Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts
and New York

March 10, 2023

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-106-221005 – Cellco Partnership d/b/a Verizon Wireless – 1363 Boston Post Road, Old Saybrook, Connecticut**

Dear Attorney Bachman:

Pursuant to Condition No. 2 of the Siting Council's EM-VER-106-221005 approval, enclosed is a revised Comprehensive Structural Analysis Report referencing the recently revised Connecticut State Building Code, effective October 1, 2022.

Pursuant to Condition No. 3, also enclosed is a Calculated Radio Frequency (RF) Report, prepared by C-Squared Systems presenting a cumulative far-field analysis for all carriers on the tower. This RF report demonstrates that the modified facility will operate well within the FCC's Maximum Permissible Exposure limits.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachments

BST Management, LLC
325 Park Street, Suite 106
North Reading, MA 01864

Dan Palkovic
520 South Main Street, Suite 2531
Akron, OH 44311
(216) 927-8663
dpalkovic@gpdgroup.com

GPD# 2022703.54
June 28, 2022

COMPREHENSIVE STRUCTURAL ANALYSIS REPORT

SITE DESIGNATION:	**BST Site #:**	**CT-1263**
	BST Site Name:	**Old Saybrook, Boston Post Road**
	Verizon Site #:	**467406**
	Verizon Site Name:	**Old Saybrook 2 CT**
ANALYSIS CRITERIA:	**Codes:**	**TIA-222-H & 2022 Connecticut State Building Code** **125 mph (3-second gust) w/ 0" ice** **50 mph (3-second gust) w/ 1" ice**
SITE DATA:		**1363 Boston Post Road, Old Saybrook, CT 06475, Middlesex County** **Latitude 41° 17' 23.27" N, Longitude 72° 24' 21.398" W** **99' Sabre Monopole**

To whom it may concern,

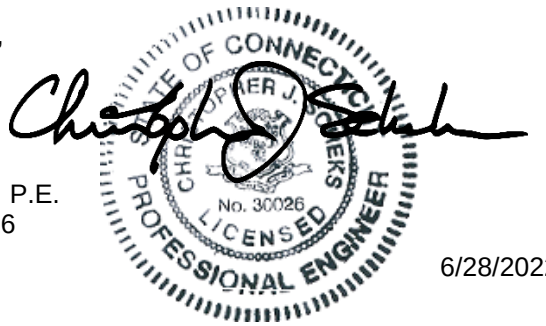
GPD is pleased to submit this Comprehensive Structural Analysis Report to determine the structural integrity of the aforementioned tower. The purpose of the analysis is to determine the suitability of the tower with the existing and proposed loading configuration detailed in the analysis report.

Analysis Results

Tower Stress Level with Proposed Equipment:	52.7%	Pass
Foundation Ratio with Proposed Equipment:	73.6%	Pass

We at GPD appreciate the opportunity of providing our continuing professional services to you and BST Management, LLC. If you have any questions or need further assistance on this or any other projects please do not hesitate to call.

Respectfully submitted,



Christopher J. Scheks, P.E.
Connecticut #: 0030026

6/28/2022

SUMMARY & RESULTS

The purpose of this analysis was to verify whether the existing structure is capable of carrying the proposed loading configuration as specified by Verizon Wireless and commissioned by BST Management, LLC.

This analysis has been performed in accordance with the TIA-222-H Standard based upon a 3-second gust wind speed of 125 mph. Applicable Standard references and design criteria are listed in Appendices A & B.

The proposed feedlines shall be installed as shown in Appendices A & B for the analysis results to be valid.

TOWER SUMMARY AND RESULTS

Member	Capacity	Results
Monopole	52.7%	Pass
Anchor Rods	41.1%	Pass
Base Plate	47.0%	Pass
Foundation	73.6%	Pass

RECOMMENDATIONS

The tower and its foundation(s) have sufficient capacity to carry the proposed loading configuration. No modifications are required at this time.

ANALYSIS METHOD

tnxTower (Version 8.1.1.0), a commercially available software program, was used to create a three-dimensional model of the tower and calculate primary member stresses for various load cases. Selected output from the analysis is included the report appendices. The following table details the information provided to complete this structural analysis. This analysis is solely based on this information.

DOCUMENTS PROVIDED

Document	Remarks	Source
Colocation Application	CT-1263 VZW Colocation Application, dated 5/25/2022	BST Management
Tower Design	Sabre Job #: 49722, dated 9/22/2011	GPD
Foundation Design	Sabre Job #: 49722, dated 9/22/2011	GPD
Geotechnical Report	Dr. Clarence Welti, P.E., P.C., dated 6/1/2011	GPD
Previous Tower Analysis	GPD Job #: 2022701.78, dated 2/1/2022	GPD

ASSUMPTIONS

This structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the tower. This analysis is from information supplied, and therefore, its results are based on and are as accurate as that supplied data. GPD has made no independent determination, nor is it required to, of its accuracy. The following assumptions were made for this structural analysis.

1. The tower member sizes and shapes are considered accurate as supplied. The material grade is as per data supplied and/or as assumed and as stated in the materials section.
2. The appurtenance configuration is as supplied, determined from available photos, and/or as modeled in the analysis. It is assumed to be complete and accurate. All antennas, mounts, coax and waveguides are assumed to be properly installed and supported as per manufacturer requirements.
3. All mounts, if applicable, are considered adequate to support the loading. No actual analysis of the mount(s) is performed. This analysis is limited to analyzing the tower only.
4. The soil parameters are as per data supplied or as assumed and stated in the calculations.
5. Foundations are properly designed and constructed to resist the original design loads indicated in the documents provided.
6. The tower and structures have been properly maintained in accordance with TIA Standards and/or with manufacturer's specifications.
7. All welds and connections are assumed to develop at least the member capacity unless determined otherwise and explicitly stated in this report.
8. All prior structural modifications, if applicable, are assumed to be as per data supplied/available and to have been properly installed.
9. Loading interpreted from photos is accurate to ±5' AGL, antenna size accurate to ±3.3 sf, and coax equal to the number of existing antennas without reserve.
10. All existing and proposed loading has been taken from the available site photos as well as documents supplied to GPD at the time of generating this report. All such documents are listed in the Documents Provided Table and are assumed to be accurate. GPD is not responsible for loading scenarios outside those conveyed in the supplied documentation.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and GPD should be allowed to review any new information to determine its effect on the structural integrity of the tower.

DISCLAIMER OF WARRANTIES

GPD has not performed a site visit to the tower to verify the member sizes or antenna/coax loading. If the existing conditions are not as represented on the tower elevation contained in this report, we should be contacted immediately to evaluate the significance of the discrepancy. This is not a condition assessment of the tower or foundation. This report does not replace a full tower inspection. The tower and foundations are assumed to have been properly fabricated, erected, maintained, in good condition, twist free, and plumb.

The engineering services rendered by GPD in connection with this Comprehensive Structural Analysis are limited to a computer analysis of the tower structure and theoretical capacity of its main structural members. No allowance was made for any damaged, bent, missing, loose, or rusted members (above and below ground). No allowance was made for loose bolts or cracked welds.

This analysis is limited to the designated maximum wind and seismic conditions per the governing tower standards and code. Wind forces resulting in tower vibrations near the structure's resonant frequencies were not considered in this analysis and are outside the scope of this analysis. Lateral loading from any dynamic response was not evaluated under a time-domain based fatigue analysis.

GPD does not analyze the fabrication of the structure (including welding). It is not possible to have all the very detailed information needed to perform a thorough analysis of every structural sub-component and connection of an existing tower. GPD provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc. The purpose of this report is to assess the capability of adding appurtenances usually accompanied by transmission lines to the structure.

It is the owner's responsibility to determine the amount of ice accumulation in excess of the code specified amount, if any, that should be considered in the structural analysis.

The attached sketches are a schematic representation of the analyzed tower. If any material is fabricated from these sketches, the contractor shall be responsible for field verifying the existing conditions, proper fit, and clearance in the field. Any mentions of structural modifications are reasonable estimates and should not be used as a precise construction document. Precise modification drawings are obtainable from GPD, but are beyond the scope of this report.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as a part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

Towers are designed to carry gravity, wind, and ice loads. All members, legs, diagonals, struts, and redundant members provide structural stability to the tower with little redundancy. Absence or removal of a member can trigger catastrophic failure unless a substitute is provided before any removal. Legs carry axial loads and derive their strength from shorter unbraced lengths by the presence of redundant members and their connection to the diagonals with bolts or welds. If the bolts or welds are removed without providing any substitute to the frame, the leg is subjected to a higher unbraced length that immediately reduces its load carrying capacity. If a diagonal is also removed in addition to the connection, the unbraced length of the leg is greatly increased, jeopardizing its load carrying capacity. Failure of one leg can result in a tower collapse because there is no redundancy. Redundant members and diagonals are critical to the stability of the tower.

GPD makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of this tower. GPD will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report. The maximum liability of GPD pursuant to this report will be limited to the total fee received for preparation of this report.

APPENDIX A

Tower Analysis Summary Form

Tower Analysis Summary Form

General Info

Site Name	Old Saybrook, Boston Post Road (CT-1263)
Site Number	105130
FA Number	10133875
Date of Analysis	6/28/2022
Company Performing Analysis	GPD

The information contained in this summary report is not to be used independently from the PE stamped tower analysis.

Tower Info	Description	Date
Tower Type (G, SST, MP)	MP	
Tower Height (top of steel AGL)	99'	
Tower Manufacturer	n/a	
Tower Model	n/a	
Tower Design	Sabre Job #: 49722	9/22/2011
Foundation Design	Sabre Job #: 49722	9/22/2011
Geotechnical Report	Dr. Clarence Welti, P.E., P.C.	6/1/2011
Previous Tower Analysis	GPD Job #: 2022701.78	2/1/2022

Design Parameters	
Design Code Used	TIA-222-H
Location of Tower (County, State)	Middlesex, CT
Wind Speed (mph)	125 (3-second gust)
Ice Thickness (in)	1
Risk Category (I, II, III)	II
Exposure Category (B, C, D)	B
Topographic Category (1 to 5)	1

Analysis Results (% Maximum Usage)

Existing/Reserved + Future + Proposed Condition	
Tower (%)	52.7%
Tower Base (%)	47.0%
Foundation (%)	73.6%
Foundation Adequate?	Yes

Existing / Reserved Loading

Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Int/Ext
AT&T Mobility	97	97	3	Panel	KMW	AM-X-CD-16-65-00T-RET	40/150/270	6	Site Pro	12.5' T-Arms	6	Unknown	1-5/8"	Internal
AT&T Mobility	97	97	9	Panel	CCI Antennas	HPA-65R-BUU-H6	40/150/270			on the same mount	6	DC Cable	15.4 mm	Internal
AT&T Mobility	97	97	3	TMA	CCI	DTMABP7819VG12A				on the same mount	1	Fiber Cable	10 mm	Internal
AT&T Mobility	97	97	6	RRH	Ericsson	RRUS 11				on the same mount				
AT&T Mobility	97	97	6	RRH	Ericsson	RRUS 12				on the same mount				
AT&T Mobility	97	97	3	RRH	Ericsson	RRUS E2				on the same mount				
AT&T Mobility	97	97	3	RRH	Ericsson	RRUS 32				on the same mount				
AT&T Mobility	97	97	6	RRH	Ericsson	KRC 161 286-1 (A2 Module)				on the same mount				
AT&T Mobility	97	97	3	Surge	Raycap	DC6-48-60-18-8F				on the same mount				
Verizon	85	85	3*	Panel	Commscope	LNX-6513DS-VTM	30/150/270	1	Unknown	14.33' Platform	2	Unknown	1-5/8"	Internal
Verizon	85	85	6*	Panel	Commscope	SBNHH-1D65B	30/150/270	3*	Commscope	BSAMNT-SBS-1-2				
Verizon	85	85	3*	RRH	Nokia	UHBA B13 RRH 4x30				on the same mount				
Verizon	85	85	3*	RRH	Nokia	UHIE B66A RRH 4x45				on the same mount				
Verizon	85	85	2	Surge	RFS	DB-B1-6C-12AB-0Z				on the same mount				
Dish Wireless	75	75	3	Panel	JMA	MX08FRO665-20_V0F	0/120/240	3	Commscope	MC-K6M-9-96	1	Hybrid	1.60"	Internal
Dish Wireless	75	75	6	RRH	Fujitsu	TA08025-B605				on the same mounts				
Dish Wireless	75	75	1	Surge	Raycap	RDIDC-9181-PF-48				on the same mounts				

*Indicates equipment/feedline quantity to be removed.

Proposed Loading

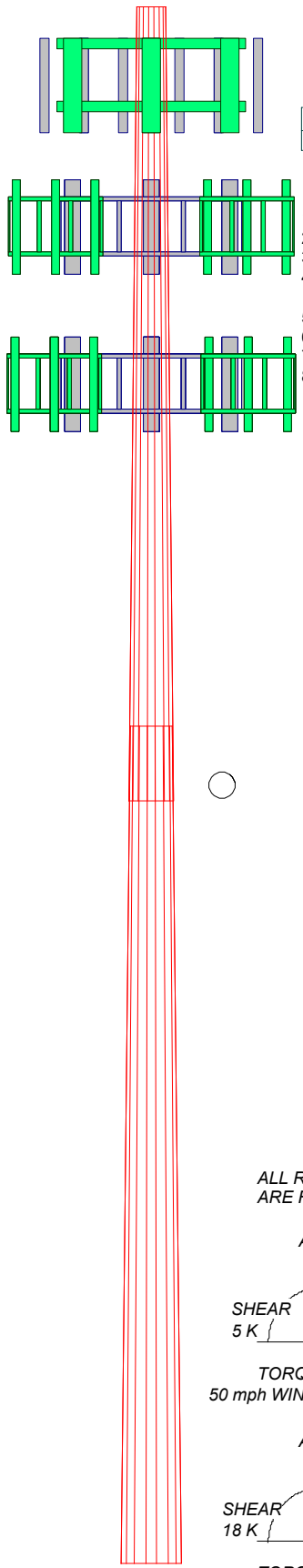
Antenna								Mount			Transmission Line			
Antenna Owner	Mount Height (ft)	Antenna CL (ft)	Quantity	Type	Manufacturer	Model	Azimuth	Quantity	Manufacturer	Type	Quantity	Model	Size	Attachment Int/Ext
Verizon	85	85	6	Panel	Andrew	JAHH-65B-R3B	30/150/270	3	Commscope	BSAMNT-SBS-2-2				
Verizon	85	85	3	Panel	Samsung	MT6407-77A	30/150/270	1	VZWSMART	PLK5 Kicker Kit				
Verizon	85	85	3	Diplexer	Commscope	CBC78T-DS-43-2X		1	VZWSMART	PLK7 Collar Mount				
Verizon	85	85	3	RRH	Samsung	B2/B66A RRH-BR049 (RFV01U-D2A)		3	Unknown	Support Rail				
Verizon	85	85	3	RRH	Samsung	B5/B13 RRH-BR04C (RFV01U-D2A)		3	Unknown	Support Rail Bracing				

Note: The proposed loading shall be in addition to the remaining existing equipment at the same elevation.

APPENDIX B

Tower Analysis Output File

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	50.50	18	0.2500	4.75	22.1400	34.1500	A572-65	3.8
2	53.25	18	0.3125		32.5203	45.2000		6.9
								10.7



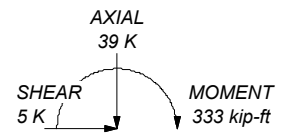
MATERIAL STRENGTH

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

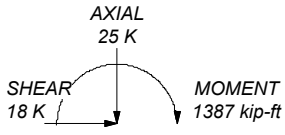
TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 125 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 52.7%

ALL REACTIONS ARE FACTORED



TORQUE 0 kip-ft
50 mph WIND - 1.0000 in ICE



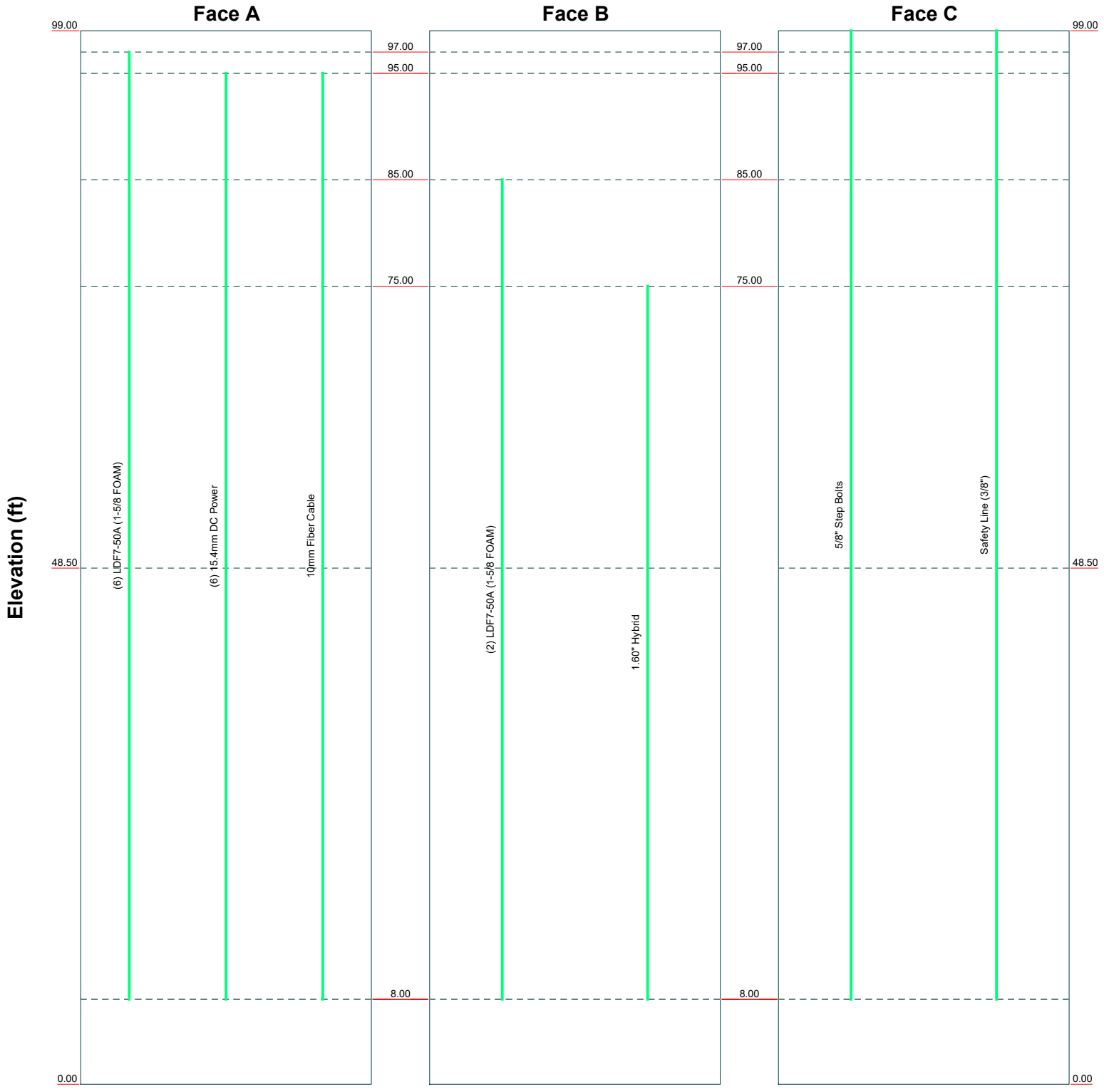
TORQUE 0 kip-ft
REACTIONS - 125 mph WIND

GPD
520 South Main Street Suite 2531
Akron, Ohio 44311
Phone: (330) 572-2100
FAX: (330) 572-2101

Job: ***CT1263 / OLD SAYBROOK BOSTON POST RD***			
Project: ***2022703.54***			
Client: BST Management, LLC	Drawn by: clifke	App'd:	
Code: TIA-222-H	Date: 06/28/22	Scale: NTS	
Path: T:\ATandT\105130\06 2022703.54 BST SA\5_Structural\00_Structure\00_Rev 0\03_Modeling\105130.eri		Dwg No. E-1	

Feed Line Distribution Chart
0' - 99'

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

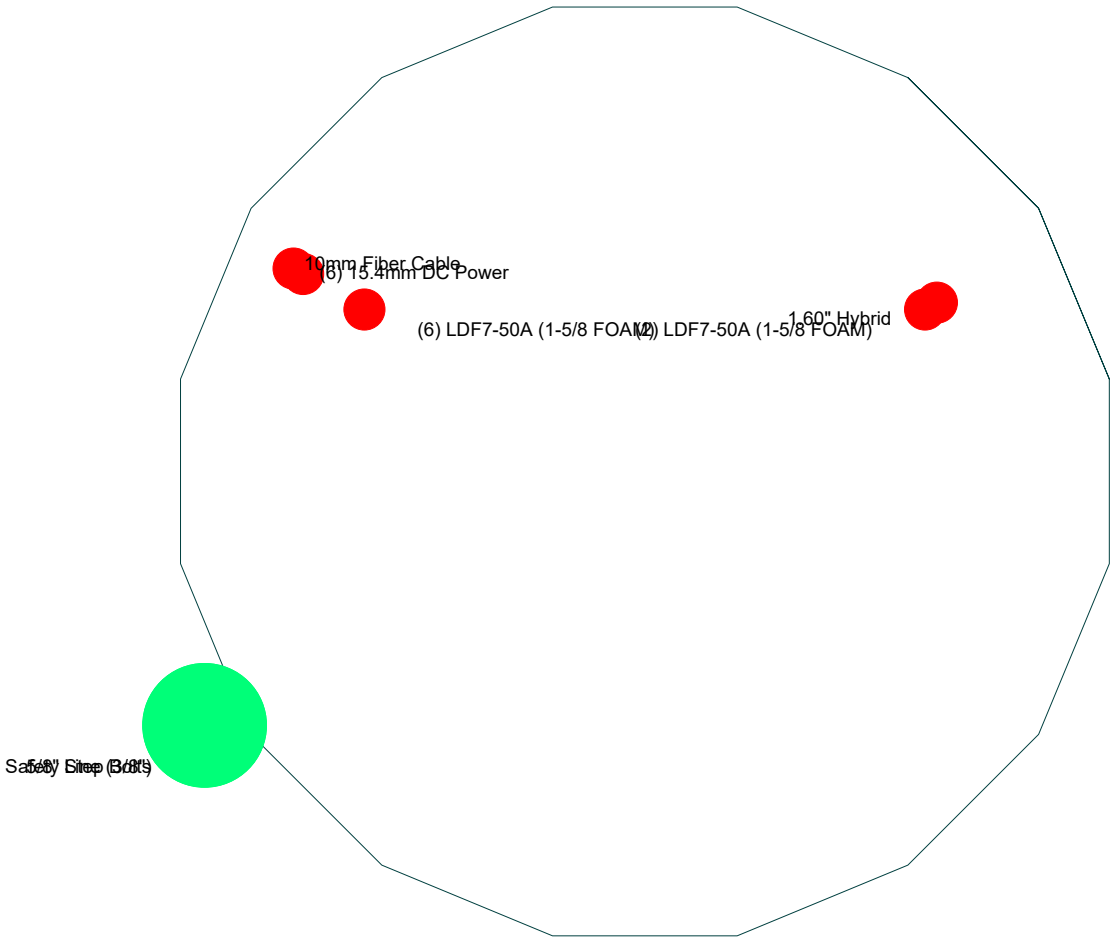


GPD
520 South Main Street Suite 2531
Akron, Ohio 44311
Phone: (330) 572-2100
FAX: (330) 572-2101

Job: CT1263 / OLD SAYBROOK BOSTON POST RD		
Project: 2022703.54		
Client: BST Management, LLC	Drawn by: clifke	App'd:
Code: TIA-222-H	Date: 06/28/22	Scale: NTS
Path: T:\ATandT\105130\06 2022703.54 BST SA\5_Structural\00_Structure\00_Rev 0\03_Modeling\105130.er		Dwg No. E-7

Feed Line Plan

Round Flat App In Face App Out Face



GPD 520 South Main Street Suite 2531 Akron, Ohio 44311 Phone: (330) 572-2100 FAX: (330) 572-2101	Job: CT1263 / OLD SAYBROOK BOSTON POST RD		
	Project: 2022703.54		
	Client: BST Management, LLC	Drawn by: clifke	App'd:
	Code: TIA-222-H	Date: 06/28/22	Scale: NTS
	Path: T:\ATandT\105130\06 2022703.54 BST SA\5_Structural\00_Structure\00_Rev 0\03_Modeling\105130.er		Dwg No. E-7

Tower Input Data

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

Tower is located in Middlesex County, Connecticut.
Tower base elevation above sea level: 8.00 ft.
Basic wind speed of 125 mph.
Risk Category II.
Exposure Category B.
Simplified Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Category: 1.
Crest Height: 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	*Elevation*	*Section Length*	*Splice Length*	*Number of Sides*	*Top Diameter*	*Bottom Diameter*	*Wall Thickness*	*Bend Radius*	*Pole Grade*
	ft	*ft*	*ft*		*in*	*in*	*in*	*in*	
L1	99.00-48.50	50.50	4.75	18	22.1400	34.1500	0.2500	1.0000	A572-65

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L2	48.50-0.00	53.25		18	32.5203	45.2000	0.3125	1.2500	(65 ksi) A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	22.4430	17.3697	1051.5300	7.7710	11.2471	93.4933	2104.4436	8.6865	3.4566	13.827
	34.6383	26.8996	3905.5615	12.0345	17.3482	225.1278	7816.2619	13.4524	5.5704	22.282
L2	34.1223	31.9462	4186.7736	11.4338	16.5203	253.4315	8379.0563	15.9761	5.1736	16.555
	45.8491	44.5228	11333.6722	15.9351	22.9616	493.5924	22682.2576	22.2656	7.4052	23.697

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 99.00-48.50				1	1	1			
L2 48.50-0.00				1	1	1			

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
5/8" Step Bolts	C	No	No	CaAa (Out Of Face)	99.00 - 8.00	1	No Ice	0.04	1.00
							1/2" Ice	0.14	1.56
							1" Ice	0.24	2.73
Safety Line (3/8")	C	No	No	CaAa (Out Of Face)	99.00 - 8.00	1	No Ice	0.04	0.22
							1/2" Ice	0.14	0.75
							1" Ice	0.24	1.28
****									
LDF7-50A (1-5/8 FOAM)	A	No	No	Inside Pole	97.00 - 8.00	6	No Ice	0.00	0.82
							1/2" Ice	0.00	0.82
							1" Ice	0.00	0.82
15.4mm DC Power	A	No	No	Inside Pole	95.00 - 8.00	6	No Ice	0.00	0.50
							1/2" Ice	0.00	0.50
							1" Ice	0.00	0.50
10mm Fiber Cable	A	No	No	Inside Pole	95.00 - 8.00	1	No Ice	0.00	0.10
							1/2" Ice	0.00	0.10
							1" Ice	0.00	0.10
****									
LDF7-50A (1-5/8 FOAM)	B	No	No	Inside Pole	85.00 - 8.00	2	No Ice	0.00	0.82
							1/2" Ice	0.00	0.82
							1" Ice	0.00	0.82
****									
1.60" Hybrid	B	No	No	Inside Pole	75.00 - 8.00	1	No Ice	0.00	0.85
							1/2" Ice	0.00	0.85
							1" Ice	0.00	0.85

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	99.00-48.50	A	0.000	0.000	0.000	0.000	0.38
		B	0.000	0.000	0.000	0.000	0.08
		C	0.000	0.000	0.000	3.998	0.06
L2	48.50-0.00	A	0.000	0.000	0.000	0.000	0.32
		B	0.000	0.000	0.000	0.000	0.10
		C	0.000	0.000	0.000	3.206	0.05

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	99.00-48.50	A	1.082	0.000	0.000	0.000	0.000	0.38
		B		0.000	0.000	0.000	0.000	0.08
		C		0.000	0.000	0.000	25.854	0.22
L2	48.50-0.00	A	0.966	0.000	0.000	0.000	0.000	0.32
		B		0.000	0.000	0.000	0.000	0.10
		C		0.000	0.000	0.000	20.735	0.18

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	99.00-48.50	-0.6116	0.3531	-1.8756	1.0829
L2	48.50-0.00	-0.5086	0.2936	-1.6680	0.9630

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 / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
T-Arm Mount [TA 602-3]	A	None		0.0000	97.00	No Ice	13.40	13.40	0.77
						1/2" Ice	16.44	16.44	1.00

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	19.70	19.70	1.29
T-Arm Mount [TA 602-3]	A	None		0.0000	93.00	No Ice	13.40	13.40	0.77
						1/2" Ice	16.44	16.44	1.00
						1" Ice	19.70	19.70	1.29
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	8.31 8.85 9.37	6.65 7.68 8.56	0.09 0.16 0.23
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	8.31 8.85 9.37	6.65 7.68 8.56	0.09 0.16 0.23
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	8.31 8.85 9.37	6.65 7.68 8.56	0.09 0.16 0.23
(3) HPA-65R-BUU-H6 w/ Mount Pipe	A	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	9.90 10.47 11.01	8.11 9.30 10.21	0.08 0.16 0.25
(3) HPA-65R-BUU-H6 w/ Mount Pipe	B	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	9.90 10.47 11.01	8.11 9.30 10.21	0.08 0.16 0.25
(3) HPA-65R-BUU-H6 w/ Mount Pipe	C	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	9.90 10.47 11.01	8.11 9.30 10.21	0.08 0.16 0.25
DTMABP7819VG12A	A	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	1.00 1.13 1.27	0.41 0.51 0.61	0.02 0.03 0.04
DTMABP7819VG12A	B	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	1.00 1.13 1.27	0.41 0.51 0.61	0.02 0.03 0.04
DTMABP7819VG12A	C	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	1.00 1.13 1.27	0.41 0.51 0.61	0.02 0.03 0.04
(2) RRUS 11	A	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.10
(2) RRUS 11	B	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.10
(2) RRUS 11	C	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	2.78 2.99 3.21	1.19 1.33 1.49	0.05 0.07 0.10
(2) RRUS 12	A	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
(2) RRUS 12	B	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
(2) RRUS 12	C	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
RRUS E2	A	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
RRUS E2	B	From Face	4.00 0.00 -3.00	0.0000	97.00	No Ice 1/2" Ice 1" Ice	3.15 3.36 3.59	1.29 1.44 1.60	0.06 0.08 0.11
RRUS E2	C	From Face	4.00 0.00	0.0000	97.00	No Ice 1/2" Ice	3.15 3.36	1.29 1.44	0.06 0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			-3.00			1" Ice	3.59	1.60	0.11
RRUS 32	A	From Face	4.00	0.0000	97.00	No Ice	3.31	2.42	0.08
			0.00			1/2" Ice	3.56	2.64	0.10
			-3.00			1" Ice	3.81	2.86	0.14
RRUS 32	B	From Face	4.00	0.0000	97.00	No Ice	3.31	2.42	0.08
			0.00			1/2" Ice	3.56	2.64	0.10
			-3.00			1" Ice	3.81	2.86	0.14
RRUS 32	C	From Face	4.00	0.0000	97.00	No Ice	3.31	2.42	0.08
			0.00			1/2" Ice	3.56	2.64	0.10
			-3.00			1" Ice	3.81	2.86	0.14
(2) KRC 161 286-1 (A2 Module)	A	From Face	4.00	0.0000	97.00	No Ice	1.87	0.43	0.02
			0.00			1/2" Ice	2.05	0.54	0.03
			-3.00			1" Ice	2.24	0.66	0.04
(2) KRC 161 286-1 (A2 Module)	B	From Face	4.00	0.0000	97.00	No Ice	1.87	0.43	0.02
			0.00			1/2" Ice	2.05	0.54	0.03
			-3.00			1" Ice	2.24	0.66	0.04
(2) KRC 161 286-1 (A2 Module)	C	From Face	4.00	0.0000	97.00	No Ice	1.87	0.43	0.02
			0.00			1/2" Ice	2.05	0.54	0.03
			-3.00			1" Ice	2.24	0.66	0.04
DC6-48-60-18-8F Surge Suppression Unit	A	From Face	1.00	0.0000	95.00	No Ice	0.92	0.92	0.02
			0.00			1/2" Ice	1.46	1.46	0.04
			0.00			1" Ice	1.64	1.64	0.06
DC6-48-60-18-8F Surge Suppression Unit	B	From Face	1.00	0.0000	95.00	No Ice	0.92	0.92	0.02
			0.00			1/2" Ice	1.46	1.46	0.04
			0.00			1" Ice	1.64	1.64	0.06
DC6-48-60-18-8F Surge Suppression Unit	C	From Face	1.00	0.0000	95.00	No Ice	0.92	0.92	0.02
			0.00			1/2" Ice	1.46	1.46	0.04
			0.00			1" Ice	1.64	1.64	0.06
****									
14.33' Platform [LP 302-1_KCKR]	A	None		0.0000	85.00	No Ice	37.79	37.79	1.98
						1/2" Ice	47.89	47.89	2.68
						1" Ice	57.78	57.78	3.55
(2) JAHH-65B-R3B	A	From Centroid-Face	4.00	0.0000	85.00	No Ice	9.11	5.98	0.06
			0.00			1/2" Ice	9.58	6.44	0.12
			0.00			1" Ice	10.05	6.91	0.18
(2) JAHH-65B-R3B	B	From Centroid-Face	4.00	0.0000	85.00	No Ice	9.11	5.98	0.06
			0.00			1/2" Ice	9.58	6.44	0.12
			0.00			1" Ice	10.05	6.91	0.18
(2) JAHH-65B-R3B	C	From Centroid-Face	4.00	0.0000	85.00	No Ice	9.11	5.98	0.06
			0.00			1/2" Ice	9.58	6.44	0.12
			0.00			1" Ice	10.05	6.91	0.18
MT6407-77A	A	From Centroid-Face	4.00	0.0000	85.00	No Ice	4.69	1.84	0.08
			0.00			1/2" Ice	4.98	2.06	0.11
			0.00			1" Ice	5.28	2.29	0.14
MT6407-77A	B	From Centroid-Face	4.00	0.0000	85.00	No Ice	4.69	1.84	0.08
			0.00			1/2" Ice	4.98	2.06	0.11
			0.00			1" Ice	5.28	2.29	0.14
MT6407-77A	C	From Centroid-Face	4.00	0.0000	85.00	No Ice	4.69	1.84	0.08
			0.00			1/2" Ice	4.98	2.06	0.11
			0.00			1" Ice	5.28	2.29	0.14
B2/B66A RRH-BR049	A	From Centroid-Face	4.00	0.0000	85.00	No Ice	1.88	1.25	0.08
			0.00			1/2" Ice	2.05	1.39	0.10
			0.00			1" Ice	2.22	1.54	0.12
B2/B66A RRH-BR049	B	From Centroid-Face	4.00	0.0000	85.00	No Ice	1.88	1.25	0.08
			0.00			1/2" Ice	2.05	1.39	0.10
			0.00			1" Ice	2.22	1.54	0.12
B2/B66A RRH-BR049	C	From	4.00	0.0000	85.00	No Ice	1.88	1.25	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
		Centroid-Face	0.00 0.00			1/2" Ice 1" Ice	2.05 2.22	1.39 1.54	0.10 0.12
B5/B13 RRH-BR04C	A	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B5/B13 RRH-BR04C	B	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
B5/B13 RRH-BR04C	C	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	1.88 2.05 2.22	1.01 1.14 1.28	0.07 0.09 0.11
CBC78T-DS-43-2X	A	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	0.37 0.45 0.53	0.51 0.60 0.70	0.02 0.03 0.04
CBC78T-DS-43-2X	B	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	0.37 0.45 0.53	0.51 0.60 0.70	0.02 0.03 0.04
CBC78T-DS-43-2X	C	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	0.37 0.45 0.53	0.51 0.60 0.70	0.02 0.03 0.04
DB-T1-6Z-8AB-0Z	A	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	0.04 0.08 0.12
DB-T1-6Z-8AB-0Z	B	From Centroid-Face	4.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	0.04 0.08 0.12
****									
MC-K6M-9-96	A	None		0.0000	75.00	No Ice 1/2" Ice 1" Ice	12.56 15.36 18.04	12.56 15.36 18.04	0.73 0.94 1.21
(2) 8' x 2.375" Mount Pipe	A	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	1.90 2.73 3.40	1.90 2.73 3.40	0.04 0.05 0.07
(2) 8' x 2.375" Mount Pipe	B	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	1.90 2.73 3.40	1.90 2.73 3.40	0.04 0.05 0.07
(2) 8' x 2.375" Mount Pipe	C	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	1.90 2.73 3.40	1.90 2.73 3.40	0.04 0.05 0.07
MX08FRO665-20_V0F w/ Mount Pipe	A	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	12.96 13.67 14.34	7.77 9.05 10.19	0.08 0.18 0.28
MX08FRO665-20_V0F w/ Mount Pipe	B	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	12.96 13.67 14.34	7.77 9.05 10.19	0.08 0.18 0.28
MX08FRO665-20_V0F w/ Mount Pipe	C	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	12.96 13.67 14.34	7.77 9.05 10.19	0.08 0.18 0.28
(2) TA08025-B605	A	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	1.96 2.14 2.32	1.13 1.27 1.41	0.08 0.09 0.11
(2) TA08025-B605	B	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	1.96 2.14 2.32	1.13 1.27 1.41	0.08 0.09 0.11
(2) TA08025-B605	C	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	1.96 2.14 2.32	1.13 1.27 1.41	0.08 0.09 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
RDIDC-9181-PF-48	A	From Centroid-Face	3.00 0.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice	2.56 2.76 2.97	1.34 1.49 1.66	0.02 0.04 0.07
****									

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
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

Comb. No.	Description
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	99 - 48.5	7.102	48	0.5761	0.0005
L2	53.25 - 0	2.184	48	0.3768	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
97.00	T-Arm Mount [TA 602-3]	48	6.856	0.5687	0.0005	54502
95.00	DC6-48-60-18-8F Surge Suppression Unit	48	6.611	0.5612	0.0004	54502
93.00	T-Arm Mount [TA 602-3]	48	6.366	0.5537	0.0004	45418
85.00	14.33' Platform [LP 302-1_KCKR]	48	5.402	0.5231	0.0004	19465
75.00	MC-K6M-9-96	48	4.255	0.4825	0.0003	11354

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	99 - 48.5	34.548	20	2.8038	0.0023
L2	53.25 - 0	10.623	20	1.8335	0.0010

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
97.00	T-Arm Mount [TA 602-3]	20	33.353	2.7675	0.0022	11243
95.00	DC6-48-60-18-8F Surge Suppression Unit	20	32.160	2.7311	0.0022	11243
93.00	T-Arm Mount [TA 602-3]	20	30.970	2.6945	0.0021	9369
85.00	14.33' Platform [LP 302-1_KCKR]	20	26.278	2.5456	0.0018	4014

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
75.00	MC-K6M-9-96	20	20.697	2.3479	0.0016	2341

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	99 - 48.5 (1)	TP34.15x22.14x0.25	50.50	0.00	0.0	26.0033	-14.63	1521.19	0.010
L2	48.5 - 0 (2)	TP45.2x32.5203x0.3125	53.25	0.00	0.0	44.5228	-24.56	2604.58	0.009

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	99 - 48.5 (1)	TP34.15x22.14x0.25	496.26	1184.53	0.419	0.00	1184.53	0.000
L2	48.5 - 0 (2)	TP45.2x32.5203x0.3125	1387.50	2683.70	0.517	0.00	2683.70	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	99 - 48.5 (1)	TP34.15x22.14x0.25	15.24	456.36	0.033	0.24	1309.68	0.000
L2	48.5 - 0 (2)	TP45.2x32.5203x0.3125	18.23	781.38	0.023	0.15	3071.60	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	99 - 48.5 (1)	0.010	0.419	0.000	0.033	0.000	0.430 ✔	1.000	4.8.2 ✔
L2	48.5 - 0 (2)	0.009	0.517	0.000	0.023	0.000	0.527 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	99 - 48.5	Pole	TP34.15x22.14x0.25	1	-14.63	1521.19	43.0	Pass
L2	48.5 - 0	Pole	TP45.2x32.5203x0.3125	2	-24.56	2604.58	52.7	Pass
						Summary	ELC:	Existing + Proposed
						Pole (L2)	52.7	Pass
						Rating =	52.7	Pass

APPENDIX C

Additional Calculations

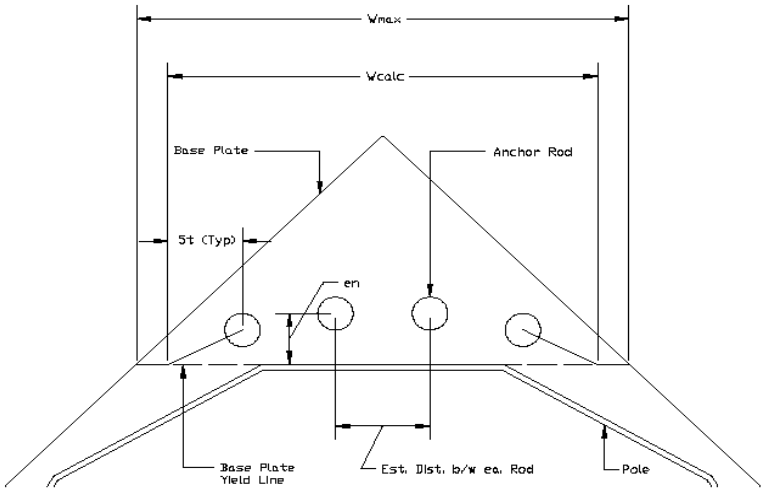
Anchor Rod and Base Plate Stresses, TIA-222-H-1
CT1263 / OLD SAYBROOK BOSTON POST RD
2022703.54

Overturning Moment =	1387.00	k*ft
Axial Force =	25.00	k
Shear Force =	18.00	k

Maximum Capacity	105%
Apply TIA-222-H Section 15.5?	No

Anchor Rods		
Pole Diameter =	45.2	in
Number of Rods =	12	
Rod Yield Strength, F_y =	75	ksi
Rod Ultimate Strength, F_u =	100	ksi
Rod Circle =	51.25	in
Rod Diameter =	2.25	in
Rod Projection, l_{ar} =	2.25	in
Is grout present?	No	
Max Tension on Rod, P_{ut} =	106.07	k
Max Compression on Rod, P_{uc} =	110.23	k
Shear on Rod, V_u =	1.50	k
Moment on Rod, M_u =	0.00	k-in
Tension Interaction =	**18.9%**	**OK**
Compression Interaction =	**41.1%**	**OK**

Base Plate		
Plate Yield Strength, F_y =	50	ksi
ϕ =	0.9	
Plate Thickness =	2.5	in
Plate Width =	49.75	in
Est. Dist. b/w ea. Rod =	6	in
w_{calc} =	36.92	in
w_{max} =	25.16	in
w =	25.16	in
Z =	39.31	in^3
M_u =	831.73	k-in
φM_n =	1768.86	k-in
Base Plate Capacity =	**47.0%**	**OK**



Pier and Pad Foundation

Site # :	CT1284
Site Name:	OLD SAYBROOK E

TIA-222 Revision:	H
Tower Type:	Monopole

Top & Bot. Pad Rein. Different?:	☐
Block Foundation?:	☐
Rectangular Pad?:	☐

Superstructure Analysis Reactions		
Compression, P_{comp}:	25	kips
Base Shear, Vu_comp:	18	kips
Moment, M_u:	1387	ft-kips
Tower Height, **H**:	99	ft
BP Dist. Above Fdn, bp_{dist}:	3	in

Pier Properties		
Pier Shape:	Square	
Pier Diameter, **dpier**:	6	ft
Ext. Above Grade, **E**:	0.5	ft
Pier Rebar Size, **Sc**:	8	
Pier Rebar Quantity, **mc**:	26	
Pier Tie/Spiral Size, **St**:	4	
Pier Tie/Spiral Quantity, **mt**:		
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier}:	3	in

Pad Properties		
Depth, **D**:	6	ft
Pad Width, W_1:	20.5	ft
Pad Thickness, **T**:	1.5	ft
Pad Rebar Size (Bottom dir. 2), Sp_2:	8	
Pad Rebar Quantity (Bottom dir. 2), mp_2:	26	
Pad Clear Cover, cc_{pad}:	3	in

Material Properties		
Rebar Grade, **Fy**:	60	ksi
Concrete Compressive Strength, **F'c**:	4.5	ksi
Dry Concrete Density, δ**c**:	150	pcf

Soil Properties		
Total Soil Unit Weight, γ:	125	pcf
Ultimate Gross Bearing, Qult:	8.000	ksf
Cohesion, **Cu**:		ksf
Friction Angle, φ:	34	degrees
SPT Blow Count, N_{blows}:		
Base Friction, μ:		
Neglected Depth, **N**:	3.50	ft
Foundation Bearing on Rock?		
Groundwater Depth, **gw**:	5	ft

<--Toggle between Gross and Net

Foundation Analysis Checks	Capacity	Demand	Rating	Check
Lateral (Sliding) (kips)	153.47	18.00	**11.7%**	**Pass**
Bearing Pressure (ksf)	6.00	2.15	**35.8%**	**Pass**
*Overturning (kip*ft)*	2919.69	1508.50	**51.7%**	**Pass**
*Pier Flexure (Comp.) (kip*ft)*	2915.71	1477.00	**50.7%**	**Pass**
Pier Compression (kip)	25777.44	57.40	**0.2%**	**Pass**
*Pad Flexure (kip*ft)*	1187.28	499.18	**42.0%**	**Pass**
Pad Shear - 1-way (kips)	334.17	106.64	**31.9%**	**Pass**
Pad Shear - 2-way (Comp) (ksi)	0.201	0.063	**31.3%**	**Pass**
*Flexural 2-way (Comp) (kip*ft)*	1204.34	886.20	**73.6%**	**Pass**

Structural Rating:	**73.6%**
Soil Rating:	**51.7%**

C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

Calculated Radio Frequency Emissions Report

Old Saybrook 2

1363 Boston Post Rd, Old Saybrook, CT 06475

February 28, 2023

Table of Contents

List of Figures

List of Tables

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modification of Verizon's antenna arrays to be mounted at 85' AGL on an existing monopole tower located at 1363 Boston Post Rd in Old Saybrook, CT. The coordinates of the monopole tower are 41° 17' 23.2008" N, 72° 24' 21.3984" W.

Verizon is proposing the following:

1) Install nine (9) multi-band antennas (three (3) per sector) to support its commercial LTE network.

This report considers the planned antenna configuration for Verizon[1] and the existing antennas for AT&T and Dish Network to derive the resulting % MPE of its proposed installation.

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment C of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment C contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

[1] As referenced to Verizon's Radio Frequency Design Sheet updated 7/20/2022.

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{PowerDensity} = \left(\frac{EIRP}{\pi \times R^2} \right) \times \text{Off BeamLoss}$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{\left(H^2 + V^2\right)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Off Beam Loss is determined by the selected antenna patterns

Ground reflection factor of 1.6

These calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the final installations.

4. Antenna Inventory

Table 1 below outlines Verizon's proposed antenna configuration for the site. The associated data sheets and antenna patterns for these specific antenna models are included in Attachments C.

Operator	Sector / Call Sign	TX Freq (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Mech. Tilt	Length (ft)	Antenna Centerline Height (ft)
Verizon	Alpha / 30°	700	160	14.5	4509	JAHH-65B-R3B	67	0	5.99	85
		850	160	15.8	6083		65			
		1900	160	18.4	11069		65			
		2100	240	18.5	16990		68			
		3700	200	23.35	43254	MT6407-77A	-	0	2.92	85
	Beta / 150°	700	160	14.5	4509	JAHH-65B-R3B	67	0	5.99	85
		850	160	15.8	6083		65			
		1900	160	18.4	11069		65			
		2100	240	18.5	16990		68			
		3700	200	23.35	43254	MT6407-77A	-	0	2.92	85
	Gamma / 270°	700	160	14.5	4509	JAHH-65B-R3B	67	0	5.99	85
		850	160	15.8	6083		65			
		1900	160	18.4	11069		65			
		2100	240	18.5	16990		68			
		3700	200	23.35	43254	MT6407-77A	-	0	2.92	85

Table 1: Proposed Antenna Inventory[2] [3]

[2] Antenna heights are in reference to Verizon's Radio Frequency Design Sheet updated 7/20/2022.

[3] Transmit power assumes 0 dB of cable loss.

5. Calculation Results

The calculated power density results are shown in Figure 1 below. For completeness, the calculations for this analysis range from 0 feet horizontal distance (directly below the antennas) to a value of 3,000 feet horizontal distance from the site. In addition to the other worst-case scenario considerations that were previously mentioned, the power density calculations to each horizontal distance point away from the antennas was completed using a local maximum off beam antenna gain (within ± 5 degrees of the true mathematical angle) to incorporate a realistic worst-case scenario.

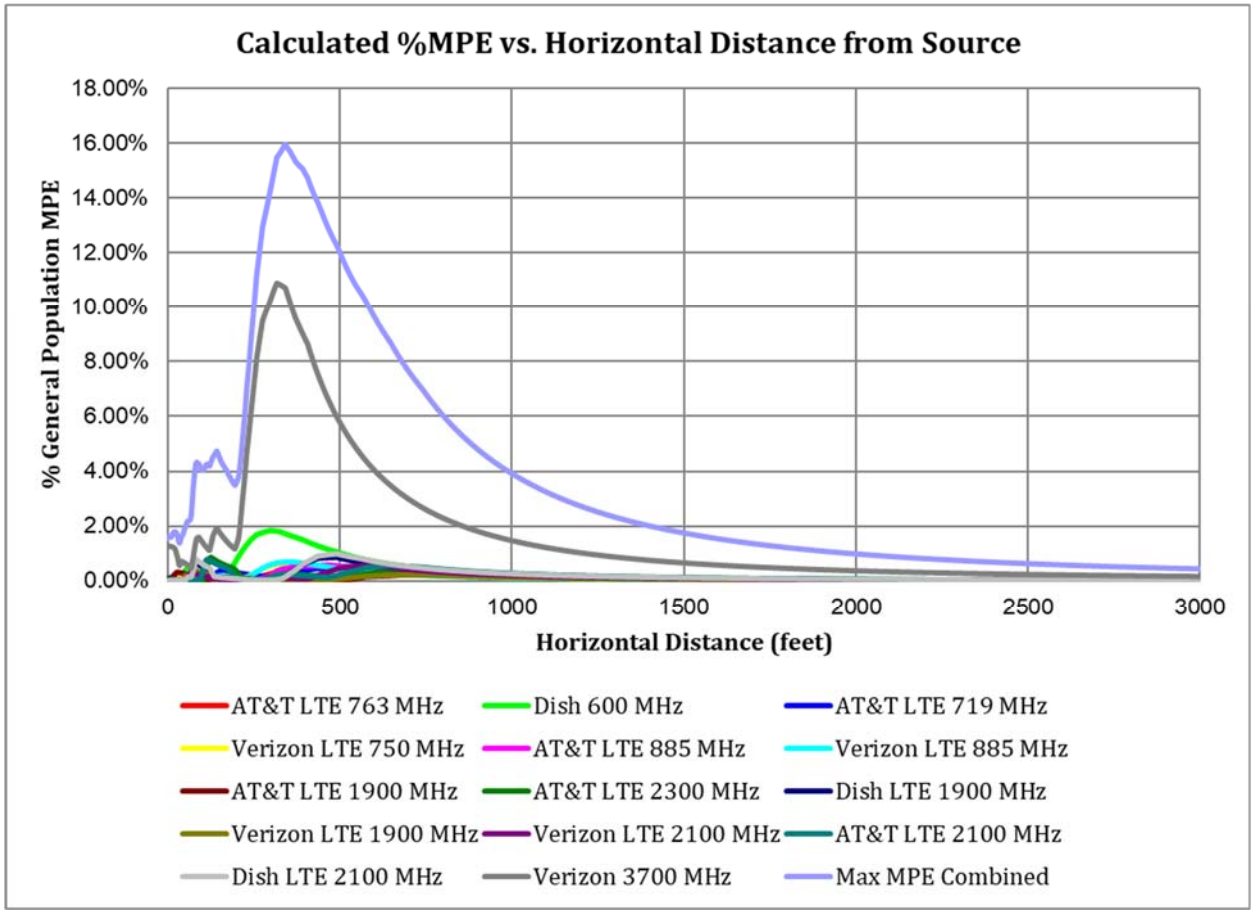


Figure 1: Graph of General Population % MPE vs. Distance

The highest percent of MPE (15.95**%** of the General Population limit) is calculated to occur at a horizontal distance of 342 feet from antennas. Please note that the percent of MPE calculations close to the site take into account off beam loss, which is determined from the vertical pattern of the antennas used. Therefore, RF power density levels may increase as the distance from the site increases. At distances of approximately 1500 feet and beyond, one would now be in the main beam of the antenna pattern and off beam loss is no longer considered. Beyond this point, RF levels become calculated solely on distance from the site and the percent of MPE decreases significantly as distance from the site increases.

Table 2 below lists percent of MPE values as well as the associated parameters that were included in the calculations. The highest percent of MPE value was calculated to occur at a horizontal distance of 342 feet from the site (reference Figure 1).

As stated in Section 3, all calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. Obstructions (trees, buildings etc.) that would normally attenuate the signal are not taken into account. In addition, a six foot height offset was considered in this analysis to account for average human height. As a result, the predicted signal levels are significantly higher than the actual signal levels will be from the final configuration. The results presented in Figure 1 and Table 2 assume level ground elevation from the base of the tower out to the horizontal distances calculated.

Carrier	Number of Transmitters	Power out of Base Station Per Transmitter (Watts)	Antenna Height (Feet)	Distance to the Base of Antennas (Feet)	Power Density (mW/cm^2)	Limit (mW/cm^2)	% MPE
AT&T LTE 1900 MHz	1	160.0	97.0	342	0.000206	1.000	0.02%
AT&T LTE 2100 MHz	1	240.0	97.0	342	0.002452	1.000	0.25%
AT&T LTE 2300 MHz	1	160.0	97.0	342	0.002635	1.000	0.26%
AT&T LTE 719 MHz	1	160.0	97.0	342	0.001053	0.479	0.22%
AT&T LTE 763 MHz	1	160.0	97.0	342	0.002555	0.509	0.50%
AT&T LTE 885 MHz	1	160.0	97.0	342	0.002681	0.590	0.45%
Dish 600 MHz	1	246.0	75.0	342	0.007249	0.421	1.72%
Dish LTE 1900 MHz	1	160.0	75.0	342	0.001818	1.000	0.18%
Dish LTE 2100 MHz	1	160.0	75.0	342	0.001475	1.000	0.15%
Verizon 3700 MHz	1	200.0	85.0	342	0.107112	1.000	10.71%
Verizon LTE 1900 MHz	1	160.0	85.0	342	0.000521	1.000	0.05%
Verizon LTE 2100 MHz	1	240.0	85.0	342	0.001025	1.000	0.10%
Verizon LTE 750 MHz	1	160.0	85.0	342	0.003161	0.497	0.64%
Verizon LTE 885 MHz	1	160.0	85.0	342	0.004092	0.590	0.69%
						Total	**15.95%**

Table 2: Maximum Percent of General Population Exposure Values[4][5]

[4] Antenna information for DISH was taken from Fox Hill Telecom, Inc, Radio Frequency Emissions Analysis Report, dated 10/11/2022

[5] Antenna information for AT&T was taken from Connecticut Siting Council Notice of Exempt Modification – Facility Modification 1363 Boston Post Road, Old Saybrook, Connecticut, dated 10/04/2022

6. Conclusion

The above analysis verifies that RF exposure levels from the site with Verizon's proposed antenna configuration will be well below the maximum permissible levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Using the conservative calculation methods and parameters detailed above, the maximum cumulative percent of MPE in consideration of all transmitters is calculated to be **15.95% of the FCC limit (General Population/Uncontrolled)**. This maximum cumulative percent of MPE value is calculated to occur 342 feet away from the site.

7. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.

Report Prepared By: Ram Acharya
RF Engineer 1
C Squared Systems, LLC

February 27, 2023
Date

Reviewed/Approved By: Martin J. Lavin
Senior RF Engineer
C Squared Systems, LLC

February 28, 2023
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

IEEE C95.1-2005, IEEE Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz IEEE-SA Standards Board

IEEE C95.3-2002 (R2008), IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz-300 GHz IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[6]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure[7]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 3: FCC Limits for Maximum Permissible Exposure

[6] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

[7] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

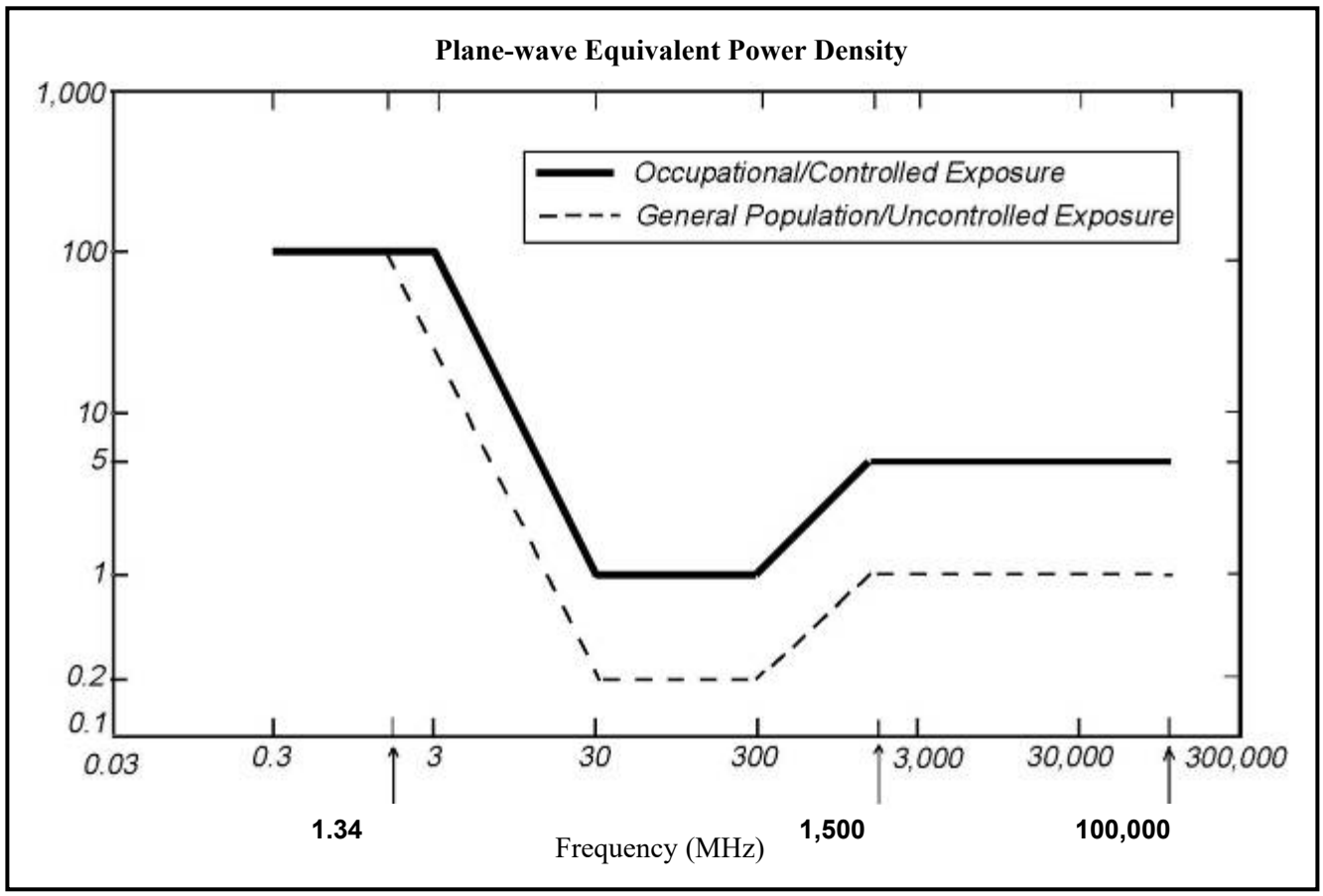
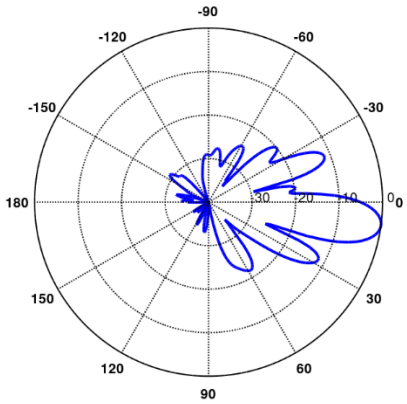


Figure 2: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Verizon Antenna Model Data Sheets and Electrical Patterns

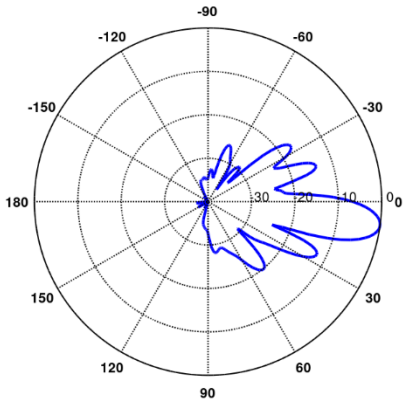
750 MHz

Manufacturer:	COMMSCOPE
Model #:	JAHH-65B-R3B
Frequency Band:	698-787 MHz
Gain:	14.5 dBi
Vertical Beamwidth:	12.4°
Horizontal Beamwidth:	67°
Polarization:	±45°
Dimensions (L x W x D):	71.9” x 13.8” x 8.2”



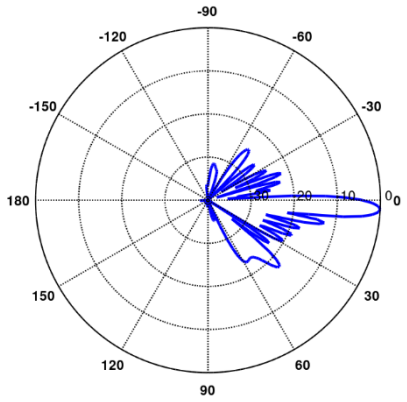
885 MHz

Manufacturer:	COMMSCOPE
Model #:	JAHH-65B-R3B
Frequency Band:	824-894 MHz
Gain:	15.8 dBi
Vertical Beamwidth:	10.5°
Horizontal Beamwidth:	65°
Polarization:	±45°
Dimensions (L x W x D):	71.9” x 13.8” x 8.2”



1900 MHz

Manufacturer:	COMMSCOPE
Model #:	JAHH-65B-R3B
Frequency Band:	1850-1990 MHz
Gain:	18.4 dBi
Vertical Beamwidth:	5.2°
Horizontal Beamwidth:	63°
Polarization:	±45°
Dimensions (L x W x D):	71.9” x 13.8” x 8.2”



2100 MHz

Manufacturer:	COMMSCOPE
Model #:	JAHH-65B-R3B
Frequency Band:	1920-2200 MHz
Gain:	18.5 dBi
Vertical Beamwidth:	4.9°
Horizontal Beamwidth:	65°
Polarization:	±45°
Dimensions (L x W x D):	71.9” x 13.8” x 8.2”