



STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

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VIA ELECTRONIC MAIL

May 6, 2024

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

RE: **EM-VER-014-230913** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 180 North Main Street, Branford, Connecticut.
Request for Project Change.

Dear Jeffrey Barbadora:

The Connecticut Siting Council (Council) is in receipt of the correspondence dated May 3, 2024 and the associated Structural Analysis dated April 23, 2024, regarding a project change for the above-referenced exempt modification request acknowledged by the Council on October 10, 2023.

Pursuant to Condition No. 1 of the Council's October 10, 2023 exempt modification approval, the request to increase the number of Kaelus interference mitigation filters to be installed from one to two is hereby approved.

This approval applies only to the project change in the correspondence dated May 3, 2024.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/ANM/laf

c: The Honorable James B. Cosgrove, First Selectperson, Town of Branford
(jcosgrove@branford-ct.gov)

From: Barbadora, Jeff <Jeff.Barbadora@crowncastle.com>
Sent: Friday, May 3, 2024 6:00 AM
To: CSC-DL Siting Council <Siting.Council@ct.gov>
Subject: EM-VER-014-230913 - 180-184 North Main Street Branford CT - 806360

Good afternoon,

Would the CSC please update the approval for EM-VER-014-230913 to include a total of 2 filters?

The original SA submitted with the application and dated 8/17/2023 stated only 1 filter and should have stated 2 filters.

Please see updated SA stating 2 filters and let me know if you have any questions.

Thanks,

Jeffrey Barbadora
Permitting Specialist
781-970-0053

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

Date: **April 23, 2024**

Subject: **Structural Analysis Report**

Carrier Designation: **Verizon Wireless Co-Locate**
Site Number: 5000385364
Site Name: Branford CT

Crown Castle Designation: **BU Number:** 806360
Site Name: NHV 113 943126
JDE Job Number: 2112037
Work Order Number: 2296358
Order Number: 666926 Rev. 3

Engineering Firm Designation: **Morrison Hershfield Project Number:** CN13-372R1 / 2400001

Site Data: **180 & 184 North Main ST, Branford, New Haven County, CT 06405**
Latitude 41° 17' 22.77", Longitude -72° 48' 42.22"
110 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 – 42.4%

This analysis utilizes an ultimate 3-second gust wind speed of 121 mph as required by the 2022 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Respectfully submitted by:

G. Lance Cooke, P.E. (CT License No. PEN.0028133)
Senior Engineer



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1) INTRODUCTION

This tower is a 110 ft monopole tower designed by Valmont Industries, Inc.

2) ANALYSIS CRITERIA

TIA-222 Revision: TIA-222-H
Risk Category: II
Wind Speed: 121 mph
Exposure Category: B
Topographic Factor: 1
Ice Thickness: 1 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)	
109.0	112.0	1	gps	GPS_A	1	1/2	
	109.0	1	-	Platform Mount [LP 714-1]			
98.0	101.0	4	cambridge broadband networks	CBNG gNodeB NTE w/ Mount Pipe	6 6 2 1	1-1/4 7/8 1-5/8 1-3/8	
		1	raycap	RCMDC-6627-PF-48			
	100.0	2	samsung telecommunications	MT6407-77A w/ Mount Pipe			
		2	kaelus	BSF0020F3V1			
		3	samsung telecommunications	RFV01U-D1A			
	99.0	3	samsung telecommunications	RFV01U-D2A			
			6	commscope			JAHH-65B-R3B
			2	decibel			DB846F65ZAXY w/ Mount Pipe
	98.0	3	commscope	CBC78T-DS-43			
			2	raycap			RC3DC-3315-PF-48
			1	-			Platform Mount [LP 714-1]
	97.0	1	-	Sector Mount [SM 201-3]			
			samsung telecommunications	MT6407-77A w/ Mount Pipe			

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)
80.0	88.0	1	-	Side Arm Mount [SO 901-1]	1	1/2
	80.0	1	decibel	DB225-A		
	72.0	1	-	Side Arm Mount [SO 901-1]		
60.0	68.0	1	-	Side Arm Mount [SO 901-1]	1	1/2
	60.0	1	decibel	DB225-A		
	52.0	1	-	Side Arm Mount [SO 901-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
4-GEOTECHNICAL REPORTS	262228	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	217660	CCISITES
4-TOWER MANUFACTURER DRAWINGS	971913	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. 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	110 - 67.333	Pole	TP30.45x21.91x0.2188	1	-11.23	1267.58	37.7	Pass
L2	67.333 - 29.417	Pole	TP37.6x29.0784x0.3125	2	-17.82	2235.64	42.4	Pass
L3	29.417 - 0	Pole	TP42.85x35.8577x0.4063	3	-26.74	3410.42	39.1	Pass
							Summary	
						Pole (L2)	42.4	Pass
						Rating =	42.4	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	39.3	Pass
1	Base Plate		21.7	Pass
1	Base Foundation (Structure)	0	22.9	Pass
1	Base Foundation (Soil Interaction)		36.3	Pass

Structure Rating (max from all components) =	42.4%*
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Notes:

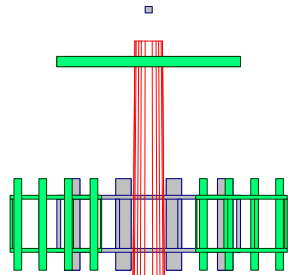
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) *Rating per TIA-222-H, Section 15.5.

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

110.0 ft



MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 121 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 42.4%

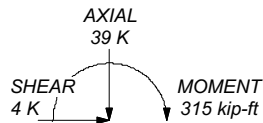
Section	1	2	3
Length (ft)	42.87	42.58	35.00
Number of Sides	12	12	12
Thickness (in)	0.2188	0.3125	0.4062
Socket Length (ft)	4.67	5.58	5.58
Top Dia (in)	21.9100	29.0784	35.8577
Bot Dia (in)	30.4500	37.6000	42.8500
Grade		A572-65	
Weight (K)	2.7	4.8	6.1

67.3 ft

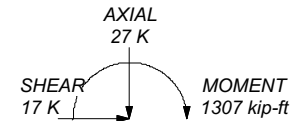
29.4 ft

0.0 ft

ALL REACTIONS ARE FACTORED



TORQUE 0 kip-ft
50 mph WIND - 1.0000 in ICE



TORQUE 2 kip-ft
REACTIONS - 121 mph WIND

Morrison Hershfield
1455 Lincoln Parkway, Suite 500
Atlanta, GA 30346
Phone: (770) 379-8500
FAX: (770) 379-8501

Job: CN13-372R1 / 2400001	Project: 806360 / NHV 113 943126	
Client: Crown Castle USA	Drawn by: RP	App'd:
Code: TIA-222-H	Date: 04/23/24	Scale: NTS
Path:		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 New Haven County, Connecticut.
- Tower base elevation above sea level: 59.00 ft.
- Basic wind speed of 121 mph.
- Risk Category II.
- Exposure Category B.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.00 ft.
- Nominal ice thickness of 1.0000 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

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric Distribute Leg Loads As Uniform | <ul style="list-style-type: none"> Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retention Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurtenances √ Alternative Appurt. EPA Calculation Autocalc Torque Arm Areas Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder Ignore KL/ry For 60 Deg. Angle Legs Use ASCE 10 X-Brace Ly Rules | <ul style="list-style-type: none"> Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-H Bracing Resist. Exemption Use TIA-222-H Tension Splice Exemption <p style="text-align: center; background-color: #e0e0e0; margin: 5px 0;">Poles</p> <ul style="list-style-type: none"> √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets Pole Without Linear Attachments Pole With Shroud Or No Appurtenances Outside and Inside Corner Radii Are Known |
|---|---|--|

Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	110.00-67.33	42.67	4.67	12	21.9100	30.4500	0.2188	0.8750	A572-65 (65 ksi)
L2	67.33-29.42	42.58	5.58	12	29.0784	37.6000	0.3125	1.2500	A572-65 (65 ksi)
L3	29.42-0.00	35.00		12	35.8577	42.8500	0.4062	1.6250	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	22.6057	15.2788	917.5793	7.7655	11.3494	80.8484	1859.2645	7.5197	5.2856	24.163
	31.4470	21.2941	2484.0378	10.8228	15.7731	157.4857	5033.3340	10.4803	7.5743	34.626
L2	30.9608	28.9457	3057.2063	10.2982	15.0626	202.9667	6194.7288	14.2462	6.9555	22.258
	38.8161	37.5205	6658.5803	13.3489	19.4768	341.8724	13492.0890	18.4665	9.2393	29.566
L3	38.1341	46.3750	7439.4144	12.6916	18.5743	400.5217	15074.2704	22.8244	8.5211	20.975
	44.2183	55.5217	12766.6349	15.1949	22.1963	575.1695	25868.6636	27.3261	10.3950	25.588

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _r	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1 110.00-67.33				1	1	1			
L2 67.33-29.42				1	1	1			
L3 29.42-0.00				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 r in	Perimeter r in	Weight plf

Safety Line 3/8"	B	No	Surface Ar (CaAa)	110.00 - 8.00	1	1	0.450	0.3750		0.22
Step Pegs	B	No	Surface Ar (CaAa)	110.00 - 8.00	1	1	0.400	0.7050		1.80

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight plf

LDF4-50A(1/2)	B	No	No	Inside Pole	109.00 - 6.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.15

LDF6-50A(1-1/4)	B	No	No	Inside Pole	98.00 - 6.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.60
HB158-U12S24-XXX-LI(1-5/8)	B	No	No	Inside Pole	98.00 - 6.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 3.20
LCF78-50A(7/8)	B	No	No	Inside Pole	98.00 - 6.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.34

HFT1206-24S26-XXX(1-3/8)	B	No	No	Inside Pole	98.00 - 6.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 1.62

LDF4-50A(1/2)	B	No	No	Inside Pole	80.00 - 6.00	1	No Ice 1/2" Ice	0.00 0.15

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C _{AA} ft ² /ft	Weight plf
							1" Ice	0.00	0.15
LDF4-50A(1/2)	B	No	No	Inside Pole	60.00 - 6.00	1	No Ice	0.00	0.15
							1/2" Ice	0.00	0.15
							1" Ice	0.00	0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section n	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	110.00-67.33	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	4.608	0.000	0.51
		C	0.000	0.000	0.000	0.000	0.00
L2	67.33-29.42	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	4.095	0.000	0.61
		C	0.000	0.000	0.000	0.000	0.00
L3	29.42-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	2.313	0.000	0.37
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section n	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	110.00-67.33	A	0.937	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	20.607	0.000	0.66
		C		0.000	0.000	0.000	0.000	0.00
L2	67.33-29.42	A	0.883	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	18.313	0.000	0.74
		C		0.000	0.000	0.000	0.000	0.00
L3	29.42-0.00	A	0.782	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	9.876	0.000	0.44
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP _x in	CP _z in	CP _x Ice in	CP _z Ice in
L1	110.00-67.33	0.5876	0.2616	1.7483	0.7784
L2	67.33-29.42	0.5912	0.2632	1.8271	0.8135
L3	29.42-0.00	0.4271	0.1902	1.3195	0.5875

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	2	Safety Line 3/8"	67.33 - 110.00	1.0000	1.0000
L1	3	Step Pegs	67.33 - 110.00	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L2	2	Safety Line 3/8"	29.42 - 67.33	1.0000	1.0000
L2	3	Step Pegs	29.42 - 67.33	1.0000	1.0000
L3	2	Safety Line 3/8"	8.00 - 29.42	1.0000	1.0000
L3	3	Step Pegs	8.00 - 29.42	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C_{AA} Front	C_{AA} Side	Weight K	

GPS_A	A	From Leg	4.00 0.00 3.00	0.0000	109.00	No Ice 0.26 1/2" Ice 0.32 1" Ice 0.39	0.26 0.32 0.39	0.00 0.00 0.01	
Platform Mount [LP 714-1]	C	None		0.0000	109.00	No Ice 37.51 1/2" Ice 41.70 1" Ice 45.89	37.51 41.70 45.89	1.60 2.50 3.46	

(2) JAHH-65B-R3B	A	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 5.29 1/2" Ice 5.75 1" Ice 6.22	3.05 3.48 3.93	0.06 0.12 0.19	
(2) JAHH-65B-R3B	B	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 5.29 1/2" Ice 5.75 1" Ice 6.22	3.05 3.48 3.93	0.06 0.12 0.19	
(2) JAHH-65B-R3B	C	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 5.29 1/2" Ice 5.75 1" Ice 6.22	3.05 3.48 3.93	0.06 0.12 0.19	
DB846F65ZAXY w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 6.10 1/2" Ice 6.80 1" Ice 7.51	6.81 7.52 8.24	0.06 0.12 0.19	
DB846F65ZAXY w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 6.10 1/2" Ice 6.80 1" Ice 7.51	6.81 7.52 8.24	0.06 0.12 0.19	
MT6407-77A w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	98.00	No Ice 5.94 1/2" Ice 6.47 1" Ice 7.02	3.10 3.55 4.02	0.10 0.13 0.18	
MT6407-77A w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	98.00	No Ice 5.94 1/2" Ice 6.47 1" Ice 7.02	3.10 3.55 4.02	0.10 0.13 0.18	
MT6407-77A w/ Mount Pipe	C	From Leg	4.00 0.00 -1.00	0.0000	98.00	No Ice 5.94 1/2" Ice 6.47 1" Ice 7.02	3.10 3.55 4.02	0.10 0.13 0.18	
CBC78T-DS-43	A	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 0.37 1/2" Ice 0.45 1" Ice 0.53	0.25 0.32 0.39	0.01 0.01 0.02	
CBC78T-DS-43	B	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 0.37 1/2" Ice 0.45 1" Ice 0.53	0.25 0.32 0.39	0.01 0.01 0.02	
CBC78T-DS-43	C	From Leg	4.00 0.00 1.00	0.0000	98.00	No Ice 0.37 1/2" Ice 0.45 1" Ice 0.53	0.25 0.32 0.39	0.01 0.01 0.02	
RFV01U-D1A	A	From Leg	4.00 0.00 2.00	0.0000	98.00	No Ice 1.88 1/2" Ice 2.05 1" Ice 2.22	1.25 1.39 1.54	0.08 0.10 0.12	
RFV01U-D1A	B	From Leg	4.00 0.00 2.00	0.0000	98.00	No Ice 1.88 1/2" Ice 2.05 1" Ice 2.22	1.25 1.39 1.54	0.08 0.10 0.12	
RFV01U-D1A	C	From Leg	4.00 0.00 2.00	0.0000	98.00	No Ice 1.88 1/2" Ice 2.05 1" Ice 2.22	1.25 1.39 1.54	0.08 0.10 0.12	

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft ²	ft ²	K
RFV01U-D2A	A	From Leg	4.00	0.0000	98.00	No Ice	1.88	1.01	0.07
			0.00			1/2" Ice	2.05	1.14	0.09
			2.00			1" Ice	2.22	1.28	0.11
RFV01U-D2A	B	From Leg	4.00	0.0000	98.00	No Ice	1.88	1.01	0.07
			0.00			1/2" Ice	2.05	1.14	0.09
			2.00			1" Ice	2.22	1.28	0.11
RFV01U-D2A	C	From Leg	4.00	0.0000	98.00	No Ice	1.88	1.01	0.07
			0.00			1/2" Ice	2.05	1.14	0.09
			2.00			1" Ice	2.22	1.28	0.11
16'x2" Antenna Mount Pipe	A	From Leg	4.00	0.0000	98.00	No Ice	3.80	3.80	0.06
			0.00			1/2" Ice	5.43	5.43	0.09
			4.00			1" Ice	7.07	7.07	0.13
16'x2" Antenna Mount Pipe	B	From Leg	4.00	0.0000	98.00	No Ice	3.80	3.80	0.06
			0.00			1/2" Ice	5.43	5.43	0.09
			4.00			1" Ice	7.07	7.07	0.13
16'x2" Antenna Mount Pipe	C	From Leg	4.00	0.0000	98.00	No Ice	3.80	3.80	0.06
			0.00			1/2" Ice	5.43	5.43	0.09
			4.00			1" Ice	7.07	7.07	0.13
6' x 2" Horizontal Mount Pipe	A	From Leg	4.00	0.0000	98.00	No Ice	1.14	0.01	0.02
			0.00			1/2" Ice	1.76	0.04	0.03
			8.00			1" Ice	2.14	0.09	0.04
6' x 2" Horizontal Mount Pipe	B	From Leg	4.00	0.0000	98.00	No Ice	1.14	0.01	0.02
			0.00			1/2" Ice	1.76	0.04	0.03
			8.00			1" Ice	2.14	0.09	0.04
6' x 2" Horizontal Mount Pipe	C	From Leg	4.00	0.0000	98.00	No Ice	1.14	0.01	0.02
			0.00			1/2" Ice	1.76	0.04	0.03
			8.00			1" Ice	2.14	0.09	0.04
(2) 10' x 2" Mount Pipe	A	From Leg	4.00	0.0000	98.00	No Ice	2.38	2.38	0.04
			0.00			1/2" Ice	3.40	3.40	0.05
			0.00			1" Ice	4.45	4.45	0.08
(2) 10' x 2" Mount Pipe	B	From Leg	4.00	0.0000	98.00	No Ice	2.38	2.38	0.04
			0.00			1/2" Ice	3.40	3.40	0.05
			0.00			1" Ice	4.45	4.45	0.08
(2) 10' x 2" Mount Pipe	C	From Leg	4.00	0.0000	98.00	No Ice	2.38	2.38	0.04
			0.00			1/2" Ice	3.40	3.40	0.05
			0.00			1" Ice	4.45	4.45	0.08
Side-by-side Mount Pipe	A	From Leg	4.00	0.0000	98.00	No Ice	1.90	1.90	0.03
			0.00			1/2" Ice	2.73	2.73	0.04
			0.00			1" Ice	3.40	3.40	0.06
Side-by-side Mount Pipe	B	From Leg	4.00	0.0000	98.00	No Ice	1.90	1.90	0.03
			0.00			1/2" Ice	2.73	2.73	0.04
			0.00			1" Ice	3.40	3.40	0.06
Side-by-side Mount Pipe	C	From Leg	4.00	0.0000	98.00	No Ice	1.90	1.90	0.03
			0.00			1/2" Ice	2.73	2.73	0.04
			0.00			1" Ice	3.40	3.40	0.06
(2) 8' L1.5x1.5 Horizontal angle	A	From Leg	4.00	0.0000	98.00	No Ice	1.90	1.90	0.03
			0.00			1/2" Ice	2.73	2.73	0.04
			0.00			1" Ice	3.40	3.40	0.06
(2) 8' L1.5x1.5 Horizontal angle	B	From Leg	4.00	0.0000	98.00	No Ice	1.90	1.90	0.03
			0.00			1/2" Ice	2.73	2.73	0.04
			0.00			1" Ice	3.40	3.40	0.06
(2) 8' L1.5x1.5 Horizontal angle	C	From Leg	4.00	0.0000	98.00	No Ice	1.90	1.90	0.03
			0.00			1/2" Ice	2.73	2.73	0.04
			0.00			1" Ice	3.40	3.40	0.06
Sector Mount [SM 201-3]	C	None		0.0000	98.00	No Ice	24.76	24.76	1.08
						1/2" Ice	33.89	33.89	1.52
						1" Ice	43.00	43.00	2.10
Platform Mount [LP 714-1]	C	None		0.0000	98.00	No Ice	37.51	37.51	1.60
						1/2" Ice	41.70	41.70	2.50
						1" Ice	45.89	45.89	3.46

(2) CBNG gNodeB NTE w/ Mount Pipe	A	From Leg	4.00	0.0000	98.00	No Ice	3.79	2.05	0.04
			0.00			1/2" Ice	4.09	2.41	0.08
			3.00			1" Ice	4.40	2.78	0.12
CBNG gNodeB NTE w/	B	From Leg	4.00	0.0000	98.00	No Ice	3.79	2.05	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
Mount Pipe			0.00		1/2" Ice	4.09	2.41	0.08	
			3.00		1" Ice	4.40	2.78	0.12	
CBNG gNodeB NTE w/ Mount Pipe	C	From Leg	4.00	0.0000	98.00	No Ice	3.79	2.05	0.04
			0.00		1/2" Ice	4.09	2.41	0.08	
			3.00		1" Ice	4.40	2.78	0.12	
(2) BSF0020F3V1	A	From Leg	4.00	0.0000	98.00	No Ice	0.96	0.29	0.02
			0.00		1/2" Ice	1.09	0.36	0.02	
			2.00		1" Ice	1.22	0.45	0.03	
RCMDC-6627-PF-48	B	From Leg	4.00	0.0000	98.00	No Ice	4.06	3.10	0.03
			0.00		1/2" Ice	4.32	3.34	0.07	
			3.00		1" Ice	4.58	3.58	0.11	
RC3DC-3315-PF-48	A	From Leg	4.00	0.0000	98.00	No Ice	3.79	2.51	0.03
			0.00		1/2" Ice	4.04	2.72	0.06	
			0.00		1" Ice	4.30	2.94	0.10	
RC3DC-3315-PF-48	B	From Leg	4.00	0.0000	98.00	No Ice	3.79	2.51	0.03
			0.00		1/2" Ice	4.04	2.72	0.06	
			0.00		1" Ice	4.30	2.94	0.10	

DB225-A	B	From Leg	2.00	0.0000	80.00	No Ice	3.21	3.21	0.04
			0.00		1/2" Ice	5.78	5.78	0.05	
			0.00		1" Ice	8.35	8.35	0.06	
20' x 2" Mount Pipe	B	From Leg	2.00	0.0000	80.00	No Ice	4.75	4.75	0.09
			0.00		1/2" Ice	6.78	6.78	0.12	
			0.00		1" Ice	8.82	8.82	0.17	
Side Arm Mount [SO 901- 1]	B	From Leg	1.00	0.0000	80.00	No Ice	0.33	0.62	0.11
			0.00		1/2" Ice	0.46	0.78	0.11	
			8.00		1" Ice	0.62	0.97	0.12	
Side Arm Mount [SO 901- 1]	B	From Leg	1.00	0.0000	80.00	No Ice	0.33	0.62	0.11
			0.00		1/2" Ice	0.46	0.78	0.11	
			-8.00		1" Ice	0.62	0.97	0.12	

DB225-A	C	From Leg	2.00	0.0000	60.00	No Ice	3.21	3.21	0.04
			0.00		1/2" Ice	5.78	5.78	0.05	
			0.00		1" Ice	8.35	8.35	0.06	
20' x 2" Mount Pipe	C	From Leg	2.00	0.0000	60.00	No Ice	4.75	4.75	0.09
			0.00		1/2" Ice	6.78	6.78	0.12	
			0.00		1" Ice	8.82	8.82	0.17	
Side Arm Mount [SO 901- 1]	C	From Leg	1.00	0.0000	60.00	No Ice	0.33	0.62	0.11
			0.00		1/2" Ice	0.46	0.78	0.11	
			8.00		1" Ice	0.62	0.97	0.12	
Side Arm Mount [SO 901- 1]	C	From Leg	1.00	0.0000	60.00	No Ice	0.33	0.62	0.11
			0.00		1/2" Ice	0.46	0.78	0.11	
			-8.00		1" Ice	0.62	0.97	0.12	

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
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

Comb. No.	Description
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

Sectio n No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	110 - 67.333	Pole	Max Tension	33	0.00	0.00	0.00
			Max. Compression	26	-20.29	-2.43	-0.61
			Max. Mx	8	-11.24	-282.39	-1.18
			Max. My	14	-11.23	-2.13	-285.00
			Max. Vy	8	11.00	-282.39	-1.18
			Max. Vx	14	11.13	-2.13	-285.00
			Max. Torque	16			1.94
L2	67.333 - 29.417	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-28.54	-1.43	-1.20
			Max. Mx	8	-17.83	-750.14	-2.66
			Max. My	14	-17.82	-2.32	-759.16
			Max. Vy	8	14.18	-750.14	-2.66
			Max. Vx	14	14.32	-2.32	-759.16
			Max. Torque	16			1.94
L3	29.417 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-38.91	-1.64	-1.08
			Max. Mx	8	-26.74	-1293.24	-3.61
			Max. My	14	-26.74	-3.41	-1306.94
			Max. Vy	8	16.85	-1293.24	-3.61
			Max. Vx	14	16.98	-3.41	-1306.94
			Max. Torque	18			1.75

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	38.91	-0.00	-0.00
	Max. H _x	20	26.74	16.84	0.03
	Max. H _z	2	26.74	0.03	16.97
	Max. M _x	2	1305.38	0.03	16.97
	Max. M _z	8	1293.24	-16.84	-0.03
	Max. Torsion	18	1.75	14.57	-8.46
	Min. Vert	19	20.06	14.57	-8.46
	Min. H _x	8	26.74	-16.84	-0.03
	Min. H _z	14	26.74	-0.03	-16.97
	Min. M _x	14	-1306.94	-0.03	-16.97
	Min. M _z	20	-1292.08	16.84	0.03
	Min. Torsion	6	-1.75	-14.57	8.46

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	22.29	0.00	0.00	0.63	-0.46	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	26.74	-0.03	-16.97	-1305.38	2.25	0.77
0.9 Dead+1.0 Wind 0 deg - No Ice	20.06	-0.03	-16.97	-1296.88	2.38	0.76
1.2 Dead+1.0 Wind 30 deg - No Ice	26.74	8.39	-14.68	-1128.98	-644.46	1.45
0.9 Dead+1.0 Wind 30 deg - No Ice	20.06	8.39	-14.68	-1121.66	-640.03	1.44
1.2 Dead+1.0 Wind 60 deg - No Ice	26.74	14.57	-8.46	-649.86	-1118.64	1.75
0.9 Dead+1.0 Wind 60 deg - No Ice	20.06	14.57	-8.46	-645.73	-1111.06	1.74
1.2 Dead+1.0 Wind 90 deg - No Ice	26.74	16.84	0.03	3.61	-1293.24	1.58
0.9 Dead+1.0 Wind 90 deg - No Ice	20.06	16.84	0.03	3.38	-1284.49	1.57
1.2 Dead+1.0 Wind 120 deg - No Ice	26.74	14.59	8.51	656.31	-1121.47	0.98
0.9 Dead+1.0 Wind 120 deg - No Ice	20.06	14.59	8.51	651.74	-1113.86	0.98
1.2 Dead+1.0 Wind 150 deg - No Ice	26.74	8.44	14.71	1133.37	-649.36	0.11
0.9 Dead+1.0 Wind 150 deg - No Ice	20.06	8.44	14.71	1125.62	-644.89	0.12
1.2 Dead+1.0 Wind 180 deg - No Ice	26.74	0.03	16.97	1306.94	-3.41	-0.78
0.9 Dead+1.0 Wind 180 deg - No Ice	20.06	0.03	16.97	1298.05	-3.23	-0.77
1.2 Dead+1.0 Wind 210 deg - No Ice	26.74	-8.39	14.68	1130.54	643.30	-1.47
0.9 Dead+1.0 Wind 210 deg - No Ice	20.06	-8.39	14.68	1122.82	639.17	-1.46
1.2 Dead+1.0 Wind 240 deg - No Ice	26.74	-14.57	8.46	651.42	1117.48	-1.75
0.9 Dead+1.0 Wind 240 deg - No Ice	20.06	-14.57	8.46	646.89	1110.20	-1.74
1.2 Dead+1.0 Wind 270 deg - No Ice	26.74	-16.84	-0.03	-2.05	1292.08	-1.57
0.9 Dead+1.0 Wind 270 deg - No Ice	20.06	-16.84	-0.03	-2.23	1283.63	-1.56
1.2 Dead+1.0 Wind 300 deg - No Ice	26.74	-14.59	-8.51	-654.75	1120.30	-0.96
0.9 Dead+1.0 Wind 300 deg - No Ice	20.06	-14.59	-8.51	-650.58	1113.00	-0.96

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
- No Ice						
1.2 Dead+1.0 Wind 330 deg	26.74	-8.44	-14.71	-1131.80	648.19	-0.11
- No Ice						
0.9 Dead+1.0 Wind 330 deg	20.06	-8.44	-14.71	-1124.46	644.03	-0.11
- No Ice						
1.2 Dead+1.0 Ice+1.0 Temp	38.91	0.00	0.00	1.08	-1.64	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	38.91	-0.01	-3.98	-312.37	-1.18	0.17
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	38.91	1.97	-3.44	-270.11	-156.76	0.37
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	38.91	3.42	-1.98	-155.18	-270.80	0.47
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	38.91	3.95	0.01	1.63	-312.73	0.44
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	38.91	3.43	1.99	158.31	-271.31	0.30
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	38.91	1.98	3.45	272.86	-157.65	0.07
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	38.91	0.01	3.98	314.60	-2.20	-0.17
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	38.91	-1.97	3.44	272.35	153.38	-0.37
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	38.91	-3.42	1.98	157.42	267.42	-0.47
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	38.91	-3.95	-0.01	0.61	309.34	-0.44
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	38.91	-3.43	-1.99	-156.07	267.93	-0.30
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	38.91	-1.98	-3.45	-270.62	154.27	-0.07
Dead+Wind 0 deg - Service	22.29	-0.01	-3.93	-300.59	0.17	0.18
Dead+Wind 30 deg - Service	22.29	1.94	-3.40	-259.90	-148.98	0.34
Dead+Wind 60 deg - Service	22.29	3.37	-1.96	-149.40	-258.33	0.40
Dead+Wind 90 deg - Service	22.29	3.90	0.01	1.30	-298.60	0.36
Dead+Wind 120 deg - Service	22.29	3.38	1.97	151.83	-258.99	0.23
Dead+Wind 150 deg - Service	22.29	1.96	3.41	261.85	-150.11	0.03
Dead+Wind 180 deg - Service	22.29	0.01	3.93	301.88	-1.13	-0.18
Dead+Wind 210 deg - Service	22.29	-1.94	3.40	261.20	148.01	-0.34
Dead+Wind 240 deg - Service	22.29	-3.37	1.96	150.70	257.37	-0.40
Dead+Wind 270 deg - Service	22.29	-3.90	-0.01	-0.01	297.64	-0.36
Dead+Wind 300 deg - Service	22.29	-3.38	-1.97	-150.53	258.02	-0.22
Dead+Wind 330 deg - Service	22.29	-1.96	-3.41	-260.55	149.14	-0.03

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-22.29	0.00	0.00	22.29	0.00	0.000%
2	-0.03	-26.74	-16.97	0.03	26.74	16.97	0.000%
3	-0.03	-20.06	-16.97	0.03	20.06	16.97	0.000%
4	8.39	-26.74	-14.68	-8.39	26.74	14.68	0.000%
5	8.39	-20.06	-14.68	-8.39	20.06	14.68	0.000%
6	14.57	-26.74	-8.46	-14.57	26.74	8.46	0.000%
7	14.57	-20.06	-8.46	-14.57	20.06	8.46	0.000%
8	16.84	-26.74	0.03	-16.84	26.74	-0.03	0.000%
9	16.84	-20.06	0.03	-16.84	20.06	-0.03	0.000%
10	14.59	-26.74	8.51	-14.59	26.74	-8.51	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
11	14.59	-20.06	8.51	-14.59	20.06	-8.51	0.000%
12	8.44	-26.74	14.71	-8.44	26.74	-14.71	0.000%
13	8.44	-20.06	14.71	-8.44	20.06	-14.71	0.000%
14	0.03	-26.74	16.97	-0.03	26.74	-16.97	0.000%
15	0.03	-20.06	16.97	-0.03	20.06	-16.97	0.000%
16	-8.39	-26.74	14.68	8.39	26.74	-14.68	0.000%
17	-8.39	-20.06	14.68	8.39	20.06	-14.68	0.000%
18	-14.57	-26.74	8.46	14.57	26.74	-8.46	0.000%
19	-14.57	-20.06	8.46	14.57	20.06	-8.46	0.000%
20	-16.84	-26.74	-0.03	16.84	26.74	0.03	0.000%
21	-16.84	-20.06	-0.03	16.84	20.06	0.03	0.000%
22	-14.59	-26.74	-8.51	14.59	26.74	8.51	0.000%
23	-14.59	-20.06	-8.51	14.59	20.06	8.51	0.000%
24	-8.44	-26.74	-14.71	8.44	26.74	14.71	0.000%
25	-8.44	-20.06	-14.71	8.44	20.06	14.71	0.000%
26	0.00	-38.91	0.00	-0.00	38.91	-0.00	0.000%
27	-0.01	-38.91	-3.98	0.01	38.91	3.98	0.000%
28	1.97	-38.91	-3.44	-1.97	38.91	3.44	0.000%
29	3.42	-38.91	-1.98	-3.42	38.91	1.98	0.000%
30	3.95	-38.91	0.01	-3.95	38.91	-0.01	0.000%
31	3.43	-38.91	1.99	-3.43	38.91	-1.99	0.000%
32	1.98	-38.91	3.45	-1.98	38.91	-3.45	0.000%
33	0.01	-38.91	3.98	-0.01	38.91	-3.98	0.000%
34	-1.97	-38.91	3.44	1.97	38.91	-3.44	0.000%
35	-3.42	-38.91	1.98	3.42	38.91	-1.98	0.000%
36	-3.95	-38.91	-0.01	3.95	38.91	0.01	0.000%
37	-3.43	-38.91	-1.99	3.43	38.91	1.99	0.000%
38	-1.98	-38.91	-3.45	1.98	38.91	3.45	0.000%
39	-0.01	-22.29	-3.93	0.01	22.29	3.93	0.000%
40	1.94	-22.29	-3.40	-1.94	22.29	3.40	0.000%
41	3.37	-22.29	-1.96	-3.37	22.29	1.96	0.000%
42	3.90	-22.29	0.01	-3.90	22.29	-0.01	0.000%
43	3.38	-22.29	1.97	-3.38	22.29	-1.97	0.000%
44	1.96	-22.29	3.41	-1.96	22.29	-3.41	0.000%
45	0.01	-22.29	3.93	-0.01	22.29	-3.93	0.000%
46	-1.94	-22.29	3.40	1.94	22.29	-3.40	0.000%
47	-3.37	-22.29	1.96	3.37	22.29	-1.96	0.000%
48	-3.90	-22.29	-0.01	3.90	22.29	0.01	0.020%
49	-3.38	-22.29	-1.97	3.38	22.29	1.97	0.000%
50	-1.96	-22.29	-3.41	1.96	22.29	3.41	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00019686
3	Yes	4	0.00000001	0.00012754
4	Yes	5	0.00000001	0.00005366
5	Yes	5	0.00000001	0.00002565
6	Yes	5	0.00000001	0.00004284
7	Yes	4	0.00000001	0.00080992
8	Yes	4	0.00000001	0.00028116
9	Yes	4	0.00000001	0.00018437
10	Yes	5	0.00000001	0.00005062
11	Yes	4	0.00000001	0.00095666
12	Yes	5	0.00000001	0.00004894
13	Yes	4	0.00000001	0.00092350
14	Yes	4	0.00000001	0.00021473
15	Yes	4	0.00000001	0.00013921
16	Yes	5	0.00000001	0.00004298
17	Yes	4	0.00000001	0.00081248
18	Yes	5	0.00000001	0.00005388
19	Yes	5	0.00000001	0.00002580
20	Yes	4	0.00000001	0.00026312
21	Yes	4	0.00000001	0.00017266

22	Yes	5	0.00000001	0.00004560
23	Yes	4	0.00000001	0.00086271
24	Yes	5	0.00000001	0.00004724
25	Yes	4	0.00000001	0.00089381
26	Yes	4	0.00000001	0.00000464
27	Yes	4	0.00000001	0.00065738
28	Yes	4	0.00000001	0.00069335
29	Yes	4	0.00000001	0.00069135
30	Yes	4	0.00000001	0.00066467
31	Yes	4	0.00000001	0.00070054
32	Yes	4	0.00000001	0.00070120
33	Yes	4	0.00000001	0.00066584
34	Yes	4	0.00000001	0.00068789
35	Yes	4	0.00000001	0.00068500
36	Yes	4	0.00000001	0.00064852
37	Yes	4	0.00000001	0.00067855
38	Yes	4	0.00000001	0.00068261
39	Yes	4	0.00000001	0.00001377
40	Yes	4	0.00000001	0.00003389
41	Yes	4	0.00000001	0.00002345
42	Yes	4	0.00000001	0.00001729
43	Yes	4	0.00000001	0.00002779
44	Yes	4	0.00000001	0.00002496
45	Yes	4	0.00000001	0.00001406
46	Yes	4	0.00000001	0.00002272
47	Yes	4	0.00000001	0.00003464
48	Yes	4	0.00000001	0.00008223
49	Yes	4	0.00000001	0.00002164
50	Yes	4	0.00000001	0.00002273

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 67.333	8.353	44	0.6309	0.0031
L2	72 - 29.417	3.676	45	0.4833	0.0017
L3	35 - 0	0.860	45	0.2202	0.0005

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
109.00	GPS_A	44	8.221	0.6280	0.0030	63343
98.00	(2) JAHH-65B-R3B	44	6.777	0.5944	0.0026	26393
80.00	DB225-A	44	4.557	0.5249	0.0020	10557
60.00	DB225-A	45	2.525	0.4055	0.0012	7744

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 67.333	36.138	14	2.7297	0.0132
L2	72 - 29.417	15.914	14	2.0914	0.0072
L3	35 - 0	3.722	14	0.9535	0.0021

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
109.00	GPS_A	14	35.567	2.7169	0.0131	14729
98.00	(2) JAHH-65B-R3B	14	29.327	2.5712	0.0113	6136
80.00	DB225-A	14	19.728	2.2711	0.0084	2453
60.00	DB225-A	14	10.930	1.7551	0.0053	1795

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 P _u / φP _n
L1	110 - 67.333 (1)	TP30.45x21.91x0.2188	42.67	0.00	0.0	20.636 2	-11.23	1207.22	0.009
L2	67.333 - 29.417 (2)	TP37.6x29.0784x0.3125	42.58	0.00	0.0	36.396 3	-17.82	2129.18	0.008
L3	29.417 - 0 (3)	TP42.85x35.8577x0.4063	35.00	0.00	0.0	55.521 7	-26.74	3248.02	0.008

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{nx} kip-ft	Ratio M _{ux} / φM _{nx}	M _{uy} kip-ft	φM _{ny} kip-ft	Ratio M _{uy} / φM _{ny}
L1	110 - 67.333 (1)	TP30.45x21.91x0.2188	285.45	740.13	0.386	0.00	740.13	0.000
L2	67.333 - 29.417 (2)	TP37.6x29.0784x0.3125	759.16	1737.95	0.437	0.00	1737.95	0.000
L3	29.417 - 0 (3)	TP42.85x35.8577x0.4063	1306.95	3250.25	0.402	0.00	3250.25	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio V _u / φV _n	Actual T _u kip-ft	φT _n kip-ft	Ratio T _u / φT _n
L1	110 - 67.333 (1)	TP30.45x21.91x0.2188	11.12	362.17	0.031	0.83	933.33	0.001
L2	67.333 - 29.417 (2)	TP37.6x29.0784x0.3125	14.32	638.75	0.022	0.78	2032.29	0.000
L3	29.417 - 0 (3)	TP42.85x35.8577x0.4063	16.98	974.41	0.017	0.78	3637.93	0.000

Pole Interaction Design Data

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
L1	110 - 67.333 (1)	0.009	0.386	0.000	0.031	0.001	0.396	1.050	

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	67.333 - 29.417 (2)	0.008	0.437	0.000	0.022	0.000	0.446	1.050	
L3	29.417 - 0 (3)	0.008	0.402	0.000	0.017	0.000	0.411	1.050	

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail	
L1	110 - 67.333	Pole	TP30.45x21.91x0.2188	1	-11.23	1267.58	37.7	Pass	
L2	67.333 - 29.417	Pole	TP37.6x29.0784x0.3125	2	-17.82	2235.64	42.4	Pass	
L3	29.417 - 0	Pole	TP42.85x35.8577x0.4063	3	-26.74	3410.42	39.1	Pass	
							Summary		
							Pole (L2)	42.4	Pass
							RATING =	42.4	Pass

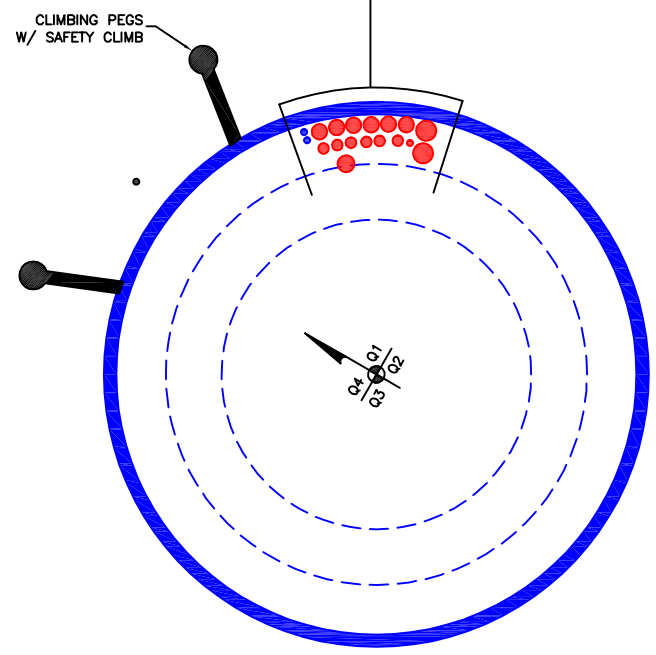
APPENDIX B
BASE LEVEL DRAWING



(PROPOSED EQUIPMENT CONFIGURATION)
(1) 1/2" TO 109 FT LEVEL

(PROPOSED EQUIPMENT CONFIGURATION)
(6) 7/8" TO 98 FT LEVEL
(6) 1-1/4" TO 98 FT LEVEL
(1) 1-3/8" TO 98 FT LEVEL
(2) 1-5/8" TO 98 FT LEVEL

(OTHER CONSIDERED EQUIPMENT)
(1) 1/2" TO 60 FT LEVEL
(1) 1/2" TO 80 FT LEVEL



APPENDIX C
ADDITIONAL CALCULATIONS

Monopole Base Plate Connection

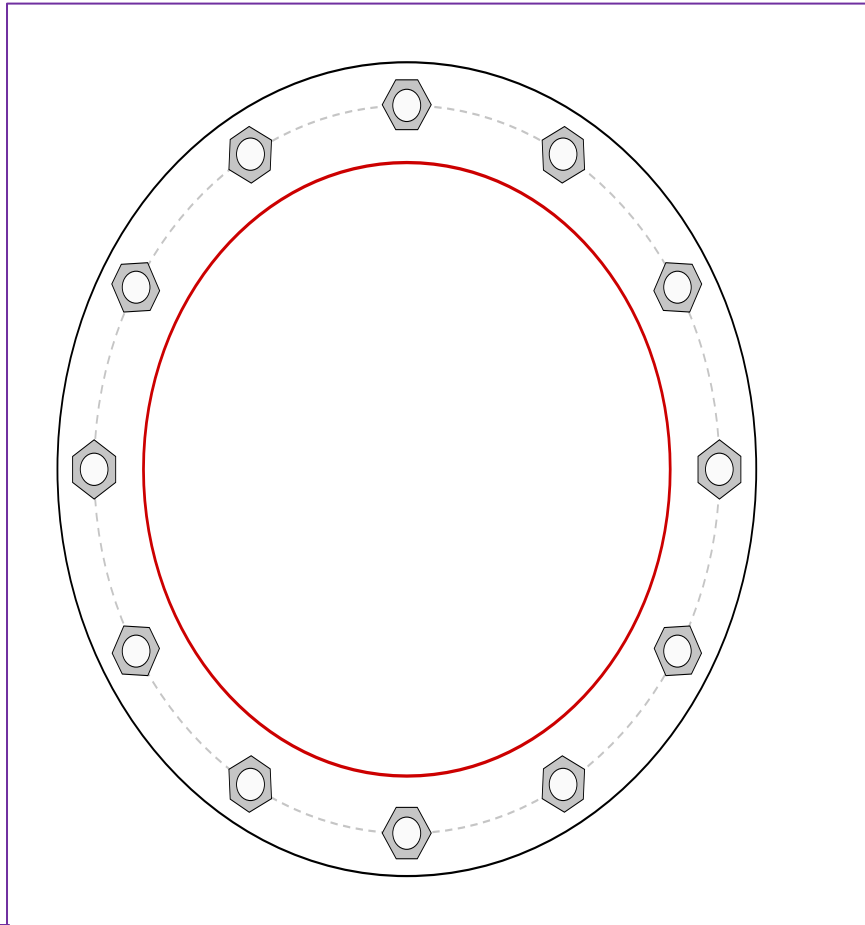


Site Info	
BU #	806360
Site Name	NHV 113 943126
Order #	666926 Rev. 3

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	0.5

Applied Loads	
Moment (kip-ft)	1306.95
Axial Force (kips)	26.74
Shear Force (kips)	16.98

*TIA-222-H Section 15.5 Applied



Connection Properties

Anchor Rod Data

(12) 2-1/4" ϕ bolts (A615-75 N; $F_y=75$ ksi, $F_u=100$ ksi) on 50.86" BC

Base Plate Data

56.86" OD x 2.75" Plate (S-128; $F_y=60$ ksi, $F_u=80$ ksi)

Stiffener Data

N/A

Pole Data

42.85" x 0.40625" 12-sided pole (A572-65; $F_y=65$ ksi, $F_u=80$ ksi)

Analysis Results

Anchor Rod Summary

(units of kips, kip-in)

$P_{u_t} = 100.48$	$\phi P_{n_t} = 243.75$	Stress Rating
$V_u = 1.42$	$\phi V_n = 149.1$	39.3%
$M_u = n/a$	$\phi M_n = n/a$	Pass

Base Plate Summary

Max Stress (ksi):	12.29	(Flexural)
Allowable Stress (ksi):	54	
Stress Rating:	21.7%	Pass

Drilled Pier Foundation

BU # :	806360
Site Name:	NHV 113 943126
Order Number:	666926 Rev. 3
TIA-222 Revision:	H
Tower Type:	Monopole



Applied Loads		
	Comp.	Uplift
Moment (kip-ft)	1306.94	
Axial Force (kips)	26.74	
Shear Force (kips)	16.97	

Material Properties		
Concrete Strength, f _c :	3	ksi
Rebar Strength, F _y :	60	ksi
Tie Yield Strength, F _{yt} :	60	ksi

Pier Design Data		
Depth	32	ft
Ext. Above Grade	0.5	ft
Pier Section 1		
<i>From 0.5' above grade to 32' below grade</i>		
Pier Diameter	6	ft
Rebar Quantity	32	
Rebar Size	11	
Clear Cover to Ties	3	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)	5.69	-
Soil Safety Factor	8.07	-
Max Moment (kip-ft)	1390.30	-
Rating*	15.7%	-
Soil Vertical Check	Compression	Uplift
Skin Friction (kips)	293.13	-
End Bearing (kips)	72.10	-
Weight of Concrete (kips)	112.46	-
Total Capacity (kips)	365.23	-
Axial (kips)	139.20	-
Rating*	36.3%	-
Reinforced Concrete Flexure	Compression	Uplift
Critical Depth (ft from TOC)	5.69	-
Critical Moment (kip-ft)	1390.30	-
Critical Moment Capacity	6199.45	-
Rating*	21.4%	-
Reinforced Concrete Shear	Compression	Uplift
Critical Depth (ft from TOC)	19.09	-
Critical Shear (kip)	103.71	-
Critical Shear Capacity	431.25	-
Rating*	22.9%	-

Structural Foundation Rating*	22.9%
Soil Interaction Rating*	36.3%

*Rating per TIA-222-H Section 15.5

Check Limitation	
Apply TIA-222-H Section 15.5:	<input checked="" type="checkbox"/>
N/A	<input type="checkbox"/>
Design Options	
Input Effective Depths (else Actual):	<input type="checkbox"/>
Consider non-tapered moment capacity:	<input type="checkbox"/>
Check Shear along Depth of Pier:	<input checked="" type="checkbox"/>
Utilize Shear-Friction Methodology:	<input type="checkbox"/>
Override Critical Depth:	<input type="checkbox"/>

[Go to Soil Calculations](#)

Soil Profile			
Groundwater Depth	7	# of Layers	3

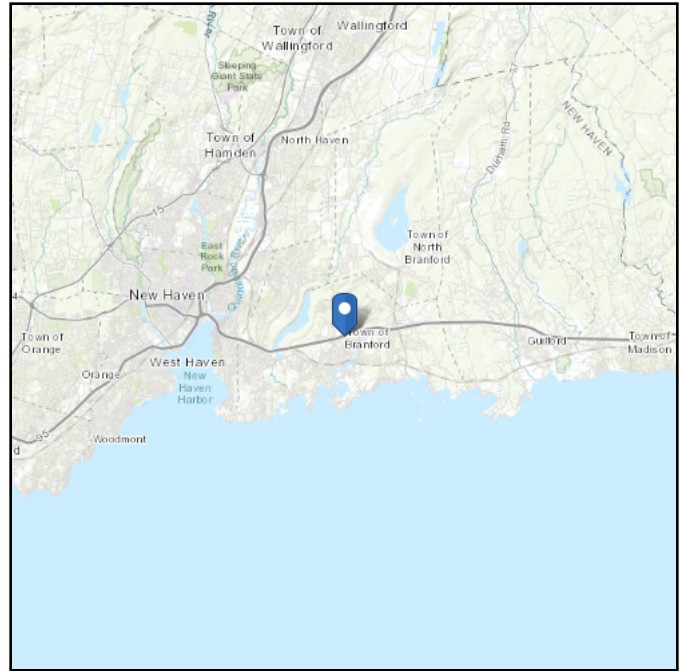
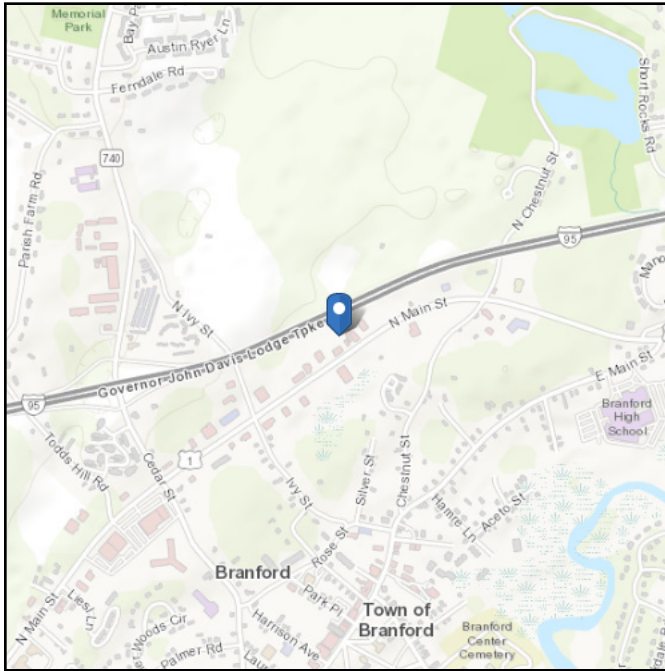
Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ _{soil} (pcf)	γ _{concrete} (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Net Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	3	3	155	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
2	3	7	4	155	150	1.3	0	0.715	0.715					Cohesive
3	7	32	25	92.6	87.6	1.3	0	0.715	0.715			0		Cohesive

ASCE 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)

Latitude: 41.289658
Longitude: -72.811728
Elevation: 59.330021009453 ft (NAVD 88)



Wind

Results:

Wind Speed	121 Vmph
10-year MRI	75 Vmph
25-year MRI	85 Vmph
50-year MRI	92 Vmph
100-year MRI	99 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 Apr 20 2024

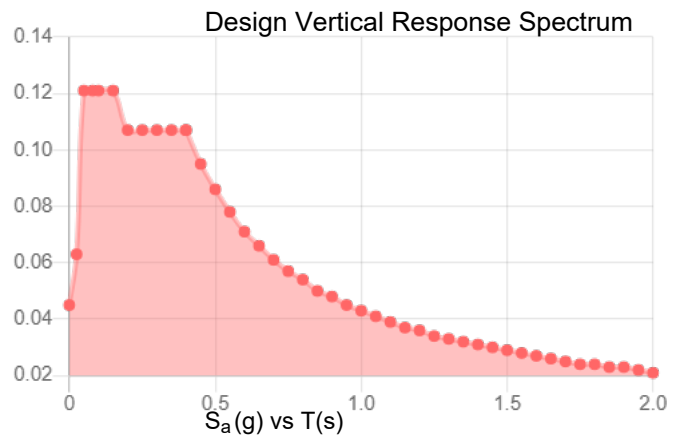
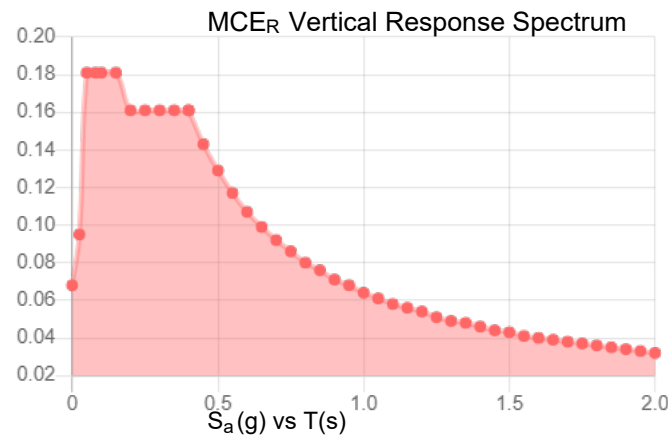
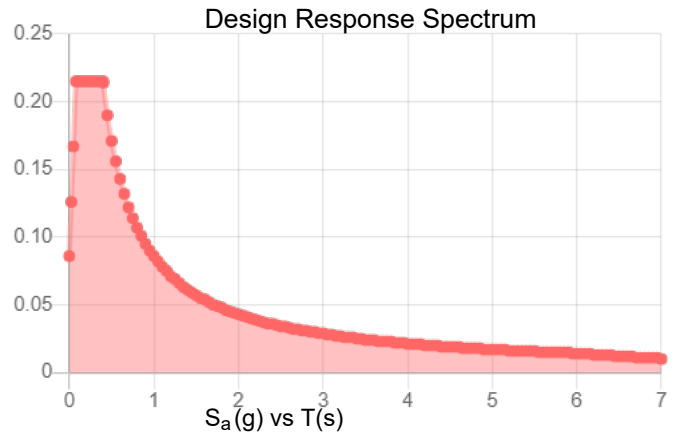
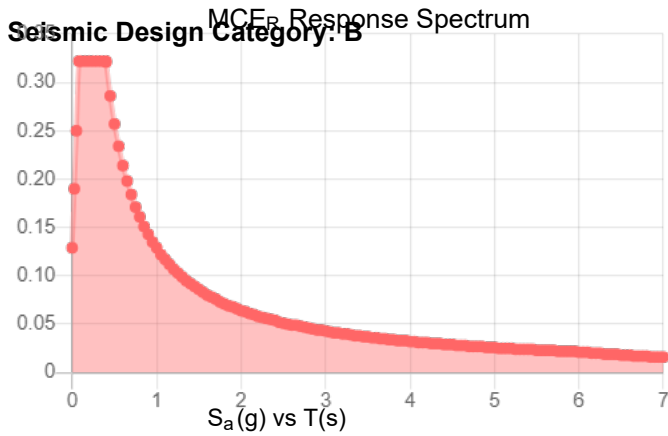
Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance 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 :	0.201	S_{D1} :	0.086
S_1 :	0.054	T_L :	6
F_a :	1.6	PGA :	0.113
F_v :	2.4	PGA _M :	0.177
S_{MS} :	0.322	F_{PGA} :	1.575
S_{M1} :	0.129	I_e :	1
S_{DS} :	0.215	C_v :	0.703



Data Accessed: Sat Apr 20 2024

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: 1.00 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 Apr 20 2024

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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