TOWER ANALYSIS REPORT

T-Mobile

Lee's Summit Fire Station #1, A5C0028A

SSC # MO-0552-F

February 9, 2022

SSC Inc.

7171 W 95th St., Suite 600, Overland Park, KS, 66212

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serve solve communicate

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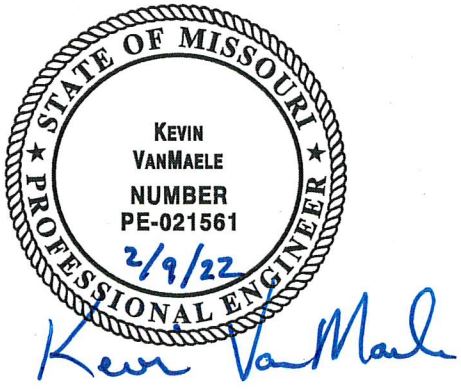


GENERAL TOWER INFORMATION

Date:	February 9, 2022
Site Name:	Lee's Summit Fire Station #1
Site Location:	209 SE Douglas Lee's Summit, Jackson County, MO 64063
Site Coordinates:	38.913883, -94.376408
Proposed Carrier:	T-Mobile
Location Code:	A5C0028A
Tower Height:	180'
Tower Type:	Monopole
Tower Manufacturer:	Engineered Endeavors Inc.
Design Standard:	TIA-222-H (2018 IBC) Using Annex S load modification factors
Risk Category:	III
Ultimate Wind Loading:	117 mph w/o ice
Wind and Ice Loading:	40 mph w/ 1.50" ice
Serviceability Criteria:	60 mph w/o ice
Exposure Category:	B
Topographic Category:	1
Seismic Criteria:	Ss=0.10
SSC Project Number:	MO-0552-F

Introduction

Selective Site Consultants, Inc. (SSC) has performed a comprehensive structural analysis for the referenced existing communication tower. The purpose of this analysis is to determine the overall stability and structural adequacy of the existing structure to accommodate the proposed changed condition in accordance with TIA-222-H.

Source of Data

Document	Remarks	Date
Tower Geometry	Engineered Endeavors Inc. Original Tower Drawings Project No. GS49716	09/09/1996
Foundation Geometry	Engineered Endeavors Inc. Design Calc for Drilled Pier Foundation Project No. KS 1774	07/31/1996
Geotechnical Data	KAW Valley Engineering, Inc. Geotechnical Exploration Project No. 40200	07/19/1996
Proposed Loading	T-Mobile RFDS A5C0028A Project Type: FOA	11/23/2021
Existing Loading	SSC Tower Analysis Report SSC # MO-0552-D	10/13/2021
	EFI Global Mount Analysis Report Project # 049.00808-2099001	09/15/2020

This analysis assumes the monopole is fabricated from 65 ksi steel and the base plate is fabricated from 60 ksi steel. Anchor bolts are assumed as A615 grade 75. All other steel is assumed to be 36 ksi.

A comprehensive structural analysis was performed utilizing tnxTower Version 8.1.1.0 software. The calculations were performed in accordance with TIA-222-H 'Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures'. The tower was analyzed for TIA-222-H specified load combinations, with the specified loads, as reproduced in General Tower Information of this report. Risk Category, Exposure Category, and Topographic Category are also listed General Tower Information of this report. Topographic Category and the height of topographic features were estimated from USGS Quadrangle maps. This analysis considers wind from all specified directions. See the Appendix B for structural calculations.

Antenna and Transmission Line Loading

Our understanding of the antenna and transmission line loading conditions is shown below.

Antenna Status	Qty	Antenna Vendor	Antenna Type	CL Elev. Ant./Mount	Mount	Azimuth	Feed Line
Existing	6	RFS Celwave	APXVSPP18-C	180'/180'	(1) 12' Low Profile Platform w/ Handrail	Sectored	(3) 1-1/2" Coax (3)
	18	RFS Celwave	ACU-A20-N				
	3	Ericsson	RRUS11				
	6	Ericsson	RRUS 31 B25				
Existing (TMO)	1	Andrew	20' 8-Element Dipoles	172.25'/158.25'	(1) 12' Low Profile Platform w/ Handrail & (3) Side Arms	Sectored	(3) 7/8" Coax
	2		20' 4-Element Dipoles	170.5'/158.25'			
	3	Nokia	AEHC	159'/158.25'			(2) HCS 2.0 Hybrid Trunk Cable w/ Breakout features
	3	Commscope	FFHH-65C-R3				
	3	Nokia	AHLOA	162.25'/158.25'			
	3	Nokia	AHFIG				
Proposed (TMO)	**3**	**Nokia**	**AEQK**	**159'/158.25'**			
	3		**AEQU**				
Existing	2	Telewave	ANT150D6-9	142'/134'	(1) 12' Low Profile Platform w/ Handrail & (3) Side Arms	Sectored	(6) 1/2" Cables (3) (3) 5/16" Cables (3)
	1	Andrew	VHLP2-18	140'/134'			
	1	Andrew	VHLP2-18	136'/134'			
	3	Argus	LLPX310R-V1				
	2	Andrew	VHLP1-23				
	4	Dragonwave	Horizon Duo				
	3	Samsung Technologies	nRRHv2				
	1	Unknown	Junction Box			N/A	
	1	Telewave	ANT150D6-9	126'/134'			

Antenna and Transmission Line Loading, *continued*

Antenna Status	Qty	Antenna Vendor	Antenna Type	CL Elev. Ant./Mount	Mount	Azimuth	Feed Line
Existing	1	Kathrein	OGB4-900D	120'/118'	(1) Side Arm	N/A	(1) 7/8" Coax
Existing	1	RFS / Celwave	PD220	111'/100'	(2) Side Arms	N/A	(2) 7/8" Coax
	1	Sinclair	SRL235-2	109'/100'			
Existing	1	Kathrein	OGB4-900D	100'/98'	(1) Side Arm	N/A	(1) 1/2" Cable
Existing	1	Astron Wireless	918-2	70'/69'	(1) Side Arm	N/A	(1) 1/2" Cable
Existing	4	Federal Signal	Directional Speaker Array (DSA6)	51'/50'	(1) Ring Mount	N/A	(4) 12AWG Cable
Existing	1	Kathrein	OGB4-900D	47'/45'	(1) Side Arm	N/A	(1) 1/2" Cable
	1	Decibel	DB230-J	44'/45'		N/A	(1) 1/2" Cable
Existing	1	Astron Wireless	VG-1060	44'/42'	(1) Side Arm	N/A	(1) 1/2" Cable
Existing	1	Sinclair	SRL224NM*5	35'/29'	(1) Side Arm	N/A	(1) 1/2" Cable

Note:
1. In addition to above listed antennas, the tower was analyzed with a lightning rod at 180'.
2. Feed lines are assumed to be inside of the pole, unless otherwise noted.
3. Feed lines are analyzed outside of the pole where indicated.

Structural Analysis of Tower Results

The analysis of the existing tower with the proposed loadings installed indicates **no member overstressing** according to TIA-222-H standards*. Results of the analysis are shown in the following table and calculations may be found in Appendix B:

Tower Section	Max % Allowable Stress*
Pole Steel (180'-149.65')	18.9
Pole Steel (149.65'-106.76')	44.6
Pole Steel (106.76'-76.41')	48.7
Pole Steel (76.41'-35.93')	52.6
Pole Steel (35.93'-0')	54.2
Flange Plate 150'	9.5
Flange Plate Bolts 150'	19.4
Base Plate	52.2
Anchor Bolts	51.8

* Ratings per TIA-222-H, Section 15.5, using Annex S load modification factors.
A demand-capacity ratio of 1.05 was used in this analysis.

Foundation Analysis Results

Reactions corresponding to the proposed factored loading were investigated and compared to the analyzed foundation capacities. Assuming the original foundations were properly installed for the referenced geotechnical conditions, the existing foundation **can be considered adequate** for the proposed loading condition.

Recommendations

It is our conclusion that this tower as analyzed **does comply** with TIA-222-H Structural Standards under the proposed loading conditions.

If the proposed loading conditions are different or change from those analyzed, this report shall be deemed obsolete and further investigation will be required.

If you have any questions or comments, please do not hesitate to call.

Sincerely,

William Barnhart
William Barnhart

APPENDIX A

General Conditions

Please note that SSC makes no warranties, expressed or implied in connection with this report and disclaims any liability arising from original design, material, fabrication and erection deficiencies for this tower.

It is the responsibility of the Client to ensure that information provided by the Client to SSC and used in this analysis is correct. This information is assumed correct unless notified otherwise by the Client.

This analysis assumes the tower steel is in its original state with no deterioration due to improper erection procedures or field modifications and does not consider fabrication quality. The recommendations, conclusions, and opinions contained in this report pertain only to the analysis of the tower structure and the load carrying capacity of its members.

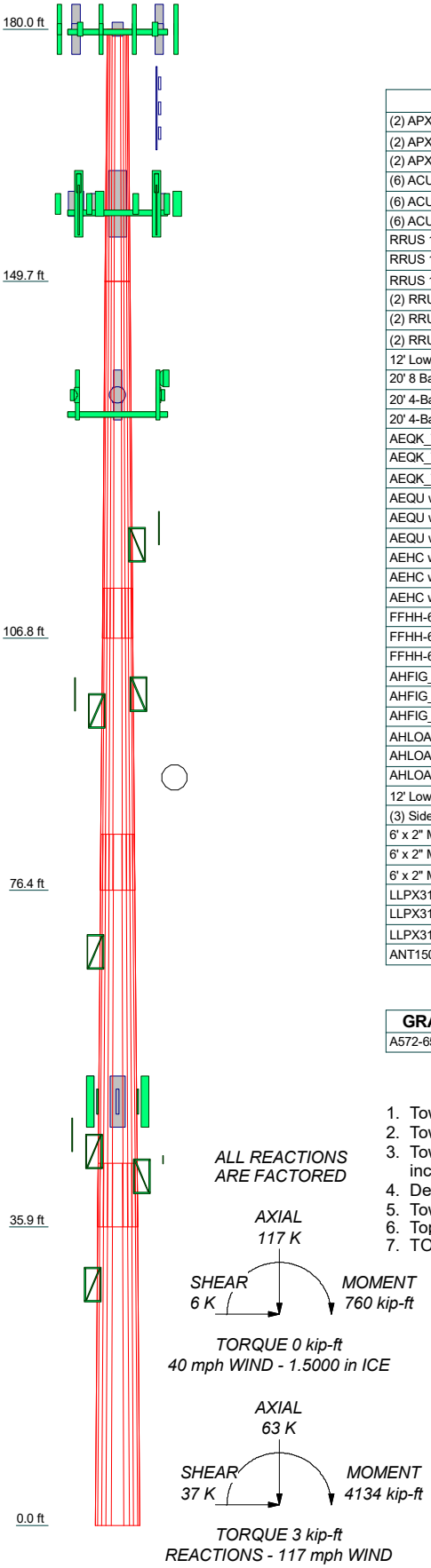
This analysis assumes any suggested modifications are installed as recommended and is not intended to address temporary conditions of the tower as modifications are being performed. It is strongly recommended that the Installer of any tower modification thoroughly assess installation procedures and how temporary conditions present while modifications are being performed influence tower members. Installer is responsible for sequence of operation and any required temporary bracing or strengthening of tower during modification operations. SSC is not responsible for the conclusions, opinion, or recommendations made by others based on the information we supply.

APPENDIX B

Structural Calculations and Diagrams

Existing Tower with Proposed Loading

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	30.35	12	0.2500		29.0000	35.2490		2.8
2	42.89	12	0.2810	6.03	35.2490	44.0810		5.5
3	36.38	12	0.3440	6.73	42.2773	49.7680	A572-65	6.6
4	47.21	12	0.4060	7.68	47.6943	57.4140		11.5
5	43.61	12	0.4690		55.0208	64.0000		13.9
								40.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) APXVSPP18-C_TIA w/ Mount Pipe	180	ANT150D6-9	134
(2) APXVSPP18-C_TIA w/ Mount Pipe	180	ANT150D6-9	134
(2) APXVSPP18-C_TIA w/ Mount Pipe	180	HORIZON DUO	134
(6) ACU-A20-N	180	HORIZON DUO	134
(6) ACU-A20-N	180	HORIZON DUO	134
(6) ACU-A20-N	180	HORIZON DUO	134
RRUS 11	180	nRRHv2	134
RRUS 11	180	nRRHv2	134
RRUS 11	180	nRRHv2	134
(2) RRUS 31 B25	180	JUNCTION BOX	134
(2) RRUS 31 B25	180	(3) Side Arms	134
(2) RRUS 31 B25	180	12' Low Profile Platform w/ Handrail	134
12' Low Profile Platform w/ Handrail	180	VHLP2-18	134
20' 8 Bay Di-Pole	158.25	VHLP1-23	134
20' 4-Bay Dipole	158.25	VHLP2-18	134
20' 4-Bay Dipole	158.25	VHLP1-23	134
AEQK_TMO w/ Mount Pipe	158.25	OGB4-900D	118
AEQK_TMO w/ Mount Pipe	158.25	Side Arm	118
AEQK_TMO w/ Mount Pipe	158.25	Side Arm	100
AEQU w/ Pipe Mount	158.25	Side Arm	100
AEQU w/ Pipe Mount	158.25	SRL235-2	100
AEQU w/ Pipe Mount	158.25	PD220	100
AEHC w/ Mount Pipe	158.25	OGB4-900D	98
AEHC w/ Mount Pipe	158.25	Side Arm	98
AEHC w/ Mount Pipe	158.25	918-2	69
FFHH-65C-R3_TIA w/ Mount Pipe	158.25	Side Arm	69
FFHH-65C-R3_TIA w/ Mount Pipe	158.25	Directional Speaker Array DSA6	50
FFHH-65C-R3_TIA w/ Mount Pipe	158.25	Directional Speaker Array DSA6	50
AHFIG_TMO	158.25	Directional Speaker Array DSA6	50
AHFIG_TMO	158.25	Directional Speaker Array DSA6	50
AHFIG_TMO	158.25	Ring Mount MC-RM3060-4	50
AHLOA_T-MOBILE	158.25	3' x 4.5"OD Pipe Mount	50
AHLOA_T-MOBILE	158.25	3' x 4.5"OD Pipe Mount	50
AHLOA_T-MOBILE	158.25	3' x 4.5"OD Pipe Mount	50
12' Low Profile Platform w/ Handrail	158.25	3' x 4.5"OD Pipe Mount	50
(3) Side Arm Mounts	158.25	OGB4-900D	45
6' x 2" Mount Pipe	158.25	DB230-J	45
6' x 2" Mount Pipe	158.25	Side Arm	45
6' x 2" Mount Pipe	158.25	Side Arm	42
LLPX310R-V1 w/ Mount Pipe	134	VG-1060	42
LLPX310R-V1 w/ Mount Pipe	134	Side Arm	29
LLPX310R-V1 w/ Mount Pipe	134	SRL224NM*5	29
ANT150D6-9	134		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-H Standard.
2. Tower designed for a 117 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 40 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 54.2%

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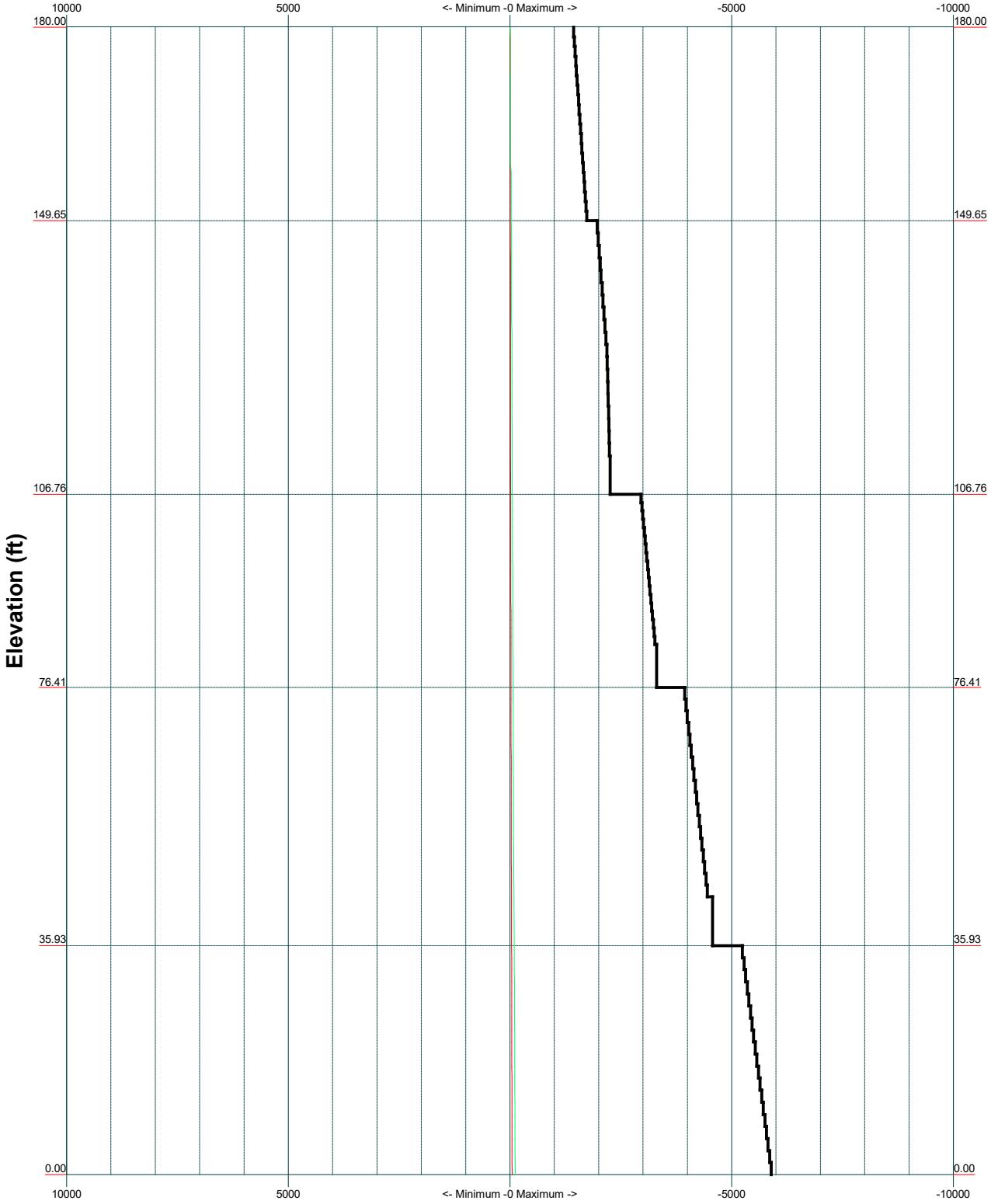
Job: **MO-0552-F**			
Project: **Lee's Summit Fire Station #1, A5C0028A**			
Client: T-Mobile	Drawn by: WBarnhart	App'd:	
Code: TIA-222-H	Date: 02/09/22	Scale: NTS	
Path:		Dwg No. E-1	

TIA-222-H - 117 mph/40 mph 1.5000 in Ice Exposure B

Leg Capacity ——— **Leg Compression (K)**



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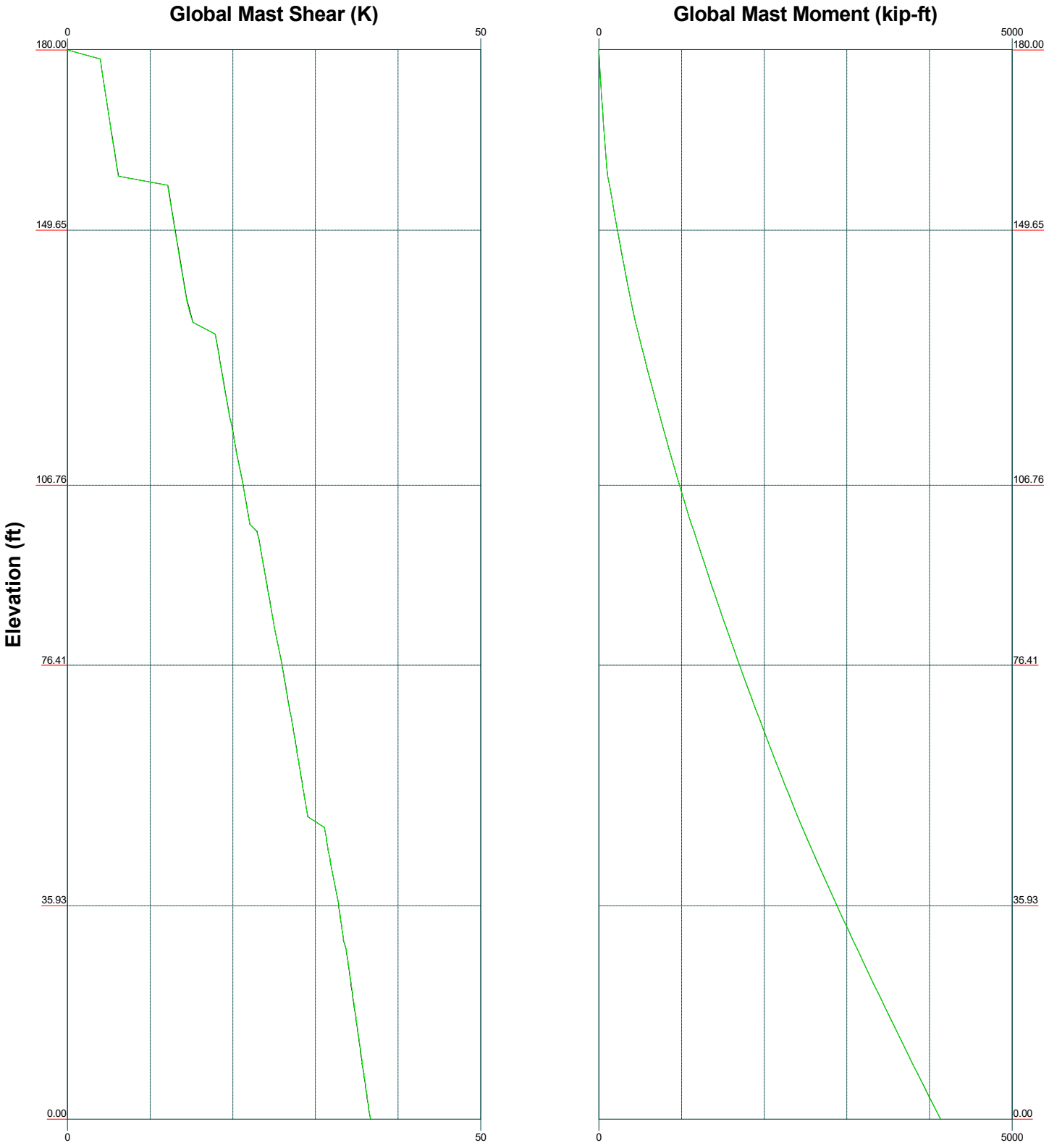
Client: T-Mobile	Drawn by: WBarnhart	App'd:	
Code: TIA-222-H	Date: 02/09/22	Scale: NTS	
Path:		Dwg No. E-3	

TIA-222-H - 117 mph/40 mph 1.5000 in Ice Exposure B

Maximum Values

Vx Vz Mx Mz



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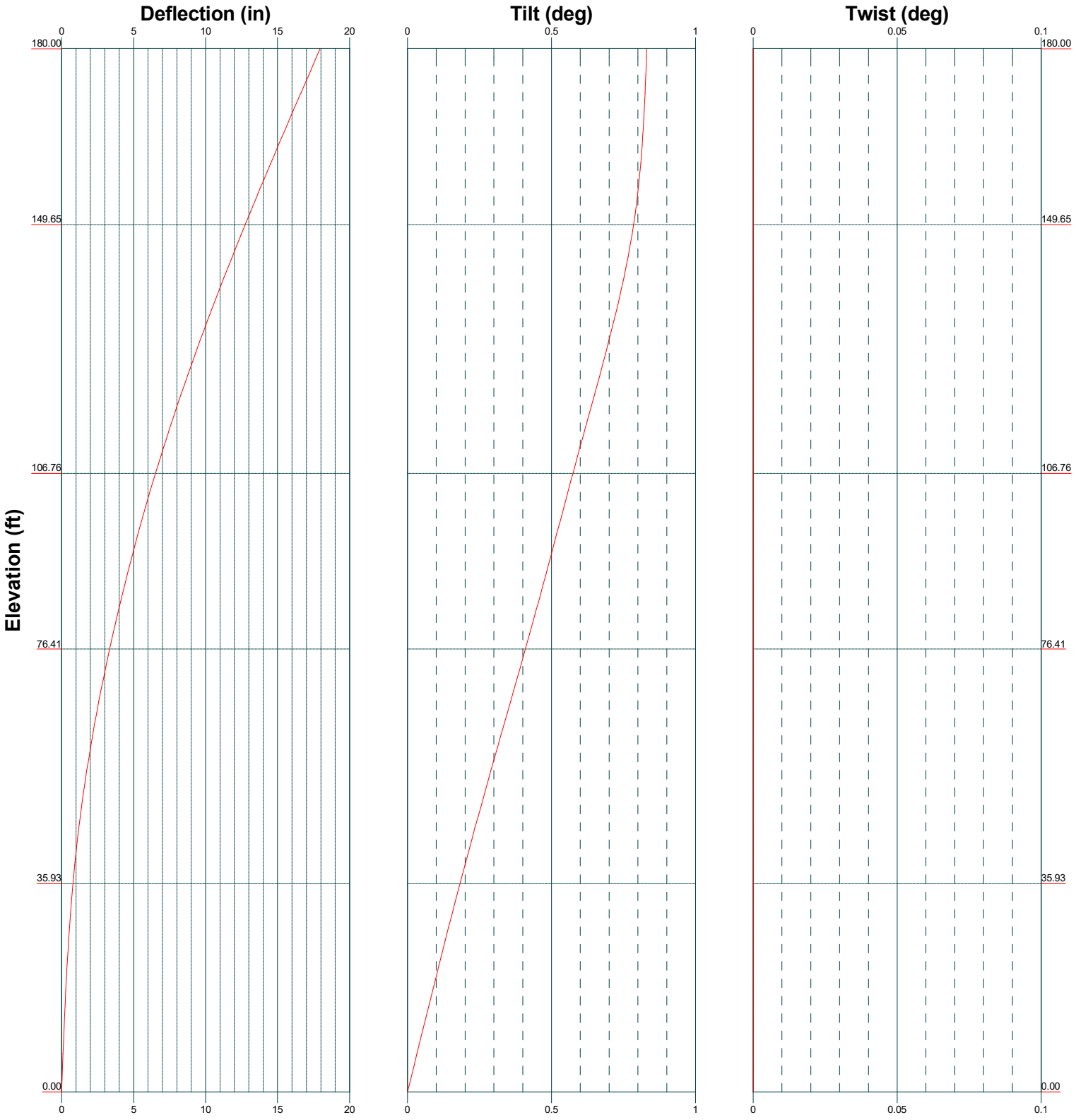
Job: MO-0552-F			
Project: Lee's Summit Fire Station #1, A5C0028A			
Client: T-Mobile	Drawn by: WBarnhart	App'd:	
Code: TIA-222-H	Date: 02/09/22	Scale: NTS	
Path:		Dwg No. E-4	

TIA-222-H - Service - 60 mph

Maximum Values



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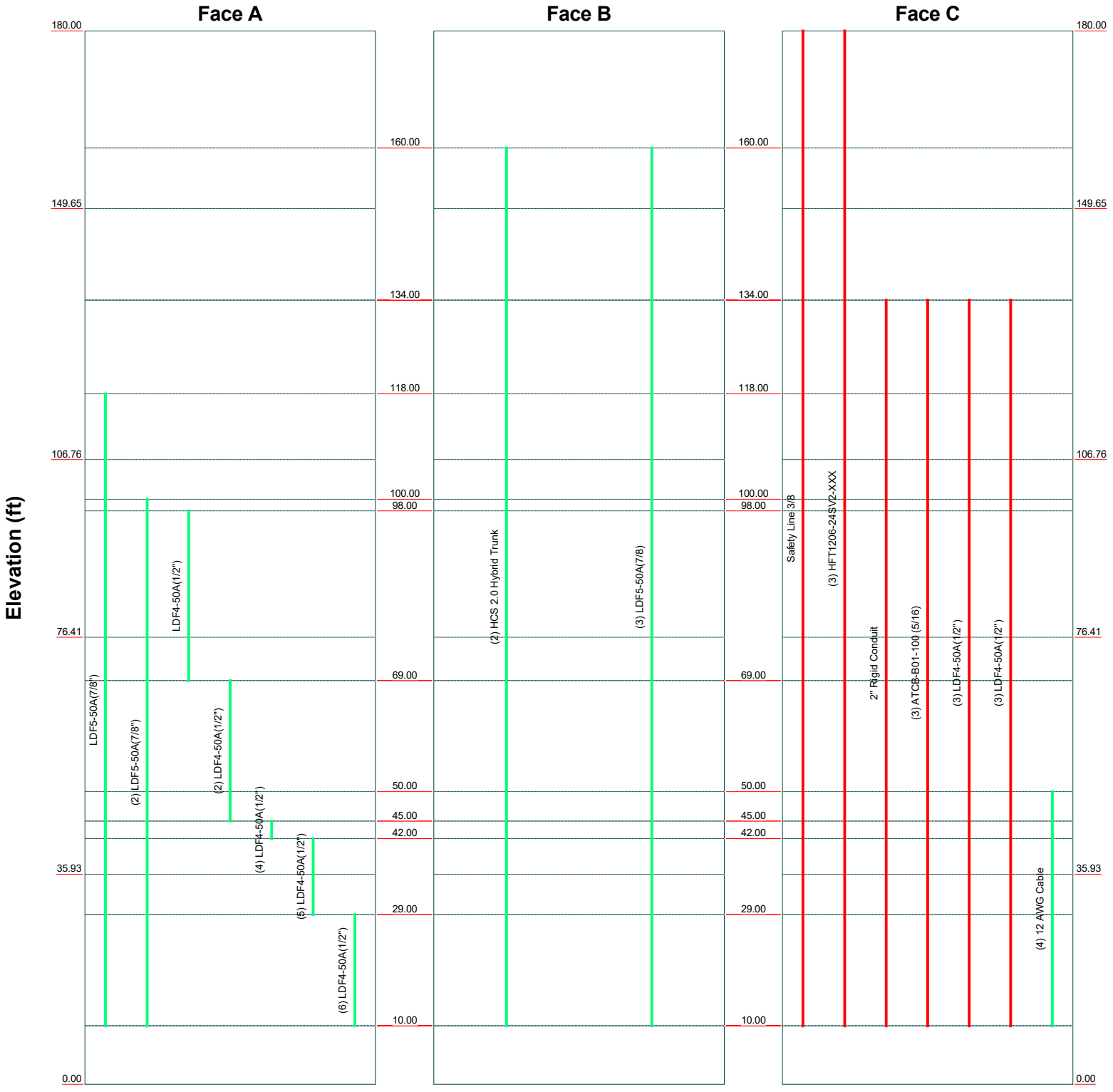
Job: ***MO-0552-F***			
Project: ***Lee's Summit Fire Station #1, A5C0028A***			
Client: T-Mobile	Drawn by: WBarnhart	App'd:	
Code: TIA-222-H	Date: 02/09/22	Scale: NTS	
Path:		Dwg No. E-5	

Feed Line Distribution Chart
0' - 180'

Round | Flat | App In Face | App Out Face | Truss Leg



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Job:	***MO-0552-F***		
Project:	***Lee's Summit Fire Station #1, A5C0028A***		
Client: T-Mobile	Drawn by: WBarnhart	App'd:	
Code: TIA-222-H	Date: 02/09/22	Scale: NTS	
Path:		Dwg No. E-7	

Tower Input Data

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

Tower base elevation above sea level: 1023.72 ft.
Basic wind speed of 117 mph.
Risk Category III.
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 40 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: $K_{es}(F_w) = 1.0$, $K_{es}(t_i) = 1.0$.
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 Redundant Bracing Forces
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Use Moment Magnification	√	Use Clear Spans For Wind Area		SR Leg Bolts Resist Compression
√	Use Code Stress Ratios		Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		Offset Girt At Foundation
	Escalate Ice	√	Bypass Mast Stability Checks	√	Consider Feed Line Torque
	Always Use Max Kz	√	Use Azimuth Dish Coefficients		Include Angle Block Shear Check
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Use TIA-222-H Bracing Resist. Exemption
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-H Tension Splice Exemption
	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination		Poles
	Secondary Horizontal Braces Leg		Sort Capacity Reports By Component		Include Shear-Torsion Interaction
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Always Use Sub-Critical Flow
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Use Top Mounted Sockets
	SR Members Are Concentric		Ignore KL/ry For 60 Deg. Angle Legs		Pole Without Linear Attachments
					Pole With Shroud Or No Appurtenances
					Outside and Inside Corner Radii Are Known

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	180.00-149.65	30.35	0.00	12	29.0000	35.2490	0.2500	0.3750	A572-65 (65 ksi)
L2	149.65-106.76	42.89	6.03	12	35.2490	44.0810	0.2810	0.4215	A572-65 (65 ksi)
L3	106.76-76.41	36.38	6.73	12	42.2773	49.7680	0.3440	0.5160	A572-65 (65 ksi)
L4	76.41-35.93	47.21	7.68	12	47.6943	57.4140	0.4060	0.6090	A572-65 (65 ksi)
L5	35.93-0.00	43.61		12	55.0208	64.0000	0.4690	0.7035	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	29.9789	23.1438	2441.7173	10.2925	15.0220	162.5428	4947.5812	11.3906	7.4370	29.748
	36.4484	28.1742	4405.0287	12.5296	18.2590	241.2527	8925.7823	13.8665	9.1117	36.447
L2	36.4429	31.6397	4938.1073	12.5185	18.2590	270.4481	10005.9442	15.5721	9.0702	32.278
	45.5864	39.6311	9704.4399	15.6804	22.8340	425.0003	19663.8262	19.5052	11.4372	40.702
L3	44.9934	46.4487	10425.0243	15.0121	21.8996	476.0364	21123.9257	22.8606	10.8694	31.597
	51.4629	54.7460	17069.2303	17.6938	25.7798	662.1159	34586.8882	26.9443	12.8769	37.433
L4	50.7396	61.8209	17645.2741	16.9292	24.7056	714.2206	35754.1092	30.4264	12.2380	30.143
	59.3677	74.5277	30915.4285	20.4089	29.7405	1039.5077	62643.0397	36.6803	14.8429	36.559
L5	58.5161	82.3831	31292.6557	19.5296	28.5008	1097.9577	63407.4043	40.5464	14.1171	30.1
	66.1750	95.9432	49427.8521	22.7441	33.1520	1490.9463	100154.2289	47.2203	16.5235	35.231

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 180.00-149.65				1	1	1.05			
L2 149.65-106.76				1	1	1.05			
L3 106.76-76.41				1	1	1.05			
L4 76.41-35.93				1	1	1.05			
L5 35.93-0.00				1	1	1.05			

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
Safety Line 3/8 *180*	C	No	Surface Ar (CaAa)	180.00 - 10.00	1	1	0.000 0.000	0.3750		0.22
HFT1206-24SV2-XXX	C	No	Surface Ar	180.00 -	3	2	0.000	1.5500		1.89

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
			(CaAa)	10.00			0.000			
134										
2" Rigid Conduit	C	No	Surface Ar (CaAa)	134.00 - 10.00	1	1	-0.280 -0.280	2.0000		2.80
ATCB-B01-100 (5/16)	C	No	Surface Ar (CaAa)	134.00 - 10.00	3	3	-0.280 -0.280	0.0000		0.40
LDF4-50A(1/2")	C	No	Surface Ar (CaAa)	134.00 - 10.00	3	3	-0.280 -0.280	0.0000		0.15
LDF4-50A(1/2")	C	No	Surface Ar (CaAa)	134.00 - 10.00	3	3	-0.270 -0.250	0.6250		0.15

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
160									
HCS 2.0 Hybrid Trunk	B	No	No	Inside Pole	160.00 - 10.00	2	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	2.48 2.48 2.48 2.48
LDF5-50A(7/8)	B	No	No	Inside Pole	160.00 - 10.00	3	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.33 0.33 0.33 0.33
118									
LDF5-50A(7/8")	A	No	No	Inside Pole	118.00 - 10.00	1	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.33 0.33 0.33 0.33
100									
LDF5-50A(7/8")	A	No	No	Inside Pole	100.00 - 10.00	2	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.33 0.33 0.33 0.33
**									
LDF4-50A(1/2")	A	No	No	Inside Pole	98.00 - 69.00	1	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.15 0.15 0.15 0.15
LDF4-50A(1/2")	A	No	No	Inside Pole	69.00 - 45.00	2	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.15 0.15 0.15 0.15
LDF4-50A(1/2")	A	No	No	Inside Pole	45.00 - 42.00	4	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.15 0.15 0.15 0.15
LDF4-50A(1/2")	A	No	No	Inside Pole	42.00 - 29.00	5	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.15 0.15 0.15 0.15
LDF4-50A(1/2")	A	No	No	Inside Pole	29.00 - 10.00	6	No Ice 1/2" Ice 1" Ice 2" Ice	0.00 0.00 0.00 0.00	0.15 0.15 0.15 0.15

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
**									
12 AWG Cable	C	No	No	Inside Pole	50.00 - 10.00	4	No Ice	0.00	0.10
							1/2" Ice	0.00	0.10
							1" Ice	0.00	0.10
							2" Ice	0.00	0.10

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	180.00-149.65	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.06
		C	0.000	0.000	10.547	0.000	0.18
L2	149.65-106.76	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.26
		C	0.000	0.000	25.460	0.000	0.39
L3	106.76-76.41	A	0.000	0.000	0.000	0.000	0.03
		B	0.000	0.000	0.000	0.000	0.18
		C	0.000	0.000	22.307	0.000	0.33
L4	76.41-35.93	A	0.000	0.000	0.000	0.000	0.05
		B	0.000	0.000	0.000	0.000	0.24
		C	0.000	0.000	29.753	0.000	0.44
L5	35.93-0.00	A	0.000	0.000	0.000	0.000	0.05
		B	0.000	0.000	0.000	0.000	0.15
		C	0.000	0.000	19.059	0.000	0.29

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	180.00-149.65	A	2.026	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.06
		C		0.000	0.000	40.562	0.000	0.77
L2	149.65-106.76	A	1.975	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.26
		C		0.000	0.000	119.284	0.000	1.94
L3	106.76-76.41	A	1.910	0.000	0.000	0.000	0.000	0.03
		B		0.000	0.000	0.000	0.000	0.18
		C		0.000	0.000	109.995	0.000	1.73
L4	76.41-35.93	A	1.819	0.000	0.000	0.000	0.000	0.05
		B		0.000	0.000	0.000	0.000	0.24
		C		0.000	0.000	143.034	0.000	2.21
L5	35.93-0.00	A	1.620	0.000	0.000	0.000	0.000	0.05
		B		0.000	0.000	0.000	0.000	0.15
		C		0.000	0.000	88.325	0.000	1.34

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	180.00-149.65	0.0000	2.0387	0.0000	3.9797
L2	149.65-106.76	0.7326	3.0731	1.8655	5.9605
L3	106.76-76.41	1.0954	3.6094	2.6785	7.0458
L4	76.41-35.93	1.1139	3.6637	2.8401	7.4745
L5	35.93-0.00	0.8317	2.7320	2.4113	6.3580

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	1	Safety Line 3/8	149.65 - 180.00	1.0000	1.0000
L1	3	HFT1206-24SV2-XXX	149.65 - 180.00	1.0000	1.0000
L2	1	Safety Line 3/8	106.76 - 149.65	1.0000	1.0000
L2	3	HFT1206-24SV2-XXX	106.76 - 149.65	1.0000	1.0000
L2	10	2" Rigid Conduit	106.76 - 134.00	1.0000	1.0000
L2	11	ATCB-B01-100 (5/16)	106.76 - 134.00	1.0000	1.0000
L2	12	LDF4-50A(1/2")	106.76 - 134.00	1.0000	1.0000
L2	13	LDF4-50A(1/2")	106.76 - 134.00	1.0000	1.0000
L3	1	Safety Line 3/8	76.41 - 106.76	1.0000	1.0000
L3	3	HFT1206-24SV2-XXX	76.41 - 106.76	1.0000	1.0000
L3	10	2" Rigid Conduit	76.41 - 106.76	1.0000	1.0000
L3	11	ATCB-B01-100 (5/16)	76.41 - 106.76	1.0000	1.0000
L3	12	LDF4-50A(1/2")	76.41 - 106.76	1.0000	1.0000
L3	13	LDF4-50A(1/2")	76.41 - 106.76	1.0000	1.0000
L4	1	Safety Line 3/8	35.93 - 76.41	1.0000	1.0000
L4	3	HFT1206-24SV2-XXX	35.93 - 76.41	1.0000	1.0000
L4	10	2" Rigid Conduit	35.93 - 76.41	1.0000	1.0000
L4	11	ATCB-B01-100 (5/16)	35.93 - 76.41	1.0000	1.0000
L4	12	LDF4-50A(1/2")	35.93 - 76.41	1.0000	1.0000
L4	13	LDF4-50A(1/2")	35.93 - 76.41	1.0000	1.0000
L5	1	Safety Line 3/8	10.00 - 35.93	1.0000	1.0000
L5	3	HFT1206-24SV2-XXX	10.00 - 35.93	1.0000	1.0000
L5	10	2" Rigid Conduit	10.00 - 35.93	1.0000	1.0000
L5	11	ATCB-B01-100 (5/16)	10.00 - 35.93	1.0000	1.0000
L5	12	LDF4-50A(1/2")	10.00 - 35.93	1.0000	1.0000
L5	13	LDF4-50A(1/2")	10.00 - 35.93	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
180									
(2) APXVSPP18-C_TIA w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.26 8.82 9.35 10.42	7.47 8.66 9.56 11.39	0.09 0.16 0.24 0.42
(2) APXVSPP18-C_TIA w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.26 8.82 9.35 10.42	7.47 8.66 9.56 11.39	0.09 0.16 0.24 0.42
(2) APXVSPP18-C_TIA w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.26 8.82 9.35 10.42	7.47 8.66 9.56 11.39	0.09 0.16 0.24 0.42
(6) ACU-A20-N	A	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.07 0.10 0.15 0.26	0.12 0.16 0.21 0.34	0.00 0.00 0.00 0.01
(6) ACU-A20-N	B	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.07 0.10 0.15 0.26	0.12 0.16 0.21 0.34	0.00 0.00 0.00 0.01
(6) ACU-A20-N	C	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.07 0.10 0.15 0.26	0.12 0.16 0.21 0.34	0.00 0.00 0.00 0.01
RRUS 11	A	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 2.99 3.21 3.66	1.19 1.33 1.49 1.83	0.05 0.07 0.09 0.15
RRUS 11	B	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 2.99 3.21 3.66	1.19 1.33 1.49 1.83	0.05 0.07 0.09 0.15
RRUS 11	C	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 2.99 3.21 3.66	1.19 1.33 1.49 1.83	0.05 0.07 0.09 0.15
(2) RRUS 31 B25	A	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.62 1.78 1.95 2.31	1.28 1.43 1.58 1.91	0.06 0.07 0.09 0.14
(2) RRUS 31 B25	B	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.62 1.78 1.95 2.31	1.28 1.43 1.58 1.91	0.06 0.07 0.09 0.14
(2) RRUS 31 B25	C	From Leg	4.00 0.00 0.00	0.0000	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.62 1.78 1.95 2.31	1.28 1.43 1.58 1.91	0.06 0.07 0.09 0.14
12' Low Profile Platform w/ Handrail	C	None		0.0000	180.00	No Ice 1/2" Ice	31.07 34.82	31.07 34.82	1.34 1.97

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	38.48	38.48	2.67
						2" Ice	45.60	45.60	4.31
160									
20' 8 Bay Di-Pole	A	From Face	4.00 0.00 14.00	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	4.00 6.00 8.00 12.00	4.00 6.00 8.00 12.00	0.06 0.10 0.14 0.23
20' 4-Bay Dipole	B	From Face	4.00 0.00 12.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	4.00 6.00 8.00 12.00	4.00 6.00 8.00 12.00	0.06 0.10 0.14 0.23
20' 4-Bay Dipole	C	From Face	4.00 0.00 12.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	4.00 6.00 8.00 12.00	4.00 6.00 8.00 12.00	0.06 0.10 0.14 0.23
AEQK_TMO w/ Mount Pipe	A	From Leg	4.00 -2.50 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	4.57 4.89 5.23 5.94	3.10 3.53 3.97 4.91	0.11 0.15 0.20 0.32
AEQK_TMO w/ Mount Pipe	B	From Leg	4.00 -2.50 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	4.57 4.89 5.23 5.94	3.10 3.53 3.97 4.91	0.11 0.15 0.20 0.32
AEQK_TMO w/ Mount Pipe	C	From Leg	4.00 -2.50 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	4.57 4.89 5.23 5.94	3.10 3.53 3.97 4.91	0.11 0.15 0.20 0.32
AEQU w/ Pipe Mount	A	From Leg	4.00 5.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	5.68 6.52 7.26 8.51	4.28 5.32 6.21 7.67	0.13 0.18 0.24 0.39
AEQU w/ Pipe Mount	B	From Leg	4.00 5.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	5.68 6.52 7.26 8.51	4.28 5.32 6.21 7.67	0.13 0.18 0.24 0.39
AEQU w/ Pipe Mount	C	From Leg	4.00 5.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	5.68 6.52 7.26 8.51	4.28 5.32 6.21 7.67	0.13 0.18 0.24 0.39
AEHC w/ Mount Pipe	A	From Leg	4.00 -5.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	6.96 7.34 7.74 8.57	3.45 3.93 4.43 5.47	0.11 0.17 0.23 0.37
AEHC w/ Mount Pipe	B	From Leg	4.00 -5.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	6.96 7.34 7.74 8.57	3.45 3.93 4.43 5.47	0.11 0.17 0.23 0.37
AEHC w/ Mount Pipe	C	From Leg	4.00 -5.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	6.96 7.34 7.74 8.57	3.45 3.93 4.43 5.47	0.11 0.17 0.23 0.37
FFHH-65C-R3_TIA w/ Mount Pipe	A	From Leg	4.00 0.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice 2" Ice	21.38 22.13 22.90 24.37	11.50 13.03 14.59 16.95	0.16 0.30 0.46 0.80
FFHH-65C-R3_TIA w/ Mount Pipe	B	From Leg	4.00 0.00	0.0000	158.25	No Ice 1/2" Ice	21.38 22.13	11.50 13.03	0.16 0.30

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.75			1" Ice	22.90	14.59	0.46
						2" Ice	24.37	16.95	0.80
FFHH-65C-R3_TIA w/ Mount Pipe	C	From Leg	4.00 0.00 0.75	0.0000	158.25	No Ice 1/2" Ice 1" Ice	21.38 22.13 22.90	11.50 13.03 14.59	0.16 0.30 0.46
						2" Ice	24.37	16.95	0.80
AHFIG_TMO	A	From Leg	4.00 0.00 3.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice	3.08 3.32 3.56	1.47 1.66 1.85	0.07 0.09 0.12
						2" Ice	4.07	2.27	0.18
AHFIG_TMO	B	From Leg	4.00 0.00 3.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice	3.08 3.32 3.56	1.47 1.66 1.85	0.07 0.09 0.12
						2" Ice	4.07	2.27	0.18
AHFIG_TMO	C	From Leg	4.00 0.00 3.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice	3.08 3.32 3.56	1.47 1.66 1.85	0.07 0.09 0.12
						2" Ice	4.07	2.27	0.18
AHLOA_T-MOBILE	A	From Leg	4.00 0.00 3.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice	2.86 3.08 3.31	1.85 2.04 2.23	0.08 0.11 0.13
						2" Ice	3.80	2.65	0.20
AHLOA_T-MOBILE	B	From Leg	4.00 0.00 3.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice	2.86 3.08 3.31	1.85 2.04 2.23	0.08 0.11 0.13
						2" Ice	3.80	2.65	0.20
AHLOA_T-MOBILE	C	From Leg	4.00 0.00 3.25	0.0000	158.25	No Ice 1/2" Ice 1" Ice	2.86 3.08 3.31	1.85 2.04 2.23	0.08 0.11 0.13
						2" Ice	3.80	2.65	0.20
12' Low Profile Platform w/ Handrail	C	None		0.0000	158.25	No Ice 1/2" Ice 1" Ice	32.89 35.76 38.76	32.89 35.76 38.76	1.51 2.23 3.03
						2" Ice	45.26	45.26	4.86
(3) Side Arm Mounts	C	None		0.0000	158.25	No Ice 1/2" Ice 1" Ice	7.63 9.41 11.34	7.63 9.41 11.34	0.48 0.59 0.72
						2" Ice	15.83	15.83	1.08
6' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	158.25	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	0.02 0.03 0.05
						2" Ice	3.06	3.06	0.09
6' x 2" Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	158.25	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	0.02 0.03 0.05
						2" Ice	3.06	3.06	0.09
6' x 2" Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	158.25	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	0.02 0.03 0.05
						2" Ice	3.06	3.06	0.09
134 LLPX310R-V1 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	5.07 5.48 5.91	2.98 3.53 4.09	0.04 0.08 0.13
						2" Ice	6.79	5.31	0.23
LLPX310R-V1 w/ Mount Pipe	B	From Leg	4.00 0.00	0.0000	134.00	No Ice 1/2" Ice	5.07 5.48	2.98 3.53	0.04 0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			2.00			1" Ice	5.91	4.09	0.13
						2" Ice	6.79	5.31	0.23
LLPX310R-V1 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	5.07 5.48 5.91	2.98 3.53 4.09	0.04 0.08 0.13
						2" Ice	6.79	5.31	0.23
ANT150D6-9	A	From Leg	4.00 0.00 8.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	3.96 5.61 7.26	3.96 5.61 7.26	0.03 0.06 0.09
						2" Ice	10.56	10.56	0.15
ANT150D6-9	B	From Leg	4.00 0.00 8.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	3.96 5.61 7.26	3.96 5.61 7.26	0.03 0.06 0.09
						2" Ice	10.56	10.56	0.15
ANT150D6-9	C	From Leg	4.00 0.00 -8.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	3.96 5.61 7.26	3.96 5.61 7.26	0.03 0.06 0.09
						2" Ice	10.56	10.56	0.15
HORIZON DUO	B	From Leg	4.00 0.00 4.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	0.47 0.56 0.65	0.29 0.37 0.44	0.01 0.01 0.02
						2" Ice	0.86	0.62	0.04
HORIZON DUO	A	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	0.47 0.56 0.65	0.29 0.37 0.44	0.01 0.01 0.02
						2" Ice	0.86	0.62	0.04
HORIZON DUO	B	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	0.47 0.56 0.65	0.29 0.37 0.44	0.01 0.01 0.02
						2" Ice	0.86	0.62	0.04
HORIZON DUO	C	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	0.47 0.56 0.65	0.29 0.37 0.44	0.01 0.01 0.02
						2" Ice	0.86	0.62	0.04
nRRHv2	A	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	2.49 2.69 2.89	1.48 1.64 1.82	0.06 0.08 0.10
						2" Ice	3.33	2.20	0.16
nRRHv2	B	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	2.49 2.69 2.89	1.48 1.64 1.82	0.06 0.08 0.10
						2" Ice	3.33	2.20	0.16
nRRHv2	C	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	2.49 2.69 2.89	1.48 1.64 1.82	0.06 0.08 0.10
						2" Ice	3.33	2.20	0.16
JUNCTION BOX	A	From Leg	4.00 0.00 2.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice	0.53 0.63 0.73	0.27 0.34 0.41	0.00 0.01 0.01
						2" Ice	0.95	0.59	0.03
(3) Side Arms	C	None		0.0000	134.00	No Ice 1/2" Ice 1" Ice	3.22 4.15 5.08	3.22 4.15 5.08	0.08 0.11 0.15
						2" Ice	6.94	6.94	0.21
12' Low Profile Platform w/ Handrail	C	None		0.0000	134.00	No Ice 1/2" Ice 1" Ice	32.89 35.76 38.76	32.89 35.76 38.76	1.51 2.23 3.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	45.26	45.26	4.86
118									
OGB4-900D	B	From Leg	4.00	0.0000	118.00	No Ice	0.79	0.79	0.01
			0.00			1/2" Ice	1.03	1.03	0.02
			2.00			1" Ice	1.28	1.28	0.03
						2" Ice	1.81	1.81	0.05
Side Arm	B	From Leg	1.00	0.0000	118.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			0.00			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
100									
SRL235-2	A	From Leg	4.00	0.0000	100.00	No Ice	13.63	13.63	0.05
			0.00			1/2" Ice	15.63	15.63	0.14
			9.00			1" Ice	17.63	17.63	0.22
						2" Ice	21.63	21.63	0.40
PD220	B	From Leg	4.00	0.0000	100.00	No Ice	3.56	3.56	0.02
			0.00			1/2" Ice	7.13	7.13	0.05
			11.00			1" Ice	10.70	10.70	0.07
						2" Ice	17.84	17.84	0.12
Side Arm	A	From Leg	1.00	0.0000	100.00	No Ice	0.62	1.49	0.03
			0.00			1/2" Ice	0.74	2.07	0.04
			0.00			1" Ice	0.89	2.54	0.06
						2" Ice	1.25	3.55	0.12
Side Arm	B	From Leg	1.00	0.0000	100.00	No Ice	0.62	1.49	0.03
			0.00			1/2" Ice	0.74	2.07	0.04
			0.00			1" Ice	0.89	2.54	0.06
						2" Ice	1.25	3.55	0.12
98									
OGB4-900D	C	From Leg	4.00	0.0000	98.00	No Ice	0.79	0.79	0.01
			0.00			1/2" Ice	1.03	1.03	0.02
			2.00			1" Ice	1.28	1.28	0.03
						2" Ice	1.81	1.81	0.05
Side Arm	C	From Leg	1.00	0.0000	98.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			0.00			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
69									
918-2	C	From Leg	4.00	0.0000	69.00	No Ice	0.12	0.03	0.00
			0.00			1/2" Ice	0.28	0.11	0.00
			1.00			1" Ice	0.44	0.19	0.00
						2" Ice	0.76	0.35	0.00
Side Arm	C	From Leg	1.00	0.0000	69.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			0.00			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
45									
OGB4-900D	C	From Leg	4.00	0.0000	45.00	No Ice	0.79	0.79	0.01
			0.00			1/2" Ice	1.03	1.03	0.02
			2.00			1" Ice	1.28	1.28	0.03
						2" Ice	1.81	1.81	0.05
DB230-J	C	From Leg	4.00	0.0000	45.00	No Ice	0.25	0.25	0.01
			0.00			1/2" Ice	0.45	0.45	0.01
			-1.00			1" Ice	0.65	0.65	0.02
						2" Ice	1.05	1.05	0.02
Side Arm	C	From Leg	1.00	0.0000	45.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			0.00			1" Ice	1.43	3.01	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	2.01	4.35	0.12
42									
VG-1060	B	From Leg	4.00	0.0000	42.00	No Ice	0.13	0.13	0.00
			0.00			1/2" Ice	0.20	0.20	0.00
			2.00			1" Ice	0.28	0.28	0.01
						2" Ice	0.47	0.47	0.01
Side Arm	B	From Leg	1.00	0.0000	42.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			0.00			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
29									
SRL224NM*5	C	From Leg	4.00	0.0000	29.00	No Ice	5.22	5.22	0.04
			0.00			1/2" Ice	7.02	7.02	0.07
			6.00			1" Ice	8.82	8.82	0.11
						2" Ice	12.42	12.42	0.18
Side Arm	C	From Leg	1.00	0.0000	29.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			0.00			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
**									
Directional Speaker Array DSA6	A	From Leg	1.50	0.0000	50.00	No Ice	13.84	14.09	0.13
			0.00			1/2" Ice	14.36	14.60	0.25
			1.00			1" Ice	14.88	15.12	0.38
						2" Ice	15.94	16.19	0.67
Directional Speaker Array DSA6	B	From Leg	1.50	0.0000	50.00	No Ice	13.84	14.09	0.13
			0.00			1/2" Ice	14.36	14.60	0.25
			1.00			1" Ice	14.88	15.12	0.38
						2" Ice	15.94	16.19	0.67
Directional Speaker Array DSA6	C	From Leg	1.50	0.0000	50.00	No Ice	13.84	14.09	0.13
			0.00			1/2" Ice	14.36	14.60	0.25
			1.00			1" Ice	14.88	15.12	0.38
						2" Ice	15.94	16.19	0.67
Directional Speaker Array DSA6	A	From Face	1.50	0.0000	50.00	No Ice	13.84	14.09	0.13
			0.00			1/2" Ice	14.36	14.60	0.25
			1.00			1" Ice	14.88	15.12	0.38
						2" Ice	15.94	16.19	0.67
Ring Mount MC-RM3060-4	C	None		0.0000	50.00	No Ice	3.60	3.60	0.07
						1/2" Ice	4.18	4.18	0.11
						1" Ice	4.75	4.75	0.14
						2" Ice	5.90	5.90	0.20
3' x 4.5"OD Pipe Mount	A	From Leg	0.50	0.0000	50.00	No Ice	0.93	0.93	0.01
			0.00			1/2" Ice	1.12	1.12	0.02
			1.00			1" Ice	1.33	1.33	0.03
						2" Ice	1.77	1.77	0.07
3' x 4.5"OD Pipe Mount	B	From Leg	0.50	0.0000	50.00	No Ice	0.93	0.93	0.01
			0.00			1/2" Ice	1.12	1.12	0.02
			1.00			1" Ice	1.33	1.33	0.03
						2" Ice	1.77	1.77	0.07
3' x 4.5"OD Pipe Mount	C	From Leg	0.50	0.0000	50.00	No Ice	0.93	0.93	0.01
			0.00			1/2" Ice	1.12	1.12	0.02
			1.00			1" Ice	1.33	1.33	0.03
						2" Ice	1.77	1.77	0.07
3' x 4.5"OD Pipe Mount	A	From Face	0.50	0.0000	50.00	No Ice	0.93	0.93	0.01
			0.00			1/2" Ice	1.12	1.12	0.02
			1.00			1" Ice	1.33	1.33	0.03
						2" Ice	1.77	1.77	0.07
**									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
VHLP2-18	A	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 2.00	0.0000		134.00	2.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.14 3.41 3.68 4.21	0.03 0.04 0.06 0.10
VHLP1-23	B	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 2.00	0.0000		134.00	1.27	No Ice 1/2" Ice 1" Ice 2" Ice	0.79 0.92 1.06 1.33	0.01 0.02 0.02 0.03
VHLP2-18	B	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 4.00	0.0000		134.00	2.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.14 3.41 3.68 4.21	0.03 0.04 0.06 0.10
VHLP1-23	C	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 2.00	0.0000		134.00	1.27	No Ice 1/2" Ice 1" Ice 2" Ice	0.79 0.92 1.06 1.33	0.01 0.02 0.02 0.03

**

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	40.21					
Bracing Weight	0.00					
Total Member Self-Weight	40.21			3.67	0.76	
Total Weight	52.80			3.67	0.76	
Wind 0 deg - No Ice		-0.08	-36.64	-3998.66	10.78	-1.46
Wind 30 deg - No Ice		18.26	-31.71	-3460.37	-1995.56	-2.20
Wind 60 deg - No Ice		31.65	-18.29	-1994.51	-3459.17	-2.69
Wind 90 deg - No Ice		36.60	0.03	6.48	-4002.04	-2.46
Wind 120 deg - No Ice		31.65	18.37	2011.59	-3458.09	-1.25
Wind 150 deg - No Ice		18.30	31.76	3473.44	-1999.62	0.16
Wind 180 deg - No Ice		0.05	36.66	4008.60	-5.31	1.38
Wind 210 deg - No Ice		-18.23	31.75	3473.37	1993.35	2.21
Wind 240 deg - No Ice		-31.66	18.29	2001.48	3462.15	2.71
Wind 270 deg - No Ice		-36.63	-0.07	-4.59	4007.70	2.45
Wind 300 deg - No Ice		-31.69	-18.37	-2003.71	3464.48	1.31
Wind 330 deg - No Ice		-18.33	-31.75	-3465.20	2004.91	-0.16
Member Ice	20.16					
Total Weight Ice	103.44			15.01	2.56	
Wind 0 deg - Ice		-0.01	-6.17	-674.26	3.97	-0.04
Wind 30 deg - Ice		3.07	-5.34	-581.65	-341.20	-0.07
Wind 60 deg - Ice		5.33	-3.08	-329.25	-593.02	-0.13
Wind 90 deg - Ice		6.15	0.00	15.31	-685.11	-0.16
Wind 120 deg - Ice		5.33	3.10	360.51	-592.73	-0.09

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 150 deg - Ice		3.08	5.35	612.42	-341.57	-0.02
Wind 180 deg - Ice		0.01	6.18	704.66	1.75	0.03
Wind 210 deg - Ice		-3.07	5.35	612.52	345.70	0.07
Wind 240 deg - Ice		-5.33	3.08	359.17	598.35	0.13
Wind 270 deg - Ice		-6.16	-0.01	13.86	690.86	0.16
Wind 300 deg - Ice		-5.33	-3.10	-330.45	598.60	0.10
Wind 330 deg - Ice		-3.09	-5.35	-582.27	347.32	0.02
Total Weight	52.80			3.67	0.76	
Wind 0 deg - Service		-0.02	-8.62	-941.43	3.12	-0.34
Wind 30 deg - Service		4.30	-7.46	-814.77	-468.98	-0.52
Wind 60 deg - Service		7.45	-4.30	-469.85	-813.37	-0.63
Wind 90 deg - Service		8.61	0.01	0.99	-941.11	-0.58
Wind 120 deg - Service		7.45	4.32	472.80	-813.11	-0.30
Wind 150 deg - Service		4.31	7.47	816.78	-469.93	0.04
Wind 180 deg - Service		0.01	8.63	942.70	-0.67	0.33
Wind 210 deg - Service		-4.29	7.47	816.76	469.62	0.52
Wind 240 deg - Service		-7.45	4.30	470.42	815.23	0.64
Wind 270 deg - Service		-8.62	-0.02	-1.61	943.60	0.58
Wind 300 deg - Service		-7.46	-4.32	-472.01	815.78	0.31
Wind 330 deg - Service		-4.31	-7.47	-815.90	472.34	-0.04

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
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

Comb. No.	Description
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	180 - 149.65	Pole	Max Tension	26	0.00	0.00	0.00
			Max. Compression	26	-30.49	-0.01	-1.31
			Max. Mx	20	-10.80	225.13	-0.29
			Max. My	14	-10.81	-0.02	-224.78
			Max. Vy	20	-13.04	225.13	-0.29
			Max. Vx	14	13.00	-0.02	-224.78
			Max. Torque	3			0.00
L2	149.65 - 106.76	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-49.49	-1.27	-4.86
			Max. Mx	8	-19.47	-849.80	-1.79
			Max. My	14	-19.47	-1.70	-849.18
			Max. Vy	20	-20.40	849.67	0.51
			Max. Vx	14	20.38	-1.70	-849.18
			Max. Torque	4			-0.75
L3	106.76 - 76.41	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-63.77	-1.58	-6.62
			Max. Mx	20	-27.75	1530.88	1.40
			Max. My	14	-27.75	-2.74	-1530.37
			Max. Vy	20	-25.01	1530.88	1.40
			Max. Vx	14	24.99	-2.74	-1530.37
			Max. Torque	22			-2.91
L4	76.41 - 35.93	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-88.40	1.80	-11.24
			Max. Mx	20	-42.77	2634.27	2.57
			Max. My	14	-42.77	-3.38	-2633.40
			Max. Vy	20	-31.81	2634.27	2.57
			Max. Vx	14	31.82	-3.38	-2633.40
			Max. Torque	8			3.21
L5	35.93 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-116.51	2.68	-16.76
			Max. Mx	20	-63.35	4132.50	3.96
			Max. My	14	-63.35	-5.34	-4133.98
			Max. Vy	20	-36.65	4132.50	3.96

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	14	36.68	-5.34	-4133.98
			Max. Torque	8			2.96

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	116.51	-0.00	-0.00
	Max. H_x	20	63.36	36.63	0.07
	Max. H_z	2	63.36	0.08	36.64
	Max. M_x	2	4122.20	0.08	36.64
	Max. M_z	8	4126.40	-36.60	-0.03
	Max. Torsion	7	2.68	-31.65	18.29
	Min. Vert	7	47.52	-31.65	18.29
	Min. H_x	8	63.36	-36.60	-0.03
	Min. H_z	14	63.36	-0.05	-36.66
	Min. M_x	14	-4133.98	-0.05	-36.66
	Min. M_z	20	-4132.50	36.63	0.07
	Min. Torsion	19	-2.70	31.66	-18.29

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	52.80	0.00	0.00	3.67	0.76	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	63.36	-0.08	-36.64	-4122.20	11.26	-1.44
0.9 Dead+1.0 Wind 0 deg - No Ice	47.52	-0.08	-36.64	-4090.80	10.94	-1.45
1.2 Dead+1.0 Wind 30 deg - No Ice	63.36	18.26	-31.71	-3567.19	-2057.50	-2.19
0.9 Dead+1.0 Wind 30 deg - No Ice	47.52	18.26	-31.71	-3540.17	-2041.48	-2.19
1.2 Dead+1.0 Wind 60 deg - No Ice	63.36	31.65	-18.29	-2055.75	-3566.63	-2.68
0.9 Dead+1.0 Wind 60 deg - No Ice	47.52	31.65	-18.29	-2040.66	-3538.70	-2.68
1.2 Dead+1.0 Wind 90 deg - No Ice	63.36	36.60	0.03	7.46	-4126.40	-2.45
0.9 Dead+1.0 Wind 90 deg - No Ice	47.52	36.60	0.03	6.27	-4094.05	-2.45
1.2 Dead+1.0 Wind 120 deg - No Ice	63.36	31.65	18.37	2074.89	-3565.50	-1.26
0.9 Dead+1.0 Wind 120 deg - No Ice	47.52	31.65	18.37	2057.39	-3537.58	-1.26
1.2 Dead+1.0 Wind 150 deg - No Ice	63.36	18.30	31.76	3582.19	-2061.67	0.15
0.9 Dead+1.0 Wind 150 deg - No Ice	47.52	18.30	31.76	3552.79	-2045.62	0.16
1.2 Dead+1.0 Wind 180 deg - No Ice	63.36	0.05	36.66	4133.98	-5.34	1.37

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
0.9 Dead+1.0 Wind 180 deg - No Ice	47.52	0.05	36.66	4100.23	-5.52	1.37
1.2 Dead+1.0 Wind 210 deg - No Ice	63.36	-18.23	31.75	3582.12	2055.47	2.19
0.9 Dead+1.0 Wind 210 deg - No Ice	47.52	-18.23	31.75	3552.72	2039.02	2.20
1.2 Dead+1.0 Wind 240 deg - No Ice	63.36	-31.66	18.29	2064.47	3569.96	2.70
0.9 Dead+1.0 Wind 240 deg - No Ice	47.52	-31.66	18.29	2047.05	3541.56	2.70
1.2 Dead+1.0 Wind 270 deg - No Ice	63.36	-36.63	-0.07	-3.96	4132.50	2.44
0.9 Dead+1.0 Wind 270 deg - No Ice	47.52	-36.63	-0.07	-5.06	4099.65	2.44
1.2 Dead+1.0 Wind 300 deg - No Ice	63.36	-31.69	-18.37	-2065.23	3572.36	1.32
0.9 Dead+1.0 Wind 300 deg - No Ice	47.52	-31.69	-18.37	-2050.06	3543.93	1.31
1.2 Dead+1.0 Wind 330 deg - No Ice	63.36	-18.33	-31.75	-3572.16	2067.40	-0.15
0.9 Dead+1.0 Wind 330 deg - No Ice	47.52	-18.33	-31.75	-3545.10	2050.85	-0.15
1.2 Dead+1.0 Ice+1.0 Temp	116.51	0.00	0.00	16.76	2.68	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	116.51	-0.01	-6.17	-725.54	4.23	-0.03
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	116.51	3.07	-5.34	-625.77	-367.65	-0.06
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	116.51	5.33	-3.08	-353.85	-638.96	-0.13
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	116.51	6.15	0.00	17.37	-738.18	-0.16
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	116.51	5.33	3.10	389.26	-638.65	-0.10
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	116.51	3.08	5.35	660.65	-368.04	-0.04
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	116.51	0.01	6.18	760.04	1.86	0.02
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	116.51	-3.07	5.35	660.77	372.43	0.06
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	116.51	-5.33	3.08	387.83	644.63	0.13
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	116.51	-6.16	-0.01	15.81	744.30	0.16
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	116.51	-5.33	-3.10	-355.13	644.89	0.11
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	116.51	-3.09	-5.35	-626.43	374.15	0.04
Dead+Wind 0 deg - Service	52.80	-0.02	-8.62	-962.62	3.19	-0.34
Dead+Wind 30 deg - Service	52.80	4.30	-7.46	-832.65	-481.27	-0.52
Dead+Wind 60 deg - Service	52.80	7.45	-4.30	-478.70	-834.67	-0.63
Dead+Wind 90 deg - Service	52.80	8.61	0.01	4.45	-965.76	-0.58
Dead+Wind 120 deg - Service	52.80	7.45	4.32	488.60	-834.41	-0.30
Dead+Wind 150 deg - Service	52.80	4.31	7.47	841.58	-482.25	0.04
Dead+Wind 180 deg - Service	52.80	0.01	8.63	970.80	-0.70	0.32
Dead+Wind 210 deg - Service	52.80	-4.29	7.47	841.56	481.90	0.52
Dead+Wind 240 deg - Service	52.80	-7.45	4.30	486.16	836.55	0.64
Dead+Wind 270 deg - Service	52.80	-8.62	-0.02	1.78	968.29	0.58
Dead+Wind 300 deg - Service	52.80	-7.46	-4.32	-480.92	837.12	0.31
Dead+Wind 330 deg - Service	52.80	-4.31	-7.47	-833.81	484.69	-0.03

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-52.80	0.00	0.00	52.80	0.00	0.000%
2	-0.08	-63.36	-36.64	0.08	63.36	36.64	0.000%
3	-0.08	-47.52	-36.64	0.08	47.52	36.64	0.000%
4	18.26	-63.36	-31.71	-18.26	63.36	31.71	0.000%
5	18.26	-47.52	-31.71	-18.26	47.52	31.71	0.000%
6	31.65	-63.36	-18.29	-31.65	63.36	18.29	0.000%
7	31.65	-47.52	-18.29	-31.65	47.52	18.29	0.000%
8	36.60	-63.36	0.03	-36.60	63.36	-0.03	0.000%
9	36.60	-47.52	0.03	-36.60	47.52	-0.03	0.000%
10	31.65	-63.36	18.37	-31.65	63.36	-18.37	0.000%
11	31.65	-47.52	18.37	-31.65	47.52	-18.37	0.000%
12	18.30	-63.36	31.76	-18.30	63.36	-31.76	0.000%
13	18.30	-47.52	31.76	-18.30	47.52	-31.76	0.000%
14	0.05	-63.36	36.66	-0.05	63.36	-36.66	0.000%
15	0.05	-47.52	36.66	-0.05	47.52	-36.66	0.000%
16	-18.23	-63.36	31.75	18.23	63.36	-31.75	0.000%
17	-18.23	-47.52	31.75	18.23	47.52	-31.75	0.000%
18	-31.66	-63.36	18.29	31.66	63.36	-18.29	0.000%
19	-31.66	-47.52	18.29	31.66	47.52	-18.29	0.000%
20	-36.63	-63.36	-0.07	36.63	63.36	0.07	0.000%
21	-36.63	-47.52	-0.07	36.63	47.52	0.07	0.000%
22	-31.69	-63.36	-18.37	31.69	63.36	18.37	0.000%
23	-31.69	-47.52	-18.37	31.69	47.52	18.37	0.000%
24	-18.33	-63.36	-31.75	18.33	63.36	31.75	0.000%
25	-18.33	-47.52	-31.75	18.33	47.52	31.75	0.000%
26	0.00	-116.51	0.00	-0.00	116.51	-0.00	0.000%
27	-0.01	-116.51	-6.17	0.01	116.51	6.17	0.000%
28	3.07	-116.51	-5.34	-3.07	116.51	5.34	0.000%
29	5.33	-116.51	-3.08	-5.33	116.51	3.08	0.000%
30	6.15	-116.51	0.00	-6.15	116.51	-0.00	0.000%
31	5.33	-116.51	3.10	-5.33	116.51	-3.10	0.000%
32	3.08	-116.51	5.35	-3.08	116.51	-5.35	0.000%
33	0.01	-116.51	6.18	-0.01	116.51	-6.18	0.000%
34	-3.07	-116.51	5.35	3.07	116.51	-5.35	0.000%
35	-5.33	-116.51	3.08	5.33	116.51	-3.08	0.000%
36	-6.16	-116.51	-0.01	6.16	116.51	0.01	0.000%
37	-5.33	-116.51	-3.10	5.33	116.51	3.10	0.000%
38	-3.09	-116.51	-5.35	3.09	116.51	5.35	0.000%
39	-0.02	-52.80	-8.62	0.02	52.80	8.62	0.000%
40	4.30	-52.80	-7.46	-4.30	52.80	7.46	0.000%
41	7.45	-52.80	-4.30	-7.45	52.80	4.30	0.000%
42	8.61	-52.80	0.01	-8.61	52.80	-0.01	0.000%
43	7.45	-52.80	4.32	-7.45	52.80	-4.32	0.000%
44	4.31	-52.80	7.47	-4.31	52.80	-7.47	0.000%
45	0.01	-52.80	8.63	-0.01	52.80	-8.63	0.000%
46	-4.29	-52.80	7.47	4.29	52.80	-7.47	0.000%
47	-7.45	-52.80	4.30	7.45	52.80	-4.30	0.000%
48	-8.62	-52.80	-0.02	8.62	52.80	0.02	0.000%
49	-7.46	-52.80	-4.32	7.46	52.80	4.32	0.000%
50	-4.31	-52.80	-7.47	4.31	52.80	7.47	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	0.00023401
3	Yes	4	0.00000001	0.00012021
4	Yes	5	0.00000001	0.00041036
5	Yes	5	0.00000001	0.00019334
6	Yes	5	0.00000001	0.00042351
7	Yes	5	0.00000001	0.00020001
8	Yes	4	0.00000001	0.00073305
9	Yes	4	0.00000001	0.00048186
10	Yes	5	0.00000001	0.00040513
11	Yes	5	0.00000001	0.00019031
12	Yes	5	0.00000001	0.00042540
13	Yes	5	0.00000001	0.00020046
14	Yes	4	0.00000001	0.00029443
15	Yes	4	0.00000001	0.00016788
16	Yes	5	0.00000001	0.00041812
17	Yes	5	0.00000001	0.00019693
18	Yes	5	0.00000001	0.00040553
19	Yes	5	0.00000001	0.00019062
20	Yes	4	0.00000001	0.00079343
21	Yes	4	0.00000001	0.00052186
22	Yes	5	0.00000001	0.00042915
23	Yes	5	0.00000001	0.00020267
24	Yes	5	0.00000001	0.00040740
25	Yes	5	0.00000001	0.00019171
26	Yes	4	0.00000001	0.00007627
27	Yes	5	0.00000001	0.00029191
28	Yes	5	0.00000001	0.00030957
29	Yes	5	0.00000001	0.00031128
30	Yes	5	0.00000001	0.00029925
31	Yes	5	0.00000001	0.00032161
32	Yes	5	0.00000001	0.00032414
33	Yes	5	0.00000001	0.00030683
34	Yes	5	0.00000001	0.00032311
35	Yes	5	0.00000001	0.00032105
36	Yes	5	0.00000001	0.00029891
37	Yes	5	0.00000001	0.00031145
38	Yes	5	0.00000001	0.00030935
39	Yes	4	0.00000001	0.00004581
40	Yes	4	0.00000001	0.00017644
41	Yes	4	0.00000001	0.00019312
42	Yes	4	0.00000001	0.00006192
43	Yes	4	0.00000001	0.00017233
44	Yes	4	0.00000001	0.00019425
45	Yes	4	0.00000001	0.00004672
46	Yes	4	0.00000001	0.00018601
47	Yes	4	0.00000001	0.00017315
48	Yes	4	0.00000001	0.00006242
49	Yes	4	0.00000001	0.00019879
50	Yes	4	0.00000001	0.00017226

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	180 - 149.65 (1)	TP35.249x29x0.25	30.35	0.00	0.0	28.1742	-10.80	1647.27	0.007
L2	149.65 - 106.76 (2)	TP44.081x35.249x0.281	42.89	0.00	0.0	38.5076	-19.47	2135.38	0.009
L3	106.76 - 76.41 (3)	TP49.768x42.2773x0.344	36.38	0.00	0.0	53.2110	-27.75	3112.85	0.009
L4	76.41 - 35.93 (4)	TP57.414x47.6943x0.406	47.21	0.00	0.0	72.4606	-42.77	4238.94	0.010
L5	35.93 - 0 (5)	TP64x55.0208x0.469	43.61	0.00	0.0	95.9432	-63.35	5612.68	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	180 - 149.65 (1)	TP35.249x29x0.25	225.13	1175.45	0.192	0.00	1175.45	0.000
L2	149.65 - 106.76 (2)	TP44.081x35.249x0.281	849.80	1853.86	0.458	0.00	1853.86	0.000
L3	106.76 - 76.41 (3)	TP49.768x42.2773x0.344	1530.88	3051.84	0.502	0.00	3051.84	0.000
L4	76.41 - 35.93 (4)	TP57.414x47.6943x0.406	2634.27	4861.63	0.542	0.00	4861.63	0.000
L5	35.93 - 0 (5)	TP64x55.0208x0.469	4133.98	7412.56	0.558	0.00	7412.56	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	180 - 149.65 (1)	TP35.249x29x0.25	13.04	494.46	0.026	0.00	1522.24	0.000
L2	149.65 - 106.76 (2)	TP44.081x35.249x0.281	20.37	675.81	0.030	0.11	2529.93	0.000
L3	106.76 - 76.41 (3)	TP49.768x42.2773x0.344	25.01	933.85	0.027	2.49	3946.08	0.001
L4	76.41 - 35.93 (4)	TP57.414x47.6943x0.406	31.81	1271.68	0.025	3.20	6200.10	0.001
L5	35.93 - 0 (5)	TP64x55.0208x0.469	36.68	1683.80	0.022	1.37	9409.75	0.000

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

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	180 - 149.65 (1)	0.007	0.192	0.000	0.026	0.000	0.199 ✔	1.050	4.8.2 ✔
L2	149.65 - 106.76 (2)	0.009	0.458	0.000	0.030	0.000	0.468 ✔	1.050	4.8.2 ✔
L3	106.76 - 76.41 (3)	0.009	0.502	0.000	0.027	0.001	0.511 ✔	1.050	4.8.2 ✔
L4	76.41 - 35.93 (4)	0.010	0.542	0.000	0.025	0.001	0.553 ✔	1.050	4.8.2 ✔
L5	35.93 - 0 (5)	0.011	0.558	0.000	0.022	0.000	0.569 ✔	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	180 - 149.65	Pole	TP35.249x29x0.25	1	-10.80	1729.63	18.9	Pass
L2	149.65 - 106.76	Pole	TP44.081x35.249x0.281	2	-19.47	2242.15	44.6	Pass
L3	106.76 - 76.41	Pole	TP49.768x42.2773x0.344	3	-27.75	3268.49	48.7	Pass
L4	76.41 - 35.93	Pole	TP57.414x47.6943x0.406	4	-42.77	4450.89	52.6	Pass
L5	35.93 - 0	Pole	TP64x55.0208x0.469	5	-63.35	5893.31	54.2	Pass
							Summary	
						Pole (L5)	54.2	Pass
						RATING =	**54.2**	**Pass**

Monopole Flange Plate Connection

Elevation = 149.65 ft.

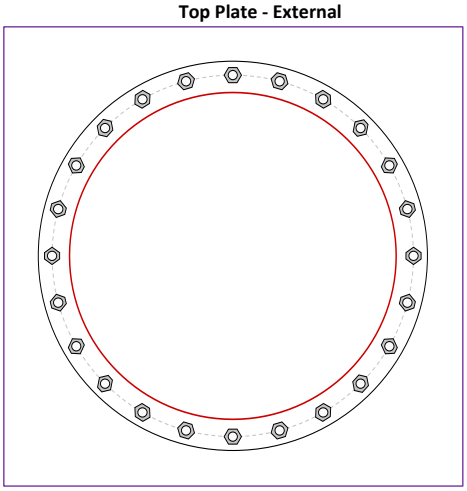
Client:	T-Mobile
Site Name:	LS Fire Station #1
SSC #:	MO-0552-F

TIA-222 Revision	H

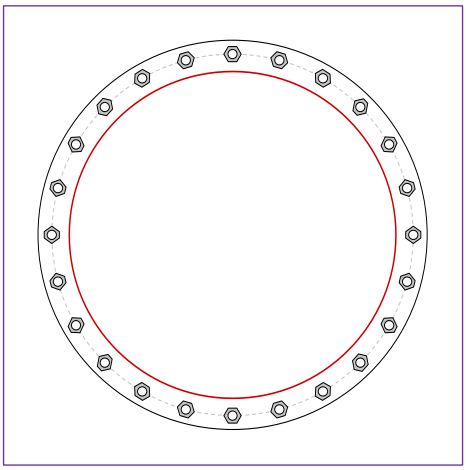
Applied Loads	
Moment (kip-ft)	225.13
Axial Force (kips)	10.80
Shear Force (kips)	13.04

**TIA-222-H Section 15.5 Applied*

Top Plate - External



Bottom Plate - External



Connection Properties

Bolt Data

(24) 1" ø bolts (A325 N; Fy=92 ksi, Fu=120 ksi) on 39" BC

Top Plate Data

42" OD x 1.5" Plate (A572-60; Fy=60 ksi, Fu=75 ksi)

Bottom Plate Data

42" OD x 1.5" Plate (A572-60; Fy=60 ksi, Fu=75 ksi)

Top Stiffener Data

N/A

Bottom Stiffener Data

N/A

Top Pole Data

35.249" x 0.25" 12-sided pole (A572-65; Fy=65 ksi, Fu=80 ksi)

Bottom Pole Data

35.249" x 0.281" 12-sided pole (A572-65; Fy=65 ksi, Fu=80 ksi)

Analysis Results

Bolt Capacity

Max Load (kips)	11.09	
Allowable (kips)	54.53	
Stress Rating:	**19.4%**	**Pass**

Top Plate Capacity

Max Stress (ksi):	5.39	(Flexural)
Allowable Stress (ksi):	54.00	
Stress Rating:	**9.5%**	**Pass**
Tension Side Stress Rating:	**4.7%**	**Pass**

Bottom Plate Capacity

Max Stress (ksi):	5.39	(Flexural)
Allowable Stress (ksi):	54.00	
Stress Rating:	**9.5%**	**Pass**
Tension Side Stress Rating:	**4.7%**	**Pass**

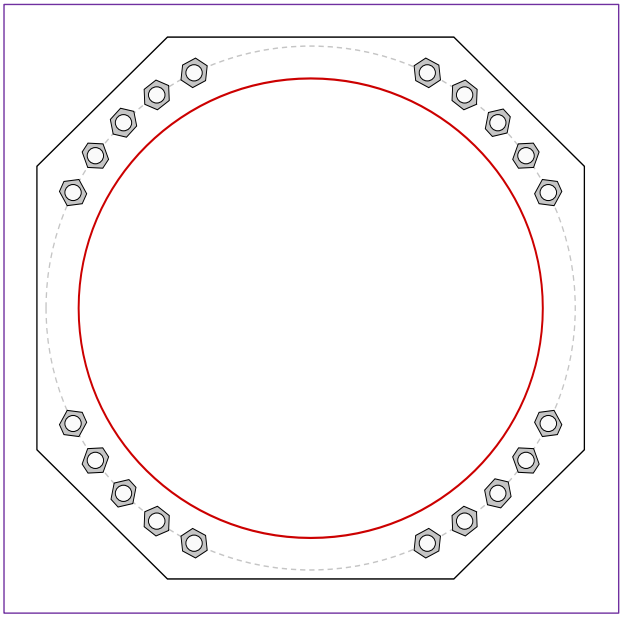
Monopole Base Plate Connection

Site Info	
Client:	T-Mobile
Site Name:	LS Fire Station #1
SSC #:	MO-0552-F

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	Yes
l_{ar} (in)	0

Applied Loads	
Moment (kip-ft)	4133.98
Axial Force (kips)	63.35
Shear Force (kips)	36.68

**TIA-222-H Section 15.5 Applied*



Connection Properties

Anchor Rod Data

(20) 2-1/4" ø bolts (A615-75 N; Fy=75 ksi, Fu=100 ksi) on 73" BC

Anchor Spacing: 6 in

Base Plate Data

75.5" W x 2.75" Plate (A572-60; Fy=60 ksi, Fu=75 ksi); Clip: 18 in

Stiffener Data

N/A

Pole Data

64" x 0.469" 12-sided pole (A572-65; Fy=65 ksi, Fu=80 ksi)

Analysis Results

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

Pu_t = 132.69	ϕPn_t = 243.75	**Stress Rating**
Vu = 1.83	ϕVn = 149.1	**51.8%**
Mu = n/a	ϕMn = n/a	**Pass**

Base Plate Summary

Max Stress (ksi):	29.61	(Flexural)
Allowable Stress (ksi):	54	
Stress Rating:	**52.2%**	**Pass**

Drilled Pier Foundation

Client :	T-Mobile
Site Name:	LS Fire Station #1
SSC # :	MO-0552-F
TIA-222 Revison:	H
Tower Type:	Monopole

Applied Loads	Comp.	Uplift
Moment (kip-ft)	4133.98	
Axial Force (kips)	63.36	
Shear Force (kips)	36.66	

Material Properties		
Concrete Strength, f'c:	4	ksi
Rebar Strength, Fy:	60	ksi
Tie Yield Strength, Fyt:	60	ksi

Pier Design Data		
Depth	31	ft
Ext. Above Grade	1	ft
Pier Section 1		
From 1' above grade to 31' below grade		
Pier Diameter	8	ft
Rebar Quantity	24	
Rebar Size	11	
Clear Cover to Ties	3	in
Tie Size	5	
Tie Spacing	12	in

Rebar & Pier Options

Embedded Pole Inputs

Belled Pier Inputs

Analysis Results		
Soil Lateral Check	*Compression*	*Uplift*
$D_{v=0}$ (ft from TOC)	8.72	-
Soil Safety Factor	9.97	-
Max Moment (kip-ft)	4468.70	-
Rating*	*12.7%*	-
Soil Vertical Check	*Compression*	*Uplift*
Skin Friction (kips)	1328.37	-
End Bearing (kips)	1189.78	-
Weight of Concrete (kips)	261.29	-
Total Capacity (kips)	2518.16	-
Axial (kips)	324.65	-
Rating*	*12.3%*	-
Reinforced Concrete Flexure	*Compression*	*Uplift*
Critical Depth (ft from TOC)	8.42	-
Critical Moment (kip-ft)	4467.88	-
Critical Moment Capacity	7257.25	-
Rating*	*58.6%*	-
Reinforced Concrete Shear	*Compression*	*Uplift*
Critical Depth (ft from TOC)	23.33	-
Critical Shear (kip)	463.54	-
Critical Shear Capacity	2358.72	-
Rating*	*18.7%*	-

Shear-Friction Methodology is Applied

Structural Foundation Rating*	**58.6%**
Soil Interaction Rating*	**12.7%**

*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	23.5

# of Layers	5

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	4	4	125.6	150			0.000	0.000					Cohesionless
2	4	6.5	2.5	125.6	150	0.955	0	0.525	0.525					Cohesive
3	6.5	16.5	10	122.04	150	2.692	0	1.481	1.481					Cohesive
4	16.5	23.5	7	142.1	150	8.33	0	3.749	3.749					Cohesive
5	23.5	31	7.5	79.7	87.6	8.33	0	3.749	3.749			31.56		Cohesive