

February 6, 2025

Jason Skaggs
Smartlink, LLC
10 Church Circle
Annapolis, MD 21401
(510) 778-2166

PRCTI20250451

Calculations required to be provided by
the Permittee on site for all Inspections



326 Tryon Road
Raleigh, NC 27603
(919) 661-6351
Structures@tepgroup.net

City of Puyallup
Building
REVIEWED
FOR
COMPLIANCE

SKinnear
04/18/2025
10:00:08 AM



Subject: Structural Analysis Report

Carrier Designation:

AT&T Mobility Reconfiguration

Carrier Site Number:

WA6413

Carrier Site Name:

SOUTH HILL MALL

FA Location Code:

10038029

Engineering Firm Designation:

TEP Project Number:

340502.1060260

Site Data:

3310 South Meridian, Puyallup, Pierce County, WA 98373

Latitude 47° 09' 35.06", Longitude -122° 17' 47.76"

79.0± Foot – Monopole Tower

Dear Jason Skaggs,

TEP 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 stress level for the tower and foundation structure, under the following load case, to be:

LC1: Existing + Proposed + Reserved Loading

Note: See Table 1 for the existing, proposed, and reserved loading

Sufficient Capacity

Structure Capacity	Foundation Capacity
81.9%	47.9%

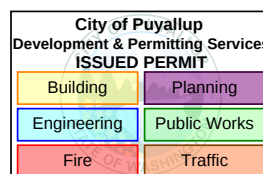
The analysis has been performed in accordance with the ANSI/TIA-222-H Structural Standard for Antenna Supporting Structures, Antennas, and Small Wind Turbine Support Structures and the 2021 Washington State Building Code.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Table 1 for the determined available structural capacity to be effective.

We at TEP appreciate the opportunity of providing our continuing professional services to you and Smartlink, LLC. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

Ronald E. Glover, P.E., S.E.



02/06/2025

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Seismic Analysis

1) INTRODUCTION

The tower is a 79.0± Foot Monopole designed by Western Utility Telecom, Inc., in March of 2017. The tower has been extended to the current height per the modifications by Morrison Hershfield in September of 2022. The original design standard and wind speed were unavailable for review. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

TIA-222 Revision:	ANSI/TIA-222-H
Type of Analysis:	Comprehensive
Risk Category:	II
Wind Speed:	97 mph (Ultimate)
Exposure Category:	C
Topographic Procedure:	Method 1 (Kzt = 1.0)
Ice Thickness:	1.0 in
Wind Speed with Ice:	30 mph
Seismic Design Category:	D
Seismic Ss:	1.264
Seismic S1:	0.436
Service Wind Speed:	60 mph

Table 1 - Existing, Proposed, and Reserved Antenna and Cable Information

Existing/ Proposed/ Reserved	Mount Level (ft)	Ant CL (ft)	Qty	Antenna Model	Mount Type	Qty Coax	Coax Size	Coax Location	Owner/ Tenant
Proposed	79.0	79.0	3	Ericsson AIR6419 B77G¹	42"Ø Canister	-	-	-	AT&T
		74.5	3	Ericsson AIR6419 B77D¹		-	-	-	
Existing	79.0	79.0	1	Raycap DC9-48-60-24-PC16-EV	42"Ø Canister	2 1 8	DC Fiber 7/8" Coax	Inside	AT&T
<i>To Be Removed</i>	79.0	79.0	3	Nokia AEQK	-	-	-	-	AT&T
			3	Nokia AEQU		-	-	-	
Proposed	64.0	64.0	6	Commscope TMAT192123B68-21	36"Ø Canister	-	-	-	AT&T
Existing	64.0	64.0	3	Kathrein 800372991		8	7/8" Coax	Inside	
<i>To Be Removed</i>	64.0	64.0	6	Kaelus TMA2117F00V1-1	-	-	-	-	AT&T
Proposed	56.0	56.0	6	Commscope TMAT192123B68-31	36"Ø Canister	-	-	-	AT&T
Existing	56.0	56.0	3	Kathrein 800372991		8	7/8" Coax	Inside	
<i>To Be Removed</i>	56.0	56.0	6	Kathrein 78211273V02	-	-	-	-	AT&T
Existing	26.7	26.7	2	Box Light	Direct	2	3/8" Coax	Inside	Unknown

Notes:

- 1) Antennas are to be vertically stacked in the same position (typical of 2 antennas per sector, 6 total).

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Remarks	Source
Previous Structural Analysis	Morrison Hershfield, dated September 12, 2022 Project No. MAS-532R2 / 2200078	Smartlink
Structural Modification Drawings	Morrison Hershfield, dated September 12, 2022 Project No. MAS-532R2 / 2200078	Smartlink
Previous Structural Analysis	TEP, dated June 4, 2024 TEP No. 340502.957987	TEP
Tower Mapping Report	Sinnott, Gering & Schmitt, Inc, dated December 18, 2024 Job No. 2408256	Smartlink
Construction Drawings	Trylon, dated January 20, 2025 Job No. WA6413	Smartlink
Correspondence	Correspondence from Smartlink in reference to the existing, proposed, and reserved loading.	Smartlink

3.1) Analysis Method

tnxTower (version 8.2.4.3), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Analysis Assumptions

- 1) The tower and foundation were built and maintained in accordance with the manufacturer's specification.
- 2) Unless specified by the client or tower mapping, the location of the existing and proposed coax is assumed by TEP and listed in Table 1.
- 3) All tower components are in sufficient condition to carry their full design capacity.
- 4) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance.
- 5) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.
- 6) Existing tower and foundation geometry, geotechnical information and existing loading are based solely on documents provided in Table 2. TEP assumed that the information interpreted in these documents, from the original documents, was accurate.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 3 - Section Capacity (Summary)¹

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	øP _{allow} (lb)	% Capacity	Pass / Fail
L1	80 - 70	Pole	P6.625x0.28	1	-1036.920	184603.641	20.4	Pass
L2	70 - 60	Pole	P8.625x0.5	2	-3053.850	422127.281	27.8	Pass
L3	60 - 48	Pole	P8.625x0.5	3	-5272.170	422127.281	71.0	Pass
L4	48 - 1	Pole	P36x0.375	4	-15863.300	1564604.875	22.8	Pass
							Summary	
						Pole (L3)	71.0	Pass
						RATING =	71.0	Pass

Table 4 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1,2	Bolt Connection	69.0	2.4	Pass
1,2	Flange Connection	69.0	23.5	Pass
1,2	Bolt Connection	59.0	8.1	Pass
1,2	Flange Connection	59.0	23.7	Pass
1,2	Bolt Connection	47.0	12.0	Pass
1,2	Flange Connection	47.0	34.0	Pass
1,2	Anchor Rods	-	81.9	Pass
1,2	Base Plate	-	56.1	Pass
1,2	Drilled Foundation Soil Interaction	-	47.9	Pass
1,2	Drilled Foundation Structural	-	7.6	Pass

Structure Rating (max from all components)¹ =	81.9%
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Notes:

1) Rating per TIA-222-H, Section 15.5

2) See additional documentation in "Appendix B - Additional Calculations" for calculations supporting the % capacity listed.

Table 5 - Dish Twist/Sway Results for 60 mph Service Wind Speed

Elevation (ft)	Dish Model	Beam Deflection		
		Deflection (in)	Tilt (deg)	Twist (deg)
-	-	-	-	-

4.1) Recommendations

- 1) If the load differs from that described in Table 1 of this report or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
- 2) The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

APPENDIX A

TNX TOWER OUTPUT

1	P6.625x0.28	10.000	A53-B-35	189.9
2	P8.625x0.5	10.000		434.3
3	P8.625x0.5	12.000		521.1
4	P36x0.375	47.000	API 5L X42	6712.2
Section	Size	Length (ft)	Grade	Weight (lb)
				7857.6

80.0 ft

70.0 ft

60.0 ft

48.0 ft

1.0 ft

DESIGNED APPURTENANCE LOADING

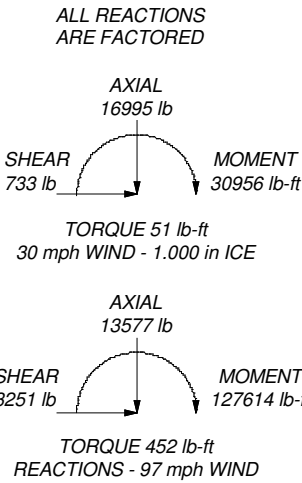
TYPE	ELEVATION	TYPE	ELEVATION
AIR 6419 B77G w/ Mount Pipe	79	800372991 w/ Mount Pipe	64
AIR 6419 B77G w/ Mount Pipe	79	800372991 w/ Mount Pipe	64
AIR 6419 B77G w/ Mount Pipe	79	Canister Load3	59
Canister Load1	79	(2) TMAT192123B68-31	56
AIR 6419 B77D	74	(2) TMAT192123B68-31	56
AIR 6419 B77D	74	(2) TMAT192123B68-31	56
AIR 6419 B77D	74	DC9-48-60-24-PC16-EV	56
Canister Load2	69	800372991 w/ Mount Pipe	56
800372991 w/ Mount Pipe	64	800372991 w/ Mount Pipe	56
(2) TMAT192123B68-21	64	800372991 w/ Mount Pipe	56
(2) TMAT192123B68-21	64	Canister Load4	47
(2) TMAT192123B68-21	64	(2) Box Light	26.75

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi	API 5L X42	42 ksi	60 ksi

TOWER DESIGN NOTES

1. Tower is located in Pierce County, Washington.
2. Tower designed for Exposure C to the TIA-222-H Standard.
3. Tower designed for a 97 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 30 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 22.9%



 Tower Engineering Professionals, Inc. Tower Engineering Professionals, Inc.	Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350		Job: SOUTH HILL MALL (10038029)		
			Project: TEP No. 340502.1060260		
			Client: Smartlink LLC	Drawn by: Ryan M. Barger, E.I.	App'd:
			Code: TIA-222-H	Date: 02/06/25	Scale: NTS
			Path:		Dwg No. E-1

<i>tnxTower</i> <i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	1 of 13
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	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

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 Pierce County, Washington.

Tower base elevation above sea level: 438.394 ft.

Basic wind speed of 97 mph.

Risk Category II.

Exposure Category C.

Simplified Topographic Factor Procedure for wind speed-up calculations is used.

Topographic Category: 1.

Crest Height: 0.000 ft.

Nominal ice thickness of 1.000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 30 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 1.05.

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.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Pole Section Geometry

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Section	Elevation	Section Length	Pole Size	Pole Grade	Socket Length
	ft	ft			ft
L1	80.000-70.000	10.000	P6.625x0.28	A53-B-35 (35 ksi)	
L2	70.000-60.000	10.000	P8.625x0.5	A53-B-35 (35 ksi)	
L3	60.000-48.000	12.000	P8.625x0.5	A53-B-35 (35 ksi)	
L4	48.000-1.000	47.000	P36x0.375	API 5L X42 (42 ksi)	

Tower Elevation	Gusset Area (per face)	Gusset Thickness	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
ft	ft²	in							
L1				1	0	1			
80.000-70.000				1	0	1			
L2				1	0	1			
70.000-60.000				1	1	1			
L3									
60.000-48.000									
L4									
48.000-1.000									

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
*****					ft						

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement	Total Number	C _A A _A	Weight
					ft		ft²/ft	plf
79								
RFFT-48SM-001-X XX(3/8)	C	No	No	Inside Pole	79.000 - 1.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.060
PWRT-606-S(7/8")	C	No	No	Inside Pole	79.000 - 1.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.890 0.890

7/8" Coax	C	No	No	Inside Pole	79.000 - 1.000	8	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.265
PWRT-606-S(7/8")	C	No	No	Inside Pole	79.000 - 1.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.890 0.890

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	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight plf
7/8" Coax	C	No	No	Inside Pole	64,000 - 1,000	8	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.265 0.265 0.265
***** 7/8" Coax	C	No	No	Inside Pole	56,000 - 1,000	8	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.265 0.265 0.265
***** 3/8" Coax	C	No	No	Inside Pole	26,750 - 1,000	2	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.075 0.075 0.075

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
L1	80,000-70,000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	35.633
L2	70,000-60,000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	48.070
L3	60,000-48,000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	89.896
L4	48,000-1,000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	389.159

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
L1	80,000-70,000	A	0.923	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	35.633
L2	70,000-60,000	A	0.910	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	48.070
L3	60,000-48,000	A	0.893	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	89.896
L4	48,000-1,000	A	0.829	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	389.159

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Feed Line Center of Pressure

Section	Elevation	CP _X	CP _Z	CP _X Ice in	CP _Z Ice in
	ft	in	in		
L1	80,000-70,000	0.000	0.000	0.000	0.000
L2	70,000-60,000	0.000	0.000	0.000	0.000
L3	60,000-48,000	0.000	0.000	0.000	0.000
L4	48,000-1,000	0.000	0.000	0.000	0.000

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horiz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight lb
***** **79**									
AIR 6419 B77G w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	0.000	79,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	78.351 78.351 78.351
AIR 6419 B77G w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	79,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	78.351 78.351 78.351
AIR 6419 B77G w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	0.000	79,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	78.351 78.351 78.351
AIR 6419 B77D	A	From Leg	0.500 0.000 0.000	0.000	74,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	66.100 66.100 66.100
AIR 6419 B77D	B	From Leg	0.500 0.000 0.000	0.000	74,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	66.100 66.100 66.100
AIR 6419 B77D	C	From Leg	0.500 0.000 0.000	0.000	74,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	66.100 66.100 66.100
64									
800372991 w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	0.000	64,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	112.145 112.145 112.145
800372991 w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	64,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	112.145 112.145 112.145
800372991 w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	0.000	64,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	112.145 112.145 112.145
(2) TMAT192123B68-21	A	From Leg	0.500 0.000 0.000	0.000	64,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	20.700 20.700 20.700
(2) TMAT192123B68-21	B	From Leg	0.500 0.000 0.000	0.000	64,000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000	20.700 20.700 20.700

<i>tnxTower</i> <i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	5 of 13
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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _N A _A Front ft ²	C _N A _A Side ft ²	Weight lb
(2) TMAP192123B68-21	C	From Leg	0.000 0.500 0.000 0.000	0.000	64.000	0.000 0.000 0.000 0.000	0.000 0.000 0.000 0.000	20.700 20.700 20.700 20.700
56								
800372991 w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	112.145 112.145 112.145
800372991 w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	112.145 112.145 112.145
800372991 w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	112.145 112.145 112.145
(2) TMAP192123B68-31	A	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	20.700 20.700 20.700
(2) TMAP192123B68-31	B	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	20.700 20.700 20.700
(2) TMAP192123B68-31	C	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	20.700 20.700 20.700
DC9-48-60-24-PC16-EV	C	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	34.900 34.900 34.900
26.75								
(2) Box Light	C	From Leg	1.000 0.000 0.000	0.000	26.750	No Ice 1/2" Ice 1" Ice	4.000 4.400 4.800	40.000 44.000 48.000

Canister Load1	C	None		0.000	79.000	No Ice 1/2" Ice 1" Ice	7.500 18.792 19.250	105.000 228.000 351.000
Canister Load2	C	None		0.000	69.000	No Ice 1/2" Ice 1" Ice	14.250 35.750 36.667	523.000 758.000 993.000
Canister Load3	C	None		0.000	59.000	No Ice 1/2" Ice 1" Ice	14.850 37.308 38.317	445.000 691.000 937.000
Canister Load4	C	None		0.000	47.000	No Ice 1/2" Ice 1" Ice	8.100 38.130 39.043	351.000 485.000 619.000

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice

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Comb. No.	Description
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	80 - 70	Pole	Max Tension	20	0.000	-0.000	0.000
			Max. Compression	26	-1229.951	0.000	0.000
			Max. Mx	20	-913.983	1991.906	-0.071
			Max. My	14	-913.984	0.122	-1991.862
			Max. Vy	20	-223.950	1991.906	-0.071

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L2	70 - 60	Pole	Max. Vx	14	223.944	0.122	-1991.862
			Max. Torque	12			0.000
			Max. Tension	1	0.000	0.000	0.000
			Max. Compression	26	-3525.183	0.000	0.000
			Max. Mx	20	-2669.580	7874.010	-0.301
			Max. My	14	-2669.584	0.521	-7873.820
			Max. Vy	20	-632.965	5976.916	-0.213
L3	60 - 48	Pole	Max. Vx	14	632.946	0.369	-5976.783
			Max. Torque	12			0.000
			Max. Tension	1	0.000	0.000	0.000
			Max. Compression	26	-5954.891	31.169	-17.995
			Max. Mx	20	-4535.010	19825.403	-18.704
			Max. My	14	-4535.012	32.397	-19811.787
			Max. Vy	20	-1033.571	12663.439	-18.486
L4	48 - 1	Pole	Max. Vx	14	1033.542	32.019	-12649.955
			Max. Torque	24			0.294
			Max. Tension	1	0.000	0.000	0.000
			Max. Compression	26	-16995.423	267.848	-154.642
			Max. Mx	20	-13576.298	127576.644	-139.371
			Max. My	14	-13576.298	241.397	-127474.618
						8	
			Max. Vy	20	-3252.845	127576.644	-139.371
			Max. Vx	14	3252.843	241.397	-127474.618
						8	
			Max. Torque	24			451.958

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	26	16995.423	0.000	0.000
	Max. H _x	21	10182.490	3251.357	-0.000
	Max. H _y	2	13576.654	0.000	3251.357
	Max. M _x	2	127195.877	0.000	3251.357
	Max. M _y	8	127093.850	-3251.357	-0.000
	Max. Torsion	24	451.957	1625.679	2815.758
	Min. Vert	7	10182.490	-2815.758	1625.679
	Min. H _x	8	13576.654	-3251.357	-0.000
	Min. H _y	14	13576.654	0.000	-3251.357
	Min. M _x	14	-127474.618	0.000	-3251.357
	Min. M _y	20	-127576.644	3251.357	-0.000
	Min. Torsion	12	-451.957	-1625.679	-2815.758

Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear _x lb	Shear _y lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _y lb-ft	Torque lb-ft
Dead Only	11313.878	0.000	0.000	114.996	199.179	0.000
1.2 Dead+1.0 Wind 0 deg - No Ice	13576.654	-0.000	-3251.357	-127195.877	241.385	-391.406
0.9 Dead+1.0 Wind 0 deg - No	10182.490	-0.000	-3251.357	-126935.399	180.586	-391.273

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Load Combination	Vertical lb	Shear _x lb	Shear _y lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _y lb-ft	Torque lb-ft
Ice						
1.2 Dead+1.0 Wind 30 deg - No Ice	13576.654	1625.679	-2815.758	-110136.185	-63426.232	-225.979
0.9 Dead+1.0 Wind 30 deg - No Ice	10182.490	1625.679	-2815.758	-109915.309	-63339.242	-225.901
1.2 Dead+1.0 Wind 60 deg - No Ice	13576.654	2815.758	-1625.679	-63528.253	-110034.162	-0.000
0.9 Dead+1.0 Wind 60 deg - No Ice	10182.490	2815.758	-1625.679	-63415.566	-109838.983	-0.000
1.2 Dead+1.0 Wind 90 deg - No Ice	13576.654	3251.357	0.000	139.364	-127093.850	225.979
0.9 Dead+1.0 Wind 90 deg - No Ice	10182.490	3251.357	0.000	104.261	-126859.071	225.901
1.2 Dead+1.0 Wind 120 deg - No Ice	13576.654	2815.758	1625.679	63806.984	-110034.168	391.406
0.9 Dead+1.0 Wind 120 deg - No Ice	10182.490	2815.758	1625.679	63624.091	-109838.987	391.273
1.2 Dead+1.0 Wind 150 deg - No Ice	13576.654	1625.679	2815.758	110414.923	-63426.238	451.957
0.9 Dead+1.0 Wind 150 deg - No Ice	10182.490	1625.679	2815.758	110123.839	-63339.247	451.803
1.2 Dead+1.0 Wind 180 deg - No Ice	13576.654	-0.000	3251.357	127474.618	241.385	391.406
0.9 Dead+1.0 Wind 180 deg - No Ice	10182.490	-0.000	3251.357	127143.931	180.586	391.273
1.2 Dead+1.0 Wind 210 deg - No Ice	13576.654	-1625.679	2815.758	110414.933	63909.015	225.979
0.9 Dead+1.0 Wind 210 deg - No Ice	10182.490	-1625.679	2815.758	110123.846	63700.423	225.901
1.2 Dead+1.0 Wind 240 deg - No Ice	13576.654	-2815.758	1625.679	63806.994	110516.956	-0.000
0.9 Dead+1.0 Wind 240 deg - No Ice	10182.490	-2815.758	1625.679	63624.099	110200.172	-0.000
1.2 Dead+1.0 Wind 270 deg - No Ice	13576.654	-3251.357	0.000	139.364	127576.644	-225.979
0.9 Dead+1.0 Wind 270 deg - No Ice	10182.490	-3251.357	0.000	104.261	127220.259	-225.901
1.2 Dead+1.0 Wind 300 deg - No Ice	13576.654	-2815.758	-1625.679	-63528.263	110516.950	-391.406
0.9 Dead+1.0 Wind 300 deg - No Ice	10182.490	-2815.758	-1625.679	-63415.574	110200.167	-391.273
1.2 Dead+1.0 Wind 330 deg - No Ice	13576.654	-1625.679	-2815.758	-110136.195	63909.009	-451.957
0.9 Dead+1.0 Wind 330 deg - No Ice	10182.490	-1625.679	-2815.758	-109915.316	63700.418	-451.803
1.2 Dead+1.0 Ice+1.0 Temp	16995.423	0.000	0.000	154.642	267.848	0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	16995.423	-0.000	-732.934	-30485.894	271.232	-43.751
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	16995.423	366.467	-634.740	-26380.579	-15050.013	-25.260
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	16995.423	634.740	-366.467	-15164.649	-26265.943	-0.000
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	16995.423	732.934	0.000	156.596	-30371.258	25.260
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	16995.423	634.740	366.467	15477.841	-26265.943	43.751
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	16995.423	366.467	634.740	26693.770	-15050.013	50.519
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	16995.423	-0.000	732.934	30799.086	271.232	43.751
1.2 Dead+1.0 Wind 210	16995.423	-366.467	634.740	26693.771	15592.477	25.260

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<i>Load Combination</i>	<i>Vertical</i>	<i>Shear_x</i>	<i>Shear_y</i>	<i>Overturning Moment, M_x</i>	<i>Overturning Moment, M_y</i>	<i>Torque</i>
	<i>lb</i>	<i>lb</i>	<i>lb</i>	<i>lb-ft</i>	<i>lb-ft</i>	<i>lb-ft</i>
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 240	16995.423	-634.740	366.467	15477.841	26808.407	-0.000
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 270	16995.423	-732.934	0.000	156.596	30913.722	-25.260
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 300	16995.423	-634.740	-366.467	-15164.649	26808.407	-43.751
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 330	16995.423	-366.467	-634.740	-26380.579	15592.477	-50.519
deg+1.0 Ice+1.0 Temp						
Dead+Wind 0 deg - Service	11313.878	-0.000	-1171.643	-45698.100	200.824	-141.014
Dead+Wind 30 deg - Service	11313.878	585.822	-1014.673	-39560.181	-22706.198	-81.414
Dead+Wind 60 deg - Service	11313.878	1014.673	-585.822	-22791.077	-39475.303	-0.000
Dead+Wind 90 deg - Service	11313.878	1171.643	0.000	115.946	-45613.221	81.414
Dead+Wind 120 deg - Service	11313.878	1014.673	585.822	23022.969	-39475.303	141.014
Dead+Wind 150 deg - Service	11313.878	585.822	1014.673	39792.074	-22706.199	162.829
Dead+Wind 180 deg - Service	11313.878	-0.000	1171.643	45929.993	200.824	141.014
Dead+Wind 210 deg - Service	11313.878	-585.822	1014.673	39792.075	23107.848	81.414
Dead+Wind 240 deg - Service	11313.878	-1014.673	585.822	23022.970	39876.954	-0.000
Dead+Wind 270 deg - Service	11313.878	-1171.643	0.000	115.946	46014.872	-81.414
Dead+Wind 300 deg - Service	11313.878	-1014.673	-585.822	-22791.078	39876.953	-141.014
Dead+Wind 330 deg - Service	11313.878	-585.822	-1014.673	-39560.182	23107.848	-162.829

Solution Summary

<i>Load Comb.</i>	<i>Sum of Applied Forces</i>			<i>Sum of Reactions</i>			<i>% Error</i>
	<i>PX lb</i>	<i>PY lb</i>	<i>PZ lb</i>	<i>PX lb</i>	<i>PY lb</i>	<i>PZ lb</i>	
1	0.000	-11313.878	0.000	0.000	11313.878	0.000	0.000%
2	0.000	-13576.654	-3251.357	0.000	13576.654	3251.357	0.000%
3	0.000	-10182.490	-3251.357	0.000	10182.490	3251.357	0.000%
4	1625.679	-13576.654	-2815.758	-1625.679	13576.654	2815.758	0.000%
5	1625.679	-10182.490	-2815.758	-1625.679	10182.490	2815.758	0.000%
6	2815.758	-13576.654	-1625.679	-2815.758	13576.654	1625.679	0.000%
7	2815.758	-10182.490	-1625.679	-2815.758	10182.490	1625.679	0.000%
8	3251.357	-13576.654	0.000	-3251.357	13576.654	-0.000	0.000%
9	3251.357	-10182.490	0.000	-3251.357	10182.490	-0.000	0.000%
10	2815.758	-13576.654	1625.679	-2815.758	13576.654	-1625.679	0.000%
11	2815.758	-10182.490	1625.679	-2815.758	10182.490	-1625.679	0.000%
12	1625.679	-13576.654	2815.758	-1625.679	13576.654	-2815.758	0.000%
13	1625.679	-10182.490	2815.758	-1625.679	10182.490	-2815.758	0.000%
14	0.000	-13576.654	3251.357	0.000	13576.654	-3251.357	0.000%
15	0.000	-10182.490	3251.357	0.000	10182.490	-3251.357	0.000%
16	-1625.679	-13576.654	2815.758	1625.679	13576.654	-2815.758	0.000%
17	-1625.679	-10182.490	2815.758	1625.679	10182.490	-2815.758	0.000%
18	-2815.758	-13576.654	1625.679	2815.758	13576.654	-1625.679	0.000%
19	-2815.758	-10182.490	1625.679	2815.758	10182.490	-1625.679	0.000%
20	-3251.357	-13576.654	0.000	3251.357	13576.654	-0.000	0.000%
21	-3251.357	-10182.490	0.000	3251.357	10182.490	-0.000	0.000%
22	-2815.758	-13576.654	-1625.679	2815.758	13576.654	1625.679	0.000%
23	-2815.758	-10182.490	-1625.679	2815.758	10182.490	1625.679	0.000%
24	-1625.679	-13576.654	-2815.758	1625.679	13576.654	2815.758	0.000%
25	-1625.679	-10182.490	-2815.758	1625.679	10182.490	2815.758	0.000%
26	0.000	-16995.423	0.000	0.000	16995.423	0.000	0.000%
27	0.000	-16995.423	-732.934	0.000	16995.423	732.934	0.000%
28	366.467	-16995.423	-634.739	-366.467	16995.423	634.740	0.000%
29	634.739	-16995.423	-366.467	-634.740	16995.423	366.467	0.000%
30	732.934	-16995.423	0.000	-732.934	16995.423	-0.000	0.000%
31	634.739	-16995.423	366.467	-634.740	16995.423	-366.467	0.000%

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<i>Load Comb.</i>	<i>Sum of Applied Forces</i>			<i>Sum of Reactions</i>			<i>% Error</i>
	<i>PX lb</i>	<i>PY lb</i>	<i>PZ lb</i>	<i>PX lb</i>	<i>PY lb</i>	<i>PZ lb</i>	
32	366.467	-16995.423	634.739	-366.467	16995.423	-634.740	0.000%
33	0.000	-16995.423	732.934	0.000	16995.423	-732.934	0.000%
34	-366.467	-16995.423	634.739	366.467	16995.423	-634.740	0.000%
35	-634.739	-16995.423	366.467	634.740	16995.423	-366.467	0.000%
36	-732.934	-16995.423	0.000	732.934	16995.423	-0.000	0.000%
37	-634.739	-16995.423	-366.467	634.740	16995.423	366.467	0.000%
38	-366.467	-16995.423	-634.739	366.467	16995.423	634.740	0.000%
39	0.000	-11313.878	-1171.643	0.000	11313.878	1171.643	0.000%
40	585.822	-11313.878	-1014.673	-585.822	11313.878	1014.673	0.000%
41	1014.673	-11313.878	-585.822	-1014.673	11313.878	585.822	0.000%
42	1171.643	-11313.878	0.000	-1171.643	11313.878	0.000	0.000%
43	1014.673	-11313.878	585.822	-1014.673	11313.878	-585.822	0.000%
44	585.822	-11313.878	1014.673	-585.822	11313.878	-1014.673	0.000%
45	0.000	-11313.878	1171.643	0.000	11313.878	-1171.643	0.000%
46	-585.822	-11313.878	1014.673	585.822	11313.878	-1014.673	0.000%
47	-1014.673	-11313.878	585.822	1014.673	11313.878	-585.822	0.000%
48	-1171.643	-11313.878	0.000	1171.643	11313.878	0.000	0.000%
49	-1014.673	-11313.878	-585.822	1014.673	11313.878	585.822	0.000%
50	-585.822	-11313.878	-1014.673	585.822	11313.878	1014.673	0.000%

Non-Linear Convergence Results

<i>Load Combination</i>	<i>Converged?</i>	<i>Number of Cycles</i>	<i>Displacement Tolerance</i>	<i>Force Tolerance</i>
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00000001
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000001
23	Yes	4	0.00000001	0.00000001
24	Yes	4	0.00000001	0.00000001
25	Yes	4	0.00000001	0.00000001
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00002716
28	Yes	4	0.00000001	0.00002725
29	Yes	4	0.00000001	0.00002722
30	Yes	4	0.00000001	0.00002708
31	Yes	4	0.00000001	0.00002734
32	Yes	4	0.00000001	0.00002745

tnxTower Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	11 of 13
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33	Yes	4	0.00000001	0.00002739
34	Yes	4	0.00000001	0.00002765
35	Yes	4	0.00000001	0.00002768
36	Yes	4	0.00000001	0.00002747
37	Yes	4	0.00000001	0.00002756
38	Yes	4	0.00000001	0.00002746
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation <i>ft</i>	Horz. Deflection <i>in</i>	Gov. Load Comb.	Tilt °	Twist °
L1	80 - 70	1.711	47	0.284	0.000
L2	70 - 60	1.136	47	0.252	0.000
L3	60 - 48	0.646	47	0.206	0.000
L4	48 - 1	0.298	47	0.047	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation <i>ft</i>	Appurtenance	Gov. Load Comb.	Deflection <i>in</i>	Tilt °	Twist °	Radius of Curvature <i>ft</i>
79.000	AIR 6419 B77G w/ Mount Pipe	47	1.652	0.281	0.000	34405
74.000	AIR 6419 B77D	47	1.362	0.264	0.000	28629
69.000	Canister Load2	47	1.081	0.249	0.000	13382
64.000	800372991 w/ Mount Pipe	47	0.823	0.233	0.000	7212
59.000	Canister Load3	47	0.607	0.196	0.000	5774
56.000	800372991 w/ Mount Pipe	47	0.503	0.160	0.000	6499
47.000	Canister Load4	47	0.277	0.035	0.000	12754
26.750	(2) Box Light	47	0.033	0.000	0.000	23826

Maximum Tower Deflections - Design Wind

Section No.	Elevation <i>ft</i>	Horz. Deflection <i>in</i>	Gov. Load Comb.	Tilt °	Twist °
L1	80 - 70	4.757	18	0.791	0.001
L2	70 - 60	3.157	18	0.701	0.001
L3	60 - 48	1.793	18	0.573	0.001

tnxTower Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	12 of 13
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	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

Section No.	Elevation <i>ft</i>	Horz. Deflection <i>in</i>	Gov. Load Comb.	Tilt °	Twist °
L4	48 - 1	0.825	18	0.131	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation <i>ft</i>	Appurtenance	Gov. Load Comb.	Deflection <i>in</i>	Tilt °	Twist °	Radius of Curvature <i>ft</i>
79.000	AIR 6419 B77G w/ Mount Pipe	18	4.594	0.782	0.001	12340
74.000	AIR 6419 B77D	18	3.785	0.734	0.001	10268
69.000	Canister Load2	18	3.004	0.694	0.001	4795
64.000	800372991 w/ Mount Pipe	18	2.286	0.647	0.001	2586
59.000	Canister Load3	18	1.685	0.546	0.001	2071
56.000	800372991 w/ Mount Pipe	18	1.395	0.446	0.001	2332
47.000	Canister Load4	18	0.768	0.096	0.001	4587
26.750	(2) Box Light	19	0.092	0.000	0.000	8571

Compression Checks

Pole Design Data

Section No.	Elevation <i>ft</i>	Size	L <i>ft</i>	L _u <i>ft</i>	Kl/r	A <i>in</i> ²	P _a <i>lb</i>	ΦP _a <i>lb</i>	Ratio $\frac{P_a}{\Phi P_a}$
L1	80 - 70 (1)	P6.625x0.28	10.000	0.000	0.0	5.581	-913.982	175813.000	0.005
L2	70 - 60 (2)	P8.625x0.5	10.000	0.000	0.0	12.763	-2669.580	402026.000	0.007
L3	60 - 48 (3)	P8.625x0.5	12.000	0.000	0.0	12.763	-4535.010	402026.000	0.011
L4	48 - 1 (4)	P36x0.375	47.000	0.000	0.0	41.970	-13576.300	1490100.000	0.009

Pole Bending Design Data

Section No.	Elevation <i>ft</i>	Size	M _{ux} <i>lb-ft</i>	ΦM _{ux} <i>lb-ft</i>	Ratio $\frac{M_{ux}}{\Phi M_{ux}}$	M _{uy} <i>lb-ft</i>	ΦM _{uy} <i>lb-ft</i>	Ratio $\frac{M_{uy}}{\Phi M_{uy}}$
L1	80 - 70 (1)	P6.625x0.28	1991.925	29609.583	0.067	0.000	29609.583	0.000
L2	70 - 60 (2)	P8.625x0.5	7874.083	86755.000	0.091	0.000	86755.000	0.000
L3	60 - 48 (3)	P8.625x0.5	19830.417	86755.000	0.229	0.000	86755.000	0.000
L4	48 - 1 (4)	P36x0.375	127614.167	1338808.333	0.095	0.000	1338808.333	0.000

Pole Shear Design Data

tnxTower Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	Page
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	Project	Date
	TEP No. 340502.1060260	15:28:08 02/06/25
	Client	Designed by
	Smartlink LLC	Ryan M. Barger, E.I.

Section No.	Elevation	Size	Actual V_u lb	ϕV_u lb	Ratio $\frac{V_u}{\phi V_u}$	Actual T_u lb-ft	ϕT_u lb-ft	Ratio $\frac{T_u}{\phi T_u}$
	ft							
L1	80 - 70 (1)	P6.625x0.28	223.954	52743.801	0.004	0.000	29422.667	0.000
L2	70 - 60 (2)	P8.625x0.5	632.419	120608.000	0.005	0.000	86154.167	0.000
L3	60 - 48 (3)	P8.625x0.5	1013.500	120608.000	0.008	0.000	86154.167	0.000
L4	48 - 1 (4)	P36x0.375	3252.840	475937.000	0.007	0.000	1368341.667	0.000

Pole Interaction Design Data

Section No.	Elevation	Ratio P_u ϕP_u	Ratio M_{ux} ϕM_{ux}	Ratio M_{uy} ϕM_{uy}	Ratio V_u ϕV_u	Ratio T_u ϕT_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft								
L1	80 - 70 (1)	0.005	0.067	0.000	0.004	0.000	0.072	1.050	
L2	70 - 60 (2)	0.007	0.091	0.000	0.005	0.000	0.097	1.050	
L3	60 - 48 (3)	0.011	0.229	0.000	0.008	0.000	0.240	1.050	
L4	48 - 1 (4)	0.009	0.095	0.000	0.007	0.000	0.104	1.050	

Section Capacity Table

Section No.	Elevation	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
	ft							
L1	80 - 70	Pole	P6.625x0.28	1	-913.982	184603.641	6.9	Pass
L2	70 - 60	Pole	P8.625x0.5	2	-2669.580	422127.281	9.3	Pass
L3	60 - 48	Pole	P8.625x0.5	3	-4535.010	422127.281	22.9	Pass
L4	48 - 1	Pole	P36x0.375	4	-13576.300	1564604.87	10.0	Pass
5								
Summary								
Pole (L3)							22.9	Pass
RATING =							22.9	Pass

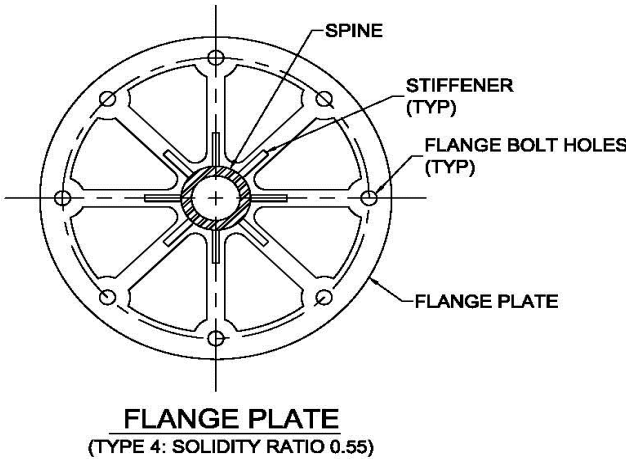
APPENDIX B
ADDITIONAL CALCULATIONS

CCI Flagpole Tool

Site Data	
BU#:	10038029
Site Name:	SOUTH HILL MALL
Order #:	340502.1060260

Code	
Code:	TIA-222-H
Ice Thickness:	0 in
Windspeed (V):	97 mph
Ice Wind Speed (V):	30 mph
Exposure Category:	C
Topographic Feature:	N/A
Risk Category:	II

Tower Information	
Total Tower Height:	79 ft
Base Tower Height:	47 ft
Total Canister Length:	32 ft
Number of Canister Assembly Sections:	3



Canister Section Number ¹ :	Canister Assembly Length (ft):	Canister Assembly Diameter (in):	Ventilated Canister:	Manufacturer ² :	Number of Sides Canister Section	Plate Type:	Mating Flange Plate Thickness (in) ³ :	Mating Flange Plate Diameter (in):	Solidity Ratio	Plate Weight (Kip):	Canister Weight (Kip)	Vent Length (ft):
1	10	40	No		Round	4	0.75	42	0.55	0.324	0.209	0-0
2	10	36	No		Round	4	0.75	36	0.55	0.238	0.188	0-0
3	12	36	No		Round	4	0.75	36	0.55	0.238	0.226	0-0

¹ Sections are numbered from the top of the tower down

² Select manufacturer if available for vented canister. Leave blank to autocalculate Cf values.

³ Mating Flange Plate Thickness at the bottom of canister section

Flag on Tower:	No
----------------	----

Truck Ball on Tower:	No
----------------------	----

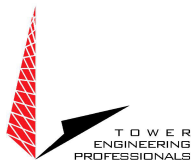
Geometry : Base Tower + Spine				SOUTH HILL MALL (WA6413) - with canister.eri (last saved 02/ 5 3:17 pm)				
Pole Height Above Base (ft)	Section Length (ft)	Lap Splice Length (ft)	Number of Sides	Top Diameter (in)	Bottom Diameter (in)	Wall Thickness (in)	Bend Radius (in)	Pole Material
79	10		0	6.625	6.625	0.28	n/a	A53-B-35
69	10		0	8.625	8.625	0.5	n/a	A53-B-35
59	12		0	8.625	8.625	0.5	n/a	A53-B-35
47	47		0	36	36	0.375	n/a	A36

Delete
[x]
[x]
[x]
[x]

Discrete Loads : C _F A _F for Canister Assembly								
Canister Loading	Apply C _F A _F at Elevation(z) (ft)	C _F A _F No Ice (ft ²)	C _F A _F 1/2" Ice (ft ²)	C _F A _F 1" Ice (ft ²)	C _F A _F 2" Ice (ft ²)	C _F A _F 4" Ice (ft ²)	Canister Assembly Weight No Ice (Kip)	Canister Assembly Weight 1/2" Ice (Kip)
Canister Load 1	79	7.500	18.792	19.250	20.167	22.000	0.105	0.228
Canister Load 2	69	14.250	35.750	36.667	38.500	42.167	0.523	0.758
Canister Load 3	59	14.850	37.308	38.317	40.333	44.367	0.445	0.691
Canister Load 4	47	8.100	38.130	39.043	40.869	44.520	0.351	0.485

Deflection Check Required:	Yes	Import Deflection Results
3% Spine Deflection Check		
Allowable (3%) Horizontal Spine Deflection (inches)	Actual Deflection ¹ (inches)	Sufficient/ Insufficient
11.520		

¹ Relative deflection under service level wind speed



Bolt Capacity: **2.4%** **PASS** *
 Flange Capacity: **23.5%** **PASS** *

SOUTH HILL MALL (10038029)

TEP #: 340502.1060260

Analysis: PW 2/6/2025

Check: RMB 2/6/2025

Spoked Flange Check_TIA-222-H_v0.5.5

*Capacity per Section 15.5

Section Reactions

Elevation: 69 ft
 Moment: 2.0 k-ft
 Axial: 0.9 k
 Shear: 0.2 k

Bolts

Diameter: 0.625 in
 Grade: A325N
 Bolt Qty: 6
 Bolt Circle: 24 in
 F_y : 92 ksi
 F_u : 120 ksi

Top Stiffener Plate Geometry

Height: 8 in
 Width: 8 in
 Thickness: 0.5 in
 Chamfer: 0.75 in
 F_y : 36 ksi
 F_u : 58 ksi

Top Stiffener Qty: 6

ϕ_b : 0.90 ϕ_{vy} : 1.00
 ϕ_w : 0.75 ϕ_{ty} : 0.90

ϕ_{vr} : 0.75
 ϕ_{tr} : 0.75

ϕ_c : 0.90

Flange Bolts

A_{net} : 0.226 in²
 A_g : 0.307 in²
 $F_{bolt, max, T}$: 0.51 k
 $F_{bolt, max, C}$: 0.82 k
 $V_{bolt, max}$: 0.04 k
 $\phi_{R_{nt}}$: 20.34 k
 $\phi_{R_{nv}}$: 12.43 k
 Capacity: **2.4%** **PASS** *

Top Pole Geometry

Diameter: 8.625 in
 Thickness: 0.5 in
 F_y : 35 ksi
 F_u : 60 ksi

Bottom Pole Geometry

Diameter: 8.625 in
 Thickness: 0.5 in
 F_y : 35 ksi
 F_u : 60 ksi

Top Spoke Plate Geometry

Inner Dia.: 8.625 in
 Outer Dia.: 42 in
 Spoke Width: 7.5 in
 Thickness: 0.75 in
 Spoke Qty.: 6
 F_y : 50 ksi
 F_u : 65 ksi
 Z_{spoke} : 1.05 in³

Bottom Spoke Plate Geometry

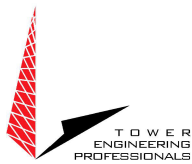
Inner Dia.: 8.625 in
 Outer Dia.: 42 in
 Spoke Width: 7.5 in
 Thickness: 0.75 in
 Spoke Qty.: 6
 F_y : 50 ksi
 F_u : 65 ksi
 Z_{spoke} : 1.05 in³

Top Spoked Flange Plate

e_{spoke} : -0.31 in
 $M_{spoke, Z}$: -0.26 k-in
 $\phi M_{n, y}$: 47.46 k-in
 Capacity: **-0.5%** **PASS** *

Bottom Spoked Flange Plate

e_{spoke} : 7.69 in
 $M_{spoke, Z}$: 4.79 k-in
 $\phi M_{n, y}$: 47.46 k-in
 Capacity: **9.6%** **PASS** *



Spoked Flange Check_TIA-222-H_v0.5.5 (Cont.)

Stiffener Plate

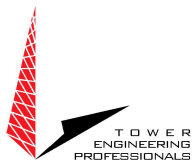
$A_{g,vert}$:	3.63	in^2	
$A_{g,horiz}$:	3.63	in^2	
e_{stiff} :	7.69	in	
I_{stiff} :	85.26	in^4	
$M_{u,vert}$:	6.28	$k-in$	
$\phi M_{n,vert}$:	25.42	$k-in$	
Capacity:	23.5%	PASS	*
$V_{u,vert}$:	0.82	k	
$\phi V_{n,vert}$:	78.30	k	
Capacity:	1.0%	PASS	*
M&V Interaction:	23.5%	PASS	*
Q:	1.17	k	
$\phi V_{n,horiz}$:	78.30	k	
Capacity:	1.4%	PASS	*
$T_{u,horiz}$:	0.82	k	
$\phi T_{n,horiz}$:	117.45	k	
Capacity:	0.7%	PASS	*
V&T Interaction:	1.6%	PASS	*
z:	0.21	(AISC 13th p. 15-3)	
P_u :	0.82	k - maximum force in stiffener	
ϕP_n :	27.22	k - design strength of stiffener in comp.	
Capacity:	2.9%	PASS	*

Stiffener Welds - Vertical

L:	45.22	in^4	(at pole face)
D:	3	# of 16ths of an in of fillet weld	
t_w :	0.27	in - effective throat of weld (assumes N.S. & F.S.)	
F_{EXX} :	70	ksi	
$I_{weld,vert}$:	7.25	in	
$f_{v//}$:	0.42	ksi - horizontal stress from P_{stiff} (acting $\parallel$ to weld)	
$f_{v\perp}$:	1.11	ksi - vertical stress from M (acting $\perp$ to weld)	
$\phi R_{w//}$:	31.50	ksi	
$\phi R_{w\perp}$:	47.25	ksi	
ϕR_{vbase} :	79.20	ksi - allowable base metal stress (if $t_w = t_{pole}$)	
Capacity:	2.6%	PASS	*

Stiffener Welds - Horizontal

D:	3	# of 16ths of an in of fillet weld	
Groove:		in - depth of groove ($1/2 * t$ for full penetration)	
a:		deg - groove angle	
t_w :	0.27	in - effective throat of weld (assumes N.S. & F.S.)	
F_{EXX} :	70	ksi - weld electrode classification	
$I_{weld,horiz}$:	7.25	in	
$f_{v//}$:	0.42	ksi - horizontal stress from Q (acting $\parallel$ to weld)	
$f_{v\perp}$:	0.42	ksi - vertical stress from $V_{u,horiz}$ (acting $\perp$ to weld)	
$\phi R_{w//}$:	31.50	ksi	
$\phi R_{w\perp}$:	47.25	ksi	
ϕR_{vbase} :	79.20	ksi - allowable base metal stress (if $t_w = t_{base PL}$)	
Capacity:	1.5%	PASS	*



Bolt Capacity: **8.1%** **PASS** *
 Flange Capacity: **23.7%** **PASS** *

Spoked Flange Check_TIA-222-H_v0.5.5

*Capacity per Section 15.5

SOUTH HILL MALL (10038029)

TEP #: 340502.1060260

Analysis: PW 2/6/2025

Check: RMB 2/6/2025

Section Reactions

Elevation: 59 ft
 Moment: 7.9 k-ft
 Axial: 2.7 k
 Shear: 0.6 k

Bolts

Diameter: 0.625 in
 Grade: A325N
 Bolt Qty: 6
 Bolt Circle: 29 in
 F_y : 92 ksi
 F_u : 120 ksi

Top Stiffener Plate Geometry

Height: 8 in
 Width: 8 in
 Thickness: 0.5 in
 Chamfer: 0.75 in
 F_y : 36 ksi
 F_u : 58 ksi

Top Stiffener Qty: 6

ϕ_b : 0.90 ϕ_{vy} : 1.00
 ϕ_w : 0.75 ϕ_{ty} : 0.90

ϕ_{vr} : 0.75
 ϕ_{tr} : 0.75

ϕ_c : 0.90

Flange Bolts

A_{net} : 0.226 in²
 A_g : 0.307 in²
 $F_{bolt, max, T}$: 1.73 k
 $F_{bolt, max, C}$: 2.62 k
 $V_{bolt, max}$: 0.11 k
 ϕR_{nt} : 20.34 k
 ϕR_{nv} : 12.43 k
 Capacity: **8.1%** **PASS** *

Top Pole Geometry

Diameter: 8.625 in
 Thickness: 0.5 in
 F_y : 35 ksi
 F_u : 60 ksi

Bottom Pole Geometry

Diameter: 8.625 in
 Thickness: 0.5 in
 F_y : 35 ksi
 F_u : 60 ksi

Top Spoke Plate Geometry

Inner Dia.: 8.625 in
 Outer Dia.: 36 in
 Spoke Width: 7.5 in
 Thickness: 0.75 in
 Spoke Qty.: 6
 F_y : 50 ksi
 F_u : 65 ksi
 Z_{spoke} : 1.05 in³

Bottom Spoke Plate Geometry

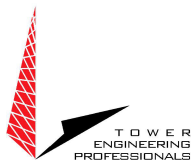
Inner Dia.: 8.625 in
 Outer Dia.: 36 in
 Spoke Width: 7.5 in
 Thickness: 0.75 in
 Spoke Qty.: 6
 F_y : 50 ksi
 F_u : 65 ksi
 Z_{spoke} : 1.05 in³

Top Spoked Flange Plate

e_{spoke} : 2.19 in
 $M_{spoke, Z}$: 5.72 k-in
 $\phi M_{n, y}$: 47.46 k-in
 Capacity: **11.5%** **PASS** *

Bottom Spoked Flange Plate

e_{spoke} : 10.19 in
 $M_{spoke, Z}$: 7.68 k-in
 $\phi M_{n, y}$: 47.46 k-in
 Capacity: **15.4%** **PASS** *



Spoked Flange Check_TIA-222-H_v0.5.5 (Cont.)

Stiffener Plate

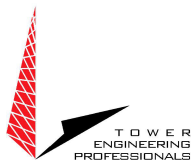
$A_{g,vert}$:	3.63	in^2	
$A_{g,horiz}$:	3.63	in^2	
e_{stiff} :	10.19	in	
I_{stiff} :	85.26	in^4	
$M_{u,vert}$:	26.66	$k-in$	
$\phi M_{n,vert}$:	107.98	$k-in$	
Capacity:	23.5%	PASS	*
$V_{u,vert}$:	2.62	k	
$\phi V_{n,vert}$:	78.30	k	
Capacity:	3.2%	PASS	*
M&V Interaction:	23.7%	PASS	*
Q:	4.96	k	
$\phi V_{n,horiz}$:	78.30	k	
Capacity:	6.0%	PASS	*
$T_{u,horiz}$:	2.62	k	
$\phi T_{n,horiz}$:	117.45	k	
Capacity:	2.1%	PASS	*
V&T Interaction:	6.4%	PASS	*
z:	0.21	(AISC 13th p. 15-3)	
P_u :	2.62	k - maximum force in stiffener	
ϕP_n :	27.22	k - design strength of stiffener in comp.	
Capacity:	9.2%	PASS	*

Stiffener Welds - Vertical

I:	45.22	in^4	(at pole face)
D:	3	# of 16ths of an in of fillet weld	
t_w :	0.27	in - effective throat of weld (assumes N.S. & F.S.)	
F_{EXX} :	70	ksi	
$I_{weld,vert}$:	7.25	in	
$f_{v//}$:	1.36	ksi - horizontal stress from P_{stiff} (acting $\parallel$ to weld)	
$f_{v\perp}$:	4.72	ksi - vertical stress from M (acting $\perp$ to weld)	
$\phi R_{w//}$:	31.50	ksi	
$\phi R_{w\perp}$:	47.25	ksi	
ϕR_{vbase} :	79.20	ksi - allowable base metal stress (if $t_w = t_{pole}$)	
Capacity:	10.4%	PASS	*

Stiffener Welds - Horizontal

D:	3	# of 16ths of an in of fillet weld	
Groove:		in - depth of groove ($1/2 * t$ for full penetration)	
a:		deg - groove angle	
t_w :	0.27	in - effective throat of weld (assumes N.S. & F.S.)	
F_{EXX} :	70	ksi - weld electrode classification	
$I_{weld,horiz}$:	7.25	in	
$f_{v//}$:	1.36	ksi - horizontal stress from Q (acting $\parallel$ to weld)	
$f_{v\perp}$:	1.36	ksi - vertical stress from $V_{u,horiz}$ (acting $\perp$ to weld)	
$\phi R_{w//}$:	31.50	ksi	
$\phi R_{w\perp}$:	47.25	ksi	
ϕR_{vbase} :	79.20	ksi - allowable base metal stress (if $t_w = t_{base PL}$)	
Capacity:	4.9%	PASS	*



Bolt Capacity: **12.0%** **PASS** *
 Flange Capacity: **34.0%** **PASS** *

Spoked Flange Check_TIA-222-H_v0.5.5

*Capacity per Section 15.5

SOUTH HILL MALL (10038029)

TEP #: 340502.1060260

Analysis: PW 2/6/2025

Check: RMB 2/6/2025

Section Reactions

Elevation: 47 ft
 Moment: 19.8 k-ft
 Axial: 4.5 k
 Shear: 1.0 k

Bolts

Diameter: 0.75 in
 Grade: A490
 Bolt Qty: 6
 Bolt Circle: 29 in
 F_y : 130 ksi
 F_u : 150 ksi

Top Stiffener Plate Geometry

Height: 8 in
 Width: 8 in
 Thickness: 0.5 in
 Chamfer: 0.75 in
 F_y : 36 ksi
 F_u : 58 ksi

Top Stiffener Qty: 6

ϕ_b : 0.90 ϕ_{vy} : 1.00
 ϕ_w : 0.75 ϕ_{ty} : 0.90

ϕ_{vr} : 0.75
 ϕ_{tr} : 0.75

ϕ_c : 0.90

Flange Bolts

A_{net} : 0.334 in²
 A_g : 0.442 in²
 $F_{bolt, max, T}$: 4.71 k
 $F_{bolt, max, C}$: 6.23 k
 $V_{bolt, max}$: 0.17 k
 ϕR_{nt} : 37.58 k
 ϕR_{nv} : 22.37 k
 Capacity: **12.0%** **PASS** *

Top Pole Geometry

Diameter: 8.625 in
 Thickness: 0.5 in
 F_y : 35 ksi
 F_u : 60 ksi

Bottom Pole Geometry

Diameter: 36 in
 Thickness: 0.375 in
 F_y : 42 ksi
 F_u : 60 ksi

Top Spoke Plate Geometry

Inner Dia.: 8.625 in
 Outer Dia.: 36 in
 Spoke Width: 7.5 in
 Thickness: 0.75 in
 Spoke Qty.: 6
 F_y : 50 ksi
 F_u : 65 ksi
 Z_{spoke} : 1.05 in³

Bottom Spoke Plate Geometry

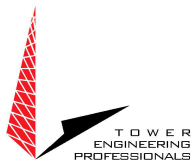
Inner Dia.: 8.625 in
 Outer Dia.: 36 in
 Spoke Width: 8 in
 Thickness: 0.75 in
 Spoke Qty.: 6
 F_y : 50 ksi
 F_u : 65 ksi
 Z_{spoke} : 1.13 in³

Top Spoked Flange Plate

e_{spoke} : 2.19 in
 $M_{spoke, Z}$: 13.62 k-in
 $\phi M_{n, y}$: 47.46 k-in
 Capacity: **27.3%** **PASS** *

Bottom Spoked Flange Plate

e_{spoke} : 3.13 in
 $M_{spoke, Z}$: 18.07 k-in
 $\phi M_{n, y}$: 50.63 k-in
 Capacity: **34.0%** **PASS** *



Spoked Flange Check_TIA-222-H_v0.5.5 (Cont.)

Stiffener Plate

$A_{g,vert}$:	3.63	in^2	
$A_{g,horiz}$:	3.63	in^2	
e_{stiff} :	10.19	in	
I_{stiff} :	85.26	in^4	
$M_{u,vert}$:	63.43	$k-in$	
$\phi M_{n,vert}$:	256.89	$k-in$	
Capacity:	23.5%	PASS	*
$V_{u,vert}$:	6.23	k	
$\phi V_{n,vert}$:	78.30	k	
Capacity:	7.6%	PASS	*
M&V Interaction:	24.7%	PASS	*
Q:	11.80	k	
$\phi V_{n,horiz}$:	78.30	k	
Capacity:	14.4%	PASS	*
$T_{u,horiz}$:	6.23	k	
$\phi T_{n,horiz}$:	117.45	k	
Capacity:	5.0%	PASS	*
V&T Interaction:	15.2%	PASS	*
z:	0.21	(AISC 13th p. 15-3)	
P_u :	6.23	k - maximum force in stiffener	
ϕP_n :	27.22	k - design strength of stiffener in comp.	
Capacity:	21.8%	PASS	*

Stiffener Welds - Vertical

I:	45.22	in^4	(at pole face)
D:	3	# of 16ths of an in of fillet weld	
t_w :	0.27	in - effective throat of weld (assumes N.S. & F.S.)	
F_{EXX} :	70	ksi	
$I_{weld,vert}$:	7.25	in	
$f_{v//}$:	3.24	ksi - horizontal stress from P_{stiff} (acting $\parallel$ to weld)	
$f_{v\perp}$:	11.22	ksi - vertical stress from M (acting $\perp$ to weld)	
$\phi R_{w//}$:	31.50	ksi	
$\phi R_{w\perp}$:	47.25	ksi	
ϕR_{vbase} :	79.20	ksi - allowable base metal stress (if $t_w = t_{pole}$)	
Capacity:	24.6%	PASS	*

Stiffener Welds - Horizontal

D:	3	# of 16ths of an in of fillet weld	
Groove:		in - depth of groove ($1/2 * t$ for full penetration)	
a:		deg - groove angle	
t_w :	0.27	in - effective throat of weld (assumes N.S. & F.S.)	
F_{EXX} :	70	ksi - weld electrode classification	
$I_{weld,horiz}$:	7.25	in	
$f_{v//}$:	3.24	ksi - horizontal stress from Q (acting $\parallel$ to weld)	
$f_{v\perp}$:	3.24	ksi - vertical stress from $V_{u,horiz}$ (acting $\perp$ to weld)	
$\phi R_{w//}$:	31.50	ksi	
$\phi R_{w\perp}$:	47.25	ksi	
ϕR_{vbase} :	79.20	ksi - allowable base metal stress (if $t_w = t_{base PL}$)	
Capacity:	11.8%	PASS	*

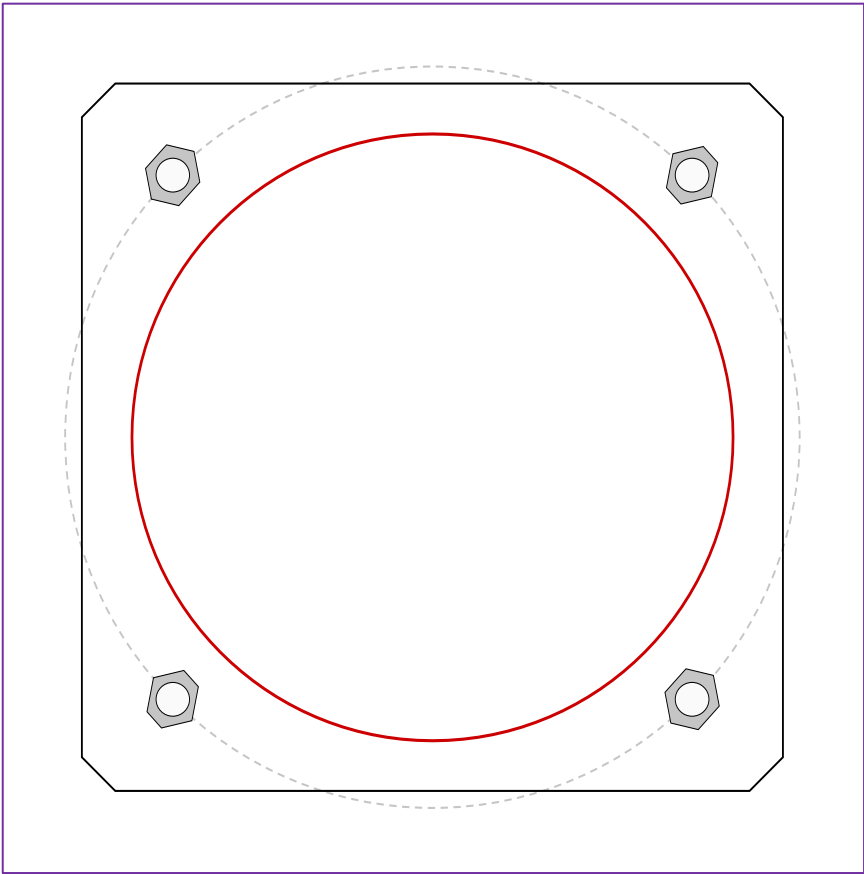
Monopole Base Plate Connection

Site Info	
Site #	10038029
Site Name	SOUTH HILL MALL
TEP #	340502.1060260

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	1

Applied Loads	
Moment (kip-ft)	127.61
Axial Force (kips)	13.58
Shear Force (kips)	3.25

*TIA-222-H Section 15.5 Applied



Connection Properties		Analysis Results	
Anchor Rod Data		Anchor Rod Summary <i>(units of kips, kip-in)</i>	
(4) 2" $\varnothing$ bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi) on 44" BC		$Pu_c = 38.17$	$\phi Pn_c = 155.51$ Stress Rating
Base Plate Data		$Vu = 0.81$	$\phi Vn = 69.98$ 23.4%
42" W x 1.5" Plate (A572-50; Fy=50 ksi, Fu=65 ksi); Clip: 2 in		$Mu = n/a$	$\phi Mn = n/a$ Pass
Stiffener Data		Base Plate Summary	
N/A		Max Stress (ksi):	11.6 (Flexural)
Pole Data		Allowable Stress (ksi):	45
36" x 0.375" round pole (API 5L X42; Fy=42 ksi, Fu=60 ksi)		Stress Rating:	24.6% Pass

Drilled Pier Foundation

BU # :	10038029
Site Name:	SOUTH HILL MALL
Order Number:	340502.1060260
TIA-222 Revision:	H
Tower Type:	Monopole

Applied Loads		
	Comp.	Uplift
Moment (kip-ft)	127.614	
Axial Force (kips)	13.577	
Shear Force (kips)	3.251	

Material Properties		
Concrete Strength, f'c:	4	ksi
Rebar Strength, Fy:	60	ksi
Tie Yield Strength, Fyt:	40	ksi

Pier Design Data		
Depth	12.5	ft
Ext. Above Grade	0.5	ft
Pier Section 1		
From 0.5' above grade to 12.5' below grade		
Pier Diameter	5	ft
Rebar Quantity	12	
Rebar Size	10	
Clear Cover to Ties	4	in
Tie Size	3	
Tie Spacing	4	in

Rebar & Pier Options

Embedded Pole Inputs

Belled Pier Inputs

Analysis Results

Soil Lateral Check	Compression	Uplift
D _{v=0} (ft from TOC)	4.17	-
Soil Safety Factor	5.91	-
Max Moment (kip-ft)	139.00	-
Rating*	21.4%	-

Soil Vertical Check	Compression	Uplift
Skin Friction (kips)	74.22	-
End Bearing (kips)	44.18	-
Weight of Concrete (kips)	45.95	-
Total Capacity (kips)	118.40	-
Axial (kips)	59.52	-
Rating*	47.9%	-

Reinforced Concrete Flexure	Compression	Uplift
Critical Depth (ft from TOC)	4.21	-
Critical Moment (kip-ft)	138.99	-
Critical Moment Capacity	1738.38	-
Rating*	7.6%	-

Reinforced Concrete Shear	Compression	Uplift
Critical Depth (ft from TOC)	9.91	-
Critical Shear (kip)	32.17	-
Critical Shear Capacity	404.01	-
Rating*	7.6%	-

Structural Foundation Rating*	7.6%
Soil Interaction Rating*	47.9%

*Rating per TIA-222-H Section 15.5

Check Limitation	
Apply TIA-222-H Section 15.5:	☒
N/A	☐
Design Options	
Input Effective Depths (else Actual):	☐
Consider non-tapered moment capacity:	☐
Check Shear along Depth of Pier:	☒
Utilize Shear-Friction Methodology:	☐
Override Critical Depth:	☐

[Go to Soil Calculations](#)

Soil Profile														
Groundwater Depth	N/A													

Layer	Top (ft)	Bottom (ft)	Thickness (ft)	Y _{soil} (pcf)	Y _{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	2	2	100	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
2	2	4	2	100	150	0	28	0.000	0.000	0.60	0.60			Cohesionless
3	4	9	5	110	150	0	32	0.000	0.000	0.60	0.60			Cohesionless
4	9	12.5	3.5	110	150	0	38	0.000	0.000	0.60	0.60	3		Cohesionless

APPENDIX C
SEISMIC ANALYSIS

BU: SOUTH HILL MALL
WO: WA6413
Order: 340502.1060260

Structure: A
Rev:

Location				
	Decimal Degrees	Deg	Min	Sec
Lat:	47.159739	+	47	9
Long:	-122.296600	-	122	17
				35.06
				47.76
Code and Site Parameters				
Seismic Design Code:		TIA-222-H-1		
Site Soil:		D (Default) Default		
Risk Category:		II		
<u>USGS Seismic Reference</u>				
	S _s :	1.2640	g	
	S ₁ :	0.4360	g	
	T _L :	6	s	
Seismic Design Category Determination				
Importance Factor, I _e :		1		
Acceleration-based site coefficient, F _a :		1.2000		
Velocity-based site coefficient, F _v :		1.8640		
Design spectral response acceleration short period, S _{DS} :		1.0112	g	
Design spectral response acceleration 1 s period, S _{D1} :		0.5418	g	
		T _s :	0.5358	
Seismic Design Category Based on S _{DS} :		D		
Seismic Design Category Based on S _{D1} :		D		
Seismic Design Category Based on S ₁ :		N/A		
Controlling Seismic Design Category:		D		

BU: SOUTH HILL MALL
WO: WA6413
Order: 340502.1060260

Structure: A
Rev:

Tower Details

Tower Type: Stepped Monopole
Height, h: 79 ft
Effective Seismic Weight, W: 11.31 kips
Amplification Factor, A_s : 1.0 2.7.8.1

Seismic Base Shear

Response Modification Factor, R: 1.5

Discrete Appurtenance Weight in Top 1/3 of Structure, W_u : 2.462523 kips
 W_L : 8.851350446 kips
E: 29000.0 ksi
g: 386.088 in/s²
Average Moment of Inertia, I_{avg} : 3994.639061 in⁴
 F_a : 0.936213035 hz
Approximate Fundamental Period Monopole, T_a : 1.0681 s 2.7.7.1.3.3

Seismic Response Coefficient, C_s : 0.5072 Table 2-12 Note 3
Seismic Response Coefficient Max 1, C_{smax} : N/A
Seismic Response Coefficient Max 2, C_{smax} : N/A
Seismic Response Coefficient Min 1, C_{smin} : 0.0445 2.7.7.1.1
Seismic Response Coefficient Min 2, C_{smin} : N/A 2.7.7.1.1
Controlling Seismic Response Coefficient, C_{sc} : 0.5072

Seismic Base Shear, V: 5.739 kips 2.7.7.1.1

Vertical Distribution Factors

Period Related Exponent, k: 1.284
Sum of $w_i h_i^k$: 1264.00

Tower Section Loads								
Section Number	Length	Top Height	Mid Height, h_x	Section Weight, w_x	$w_x h_x^k$	C_{vx}	F_{xh}	F_{xv}
1 - 1	10.00	79.00	74.00	0.1899	47.73	0.0378	0.2167	0.0384
2 - 1	10.00	69.00	64.00	0.4343	90.58	0.0717	0.4113	0.0878
3 - 1	2.00	59.00	58.00	0.0869	15.96	0.0126	0.0725	0.0176
3 - 2	10.00	57.00	52.00	0.4343	69.38	0.0549	0.3150	0.0878
4 - 1	7.00	47.00	43.50	0.9997	127.00	0.1005	0.5766	0.2022
4 - 2	10.00	40.00	35.00	1.4281	137.23	0.1086	0.6231	0.2888
4 - 3	10.00	30.00	25.00	1.4281	89.09	0.0705	0.4045	0.2888
4 - 4	10.00	20.00	15.00	1.4281	46.23	0.0366	0.2099	0.2888
4 - 5	10.00	10.00	5.00	1.4281	11.28	0.0089	0.0512	0.2888
Sum				7.8576	634.49			

Discrete Loads						
Name	h_x	w_x	$w_x h_x^k$	C_{vx}	F_{xh}	F_{xv}
AIR 6419 B77G w/ Mount Pipe	78.00	0.0784	21.07	0.0167	0.0957	0.0158
AIR 6419 B77G w/ Mount Pipe	78.00	0.0784	21.07	0.0167	0.0957	0.0158
AIR 6419 B77G w/ Mount Pipe	78.00	0.0784	21.07	0.0167	0.0957	0.0158
AIR 6419 B77D	73.00	0.0661	16.32	0.0129	0.0741	0.0134
AIR 6419 B77D	73.00	0.0661	16.32	0.0129	0.0741	0.0134
AIR 6419 B77D	73.00	0.0661	16.32	0.0129	0.0741	0.0134
800372991 w/ Mount Pipe	63.00	0.1121	22.92	0.0181	0.1041	0.0227
800372991 w/ Mount Pipe	63.00	0.1121	22.92	0.0181	0.1041	0.0227
800372991 w/ Mount Pipe	63.00	0.1121	22.92	0.0181	0.1041	0.0227
(2) TMAT192123B68-21	63.00	0.0414	8.46	0.0067	0.0384	0.0084
(2) TMAT192123B68-21	63.00	0.0414	8.46	0.0067	0.0384	0.0084
(2) TMAT192123B68-21	63.00	0.0414	8.46	0.0067	0.0384	0.0084
800372991 w/ Mount Pipe	55.00	0.1121	19.25	0.0152	0.0874	0.0227
800372991 w/ Mount Pipe	55.00	0.1121	19.25	0.0152	0.0874	0.0227
800372991 w/ Mount Pipe	55.00	0.1121	19.25	0.0152	0.0874	0.0227
(2) TMAT192123B68-31	55.00	0.0414	7.11	0.0056	0.0323	0.0084
(2) TMAT192123B68-31	55.00	0.0414	7.11	0.0056	0.0323	0.0084
(2) TMAT192123B68-31	55.00	0.0414	7.11	0.0056	0.0323	0.0084
DC9-48-60-24-PC16-EV	55.00	0.0349	5.99	0.0047	0.0272	0.0071
(2) Box Light	25.75	0.0800	5.18	0.0041	0.0235	0.0162
Canister Load1	78.00	0.1050	28.23	0.0223	0.1282	0.0212
Canister Load2	68.00	0.5230	117.91	0.0933	0.5354	0.1058
Canister Load3	58.00	0.4450	81.79	0.0647	0.3714	0.0900
Canister Load4	46.00	0.3510	47.91	0.0379	0.2175	0.0710
Sum		2.8935	572.44			

Linear Loads								
Name	Start Height	End Height	h_x	w_x	$w_x h_x^k$	C_{vx}	F_{xh}	F_{xv}
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	69.00	78.00	73.50	0.0005	0.13	0.0001	0.0006	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	59.00	69.00	64.00	0.0006	0.13	0.0001	0.0006	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	49.00	59.00	54.00	0.0006	0.10	0.0001	0.0005	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	39.00	49.00	44.00	0.0006	0.08	0.0001	0.0004	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	29.00	39.00	34.00	0.0006	0.06	0.0000	0.0003	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	19.00	29.00	24.00	0.0006	0.04	0.0000	0.0002	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	9.00	19.00	14.00	0.0006	0.02	0.0000	0.0001	0.0001
commscope RFFT-48SM-001-XXX(3/8) From 0 to 78	0.00	9.00	4.50	0.0005	0.00	0.0000	0.0000	0.0001
commscope PWRT-606-S(7/8") From 0 to 78	69.00	78.00	73.50	0.0080	2.00	0.0016	0.0091	0.0016
commscope PWRT-606-S(7/8") From 0 to 78	59.00	69.00	64.00	0.0089	1.86	0.0015	0.0084	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	49.00	59.00	54.00	0.0089	1.49	0.0012	0.0068	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	39.00	49.00	44.00	0.0089	1.15	0.0009	0.0052	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	29.00	39.00	34.00	0.0089	0.82	0.0007	0.0037	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	19.00	29.00	24.00	0.0089	0.53	0.0004	0.0024	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	9.00	19.00	14.00	0.0089	0.26	0.0002	0.0012	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	0.00	9.00	4.50	0.0080	0.06	0.0000	0.0003	0.0016
(8) miscl 7/8" Coax From 0 to 78	69.00	78.00	73.50	0.0191	4.75	0.0038	0.0216	0.0039
(8) miscl 7/8" Coax From 0 to 78	59.00	69.00	64.00	0.0212	4.42	0.0035	0.0201	0.0043
(8) miscl 7/8" Coax From 0 to 78	49.00	59.00	54.00	0.0212	3.55	0.0028	0.0161	0.0043
(8) miscl 7/8" Coax From 0 to 78	39.00	49.00	44.00	0.0212	2.73	0.0022	0.0124	0.0043
(8) miscl 7/8" Coax From 0 to 78	29.00	39.00	34.00	0.0212	1.96	0.0016	0.0089	0.0043
(8) miscl 7/8" Coax From 0 to 78	19.00	29.00	24.00	0.0212	1.25	0.0010	0.0057	0.0043
(8) miscl 7/8" Coax From 0 to 78	9.00	19.00	14.00	0.0212	0.63	0.0005	0.0029	0.0043
(8) miscl 7/8" Coax From 0 to 78	0.00	9.00	4.50	0.0191	0.13	0.0001	0.0006	0.0039
commscope PWRT-606-S(7/8") From 0 to 78	69.00	78.00	73.50	0.0080	2.00	0.0016	0.0091	0.0016
commscope PWRT-606-S(7/8") From 0 to 78	59.00	69.00	64.00	0.0089	1.86	0.0015	0.0084	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	49.00	59.00	54.00	0.0089	1.49	0.0012	0.0068	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	39.00	49.00	44.00	0.0089	1.15	0.0009	0.0052	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	29.00	39.00	34.00	0.0089	0.82	0.0007	0.0037	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	19.00	29.00	24.00	0.0089	0.53	0.0004	0.0024	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	9.00	19.00	14.00	0.0089	0.26	0.0002	0.0012	0.0018
commscope PWRT-606-S(7/8") From 0 to 78	0.00	9.00	4.50	0.0080	0.06	0.0000	0.0003	0.0016
(8) miscl 7/8" Coax From 0 to 63	59.00	63.00	61.00	0.0085	1.66	0.0013	0.0075	0.0017
(8) miscl 7/8" Coax From 0 to 63	49.00	59.00	54.00	0.0212	3.55	0.0028	0.0161	0.0043
(8) miscl 7/8" Coax From 0 to 63	39.00	49.00	44.00	0.0212	2.73	0.0022	0.0124	0.0043
(8) miscl 7/8" Coax From 0 to 63	29.00	39.00	34.00	0.0212	1.96	0.0016	0.0089	0.0043
(8) miscl 7/8" Coax From 0 to 63	19.00	29.00	24.00	0.0212	1.25	0.0010	0.0057	0.0043
(8) miscl 7/8" Coax From 0 to 63	9.00	19.00	14.00	0.0212	0.63	0.0005	0.0029	0.0043
(8) miscl 7/8" Coax From 0 to 63	0.00	9.00	4.50	0.0191	0.13	0.0001	0.0006	0.0039
(8) miscl 7/8" Coax From 0 to 55	49.00	55.00	52.00	0.0127	2.03	0.0016	0.0092	0.0026
(8) miscl 7/8" Coax From 0 to 55	39.00	49.00	44.00	0.0212	2.73	0.0022	0.0124	0.0043
(8) miscl 7/8" Coax From 0 to 55	29.00	39.00	34.00	0.0212	1.96	0.0016	0.0089	0.0043
(8) miscl 7/8" Coax From 0 to 55	19.00	29.00	24.00	0.0212	1.25	0.0010	0.0057	0.0043
(8) miscl 7/8" Coax From 0 to 55	9.00	19.00	14.00	0.0212	0.63	0.0005	0.0029	0.0043
(8) miscl 7/8" Coax From 0 to 55	0.00	9.00	4.50	0.0191	0.13	0.0001	0.0006	0.0039
(2) miscl 3/8" Coax From 0 to 25.75	19.00	25.75	22.38	0.0010	0.05	0.0000	0.0002	0.0002
(2) miscl 3/8" Coax From 0 to 25.75	9.00	19.00	14.00	0.0015	0.04	0.0000	0.0002	0.0003
(2) miscl 3/8" Coax From 0 to 25.75	0.00	9.00	4.50	0.0014	0.01	0.0000	0.0000	0.0003
Sum				0.5628	57.08			

Section	4	3	2	1
Size	P8.625x0.375	P8.625x0.5	P8.625x0.5	P8.625x0.28
Length (ft)	47.000	12.000	10.000	10.000
Grade	API 5L X42 A53-B-35			
Weight (lb)	7857.6	521.1	434.3	189.9



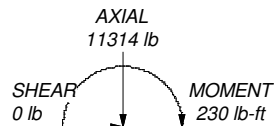
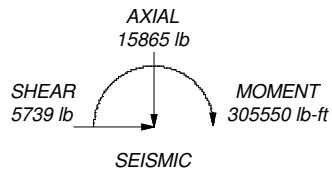
MATERIAL STRENGTH					
GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi	API 5L X42	42 ksi	60 ksi

TOWER DESIGN NOTES

1. Tower is located in Pierce County, Washington.
2. Tower designed in accordance with the TIA-222-H Standard.
3. Tower Risk Category II.
4. Topographic Category 1 with Crest Height of 0.000 ft
5. CCISeismic Note: Seismic loads generated by CCISeismic 4.0.2
6. CCISeismic Note: Seismic calculations are in accordance with TIA-222-H-1
7. TOWER RATING: 71%



ALL REACTIONS
ARE FACTORED



REACTIONS - DEAD

 TEP Tower Engineering Professionals, Inc.	<i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350		Job: <i>SOUTH HILL MALL (10038029)</i> Project: <i>TEP No. 340502.1060260</i> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Client: Smartlink LLC</td> <td style="width: 33%;">Drawn by: Ryan M. Barger, E.I.</td> <td style="width: 33%;">App'd:</td> </tr> <tr> <td>Code: TIA-222-H</td> <td>Date: 02/06/25</td> <td>Scale: NTS</td> </tr> <tr> <td colspan="2">Path:</td> <td>Dwg No. E-1</td> </tr> </table>		Client: Smartlink LLC	Drawn by: Ryan M. Barger, E.I.	App'd:	Code: TIA-222-H	Date: 02/06/25	Scale: NTS	Path:		Dwg No. E-1
	Client: Smartlink LLC	Drawn by: Ryan M. Barger, E.I.	App'd:										
	Code: TIA-222-H	Date: 02/06/25	Scale: NTS										
	Path:		Dwg No. E-1										

<i>tnxTower</i> <i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job SOUTH HILL MALL (10038029)	Page 1 of 14
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Tower Input Data	
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The tower is a monopole.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

- Tower is located in Pierce County, Washington.
- Tower base elevation above sea level: 438.394 ft.
- Risk Category II.
- Exposure Category C.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.000 ft.
- CCISeismic Note: Seismic loads generated by CCISeismic 4.0.2.
- CCISeismic Note: Seismic calculations are in accordance with TIA-222-H-1.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.05.
- Tower analysis based on target reliabilities in accordance with Annex S.
- Load Modification Factors used: $K_{cs}(F_w) = 0.95$, $K_{cs}(E_w \text{ and } E_h) = 1.0$.
- Maximum demand-capacity ratio is: 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

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

Pole Section Geometry	
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Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	80.000-70.000	10.000	P6.625x0.28	A53-B-35 (35 ksi)	
L2	70.000-60.000	10.000	P8.625x0.5	A53-B-35 (35 ksi)	
L3	60.000-48.000	12.000	P8.625x0.5	A53-B-35 (35 ksi)	

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<i>Section</i>	<i>Elevation</i>	<i>Section Length</i>	<i>Pole Size</i>	<i>Pole Grade</i>	<i>Socket Length</i>
	<i>ft</i>	<i>ft</i>			<i>ft</i>
L4	48.000-1.000	47.000	P36x0.375	API 5L X42 (42 ksi)	

[illegible]

Feed Line/Linear Appurtenances - Entered As Round Or Flat	
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
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90	90
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92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf

Feed Line/Linear Appurtenances - Entered As Area	
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
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80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C _A A _s ft²/ft	Weight plf
***79**									
RFT-48SM-001-X XX(3/8)	C	No	No	Inside Pole	79.000 - 1.000	1	No Ice	0.000	0.060
PWRT-606-S(7/8")	C	No	No	Inside Pole	79.000 - 1.000	1	No Ice	0.000	0.890

7/8" Coax	C	No	No	Inside Pole	79.000 - 1.000	8	No Ice	0.000	0.265
PWRT-606-S(7/8")	C	No	No	Inside Pole	79.000 - 1.000	1	No Ice	0.000	0.890

7/8" Coax	C	No	No	Inside Pole	64.000 - 1.000	8	No Ice	0.000	0.265

7/8" Coax	C	No	No	Inside Pole	56.000 - 1.000	8	No Ice	0.000	0.265

3/8" Coax	C	No	No	Inside Pole	26.750 - 1.000	2	No Ice	0.000	0.075

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Feed Line/Linear Appurtenances Section Areas

<i>Tower Section</i>	<i>Tower Elevation ft</i>	<i>Face</i>	<i>A_R ft²</i>	<i>A_F ft²</i>	<i>C_AA_A In Face ft²</i>	<i>C_AA_A Out Face ft²</i>	<i>Weight lb</i>
L1	80.000-70.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	35.633
L2	70.000-60.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	48.070
L3	60.000-48.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	89.896
L4	48.000-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	389.159

Feed Line/Linear Appurtenances Section Areas - With Ice

<i>Tower Section</i>	<i>Tower Elevation ft</i>	<i>Face or Leg</i>	<i>Ice Thickness in</i>	<i>A_R ft²</i>	<i>A_F ft²</i>	<i>C_AA_A In Face ft²</i>	<i>C_AA_A Out Face ft²</i>	<i>Weight lb</i>
L1	80.000-70.000	A	0.923	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	35.633
L2	70.000-60.000	A	0.910	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	48.070
L3	60.000-48.000	A	0.893	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	89.896
L4	48.000-1.000	A	0.825	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	389.159

Feed Line Center of Pressure

<i>Section</i>	<i>Elevation ft</i>	<i>CP_X in</i>	<i>CP_Z in</i>	<i>CP_X Ice in</i>	<i>CP_Z Ice in</i>
L1	80.000-70.000	0.000	0.000	0.000	0.000
L2	70.000-60.000	0.000	0.000	0.000	0.000
L3	60.000-48.000	0.000	0.000	0.000	0.000
L4	48.000-1.000	0.000	0.000	0.000	0.000

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

User Defined Loads - Seismic

<i>Description</i>	<i>Elevation ft</i>	<i>Offset From Centroid ft</i>	<i>Azimuth Angle °</i>	<i>E_v lb</i>	<i>E_{ss} lb</i>	<i>E_{hc} lb</i>	<i>E_h lb</i>
CCISeismic Tower Section 1 - 1	75.000	0.000	0.000	38.410	0.000	0.000	216.706
CCISeismic Tower Section 2 - 1	65.000	0.000	0.000	87.830	0.000	0.000	411.255
CCISeismic Tower Section 3 - 1	59.000	0.000	0.000	17.566	0.000	0.000	72.484
CCISeismic Tower Section 3 - 2	53.000	0.000	0.000	87.830	0.000	0.000	315.006
CCISeismic Tower Section 4 - 1	44.500	0.000	0.000	202.178	0.000	0.000	576.602
CCISeismic Tower Section 4 - 2	36.000	0.000	0.000	288.826	0.000	0.000	623.067
CCISeismic Tower Section 4 - 3	26.000	0.000	0.000	288.826	0.000	0.000	404.480
CCISeismic Tower Section 4 - 4	16.000	0.000	0.000	288.826	0.000	0.000	209.908
CCISeismic Tower Section 4 - 5	6.000	0.000	0.000	288.826	0.000	0.000	51.212
CCISeismic AIR 6419 B77G w/ Mount Pipe	79.000	0.000	0.000	15.846	0.000	0.000	95.653
CCISeismic AIR 6419 B77G w/ Mount Pipe	79.000	0.000	0.000	15.846	0.000	0.000	95.653
CCISeismic AIR 6419 B77D	74.000	0.000	0.000	13.368	0.000	0.000	74.116
CCISeismic AIR 6419 B77D	74.000	0.000	0.000	13.368	0.000	0.000	74.116
CCISeismic 800372991 w/ Mount Pipe	64.000	0.000	0.000	22.680	0.000	0.000	104.072
CCISeismic 800372991 w/ Mount Pipe	64.000	0.000	0.000	22.680	0.000	0.000	104.072
CCISeismic 800372991 w/ Mount Pipe	64.000	0.000	0.000	22.680	0.000	0.000	104.072
TMAT192123B68-21 CCISeismic (2)	64.000	0.000	0.000	8.373	0.000	0.000	38.420
TMAT192123B68-21 CCISeismic (2)	64.000	0.000	0.000	8.373	0.000	0.000	38.420
TMAT192123B68-21 CCISeismic (2)	64.000	0.000	0.000	8.373	0.000	0.000	38.420
TMAT192123B68-21 CCISeismic (2)	64.000	0.000	0.000	8.373	0.000	0.000	38.420
CCISeismic 800372991 w/ Mount Pipe	56.000	0.000	0.000	22.680	0.000	0.000	87.418
CCISeismic 800372991 w/ Mount Pipe	56.000	0.000	0.000	22.680	0.000	0.000	87.418
CCISeismic 800372991 w/ Mount Pipe	56.000	0.000	0.000	22.680	0.000	0.000	87.418
CCISeismic (2)	56.000	0.000	0.000	8.373	0.000	0.000	32.272
TMAT192123B68-31 CCISeismic (2)	56.000	0.000	0.000	8.373	0.000	0.000	32.272
TMAT192123B68-31 CCISeismic (2)	56.000	0.000	0.000	8.373	0.000	0.000	32.272
TMAT192123B68-31 CCISeismic (2)	56.000	0.000	0.000	8.373	0.000	0.000	32.272
DC9-48-60-24-PC16-EV CCISeismic (2) Box Light	26.750	0.000	0.000	16.179	0.000	0.000	23.534
CCISeismic Canister Load1	79.000	0.000	0.000	21.235	0.000	0.000	128.187
CCISeismic Canister Load2	69.000	0.000	0.000	105.772	0.000	0.000	535.358
CCISeismic Canister Load3	59.000	0.000	0.000	89.997	0.000	0.000	371.363
CCISeismic Canister Load4	47.000	0.000	0.000	70.986	0.000	0.000	217.510
CCISeismic commscope RFFT-48SM-001-XXX(3/8) From 0 to 78 (69ft to 78ft)	74.500	0.000	0.000	0.109	0.000	0.000	0.611
CCISeismic commscope RFFT-48SM-001-XXX(3/8) From 0 to 78 (59ft to 69ft)	65.000	0.000	0.000	0.121	0.000	0.000	0.568
CCISeismic commscope RFFT-48SM-001-XXX(3/8) From 0 to 78 (49ft to 59ft)	55.000	0.000	0.000	0.121	0.000	0.000	0.457
CCISeismic commscope RFFT-48SM-001-XXX(3/8)	45.000	0.000	0.000	0.121	0.000	0.000	0.351

<i>tnxTower</i> <i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	5 of 14
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	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

<i>Description</i>	<i>Elevation</i>	<i>Offset From Centroid</i>	<i>Azimuth Angle</i>	<i>E_v</i>	<i>E_{ax}</i>	<i>E_{bx}</i>	<i>E_b</i>
	<i>ft</i>	<i>ft</i>	<i>°</i>	<i>lb</i>	<i>lb</i>	<i>lb</i>	<i>lb</i>
From 0 to 78 (39ft to49ft)							
CCISeismic commscope	35.000	0.000	0.000	0.121	0.000	0.000	0.252
RFFT-48SM-001-XXX(3/8)							
From 0 to 78 (29ft to39ft)							
CCISeismic commscope	25.000	0.000	0.000	0.121	0.000	0.000	0.161
RFFT-48SM-001-XXX(3/8)							
From 0 to 78 (19ft to29ft)							
CCISeismic commscope	15.000	0.000	0.000	0.121	0.000	0.000	0.081
RFFT-48SM-001-XXX(3/8)							
From 0 to 78 (9ft to19ft)							
CCISeismic commscope	5.500	0.000	0.000	0.109	0.000	0.000	0.017
RFFT-48SM-001-XXX(3/8)							
From 0 to 78 (0ft to9ft)							
CCISeismic commscope	74.500	0.000	0.000	1.620	0.000	0.000	9.060
PWRT-606-S(7/8") From 0 to 78 (69ft to78ft)							
CCISeismic commscope	65.000	0.000	0.000	1.800	0.000	0.000	8.428
PWRT-606-S(7/8") From 0 to 78 (59ft to69ft)							
CCISeismic commscope	55.000	0.000	0.000	1.800	0.000	0.000	6.776
PWRT-606-S(7/8") From 0 to 78 (49ft to59ft)							
CCISeismic commscope	45.000	0.000	0.000	1.800	0.000	0.000	5.209
PWRT-606-S(7/8") From 0 to 78 (39ft to49ft)							
CCISeismic commscope	35.000	0.000	0.000	1.800	0.000	0.000	3.741
PWRT-606-S(7/8") From 0 to 78 (29ft to39ft)							
CCISeismic commscope	25.000	0.000	0.000	1.800	0.000	0.000	2.392
PWRT-606-S(7/8") From 0 to 78 (19ft to29ft)							
CCISeismic commscope	15.000	0.000	0.000	1.800	0.000	0.000	1.197
PWRT-606-S(7/8") From 0 to 78 (9ft to19ft)							
CCISeismic commscope	5.500	0.000	0.000	1.620	0.000	0.000	0.251
PWRT-606-S(7/8") From 0 to 78 (0ft to9ft)							
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (69ft to78ft)	74.500	0.000	0.000	3.857	0.000	0.000	21.575
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (59ft to69ft)	65.000	0.000	0.000	4.286	0.000	0.000	20.069
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (49ft to59ft)	55.000	0.000	0.000	4.286	0.000	0.000	16.135
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (39ft to49ft)	45.000	0.000	0.000	4.286	0.000	0.000	12.404
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (29ft to39ft)	35.000	0.000	0.000	4.286	0.000	0.000	8.908
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (19ft to29ft)	25.000	0.000	0.000	4.286	0.000	0.000	5.696
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (9ft to19ft)	15.000	0.000	0.000	4.286	0.000	0.000	2.851
CCISeismic (8) miscl 7/8" Coax From 0 to 78 (0ft to9ft)	5.500	0.000	0.000	3.857	0.000	0.000	0.597
PWRT-606-S(7/8") From 0 to 78 (69ft to78ft)							
CCISeismic commscope	74.500	0.000	0.000	1.620	0.000	0.000	9.060
PWRT-606-S(7/8") From 0 to 78 (59ft to69ft)							
CCISeismic commscope	65.000	0.000	0.000	1.800	0.000	0.000	8.428
CCISeismic commscope	55.000	0.000	0.000	1.800	0.000	0.000	6.776

<i>tnxTower</i> <i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	6 of 14
	Project	TEP No. 340502.1060260	Date	16:04:36 02/06/25
	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

<i>Description</i>	<i>Elevation</i>	<i>Offset From Centroid</i>	<i>Azimuth Angle</i>	<i>E_v</i>	<i>E_{ax}</i>	<i>E_{bx}</i>	<i>E_b</i>
	<i>ft</i>	<i>ft</i>	<i>°</i>	<i>lb</i>	<i>lb</i>	<i>lb</i>	<i>lb</i>
PWRT-606-S(7/8") From 0 to 78 (49ft to59ft)							
CCISeismic commscope	45.000	0.000	0.000	1.800	0.000	0.000	5.209
PWRT-606-S(7/8") From 0 to 78 (39ft to49ft)							
CCISeismic commscope	35.000	0.000	0.000	1.800	0.000	0.000	3.741
PWRT-606-S(7/8") From 0 to 78 (29ft to39ft)							
CCISeismic commscope	25.000	0.000	0.000	1.800	0.000	0.000	2.392
PWRT-606-S(7/8") From 0 to 78 (19ft to29ft)							
CCISeismic commscope	15.000	0.000	0.000	1.800	0.000	0.000	1.197
PWRT-606-S(7/8") From 0 to 78 (9ft to19ft)							
CCISeismic commscope	5.500	0.000	0.000	1.620	0.000	0.000	0.251
PWRT-606-S(7/8") From 0 to 78 (0ft to9ft)							
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (59ft to63ft)	62.000	0.000	0.000	1.714	0.000	0.000	7.548
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (49ft to59ft)	55.000	0.000	0.000	4.286	0.000	0.000	16.135
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (39ft to49ft)	45.000	0.000	0.000	4.286	0.000	0.000	12.404
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (29ft to39ft)	35.000	0.000	0.000	4.286	0.000	0.000	8.908
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (19ft to29ft)	25.000	0.000	0.000	4.286	0.000	0.000	5.696
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (9ft to19ft)	15.000	0.000	0.000	4.286	0.000	0.000	2.851
CCISeismic (8) miscl 7/8" Coax From 0 to 63 (0ft to9ft)	5.500	0.000	0.000	3.857	0.000	0.000	0.597
CCISeismic (8) miscl 7/8" Coax From 0 to 55 (49ft to55ft)	53.000	0.000	0.000	2.572	0.000	0.000	9.223
CCISeismic (8) miscl 7/8" Coax From 0 to 55 (39ft to49ft)	45.000	0.000	0.000	4.286	0.000	0.000	12.404
CCISeismic (8) miscl 7/8" Coax From 0 to 55 (29ft to39ft)	35.000	0.000	0.000	4.286	0.000	0.000	8.908
CCISeismic (8) miscl 7/8" Coax From 0 to 55 (19ft to29ft)	25.000	0.000	0.000	4.286	0.000	0.000	5.696
CCISeismic (8) miscl 7/8" Coax From 0 to 55 (9ft to19ft)	15.000	0.000	0.000	4.286	0.000	0.000	2.851
CCISeismic (8) miscl 7/8" Coax From 0 to 55 (0ft to9ft)	5.500	0.000	0.000	3.857	0.000	0.000	0.597
CCISeismic (2) miscl 3/8" Coax From 0 to 25.75 (19ft to25.75ft)	23.375	0.000	0.000	0.205	0.000	0.000	0.249
CCISeismic (2) miscl 3/8" Coax From 0 to 25.75 (9ft to19ft)	15.000	0.000	0.000	0.303	0.000	0.000	0.202
CCISeismic (2) miscl 3/8" Coax From 0 to 25.75 (0ft to9ft)	5.500	0.000	0.000	0.273	0.000	0.000	0.042

Discrete Tower Loads

<i>tnxTower</i> <i>Tower Engineering Professionals, Inc.</i> 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	7 of 14
	Project	TEP No. 340502.1060260	Date	16:04:36 02/06/25
	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{MA} Front ft ²	C _{MA} Side ft ²	Weight lb
***** **79**								
AIR 6419 B77G w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	0.000	79.000	No Ice 0.000	0.000	78.351
AIR 6419 B77G w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	79.000	No Ice 0.000	0.000	78.351
AIR 6419 B77G w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	0.000	79.000	No Ice 0.000	0.000	78.351
AIR 6419 B77D	A	From Leg	0.500 0.000 0.000	0.000	74.000	No Ice 0.000	0.000	66.100
AIR 6419 B77D	B	From Leg	0.500 0.000 0.000	0.000	74.000	No Ice 0.000	0.000	66.100
AIR 6419 B77D	C	From Leg	0.500 0.000 0.000	0.000	74.000	No Ice 0.000	0.000	66.100
64								
800372991 w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	0.000	64.000	No Ice 0.000	0.000	112.145
800372991 w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	64.000	No Ice 0.000	0.000	112.145
800372991 w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	0.000	64.000	No Ice 0.000	0.000	112.145
(2) TMAT192123B68-21	A	From Leg	0.500 0.000 0.000	0.000	64.000	No Ice 0.000	0.000	20.700
(2) TMAT192123B68-21	B	From Leg	0.500 0.000 0.000	0.000	64.000	No Ice 0.000	0.000	20.700
(2) TMAT192123B68-21	C	From Leg	0.500 0.000 0.000	0.000	64.000	No Ice 0.000	0.000	20.700
56								
800372991 w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	112.145
800372991 w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	112.145
800372991 w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	112.145
(2) TMAT192123B68-31	A	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	20.700
(2) TMAT192123B68-31	B	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	20.700
(2) TMAT192123B68-31	C	From Leg	0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	20.700

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	Project	TEP No. 340502.1060260	Date	16:04:36 02/06/25
	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{MA} Front ft ²	C _{MA} Side ft ²	Weight lb
DC9-48-60-24-PC16-EV	C	From Leg	0.000 0.500 0.000 0.000	0.000	56.000	No Ice 0.000	0.000	34.900
26.75 (2) Box Light	C	From Leg	1.000 0.000 0.000	0.000	26.750	No Ice 4.000	4.000	40.000

Canister Load1	C	None		0.000	79.000	No Ice 7.500	7.500	105.000
Canister Load2	C	None		0.000	69.000	No Ice 14.250	14.250	523.000
Canister Load3	C	None		0.000	59.000	No Ice 14.850	14.850	445.000
Canister Load4	C	None		0.000	47.000	No Ice 8.100	8.100	351.000

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Ev+1.0 Eh 0 deg
3	0.9 Dead-1.0 Ev+1.0 Eh 0 deg
4	1.2 Dead+1.0 Ev+1.0 Eh 30 deg
5	0.9 Dead-1.0 Ev+1.0 Eh 30 deg
6	1.2 Dead+1.0 Ev+1.0 Eh 60 deg
7	0.9 Dead-1.0 Ev+1.0 Eh 60 deg
8	1.2 Dead+1.0 Ev+1.0 Eh 90 deg
9	0.9 Dead-1.0 Ev+1.0 Eh 90 deg
10	1.2 Dead+1.0 Ev+1.0 Eh 120 deg
11	0.9 Dead-1.0 Ev+1.0 Eh 120 deg
12	1.2 Dead+1.0 Ev+1.0 Eh 150 deg
13	0.9 Dead-1.0 Ev+1.0 Eh 150 deg
14	1.2 Dead+1.0 Ev+1.0 Eh 180 deg
15	0.9 Dead-1.0 Ev+1.0 Eh 180 deg
16	1.2 Dead+1.0 Ev+1.0 Eh 210 deg
17	0.9 Dead-1.0 Ev+1.0 Eh 210 deg
18	1.2 Dead+1.0 Ev+1.0 Eh 240 deg
19	0.9 Dead-1.0 Ev+1.0 Eh 240 deg
20	1.2 Dead+1.0 Ev+1.0 Eh 270 deg
21	0.9 Dead-1.0 Ev+1.0 Eh 270 deg
22	1.2 Dead+1.0 Ev+1.0 Eh 300 deg
23	0.9 Dead-1.0 Ev+1.0 Eh 300 deg
24	1.2 Dead+1.0 Ev+1.0 Eh 330 deg
25	0.9 Dead-1.0 Ev+1.0 Eh 330 deg

Maximum Member Forces

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	Client Smartlink LLC	Designed by Ryan M. Barger, E.I.

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	80 - 70	Pole	Max Tension	20	0.000	-0.000	0.000
			Max. Compression	6	-1036.961	-5335.877	3080.688
			Max. Mx	20	-1036.925	6161.579	-0.072
			Max. My	14	-1036.931	0.124	-6161.529
			Max. Vy	20	-934.003	6161.579	-0.072
			Max. Vx	14	933.995	0.124	-6161.529
			Max. Torque	12			0.000
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	6	-3053.948	-21366.118	12335.769
			Max. Mx	20	-3053.856	24672.542	-0.309
L2	70 - 60	Pole	Max. My	14	-3053.874	0.535	-24672.325
			Max. Vy	20	-2410.514	22264.268	-0.277
			Max. Vx	14	2410.492	0.481	-22264.073
			Max. Torque	12			0.001
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	6	-5272.218	-54877.341	31683.449
			Max. Mx	20	-5272.173	63436.654	-18.706
			Max. My	14	-5272.182	32.399	-63422.970
			Max. Vy	20	-3604.156	49139.063	-18.609
			Max. Vx	14	3604.130	32.231	-49125.450
L3	60 - 48	Pole	Max. Torque	24			0.888
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	6	-15863.259	-264130.07	152495.573
						8	
			Max. Mx	20	-15863.256	305512.103	-139.608
			Max. My	14	-15863.257	241.807	-305409.91
						5	
			Max. Vy	20	-5755.472	278502.398	-139.590
			Max. Vx	14	5755.465	241.777	-278400.22
						3	
L4	48 - 1	Pole	Max. Torque	24			1.705

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	20	15864.770	5738.880	-0.000
	Max. H _x	21	7894.374	5738.880	0.000
	Max. H _y	2	15864.770	0.000	5738.880
	Max. M _x	2	305130.733	0.000	5738.880
	Max. M _y	8	305028.545	-5738.880	-0.000
	Max. Torsion	24	1.705	2869.440	4970.016
	Min. Vert	7	7894.374	-4970.016	2869.440
	Min. H _x	8	15864.770	-5738.880	-0.000
	Min. H _y	14	15864.770	0.000	-5738.880
	Min. M _x	14	-305409.915	0.000	-5738.880
	Min. M _y	20	-305512.103	5738.880	-0.000
	Min. Torsion	12	-1.704	-2869.440	-4970.016

Tower Mast Reaction Summary

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Load Combination	Vertical lb	Shear _x lb	Shear _y lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _y lb-ft	Torque lb-ft
Dead Only	11313.878	0.000	0.000	114.996	199.179	0.000
1.2 Dead+1.0 Ev+1.0 Eh 0 deg	15864.770	-0.000	-5738.880	-305130.733	241.807	-1.476
0.9 Dead-1.0 Ev+1.0 Eh 0 deg	7894.374	0.000	-5738.880	-303228.082	180.294	-1.094
1.2 Dead+1.0 Ev+1.0 Eh 30 deg	15864.770	2869.440	-4970.016	-264232.274	-152393.371	-0.851
0.9 Dead-1.0 Ev+1.0 Eh 30 deg	7894.374	2869.440	-4970.016	-262589.284	-151485.798	-0.631
1.2 Dead+1.0 Ev+1.0 Eh 60 deg	15864.770	4970.016	-2869.440	-152495.573	-264130.078	-0.001
0.9 Dead-1.0 Ev+1.0 Eh 60 deg	7894.374	4970.016	-2869.440	-151562.001	-262513.085	-0.000
1.2 Dead+1.0 Ev+1.0 Eh 90 deg	15864.770	5738.880	0.000	139.607	-305028.545	0.852
0.9 Dead-1.0 Ev+1.0 Eh 90 deg	7894.374	5738.880	0.000	104.093	-303151.889	0.631
1.2 Dead+1.0 Ev+1.0 Eh 120 deg	15864.770	4970.016	2869.440	152774.780	-264130.063	1.477
0.9 Dead-1.0 Ev+1.0 Eh 120 deg	7894.374	4970.016	2869.440	151770.180	-262513.075	1.094
1.2 Dead+1.0 Ev+1.0 Eh 150 deg	15864.770	2869.440	4970.016	264511.464	-152393.357	1.704
0.9 Dead-1.0 Ev+1.0 Eh 150 deg	7894.374	2869.440	4970.016	262797.451	-151485.788	1.263
1.2 Dead+1.0 Ev+1.0 Eh 180 deg	15864.770	-0.000	5738.880	305409.915	241.807	1.476
0.9 Dead-1.0 Ev+1.0 Eh 180 deg	7894.374	0.000	5738.880	303436.243	180.294	1.094
1.2 Dead+1.0 Ev+1.0 Eh 210 deg	15864.770	-2869.440	4970.016	264511.439	152876.957	0.853
0.9 Dead-1.0 Ev+1.0 Eh 210 deg	7894.374	-2869.440	4970.016	262797.433	151846.365	0.632
1.2 Dead+1.0 Ev+1.0 Eh 240 deg	15864.770	-4970.016	2869.440	152774.755	264613.635	-0.001
0.9 Dead-1.0 Ev+1.0 Eh 240 deg	7894.374	-4970.016	2869.440	151770.162	262873.632	-0.000
1.2 Dead+1.0 Ev+1.0 Eh 270 deg	15864.770	-5738.880	0.000	139.607	305512.103	-0.852
0.9 Dead-1.0 Ev+1.0 Eh 270 deg	7894.374	-5738.880	0.000	104.093	303512.436	-0.631
1.2 Dead+1.0 Ev+1.0 Eh 300 deg	15864.770	-4970.016	-2869.440	-152495.548	264613.650	-1.475
0.9 Dead-1.0 Ev+1.0 Eh 300 deg	7894.374	-4970.016	-2869.440	-151561.983	262873.642	-1.093
1.2 Dead+1.0 Ev+1.0 Eh 330 deg	15864.770	-2869.440	-4970.016	-264232.249	152876.971	-1.705
0.9 Dead-1.0 Ev+1.0 Eh 330 deg	7894.374	-2869.440	-4970.016	-262589.266	151846.375	-1.263

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.000	-11313.878	0.000	0.000	11313.878	0.000	0.000%
2	0.000	-15864.770	-5738.880	0.000	15864.770	5738.880	0.000%
3	0.000	-7894.374	-5738.880	0.000	7894.374	5738.880	0.000%
4	2869.440	-15864.770	-4970.016	-2869.440	15864.770	4970.016	0.000%
5	2869.440	-7894.374	-4970.016	-2869.440	7894.374	4970.016	0.000%
6	4970.016	-15864.770	-2869.440	-4970.016	15864.770	2869.440	0.000%
7	4970.016	-7894.374	-2869.440	-4970.016	7894.374	2869.440	0.000%
8	5738.880	-15864.770	0.000	-5738.880	15864.770	-0.000	0.000%
9	5738.880	-7894.374	0.000	-5738.880	7894.374	0.000	0.000%
10	4970.016	-15864.770	2869.440	-4970.016	15864.770	-2869.440	0.000%
11	4970.016	-7894.374	2869.440	-4970.016	7894.374	-2869.440	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
12	2869.440	-15864.770	4970.016	-2869.440	15864.770	-4970.016	0.000%
13	2869.440	-7894.374	4970.016	-2869.440	7894.374	-4970.016	0.000%
14	0.000	-15864.770	5738.880	0.000	15864.770	-5738.880	0.000%
15	0.000	-7894.374	5738.880	0.000	7894.374	-5738.880	0.000%
16	-2869.440	-15864.770	4970.016	2869.440	15864.770	-4970.016	0.000%
17	-2869.440	-7894.374	4970.016	2869.440	7894.374	-4970.016	0.000%
18	-4970.016	-15864.770	2869.440	4970.016	15864.770	-2869.440	0.000%
19	-4970.016	-7894.374	2869.440	4970.016	7894.374	-2869.440	0.000%
20	-5738.880	-15864.770	0.000	5738.880	15864.770	-0.000	0.000%
21	-5738.880	-7894.374	0.000	5738.880	7894.374	0.000	0.000%
22	-4970.016	-15864.770	-2869.440	4970.016	15864.770	2869.440	0.000%
23	-4970.016	-7894.374	-2869.440	4970.016	7894.374	2869.440	0.000%
24	-2869.440	-15864.770	-4970.016	2869.440	15864.770	4970.016	0.000%
25	-2869.440	-7894.374	-4970.016	2869.440	7894.374	4970.016	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	0.00001514
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00030154
5	Yes	4	0.00000001	0.00011324
6	Yes	4	0.00000001	0.00030167
7	Yes	4	0.00000001	0.00011328
8	Yes	4	0.00000001	0.00001512
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00030229
11	Yes	4	0.00000001	0.00011345
12	Yes	4	0.00000001	0.00030180
13	Yes	4	0.00000001	0.00011331
14	Yes	4	0.00000001	0.00001516
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00030288
17	Yes	4	0.00000001	0.00011361
18	Yes	4	0.00000001	0.00030275
19	Yes	4	0.00000001	0.00011357
20	Yes	4	0.00000001	0.00001516
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00030213
23	Yes	4	0.00000001	0.00011340
24	Yes	4	0.00000001	0.00030261
25	Yes	4	0.00000001	0.00011354

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	80 - 70	0.008	1	0.000	0.000
L2	70 - 60	0.006	1	0.000	0.000

tnxTower Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job SOUTH HILL MALL (10038029)	Page 12 of 14
	Project TEP No. 340502.1060260	Date 16:04:36 02/06/25
	Client Smartlink LLC	Designed by Ryan M. Barger, E.I.

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L3	60 - 48	0.004	1	0.000	0.000
L4	48 - 1	0.002	1	0.000	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
79.000	AIR 6419 B77G w/ Mount Pipe	1	0.007	0.000	0.000	Inf
75.000	CCISeismic Tower Section 1 - 1	1	0.007	0.000	0.000	Inf
74.500	CCISeismic commscope	1	0.006	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (69ft to 78ft)					
74.000	AIR 6419 B77D	1	0.006	0.000	0.000	Inf
69.000	Canister Load2	1	0.005	0.000	0.000	Inf
65.000	CCISeismic Tower Section 2 - 1	1	0.005	0.000	0.000	Inf
64.000	800372991 w/ Mount Pipe	1	0.004	0.000	0.000	Inf
62.000	CCISeismic (8) miscel 7/8" Coax	1	0.004	0.000	0.000	Inf
	From 0 to 63 (59ft to 63ft)					
59.000	Canister Load3	1	0.003	0.000	0.000	Inf
56.000	800372991 w/ Mount Pipe	1	0.003	0.000	0.000	Inf
55.000	CCISeismic commscope	1	0.003	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (49ft to 59ft)					
53.000	CCISeismic Tower Section 3 - 2	1	0.003	0.000	0.000	Inf
47.000	Canister Load4	1	0.002	0.000	0.000	Inf
45.000	CCISeismic commscope	1	0.002	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (39ft to 49ft)					
44.500	CCISeismic Tower Section 4 - 1	1	0.001	0.000	0.000	Inf
36.000	CCISeismic Tower Section 4 - 2	1	0.001	0.000	0.000	Inf
35.000	CCISeismic commscope	1	0.001	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (29ft to 39ft)					
26.750	(2) Box Light	1	0.000	0.000	0.000	Inf
26.000	CCISeismic Tower Section 4 - 3	1	0.000	0.000	0.000	Inf
25.000	CCISeismic commscope	1	0.000	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (19ft to 29ft)					
23.375	CCISeismic (2) miscel 3/8" Coax	1	0.000	0.000	0.000	Inf
	From 0 to 25.75 (19ft to 25.75ft)					
16.000	CCISeismic Tower Section 4 - 4	1	0.000	0.000	0.000	Inf
15.000	CCISeismic commscope	1	0.000	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (9ft to 19ft)					
6.000	CCISeismic Tower Section 4 - 5	1	0.000	0.000	0.000	Inf
5.500	CCISeismic commscope	1	0.000	0.000	0.000	Inf
	RFFT-48SM-001-XXX(3/8) From 0 to 78 (0ft to 9ft)					

Compression Checks

tnxTower Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	13 of 14
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	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

tnxTower Tower Engineering Professionals, Inc. 326 Tryon Road Raleigh, NC 27603 Phone: (919) 661-6351 FAX: (919) 661-6350	Job	SOUTH HILL MALL (10038029)	Page	14 of 14
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	Client	Smartlink LLC	Designed by	Ryan M. Barger, E.I.

Pole Design Data									
Section No.	Elevation	Size	L	L _u	Kl/r	A	P _a	ΦP _n	Ratio P _a
	ft		ft	ft		in²	lb	lb	ΦP _n
L1	80 - 70 (1)	P6.625x0.28	10.000	0.000	0.0	5.581	-1036.920	175813.000	0.006
L2	70 - 60 (2)	P8.625x0.5	10.000	0.000	0.0	12.763	-3053.850	402026.000	0.008
L3	60 - 48 (3)	P8.625x0.5	12.000	0.000	0.0	12.763	-5272.170	402026.000	0.013
L4	48 - 1 (4)	P36x0.375	47.000	0.000	0.0	41.970	-15863.300	1490100.000	0.011

Pole Bending Design Data									
Section No.	Elevation	Size	M _{ux}	ΦM _{ux}	Ratio M _{ux}	M _{uy}	ΦM _{uy}	Ratio M _{uy}	
	ft		lb-ft	lb-ft	ΦM _{ux}	lb-ft	lb-ft	ΦM _{uy}	
L1	80 - 70 (1)	P6.625x0.28	6161.625	29609.583	0.208	0.000	29609.583	0.000	
L2	70 - 60 (2)	P8.625x0.5	24672.667	86755.000	0.284	0.000	86755.000	0.000	
L3	60 - 48 (3)	P8.625x0.5	63441.667	86755.000	0.731	0.000	86755.000	0.000	
L4	48 - 1 (4)	P36x0.375	305549.167	1338808.333	0.228	0.000	1338808.333	0.000	

Pole Shear Design Data									
Section No.	Elevation	Size	Actual V _u	ΦV _n	Ratio V _u	Actual T _u	ΦT _n	Ratio T _u	
	ft		lb	lb	ΦV _u	lb-ft	lb-ft	ΦT _u	
L1	80 - 70 (1)	P6.625x0.28	934.056	52743.801	0.018	0.000	29422.667	0.000	
L2	70 - 60 (2)	P8.625x0.5	2409.280	120608.000	0.020	0.000	86154.167	0.000	
L3	60 - 48 (3)	P8.625x0.5	3554.720	120608.000	0.029	0.001	86154.167	0.000	
L4	48 - 1 (4)	P36x0.375	5743.060	475937.000	0.012	0.001	1368341.667	0.000	

Pole Interaction Design Data									
Section No.	Elevation	Ratio P _n	Ratio M _{ux}	Ratio M _{uy}	Ratio V _n	Ratio T _n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft	ΦP _n	ΦM _{ux}	ΦM _{uy}	ΦV _n	ΦT _n			
L1	80 - 70 (1)	0.006	0.208	0.000	0.018	0.000	0.214	1.050	
L2	70 - 60 (2)	0.008	0.284	0.000	0.020	0.000	0.292	1.050	
L3	60 - 48 (3)	0.013	0.731	0.000	0.029	0.000	0.745	1.050	
L4	48 - 1 (4)	0.011	0.228	0.000	0.012	0.000	0.239	1.050	

Section Capacity Table									
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Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ΦP _{allow} lb	% Capacity	Pass Fail
L1	80 - 70	Pole	P6.625x0.28	1	-1036.920	184603.641	20.4	Pass
L2	70 - 60	Pole	P8.625x0.5	2	-3053.850	422127.281	27.8	Pass
L3	60 - 48	Pole	P8.625x0.5	3	-5272.170	422127.281	71.0	Pass
L4	48 - 1	Pole	P36x0.375	4	-15863.300	1564604.875	22.8	Pass
							Summary	
							Pole (L3)	Pass
							RATING = 71.0	Pass

Program Version 8.2.4.3 - 1/24/2024 File:G:/Shared drives/340429 - 341035/340502/P-464041_L-1060260_10038029_Orbit_Structural Analysis/Tnx/Seismic/SOUTH HILL MALL (WA6413) with canister CCISeismic 4.0.2 Wind And Seismic Analysis.eri

Monopole Base Plate Connection - Seismic

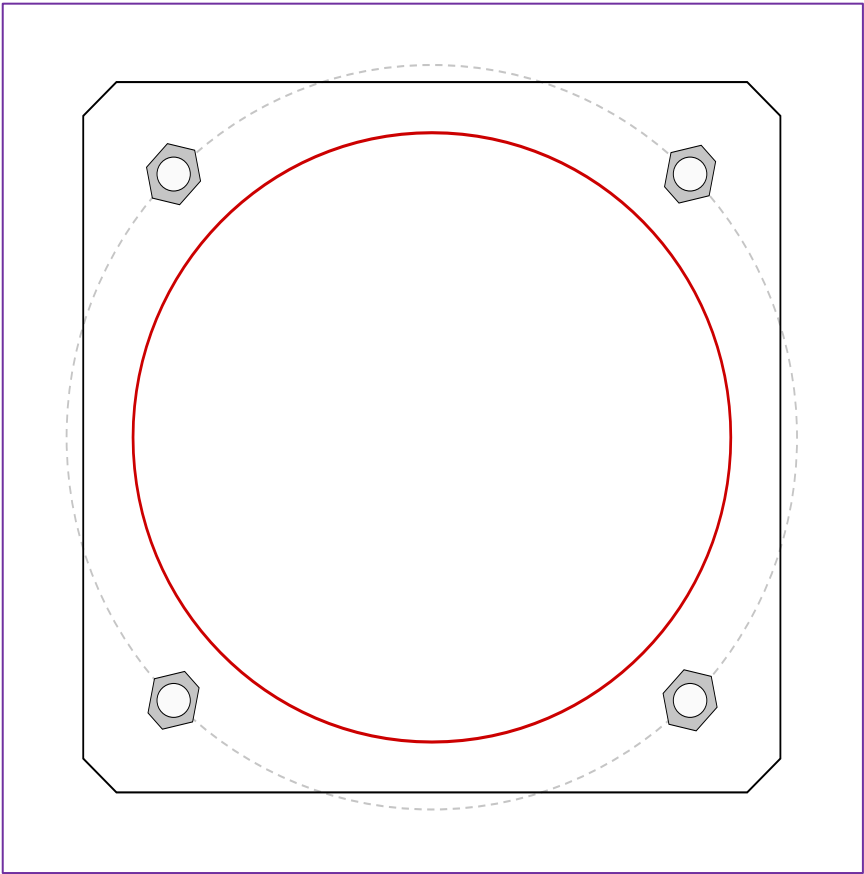
Site Info	
Site #	10038029
Site Name	SOUTH HILL MALL
TEP #	340502.1060260

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l _{ar} (in)	1

Applied Loads	
Moment (kip-ft)	305.55
Axial Force (kips)	15.86
Shear Force (kips)	5.74

*TIA-222-H Section 15.5 Applied

*1.5 Overstrength Factor Applied



Connection Properties		Analysis Results	
Anchor Rod Data		Anchor Rod Summary <i>(units of kips, kip-in)</i>	
(4) 2" $\varnothing$ bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi) on 44" BC		Pu _t = 120.93	ϕ Pn _t = 140.63 Stress Rating
Base Plate Data		Vu = 2.15	ϕ Vn = 88.36 81.9%
42" W x 1.5" Plate (A572-50; Fy=50 ksi, Fu=65 ksi); Clip: 2 in		Mu = n/a	ϕ Mn = n/a Pass
Stiffener Data		Base Plate Summary	
N/A		Max Stress (ksi):	26.51 (Flexural)
Pole Data		Allowable Stress (ksi):	45
36" x 0.375" round pole (API 5L X42; Fy=42 ksi, Fu=60 ksi)		Stress Rating:	56.1% Pass