



MORRISON HERSHFIELD

Date: **May 25, 2021**

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

Structural Analysis Report

2 2

Co-Locate

Site Number:

9JK0231D

2 2

BU Number:

824653

Site Name:

Hwy90 at NW Brown Rd

JDE Job Number:

669248

Work Order Number:

1973514

Order Number:

570259 Rev. 0

2 2

Morrison Hershfield Project Number: CN3-182R2 / 2101398

2

297 NW Brown Rd, Lake City, Columbia County, FL 32055

Latitude 2 2 , Longitude 2 2

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:

LC5: 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
2021.05.25
10:25:02-07'00'

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Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
		2	raycap	RRFDC-3315-PF-48		
		1	-	Platform Mount [LP 303-1]		
163.0	163.0	3	argus technologies	TLLPX310M-E w/ Mount Pipe	12 3	3/8 1/4
		2	andrew	P3F-52		
		2	dragonwave	HORIZON COMPACT		
		3	alvarion	BREEZEMAX ELITE NAU		
		1	-	T-Arm Mount [TA 702-3]		

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

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	-1.64	924.91	2.7	Pass
L2	187.583 - 138.667	Pole	TP36.227x24.0836x0.25	2	-16.69	1702.34	53.2	Pass
L3	138.667 - 91.5	Pole	TP46.583x34.5012x0.375	3	-29.56	3285.44	52.3	Pass
L4	91.5 - 45.083	Pole	TP56.513x44.3372x0.4375	4	-45.93	4655.91	54.1	Pass
L5	45.083 - 0	Pole	TP65.999x53.8739x0.5	5	-71.30	6417.13	53.2	Pass
							Summary	
						Pole (L4)	54.1	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
						Rating =	54.1	Pass

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	39.1	Pass
1	Base Plate		33.8	Pass
1	Base Foundation (Structure)	0	41.7	Pass
1	Base Foundation (Soil Interaction)		16.9	Pass

Notes:

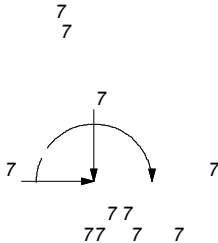
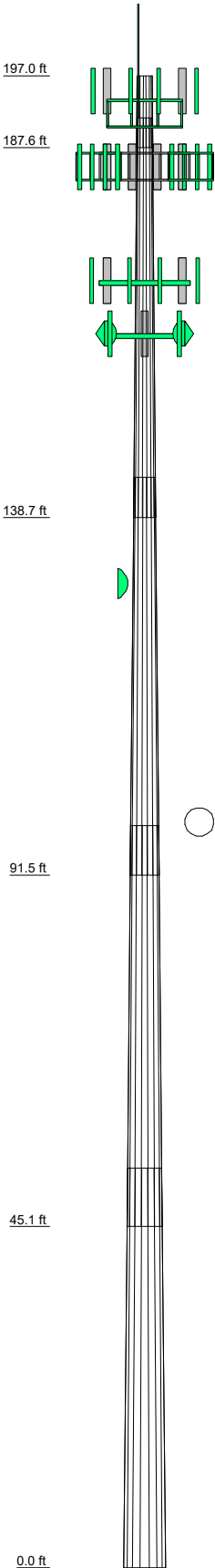
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) Rating per TIA-222-H, Section 15.5.

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

Elevation (ft)	Appurtenance	Deflection (in)	Tilt (°)	Twist (°)
130.0	HP4-102	12.134	0.9354	0.0017

APPENDIX A
TNXTOWER OUTPUT

Section	1	2	3	4	5
Length (ft)	9.42	52.83	52.50	52.92	52.75
Number of Sides	16	16	16	16	16
Thickness (in)	0.1875	0.2500	0.3750	0.4375	0.5000
Socket Length (ft)	3.92	5.33	6.50	7.67	
Top Dia (in)	23.1900	24.0636	34.5012	44.3372	53.8739
Bot Dia (in)	25.3620	36.2270	46.5830	56.5130	65.9990
Grade	A572-65				
Weight (K)	0.5	4.3	8.6	12.6	17.0



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: 54.1%



Consulting Engineers

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Phone: (770) 379-8500
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Job:

Project:

Client: Crown Castle USA	Drawn by: AP	App'd:
Code: TIA-222-H	Date: 05/25/21	Scale: NTS
Path:	Dwg No. E-1	

C:\Users\APerial\OneDrive - MORRISON HERSHFIELD\Documents\CN3-16292 SAAnalysis\CN3-16292 BU E-101214.dwg

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.

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

N	Δ V	N	N	N	N	N	N	N	N	N
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)	

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 ZZXX N NLDKWH
 ME

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

Discrete Tower Loads

Lighting Rod 3/4" x 4'	C	From Leg	0.00 0.00 2.00	0.0000	197.00	No Ice	0.30	0.30	0.03	

FFV-65C-R3-V1_TMO	A	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	12.95	4.89	0.12	
FFV-65C-R3-V1_TMO	B	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	12.95	4.89	0.12	
FFV-65C-R3-V1_TMO	C	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	12.95	4.89	0.12	

AIR6449 B41_T-MOBILE	A	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	5.66	2.48	0.11	
AIR6449 B41_T-MOBILE	B	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	5.66	2.48	0.11	
AIR6449 B41_T-MOBILE	C	From Leg	4.00 0.00 3.00	0.0000	192.00	No Ice	5.66	2.48	0.11	

NLWOLF
 ZZXX N NLDKWH
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	N	°	N	N	Y	K	N	N	N	Z _K K _K N	Z _K K _K N	N
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			
(3) 8' x 2" Mount Pipe	A	From Leg	1.00 0.00 0.00	0.0000	192.00	No Ice	1.90	1.90	0.03			
(3) 8' x 2" Mount Pipe	B	From Leg	1.00 0.00 0.00	0.0000	192.00	No Ice	1.90	1.90	0.03			
(3) 8' x 2" Mount Pipe	C	From Leg	1.00 0.00 0.00	0.0000	192.00	No Ice	1.90	1.90	0.03			
Square Face Snub Platform [#T1507KTHD- 996C9-M-H] *****	C	None		0.0000	192.00	No Ice	27.59	27.59	1.17			
7772.00	B	From Leg	4.00 0.00 -2.00	0.0000	185.00	No Ice	8.61	4.72	0.04			
7772.00	C	From Leg	4.00 0.00 -2.00	0.0000	185.00	No Ice	8.61	4.72	0.04			
(2) SBNHH-1D65B	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.16	2.49	0.04			
(2) SBNHH-1D65B	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.16	2.49	0.04			
(2) SBNHH-1D65B	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	4.16	2.49	0.04			
NNHH-65B-R4	A	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.62	3.01	0.08			
NNHH-65B-R4	B	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.62	3.01	0.08			
NNHH-65B-R4	C	From Leg	4.00 0.00 1.00	0.0000	185.00	No Ice	7.62	3.01	0.08			
(2) LGP 17401	A	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	0.82	0.47	0.02			
(2) LGP 17401	B	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	0.82	0.47	0.02			
(2) LGP 17401	C	From Leg	4.00 0.00 0.00	0.0000	185.00	No Ice	0.82	0.47	0.02			
(2) RRUS 11	A	From Leg	4.00	0.0000	185.00	No Ice	2.78	1.19	0.05			

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:	N	°	N	N	Q	K	N		N	N	Z _K K _K N	Z _K K _K N	N
			N	N	Y	N	K		N		N	N	N
			N			N		N	N		N	N	N
						N		N	N		N	N	N
						N		N	N	L _N	L _N	N	
						N		N					N
						Λ							
*****					0.00								

Station	Lat	Long	Alt	Dist	Time	Temp	Hum	Wind	Dir	Speed	Pressure

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	1.00 0.00 0.00	40.0000			130.00	4.00	No Ice	12.57 0.08

Z	W	:	N
W			
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		
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		

~~NLWOLF~~
 ZZ ~~7X~~ N NLDKWH
 MW

Maximum Member Forces	
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Maximum Reactions

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~~NLWOLEF~~
 ZZ ~~7X~~ N NLDK ~~VH~~
~~Nk~~

N	Z	N	$\% \frac{W}{N}$	N	Y	$\frac{O}{N}$	Y	$\frac{O}{N}$
			Z					
	Min. H_z		14			-0.04		-38.51
	Min. M_x		14			-0.04		-38.51
	Min. M_z		20			38.59		0.08
	Min. Torsion		10			-33.48		-19.37

Tower Mast Reaction Summary	
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	N	N	N	N	N	N	N
Z	N	N	N	N	N	N	N
	c	c	c	c	c	c	c
Dead Only	59.44	-0.00	0.00	2.38	2.61	0.00	
1.2 Dead+1.0 Wind 0 deg - No Ice	71.32	-0.03	-38.52	-5059.31	6.52	-1.90	
0.9 Dead+1.0 Wind 0 deg - No Ice	53.49	-0.03	-38.52	-5002.50	5.63	-1.90	
1.2 Dead+1.0 Wind 30 deg - No Ice	71.32	19.25	-33.31	-4373.01	-2526.89	-0.71	
0.9 Dead+1.0 Wind 30 deg - No Ice	53.49	19.25	-33.31	-4323.99	-2498.95	-0.71	
1.2 Dead+1.0 Wind 60 deg - No Ice	71.32	33.37	-19.27	-2528.52	-4379.81	0.70	
0.9 Dead+1.0 Wind 60 deg - No Ice	53.49	33.37	-19.27	-2500.51	-4330.81	0.69	
1.2 Dead+1.0 Wind 90 deg - No Ice	71.32	38.61	-0.02	-0.57	-5069.96	2.44	
0.9 Dead+1.0 Wind 90 deg - No Ice	53.49	38.61	-0.02	-1.32	-5013.08	2.43	
1.2 Dead+1.0 Wind 120 deg - No Ice	71.32	33.48	19.37	2550.03	-4398.44	3.47	
0.9 Dead+1.0 Wind 120 deg - No Ice	53.49	33.48	19.37	2520.26	-4349.22	3.46	
1.2 Dead+1.0 Wind 150 deg - No Ice	71.32	19.40	33.50	4409.12	-2549.99	3.40	
0.9 Dead+1.0 Wind 150 deg - No Ice	53.49	19.40	33.50	4358.17	-2521.80	3.39	
1.2 Dead+1.0 Wind 180 deg - No Ice	71.32	0.04	38.51	5064.59	-4.00	2.28	
0.9 Dead+1.0 Wind 180 deg - No Ice	53.49	0.04	38.51	5006.19	-4.78	2.27	
1.2 Dead+1.0 Wind 210 deg - No Ice	71.32	-19.14	33.24	4366.14	2513.22	1.39	
0.9 Dead+1.0 Wind 210 deg - No Ice	53.49	-19.14	33.24	4315.68	2483.79	1.39	
1.2 Dead+1.0 Wind 240 deg - No Ice	71.32	-33.26	19.14	2513.10	4367.61	0.02	
0.9 Dead+1.0 Wind 240 deg - No Ice	53.49	-33.26	19.14	2483.74	4317.08	0.03	
1.2 Dead+1.0 Wind 270 deg - No Ice	71.32	-38.59	-0.08	-10.03	5073.22	-1.71	
0.9 Dead+1.0 Wind 270 deg - No Ice	53.49	-38.59	-0.08	-10.67	5014.68	-1.70	
1.2 Dead+1.0 Wind 300 deg - No Ice	71.32	-33.55	-19.40	-2549.29	4416.57	-2.91	
0.9 Dead+1.0 Wind 300 deg - No Ice	53.49	-33.55	-19.40	-2521.04	4365.47	-2.90	
1.2 Dead+1.0 Wind 330 deg - No Ice	71.32	-19.37	-33.47	-4398.49	2550.89	-2.72	
0.9 Dead+1.0 Wind 330 deg - No Ice	53.49	-19.37	-33.47	-4349.18	2521.02	-2.71	
Dead+Wind 0 deg - Service	59.44	-0.01	-9.38	-1222.49	3.53	-0.46	
Dead+Wind 30 deg - Service	59.44	4.69	-8.11	-1056.40	-609.51	-0.17	
Dead+Wind 60 deg - Service	59.44	8.13	-4.69	-610.08	-1057.88	0.17	
Dead+Wind 90 deg - Service	59.44	9.40	-0.01	1.64	-1224.89	0.59	
Dead+Wind 120 deg - Service	59.44	8.15	4.72	618.84	-1062.40	0.84	

N
f JG N N N N N N N
N N N N N N N N N

NLVWOLF
ZZ N NLDKVN
N.

2	Yes	4	0.00000001	0.00079500
3	Yes	4	0.00000001	0.00045195
4	Yes	6	0.00000001	0.00006791
5	Yes	5	0.00000001	0.00056811
6	Yes	6	0.00000001	0.00006709
7	Yes	5	0.00000001	0.00056112
8	Yes	5	0.00000001	0.00005993
9	Yes	4	0.00000001	0.00070026
10	Yes	6	0.00000001	0.00007118
11	Yes	5	0.00000001	0.00059519
12	Yes	6	0.00000001	0.00006719
13	Yes	5	0.00000001	0.00056098
14	Yes	4	0.00000001	0.00084433
15	Yes	4	0.00000001	0.00048953
16	Yes	6	0.00000001	0.00006810
17	Yes	5	0.00000001	0.00056917
18	Yes	6	0.00000001	0.00006774
19	Yes	5	0.00000001	0.00056587
20	Yes	4	0.00000001	0.00074064
21	Yes	4	0.00000001	0.00040632
22	Yes	6	0.00000001	0.00006744
23	Yes	5	0.00000001	0.00056309
24	Yes	6	0.00000001	0.00007025
25	Yes	5	0.00000001	0.00058731
26	Yes	4	0.00000001	0.00006418
27	Yes	4	0.00000001	0.00038274
28	Yes	4	0.00000001	0.00036806
29	Yes	4	0.00000001	0.00008467
30	Yes	4	0.00000001	0.00043559
31	Yes	4	0.00000001	0.00036699
32	Yes	4	0.00000001	0.00006976
33	Yes	4	0.00000001	0.00039573
34	Yes	4	0.00000001	0.00038915
35	Yes	4	0.00000001	0.00006676
36	Yes	4	0.00000001	0.00036943
37	Yes	4	0.00000001	0.00041805

Maximum Tower Deflections - Service Wind

N	V	N	Y	W	%	W	N	N
W	N	N	:	N	Z	N	N	N
L1	197 - 187.583		29.242		36	1.3701		0.0023
L2	191.5 - 138.667		27.664		36	1.3696		0.0023
L3	144 - 91.5		15.124		36	1.0595		0.0020
L4	98 - 45.083		6.678		36	0.6684		0.0010
L5	52.75 - 0		1.881		36	0.3265		0.0004

Critical Deflections and Radius of Curvature - Service Wind

V	N	K	N	%	W	:	N	N	N	N	N
N	N			Z	N	N	N	N	N	Z	N
197.00		Lighting Rod 3/4" x 4'		36	29.242		1.3701		0.0023		38667
192.00		FFVV-65C-R3-V1_TMO		36	27.808		1.3700		0.0023		38667
185.00		7772.00		36	25.813		1.3570		0.0023		20055
170.00		MX06FIT845-02 w/ Mount Pipe		36	21.653		1.2797		0.0022		10447
163.00		P3F-52		36	19.792		1.2270		0.0022		8531
130.00		HP4-102		36	12.134		0.9354		0.0017		6172

	N	V	N	Y	W	$\%$	W	N	N
	W	N	N	$:$	N	Z	N	N	N
		$\wedge$			$\wedge$		$\wedge$	$\wedge$	$\wedge$
L1		197 - 187.583			120.783	22		5.6710	0.0098
L2		191.5 - 138.667			114.269	22		5.6692	0.0098
L3		144 - 91.5			62.488	22		4.3826	0.0081
L4		98 - 45.083			27.600	22		2.7640	0.0040
L5		52.75 - 0			7.772	22		1.3497	0.0015

V	N	K	N	%	W	:	N	N	N	N	N	N
N				N	N		N	N	N	N	N	N
N				Z	N		N	N	N	N	N	N
197.00		Lighting Rod 3/4" x 4'		22			120.783	5.6710	0.0098		9600	
192.00		FFVV-65C-R3-V1_TMO		22			114.860	5.6707	0.0098		9600	
185.00		7772.00		22			106.626	5.6169	0.0097		4951	
170.00		MX06FIT845-02 w/ Mount Pipe		22			89.449	5.2964	0.0094		2568	
163.00		P3F-52		22			81.765	5.0777	0.0092		2096	
130.00		HP4-102		22			50.138	3.8685	0.0070		1508	

$\frac{N}{W}$	$\frac{V}{N}$	$\frac{N}{N}$	$\frac{N}{N}$	$\frac{N}{N}$	$\frac{N}{N}$	$\frac{gN}{N}$	$\frac{KN}{N}$	$\frac{N}{N}$	$\frac{\phi}{N}$	$\frac{N}{N}$
L1	197 - 187.583 (1)	TP25.362x23.19x0.1875	9.42	0.00	0.0	15.057 5	-1.64	880.86	0.002	
L2	187.583 - 138.667 (2)	TP36.227x24.0836x0.25	52.83	0.00	0.0	27.714 1	-16.69	1621.28	0.010	
L3	138.667 - 91.5 (3)	TP46.583x34.5012x0.375	52.50	0.00	0.0	53.486 9	-29.56	3128.99	0.009	
L4	91.5 - 45.083 (4)	TP56.513x44.3372x0.437 5	52.92	0.00	0.0	75.798 3	-45.93	4434.20	0.010	
L5	45.083 - 0 (5)	TP65.999x53.8739x0.5	52.75	0.00	0.0	104.47 10	-71.30	6111.55	0.012	

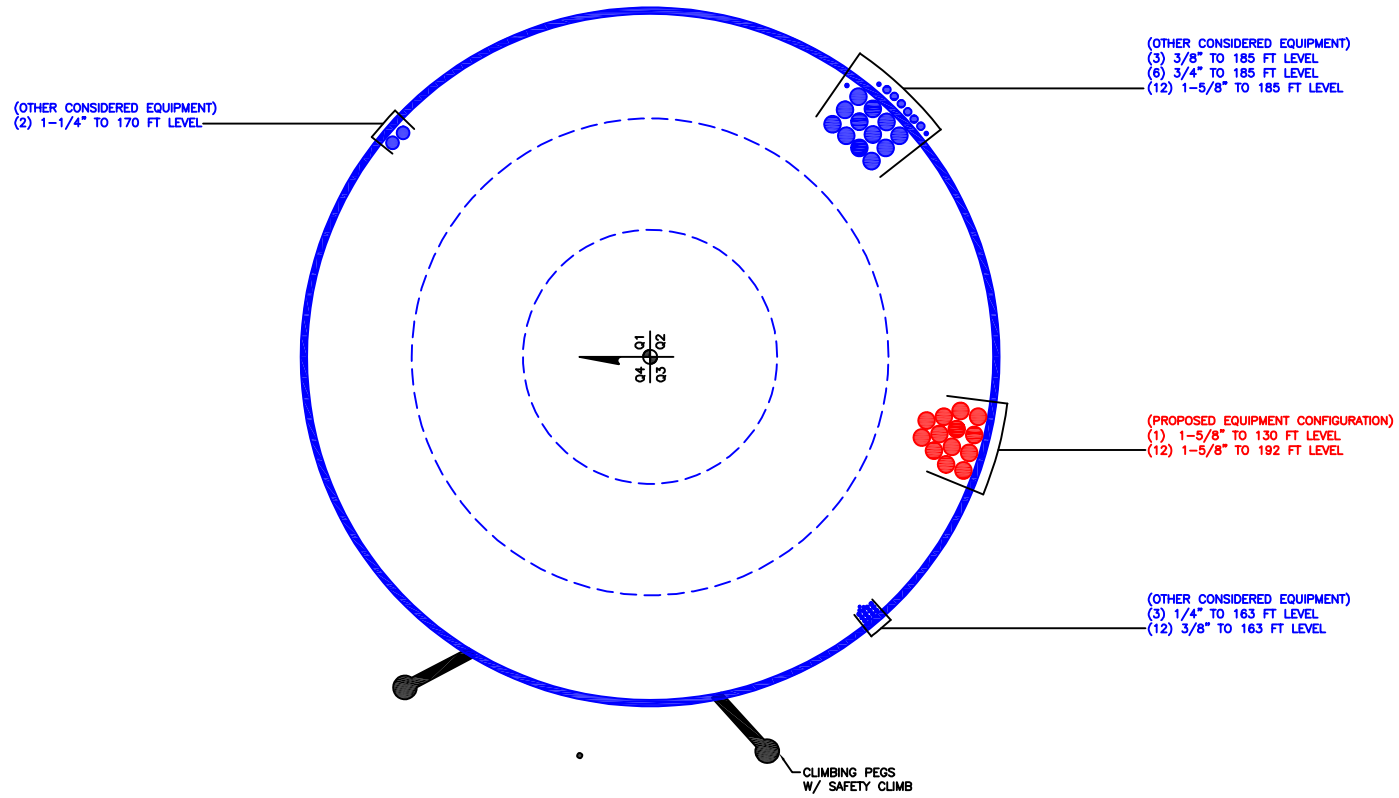
	$\frac{N}{W}$	$\frac{V}{N}$	$\frac{N}{N}$	$\frac{N}{N}$	$\frac{N}{d N}$	$\frac{\phi}{d N}$	$\frac{N}{\phi N}$	$\frac{N}{d N}$	$\frac{\phi}{d N}$	$\frac{N}{\phi N}$
L1	197 - 187.583 (1)		TP25.362x23.19x0.1875		13.39	511.97	0.026	0.00	511.97	0.000
L2	187.583 - 138.667 (2)		TP36.227x24.0836x0.25		700.37	1282.14	0.546	0.00	1282.14	0.000
L3	138.667 - 91.5 (3)		TP46.583x34.5012x0.375		1817.88	3376.13	0.538	0.00	3376.13	0.000
L4	91.5 - 45.083 (4)		TP56.513x44.3372x0.4375		3192.74	5729.68	0.557	0.00	5729.68	0.000
L5	45.083 - 0 (5)		TP65.999x53.8739x0.5		5099.50	9333.00	0.546	0.00	9333.00	0.000

Pole Shear Design Data									
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Pole Interaction Design Data									
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Section Capacity Table	
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APPENDIX B
BASE LEVEL DRAWING



BUSINESS UNIT: 824653 TOWER ID: C_BASELEVEL

APPENDIX C
ADDITIONAL CALCULATIONS

Monopole Base Plate Connection

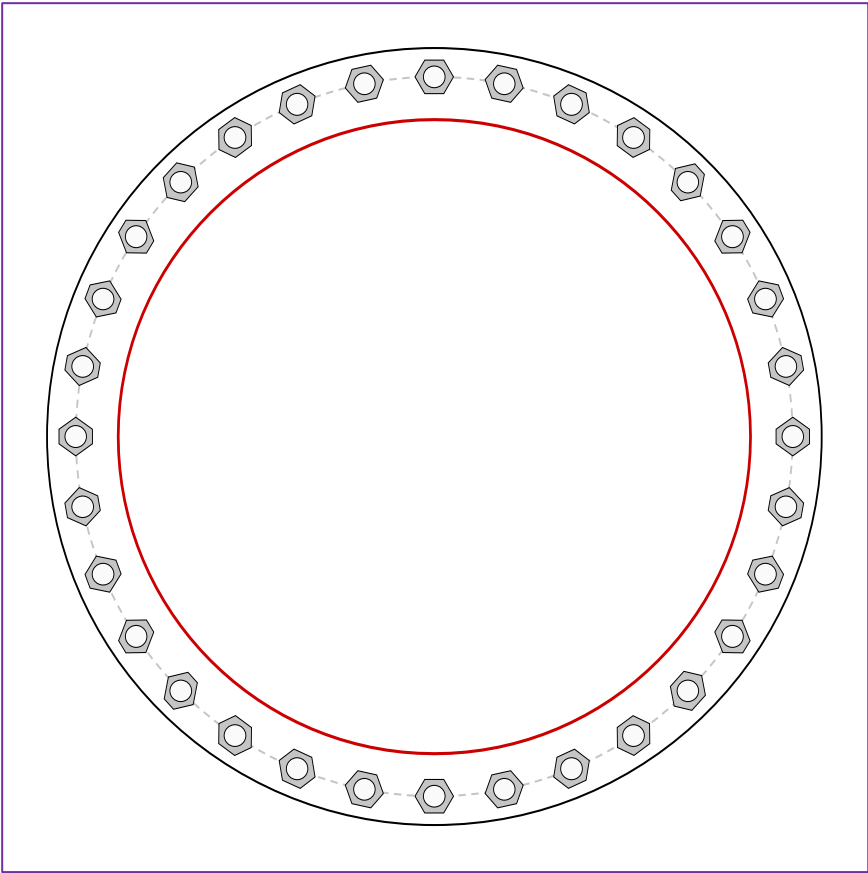


Site Info	
BU #	824653
Site Name	Hwy90 at NW Brown Rd
Order #	570259 Rev. 0

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

Applied Loads	
Moment (kip-ft)	5099.50
Axial Force (kips)	71.30
Shear Force (kips)	38.80

*TIA-222-H Section 15.5 Applied



Connection Properties		Analysis Results	
Anchor Rod Data		Anchor Rod Summary <i>(units of kips, kip-in)</i>	
(32) 2-1/4" ϕ bolts (A615-75 N; F _y =75 ksi, F _u =100 ksi) on 74.83" BC		Pu _t = 99.96	ϕ Pn _t = 243.75 Stress Rating
Base Plate Data		Vu = 1.21	ϕ Vn = 149.1 39.1%
80.83" OD x 3" Plate (A572-60; F _y =60 ksi, F _u =75 ksi)		Mu = n/a	ϕ Mn = n/a Pass
Stiffener Data		Base Plate Summary	
N/A		Max Stress (ksi):	19.17 (Flexural)
Pole Data		Allowable Stress (ksi):	54
65.999" x 0.5" 16-sided pole (A572-65; F _y =65 ksi, F _u =80 ksi)		Stress Rating:	33.8% Pass

Drilled Pier Foundation

BU #: 824653
 Site Name: Hwy90 at NW Brown R
 Order Number: 570259 Rev. 0

TIA-222 Revision: H
 Tower Type: Monopole

Applied Loads		
	Comp.	Uplift
Moment (kip-ft)	5099.51	
Axial Force (kips)	71.32	
Shear Force (kips)	38.76	

Material Properties		
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		in

[Rebar & Pier Options](#)

[Embedded Pole Inputs](#)

[Belled Pier Inputs](#)

Analysis Results		
Soil Lateral Check	Compression	Uplift
D _{v=0} (ft from TOC)	10.74	-
Soil Safety Factor	7.49	-
Max Moment (kip-ft)	5439.51	-
Rating*	16.9%	-
Soil Vertical Check	Compression	Uplift
Skin Friction (kips)	1070.89	-
End Bearing (kips)	1717.67	-
Weight of Concrete (kips)	315.13	-
Total Capacity (kips)	2788.56	-
Axial (kips)	386.45	-
Rating*	13.2%	-
Reinforced Concrete Flexure	Compression	Uplift
Critical Depth (ft from TOC)	10.54	-
Critical Moment (kip-ft)	5439.31	-
Critical Moment Capacity	13836.66	-
Rating*	37.4%	-
Reinforced Concrete Shear	Compression	Uplift
Critical Depth (ft from TOC)	28.98	-
Critical Shear (kip)	386.22	-
Critical Shear Capacity	882.28	-
Rating*	41.7%	-
Soil Interaction Rating* 16.9%		
Structural Foundation Rating* 41.7%		

*Rating per TIA-222-H Section 15.5



Check Limitation	
Apply TIA-222-H Section 15.5:	☒
N/A	☐
Shear Design Options	
Check Shear along Depth of Pier:	☒
Utilize Shear-Friction Methodology:	☐
Override Critical Depth:	☐

[Go to Soil Calculations](#)

Soil Profile													
Groundwater Depth	9	# of Layers		8									

Layer	Top (ft)	Bottom (ft)	Thickness (ft)	Y _{soil} (pcf)	Y _{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	31	9	47.6	87.6	3	0	1.65	1.65	1.70	1.70			Cohesive
8	31	39	8	52.6	87.6	4	0	2.05	2.05	2.20	2.20	36		Cohesive

ASCE 7 Hazards Report

Address:

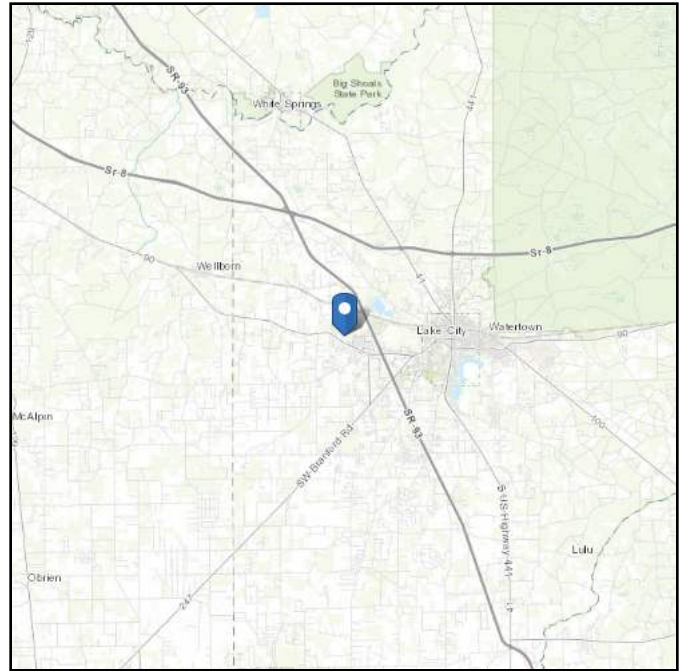
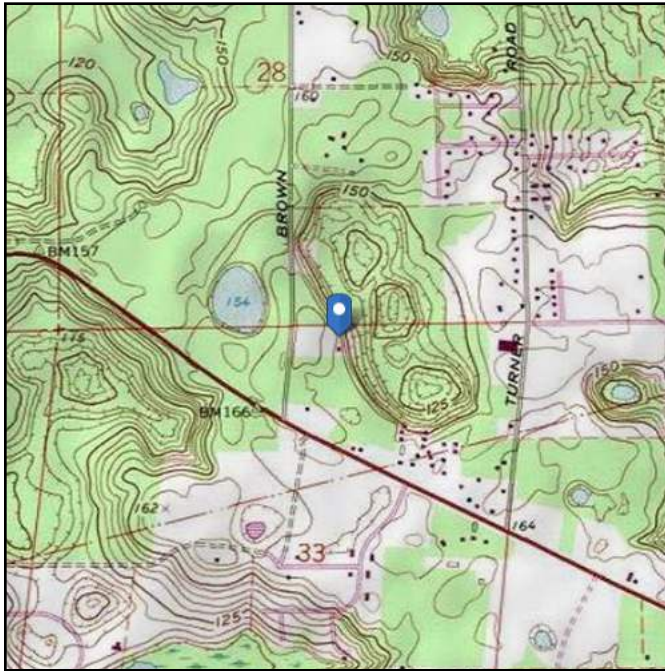
No Address at This
Location

Standard:

ASCE/SEI 7-16

Risk Category: II**Soil Class:**

D - Default (see
Section 11.4.3)

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:

Mon May 24 2021

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).

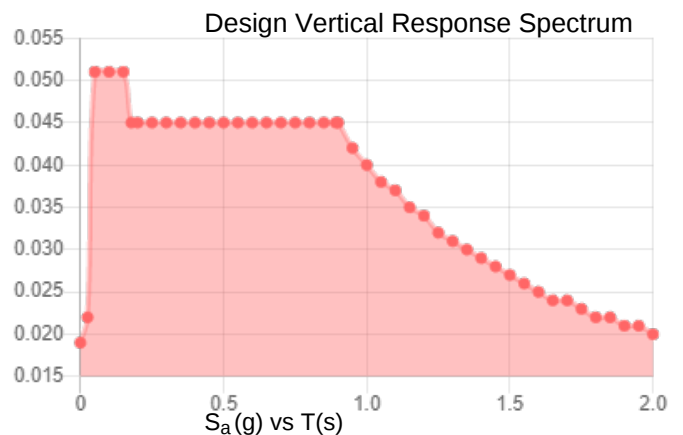
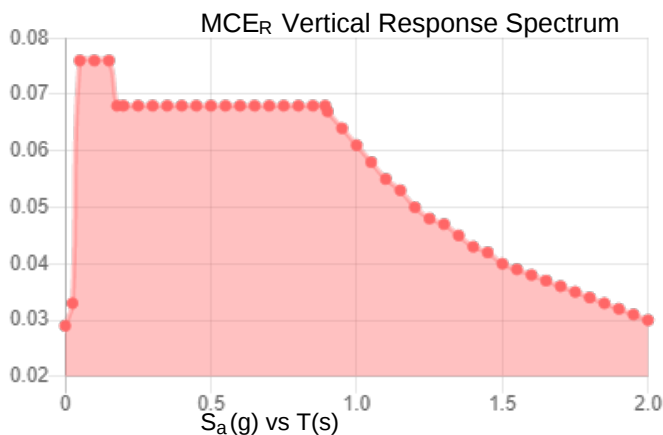
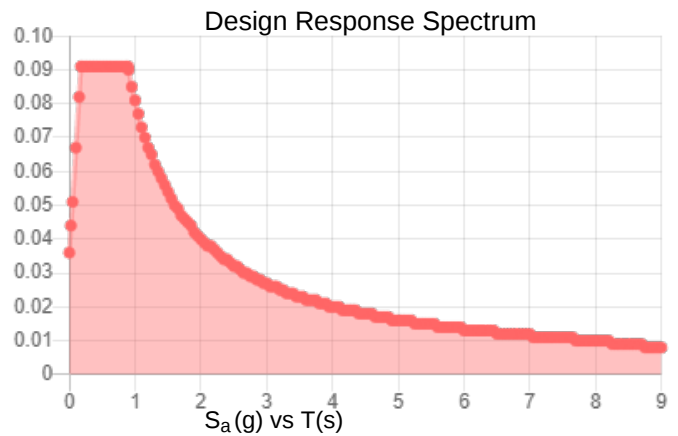
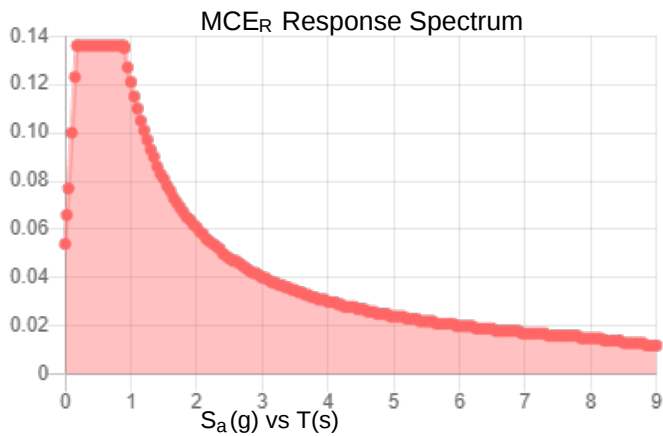
Site is in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Site Soil Class: D - Default (see Section 11.4.3)

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:

Mon May 24 2021

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.

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: Mon May 24 2021

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.

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