Date: **December 12, 2023**

Tower Engineering Professionals
326 Tryon Road
Raleigh, NC 27603
(919) 661-6351

Subject: Structural Modification Analysis Report

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Site Number:	5000381667
	Site Name:	Islander- A
Crown Castle Designation:	**BU Number:**	880416
	Site Name:	Seattle Qwest - SEA155
	JDE Job Number:	736871
	Work Order Number:	2271772
	Order Number:	640386 Rev. 5
Engineering Firm Designation:	**TEP Project Number:**	151934.904269
Site Data:	**8477 SE 68th Street, Mercer Island, King County, WA 98040** **Latitude *47° 32' 30.00"*, Longitude *-122° 13' 25.00"*** **150 Foot - Concealment Tower**	

Tower Engineering Professionals is pleased to submit this **"Structural Modification 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 including the proposed modifications as outlined in the attached drawings, "Appendix D". Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC4: Modified Structure w/ Proposed Equipment Configuration **Sufficient Capacity**

This analysis utilizes an ultimate 3-second gust wind speed of 98 mph as required by the 2021 Washington State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Rhett Park, P.E. / CDC

Respectfully submitted by:

Ronnie E. Glover, P.E., S.E.

Electronic Copy 12/12/2023

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1) INTRODUCTION

This is a 130-ft concealment tower designed by Rohn and mapped by CMC Communications in January of 2015 and FDH, Inc. in October 2014. The base tower is 100-ft, and the concealment spine extends from 100-ft to 130-ft. The tower has been modified per reinforcement drawings prepared by GPD Group in September of 2018. A proposed 50-ft spine replacement with 60-in ventilated canisters from 100-ft to 110-ft, and 60-in unvented canisters from 110-ft to 150-ft prepared by TEP in September of 2023, has been considered in this analysis, increasing the overall height to 150-ft.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	II
Wind Speed:	98 mph
Exposure Category:	B
Topographic Factor:	1.182
Ice Thickness:	1.0 in
Wind Speed with Ice:	30 mph
Seismic Ss:	1.461
Seismic S1:	0.505
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
105.0	107.0	3	Commscope	NHHS4-65A-R3B w/ Mount Pipe	6 1	7/8 1-5/8
		3	JMA wireless	TBC-67C-A-P-2SF		
		3	Andrew	ATSBT-TOP-FM		
		1	Raycap	RRFDC-3315-PF-48		
	105.0	1	Generic	60" Dia. x 10' Long Ventilated Concealment Canister		
	104.0	3	Ericsson	4449		
	102.0	3	Ericsson	8843		
	101.0	3	Ericsson	RADIO 8863		

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
146.0	146.0	3	JMA wireless	MX08FRO665-21 w/ Mount Pipe	12	1-5/8
145.0	145.0	1	Generic	60" Dia. x 10' Long Concealment Canister	-	-
135.0	135.0	1	Generic	60" Dia. x 10' Long Concealment Canister	-	-
130.0	130.0	1	GPS	GPS_A	1	1/2

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
125.0	128.0	3	Nokia	AEHC w/ Mount Pipe	-	-
	125.0	1	Generic	60" Dia. x 10' Long Concealment Canister		
	124.0	3	Nokia	AHLOA_T-MOBILE		
		3	Nokia	AHFIG_TMO		
	121.0	2	Commscope	HCS 2.0		
117.0	117.0	3	Commscope	FFVV-65C-R3-V1_TMO w/ Mount Pipe	2	1-1/2
115.0	115.0	1	Generic	60" Dia. x 10' Long Concealment Canister	-	-

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Reference	Source
Geotechnical Report	1584043	CCISites
Tower Foundation Drawings	2030381	CCISites
Tower Manufacturer Drawings	2030383	CCISites
Tower Mapping Report		
Tower Reinforcement Drawings	7839688	CCISites
Post-Modification Inspection	8856717	CCISites
Tower Reinforcement Drawings	11095830	CCISites
Tower Structural Analysis Report	11197949	CCISites

3.1) Analysis Method

tnxTower (version 8.2.2.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A. When applicable, Crown Castle has calculated and provided the effective area for panel antennas using approved methods following the intent of the TIA-222 Standard.

RISA-3D, a commercially available analysis software package, was used to run a modal analysis for the seismic loading on the tower. Selected output from the analysis is included in Appendix C.

SolidWorks, a commercially available analysis software package, was used to create a finite element model of the canister spine flange connection at the 100-ft level. Selected output from the analysis is included in Appendix C - Additional Calculations.

3.2) Assumptions

1) The tower and structures were maintained in accordance with the TIA-222 Standard.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2, and the referenced drawings.
3) Base and flange plate design methodology of the manufacturer has been reviewed and found to be an acceptable means of designing to resist the full capacity of the bolts and shaft.

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 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (k)	ϕP_{allow} (k)	% Capacity	Pass / Fail
L1	150 - 130	Pole	P6.625x0.432	1	Note 1	Note 1	43.8	Pass
L2	130 - 110	Pole	P8.625x0.5	2	-6.53	422.13	74.4	Pass
L3	110 - 100	Pole	P8.625x0.5	3	-9.33	506.55	96.6	Pass
L4	100 - 60	Pole	P36x0.375	4	-17.93	1564.60	22.8	Pass
L5	60 - 20	Pole	P36x0.375	5	-25.68	1564.60	41.2	Pass
L6	20 - 0	Pole	P36x0.375	6	-29.59	1564.60	51.3	Pass
							Summary	
						Pole (L3)	96.6	Pass
						RATING =	**96.6**	**Pass**

Table 5 - Tower Component Stresses vs. Capacity - LC4

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1,2	Flange Connection	130.0	18.0	Pass
1,2	Flange Connection	110.0	59.8	Pass
1	Flange Connection (Stiffener Welds)	100.0	Sufficient	Pass
1,2	Flange Bolts	100.0	48.9	Pass
1,2,3	Flange Connection	60.0	15.9	Pass
1,2,3	Flange Connection	20.0	29.3	Pass
1,2	Anchor Rods	-	35.2	Pass
1,2,3	Base Plate	-	35.2	Pass
1,2	Base Foundation Structural	-	21.6	Pass
1,2	Base Foundation Soil Interaction	-	33.8	Pass

Structure Rating (max from all components) =	**96.6%**

Notes:
1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.
2) Rating per TIA-222-H Section 15.5
3) Base/Flange plates are assumed to have the same capacity as their respective splice bolts or shaft.

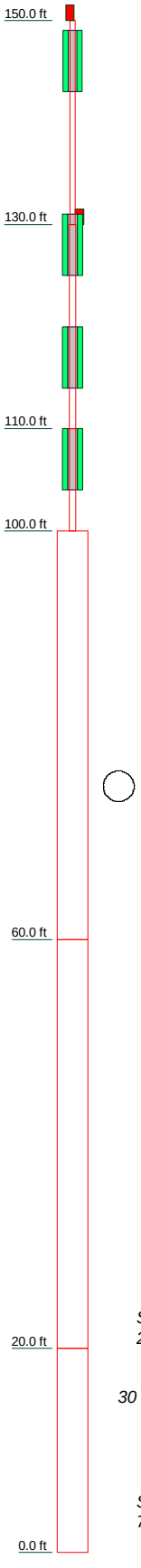
4.1) Recommendations

1) The modifications depicted in “Appendix D - Structural Design Drawings” shall be installed and, upon completion, inspected. The tower and its foundation have sufficient capacity to carry the proposed load configuration once the proposed modifications are installed.

APPENDIX A

TNXTOWER OUTPUT

Section	Size	Length (ft)	Grade	Weight (K)
1	P6.625x0.432	20.00	A53-B-35	0.6
2	P8.625x0.5	20.00		0.9
3	P8.625x0.5	10.00	A53-B-42	0.4
4	P36x0.375	40.00		5.7
5	P36x0.375	40.00		5.7
6	P36x0.375	20.00		2.9
				16.2



ALL REACTIONS ARE FACTORED

AXIAL 40 K

SHEAR 2 K

MOMENT 154 kip-ft

TORQUE 0 kip-ft

30 mph WIND - 1.0000 in ICE

AXIAL 30 K

SHEAR 7 K

MOMENT 694 kip-ft

TORQUE 0 kip-ft

REACTIONS - 98 mph WIND

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi	A53-B-42	42 ksi	63 ksi

TOWER DESIGN NOTES

1. Tower is located in King County, Washington.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 98 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 5 with Crest Height of 360.00 ft
8. TOWER RATING: 96.6%

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Tower Engineering Professionals

Job: ***Seattle Qwest - SEA155 (BU 880416)***		
Project: ***TEP No. 151934.904269***		
Client: Crown Castle	Drawn by: RTP	App'd:
Code: TIA-222-H	Date: 12/04/23	Scale: NTS
Path: C:\Shotrun\LOCAL\880416\RTP_LOCAL_151934.904269_880416_SEATTLE QWEST - SEA155_CMRP\tnxTower\880416_2271772_LC4.eri		Dwg No. E-1

Tower Input Data

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

Tower is located in King County, Washington.
Tower base elevation above sea level: 350.00 ft.
Basic wind speed of 98 mph.
Risk Category II.
Exposure Category B.
Crest Height: 360.00 ft.
Rigorous Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Feature: Continuous Escarpment. Slope Distance L: 2360.00 ft.
Distance from Crest x: 2945.00 ft.
Horizontal Distance Downwind: Yes.
Nominal ice thickness of 1.0000 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.
Tower analysis based on target reliabilities in accordance with Annex S.
Load Modification Factors used: $K_{es}(F_w) = 0.95$, $K_{es}(t_i) = 0.85$.
Maximum demand-capacity ratio is: 1.05.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		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		Retension 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

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	150.00-130.00	20.00	P6.625x0.432	A53-B-35 (35 ksi)	
L2	130.00-110.00	20.00	P8.625x0.5	A53-B-35 (35 ksi)	
L3	110.00-100.00	10.00	P8.625x0.5	A53-B-42 (42 ksi)	
L4	100.00-60.00	40.00	P36x0.375	A53-B-42 (42 ksi)	
L5	60.00-20.00	40.00	P36x0.375	A53-B-42 (42 ksi)	
L6	20.00-0.00	20.00	P36x0.375	A53-B-42 (42 ksi)	

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 150.00-130.00				1	0	1			
L2 130.00-110.00				1	0	1			
L3 110.00-100.00				1	0	1			
L4 100.00-60.00				1	1	1			
L5 60.00-20.00				1	1	1			
L6 20.00-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

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
105 *											

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
3/4" Lighting Cable	C	No	No	Inside Pole	150.00 - 0.00	1	No Ice	0.00	0.35
							1/2" Ice	0.00	0.35
							1" Ice	0.00	0.35
146 AVA7-50(1-5/8")	B	No	No	Inside Pole	146.00 - 0.00	12	No Ice	0.00	0.72
							1/2" Ice	0.00	0.72
							1" Ice	0.00	0.72
130									

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF4-50A(1/2)	C	No	No	Inside Pole	130.00 - 0.00	1	No Ice	0.00	0.15
							1/2" Ice	0.00	0.15
							1" Ice	0.00	0.15
1" Rigid Conduit	C	No	No	Inside Pole	130.00 - 0.00	1	No Ice	0.00	1.13
							1/2" Ice	0.00	1.13
							1" Ice	0.00	1.13
125 *117*									
HCS 2.0 Part 3(1-1/2)	B	No	No	Inside Pole	117.00 - 0.00	2	No Ice	0.00	1.71
							1/2" Ice	0.00	1.71
							1" Ice	0.00	1.71
AVA5-50 (7/8")	B	No	No	Inside Pole	105.00 - 0.00	6	No Ice	0.00	0.30
							1/2" Ice	0.00	0.30
							1" Ice	0.00	0.30
HB158-21U6S12-X XXM-01(1-5/8)	B	No	No	Inside Pole	105.00 - 0.00	1	No Ice	0.00	1.90
							1/2" Ice	0.00	1.90
							1" Ice	0.00	1.90
*									

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	150.00-130.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.14
		C	0.000	0.000	0.000	0.000	0.01
L2	130.00-110.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.20
		C	0.000	0.000	0.000	0.000	0.03
L3	110.00-100.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.14
		C	0.000	0.000	0.000	0.000	0.02
L4	100.00-60.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.63
		C	0.000	0.000	0.000	0.000	0.07
L5	60.00-20.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.63
		C	0.000	0.000	0.000	0.000	0.07
L6	20.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.32
		C	0.000	0.000	0.000	0.000	0.03

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	150.00-130.00	A	1.026	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.14
		C		0.000	0.000	0.000	0.000	0.01

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L2	130.00-110.00	A	1.012	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.20
		C		0.000	0.000	0.000	0.000	0.03
L3	110.00-100.00	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.14
		C		0.000	0.000	0.000	0.000	0.02
L4	100.00-60.00	A	0.976	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.63
		C		0.000	0.000	0.000	0.000	0.07
L5	60.00-20.00	A	0.916	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.63
		C		0.000	0.000	0.000	0.000	0.07
L6	20.00-0.00	A	0.799	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.32
		C		0.000	0.000	0.000	0.000	0.03

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	150.00-130.00	0.0000	0.0000	0.0000	0.0000
L2	130.00-110.00	0.0000	0.0000	0.0000	0.0000
L3	110.00-100.00	0.0000	0.0000	0.0000	0.0000
L4	100.00-60.00	0.0000	0.0000	0.0000	0.0000
L5	60.00-20.00	0.0000	0.0000	0.0000	0.0000
L6	20.00-0.00	0.0000	0.0000	0.0000	0.0000

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) 9"x5"x3.5" Sidelight	C	From Leg	0.00		0.0000	150.00	No Ice	0.38	0.26	0.00
			0.00				1/2" Ice	0.46	0.34	0.01
			0.00				1" Ice	0.55	0.42	0.01
146										
MX08FRO665-21 w/ Mount Pipe	A	From Leg	0.50		0.0000	146.00	No Ice	0.00	0.00	0.11
			0.00				1/2" Ice	0.00	0.00	0.11
			0.00				1" Ice	0.00	0.00	0.11
MX08FRO665-21 w/ Mount Pipe	B	From Leg	0.50		0.0000	146.00	No Ice	0.00	0.00	0.11
			0.00				1/2" Ice	0.00	0.00	0.11
			0.00				1" Ice	0.00	0.00	0.11
MX08FRO665-21 w/ Mount Pipe	C	From Leg	0.50		0.0000	146.00	No Ice	0.00	0.00	0.11
			0.00				1/2" Ice	0.00	0.00	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	0.00	0.00	0.11
130									
GPS_A	B	From Face	0.50	0.0000	130.00	No Ice	0.00	0.00	0.00
			0.00			1/2" Ice	0.00	0.00	0.00
			0.00			1" Ice	0.00	0.00	0.00
125									
AEHC w/ Mount Pipe	A	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.11
			0.00			1/2" Ice	0.00	0.00	0.16
			3.00			1" Ice	0.00	0.00	0.22
AEHC w/ Mount Pipe	B	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.11
			0.00			1/2" Ice	0.00	0.00	0.16
			3.00			1" Ice	0.00	0.00	0.22
AEHC w/ Mount Pipe	C	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.11
			0.00			1/2" Ice	0.00	0.00	0.16
			3.00			1" Ice	0.00	0.00	0.22
(2) AHLOA_T-MOBILE	A	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.08
			0.00			1/2" Ice	0.00	0.00	0.11
			-1.00			1" Ice	0.00	0.00	0.13
AHLOA_T-MOBILE	B	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.08
			0.00			1/2" Ice	0.00	0.00	0.11
			-1.00			1" Ice	0.00	0.00	0.13
AHFIG_TMO	A	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-1.00			1" Ice	0.00	0.00	0.12
AHFIG_TMO	B	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-1.00			1" Ice	0.00	0.00	0.12
AHFIG_TMO	C	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-1.00			1" Ice	0.00	0.00	0.12
HCS 2.0	B	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.00
			0.00			1/2" Ice	0.00	0.00	0.01
			-4.00			1" Ice	0.00	0.00	0.02
HCS 2.0	C	From Leg	0.50	0.0000	125.00	No Ice	0.00	0.00	0.00
			0.00			1/2" Ice	0.00	0.00	0.01
			-4.00			1" Ice	0.00	0.00	0.02
*									
117									
FFVV-65C-R3-V1_TMO w/ Mount Pipe	A	From Leg	0.50	0.0000	117.00	No Ice	0.00	0.00	0.16
			0.00			1/2" Ice	0.00	0.00	0.29
			0.00			1" Ice	0.00	0.00	0.44
FFVV-65C-R3-V1_TMO w/ Mount Pipe	B	From Leg	0.50	0.0000	117.00	No Ice	0.00	0.00	0.16
			0.00			1/2" Ice	0.00	0.00	0.29
			0.00			1" Ice	0.00	0.00	0.44
FFVV-65C-R3-V1_TMO w/ Mount Pipe	C	From Leg	0.50	0.0000	117.00	No Ice	0.00	0.00	0.16
			0.00			1/2" Ice	0.00	0.00	0.29
			0.00			1" Ice	0.00	0.00	0.44
105									
NHHS4-65A-R3B w/ Mount Pipe	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.10
			0.00			1/2" Ice	0.00	0.00	0.16
			2.00			1" Ice	0.00	0.00	0.23
NHHS4-65A-R3B w/ Mount Pipe	B	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.10
			0.00			1/2" Ice	0.00	0.00	0.16
			2.00			1" Ice	0.00	0.00	0.23
NHHS4-65A-R3B w/ Mount Pipe	C	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.10
			0.00			1/2" Ice	0.00	0.00	0.16
			2.00			1" Ice	0.00	0.00	0.23

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
TBC-67C-A-P-2SF	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.01
			0.00			1/2" Ice	0.00	0.00	0.01
			2.00			1" Ice	0.00	0.00	0.02
TBC-67C-A-P-2SF	B	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.01
			0.00			1/2" Ice	0.00	0.00	0.01
			2.00			1" Ice	0.00	0.00	0.02
TBC-67C-A-P-2SF	C	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.01
			0.00			1/2" Ice	0.00	0.00	0.01
			2.00			1" Ice	0.00	0.00	0.02
RADIO 8863	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.05
			0.00			1/2" Ice	0.00	0.00	0.07
			-4.00			1" Ice	0.00	0.00	0.09
RADIO 8863	B	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.05
			0.00			1/2" Ice	0.00	0.00	0.07
			-4.00			1" Ice	0.00	0.00	0.09
RADIO 8863	C	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.05
			0.00			1/2" Ice	0.00	0.00	0.07
			-4.00			1" Ice	0.00	0.00	0.09
ATSBT-TOP-FM	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.00
			0.00			1/2" Ice	0.00	0.00	0.00
			2.00			1" Ice	0.00	0.00	0.01
ATSBT-TOP-FM	B	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.00
			0.00			1/2" Ice	0.00	0.00	0.00
			2.00			1" Ice	0.00	0.00	0.01
ATSBT-TOP-FM	C	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.00
			0.00			1/2" Ice	0.00	0.00	0.00
			2.00			1" Ice	0.00	0.00	0.01
RRFDC-3315-PF-48	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.02
			0.00			1/2" Ice	0.00	0.00	0.05
			2.00			1" Ice	0.00	0.00	0.08
4449	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-1.00			1" Ice	0.00	0.00	0.11
4449	B	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-1.00			1" Ice	0.00	0.00	0.11
4449	C	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-1.00			1" Ice	0.00	0.00	0.11
8843	A	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-3.00			1" Ice	0.00	0.00	0.11
8843	B	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-3.00			1" Ice	0.00	0.00	0.11
8843	C	From Leg	0.50	0.0000	105.00	No Ice	0.00	0.00	0.07
			0.00			1/2" Ice	0.00	0.00	0.09
			-3.00			1" Ice	0.00	0.00	0.11
*									
60" Dia. x 10' Long Concealment Canister	C	None		0.0000	145.00	No Ice	0.00	0.00	0.00
						1/2" Ice	0.00	0.00	0.00
						1" Ice	0.00	0.00	0.00
60" Dia. x 10' Long Concealment Canister	C	None		0.0000	135.00	No Ice	0.00	0.00	0.00
						1/2" Ice	0.00	0.00	0.00
						1" Ice	0.00	0.00	0.00
60" Dia. x 10' Long Concealment Canister	C	None		0.0000	125.00	No Ice	0.00	0.00	0.00
						1/2" Ice	0.00	0.00	0.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	0.00	0.00	0.00
60" Dia. x 10' Long Concealment Canister	C	None		0.0000	115.00	No Ice	0.00	0.00	0.00
						1/2" Ice	0.00	0.00	0.00
						1" Ice	0.00	0.00	0.00
60" Dia. x 10' Long Ventilated Concealment Canister	C	None		0.0000	105.00	No Ice	0.00	0.00	0.00
						1/2" Ice	0.00	0.00	0.00
						1" Ice	0.00	0.00	0.00
*									
Canister Load0	C	None		0.0000	150.00	No Ice	0.00	0.00	0.22
						1/2" Ice	0.00	0.00	0.22
						1" Ice	0.00	0.00	0.22
*									
Canister Load1	C	None		0.0000	150.00	No Ice	11.25	11.25	0.16
						1/2" Ice	27.96	27.96	0.34
						1" Ice	28.42	28.42	0.53
Canister Load2	C	None		0.0000	140.00	No Ice	22.50	22.50	0.53
						1/2" Ice	55.92	55.92	0.90
						1" Ice	56.83	56.83	1.28
Canister Load3	C	None		0.0000	130.00	No Ice	22.50	22.50	0.53
						1/2" Ice	55.92	55.92	0.90
						1" Ice	56.83	56.83	1.28
Canister Load4	C	None		0.0000	120.00	No Ice	22.50	22.50	0.72
						1/2" Ice	55.92	55.92	1.09
						1" Ice	56.83	56.83	1.46
Canister Load5	C	None		0.0000	110.00	No Ice	35.00	35.00	0.75
						1/2" Ice	55.92	55.92	1.12
						1" Ice	56.83	56.83	1.49
Canister Load6	C	None		0.0000	100.00	No Ice	23.75	23.75	0.77
						1/2" Ice	27.96	27.96	0.96
						1" Ice	28.42	28.42	1.15

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice

Comb. No.	Description
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 130	26.604	41	2.3990	0.0003
L2	130 - 110	16.933	41	2.0813	0.0002
L3	110 - 100	9.442	41	1.3445	0.0001
L4	100 - 60	7.390	41	0.5575	0.0000
L5	60 - 20	3.130	41	0.4397	0.0000
L6	20 - 0	0.404	41	0.1860	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.00	(2) 9"x5"x3.5" Sidelight	41	26.604	2.3990	0.0003	10661
146.00	MX08FRO665-21 w/ Mount Pipe	41	24.612	2.3395	0.0003	10661
145.00	60" Dia. x 10' Long Concealment	41	24.116	2.3245	0.0003	10661

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
	Canister					
140.00	Canister Load2	41	21.656	2.2480	0.0002	5330
135.00	60" Dia. x 10' Long Concealment Canister	41	19.252	2.1676	0.0002	3553
130.00	GPS_A	41	16.933	2.0813	0.0002	2532
125.00	AEHC w/ Mount Pipe	41	14.732	1.9826	0.0002	1705
120.00	Canister Load4	41	12.708	1.8466	0.0001	1253
117.00	FFVV-65C-R3-V1_TMO w/ Mount Pipe	41	11.605	1.7347	0.0001	1081
115.00	60" Dia. x 10' Long Concealment Canister	41	10.924	1.6437	0.0001	991
110.00	Canister Load5	41	9.442	1.3445	0.0001	896
105.00	NHHS4-65A-R3B w/ Mount Pipe	41	8.296	0.9467	0.0000	1247
100.00	Canister Load6	41	7.390	0.5575	0.0000	2253

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 130	76.822	6	6.9710	0.0009
L2	130 - 110	48.827	6	6.0399	0.0006
L3	110 - 100	27.153	6	3.8930	0.0003
L4	100 - 60	21.228	6	1.6031	0.0001
L5	60 - 20	8.984	6	1.2631	0.0000
L6	20 - 0	1.159	6	0.5336	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.00	(2) 9"x5"x3.5" Sidelight	6	76.822	6.9710	0.0009	3741
146.00	MX08FRO665-21 w/ Mount Pipe	6	71.056	6.7963	0.0007	3741
145.00	60" Dia. x 10' Long Concealment Canister	6	69.619	6.7523	0.0007	3741
140.00	Canister Load2	6	62.498	6.5280	0.0006	1869
135.00	60" Dia. x 10' Long Concealment Canister	6	55.540	6.2924	0.0006	1245
130.00	GPS_A	6	48.827	6.0399	0.0006	886
125.00	AEHC w/ Mount Pipe	6	42.458	5.7515	0.0006	596
120.00	Canister Load4	6	36.600	5.3548	0.0005	437
117.00	FFVV-65C-R3-V1_TMO w/ Mount Pipe	6	33.407	5.0291	0.0005	376
115.00	60" Dia. x 10' Long Concealment Canister	6	31.437	4.7639	0.0005	344
110.00	Canister Load5	6	27.153	3.8930	0.0003	311
105.00	NHHS4-65A-R3B w/ Mount Pipe	6	23.841	2.7357	0.0002	431
100.00	Canister Load6	6	21.228	1.6031	0.0001	778

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	150 - 130 (1)	P6.625x0.432	20.00	0.00	0.0	8.4049	-2.23	264.76	0.008
L2	130 - 110 (2)	P8.625x0.5	20.00	0.00	0.0	12.7627	-6.53	402.03	0.016
L3	110 - 100 (3)	P8.625x0.5	10.00	0.00	0.0	12.7627	-9.33	482.43	0.019
L4	100 - 60 (4)	P36x0.375	40.00	0.00	0.0	41.9697	-17.93	1490.10	0.012
L5	60 - 20 (5)	P36x0.375	40.00	0.00	0.0	41.9697	-25.68	1490.10	0.017
L6	20 - 0 (6)	P36x0.375	20.00	0.00	0.0	41.9697	-29.59	1490.10	0.020

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	150 - 130 (1)	P6.625x0.432	17.35	43.56	0.398	0.00	43.56	0.000
L2	130 - 110 (2)	P8.625x0.5	66.31	86.75	0.764	0.00	86.75	0.000
L3	110 - 100 (3)	P8.625x0.5	103.51	104.11	0.994	0.00	104.11	0.000
L4	100 - 60 (4)	P36x0.375	304.40	1338.81	0.227	0.00	1338.81	0.000
L5	60 - 20 (5)	P36x0.375	555.97	1338.81	0.415	0.00	1338.81	0.000
L6	20 - 0 (6)	P36x0.375	693.84	1338.81	0.518	0.00	1338.81	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	150 - 130 (1)	P6.625x0.432	1.28	79.43	0.016	0.00	43.25	0.000
L2	130 - 110 (2)	P8.625x0.5	2.79	120.61	0.023	0.01	86.15	0.000
L3	110 - 100 (3)	P8.625x0.5	3.60	144.73	0.025	0.01	103.39	0.000
L4	100 - 60 (4)	P36x0.375	5.75	454.19	0.013	0.01	1094.28	0.000
L5	60 - 20 (5)	P36x0.375	6.74	454.19	0.015	0.01	1094.28	0.000
L6	20 - 0 (6)	P36x0.375	7.04	454.19	0.015	0.01	1094.28	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 130 (1)	0.008	0.398	0.000	0.016	0.000	0.407	1.050	
L2	130 - 110 (2)	0.016	0.764	0.000	0.023	0.000	0.781	1.050	

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	110 - 100 (3)	0.019	0.994	0.000	0.025	0.000	1.014	1.050	
L4	100 - 60 (4)	0.012	0.227	0.000	0.013	0.000	0.240	1.050	
L5	60 - 20 (5)	0.017	0.415	0.000	0.015	0.000	0.433	1.050	
L6	20 - 0 (6)	0.020	0.518	0.000	0.015	0.000	0.538	1.050	

Section Capacity Table

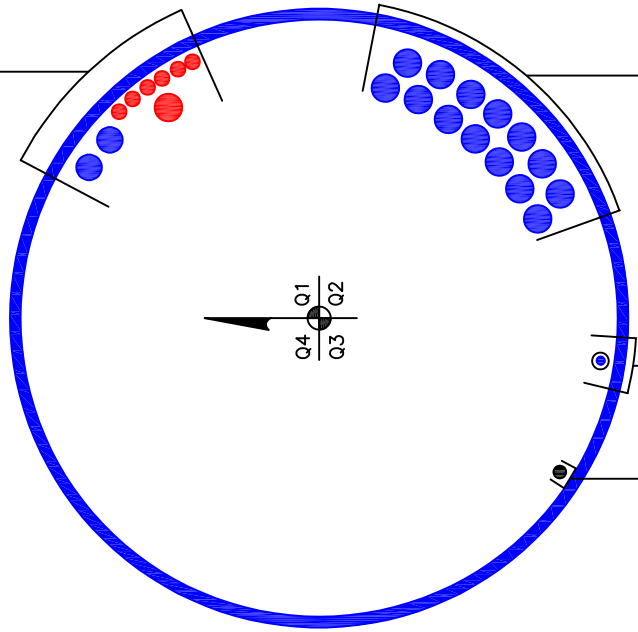
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	150 - 130	Pole	P6.625x0.432	1	-2.23	277.99	38.8	Pass
L2	130 - 110	Pole	P8.625x0.5	2	-6.53	422.13	74.4	Pass
L3	110 - 100	Pole	P8.625x0.5	3	-9.33	506.55	96.6	Pass
L4	100 - 60	Pole	P36x0.375	4	-17.93	1564.60	22.8	Pass
L5	60 - 20	Pole	P36x0.375	5	-25.68	1564.60	41.2	Pass
L6	20 - 0	Pole	P36x0.375	6	-29.59	1564.60	51.3	Pass
							Summary	
						Pole (L3)	96.6	Pass
						RATING =	**96.6**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

(PROPOSED EQUIPMENT CONFIGURATION)
(6) 7/8" TO 105 FT LEVEL
(1) 1-5/8" TO 105 FT LEVEL

(OTHER CONSIDERED EQUIPMENT)
(2) 1-1/2" TO 117 FT LEVEL



(OTHER CONSIDERED EQUIPMENT)
(12) 1-5/8" TO 146 FT LEVEL

(OTHER CONSIDERED EQUIPMENT-IN 1" CONDUIT)
(1) 1/2" TO 130 FT LEVEL

(OTHER CONSIDERED EQUIPMENT)
(1) 3/4" TO 130 FT TOWER LIGHTING

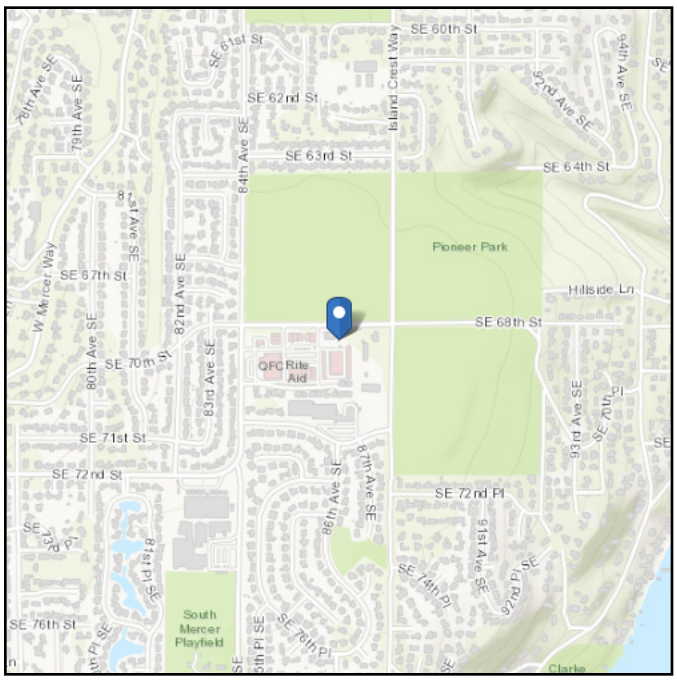
APPENDIX C

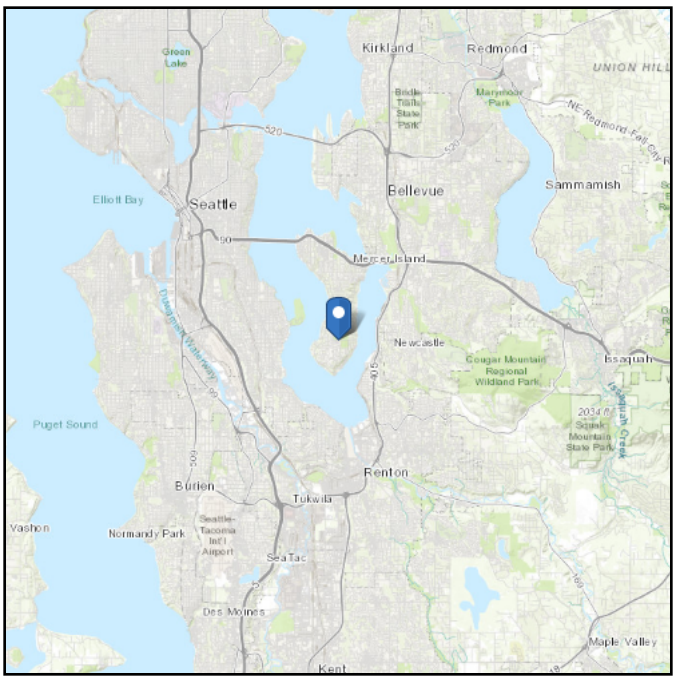
ADDITIONAL CALCULATIONS

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Latitude:**	47.541667
Risk Category:	II	**Longitude:**	-122.223611
Soil Class:	D - Default (see Section 11.4.3)	**Elevation:**	350.4819556609603 ft (NAVD 88)





Wind

Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	74 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed:	Fri Nov 03 2023

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

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.461	S_{D1} :	N/A
S_1 :	0.505	T_L :	6
F_a :	1.2	PGA :	0.625
F_v :	N/A	PGA_M :	0.75
S_{MS} :	1.753	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.168	C_v :	1.392

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Fri Nov 03 2023

Date Source: USGS Seismic Design Maps

Ice

Results:

Ice Thickness:	1.00 in.
Concurrent Temperature:	25 F
Gust Speed	30 mph
Data Source:	Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
Date Accessed:	Fri Nov 03 2023

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

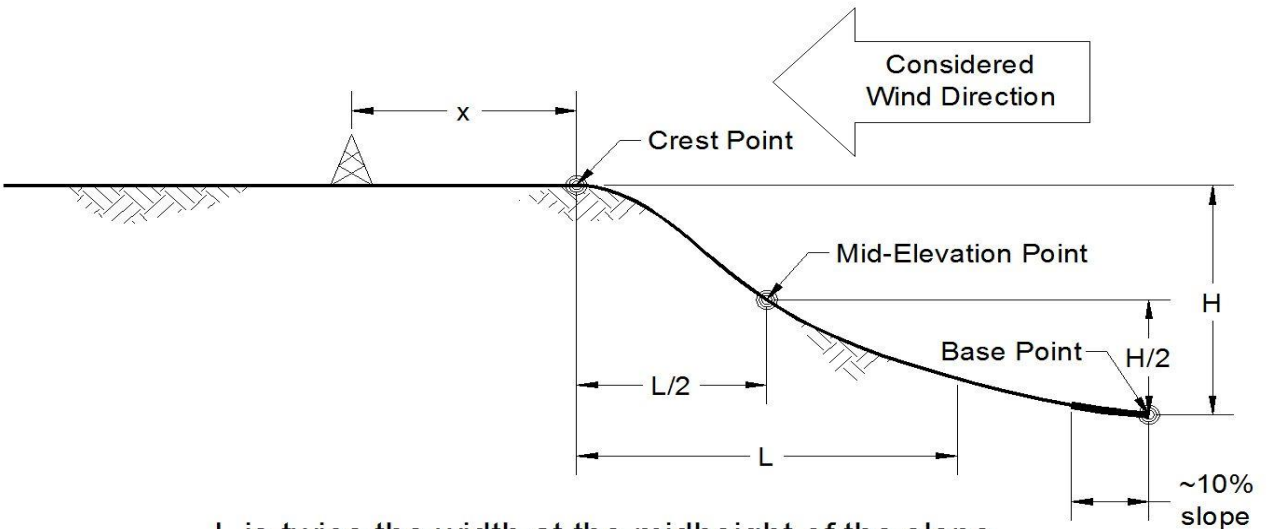
Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from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

Topographic Factors for use in tnxTower

(V. 3.2.3, Effecitve 09-06-2018)

per SEAW RSM-03 Figure 3-3 & ANSI/TIA-222-H Section 2.6.6.2.2

BU:	880416
Site Name:	SEATTLE QWEST - SEA155
Order:	640386 Rev. 5



L is twice the width at the midheight of the slope

Topographic Feature

- ○ Continuous Ridge
- ○ Flat Topped Ridge
- ○ Hill
- ○ Flat Topped Hill
- ◉ Continuous Escarpment
  - ☑ Tower is downwind from crest point

Exposure Category

- ◉ Exposure B
- ○ Exposure C
- ○ Exposure D

Notes:

1) Feature is assumed to be isolated per section 1.8 of the Crown Castle standard for the Determination of Topographic Factors (ENG-PRC-10040).

2) Base Kzt may differ slightly from TNX value due to differences in where the base line is established. This does not effect the results in anyway.

Topographic Input	
Crest Point Elevation (ft. AMSL)	380
Base Point Elevation (ft. AMSL)	20
Mid-Height Elevation (ft. AMSL)	200
Crest to Mid-Height Distance (L/2) (ft.)	1180
Tower Point Elevation (ft. AMSL)	380
Structure Distance from Crest Line (x)(ft.)	2945

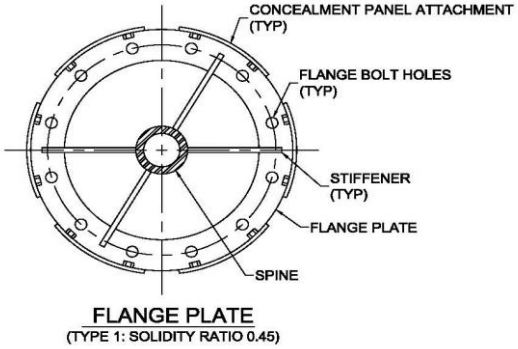
tnxTower Input		K_{ZT} (RSM-03)
Topographic Category	Rigorous Procedure / Category 5	**At Base:** **1.182^2**
Crest Height, H (ft.)	360	
Slope Distance, L (ft.)	2360	
Distance from Crest, x (ft.)	2945	

CCI Flagpole Tool

Site Data	
BU#:	880416
Site Name:	Seattle Qwest - SEA155
Order #:	640386 Rev. 5

Code		
Code:	TIA-222-H	
Ice Thickness:	1	in
Windspeed (V):	98	mph
Ice Wind Speed (V):	30	mph
Exposure Category:	B	
	Continuous	
Topographic Feature:	Escarpment	
Distance From Crest (x):	2945	ft
Slope Distance (L):	2360	ft
Crest Height (H):	360	ft
Risk Category:	II	

Tower Information		
Total Tower Height:	150	ft
Base Tower Height:	100	ft
Total Canister Length:	50	ft
Number of Canister Assembly Sections:	5	



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	60	No		Round	4	0.25	60	0.55	0.220	0.314	0-0
2	10	60	No		Round	4	0.25	60	0.55	0.220	0.314	0-0
3	10	60	No		Round	5	0.28	60	0.9	0.404	0.314	0-0
4	10	60	No		Round	5	0.30	60	0.9	0.433	0.314	0-0
5	10	60	Yes	Generic	Round	1	2.00	39.25	0.45	0.618	0.314	0-10

[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 PreQT_880416_2271772_LC4.eri *(last saved 12/ 4 11:28 am)*

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	Delete
150	20		0	6.625	6.625	0.432	n/a	A53-B-35	[x]
130	20		0	8.625	8.625	0.5	n/a	A53-B-35	[x]
110	10		0	8.625	8.625	0.5	n/a	A53-B-42	[x]
100	40		0	36	36	0.375	n/a	A53-B-42	[x]
60	40		0	36	36	0.375	n/a	A53-B-42	[x]
20	20		0	36	36	0.375	n/a	A53-B-42	[x]

Discrete Loads : C_FA_F for Canister Assembly								
Canister Loading	Apply C_FA_F at Elevation(z) (ft)	C_FA_F No Ice (ft^2)	C_FA_F 1/2" Ice (ft^2)	C_FA_F 1" Ice (ft^2)	C_FA_F 2" Ice (ft^2)	C_FA_F 4" Ice (ft^2)	Canister Assembly Weight No Ice (Kip)	Canister Assembly Weight 1/2" Ice (Kip)
Canister Load 1	150	11.250	27.958	28.417	29.333	31.167	0.157	0.342
Canister Load 2	140	22.500	55.917	56.833	58.667	62.333	0.535	0.904
Canister Load 3	130	22.500	55.917	56.833	58.667	62.333	0.535	0.904
Canister Load 4	120	22.500	55.917	56.833	58.667	62.333	0.718	1.088
Canister Load 5	110	35.000	55.917	56.833	58.667	62.333	0.747	1.117
Canister Load 6	100	23.750	27.958	28.417	29.333	31.167	0.775	0.959

Deflection Check Required:	**Yes**	Import Deflection Results
3% Spine Deflection Check		
Allowable (3%) Horizontal Spine Deflection (inches)	Actual Deflection[1] (inches)	Sufficient/ Insufficient
18.000	19.214	Insufficient

[1] Relative deflection under service level wind speed

BU:	880416	Structure:	A
WO:	2271772		
Order:	640386	Rev:	5

Location

	Decimal Degrees		Deg	Min	Sec
Lat:	47.541667	+	47	32	30.00
Long:	-122.223611	-	122	13	25.00

Code and Site Parameters

Seismic Design Code:	TIA-222-H-1	
Site Soil:	D (Default)	Default
Risk Category:	II	

USGS Seismic Reference	S_S:	1.4610 g
	S_1:	0.5050 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:	1.7950

Design spectral response acceleration short period, S_{DS}:	1.1688	g
Design spectral response acceleration 1 s period, S_{D1}:	0.6043	g
T_s:	0.5170	

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:	880416	Structure:	A
WO:	2271772		
Order:	640386	Rev:	5

Tower Details

Tower Type:	Stepped Monopole		
Height, h:	150	ft	
Effective Seismic Weight, W:	24.66	kips	
Amplification Factor, A_s:	1.0		2.7.8.1

Seismic Base Shear

Response Modification Factor, R:	1.5		
Fundamental Period, T:	2.9370	s	
Seismic Response Coefficient, C_s	0.2058		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}	0.0514		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}	0.2058		
Seismic Base Shear, V	5.073	kips	2.7.7.1.1

Vertical Distribution Factors

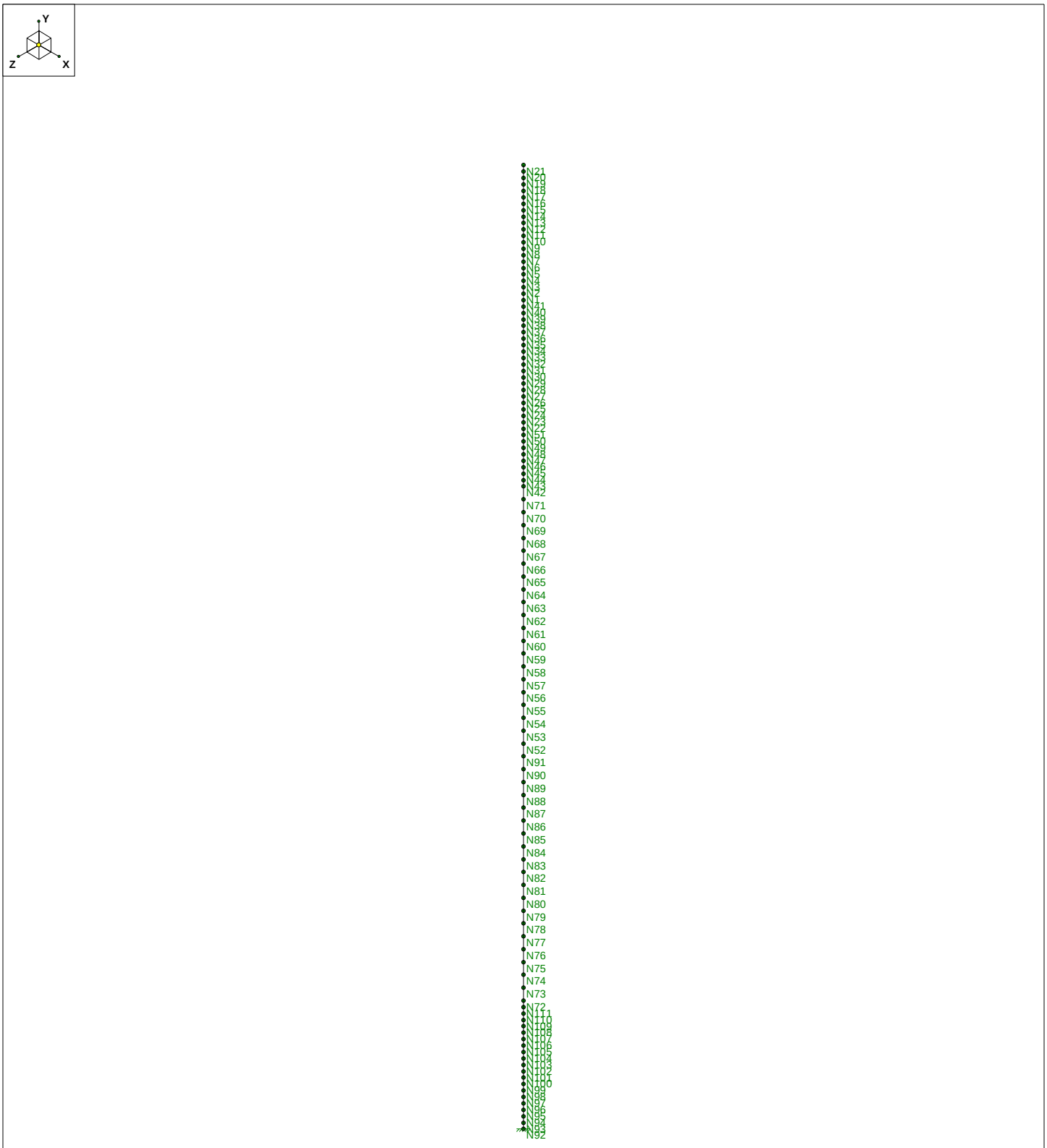
Period Related Exponent, k:	2.000
Sum of $w_i h_i^k$	181113.26

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	150.00	145.00	0.2860	6013.18	0.0332	0.1684	0.0669
1 - 2	10.00	140.00	135.00	0.2860	5212.38	0.0288	0.1460	0.0669
2 - 1	10.00	130.00	125.00	0.4343	6785.73	0.0375	0.1901	0.1015
2 - 2	10.00	120.00	115.00	0.4343	5743.45	0.0317	0.1609	0.1015
3 - 1	10.00	110.00	105.00	0.4343	4788.01	0.0264	0.1341	0.1015
4 - 1	10.00	100.00	95.00	1.4281	12888.93	0.0712	0.3611	0.3338
4 - 2	10.00	90.00	85.00	1.4281	10318.28	0.0570	0.2890	0.3338
4 - 3	10.00	80.00	75.00	1.4281	8033.27	0.0444	0.2250	0.3338
4 - 4	10.00	70.00	65.00	1.4281	6033.88	0.0333	0.1690	0.3338
5 - 1	10.00	60.00	55.00	1.4281	4320.11	0.0239	0.1210	0.3338
5 - 2	10.00	50.00	45.00	1.4281	2891.98	0.0160	0.0810	0.3338
5 - 3	10.00	40.00	35.00	1.4281	1749.47	0.0097	0.0490	0.3338
5 - 4	10.00	30.00	25.00	1.4281	892.59	0.0049	0.0250	0.3338
6 - 1	10.00	20.00	15.00	1.4281	321.33	0.0018	0.0090	0.3338
6 - 2	10.00	10.00	5.00	1.4281	35.70	0.0002	0.0010	0.3338
			Sum	16.1562	76028.28			

Discrete Loads						
Name	h_x	w_x	$w_x h_x^k$	C_{vx}	F_{xh}	F_{xv}
(2) beacon 9"x5"x3.5" Sidelight	150.00	0.0040	90.00	0.0005	0.0025	0.0009
MX08FRO665-21 w/ Mount Pipe	146.00	0.1081	2304.15	0.0127	0.0645	0.0253
MX08FRO665-21 w/ Mount Pipe	146.00	0.1081	2304.15	0.0127	0.0645	0.0253
MX08FRO665-21 w/ Mount Pipe	146.00	0.1081	2304.15	0.0127	0.0645	0.0253
GPS_A	130.00	0.0009	14.70	0.0001	0.0004	0.0002
AEHC w/ Mount Pipe	125.00	0.1136	1775.67	0.0098	0.0497	0.0266
AEHC w/ Mount Pipe	125.00	0.1136	1775.67	0.0098	0.0497	0.0266
AEHC w/ Mount Pipe	125.00	0.1136	1775.67	0.0098	0.0497	0.0266
(2) AHLOA_T-MOBILE	125.00	0.1680	2625.00	0.0145	0.0735	0.0393
AHLOA_T-MOBILE	125.00	0.0840	1312.50	0.0072	0.0368	0.0196
AHFIG_TMO	125.00	0.0710	1109.38	0.0061	0.0311	0.0166
AHFIG_TMO	125.00	0.0710	1109.38	0.0061	0.0311	0.0166
AHFIG_TMO	125.00	0.0710	1109.38	0.0061	0.0311	0.0166
HCS 2.0	125.00	0.0010	15.63	0.0001	0.0004	0.0002
HCS 2.0	125.00	0.0010	15.63	0.0001	0.0004	0.0002
FFVV-65C-R3-V1_TMO w/ Mount Pipe	117.00	0.1575	2155.70	0.0119	0.0604	0.0368
FFVV-65C-R3-V1_TMO w/ Mount Pipe	117.00	0.1575	2155.70	0.0119	0.0604	0.0368
FFVV-65C-R3-V1_TMO w/ Mount Pipe	117.00	0.1575	2155.70	0.0119	0.0604	0.0368
NHHS4-65A-R3B w/ Mount Pipe	105.00	0.0980	1080.45	0.0060	0.0303	0.0229
NHHS4-65A-R3B w/ Mount Pipe	105.00	0.0980	1080.45	0.0060	0.0303	0.0229
NHHS4-65A-R3B w/ Mount Pipe	105.00	0.0980	1080.45	0.0060	0.0303	0.0229
TBC-67C-A-P-2SF	105.00	0.0110	121.28	0.0007	0.0034	0.0026
TBC-67C-A-P-2SF	105.00	0.0110	121.28	0.0007	0.0034	0.0026
TBC-67C-A-P-2SF	105.00	0.0110	121.28	0.0007	0.0034	0.0026
RADIO 8863	105.00	0.0510	562.28	0.0031	0.0158	0.0119
RADIO 8863	105.00	0.0510	562.28	0.0031	0.0158	0.0119
RADIO 8863	105.00	0.0510	562.28	0.0031	0.0158	0.0119
ATSBT-TOP-FM	105.00	0.0020	22.05	0.0001	0.0006	0.0005
ATSBT-TOP-FM	105.00	0.0020	22.05	0.0001	0.0006	0.0005
ATSBT-TOP-FM	105.00	0.0020	22.05	0.0001	0.0006	0.0005
RRFDC-3315-PF-48	105.00	0.0210	231.53	0.0013	0.0065	0.0049
4449	105.00	0.0710	782.78	0.0043	0.0219	0.0166
4449	105.00	0.0710	782.78	0.0043	0.0219	0.0166
4449	105.00	0.0710	782.78	0.0043	0.0219	0.0166
8843	105.00	0.0720	793.80	0.0044	0.0222	0.0168
8843	105.00	0.0720	793.80	0.0044	0.0222	0.0168
8843	105.00	0.0720	793.80	0.0044	0.0222	0.0168
Canister Load0	150.00	0.2200	4950.00	0.0273	0.1387	0.0514
Canister Load1	150.00	0.1571	3534.30	0.0195	0.0990	0.0367
Canister Load2	140.00	0.5346	10479.00	0.0579	0.2935	0.1250
Canister Load3	130.00	0.5346	9035.47	0.0499	0.2531	0.1250
Canister Load4	120.00	0.7182	10342.76	0.0571	0.2897	0.1679
Canister Load5	110.00	0.7471	9040.03	0.0499	0.2532	0.1746
Canister Load6	100.00	0.7747	7746.61	0.0428	0.2170	0.1811
	Sum	6.2319	91555.73			

Linear Loads								
Name	Start Height	End Height	h_x	w_x	$w_x h_x^k$	C_{vx}	F_{xh}	F_{xv}
3/4" Lighting Cable From 0 to 150	140.00	150.00	145.00	0.0035	73.59	0.0004	0.0021	0.0008
3/4" Lighting Cable From 0 to 150	130.00	140.00	135.00	0.0035	63.79	0.0004	0.0018	0.0008
3/4" Lighting Cable From 0 to 150	120.00	130.00	125.00	0.0035	54.69	0.0003	0.0015	0.0008
3/4" Lighting Cable From 0 to 150	110.00	120.00	115.00	0.0035	46.29	0.0003	0.0013	0.0008
3/4" Lighting Cable From 0 to 150	100.00	110.00	105.00	0.0035	38.59	0.0002	0.0011	0.0008
3/4" Lighting Cable From 0 to 150	90.00	100.00	95.00	0.0035	31.59	0.0002	0.0009	0.0008
3/4" Lighting Cable From 0 to 150	80.00	90.00	85.00	0.0035	25.29	0.0001	0.0007	0.0008
3/4" Lighting Cable From 0 to 150	70.00	80.00	75.00	0.0035	19.69	0.0001	0.0006	0.0008
3/4" Lighting Cable From 0 to 150	60.00	70.00	65.00	0.0035	14.79	0.0001	0.0004	0.0008
3/4" Lighting Cable From 0 to 150	50.00	60.00	55.00	0.0035	10.59	0.0001	0.0003	0.0008
3/4" Lighting Cable From 0 to 150	40.00	50.00	45.00	0.0035	7.09	0.0000	0.0002	0.0008
3/4" Lighting Cable From 0 to 150	30.00	40.00	35.00	0.0035	4.29	0.0000	0.0001	0.0008
3/4" Lighting Cable From 0 to 150	20.00	30.00	25.00	0.0035	2.19	0.0000	0.0001	0.0008
3/4" Lighting Cable From 0 to 150	10.00	20.00	15.00	0.0035	0.79	0.0000	0.0000	0.0008
3/4" Lighting Cable From 0 to 150	0.00	10.00	5.00	0.0035	0.09	0.0000	0.0000	0.0008
(12) andrew AVA7-50(1-5/8") From 0 to 146	140.00	146.00	143.00	0.0518	1060.08	0.0059	0.0297	0.0121
(12) andrew AVA7-50(1-5/8") From 0 to 146	130.00	140.00	135.00	0.0864	1574.64	0.0087	0.0441	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	120.00	130.00	125.00	0.0864	1350.00	0.0075	0.0378	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	110.00	120.00	115.00	0.0864	1142.64	0.0063	0.0320	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	100.00	110.00	105.00	0.0864	952.56	0.0053	0.0267	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	90.00	100.00	95.00	0.0864	779.76	0.0043	0.0218	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	80.00	90.00	85.00	0.0864	624.24	0.0034	0.0175	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	70.00	80.00	75.00	0.0864	486.00	0.0027	0.0136	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	60.00	70.00	65.00	0.0864	365.04	0.0020	0.0102	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	50.00	60.00	55.00	0.0864	261.36	0.0014	0.0073	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	40.00	50.00	45.00	0.0864	174.96	0.0010	0.0049	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	30.00	40.00	35.00	0.0864	105.84	0.0006	0.0030	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	20.00	30.00	25.00	0.0864	54.00	0.0003	0.0015	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	10.00	20.00	15.00	0.0864	19.44	0.0001	0.0005	0.0202
(12) andrew AVA7-50(1-5/8") From 0 to 146	0.00	10.00	5.00	0.0864	2.16	0.0000	0.0001	0.0202
andrew LDF4-50A(1/2) From 0 to 130	120.00	130.00	125.00	0.0015	23.44	0.0001	0.0007	0.0004
andrew LDF4-50A(1/2) From 0 to 130	110.00	120.00	115.00	0.0015	19.84	0.0001	0.0006	0.0004
andrew LDF4-50A(1/2) From 0 to 130	100.00	110.00	105.00	0.0015	16.54	0.0001	0.0005	0.0004
andrew LDF4-50A(1/2) From 0 to 130	90.00	100.00	95.00	0.0015	13.54	0.0001	0.0004	0.0004
andrew LDF4-50A(1/2) From 0 to 130	80.00	90.00	85.00	0.0015	10.84	0.0001	0.0003	0.0004
andrew LDF4-50A(1/2) From 0 to 130	70.00	80.00	75.00	0.0015	8.44	0.0000	0.0002	0.0004
andrew LDF4-50A(1/2) From 0 to 130	60.00	70.00	65.00	0.0015	6.34	0.0000	0.0002	0.0004
andrew LDF4-50A(1/2) From 0 to 130	50.00	60.00	55.00	0.0015	4.54	0.0000	0.0001	0.0004
andrew LDF4-50A(1/2) From 0 to 130	40.00	50.00	45.00	0.0015	3.04	0.0000	0.0001	0.0004
andrew LDF4-50A(1/2) From 0 to 130	30.00	40.00	35.00	0.0015	1.84	0.0000	0.0001	0.0004
andrew LDF4-50A(1/2) From 0 to 130	20.00	30.00	25.00	0.0015	0.94	0.0000	0.0000	0.0004
andrew LDF4-50A(1/2) From 0 to 130	10.00	20.00	15.00	0.0015	0.34	0.0000	0.0000	0.0004
andrew LDF4-50A(1/2) From 0 to 130	0.00	10.00	5.00	0.0015	0.04	0.0000	0.0000	0.0004
miscl 1" Rigid Conduit From 0 to 130	120.00	130.00	125.00	0.0113	176.56	0.0010	0.0049	0.0026
miscl 1" Rigid Conduit From 0 to 130	110.00	120.00	115.00	0.0113	149.44	0.0008	0.0042	0.0026
miscl 1" Rigid Conduit From 0 to 130	100.00	110.00	105.00	0.0113	124.58	0.0007	0.0035	0.0026
miscl 1" Rigid Conduit From 0 to 130	90.00	100.00	95.00	0.0113	101.98	0.0006	0.0029	0.0026
miscl 1" Rigid Conduit From 0 to 130	80.00	90.00	85.00	0.0113	81.64	0.0005	0.0023	0.0026
miscl 1" Rigid Conduit From 0 to 130	70.00	80.00	75.00	0.0113	63.56	0.0004	0.0018	0.0026
miscl 1" Rigid Conduit From 0 to 130	60.00	70.00	65.00	0.0113	47.74	0.0003	0.0013	0.0026
miscl 1" Rigid Conduit From 0 to 130	50.00	60.00	55.00	0.0113	34.18	0.0002	0.0010	0.0026
miscl 1" Rigid Conduit From 0 to 130	40.00	50.00	45.00	0.0113	22.88	0.0001	0.0006	0.0026
miscl 1" Rigid Conduit From 0 to 130	30.00	40.00	35.00	0.0113	13.84	0.0001	0.0004	0.0026
miscl 1" Rigid Conduit From 0 to 130	20.00	30.00	25.00	0.0113	7.06	0.0000	0.0002	0.0026
miscl 1" Rigid Conduit From 0 to 130	10.00	20.00	15.00	0.0113	2.54	0.0000	0.0001	0.0026
miscl 1" Rigid Conduit From 0 to 130	0.00	10.00	5.00	0.0113	0.28	0.0000	0.0000	0.0026
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	110.00	117.00	113.50	0.0239	308.40	0.0017	0.0086	0.0056
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	100.00	110.00	105.00	0.0342	377.06	0.0021	0.0106	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	90.00	100.00	95.00	0.0342	308.66	0.0017	0.0086	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	80.00	90.00	85.00	0.0342	247.10	0.0014	0.0069	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	70.00	80.00	75.00	0.0342	192.38	0.0011	0.0054	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	60.00	70.00	65.00	0.0342	144.50	0.0008	0.0040	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	50.00	60.00	55.00	0.0342	103.46	0.0006	0.0029	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	40.00	50.00	45.00	0.0342	69.26	0.0004	0.0019	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	30.00	40.00	35.00	0.0342	41.90	0.0002	0.0012	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	20.00	30.00	25.00	0.0342	21.38	0.0001	0.0006	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	10.00	20.00	15.00	0.0342	7.70	0.0000	0.0002	0.0080
(2) nokia HCS 2.0 Part 3(1-1/2) From 0 to 117	0.00	10.00	5.00	0.0342	0.86	0.0000	0.0000	0.0080
(6) andrew AVA5-50 (7/8") From 0 to 105	100.00	105.00	102.50	0.0090	94.56	0.0005	0.0026	0.0021
(6) andrew AVA5-50 (7/8") From 0 to 105	90.00	100.00	95.00	0.0180	162.45	0.0009	0.0046	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	80.00	90.00	85.00	0.0180	130.05	0.0007	0.0036	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	70.00	80.00	75.00	0.0180	101.25	0.0006	0.0028	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	60.00	70.00	65.00	0.0180	76.05	0.0004	0.0021	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	50.00	60.00	55.00	0.0180	54.45	0.0003	0.0015	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	40.00	50.00	45.00	0.0180	36.45	0.0002	0.0010	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	30.00	40.00	35.00	0.0180	22.05	0.0001	0.0006	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	20.00	30.00	25.00	0.0180	11.25	0.0001	0.0003	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	10.00	20.00	15.00	0.0180	4.05	0.0000	0.0001	0.0042
(6) andrew AVA5-50 (7/8") From 0 to 105	0.00	10.00	5.00	0.0180	0.45	0.0000	0.0000	0.0042
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	100.00	105.00	102.50	0.0095	99.81	0.0006	0.0028	0.0022

rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	90.00	100.00	95.00	0.0190	171.47	0.0009	0.0048	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	80.00	90.00	85.00	0.0190	137.27	0.0008	0.0038	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	70.00	80.00	75.00	0.0190	106.87	0.0006	0.0030	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	60.00	70.00	65.00	0.0190	80.27	0.0004	0.0022	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	50.00	60.00	55.00	0.0190	57.47	0.0003	0.0016	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	40.00	50.00	45.00	0.0190	38.47	0.0002	0.0011	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	30.00	40.00	35.00	0.0190	23.27	0.0001	0.0007	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	20.00	30.00	25.00	0.0190	11.87	0.0001	0.0003	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	10.00	20.00	15.00	0.0190	4.27	0.0000	0.0001	0.0044
rfs celwave HB158-21U6S12-XXXM-01(1-5/8) From 0 to 105	0.00	10.00	5.00	0.0190	0.47	0.0000	0.0000	0.0044
			Sum	2.2690	13529.25			



Tower Engineering Profess...	Seattle Qwest - SEA155 (BU 880416)	SK - 1
RTP		Dec 4, 2023 at 12:29 PM
TEP No. 151934.904269		Modal_880416_2271772_LC4.rt3

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Standard Solver

Hot Rolled Steel Code	None
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	None

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-16
Seismic Base Elevation (ft)	0
Add Base Weight?	Yes
Ct X	1
Ct Z	1
T X (sec)	2.937
T Z (sec)	2.937
R X	1.5
R Z	1.5
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	.604
SDS	1.169
S1	.505
TL (sec)	6
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
1	gen_Conc3NW	3155	1372	.15	.6	.145
2	gen_Conc4NW	3644	1584	.15	.6	.145
3	gen_Conc3LW	2085	906	.15	.6	.11
4	gen_Conc4LW	2408	1047	.15	.6	.11
5	gen_Alum	10600	4077	.3	1.29	.173
6	gen_Steel	29000	11154	.3	.65	.49
7	RIGID	1e+6		.3	0	0

General Section Sets

	Label	Shape	Type	Material	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	GEN1	RE4X4	Beam	gen_Conc3NW	16	21.333	21.333	31.573

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N92	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distri...	Area(Member)	Surface(Plate/Wall)
1	Dead	None		-1			106	7		

Load Combinations

	Description	Sol..	PD...	SRSS	B...	Fa...	BLC	Fa...	BLC	Fac..	BLC	Fac..	BLC	Fac.....	F.....	F.....	F.....	F.....	F...
1	Dead Only	Yes	Y		1	1					0		0		0		0		0				
2	(1.2+0.2Sds)*DL+1.0E	Yes	Y		1	1.2	1	.234	SX...	1	0		0		0		0		0				

Spectra Scaling Factor

Scaling Factor Z:	1	Scaling Factor X:	1	

Dynamics Input

Number of Modes	14
Load Combination Number	1 - Dead Only
Acceleration of Gravity	32.2 (ft/sec^2)
Convergence Tolerance	0.0001

Response Spectra Data

X Direction Spectra	ASCE 2016, Parametric Design Spectra
Modes Used	All 14 modes
Mode No. for Signs	
Modal Combination Method	CQC
Damping Ratio	5 Percent

Y Direction Spectra	ASCE 2016, Parametric Design Spectra
Modes Used	All 14 modes
Mode No. for Signs	
Modal Combination Method	CQC
Damping Ratio	5 Percent

Z Direction Spectra	ASCE 2016, Parametric Design Spectra
Modes Used	All 14 modes
Mode No. for Signs	
Modal Combination Method	CQC
Damping Ratio	5 Percent

Frequencies / Participation

Mode Number	Frequency (Hz)	Period (Sec)	Percent Modal Participation X Spectra	Y Spectra	Z Spectra
1	.341	2.937	37.401		10.479
2	.341	2.937	10.479		37.401
3	.851	1.176	15.892		5.919
4	.851	1.176	5.919		15.892
5	2.539	.394	3.078		1.608
6	2.539	.394	1.608		3.078
7	4.701	.213	6.679		3.677
8	4.701	.213	3.677		6.679
9	7.493	.133	.982		.549
10	7.493	.133	.549		.982

Frequencies / Participation, (continued)

Mode Number	Frequency (Hz)	Period (Sec)	Percent Modal Participation X Spectra	Y Spectra	Z Spectra
11	12.148	.082	1.435		.819
12	12.148	.082	.819		1.435
13	15.133	.066	1.394		.798
14	15.133	.066	.798		1.394
Totals :			90.709		90.709

Member Section Forces (By Combination)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-ft]	z-z Moment[k-ft]
1	2	M1	1	2.806	1.246	0	0	-.008	19.557
2			2	2.549	1.233	0	0	-.005	13.779
3			3	2.292	1.184	0	0	-.002	8.329
4			4	1.268	.964	0	0	0	3.407
5			5	.546	.561	0	0	0	-.001
6	2	M2	1	8.014	1.924	0	0	-.184	44.039
7			2	7.62	1.908	.001	0	-.179	37.046
8			3	6.549	1.785	.001	0	-.173	30.902
9			4	5.126	1.607	.001	0	-.167	25.205
10			5	3.574	1.342	0	0	-.008	19.558
11	2	M3A	1	11.019	2.244	0	0	-.215	54.081
12			2	10.871	2.229	0	0	-.214	51.594
13			3	9.381	2.038	0	0	-.187	49.002
14			4	9.233	2.021	0	0	-.186	46.468
15			5	9.085	2.011	0	0	-.184	44.039
16	2	M3B	1	11.273	2.282	0	0	-.216	58.67
17			2	11.209	2.282	0	0	-.216	57.492
18			3	11.146	2.27	0	0	-.216	56.333
19			4	11.082	2.258	0	0	-.216	55.196
20			5	11.019	2.258	0	0	-.215	54.081
21	2	M4	1	21.571	3.253	0	0	-.225	147.627
22			2	19.274	3.119	0	0	-.223	122.445
23			3	16.977	3.029	0	0	-.221	98.121
24			4	14.68	2.872	0	0	-.218	76.182
25			5	12.383	2.517	0	0	-.216	58.67
26	2	M5	1	30.759	4.824	0	0	-.232	266.711
27			2	28.462	4.531	0	0	-.231	231.949
28			3	26.165	4.077	0	0	-.229	201.221
29			4	23.868	3.635	0	0	-.227	173.562
30			5	21.571	3.301	0	0	-.225	147.627
31	2	M6	1	35.353	5.074	0	0	-.233	347.497
32			2	34.205	5.071	0	0	-.233	326.191
33			3	33.056	5.045	0	0	-.233	305.526
34			4	31.908	4.979	0	0	-.233	285.653
35			5	30.759	4.866	0	0	-.232	266.711

Joint Reactions (By Combination)

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	N92	-5.074	35.353	0	.233	0	-347.261
2	2	Totals:	-5.074	35.353	0			
3	2	COG (ft):	X: 0	Y: 74.804	Z: 0			

Mod #	Modification Type	Termination Length (ft)	Bot. Elevation (ft)	Top Elevation (ft)	Termination Length (ft)	Modification Location (° or Flat/Point #)	Location (F/P)	Lateral Offset (in)

MODIFICATION PROPERTIES									
#	Modification	Default Termination (ft)	Stitch (in)	k	Drill Hole (in)	Bolt/Weld Capacity (k)	A_G (in²)	F_Y (ksi)	F_U (ksi)

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Section No.	Elevation (ft)	Type	Size	Critical Element	Pu (k)	φPn (k)	% Capacity (Note 2)	Pass/Fail
L1	150.00-130.00	Pole	TP6.63×6.63×0.4320	1	Note 1	Note 1	43.8	Pass
L2	130.00-110.00	Pole	TP8.63×8.63×0.5000	2	Note 1	Note 1	50.3	Pass
L3	110.00-100.00	Pole	TP8.63×8.63×0.5000	3	Note 1	Note 1	55.9	Pass
L4	100.00-60.00	Pole	TP36.00×36.00×0.3750	4	Note 1	Note 1	11.9	Pass
L5	60.00-20.00	Pole	TP36.00×36.00×0.3750	5	Note 1	Note 1	20.9	Pass
L6	20.00-0.00	Pole	TP36.00×36.00×0.3750	6	Note 1	Note 1	27.0	Pass

	Summary	
Pole (L3)	55.9	Pass
RATING =	55.9	Pass

NOTES:

Note 1: See additional documentation in following sheets for details

Note 2: Per TIA-222-H Section 15.5

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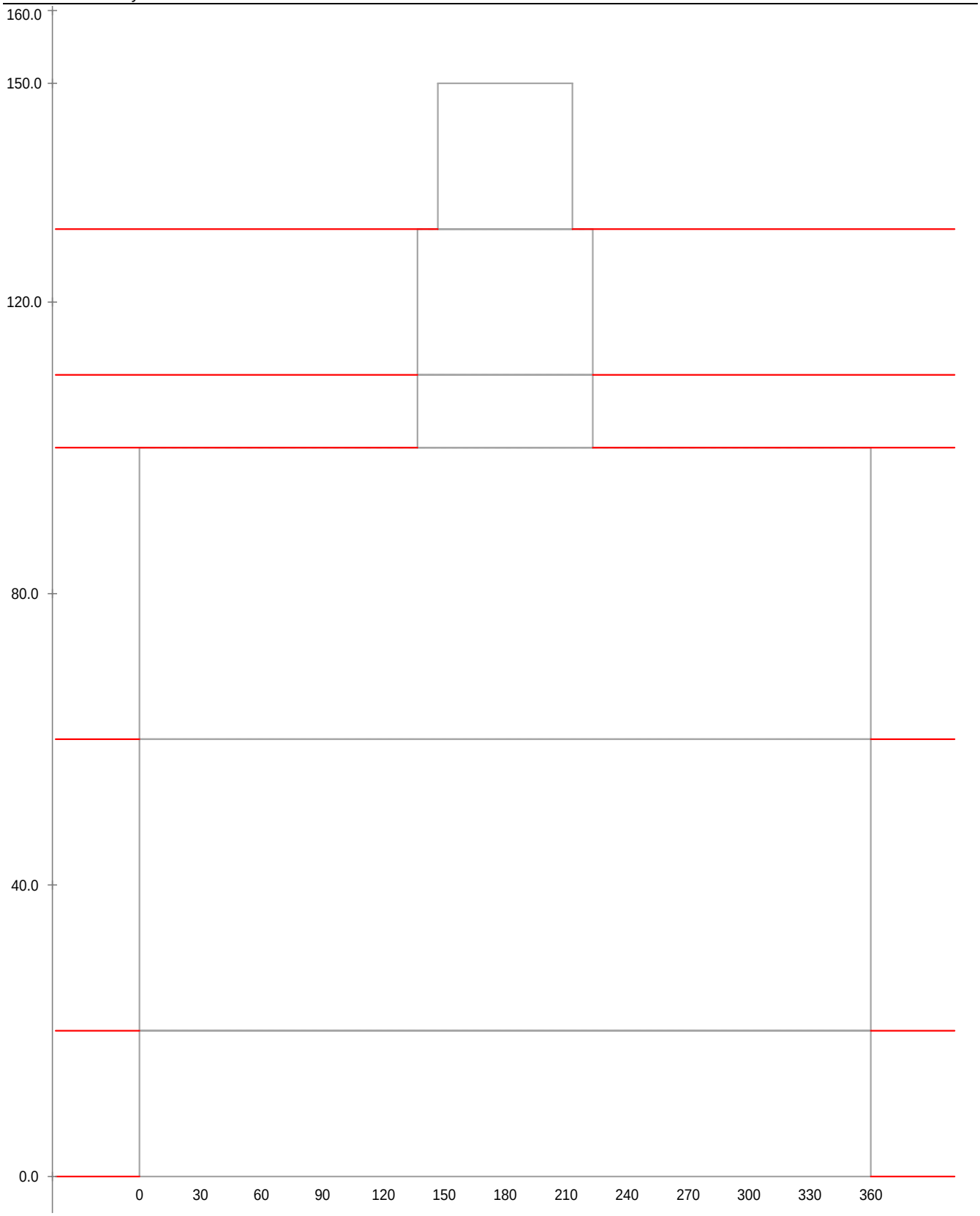
Reinforcement Layout



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Elevation: 0.00-ft

Loads	
Axial:	35.4 k
Moment:	347.5 k·ft
Shear:	5.1 k
Torsion:	0.0 k·ft

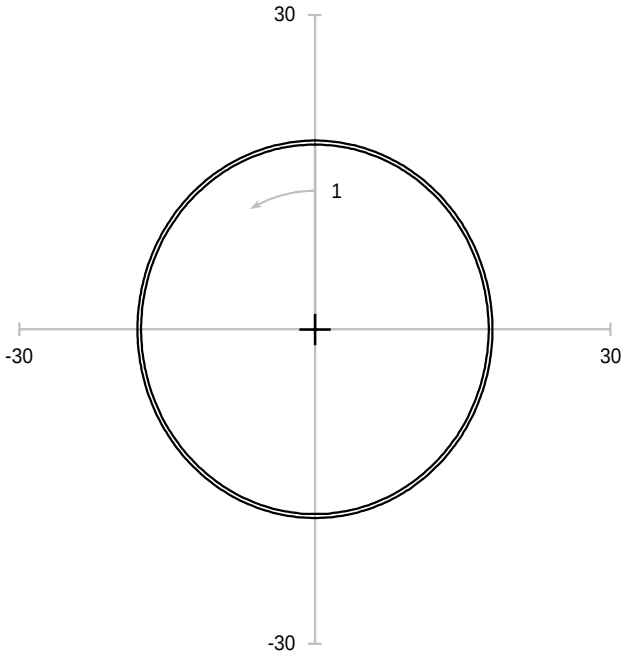
Equivalent Loads to Pole	
Axial:	35.4 k
Moment:	347.5 k·ft
Shear:	5.1 k
Torsion:	0.0 k·ft

Shear Flow N/A

Pole Info	
OD:	36.00 in
t:	0.3750 in
Pole A_G:	41.97 in²
Pole I_G:	6,658.9 in⁴

Controlling	
Angle:	0.00°
I_{CONT}:	6,658.9 in⁴
A_G:	41.97 in²

Minimum	
Angle:	0.00°
I_{MIN}:	6,658.9 in⁴
t_{EFF}:	0.3750 in



Pole Segment: L6, F_Y = 42 ksi

POLE CAPACITY											
Angle (°)	y_{CONT} (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	σ_T (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	ϕF_T (ksi)	Capacity
0.00	18.00	6658.9	0.842	11.272	0.121	0.000	35.517	43.428	10.822	17.574	27.0%

MODIFICATION CAPACITIES											
Mod Number	#	Angle (°)	$\bar{y}_{CONT}$ (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	Capacity

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Elevation: 20.00-ft

Loads	
Axial:	30.8 k
Moment:	266.7 k·ft
Shear:	4.8 k
Torsion:	0.0 k·ft

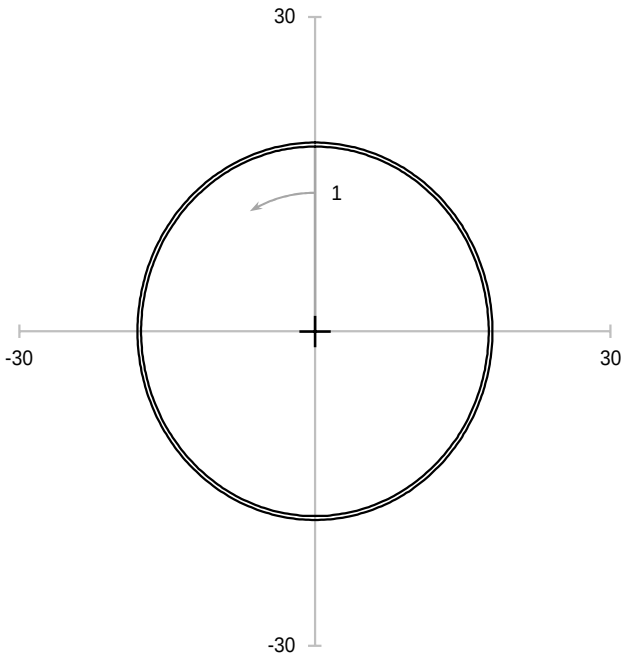
Equivalent Loads to Pole	
Axial:	30.8 k
Moment:	266.7 k·ft
Shear:	4.8 k
Torsion:	0.0 k·ft

Shear Flow N/A

Pole Info	
OD:	36.00 in
t:	0.3750 in
Pole A_G:	41.97 in²
Pole I_G:	6,658.9 in⁴

Controlling	
Angle:	0.00°
I_G:	6,658.9 in⁴
A_G:	41.97 in²

Minimum	
Angle:	0.00°
I_{MIN}:	6,658.9 in⁴
t_{EFF}:	0.3750 in



Pole Segment: L5, F_Y = 42 ksi

POLE CAPACITY											
Angle (°)	y_{CONT} (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	σ_T (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	ϕF_T (ksi)	Capacity
0.00	18.00	6658.9	0.733	8.651	0.115	0.000	35.517	43.428	10.822	17.574	20.9%

MODIFICATION CAPACITIES											
Mod Number	#	Angle (°)	$\bar{y}_{CONT}$ (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	Capacity

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Elevation: 60.00-ft

Loads	
Axial:	21.6 k
Moment:	147.6 k·ft
Shear:	3.3 k
Torsion:	0.0 k·ft

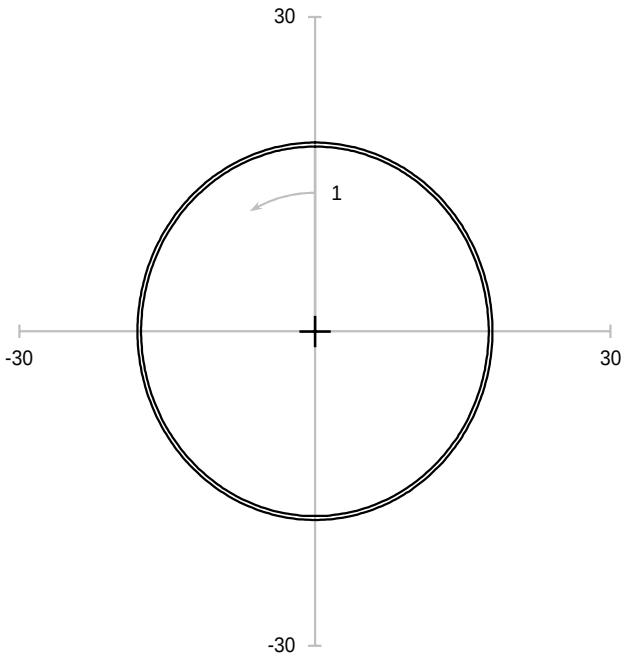
Equivalent Loads to Pole	
Axial:	21.6 k
Moment:	147.6 k·ft
Shear:	3.3 k
Torsion:	0.0 k·ft

Shear Flow N/A

Pole Info	
OD:	36.00 in
t:	0.3750 in
Pole A_G:	41.97 in²
Pole I_G:	6,658.9 in⁴

Controlling	
Angle:	0.00°
I_G:	6,658.9 in⁴
A_G:	41.97 in²

Minimum	
Angle:	0.00°
I_{MIN}:	6,658.9 in⁴
t_{EFF}:	0.3750 in



Pole Segment: L4, F_Y = 42 ksi

POLE CAPACITY											
Angle (°)	y_{CONT} (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	σ_T (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	ϕF_T (ksi)	Capacity
0.00	18.00	6658.9	0.514	4.789	0.078	0.000	35.517	43.428	10.822	17.574	11.9%

MODIFICATION CAPACITIES											
Mod Number	#	Angle (°)	$\bar{y}_{CONT}$ (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	Capacity

Tower Engineering Professionals, Inc.
326 Tryon Road|Raleigh, NC 27603-3530|Office: (919) 661-6351|Fax: (919) 661-6350|www.tepgroup.net

Elevation: 100.00-ft

Loads	
Axial:	11.3 k
Moment:	58.7 k·ft
Shear:	2.3 k
Torsion:	0.0 k·ft

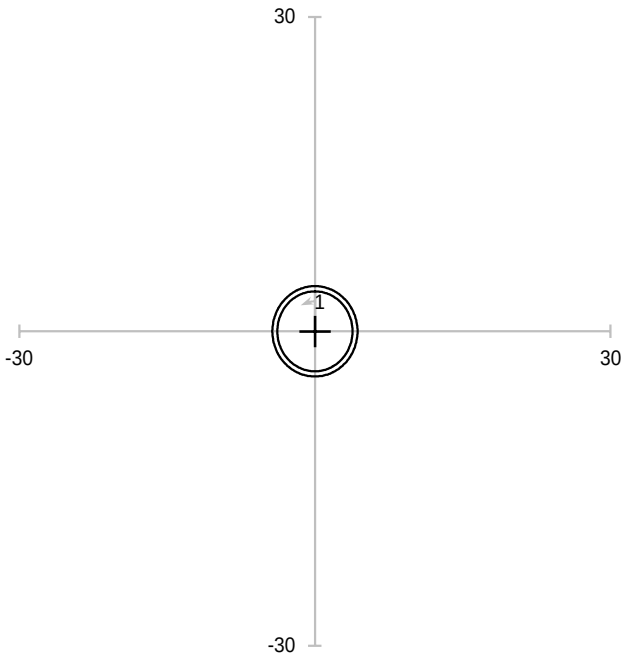
Equivalent Loads to Pole	
Axial:	11.3 k
Moment:	58.7 k·ft
Shear:	2.3 k
Torsion:	0.0 k·ft

Shear Flow N/A

Pole Info	
OD:	8.63 in
t:	0.5000 in
Pole A_G:	12.76 in²
Pole I_G:	105.7 in⁴

Controlling	
Angle:	0.00°
I_G:	105.7 in⁴
A_G:	12.76 in²

Minimum	
Angle:	0.00°
I_{MIN}:	105.7 in⁴
t_{EFF}:	0.5000 in



Pole Segment: L3, F_Y = 42 ksi

POLE CAPACITY											
Angle (°)	y_{CONT} (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	σ_T (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	ϕF_T (ksi)	Capacity
0.00	4.31	105.7	0.883	28.720	0.179	0.002	37.800	50.962	11.340	23.940	55.9%

MODIFICATION CAPACITIES											
Mod Number	#	Angle (°)	$\bar{y}_{CONT}$ (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	Capacity

Tower Engineering Professionals, Inc.
326 Tryon Road|Raleigh, NC 27603-3530|Office: (919) 661-6351|Fax: (919) 661-6350|www.tepgroup.net

Elevation: 110.00-ft

Loads	
Axial:	8.0 k
Moment:	44.0 k·ft
Shear:	1.9 k
Torsion:	0.0 k·ft

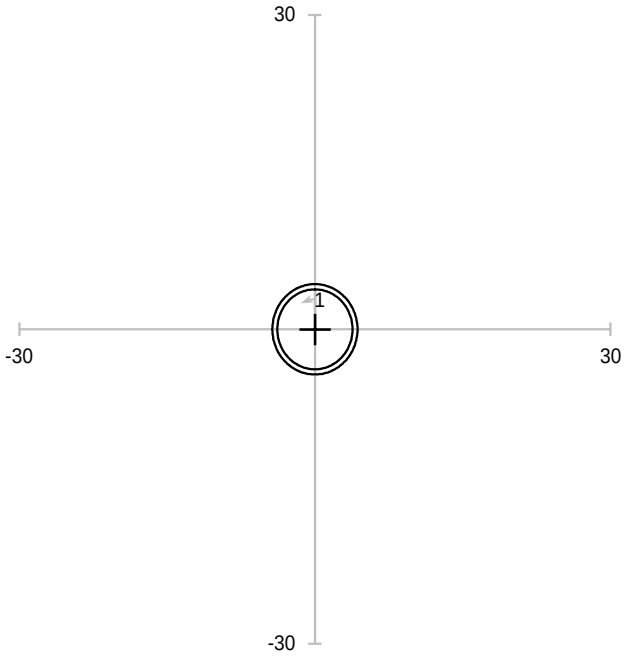
Equivalent Loads to Pole	
Axial:	8.0 k
Moment:	44.0 k·ft
Shear:	1.9 k
Torsion:	0.0 k·ft

Shear Flow N/A

Pole Info	
OD:	8.63 in
t:	0.5000 in
Pole A_G:	12.76 in²
Pole I_G:	105.7 in⁴

Controlling	
Angle:	0.00°
I_G:	105.7 in⁴
A_G:	12.76 in²

Minimum	
Angle:	0.00°
I_{MIN}:	105.7 in⁴
t_{EFF}:	0.5000 in



Pole Segment: L2, F_Y = 35 ksi

POLE CAPACITY											
Angle (°)	y_{CONT} (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	σ_T (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	ϕF_T (ksi)	Capacity
0.00	4.31	105.7	0.628	21.558	0.151	0.002	31.500	42.468	9.450	19.950	50.3%

MODIFICATION CAPACITIES											
Mod Number	#	Angle (°)	$\bar{y}_{CONT}$ (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	Capacity

Tower Engineering Professionals, Inc.
326 Tryon Road|Raleigh, NC 27603-3530|Office: (919) 661-6351|Fax: (919) 661-6350|www.tepgroup.net

Elevation: 130.00-ft

Loads	
Axial:	2.8 k
Moment:	19.6 k·ft
Shear:	1.2 k
Torsion:	0.0 k·ft

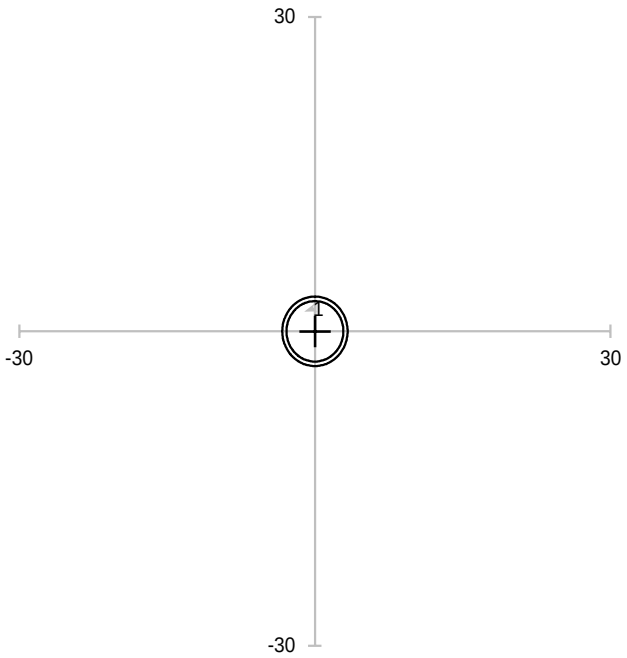
Equivalent Loads to Pole	
Axial:	2.8 k
Moment:	19.6 k·ft
Shear:	1.2 k
Torsion:	0.0 k·ft

Shear Flow N/A

Pole Info	
OD:	6.63 in
t:	0.4320 in
Pole A_G:	8.40 in²
Pole I_G:	40.5 in⁴

Controlling	
Angle:	0.00°
I_G:	40.5 in⁴
A_G:	8.40 in²

Minimum	
Angle:	0.00°
I_{MIN}:	40.5 in⁴
t_{EFF}:	0.4320 in



Pole Segment: L1, F_Y = 35 ksi

POLE CAPACITY											
Angle (°)	y_{CONT} (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	σ_T (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	ϕF_T (ksi)	Capacity
0.00	3.31	40.5	0.334	19.199	0.148	0.000	31.500	42.766	9.450	19.950	43.8%

MODIFICATION CAPACITIES											
Mod Number	#	Angle (°)	$\bar{y}_{CONT}$ (in)	I (in⁴)	σ_A (ksi)	σ_B (ksi)	σ_V (ksi)	ϕF_A (ksi)	ϕF_B (ksi)	ϕF_V (ksi)	Capacity

Tower Engineering Professionals, Inc.
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Monopole Flange Plate Connection

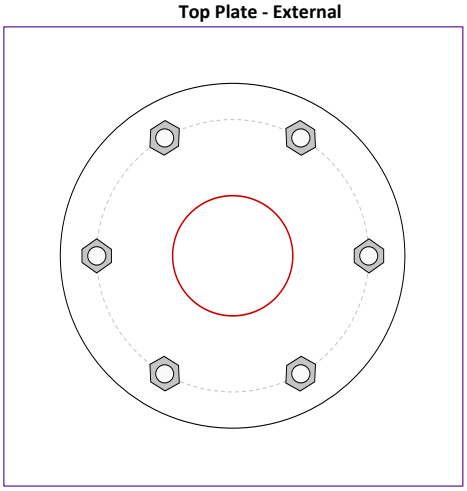
Elevation = 130 ft.

BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5
TIA-222 Revision	H

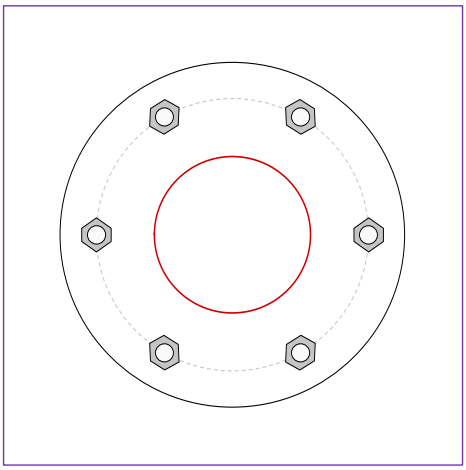
Applied Loads	
Moment (kip-ft)	19.56
Axial Force (kips)	2.81
Shear Force (kips)	1.25

**TIA-222-H Section 15.5 Applied*

Top Plate - External



Bottom Plate - External



Connection Properties

Bolt Data

(6) 1" ø bolts (A325 N; Fy=92 ksi, Fu=120 ksi) on 15" BC

Top Plate Data

19" OD x 1.5" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

Bottom Plate Data

19" OD x 1.5" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

Top Stiffener Data

N/A

Bottom Stiffener Data

N/A

Top Pole Data

6.625" x 0.432" round pole (A53-B-35; Fy=35 ksi, Fu=60 ksi)

Bottom Pole Data

8.625" x 0.5" round pole (A53-B-35; Fy=35 ksi, Fu=60 ksi)

Analysis Results

Bolt Capacity

Max Load (kips)	9.94	
Allowable (kips)	54.54	
Stress Rating:	**17.4%**	Pass

Top Plate Capacity

Max Stress (ksi):	7.98	(Flexural)
Allowable Stress (ksi):	45.00	
Stress Rating:	**16.9%**	Pass
Tension Side Stress Rating:	**18.0%**	Pass

Bottom Plate Capacity

Max Stress (ksi):	6.00	(Flexural)
Allowable Stress (ksi):	45.00	
Stress Rating:	**12.7%**	Pass
Tension Side Stress Rating:	**9.7%**	Pass

Monopole Flange Plate Connection

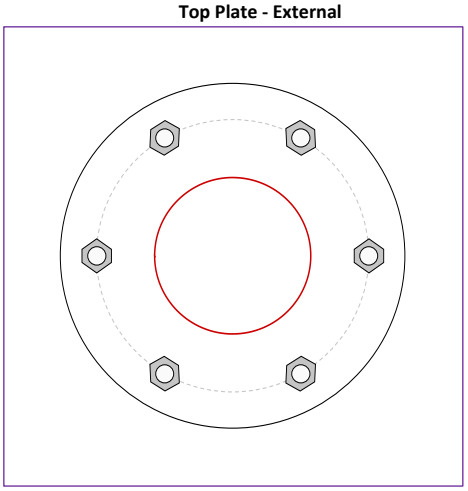
Elevation = 110 ft.

BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5
TIA-222 Revision	H

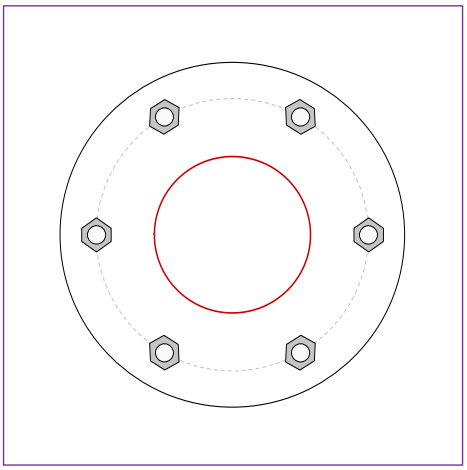
Applied Loads	
Moment (kip-ft)	66.31
Axial Force (kips)	6.53
Shear Force (kips)	2.79

**TIA-222-H Section 15.5 Applied*

Top Plate - External



Bottom Plate - External



Connection Properties

Bolt Data

(6) 1" ø bolts (A325 N; Fy=92 ksi, Fu=120 ksi) on 15" BC

Top Plate Data

19" OD x 1.5" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

Bottom Plate Data

19" OD x 2" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

Top Stiffener Data

N/A

Bottom Stiffener Data

N/A

Top Pole Data

8.625" x 0.5" round pole (A53-B-35; Fy=35 ksi, Fu=60 ksi)

Bottom Pole Data

8.625" x 0.5" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Analysis Results

Bolt Capacity

Max Load (kips)	34.22	
Allowable (kips)	54.54	
Stress Rating:	**59.8%**	Pass

Top Plate Capacity

Max Stress (ksi):	20.02	(Flexural)
Allowable Stress (ksi):	45.00	
Stress Rating:	**42.4%**	Pass
Tension Side Stress Rating:	**33.4%**	Pass

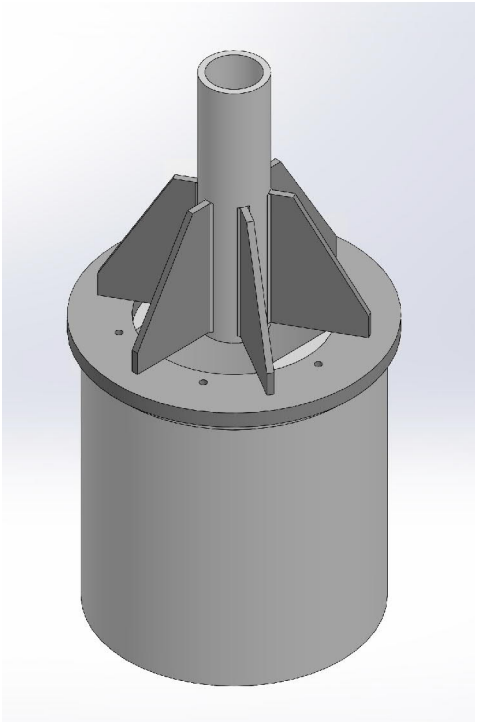
Bottom Plate Capacity

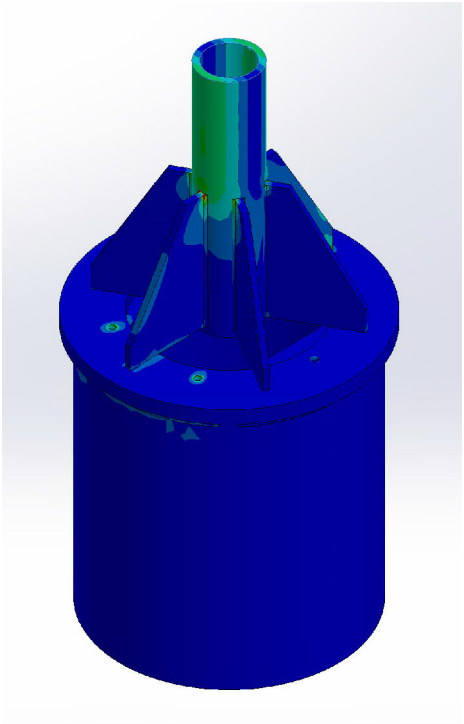
Max Stress (ksi):	11.26	(Flexural)
Allowable Stress (ksi):	45.00	
Stress Rating:	**23.8%**	Pass
Tension Side Stress Rating:	**18.8%**	Pass

Client Site Name:	Seattle Qwest - SEA155	Engineer:	RTP
Client Site Number:	BU 880416	Check:	CS
Client Order Number:	640386 Rev. 5	Date:	12/4/2023
TEP Project Number:	151934.904269	Page:	1

Tower Engineering Professionals

Simulation of Concealment Flange - 100-ft Elevation





Model Loads

Axial	9,330	lb
Shear	3,596	lb
Moment	103,514	lb-ft
Self-Weight Factor	1.2	

Overall Results

Sufficient

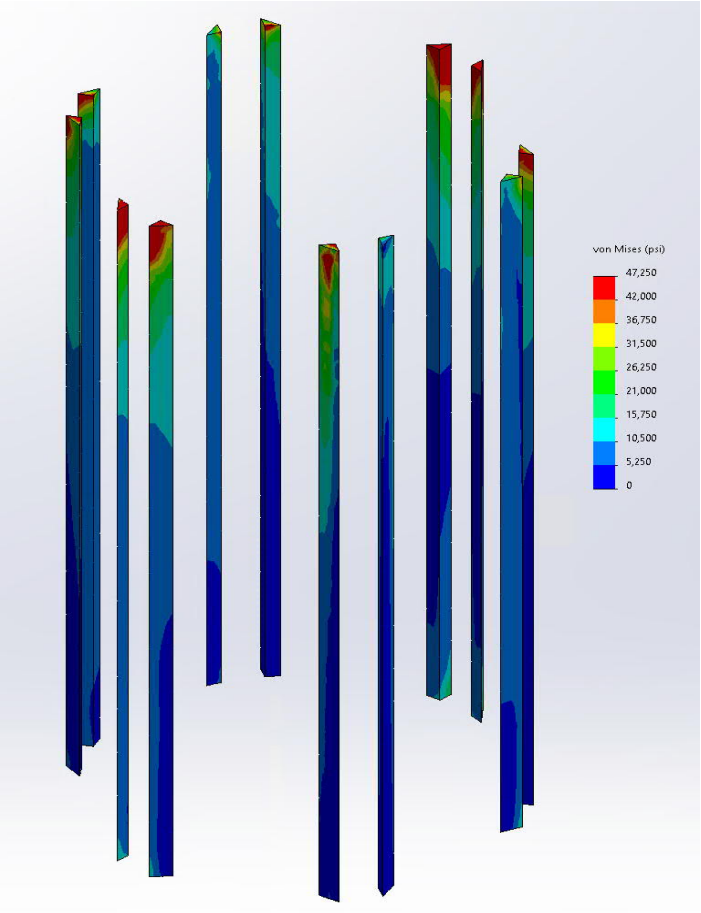
Model Part Information

Part	Part Grade
Spine Stub Section	A53-B-42
Spine to Top Flange Welds	E70XX
Stiffeners	A572-50
Top Flange	A572-50
Bottom Flange	A36
Tower Stub Section	A53-B-42

Client Site Name:	Seattle Qwest - SEA155		Engineer:	RTP
Client Site Number:	BU 880416		Check:	CS
Client Order Number:	640386 Rev. 5		Date:	12/4/2023
TEP Project Number:	151934.904269	Tower Engineering Professionals	Page:	2

Study: 0 Degree

Spine to Top Flange Welds

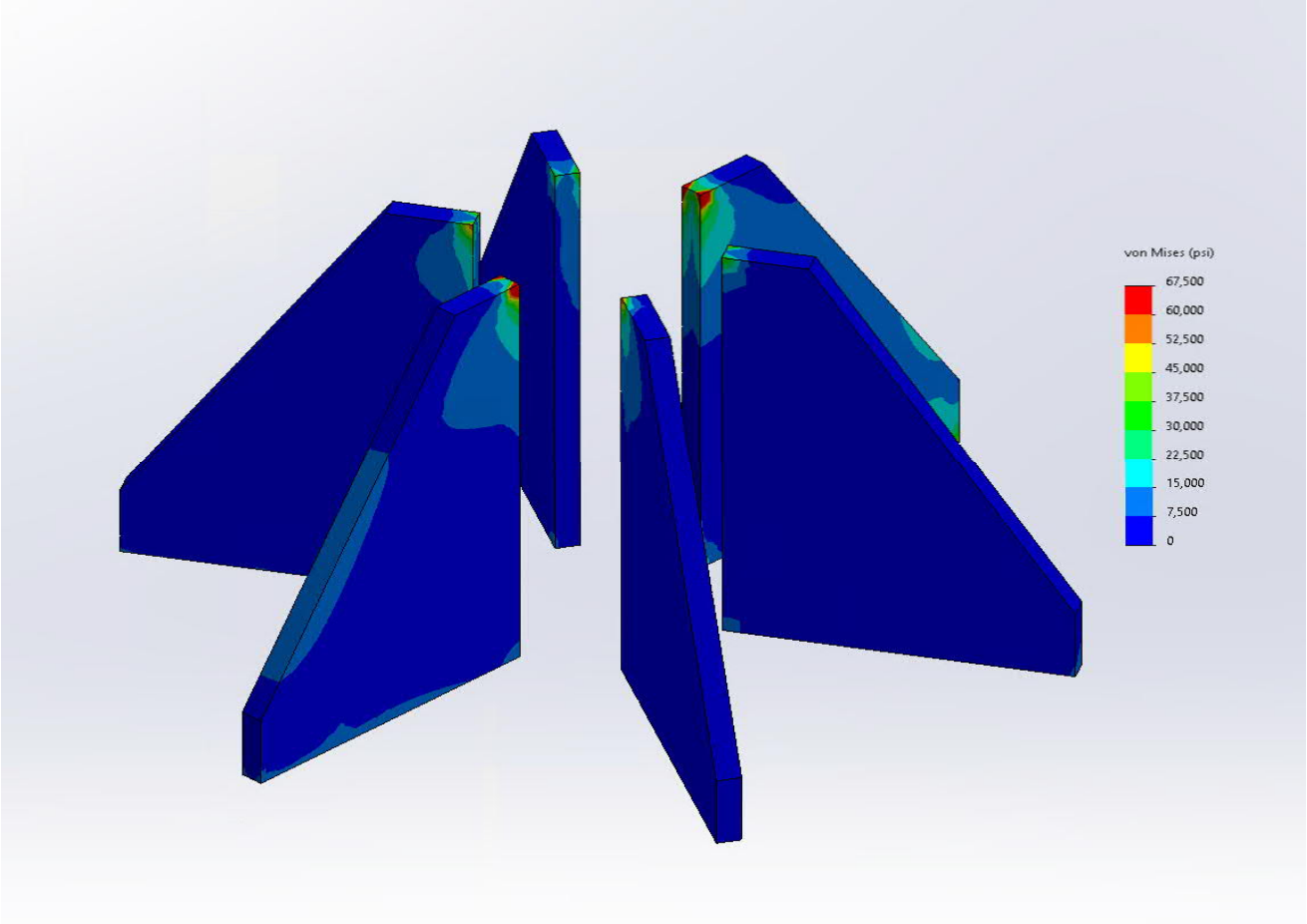


Assumptions	Results
N/A	Sufficient

Client Site Name:	Seattle Qwest - SEA155		Tower Engineering Professionals	Engineer:	RTP
Client Site Number:	BU 880416			Check:	CS
Client Order Number:	640386 Rev. 5			Date:	12/4/2023
TEP Project Number:	151934.904269			Page:	3

Study: 0 Degree

Stiffeners

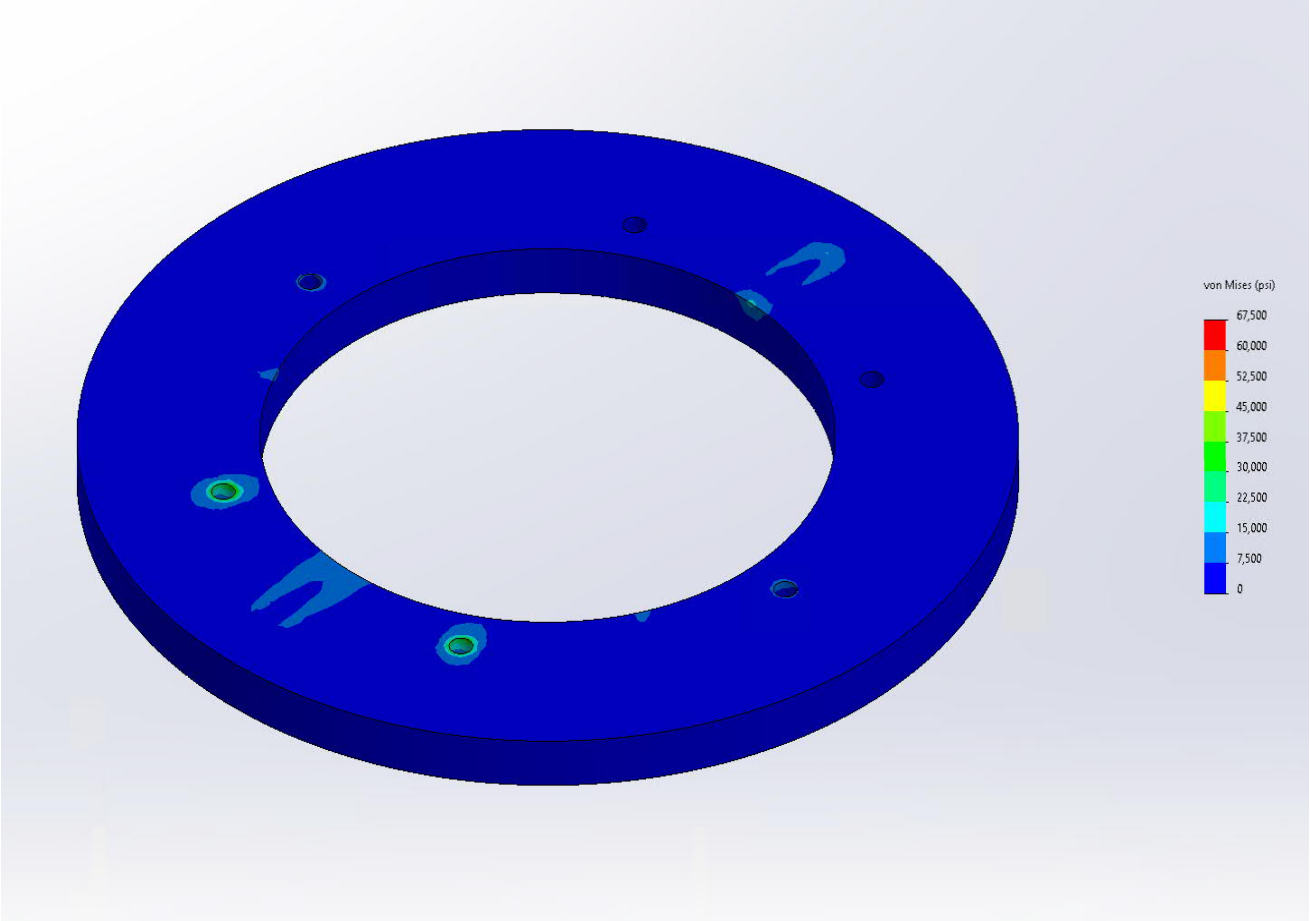


Assumptions	Results
N/A	Sufficient

Client Site Name:	Seattle Qwest - SEA155		Engineer:	RTP
Client Site Number:	BU 880416		Check:	CS
Client Order Number:	640386 Rev. 5		Date:	12/4/2023
TEP Project Number:	151934.904269	Tower Engineering Professionals	Page:	4

Study: 0 Degree

Top Flange

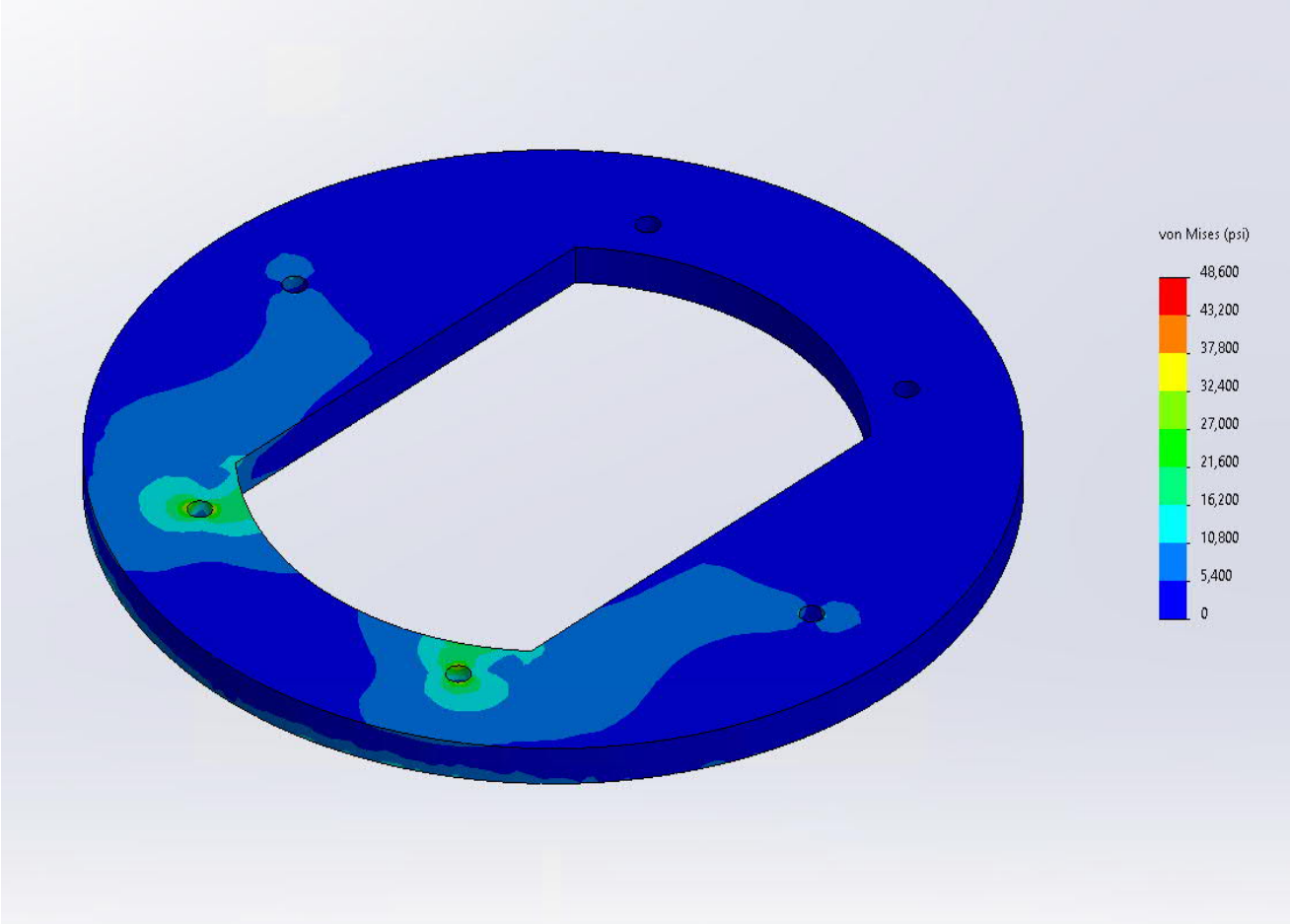


Assumptions	Results
N/A	Sufficient

Client Site Name:	Seattle Qwest - SEA155		Engineer:	RTP
Client Site Number:	BU 880416		Check:	CS
Client Order Number:	640386 Rev. 5		Date:	12/4/2023
TEP Project Number:	151934.904269	Tower Engineering Professionals	Page:	5

Study: 0 Degree

Bottom Flange



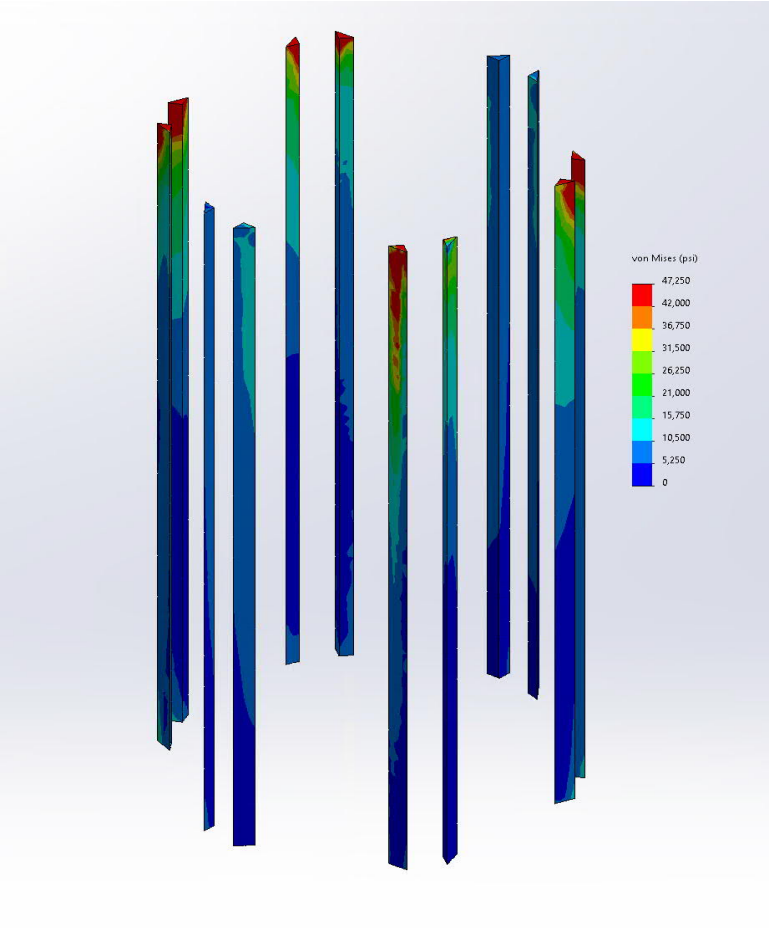
Assumptions	Results
N/A	Sufficient

Client Site Name:	Seattle Qwest - SEA155	Engineer:	RTP
Client Site Number:	BU 880416	Check:	CS
Client Order Number:	640386 Rev. 5	Date:	12/4/2023
TEP Project Number:	151934.904269	Page:	6

Tower Engineering Professionals

Study: 90 Degree

Spine to Top Flange Welds



Assumptions

N/A

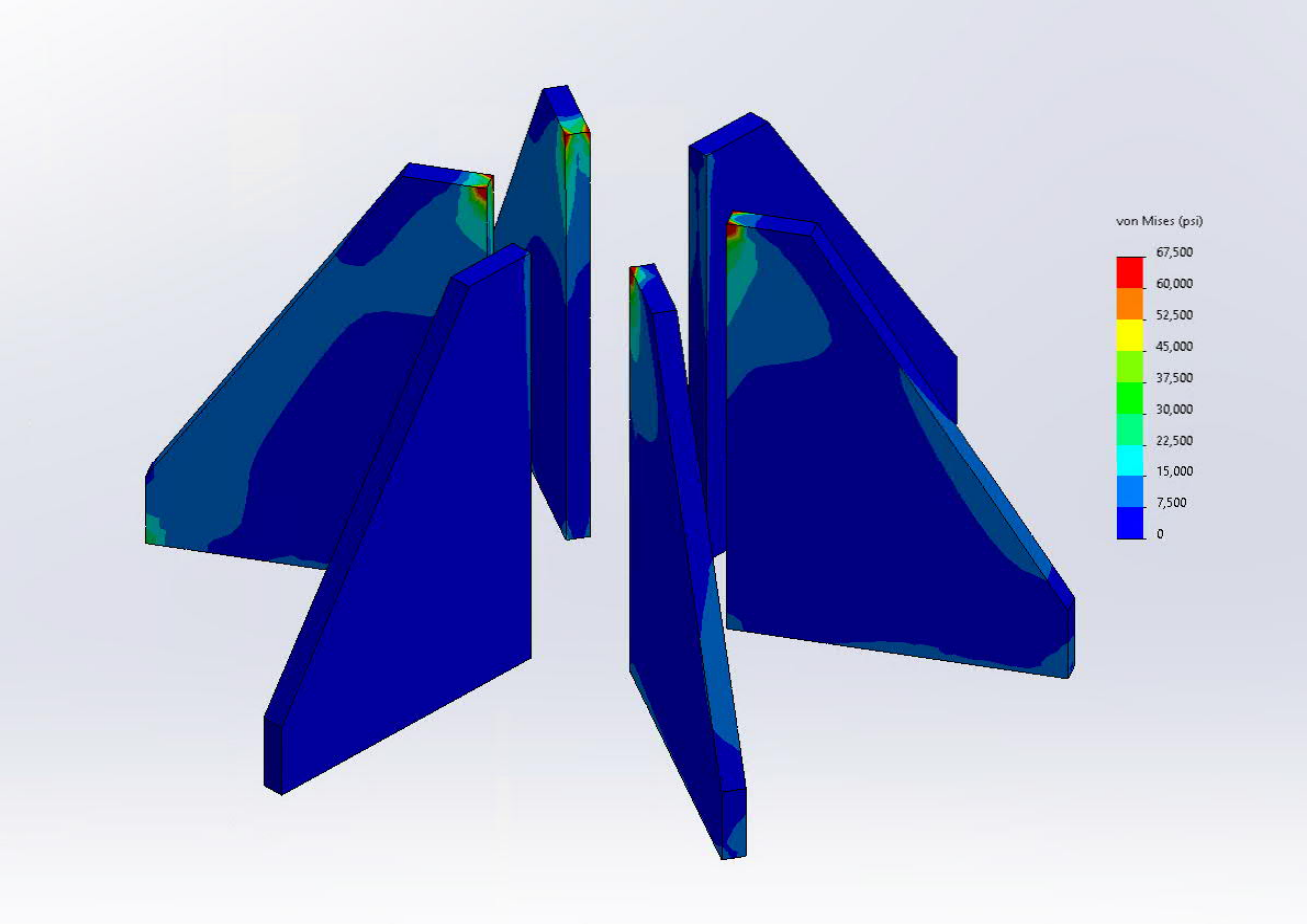
Results

Sufficient

Client Site Name:	Seattle Qwest - SEA155		Engineer:	RTP
Client Site Number:	BU 880416		Check:	CS
Client Order Number:	640386 Rev. 5		Date:	12/4/2023
TEP Project Number:	151934.904269	Tower Engineering Professionals	Page:	7

Study: 90 Degree

Stiffeners

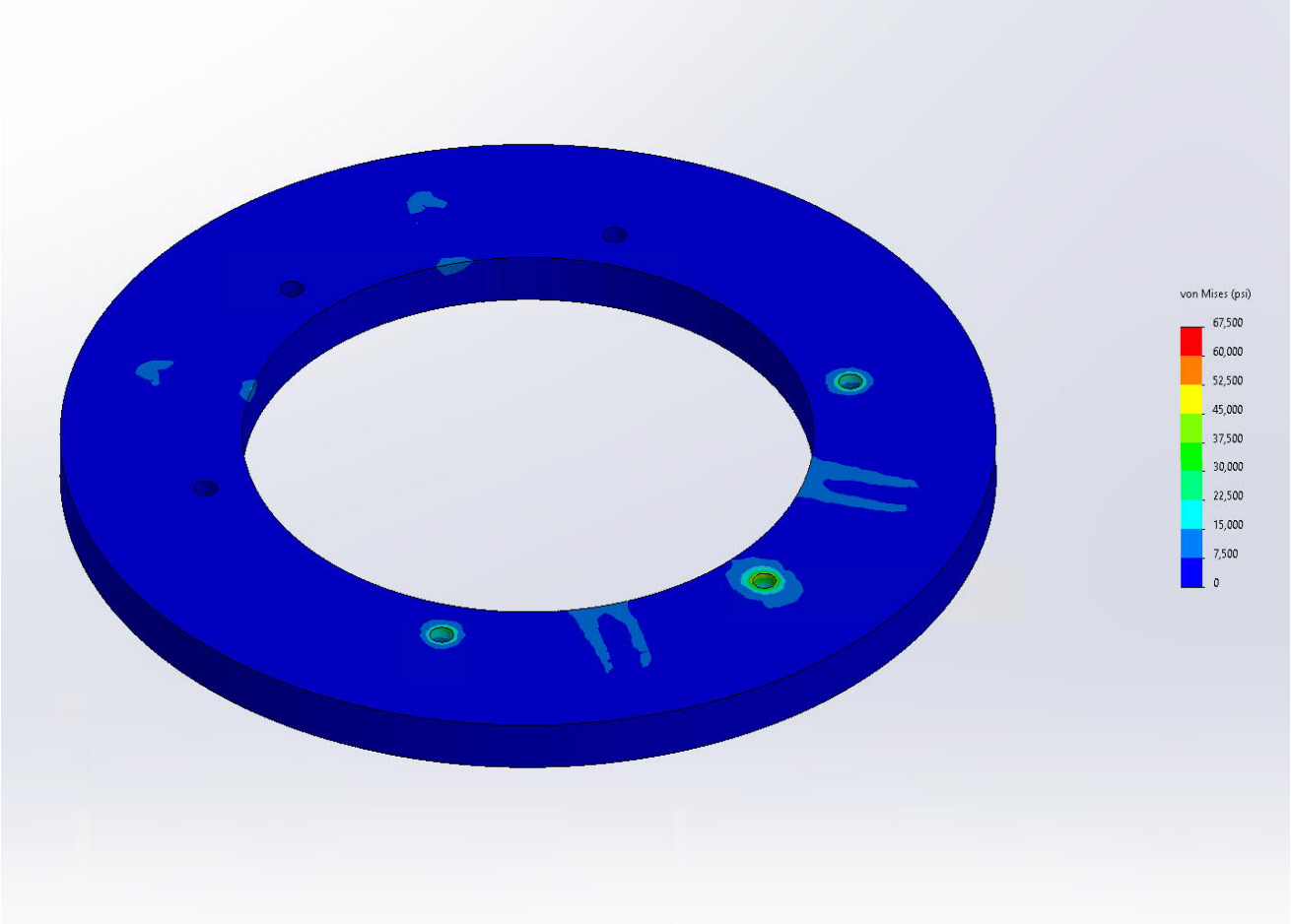


Assumptions	Results
N/A	Sufficient

Client Site Name:	Seattle Qwest - SEA155		Engineer:	RTP
Client Site Number:	BU 880416		Check:	CS
Client Order Number:	640386 Rev. 5		Date:	12/4/2023
TEP Project Number:	151934.904269	Tower Engineering Professionals	Page:	8

Study: 90 Degree

Top Flange

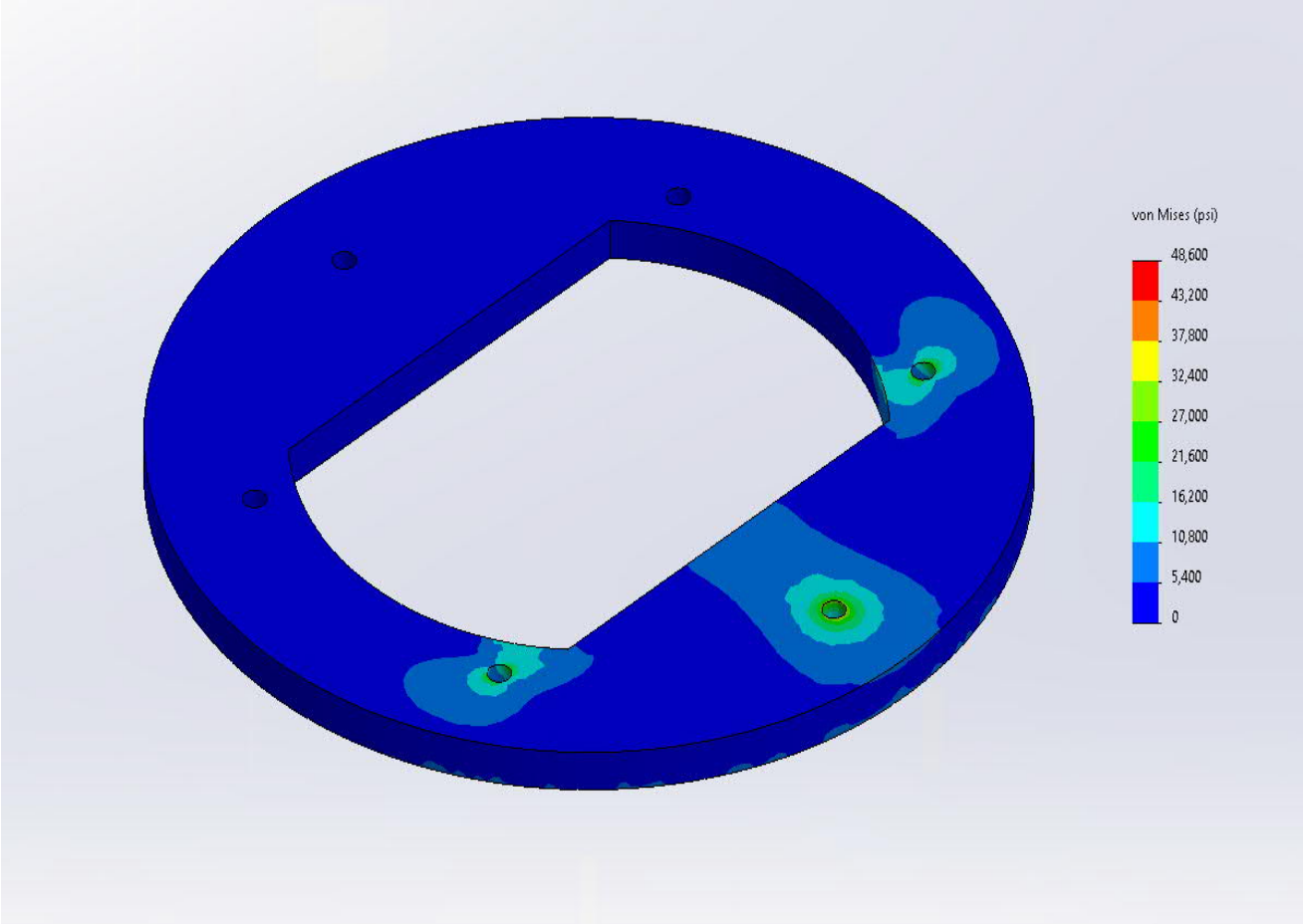


Assumptions	Results
N/A	Sufficient

Client Site Name:	Seattle Qwest - SEA155		Tower Engineering Professionals	Engineer:	RTP
Client Site Number:	BU 880416			Check:	CS
Client Order Number:	640386 Rev. 5			Date:	12/4/2023
TEP Project Number:	151934.904269			Page:	9

Study: 90 Degree

Bottom Flange



Assumptions	Results
N/A	Sufficient

Monopole Flange Plate Connection

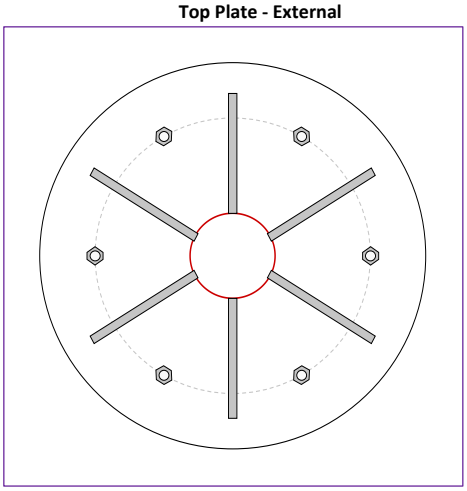
Elevation = 100 ft.

BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5
TIA-222 Revision	H

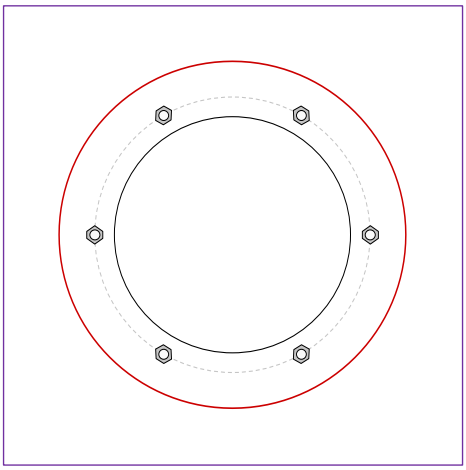
Applied Loads	
Moment (kip-ft)	103.51
Axial Force (kips)	9.33
Shear Force (kips)	3.60

**TIA-222-H Section 15.5 Applied*

Top Plate - External



Bottom Plate - Internal



Connection Properties

Bolt Data

(6) 1" ø bolts (A325 N; Fy=92 ksi, Fu=120 ksi) on 28" BC

Top Plate Data

39.25" OD x 2" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

Bottom Plate Data

24" ID x 1.5" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Top Stiffener Data

(6) 18"H x 12.1875"W x 0.875"T, Notch: 7.6875" horiz. x 0" vert.
plate: Fy= 50 ksi ; weld: Fy= 70 ksi
horiz. weld: 0.4375" groove, 45° dbl bevel, 0.25" fillet
vert. weld: 0.3125" fillet

Bottom Stiffener Data

N/A

Top Pole Data

8.625" x 0.5" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Bottom Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Analysis Results

Bolt Capacity

Max Load (kips)	28.01	
Allowable (kips)	54.53	
Stress Rating:	**48.9%**	**Pass**

Top Plate Capacity

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**
Tension Side Stress Rating:	**Rohn OK**

Bottom Plate Capacity

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**
Tension Side Stress Rating:	**Rohn OK**

Top Stiffener Capacity

Horizontal Weld:	**Rohn OK**
Vertical Weld:	**Rohn OK**
Plate Flexure+Shear:	**Rohn OK**
Plate Tension+Shear:	**Rohn OK**
Plate Compression:	**Rohn OK**

Bottom Stiffener Capacity

Horizontal Weld:	**N/A**
Vertical Weld:	**N/A**
Plate Flexure+Shear:	**N/A**
Plate Tension+Shear:	**N/A**
Plate Compression:	**N/A**

Top Pole Capacity

Punching Shear:	**Rohn OK**

Bottom Pole Capacity

Punching Shear:	**N/A**

Monopole Flange Plate Connection

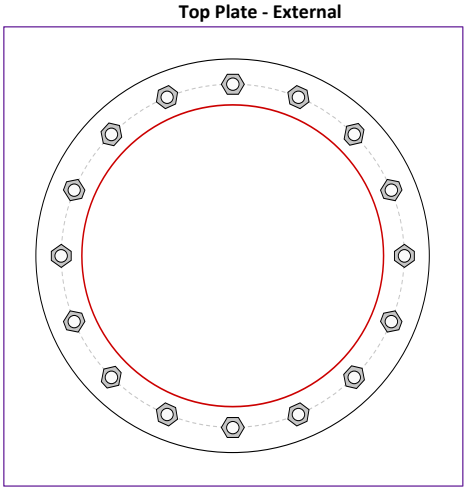
Elevation = 60 ft.

BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5
TIA-222 Revision	H

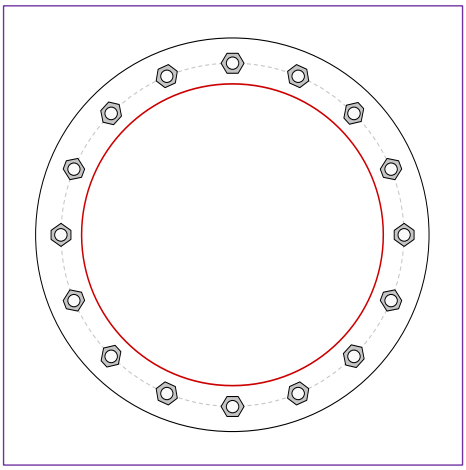
Applied Loads	
Moment (kip-ft)	304.40
Axial Force (kips)	17.93
Shear Force (kips)	5.75

**TIA-222-H Section 15.5 Applied*

Top Plate - External



Bottom Plate - External



Connection Properties

Bolt Data

(16) 1-1/2" ø bolts (A325 N; Fy=81 ksi, Fu=120 ksi) on 41" BC

Top Plate Data

47" OD x 2" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Bottom Plate Data

47" OD x 2" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Top Stiffener Data

N/A

Bottom Stiffener Data

N/A

Top Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Bottom Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Analysis Results

Bolt Capacity

Max Load (kips)	21.14	
Allowable (kips)	126.90	
Stress Rating:	**15.9%**	**Pass**

Top Plate Capacity

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**
Tension Side Stress Rating:	**Rohn OK**

Bottom Plate Capacity

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**
Tension Side Stress Rating:	**Rohn OK**

Monopole Flange Plate Connection

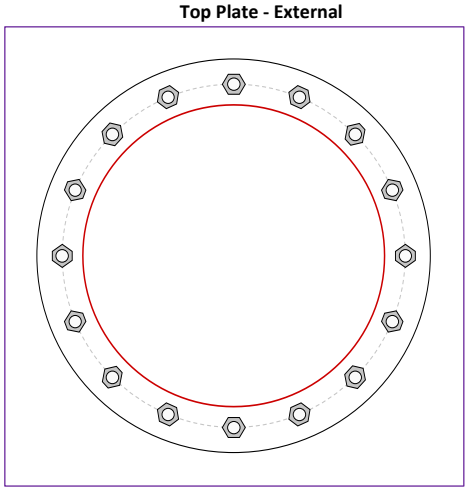
Elevation = 20 ft.

BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5
TIA-222 Revision	H

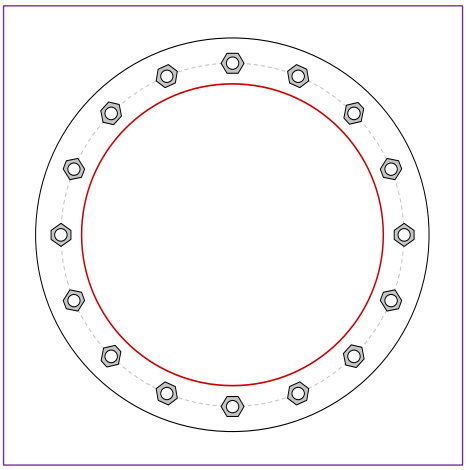
Applied Loads	
Moment (kip-ft)	555.97
Axial Force (kips)	25.68
Shear Force (kips)	6.74

**TIA-222-H Section 15.5 Applied*

Top Plate - External



Bottom Plate - External



Connection Properties

Bolt Data

(16) 1-1/2" ø bolts (A325 N; Fy=81 ksi, Fu=120 ksi) on 41" BC

Top Plate Data

47" OD x 2" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Bottom Plate Data

47" OD x 2" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Top Stiffener Data

N/A

Bottom Stiffener Data

N/A

Top Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Bottom Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Analysis Results

Bolt Capacity

Max Load (kips)	39.05	
Allowable (kips)	126.90	
Stress Rating:	**29.3%**	**Pass**

Top Plate Capacity

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**
Tension Side Stress Rating:	**Rohn OK**

Bottom Plate Capacity

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**
Tension Side Stress Rating:	**Rohn OK**

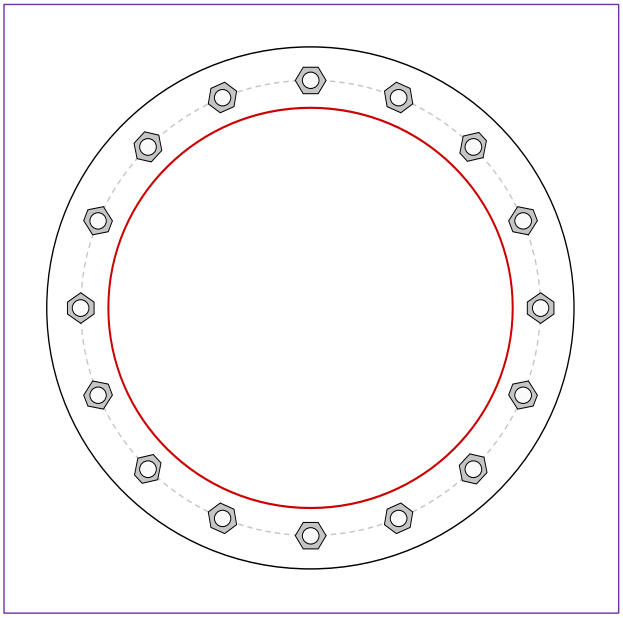
Monopole Base Plate Connection

Site Info	
BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	1.5

Applied Loads	
Moment (kip-ft)	693.84
Axial Force (kips)	29.59
Shear Force (kips)	7.04

**TIA-222-H Section 15.5 Applied*



Connection Properties

Anchor Rod Data

(16) 1-1/2" ø bolts (A354-BC N; Fy=109 ksi, Fu=125 ksi) on 41" BC

Base Plate Data

47" OD x 2" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Stiffener Data

N/A

Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Analysis Results

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

Pu_t = 48.89	ϕPn_t = 132.19	**Stress Rating**
Vu = 0.44	ϕVn = 82.83	**35.2%**
Mu = n/a	ϕMn = n/a	**Pass**

Base Plate Summary

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**

Monopole Base Plate Connection - Seismic

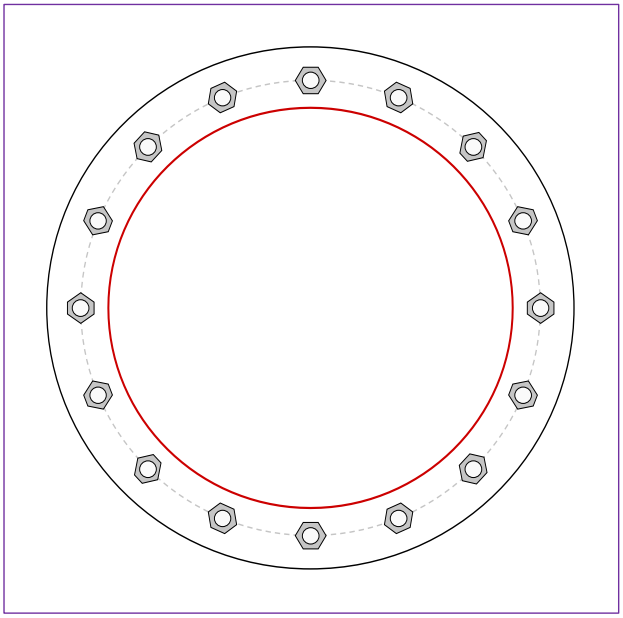
Site Info	
BU #	880416
Site Name	Seattle Qwest - SEA155
Order #	640386 Rev. 5

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
l_{ar} (in)	1.5

Applied Loads	
Moment (kip-ft)	347.50
Axial Force (kips)	35.35
Shear Force (kips)	5.07

**TIA-222-H Section 15.5 Applied*

**1.5 Overstrength Factor Applied*



Connection Properties

Anchor Rod Data

(16) 1-1/2" ø bolts (A354-BC N; Fy=109 ksi, Fu=125 ksi) on 41" BC

Base Plate Data

47" OD x 2" Plate (A36; Fy=36 ksi, Fu=58 ksi)

Stiffener Data

N/A

Pole Data

36" x 0.375" round pole (A53-B-42; Fy=42 ksi, Fu=63 ksi)

Analysis Results

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

Pu_t = 35.91	ϕPn_t = 132.19	**Stress Rating**
Vu = 0.48	ϕVn = 82.83	**25.9%**
Mu = n/a	ϕMn = n/a	**Pass**

Base Plate Summary

Max Stress (ksi):	-
Allowable Stress (ksi):	-
Stress Rating:	**Rohn OK**

Drilled Pier Foundation

BU # :	880416
Site Name:	Seattle Qwest - SEA155
Order Number:	640386 Rev. 5
TIA-222 Revison:	H
Tower Type:	Monopole

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

Applied Loads	Comp.	Uplift
Moment (kip-ft)	693.8	
Axial Force (kips)	29.6	
Shear Force (kips)	7	

Material Properties		
Concrete Strength, f'c:	3	ksi
Rebar Strength, Fy:	60	ksi
Tie Yield Strength, Fyt:	60	ksi

Pier Design Data		
Depth	20	ft
Ext. Above Grade	0.5	ft
Pier Section 1		
From 0.5' above grade to 20' below grade		
Pier Diameter	6	ft
Rebar Quantity	24	
Rebar Size	9	
Rebar Cage Diameter	63	in
Tie Size	5	
Tie Spacing	12	in

Rebar & Pier Options

Embedded Pole Inputs

Belled Pier Inputs

Analysis Results		
Soil Lateral Check	*Compression*	*Uplift*
$D_{v=0}$ (ft from TOC)	5.14	-
Soil Safety Factor	3.75	-
Max Moment (kip-ft)	739.47	-
Rating*	*33.8%*	-
Soil Vertical Check	*Compression*	*Uplift*
Skin Friction (kips)	168.23	-
End Bearing (kips)	1908.52	-
Weight of Concrete (kips)	104.33	-
Total Capacity (kips)	2076.75	-
Axial (kips)	133.93	-
Rating*	*6.1%*	-
Reinforced Concrete Flexure	*Compression*	*Uplift*
Critical Depth (ft from TOC)	4.86	-
Critical Moment (kip-ft)	739.27	-
Critical Moment Capacity	3259.99	-
Rating*	*21.6%*	-
Reinforced Concrete Shear	*Compression*	*Uplift*
Critical Depth (ft from TOC)	14.40	-
Critical Shear (kip)	96.18	-
Critical Shear Capacity	520.74	-
Rating*	*17.6%*	-

Structural Foundation Rating*	**21.6%**
Soil Interaction Rating*	**33.8%**

*Rating per TIA-222-H Section 15.5

Soil Profile

Groundwater Depth	N/A	# of Layers	2

Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ_{soil} (pcf)	$\gamma_{concrete}$ (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	3	3	100	150	0		0.000	0.000	0.00	0.00			Cohesionless
2	3	20	17	100	150		23.58	0.000	0.000	0.70	0.70	90		Cohesionless

APPENDIX D

STRUCTURAL DESIGN DRAWINGS

STRUCTURAL DESIGN DRAWINGS

SITE NAME:

SEATTLE QWEST - SEA155

CROWN CASTLE BU NUMBER:

880416

SITE ADDRESS:

8477 SE 68TH STREET
MERCER ISLAND, WA 98040
(KING COUNTY)
N 47°32'30.00", W 122°13'25.00"

HOT WORK INCLUDED	
NA	BASE GRINDING ONLY
NA	BASE WELDING (AND GRINDING)
NA	AERIAL GRINDING ONLY
NA	AERIAL WELDING (AND GRINDING)

MODIFICATION PROVISIONS

THE MODIFICATIONS DEPICTED ON THESE DRAWINGS ARE BASED ON THE RECOMMENDATIONS OUTLINED IN THE STRUCTURAL MODIFICATION ANALYSIS REPORT COMPLETED BY TEP, JOB NO.: 151934.904269 DATED DECEMBER 12, 2023 (REV 0).

ATTENTION ALL CONTRACTORS, ANYTIME YOU ACCESS A CROWN SITE FOR ANY REASON YOU ARE TO CALL THE CROWN NOC UPON ARRIVAL AND DEPARTURE, DAILY AT 800-788-7011.

QUALIFIED ENGINEERING SERVICES ARE AVAILABLE FROM TEP TO ASSIST CONTRACTORS IN CLASS IV RIGGING PLAN REVIEWS. FOR REQUESTED QUALIFIED ENGINEERING SERVICES, CONTACT TEP FOR QUOTE AT RIGGING@TEPGROUP.NET

SAFETY CLIMB: 'LOOK UP'

LOOK UP!

THE INTEGRITY OF THE WIRE ROPE SAFETY CLIMB SYSTEM SHALL BE CONSIDERED DURING ALL STAGES OF DESIGN, INSTALLATION, AND INSPECTION. TOWER REINFORCEMENTS AND EQUIPMENT INSTALLATIONS SHALL NOT COMPROMISE THE INTEGRITY OR FUNCTIONAL USE OF ANY WIRE ROPE SAFETY CLIMB ON THE STRUCTURE. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO: PINCHING OF THE WIRE ROPE, BENDING OF THE WIRE ROPE FROM ITS SUPPORTS, DIRECT CONTACT OR CLOSE PROXIMITY TO THE WIRE ROPE WHICH MAY CAUSE FRICTIONAL WEAR, OR IMPACT TO THE ANCHORAGE POINTS IN ANY WAY. ANY COMPROMISED SAFETY CLIMB MUST BE REPORTED TO YOUR CROWN POC FOR RESOLUTION, INCLUDING EXISTING CONDITIONS.

INDEX OF SHEETS

NO.	SHEET TITLE	REV
T-1	TITLE SHEET	0
N-1	MI CHECKLIST AND NOTES	0
N-2	GENERAL NOTES	0
N-3	PROJECT NOTES	0
S-1	TOWER ELEVATION AND MODIFICATION SCHEDULE	0
S-2	CONCEALMENT INSTALLATION DETAILS	0

PROJECT INFORMATION

TOWER HEIGHT:	150-FT
TOWER MANUFACTURER:	ROHN CCI DOCUMENT: 2030383
WORK ORDER NO.:	2271772
ORDER NO.:	640386 REV. 5
DESIGN BUILDING CODE:	2021 WASHINGTON STATE BUILDING CODE
DESIGN STANDARD:	TIA-222-H

PROJECT TEAM

CCI MODIFICATION PROJECT MANAGER:

NAME	CROWN CASTLE
CONTACT	WESLEY POWER
PHONE	(678) 259-2265
EMAIL	WESLEY.POWER@CROWNCASTLE.COM

ENGINEERING FIRM PROJECT MANAGER:

NAME	TOWER ENGINEERING PROFESSIONALS, INC.
CONTACT	RHETT PARK, P.E.
PHONE	(919) 661-6351
EMAIL	CMRP@TEPGROUP.NET

PLANS PREPARED FOR:

CROWN CASTLE

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603
OFFICE: (919) 661-6351
www.tepgroup.net

SEAL:

RONALD E. BRIDGE SLAVER, JR. STATE OF WASHINGTON 52921 STRUCTURAL ENGINEER PROFESSIONAL ENGINEER

Electronic Copy

December 12, 2023

REV	DATE	ISSUED FOR:
0	12-12-23	MODIFICATION DRAWINGS

DRAWN BY: RTP | CHECKED BY: CDC

SHEET TITLE:

TITLE SHEET

SHEET NUMBER: **T-1**

REVISION: **0**

TEP#: 151934.904269

CON-FRM-10354 MI CHECKLIST

REQUIRED	REPORT ITEM	APPLICABLE CROWN DOC	BRIEF DESCRIPTION
		PRE-CONSTRUCTION	
X	EOR APPROVED SHOP DRAWINGS	CON-SOW-10007	ONCE THE PRE-MODIFICATION MAPPING IS COMPLETE AND PRIOR TO FABRICATION, THE CONTRACTOR SHALL PROVIDE DETAILED ASSEMBLY DRAWINGS AND/OR SHOP DRAWINGS ALONG WITH EOR RFI FORM DETAILING ANY CHANGES FROM THE ORIGINAL DESIGN TO THE EOR FOR REVIEW AND APPROVAL.
NA	FABRICATION INSPECTION	CON-SOW-10007	A LETTER FROM THE FABRICATOR, STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THE CONTRACT DOCUMENTS, SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
NA	FABRICATOR CERTIFIED WELD INSPECTION	CON-SOW-10007 CED-STD-10069	A CWI SHALL INSPECT ALL WELDING PERFORMED ON STRUCTURAL MEMBERS DURING FABRICATION. A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
NA	MATERIAL TEST REPORTS (MTR)	CON-SOW-10007	MATERIAL TEST REPORTS SHALL BE PROVIDED FOR MATERIAL USED AS REQUIRED PER SECTION 9.2.5 OF CED-SOW-10007. MTRS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
NA	FABRICATOR NDE INSPECTION REPORT	CED-SOW-10066 CED-STD-10069	CRITICAL SHOP WELDS THAT REQUIRE TESTING ARE NOTED ON THESE CONTRACT DRAWINGS. A CERTIFIED NDT INSPECTOR SHALL PERFORM NON-DESTRUCTIVE EXAMINATION AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
NA	NDE OF MONOPOLE BASE PLATE	ENG-SOW-10033	A NDE OF THE POLE TO BASE PLATE CONNECTION IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PACKING SLIPS	CON-SOW-10007	PACKING/SHIPPING LIST FOR ALL MATERIAL USED DURING CONSTRUCTION OF THE MODIFICATION
ADDITIONAL TESTING AND INSPECTIONS:			
NA			
		CONSTRUCTION	
NA	FOUNDATION INSPECTIONS	CED-SOW-10144	A VISUAL OBSERVATION OF THE EXCAVATION AND REBAR SHALL BE PERFORMED BEFORE PLACING THE CONCRETE. A VISUAL OBSERVATION OF THE REBAR SHALL BE PERFORMED BEFORE PLACING THE EPOXY. A SEALED WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
NA	CONCRETE COMP. STRENGTH AND SLUMP TEST	CED-SOW-10144	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED AS PART OF THE FOUNDATION REPORT.
NA	EARTHWORK: SOIL COMPACTION	CED-SOW-10144	FOUNDATION SOIL COMPACTION SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
NA	EARTHWORK: BEARING CAPACITY	CED-SOW-10144	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
NA	MICROPILE/ROCK ANCHOR	CED-SOW-10144	MICROPILES/ROCK ANCHORS SHALL BE INSPECTED BY THE FOUNDATION INSPECTION VENDOR AND SHALL BE INCLUDED AS PART OF THE FOUNDATION INSPECTION REPORT, ADDITIONAL TESTING AND/OR INSPECTION REQUIREMENTS ARE NOTED IN THESE CONTRACT DOCUMENTS AND GENERAL NOTES PAGE TWO.
NA	POST-INSTALLED ANCHOR ROD VERIFICATION	CON-SOW-10007 CON-FRM-10358	POST INSTALLED ANCHOR ROD VERIFICATION SHALL BE PERFORMED IN ACCORDANCE WITH CROWN REQUIREMENTS AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
NA	BASE PLATE GROUT VERIFICATION	ENG-STD-10323	THE GENERAL CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE MI INSPECTOR THAT CERTIFIES THAT THE GROUT WAS REMOVED AND/OR INSTALLED IN ACCORDANCE WITH CROWN REQUIREMENTS FOR INCLUSION IN THE MI REPORT.
NA	ELEPHANT ARMOR	OPS-SOW-10331	PHOTOS SHALL BE SUBMITTED IN ACCORDANCE WITH SECTION 6 FOR INCLUSION IN THE MI REPORT
NA	FIELD CERTIFIED WELD INSPECTION	CED-SOW-10066 CED-STD-10069	A CROWN APPROVED CERTIFIED WELD INSPECTOR SHALL INSPECT AND TEST FIELD WELDS, FOLLOWING ALL PROCEDURES SPECIFIED IN CROWN STANDARD DOCUMENTS APPLICABLE TO WELD INSPECTIONS. A REPORT SHALL BE PROVIDED. NDE OF FIELD WELDS SHALL BE PERFORMED AS REQUIRED BY CROWN STANDARDS AND CONTRACT DOCUMENTS. THE NDE REPORT SHALL BE INCLUDED IN THE CWI REPORT.
NA	FIELD NDE	CON-STD-10159 CON-SOW-10007	A NDE OF THE FIELD WELDS IN ACCORDANCE WITH CON-STD-10159 AND ANY ADDITIONAL NDE REQUIREMENTS NOTED IN THESE DESIGN DOCUMENTS
X	ON-SITE COLD GALVANIZING VERIFICATION	CON-STD-10149 CON-FRM-10358	THE GENERAL CONTRACTOR SHALL PROVIDE WRITTEN AND PHOTOGRAPHIC DOCUMENTATION TO THE MI INSPECTOR VERIFYING THAT ANY ON-SITE COLD GALVANIZING WAS APPLIED PER MANUFACTURER SPECIFICATIONS AND APPLICABLE STANDARDS.
NA	TENSION TWIST AND PLUMB	CON-STD-10261	THE GENERAL CONTRACTOR SHALL PROVIDE A REPORT IN ACCORDANCE WITH APPLICABLE STANDARDS DOCUMENTING TENSION TWIST AND PLUMB.
X	TOWER PLUMB DELIVERABLES	CON-SOW-10007	THE CONTRACTOR SHALL PROVIDE WRITTEN AND PHOTOGRAPHIC DOCUMENTATION TO THE MI INSPECTOR VERIFYING THE TOWER PLUMB CONDITION SEE REQUIREMENTS ON GENERAL NOTES SHEET PAGE TWO
X	CANISTER DRAWINGS	CON-SOW-10007	THE CONTRACTOR SHALL SUBMIT A LEGIBLE COPY OF ANY FINAL FABRICATION OR PARTS DRAWINGS PROVIDED BY THE CANISTER VENDOR
X	GC AS-BUILT DRAWINGS	CON-SOW-10007	THE GENERAL CONTRACTOR SHALL SUBMIT A LEGIBLE COPY OF THE ORIGINAL DESIGN DRAWINGS EITHER STATING "INSTALLED AS DESIGNED" OR NOTING ANY CHANGES THAT WERE REQUIRED AND APPROVED BY THE ENGINEER OF RECORD. EOR/RFI FORMS APPROVING ALL CHANGES SHALL BE SUBMITTED
ADDITIONAL TESTING AND INSPECTIONS:			
NA			
		POST-CONSTRUCTION	
X	CONSTRUCTION COMPLIANCE LETTER	CON-SOW-10007 CON-FRM-10358	A LETTER FROM THE GENERAL CONTRACTOR STATING THAT THE WORKMANSHIP WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THESE CONTRACT DRAWINGS
NA	POST-INSTALLED ANCHOR ROD PULL TESTS	CED-PRC-10119	POST-INSTALLED ANCHOR RODS SHALL BE TESTED BY A CROWN APPROVED PULL TEST INSPECTOR AND A REPORT SHALL BE PROVIDED INDICATING TESTING RESULTS.
X	PHOTOGRAPHS	CON-SOW-10007	PHOTOGRAPHS SHALL BE SUBMITTED TO THE MI. PHOTOS SHALL DOCUMENT ALL PHASES OF THE CONSTRUCTION. THE PHOTOS SHALL BE ORGANIZED IN A MANNER THAT EASILY IDENTIFIES THE EXACT LOCATION OF THE PHOTO.
NA	BOLT HOLE INSTALLATION VERIFICATION REPORT	CON-SOW-10007	THE MI INSPECTOR SHALL VERIFY THE HOLE SIZE AND CONDITION OF 10% OF ALL NON PRE-TENSIONED BOLTS INSTALLED AS PART OF THE MODIFICATION. THE MI REPORT SHALL CONTAIN THE COMPLETED BOLT INSTALLATION VERIFICATION REPORT, INCLUDING THE SUPPORTING PHOTOGRAPHS.
X	PUNCH LIST DEVELOPMENT AND CORRECTION DOCUMENTATION	CON-PRC-10283 CON-FRM-10285	FINAL PUNCH LIST INDICATING ALL NONCONFORMANCE(S) IDENTIFIED AND THE FINAL RESOLUTION/APPROVAL.
X	MI INSPECTOR RECORD DRAWING(S)	CON-SOW-10007	THE MI INSPECTOR SHALL OBSERVE AND REPORT ANY DISCREPANCIES BETWEEN THE CONTRACTOR'S REDLINE DRAWING AND THE ACTUAL COMPLETED INSTALLATION.
ADDITIONAL TESTING AND INSPECTIONS:			
NA			

THE MI CHECKLIST SHALL BE REVIEWED PRIOR TO THE START OF CONSTRUCTION. ALL PARTIES TO THE MODIFICATION SHALL UNDERSTAND CROWN REQUIREMENTS AND INSPECTION/DOCUMENTATION THAT IS APPLICABLE TO THE SCOPE OF WORK THEY ARE PERFORMING. ERRORS ON THE MI CHECKLIST SHALL BE BROUGHT TO THE ATTENTION OF THE CROWN POC AND EOR AS SOON AS POSSIBLE.

MODIFICATION INSPECTION NOTES:

GENERAL

THE MI IS AN ON-SITE VISUAL AND HANDS-ON INSPECTION OF TOWER MODIFICATIONS INCLUDING A REVIEW OF CONSTRUCTION REPORTS AND ADDITIONAL PERTINENT DOCUMENTATION PROVIDED BY THE GENERAL CONTRACTOR (GC), AS WELL AS ANY INSPECTION DOCUMENTS PROVIDED BY 3RD PARTY INSPECTORS. THE MI IS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS; IN ACCORDANCE WITH APPLICABLE CROWN STANDARDS; AND AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

NO DOCUMENT, CODE OR POLICY CAN ANTICIPATE EVERY SITUATION THAT MAY ARISE. ACCORDINGLY, THIS CHECKLIST IS INTENDED TO SERVE AS A SOURCE OF GUIDING PRINCIPLES IN ESTABLISHING GUIDELINES FOR MODIFICATION INSPECTION.

THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, AND THE MI INSPECTOR DOES NOT TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES. THE MI INSPECTOR SHALL INSPECT AND NOTE CONFORMANCE/NONCONFORMANCE AND PROVIDE TO THE CROWN POINT OF CONTACT (CROWN POC) FOR EVALUATION.

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PURCHASE ORDER (PO) IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN THE GC AND/OR INSPECTOR SHALL CONTACT THE CROWN POINT OF CONTACT (CROWN POC).

REFER TO CROWN CON-SOW-10007, "MODIFICATION INSPECTION", FOR FURTHER DETAILS AND REQUIREMENTS.

SERVICE LEVEL COMMITMENT

THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING AN MI REPORT:

- THE GC SHALL PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLY 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY MINOR DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE.

REQUIRED PHOTOS

BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

- PRE-CONSTRUCTION GENERAL SITE CONDITION
- PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION
  - RAW MATERIALS
  - PHOTOS OF ALL CRITICAL DETAILS
  - FOUNDATION MODIFICATIONS
  - WELD PREPARATION
  - BOLT INSTALLATION
  - FINAL INSTALLED CONDITION
  - SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
  - FINAL INFIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN ONLY FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.

THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS, FOR A COMPLETE LIST OF PHOTOS SEE CROWN DOCUMENT # CED-SOW-10007.

NOTE:

X DENOTES A DOCUMENT NEEDED FOR THE PMI REPORT
NA DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE PMI REPORT

PLANS PREPARED FOR:

CROWN CASTLE

PROJECT INFORMATION:

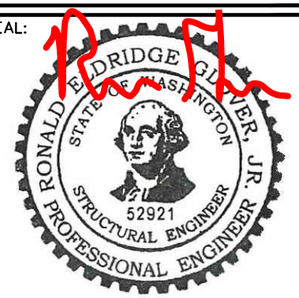
SEATTLE - SEA155
BU #: 880416

8477 SE 68TH STREET
MERCER ISLAND, WA 98040
(KING COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603
OFFICE: (919) 661-6351
www.tepgroup.net

SEAL:



REV	DATE	ISSUED FOR:
0	12-12-23	MODIFICATION DRAWINGS

DRAWN BY: RTP | CHECKED BY: CDC

SHEET TITLE:

MI CHECKLIST AND NOTES

SHEET NUMBER: **N-1**

REVISION: **0**

TEP#: 151934.904269

GENERAL NOTES:

1. The General Contractor (GC) shall reference CON–STD–10159, "Tower Modification Construction Specifications", as a continuation of the following General Notes. The GC shall keep a printed or electronic copy of this document with the Structural Design Drawings (SDD) at all times, in a location accessible to all Contractor Personnel, and shall ensure that all Contractor Personnel are aware of the information enclosed within the General Notes and CON–STD–10159.

2. The Contract Documents are the property of Crown Castle (Crown). They are provided to the GC and its Lower Tier Contractors and material suppliers for the limited purpose of use in completing the Work for this Site, and shall be kept in strict confidence and not disclosed to any third parties. The Contract Documents shall not be used for any other purpose whatsoever without the prior written consent of Crown.

3. Detail drawings, including notes and tables, shall govern over general notes and typical details. Contact the Crown Point of Contact (POC) and Engineer of Record (EOR) for clarification as needed.

4. Do not scale drawings.

5. Any Work performed without a prefabrication mapping is done at the risk of the GC and/or fabricator. All dimensions of existing structural elements are assumed based on the available documentation and are preliminary until field–verified by the GC, unless noted otherwise (UNO). Where discrepancies are found, GC shall contact the Crown POC and EOR through RFI.

6. For this analysis and modification, the tower has been assumed to be in good condition without any structural defects, UNO. If the GC discovers any indication of an existing structural defect, contact the Crown POC and EOR immediately.

7. All construction means and methods, including but not limited to erection plans, rigging plans, climbing plans, and rescue plans, shall be the responsibility of the GC responsible for the execution of the Work contained herein, and shall meet ANSI/ASSE A10.48 (latest edition); federal, state, and local regulations; and any applicable industry consensus standards related to the construction activities being performed. All rigging plans shall adhere to ANSI/ASSE A10.48 (latest edition) and Crown standard CED–STD–10253, "Rigging Program", including the required involvement of a qualified engineer for class IV construction to certify the supporting structure(s) in accordance with the ANSI/TIA–322 (latest edition).

8. Hoisting grips used for feed line installation shall follow manufacturer guidelines for maximum installed spacing intervals and pull load capacity restrictions.

9. The structural integrity of the modification design extends to the complete condition only. The GC must be cognizant that the removal of any structural component of an existing tower has the potential to cause the partial or complete collapse of the structure. All necessary precautions must be taken to ensure structural integrity, including, but not limited to, engineering assessment of construction stresses with installation maximum wind speed and/or temporary bracing and shoring.

10. Aerial and underground utilities and facilities may or may not be shown on the drawings. The GC shall take every precaution to preserve and protect these items, which may include aerial or underground power lines, telephone lines, water lines, sewer lines, cable television facilities, pipelines, structures and other public and private improvements within or adjacent to the work area. The responsibility for determining the actual on–site location of these items shall rest exclusively with the GC.

11. All manufacturer's hardware assembly instructions shall be followed, UNO. Conflicting notes shall be brought to the attention of the EOR and the Crown POC.

12. The GC shall fabricate all required items per the materials specified below, UNO on the detail drawing sheets. If the GC finds for any component that the materials have not been clearly specified, the GC shall submit an RFI to the EOR to confirm the required material.

    All structural elements shall be new and shall conform to the following requirements, UNO:

    Monopoles:

–Structural shapes and plates:	ASTM A572 Grade 65 (FY = 65 KSI)
–Welding electrodes, SMAW:	E80XX
–Welding electrodes, FCAW:	E8XT–XX
–Welding electrodes, GMAW:	ER80S–X

    Self–Support and Guyed Towers:

–Structural shapes and plates:	ASTM A572 Grade 50 (FY = 50 KSI)
–Welding electrodes, SMAW:	E70XX
–Welding electrodes, FCAW:	E7XT–XX
–Welding electrodes, GMAW:	ER70S–X

    All tower types:

–Steel angle:	ASTM A572 Grade 50 (FY = 50 KSI)
–Solid rod:	ASTM A36 (FY = 36 KSI)
–Pipe/tube (round):	ASTM A500 Grade C (FY = 46 KSI)
–Pipe/tube (square):	ASTM A500 Grade C (FY = 50 KSI)
–Bolts:	ASTM F3125 Grade A325 Type 1
–U–bolts:	ASTM A307 Grade A, OR SAE J429 Grade 2
–Nuts:	ASTM A563 Grade DH
–Washers:	ASTM F436 Type 1
–Guy wires:	ASTM A475 Grade EHS
–Bridge strand:	ASTM A586 Grade 1

13. After fabrication, hot–dip galvanize all steel items, UNO. Galvanize per ASTM A123, ASTM A153/A153M, OR ASTM A653 G90, as applicable. ASTM A490 bolts shall not be hot–dip galvanized, but shall instead be coated with Magni 565 or EOR approved equivalent, per ASTM F2833.

14. Contractor Personnel shall not drill holes in any new or existing structural members, other than those drilled holes shown on structural drawings, without the approval of the EOR.

15. For a list of Crown–approved cold galvanizing compounds, refer to OPS–STD–10149, "Tower Protective Coatings Guidelines".

16. All exposed structural steel as the result of this scope of Work including welds (after final inspection of the weld by the CWI), field drilled holes, and shaft interiors (where accessible), shall be cleaned and two (2) coats cold galvanizing shall be applied by brush in accordance with OPS–STD–10149, "Tower Protective Coatings Guidelines". Photo documentation is required to be submitted to the MI Inspector.

17. If removal of existing modifications is required per the modification scope, the GC shall clean and cold galvanize any existing empty bolt holes, UNO. If additional unexpected, oversized, or slotted holes are found, the GC shall contact the EOR and Crown POC for guidance prior to proceeding with the modifications.

18. All Work involving base plate grout scope items or resulting in disturbance of base plate grout shall reference ENG–STD–10323, "Base Plate Grout", and shall follow any Base Plate Grout Removal notes contained herein.

19. If scope of modification involves bark removal or installation, the GC shall reference CED–SOW–10265, "Tree Concealment for Monopoles", as well as CED–STD–10395, "Installation Guidelines for Bark Surfaces".

20. If scope of modification involves concealment components including branching, the GC shall reference CED–CAT–10398, "Monopole Concealed Decorative Structures (CDS) Approved Components". All new branch installations require tethering.

21. If scope of modification involves cathodic protection, the GC shall reference CED–SOW–10397, "Cathodic Protection Installation, Replacement, and Enhancement".

22. All tower grounding affected by the Work shall be repaired or replaced in accordance with OPS–STD–10090, "Tower Grounding", and OPS–BUL–10133, "Grounding Repair Recommendation".

23. If scope of modification requires removal or covering of tower ID tag, the tag must be replaced.

24. Any hardware removed from the existing tower shall be replaced with new hardware of equal size and quality, UNO. No existing fasteners shall be reused.

25. All joints using ASTM A325 or A490 bolts, U–bolts, V–bolts, and threaded rods shall be snug tightened, UNO.

26. A nut locking device shall be installed on all proposed and/or replaced snug tightened ASTM A325 or A490 bolts, U–bolts, V–bolts, and threaded rods.

27. All joints are bearing type connections UNO. If no bolt length is given in the Bill of Materials, the connection may include threads in the shear planes, and the GC is responsible for sizing the length of the bolt.

28. Blind bolts shall be installed per the installation specifications on the corresponding Approved Fastener sheets contained in CON–CAT–10300, "Monopole Standard Drawings and Approved Reinforcement Components".

29. If ASTM A325 or A490 bolts, and/or threaded rods are specified to be pre–tensioned, these shall be installed and tightened to the pretensioned condition according to the requirements of the RCSC Specification for Structural Joints Using ASTM High Strength Bolts.

30. All proposed and/or replaced bolts shall be of sufficient length such that the end of the bolt be at least flush with the face of the nut. It is not permitted for the bolt end to be below the face of the nut after tightening is completed.

PLANS PREPARED FOR:

CROWN CASTLE

PROJECT INFORMATION:

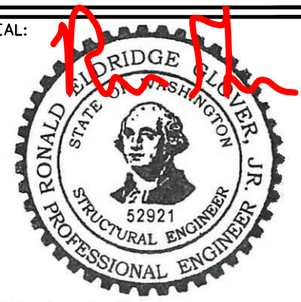
SEATTLE - SEA155
BU #: 880416

8477 SE 68TH STREET
MERCER ISLAND, WA 98040
(KING COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603
OFFICE: (919) 661-6351
www.tepgroup.net

SEAL:



Electronic Copy

December 12, 2023

REV	DATE	ISSUED FOR:
0	12-12-23	MODIFICATION DRAWINGS

DRAWN BY: RTP | CHECKED BY: CDC

SHEET TITLE:

GENERAL NOTES

SHEET NUMBER: **N-2**

REVISION: **0**

TEP#: 151934.904269

TOWER PLUMB REQUIREMENTS:

1. CHECK OF VERTICAL ALIGNMENT AND LEVEL OF BASE TOWER AND CANISTER ASSEMBLY SECTIONS FOR CONFORMANCE TO A PLUMB CONDITION IN ACCORDANCE WITH ANSI/TIA-222-H STANDARDS. PLUMB CONDITION IS TO BE DOCUMENTED WITH THE PROPER NOTES AND PICTURES TO PROVE, AT MINIMUM, THE FOLLOWING:

   1.1. DEFLECTION CALCULATIONS PER ANSI/TIA-222-H STANDARDS

   1.2. MINIMUM AND MAXIMUM (I.E. HOT AND COLD) SURFACE TEMPERATURE READINGS ON BASE MONOPOLE

   1.3. TIME OF DAY MEASURE WAS TAKEN (E.G. DAWN, NOON, DUSK)

   1.4. PICTURES OF A LEVEL OR DIGITAL INCLINOMETER MEASURED AT A MINIMUM OF (3) EQUIDISTANT LOCATIONS AROUND THE BASE PLATE TO PROVE LEVEL CONDITIONS

   1.5. AZIMUTH OR MONOPOLE FLAT NUMBER OF THE DIRECTION OF THE OUT-OF-PLUMB DEFLECTION

PLANS PREPARED FOR:

CROWN CASTLE

PROJECT INFORMATION:

SEATTLE - SEA155
BU #: 880416

8477 SE 68TH STREET
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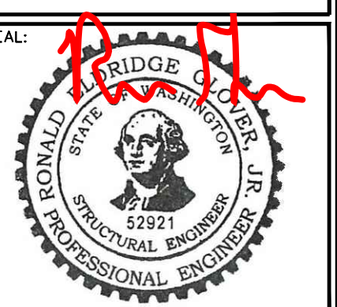


Electronic Copy

December 12, 2023

REV	DATE	ISSUED FOR:
0	12-12-23	MODIFICATION DRAWINGS

DRAWN BY: RTP | CHECKED BY: CDC

SHEET TITLE:

PROJECT NOTES

SHEET NUMBER: **N-3**

REVISION: **0**

TEP#: 151934.904269

MANUFACTURER POLE SPECIFICATIONS

TAPER:	–
BASE PLATE STEEL (Fy):	ASTM A36 (36 KSI)
ANCHOR RODS:	1 1/2"ø ASTM A354

MANUFACTURER SHAFT SECTION DATA

SHAFT SECTION	SECTION SHAPE	SECTION LENGTH (FT.)	SECTION THICKNESS (IN.)	SECTION GRADE Fy (KSI)	FLANGE PLATE GRADE Fy (KSI)	LAP SPLICE (IN.)	DIAMETER ACROSS FLATS OR OF ROUND SECTION (IN.)	
							TOP	BOTTOM
1	ROUND	20.00	0.4320	35	50	–	6.625	6.625
2	ROUND	20.00	0.5000	35	50	–	8.625	8.625
3	ROUND	10.00	0.5000	42	50	–	8.625	8.625
4	ROUND	40.00	0.3750	42	36	–	36.000	36.000
5	ROUND	40.00	0.3750	42	36	–	36.000	36.000
6	ROUND	20.00	0.3750	42	36	–	36.000	36.000

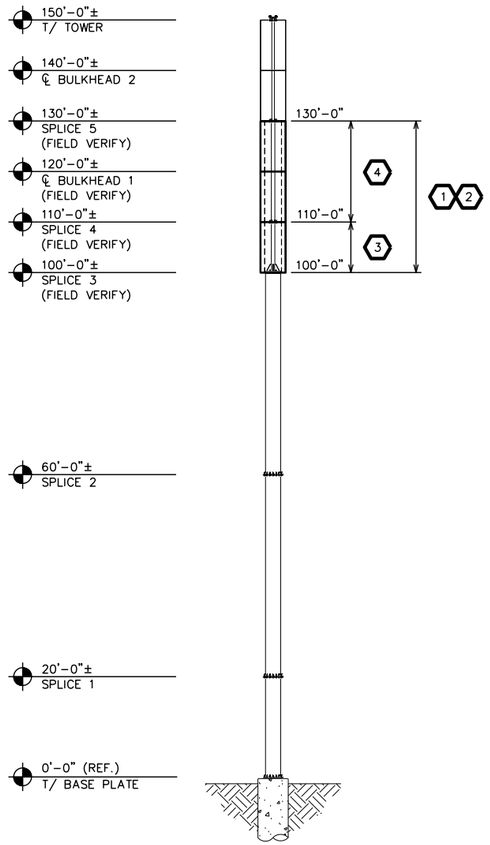
NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

MODIFICATION SCHEDULE

NO.	MODIFICATION DESCRIPTION	ELEVATION (FT.)	SHEET
1	REMOVE EXISTING CONCEALMENT CANISTERS AND BULKHEAD ATTACHMENTS.	100.00 – 130.00	S-2
2	INSTALL PROPOSED UNVENTED AND VENTED CONCEALMENT CANISTERS AND BULKHEAD ATTACHMENTS. CONCEALMENT CANISTERS TO BE INSTALLED PER CROWN DOC: CON-PRC-10127.	100.00 – 130.00	S-2
3	(1) NEW 60" NOMINAL DIAMETER VENTED CONCEALMENT ASSEMBLIES SHALL BE PROVIDED BY APPROVED VENTED CANISTER VENDOR. REFERENCE ITB EMAIL FOR MORE INFORMATION.	100.00 – 110.00	S-2
4	(2) NEW 60" NOMINAL DIAMETER UNVENTED CONCEALMENT ASSEMBLIES SHALL BE PROVIDED BY APPROVED UNVENTED CANISTER VENDOR. REFERENCE ITB EMAIL FOR MORE INFORMATION.	110.00 – 130.00	S-2
5	PAINT PROPOSED MODIFICATIONS TO MATCH TOWER SHAFT.	–	–
6	CONTRACTOR TO PLUMB TOWER PER SECTION 13.3.3 OF ANSI/TIA-222-H.	–	–
7	CROWN CASTLE WILL CONTRACT WITH A THIRD PARTY VENDOR TO PERFORM THE MODIFICATION INSPECTION. THE CONTRACTOR SHALL COORDINATE THE INSPECTION WITH THE MODIFICATION INSPECTOR AND CROWN CASTLE PROJECT MANAGER. SEE SHEET N-1 FOR DETAILS.	–	–

NOTES:

1. PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL FIELD VERIFY ALL LENGTHS AND QUANTITIES GIVEN. LENGTH AND QUANTITIES PROVIDED ARE FOR QUOTING PURPOSES ONLY, AND SHALL NOT BE USED FOR FABRICATION.
2. FOR PARTS NOT DETAILED WITHIN THE DRAWING AND STARTING WITH "CCI-", SEE THE FOLLOWING CATALOG FOR DETAILS: CON-CAT-10300, MONOPOLE STANDARD DRAWINGS AND APPROVED REINFORCEMENT COMPONENTS.



TOWER ELEVATION

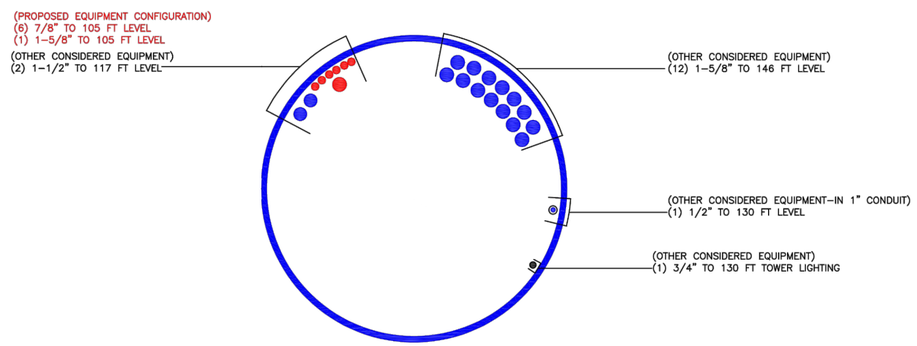
SCALE: 1" = 30'-0"

0 30 60

SCALE IN FEET

NOTE:

BASE LEVEL DRAWING PROVIDED BY CROWN CASTLE.



BASE LEVEL DRAWING

SCALE: N.T.S.

PLANS PREPARED FOR:

CROWN CASTLE

PROJECT INFORMATION:

SEATTLE - SEA155
BU #: 880416

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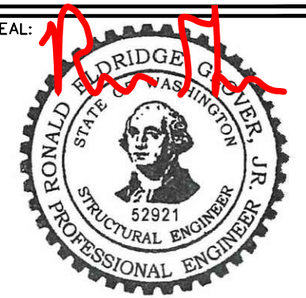


Electronic Copy

December 12, 2023

REV	DATE	ISSUED FOR:
0	12-12-23	MODIFICATION DRAWINGS

DRAWN BY: RTP CHECKED BY: CDC

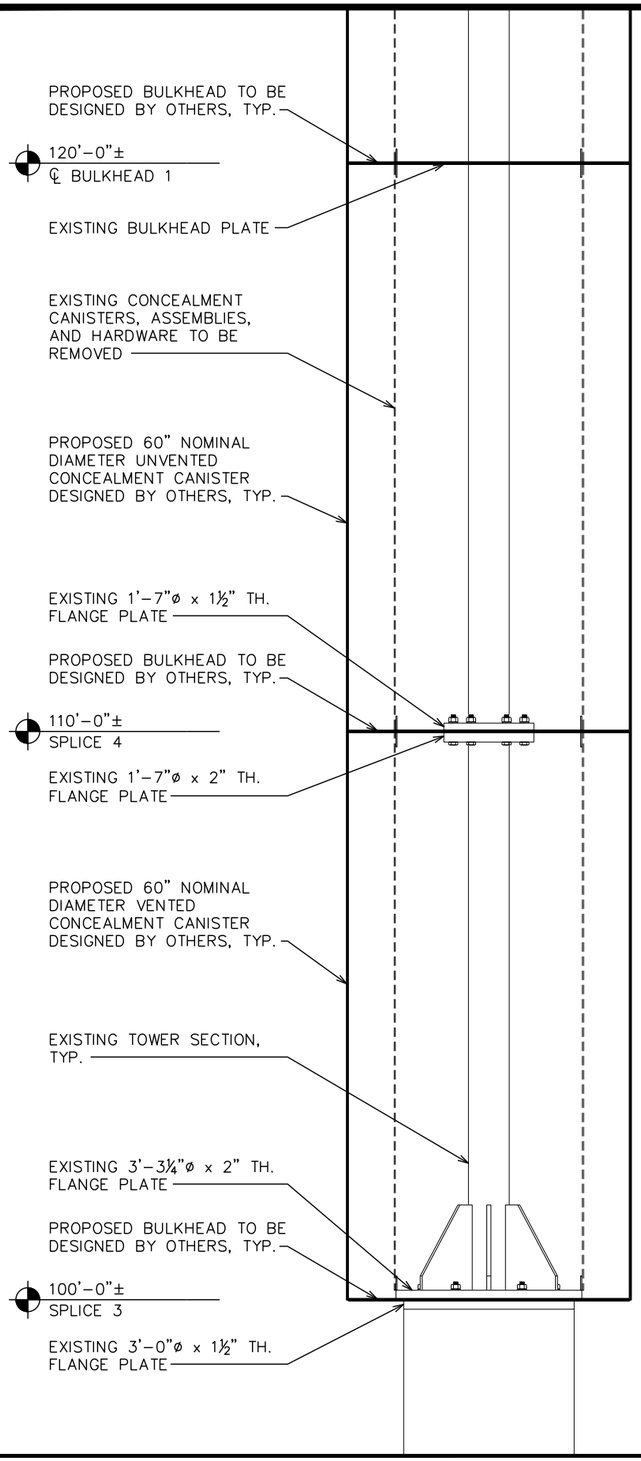
SHEET TITLE:

TOWER ELEVATION AND MODIFICATION SCHEDULE

SHEET NUMBER: **S-1**

REVISION: **0**

TEP#: 151934.904269

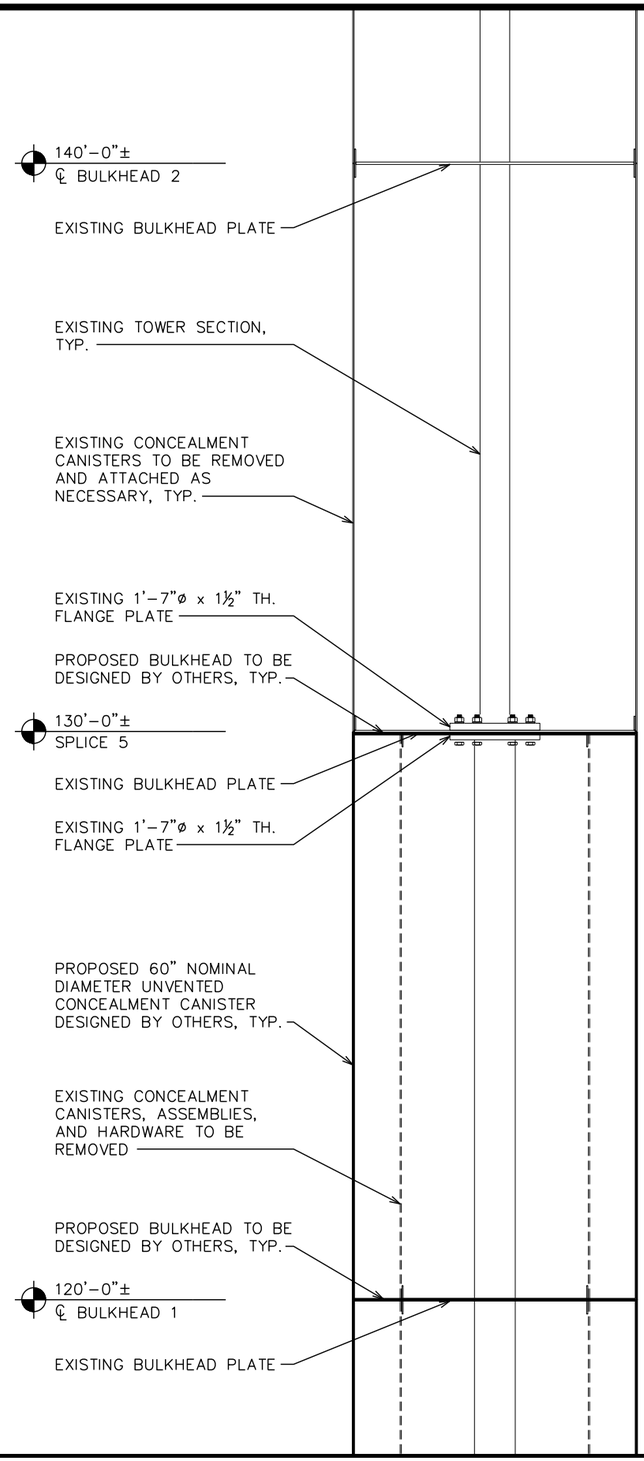


PARTIAL ELEVATION

SCALE: ⅜" = 1'-0"

0 1 2

SCALE IN FEET



PARTIAL ELEVATION

SCALE: ⅜" = 1'-0"

0 1 2

SCALE IN FEET

PLANS PREPARED FOR:

CROWN CASTLE

PROJECT INFORMATION:

SEATTLE - SEA155
BU #: 880416

8477 SE 68TH STREET
MERCER ISLAND, WA 98040
(KING COUNTY)

PLANS PREPARED BY:

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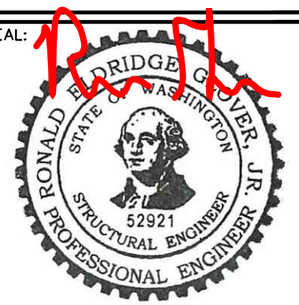
SEAL:



Electronic Copy

December 12, 2023

REV	DATE	ISSUED FOR:
0	12-12-23	MODIFICATION DRAWINGS

DRAWN BY: RTP | CHECKED BY: CDC

SHEET TITLE:

CONCEALMENT INSTALLATION DETAILS

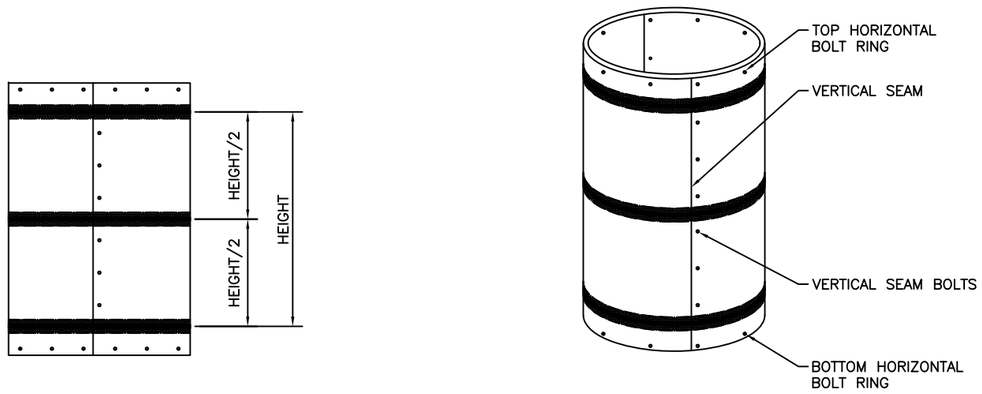
SHEET NUMBER: **S-2**

REVISION: **0**

TEP#: 151934.904269

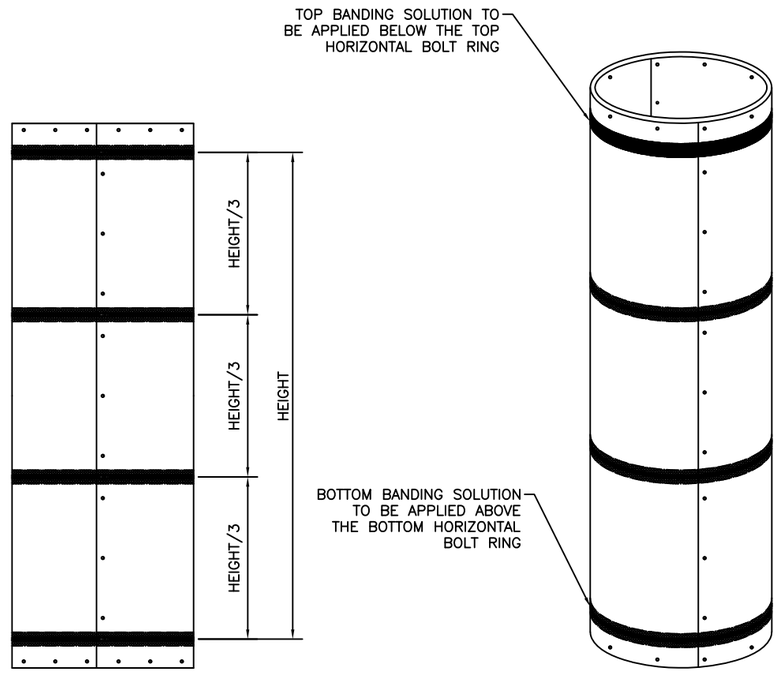
CONCEALMENT REINFORCEMENT SOLUTION – PARTS LIST

NO.	MANUFACTURER	DESCRIPTION	SIZE	PRODUCT NO.
(1)	USA STRAPPING	WOVEN POLYESTER STRAPPING	3/4"x250 FT. COIL	2700–34
(2)	MCNETT GEAR AID	DUAL–ADJUST BUCKLE	3/4" SIZE	80355
(3)	3M SCOTCH	BI–DIRECTIONAL FILAMENT TAPE	2.95"x54.7 YD. ROLL	8959
(4)	RUST–OLEUM	GLOSS CLEAR SPRAY	12 OZ.	249117



≤ 10'–0" CONCEALMENT COVER LEVEL HEIGHT

NOT TO SCALE



> 10'–0" CONCEALMENT COVER LEVEL HEIGHT

NOT TO SCALE

GENERAL:

1.) THE REINFORCEMENT SOLUTION IS ONLY TO BE APPLIED TO VERTICALLY-FASTENED MULTI-PANEL OR "SECTORIZED" CONCEALMENT COVERS. SOLID ONE-PIECE CONCEALMENT COVERS ARE NOT TO BE TREATED WITH THIS SOLUTION. CONCEALMENT COVERS THAT HAVE UNDERGONE CROWN-SPECIFIED WIND TESTING AND HAVE BEEN APPROVED BY CROWN ARE NOT REQUIRED TO BE TREATED WITH THE BANDING SOLUTION. SEE CON-PRC-10127 FOR A LIST OF APPROVED CONCEALMENT COVERS.

2.) FOR CONCEALMENT COVER LEVELS MEASURING 10 FT. IN HEIGHT OR LESS, (3) EQUALLY-SPACED BANDING APPLICATIONS ARE TO BE INSTALLED AT THE TOP, MID-SPAN, AND BOTTOM REGIONS. FOR LEVELS GREATER THAN 10 FT. IN HEIGHT, (4) EQUALLY-SPACED BANDING APPLICATIONS ARE TO BE INSTALLED, AT THE TOP, UPPER MIDDLE, LOWER MIDDLE, AND BOTTOM REGIONS.

3.) FOR CONCEALMENT COVERS OF ALL HEIGHTS, THE TOP BANDING APPLICATION IS TO BE POSITIONED DIRECTLY BELOW THE TOP CONCEALMENT COVER HORIZONTAL BOLT RING AND THE BOTTOM BANDING APPLICATION DIRECTLY ABOVE THE BOTTOM HORIZONTAL BOLT RING.

4.) BANDING APPLICATION SHALL NOT COVER ANY VERTICAL OR HORIZONTAL FASTENERS.

INSTALLATION:

1.) STRAPPING IS TO BE LOOPED AROUND THE CONCEALMENT COVER AND EACH CUT END OF THE STRAPPING FED AROUND A CROSS BAR ON EACH END OF THE DUAL-ADJUST BUCKLE.

2.) STRAPPING IS TO BE HAND-TIGHTENED USING THE BUCKLE SUCH THAT THE STRAPPING LIES FLAT, UNTWISTED, AND SQUARE TO THE CONCEALMENT COVER.

3.) AT LEAST (2) CONTINUOUS LAYERS OF 3M 8959 TAPE ARE TO BE APPLIED ON TOP OF THE TIGHTENED STRAPPING SUCH THAT NO TAIL OF THE STRAPPING IS SHOWING OUTSIDE THE LAYERS OF TAPE.

4.) THE CURRENT DATE IS TO BE MARKED WITH PERMANENT INK ON THE TOP LAYER OF TAPE TO RECORD INSTALLATION DATE.

5.) ENSURE THAT THE SURFACE OF THE CANISTER IS FREE FROM OIL, GREASE, SOIL, DIRT, AND OTHER FOREIGN MATTER. THE SURFACE SHALL BE CLEAN, DRY AND SMOOTH TO RECEIVE THE STRAPPING AND THE TAPE.

6.) 3M 8959 TAPE SHALL BE TACKED DOWN BY APPLYING (2) COATS OF NON-YELLOWING CLEAR COAT SPRAY OVER THE TAIL END OF THE TAPE AFTER IT IS SECURELY TAPED DOWN. SECOND COAT SHALL BE APPLIED ONCE THE FIRST COAT IS DRY TO TOUCH.

PAINTING 3M 8959 TAPE [IF REQUIRED]:

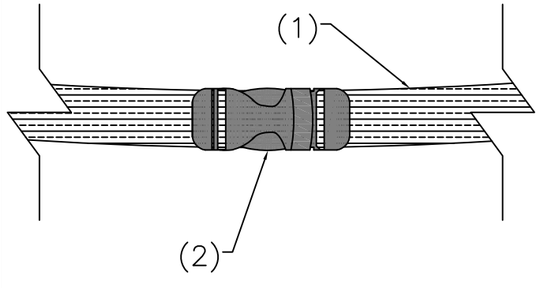
1.) AFTER FULL INSTALLATION OF THE THE REINFORCEMENT SOLUTION, THE TAPE SHALL BE COATED TO MATCH THE COLOR OF THE EXISTING CONCEALMENT CANISTER

1.1) AS AN EXAMPLE, IF THE EXISTING CONCEALMENT CANISTER IS WHITE, PAINTING WOULD NOT BE REQUIRED SINCE THE TAPE COLOR IS ALSO WHITE. HOWEVER, IF THE CANISTER IS BLACK, PAINT THE TAPE TO MATCH THE CANISTER COLOR.

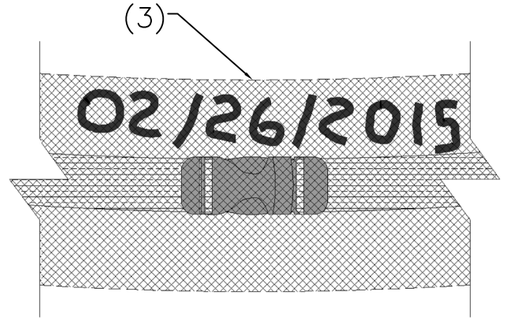
2.) PAINT SHALL BE APPLIED WITH A BRUSH FOR A CLEAN EDGE ON THE TAPE. SPRAY PAINT IS PERMISSIBLE PROVIDED THAT PAINTER'S TAPE IS UTILIZED TO AVOID PAINTING THE CANISTER. SECOND COAT SHALL BE APPLIED AFTER THE FIRST COAT IS DRY. THE SHEEN OF THE PAINT SHALL MATCH THE CANISTER

3.) THE INSTALLATION DATE SHALL BE MARKED ON TOP OF THE COATED SURFACE.

STRAPPING INSTALLATION DETAIL



TAPE INSTALLATION DETAIL



CROWN CASTLE CONCEALMENT REINFORCEMENT SOLUTION

SCALE: N.T.S.

REV E

PLOT DATE: PLOTDATE FILE NAME: FILEN

CARRIERS LOGO

2000 CORPORATE DRIVE
CANONSBURG PA, 15317

SPACE RESERVED FOR PROFESSIONAL SEALS

REVISIONS NO.	DATE	DESCRIPTION	BY
A	02/06/15	CONCEALMENT SOLUTION	MAJ
B	02/04/16	CONCEALMENT SOLUTION	MAJ
C	01/09/17	CONCEALMENT SOLUTION	MAJ
D	06/29/20	ADDED SUBSTITUTE FOR HURRICANE TAPE	JYK
E	06/29/20		AOS
E	07/31/23	REMOVED HURRICANE TAPE AND EDITED NOTE 1	

DRAWN BY: **AOS**
CHECKED BY:
DRAWING DATE: **07/31/23**

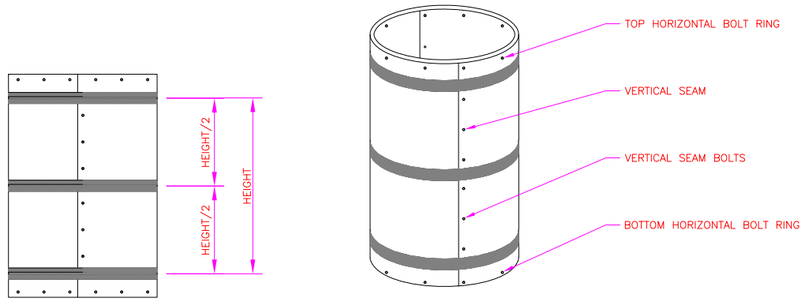
SHEET TITLE

TYPE

SHEET NUMBER

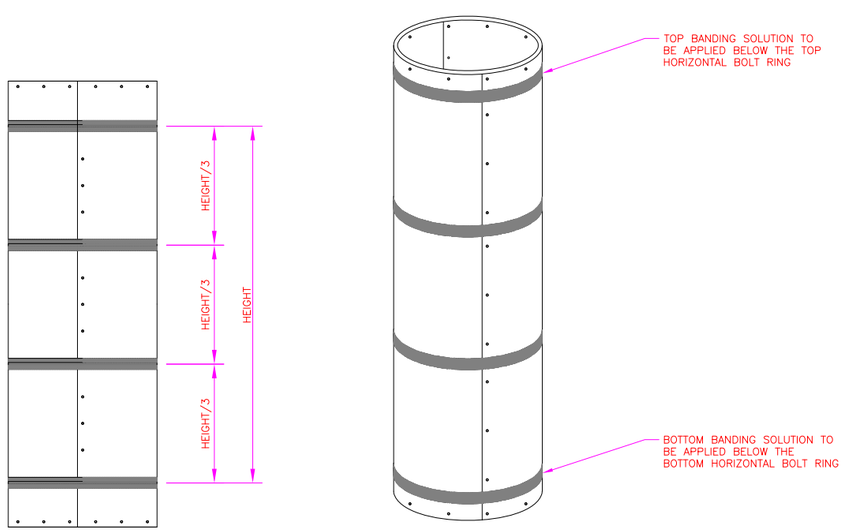
CON-PRC-10127

PARTS LIST (MATERIAL PRICING GUIDE VENDOR PART #: CC-TWOTAPE-KIT)				
NO.	MANUFACTURER	DESCRIPTION	SIZE	PRODUCT NO.
(1)	3M SCOTCH	BL DIRECTIONAL FILAMENT TAPE	"2.95"x57.7 YD. ROLL	8959
(2)	GORILLA GLUE COMPANY	WHITE GORILLA TAPE	(2) 1.88" x 30 YD. ROLLS	6025001



≤ 10'-0" CONCEALMENT COVER LEVEL HEIGHT

NOT TO SCALE



> 10'-0" CONCEALMENT COVER LEVEL HEIGHT

NOT TO SCALE

NOTES:

1.) THE REINFORCEMENT SOLUTION IS ONLY TO BE APPLIED TO VERTICALLY-FASTENED MULTI-PANEL OR "SECTORIZED" CONCEALMENT COVERS. SOLID ONE-PIECE CONCEALMENT COVERS ARE NOT TO BE TREATED WITH THIS SOLUTION. CONCEALMENT COVERS THAT HAVE UNDERGONE CROWN-SPECIFIED WIND TESTING AND HAVE BEEN APPROVED BY CROWN ARE NOT REQUIRED TO BE TREATED WITH THE BANDING SOLUTION. SEE CON-PRC-10127 FOR A LIST OF APPROVED CONCEALMENT COVERS.

2.) FOR CONCEALMENT COVER LEVELS MEASURING 10 FT. IN HEIGHT OR LESS, (3) EQUALLY-SPACED BANDING APPLICATIONS ARE TO BE INSTALLED AT THE TOP, MID-SPAN, AND BOTTOM REGIONS. FOR LEVELS GREATER THAN 10 FT. IN HEIGHT, (4) EQUALLY-SPACED BANDING APPLICATIONS ARE TO BE INSTALLED, AT THE TOP, UPPER MIDDLE, LOWER MIDDLE, AND BOTTOM REGIONS.

3.) FOR CONCEALMENT COVERS OF ALL HEIGHTS, THE TOP BANDING APPLICATION IS TO BE POSITIONED DIRECTLY BELOW THE TOP CONCEALMENT COVER HORIZONTAL BOLT RING AND THE BOTTOM BANDING APPLICATION DIRECTLY ABOVE THE BOTTOM HORIZONTAL BOLT RING.

4.) BANDING APPLICATION SHALL NOT COVER ANY VERTICAL OR HORIZONTAL FASTENERS.

INSTALLATION:

1.) ENSURE THAT THE SURFACE OF THE CANISTER IS FREE FROM OIL, GREASE, SOIL, DIRT, AND OTHER FOREIGN MATTER. THE SURFACE SHALL BE CLEAN, DRY AND SMOOTH TO RECEIVE THE TAPES.

2.) AT LEAST (2) CONTINUOUS LAYERS OF 3M 8959 TAPE ARE TO BE APPLIED FIRST ON TOP OF THE CONCEALMENT CANISTER.

3.) APPLY A 3" LONG GORILLA TAPE VERTICALLY TO TAPE DOWN THE END EDGE OF THE 3M 8959 TAPE PRIOR TO STEP 4.

4.) APPLY AT LEAST (2) CONTINUOUS LAYERS OF GORILLA TAPE OVER THE 3M 8959 TAPE.

5.) THE CURRENT DATE IS TO BE MARKED WITH PERMANENT MARKER ON THE TOP LAYER OF TAPE TO RECORD THE INSTALLATION DATE.

PAINTING TAPES [IF REQUIRED]:

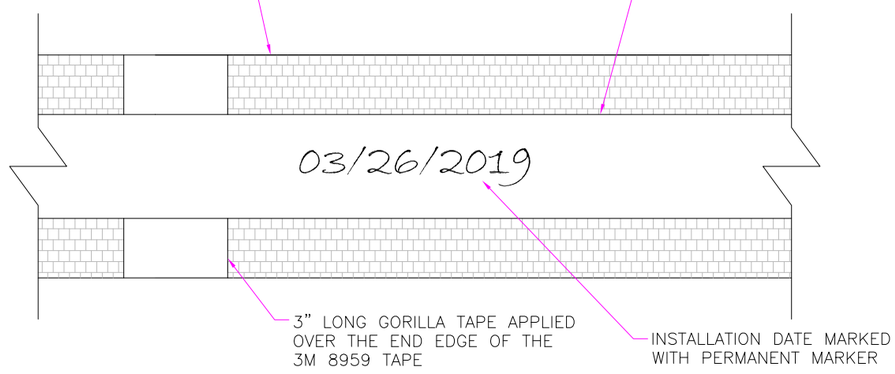
1.) AFTER FULL INSTALLATION OF THE THE REINFORCEMENT SOLUTION, THE TAPES SHALL BE COATED TO MATCH THE COLOR OF THE EXISTING CONCEALMENT CANISTER.

1.1) AS AN EXAMPLE, IF THE EXISTING CONCEALMENT CANISTER IS WHITE, PAINTING WOULD NOT BE REQUIRED SINCE THE TAPES ARE ALSO WHITE. HOWEVER, IF THE CANISTER IS BLACK, PAINT THE TAPES TO MATCH THE CANISTER COLOR.

2.) PAINT SHALL BE APPLIED WITH A BRUSH FOR A CLEAN EDGE. SPRAY PAINT IS PERMISSIBLE PROVIDED THAT PAINTER'S TAPE IS UTILIZED TO AVOID PAINTING THE CANISTER. SECOND COAT SHALL BE APPLIED AFTER THE FIRST COAT IS DRY. THE SHEEN OF THE PAINT SHALL MATCH THE CANISTER.

3.) THE INSTALLATION DATE SHALL BE MARKED ON TOP OF THE COATED SURFACE.

INSTALLATION DETAIL



DRAWN BY: AOS

CHECKED BY:

DRAWING DATE: 07/31/2023

CROWN CASTLE
2000 CORPORATE DRIVE
CANONSBURG, PA 15317

CONCEALMENT REINFORCEMENT SOLUTION - TWO-TAPE BANDING

SHEET NUMBER: CON-PRC-10127P

REVISION: E