Date: **November 15, 2022**

Columbia County Building Department — Plans Reviewed for Code Compliance — State of Florida

MORRISON HERSHFIELD

Morrison Hershfield
1455 Lincoln Parkway, Suite 500
Atlanta, GA 30346
(770) 379-8500

Structural Analysis Report

1 1 **- *1* Co-Locate**

Site Number:	10096114
Site Name:	West Lake City
FA Number:	10096114
BU Number:	824653
Site Name:	Hwy90 at NW Brown Rd
JDE Job Number:	735331
Work Order Number:	2180921
Order Number:	638092 Rev. 0

1 1 **Morrison Hershfield Project Number:** CN3-182R5 / 2300001

1 **297 NW Brown Rd, Lake City, Columbia County, FL 32055**
Latitude *1 8* *8*, Longitude *1 8* *8*
197 Foot – Valmont Monopole Tower

Morrison Hershfield 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 Capacity**

This analysis utilizes an ultimate 3-second gust wind speed of 118 mph as required by the 2020 Florida Building Code 7th Edition. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Respectfully submitted by:

G. Lance Cooke, P.E. (FL License No. 68787)
Senior Engineer

Certificate of Authorization # 8508

G. LANCE COOKE LICENSE No 68787 STATE OF FLORIDA PROFESSIONAL ENGINEER
EXP 2/28/23

Digitally signed by G. Lance Cooke
Date: 2022.11.15 16:16:27+05'30'

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1) INTRODUCTION

This tower is a 197 ft monopole tower designed by Valmont Industries, Inc.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	118 mph
Exposure Category:	C
Topographic Factor:	1
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)
185.0	186.0	6	commscope	NNHH-65B-R4 w/ Mount Pipe	10 6 3 2	1-5/8 3/4 3/8 7/8
		3	commscope	SBNHH-1D65B w/ Mount Pipe		
		3	ericsson	AIR 6419 B77G w/ Mount Pipe		
		3	ericsson	AIR 6449 B77D C-BAND w/ Mount Pipe		
		3	ericsson	RRUS 4415 B25		
		3	ericsson	RRUS 4449 B5/B12		
		2	raycap	DC9-48-60-24-8C-EV		
	185.0	3	ericsson	RRUS 32		
		3	ericsson	RRUS 4426 B66		
		3	ericsson	RRUS 4478 B14		
		3	ericsson	RRUS-11		
		1	raycap	DC6-48-60-18-8C		
		1	-	Platform Mount [LP 304-1_HR-1]		

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)
192.0	195.0	3	commscope	FFVV-65C-R3-V1_TMO w/ Mount Pipe	12	1-5/8
		3	ericsson	AIR6449 B41_T-MOBILE w/ Mount Pipe		
		3	ericsson	RADIO 4460 B2/B25 B66_TMO		
		3	ericsson	RADIO 4480 B71_TMO		
	192.0	1	-	Platform Mount [LP 716-1]		
170.0	170.0	2	jma wireless	MX06FIT845-02 w/ Mount Pipe	2	1-1/4
		4	jma wireless	MX06FIT865-02 w/ Mount Pipe		
		3	ericsson	AIR 6449 B77 w/ Mount Pipe		
		3	ericsson	RADIO 4449		
		3	ericsson	RADIO 8843		
		2	raycap	RRFDC-3315-PF-48		

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
170.0	170.0	1	-	Support Rail Kit [# VZWSAMRT-PLK1]	-	-
		1	-	Platform Mount [LP 304-1]		
163.0	163.0	3	argus technologies	TLLPX310M-E w/ Mount Pipe	12 3	3/8 1/4
		2	andrew	P3F-52		
		3	alvarion	BREEZEMAX ELITE NAU		
		2	dragonwave	Horizon Compact		
		1	-	T-Arm Mount [TA 702-3]		
130.0	130.0	1	andrew	HP4-102	1	1-5/8
		1	-	Side Arm Mount [SO 301-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
4-GEOTECHNICAL REPORTS	3531109	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	3531108	CCISITES
4-TOWER MANUFACTURER DRAWINGS	4007399	CCISITES

3.1) Analysis Method

tnxTower (version 8.1.1.0), 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. 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. Morrison Hershfield 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	197 - 187.583	Pole	TP25.362x23.19x0.1875	1	-1.80	924.91	2.5	Pass
L2	187.583 - 138.667	Pole	TP36.227x24.0836x0.25	2	-18.69	1702.34	55.0	Pass
L3	138.667 - 91.5	Pole	TP46.583x34.5012x0.375	3	-30.35	3285.44	52.6	Pass
L4	91.5 - 45.083	Pole	TP56.513x44.3372x0.4375	4	-46.72	4655.91	53.8	Pass
L5	45.083 - 0	Pole	TP65.999x53.8739x0.5	5	-72.05	6417.13	52.6	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
							Summary	
						Pole (L2)	55.0	Pass
						Rating =	55.0	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	38.6	Pass
1	Base Plate		33.4	Pass
1	Base Foundation (Structure)	0	40.0	Pass
1	Base Foundation (Soil Interaction)		16.6	Pass

Structure Rating (max from all components) =	55.0%*

Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity consumed.
2) *Rating per TIA-222-H, Section 15.5

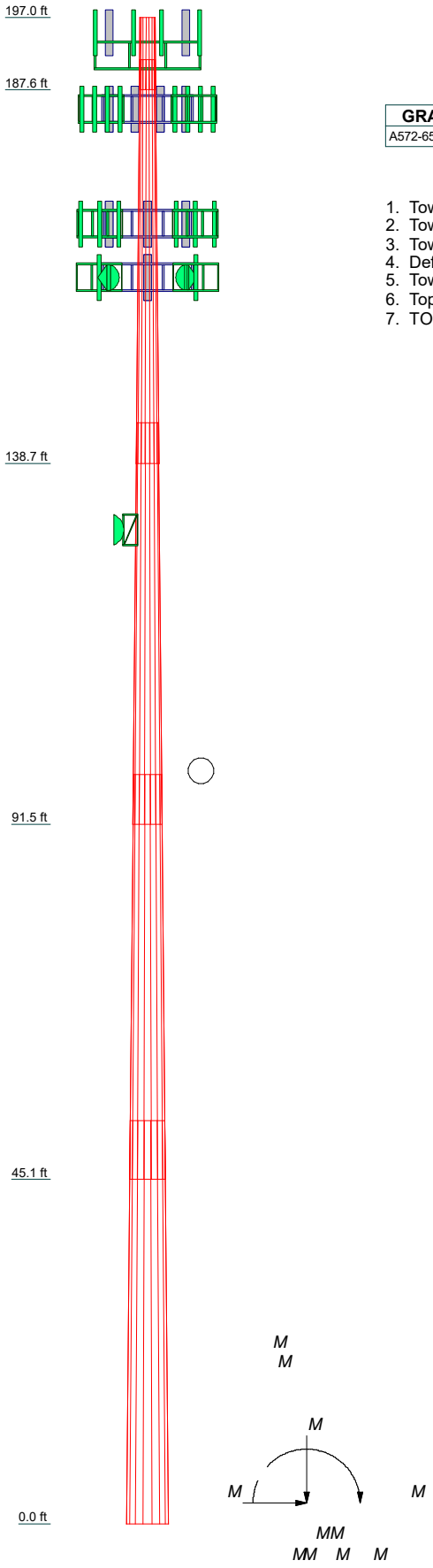
4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the proposed load 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	9.42	16	0.1875	3.92	23.1900	25.3620		0.5
2	52.83	16	0.2500	5.33	24.0836	36.2270		4.3
3	52.50	16	0.3750	6.50	34.5012	46.5830		8.6
4	52.92	16	0.4375	7.67	44.3372	56.5130		12.6
5	52.75	16	0.5000		53.8739	65.9990		17.0
							A572-65	42.9



MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Columbia County, Florida.
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. Deflections are based upon a 60 mph wind.
5. Tower Risk Category II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 55%

Consulting Engineers
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Atlanta, GA 30346
Phone: (770) 379-8500
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Job:			
Project:			
Client: Crown Castle USA	Drawn by: NN	App'd:	
Code: TIA-222-H	Date: 11/15/22	Scale: NTS	
Path: C:\Users\NNaidu\Desktop\Daily Jobs\MP\CN3-182R5\CN3-182R5 BU_824653 WO_2180921.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 Columbia County, Florida.
- Tower base elevation above sea level: 165.00 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.
- 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: $K_{es}(F_w) = 0.95$.
- 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		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-H Bracing Resist. Exemption
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-H 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		Ignore KL/ry For 60 Deg. Angle Legs		Pole Without Linear Attachments
					Pole With Shroud Or No Appurtenances
					Outside and Inside Corner Radii Are Known

Tapered Pole Section Geometry

L1	197.00-187.58	9.42	3.92	16	23.1900	25.3620	0.1875	0.7500	A572-65 (65 ksi)
L2	187.58-138.67	52.83	5.33	16	24.0836	36.2270	0.2500	1.0000	A572-65 (65 ksi)
L3	138.67-91.50	52.50	6.50	16	34.5012	46.5830	0.3750	1.5000	A572-65 (65 ksi)
L4	91.50-45.08	52.92	7.67	16	44.3372	56.5130	0.4375	1.7500	A572-65 (65 ksi)
L5	45.08-0.00	52.75		16	53.8739	65.9990	0.5000	2.0000	A572-65

											(65 ksi)

Tapered Pole Properties

L1	23.6076	13.7584	919.6688	8.1889	11.8269	77.7608	1853.2624	6.8028	4.2417	22.622
	25.8221	15.0575	1205.5601	8.9621	12.9346	93.2041	2429.3739	7.4451	4.6739	24.928
L2	25.4243	19.0073	1363.9914	8.4847	12.2826	111.0506	2748.6353	9.3981	4.2951	17.181
	36.8878	28.6917	4691.5883	12.8078	18.4758	253.9319	9454.2129	14.1865	6.7117	26.847
L3	36.3550	40.8235	6006.2215	12.1489	17.5956	341.3474	12103.3845	20.1851	6.1195	16.319
	47.4221	55.2763	14910.3497	16.4500	23.7573	627.6105	30046.4602	27.3312	8.5238	22.73
L4	46.6450	61.2675	14916.4898	15.6283	22.6120	659.6728	30058.8334	30.2935	7.9525	18.177
	57.5344	78.2604	31088.7004	19.9629	28.8216	1078.6586	62648.1216	38.6956	10.3755	23.715
L5	56.6282	85.1313	30638.0611	19.0011	27.4757	1115.0976	61740.0197	42.0930	9.7259	19.452
	67.1940	104.4709	56621.1986	23.3176	33.6595	1682.1764	114099.7112	51.6554	12.1388	24.278

L1 197.00-187.58					1	1	1			
L2 187.58-138.67					1	1	1			
L3 138.67-91.50					1	1	1			
L4 91.50-45.08					1	1	1			
L5 45.08-0.00					1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

****										
Safety Line 3/8	A	No	Surface Ar (CaAa)	197.00 - 10.00	1	1	-0.100 -0.100	0.3750		0.22
Climbing Rungs	A	No	Surface Ar (CaAa)	197.00 - 10.00	1	1	-0.150 -0.050	0.7050		1.80
FB-L98B-034-XXXXXX(3/8)	C	No	Surface Ar (CaAa)	185.00 - 10.00	2	2	-0.450 -0.420	0.3937		0.05
WR-VG86ST-BRD(3/4)	C	No	Surface Ar (CaAa)	185.00 - 10.00	6	6	-0.420 -0.280	0.7950		0.58
****										
WR-VG66ST-BRD(7/8)	C	No	Surface Ar (CaAa)	185.00 - 10.00	2	2	-0.500 -0.460	0.9570		0.91
****										

Feed Line/Linear Appurtenances - Entered As Area

****									
LDF7-50A(1-5/8)	C	No	No	Inside Pole	192.00 - 4.00	10	No Ice	0.00	0.82
HB158-21U6S24-xxM_TMO(1-5/8)	C	No	No	Inside Pole	192.00 - 4.00	2	No Ice	0.00	2.50
****									
LDF7-50A(1-5/8)	C	No	No	Inside Pole	185.00 - 10.00	10	No Ice	0.00	0.82
FB-L98B-034-XXXXXX(3/8)	C	No	No	Inside Pole	185.00 - 10.00	1	No Ice	0.00	0.05
****									
MLE HYBRID 3POWER/6FIBER RL 2(1-1/4)	B	No	No	Inside Pole	170.00 - 10.00	2	No Ice	0.00	0.68
****									
LDF1-50A(1/4)	C	No	No	Inside Pole	163.00 - 8.00	3	No Ice	0.00	0.06
LDF2-50(3/8)	C	No	No	Inside Pole	163.00 - 8.00	12	No Ice	0.00	0.08
****									
LDF7-50A(1-5/8)	C	No	No	Inside Pole	130.00 - 4.00	1	No Ice	0.00	0.82
****									

Feed Line/Linear Appurtenances Section Areas

L1	197.00-187.58	A	0.000	0.000	1.017	0.000	0.02
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.06
L2	187.58-138.67	A	0.000	0.000	5.283	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.04
		C	0.000	0.000	34.617	0.000	1.31
L3	138.67-91.50	A	0.000	0.000	5.094	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.06
		C	0.000	0.000	35.240	0.000	1.35
L4	91.50-45.08	A	0.000	0.000	5.013	0.000	0.09
		B	0.000	0.000	0.000	0.000	0.06
		C	0.000	0.000	34.680	0.000	1.34
L5	45.08-0.00	A	0.000	0.000	3.789	0.000	0.07
		B	0.000	0.000	0.000	0.000	0.05
		C	0.000	0.000	26.212	0.000	1.10

Feed Line Center of Pressure

L1	197.00-187.58	-0.7727	-0.2511	-0.4951	-0.1609
L2	187.58-138.67	2.3706	2.5565	1.6661	1.7967
L3	138.67-91.50	2.6622	2.8507	1.8331	1.9629
L4	91.50-45.08	2.7857	2.9835	1.8884	2.0225
L5	45.08-0.00	2.2860	2.4486	1.5119	1.6195

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

Shielding Factor Ka

C	° C C C d	:	° C C C V (	C C?	C ?
L1	2	Safety Line 3/8	187.58 - 197.00	1.0000	1.0000
L1	3	Climbing Rungs	187.58 - 197.00	1.0000	1.0000
L2	2	Safety Line 3/8	138.67 - 187.58	1.0000	1.0000
L2	3	Climbing Rungs	138.67 - 187.58	1.0000	1.0000
L2	10	FB-L98B-034-XXXXXX(3/8)	138.67 - 185.00	1.0000	1.0000
L2	12	WR-VG86ST-BRD(3/4)	138.67 - 185.00	1.0000	1.0000
L2	14	WR-VG66ST-BRD(7/8)	138.67 - 185.00	1.0000	1.0000
L3	2	Safety Line 3/8	91.50 - 138.67	1.0000	1.0000
L3	3	Climbing Rungs	91.50 - 138.67	1.0000	1.0000
L3	10	FB-L98B-034-XXXXXX(3/8)	91.50 - 138.67	1.0000	1.0000
L3	12	WR-VG86ST-BRD(3/4)	91.50 - 138.67	1.0000	1.0000
L3	14	WR-VG66ST-BRD(7/8)	91.50 - 138.67	1.0000	1.0000
L4	2	Safety Line 3/8	45.08 - 91.50	1.0000	1.0000
L4	3	Climbing Rungs	45.08 - 91.50	1.0000	1.0000
L4	10	FB-L98B-034-XXXXXX(3/8)	45.08 - 91.50	1.0000	1.0000
L4	12	WR-VG86ST-BRD(3/4)	45.08 - 91.50	1.0000	1.0000
L4	14	WR-VG66ST-BRD(7/8)	45.08 - 91.50	1.0000	1.0000
L5	2	Safety Line 3/8	10.00 - 45.08	1.0000	1.0000
L5	3	Climbing Rungs	10.00 - 45.08	1.0000	1.0000
L5	10	FB-L98B-034-XXXXXX(3/8)	10.00 - 45.08	1.0000	1.0000
L5	12	WR-VG86ST-BRD(3/4)	10.00 - 45.08	1.0000	1.0000
L5	14	WR-VG66ST-BRD(7/8)	10.00 - 45.08	1.0000	1.0000

Discrete Tower Loads

:	C	° C C C	C C	CC K Y C K C C C C C	C C C C C	C C C C C	C C	ZKKC ° C C C LC	ZKKC C C C LC	C C C C C
FFVV-65C-R3-V1_TMO w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	12.97	6.20	0.16
FFVV-65C-R3-V1_TMO w/ Mount Pipe	B	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	12.97	6.20	0.16
FFVV-65C-R3-V1_TMO w/ Mount Pipe	C	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	12.97	6.20	0.16

AIR6449 B41_T-MOBILE w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	5.19	2.71	0.13
AIR6449 B41_T-MOBILE w/ Mount Pipe	B	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	5.19	2.71	0.13
AIR6449 B41_T-MOBILE w/ Mount Pipe	C	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	5.19	2.71	0.13
RADIO 4460 B2/B25 B66_TMO	A	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	2.14	1.69	0.11
RADIO 4460 B2/B25 B66_TMO	B	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	2.14	1.69	0.11
RADIO 4460 B2/B25 B66_TMO	C	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	2.14	1.69	0.11
RADIO 4480 B71_TMO	A	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	2.85	1.38	0.09
RADIO 4480 B71_TMO	B	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	2.85	1.38	0.09
RADIO 4480 B71_TMO	C	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	2.85	1.38	0.09
8' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	192.00	No Ice	1.90	1.90	0.03
8' x 2" Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	192.00	No Ice	1.90	1.90	0.03
8' x 2" Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	192.00	No Ice	1.90	1.90	0.03
Platform Mount [LP 716-1] ****	A	None		0.0000	192.00	No Ice	26.80	26.80	1.51
SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.09	3.30	0.07
SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.09	3.30	0.07
SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.09	3.30	0.07
NNHH-65B-R4 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.55	4.23	0.11
NNHH-65B-R4 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.55	4.23	0.11
NNHH-65B-R4 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.55	4.23	0.11
RRUS 4478 B14	B	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	1.84	1.06	0.06
(2) RRUS 4478 B14	C	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	1.84	1.06	0.06
RRUS-11	A	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	2.78	1.19	0.05

(2) RRUS-11	C	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	2.78	1.19	0.05
RRUS 32	A	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	2.86	1.78	0.06
RRUS 32	B	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	2.86	1.78	0.06
RRUS 32	C	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	2.86	1.78	0.06
RRUS 4426 B66	A	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	1.64	0.73	0.05
(2) RRUS 4426 B66	B	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	1.64	0.73	0.05
DC6-48-60-18-8C	A	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	2.74	2.74	0.03
Platform Mount [LP 304-1_HR-1] *****	A	None		0.0000	185.00	No Ice	21.41	21.41	1.60
AIR 6449 B77D C-BAND w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	3.58	2.31	0.10
AIR 6449 B77D C-BAND w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	3.58	2.31	0.10
AIR 6449 B77D C-BAND w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	3.58	2.31	0.10
NNHH-65B-R4 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.55	4.23	0.11
NNHH-65B-R4 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.55	4.23	0.11
NNHH-65B-R4 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.55	4.23	0.11
AIR 6419 B77G w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.32	2.49	0.08
AIR 6419 B77G w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.32	2.49	0.08
AIR 6419 B77G w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.32	2.49	0.08
RRUS 4415 B25	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	1.64	0.68	0.04
RRUS 4415 B25	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	1.64	0.68	0.04
RRUS 4415 B25	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	1.64	0.68	0.04
RRUS 4449 B5/B12	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	1.97	1.41	0.07
RRUS 4449 B5/B12	B	From Leg	4.00 0.00	0.0000	185.00	No Ice	1.97	1.41	0.07

			1.00						
RRUS 4449 B5/B12	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	1.97	1.41	0.07
DC9-48-60-24-8C-EV	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	2.74	4.78	0.03
DC9-48-60-24-8C-EV	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	2.74	4.78	0.03
****									
(2) MX06FIT845-02 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	8.97	7.62	0.11
(2) MX06FIT865-02 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	4.54	4.71	0.10
(2) MX06FIT865-02 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	4.54	4.71	0.10
(2) RADIO 8843	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.50	2.36	0.09
RADIO 8843	B	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.50	2.36	0.09
RADIO 4449	B	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.50	2.36	0.09
(2) RADIO 4449	C	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.50	2.36	0.09
(2) RRFDC-3315-PF-48	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.79	2.51	0.03
8' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	1.90	1.90	0.03
8' x 2" Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	1.90	1.90	0.03
8' x 2" Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	1.90	1.90	0.03
Platform Mount [LP 304-1]	A	None		0.0000	170.00	No Ice	17.49	17.49	1.35
****									
AIR 6449 B77 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.65	2.72	0.11
AIR 6449 B77 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.65	2.72	0.11
AIR 6449 B77 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	170.00	No Ice	3.65	2.72	0.11
Support Rail Kit [# VZWSAMRT-PLK1]	A	None		0.0000	170.00	No Ice	4.56	4.56	0.25
****									
TLLPX310M-E w/ Mount Pipe	A	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	3.88	2.36	0.06
TLLPX310M-E w/ Mount Pipe	B	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	3.88	2.36	0.06
TLLPX310M-E w/ Mount	C	From Leg	3.00	0.0000	163.00	No Ice	3.88	2.36	0.06

Pipe			0.00 0.00						
BREEZEMAX ELITE NAU	A	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	1.87	1.28	0.04
BREEZEMAX ELITE NAU	B	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	1.87	1.28	0.04
BREEZEMAX ELITE NAU	C	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	1.87	1.28	0.04
Horizon Compact	B	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	0.72	0.37	0.01
Horizon Compact	C	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	0.72	0.37	0.01
6' x 2" Mount Pipe	A	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	1.43	1.43	0.02
6' x 2" Mount Pipe	B	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	1.43	1.43	0.02
6' x 2" Mount Pipe	C	From Leg	3.00 0.00 0.00	0.0000	163.00	No Ice	1.43	1.43	0.02
T-Arm Mount [TA 702-3]	C	None		0.0000	163.00	No Ice	4.75	4.75	0.34
****									
Side Arm Mount [SO 301-1]	C	From Leg	1.00 0.00 0.00	0.0000	130.00	No Ice	0.46	0.91	0.02
*********									

Dishes

****											
P3F-52	B	Paraboloid w/Radome	From Leg	3.00 0.00 0.00	40.0000		163.00	3.33	No Ice	8.73	0.09
P3F-52	C	Paraboloid w/Radome	From Leg	3.00 0.00 0.00	60.0000		163.00	3.33	No Ice	8.73	0.09
****											
HP4-102	C	Grid	From Leg	2.00 0.00 0.00	40.0000		130.00	4.00	No Ice	12.57	0.08
****											

Load Combinations

1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice

Z cC cC	: C
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
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	Dead+Wind 0 deg - Service
27	Dead+Wind 30 deg - Service
28	Dead+Wind 60 deg - Service
29	Dead+Wind 90 deg - Service
30	Dead+Wind 120 deg - Service
31	Dead+Wind 150 deg - Service
32	Dead+Wind 180 deg - Service
33	Dead+Wind 210 deg - Service
34	Dead+Wind 240 deg - Service
35	Dead+Wind 270 deg - Service
36	Dead+Wind 300 deg - Service
37	Dead+Wind 330 deg - Service

Maximum Member Forces

C cC	V C C	Z C C	Z C	% dC C Z cC	K C C C	CK C C (C	CK C C (C
L1	197 - 187.583	Pole	Max Tension	14	0.00	0.00	0.00
			Max. Compression	18	-3.61	8.45	-4.86
			Max. Mx	20	-1.80	12.59	0.01
			Max. My	2	-1.80	0.00	12.59
			Max. Vy	20	-4.57	9.75	0.01
			Max. Vx	14	4.57	0.01	-9.73
			Max. Torque	9			0.00
L2	187.583 - 138.667	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-18.72	622.71	-362.18
			Max. Mx	8	-18.70	-720.44	2.95
			Max. My	14	-18.69	2.68	-723.65
			Max. Vy	8	21.00	-720.44	2.95
			Max. Vx	14	21.14	2.68	-723.65
			Max. Torque	9			2.95
L3	138.667 - 91.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-30.38	1568.88	-910.26
			Max. Mx	8	-30.36	-1819.43	6.66
			Max. My	14	-30.36	4.41	-1825.47
			Max. Vy	8	26.72	-1819.43	6.66
			Max. Vx	2	-26.72	-5.22	1822.85
			Max. Torque	21			-2.02
L4	91.5 - 45.083	Pole	Max Tension	1	0.00	0.00	0.00

V C C	C	Z C	Z C	% dC Z cC	K C C C	CK C C (C	CK C C (C
			Max. Compression	18	-46.73	2720.34	-1576.14
			Max. Mx	8	-46.72	-3156.32	10.28
			Max. My	14	-46.72	5.73	-3162.52
			Max. Vy	8	32.30	-3156.32	10.28
			Max. Vx	2	-32.29	-6.83	3159.24
			Max. Torque	19			-1.70
L5	45.083 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-72.05	4325.52	-2504.09
			Max. Mx	8	-72.05	-5018.20	14.39
			Max. My	14	-72.05	7.17	-5024.48
			Max. Vy	8	37.95	-5018.20	14.39
			Max. Vx	2	-37.95	-8.64	5020.53
			Max. Torque	19			-1.70

Maximum Reactions

C	Z C	% dC C Z cC	C C	Y /C C C	Y /C C C
Pole	Max. Vert	14	72.07	0.02	-37.90
	Max. H_x	21	54.05	37.90	0.01
	Max. H_z	2	72.07	-0.04	37.91
	Max. M_x	2	5020.53	-0.04	37.91
	Max. M_z	8	5018.20	-37.91	0.09
	Max. Torsion	7	0.98	-32.80	19.02
	Min. Vert	19	54.05	32.69	-18.89
	Min. H_x	9	54.05	-37.91	0.09
	Min. H_z	14	72.07	0.02	-37.90
	Min. M_x	14	-5024.48	0.02	-37.90
	Min. M_z	20	-5017.48	37.90	0.01
	Min. Torsion	19	-1.70	32.69	-18.89

Tower Mast Reaction Summary

C Z	CC C	C C	C C	C C /C (	C C /C (	C C (
Dead Only	60.06	0.00	0.00	1.86	1.03	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	72.07	0.04	-37.91	-5020.53	-8.64	0.10
0.9 Dead+1.0 Wind 0 deg - No Ice	54.05	0.04	-37.91	-4960.13	-8.82	0.10
1.2 Dead+1.0 Wind 30 deg - No Ice	72.07	18.96	-32.81	-4346.07	-2513.38	-0.51
0.9 Dead+1.0 Wind 30 deg - No Ice	54.05	18.96	-32.81	-4293.81	-2483.13	-0.51
1.2 Dead+1.0 Wind 60 deg - No Ice	72.07	32.80	-19.02	-2520.86	-4341.79	-0.97
0.9 Dead+1.0 Wind 60 deg - No Ice	54.05	32.80	-19.02	-2490.79	-4289.36	-0.98
1.2 Dead+1.0 Wind 90 deg - No Ice	72.07	37.91	-0.09	-14.39	-5018.20	-0.63
0.9 Dead+1.0 Wind 90 deg - No Ice	54.05	37.91	-0.09	-14.78	-4957.56	-0.64
1.2 Dead+1.0 Wind 120 deg - No Ice	72.07	32.85	19.01	2518.33	-4347.33	-0.13
0.9 Dead+1.0 Wind 120 deg - No Ice	54.05	32.85	19.01	2487.18	-4294.87	-0.15
1.2 Dead+1.0 Wind 150 deg - No Ice	72.07	19.00	32.94	4367.82	-2513.73	0.16
0.9 Dead+1.0 Wind 150 deg - No Ice	54.05	19.00	32.94	4314.16	-2483.55	0.15
1.2 Dead+1.0 Wind 180 deg - No Ice	72.07	-0.02	37.90	5024.48	7.17	0.25
0.9 Dead+1.0 Wind 180 deg - No Ice	54.05	-0.02	37.90	4962.85	6.72	0.24
1.2 Dead+1.0 Wind 210 deg - No Ice	72.07	-18.85	32.74	4337.84	2495.64	1.20
0.9 Dead+1.0 Wind 210 deg - No Ice	54.05	-18.85	32.74	4284.51	2464.98	1.20
1.2 Dead+1.0 Wind 240 deg - No Ice	72.07	-32.69	18.89	2504.09	4325.52	1.69
0.9 Dead+1.0 Wind 240 deg - No Ice	54.05	-32.69	18.89	2473.04	4272.64	1.70
1.2 Dead+1.0 Wind 270 deg - No Ice	72.07	-37.90	-0.01	2.48	5017.48	1.32
0.9 Dead+1.0 Wind 270 deg - No Ice	54.05	-37.90	-0.01	1.82	4956.20	1.33
1.2 Dead+1.0 Wind 300 deg - No Ice	72.07	-32.92	-19.04	-2518.88	4361.51	0.67
0.9 Dead+1.0 Wind 300 deg - No Ice	54.05	-32.92	-19.04	-2488.90	4308.21	0.68
1.2 Dead+1.0 Wind 330 deg - No Ice	72.07	-18.97	-32.91	-4358.49	2510.65	0.51

0.9 Dead+1.0 Wind 330 deg - No Ice	54.05	-18.97	-32.91	-4306.12	2479.85	0.52
Dead+Wind 0 deg - Service	60.06	0.01	-9.23	-1212.60	-1.31	0.02
Dead+Wind 30 deg - Service	60.06	4.62	-7.99	-1049.50	-606.96	-0.13
Dead+Wind 60 deg - Service	60.06	7.99	-4.63	-608.16	-1049.08	-0.24
Dead+Wind 90 deg - Service	60.06	9.23	-0.02	-2.10	-1212.63	-0.16
Dead+Wind 120 deg - Service	60.06	8.00	4.63	610.32	-1050.42	-0.04
Dead+Wind 150 deg - Service	60.06	4.63	8.02	1057.53	-607.06	0.04
Dead+Wind 180 deg - Service	60.06	-0.01	9.23	1216.32	2.50	0.06
Dead+Wind 210 deg - Service	60.06	-4.59	7.97	1050.27	604.22	0.29
Dead+Wind 240 deg - Service	60.06	-7.96	4.60	606.86	1046.68	0.42
Dead+Wind 270 deg - Service	60.06	-9.23	-0.00	1.97	1214.01	0.33
Dead+Wind 300 deg - Service	60.06	-8.02	-4.64	-607.70	1055.40	0.17
Dead+Wind 330 deg - Service	60.06	-4.62	-8.01	-1052.51	607.86	0.13

Solution Summary

1	0.00	-60.06	0.00	0.00	60.06	0.00	0.000%
2	0.04	-72.07	-37.91	-0.04	72.07	37.91	0.000%
3	0.04	-54.05	-37.91	-0.04	54.05	37.91	0.000%
4	18.96	-72.07	-32.81	-18.96	72.07	32.81	0.000%
5	18.96	-54.05	-32.81	-18.96	54.05	32.81	0.000%
6	32.80	-72.07	-19.02	-32.80	72.07	19.02	0.000%
7	32.80	-54.05	-19.02	-32.80	54.05	19.02	0.000%
8	37.91	-72.07	-0.09	-37.91	72.07	0.09	0.000%
9	37.91	-54.05	-0.09	-37.91	54.05	0.09	0.000%
10	32.85	-72.07	19.01	-32.85	72.07	-19.01	0.000%
11	32.85	-54.05	19.01	-32.85	54.05	-19.01	0.000%
12	19.00	-72.07	32.94	-19.00	72.07	-32.94	0.000%
13	19.00	-54.05	32.94	-19.00	54.05	-32.94	0.000%
14	-0.02	-72.07	37.90	0.02	72.07	-37.90	0.000%
15	-0.02	-54.05	37.90	0.02	54.05	-37.90	0.000%
16	-18.85	-72.07	32.74	18.85	72.07	-32.74	0.000%
17	-18.85	-54.05	32.74	18.85	54.05	-32.74	0.000%
18	-32.69	-72.07	18.89	32.69	72.07	-18.89	0.000%
19	-32.69	-54.05	18.89	32.69	54.05	-18.89	0.000%
20	-37.90	-72.07	-0.01	37.90	72.07	0.01	0.000%
21	-37.90	-54.05	-0.01	37.90	54.05	0.01	0.000%
22	-32.92	-72.07	-19.04	32.92	72.07	19.04	0.000%
23	-32.92	-54.05	-19.04	32.92	54.05	19.04	0.000%
24	-18.97	-72.07	-32.91	18.97	72.07	32.91	0.000%
25	-18.97	-54.05	-32.91	18.97	54.05	32.91	0.000%
26	0.01	-60.06	-9.23	-0.01	60.06	9.23	0.000%
27	4.62	-60.06	-7.99	-4.62	60.06	7.99	0.000%
28	7.99	-60.06	-4.63	-7.99	60.06	4.63	0.000%
29	9.23	-60.06	-0.02	-9.23	60.06	0.02	0.000%
30	8.00	-60.06	4.63	-8.00	60.06	-4.63	0.000%
31	4.63	-60.06	8.02	-4.63	60.06	-8.02	0.000%
32	-0.01	-60.06	9.23	0.01	60.06	-9.23	0.000%
33	-4.59	-60.06	7.97	4.59	60.06	-7.97	0.000%
34	-7.96	-60.06	4.60	7.96	60.06	-4.60	0.000%
35	-9.23	-60.06	-0.00	9.23	60.06	0.00	0.000%
36	-8.02	-60.06	-4.64	8.02	60.06	4.64	0.000%
37	-4.62	-60.06	-8.01	4.62	60.06	8.01	0.000%

Non-Linear Convergence Results

1	Yes	4	0.00000001	0.00000001

2	Yes	4	0.00000001	0.00081485
3	Yes	4	0.00000001	0.00040838
4	Yes	6	0.00000001	0.00009513
5	Yes	5	0.00000001	0.00073706
6	Yes	6	0.00000001	0.00009730
7	Yes	5	0.00000001	0.00075451
8	Yes	5	0.00000001	0.00006357
9	Yes	4	0.00000001	0.00071607
10	Yes	6	0.00000001	0.00009432
11	Yes	5	0.00000001	0.00073004
12	Yes	6	0.00000001	0.00009663
13	Yes	5	0.00000001	0.00074837
14	Yes	4	0.00000001	0.00066662
15	Yes	4	0.00000001	0.00025760
16	Yes	6	0.00000001	0.00009640
17	Yes	5	0.00000001	0.00074697
18	Yes	6	0.00000001	0.00009252
19	Yes	5	0.00000001	0.00071605
20	Yes	5	0.00000001	0.00007106
21	Yes	4	0.00000001	0.00080425
22	Yes	6	0.00000001	0.00009776
23	Yes	5	0.00000001	0.00075761
24	Yes	6	0.00000001	0.00009406
25	Yes	5	0.00000001	0.00072806
26	Yes	4	0.00000001	0.00006507
27	Yes	4	0.00000001	0.00044082
28	Yes	4	0.00000001	0.00047269
29	Yes	4	0.00000001	0.00008033
30	Yes	4	0.00000001	0.00043502
31	Yes	4	0.00000001	0.00046365
32	Yes	4	0.00000001	0.00006172
33	Yes	4	0.00000001	0.00047006
34	Yes	4	0.00000001	0.00041877
35	Yes	4	0.00000001	0.00009609
36	Yes	4	0.00000001	0.00048123
37	Yes	4	0.00000001	0.00043049

Maximum Tower Deflections - Service Wind

L1	197 - 187.583	29.246	31	1.3794	0.0033
L2	191.5 - 138.667	27.658	31	1.3790	0.0033
L3	144 - 91.5	15.041	31	1.0621	0.0012
L4	98 - 45.083	6.615	31	0.6636	0.0005
L5	52.75 - 0	1.859	31	0.3230	0.0002

Critical Deflections and Radius of Curvature - Service Wind

192.00	FFVV-65C-R3-V1_TMO w/ Mount Pipe	31	27.802	1.3794	0.0033	39585
185.00	SBNHH-1D65B w/ Mount Pipe	31	25.794	1.3661	0.0032	20022
170.00	(2) MX06FIT845-02 w/ Mount Pipe	31	21.605	1.2871	0.0025	10221
163.00	P3F-52	31	19.732	1.2333	0.0021	8314
130.00	HP4-102	31	12.048	0.9352	0.0008	6016

Maximum Tower Deflections - Design Wind

dC C	V C C	Y dC : C	% dC Z C	C C C	C C C
L1	197 - 187.583	120.948	12	5.7138	0.0137
L2	191.5 - 138.667	114.385	12	5.7121	0.0137
L3	144 - 91.5	62.230	12	4.4001	0.0051
L4	98 - 45.083	27.366	12	2.7478	0.0020
L5	52.75 - 0	7.690	12	1.3364	0.0007

Critical Deflections and Radius of Curvature - Design Wind

V C C	C K	% dC Z C	: C C	C C C	C C C	C C Z C C
192.00	FFVV-65C-R3-V1_TMO w/ Mount Pipe	12	114.981	5.7135	0.0137	9883
185.00	SBNHH-1D65B w/ Mount Pipe	12	106.682	5.6590	0.0133	4965
170.00	(2) MX06FIT845-02 w/ Mount Pipe	12	89.368	5.3328	0.0105	2516
163.00	P3F-52	12	81.625	5.1099	0.0088	2040
130.00	HP4-102	12	49.848	3.8738	0.0035	1465

Pole Design Data

C dC	V C C C	C C	C C C	C C	gC C	KC C C	C C	ϕ C C C	C / ϕ C
L1	197 - 187.583 (1)	TP25.362x23.19x0.1875	9.42	0.00	0.0	15.057 5	-1.80	880.86	0.002
L2	187.583 - 138.667 (2)	TP36.227x24.0836x0.25	52.83	0.00	0.0	27.714 1	-18.69	1621.28	0.012
L3	138.667 - 91.5 (3)	TP46.583x34.5012x0.375	52.50	0.00	0.0	53.486 9	-30.35	3128.99	0.010
L4	91.5 - 45.083 (4)	TP56.513x44.3372x0.437 5	52.92	0.00	0.0	75.798 3	-46.72	4434.20	0.011
L5	45.083 - 0 (5)	TP65.999x53.8739x0.5	52.75	0.00	0.0	104.47 10	-72.05	6111.55	0.012

Pole Bending Design Data

C dC	V C C C	C C	C OC	ϕ C OC	C / ϕ C	C OC	ϕ C OC	C / ϕ C
L1	197 - 187.583 (1)	TP25.362x23.19x0.1875	12.60	511.97	0.025	0.00	511.97	0.000
L2	187.583 - 138.667 (2)	TP36.227x24.0836x0.25	723.66	1282.14	0.564	0.00	1282.14	0.000
L3	138.667 - 91.5 (3)	TP46.583x34.5012x0.375	1828.31	3376.13	0.542	0.00	3376.13	0.000
L4	91.5 - 45.083 (4)	TP56.513x44.3372x0.437 5	3171.03	5729.68	0.553	0.00	5729.68	0.000
L5	45.083 - 0 (5)	TP65.999x53.8739x0.5	5039.52	9333.00	0.540	0.00	9333.00	0.000

Pole Shear Design Data

dC	C V C C C	C C	K C c C	ϕ c C C	C c / ϕ C	K C c OC	ϕ c C OC	C c / ϕ C
L1	197 - 187.583 (1)	TP25.362x23.19x0.1875	2.27	264.26	0.009	0.00	583.35	0.000
L2	187.583 - 138.667 (2)	TP36.227x24.0836x0.25	21.14	486.38	0.043	0.42	1482.13	0.000
L3	138.667 - 91.5 (3)	TP46.583x34.5012x0.375	26.84	938.70	0.029	0.16	3680.33	0.000
L4	91.5 - 45.083 (4)	TP56.513x44.3372x0.4375	32.41	1330.26	0.024	0.16	6335.25	0.000
L5	45.083 - 0 (5)	TP65.999x53.8739x0.5	38.06	1833.46	0.021	0.16	10530.33	0.000

Pole Interaction Design Data

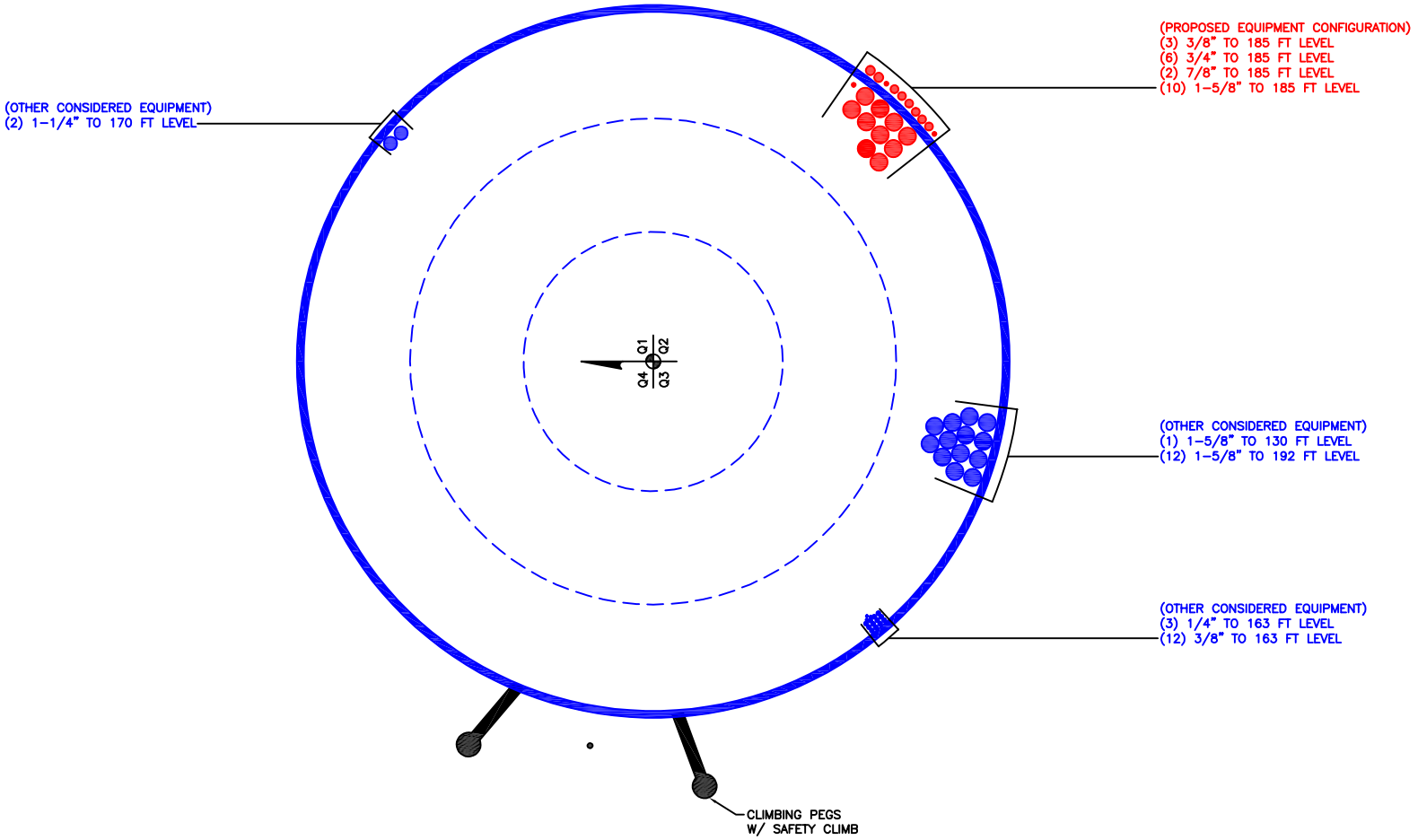
dC	C V C C C	C c / ϕ C	C c / ϕ C	C c / ϕ C	C c / ϕ C	C c / ϕ C	Z dC C C	K dC C C	Z C
L1	197 - 187.583 (1)	0.002	0.025	0.000	0.009	0.000	0.027	1.050	4.8.2
L2	187.583 - 138.667 (2)	0.012	0.564	0.000	0.043	0.000	0.578	1.050	4.8.2
L3	138.667 - 91.5 (3)	0.010	0.542	0.000	0.029	0.000	0.552	1.050	4.8.2
L4	91.5 - 45.083 (4)	0.011	0.553	0.000	0.024	0.000	0.565	1.050	4.8.2
L5	45.083 - 0 (5)	0.012	0.540	0.000	0.021	0.000	0.552	1.050	4.8.2

Section Capacity Table

S C cC	V C C	Z C C	C	Z V	C C	C C	c C Z	4 C (	° C C
L1	197 - 187.583	Pole	TP25.362x23.19x0.1875	1		-1.80	924.91	2.5	Pass
L2	187.583 - 138.667	Pole	TP36.227x24.0836x0.25	2		-18.69	1702.34	55.0	Pass
L3	138.667 - 91.5	Pole	TP46.583x34.5012x0.375	3		-30.35	3285.44	52.6	Pass
L4	91.5 - 45.083	Pole	TP56.513x44.3372x0.4375	4		-46.72	4655.91	53.8	Pass
L5	45.083 - 0	Pole	TP65.999x53.8739x0.5	5		-72.05	6417.13	52.6	Pass
								Summary	
							Pole (L2)	55.0	Pass
							RATING =	**55.0**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 824653 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

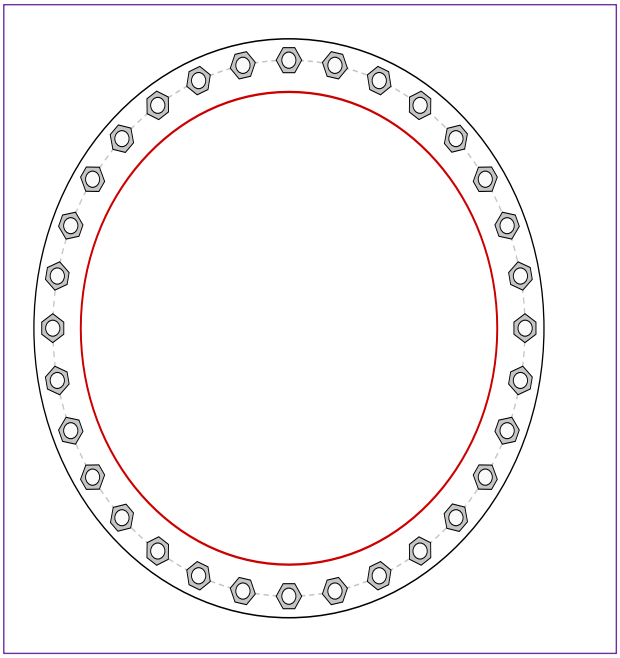
Monopole Base Plate Connection

Site Info	
BU #	824653
Site Name	Hwy90 at NW Brown R
Order #	638092 Rev. 0

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	1.25

Applied Loads	
Moment (kip-ft)	5039.51
Axial Force (kips)	72.05
Shear Force (kips)	38.06

**TIA-222-H Section 15.5 Applied*



Connection Properties

Anchor Rod Data

(32) 2-1/4" ø bolts (A615-75 N; Fy=75 ksi, Fu=100 ksi) on 74.83" BC

Base Plate Data

80.83" OD x 3" Plate (A633 Gr. E; Fy=60 ksi, Fu=70 ksi)

Stiffener Data

N/A

Pole Data

65.999" x 0.5" 16-sided pole (A572-65; Fy=65 ksi, Fu=80 ksi)

Analysis Results

Anchor Rod Summary		*(units of kips, kip-in)*
Pu_t = 98.73	ϕPn_t = 243.75	**Stress Rating**
Vu = 1.19	ϕVn = 149.1	**38.6%**
Mu = n/a	ϕMn = n/a	**Pass**

Base Plate Summary		
Max Stress (ksi):	18.96	(Flexural)
Allowable Stress (ksi):	54	
Stress Rating:	**33.4%**	**Pass**

Drilled Pier Foundation

BU # :	824653
Site Name:	Hwy90 at NW Brown Rd
Order Number:	638092 Rev. 0
TIA-222 Revison:	H
Tower Type:	Monopole

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

Go to Soil Calculations

Applied Loads	Comp.	Uplift
Moment (kip-ft)	5039.51	
Axial Force (kips)	72.07	
Shear Force (kips)	38.03	

Material Properties			Rebar 2, Fy Override (ksi)	Rebar 3, Fy Override (ksi)
Concrete Strength, f'c:	3	ksi		
Rebar Strength, Fy:	60	ksi		
Tie Yield Strength, Fyt:	40	ksi		

Pier Design Data		
Depth	39	ft
Ext. Above Grade	1	ft
Pier Section 1		
From 1' above grade to 39' below grade		
Pier Diameter	9	ft
Rebar Quantity	68	
Rebar Size	9	
Clear Cover to Ties	4	in
Tie Size	4	
Tie Spacing	12	in

Rebar & Pier Options

Embedded Pole Inputs

Belled Pier Inputs

Analysis Results		
Soil Lateral Check	*Compression*	*Uplift*
$D_{v=0}$ (ft from TOC)	10.70	-
Soil Safety Factor	7.63	-
Max Moment (kip-ft)	5369.24	-
Rating*	*16.6%*	-
Soil Vertical Check	*Compression*	*Uplift*
Skin Friction (kips)	1081.49	-
End Bearing (kips)	1717.67	-
Weight of Concrete (kips)	315.13	-
Total Capacity (kips)	2799.16	-
Axial (kips)	387.20	-
Rating*	*13.2%*	-
Reinforced Concrete Flexure	*Compression*	*Uplift*
Critical Depth (ft from TOC)	10.50	-
Critical Moment (kip-ft)	5369.03	-
Critical Moment Capacity	13838.48	-
Rating*	*37.0%*	-
Reinforced Concrete Shear	*Compression*	*Uplift*
Critical Depth (ft from TOC)	29.04	-
Critical Shear (kip)	384.76	-
Critical Shear Capacity	916.36	-
Rating*	*40.0%*	-

Structural Foundation Rating*	**40.0%**
Soil Interaction Rating*	**16.6%**

*Rating per TIA-222-H Section 15.5

Soil Profile

Groundwater Depth	9

# of Layers	8

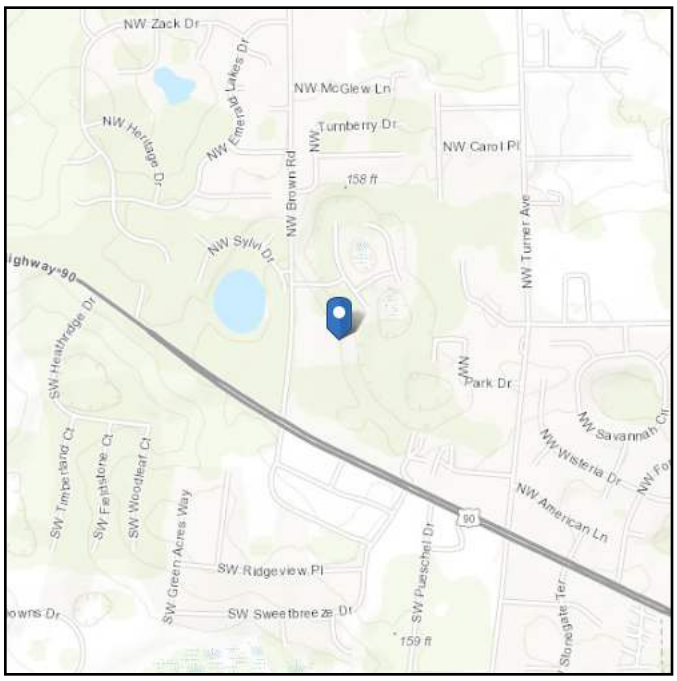
Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ_{soil} (pcf)	$\gamma_{concrete}$ (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	5	5	105	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
2	5	8	3	105	150	0	29	0.000	0.000	0.40	0.40			Cohesionless
3	8	9	1	110	150	0	31	0.000	0.000	1.00	1.00			Cohesionless
4	9	10	1	47.6	87.6	0	31	0.000	0.000	1.00	1.00			Cohesionless
5	10	16	6	57.6	87.6	0	39	0.000	0.000	1.10	1.10			Cohesionless
6	16	22	6	47.6	87.6	0	32	0.000	0.000	1.30	1.30			Cohesionless
7	22	30	8	47.6	87.6	3	0	1.65	1.65	1.70	1.70			Cohesive
8	30	39	9	52.6	87.6	4	0	2.05	2.05	2.20	2.20	36		Cohesive

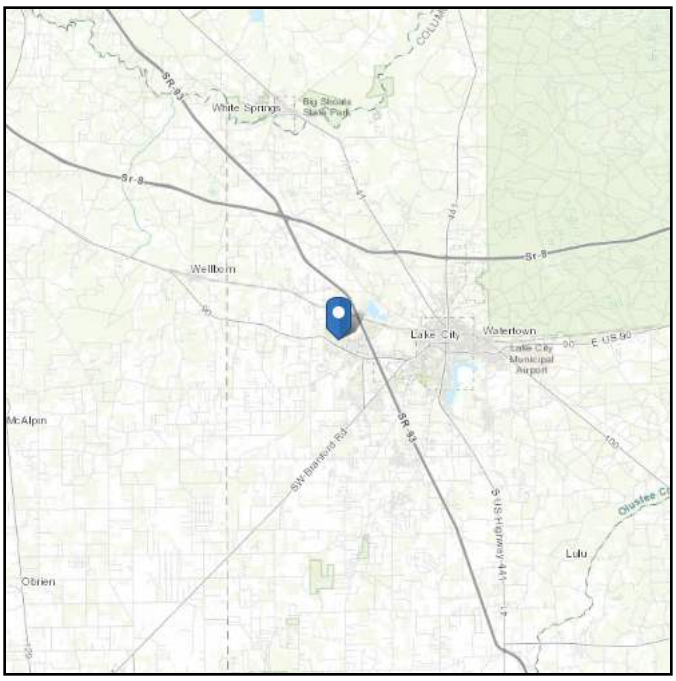
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 165.29 ft (NAVD 88)
Latitude: 30.190542
Longitude: -82.715661





Wind

Results:

Wind Speed	118 Vmph
10-year MRI	75 Vmph
25-year MRI	83 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: Tue Nov 15 2022

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.

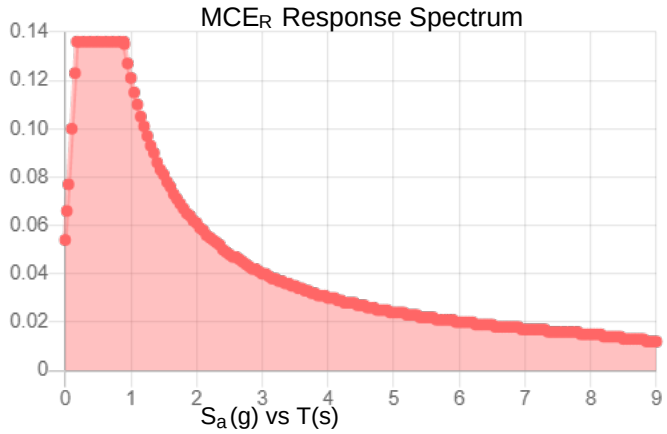
Seismic

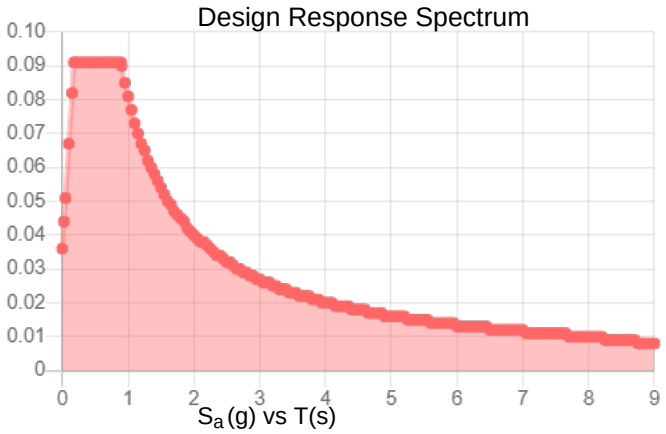
Site Soil Class: D - Stiff Soil

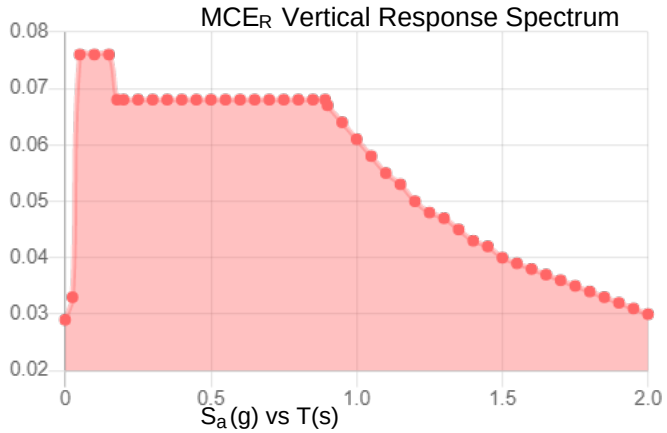
Results:

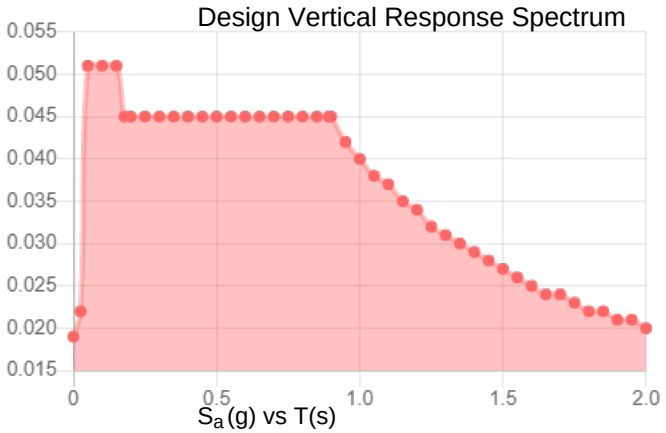
S_S :	0.085	S_{D1} :	0.081
S_1 :	0.05	T_L :	8
F_a :	1.6	PGA :	0.04
F_v :	2.4	PGA_M :	0.065
S_{MS} :	0.136	F_{PGA} :	1.6
S_{M1} :	0.121	I_e :	1
S_{DS} :	0.091	C_v :	0.7

Seismic Design Category B









Data Accessed: **Tue Nov 15 2022**

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:	0.25 in.
Concurrent Temperature:	25 F
Gust Speed	30 mph
Data Source:	Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
Date Accessed:	Tue Nov 15 2022

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.