

Date: **May 25, 2021**



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

Subject: **Structural Analysis Report**

Carrier Designation: **DISH Network Co-Locate**
Site Number: BOBDL00074A
Site Name: CT-CCI-T-857011

Crown Castle Designation: **BU Number:** 857011
Site Name: WESTBROOK NORTH HORSE HILL ROA
JDE Job Number: 645153
Work Order Number: 1973897
Order Number: 553288 Rev. 2

Engineering Firm Designation: **Crown Castle Project Number:** 1973897

Site Data: **1102 HORSE HILL ROAD, WESTBROOK, Middlesex County, CT**
Latitude 41° 19' 25.71", Longitude -72° 29' 28.1"
159.08 Foot - Monopole Tower

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

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

LC5: Proposed Equipment Configuration

Sufficient Capacity - 55.8%

This analysis has been performed in accordance with the 2018 Connecticut Building Code based upon an ultimate 3-second gust wind speed of 135 mph. Applicable Standard references and design criteria are listed in Section 2 - "Analysis Criteria".

Structural analysis prepared by: Tyler Ho

Respectfully submitted by:

Terry P. Styran, P.E.
Senior Project Engineer

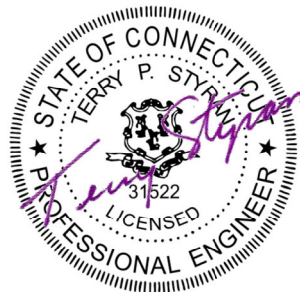


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1) INTRODUCTION

This tower is a 159.08 ft Monopole tower designed by Elevated Services.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	135 mph
Exposure Category:	B
Topographic Factor:	1
Ice Thickness:	1.5 in
Wind Speed with Ice:	50 mph
Seismic Ss:	0.167
Seismic S1:	0.059
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)
135.0	135.0	3	fujitsu	TA08025-B604	1	1-1/2
		3	fujitsu	TA08025-B605		
		3	jma wireless	MX08FRO665-20 w/ Mount Pipe		
		1	raycap	RDIDC-9181-PF-48		
		1	tower mounts	Commscope MC-PK8-DSH		

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)
159.0	163.0	3	ericsson	RRUS 4415 B25	2	3/8
		3	ericsson	RRUS 4449 B5/B12		
		3	ericsson	RRUS 8843 B2/B66A		
		3	kathrein	80010965 w/ Mount Pipe		
		3	kathrein	80010991 w/ Mount Pipe		
		3	powerwave technologies	7770.00 w/ Mount Pipe		
		6	powerwave technologies	LGP21402		
	3	raycap	DC6-48-60-18-8C-EV	3	2-1/2" Conduit	
159.0	1	tower mounts	Platform Mount [LP 714-1]			
147.0	147.0	3	alcatel lucent	B13 RRH 4X30	2	1-5/8
		3	alcatel lucent	B66A RRH4X45		
		3	amphenol	QUAD656C0000X w/ Mount Pipe		
		9	commscope	SBNHH-1D65B w/ Mount Pipe		
		1	raycap	RCMDC-6627-PF-48		
		1	tower mounts	Platform Mount [LP 303-1_KCKR-HR-1]		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
4-GEOTECHNICAL REPORTS	4306672	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	4723512	CCISITES
4-TOWER MANUFACTURER DRAWINGS	5177796	CCISITES

3.1) Analysis Method

tnxTower (version 8.0.9.0), 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. Crown Castle should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	159.08 - 139.33	Pole	TP24.1x18.43x0.188	1	-8.05	842.55	37.6	Pass
L2	139.33 - 91.24	Pole	TP40.49x22.861x0.313	2	-18.69	2341.50	47.0	Pass
L3	91.24 - 44.66	Pole	TP54.61x38.119x0.375	3	-31.13	3805.71	45.4	Pass
L4	44.66 - 0	Pole	TP69.47x51.679x0.375	4	-50.17	4980.67	50.8	Pass
							Summary	
						Pole (L4)	50.8	Pass
						Rating =	50.8	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	40.9	Pass
1	Base Plate	0	37.1	Pass
1	Base Foundation (Structure)	0	55.8	Pass
1	Base Foundation (Soil Interaction)	0	37.2	Pass

Structure Rating (max from all components) =	55.8%
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Notes:

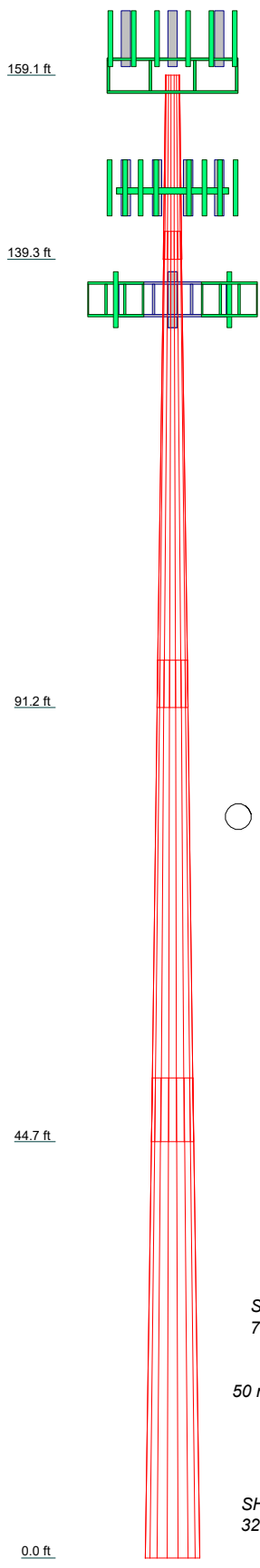
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

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

APPENDIX A
TNXTOWER OUTPUT

Section	1	2	3	4	
Length (ft)	19.75	51.10	51.64	51.49	
Number of Sides	18	18	18	18	
Thickness (in)	0.188	0.313	0.375	0.375	
Socket Length (ft)	3.01	5.06	6.83		
Top Dia (in)	18.430	22.861	38.119	51.679	
Bot Dia (in)	24.100	40.490	54.610	69.470	
Grade			A572-65		
Weight (K)	0.8	5.4	9.6	12.6	28.4



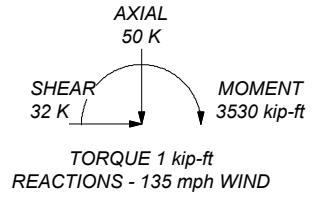
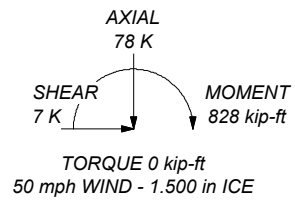
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 135 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 50.8%

ALL REACTIONS ARE FACTORED



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Job: BU# 857011		
Project:	Client: Crown Castle	App'd:
Code: TIA-222-H	Drawn by: THo	Scale: NTS
Path:	Date: 05/25/21	Dwg No. E-1

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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 Middlesex County, Connecticut.
- Tower base elevation above sea level: 236.00 ft.
- Basic wind speed of 135 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 1.500 in.
- Ice thickness is considered to increase with height.
- Ice density of 56.00 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Tower analysis based on target reliabilities in accordance with Annex S.
- Load Modification Factors used: $K_{es}(F_w) = 0.95$, $K_{es}(t_i) = 0.85$.
- Maximum demand-capacity ratio is: 1.05.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs 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 Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. 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 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 <div style="text-align: center; background-color: #e0e0e0; padding: 2px;">Poles</div> ✓ 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
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Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	159.08-139.33	19.75	3.01	18	18.430	24.100	0.188	0.750	A572-65 (65 ksi)
L2	139.33-91.24	51.10	5.06	18	22.861	40.490	0.313	1.250	A572-65 (65 ksi)
L3	91.24-44.66	51.64	6.83	18	38.119	54.610	0.375	1.500	A572-65 (65 ksi)
L4	44.66-0.00	51.49		18	51.679	69.470	0.375	1.500	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	18.685	10.857	456.456	6.476	9.362	48.754	913.512	5.429	2.914	15.54
	24.443	14.231	1028.065	8.489	12.243	83.973	2057.483	7.117	3.912	20.862
L2	24.220	22.365	1436.612	8.005	11.613	123.704	2875.114	11.185	3.474	11.115
	41.066	39.851	8127.241	14.263	20.569	395.122	16265.175	19.929	6.576	21.044
L3	40.290	44.925	8085.949	13.399	19.365	417.563	16182.538	22.467	6.049	16.131
	55.395	64.553	23989.134	19.253	27.742	864.726	48009.834	32.283	8.951	23.87
L4	54.815	61.064	20306.130	18.213	26.253	773.482	40638.979	30.538	8.435	22.495
	70.484	82.240	49603.864	24.529	35.291	1405.577	99272.997	41.128	11.567	30.845

Tower Elevation ft	Gusset Area (per face) ft ²	Gusset Thickness in	Gusset Grade	Adjust. Factor A _r	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontal in	Double Angle Stitch Bolt Spacing Redundants in
L1 159.08- 139.33				1	1	1			
L2 139.33- 91.24				1	1	1			
L3 91.24- 44.66				1	1	1			
L4 44.66-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Componen t Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diamete r in	Perimete r in	Weight plf
*											

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Componen t Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight plf
Level 159								
LDF7-50A(1-5/8)	A	No	No	Inside Pole	159.00 - 0.00	12	No Ice	0.82
							1/2" Ice	0.82
							1" Ice	0.82
							2" Ice	0.82
FB-L98B-034- XXX(3/8)	A	No	No	Inside Pole	159.00 - 0.00	2	No Ice	0.06
							1/2" Ice	0.06
							1" Ice	0.06

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
WR-VG86ST-BRD(3/4)	A	No	No	Inside Pole	159.00 - 0.00	4	2" Ice	0.00	0.06
							No Ice	0.00	0.58
							1/2" Ice	0.00	0.58
							1" Ice	0.00	0.58
WR-VG86ST-BRDA(7/8)	A	No	No	Inside Pole	159.00 - 0.00	2	2" Ice	0.00	0.58
							No Ice	0.00	0.68
							1/2" Ice	0.00	0.68
							1" Ice	0.00	0.68
2-1/2" Rigid Conduit	A	No	No	Inside Pole	159.00 - 0.00	3	2" Ice	0.00	0.68
							No Ice	0.00	3.00
							1/2" Ice	0.00	3.00
							1" Ice	0.00	3.00
Level 147 HB158-1-08U8-S8J18(1-5/8)	B	No	No	Inside Pole	147.00 - 0.00	2	2" Ice	0.00	3.00
							No Ice	0.00	1.30
							1/2" Ice	0.00	1.30
							1" Ice	0.00	1.30
**** CU12PSM9P6XXX (1-1/2)	C	No	No	Inside Pole	135.00 - 0.00	1	2" Ice	0.00	1.30
							No Ice	0.00	2.35
							1/2" Ice	0.00	2.35
							1" Ice	0.00	2.35
							2" Ice	0.00	2.35

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	159.08-139.33	A	0.000	0.000	0.000	0.000	0.45
		B	0.000	0.000	0.000	0.000	0.02
		C	0.000	0.000	0.000	0.000	0.00
L2	139.33-91.24	A	0.000	0.000	0.000	0.000	1.09
		B	0.000	0.000	0.000	0.000	0.13
		C	0.000	0.000	0.000	0.000	0.10
L3	91.24-44.66	A	0.000	0.000	0.000	0.000	1.06
		B	0.000	0.000	0.000	0.000	0.12
		C	0.000	0.000	0.000	0.000	0.11
L4	44.66-0.00	A	0.000	0.000	0.000	0.000	1.01
		B	0.000	0.000	0.000	0.000	0.12
		C	0.000	0.000	0.000	0.000	0.10

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	159.08-139.33	A	1.482	0.000	0.000	0.000	0.000	0.45
		B		0.000	0.000	0.000	0.000	0.02
		C		0.000	0.000	0.000	0.000	0.00
L2	139.33-91.24	A	1.443	0.000	0.000	0.000	0.000	1.09
		B		0.000	0.000	0.000	0.000	0.13
		C		0.000	0.000	0.000	0.000	0.10
L3	91.24-44.66	A	1.369	0.000	0.000	0.000	0.000	1.06
		B		0.000	0.000	0.000	0.000	0.12
		C		0.000	0.000	0.000	0.000	0.11
L4	44.66-0.00	A	1.222	0.000	0.000	0.000	0.000	1.01
		B		0.000	0.000	0.000	0.000	0.12

Tower Section	Tower Elevation	Face or Leg	Ice Thickness	A _R	A _F	C _A A _A In Face	C _A A _A Out Face	Weight
n	ft		in	ft ²	ft ²	ft ²	ft ²	K
		C		0.000	0.000	0.000	0.000	0.10

Feed Line Center of Pressure

Section	Elevation	CP _X	CP _Z	CP _X Ice	CP _Z Ice
	ft	in	in	in	in
L1	159.08-139.33	0.000	0.000	0.000	0.000
L2	139.33-91.24	0.000	0.000	0.000	0.000
L3	91.24-44.66	0.000	0.000	0.000	0.000
L4	44.66-0.00	0.000	0.000	0.000	0.000

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustmen t	Placement	C _A A _A Front	C _A A _A Side	Weight	
			ft ft ft	°	ft	ft ²	ft ²	K	
Level 159									
Platform Mount [LP 714-1]	C	None		0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	37.51 41.70 45.89 54.29	37.51 41.70 45.89 54.29	1.60 2.50 3.46 5.58
6' x 2" Mount Pipe	A	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.43 1.92 2.29 3.06	1.43 1.92 2.29 3.06	0.02 0.03 0.05 0.09
6' x 2" Mount Pipe	B	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.43 1.92 2.29 3.06	1.43 1.92 2.29 3.06	0.02 0.03 0.05 0.09
6' x 2" Mount Pipe	C	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.43 1.92 2.29 3.06	1.43 1.92 2.29 3.06	0.02 0.03 0.05 0.09
7770.00 w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.75 6.18 6.61 7.49	4.25 5.01 5.71 7.16	0.06 0.10 0.16 0.29
7770.00 w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.75 6.18 6.61 7.49	4.25 5.01 5.71 7.16	0.06 0.10 0.16 0.29
7770.00 w/ Mount Pipe	C	From Leg	4.00 0.00 4.00	0.000	159.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.75 6.18 6.61 7.49	4.25 5.01 5.71 7.16	0.06 0.10 0.16 0.29

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A _A Front	C _A A _A Side	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft ²	ft ²	K
80010991 w/ Mount Pipe	A	From Leg	4.00	0.000	159.00	No Ice	12.26	5.79	0.14
			0.00			1/2"	13.03	6.47	0.23
			4.00			Ice	13.80	7.17	0.33
						1" Ice	15.41	8.60	0.57
						2" Ice			
80010991 w/ Mount Pipe	B	From Leg	4.00	0.000	159.00	No Ice	12.26	5.79	0.14
			0.00			1/2"	13.03	6.47	0.23
			4.00			Ice	13.80	7.17	0.33
						1" Ice	15.41	8.60	0.57
						2" Ice			
80010991 w/ Mount Pipe	C	From Leg	4.00	0.000	159.00	No Ice	12.26	5.79	0.14
			0.00			1/2"	13.03	6.47	0.23
			4.00			Ice	13.80	7.17	0.33
						1" Ice	15.41	8.60	0.57
						2" Ice			
80010965 w/ Mount Pipe	A	From Leg	4.00	0.000	159.00	No Ice	12.26	5.79	0.14
			0.00			1/2"	13.03	6.47	0.23
			4.00			Ice	13.80	7.17	0.33
						1" Ice	15.41	8.60	0.57
						2" Ice			
80010965 w/ Mount Pipe	B	From Leg	4.00	0.000	159.00	No Ice	12.26	5.79	0.14
			0.00			1/2"	13.03	6.47	0.23
			4.00			Ice	13.80	7.17	0.33
						1" Ice	15.41	8.60	0.57
						2" Ice			
80010965 w/ Mount Pipe	C	From Leg	4.00	0.000	159.00	No Ice	12.26	5.79	0.14
			0.00			1/2"	13.03	6.47	0.23
			4.00			Ice	13.80	7.17	0.33
						1" Ice	15.41	8.60	0.57
						2" Ice			
(2) LGP21402	A	From Leg	4.00	0.000	159.00	No Ice	1.05	0.23	0.01
			0.00			1/2"	1.18	0.30	0.02
			4.00			Ice	1.32	0.37	0.03
						1" Ice	1.62	0.55	0.05
						2" Ice			
(2) LGP21402	B	From Leg	4.00	0.000	159.00	No Ice	1.05	0.23	0.01
			0.00			1/2"	1.18	0.30	0.02
			4.00			Ice	1.32	0.37	0.03
						1" Ice	1.62	0.55	0.05
						2" Ice			
(2) LGP21402	C	From Leg	4.00	0.000	159.00	No Ice	1.05	0.23	0.01
			0.00			1/2"	1.18	0.30	0.02
			4.00			Ice	1.32	0.37	0.03
						1" Ice	1.62	0.55	0.05
						2" Ice			
RRUS 4415 B25	A	From Leg	4.00	0.000	159.00	No Ice	1.64	0.68	0.04
			0.00			1/2"	1.80	0.79	0.06
			4.00			Ice	1.97	0.91	0.07
						1" Ice	2.33	1.18	0.11
						2" Ice			
RRUS 4415 B25	B	From Leg	4.00	0.000	159.00	No Ice	1.64	0.68	0.04
			0.00			1/2"	1.80	0.79	0.06
			4.00			Ice	1.97	0.91	0.07
						1" Ice	2.33	1.18	0.11
						2" Ice			
RRUS 4415 B25	C	From Leg	4.00	0.000	159.00	No Ice	1.64	0.68	0.04
			0.00			1/2"	1.80	0.79	0.06
			4.00			Ice	1.97	0.91	0.07
						1" Ice	2.33	1.18	0.11
						2" Ice			
RRUS 4449 B5/B12	A	From Leg	4.00	0.000	159.00	No Ice	1.97	1.41	0.07
			0.00			1/2"	2.14	1.56	0.09
			4.00			Ice	2.33	1.73	0.11
						1" Ice	2.72	2.07	0.16
						2" Ice			

Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz	Lateral	Vert					
			ft	ft	ft	°	ft	ft ²	ft ²	K
RRUS 4449 B5/B12	B	From Leg	4.00	0.00	159.00		No Ice	1.97	1.41	0.07
			0.00				1/2"	2.14	1.56	0.09
			4.00				Ice	2.33	1.73	0.11
							1" Ice	2.72	2.07	0.16
							2" Ice			
RRUS 4449 B5/B12	C	From Leg	4.00	0.00	159.00		No Ice	1.97	1.41	0.07
			0.00				1/2"	2.14	1.56	0.09
			4.00				Ice	2.33	1.73	0.11
							1" Ice	2.72	2.07	0.16
							2" Ice			
RRUS 8843 B2/B66A	A	From Leg	4.00	0.00	159.00		No Ice	1.64	1.35	0.07
			0.00				1/2"	1.80	1.50	0.09
			4.00				Ice	1.97	1.65	0.11
							1" Ice	2.32	1.99	0.16
							2" Ice			
RRUS 8843 B2/B66A	B	From Leg	4.00	0.00	159.00		No Ice	1.64	1.35	0.07
			0.00				1/2"	1.80	1.50	0.09
			4.00				Ice	1.97	1.65	0.11
							1" Ice	2.32	1.99	0.16
							2" Ice			
RRUS 8843 B2/B66A	C	From Leg	4.00	0.00	159.00		No Ice	1.64	1.35	0.07
			0.00				1/2"	1.80	1.50	0.09
			4.00				Ice	1.97	1.65	0.11
							1" Ice	2.32	1.99	0.16
							2" Ice			
DC6-48-60-18-8C-EV	A	From Leg	4.00	0.00	159.00		No Ice	1.14	1.14	0.03
			0.00				1/2"	1.79	1.79	0.05
			4.00				Ice	2.00	2.00	0.07
							1" Ice	2.45	2.45	0.13
							2" Ice			
DC6-48-60-18-8C-EV	A	From Leg	4.00	0.00	159.00		No Ice	1.14	1.14	0.03
			0.00				1/2"	1.79	1.79	0.05
			4.00				Ice	2.00	2.00	0.07
							1" Ice	2.45	2.45	0.13
							2" Ice			
DC6-48-60-18-8C-EV	B	From Leg	4.00	0.00	159.00		No Ice	1.14	1.14	0.03
			0.00				1/2"	1.79	1.79	0.05
			4.00				Ice	2.00	2.00	0.07
							1" Ice	2.45	2.45	0.13
							2" Ice			
** MX08FRO665-20 w/ Mount Pipe	A	From Leg	4.00	0.00	135.00		No Ice	8.01	4.23	0.10
			0.00				1/2"	8.52	4.69	0.18
			0.00				Ice	9.04	5.16	0.28
							1" Ice	10.11	6.12	0.51
							2" Ice			
MX08FRO665-20 w/ Mount Pipe	B	From Leg	4.00	0.00	135.00		No Ice	8.01	4.23	0.10
			0.00				1/2"	8.52	4.69	0.18
			0.00				Ice	9.04	5.16	0.28
							1" Ice	10.11	6.12	0.51
							2" Ice			
MX08FRO665-20 w/ Mount Pipe	C	From Leg	4.00	0.00	135.00		No Ice	8.01	4.23	0.10
			0.00				1/2"	8.52	4.69	0.18
			0.00				Ice	9.04	5.16	0.28
							1" Ice	10.11	6.12	0.51
							2" Ice			
TA08025-B604	A	From Leg	4.00	0.00	135.00		No Ice	1.96	0.98	0.06
			0.00				1/2"	2.14	1.11	0.08
			0.00				Ice	2.32	1.25	0.10
							1" Ice	2.71	1.55	0.15
							2" Ice			
TA08025-B604	B	From Leg	4.00	0.00	135.00		No Ice	1.96	0.98	0.06
			0.00				1/2"	2.14	1.11	0.08
			0.00				Ice	2.32	1.25	0.10
							1" Ice	2.71	1.55	0.15
							2" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight	
			Horz	Lateral						ft
TA08025-B604	C	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.96	0.98	0.06
							1/2"	2.14	1.11	0.08
							Ice	2.32	1.25	0.10
TA08025-B605	A	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.96	1.13	0.08
							1/2"	2.14	1.27	0.09
							Ice	2.32	1.41	0.11
TA08025-B605	B	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.96	1.13	0.08
							1/2"	2.14	1.27	0.09
							Ice	2.32	1.41	0.11
TA08025-B605	C	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.96	1.13	0.08
							1/2"	2.14	1.27	0.09
							Ice	2.32	1.41	0.11
RDIDC-9181-PF-48	A	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	2.31	1.29	0.02
							1/2"	2.50	1.45	0.04
							Ice	2.70	1.61	0.06
(2) 8' x 2" Mount Pipe	A	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.90	1.90	0.03
							1/2"	2.73	2.73	0.04
							Ice	3.40	3.40	0.06
(2) 8' x 2" Mount Pipe	B	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.90	1.90	0.03
							1/2"	2.73	2.73	0.04
							Ice	3.40	3.40	0.06
(2) 8' x 2" Mount Pipe	C	From Leg	4.00	0.00	0.000	135.00	2" Ice			
							No Ice	1.90	1.90	0.03
							1/2"	2.73	2.73	0.04
							Ice	3.40	3.40	0.06
Commscope MC-PK8-DSH	C	None			0.000	135.00	2" Ice			
							No Ice	34.24	34.24	1.75
							1/2"	62.95	62.95	2.10
							Ice	91.66	91.66	2.45
Level 147 Platform Mount [LP 303-1_KCKR-HR-1]	C	None			0.000	147.00	2" Ice			
							No Ice	28.31	28.31	1.77
							1/2"	35.69	35.69	2.30
							Ice	43.11	43.11	2.94
QUAD656C0000X w/ Mount Pipe	A	From Leg	4.00	0.00	0.000	147.00	2" Ice			
							No Ice	13.90	6.62	0.10
							1/2"	14.77	7.39	0.18
							Ice	15.64	8.17	0.28
QUAD656C0000X w/ Mount Pipe	B	From Leg	4.00	0.00	0.000	147.00	2" Ice			
							No Ice	13.90	6.62	0.10
							1/2"	14.77	7.39	0.18
							Ice	15.64	8.17	0.28
QUAD656C0000X w/ Mount Pipe	C	From Leg	4.00	0.00	0.000	147.00	2" Ice			
							No Ice	13.90	6.62	0.10
							1/2"	14.77	7.39	0.18
							Ice	15.64	8.17	0.28

Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight
			Horz	Lateral	Vert					
			ft	ft	ft	°	ft	ft ²	ft ²	K
							1" Ice	17.46	9.78	0.52
(3) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00	0.00	147.00		2" Ice	4.09	3.30	0.07
							No Ice	4.49	3.68	0.13
							1/2" Ice	4.89	4.07	0.20
							1" Ice	5.72	4.87	0.39
(3) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00	0.00	147.00		2" Ice	4.09	3.30	0.07
							No Ice	4.49	3.68	0.13
							1/2" Ice	4.89	4.07	0.20
							1" Ice	5.72	4.87	0.39
(3) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00	0.00	147.00		2" Ice	4.09	3.30	0.07
							No Ice	4.49	3.68	0.13
							1/2" Ice	4.89	4.07	0.20
							1" Ice	5.72	4.87	0.39
B66A RRH4X45	A	From Leg	4.00	0.00	147.00		2" Ice	2.58	1.63	0.07
							No Ice	2.79	1.81	0.09
							1/2" Ice	3.01	2.00	0.11
							1" Ice	3.48	2.40	0.17
B66A RRH4X45	B	From Leg	4.00	0.00	147.00		2" Ice	2.58	1.63	0.07
							No Ice	2.79	1.81	0.09
							1/2" Ice	3.01	2.00	0.11
							1" Ice	3.48	2.40	0.17
B66A RRH4X45	C	From Leg	4.00	0.00	147.00		2" Ice	2.58	1.63	0.07
							No Ice	2.79	1.81	0.09
							1/2" Ice	3.01	2.00	0.11
							1" Ice	3.48	2.40	0.17
B13 RRH 4X30	A	From Leg	4.00	0.00	147.00		2" Ice	2.06	1.32	0.06
							No Ice	2.24	1.48	0.07
							1/2" Ice	2.43	1.64	0.09
							1" Ice	2.84	2.00	0.14
B13 RRH 4X30	B	From Leg	4.00	0.00	147.00		2" Ice	2.06	1.32	0.06
							No Ice	2.24	1.48	0.07
							1/2" Ice	2.43	1.64	0.09
							1" Ice	2.84	2.00	0.14
B13 RRH 4X30	C	From Leg	4.00	0.00	147.00		2" Ice	2.06	1.32	0.06
							No Ice	2.24	1.48	0.07
							1/2" Ice	2.43	1.64	0.09
							1" Ice	2.84	2.00	0.14
RCMDC-6627-PF-48	B	From Leg	4.00	0.00	147.00		2" Ice	4.06	3.10	0.03
							No Ice	4.32	3.34	0.07
							1/2" Ice	4.58	3.58	0.11
							1" Ice	5.14	4.09	0.20
							2" Ice			

Load Combinations

Comb. No.	Description
1	Dead Only

Comb. No.	Description
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	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	159.08 - 139.33	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-21.47	-1.14	0.37
			Max. Mx	8	-8.05	-171.35	0.09
			Max. My	2	-8.05	-0.18	171.13
			Max. Vy	8	13.23	-171.35	0.09
			Max. Vx	2	-13.21	-0.18	171.13
			Max. Torque	2			-0.78
L2	139.33 - 91.24	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-37.59	-1.16	0.85
			Max. Mx	8	-18.69	-1005.40	-0.59

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L3	91.24 - 44.66	Pole	Max. My	2	-18.69	0.59	1005.98
			Max. Vy	8	20.84	-1005.40	-0.59
			Max. Vx	2	-20.86	0.59	1005.98
			Max. Torque	24			-0.87
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-53.63	-1.16	0.85
			Max. Mx	8	-31.13	-2049.55	-1.37
			Max. My	2	-31.13	1.36	2051.09
			Max. Vy	8	25.81	-2049.55	-1.37
			Max. Vx	2	-25.83	1.36	2051.09
L4	44.66 - 0	Pole	Max. Torque	24			-0.87
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-77.62	-1.16	0.85
			Max. Mx	8	-50.17	-3526.18	-2.25
			Max. My	2	-50.17	2.24	3528.82
			Max. Vy	8	31.60	-3526.18	-2.25
			Max. Vx	2	-31.62	2.24	3528.82
			Max. Torque	24			-0.87

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	77.62	-0.00	0.00
	Max. H _x	20	50.19	31.58	0.02
	Max. H _z	2	50.19	0.02	31.60
	Max. M _x	2	3528.82	0.02	31.60
	Max. M _z	8	3526.18	-31.58	-0.02
	Max. Torsion	12	0.87	-15.80	-27.37
	Min. Vert	19	37.64	27.34	-15.78
	Min. H _x	8	50.19	-31.58	-0.02
	Min. H _z	14	50.19	-0.02	-31.60
	Min. M _x	14	-3528.20	-0.02	-31.60
	Min. M _z	20	-3525.54	31.58	0.02
	Min. Torsion	24	-0.87	15.80	27.37

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	41.82	0.00	0.00	-0.24	-0.25	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	50.19	-0.02	-31.60	-3528.82	2.24	0.78
0.9 Dead+1.0 Wind 0 deg - No Ice	37.64	-0.02	-31.60	-3502.06	2.30	0.78
1.2 Dead+1.0 Wind 30 deg - No Ice	50.19	15.77	-27.36	-3054.82	-1761.04	0.48
0.9 Dead+1.0 Wind 30 deg - No Ice	37.64	15.77	-27.36	-3031.65	-1747.65	0.48
1.2 Dead+1.0 Wind 60 deg - No Ice	50.19	27.34	-15.78	-1762.36	-3052.54	0.05
0.9 Dead+1.0 Wind 60 deg - No Ice	37.64	27.34	-15.78	-1748.96	-3029.37	0.05
1.2 Dead+1.0 Wind 90 deg - No Ice	50.19	31.58	0.02	2.25	-3526.18	-0.39
0.9 Dead+1.0 Wind 90 deg - No Ice	37.64	31.58	0.02	2.31	-3499.44	-0.39
1.2 Dead+1.0 Wind 120 deg	50.19	27.35	15.81	1766.16	-3055.08	-0.73

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						
0.9 Dead+1.0 Wind 120 deg	37.64	27.35	15.81	1752.89	-3031.90	-0.72
- No Ice						
1.2 Dead+1.0 Wind 150 deg	50.19	15.80	27.37	3056.75	-1765.46	-0.87
- No Ice						
0.9 Dead+1.0 Wind 150 deg	37.64	15.80	27.37	3033.72	-1752.03	-0.86
- No Ice						
1.2 Dead+1.0 Wind 180 deg	50.19	0.02	31.60	3528.20	-2.87	-0.77
- No Ice						
0.9 Dead+1.0 Wind 180 deg	37.64	0.02	31.60	3501.61	-2.77	-0.77
- No Ice						
1.2 Dead+1.0 Wind 210 deg	50.19	-15.77	27.36	3054.20	1760.40	-0.48
- No Ice						
0.9 Dead+1.0 Wind 210 deg	37.64	-15.77	27.36	3031.19	1747.18	-0.48
- No Ice						
1.2 Dead+1.0 Wind 240 deg	50.19	-27.34	15.78	1761.74	3051.90	-0.05
- No Ice						
0.9 Dead+1.0 Wind 240 deg	37.64	-27.34	15.78	1748.50	3028.90	-0.05
- No Ice						
1.2 Dead+1.0 Wind 270 deg	50.19	-31.58	-0.02	-2.86	3525.54	0.39
- No Ice						
0.9 Dead+1.0 Wind 270 deg	37.64	-31.58	-0.02	-2.76	3498.97	0.39
- No Ice						
1.2 Dead+1.0 Wind 300 deg	50.19	-27.35	-15.81	-1766.78	3054.44	0.73
- No Ice						
0.9 Dead+1.0 Wind 300 deg	37.64	-27.35	-15.81	-1753.34	3031.43	0.72
- No Ice						
1.2 Dead+1.0 Wind 330 deg	50.19	-15.80	-27.37	-3057.37	1764.83	0.87
- No Ice						
0.9 Dead+1.0 Wind 330 deg	37.64	-15.80	-27.37	-3034.17	1751.56	0.87
- No Ice						
1.2 Dead+1.0 Ice+1.0 Temp	77.62	0.00	-0.00	-0.85	-1.16	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	77.62	-0.00	-7.34	-828.32	-0.89	0.15
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	77.62	3.67	-6.36	-717.28	-414.42	0.07
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	77.62	6.35	-3.67	-414.29	-717.25	-0.03
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	77.62	7.34	0.00	-0.55	-828.24	-0.12
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	77.62	6.36	3.67	413.10	-717.64	-0.18
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	77.62	3.67	6.36	715.80	-415.09	-0.20
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	77.62	0.00	7.34	826.45	-1.66	-0.15
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	77.62	-3.67	6.36	715.41	411.87	-0.07
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	77.62	-6.35	3.67	412.43	714.70	0.03
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	77.62	-7.34	-0.00	-1.32	825.69	0.12
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	77.62	-6.36	-3.67	-414.96	715.09	0.18
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	77.62	-3.67	-6.36	-717.67	412.54	0.19
Dead+Wind 0 deg - Service	41.82	-0.00	-5.88	-654.91	0.21	0.15
Dead+Wind 30 deg - Service	41.82	2.94	-5.09	-566.97	-326.94	0.09
Dead+Wind 60 deg - Service	41.82	5.09	-2.94	-327.17	-566.55	0.00
Dead+Wind 90 deg - Service	41.82	5.88	0.00	0.22	-654.43	-0.09
Dead+Wind 120 deg - Service	41.82	5.09	2.95	327.48	-567.03	-0.15
Dead+Wind 150 deg - Service	41.82	2.94	5.10	566.93	-327.76	-0.18
Dead+Wind 180 deg - Service	41.82	0.00	5.88	654.40	-0.74	-0.15
Dead+Wind 210 deg - Service	41.82	-2.94	5.09	566.46	326.41	-0.09
Dead+Wind 240 deg -	41.82	-5.09	2.94	326.66	566.02	-0.00

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
Service						
Dead+Wind 270 deg - Service	41.82	-5.88	-0.00	-0.73	653.90	0.09
Dead+Wind 300 deg - Service	41.82	-5.09	-2.95	-327.99	566.49	0.15
Dead+Wind 330 deg - Service	41.82	-2.94	-5.10	-567.44	327.23	0.18

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	-41.82	0.00	0.00	41.82	0.00	0.000%
2	-0.02	-50.19	-31.60	0.02	50.19	31.60	0.000%
3	-0.02	-37.64	-31.60	0.02	37.64	31.60	0.000%
4	15.77	-50.19	-27.36	-15.77	50.19	27.36	0.000%
5	15.77	-37.64	-27.36	-15.77	37.64	27.36	0.000%
6	27.34	-50.19	-15.78	-27.34	50.19	15.78	0.000%
7	27.34	-37.64	-15.78	-27.34	37.64	15.78	0.000%
8	31.58	-50.19	0.02	-31.58	50.19	-0.02	0.000%
9	31.58	-37.64	0.02	-31.58	37.64	-0.02	0.000%
10	27.35	-50.19	15.81	-27.35	50.19	-15.81	0.000%
11	27.35	-37.64	15.81	-27.35	37.64	-15.81	0.000%
12	15.80	-50.19	27.37	-15.80	50.19	-27.37	0.000%
13	15.80	-37.64	27.37	-15.80	37.64	-27.37	0.000%
14	0.02	-50.19	31.60	-0.02	50.19	-31.60	0.000%
15	0.02	-37.64	31.60	-0.02	37.64	-31.60	0.000%
16	-15.77	-50.19	27.36	15.77	50.19	-27.36	0.000%
17	-15.77	-37.64	27.36	15.77	37.64	-27.36	0.000%
18	-27.34	-50.19	15.78	27.34	50.19	-15.78	0.000%
19	-27.34	-37.64	15.78	27.34	37.64	-15.78	0.000%
20	-31.58	-50.19	-0.02	31.58	50.19	0.02	0.000%
21	-31.58	-37.64	-0.02	31.58	37.64	0.02	0.000%
22	-27.35	-50.19	-15.81	27.35	50.19	15.81	0.000%
23	-27.35	-37.64	-15.81	27.35	37.64	15.81	0.000%
24	-15.80	-50.19	-27.37	15.80	50.19	27.37	0.000%
25	-15.80	-37.64	-27.37	15.80	37.64	27.37	0.000%
26	0.00	-77.62	0.00	-0.00	77.62	0.00	0.000%
27	-0.00	-77.62	-7.34	0.00	77.62	7.34	0.000%
28	3.67	-77.62	-6.36	-3.67	77.62	6.36	0.000%
29	6.35	-77.62	-3.67	-6.35	77.62	3.67	0.000%
30	7.34	-77.62	0.00	-7.34	77.62	-0.00	0.000%
31	6.36	-77.62	3.67	-6.36	77.62	-3.67	0.000%
32	3.67	-77.62	6.36	-3.67	77.62	-6.36	0.000%
33	0.00	-77.62	7.34	-0.00	77.62	-7.34	0.000%
34	-3.67	-77.62	6.36	3.67	77.62	-6.36	0.000%
35	-6.35	-77.62	3.67	6.35	77.62	-3.67	0.000%
36	-7.34	-77.62	-0.00	7.34	77.62	0.00	0.000%
37	-6.36	-77.62	-3.67	6.36	77.62	3.67	0.000%
38	-3.67	-77.62	-6.36	3.67	77.62	6.36	0.000%
39	-0.00	-41.82	-5.88	0.00	41.82	5.88	0.000%
40	2.94	-41.82	-5.09	-2.94	41.82	5.09	0.000%
41	5.09	-41.82	-2.94	-5.09	41.82	2.94	0.000%
42	5.88	-41.82	0.00	-5.88	41.82	-0.00	0.000%
43	5.09	-41.82	2.95	-5.09	41.82	-2.95	0.000%
44	2.94	-41.82	5.10	-2.94	41.82	-5.10	0.000%
45	0.00	-41.82	5.88	-0.00	41.82	-5.88	0.000%
46	-2.94	-41.82	5.09	2.94	41.82	-5.09	0.000%
47	-5.09	-41.82	2.94	5.09	41.82	-2.94	0.000%
48	-5.88	-41.82	-0.00	5.88	41.82	0.00	0.000%
49	-5.09	-41.82	-2.95	5.09	41.82	2.95	0.000%
50	-2.94	-41.82	-5.10	2.94	41.82	5.10	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	0.00034346
3	Yes	4	0.00000001	0.00021704
4	Yes	5	0.00000001	0.00029358
5	Yes	5	0.00000001	0.00013115
6	Yes	5	0.00000001	0.00028832
7	Yes	5	0.00000001	0.00012855
8	Yes	4	0.00000001	0.00017913
9	Yes	4	0.00000001	0.00010611
10	Yes	5	0.00000001	0.00028321
11	Yes	5	0.00000001	0.00012602
12	Yes	5	0.00000001	0.00029792
13	Yes	5	0.00000001	0.00013322
14	Yes	4	0.00000001	0.00037219
15	Yes	4	0.00000001	0.00023552
16	Yes	5	0.00000001	0.00028373
17	Yes	5	0.00000001	0.00012643
18	Yes	5	0.00000001	0.00028882
19	Yes	5	0.00000001	0.00012896
20	Yes	4	0.00000001	0.00020520
21	Yes	4	0.00000001	0.00012360
22	Yes	5	0.00000001	0.00029647
23	Yes	5	0.00000001	0.00013251
24	Yes	5	0.00000001	0.00028190
25	Yes	5	0.00000001	0.00012538
26	Yes	4	0.00000001	0.00000592
27	Yes	5	0.00000001	0.00012113
28	Yes	5	0.00000001	0.00014160
29	Yes	5	0.00000001	0.00014143
30	Yes	5	0.00000001	0.00012119
31	Yes	5	0.00000001	0.00014015
32	Yes	5	0.00000001	0.00014126
33	Yes	5	0.00000001	0.00012034
34	Yes	5	0.00000001	0.00013888
35	Yes	5	0.00000001	0.00013897
36	Yes	5	0.00000001	0.00012009
37	Yes	5	0.00000001	0.00014079
38	Yes	5	0.00000001	0.00013976
39	Yes	4	0.00000001	0.00001963
40	Yes	4	0.00000001	0.00007215
41	Yes	4	0.00000001	0.00006784
42	Yes	4	0.00000001	0.00001545
43	Yes	4	0.00000001	0.00006284
44	Yes	4	0.00000001	0.00007664
45	Yes	4	0.00000001	0.00001975
46	Yes	4	0.00000001	0.00006377
47	Yes	4	0.00000001	0.00006719
48	Yes	4	0.00000001	0.00001553
49	Yes	4	0.00000001	0.00007519
50	Yes	4	0.00000001	0.00006225

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	159.08 - 139.33	13.52	39	0.914	0.002
L2	142.34 - 91.24	10.47	39	0.807	0.001
L3	96.3 - 44.66	4.31	50	0.457	0.000
L4	51.49 - 0	1.16	50	0.212	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
159.00	Platform Mount [LP 714-1]	39	13.50	0.914	0.002	21976
147.00	Platform Mount [LP 303- 1_KCKR-HR-1]	39	11.29	0.838	0.001	9096
135.00	MX08FRO665-20 w/ Mount Pipe	39	9.25	0.754	0.001	6857

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	159.08 - 139.33	72.81	2	4.916	0.010
L2	142.34 - 91.24	56.41	24	4.348	0.006
L3	96.3 - 44.66	23.23	24	2.467	0.001
L4	51.49 - 0	6.23	24	1.143	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
159.00	Platform Mount [LP 714-1]	2	72.73	4.914	0.010	4164
147.00	Platform Mount [LP 303- 1_KCKR-HR-1]	24	60.82	4.515	0.007	1723
135.00	MX08FRO665-20 w/ Mount Pipe	24	49.88	4.066	0.004	1294

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L1	159.08 - 139.33 (1)	TP24.1x18.43x0.188	19.75	0.00	0.0	13.717	-8.05	802.42	0.010
L2	139.33 - 91.24 (2)	TP40.49x22.861x0.313	51.10	0.00	0.0	38.120	-18.69	2230.00	0.008
L3	91.24 - 44.66 (3)	TP54.61x38.119x0.375	51.64	0.00	0.0	61.957	-31.13	3624.49	0.009
L4	44.66 - 0 (4)	TP69.47x51.679x0.375	51.49	0.00	0.0	82.240	-50.17	4743.50	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	159.08 - 139.33 (1)	TP24.1x18.43x0.188	171.35	449.12	0.382	0.00	449.12	0.000
L2	139.33 - 91.24 (2)	TP40.49x22.861x0.313	1006.41	2080.90	0.484	0.00	2080.90	0.000
L3	91.24 - 44.66 (3)	TP54.61x38.119x0.375	2051.95	4389.49	0.467	0.00	4389.49	0.000
L4	44.66 - 0 (4)	TP69.47x51.679x0.375	3530.17	6755.96	0.523	0.00	6755.96	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	159.08 - 139.33 (1)	TP24.1x18.43x0.188	13.23	240.73	0.055	0.13	485.90	0.000
L2	139.33 - 91.24 (2)	TP40.49x22.861x0.313	20.87	669.00	0.031	0.87	2251.63	0.000
L3	91.24 - 44.66 (3)	TP54.61x38.119x0.375	25.84	1087.35	0.024	0.87	4956.81	0.000
L4	44.66 - 0 (4)	TP69.47x51.679x0.375	31.63	1443.32	0.022	0.87	8733.50	0.000

Pole Interaction Design Data

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
		ϕP_n	ϕM_{nx}	ϕM_{ny}	ϕV_n	ϕT_n			
L1	159.08 - 139.33 (1)	0.010	0.382	0.000	0.055	0.000	0.395	1.050	4.8.2
L2	139.33 - 91.24 (2)	0.008	0.484	0.000	0.031	0.000	0.493	1.050	4.8.2
L3	91.24 - 44.66 (3)	0.009	0.467	0.000	0.024	0.000	0.477	1.050	4.8.2
L4	44.66 - 0 (4)	0.011	0.523	0.000	0.022	0.000	0.534	1.050	4.8.2

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	159.08 - 139.33	Pole	TP24.1x18.43x0.188	1	-8.05	842.55	37.6	Pass
L2	139.33 - 91.24	Pole	TP40.49x22.861x0.313	2	-18.69	2341.50	47.0	Pass
L3	91.24 - 44.66	Pole	TP54.61x38.119x0.375	3	-31.13	3805.71	45.4	Pass
L4	44.66 - 0	Pole	TP69.47x51.679x0.375	4	-50.17	4980.67	50.8	Pass
Summary								
Pole (L4)							50.8	Pass
RATING =							50.8	Pass

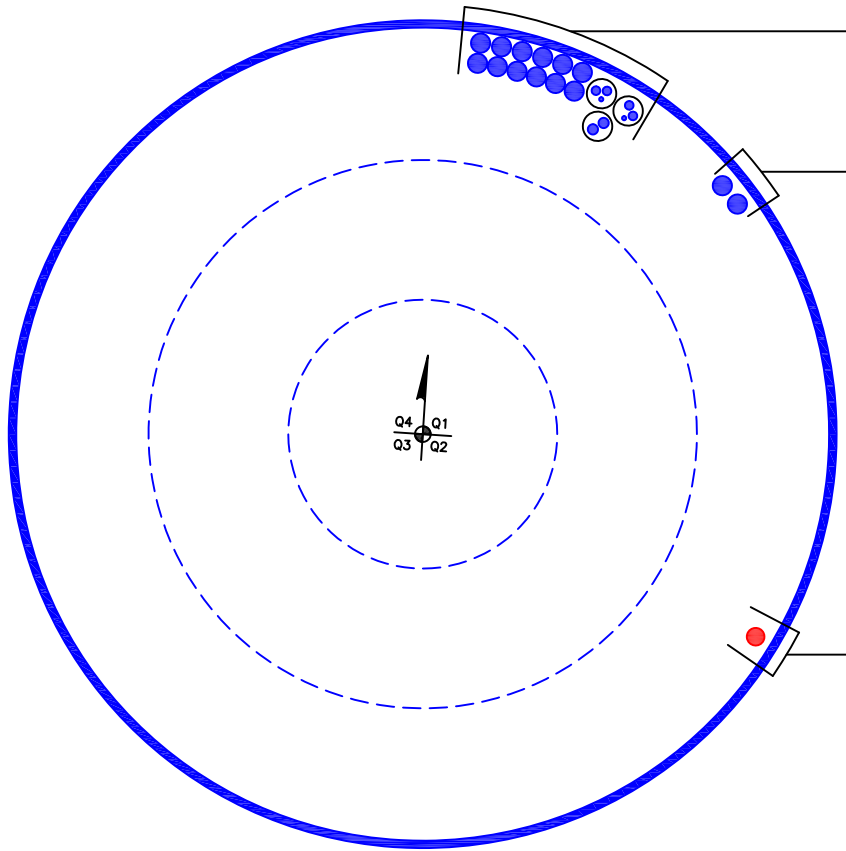
APPENDIX B
BASE LEVEL DRAWING



(OTHER CONSIDERED EQUIPMENT—IN (3) 2-1/2" CONDUITS)
(2) 3/8" TO 159 FT LEVEL
(4) 3/4" TO 159 FT LEVEL
(2) 7/8" TO 159 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(12) 1-5/8" TO 159 FT LEVEL

(OTHER CONSIDERED EQUIPMENT)
(2) 1-5/8" TO 147 FT LEVEL

(PROPOSED EQUIPMENT CONFIGURATION)
(1) 1-1/2" TO 135 FT LEVEL



Q4
Q1
Q3
Q2

APPENDIX C
ADDITIONAL CALCULATIONS

Monopole Base Plate Connection

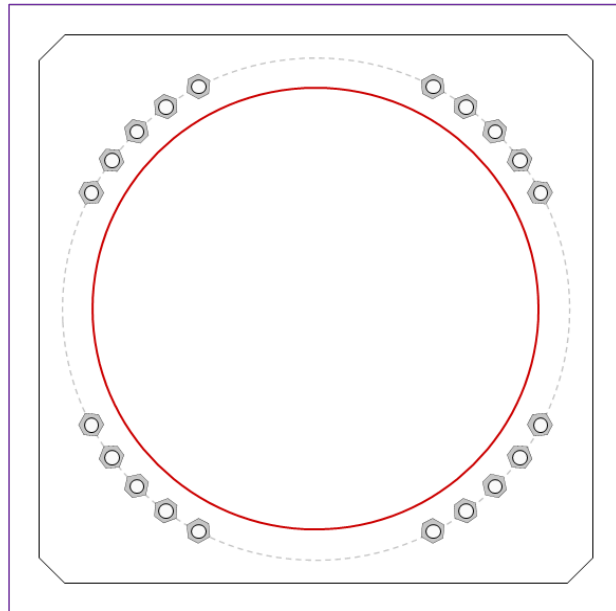


Site Info	
BU #	857011
Site Name	brook North Horse Hill
Order #	553288 Rev. 2

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	2.5

Applied Loads	
Moment (kip-ft)	3530.17
Axial Force (kips)	50.17
Shear Force (kips)	31.63

*TIA-222-H Section 15.5 Applied



Connection Properties	Analysis Results
-----------------------	------------------

Anchor Rod Data
 (20) 2-1/4" ϕ bolts (A615-75 N; $F_y=75$ ksi, $F_u=100$ ksi) on 78.97" BC
 Anchor Spacing: 6 in

Base Plate Data
 86.21" W x 3" Plate (A572-50; $F_y=50$ ksi, $F_u=65$ ksi); Clip: 4 in

Stiffener Data
 N/A

Pole Data
 69.47" x 0.375" 18-sided pole (A572-65; $F_y=65$ ksi, $F_u=80$ ksi)

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

$P_{u,t} = 104.74$	$\phi P_{n,t} = 243.75$	Stress Rating
$V_u = 1.58$	$\phi V_n = 149.1$	40.9%
$M_u = 2.57$	$\phi M_n = 128.14$	Pass

Base Plate Summary

Max Stress (ksi):	17.53	(Flexural)
Allowable Stress (ksi):	45	
Stress Rating:	37.1%	Pass

Pier and Pad Foundation



BU #: 857011
 Site Name: Westbrook North H
 553288 Rev.2

TIA-222 Revision: H
 Tower Type: Monopole

Top & Bot. Pad Rein. Different?:
 Block Foundation?:
 Rectangular Pad?:

Superstructure Analysis Reactions		
Compression, P_{comp} :	50	kips
Base Shear, V_{u_comp} :	32	kips
Moment, M_u :	3530	ft-kips
Tower Height, H :	159	ft
BP Dist. Above Fdn, bp_{dist} :	4.75	in

Foundation Analysis Checks				
	Capacity	Demand	Rating*	Check
<i>Lateral (Sliding) (kips)</i>	440.72	32.00	6.9%	Pass
<i>Bearing Pressure (ksf)</i>	9.00	2.14	22.6%	Pass
<i>Overtuning (kip*ft)</i>	10247.98	3814.67	37.2%	Pass
<i>Pier Flexure (Comp.) (kip*ft)</i>	11981.77	3706.00	29.5%	Pass
<i>Pier Compression (kip)</i>	38666.16	130.19	0.3%	Pass
<i>Pad Flexure (kip*ft)</i>	3023.23	1127.39	35.5%	Pass
<i>Pad Shear - 1-way (kips)</i>	864.26	168.16	18.5%	Pass
<i>Pad Shear - 2-way (Comp) (ksi)</i>	0.164	0.028	16.5%	Pass
<i>Flexural 2-way (Comp) (kip*ft)</i>	3793.12	2223.60	55.8%	Pass

Pier Properties		
Pier Shape:	Square	
Pier Diameter, $dpier$:	9	ft
Ext. Above Grade, E :	0.5	ft
Pier Rebar Size, Sc :	8	
Pier Rebar Quantity, mc :	74	
Pier Tie/Spiral Size, St :	3	
Pier Tie/Spiral Quantity, mt :	6	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier} :	3	in

*Rating per TIA-222-H Section 15.5

Structural Rating*:	55.8%
Soil Rating*:	37.2%

Pad Properties		
Depth, D :	8	ft
Pad Width, W_1 :	28	ft
Pad Thickness, T :	3	ft
Pad Rebar Size (Bottom dir. 2), Sp_2 :	9	
Pad Rebar Quantity (Bottom dir. 2), mp_2 :	22	
Pad Clear Cover, cc_{pad} :	3	in

Material Properties		
Rebar Grade, F_y :	60	ksi
Concrete Compressive Strength, F'_c :	3	ksi
Dry Concrete Density, δ_c :	150	pcf

Soil Properties		
Total Soil Unit Weight, γ :	130	pcf
Ultimate Gross Bearing, Q_{ult} :	12.000	ksf
Cohesion, C_u :	0.000	ksf
Friction Angle, ϕ :	38	degrees
SPT Blow Count, N_{blows} :	35	
Base Friction, μ :	0.35	
Neglected Depth, N :	5.00	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, gw :	N/A	ft

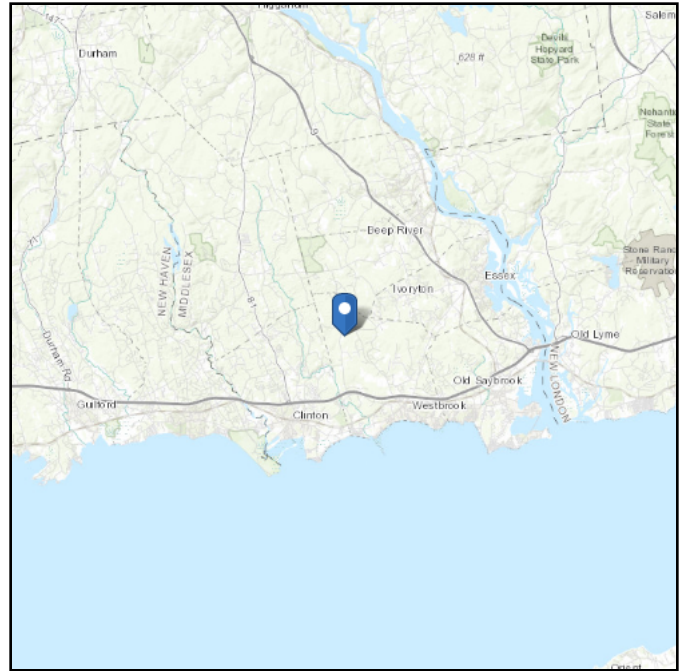
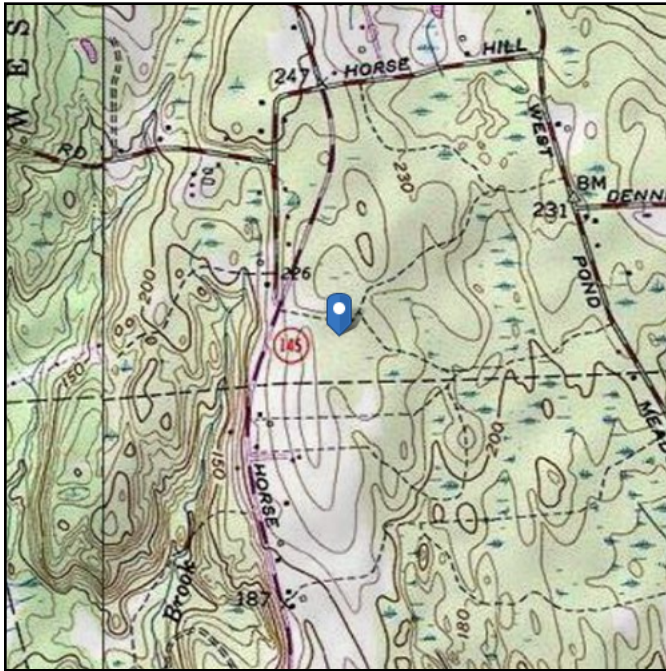
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ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 235.72 ft (NAVD 88)
Latitude: 41.323808
Longitude: -72.491139



Wind

Results:

Wind Speed:	130 Vmph
10-year MRI	79 Vmph
25-year MRI	88 Vmph
50-year MRI	97 Vmph
100-year MRI	106 Vmph

Data Source: ASCE/SEI 7-10, Fig. 26.5-1A and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014

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 7-10 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

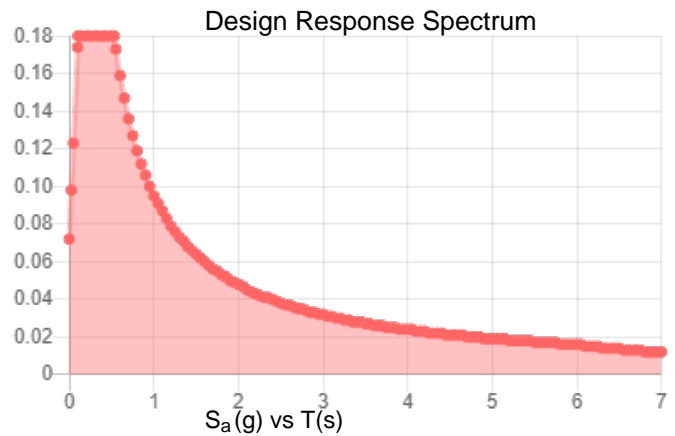
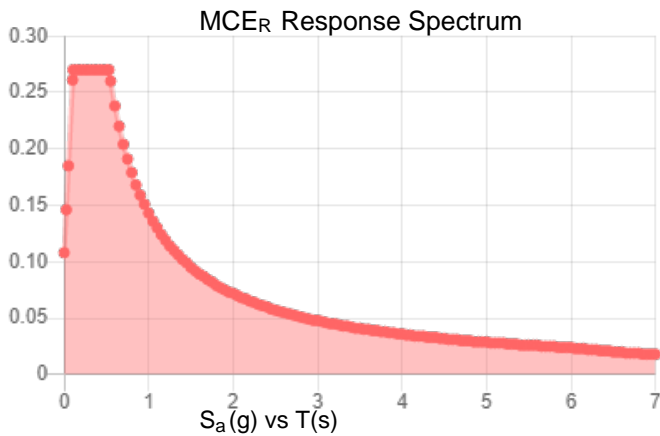
Site is in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Site Soil Class: D - Stiff Soil

Results:

S_s :	0.169 0.167	S_{DS} :	0.18
S_1 :	0.06 0.059	S_{D1} :	0.095
F_a :	1.6	T_L :	6
F_v :	2.4	PGA :	0.085
S_{MS} :	0.27	PGA _M :	0.136
S_{M1} :	0.143	F _{PGA} :	1.6
		I_e :	1

Seismic Design Category B



Data Accessed:

Sun Mar 28 2021

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

Ice

Results:

Ice Thickness: 0.75 in.
Concurrent Temperature: 15 F
Gust Speed: 50 mph

Data Source: Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8

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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 50-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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