



STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: siting.council@ct.gov

Web Site: portal.ct.gov/csc

VIA ELECTRONIC MAIL

May 16, 2024

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

RE: **EM-VER-077-231004** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 266R Center Street, Manchester, Connecticut.
Request for Project Change.

Dear Jeffrey Barbadora:

The Connecticut Siting Council (Council) is in receipt of the correspondence dated May 8, 2024 and the associated Structural Analysis dated October 26, 2023, regarding a project change for the above-referenced exempt modification request acknowledged by the Council on November 13, 2023.

Pursuant to Condition No. 1 of the Council's November 13, 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 8, 2024.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/ANM/laf

c: The Honorable Jay Moran, Mayor, Town of Manchester (jmoran@manchesterct.gov)
Steve Stephanou, Town Manager, Town of Manchester (sstephanou@manchesterct.gov)

From: Barbadora, Jeff <Jeff.Barbadora@crowncastle.com>
Sent: Wednesday, May 8, 2024 11:26 AM
To: CSC-DL Siting Council <Siting.Council@ct.gov>
Subject: EM-VER-077-231004 -266R Center Street, Manchester, CT - 806372

Good afternoon,

Would the CSC please update the approval for EM-VER-077-231004 to include a total of 2 filters?

The original SA submitted with the application and dated 5/4/2023 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



VERIZON SITE NUMBER:
50003819/61

BU #: 806372

CROWN CASTLE SITE NAME
HRT 093 943228
VERIZON SITE NAME
MANCHESTER CT

266R CENTER STREET
MANCHESTER, CT 06040
EXISTING 115'-0"
MONOPOLE

REV	DATE	DRWN	DESCRIPTION	DESIGN
0	4/01/24	MJW	ISSUE EXHIBIT	MD

DocuSigned by:
Michael D'Amico
018341536468402

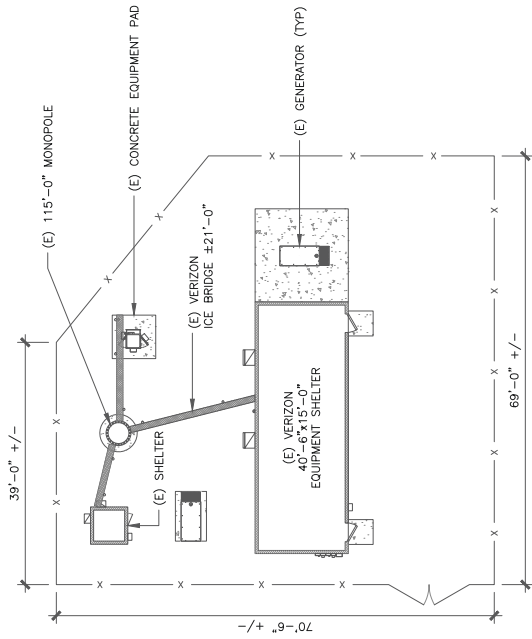
4/1/2024 | 3:59:32 PM CDT

CROWN CASTLE USA INC.
CERTIFICATE OF REGISTRATION #PEC000100
I AM A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF CONNECTICUT AND I AM NOT PROVIDING ENGINEERING SERVICES TO ANY OTHER PROJECTS.
TO ALTER THIS DOCUMENT.

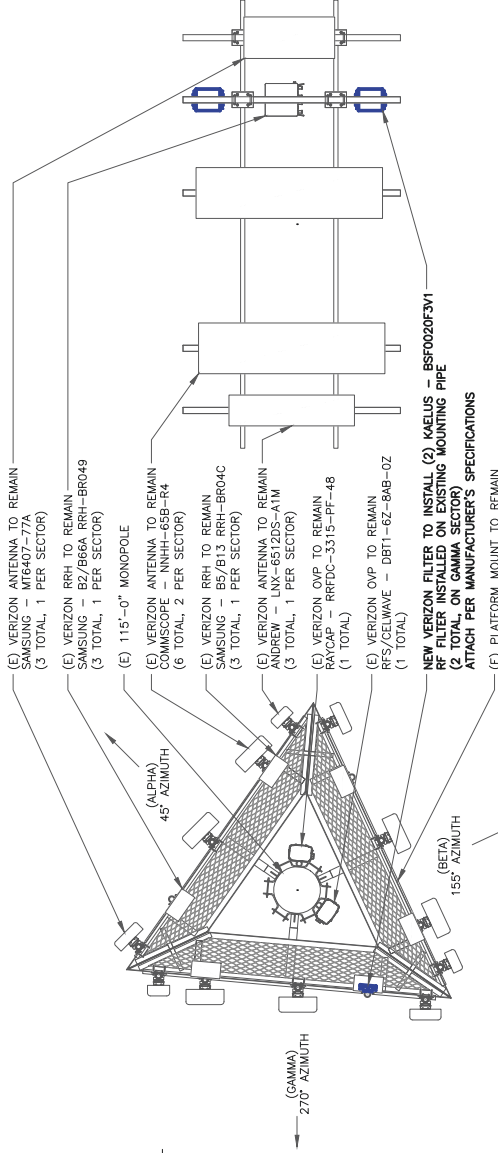
SHEET NUMBER: **LE-1**
REVISION: **0**

NOTE:
AN ANALYSIS OF THE CAPACITY OF THE STRUCTURE TO SUPPORT THE PROPOSED LOADING HAS NOT BEEN COMPLETED BY CROWN CASTLE. DRAWINGS ARE SUBJECT TO CHANGE PENDING OUTCOME OF A STRUCTURAL ANALYSIS.

LEASE EXHIBIT:
THIS LEASE EXHIBIT IS DIAGRAMMATIC IN NATURE AND IS INTENDED TO PROVIDE GENERAL INFORMATION REGARDING THE PROPOSED MONOPOLE AND THE WIRELESS COMMUNICATION FACILITY. THE SITE LAYOUT WILL BE FINALIZED UPON COMPLETION OF THE SITE SURVEY AND FACILITY DESIGN.



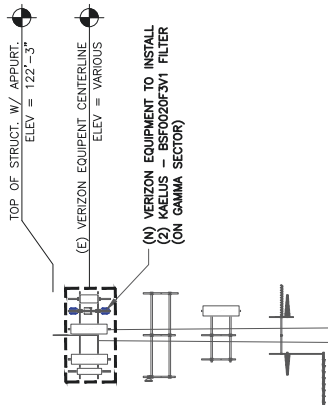
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SCALE: 1" = 20'



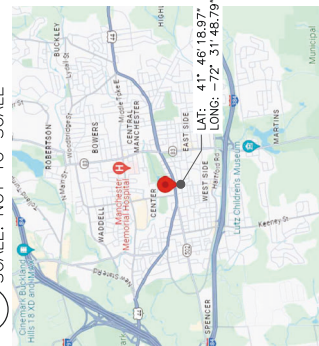
4 FINAL ANTENNA PLAN
SCALE: 1" = 4'



5 FINAL RF FILTER ELEVATION
SCALE: 1" = 4'



1 FINAL TOWER ELEVATION
SCALE: NOT TO SCALE



2 LOCATION MAP
SCALE: NOT TO SCALE



6 FINAL ANTENNA PLAN
SCALE: 1" = 16'



5 FINAL RF FILTER ELEVATION
SCALE: 1" = 4'

7 FINAL ANTENNA PLAN
SCALE: 1" = 4'

8 FINAL ANTENNA PLAN
SCALE: 1" = 4'

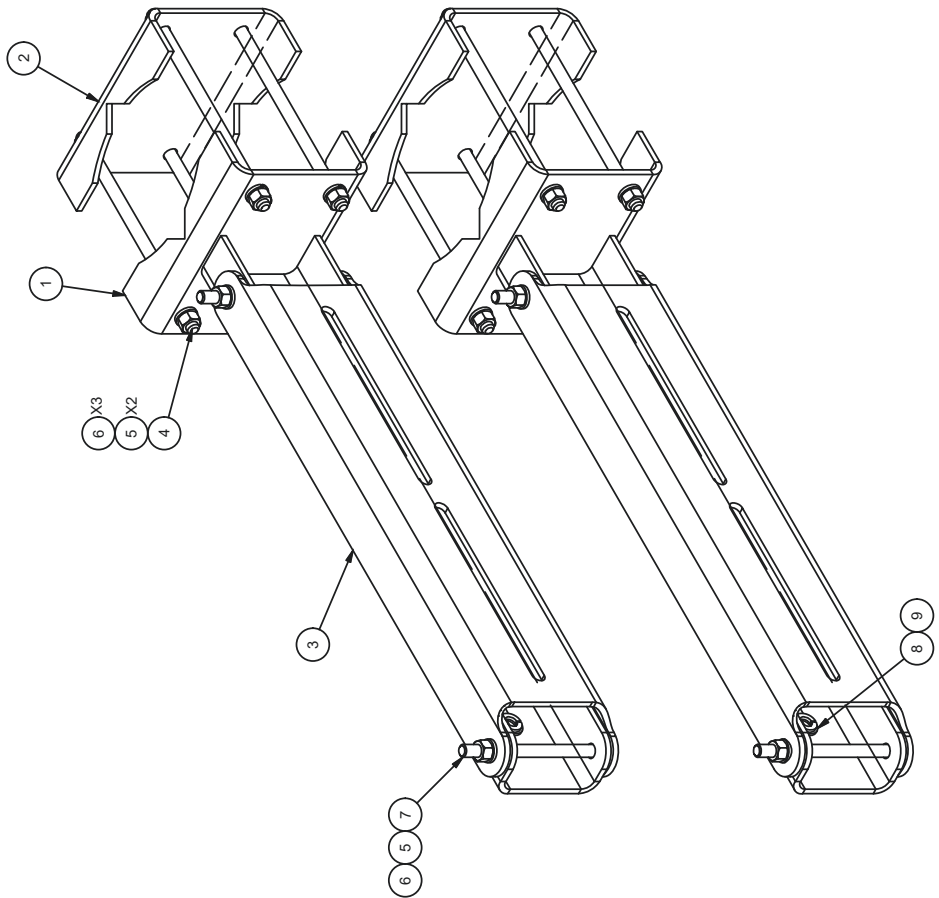
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SCALE: 1" = 4'

10 FINAL ANTENNA PLAN
SCALE: 1" = 4'

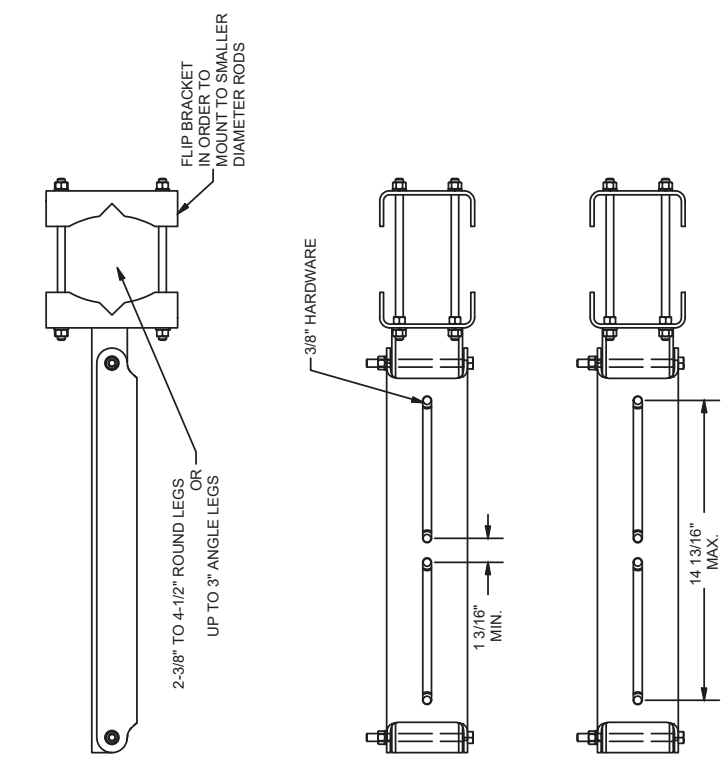
11 FINAL ANTENNA PLAN
SCALE: 1" = 4'

12 FINAL ANTENNA PLAN
SCALE: 1" = 4'

82:1547A.7:36883AO)X#-SS'A-\$64# #.A(+ A%+-,%R(&&



PARTS LIST					
ITEM	QTY	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	2	MOUNTING ARM		8.99	17.97
2	2	CLAMP PLATE		2.35	4.69
3	2	SWIVEL MOUNT		6.65	13.30
4	8	3/8"-16 UNC X 8" GALV. THREADED ROD		0.25	2.00
5	20	3/8" GALV LOCK WASHER		0.01	0.13
6	28	3/8"-16 UNC GALV HEX NUT		0.02	0.52
7	4	3/8" X 5" GALV BOLT		0.18	0.71
8	8	3/8" SS FLAT WASHER		0.01	0.08
9	8	3/8" SS LOCK WASHER		0.01	0.05
TOTAL WT. #				39.43	



<p>TOLERANCE NOTES: TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE: SAWED, SHEARED AND GAS CUT EDGES ($\pm 0.030"$) DRILLED AND GAS CUT HOLES ($\pm 0.030"$) - NO CONING OF HOLES LASER CUT EDGES AND HOLES ($\pm 0.010"$) - NO CONING OF HOLES BENDS ARE $\pm 1/2$ DEGREE ALL OTHER MACHINING ($\pm 0.030"$) ALL OTHER ASSEMBLY ($\pm 0.060"$)</p> <p>PROPRIETARY NOTE: DIMENSIONS CONTAINED IN THIS DRAWING ARE PROPRIETARY INFORMATION OF VALMONT INDUSTRIES AND CONSIDERED A TRADE SECRET. ANY USE OR DISCLOSURE WITHOUT THE CONSENT OF VALMONT INDUSTRIES IS STRICTLY PROHIBITED.</p>		<p>DESCRIPTION</p> <p>RRU DUAL SWIVEL MOUNT</p>	<p>CPD NO.</p> <p>81</p>	<p>DRAWN BY</p> <p>CEK</p>	<p>1/12/2015</p>	<p>ENG. APPROVAL</p>	<p>PART NO.</p> <p>RRUDSM</p>	<p>PAGE</p> <p>1 OF 1</p>
		<p>RRU DUAL SWIVEL MOUNT</p>	<p>CLASS</p> <p>81</p>	<p>DRAWING USAGE</p> <p>SHOP</p>	<p>CHECKED BY</p> <p>BMC 2/3/2015</p>	<p>DWG. NO.</p> <p>RRUDSM</p>	<p>RRUDSM</p>	<p>1 OF 1</p>

A Valmont COMPANY

Locations:
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 Atlanta, GA
 Los Angeles, CA
 Plymouth, IN
 Salem, OR
 Dallas, TX

Engineering Support Team:
 1-888-753-7446

Certificate Of Completion

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2000 Corporate Drive
Canonsburg, PA 15317
Lisa.McCabe@crowncastle.com
IP Address: 4.7.101.195

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Crown Castle International Corp.
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To contact us by email, send messages to: signature@CrownCastle.com

To contact us by paper mail, send correspondence to
Crown Castle

2000 Corporate Drive
Canonsburg, PA 15317

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Screen Resolution:	1024 x 768

Enabled Security Settings:

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Date: **October 26, 2023**



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

Subject: **Structural Analysis Report**

Carrier Designation: **Verizon Wireless Co-Locate**
Site Number: 5000381961
Site Name: MANCHESTER CT

Crown Castle Designation: **BU Number:** 806372
Site Name: HRT 093 943228
JDE Job Number: 2103560
Work Order Number: 2265524
Order Number: 658860 Rev. 0

Engineering Firm Designation: **Crown Castle Project Number:** 2265524

Site Data: **266R Center Street, MANCHESTER, HARTFORD County, CT**
Latitude 41° 46' 18.97", Longitude -72° 31' 48.79"
115 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 - 58.5%

This analysis utilizes an ultimate 3-second gust wind speed of 118 mph as required by the 2022 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Dolly Hsu

Respectfully submitted by:

Rohit Soni, P.E.
Senior Project Engineer

Digitally signed
by Rohit Soni
Date: 2023.10.26
22:39:37 -04'00'

A circular professional engineer seal for Rohit Soni, State of Connecticut. The seal contains the text 'STATE OF CONNECTICUT', 'ROHIT SONI', 'No. 0036005', and 'LICENSED PROFESSIONAL ENGINEER'. A red signature is written over the seal.

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1) INTRODUCTION

This tower is a 115 ft Monopole tower designed by VALMONT.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	118 mph
Exposure Category:	B
Topographic Factor:	1
Ice Thickness:	1.5 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)
117.0	120.0	3	commscope	LNx-6513DS-A1M w/ Mount Pipe	8	1-5/8
		3	samsung telecommunications	MT6407-77A w/ Mount Pipe		
	119.0	6	commscope	NNHH-65B-R4 w/ Mount Pipe		
	117.0	2	kaelus	BSF0020F3V1		
		1	raycap	RRFDC-3315-PF-48		
		1	rfs celwave	DB-T1-6Z-8AB-0Z		
		3	samsung telecommunications	RFV01U-D1A		
		3	samsung telecommunications	RFV01U-D2A		
		3	samsung telecommunications	RT4401-48A		
		1	tower mounts	Platform Mount [LP 1201-1_KCKR-HR-1]		

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
105.0	107.0	2	andrew	VHLP1-23	5	1/4
		1	andrew	VHLP2-23	5	5/16
	105.0	1	tower mounts	Platform Mount [LP 602-1]	5 2	1/2 Conduit
94.0	95.0	3	fujitsu	TA08025-B604	1	1-1/2
		3	fujitsu	TA08025-B605		
		3	jma wireless	MX08FRO665-21 w/ Mount Pipe		
		1	raycap	RDIDC-9181-PF-48		
	94.0	1	tower mounts	Sabre_C10801018-32788		

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
85.0	85.0	4	tower mounts	Side Arm Mount [SO 701-1]	5	13/32
		1	wade antenna	WH14-69/S		
	84.0	3	wade antenna	WL 14-69/S		
	78.0	1	wade antenna	J105-HI		

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
4-GEOTECHNICAL REPORTS	262174	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	2668863	CCISITES
4-TOWER MANUFACTURER DRAWINGS	262172	CCISITES

3.1) Analysis Method

tnxTower (version 8.1.4.0), 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	115 - 72.3334	Pole	TP30.45x21.91x0.219	1	-13.45	1269.02	45.0	Pass
L2	72.3334 - 29.3334	Pole	TP38.61x29.0779x0.313	2	-20.47	2300.73	48.8	Pass
L3	29.3334 - 0	Pole	TP43.85x36.8508x0.375	3	-29.12	3224.57	47.9	Pass
							Summary	
						Pole (L2)	48.8	Pass
						Rating =	48.8	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	43.7	Pass
1	Base Plate	0	26.1	Pass
1	Base Foundation (Structure)	0	55.8	Pass
1	Base Foundation (Soil Interaction)	0	58.5	Pass

Structure Rating (max from all components) =	58.5%
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Notes:

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

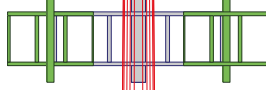
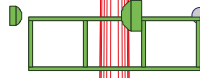
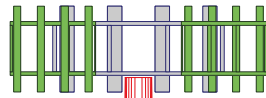
4.1) Recommendations

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	
Length (ft)	42.67	47.67	35.00	
Number of Sides	12	12	12	
Thickness (in)	0.2190	0.3130	0.3750	
Socket Length (ft)	4.67	5.67		
Top Dia (in)	21.9100	29.0779	36.8508	
Bot Dia (in)	30.4500	38.6100	43.8500	
Grade		A572-65		
Weight (K)	2.7	5.5	5.7	13.9

115.0 ft



72.3 ft

29.3 ft

0.0 ft

MATERIAL STRENGTH

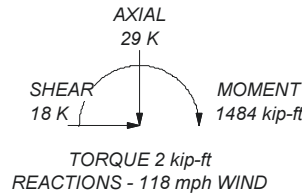
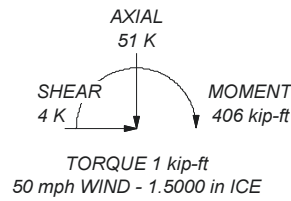
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 118 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 48.8%



ALL REACTIONS ARE FACTORED



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

Job:	BU 806372		
Project:			
Client:	Crown Castle	Drawn by:	Dolly Hsu
Code:	TIA-222-H	Date:	10/26/23
Path:			Scale: NTS
			Dwg No. E-1

Tower Input Data

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

- Tower is located in Hartford County, Connecticut.
- Tower base elevation above sea level: 196.00 ft.
- Basic wind speed of 118 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 1.5000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Tower analysis based on target reliabilities in accordance with Annex S.
- Load Modification Factors used: $K_{es}(F_w) = 0.95$, $K_{es}(t_i) = 0.85$.
- Maximum demand-capacity ratio is: 1.05.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs 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 Forces in Supporting Bracing Members 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="background-color: #e0e0e0; text-align: center; 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	115.00-72.33	42.67	4.6666	12	21.9100	30.4500	0.2190	0.8760	A572-65 (65 ksi)

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
L2	72.33-29.33	47.67	5.6666	12	29.0779	38.6100	0.3130	1.2520	A572-65 (65 ksi)
L3	29.33-0.00	35.00		12	36.8508	43.8500	0.3750	1.5000	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	22.6056	15.2961	918.5962	7.7654	11.3494	80.9380	1861.3250	7.5283	5.2850	24.132
	31.4469	21.3183	2486.8150	10.8227	15.7731	157.6618	5038.9614	10.4922	7.5737	34.583
L2	30.9594	28.9910	3061.8012	10.2979	15.0624	203.2748	6204.0393	14.2685	6.9541	22.217
	39.8616	38.5980	7225.7083	13.7103	20.0000	361.2858	14641.244 0	18.9968	9.5086	30.379
L3	39.1917	44.0446	7479.7774	13.0583	19.0887	391.8426	15156.056 9	21.6774	8.8710	23.656
	45.2646	52.4961	12664.611 2	15.5641	22.7143	557.5611	25661.935 8	25.8370	10.7468	28.658

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 115.00- 72.33				1	1	1			
L2 72.33- 29.33				1	1	1			
L3 29.33-0.00				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
LDF7-50A(1-5/8)	A	No	Surface Ar (CaAa)	115.00 - 0.00	1	1	-0.400 -0.400	1.9800		0.82
85 1110(13/32)	A	No	Surface Ar (CaAa)	85.00 - 0.00	5	5	0.000 0.080	0.4050		0.05
*** CU12PSM9P6XXX(1- 1/2) ** ***	A	No	Surface Ar (CaAa)	94.00 - 0.00	1	1	-0.450 -0.450	1.6000		2.35

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	
115 LDF7-50A(1-5/8)	C	No	No	Inside Pole	115.00 - 0.00	7	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82

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
							2" Ice	0.00	0.82
105 FSJ1-50A(1/4)	C	No	No	Inside Pole	105.00 - 0.00	5	No Ice	0.00	0.04
							1/2" Ice	0.00	0.04
							1" Ice	0.00	0.04
							2" Ice	0.00	0.04
FSJ4-50B(1/2)	C	No	No	Inside Pole	105.00 - 0.00	5	No Ice	0.00	0.14
							1/2" Ice	0.00	0.14
							1" Ice	0.00	0.14
							2" Ice	0.00	0.14
9207(5/16)	C	No	No	Inside Pole	105.00 - 0.00	5	No Ice	0.00	0.60
							1/2" Ice	0.00	0.60
							1" Ice	0.00	0.60
							2" Ice	0.00	0.60
2" Flexible Conduit	C	No	No	Inside Pole	105.00 - 0.00	2	No Ice	0.00	0.34
							1/2" Ice	0.00	0.34
							1" Ice	0.00	0.34
							2" Ice	0.00	0.34
**									

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	115.00-72.33	A	0.000	0.000	14.480	0.000	0.09
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.40
L2	72.33-29.33	A	0.000	0.000	24.102	0.000	0.15
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.44
L3	29.33-0.00	A	0.000	0.000	16.441	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.30

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	115.00-72.33	A	1.414	0.000	0.000	37.791	0.000	0.52
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.40
L2	72.33-29.33	A	1.331	0.000	0.000	65.799	0.000	0.84
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.44
L3	29.33-0.00	A	1.173	0.000	0.000	43.298	0.000	0.53
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.30

Feed Line Center of Pressure

Section	Elevation	CP _x	CP _z	CP _x	CP _z
	ft	in	in	Ice in	Ice in
L1	115.00-72.33	-1.8115	0.3420	-2.9302	0.4855
L2	72.33-29.33	-2.6540	0.0811	-4.2161	-0.0139
L3	29.33-0.00	-2.7108	0.0789	-4.3823	-0.0232

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	5	LDF7-50A(1-5/8)	72.33 - 115.00	1.0000	1.0000
L1	12	1110(13/32)	72.33 - 85.00	1.0000	1.0000
L1	14	CU12PSM9P6XXX(1-1/2)	72.33 - 94.00	1.0000	1.0000
L2	5	LDF7-50A(1-5/8)	29.33 - 72.33	1.0000	1.0000
L2	12	1110(13/32)	29.33 - 72.33	1.0000	1.0000
L2	14	CU12PSM9P6XXX(1-1/2)	29.33 - 72.33	1.0000	1.0000
L3	5	LDF7-50A(1-5/8)	0.00 - 29.33	1.0000	1.0000
L3	12	1110(13/32)	0.00 - 29.33	1.0000	1.0000
L3	14	CU12PSM9P6XXX(1-1/2)	0.00 - 29.33	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft
** 117 **					
LNx-6513DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	117.00
LNx-6513DS-A1M w/ Mount Pipe	B	From Leg	4.00 0.00 3.00	0.0000	117.00
LNx-6513DS-A1M w/ Mount Pipe	C	From Leg	4.00 0.00 3.00	0.0000	117.00
(2) NNHH-65B-R4 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	117.00
(2) NNHH-65B-R4 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	117.00
(2) NNHH-65B-R4 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	117.00

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft
			Horz Lateral ft	Vert ft		
MT6407-77A w/ Mount Pipe	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	3.00		
MT6407-77A w/ Mount Pipe	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	3.00		
MT6407-77A w/ Mount Pipe	C	From Leg	4.00	0.00	0.0000	117.00
			0.00	3.00		
BSF0020F3V1	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
BSF0020F3V1	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RT4401-48A	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RT4401-48A	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RT4401-48A	C	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RRFDC-3315-PF-48	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
DB-T1-6Z-8AB-0Z	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RFV01U-D1A	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RFV01U-D1A	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RFV01U-D1A	C	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RFV01U-D2A	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RFV01U-D2A	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
RFV01U-D2A	C	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
Platform Mount [LP 1201-1_KCKR-HR-1]	C	None			0.0000	117.00
(2) 3.5' Hor 2.5x2.5 Angle	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
(2) 3.5' Hor 2.5x2.5 Angle	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
(2) 3.5' Hor 2.5x2.5 Angle	C	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
6' x 2" Mount Pipe	A	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
6' x 2" Mount Pipe	B	From Leg	4.00	0.00	0.0000	117.00
			0.00	0.00		
6' x 2" Mount Pipe	C	From Leg	4.00	0.00	0.0000	117.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft
			0.00		
			0.00		
** 105 **					
Platform Mount [LP 602-1]	C	None		0.0000	105.00
(3) 6' x 2" Mount Pipe	A	From Centroid-Leg	4.00	0.0000	105.00
			0.00		
			0.00		
(3) 6' x 2" Mount Pipe	B	From Centroid-Leg	4.00	0.0000	105.00
			0.00		
			0.00		
(3) 6' x 2" Mount Pipe	C	From Centroid-Leg	4.00	0.0000	105.00
			0.00		
			0.00		
** 94 **					
MX08FRO665-21 w/ Mount Pipe	A	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
MX08FRO665-21 w/ Mount Pipe	B	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
MX08FRO665-21 w/ Mount Pipe	C	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
TA08025-B604	A	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
TA08025-B604	B	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
TA08025-B604	C	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
TA08025-B605	A	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
TA08025-B605	B	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
TA08025-B605	C	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
RDIDC-9181-PF-48	A	From Leg	4.00	0.0000	94.00
			0.00		
			1.00		
Sabre_C10801018-32788	C	None		0.0000	94.00
(2) 8' x 2" Mount Pipe	A	From Leg	4.00	0.0000	94.00
			0.00		
			0.00		
(2) 8' x 2" Mount Pipe	B	From Leg	4.00	0.0000	94.00
			0.00		
			0.00		
(2) 8' x 2" Mount Pipe	C	From Leg	4.00	0.0000	94.00
			0.00		
			0.00		
** 85 **					
WH14-69/S	C	From Leg	4.00	0.0000	85.00
			0.00		
			0.00		
WL 14-69/S	A	From Leg	4.00	0.0000	85.00
			0.00		
			-1.00		
WL 14-69/S	A	From Leg	4.00	0.0000	85.00
			0.00		
			-1.00		
WL 14-69/S	C	From Leg	4.00	0.0000	85.00

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement
			Horz Lateral	Vert		
			ft	ft	°	ft
			0.00			
J105-HI	C	From Leg	-1.00		0.0000	85.00
			4.00			
(2) Side Arm Mount [SO 701-1]	A	From Leg	0.00		0.0000	85.00
			-7.00			
			2.00			
(2) Side Arm Mount [SO 701-1]	C	From Leg	0.00		0.0000	85.00
			0.00			
			2.00			
8' x 2" Mount Pipe	A	From Leg	0.00		0.0000	85.00
			0.00			
			4.00			
8' x 2" Mount Pipe	C	From Leg	0.00		0.0000	85.00
			0.00			
			4.00			
			0.00			
			0.00			
**						
**						

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter
				Horz Lateral	Vert				
				ft	ft	°	°	ft	ft
VHLP1-23	A	Paraboloid w/Shroud (HP)	From Centroi	4.00	6.00	57.0000		105.00	1.27
			d-Leg	2.00					
VHLP2-23	B	Paraboloid w/Shroud (HP)	From Centroi	4.00	6.00	90.0000		105.00	2.18
			d-Leg	2.00					
VHLP1-23	C	Paraboloid w/Shroud (HP)	From Centroi	4.00	6.00	-53.0000		105.00	1.27
			d-Leg	2.00					

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice

Comb. No.	Description
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	115 - 72.3334	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-29.36	7.02	0.42
			Max. Mx	20	-13.46	333.98	-1.01
			Max. My	2	-13.45	-0.92	341.11
			Max. Vy	20	-12.04	333.98	-1.01
			Max. Vx	2	-12.00	-0.92	341.11
			Max. Torque	18			-2.26
L2	72.3334 - 29.3334	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-39.51	8.48	1.07
			Max. Mx	20	-20.47	905.99	-2.98
			Max. My	2	-20.47	-2.58	911.62
			Max. Vy	20	-15.15	905.99	-2.98
			Max. Vx	2	-15.11	-2.58	911.62
			Max. Torque	18			-2.26
L3	29.3334 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-50.89	9.54	1.65
			Max. Mx	20	-29.12	1479.88	-4.60
			Max. My	2	-29.12	-3.91	1484.15
			Max. Vy	20	-17.62	1479.88	-4.60
			Max. Vx	2	-17.59	-3.91	1484.15
			Max. Torque	18			-2.26

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Torque	18			-2.26

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	36	50.89	4.49	-0.02
	Max. H _x	20	29.13	17.61	-0.05
	Max. H _z	2	29.13	-0.04	17.57
	Max. M _x	2	1484.15	-0.04	17.57
	Max. M _z	8	1476.99	-17.61	0.07
	Max. Torsion	6	2.20	-15.25	8.83
	Min. Vert	11	21.84	-15.23	-8.78
	Min. H _x	8	29.13	-17.61	0.07
	Min. H _z	14	29.13	0.04	-17.53
	Min. M _x	14	-1477.38	0.04	-17.53
	Min. M _z	20	-1479.88	17.61	-0.05
	Min. Torsion	18	-2.26	15.23	-8.80

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	24.27	0.00	0.00	-0.88	0.95	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	29.13	0.04	-17.57	-1484.15	-3.91	-1.00
0.9 Dead+1.0 Wind 0 deg - No Ice	21.84	0.04	-17.57	-1470.29	-4.16	-1.00
1.2 Dead+1.0 Wind 30 deg - No Ice	29.13	8.82	-15.22	-1285.67	-739.99	-1.92
0.9 Dead+1.0 Wind 30 deg - No Ice	21.84	8.82	-15.22	-1273.63	-733.54	-1.91
1.2 Dead+1.0 Wind 60 deg - No Ice	29.13	15.25	-8.83	-747.47	-1279.11	-2.20
0.9 Dead+1.0 Wind 60 deg - No Ice	21.84	15.25	-8.83	-740.35	-1267.76	-2.19
1.2 Dead+1.0 Wind 90 deg - No Ice	29.13	17.61	-0.07	-9.32	-1476.99	-1.72
0.9 Dead+1.0 Wind 90 deg - No Ice	21.84	17.61	-0.07	-8.95	-1463.84	-1.71
1.2 Dead+1.0 Wind 120 deg - No Ice	29.13	15.23	8.78	739.09	-1277.34	-0.96
0.9 Dead+1.0 Wind 120 deg - No Ice	21.84	15.23	8.78	732.61	-1266.01	-0.96
1.2 Dead+1.0 Wind 150 deg - No Ice	29.13	8.77	15.20	1281.01	-733.67	-0.04
0.9 Dead+1.0 Wind 150 deg - No Ice	21.84	8.77	15.20	1269.57	-727.30	-0.05
1.2 Dead+1.0 Wind 180 deg - No Ice	29.13	-0.04	17.53	1477.38	6.13	1.05
0.9 Dead+1.0 Wind 180 deg - No Ice	21.84	-0.04	17.53	1464.15	5.77	1.04
1.2 Dead+1.0 Wind 210 deg - No Ice	29.13	-8.81	15.19	1279.91	741.18	1.92
0.9 Dead+1.0 Wind 210 deg - No Ice	21.84	-8.81	15.19	1268.48	734.13	1.91
1.2 Dead+1.0 Wind 240 deg - No Ice	29.13	-15.23	8.80	741.98	1279.94	2.26
0.9 Dead+1.0 Wind 240 deg - No Ice	21.84	-15.23	8.80	735.47	1267.99	2.25

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 270 deg	29.13	-17.61	0.05	4.60	1479.88	1.82
- No Ice						
0.9 Dead+1.0 Wind 270 deg	21.84	-17.61	0.05	4.83	1466.11	1.82
- No Ice						
1.2 Dead+1.0 Wind 300 deg	29.13	-15.25	-8.75	-738.48	1281.62	0.80
- No Ice						
0.9 Dead+1.0 Wind 300 deg	21.84	-15.25	-8.75	-731.45	1269.65	0.80
- No Ice						
1.2 Dead+1.0 Wind 330 deg	29.13	-8.74	-15.24	-1287.41	732.85	0.21
- No Ice						
0.9 Dead+1.0 Wind 330 deg	21.84	-8.74	-15.24	-1275.34	725.88	0.21
- No Ice						
1.2 Dead+1.0 Ice+1.0 Temp	50.89	-0.00	-0.00	-1.65	9.54	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	50.89	0.02	-4.46	-397.24	7.65	-0.40
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	50.89	2.25	-3.87	-344.66	-189.73	-0.60
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	50.89	3.89	-2.25	-201.24	-334.08	-0.62
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	50.89	4.49	-0.02	-4.30	-386.80	-0.43
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	50.89	3.88	2.22	195.18	-332.97	-0.17
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	50.89	2.23	3.85	340.02	-186.99	0.12
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	50.89	-0.02	4.45	392.85	11.52	0.41
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	50.89	-2.25	3.86	340.51	208.65	0.60
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	50.89	-3.89	2.24	197.15	352.93	0.63
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	50.89	-4.49	0.02	0.44	406.13	0.45
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	50.89	-3.88	-2.21	-197.84	352.59	0.12
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	50.89	-2.22	-3.86	-344.35	205.41	-0.09
Dead+Wind 0 deg - Service	24.27	0.01	-4.28	-360.03	-0.24	-0.24
Dead+Wind 30 deg - Service	24.27	2.15	-3.71	-311.97	-178.49	-0.46
Dead+Wind 60 deg - Service	24.27	3.71	-2.15	-181.65	-309.03	-0.53
Dead+Wind 90 deg - Service	24.27	4.29	-0.02	-2.91	-356.95	-0.42
Dead+Wind 120 deg - Service	24.27	3.71	2.14	178.31	-308.61	-0.24
Dead+Wind 150 deg - Service	24.27	2.13	3.70	309.53	-176.96	-0.01
Dead+Wind 180 deg - Service	24.27	-0.01	4.27	357.08	2.18	0.26
Dead+Wind 210 deg - Service	24.27	-2.15	3.70	309.27	180.18	0.47
Dead+Wind 240 deg - Service	24.27	-3.71	2.14	179.01	310.64	0.55
Dead+Wind 270 deg - Service	24.27	-4.29	0.01	0.46	359.05	0.44
Dead+Wind 300 deg - Service	24.27	-3.71	-2.13	-179.47	311.04	0.19
Dead+Wind 330 deg - Service	24.27	-2.13	-3.71	-312.39	178.16	0.05

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	-24.27	0.00	0.00	24.27	0.00	0.000%
2	0.04	-29.13	-17.57	-0.04	29.13	17.57	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
3	0.04	-21.84	-17.57	-0.04	21.84	17.57	0.000%
4	8.82	-29.13	-15.22	-8.82	29.13	15.22	0.000%
5	8.82	-21.84	-15.22	-8.82	21.84	15.22	0.000%
6	15.25	-29.13	-8.83	-15.25	29.13	8.83	0.000%
7	15.25	-21.84	-8.83	-15.25	21.84	8.83	0.000%
8	17.61	-29.13	-0.07	-17.61	29.13	0.07	0.000%
9	17.61	-21.84	-0.07	-17.61	21.84	0.07	0.000%
10	15.23	-29.13	8.78	-15.23	29.13	-8.78	0.000%
11	15.23	-21.84	8.78	-15.23	21.84	-8.78	0.000%
12	8.77	-29.13	15.20	-8.77	29.13	-15.20	0.000%
13	8.77	-21.84	15.20	-8.77	21.84	-15.20	0.000%
14	-0.04	-29.13	17.53	0.04	29.13	-17.53	0.000%
15	-0.04	-21.84	17.53	0.04	21.84	-17.53	0.000%
16	-8.81	-29.13	15.19	8.81	29.13	-15.19	0.000%
17	-8.81	-21.84	15.19	8.81	21.84	-15.19	0.000%
18	-15.23	-29.13	8.80	15.23	29.13	-8.80	0.000%
19	-15.23	-21.84	8.80	15.23	21.84	-8.80	0.000%
20	-17.61	-29.13	0.05	17.61	29.13	-0.05	0.000%
21	-17.61	-21.84	0.05	17.61	21.84	-0.05	0.000%
22	-15.25	-29.13	-8.75	15.25	29.13	8.75	0.000%
23	-15.25	-21.84	-8.75	15.25	21.84	8.75	0.000%
24	-8.74	-29.13	-15.24	8.74	29.13	15.24	0.000%
25	-8.74	-21.84	-15.24	8.74	21.84	15.24	0.000%
26	0.00	-50.89	0.00	0.00	50.89	0.00	0.000%
27	0.02	-50.89	-4.46	-0.02	50.89	4.46	0.000%
28	2.25	-50.89	-3.87	-2.25	50.89	3.87	0.000%
29	3.89	-50.89	-2.25	-3.89	50.89	2.25	0.000%
30	4.49	-50.89	-0.02	-4.49	50.89	0.02	0.000%
31	3.88	-50.89	2.22	-3.88	50.89	-2.22	0.000%
32	2.23	-50.89	3.85	-2.23	50.89	-3.85	0.000%
33	-0.02	-50.89	4.45	0.02	50.89	-4.45	0.000%
34	-2.25	-50.89	3.86	2.25	50.89	-3.86	0.000%
35	-3.89	-50.89	2.24	3.89	50.89	-2.24	0.000%
36	-4.49	-50.89	0.02	4.49	50.89	-0.02	0.000%
37	-3.88	-50.89	-2.21	3.88	50.89	2.21	0.000%
38	-2.22	-50.89	-3.86	2.22	50.89	3.86	0.000%
39	0.01	-24.27	-4.28	-0.01	24.27	4.28	0.000%
40	2.15	-24.27	-3.71	-2.15	24.27	3.71	0.000%
41	3.71	-24.27	-2.15	-3.71	24.27	2.15	0.000%
42	4.29	-24.27	-0.02	-4.29	24.27	0.02	0.000%
43	3.71	-24.27	2.14	-3.71	24.27	-2.14	0.000%
44	2.13	-24.27	3.70	-2.13	24.27	-3.70	0.000%
45	-0.01	-24.27	4.27	0.01	24.27	-4.27	0.000%
46	-2.15	-24.27	3.70	2.15	24.27	-3.70	0.000%
47	-3.71	-24.27	2.14	3.71	24.27	-2.14	0.000%
48	-4.29	-24.27	0.01	4.29	24.27	-0.01	0.000%
49	-3.71	-24.27	-2.13	3.71	24.27	2.13	0.000%
50	-2.13	-24.27	-3.71	2.13	24.27	3.71	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	0.00030621
3	Yes	4	0.00000001	0.00019252
4	Yes	5	0.00000001	0.00017187
5	Yes	5	0.00000001	0.00008154
6	Yes	5	0.00000001	0.00020451
7	Yes	5	0.00000001	0.00009795
8	Yes	4	0.00000001	0.00066037
9	Yes	4	0.00000001	0.00043411
10	Yes	5	0.00000001	0.00017367
11	Yes	5	0.00000001	0.00008268
12	Yes	5	0.00000001	0.00018308

13	Yes	5	0.00000001	0.00008743
14	Yes	4	0.00000001	0.00038729
15	Yes	4	0.00000001	0.00024840
16	Yes	5	0.00000001	0.00020120
17	Yes	5	0.00000001	0.00009637
18	Yes	5	0.00000001	0.00016834
19	Yes	5	0.00000001	0.00007990
20	Yes	4	0.00000001	0.00060951
21	Yes	4	0.00000001	0.00040084
22	Yes	5	0.00000001	0.00018977
23	Yes	5	0.00000001	0.00009051
24	Yes	5	0.00000001	0.00018057
25	Yes	5	0.00000001	0.00008584
26	Yes	4	0.00000001	0.00005843
27	Yes	5	0.00000001	0.00014563
28	Yes	5	0.00000001	0.00015455
29	Yes	5	0.00000001	0.00015506
30	Yes	5	0.00000001	0.00013867
31	Yes	5	0.00000001	0.00015074
32	Yes	5	0.00000001	0.00015176
33	Yes	5	0.00000001	0.00014359
34	Yes	5	0.00000001	0.00016323
35	Yes	5	0.00000001	0.00016246
36	Yes	5	0.00000001	0.00014965
37	Yes	5	0.00000001	0.00016375
38	Yes	5	0.00000001	0.00016290
39	Yes	4	0.00000001	0.00002492
40	Yes	4	0.00000001	0.00006242
41	Yes	4	0.00000001	0.00009727
42	Yes	4	0.00000001	0.00004064
43	Yes	4	0.00000001	0.00006082
44	Yes	4	0.00000001	0.00006858
45	Yes	4	0.00000001	0.00002656
46	Yes	4	0.00000001	0.00009251
47	Yes	4	0.00000001	0.00006423
48	Yes	4	0.00000001	0.00004172
49	Yes	4	0.00000001	0.00007779
50	Yes	4	0.00000001	0.00006624

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	115 - 72.3334	11.271	39	0.8623	0.0041
L2	77 - 29.3334	5.101	39	0.6285	0.0024
L3	35 - 0	1.044	39	0.2679	0.0007

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
117.00	LNx-6513DS-A1M w/ Mount Pipe	39	11.271	0.8623	0.0041	47502
107.00	VHLP1-23	39	9.879	0.8183	0.0038	29688
105.00	Platform Mount [LP 602-1]	39	9.534	0.8072	0.0037	23751
94.00	MX08FRO665-21 w/ Mount Pipe	39	7.684	0.7431	0.0032	11310
85.00	WH14-69/S	39	6.262	0.6855	0.0028	7916

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	115 - 72.3334	46.468	2	3.5528	0.0172
L2	77 - 29.3334	21.040	2	2.5927	0.0100
L3	35 - 0	4.305	2	1.1052	0.0027

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
117.00	LNX-6513DS-A1M w/ Mount Pipe	2	46.468	3.5528	0.0172	11607
107.00	VHLP1-23	2	40.732	3.3726	0.0157	7254
105.00	Platform Mount [LP 602-1]	2	39.311	3.3268	0.0153	5803
94.00	MX08FRO665-21 w/ Mount Pipe	2	31.686	3.0640	0.0133	2762
85.00	WH14-69/S	2	25.828	2.8272	0.0116	1932

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	115 - 72.3334 (1)	TP30.45x21.91x0.219	42.67	0.00	0.0	20.659 6	-13.45	1208.59	0.011
L2	72.3334 - 29.3334 (2)	TP38.61x29.0779x0.313	47.67	0.00	0.0	37.455 9	-20.47	2191.17	0.009
L3	29.3334 - 0 (3)	TP43.85x36.8508x0.375	35.00	0.00	0.0	52.496 1	-29.12	3071.02	0.009

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	115 - 72.3334 (1)	TP30.45x21.91x0.219	341.12	741.46	0.460	0.00	741.46	0.000
L2	72.3334 - 29.3334 (2)	TP38.61x29.0779x0.313	911.63	1815.79	0.502	0.00	1815.79	0.000
L3	29.3334 - 0 (3)	TP43.85x36.8508x0.375	1484.16	3010.72	0.493	0.00	3010.72	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
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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	115 - 72.3334 (1)	TP30.45x21.91x0.219	12.00	362.58	0.033	1.01	934.38	0.001
L2	72.3334 - 29.3334 (2)	TP38.61x29.0779x0.313	15.11	657.35	0.023	1.00	2148.91	0.000
L3	29.3334 - 0 (3)	TP43.85x36.8508x0.375	17.59	921.31	0.019	1.00	3523.25	0.000

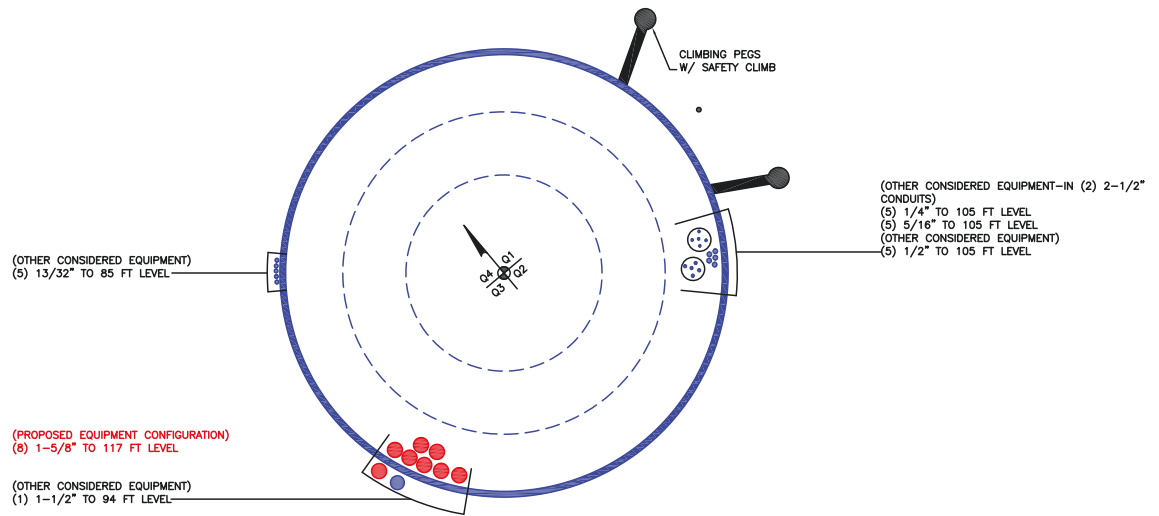
Pole Interaction Design Data

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	115 - 72.3334 (1)	0.011	0.460	0.000	0.033	0.001	0.472	1.050	4.8.2
L2	72.3334 - 29.3334 (2)	0.009	0.502	0.000	0.023	0.000	0.512	1.050	4.8.2
L3	29.3334 - 0 (3)	0.009	0.493	0.000	0.019	0.000	0.503	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	115 - 72.3334	Pole	TP30.45x21.91x0.219	1	-13.45	1269.02	45.0	Pass	
L2	72.3334 - 29.3334	Pole	TP38.61x29.0779x0.313	2	-20.47	2300.73	48.8	Pass	
L3	29.3334 - 0	Pole	TP43.85x36.8508x0.375	3	-29.12	3224.57	47.9	Pass	
							Summary		
							Pole (L2)	48.8	Pass
							RATING =	48.8	Pass

APPENDIX B
BASE LEVEL DRAWING



APPENDIX C
ADDITIONAL CALCULATIONS

Monopole Base Plate Connection

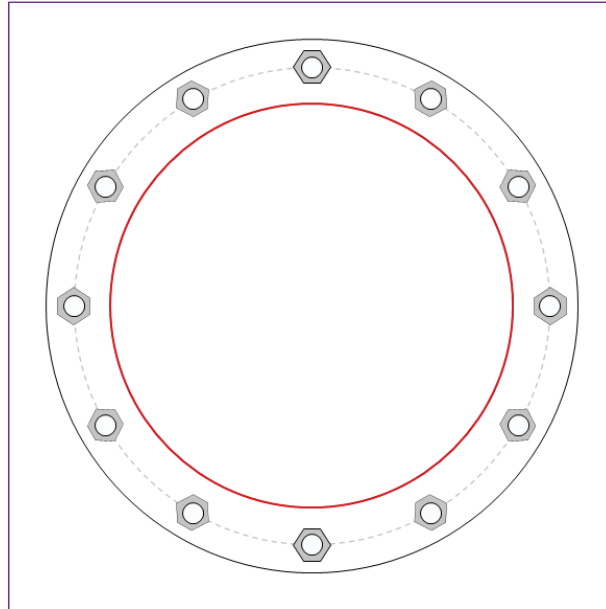


Site Info	
BU #	806372
Site Name	HRT 093 943228
Order #	

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	2

Applied Loads	
Moment (kip-ft)	1484.16
Axial Force (kips)	29.12
Shear Force (kips)	17.59

*TIA-222-H Section 15.5 Applied



Connection Properties	Analysis Results
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Anchor Rod Data
(12) 2-1/4" ϕ bolts (A615-75 N; $F_y=75$ ksi, $F_u=100$ ksi) on 51.9" BC
Base Plate Data
57.9" OD x 2.625" Plate (S-128; $F_y=60$ ksi, $F_u=80$ ksi)
Stiffener Data
N/A
Pole Data
43.85" x 0.375" 12-sided pole (A572-65; $F_y=65$ ksi, $F_u=80$ ksi)

Anchor Rod Summary	<i>(units of kips, kip-in)</i>	
$Pu_t = 111.87$	$\phi Pn_t = 243.75$	Stress Rating
$Vu = 1.47$	$\phi Vn = 149.1$	43.7%
$Mu = n/a$	$\phi Mn = n/a$	Pass
Base Plate Summary		
Max Stress (ksi):	14.82	(Flexural)
Allowable Stress (ksi):	54	
Stress Rating:	26.1%	Pass

Drilled Pier Foundation

BU # :	806372
Site Name:	HRT 093 943228
Order Number:	
TIA-222 Revison:	H
Tower Type:	Monopole



Applied Loads		
	Comp.	Uplift
Moment (kip-ft)	1484.16	
Axial Force (kips)	29.13	
Shear Force (kips)	17.57	

Material Properties	
Concrete Strength, fc:	3 ksi
Rebar Strength, Fy:	60 ksi
Tie Yield Strength, Fyt:	40 ksi

Pier Design Data	
Depth	21.1 ft
Ext. Above Grade	0.4 ft
Pier Section 1	
<i>From 0.4' above grade to 21.1' below grade</i>	
Pier Diameter	6 ft
Rebar Quantity	22
Rebar Size	10
Clear Cover to Ties	5 in
Tie Size	4
Tie Spacing	in

Rebar & Pier Options

Embedded Pole Inputs

Belled Pier Inputs

Analysis Results		
Soil Lateral Check		
	Compression	Uplift
D _{top} (ft from TOC)	6.77	-
Soil Safety Factor	2.17	-
Max Moment (kip-ft)	1624.50	-
Rating*	58.5%	-
Soil Vertical Check		
	Compression	Uplift
Skin Friction (kips)	226.42	-
End Bearing (kips)	1245.63	-
Weight of Concrete (kips)	109.42	-
Total Capacity (kips)	1472.05	-
Axial (kips)	138.55	-
Rating*	9.0%	-
Reinforced Concrete Flexure		
	Compression	Uplift
Critical Depth (ft from TOC)	6.61	-
Critical Moment (kip-ft)	1624.31	-
Critical Moment Capacity	3645.69	-
Rating*	42.4%	-
Reinforced Concrete Shear		
	Compression	Uplift
Critical Depth (ft from TOC)	16.01	-
Critical Shear (kip)	252.38	-
Critical Shear Capacity	430.97	-
Rating*	55.8%	-

Structural Foundation Rating*	55.8%
Soil Interaction Rating*	58.5%

*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"/>
Additional Longitudinal Rebar	
Input Effective Depths (else Actual):	<input type="checkbox"/>
Shear Design Options	
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](#)

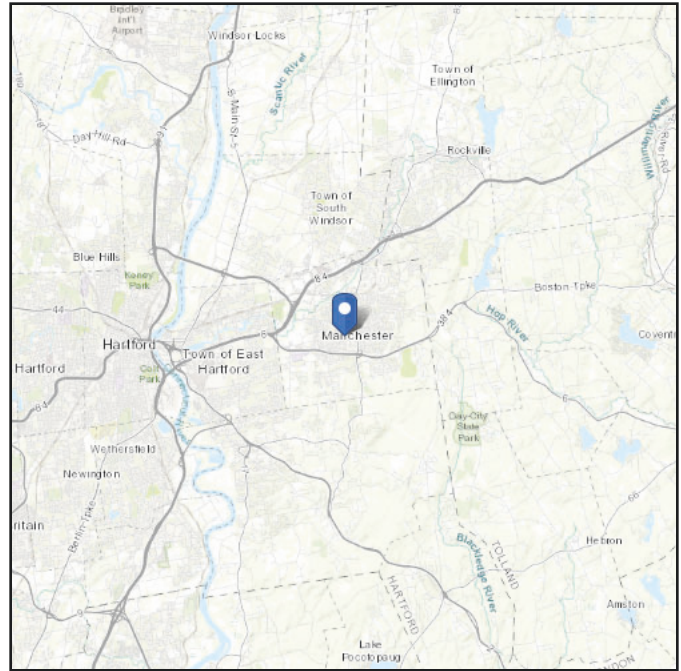
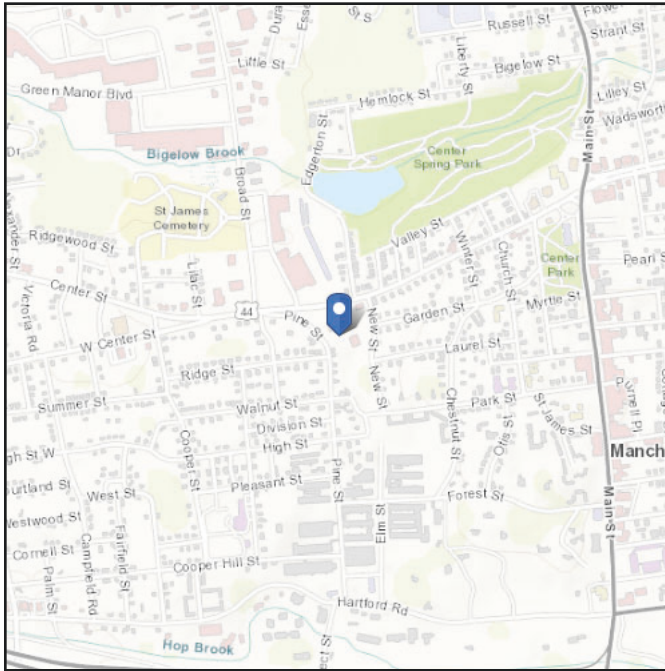
Soil Profile														
Groundwater Depth		N/A		# of Layers		4								
Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ _{soil} (pcf)	γ _{concrete} (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	5	5	90	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
2	5	14	9	90	150		30	0.618	0.618				10	Cohesionless
3	14	18	4	90	150		39	1.382	1.382				43	Cohesionless
4	18	21.1	3.1	90	150		30	1.589	1.589			58.74	16	Cohesionless

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 41.771944
Longitude: -72.530222
Elevation: 195.92798915027288 ft (NAVD 88)



Wind

Results:

Wind Speed	118 Vmph
10-year MRI	75 Vmph
25-year MRI	84 Vmph
50-year MRI	90 Vmph
100-year MRI	98 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: Thu May 04 2023

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

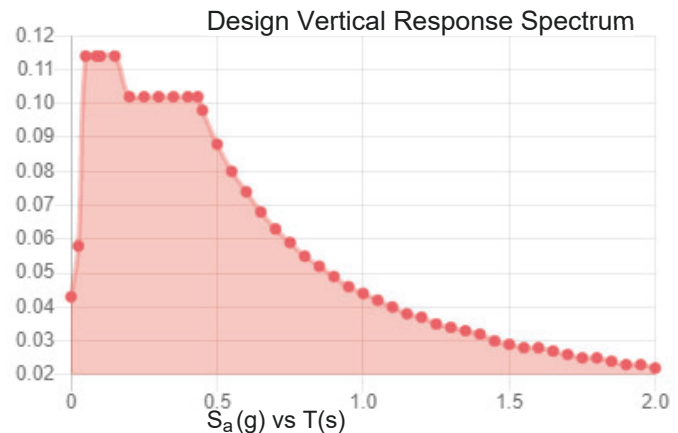
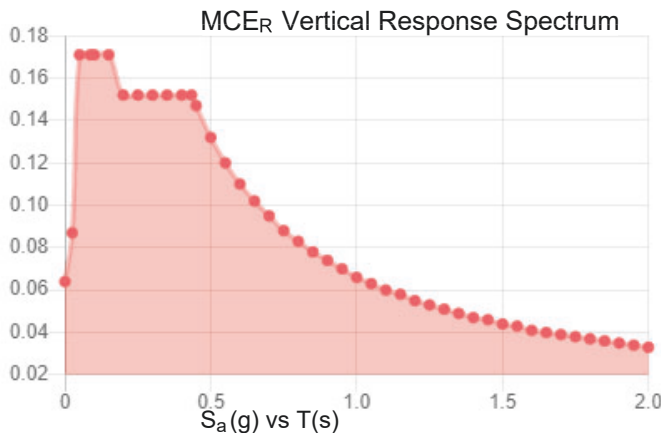
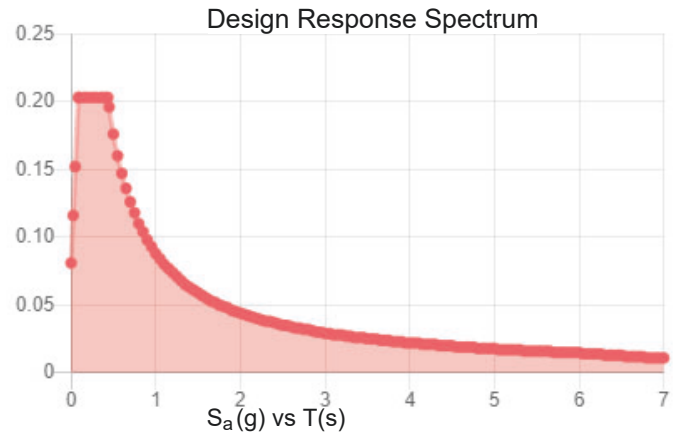
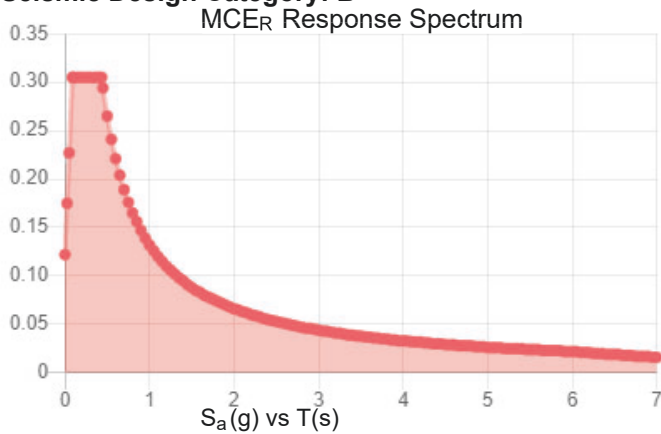
Site is in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Site Soil Class:

Results:

S_s :	0.191	S_{D1} :	0.088
S_1 :	0.055	T_L :	6
F_a :	1.6	PGA :	0.103
F_v :	2.4	PGA _M :	0.164
S_{MS} :	0.305	F_{PGA} :	1.594
S_{M1} :	0.132	I_e :	1
S_{DS} :	0.203	C_v :	0.7

Seismic Design Category: B



Data Accessed: Thu May 04 2023

Date Source:

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

Ice

Results:

Ice Thickness: 1.50 in.
Concurrent Temperature: 5 F
Gust Speed 50 mph

Data Source: Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8

Date Accessed: Thu May 04 2023

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

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

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