Date: **May 04, 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:	746889
	Work Order Number:	2226234
	Order Number:	650396 Rev. 0
Engineering Firm Designation:	**Crown Castle Project Number:**	2226234
Site Data:	**266R Center Street, MANCHESTER, HARTFORD County, CT** **Latitude *41° 46' 19"*, Longitude *-72° 31' 48.8"*** **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** - 58.4%

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:

Digitally signed by Maham Barimani
Date: 2023.05.04 15:15:01 -04'00'

STATE OF CONNECTICUT
MAHAM BARIMANI
30501
LICENSED
PROFESSIONAL ENGINEER

Maham Barimani, P.E.
Senior Project Engineer

TABLE OF CONTENTS

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	1	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 5 5 2	1/4 5/16 1/2 Conduit
		1	andrew	VHLP2-23		
	105.0	1	tower mounts	Platform Mount [LP 602-1]		
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		
85.0	85.0	4	tower mounts	Side Arm Mount [SO 701-1]	5	13/32

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
		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	-13.43	1269.02	44.9	Pass
L2	72.3334 - 29.3334	Pole	TP38.61x29.0779x0.313	2	-20.45	2300.73	48.7	Pass
L3	29.3334 - 0	Pole	TP43.85x36.8508x0.375	3	-29.09	3224.57	47.8	Pass
							Summary	
						Pole (L2)	48.7	Pass
						Rating =	48.7	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	43.6	Pass
1	Base Plate	0	36.1	Pass
1	Base Foundation (Structure)	0	55.7	Pass
1	Base Foundation (Soil Interaction)	0	58.4	Pass

Structure Rating (max from all components) =	58.4%

Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity consumed.

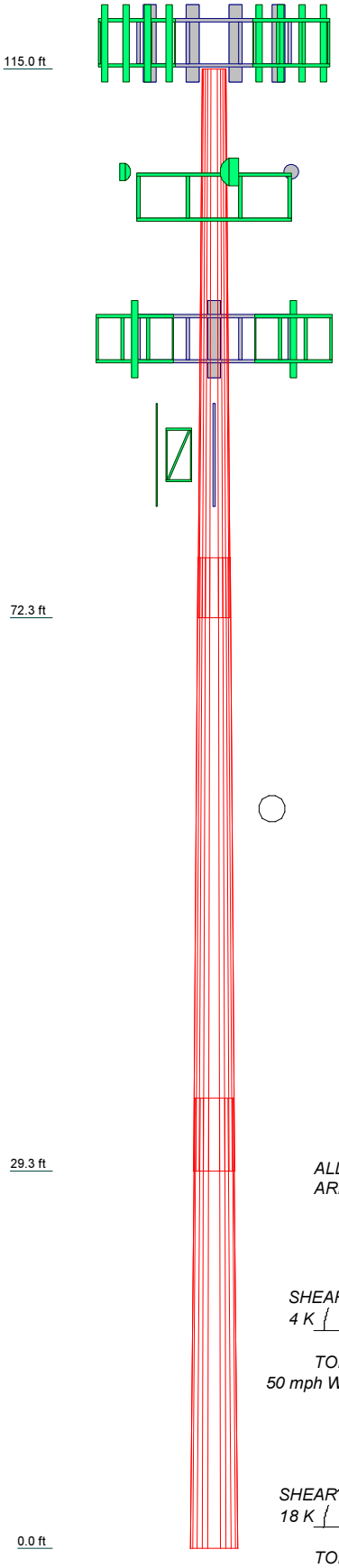
4.1) Recommendations

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	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	42.67	12	0.2190	4.67	21.9100	30.4500	A572-65	2.7
2	47.67	12	0.3130	5.67	29.0779	38.6100		5.5
3	35.00	12	0.3750		36.8508	43.8500		5.7
								13.9



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: 48.7%

ALL REACTIONS ARE FACTORED

AXIAL 51 K

SHEAR 4 K — *MOMENT 405 kip-ft*

TORQUE 1 kip-ft
50 mph WIND - 1.5000 in ICE

AXIAL 29 K

SHEAR 18 K — *MOMENT 1482 kip-ft*

TORQUE 2 kip-ft
REACTIONS - 118 mph WIND

CROWN CASTLE
The Pathway to Possible

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

Job: ***BU 806372***			
Project:			
Client: Crown Castle	Drawn by: Dolly Hsu		App'd:
Code: TIA-222-H	Date: 05/04/23		Scale: NTS
Path: C:\Users\dhsu\Documents\Weekend WIP\806372\WO 2226234 - SA\Prod\806372.eri			Dwg No. E-1

Tower Input Data

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

- Tower is located in 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		Distribute Leg Loads As Uniform		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Horizontals		Assume Legs Pinned		Calculate Forces in Supporting Bracing Members
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Use Moment Magnification	√	Use Clear Spans For Wind Area		SR Leg Bolts Resist Compression
√	Use Code Stress Ratios		Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		Offset Girt At Foundation
	Escalate Ice	√	Bypass Mast Stability Checks	√	Consider Feed Line Torque
	Always Use Max Kz	√	Use Azimuth Dish Coefficients		Include Angle Block Shear Check
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Use TIA-222-H Bracing Resist. Exemption
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-H Tension Splice Exemption
	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination		Poles
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component	√	Include Shear-Torsion Interaction
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Always Use Sub-Critical Flow
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Use Top Mounted Sockets
	SR Members Are Concentric		Ignore KL/ry For 60 Deg. Angle Legs		Pole Without Linear Attachments
					Pole With Shroud Or No Appurtenances
					Outside and Inside Corner Radii Are Known

Tapered Pole Section Geometry

Section	*Elevation*	*Section Length*	*Splice Length*	*Number of Sides*	*Top Diameter*	*Bottom Diameter*	*Wall Thickness*	*Bend Radius*	*Pole Grade*
	ft	*ft*	*ft*		*in*	*in*	*in*	*in*	
L1	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	3061.8013	10.2979	15.0624	203.2748	6204.0395	14.2685	6.9541	22.217
	39.8616	38.5980	7225.7083	13.7103	20.0000	361.2858	14641.2440	18.9968	9.5086	30.379
L3	39.1917	44.0446	7479.7774	13.0583	19.0887	391.8426	15156.0568	21.6774	8.8710	23.656
	45.2646	52.4961	12664.6112	15.5641	22.7143	557.5611	25661.9358	25.8370	10.7468	28.658

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals 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 in	Perimeter in	Weight plf
LDF7-50A(1-5/8) **85**	A	No	Surface Ar (CaAa)	115.00 - 0.00	1	1	-0.400 -0.400	1.9800		0.82
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_AA_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_AA_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_AA_A In Face ft^2	C_AA_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_AA_A In Face ft^2	C_AA_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 Ice	CP_Z Ice
	ft	in	in	in	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: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft
MT6407-77A w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	117.00
MT6407-77A w/ Mount Pipe	B	From Leg	4.00 0.00 3.00	0.0000	117.00
MT6407-77A w/ Mount Pipe	C	From Leg	4.00 0.00 3.00	0.0000	117.00
BSF0020F3V1	A	From Leg	4.00 0.00 0.00	0.0000	117.00
RT4401-48A	A	From Leg	4.00 0.00 0.00	0.0000	117.00
RT4401-48A	B	From Leg	4.00 0.00 0.00	0.0000	117.00
RT4401-48A	C	From Leg	4.00 0.00 0.00	0.0000	117.00
RRFDC-3315-PF-48	A	From Leg	4.00 0.00 0.00	0.0000	117.00
DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0.00 0.00	0.0000	117.00
RFV01U-D1A	A	From Leg	4.00 0.00 0.00	0.0000	117.00
RFV01U-D1A	B	From Leg	4.00 0.00 0.00	0.0000	117.00
RFV01U-D1A	C	From Leg	4.00 0.00 0.00	0.0000	117.00
RFV01U-D2A	A	From Leg	4.00 0.00 0.00	0.0000	117.00
RFV01U-D2A	B	From Leg	4.00 0.00 0.00	0.0000	117.00
RFV01U-D2A	C	From Leg	4.00 0.00 0.00	0.0000	117.00
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 0.00	0.0000	117.00
(2) 3.5' Hor 2.5x2.5 Angle	B	From Leg	4.00 0.00 0.00	0.0000	117.00
(2) 3.5' Hor 2.5x2.5 Angle	C	From Leg	4.00 0.00 0.00	0.0000	117.00
6' x 2'' Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	117.00
6' x 2'' Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	117.00
6' x 2'' Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	117.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft
Platform Mount [LP 602-1]	C	None		0.0000	105.00
(3) 6' x 2'' Mount Pipe	A	From Centroid-Leg	4.00 0.00 0.00	0.0000	105.00
(3) 6' x 2'' Mount Pipe	B	From Centroid-Leg	4.00 0.00 0.00	0.0000	105.00
(3) 6' x 2'' Mount Pipe	C	From Centroid-Leg	4.00 0.00 0.00	0.0000	105.00
** 94 **					
MX08FRO665-21 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	94.00
MX08FRO665-21 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	94.00
MX08FRO665-21 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	94.00
TA08025-B604	A	From Leg	4.00 0.00 1.00	0.0000	94.00
TA08025-B604	B	From Leg	4.00 0.00 1.00	0.0000	94.00
TA08025-B604	C	From Leg	4.00 0.00 1.00	0.0000	94.00
TA08025-B605	A	From Leg	4.00 0.00 1.00	0.0000	94.00
TA08025-B605	B	From Leg	4.00 0.00 1.00	0.0000	94.00
TA08025-B605	C	From Leg	4.00 0.00 1.00	0.0000	94.00
RDIDC-9181-PF-48	A	From Leg	4.00 0.00 1.00	0.0000	94.00
Sabre_C10801018-32788	C	None		0.0000	94.00
(2) 8' x 2'' Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	94.00
(2) 8' x 2'' Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	94.00
(2) 8' x 2'' Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	94.00
** 85 **					
WH14-69/S	C	From Leg	4.00 0.00 0.00	0.0000	85.00
WL 14-69/S	A	From Leg	4.00 0.00 -1.00	0.0000	85.00
WL 14-69/S	A	From Leg	4.00 0.00 -1.00	0.0000	85.00
WL 14-69/S	C	From Leg	4.00 0.00 -1.00	0.0000	85.00
J105-HI	C	From Leg	4.00	0.0000	85.00

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

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

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice

Comb. No.	Description
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	-29.32	7.24	0.55
			Max. Mx	20	-13.43	332.82	-1.39
			Max. My	2	-13.43	-1.26	340.43
			Max. Vy	20	-12.00	332.82	-1.39
			Max. Vx	2	-11.98	-1.26	340.43
			Max. Torque	18			-2.31
L2	72.3334 - 29.3334	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-39.46	8.71	1.21
			Max. Mx	20	-20.45	903.53	-3.84
			Max. My	2	-20.45	-3.39	910.17
			Max. Vy	20	-15.12	903.53	-3.84
			Max. Vx	2	-15.09	-3.39	910.17
			Max. Torque	18			-2.31
L3	29.3334 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-50.84	9.77	1.79
			Max. Mx	20	-29.09	1476.38	-5.83
			Max. My	2	-29.09	-5.09	1482.10
			Max. Vy	20	-17.59	1476.38	-5.83
			Max. Vx	2	-17.57	-5.09	1482.10
			Max. Torque	18			-2.31

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	36	50.84	4.48	-0.02
	Max. H_x	20	29.10	17.58	-0.06
	Max. H_z	2	29.10	-0.05	17.56
	Max. M_x	2	1482.10	-0.05	17.56
	Max. M_z	8	1473.27	-17.58	0.08
	Max. Torsion	6	2.25	-15.23	8.83
	Min. Vert	11	21.83	-15.20	-8.76
	Min. H_x	8	29.10	-17.58	0.08
	Min. H_z	14	29.10	0.05	-17.52
	Min. M_x	14	-1475.20	0.05	-17.52
	Min. M_z	20	-1476.38	17.58	-0.06
	Min. Torsion	18	-2.31	15.21	-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	24.25	0.00	0.00	-0.94	1.04	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	29.10	0.05	-17.56	-1482.10	-5.09	-1.05
0.9 Dead+1.0 Wind 0 deg - No Ice	21.83	0.05	-17.56	-1468.27	-5.36	-1.04
1.2 Dead+1.0 Wind 30 deg - No Ice	29.10	8.81	-15.21	-1284.55	-739.20	-1.98
0.9 Dead+1.0 Wind 30 deg - No Ice	21.83	8.81	-15.21	-1272.52	-732.80	-1.97
1.2 Dead+1.0 Wind 60 deg - No Ice	29.10	15.23	-8.83	-747.60	-1276.52	-2.25
0.9 Dead+1.0 Wind 60 deg - No Ice	21.83	15.23	-8.83	-740.47	-1265.25	-2.24
1.2 Dead+1.0 Wind 90 deg - No Ice	29.10	17.58	-0.08	-10.68	-1473.27	-1.75
0.9 Dead+1.0 Wind 90 deg - No Ice	21.83	17.58	-0.08	-10.27	-1460.22	-1.74
1.2 Dead+1.0 Wind 120 deg - No Ice	29.10	15.20	8.76	736.85	-1273.46	-0.96
0.9 Dead+1.0 Wind 120 deg - No Ice	21.83	15.20	8.76	730.42	-1262.22	-0.96
1.2 Dead+1.0 Wind 150 deg - No Ice	29.10	8.74	15.18	1278.47	-730.64	-0.01
0.9 Dead+1.0 Wind 150 deg - No Ice	21.83	8.74	15.18	1267.10	-724.33	-0.02
1.2 Dead+1.0 Wind 180 deg - No Ice	29.10	-0.05	17.52	1475.20	7.54	1.10
0.9 Dead+1.0 Wind 180 deg - No Ice	21.83	-0.05	17.52	1462.04	7.13	1.09
1.2 Dead+1.0 Wind 210 deg - No Ice	29.10	-8.80	15.18	1278.66	740.61	1.97
0.9 Dead+1.0 Wind 210 deg - No Ice	21.83	-8.80	15.18	1267.29	733.55	1.96
1.2 Dead+1.0 Wind 240 deg - No Ice	29.10	-15.21	8.80	741.98	1277.57	2.31
0.9 Dead+1.0 Wind 240 deg - No Ice	21.83	-15.21	8.80	735.50	1265.64	2.30
1.2 Dead+1.0 Wind 270 deg - No Ice	29.10	-17.58	0.06	5.83	1476.38	1.85
0.9 Dead+1.0 Wind 270 deg - No Ice	21.83	-17.58	0.06	6.06	1462.64	1.84
1.2 Dead+1.0 Wind 300 deg - No Ice	29.10	-15.22	-8.73	-736.36	1277.96	0.80

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
0.9 Dead+1.0 Wind 300 deg - No Ice	21.83	-15.22	-8.73	-729.35	1266.02	0.80
1.2 Dead+1.0 Wind 330 deg - No Ice	29.10	-8.71	-15.22	-1284.99	730.03	0.18
0.9 Dead+1.0 Wind 330 deg - No Ice	21.83	-8.71	-15.22	-1272.96	723.08	0.18
1.2 Dead+1.0 Ice+1.0 Temp	50.84	-0.00	-0.00	-1.79	9.77	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	50.84	0.02	-4.45	-396.70	7.59	-0.42
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	50.84	2.25	-3.86	-344.36	-189.25	-0.63
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	50.84	3.88	-2.25	-201.29	-333.12	-0.64
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	50.84	4.48	-0.03	-4.73	-385.56	-0.44
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	50.84	3.87	2.22	194.45	-331.72	-0.17
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	50.84	2.22	3.85	339.16	-186.00	0.13
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	50.84	-0.02	4.44	392.04	12.04	0.43
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	50.84	-2.25	3.86	339.94	208.63	0.62
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	50.84	-3.88	2.24	196.93	352.43	0.65
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	50.84	-4.48	0.02	0.59	405.36	0.46
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	50.84	-3.88	-2.21	-197.39	351.80	0.12
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	50.84	-2.22	-3.86	-343.76	204.89	-0.10
Dead+Wind 0 deg - Service	24.25	0.01	-4.28	-359.58	-0.47	-0.25
Dead+Wind 30 deg - Service	24.25	2.15	-3.70	-311.74	-178.23	-0.48
Dead+Wind 60 deg - Service	24.25	3.71	-2.15	-181.72	-308.35	-0.55
Dead+Wind 90 deg - Service	24.25	4.28	-0.02	-3.28	-355.99	-0.43
Dead+Wind 120 deg - Service	24.25	3.70	2.13	177.73	-307.61	-0.24
Dead+Wind 150 deg - Service	24.25	2.13	3.70	308.88	-176.16	-0.01
Dead+Wind 180 deg - Service	24.25	-0.01	4.27	356.52	2.59	0.27
Dead+Wind 210 deg - Service	24.25	-2.14	3.70	308.93	180.10	0.48
Dead+Wind 240 deg - Service	24.25	-3.70	2.14	178.97	310.13	0.56
Dead+Wind 270 deg - Service	24.25	-4.28	0.01	0.72	358.27	0.45
Dead+Wind 300 deg - Service	24.25	-3.71	-2.13	-179.00	310.22	0.19
Dead+Wind 330 deg - Service	24.25	-2.12	-3.71	-311.85	177.54	0.04

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-24.25	0.00	0.00	24.25	0.00	0.000%
2	0.05	-29.10	-17.56	-0.05	29.10	17.56	0.000%
3	0.05	-21.83	-17.56	-0.05	21.83	17.56	0.000%
4	8.81	-29.10	-15.21	-8.81	29.10	15.21	0.000%
5	8.81	-21.83	-15.21	-8.81	21.83	15.21	0.000%
6	15.23	-29.10	-8.83	-15.23	29.10	8.83	0.000%
7	15.23	-21.83	-8.83	-15.23	21.83	8.83	0.000%
8	17.58	-29.10	-0.08	-17.58	29.10	0.08	0.000%
9	17.58	-21.83	-0.08	-17.58	21.83	0.08	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
10	15.20	-29.10	8.76	-15.20	29.10	-8.76	0.000%
11	15.20	-21.83	8.76	-15.20	21.83	-8.76	0.000%
12	8.74	-29.10	15.18	-8.74	29.10	-15.18	0.000%
13	8.74	-21.83	15.18	-8.74	21.83	-15.18	0.000%
14	-0.05	-29.10	17.52	0.05	29.10	-17.52	0.000%
15	-0.05	-21.83	17.52	0.05	21.83	-17.52	0.000%
16	-8.80	-29.10	15.18	8.80	29.10	-15.18	0.000%
17	-8.80	-21.83	15.18	8.80	21.83	-15.18	0.000%
18	-15.21	-29.10	8.80	15.21	29.10	-8.80	0.000%
19	-15.21	-21.83	8.80	15.21	21.83	-8.80	0.000%
20	-17.58	-29.10	0.06	17.58	29.10	-0.06	0.000%
21	-17.58	-21.83	0.06	17.58	21.83	-0.06	0.000%
22	-15.22	-29.10	-8.73	15.22	29.10	8.73	0.000%
23	-15.22	-21.83	-8.73	15.22	21.83	8.73	0.000%
24	-8.71	-29.10	-15.22	8.71	29.10	15.22	0.000%
25	-8.71	-21.83	-15.22	8.71	21.83	15.22	0.000%
26	0.00	-50.84	0.00	0.00	50.84	0.00	0.000%
27	0.02	-50.84	-4.45	-0.02	50.84	4.45	0.000%
28	2.25	-50.84	-3.86	-2.25	50.84	3.86	0.000%
29	3.88	-50.84	-2.25	-3.88	50.84	2.25	0.000%
30	4.48	-50.84	-0.03	-4.48	50.84	0.03	0.000%
31	3.87	-50.84	2.22	-3.87	50.84	-2.22	0.000%
32	2.22	-50.84	3.85	-2.22	50.84	-3.85	0.000%
33	-0.02	-50.84	4.44	0.02	50.84	-4.44	0.000%
34	-2.25	-50.84	3.86	2.25	50.84	-3.86	0.000%
35	-3.88	-50.84	2.24	3.88	50.84	-2.24	0.000%
36	-4.48	-50.84	0.02	4.48	50.84	-0.02	0.000%
37	-3.87	-50.84	-2.21	3.88	50.84	2.21	0.000%
38	-2.22	-50.84	-3.86	2.22	50.84	3.86	0.000%
39	0.01	-24.25	-4.28	-0.01	24.25	4.28	0.000%
40	2.15	-24.25	-3.70	-2.15	24.25	3.70	0.000%
41	3.71	-24.25	-2.15	-3.71	24.25	2.15	0.000%
42	4.28	-24.25	-0.02	-4.28	24.25	0.02	0.000%
43	3.70	-24.25	2.13	-3.70	24.25	-2.13	0.000%
44	2.13	-24.25	3.70	-2.13	24.25	-3.70	0.000%
45	-0.01	-24.25	4.27	0.01	24.25	-4.27	0.000%
46	-2.14	-24.25	3.70	2.14	24.25	-3.70	0.000%
47	-3.70	-24.25	2.14	3.70	24.25	-2.14	0.000%
48	-4.28	-24.25	0.01	4.28	24.25	-0.01	0.000%
49	-3.71	-24.25	-2.13	3.71	24.25	2.13	0.000%
50	-2.12	-24.25	-3.71	2.12	24.25	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	0.00031573
3	Yes	4	0.00000001	0.00019896
4	Yes	5	0.00000001	0.00016989
5	Yes	5	0.00000001	0.00008060
6	Yes	5	0.00000001	0.00020322
7	Yes	5	0.00000001	0.00009735
8	Yes	4	0.00000001	0.00067797
9	Yes	4	0.00000001	0.00044575
10	Yes	5	0.00000001	0.00017093
11	Yes	5	0.00000001	0.00008143
12	Yes	5	0.00000001	0.00018004
13	Yes	5	0.00000001	0.00008603
14	Yes	4	0.00000001	0.00041475
15	Yes	4	0.00000001	0.00026675
16	Yes	5	0.00000001	0.00020025
17	Yes	5	0.00000001	0.00009592
18	Yes	5	0.00000001	0.00016656
19	Yes	5	0.00000001	0.00007907

20	Yes	4	0.00000001	0.00060968
21	Yes	4	0.00000001	0.00040093
22	Yes	5	0.00000001	0.00018711
23	Yes	5	0.00000001	0.00008927
24	Yes	5	0.00000001	0.00017835
25	Yes	5	0.00000001	0.00008480
26	Yes	4	0.00000001	0.00005795
27	Yes	5	0.00000001	0.00014486
28	Yes	5	0.00000001	0.00015357
29	Yes	5	0.00000001	0.00015399
30	Yes	5	0.00000001	0.00013747
31	Yes	5	0.00000001	0.00014915
32	Yes	5	0.00000001	0.00015024
33	Yes	5	0.00000001	0.00014264
34	Yes	5	0.00000001	0.00016235
35	Yes	5	0.00000001	0.00016151
36	Yes	5	0.00000001	0.00014877
37	Yes	5	0.00000001	0.00016265
38	Yes	5	0.00000001	0.00016187
39	Yes	4	0.00000001	0.00002567
40	Yes	4	0.00000001	0.00006214
41	Yes	4	0.00000001	0.00009751
42	Yes	4	0.00000001	0.00004118
43	Yes	4	0.00000001	0.00005990
44	Yes	4	0.00000001	0.00006725
45	Yes	4	0.00000001	0.00002755
46	Yes	4	0.00000001	0.00009308
47	Yes	4	0.00000001	0.00006424
48	Yes	4	0.00000001	0.00004207
49	Yes	4	0.00000001	0.00007698
50	Yes	4	0.00000001	0.00006580

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	115 - 72.3334	11.255	39	0.8612	0.0043
L2	77 - 29.3334	5.094	39	0.6276	0.0025
L3	35 - 0	1.043	39	0.2676	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	11.255	0.8612	0.0043	47571
107.00	VHLP1-23	39	9.865	0.8172	0.0039	29732
105.00	Platform Mount [LP 602-1]	39	9.521	0.8061	0.0038	23785
94.00	MX08FRO665-21 w/ Mount Pipe	39	7.673	0.7421	0.0033	11326
85.00	WH14-69/S	39	6.254	0.6845	0.0029	7928

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	115 - 72.3334	46.391	2	3.5464	0.0179
L2	77 - 29.3334	21.008	2	2.5885	0.0102

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L3	35 - 0	4.299	2	1.1035	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	46.391	3.5464	0.0179	11632
107.00	VHLP1-23	2	40.666	3.3666	0.0163	7269
105.00	Platform Mount [LP 602-1]	2	39.247	3.3210	0.0159	5815
94.00	MX08FRO665-21 w/ Mount Pipe	2	31.635	3.0588	0.0137	2768
85.00	WH14-69/S	2	25.788	2.8225	0.0119	1936

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 $\frac{P_u}{\phi P_n}$
L1	115 - 72.3334 (1)	TP30.45x21.91x0.219	42.67	0.00	0.0	20.6596	-13.43	1208.59	0.011
L2	72.3334 - 29.3334 (2)	TP38.61x29.0779x0.313	47.67	0.00	0.0	37.4559	-20.45	2191.17	0.009
L3	29.3334 - 0 (3)	TP43.85x36.8508x0.375	35.00	0.00	0.0	52.4961	-29.09	3071.02	0.009

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	115 - 72.3334 (1)	TP30.45x21.91x0.219	340.43	741.46	0.459	0.00	741.46	0.000
L2	72.3334 - 29.3334 (2)	TP38.61x29.0779x0.313	910.17	1815.79	0.501	0.00	1815.79	0.000
L3	29.3334 - 0 (3)	TP43.85x36.8508x0.375	1482.11	3010.72	0.492	0.00	3010.72	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	115 - 72.3334 (1)	TP30.45x21.91x0.219	11.98	362.58	0.033	1.06	934.38	0.001
L2	72.3334 - 29.3334 (2)	TP38.61x29.0779x0.313	15.09	657.35	0.023	1.05	2148.91	0.000
L3	29.3334 - 0	TP43.85x36.8508x0.375	17.57	921.31	0.019	1.05	3523.25	0.000

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 $\frac{T_u}{\phi T_n}$
	(3)							

Pole Interaction Design Data

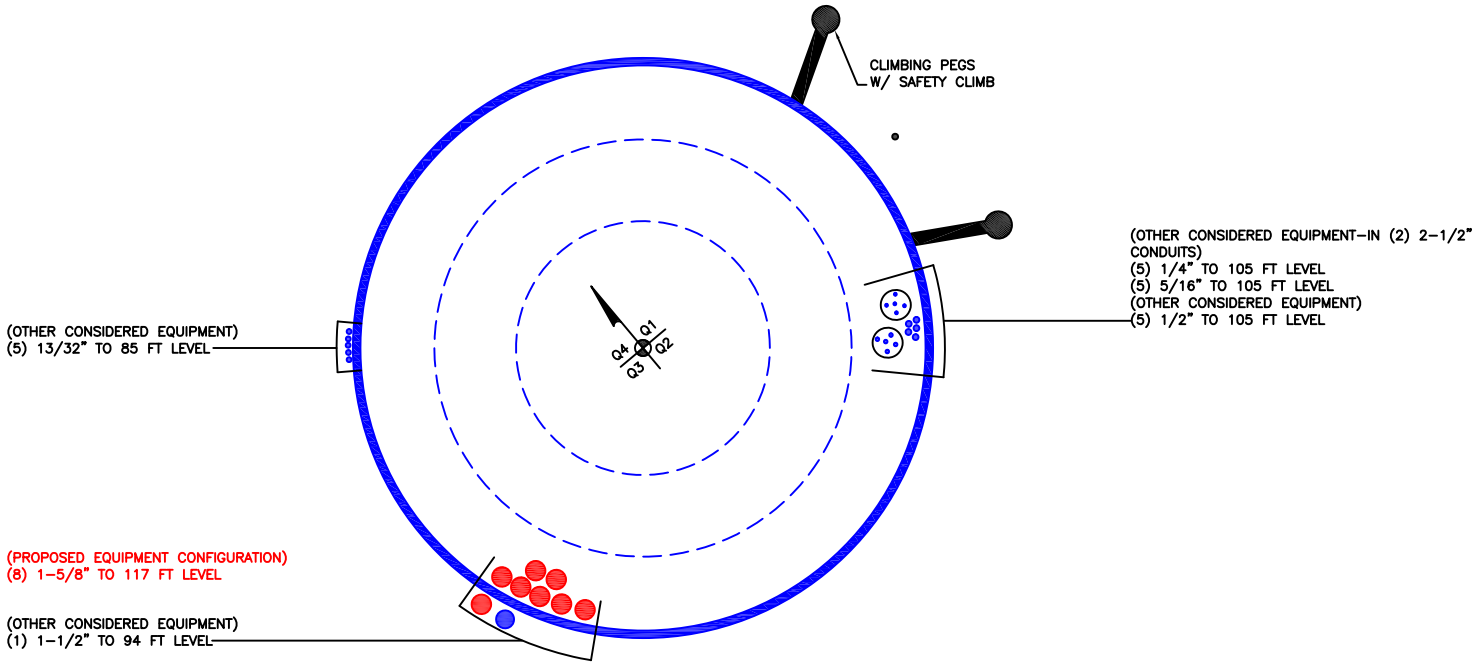
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	115 - 72.3334 (1)	0.011	0.459	0.000	0.033	0.001	0.471	1.050	4.8.2
L2	72.3334 - 29.3334 (2)	0.009	0.501	0.000	0.023	0.000	0.511	1.050	4.8.2
L3	29.3334 - 0 (3)	0.009	0.492	0.000	0.019	0.000	0.502	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	-13.43	1269.02	44.9	Pass
L2	72.3334 - 29.3334	Pole	TP38.61x29.0779x0.313	2	-20.45	2300.73	48.7	Pass
L3	29.3334 - 0	Pole	TP43.85x36.8508x0.375	3	-29.09	3224.57	47.8	Pass
						Summary		
						Pole (L2)	48.7	Pass
						RATING =	**48.7**	**Pass**

APPENDIX B

BASE LEVEL DRAWING


CLIMBING PEGS
W/ SAFETY CLIMB
(OTHER CONSIDERED EQUIPMENT–IN (2) 2–1/2" CONDUITS)
(5) 1/4" TO 105 FT LEVEL
(5) 5/16" TO 105 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(5) 1/2" TO 105 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(5) 13/32" TO 85 FT LEVEL
Q1
Q2
Q3
Q4
(PROPOSED EQUIPMENT CONFIGURATION)
(8) 1–5/8" TO 117 FT LEVEL
(OTHER CONSIDERED EQUIPMENT)
(1) 1–1/2" TO 94 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

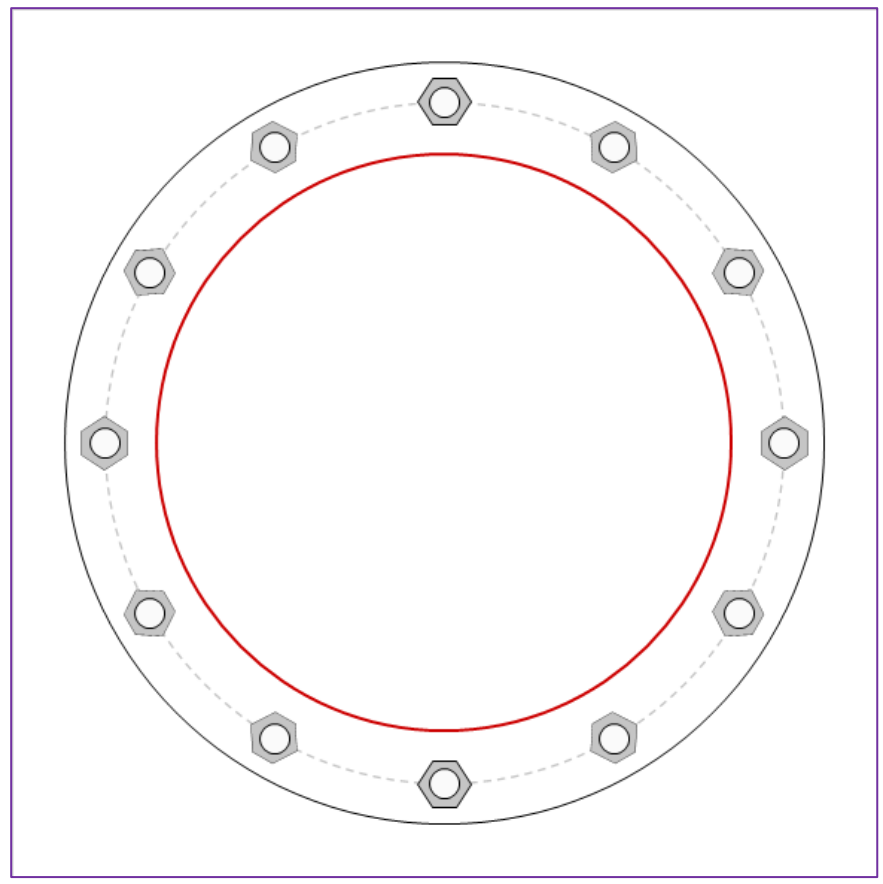
Monopole Base Plate Connection

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)	1482.11
Axial Force (kips)	29.09
Shear Force (kips)	17.57

**TIA-222-H Section 15.5 Applied*



Connection Properties

Anchor Rod Data

(12) 2-1/4" ø bolts (A615-75 N; Fy=75 ksi, Fu=100 ksi) on 51.9" BC

Base Plate Data

57.9" OD x 2.625" Plate (S-128; Fy=60 ksi, Fu=80 ksi)

Stiffener Data

N/A

Pole Data

43.85" x 0.375" 12-sided pole (A572-65; Fy=65 ksi, Fu=80 ksi)

Analysis Results

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

Pu_t = 111.72	ϕPn_t = 243.75	**Stress Rating**
Vu = 1.46	ϕVn = 149.1	**43.6%**
Mu = n/a	ϕMn = n/a	**Pass**

Base Plate Summary

Max Stress (ksi):	14.8	(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)	1482.11	
Axial Force (kips)	29.1	
Shear Force (kips)	17.56	

Material Properties		
Concrete Strength, f'c:	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		
From 0.4' above grade to 21.1' below grade		
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*
$D_{v=0}$ (ft from TOC)	6.77	-
Soil Safety Factor	2.17	-
Max Moment (kip-ft)	1623.57	-
Rating*	*58.4%*	-
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)	138.52	-
Rating*	*9.0%*	-
Reinforced Concrete Flexure	*Compression*	*Uplift*
Critical Depth (ft from TOC)	6.61	-
Critical Moment (kip-ft)	1623.38	-
Critical Moment Capacity	3645.64	-
Rating*	*42.4%*	-
Reinforced Concrete Shear	*Compression*	*Uplift*
Critical Depth (ft from TOC)	16.01	-
Critical Shear (kip)	252.23	-
Critical Shear Capacity	430.98	-
Rating*	*55.7%*	-

Structural Foundation Rating*	**55.7%**
Soil Interaction Rating*	**58.4%**

*Rating per TIA-222-H Section 15.5

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

Go to Soil Calculations

Soil Profile

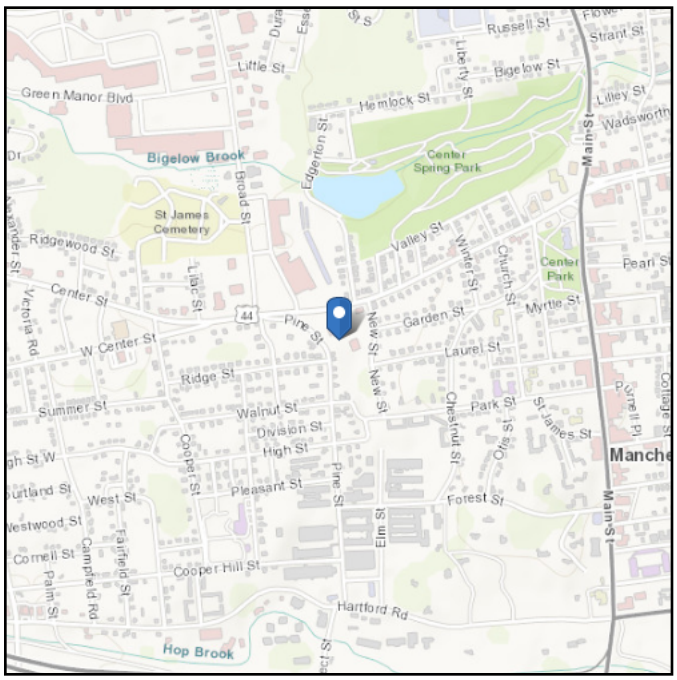
Groundwater Depth	N/A	# of Layers	4

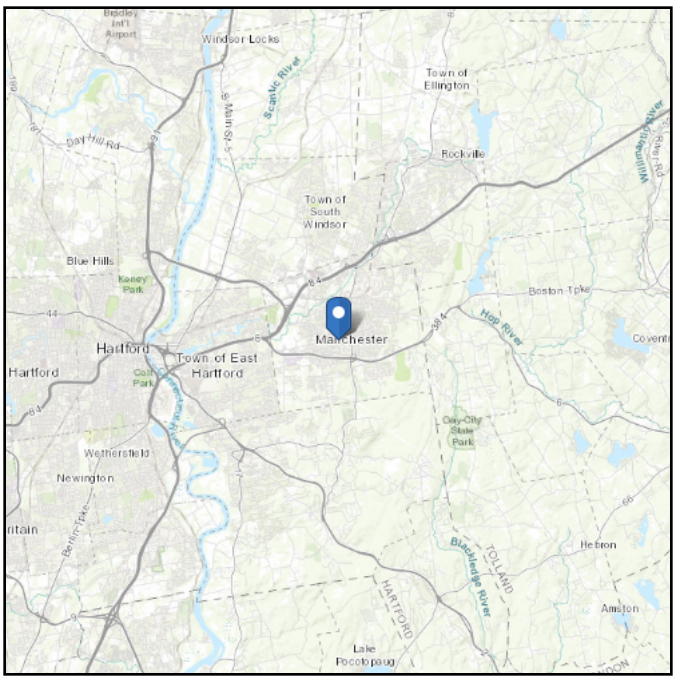
Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ_{soil} (pcf)	$\gamma_{concrete}$ (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	5	5	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	**Latitude:**	41.771944
Risk Category:	II	**Longitude:**	-72.530222
Soil Class:	D - Default (see Section 11.4.3)	**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.

Seismic

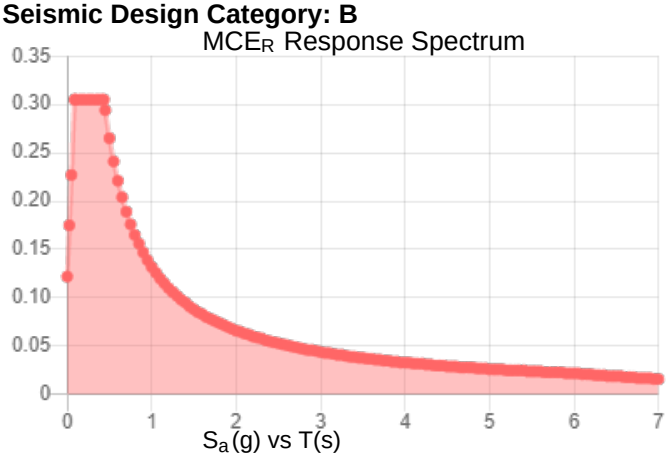
D - Default (see Section 11.4.3)

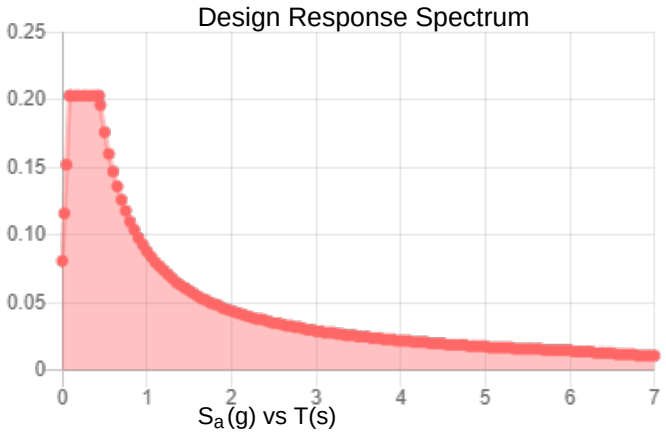
Site Soil Class:

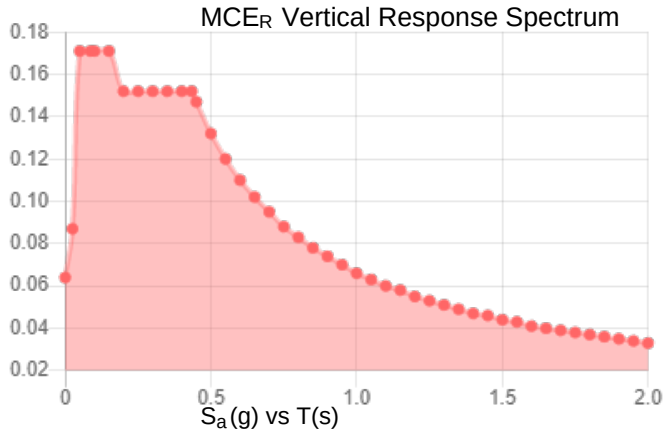
Results:

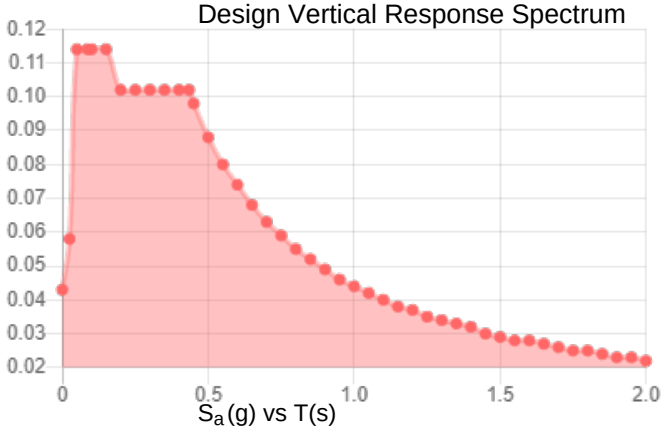
S_S :	0.191	S_{D1} :	0.088
S_1 :	0.055	T_L :	6
F_a :	1.6	PGA :	0.103
F_v :	2.4	PGA_M :	0.164
S_{MS} :	0.305	F_{PGA} :	1.594
S_{M1} :	0.132	I_e :	1
S_{DS} :	0.203	C_v :	0.7

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.