91	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	Placement ft
16'' Dia. x 30'' Beacon	C	From Leg	0.00 0.00 4.00	0.0000	98.83
2.4'' Dia x 4-ft Mount Pipe	C	From Leg	0.00 0.00 2.00	0.0000	98.83
24'' x 16'' Top Hat **103**	C	None		0.0000	98.00
AIR 6449 N77 w/ Mount Pipe	B	From Centroid -Leg	4.00 -7.00 0.00	0.0000	103.00
AIR 6449 N77 w/ Mount Pipe	A	From Centroid -Leg	4.00 -7.00 0.00	0.0000	103.00
AIR 6449 N77 w/ Mount Pipe	C	From Centroid -Leg	4.00 -7.00 0.00	0.0000	103.00
AIR 6419 B77G w/ Mount Pipe	A	From Centroid -Leg	4.00 -2.00 0.00	0.0000	103.00
AIR 6419 B77G w/ Mount Pipe	B	From Centroid -Leg	4.00 -2.00 0.00	0.0000	103.00
AIR 6419 B77G w/ Mount Pipe	C	From Centroid -Leg	4.00 7.00 0.00	0.0000	103.00
80010965 w/ Mount Pipe	A	From Centroid -Leg	4.00 2.00 0.00	0.0000	103.00
80010965 w/ Mount Pipe	B	From Centroid -Leg	4.00 2.00 0.00	0.0000	103.00
80010965 w/ Mount Pipe	C	From Centroid -Leg	4.00 2.00 0.00	0.0000	103.00
DMP65R-BU6e w/ Mount Pipe	A	From Centroid -Leg	4.00 7.00 -1.00	0.0000	103.00
DMP65R-BU6e w/ Mount Pipe	B	From Centroid -Leg	4.00 7.00 -1.00	0.0000	103.00
DMP65R-BU6e w/ Mount Pipe	C	From Centroid -Leg	4.00 -2.00 -1.00	0.0000	103.00
RRUS 32 B2	A	From Centroid -Leg	4.00 -2.00 -1.00	0.0000	103.00
RRUS 32 B2	B	From Centroid -Leg	4.00 -2.00 -1.00	0.0000	103.00
RRUS 32 B2	C	From Centroid -Leg	4.00 -2.00 -1.00	0.0000	103.00
RRUS 32 B66	A	From Centroid -Leg	4.00 2.00 -1.00	0.0000	103.00
RRUS 32 B66	B	From Centroid	4.00 2.00	0.0000	103.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	Placement ft
		-Leg	-1.00		
RRUS 32 B66	C	From	4.00	0.0000	103.00
		Centroid	2.00		
		-Leg	-1.00		
RRUS 4478 B14	A	From	4.00	0.0000	103.00
		Centroid	-2.00		
		-Leg	-1.00		
RRUS 4478 B14	B	From	4.00	0.0000	103.00
		Centroid	-2.00		
		-Leg	-1.00		
RRUS 4478 B14	C	From	4.00	0.0000	103.00
		Centroid	-2.00		
		-Leg	-1.00		
RRUS 32 B30	A	From	4.00	0.0000	103.00
		Centroid	7.00		
		-Leg	-1.00		
RRUS 32 B30	B	From	4.00	0.0000	103.00
		Centroid	7.00		
		-Leg	-1.00		
RRUS 32 B30	C	From	4.00	0.0000	103.00
		Centroid	7.00		
		-Leg	-1.00		
RRUS 4449 B5/B12	A	From	4.00	0.0000	103.00
		Centroid	7.00		
		-Leg	0.00		
RRUS 4449 B5/B12	B	From	4.00	0.0000	103.00
		Centroid	7.00		
		-Leg	0.00		
RRUS 4449 B5/B12	C	From	4.00	0.0000	103.00
		Centroid	7.00		
		-Leg	0.00		
DC9-48-60-24-8C-EV	C	From	4.00	0.0000	103.00
		Centroid	-2.00		
		-Leg	0.00		
2.4'' Dia x 14-ft Mount Pipe	A	From	4.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 14-ft Mount Pipe	B	From	4.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 14-ft Mount Pipe	C	From	4.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 3-ft Mount Pipe	A	From	2.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 3-ft Mount Pipe	B	From	2.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 3-ft Mount Pipe	C	From	2.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 7-ft Mount Pipe	A	From	2.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		
2.4'' Dia x 7-ft Mount Pipe	B	From	2.00	0.0000	103.00
		Centroid	0.00		
		-Leg	0.00		

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*
2.4'' Dia x 7-ft Mount Pipe	C	From Centroid -Leg	2.00 0.00 0.00	0.0000	103.00
Platform Mount [LP 1201-1_KCKR-HR-1] **98**	C	None		0.0000	103.00
DC6-48-60-18-8F	A	From Leg	1.00 0.00 4.00	0.0000	98.00
DC6-48-60-18-8F	B	From Leg	1.00 0.00 4.00	0.0000	98.00
2.4'' Dia x 7-ft Mount Pipe	A	From Leg	1.00 0.00 0.00	0.0000	98.00
2.4'' Dia x 7-ft Mount Pipe	B	From Leg	1.00 0.00 0.00	0.0000	98.00
2.4'' Dia x 7-ft Mount Pipe	C	From Leg	1.00 0.00 0.00	0.0000	98.00
Side Arm Mount [SO 102-3] **86**	C	None		0.0000	98.00
BXA-70063/4CF w/ Mount Pipe	A	From Centroid -Leg	4.00 -6.00 2.00	0.0000	86.00
SCCP 2X6015 w/ Mount Pipe	B	From Centroid -Leg	4.00 -2.00 2.00	-30.0000	86.00
SLCP 2X6015 w/ Mount Pipe	C	From Centroid -Leg	4.00 -6.00 2.00	30.0000	86.00
NHH-65B-R2B w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.0000	86.00
NHH-65B-R2B w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.0000	86.00
NHH-65B-R2B w/ Mount Pipe	C	From Leg	4.00 0.00 4.00	0.0000	86.00
NHHSS-65B-R2BT4 w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.0000	86.00
NHHSS-65B-R2BT4 w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.0000	86.00
NHHSS-65B-R2BT4 w/ Mount Pipe	C	From Leg	4.00 0.00 4.00	0.0000	86.00
MT6413-77A w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.0000	86.00
MT6413-77A w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.0000	86.00
MT6413-77A w/ Mount Pipe	C	From Leg	4.00 0.00	0.0000	86.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft
			4.00		
RVZDC-3315-PF-48	A	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RVZDC-3315-PF-48	C	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RF4439D-25A	A	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RF4439D-25A	B	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RF4439D-25A	C	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RF4461D-13A	A	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RF4461D-13A	B	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RF4461D-13A	C	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RT4423-48A/B	A	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RT4423-48A/B	B	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
RT4423-48A/B	C	From Leg	4.00	0.0000	86.00
			0.00		
			4.00		
*					
8' x 2'' Mount Pipe	B	From Leg	2.00	1.0000	86.00
			0.00		
			0.00		
Platform Mount [LP 303-1_KCKR-HR-1]	C	None		0.0000	86.00
78					
VV-65A-R1_TMO w/ Mount Pipe	A	From Centroid -Leg	4.00 -6.00 0.00	30.0000	78.00
VV-65A-R1_TMO w/ Mount Pipe	B	From Centroid -Leg	4.00 -6.00 0.00	50.0000	78.00
VV-65A-R1_TMO w/ Mount Pipe	C	From Centroid -Leg	4.00 -6.00 0.00	10.0000	78.00
AIR 6419 B41_TMO_CCIV2 w/ Mount Pipe	A	From Centroid -Leg	4.00 2.00 0.00	30.0000	78.00
AIR 6419 B41_TMO_CCIV2 w/ Mount Pipe	B	From Centroid -Leg	4.00 2.00 0.00	50.0000	78.00
AIR 6419 B41_TMO_CCIV2 w/ Mount Pipe	C	From Centroid	4.00 2.00	10.0000	78.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft
		-Leg	0.00		
APXVAALL24_43-U-NA20_TMO w/ Mount Pipe	A	From Centroid	4.00 -2.00	30.0000	78.00
		-Leg	0.00		
APXVAALL24_43-U-NA20_TMO w/ Mount Pipe	B	From Centroid	4.00 -2.00	50.0000	78.00
		-Leg	0.00		
APXVAALL24_43-U-NA20_TMO w/ Mount Pipe	C	From Centroid	4.00 -2.00	10.0000	78.00
		-Leg	0.00		
RADIO 4460 B2/B25 B66_TMO	A	From Centroid	4.00 -6.00	30.0000	78.00
		-Leg	0.00		
RADIO 4460 B2/B25 B66_TMO	B	From Centroid	4.00 -6.00	50.0000	78.00
		-Leg	0.00		
RADIO 4460 B2/B25 B66_TMO	C	From Centroid	4.00 -6.00	10.0000	78.00
		-Leg	0.00		
Radio 4480_TMOV2	A	From Centroid	4.00 -2.00	30.0000	78.00
		-Leg	0.00		
Radio 4480_TMOV2	B	From Centroid	4.00 -2.00	50.0000	78.00
		-Leg	0.00		
Radio 4480_TMOV2	C	From Centroid	4.00 -2.00	10.0000	78.00
		-Leg	0.00		
2.4'' Dia x 8-ft Mount Pipe	A	From Centroid	4.00 0.00	0.0000	78.00
		-Leg	0.00		
2.4'' Dia x 8-ft Mount Pipe	B	From Centroid	4.00 0.00	0.0000	78.00
		-Leg	0.00		
2.4'' Dia x 8-ft Mount Pipe	C	From Centroid	4.00 0.00	0.0000	78.00
		-Leg	0.00		
Site Pro 1 RMQP-496-HK ***	C	None		0.0000	78.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice

Comb. No.	Description
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 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	96.83 - 76.5	Pole	Max Tension	26	0.00	0.00	0.00
			Max. Compression	26	-25.12	-0.86	-4.08
			Max. Mx	8	-10.56	-229.63	-0.40
			Max. My	14	-10.53	-0.06	-230.82
			Max. Vy	8	13.93	-229.63	-0.40
			Max. Vx	14	13.97	-0.06	-230.82
			Max. Torque	8			-8.11
L2	76.5 - 39.91	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-40.46	-1.98	-3.93
			Max. Mx	8	-19.53	-904.53	-0.56
			Max. My	14	-19.49	-0.51	-918.12
			Max. Vy	8	20.08	-904.53	-0.56
			Max. Vx	14	20.46	-0.51	-918.12
			Max. Torque	20			9.16

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L3	39.91 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-51.26	-3.36	-3.27
			Max. Mx	8	-28.18	-1839.48	-0.31
			Max. My	14	-28.18	-1.09	-1868.53
			Max. Vy	8	22.15	-1839.48	-0.31
			Max. Vx	14	22.51	-1.09	-1868.53
			Max. Torque	20			9.11

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	33	51.26	-0.00	-6.21
	Max. H_x	21	21.16	22.11	0.00
	Max. H_z	2	28.21	-0.00	22.47
	Max. M_x	2	1867.71	-0.00	22.47
	Max. M_z	8	1839.48	-22.11	-0.00
	Max. Torsion	20	9.09	22.11	-0.00
	Min. Vert	23	21.16	19.00	10.97
	Min. H_x	8	28.21	-22.11	-0.00
	Min. H_z	14	28.21	-0.00	-22.47
	Min. M_x	14	-1868.53	-0.00	-22.47
	Min. M_z	20	-1837.21	22.11	-0.00
	Min. Torsion	8	-9.09	-22.11	-0.00

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	23.51	0.00	0.00	0.30	-0.90	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	28.21	0.00	-22.47	-1867.71	-1.09	3.59
0.9 Dead+1.0 Wind 0 deg - No Ice	21.16	0.00	-22.47	-1842.35	-0.81	3.58
1.2 Dead+1.0 Wind 30 deg - No Ice	28.21	11.32	-19.60	-1629.53	-942.20	-0.72
0.9 Dead+1.0 Wind 30 deg - No Ice	21.16	11.32	-19.60	-1607.44	-929.08	-0.73
1.2 Dead+1.0 Wind 60 deg - No Ice	28.21	19.45	-11.23	-933.22	-1618.18	2.86
0.9 Dead+1.0 Wind 60 deg - No Ice	21.16	19.45	-11.23	-920.60	-1595.84	2.85
1.2 Dead+1.0 Wind 90 deg - No Ice	28.21	22.11	0.00	0.30	-1839.48	9.09
0.9 Dead+1.0 Wind 90 deg - No Ice	21.16	22.11	0.00	0.22	-1814.08	9.08
1.2 Dead+1.0 Wind 120 deg - No Ice	28.21	19.00	10.97	912.53	-1581.10	5.17
0.9 Dead+1.0 Wind 120 deg - No Ice	21.16	19.00	10.97	899.97	-1559.21	5.17
1.2 Dead+1.0 Wind 150 deg - No Ice	28.21	11.06	19.15	1593.27	-920.72	-3.53
0.9 Dead+1.0 Wind 150 deg -	21.16	11.06	19.15	1571.40	-907.88	-3.54

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
No Ice						
1.2 Dead+1.0 Wind 180 deg - No Ice	28.21	0.00	22.47	1868.53	-1.09	-3.59
0.9 Dead+1.0 Wind 180 deg - No Ice	21.16	0.00	22.47	1842.94	-0.81	-3.58
1.2 Dead+1.0 Wind 210 deg - No Ice	28.21	-11.32	19.60	1630.37	939.91	0.72
0.9 Dead+1.0 Wind 210 deg - No Ice	21.16	-11.32	19.60	1608.04	927.38	0.73
1.2 Dead+1.0 Wind 240 deg - No Ice	28.21	-19.45	11.23	934.00	1615.94	-2.86
0.9 Dead+1.0 Wind 240 deg - No Ice	21.16	-19.45	11.23	921.16	1594.18	-2.85
1.2 Dead+1.0 Wind 270 deg - No Ice	28.21	-22.11	0.00	0.30	1837.21	-9.09
0.9 Dead+1.0 Wind 270 deg - No Ice	21.16	-22.11	0.00	0.22	1812.40	-9.08
1.2 Dead+1.0 Wind 300 deg - No Ice	28.21	-19.00	-10.97	-911.82	1578.77	-5.17
0.9 Dead+1.0 Wind 300 deg - No Ice	21.16	-19.00	-10.97	-899.46	1557.49	-5.17
1.2 Dead+1.0 Wind 330 deg - No Ice	28.21	-11.06	-19.15	-1592.40	918.53	3.53
0.9 Dead+1.0 Wind 330 deg - No Ice	21.16	-11.06	-19.15	-1570.77	906.26	3.54
1.2 Dead+1.0 Ice+1.0 Temp	51.26	0.00	0.00	3.27	-3.36	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	51.26	0.00	-6.21	-530.57	-3.40	0.73
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	51.26	3.12	-5.40	-461.13	-271.55	-0.01
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	51.26	5.36	-3.10	-262.95	-464.57	0.69
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	51.26	6.12	0.00	3.30	-529.73	1.87
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	51.26	5.28	3.05	265.27	-457.14	1.11
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	51.26	3.07	5.32	460.32	-267.25	-0.61
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	51.26	0.00	6.21	537.19	-3.40	-0.73
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	51.26	-3.12	5.40	467.75	264.74	0.01
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	51.26	-5.36	3.10	269.57	457.78	-0.69
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	51.26	-6.12	0.00	3.30	522.93	-1.87
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	51.26	-5.28	-3.05	-258.66	450.33	-1.11
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	51.26	-3.07	-5.32	-453.69	260.45	0.61
Dead+Wind 0 deg - Service	23.51	0.00	-5.47	-451.70	-0.94	0.88
Dead+Wind 30 deg - Service	23.51	2.76	-4.78	-394.07	-228.66	-0.18
Dead+Wind 60 deg - Service	23.51	4.74	-2.74	-225.57	-392.23	0.71
Dead+Wind 90 deg - Service	23.51	5.39	0.00	0.33	-445.75	2.24
Dead+Wind 120 deg - Service	23.51	4.63	2.67	221.04	-383.22	1.28
Dead+Wind 150 deg - Service	23.51	2.69	4.67	385.75	-223.45	-0.87
Dead+Wind 180 deg - Service	23.51	0.00	5.47	452.38	-0.94	-0.88
Dead+Wind 210 deg - Service	23.51	-2.76	4.78	394.75	226.77	0.18
Dead+Wind 240 deg - Service	23.51	-4.74	2.74	226.25	390.34	-0.71
Dead+Wind 270 deg - Service	23.51	-5.39	0.00	0.33	443.87	-2.24
Dead+Wind 300 deg - Service	23.51	-4.63	-2.67	-220.37	381.33	-1.28
Dead+Wind 330 deg - Service	23.51	-2.69	-4.67	-385.07	221.58	0.87

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-23.51	0.00	0.00	23.51	0.00	0.000%
2	0.00	-28.21	-22.47	-0.00	28.21	22.47	0.000%
3	0.00	-21.16	-22.47	-0.00	21.16	22.47	0.000%
4	11.32	-28.21	-19.60	-11.32	28.21	19.60	0.000%
5	11.32	-21.16	-19.60	-11.32	21.16	19.60	0.000%
6	19.45	-28.21	-11.23	-19.45	28.21	11.23	0.000%
7	19.45	-21.16	-11.23	-19.45	21.16	11.23	0.000%
8	22.11	-28.21	0.00	-22.11	28.21	-0.00	0.000%
9	22.11	-21.16	0.00	-22.11	21.16	0.00	0.000%
10	19.00	-28.21	10.97	-19.00	28.21	-10.97	0.000%
11	19.00	-21.16	10.97	-19.00	21.16	-10.97	0.000%
12	11.06	-28.21	19.15	-11.06	28.21	-19.15	0.000%
13	11.06	-21.16	19.15	-11.06	21.16	-19.15	0.000%
14	0.00	-28.21	22.47	-0.00	28.21	-22.47	0.000%
15	0.00	-21.16	22.47	-0.00	21.16	-22.47	0.000%
16	-11.32	-28.21	19.60	11.32	28.21	-19.60	0.000%
17	-11.32	-21.16	19.60	11.32	21.16	-19.60	0.000%
18	-19.45	-28.21	11.23	19.45	28.21	-11.23	0.000%
19	-19.45	-21.16	11.23	19.45	21.16	-11.23	0.000%
20	-22.11	-28.21	0.00	22.11	28.21	-0.00	0.000%
21	-22.11	-21.16	0.00	22.11	21.16	0.00	0.000%
22	-19.00	-28.21	-10.97	19.00	28.21	10.97	0.000%
23	-19.00	-21.16	-10.97	19.00	21.16	10.97	0.000%
24	-11.06	-28.21	-19.15	11.06	28.21	19.15	0.000%
25	-11.06	-21.16	-19.15	11.06	21.16	19.15	0.000%
26	0.00	-51.26	0.00	-0.00	51.26	-0.00	0.000%
27	0.00	-51.26	-6.21	-0.00	51.26	6.21	0.000%
28	3.12	-51.26	-5.40	-3.12	51.26	5.40	0.000%
29	5.36	-51.26	-3.10	-5.36	51.26	3.10	0.000%
30	6.12	-51.26	0.00	-6.12	51.26	-0.00	0.000%
31	5.28	-51.26	3.05	-5.28	51.26	-3.05	0.000%
32	3.07	-51.26	5.32	-3.07	51.26	-5.32	0.000%
33	0.00	-51.26	6.21	-0.00	51.26	-6.21	0.000%
34	-3.12	-51.26	5.40	3.12	51.26	-5.40	0.000%
35	-5.36	-51.26	3.10	5.36	51.26	-3.10	0.000%
36	-6.12	-51.26	0.00	6.12	51.26	-0.00	0.000%
37	-5.28	-51.26	-3.05	5.28	51.26	3.05	0.000%
38	-3.07	-51.26	-5.32	3.07	51.26	5.32	0.000%
39	0.00	-23.51	-5.47	0.00	23.51	5.47	0.000%
40	2.76	-23.51	-4.78	-2.76	23.51	4.78	0.000%
41	4.74	-23.51	-2.74	-4.74	23.51	2.74	0.000%
42	5.39	-23.51	0.00	-5.39	23.51	-0.00	0.000%
43	4.63	-23.51	2.67	-4.63	23.51	-2.67	0.000%
44	2.69	-23.51	4.67	-2.69	23.51	-4.67	0.000%
45	0.00	-23.51	5.47	0.00	23.51	-5.47	0.000%
46	-2.76	-23.51	4.78	2.76	23.51	-4.78	0.000%
47	-4.74	-23.51	2.74	4.74	23.51	-2.74	0.000%
48	-5.39	-23.51	0.00	5.39	23.51	-0.00	0.000%
49	-4.63	-23.51	-2.67	4.63	23.51	2.67	0.000%
50	-2.69	-23.51	-4.67	2.69	23.51	4.67	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00089542
3	Yes	5	0.00000001	0.00041239
4	Yes	6	0.00000001	0.00033427
5	Yes	6	0.00000001	0.00010312
6	Yes	6	0.00000001	0.00031264
7	Yes	6	0.00000001	0.00009603
8	Yes	6	0.00000001	0.00013697
9	Yes	6	0.00000001	0.00004627
10	Yes	6	0.00000001	0.00037870
11	Yes	6	0.00000001	0.00012094
12	Yes	6	0.00000001	0.00036323
13	Yes	6	0.00000001	0.00011489
14	Yes	5	0.00000001	0.00089617
15	Yes	5	0.00000001	0.00041259
16	Yes	6	0.00000001	0.00034537
17	Yes	6	0.00000001	0.00010714
18	Yes	6	0.00000001	0.00036469
19	Yes	6	0.00000001	0.00011448
20	Yes	6	0.00000001	0.00013687
21	Yes	6	0.00000001	0.00004626
22	Yes	6	0.00000001	0.00028926
23	Yes	6	0.00000001	0.00008927
24	Yes	6	0.00000001	0.00030240
25	Yes	6	0.00000001	0.00009337
26	Yes	4	0.00000001	0.00011856
27	Yes	6	0.00000001	0.00013491
28	Yes	6	0.00000001	0.00024003
29	Yes	6	0.00000001	0.00022775
30	Yes	6	0.00000001	0.00016942
31	Yes	6	0.00000001	0.00026282
32	Yes	6	0.00000001	0.00025361
33	Yes	6	0.00000001	0.00013852
34	Yes	6	0.00000001	0.00024333
35	Yes	6	0.00000001	0.00025495
36	Yes	6	0.00000001	0.00016692
37	Yes	6	0.00000001	0.00021713
38	Yes	6	0.00000001	0.00022196
39	Yes	5	0.00000001	0.00005876
40	Yes	5	0.00000001	0.00010253
41	Yes	5	0.00000001	0.00009185
42	Yes	5	0.00000001	0.00014950
43	Yes	5	0.00000001	0.00015949
44	Yes	5	0.00000001	0.00013813
45	Yes	5	0.00000001	0.00005903
46	Yes	5	0.00000001	0.00011254
47	Yes	5	0.00000001	0.00013594
48	Yes	5	0.00000001	0.00014886
49	Yes	5	0.00000001	0.00009433
50	Yes	5	0.00000001	0.00008848

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	96.83 - 76.5	17.270	46	1.4439	0.0252
L2	80.06 - 39.91	12.337	46	1.3457	0.0187
L3	44.03 - 0	3.910	40	0.7994	0.0070

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

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
103.00	AIR 6449 N77 w/ Mount Pipe	46	17.270	1.4439	0.0252	23637
98.83	16'' Dia. x 30'' Beacon	46	17.270	1.4439	0.0252	23637
98.00	24'' x 16'' Top Hat	46	17.270	1.4439	0.0252	23637
86.00	BXA-70063/4CF w/ Mount Pipe	46	14.055	1.3899	0.0210	10912
78.00	VV-65A-R1_TMO w/ Mount Pipe	46	11.755	1.3264	0.0179	6345

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	96.83 - 76.5	71.282	16	5.9642	0.1024
L2	80.06 - 39.91	50.956	16	5.5634	0.0759
L3	44.03 - 0	16.165	4	3.3074	0.0283

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
103.00	AIR 6449 N77 w/ Mount Pipe	16	71.282	5.9642	0.1024	5907
98.83	16'' Dia. x 30'' Beacon	16	71.282	5.9642	0.1024	5907
98.00	24'' x 16'' Top Hat	16	71.282	5.9642	0.1024	5907
86.00	BXA-70063/4CF w/ Mount Pipe	16	58.034	5.7443	0.0852	2726
78.00	VV-65A-R1_TMO w/ Mount Pipe	16	48.553	5.4841	0.0727	1579

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	96.83 - 95.7819	TP28.875x25.75x0.1875	20.33	0.00	0.0	15.3088	-5.81	895.56	0.006
	95.7819 - 94.7338					15.4046	-5.89	901.17	0.007
	94.7338 -					15.5005	-5.97	906.78	0.007

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	93.6856								
	93.6856 - 92.6375					15.5964	-6.05	912.39	0.007
	92.6375 - 91.5894					15.6923	-6.13	918.00	0.007
	91.5894 - 90.5413					15.7882	-6.22	923.61	0.007
	90.5413 - 89.4931					15.8841	-6.30	929.22	0.007
	89.4931 - 88.445					15.9799	-6.38	934.83	0.007
	88.445 - 87.3969					16.0758	-6.47	940.43	0.007
	87.3969 - 86.3487					16.1717	-6.55	946.04	0.007
	86.3487 - 85.3006					16.2676	-10.08	951.65	0.011
	85.3006 - 84.2525					16.3635	-10.17	957.26	0.011
	84.2525 - 83.2044					16.4593	-10.26	962.87	0.011
	83.2044 - 82.1562					16.5552	-10.35	968.48	0.011
	82.1562 - 81.1081					16.6511	-10.44	974.09	0.011
	81.1081 - 80.06					16.7470	-10.53	979.70	0.011
	80.06 - 76.5					17.0726	-8.22	998.75	0.008
L2	80.06 - 76.5	TP33.375x27.9528x0.2188	40.15	0.00	0.0	19.5899	-6.82	1146.01	0.006
	76.5 - 74.6961					19.7590	-15.25	1155.90	0.013
	74.6961 - 72.8922					19.9282	-15.47	1165.80	0.013
	72.8922 - 71.0883					20.0973	-15.70	1175.69	0.013
	71.0883 - 69.2844					20.2665	-15.93	1185.59	0.013
	69.2844 - 67.4806					20.4356	-16.16	1195.48	0.014
	67.4806 - 65.6767					20.6048	-16.39	1205.38	0.014
	65.6767 - 63.8728					20.7739	-16.63	1215.27	0.014
	63.8728 - 62.0689					20.9430	-16.87	1225.17	0.014
	62.0689 - 60.265					21.1122	-17.12	1235.06	0.014
	60.265 - 58.4611					21.2813	-17.37	1244.96	0.014
	58.4611 - 56.6572					21.4505	-17.62	1254.85	0.014
	56.6572 - 54.8533					21.6196	-17.87	1264.75	0.014
	54.8533 - 53.0494					21.7888	-18.13	1274.64	0.014
	53.0494 - 51.2456					21.9579	-18.39	1284.54	0.014
	51.2456 - 49.4417					22.1271	-18.66	1294.43	0.014
	49.4417 - 47.6378					22.2962	-18.92	1304.33	0.015
	47.6378 - 45.8339					22.4653	-19.19	1314.22	0.015

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
	45.8339 - 44.03					22.6345	-19.47	1324.12	0.015
	44.03 - 39.91					23.0208	-9.08	1346.72	0.007
L3	44.03 - 39.91	TP39x32.3811x0.2813	44.03	0.00	0.0	29.2080	-11.43	1708.67	0.007
	39.91 - 37.8095					29.4899	-20.89	1725.16	0.012
	37.8095 - 35.7089					29.7718	-21.26	1741.65	0.012
	35.7089 - 33.6084					30.0537	-21.64	1758.14	0.012
	33.6084 - 31.5079					30.3355	-22.02	1774.63	0.012
	31.5079 - 29.4074					30.6174	-22.41	1791.12	0.013
	29.4074 - 27.3068					30.8993	-22.80	1807.61	0.013
	27.3068 - 25.2063					31.1812	-23.19	1824.10	0.013
	25.2063 - 23.1058					31.4631	-23.59	1840.59	0.013
	23.1058 - 21.0053					31.7449	-23.99	1857.08	0.013
	21.0053 - 18.9047					32.0268	-24.39	1873.57	0.013
	18.9047 - 16.8042					32.3087	-24.80	1890.06	0.013
	16.8042 - 14.7037					32.5906	-25.21	1906.55	0.013
	14.7037 - 12.6032					32.8725	-25.62	1923.04	0.013
	12.6032 - 10.5026					33.1543	-26.04	1939.53	0.013
	10.5026 - 8.40211					33.4362	-26.46	1956.02	0.014
	8.40211 - 6.30158					33.7181	-26.89	1972.51	0.014
	6.30158 - 4.20105					34.0000	-27.31	1989.00	0.014
	4.20105 - 2.10053					34.2819	-27.74	2005.49	0.014
	2.10053 - 0					34.5637	-28.18	2021.98	0.014

Pole Bending Design Data

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	
L1	96.83 - 95.7819	TP28.875x25.75x0.1875	52.90	538.37	0.098	0.00	538.37	0.000
	95.7819 - 94.7338		61.93	543.84	0.114	0.00	543.84	0.000
	94.7338 - 93.6856		71.04	549.33	0.129	0.00	549.33	0.000
	93.6856 - 92.6375		80.24	554.83	0.145	0.00	554.83	0.000
	92.6375 - 91.5894		89.52	560.33	0.160	0.00	560.33	0.000
	91.5894 -		98.88	565.84	0.175	0.00	565.84	0.000

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 $\frac{M_{uy}}{\phi M_{ny}}$
	90.5413							
	90.5413 - 89.4931		108.33	571.36	0.190	0.00	571.36	0.000
	89.4931 - 88.445		117.87	576.89	0.204	0.00	576.89	0.000
	88.445 - 87.3969		127.49	582.43	0.219	0.00	582.43	0.000
	87.3969 - 86.3487		137.19	587.97	0.233	0.00	587.97	0.000
	86.3487 - 85.3006		158.68	593.52	0.267	0.00	593.52	0.000
	85.3006 - 84.2525		172.94	599.08	0.289	0.00	599.08	0.000
	84.2525 - 83.2044		187.28	604.65	0.310	0.00	604.65	0.000
	83.2044 - 82.1562		201.71	610.22	0.331	0.00	610.22	0.000
	82.1562 - 81.1081		216.22	615.80	0.351	0.00	615.80	0.000
	81.1081 - 80.06		230.82	621.38	0.371	0.00	621.38	0.000
	80.06 - 76.5		137.06	640.38	0.214	0.00	640.38	0.000
L2	80.06 - 76.5	TP33.375x27.9528x0.2188	150.36	772.68	0.195	0.00	772.68	0.000
	76.5 - 74.6961		320.93	783.74	0.409	0.00	783.74	0.000
	74.6961 - 72.8922		354.68	794.82	0.446	0.00	794.82	0.000
	72.8922 - 71.0883		388.66	805.94	0.482	0.00	805.94	0.000
	71.0883 - 69.2844		422.87	817.09	0.518	0.00	817.09	0.000
	69.2844 - 67.4806		457.30	828.27	0.552	0.00	828.27	0.000
	67.4806 - 65.6767		491.96	839.48	0.586	0.00	839.48	0.000
	65.6767 - 63.8728		526.83	850.72	0.619	0.00	850.72	0.000
	63.8728 - 62.0689		561.92	861.98	0.652	0.00	861.98	0.000
	62.0689 - 60.265		597.23	873.27	0.684	0.00	873.27	0.000
	60.265 - 58.4611		632.74	884.58	0.715	0.00	884.58	0.000
	58.4611 - 56.6572		668.46	895.92	0.746	0.00	895.92	0.000
	56.6572 - 54.8533		704.38	907.28	0.776	0.00	907.28	0.000
	54.8533 - 53.0494		740.50	918.66	0.806	0.00	918.66	0.000
	53.0494 - 51.2456		776.82	930.07	0.835	0.00	930.07	0.000
	51.2456 - 49.4417		813.33	941.48	0.864	0.00	941.48	0.000
	49.4417 - 47.6378		850.03	952.92	0.892	0.00	952.92	0.000
	47.6378 - 45.8339		886.92	964.38	0.920	0.00	964.38	0.000
	45.8339 - 44.03		924.00	975.86	0.947	0.00	975.86	0.000
	44.03 - 39.91		452.44	1002.12	0.451	0.00	1002.12	0.000
L3	44.03 - 39.91	TP39x32.3811x0.2813	557.09	1381.12	0.403	0.00	1381.12	0.000
	39.91 - 37.8095		1053.60	1403.83	0.751	0.00	1403.83	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	
	37.8095 - 35.7089		1097.91	1426.65	0.770	0.00	1426.65	0.000
	35.7089 - 33.6084		1142.45	1449.55	0.788	0.00	1449.55	0.000
	33.6084 - 31.5079		1187.21	1472.56	0.806	0.00	1472.56	0.000
	31.5079 - 29.4074		1232.20	1495.65	0.824	0.00	1495.65	0.000
	29.4074 - 27.3068		1277.40	1518.83	0.841	0.00	1518.83	0.000
	27.3068 - 25.2063		1322.82	1542.09	0.858	0.00	1542.09	0.000
	25.2063 - 23.1058		1368.43	1565.44	0.874	0.00	1565.44	0.000
	23.1058 - 21.0053		1414.24	1588.88	0.890	0.00	1588.88	0.000
	21.0053 - 18.9047		1460.25	1612.38	0.906	0.00	1612.38	0.000
	18.9047 - 16.8042		1506.43	1635.97	0.921	0.00	1635.97	0.000
	16.8042 - 14.7037		1552.86	1659.64	0.936	0.00	1659.64	0.000
	14.7037 - 12.6032		1599.45	1683.38	0.950	0.00	1683.38	0.000
	12.6032 - 10.5026		1646.22	1707.18	0.964	0.00	1707.18	0.000
	10.5026 - 8.40211		1693.13	1731.06	0.978	0.00	1731.06	0.000
	8.40211 - 6.30158		1740.22	1755.00	0.992	0.00	1755.00	0.000
	6.30158 - 4.20105		1787.44	1779.00	1.005	0.00	1779.00	0.000
	4.20105 - 2.10053		1834.81	1803.06	1.018	0.00	1803.06	0.000
	2.10053 - 0		1882.32	1827.18	1.030	0.00	1827.18	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	96.83 - 95.7819	TP28.875x25.75x0.1875	8.58	268.67	0.032	2.63	605.24	0.004
	95.7819 - 94.7338		8.66	270.35	0.032	2.63	612.85	0.004
	94.7338 - 93.6856		8.74	272.03	0.032	2.63	620.50	0.004
	93.6856 - 92.6375		8.82	273.72	0.032	2.63	628.20	0.004
	92.6375 - 91.5894		8.90	275.40	0.032	2.63	635.95	0.004
	91.5894 - 90.5413		8.98	277.08	0.032	2.63	643.74	0.004
	90.5413 - 89.4931		9.06	278.76	0.033	2.63	651.59	0.004
	89.4931 - 88.445		9.14	280.45	0.033	2.63	659.48	0.004
	88.445 -		9.22	282.13	0.033	2.63	667.41	0.004

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 $\frac{T_u}{\phi T_n}$
	87.3969							
	87.3969 - 86.3487		9.31	283.81	0.033	2.63	675.40	0.004
	86.3487 - 85.3006		13.57	285.50	0.048	2.63	683.43	0.004
	85.3006 - 84.2525		13.65	287.18	0.048	2.37	691.51	0.003
	84.2525 - 83.2044		13.73	288.86	0.048	2.37	699.64	0.003
	83.2044 - 82.1562		13.81	290.54	0.048	2.37	707.81	0.003
	82.1562 - 81.1081		13.89	292.23	0.048	2.37	716.04	0.003
	81.1081 - 80.06		13.97	293.91	0.048	2.37	724.31	0.003
	80.06 - 76.5		10.21	299.62	0.034	0.56	752.75	0.001
L2	80.06 - 76.5	TP33.375x27.9528x0.2188	8.32	343.80	0.024	0.16	849.51	0.000
	76.5 - 74.6961		18.66	346.77	0.054	0.73	864.24	0.001
	74.6961 - 72.8922		18.80	349.74	0.054	0.73	879.10	0.001
	72.8922 - 71.0883		18.92	352.71	0.054	0.73	894.08	0.001
	71.0883 - 69.2844		19.05	355.68	0.054	0.73	909.20	0.001
	69.2844 - 67.4806		19.18	358.64	0.053	0.73	924.43	0.001
	67.4806 - 65.6767		19.30	361.61	0.053	0.73	939.80	0.001
	65.6767 - 63.8728		19.42	364.58	0.053	0.73	955.30	0.001
	63.8728 - 62.0689		19.54	367.55	0.053	0.73	970.92	0.001
	62.0689 - 60.265		19.66	370.52	0.053	0.73	986.66	0.001
	60.265 - 58.4611		19.77	373.49	0.053	0.73	1002.53	0.001
	58.4611 - 56.6572		19.89	376.46	0.053	0.73	1018.53	0.001
	56.6572 - 54.8533		20.00	379.42	0.053	0.73	1034.66	0.001
	54.8533 - 53.0494		20.11	382.39	0.053	0.73	1050.92	0.001
	53.0494 - 51.2456		20.22	385.36	0.052	0.73	1067.29	0.001
	51.2456 - 49.4417		20.33	388.33	0.052	0.73	1083.80	0.001
	49.4417 - 47.6378		20.43	391.30	0.052	0.73	1100.43	0.001
	47.6378 - 45.8339		20.54	394.27	0.052	0.73	1117.19	0.001
	45.8339 - 44.03		20.64	397.24	0.052	0.73	1134.08	0.001
	44.03 - 39.91		9.49	404.01	0.023	0.32	1173.12	0.000
L3	44.03 - 39.91	TP39x32.3811x0.2813	11.47	512.60	0.022	0.40	1468.80	0.000
	39.91 - 37.8095		21.08	517.55	0.041	0.72	1497.28	0.000
	37.8095 - 35.7089		21.19	522.50	0.041	0.72	1526.04	0.000
	35.7089 - 33.6084		21.30	527.44	0.040	0.72	1555.08	0.000
	33.6084 - 31.5079		21.41	532.39	0.040	0.72	1584.38	0.000

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 $\frac{T_u}{\phi T_n}$
	31.5079 - 29.4074		21.51	537.34	0.040	0.72	1613.97	0.000
	29.4074 - 27.3068		21.61	542.28	0.040	0.72	1643.83	0.000
	27.3068 - 25.2063		21.71	547.23	0.040	0.72	1673.95	0.000
	25.2063 - 23.1058		21.81	552.18	0.039	0.72	1704.35	0.000
	23.1058 - 21.0053		21.90	557.12	0.039	0.72	1735.03	0.000
	21.0053 - 18.9047		21.99	562.07	0.039	0.72	1765.97	0.000
	18.9047 - 16.8042		22.08	567.02	0.039	0.72	1797.20	0.000
	16.8042 - 14.7037		22.17	571.97	0.039	0.72	1828.70	0.000
	14.7037 - 12.6032		22.25	576.91	0.039	0.72	1860.47	0.000
	12.6032 - 10.5026		22.33	581.86	0.038	0.72	1892.51	0.000
	10.5026 - 8.40211		22.40	586.81	0.038	0.72	1924.83	0.000
	8.40211 - 6.30158		22.48	591.75	0.038	0.72	1957.42	0.000
	6.30158 - 4.20105		22.55	596.70	0.038	0.72	1990.28	0.000
	4.20105 - 2.10053		22.61	601.65	0.038	0.72	2023.42	0.000
	2.10053 - 0		22.68	606.59	0.037	0.72	2056.83	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	96.83 - 95.7819	0.006	0.098	0.000	0.032	0.004	0.106	1.050	
	95.7819 - 94.7338	0.007	0.114	0.000	0.032	0.004	0.122	1.050	
	94.7338 - 93.6856	0.007	0.129	0.000	0.032	0.004	0.137	1.050	
	93.6856 - 92.6375	0.007	0.145	0.000	0.032	0.004	0.153	1.050	
	92.6375 - 91.5894	0.007	0.160	0.000	0.032	0.004	0.168	1.050	
	91.5894 - 90.5413	0.007	0.175	0.000	0.032	0.004	0.183	1.050	
	90.5413 - 89.4931	0.007	0.190	0.000	0.033	0.004	0.198	1.050	
	89.4931 - 88.445	0.007	0.204	0.000	0.033	0.004	0.212	1.050	
	88.445 - 87.3969	0.007	0.219	0.000	0.033	0.004	0.227	1.050	
	87.3969 - 86.3487	0.007	0.233	0.000	0.033	0.004	0.242	1.050	
	86.3487 - 85.3006	0.011	0.267	0.000	0.048	0.004	0.281	1.050	

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
	85.3006 - 84.2525	0.011	0.289	0.000	0.048	0.003	0.302	1.050	
	84.2525 - 83.2044	0.011	0.310	0.000	0.048	0.003	0.323	1.050	
	83.2044 - 82.1562	0.011	0.331	0.000	0.048	0.003	0.344	1.050	
	82.1562 - 81.1081	0.011	0.351	0.000	0.048	0.003	0.364	1.050	
	81.1081 - 80.06	0.011	0.371	0.000	0.048	0.003	0.385	1.050	
	80.06 - 76.5	0.008	0.214	0.000	0.034	0.001	0.223	1.050	
L2	80.06 - 76.5	0.006	0.195	0.000	0.024	0.000	0.201	1.050	
	76.5 - 74.6961	0.013	0.409	0.000	0.054	0.001	0.426	1.050	
	74.6961 - 72.8922	0.013	0.446	0.000	0.054	0.001	0.462	1.050	
	72.8922 - 71.0883	0.013	0.482	0.000	0.054	0.001	0.499	1.050	
	71.0883 - 69.2844	0.013	0.518	0.000	0.054	0.001	0.534	1.050	
	69.2844 - 67.4806	0.014	0.552	0.000	0.053	0.001	0.569	1.050	
	67.4806 - 65.6767	0.014	0.586	0.000	0.053	0.001	0.603	1.050	
	65.6767 - 63.8728	0.014	0.619	0.000	0.053	0.001	0.636	1.050	
	63.8728 - 62.0689	0.014	0.652	0.000	0.053	0.001	0.669	1.050	
	62.0689 - 60.265	0.014	0.684	0.000	0.053	0.001	0.701	1.050	
	60.265 - 58.4611	0.014	0.715	0.000	0.053	0.001	0.732	1.050	
	58.4611 - 56.6572	0.014	0.746	0.000	0.053	0.001	0.763	1.050	
	56.6572 - 54.8533	0.014	0.776	0.000	0.053	0.001	0.793	1.050	
	54.8533 - 53.0494	0.014	0.806	0.000	0.053	0.001	0.823	1.050	
	53.0494 - 51.2456	0.014	0.835	0.000	0.052	0.001	0.852	1.050	
	51.2456 - 49.4417	0.014	0.864	0.000	0.052	0.001	0.881	1.050	
	49.4417 - 47.6378	0.015	0.892	0.000	0.052	0.001	0.909	1.050	
	47.6378 - 45.8339	0.015	0.920	0.000	0.052	0.001	0.937	1.050	
	45.8339 - 44.03	0.015	0.947	0.000	0.052	0.001	0.964	1.050	
	44.03 - 39.91	0.007	0.451	0.000	0.023	0.000	0.459	1.050	
L3	44.03 - 39.91	0.007	0.403	0.000	0.022	0.000	0.411	1.050	
	39.91 - 37.8095	0.012	0.751	0.000	0.041	0.000	0.764	1.050	
	37.8095 - 35.7089	0.012	0.770	0.000	0.041	0.000	0.783	1.050	
	35.7089 - 33.6084	0.012	0.788	0.000	0.040	0.000	0.802	1.050	
	33.6084 - 31.5079	0.012	0.806	0.000	0.040	0.000	0.820	1.050	
	31.5079 - 29.4074	0.013	0.824	0.000	0.040	0.000	0.838	1.050	
	29.4074 - 27.3068	0.013	0.841	0.000	0.040	0.000	0.855	1.050	
	27.3068 -	0.013	0.858	0.000	0.040	0.000	0.872	1.050	

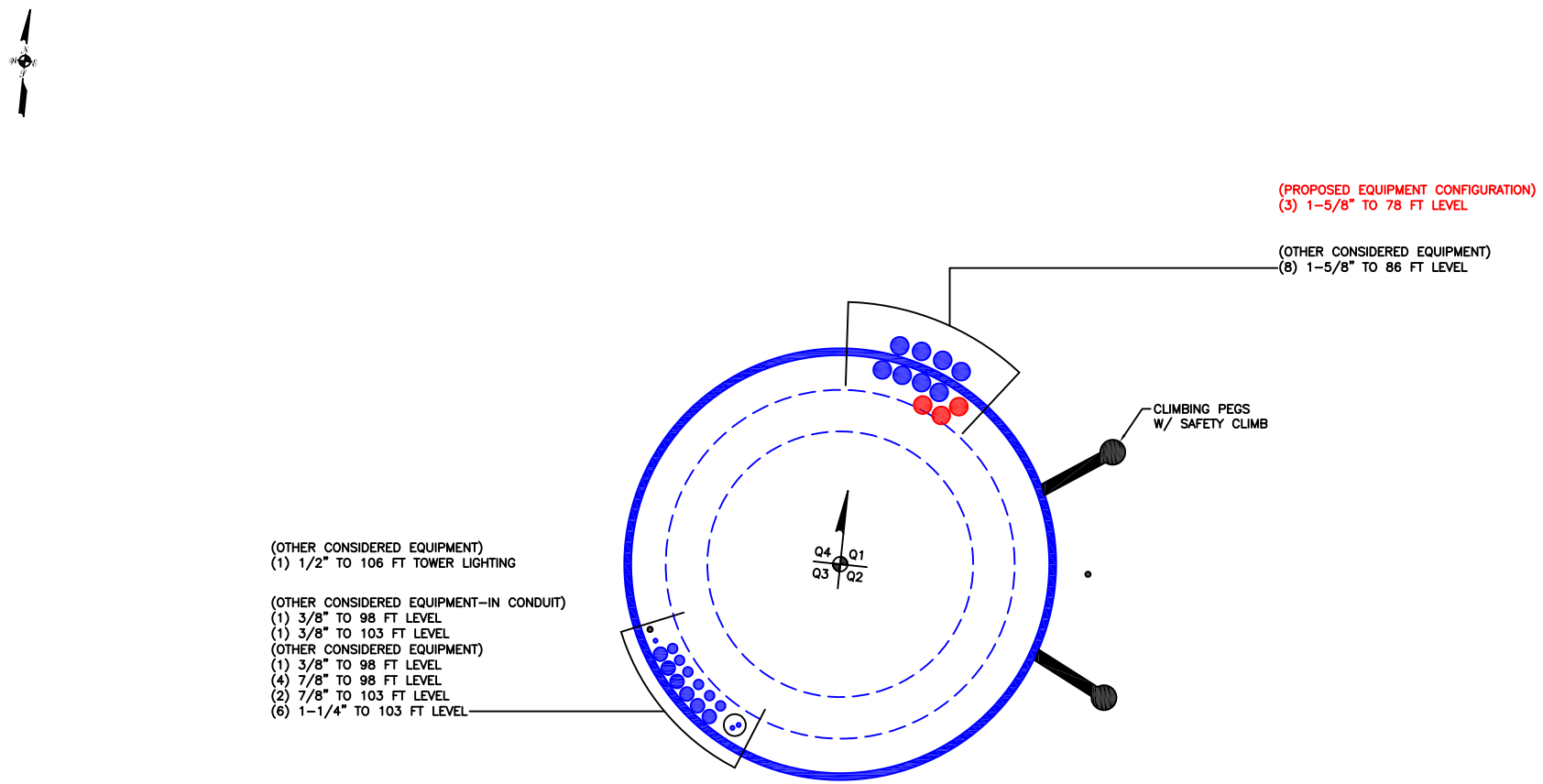
Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	25.2063								
	25.2063 - 23.1058	0.013	0.874	0.000	0.039	0.000	0.889	1.050	
	23.1058 - 21.0053	0.013	0.890	0.000	0.039	0.000	0.905	1.050	
	21.0053 - 18.9047	0.013	0.906	0.000	0.039	0.000	0.920	1.050	
	18.9047 - 16.8042	0.013	0.921	0.000	0.039	0.000	0.935	1.050	
	16.8042 - 14.7037	0.013	0.936	0.000	0.039	0.000	0.950	1.050	
	14.7037 - 12.6032	0.013	0.950	0.000	0.039	0.000	0.965	1.050	
	12.6032 - 10.5026	0.013	0.964	0.000	0.038	0.000	0.979	1.050	
	10.5026 - 8.40211	0.014	0.978	0.000	0.038	0.000	0.993	1.050	
	8.40211 - 6.30158	0.014	0.992	0.000	0.038	0.000	1.007	1.050	
	6.30158 - 4.20105	0.014	1.005	0.000	0.038	0.000	1.020	1.050	
	4.20105 - 2.10053	0.014	1.018	0.000	0.038	0.000	1.033	1.050	
	2.10053 - 0	0.014	1.030	0.000	0.037	0.000	1.046	1.050	

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	96.83 - 76.5	Pole	TP28.875x25.75x0.1875	1	-10.53	1028.68	36.6	Pass
L2	76.5 - 39.91	Pole	TP33.375x27.9528x0.2188	2	-19.47	1390.33	91.8	Pass
L3	39.91 - 0	Pole	TP39x32.3811x0.2813	3	-28.18	2123.08	99.6	Pass
							Summary	
						Pole (L3)	99.6	Pass
						RATING =	**99.6**	**Pass**

APPENDIX B

BASE LEVEL DRAWING


(PROPOSED EQUIPMENT CONFIGURATION)
(3) 1-5/8" TO 78 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(8) 1-5/8" TO 86 FT LEVEL
CLIMBING PEGS
W/ SAFETY CLIMB
(OTHER CONSIDERED EQUIPMENT)
(1) 1/2" TO 106 FT TOWER LIGHTING
(OTHER CONSIDERED EQUIPMENT-IN CONDUIT)
(1) 3/8" TO 98 FT LEVEL
(1) 3/8" TO 103 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(1) 3/8" TO 98 FT LEVEL
(4) 7/8" TO 98 FT LEVEL
(2) 7/8" TO 103 FT LEVEL
(6) 1-1/4" TO 103 FT LEVEL
Q4
Q1
Q3
Q2

APPENDIX C

ADDITIONAL CALCULATIONS

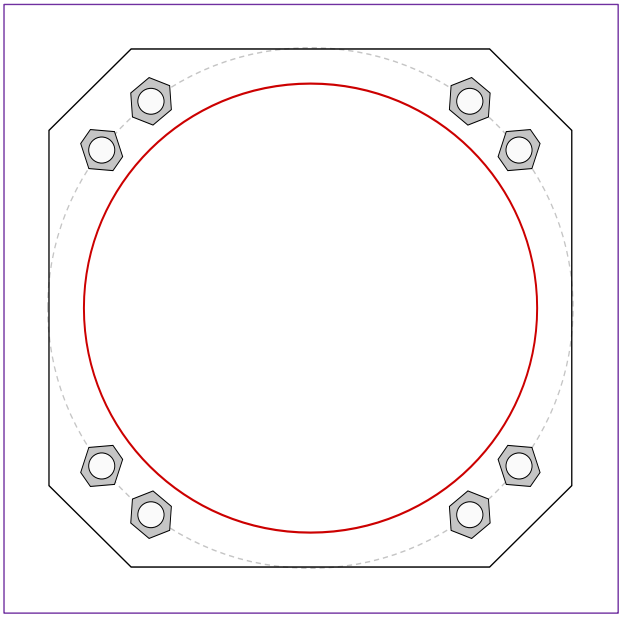
Monopole Base Plate Connection

Site Info	
BU #	842861
Site Name	East Hartford Hochanun
Order #	654558 REV. 3

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	1.375

Applied Loads	
Moment (kip-ft)	1882.32
Axial Force (kips)	28.18
Shear Force (kips)	22.68

**TIA-222-H Section 15.5 Applied*



Connection Properties

Anchor Rod Data

(8) 2-1/4" ø bolts (A615-75 N; Fy=75 ksi, Fu=100 ksi) on 45.2" BC

Anchor Spacing: 6 in

Base Plate Data

45" W x 2.75" Plate (A572-50; Fy=50 ksi, Fu=65 ksi); Clip: 7.07 in

Stiffener Data

N/A

Pole Data

39" x 0.28125" 18-sided pole (A572-65; Fy=65 ksi, Fu=80 ksi)

Analysis Results

Anchor Rod Summary *(units of kips, kip-in)*

Pu_t = 246.09	ϕPn_t = 243.75	**Stress Rating**
Vu = 2.83	ϕVn = 149.1	**97.1%**
Mu = n/a	ϕMn = n/a	**Pass**

Base Plate Summary

Max Stress (ksi):	31.24	(Flexural)
Allowable Stress (ksi):	45	
Stress Rating:	**66.1%**	**Pass**

Drilled Pier Foundation

BU # :	842861
Site Name:	East Hartford Hochanum
Order Number:	654558 REV. 3
TIA-222 Revison:	H
Tower Type:	Monopole

Check Limitation	
Apply TIA-222-H Section 15.5:	☑
N/A	☐
Design Options	
Input Effective Depths (else Actual):	☐
Consider non-tapered moment capacity:	☐
Check Shear along Depth of Pier:	☑
Utilize Shear-Friction Methodology:	☐
Override Critical Depth:	☐

Go to Soil Calculations

Applied Loads	Comp.	Uplift
Moment (kip-ft)	1882.31	
Axial Force (kips)	28.21	
Shear Force (kips)	22.63	

Material Properties		
Concrete Strength, f'c:	3	ksi
Rebar Strength, Fy:	60	ksi
Tie Yield Strength, Fyt:	40	ksi

Pier Design Data		
Depth	44.75	ft
Ext. Above Grade	0.25	ft
Pier Section 1		
From 0.25' above grade to 44.75' below grade		
Pier Diameter	7.5	ft
Rebar Quantity	22	
Rebar Size	10	
Rebar Cage Diameter	81	in
Tie Size		
Tie Spacing		in

Rebar & Pier Options

Embedded Pole Inputs

Belled Pier Inputs

Analysis Results		
Soil Lateral Check	*Compression*	*Uplift*
$D_{v=0}$ (ft from TOC)	7.92	-
Soil Safety Factor	9.16	-
Max Moment (kip-ft)	2039.56	-
Rating*	*13.8%*	-
Soil Vertical Check	*Compression*	*Uplift*
Skin Friction (kips)	432.91	-
End Bearing (kips)	77.04	-
Weight of Concrete (kips)	237.86	-
Total Capacity (kips)	509.94	-
Axial (kips)	266.07	-
Rating*	*49.7%*	-
Reinforced Concrete Flexure	*Compression*	*Uplift*
Critical Depth (ft from TOC)	7.58	-
Critical Moment (kip-ft)	2039.12	-
Critical Moment Capacity	4930.48	-
Rating*	*39.4%*	-
Reinforced Concrete Shear	*Compression*	*Uplift*
Critical Depth (ft from TOC)	21.49	-
Critical Shear (kip)	180.78	-
Critical Shear Capacity	509.54	-
Rating*	*33.8%*	-

Structural Foundation Rating*	**39.4%**
Soil Interaction Rating*	**49.7%**

*Rating per TIA-222-H Section 15.5

Soil Profile

Groundwater Depth	8.5

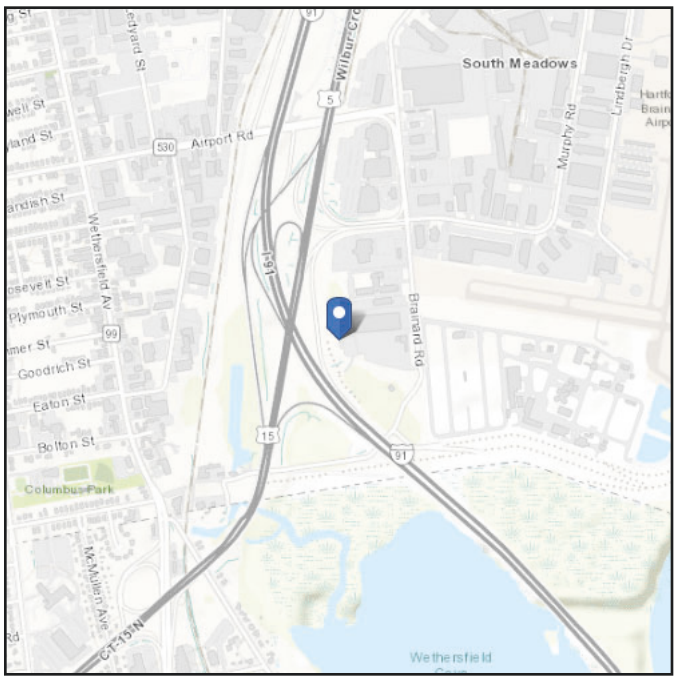
# of Layers	13

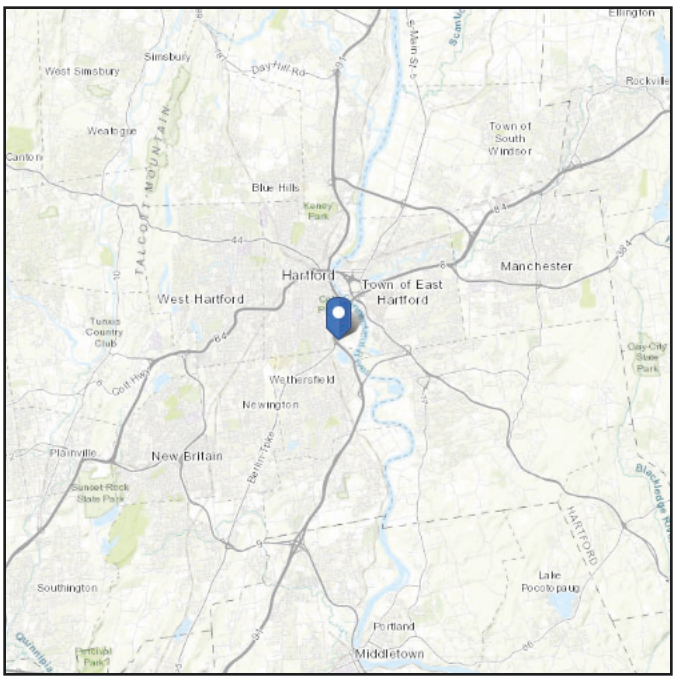
Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ_{soil} (pcf)	$\gamma_{concrete}$ (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	1	1	108	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
2	1	3.5	2.5	114	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
3	3.5	3.75	0.25	110	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
4	3.75	6	2.25	110	150	0.775		0.426	0.426	0.66	0.66			Cohesive
5	6	8.5	2.5	112	150		34	0.000	0.000	0.38	0.38			Cohesionless
6	8.5	13.5	5	49.6	87.6		34	0.000	0.000	0.51	0.51			Cohesionless
7	13.5	18.5	5	50.6	87.6		38	0.00	0.00	0.71	0.71			Cohesionless
8	18.5	23.5	5	51.6	87.6		45	0.00	0.00	1.05	1.05			Cohesionless
9	23.5	28.5	5	50.6	87.6		35	0.00	0.00	0.90	0.90			Cohesionless
10	28.5	33.5	5	47.6	87.6	0.8		0.44	0.44	0.68	0.68			Cohesive
11	33.5	38.5	5	47.6	87.6	0.25		0.14	0.14	0.25	0.25			Cohesive
12	38.5	43.5	5	47.6	87.6	0.2		0.11	0.11	0.20	0.20			Cohesive
13	43.5	44.75	1.25	47.6	87.6	0.45		0.25	0.25	0.45	0.45	2.325		Cohesive

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Latitude:**	41.732978
Risk Category:	II	**Longitude:**	-72.662075
Soil Class:	E - Soft Clay Soil	**Elevation:**	9.69175231472924 ft (NAVD 88)





Wind

Results:

Wind Speed	118 Vmph
10-year MRI	75 Vmph
25-year MRI	84 Vmph
50-year MRI	90 Vmph
100-year MRI	97 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2

Date Accessed: Sat Dec 09 2023

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Seismic

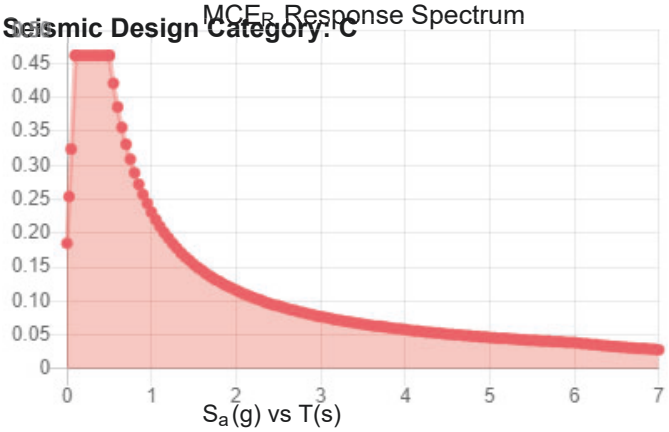
Site Soil Class: E - Soft Clay Soil

Results:

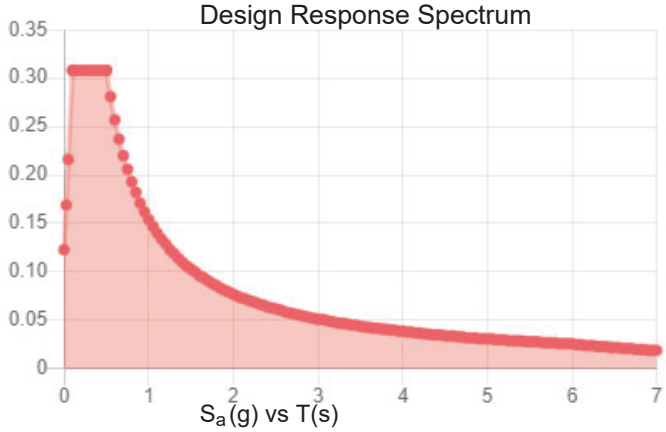
S_S :	0.193	S_{D1} :	0.154
S_1 :	0.055	T_L :	6
F_a :	2.4	PGA :	0.104
F_v :	4.2	PGA_M :	0.248
S_{MS} :	0.462	F_{PGA} :	2.378
S_{M1} :	0.231	I_e :	1
S_{DS} :	0.308	C_v :	0.7

Seismic Design Category: C

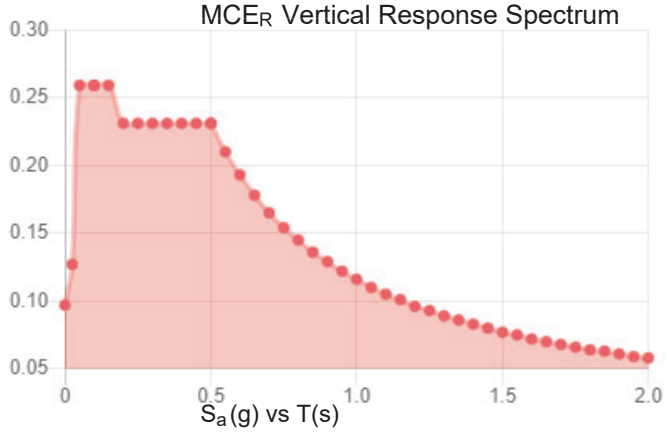
MCE_R Response Spectrum



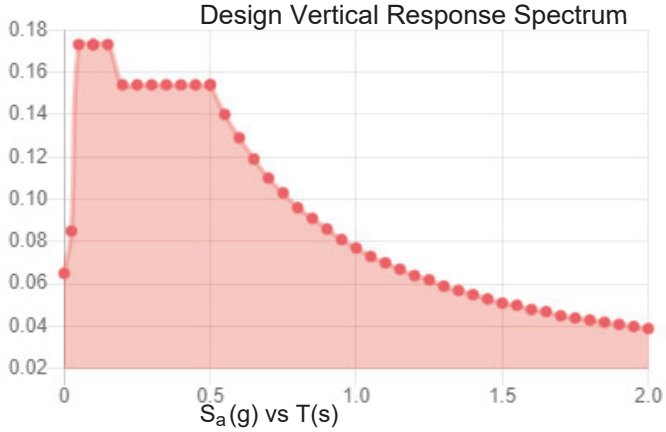
Design Response Spectrum



MCE_R Vertical Response Spectrum



Design Vertical Response Spectrum



Data Accessed: Sat Dec 09 2023

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

Ice

Results:

Ice Thickness:	1.50 in.
Concurrent Temperature:	15 F
Gust Speed	50 mph
Data Source:	Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
Date Accessed:	Sat Dec 09 2023

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.