

<u>WATAUGA COUNTY, NC</u> <u>BID #</u>	INVITATION FOR BIDS – Buckeye Mt.-Viper	
	Bids will be publicly opened: June 13 th , 2025 at 3:00pm	
	Questions Due by: June 2 nd , 2025	
Refer <u>ALL</u> Inquiries to: Marty Randall Telephone No. 828-527-2416	Commodity: Install tower modifications on an existing tower (HP-1343, Buckeye Mt.-Viper) located at 2542 Forest Grove Road, Vilas, NC 28698.	
E-Mail: marty.randall@1018consulting.com	Using Agency Name: HP-1343, Buckeye Mt.-Viper	
(See page 2 for mailing instructions.)		

NOTICE TO BIDDERS

Sealed bids, subject to the conditions made a part hereof, will be received at **814 W. King Street, Boone NC 28607** until **3:00 PM** on the day of opening and then opened, for furnishing and delivering the commodity as described herein. Refer to page 2 for proper mailing instructions.

Bids submitted via e-mail or facsimile (FAX) machine in response to this Invitation for Bids will not be acceptable. Bids are subject to rejection unless submitted on this form.

EXECUTION

In compliance with this Invitation for Bids, and subject to all the conditions herein, the undersigned offers and agrees to furnish and deliver any or all items upon which prices are bid, at the prices set opposite each item within the time specified herein. By executing this bid, I certify that this bid is submitted competitively and without collusion (G.S. 143-54).

Failure to execute/sign bid prior to submittal shall render bid invalid.

Late bids are not acceptable.

BIDDER:		FEDERAL ID OR SOCIAL SECURITY NO.	
STREET ADDRESS:		P.O. BOX:	ZIP:
CITY & STATE & ZIP:		TELEPHONE NUMBER:	TOLL FREE TEL. NO (800)
PRINCIPAL PLACE OF BUSINESS ADDRESS IF DIFFERENT FROM ABOVE (SEE INSTRUCTIONS TO BIDDERS ITEM #21):			
TYPE OR PRINT NAME & TITLE OF PERSON SIGNING:		FAX NUMBER:	
AUTHORIZED SIGNATURE:	DATE:	E-MAIL:	

Offer valid for 120 days from date of bid opening unless otherwise stated here: ____ days

ACCEPTANCE OF BID

If any or all parts of this bid are accepted by Watauga County, NC, an authorized representative of Watauga County, NC shall affix their signature hereto and this document and the provisions of the Instructions to Bidders, special terms and conditions specific to this Invitation for Bids, the specifications, and the North Carolina General Contract Terms and Conditions shall then constitute the written agreement between the parties. A copy of this acceptance will be forwarded to the successful bidder(s).

<u>FOR Watauga County, NC USE ONLY</u>	
Offer accepted and contract awarded this ____ day of _____, 20____, as indicated on attached certification,	
by _____	(Authorized representative of Watauga County, NC).

In an effort to support the sustainability efforts of Watauga County, North Carolina we solicit your cooperation in this effort.

It is desirable that all responses meet the following requirements:

- All copies should be printed **double sided**.
- All submittals and copies should be printed on **recycled paper with a minimum post-consumer content of 30%** and indicate this information accordingly on the response.
- Unless absolutely necessary, all bids and copies should **minimize or eliminate use of non-recyclable or non reusable materials** such as plastic report covers, plastic dividers, vinyl sleeves, and GBC binding. Three-ringed binders, glued materials, paper clips, and staples are acceptable.
- Materials should be submitted in a format which allows for **easy removal and recycling** of paper materials.

MAILING INSTRUCTIONS: Send two fully executed bid documents. Address envelope and insert bid name as shown below. It is the responsibility of the bidder to have the bid in this office by the specified time and date of opening.

<u>DELIVERED BY US POSTAL SERVICE</u>	<u>DELIVERED BY ANY OTHER MEANS</u>
	<u>SEND SUCH AS FEDX, UPS, ETC. FOR NEXT DAY</u>
814 W. King Street Boone NC 28607	814 W. King Street Boone NC 28607

Watauga County, NC Tower Construction Project
Watauga County, North Carolina

Scope of Work – Watauga County, NC proposes to modify an existing communications tower site per the attached **3-25-2025 ETS Structural Modification Drawings 24125017.STR.8177 REV 0**. All work shall comply with applicable North Carolina Building Codes and ANSI/TIA/EIA Standards. If the following Specification calls for a condition that is greater than the TIA/EIA Standards or North Carolina Building Codes, use the specifications shown in this document. All work shall be coordinated with Watauga County, NC. The modifications and all appurtenances shall be installed and affixed with the highest quality of workmanship. The selected Contractor will advise Watauga County, NC's Contracting Officer and Marty Randall (10-18 Consulting 828-527-2416 marty.randall@1018consulting.com) two weeks in advance of the date the work will start. The contractor will provide Marty Randall weekly project progress reports and immediately report any abnormal conditions encountered during construction.

COMPLETION DEADLINE: Work should be **completed within 90 days of receipt of materials, not counting bad weather days.**

If the above time is not possible, state completion time in days from contract issue. _____ **Days**

Understand all requirements in the Scope of Work

Yes _____

No _____

CONTRACTING OFFICER

This project will be under contract with Watauga County, NC and will be under the direction of the Contracting Officer. The Contracting Officer will be:

Will Holt
Watauga, NC
Office: 828-264-4235
Cell: 828-434-3491

NOTE: Any questions prior to issue of a contract should be directed to marty.randall@1018consulting.com as stated on page one of this document.

Understand the Contact information as listed above Yes _____ No _____

CONTRACTOR REQUIREMENTS

The Contractor shall submit the following items with their bid:

1. Each bid must be accompanied by a bid bond, for an amount equal to five percent (5%) of the total base bid, at the time the bid is filed with the City. No bid shall be considered if the bond is not received simultaneously with the bid. Bid bonds may be submitted in any form allowed under the laws of North Carolina including cash, cashier's check, certified check or surety issued bid bond.
2. Performance and payment bonds are required once bid is awarded.

Watauga County reserves the right to accept or reject any or all bids and to waive minor irregularities.

Two complete copies of your bid response must be submitted with your package. Failure to submit the above-listed items will forfeit your bid.

Understand Contractor Requirements Process Yes _____ No _____

BIDDING INSTRUCTIONS

Contractors bidding on this project must fully acquaint themselves with the following specifications, any attachments to this Invitation for Bid, and conditions at the Designated Construction Site (DCS). The contractor is encouraged to visit the DCS to fully understand any potential obstacles that would prevent speedy completion of this project. Any questions concerning any portion of the work or interpretation of documents should be referred to Marty Randall and the Contracting Officer.

Understand Bidding Instructions Yes _____ No _____

COORDINATION OF THE WORK

The Tower Contractor shall notify Marty Randall and the Contracting Officer to coordinate a construction start date at least two weeks prior to the desired construction time. Failure to give advance notice may result in delay of the starting date. Failure to give advanced notice may result in the Contractor's crew being on site and unable to perform and work.

Understand the Coordination Requirement Yes _____ No _____

MICROWAVE REALIGNMENT

The Tower Contractor shall notify Marty Randall and the Contracting Officer to coordinate if microwave antennas need to be moved during construction. The Tower Contractor shall be responsible for realigning the path of the antenna to the original RSL.

Understand the Microwave Realignment Requirement Yes _____ No _____

PERMITS

The contractor is responsible for obtaining permits and scheduling inspections with the permitting office. The County is not exempt from permits.

Understand the Permit Process Yes _____ No _____

EXPEDITE CONSTRUCTION

It is expected that the contractor will expedite completion of the project, taking full advantage of the weather and other

favorable working conditions.

Understand Expedite Construction Process Yes _____ No _____

POST CONSTRUCTION INSPECTION (PCI)

Upon completion of the tower modification the Tower Contractor will obtain the services of the third party **Engineered Tower Solutions ("ETS")** to conduct the Post Construction Inspection ("**PCI**"), and to generate a complete report documenting the findings of the Inspection. ***(Watauga County, NC has a contract to provide this service. Fees will be paid by Watauga County, NC for all initial inspections. Additional inspections due to non-conformity with contract documents are at the contractor's expense. For scheduling, email: modifications@ets-pllc.com.*** In the event any deviation from the Tower Modification Drawings and Specifications is found during, or as a result of the PCI, the Tower Contractor shall provide to the Contracting Officer, a **red-lined** copy of each Drawing and/or Specification that clearly documents each deviation along with Engineer of Record (EOR) approval if applicable.

Understand Final Inspection Process Yes _____ No _____

CONTRACTOR LICENSES

The Tower Contractor, and/or the subcontractor designated by the Tower Contractor, performing work on this tower, must be licensed to operate a contracting business in the State of North Carolina as required under NCGS 87.

NC General Contractors License Number _____

The Contractor installing the tower modifications must comply with the North Carolina Department of Labor's Tower Climbing rules that were adopted in February 2005 and any following revisions.

Understand Requirements for Contractor Licenses Yes _____ No _____

CONSTRUCTION & MATERIALS

Tower Contractor must ensure that the tower and compound always remain secure.

Tower Contractor is responsible for restroom facilities (e.g. porta-jon)

All components of the tower modification but not limited to bolts, nuts, mounting brackets, torque arms, etc. shall, at a minimum, be **hot-dipped** galvanized.

Understand Construction and Materials Yes _____ No _____

EROSION CONTROL

The Contractor will be responsible for Erosion Control practices and any fines levied if not practiced.

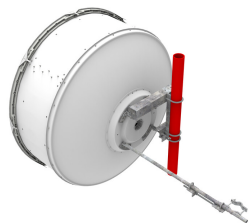
Understand Erosion Control Methods and responsibilities Yes _____ No _____

TOWER MODIFICATION DRAWINGS (SOW)

3-25-2025 ETS Structural Modification Drawings 24125017.STR.8177 REV 0

HX6-6W

Base Product



1.8m | 6ft ValuLine® High Performance, High XPD Antenna, dual-polarized, 5.925 – 7.125 GHz

Product Classification

Product Type	Microwave antenna
Product Brand	ValuLine®

General Specifications

Antenna Type	HX - ValuLine® High Performance, High XPD Antenna, dual-polarized
Polarization	Dual
Side Struts, Included	1
Side Struts, Optional	1

Dimensions

Diameter, nominal	1.8 m 6 ft
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Electrical Specifications

Operating Frequency Band	5.925 – 7.125 GHz
Gain, Low Band	38.3 dBi
Gain, Mid Band	39.1 dBi
Gain, Top Band	39.9 dBi
Boresite Cross Polarization Discrimination (XPD)	33 dB
Front-to-Back Ratio	70 dB
Beamwidth, Horizontal	1.8 °
Beamwidth, Vertical	1.8 °
Return Loss	26 dB
VSWR	1.1
Radiation Pattern Envelope Reference (RPE)	7376
Electrical Compliance	ACMA FX03_6b, 6p7b ETSI 302 217 Class 3 IC 3059A IC 3064A US FCC Part 101A

HX6-6W

Cross Polarization Discrimination (XPD) Electrical Compliance

ETSI EN 302217 XPD Category 2

Electrical Specifications, Band 2

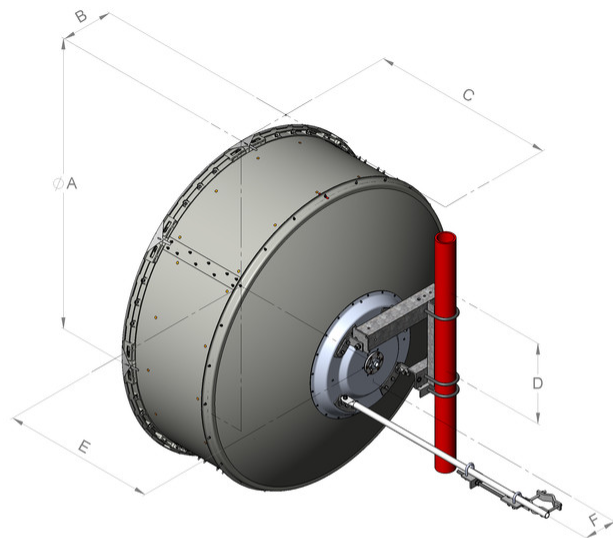
Operating Frequency Band	5.725 – 5.850 GHz
Gain, Mid Band	38.4 dBi
Beamwidth, Horizontal	2 °
Beamwidth, Vertical	2 °

Mechanical Specifications

Compatible Mounting Pipe Diameter	115 mm–120 mm 4.5 in–4.7 in
Fine Azimuth Adjustment Range	±15°
Fine Elevation Adjustment Range	±5°
Wind Speed, operational	200 km/h 124.274 mph
Wind Speed, survival	200 km/h 124.274 mph

HX6-6W

Antenna Dimensions and Mounting Information



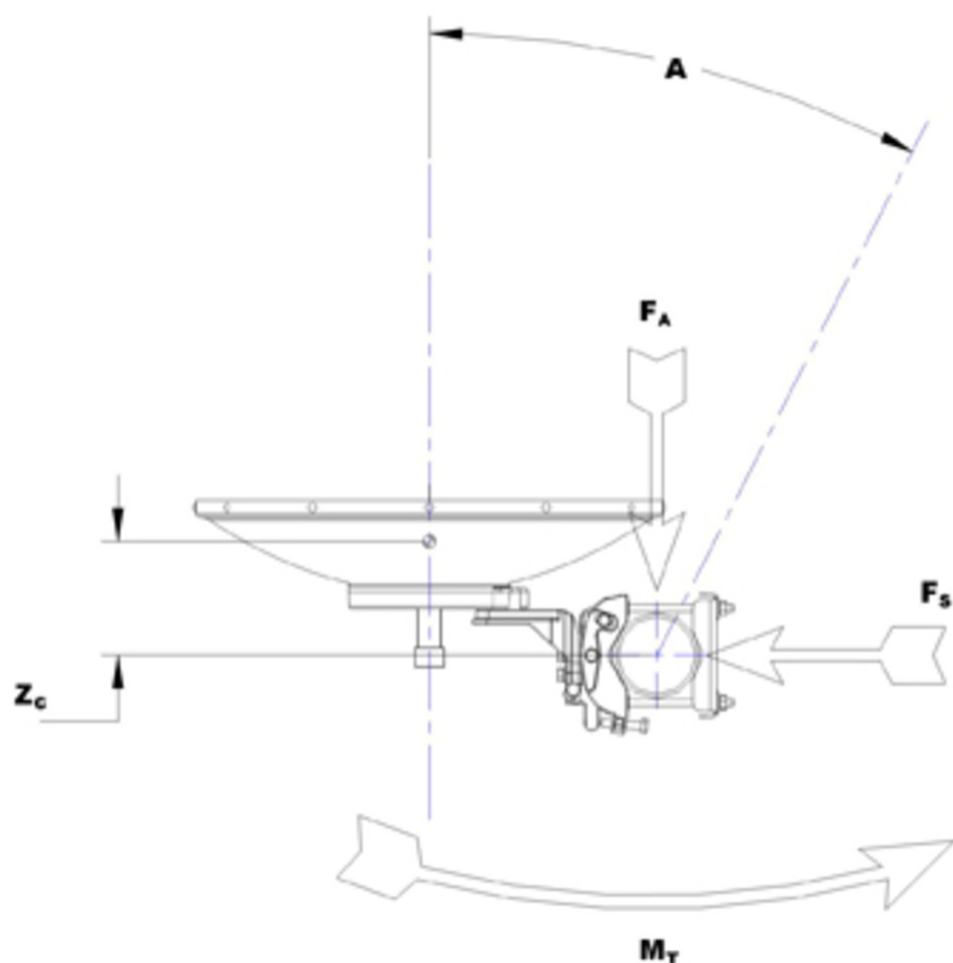
Antenna size, ft (m)	Dimensions in inches (mm)					
	A	B	C	D	E	F
6 (1.8)	74.8 (1899)	13.4 (340)	47.5 (1206)	20.9 (530)	39.4 (1001)	8.4 (214)

Wind Forces at Wind Velocity Survival Rating

Axial Force (FA)	6960 N 1,564.671 lbf
Angle α for MT Max	-130 °
Side Force (FS)	1566 N 352.051 lbf
Twisting Moment (MT)	3923 N-m 34,721.477 in lb
Force on Inboard Strut Side	4075 N 916.097 lbf
Zcg without Ice	363 mm 14.291 in
Zcg with 1/2 in (12 mm) Radial Ice	541 mm 21.299 in
Weight with 1/2 in (12 mm) Radial Ice	237 kg 522.495 lb

HX6-6W

Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net

85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency

ISO 9001:2015

Classification

Designed, manufactured and/or distributed under this quality management system

* Footnotes

Operating Frequency Band

Bands correspond with CCIR recommendations or common allocations used throughout the world. Other ranges can be accommodated on special order.

HX6-6W

Gain, Mid Band

For a given frequency band, gain is primarily a function of antenna size. The gain of Andrew antennas is determined by either gain by comparison or by computer integration of the measured antenna patterns.

Boresite Cross Polarization Discrimination (XPD)

The difference between the peak of the co-polarized main beam and the maximum cross-polarized signal over an angle twice the 3 dB beamwidth of the co-polarized main beam.

Front-to-Back Ratio

Denotes highest radiation relative to the main beam, at $180^\circ \pm 40^\circ$, across the band. Production antennas do not exceed rated values by more than 2 dB unless stated otherwise.

Return Loss

The figure that indicates the proportion of radio waves incident upon the antenna that are rejected as a ratio of those that are accepted.

VSWR

Maximum; is the guaranteed Peak Voltage-Standing-Wave-Ratio within the operating band.

Radiation Pattern Envelope Reference (RPE)

Radiation patterns define an antenna's ability to discriminate against unwanted signals. Under still dry conditions, production antennas will not have any peak exceeding the current RPE by more than 3dB, maintaining an angular accuracy of $\pm 1^\circ$ throughout

Cross Polarization Discrimination (XPD) Electrical Compliance

The difference between the peak of the co-polarized main beam and the maximum cross-polarized signal over an angle twice the 3 dB beamwidth of the co-polarized main beam.

Wind Speed, operational

For VHLP(X), SHP(X), HX and USX antennas, the wind speed where the maximum antenna deflection is $0.3 \times$ the 3 dB beam width of the antenna. For other antennas, it is defined as a deflection is equal to or less than 0.1 degrees.

Wind Speed, survival

The maximum wind speed the antenna, including mounts and radomes, where applicable, will withstand without permanent deformation. Realignment may be required. This wind speed is applicable to antenna with the specified amount of radial ice.

Axial Force (FA)

Maximum forces exerted on a supporting structure as a result of wind from the most critical direction for this parameter. The individual maximums specified may not occur simultaneously. All forces are referenced to the mounting pipe.

Side Force (FS)

Maximum side force exerted on the mounting pipe as a result of wind from the most critical direction for this

parameter. The individual maximums specified may not occur simultaneously. All forces are referenced to the mounting pipe.

Twisting Moment (MT)

Maximum forces exerted on a supporting structure as a result of wind from the most critical direction for this parameter. The individual maximums specified may not occur simultaneously. All forces are referenced to the mounting pipe.

800 MHz Corporate Collinear Antennas

746-870 MHz

CC807 Series



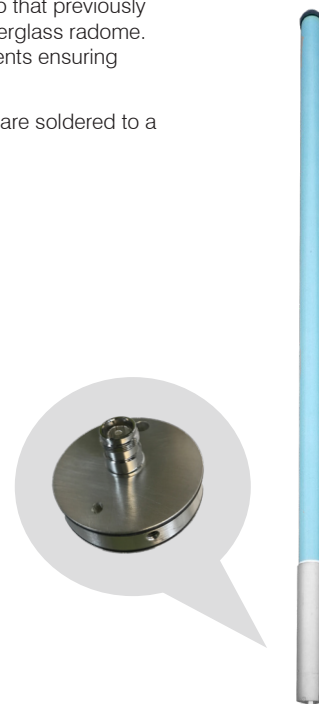
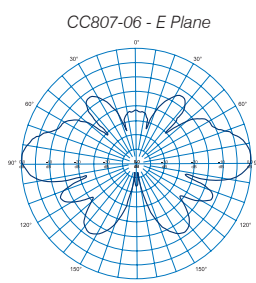
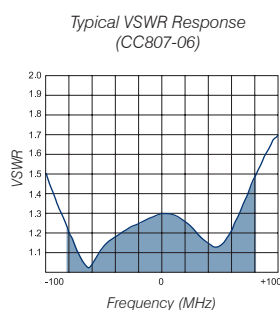
These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

The true corporate feed of these arrays maintains total pattern integrity over a very broad operating and width, similar to that previously available only in exposed dipole configurations. This is now achieved in the preferred form factor of a fully enclosed fiberglass radome. The corporate collinears employ a unique corporate phasing system enabling precision control of the element placements ensuring phase purity resulting in exceptional bandwidth and electrical performance.

Gain is maximised and side lobes reduced dramatically. In a patented design approach the individual dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.

Features:

- 500W Continuous Power rating for CC807-11, CC807-08, CC807-06
- -150dBc Passive Intermodulation (PIM) rating
- 25 kW Peak Instantaneous (PIP) rating
- Extraordinary bandwidth characteristics with superior pattern control
- DC grounding on all elements for the ultimate in lightning protection and dissipation of static noise.



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain <i>dBd</i> (<i>dBi</i>)	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency <i>MHz</i>	746 - 870			
Tuned Bandwidth <i>MHz</i>	Full Band			
VSWR (<i>Return Loss</i>)	<1.5:1			
Downtilt° ⁽¹⁾	Not Offered	0 °Std, -3°, -5°	0 °Std, -1°, -2°, -3°, -4°, -5°	
Vertical Beamwidth°	28	17	9	4.5
Horizontal Beamwidth°	Omni +/- 0.5dB			
Input Power W	250	500		
Passive IM 3rd order (<i>2x20W</i>) <i>dBc</i>	-150			
Peak Instantaneous Power <i>kW</i>	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length <i>mm (inches)</i>		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter <i>mm (inches)</i>		76 (3)			
Weight <i>kg (lbs)</i>		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight <i>kg (lbs)</i>		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions <i>mm (inches)</i>	H	115 (4.5)			
	W	115 (4.5)			
	L	1400 (55)	1900 (75)	3000 (118)	5600 (220)
Termination		4.3-10 fixed female			
Suggested Clamps (not included)		2 x UC-114			
Invertible Mounting		Yes (1)			
Projected area <i>cm² (ft²)</i>	No Ice	806 (0.9)	1268 (1.4)	2320 (2.5)	4560 (4.9)
	With Ice	1048 (1.2)	1571 (1.7)	2880 (3.1)	5760 (6.2)
Lateral Thrust @160km/h <i>N (100 mph lbs)</i>		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating <i>km/h (mph)</i>	No Ice	>240 (>150)			
Torque @ 160km/h <i>Nm (100mph ft-lbs)</i>		20 (15)	73 (54)	278 (205)	1032 (761)

(1) To order pre-set downtilt versions available, simply add a -T2 or -T4, etc towards the end of the part number to denote the downtilt model required. For eg. CC807-11-T2-P to order a CC807-11-P with 2 deg of downtilt. Please note: Models with downtilt are NOT field invertible.

Date: **March 25, 2025**

Marty Randall
10-18 Consulting
Cell: 828-527-2416
marty.randall@1018consulting.com



Engineered Tower Solutions, PLLC
3227 Wellington Court
Raleigh, NC 27615
(919) 782-2710

Subject: **Structural Modification Analysis Report**

Carrier Designation: **Watauga County Reconfiguration**
Carrier Site Name: Buckeye Mt. - Viper

Tower Owner Designation: **NCSHP Site Number:** HP-1343
NCSHP Site Name: Buckeye Mt. - Viper

Engineering Firm Designation: **ETS, PLLC Job Number:** 24125017.STR.8177

Site Data: **2542 Forest Grove Road, Vilas, Watauga County, NC 28698**
Latitude N 36° 18' 57.89", Longitude W 81° 47' 29.44"
150.0 Foot – Self Support Tower

Dear Marty Randall,

Engineered Tower Solutions, PLLC 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. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

Modified Structure W/ Final Equipment Configuration:	Tower:	85.9%	Sufficient Capacity
	Foundation:	60.3%	Sufficient Capacity

This analysis utilizes an ultimate 3-second gust wind speed of 140 mph (converted to an equivalent 108 mph nominal 3-second gust wind speed per Section 1609.3.1 for use with TIA-222 G) as required by the 2018 North Carolina State Building Code (2015 IBC). Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by:

Hicham Anssar
Structural Engineer I

Respectfully submitted by:

J. Scott Hilgoe, PE
Structural Engineering Manager
NC License #P-1016

03/25/2025

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

Table 1 - Proposed Equipment Configuration

Table 2 - Other Considered Equipment

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Table 5 - Tower Component Stresses vs. Capacity

4.1) Recommendations

4.2) Dish Antenna Deflection Results

APPENDIX A

tnxTower Output

APPENDIX B

Base Level Drawing

APPENDIX C

Additional Calculations

APPENDIX D

Modification Design Drawings

1) INTRODUCTION

This tower is a 150-ft self-supporting tower designed by Valmont in July of 2010. This tower was originally designed for a nominal 3-second gust wind speed of 90 mph per ANSI/TIA-222-G.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-G
Structure Class:	III
Nominal Wind Speed:	108 mph (As required by Watauga County)
Exposure Category:	C
Topographic Factor:	1 (Topographic effects do not need to be considered with the required special wind speeds as required by Watauga County)
Ice Thickness:	1.0 in
Wind Speed with Ice:	30 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
147.0 (Watauga County)	156.2	1	RFI	CC807-11 (Mounted to the existing Side Arm)	1	7/8"
117.0 (Watauga County)	126.2	1	RFI	CC807-11 (Mounted to the existing Side Arm)	1	1-5/8"
85.0 (Watauga County)	85.0	1	Commscope	HX6-6W-6WH	1	EU63
		1	Tower Mount	4.5"Ø x 5-ft Dish Pipe Mount		

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)
147.0 (NCSHP)	155.0	1	Unknow	15-ft Omni	2	7/8"
	150.0	1	Unknow	4-ft Omni		
	147.0	1	Unknow	Junction Box (9" x 6" x 6")	1	1/2"
		3	Tower Mounts	Horizontal Mount Pipe/Stabilizer		
		3	Tower Mounts	6-ft Side Arm Mount		
117.0 (NCSHP)	125.0	1	Unknow	15-ft Omni	1	1-5/8"
	120.0	1	Unknow	4-ft Omni		
	117.0	2	Tower Mounts	Horizontal Mount Pipe/Stabilizer	1	7/8"
		2	Tower Mounts	6-ft Side Arm Mount		
117.0 (Watauga County)	123.0	1	Unknow	10-ft Dipole *	1	1/2" *
	117.0	1	Tower Mount	Horizontal Mount Pipe/Stabilizer		
		1	Tower Mount	6-ft Side Arm Mount		
80.0 (Watauga County)	92.0	1	Unknown	6-ft Dish Ice Shield**	-	-
	80.0	1	Tower Mount	5-ft Dish Pipe Mount ***	1	EW63 ***
		1	Commscope	PL6-65-PXA ***		
80.0 (Unknown)	80.0	1	Tower Mount	5-ft Empty Pipe Mount	-	-
79.0 (NCSHP)	86.0	1	Unknown	8-ft Ice Shield	-	-
	79.0	1	Tower Mount	5-ft Dish Pipe Mount	1	EW63
		1	Commscope	PL6-65-PXA		

*Existing Dipole at 117-ft to be removed.

** Existing Ice Shield at B Leg to be relocated from 90-ft to 92-ft.

***Existing Equipment on B Leg to be removed.

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Tower Modification Drawings	ETS, PLLC (Job No. 24125017.STR.8177)	03/25/2025	Appendix D
Previous Structural Analysis Report	ETS, PLLC (Job No. 24125017.STR.9095)	02/24/2025	On File
Maintenance And Condition Assessment	ETS, PLLC (Job No. 24129454.IE.1439)	11/06/2024	On File
Geotechnical Investigation Report	ETS, PLLC (Job No. 24125017)	05/02/2024	On File
Tower Mapping Report	ETS, PLLC (Job No. 24125017.El.1178)	03/26/2024	On File
Foundation Mapping Report	ETS, PLLC (Job No. 24125017.El.1177)	03/25/2024	On File
Previous Structural Analysis Report	Tower Engineering Professionals (Project No. 090571)	05/28/2012	NCSHP
Original Foundation Design Drawings	Valmont (Drawing No. 231923)	07/23/2010	NCSHP
Original Tower Design Drawings	Valmont (Archive No. F-1013277)	07/23/2010	NCSHP

3.1) Analysis Method

tnxTower (version 8.3.1.2), 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.

tnxTower was used to determine the loads on the modified structure. Additional calculations were performed to determine the stresses in the reinforced leg sections. These calculations are presented in Appendix C.

3.2) Assumptions

- 1) Tower and structures were built and have been maintained in accordance with the manufacturer's specifications.
- 2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 3) Existing Member steel grades have been assumed as follows: Tower Legs (A500-50), Bracing (A36), and Anchor Bolts (F1554-55).

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	150 - 140	Leg	P2.5x.203 (2.875 OD)	1	-4.64	57.19	8.1	Pass
T2	140 - 120	Leg	P2.5x.203 (2.875 OD)	21	-24.42	57.19	42.7	Pass
T3	120 - 100	Leg	P4x.237 (4.50 OD)	48	-60.47	116.32	52.0	Pass
T4	100 - 80	Leg	P5x.258 (5.563 OD)	69	-87.24	169.37	51.5	Pass
T5	80 - 60	Leg	P5x.258 (5.563 OD)	90	-120.69	169.37	71.3	Pass
T6	60 - 40	Leg	P6x.28 (6.625 OD)	111	-151.51	228.83	66.2	Pass
T7	40 - 20	Leg	Pipe 8.625"ODx0.322"	132	-177.66	334.42	53.1	Pass
T8	20 - 0	Leg	Pipe 8.625"ODx0.322"	147	-205.00	334.42	61.3	Pass
T1	150 - 140	Diagonal	L2x2x1/8	8	-1.43	8.83	16.2 29.8 (b)	Pass
T2	140 - 120	Diagonal	L2x2x1/8	23	-2.73	8.83	31.0 58.3 (b)	Pass
T3	120 - 100	Diagonal	L2x2x3/16	50	-6.12	12.23	50.1 74.1 (b)	Pass
T4	100 - 80	Diagonal	L2x2x3/16	70	-4.42	8.65	51.2 60.6 (b)	Pass
T5	80 - 60	Diagonal	L2x2x3/16	92	-5.43	6.32	85.9	Pass
T6	60 - 40	Diagonal	L2 1/2x2 1/2x3/16	113	-5.39	9.55	56.5 60.5 (b)	Pass
T7	40 - 20	Diagonal	L3x3x3/16	134	-6.88	10.25	67.1	Pass
T8	20 - 0	Diagonal	L3x3x5/16	149	-7.81	13.38	58.3	Pass
T1	150 - 140	Top Girt	L2x2x3/16	4	-0.08	8.72	0.9 1.1 (b)	Pass
							Summary	
						Leg (T5)	71.3	Pass
						Diagonal (T5)	85.9	Pass
						Top Girt (T1)	1.1	Pass
						Bolt Checks	81.9	Pass
						Rating =	85.9	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	75.5	Pass
1	Base Foundation (Structural)	0	42.6	Pass
1	Base Foundation (Soil Interaction)	0	60.3	Pass
Structure Rating (max from all components) =				85.9%

Notes:

- 1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The tower and its foundations have sufficient capacity to carry the final load configuration once the proposed modifications are installed (see Appendix D).

The loading modification, as follows, must be completed for the results of this analysis to be valid:

Loading Changes:

- 1- Existing Dipole on B Leg at 117-ft to be removed.
- 2- Existing Ice Shield at B Leg to be relocated from 90-ft to 92-ft.
- 3- Existing Equipment on B Leg at 80-ft to be removed.

4.2) Dish Antenna Deflection Results

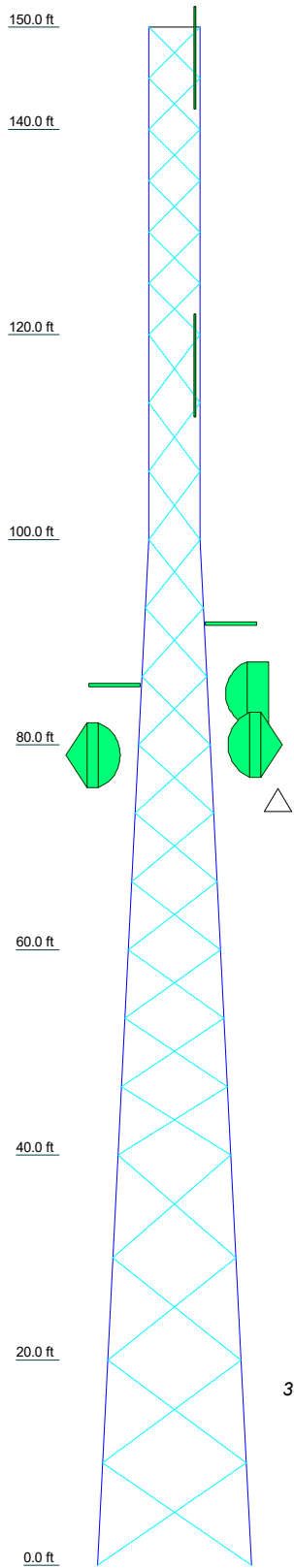
The results of the tilt and twist values for a 60 mph 3-second gust service wind speed per the TIA-222-G standard are given below:

Critical Deflections and Radius of Curvature - Service Wind						
<i>Elevation</i>	<i>Appurtenance</i>	<i>Gov. Load Comb.</i>	<i>Deflection</i>	<i>Tilt</i>	<i>Twist</i>	<i>Radius of Curvature</i>
<i>ft</i>			<i>in</i>	<i>°</i>	<i>°</i>	<i>ft</i>
85.00	HX6-6W-6WH	44	0.894	0.11	0.03	33414
80.00	PL6-65-PXA	44	0.781	0.10	0.03	35799
79.00	PL6-65-PXA	44	0.759	0.10	0.03	35910

APPENDIX A

TNXTOWER OUTPUT

Section	T1	T2	T3	T4	T5	T6	T7	T8
Legs	P2.5x.203 (2.875 OD)			P4x.237 (4.50 OD)	P5x.258 (5.563 OD)	P6x.28 (6.625 OD)	Pipe 8.625"ODx0.322"	
Leg Grade	L2x2x1/8			A500-50				
Diagonals	L2x2x3/16			A36				
Diagonal Grade	A36			N.A.				
Top Girts	L2x2x3/16			N.A.				
Face Width (ft)	5			7	9	11	13	15
# Panels @ (ft)	6 @ 5			12 @ 6.66667				
Weight (K)	0.4			0.6	1.0	1.3	1.8	2.4



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
5/8-in x 4-ft Lightning Rod	159	10' x 2.375" Horizontal Mount Pipe/Stabilizer	117
20"x3" pipe	149	10' x 2.375" Horizontal Mount Pipe/Stabilizer	117
Side Arm Mount [SO 303-3]	147	3" x 4' Omni	117
10' x 2.375" Horizontal Mount Pipe/Stabilizer	147	3" dia x 15-ft Omni Antenna	117
10' x 2.375" Horizontal Mount Pipe/Stabilizer	147	CC807-11	117
10' x 2.375" Horizontal Mount Pipe/Stabilizer	147	6' Dish Ice Shield	92
3" x 4' Omni	147	8' Dish Ice Shield	86
3" dia x 15-ft Omni Antenna	147	4.5" x 5-ft Dish Pipe Mount	85
CC807-11	147	HX6-6W-6WH	85
Junction Box (9" x 6" x 6")	147	4.5" x 5-ft Dish Pipe Mount	80
Side Arm Mount [SO 303-3]	117	4.5" x 5-ft Dish Pipe Mount	80
10' x 2.375" Horizontal Mount Pipe/Stabilizer	117	PL6-65-PXA	80
		PL6-65-PXA	79
		4.5" x 5-ft Dish Pipe Mount	79

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A572-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 108 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 30 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 85.9%

ALL REACTIONS
ARE FACTORED

MAX. CORNER REACTIONS AT BASE:

DOWN: 212 K
SHEAR: 22 K

UPLIFT: -185 K
SHEAR: 19 K

AXIAL
98 K
SHEAR 4 K
MOMENT 366 kip-ft
TORQUE 4 kip-ft
30 mph WIND - 1.0000 IN ICE

AXIAL
21 K
SHEAR 34 K
MOMENT 2670 kip-ft
TORQUE 27 kip-ft
REACTIONS - 108 mph WIND

Engineered Tower Solutions, PLLC

3227 Wellington Ct.
Raleigh, NC 27615
Phone: (919) 782-2710
FAX: 919-782-2710

Job: **Buckeye Mt. - Viper**

Project: **ETS, PLLC Job No. 24125017.STR.8177**

Client: Watauga County	Drawn by: hicham.anssar	App'd:
Code: TIA-222-G	Date: 03/25/25	Scale: NTS
Path:		Dwg No. E-1

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 1 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 150.00 ft above the ground line.

The base of the tower is set at an elevation of 0.00 ft above the ground line.

The face width of the tower is 5.00 ft at the top and 15.00 ft at the base.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Basic wind speed of 108 mph.

Structure Class III.

Exposure Category C.

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 30 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Pressures are calculated at each section.

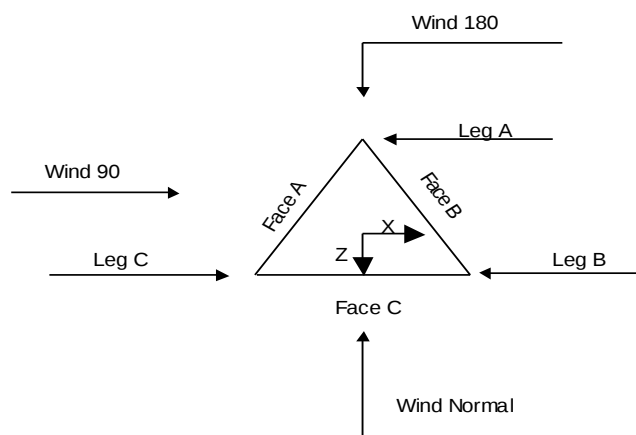
Stress ratio used in tower member design is 1.

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

Options

Consider Moments - Legs	Assume Legs Pinned	✓ Calculate Redundant Bracing Forces
Consider Moments - Horizontals	✓ Assume Rigid Index Plate	Ignore Redundant Members in FEA
Consider Moments - Diagonals	✓ Use Clear Spans For Wind Area	✓ SR Leg Bolts Resist Compression
Use Moment Magnification	✓ Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
✓ Use Code Stress Ratios	Retention Guys To Initial Tension	Offset Girt At Foundation
✓ Use Code Safety Factors - Guys	✓ Bypass Mast Stability Checks	✓ Consider Feed Line Torque
Escalate Ice	✓ Use Azimuth Dish Coefficients	✓ Include Angle Block Shear Check
Always Use Max Kz	✓ Project Wind Area of Appurtenances	Use TIA-222-G Bracing Resist. Exemption
Kz In Exposure D Hurricane Region	Alternative Appurt. EPA Calculation	Use TIA-222-G 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
Use Special Wind Profile		

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	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	150.00-140.00			5.00	1	10.00
T2	140.00-120.00			5.00	1	20.00
T3	120.00-100.00			5.00	1	20.00
T4	100.00-80.00			5.00	1	20.00
T5	80.00-60.00			7.00	1	20.00
T6	60.00-40.00			9.00	1	20.00
T7	40.00-20.00			11.00	1	20.00
T8	20.00-0.00			13.00	1	20.00

Tower Section Geometry (cont'd)

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	150.00-140.00	5.00	X Brace	No	No	0.0000	0.0000
T2	140.00-120.00	5.00	X Brace	No	No	0.0000	0.0000
T3	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T4	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T5	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000
T6	60.00-40.00	6.67	X Brace	No	No	0.0000	0.0000
T7	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	3 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T8	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 150.00-140.00	Pipe	P2.5x.203 (2.875 OD)	A500-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T2 140.00-120.00	Pipe	P2.5x.203 (2.875 OD)	A500-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T3 120.00-100.00	Pipe	P4x.237 (4.50 OD)	A500-50 (50 ksi)	Equal Angle	L2x2x3/16	A572-50 (50 ksi)
T4 100.00-80.00	Pipe	P5x.258 (5.563 OD)	A500-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T5 80.00-60.00	Pipe	P5x.258 (5.563 OD)	A500-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T6 60.00-40.00	Pipe	P6x.28 (6.625 OD)	A500-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 40.00-20.00	Pipe	Pipe 8.625"ODx0.322"	A500-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T8 20.00-0.00	Pipe	Pipe 8.625"ODx0.322"	A500-50 (50 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 150.00-140.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
T1 150.00-140.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 140.00-120.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 120.00-100.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 100.00-80.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

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	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T4 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 150.00-140.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
T2 140.00-120.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
T3 120.00-100.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
T4 100.00-80.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
T5 80.00-60.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	8 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight plf

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
T1	150.00-140.00	A	0.000	0.000	8.570	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	11.700	0.000	0.10
T2	140.00-120.00	A	0.000	0.000	19.487	0.000	0.21
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	23.400	0.000	0.20
T3	120.00-100.00	A	0.000	0.000	24.740	0.000	0.23
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	23.400	0.000	0.20
T4	100.00-80.00	A	0.000	0.000	26.682	0.000	0.24
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	23.400	0.000	0.20
T5	80.00-60.00	A	0.000	0.000	37.266	0.000	0.29
		B	0.000	0.000	1.400	0.000	0.02
		C	0.000	0.000	23.400	0.000	0.20
T6	60.00-40.00	A	0.000	0.000	37.424	0.000	0.29
		B	0.000	0.000	1.400	0.000	0.02
		C	0.000	0.000	23.400	0.000	0.20
T7	40.00-20.00	A	0.000	0.000	37.424	0.000	0.29
		B	0.000	0.000	1.400	0.000	0.02
		C	0.000	0.000	23.400	0.000	0.20
T8	20.00-0.00	A	0.000	0.000	25.245	0.000	0.24
		B	0.000	0.000	1.400	0.000	0.02
		C	0.000	0.000	23.400	0.000	0.20

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
T1	150.00-140.00	A	2.899	0.000	0.000	30.602	0.000	0.69
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	45.694	0.000	0.87
T2	140.00-120.00	A	2.867	0.000	0.000	76.834	0.000	1.69
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	90.662	0.000	1.71
T3	120.00-100.00	A	2.820	0.000	0.000	100.195	0.000	2.02
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	89.566	0.000	1.67
T4	100.00-80.00	A	2.764	0.000	0.000	106.750	0.000	2.11
		B		0.000	0.000	0.000	0.000	0.00

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	9 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
T5	80.00-60.00	C	2.695	0.000	0.000	88.274	0.000	1.62
		A		0.000	0.000	164.689	0.000	3.10
		B		0.000	0.000	21.569	0.000	0.25
T6	60.00-40.00	C	2.606	0.000	0.000	86.693	0.000	1.56
		A		0.000	0.000	161.275	0.000	2.96
		B		0.000	0.000	20.939	0.000	0.24
T7	40.00-20.00	C	2.476	0.000	0.000	84.636	0.000	1.48
		A		0.000	0.000	155.295	0.000	2.75
		B		0.000	0.000	20.023	0.000	0.22
T8	20.00-0.00	C	2.219	0.000	0.000	81.644	0.000	1.38
		A		0.000	0.000	91.085	0.000	1.49
		B		0.000	0.000	18.205	0.000	0.18
		C		0.000	0.000	75.704	0.000	1.18

Feed Line Center of Pressure

Section	Elevation ft	CP _x in	CP _z in	CP _x Ice in	CP _z Ice in
T1	150.00-140.00	-2.3951	2.0192	-4.7432	3.9421
T2	140.00-120.00	-3.0693	2.3062	-6.4135	4.7847
T3	120.00-100.00	-4.1168	2.7296	-7.4678	5.1546
T4	100.00-80.00	-5.0308	3.1161	-9.3871	6.2366
T5	80.00-60.00	-7.6857	3.7206	-12.3949	6.6827
T6	60.00-40.00	-8.1562	3.9395	-14.3158	7.7366
T7	40.00-20.00	-8.9146	4.2694	-16.4331	8.8937
T8	20.00-0.00	-5.6635	3.4317	-11.2104	8.1297

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T1	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	140.00 - 150.00	0.6000	0.3876
T1	5	Ladder Rail: PL3x1/4	140.00 - 150.00	0.6000	0.3876
T1	6	Climbing Rung: SR 5/8" (12" Step)	140.00 - 150.00	0.6000	0.3876
T1	7	Safety Line 3/8	140.00 - 150.00	0.6000	0.3876
T1	9	Feedline Ladder (Af)	140.00 - 150.00	0.6000	0.3876
T1	11		140.00 - 147.00	0.6000	0.3876
T1	12		140.00 - 147.00	0.6000	0.3876
T1	14		140.00 - 147.00	0.6000	0.3876
T1	19		140.00 - 147.00	0.6000	0.3876
T2	4	Step Pegs (5/8" SR) 7-in. w/	120.00 -	0.6000	0.4454

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 10 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T2	5	30" Step Ladder Rail: PL3x1/4	140.00 120.00 - 140.00	0.6000	0.4454
T2	6	Climbing Rung: SR 5/8" (12" Step)	120.00 - 140.00	0.6000	0.4454
T2	7	Safety Line 3/8	120.00 - 140.00	0.6000	0.4454
T2	9	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.4454
T2	11	7/8	120.00 - 140.00	0.6000	0.4454
T2	12	1/2	120.00 - 140.00	0.6000	0.4454
T2	14	7/8	120.00 - 140.00	0.6000	0.4454
T2	19	7/8	120.00 - 140.00	0.6000	0.4454
T3	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	100.00 - 120.00	0.6000	0.4590
T3	5	Ladder Rail: PL3x1/4	100.00 - 120.00	0.6000	0.4590
T3	6	Climbing Rung: SR 5/8" (12" Step)	100.00 - 120.00	0.6000	0.4590
T3	7	Safety Line 3/8	100.00 - 120.00	0.6000	0.4590
T3	9	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.4590
T3	10	1 5/8	100.00 - 117.00	0.6000	0.4590
T3	11	7/8	100.00 - 120.00	0.6000	0.4590
T3	12	1/2	100.00 - 120.00	0.6000	0.4590
T3	14	7/8	117.00 - 120.00	0.6000	0.4590
T3	15	7/8	100.00 - 117.00	0.6000	0.4590
T3	19	7/8	100.00 - 120.00	0.6000	0.4590
T4	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	80.00 - 100.00	0.6000	0.5075
T4	5	Ladder Rail: PL3x1/4	80.00 - 100.00	0.6000	0.5075
T4	6	Climbing Rung: SR 5/8" (12" Step)	80.00 - 100.00	0.6000	0.5075
T4	7	Safety Line 3/8	80.00 - 100.00	0.6000	0.5075
T4	9	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.5075
T4	10	1 5/8	80.00 - 100.00	0.6000	0.5075
T4	11	7/8	80.00 - 100.00	0.6000	0.5075
T4	12	1/2	80.00 - 100.00	0.6000	0.5075
T4	15	7/8	80.00 - 100.00	0.6000	0.5075
T4	19	7/8	80.00 - 100.00	0.6000	0.5075
T4	21	EU 63	80.00 - 85.00	0.6000	0.5075
T5	2	Step Pegs (5/8" SR) 7-in. w/ 30" Step	60.00 - 80.00	0.6000	0.5914
T5	3	Step Pegs (5/8" SR) 7-in. w/ 30" Step	60.00 - 80.00	0.6000	0.5914
T5	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	60.00 - 80.00	0.6000	0.5914
T5	5	Ladder Rail: PL3x1/4	60.00 - 80.00	0.6000	0.5914
T5	6	Climbing Rung: SR 5/8" (12" Step)	60.00 - 80.00	0.6000	0.5914
T5	7	Safety Line 3/8	60.00 - 80.00	0.6000	0.5914

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	11 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

<i>Tower Section</i>	<i>Feed Line Record No.</i>	<i>Description</i>	<i>Feed Line Segment Elev.</i>	<i>K_a No Ice</i>	<i>K_a Ice</i>
T5	9	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.5914
T5	10	1 5/8	60.00 - 80.00	0.6000	0.5914
T5	11	7/8	60.00 - 80.00	0.6000	0.5914
T5	12	1/2	60.00 - 80.00	0.6000	0.5914
T5	13	EW63	60.00 - 80.00	0.6000	0.5914
T5	15	7/8	60.00 - 80.00	0.6000	0.5914
T5	17	EW63	60.00 - 79.00	0.6000	0.5914
T5	19	7/8	60.00 - 80.00	0.6000	0.5914
T5	21	EU 63	60.00 - 80.00	0.6000	0.5914
T6	2	Step Pegs (5/8" SR) 7-in. w/ 30" Step	40.00 - 60.00	0.6000	0.6000
T6	3	Step Pegs (5/8" SR) 7-in. w/ 30" Step	40.00 - 60.00	0.6000	0.6000
T6	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	40.00 - 60.00	0.6000	0.6000
T6	5	Ladder Rail: PL3x1/4	40.00 - 60.00	0.6000	0.6000
T6	6	Climbing Rung: SR 5/8" (12" Step)	40.00 - 60.00	0.6000	0.6000
T6	7	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T6	9	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T6	10	1 5/8	40.00 - 60.00	0.6000	0.6000
T6	11	7/8	40.00 - 60.00	0.6000	0.6000
T6	12	1/2	40.00 - 60.00	0.6000	0.6000
T6	13	EW63	40.00 - 60.00	0.6000	0.6000
T6	15	7/8	40.00 - 60.00	0.6000	0.6000
T6	17	EW63	40.00 - 60.00	0.6000	0.6000
T6	19	7/8	40.00 - 60.00	0.6000	0.6000
T6	21	EU 63	40.00 - 60.00	0.6000	0.6000
T7	2	Step Pegs (5/8" SR) 7-in. w/ 30" Step	20.00 - 40.00	0.6000	0.6000
T7	3	Step Pegs (5/8" SR) 7-in. w/ 30" Step	20.00 - 40.00	0.6000	0.6000
T7	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	20.00 - 40.00	0.6000	0.6000
T7	5	Ladder Rail: PL3x1/4	20.00 - 40.00	0.6000	0.6000
T7	6	Climbing Rung: SR 5/8" (12" Step)	20.00 - 40.00	0.6000	0.6000
T7	7	Safety Line 3/8	20.00 - 40.00	0.6000	0.6000
T7	9	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T7	10	1 5/8	20.00 - 40.00	0.6000	0.6000
T7	11	7/8	20.00 - 40.00	0.6000	0.6000
T7	12	1/2	20.00 - 40.00	0.6000	0.6000
T7	13	EW63	20.00 - 40.00	0.6000	0.6000
T7	15	7/8	20.00 - 40.00	0.6000	0.6000
T7	17	EW63	20.00 - 40.00	0.6000	0.6000
T7	19	7/8	20.00 - 40.00	0.6000	0.6000
T7	21	EU 63	20.00 - 40.00	0.6000	0.6000
T8	2	Step Pegs (5/8" SR) 7-in. w/ 30" Step	0.00 - 20.00	0.6000	0.6000
T8	3	Step Pegs (5/8" SR) 7-in. w/ 30" Step	0.00 - 20.00	0.6000	0.6000
T8	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	0.00 - 20.00	0.6000	0.6000
T8	5	Ladder Rail: PL3x1/4	0.00 - 20.00	0.6000	0.6000
T8	6	Climbing Rung: SR 5/8" (12" Step)	0.00 - 20.00	0.6000	0.6000
T8	7	Safety Line 3/8	0.00 - 20.00	0.6000	0.6000
T8	9	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T8	10	1 5/8	10.00 - 20.00	0.6000	0.6000
T8	11	7/8	10.00 - 20.00	0.6000	0.6000
T8	12	1/2	10.00 - 20.00	0.6000	0.6000
T8	13	EW63	10.00 - 20.00	0.6000	0.6000

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	12 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K ₀ No Ice	K ₀ Ice
T8	15	7/8	10.00 - 20.00	0.6000	0.6000
T8	17	EW63	10.00 - 20.00	0.6000	0.6000
T8	19	7/8	10.00 - 20.00	0.6000	0.6000
T8	21	EU 63	10.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K

20'x3" pipe	A	From Centroid-Le g	2.25 0.00 10.00	0.00	149.00	No Ice	5.65	5.65	0.05
						1/2" Ice	8.03	8.03	0.09
						1" Ice	10.08	10.08	0.15
5/8-in x 4-ft Lightning Rod	A	From Centroid-Le g	2.50 0.00 1.00	0.00	159.00	No Ice	0.25	0.25	0.00
						1/2" Ice	0.66	0.66	0.01
						1" Ice	0.97	0.97	0.01

Side Arm Mount [SO 303-3]	B	None		0.00	147.00	No Ice	7.67	7.67	0.34
						1/2" Ice	11.04	11.04	0.48
						1" Ice	14.57	14.57	0.65
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice	2.38	0.06	0.04
						1/2" Ice	3.40	0.12	0.06
						1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice	2.38	0.06	0.04
						1/2" Ice	3.40	0.12	0.06
						1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	C	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice	2.38	0.06	0.04
						1/2" Ice	3.40	0.12	0.06
						1" Ice	4.45	0.21	0.08
3" x 4' Omni	A	From Leg	6.00 0.00 3.00	0.00	147.00	No Ice	1.04	1.04	0.04
						1/2" Ice	1.44	1.44	0.05
						1" Ice	1.68	1.68	0.06
3" dia x 15-ft Omni Antenna	B	From Leg	6.00 0.00 8.00	0.00	147.00	No Ice	4.25	4.25	0.04
						1/2" Ice	6.03	6.03	0.07
						1" Ice	7.58	7.58	0.11
CC807-11	C	From Leg	6.00 0.00 9.20	0.00	147.00	No Ice	4.86	4.86	0.05
						1/2" Ice	7.63	7.63	0.09
						1" Ice	9.40	9.40	0.14
Junction Box (9" x 6" x 6")	A	From Face	0.50 0.00 0.00	0.00	147.00	No Ice	0.83	0.50	0.03
						1/2" Ice	0.95	0.59	0.03
						1" Ice	1.07	0.69	0.04

Side Arm Mount [SO 303-3]	B	None		0.00	117.00	No Ice	7.67	7.67	0.34
						1/2" Ice	11.04	11.04	0.48
						1" Ice	14.57	14.57	0.65
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00 0.00 0.00	0.00	117.00	No Ice	2.38	0.06	0.04
						1/2" Ice	3.40	0.12	0.06
						1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00 0.00	0.00	117.00	No Ice	2.38	0.06	0.04
						1/2" Ice	3.40	0.12	0.06

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 13 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAAA Front ft²	CAAA Side ft²	Weight K
10' x 2.375" Horizontal Mount Pipe/Stabilizer	C	From Leg	0.00 0.00 0.00 0.00	0.00	117.00	1" Ice 4.45 No Ice 2.38 1/2" Ice 3.40	0.21 0.06 0.12	0.08 0.04 0.06
3" x 4' Omni	A	From Leg	0.00 6.00 0.00	0.00	117.00	1" Ice 4.45 No Ice 1.04 1/2" Ice 1.44	0.21 1.04 1.44	0.08 0.04 0.05
3" dia x 15-ft Omni Antenna	C	From Leg	0.00 3.00 6.00 0.00	0.00	117.00	1" Ice 1.68 No Ice 4.35 1/2" Ice 6.03	1.68 4.35 6.03	0.06 0.04 0.07
CC807-11	B	From Leg	0.00 8.00 6.00 0.00 9.20	0.00	117.00	1" Ice 7.58 No Ice 4.98 1/2" Ice 7.63 1" Ice 9.40	7.58 4.98 7.63 9.40	0.11 0.05 0.09 0.14

4.5" x 5-ft Dish Pipe Mount	B	From Leg	0.00 1.33 0.00	0.00	80.00	1" Ice 2.40 No Ice 7.72 1/2" Ice 11.08	2.40 7.72 11.08	0.09 0.31 0.53
6' Dish Ice Shield	B	From Leg	0.00 3.00 0.00	0.00	92.00	1" Ice 14.44 No Ice 8.67 1/2" Ice 11.10	14.41 8.67 11.10	0.78 0.38 0.66
4.5" x 5-ft Dish Pipe Mount	B	From Leg	0.00 1.33 0.00	0.00	85.00	1" Ice 2.40 No Ice 1.43 1/2" Ice 2.08	2.40 1.43 2.08	0.09 0.05 0.07

4.5" x 5-ft Dish Pipe Mount	C	From Leg	0.00 1.33 0.00	0.00	79.00	1" Ice 2.40 No Ice 1.43 1/2" Ice 2.08	2.40 1.43 2.08	0.09 0.05 0.07
8' Dish Ice Shield	C	From Leg	0.00 3.00 0.00 0.00	0.00	86.00	1" Ice 13.32 No Ice 8.67 1/2" Ice 11.10 1" Ice 13.32	13.32 8.67 11.10 13.32	0.97 0.38 0.66 0.97

4.5" x 5-ft Dish Pipe Mount	A	From Leg	0.00 1.33 0.00	0.00	80.00	1" Ice 2.40 No Ice 1.43 1/2" Ice 2.08	2.40 1.43 2.08	0.09 0.05 0.07

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft²	Weight K

PL6-65-PXA	B	Paraboloid w/Radome	From Leg	2.00 0.00 0.00	50.00		80.00	6.36	No Ice 31.75 1/2" Ice 32.59 1" Ice 33.43	0.16 0.33 0.50

PL6-65-PXA	C	Paraboloid w/Radome	From Leg	2.00 0.00 0.00	10.00		79.00	6.36	No Ice 31.75 1/2" Ice 32.59 1" Ice 33.43	0.16 0.33 0.50

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 14 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight K

HX6-6W-6WH	B	Paraboloid w/Shroud (HP)	From Leg	2.00 0.00 0.00	48.00		85.00	6.23	No Ice 1/2" Ice 1" Ice	30.48 31.30 32.13
***										0.19 0.35 0.51

Tower Pressures - No Ice

$$G_H = 0.850$$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
T1 150.00-140.00	145.00	1.369	40	52.396	A	5.282	4.792	4.792	47.57	8.570	0.000
					B	5.282	4.792		47.57	0.000	0.000
					C	5.282	4.792		47.57	11.700	0.000
T2 140.00-120.00	130.00	1.337	39	104.792	A	8.976	9.583	9.583	51.64	19.487	0.000
					B	8.976	9.583		51.64	0.000	0.000
					C	8.976	9.583		51.64	23.400	0.000
T3 120.00-100.00	110.00	1.291	38	107.500	A	7.708	15.000	15.000	66.06	24.740	0.000
					B	7.708	15.000		66.06	0.000	0.000
					C	7.708	15.000		66.06	23.400	0.000
T4 100.00-80.00	90.00	1.238	36	129.283	A	8.284	18.574	18.574	69.16	26.682	0.000
					B	8.284	18.574		69.16	0.000	0.000
					C	8.284	18.574		69.16	23.400	0.000
T5 80.00-60.00	70.00	1.174	34	169.283	A	9.816	18.574	18.574	65.42	37.266	0.000
					B	9.816	18.574		65.42	1.400	0.000
					C	9.816	18.574		65.42	23.400	0.000
T6 60.00-40.00	50.00	1.094	32	211.055	A	14.199	22.120	22.120	60.90	37.424	0.000
					B	14.199	22.120		60.90	1.400	0.000
					C	14.199	22.120		60.90	23.400	0.000
T7 40.00-20.00	30.00	0.982	29	254.393	A	14.690	28.798	28.798	66.22	37.424	0.000
					B	14.690	28.798		66.22	1.400	0.000
					C	14.690	28.798		66.22	23.400	0.000
T8 20.00-0.00	10.00	0.850	25	294.393	A	16.326	28.798	28.798	63.82	25.245	0.000
					B	16.326	28.798		63.82	1.400	0.000
					C	16.326	28.798		63.82	23.400	0.000

Tower Pressure - With Ice

$$G_H = 0.850$$

Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
T1 150.00-140.00	145.00	1.369	3	2.8988	57.227	A	5.282	29.765	14.454	41.24	30.602	0.000
						B	5.282	29.765		41.24	0.000	0.000
						C	5.282	29.765		41.24	45.694	0.000
T2 140.00-120.00	130.00	1.337	3	2.8674	114.350	A	8.976	54.438	28.699	45.26	76.834	0.000
						B	8.976	54.438		45.26	0.000	0.000

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	15 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
T3 120.00-100.00	110.00	1.291	3	2.8199	116.900	C	8.976	54.438		45.26	90.662	0.000
						A	7.708	55.536	33.799	53.44	100.195	0.000
						B	7.708	55.536		53.44	0.000	0.000
						C	7.708	55.536		53.44	89.566	0.000
T4 100.00-80.00	90.00	1.238	2	2.7638	138.508	A	8.284	59.925	37.030	54.29	106.750	0.000
						B	8.284	59.925		54.29	0.000	0.000
						C	8.284	59.925		54.29	88.274	0.000
T5 80.00-60.00	70.00	1.174	2	2.6952	178.279	A	9.816	63.030	36.572	50.20	164.689	0.000
						B	9.816	63.030		50.20	21.569	0.000
						C	9.816	63.030		50.20	86.693	0.000
T6 60.00-40.00	50.00	1.094	2	2.6061	219.753	A	14.199	69.127	39.523	47.43	161.275	0.000
						B	14.199	69.127		47.43	20.939	0.000
						C	14.199	69.127		47.43	84.636	0.000
T7 40.00-20.00	30.00	0.982	2	2.4763	262.658	A	14.690	69.585	45.334	53.79	155.295	0.000
						B	14.690	69.585		53.79	20.023	0.000
						C	14.690	69.585		53.79	81.644	0.000
T8 20.00-0.00	10.00	0.850	2	2.2186	301.798	A	16.326	67.761	43.614	51.87	91.085	0.000
						B	16.326	67.761		51.87	18.205	0.000
						C	16.326	67.761		51.87	75.704	0.000

Tower Pressure - Service

$$G_H = 0.850$$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
T1 150.00-140.00	145.00	1.369	11	52.396	A	5.282	4.792		47.57	8.570	0.000
					B	5.282	4.792		47.57	0.000	0.000
					C	5.282	4.792		47.57	11.700	0.000
T2 140.00-120.00	130.00	1.337	10	104.792	A	8.976	9.583	9.583	51.64	19.487	0.000
					B	8.976	9.583		51.64	0.000	0.000
					C	8.976	9.583		51.64	23.400	0.000
T3 120.00-100.00	110.00	1.291	10	107.500	A	7.708	15.000	15.000	66.06	24.740	0.000
					B	7.708	15.000		66.06	0.000	0.000
					C	7.708	15.000		66.06	23.400	0.000
T4 100.00-80.00	90.00	1.238	10	129.283	A	8.284	18.574	18.574	69.16	26.682	0.000
					B	8.284	18.574		69.16	0.000	0.000
					C	8.284	18.574		69.16	23.400	0.000
T5 80.00-60.00	70.00	1.174	9	169.283	A	9.816	18.574	18.574	65.42	37.266	0.000
					B	9.816	18.574		65.42	1.400	0.000
					C	9.816	18.574		65.42	23.400	0.000
T6 60.00-40.00	50.00	1.094	9	211.055	A	14.199	22.120	22.120	60.90	37.424	0.000
					B	14.199	22.120		60.90	1.400	0.000
					C	14.199	22.120		60.90	23.400	0.000
T7 40.00-20.00	30.00	0.982	8	254.393	A	14.690	28.798	28.798	66.22	37.424	0.000
					B	14.690	28.798		66.22	1.400	0.000
					C	14.690	28.798		66.22	23.400	0.000
T8 20.00-0.00	10.00	0.850	7	294.393	A	16.326	28.798	28.798	63.82	25.245	0.000
					B	16.326	28.798		63.82	1.400	0.000
					C	16.326	28.798		63.82	23.400	0.000

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 16 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 150.00-140.00	0.20	0.35	A	0.192	2.622	40	1	1	8.019	1.04	103.51	C
			B	0.192	2.622		1	1	8.019			
			C	0.192	2.622		1	1	8.019			
T2 140.00-120.00	0.40	0.63	A	0.177	2.674	39	1	1	14.443	1.96	97.81	C
			B	0.177	2.674		1	1	14.443			
			C	0.177	2.674		1	1	14.443			
T3 120.00-100.00	0.43	1.01	A	0.211	2.559	38	1	1	15.346	2.00	99.97	C
			B	0.211	2.559		1	1	15.346			
			C	0.211	2.559		1	1	15.346			
T4 100.00-80.00	0.44	1.27	A	0.208	2.57	36	1	1	16.957	2.08	104.16	C
			B	0.208	2.57		1	1	16.957			
			C	0.208	2.57		1	1	16.957			
T5 80.00-60.00	0.50	1.34	A	0.168	2.707	34	1	1	18.243	2.35	117.57	C
			B	0.168	2.707		1	1	18.243			
			C	0.168	2.707		1	1	18.243			
T6 60.00-40.00	0.51	1.81	A	0.172	2.692	32	1	1	23.717	2.59	129.26	C
			B	0.172	2.692		1	1	23.717			
			C	0.172	2.692		1	1	23.717			
T7 40.00-20.00	0.51	2.41	A	0.171	2.696	29	1	1	27.063	2.54	127.19	C
			B	0.171	2.696		1	1	27.063			
			C	0.171	2.696		1	1	27.063			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	1	1	28.432	2.17	108.37	C
			B	0.153	2.759		1	1	28.432			
			C	0.153	2.759		1	1	28.432			
Sum Weight:	3.44	11.79						OTM	1203.66 kip-ft	16.72		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 150.00-140.00	0.20	0.35	A	0.192	2.622	40	0.8	1	6.963	0.94	94.11	A
			B	0.192	2.622		0.8	1	6.963			
			C	0.192	2.622		0.8	1	6.963			
T2 140.00-120.00	0.40	0.63	A	0.177	2.674	39	0.8	1	12.648	1.80	89.84	A
			B	0.177	2.674		0.8	1	12.648			
			C	0.177	2.674		0.8	1	12.648			
T3 120.00-100.00	0.43	1.01	A	0.211	2.559	38	0.8	1	13.804	1.87	93.65	A
			B	0.211	2.559		0.8	1	13.804			
			C	0.211	2.559		0.8	1	13.804			
T4 100.00-80.00	0.44	1.27	A	0.208	2.57	36	0.8	1	15.301	1.95	97.62	A
			B	0.208	2.57		0.8	1	15.301			
			C	0.208	2.57		0.8	1	15.301			
T5 80.00-60.00	0.50	1.34	A	0.168	2.707	34	0.8	1	16.280	2.20	109.83	A
			B	0.168	2.707		0.8	1	16.280			
			C	0.168	2.707		0.8	1	16.280			
T6 60.00-40.00	0.51	1.81	A	0.172	2.692	32	0.8	1	20.877	2.38	118.89	A
			B	0.172	2.692		0.8	1	20.877			
			C	0.172	2.692		0.8	1	20.877			

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	17 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T7 40.00-20.00	0.51	2.41	A	0.171	2.696	29	0.8	1	24.125	2.35	117.54	A
T8 20.00-0.00	0.46	2.97	B	0.171	2.696	25	0.8	1	24.125	1.98	98.87	A
			C	0.171	2.696		0.8	1	24.125			
			A	0.153	2.759		0.8	1	25.166			
			B	0.153	2.759		0.8	1	25.166			
Sum Weight:	3.44	11.79	C	0.153	2.759		0.8	1	25.166	15.47		
								OTM	1114.74 kip-ft			

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 150.00-140.00	0.20	0.35	A	0.192	2.622	40	0.85	1	7.227	1.01	100.60	B
			B	0.192	2.622		0.85	1	7.227			
			C	0.192	2.622		0.85	1	7.227			
			A	0.177	2.674	39	0.85	1	13.097	1.92	95.88	B
T2 140.00-120.00	0.40	0.63	B	0.177	2.674		0.85	1	13.097			
			C	0.177	2.674		0.85	1	13.097			
T3 120.00-100.00	0.43	1.01	A	0.211	2.559	38	0.85	1	14.189	1.99	99.67	B
			B	0.211	2.559		0.85	1	14.189			
			C	0.211	2.559		0.85	1	14.189			
T4 100.00-80.00	0.44	1.27	A	0.208	2.57	36	0.85	1	15.715	2.07	103.61	B
			B	0.208	2.57		0.85	1	15.715			
			C	0.208	2.57		0.85	1	15.715			
T5 80.00-60.00	0.50	1.34	A	0.168	2.707	34	0.85	1	16.771	2.31	115.58	B
			B	0.168	2.707		0.85	1	16.771			
			C	0.168	2.707		0.85	1	16.771			
T6 60.00-40.00	0.51	1.81	A	0.172	2.692	32	0.85	1	21.587	2.50	125.04	B
			B	0.172	2.692		0.85	1	21.587			
			C	0.172	2.692		0.85	1	21.587			
T7 40.00-20.00	0.51	2.41	A	0.171	2.696	29	0.85	1	24.859	2.46	123.15	B
			B	0.171	2.696		0.85	1	24.859			
			C	0.171	2.696		0.85	1	24.859			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	0.85	1	25.983	2.08	103.80	B
			B	0.153	2.759		0.85	1	25.983			
			C	0.153	2.759		0.85	1	25.983			
Sum Weight:	3.44	11.79						OTM	1182.42 kip-ft	16.34		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	1	1	27.655	0.18	17.53	C

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	18 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
150.00-140.00			B	0.612	1.797		1	1	27.655			
			C	0.612	1.797		1	1	27.655			
T2	3.40	5.22	A	0.555	1.839	3	1	1	47.949	0.35	17.53	C
140.00-120.00			B	0.555	1.839		1	1	47.949			
			C	0.555	1.839		1	1	47.949			
T3	3.69	5.44	A	0.541	1.852	3	1	1	47.026	0.36	17.76	C
120.00-100.00			B	0.541	1.852		1	1	47.026			
			C	0.541	1.852		1	1	47.026			
T4	3.73	6.01	A	0.492	1.91	2	1	1	49.090	0.38	18.77	C
100.00-80.00			B	0.492	1.91		1	1	49.090			
			C	0.492	1.91		1	1	49.090			
T5	4.91	6.38	A	0.409	2.047	2	1	1	50.156	0.48	23.84	C
80.00-60.00			B	0.409	2.047		1	1	50.156			
			C	0.409	2.047		1	1	50.156			
T6	4.68	7.80	A	0.379	2.107	2	1	1	57.575	0.48	23.79	C
60.00-40.00			B	0.379	2.107		1	1	57.575			
			C	0.379	2.107		1	1	57.575			
T7	4.35	8.24	A	0.321	2.242	2	1	1	56.837	0.43	21.43	C
40.00-20.00			B	0.321	2.242		1	1	56.837			
			C	0.321	2.242		1	1	56.837			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	1	1	56.478	0.32	16.12	C
			B	0.279	2.354		1	1	56.478			
			C	0.279	2.354		1	1	56.478			
Sum Weight:	29.19	50.45						OTM	217.11 kip-ft	2.96		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	0.8	1	26.599	0.17	17.10	A
150.00-140.00			B	0.612	1.797		0.8	1	26.599			
			C	0.612	1.797		0.8	1	26.599			
T2	3.40	5.22	A	0.555	1.839	3	0.8	1	46.154	0.34	17.16	A
140.00-120.00			B	0.555	1.839		0.8	1	46.154			
			C	0.555	1.839		0.8	1	46.154			
T3	3.69	5.44	A	0.541	1.852	3	0.8	1	45.484	0.35	17.45	A
120.00-100.00			B	0.541	1.852		0.8	1	45.484			
			C	0.541	1.852		0.8	1	45.484			
T4	3.73	6.01	A	0.492	1.91	2	0.8	1	47.433	0.37	18.45	A
100.00-80.00			B	0.492	1.91		0.8	1	47.433			
			C	0.492	1.91		0.8	1	47.433			
T5	4.91	6.38	A	0.409	2.047	2	0.8	1	48.193	0.47	23.45	A
80.00-60.00			B	0.409	2.047		0.8	1	48.193			
			C	0.409	2.047		0.8	1	48.193			
T6	4.68	7.80	A	0.379	2.107	2	0.8	1	54.735	0.46	23.25	A
60.00-40.00			B	0.379	2.107		0.8	1	54.735			
			C	0.379	2.107		0.8	1	54.735			
T7	4.35	8.24	A	0.321	2.242	2	0.8	1	53.899	0.42	20.89	A
40.00-20.00			B	0.321	2.242		0.8	1	53.899			
			C	0.321	2.242		0.8	1	53.899			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	0.8	1	53.213	0.31	15.58	A

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	19 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
Sum Weight:	29.19	50.45	B C	0.279 0.279	2.354 2.354		0.8 0.8	1 1 OTM	53.213 53.213 212.73 kip-ft	2.90		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 150.00-140.00	1.56	2.99	A B C	0.612 0.612 0.612	1.797 1.797 1.797	3	0.85 0.85 0.85	1 1 1	26.863 26.863 26.863	0.17	17.36	B
T2 140.00-120.00	3.40	5.22	A B C	0.555 0.555 0.555	1.839 1.839 1.839	3	0.85 0.85 0.85	1 1 1	46.602 46.602 46.602	0.35	17.43	B
T3 120.00-100.00	3.69	5.44	A B C	0.541 0.541 0.541	1.852 1.852 1.852	3	0.85 0.85 0.85	1 1 1	45.870 45.870 45.870	0.36	17.79	B
T4 100.00-80.00	3.73	6.01	A B C	0.492 0.492 0.492	1.91 1.91 1.91	2	0.85 0.85 0.85	1 1 1	47.847 47.847 47.847	0.38	18.83	B
T5 80.00-60.00	4.91	6.38	A B C	0.409 0.409 0.409	2.047 2.047 2.047	2	0.85 0.85 0.85	1 1 1	48.684 48.684 48.684	0.48	23.90	B
T6 60.00-40.00	4.68	7.80	A B C	0.379 0.379 0.379	2.107 2.107 2.107	2	0.85 0.85 0.85	1 1 1	55.445 55.445 55.445	0.47	23.72	B
T7 40.00-20.00	4.35	8.24	A B C	0.321 0.321 0.321	2.242 2.242 2.242	2	0.85 0.85 0.85	1 1 1	54.634 54.634 54.634	0.43	21.32	B
T8 20.00-0.00	2.85	8.35	A B C	0.279 0.279 0.279	2.354 2.354 2.354	2	0.85 0.85 0.85	1 1 1	54.030 54.030 54.030	0.32	15.93	B
Sum Weight:	29.19	50.45						OTM	216.68 kip-ft	2.95		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 150.00-140.00	0.20	0.35	A B C	0.192 0.192 0.192	2.622 2.622 2.622	11	1 1 1	1 1 1	8.028 8.028 8.028	0.28	27.80	C
T2 140.00-120.00	0.40	0.63	A B	0.177 0.177	2.674 2.674	10	1 1	1 1	14.447 14.447	0.53	26.25	C

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	20 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T3 120.00-100.00	0.43	1.01	C	0.177	2.674		1	1	14.447			
			A	0.211	2.559	10	1	1	16.356	0.56	27.94	C
			B	0.211	2.559		1	1	16.356			
			C	0.211	2.559		1	1	16.356			
T4 100.00-80.00	0.44	1.27	A	0.208	2.57	10	1	1	18.980	0.60	30.10	C
			B	0.208	2.57		1	1	18.980			
			C	0.208	2.57		1	1	18.980			
T5 80.00-60.00	0.50	1.34	A	0.168	2.707	9	1	1	20.396	0.68	33.83	C
			B	0.168	2.707		1	1	20.396			
			C	0.168	2.707		1	1	20.396			
T6 60.00-40.00	0.51	1.81	A	0.172	2.692	9	1	1	26.556	0.75	37.48	C
			B	0.172	2.692		1	1	26.556			
			C	0.172	2.692		1	1	26.556			
T7 40.00-20.00	0.51	2.41	A	0.171	2.696	8	1	1	29.748	0.73	36.50	C
			B	0.171	2.696		1	1	29.748			
			C	0.171	2.696		1	1	29.748			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	1	1	31.650	0.63	31.60	C
			B	0.153	2.759		1	1	31.650			
			C	0.153	2.759		1	1	31.650			
Sum Weight:	3.44	11.79						OTM	337.28 kip-ft	4.75		

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
T1 150.00-140.00	0.20	0.35	A	0.192	2.622	11	0.8	1	6.972	0.25	25.28	A
			B	0.192	2.622		0.8	1	6.972			
			C	0.192	2.622		0.8	1	6.972			
T2 140.00-120.00	0.40	0.63	A	0.177	2.674	10	0.8	1	12.652	0.48	24.12	A
			B	0.177	2.674		0.8	1	12.652			
			C	0.177	2.674		0.8	1	12.652			
T3 120.00-100.00	0.43	1.01	A	0.211	2.559	10	0.8	1	14.815	0.52	26.25	A
			B	0.211	2.559		0.8	1	14.815			
			C	0.211	2.559		0.8	1	14.815			
T4 100.00-80.00	0.44	1.27	A	0.208	2.57	10	0.8	1	17.323	0.57	28.34	A
			B	0.208	2.57		0.8	1	17.323			
			C	0.208	2.57		0.8	1	17.323			
T5 80.00-60.00	0.50	1.34	A	0.168	2.707	9	0.8	1	18.433	0.64	31.75	A
			B	0.168	2.707		0.8	1	18.433			
			C	0.168	2.707		0.8	1	18.433			
T6 60.00-40.00	0.51	1.81	A	0.172	2.692	9	0.8	1	23.716	0.69	34.69	A
			B	0.172	2.692		0.8	1	23.716			
			C	0.172	2.692		0.8	1	23.716			
T7 40.00-20.00	0.51	2.41	A	0.171	2.696	8	0.8	1	26.810	0.68	33.91	A
			B	0.171	2.696		0.8	1	26.810			
			C	0.171	2.696		0.8	1	26.810			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	0.8	1	28.384	0.58	29.05	A
			B	0.153	2.759		0.8	1	28.384			
			C	0.153	2.759		0.8	1	28.384			
Sum Weight:	3.44	11.79						OTM	313.42 kip-ft	4.42		

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 21 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 150.00-140.00	0.20	0.35	A	0.192	2.622	11	0.85	1	7.236	0.27	27.02	B
			B	0.192	2.622		0.85	1	7.236			
			C	0.192	2.622		0.85	1	7.236			
T2 140.00-120.00	0.40	0.63	A	0.177	2.674	10	0.85	1	13.101	0.51	25.74	B
			B	0.177	2.674		0.85	1	13.101			
			C	0.177	2.674		0.85	1	13.101			
T3 120.00-100.00	0.43	1.01	A	0.211	2.559	10	0.85	1	15.200	0.56	27.86	B
			B	0.211	2.559		0.85	1	15.200			
			C	0.211	2.559		0.85	1	15.200			
T4 100.00-80.00	0.44	1.27	A	0.208	2.57	10	0.85	1	17.738	0.60	29.95	B
			B	0.208	2.57		0.85	1	17.738			
			C	0.208	2.57		0.85	1	17.738			
T5 80.00-60.00	0.50	1.34	A	0.168	2.707	9	0.85	1	18.923	0.67	33.30	B
			B	0.168	2.707		0.85	1	18.923			
			C	0.168	2.707		0.85	1	18.923			
T6 60.00-40.00	0.51	1.81	A	0.172	2.692	9	0.85	1	24.426	0.73	36.34	B
			B	0.172	2.692		0.85	1	24.426			
			C	0.172	2.692		0.85	1	24.426			
T7 40.00-20.00	0.51	2.41	A	0.171	2.696	8	0.85	1	27.545	0.71	35.42	B
			B	0.171	2.696		0.85	1	27.545			
			C	0.171	2.696		0.85	1	27.545			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	0.85	1	29.201	0.61	30.37	B
			B	0.153	2.759		0.85	1	29.201			
			C	0.153	2.759		0.85	1	29.201			
Sum Weight:	3.44	11.79						OTM	331.59 kip-ft	4.65		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M _x kip-ft	Sum of Overturning Moments, M _z kip-ft	Sum of Torques kip-ft
Leg Weight	7.51					
Bracing Weight	4.28					
Total Member Self-Weight	11.79			9.17	5.84	
Total Weight	17.90			9.17	5.84	
Wind 0 deg - No Ice		-0.01	-21.38	-1664.70	7.75	-2.08
Wind 30 deg - No Ice		9.60	-17.65	-1380.09	-746.09	7.21
Wind 60 deg - No Ice		15.80	-9.70	-753.99	-1231.38	12.33
Wind 90 deg - No Ice		17.80	0.14	21.38	-1384.64	12.80
Wind 120 deg - No Ice		17.63	10.60	839.04	-1369.34	16.85
Wind 150 deg - No Ice		10.22	17.72	1403.11	-796.84	13.68
Wind 180 deg - No Ice		0.12	19.53	1545.57	-4.46	3.60
Wind 210 deg - No Ice		-9.31	16.92	1339.72	734.84	-5.91
Wind 240 deg - No Ice		-16.72	9.95	785.65	1307.45	-11.15

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 22 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M _x kip-ft	Sum of Overturning Moments, M _z kip-ft	Sum of Torques kip-ft
Wind 270 deg - No Ice		-17.64	-0.36	-20.55	1383.50	-11.36
Wind 300 deg - No Ice		-16.53	-10.27	-801.43	1303.87	-13.45
Wind 330 deg - No Ice		-10.15	-18.20	-1424.33	803.49	-10.54
Member Ice	38.66					
Total Weight Ice	94.30			63.46	54.84	
Wind 0 deg - Ice		-0.00	-3.62	-227.58	54.99	-2.17
Wind 30 deg - Ice		1.74	-3.09	-185.92	-85.37	-0.36
Wind 60 deg - Ice		2.91	-1.73	-75.94	-180.26	1.33
Wind 90 deg - Ice		3.35	0.01	64.38	-215.28	2.60
Wind 120 deg - Ice		3.02	1.78	206.47	-188.18	3.60
Wind 150 deg - Ice		1.78	3.09	312.37	-88.70	3.57
Wind 180 deg - Ice		0.01	3.51	346.51	54.07	2.29
Wind 210 deg - Ice		-1.72	3.04	308.45	193.34	0.46
Wind 240 deg - Ice		-2.96	1.73	202.72	292.80	-1.24
Wind 270 deg - Ice		-3.34	-0.03	61.24	324.01	-2.50
Wind 300 deg - Ice		-2.97	-1.77	-79.25	294.08	-3.35
Wind 330 deg - Ice		-1.78	-3.13	-188.41	198.02	-3.34
Total Weight	17.90			9.17	5.84	
Wind 0 deg - Service		-0.00	-6.02	-462.57	-0.09	-0.56
Wind 30 deg - Service		2.72	-4.98	-383.89	-211.00	1.97
Wind 60 deg - Service		4.49	-2.75	-209.57	-347.53	3.37
Wind 90 deg - Service		5.06	0.04	7.12	-390.96	3.50
Wind 120 deg - Service		4.98	2.99	235.15	-384.55	4.58
Wind 150 deg - Service		2.88	5.00	392.82	-224.62	3.71
Wind 180 deg - Service		0.03	5.53	433.35	-3.37	0.97
Wind 210 deg - Service		-2.64	4.79	375.80	203.63	-1.62
Wind 240 deg - Service		-4.73	2.81	220.82	363.59	-3.05
Wind 270 deg - Service		-5.02	-0.10	-4.14	386.30	-3.12
Wind 300 deg - Service		-4.68	-2.90	-222.30	362.63	-3.67
Wind 330 deg - Service		-2.87	-5.13	-395.76	222.06	-2.87

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	23 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Comb. No.	Description
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	150 - 140	Leg	Max Tension	23	3.79	0.26	0.06
			Max. Compression	18	-4.64	-0.02	0.00
			Max. Mx	8	1.22	0.44	-0.05
			Max. My	3	0.65	-0.00	-0.41
			Max. Vy	20	-0.38	0.28	0.05
		Diagonal	Max. Vx	2	-0.35	-0.00	0.25
			Max Tension	22	1.38	0.00	0.00
			Max. Compression	10	-1.43	0.00	0.00
			Max. Mx	33	0.22	0.03	-0.00
			Max. My	11	1.26	0.00	-0.00
		Top Girt	Max. Vy	33	-0.04	0.03	-0.00
			Max. Vx	11	-0.00	0.00	0.00
			Max Tension	23	0.03	0.00	0.00
			Max. Compression	27	-0.04	0.00	0.00
			Max. Mx	26	-0.04	-0.07	0.00
			Max. Vy	26	-0.06	0.00	0.00
T2	140 - 120	Leg	Max Tension	15	21.90	0.01	-0.05
			Max. Compression	2	-24.42	-0.01	0.18
			Max. Mx	10	10.59	-0.22	-0.20
			Max. My	24	-1.15	0.15	0.26
			Max. Vy	10	0.09	-0.22	-0.20
		Diagonal	Max. Vx	24	-0.10	0.15	0.26
			Max Tension	10	2.70	0.00	0.00
			Max. Compression	10	-2.73	0.00	0.00

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	24 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T3	120 - 100	Leg	Max. Mx	35	0.24	0.03	0.00
			Max. My	11	2.69	0.01	-0.00
			Max. Vy	35	-0.04	0.03	0.00
			Max. Vx	11	-0.00	0.00	0.00
			Max Tension	15	54.88	0.02	-0.09
			Max. Compression	2	-60.47	-0.01	0.90
			Max. Mx	10	-59.95	-0.84	-0.31
			Max. My	2	-60.47	-0.01	0.90
		Diagonal	Max. Vy	8	0.31	-0.53	-0.04
			Max. Vx	2	-0.29	-0.01	0.60
			Max Tension	23	5.76	0.03	-0.00
			Max. Compression	10	-6.12	0.00	0.00
			Max. Mx	35	0.33	0.04	-0.00
			Max. My	25	-4.53	-0.03	0.01
			Max. Vy	35	-0.04	0.04	-0.00
			Max. Vx	25	0.00	0.00	0.00
T4	100 - 80	Leg	Max Tension	15	79.21	-0.76	-0.04
			Max. Compression	2	-87.24	1.03	-0.31
			Max. Mx	2	-79.58	1.03	-0.31
			Max. My	25	-1.71	-0.00	1.07
			Max. Vy	2	0.73	1.03	-0.31
			Max. Vx	4	-1.11	-0.14	-1.05
		Diagonal	Max Tension	7	4.20	0.00	0.00
			Max. Compression	18	-4.42	0.00	0.00
			Max. Mx	33	0.05	0.05	-0.01
			Max. My	10	-3.68	-0.01	-0.01
			Max. Vy	33	0.05	0.05	-0.01
			Max. Vx	31	0.00	0.00	0.00
		Leg	Max Tension	15	107.69	-0.55	-0.01
			Max. Compression	2	-120.69	0.83	0.01
			Max. Mx	3	-120.03	0.83	0.02
			Max. My	12	-3.72	-0.03	-0.90
			Max. Vy	3	0.85	0.83	-0.00
			Max. Vx	5	-1.31	-0.07	-0.79
T5	80 - 60	Diagonal	Max Tension	8	5.68	0.00	0.00
			Max. Compression	8	-5.65	0.00	0.00
			Max. Mx	33	0.09	0.07	0.01
			Max. My	31	-0.04	0.07	-0.01
			Max. Vy	33	0.06	0.07	0.01
			Max. Vx	31	0.00	0.00	0.00
		Leg	Max Tension	15	133.76	-0.77	-0.02
			Max. Compression	2	-151.51	1.35	0.02
			Max. Mx	2	-151.51	1.35	0.02
			Max. My	25	-1.87	-0.01	1.21
			Max. Vy	3	-0.17	1.35	0.02
			Max. Vx	12	0.20	0.01	-1.21
T6	60 - 40	Diagonal	Max Tension	8	5.43	0.00	0.00
			Max. Compression	10	-5.57	0.00	0.00
			Max. Mx	33	0.32	0.10	-0.01
			Max. My	37	-0.39	0.09	0.01
			Max. Vy	33	0.08	0.10	-0.01
			Max. Vx	37	-0.00	0.00	0.00
		Leg	Max Tension	15	155.69	-1.33	-0.03
			Max. Compression	2	-177.66	2.41	0.04
			Max. Mx	2	-177.66	2.41	0.04
			Max. My	25	-2.05	-0.08	2.33
			Max. Vy	29	0.31	-1.78	-0.01
			Max. Vx	25	0.35	-0.08	2.33
T7	40 - 20	Diagonal	Max Tension	8	6.40	0.00	0.00
			Max. Compression	10	-6.88	0.00	0.00
			Max. Mx	33	0.87	0.16	0.02

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	25 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T8	20 - 0	Leg	Max. My	32	0.84	0.16	-0.02
			Max. Vy	33	0.10	0.16	0.02
			Max. Vx	32	0.01	0.00	0.00
			Max Tension	15	178.33	-1.37	-0.01
			Max. Compression	2	-205.00	0.00	-0.00
			Max. Mx	2	-192.03	2.41	0.04
		Diagonal	Max. My	25	-2.47	-0.10	3.41
			Max. Vy	29	-0.38	-1.78	-0.01
			Max. Vx	25	0.50	-0.10	3.41
			Max Tension	23	6.96	0.00	0.00
			Max. Compression	10	-7.81	0.00	0.00
			Max. Mx	33	-0.84	0.21	-0.02
			Max. My	32	1.51	0.17	-0.03
			Max. Vy	34	0.11	0.17	0.03
			Max. Vx	32	0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	194.71	17.55	-9.35
	Max. H _x	18	194.71	17.55	-9.35
	Max. H _z	5	-159.72	-14.16	8.56
	Min. Vert	7	-172.93	-15.88	8.33
	Min. H _x	7	-172.93	-15.88	8.33
	Min. H _z	18	194.71	17.55	-9.35
Leg B	Max. Vert	10	204.91	-18.68	-9.59
	Max. H _x	23	-183.04	16.72	8.76
	Max. H _z	25	-168.03	14.91	8.79
	Min. Vert	23	-183.04	16.72	8.76
	Min. H _x	10	204.91	-18.68	-9.59
	Min. H _z	10	204.91	-18.68	-9.59
Leg A	Max. Vert	2	212.48	-0.14	21.77
	Max. H _x	21	8.39	0.63	0.79
	Max. H _z	2	212.48	-0.14	21.77
	Min. Vert	15	-184.50	0.21	-18.95
	Min. H _x	8	4.81	-0.57	0.43
	Min. H _z	15	-184.50	0.21	-18.95

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	17.90	0.00	-0.00	9.17	5.84	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	21.48	-0.02	-34.21	-2667.19	10.07	-3.32
0.9 Dead+1.6 Wind 0 deg - No Ice	16.11	-0.02	-34.21	-2669.94	8.31	-3.32
1.2 Dead+1.6 Wind 30 deg - No Ice	21.48	15.36	-28.24	-2211.81	-1196.08	11.53
0.9 Dead+1.6 Wind 30 deg - No Ice	16.11	15.36	-28.24	-2214.56	-1197.83	11.53

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 26 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Ice						
1.2 Dead+1.6 Wind 60 deg - No Ice	21.48	25.27	-15.52	-1210.05	-1972.54	19.73
0.9 Dead+1.6 Wind 60 deg - No Ice	16.11	25.27	-15.52	-1212.80	-1974.30	19.73
1.2 Dead+1.6 Wind 90 deg - No Ice	21.48	28.49	0.22	30.54	-2217.75	20.47
0.9 Dead+1.6 Wind 90 deg - No Ice	16.11	28.49	0.22	27.79	-2219.50	20.47
1.2 Dead+1.6 Wind 120 deg - No Ice	21.48	28.21	16.95	1338.80	-2193.27	26.95
0.9 Dead+1.6 Wind 120 deg - No Ice	16.11	28.21	16.95	1336.05	-2195.02	26.95
1.2 Dead+1.6 Wind 150 deg - No Ice	21.48	16.35	28.36	2241.30	-1277.28	21.89
0.9 Dead+1.6 Wind 150 deg - No Ice	16.11	16.35	28.36	2238.55	-1279.03	21.89
1.2 Dead+1.6 Wind 180 deg - No Ice	21.48	0.20	31.25	2469.24	-9.47	5.76
0.9 Dead+1.6 Wind 180 deg - No Ice	16.11	0.20	31.25	2466.49	-11.22	5.76
1.2 Dead+1.6 Wind 210 deg - No Ice	21.48	-14.90	27.08	2139.87	1173.40	-9.45
0.9 Dead+1.6 Wind 210 deg - No Ice	16.11	-14.90	27.08	2137.12	1171.65	-9.45
1.2 Dead+1.6 Wind 240 deg - No Ice	21.48	-26.75	15.91	1253.36	2089.58	-17.83
0.9 Dead+1.6 Wind 240 deg - No Ice	16.11	-26.75	15.91	1250.61	2087.83	-17.83
1.2 Dead+1.6 Wind 270 deg - No Ice	21.48	-28.23	-0.57	-36.55	2211.26	-18.18
0.9 Dead+1.6 Wind 270 deg - No Ice	16.11	-28.23	-0.57	-39.30	2209.51	-18.18
1.2 Dead+1.6 Wind 300 deg - No Ice	21.48	-26.46	-16.43	-1285.96	2083.86	-21.51
0.9 Dead+1.6 Wind 300 deg - No Ice	16.11	-26.46	-16.43	-1288.71	2082.11	-21.51
1.2 Dead+1.6 Wind 330 deg - No Ice	21.48	-16.24	-29.12	-2282.59	1283.25	-16.87
0.9 Dead+1.6 Wind 330 deg - No Ice	16.11	-16.24	-29.12	-2285.35	1281.50	-16.87
1.2 Dead+1.0 Ice+1.0 Temp	97.88	0.00	-0.00	65.29	56.01	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	97.88	-0.00	-3.62	-225.76	56.16	-2.17
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	97.88	1.74	-3.09	-184.09	-84.20	-0.36
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	97.88	2.91	-1.73	-74.11	-179.09	1.33
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	97.88	3.35	0.01	66.21	-214.11	2.60
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	97.88	3.02	1.78	208.30	-187.01	3.60
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	97.88	1.78	3.09	314.20	-87.53	3.57
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	97.88	0.01	3.51	348.33	55.24	2.29
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	97.88	-1.72	3.04	310.28	194.51	0.46
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	97.88	-2.96	1.73	204.55	293.96	-1.24
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	97.88	-3.34	-0.03	63.07	325.18	-2.50

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	27 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 300	97.88	-2.97	-1.77	-77.42	295.25	-3.35
deg+1.0 Ice+1.0 Temp						
1.2 Dead+1.0 Wind 330	97.88	-1.78	-3.13	-186.58	199.19	-3.34
deg+1.0 Ice+1.0 Temp						
Dead+Wind 0 deg - Service	17.90	-0.00	-6.02	-457.24	6.35	-0.56
Dead+Wind 30 deg - Service	17.90	2.72	-4.98	-378.55	-204.55	1.97
Dead+Wind 60 deg - Service	17.90	4.49	-2.75	-204.24	-341.08	3.37
Dead+Wind 90 deg - Service	17.90	5.06	0.04	12.45	-384.51	3.50
Dead+Wind 120 deg - Service	17.90	4.98	2.99	240.48	-378.11	4.58
Dead+Wind 150 deg - Service	17.90	2.88	5.00	398.15	-218.17	3.71
Dead+Wind 180 deg - Service	17.90	0.03	5.53	438.68	3.07	0.97
Dead+Wind 210 deg - Service	17.90	-2.64	4.79	381.14	210.07	-1.62
Dead+Wind 240 deg - Service	17.90	-4.73	2.81	226.15	370.04	-3.05
Dead+Wind 270 deg - Service	17.90	-5.02	-0.10	1.19	392.75	-3.12
Dead+Wind 300 deg - Service	17.90	-4.68	-2.90	-216.97	369.08	-3.67
Dead+Wind 330 deg - Service	17.90	-2.87	-5.13	-390.43	228.50	-2.87

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-17.90	0.00	-0.00	17.90	0.00	0.000%
2	-0.02	-21.48	-34.21	0.02	21.48	34.21	0.000%
3	-0.02	-16.11	-34.21	0.02	16.11	34.21	0.000%
4	15.36	-21.48	-28.24	-15.36	21.48	28.24	0.000%
5	15.36	-16.11	-28.24	-15.36	16.11	28.24	0.000%
6	25.27	-21.48	-15.52	-25.27	21.48	15.52	0.000%
7	25.27	-16.11	-15.52	-25.27	16.11	15.52	0.000%
8	28.49	-21.48	0.22	-28.49	21.48	-0.22	0.000%
9	28.49	-16.11	0.22	-28.49	16.11	-0.22	0.000%
10	28.21	-21.48	16.95	-28.21	21.48	-16.95	0.000%
11	28.21	-16.11	16.95	-28.21	16.11	-16.95	0.000%
12	16.35	-21.48	28.36	-16.35	21.48	-28.36	0.000%
13	16.35	-16.11	28.36	-16.35	16.11	-28.36	0.000%
14	0.20	-21.48	31.25	-0.20	21.48	-31.25	0.000%
15	0.20	-16.11	31.25	-0.20	16.11	-31.25	0.000%
16	-14.90	-21.48	27.08	14.90	21.48	-27.08	0.000%
17	-14.90	-16.11	27.08	14.90	16.11	-27.08	0.000%
18	-26.75	-21.48	15.91	26.75	21.48	-15.91	0.000%
19	-26.75	-16.11	15.91	26.75	16.11	-15.91	0.000%
20	-28.23	-21.48	-0.57	28.23	21.48	0.57	0.000%
21	-28.23	-16.11	-0.57	28.23	16.11	0.57	0.000%
22	-26.46	-21.48	-16.43	26.46	21.48	16.43	0.000%
23	-26.46	-16.11	-16.43	26.46	16.11	16.43	0.000%
24	-16.24	-21.48	-29.12	16.24	21.48	29.12	0.000%
25	-16.24	-16.11	-29.12	16.24	16.11	29.12	0.000%
26	0.00	-97.88	0.00	-0.00	97.88	0.00	0.000%
27	-0.00	-97.88	-3.62	0.00	97.88	3.62	0.000%
28	1.74	-97.88	-3.09	-1.74	97.88	3.09	0.000%
29	2.91	-97.88	-1.73	-2.91	97.88	1.73	0.000%
30	3.35	-97.88	0.01	-3.35	97.88	-0.01	0.000%
31	3.02	-97.88	1.78	-3.02	97.88	-1.78	0.000%
32	1.78	-97.88	3.09	-1.78	97.88	-3.09	0.000%
33	0.01	-97.88	3.51	-0.01	97.88	-3.51	0.000%
34	-1.72	-97.88	3.04	1.72	97.88	-3.04	0.000%
35	-2.96	-97.88	1.73	2.96	97.88	-1.73	0.000%

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	28 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
36	-3.34	-97.88	-0.03	3.34	97.88	0.03	0.000%
37	-2.97	-97.88	-1.77	2.97	97.88	1.77	0.000%
38	-1.78	-97.88	-3.13	1.78	97.88	3.13	0.000%
39	-0.00	-17.90	-6.02	0.00	17.90	6.02	0.000%
40	2.72	-17.90	-4.98	-2.72	17.90	4.98	0.000%
41	4.49	-17.90	-2.75	-4.49	17.90	2.75	0.000%
42	5.06	-17.90	0.04	-5.06	17.90	-0.04	0.000%
43	4.98	-17.90	2.99	-4.98	17.90	-2.99	0.000%
44	2.88	-17.90	5.00	-2.88	17.90	-5.00	0.000%
45	0.03	-17.90	5.53	-0.03	17.90	-5.53	0.000%
46	-2.64	-17.90	4.79	2.64	17.90	-4.79	0.000%
47	-4.73	-17.90	2.81	4.73	17.90	-2.81	0.000%
48	-5.02	-17.90	-0.10	5.02	17.90	0.10	0.000%
49	-4.68	-17.90	-2.90	4.68	17.90	2.90	0.000%
50	-2.87	-17.90	-5.13	2.87	17.90	5.13	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	150 - 140	3.153	44	0.19	0.06
T2	140 - 120	2.746	44	0.19	0.06
T3	120 - 100	1.965	44	0.17	0.05
T4	100 - 80	1.292	44	0.14	0.04
T5	80 - 60	0.781	44	0.10	0.03
T6	60 - 40	0.415	39	0.07	0.01
T7	40 - 20	0.183	39	0.04	0.01
T8	20 - 0	0.049	39	0.02	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
159.00	5/8-in x 4-ft Lightning Rod	44	3.153	0.19	0.06	301225
149.00	20"x3" pipe	44	3.112	0.19	0.06	301225
147.00	Side Arm Mount [SO 303-3]	44	3.030	0.19	0.06	301225
117.00	Side Arm Mount [SO 303-3]	44	1.855	0.17	0.05	39255
92.00	6' Dish Ice Shield	44	1.069	0.12	0.03	29786
86.00	8' Dish Ice Shield	44	0.918	0.11	0.03	32843
85.00	HX6-6W-6WH	44	0.894	0.11	0.03	33414
80.00	PL6-65-PXA	44	0.781	0.10	0.03	35799
79.00	PL6-65-PXA	44	0.759	0.10	0.03	35910

Maximum Tower Deflections - Design Wind

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	29 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	150 - 140	18.301	3	1.12	0.34
T2	140 - 120	15.946	3	1.11	0.33
T3	120 - 100	11.422	3	0.99	0.29
T4	100 - 80	7.533	3	0.79	0.22
T5	80 - 60	4.580	3	0.59	0.17
T6	60 - 40	2.426	3	0.38	0.09
T7	40 - 20	1.065	3	0.22	0.04
T8	20 - 0	0.284	3	0.11	0.02

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
159.00	5/8-in x 4-ft Lightning Rod	3	18.301	1.12	0.34	59163
149.00	20"x3" pipe	3	18.064	1.12	0.33	59163
147.00	Side Arm Mount [SO 303-3]	3	17.592	1.12	0.33	59163
117.00	Side Arm Mount [SO 303-3]	3	10.787	0.96	0.28	6766
92.00	6' Dish Ice Shield	3	6.244	0.71	0.20	5198
86.00	8' Dish Ice Shield	3	5.375	0.65	0.19	5807
85.00	HX6-6W-6WH	3	5.238	0.64	0.18	5923
80.00	PL6-65-PXA	3	4.580	0.59	0.17	6410
79.00	PL6-65-PXA	3	4.454	0.58	0.16	6433

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load Allowable	Allowable Ratio	Criteria
T1	150	Leg	A325N	0.7500	4	0.95	29.82	0.032	1	Bolt Tension
		Diagonal	A325N	0.7500	1	1.38	4.62	0.298	1	Member Block Shear
		Top Girt	A325N	0.7500	1	0.08	7.37	0.011	1	Member Block Shear
T2	140	Leg	A325N	0.7500	4	5.48	29.82	0.184	1	Bolt Tension
		Diagonal	A325N	0.7500	1	2.70	4.62	0.583	1	Member Block Shear
T3	120	Leg	A325N	0.7500	6	9.15	29.82	0.307	1	Bolt Tension
		Diagonal	A325X	0.7500	1	5.76	7.77	0.741	1	Member Block Shear
T4	100	Leg	A325N	0.7500	8	9.90	29.82	0.332	1	Bolt Tension
		Diagonal	A325N	0.7500	1	4.20	6.93	0.606	1	Member Block Shear
T5	80	Leg	A325N	0.7500	8	13.46	29.82	0.451	1	Bolt Tension
		Diagonal	A325N	0.7500	1	5.68	6.93	0.819	1	Member Block Shear
T6	60	Leg	A325N	1.0000	8	16.72	53.01	0.315	1	Bolt Tension
		Diagonal	A325N	0.7500	1	5.43	8.97	0.605	1	Member Block Shear
T7	40	Leg	A325N	1.0000	8	19.46	53.01	0.367	1	Bolt Tension
		Diagonal	A325N	1.0000	1	6.40	10.16	0.630	1	Member Block

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	30 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load Allowable	Allowable Ratio	Criteria
T8	20	Diagonal	A325N	1.0000	1	6.96	16.94	0.411	1	Shear Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	150 - 140	P2.5x.203 (2.875 OD)	10.00	5.00	63.3 K=1.00	1.7040	-4.64	57.19	0.081 ¹
T2	140 - 120	P2.5x.203 (2.875 OD)	20.00	5.00	63.3 K=1.00	1.7040	-24.42	57.19	0.427 ¹
T3	120 - 100	P4x.237 (4.50 OD)	20.00	6.67	53.0 K=1.00	3.1741	-60.47	116.32	0.520 ¹
T4	100 - 80	P5x.258 (5.563 OD)	20.03	6.68	42.7 K=1.00	4.2999	-87.24	169.37	0.515 ¹
T5	80 - 60	P5x.258 (5.563 OD)	20.03	6.68	42.7 K=1.00	4.2999	-120.69	169.37	0.713 ¹
T6	60 - 40	P6x.28 (6.625 OD)	20.03	6.68	35.7 K=1.00	5.5813	-151.51	228.83	0.662 ¹
T7	40 - 20	Pipe 8.625"ODx0.322"	20.03	10.02	40.9 K=1.00	8.3993	-177.66	334.42	0.531 ¹
T8	20 - 0	Pipe 8.625"ODx0.322"	20.03	10.02	40.9 K=1.00	8.3993	-205.00	334.42	0.613 ¹

¹ P_u / φP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	150 - 140	L2x2x1/8	7.07	3.23	103.1 K=1.06	0.4844	-1.43	8.83	0.162 ¹
T2	140 - 120	L2x2x1/8	7.07	3.23	103.1 K=1.06	0.4844	-2.73	8.83	0.310 ¹
T3	120 - 100	L2x2x3/16	8.33	3.72	114.9 K=1.01	0.7150	-6.12	12.23	0.501 ¹
T4	100 - 80	L2x2x3/16	9.43	4.49	136.7 K=1.00	0.7150	-4.42	8.65	0.512 ¹
T5	80 - 60	L2x2x3/16	10.94	5.25	159.9 K=1.00	0.7150	-5.43	6.32	0.859 ¹
T6	60 - 40	L2 1/2x2 1/2x3/16	12.58	6.03	146.1 K=1.00	0.9020	-5.39	9.55	0.565 ¹

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job	Buckeye Mt. - Viper	Page	31 of 33
	Project	ETS, PLLC Job No. 24125017.STR.8177	Date	15:00:36 03/25/25
	Client	Watauga County	Designed by	hicham.anssar

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T7	40 - 20	L3x3x3/16	16.01	7.70	155.0 K=1.00	1.0900	-6.88	10.25	0.671 ¹
T8	20 - 0	L3x3x5/16	17.62	8.51	173.4 K=1.00	1.7800	-7.81	13.38	0.583 ¹

¹ P_u / φP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	150 - 140	L2x2x3/16	5.00	4.47	136.1 K=1.00	0.7150	-0.08	8.72	0.009 ¹

¹ P_u / φP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	150 - 140	P2.5x.203 (2.875 OD)	10.00	5.00	63.3	1.7040	3.79	76.68	0.049 ¹
T2	140 - 120	P2.5x.203 (2.875 OD)	20.00	5.00	63.3	1.7040	21.90	76.68	0.286 ¹
T3	120 - 100	P4x.237 (4.50 OD)	20.00	6.67	53.0	3.1741	54.88	142.83	0.384 ¹
T4	100 - 80	P5x.258 (5.563 OD)	20.03	6.68	42.7	4.2999	79.21	193.49	0.409 ¹
T5	80 - 60	P5x.258 (5.563 OD)	20.03	6.68	42.7	4.2999	107.69	193.49	0.557 ¹
T6	60 - 40	P6x.28 (6.625 OD)	20.03	6.68	35.7	5.5813	133.76	251.16	0.533 ¹
T7	40 - 20	Pipe 8.625"ODx0.322"	20.03	10.02	40.9	8.3993	155.69	377.97	0.412 ¹
T8	20 - 0	Pipe 8.625"ODx0.322"	20.03	10.02	40.9	8.3993	178.33	377.97	0.472 ¹

¹ P_u / φP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	150 - 140	L2x2x1/8	7.07	3.23	64.5	0.2812	1.38	12.23	0.113 ¹
T2	140 - 120	L2x2x1/8	7.07	3.23	64.5	0.2812	2.70	12.23	0.220 ¹
T3	120 - 100	L2x2x3/16	8.33	3.72	75.0	0.4132	5.76	20.14	0.286 ¹
T4	100 - 80	L2x2x3/16	9.43	4.49	89.9	0.4132	4.20	17.97	0.234 ¹

tnxTower Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Job Buckeye Mt. - Viper	Page 32 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T5	80 - 60	L2x2x3/16	9.91	4.75	95.1	0.4132	5.68	17.97	0.316 ¹
T6	60 - 40	L2 1/2x2 1/2x3/16	12.02	5.75	90.8	0.5535	5.43	24.08	0.226 ¹
T7	40 - 20	L3x3x3/16	16.01	7.70	100.5	0.6593	6.40	28.68	0.223 ¹
T8	20 - 0	L3x3x5/16	17.62	8.51	112.9	1.0713	6.96	46.60	0.149 ¹

¹ P_u / φP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T1	150 - 140	L2x2x3/16	5.00	4.47	92.6	0.4132	0.08	17.97	0.004 ¹

¹ P_u / φP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	φP _{allow} K	% Capacity	Pass Fail
T1	150 - 140	Leg	P2.5x.203 (2.875 OD)	1	-4.64	57.19	8.1	Pass
T2	140 - 120	Leg	P2.5x.203 (2.875 OD)	21	-24.42	57.19	42.7	Pass
T3	120 - 100	Leg	P4x.237 (4.50 OD)	48	-60.47	116.32	52.0	Pass
T4	100 - 80	Leg	P5x.258 (5.563 OD)	69	-87.24	169.37	51.5	Pass
T5	80 - 60	Leg	P5x.258 (5.563 OD)	90	-120.69	169.37	71.3	Pass
T6	60 - 40	Leg	P6x.28 (6.625 OD)	111	-151.51	228.83	66.2	Pass
T7	40 - 20	Leg	Pipe 8.625"ODx0.322"	132	-177.66	334.42	53.1	Pass
T8	20 - 0	Leg	Pipe 8.625"ODx0.322"	147	-205.00	334.42	61.3	Pass
T1	150 - 140	Diagonal	L2x2x1/8	8	-1.43	8.83	16.2	Pass
							29.8 (b)	
T2	140 - 120	Diagonal	L2x2x1/8	23	-2.73	8.83	31.0	Pass
							58.3 (b)	
T3	120 - 100	Diagonal	L2x2x3/16	50	-6.12	12.23	50.1	Pass
							74.1 (b)	
T4	100 - 80	Diagonal	L2x2x3/16	70	-4.42	8.65	51.2	Pass
							60.6 (b)	
T5	80 - 60	Diagonal	L2x2x3/16	92	-5.43	6.32	85.9	Pass
T6	60 - 40	Diagonal	L2 1/2x2 1/2x3/16	113	-5.39	9.55	56.5	Pass
							60.5 (b)	
T7	40 - 20	Diagonal	L3x3x3/16	134	-6.88	10.25	67.1	Pass
T8	20 - 0	Diagonal	L3x3x5/16	149	-7.81	13.38	58.3	Pass
T1	150 - 140	Top Girt	L2x2x3/16	4	-0.08	8.72	0.9	Pass
							1.1 (b)	
							Summary	
						Leg (T5)	71.3	Pass
						Diagonal (T5)	85.9	Pass
						Top Girt (T1)	1.1	Pass
						Bolt Checks	81.9	Pass
						RATING =	85.9	Pass

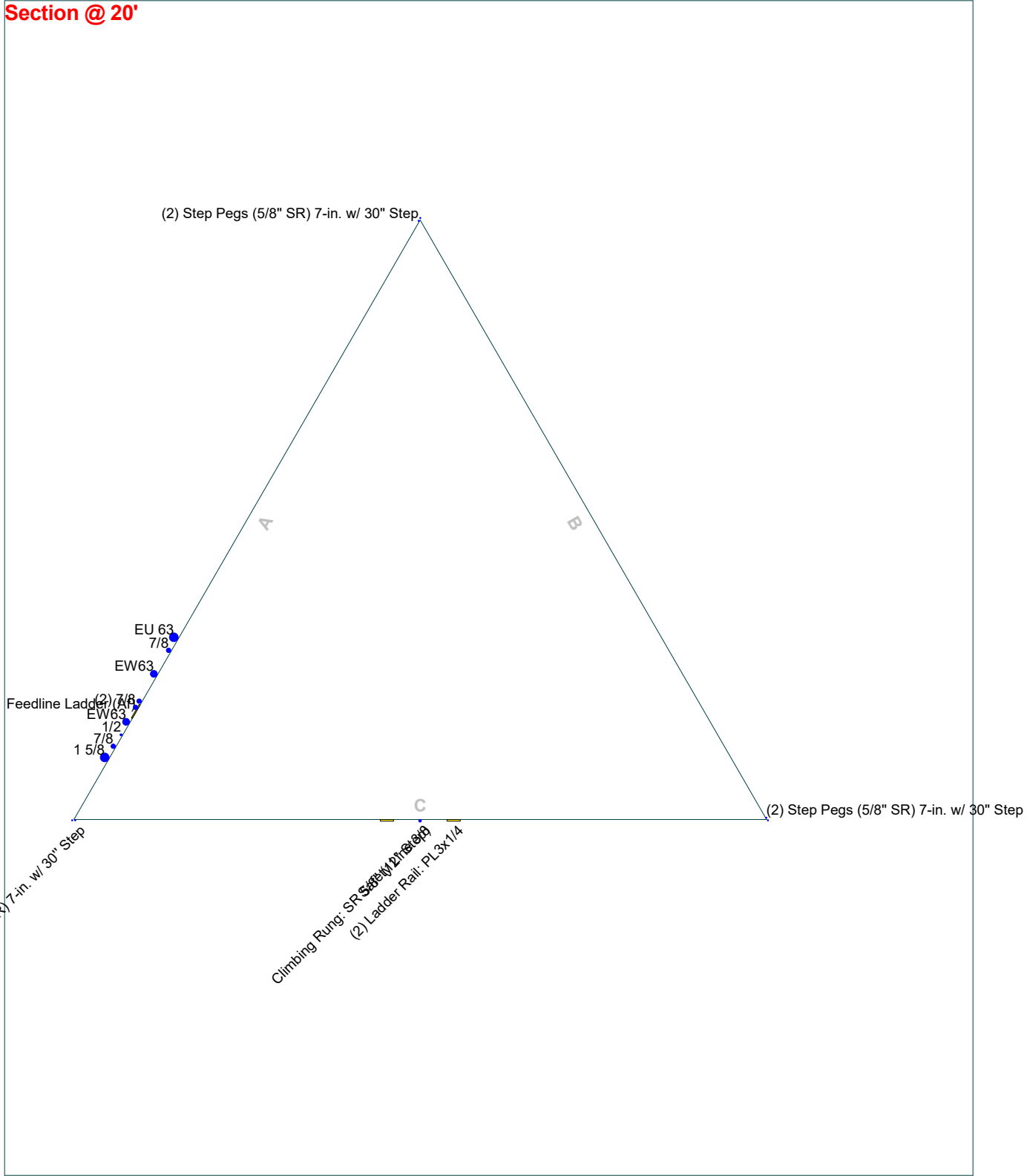
<i>tnxTower</i> <i>Engineered Tower Solutions, PLLC</i> <i>3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710</i>	Job Buckeye Mt. - Viper	Page 33 of 33
	Project ETS, PLLC Job No. 24125017.STR.8177	Date 15:00:36 03/25/25
	Client Watauga County	Designed by hicham.anssar

APPENDIX B
BASE LEVEL DRAWING

Feed Line Plan
20'

Round Flat App In Face App Out Face

Section @ 20'



Engineered Tower Solutions, PLLC
3227 Wellington Ct.
Raleigh, NC 27615
Phone: (919) 782-2710
FAX: 919-782-2710

Job: Buckeye Mt. - Viper		
Project: ETS, PLLC Job No. 24125017.STR.8177		
Client: Watauga County	Drawn by: hicham.anssar	App'd:
Code: TIA-222-G	Date: 03/25/25	Scale: NTS
Path:		Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

Self Support Anchor Rod Capacity

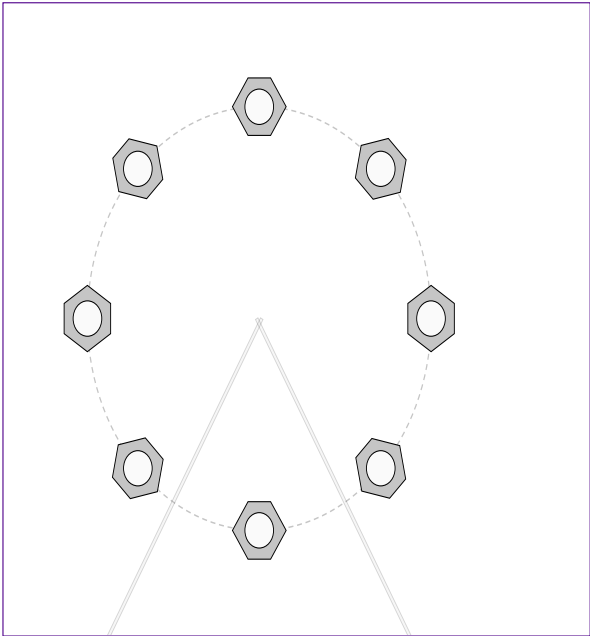
Site Info		
Site #	HP-1343	
Site Name	Buckeye Mt. - Viper	
ETS, PLLC #	24125017.STR.8177	

Analysis Considerations		
TIA-222 Revision	G	
Grout Considered:	Yes	
l_{ar} (in)	0	
Eta Factor, η	0.55	

Applied Loads		
	Comp.	Uplift
Axial Force (kips)	212.00	185.00
Shear Force (kips)	22.00	19.00

Considered Eccentricity		
Leg Mod Eccentricity (in)	0.000	
Anchor Rod N.A Shift (in)	0.000	
Total Eccentricity (in)	0.000	

*Anchor Rod Eccentricity Applied



Connection Properties		Analysis Results	
Anchor Rod Data		Anchor Rod Summary (units of kips, kip-in)	
(8) 1" $\varnothing$ bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi)		$Pu_t = 23.13$	$\phi Pn_t = 36.36$
l_{ar} (in): 0		$Vu = 2.38$	$\phi Vn = n/a$
		$Mu = n/a$	$\phi Mn = n/a$
		Stress Rating	
		75.5%	
		Pass	

SST Unit Base Foundation

Site #: HP-1343
 Site Name: Buckeye Mt. - Viper
 ETS, PLLC #: 24125017.STR.8177

TIA-222 Revision: G

Top & Bot. Pad Rein. Different?:	☐
Tower Centroid Offset?:	☒
Block Foundation?:	☐
Rectangular Pad?:	☐

Superstructure Analysis Reactions		
Global Moment, M :	2670	ft-kips
Global Axial, P :	21	kips
Global Shear, V :	34	kips
Leg Compression, P_{comp} :	212	kips
Leg Comp. Shear, V_{u,comp} :	22	kips
Leg Uplift, P_{uplift} :	185	kips
Leg Uplift. Shear, V_{u,uplift} :	19	kips
Tower Height, H :	150	ft
Base Face Width, BW :	15	ft
BP Dist. Above Fdn, bp_{dist} :	3	in

Foundation Analysis Checks				
	Capacity	Demand	Rating	Check
<i>Lateral (Sliding) (kips)</i>	209.40	34.00	16.2%	Pass
<i>Bearing Pressure (ksf)</i>	4.31	1.95	45.4%	Pass
<i>Overturning (kip*ft)</i>	5011.94	3019.70	60.3%	Pass
<i>Pier Flexure (Comp.) (kip*ft)</i>	1094.56	121.00	11.1%	Pass
<i>Pier Flexure (Tension) (kip*ft)</i>	592.82	104.50	17.6%	Pass
<i>Pier Compression (kip)</i>	5998.68	224.44	3.7%	Pass
<i>Pad Flexure (kip*ft)</i>	1815.06	215.38	11.9%	Pass
<i>Pad Shear - 1-way (kips)</i>	394.85	74.99	19.0%	Pass
<i>Pad Shear - Comp 2-way (ksi)</i>	0.164	0.070	42.6%	Pass

Pier Properties		
Pier Shape:	Circular	
Pier Diameter, dpier :	4.0	ft
Ext. Above Grade, E :	0.50	ft
Pier Rebar Size, Sc :	7	
Pier Rebar Quantity, mc :	16	
Pier Tie/Spiral Size, St :	4	
Pier Tie/Spiral Quantity, mt :	7	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier} :	3	in

Structural Rating:	42.6%
Soil Rating:	60.3%

Pad Properties		
Depth, D :	6.75	ft
Pad Width, W₁ :	24.00	ft
Pad Thickness, T :	1.75	ft
Pad Rebar Size (Bottom dir. 2), Sp₂ :	7	
Pad Rebar Quantity (Bottom dir. 2), mp₂ :	43	
Pad Clear Cover, cc_{pad} :	3	in

Material Properties		
Rebar Grade, Fy :	60	ksi
Concrete Compressive Strength, F'c :	3.0	ksi
Dry Concrete Density, δc :	150	pcf

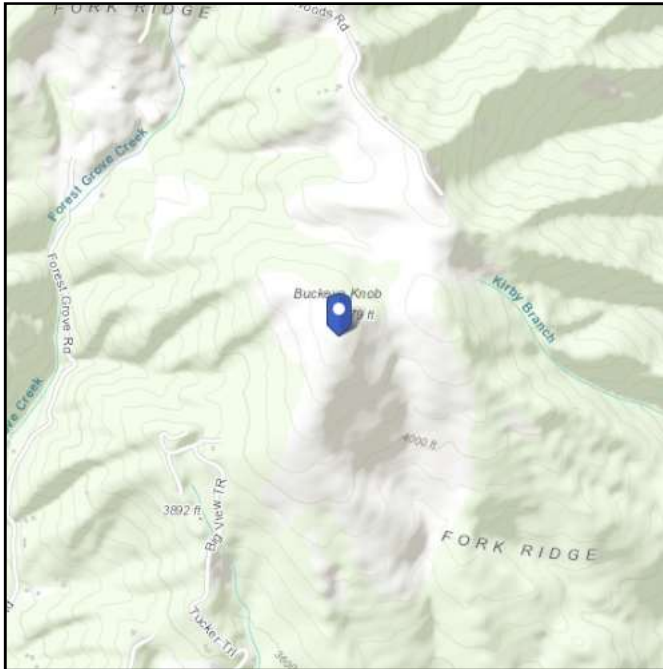
Soil Properties		
Total Soil Unit Weight, γ :	110	pcf
Ultimate Net Bearing, Qnet :	5.000	ksf
Cohesion, Cu :	0.000	ksf
Friction Angle, φ :	30	degrees
SPT Blow Count, N_{blows} :	12	
Base Friction, μ :	0.35	
Neglected Depth, N :	2.0	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, gw :	N/A	ft

ASCE Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: IV
Soil Class: D - Stiff Soil

Latitude: 36.31608
Longitude: -81.79151
Elevation: 4364.061870703125 ft (NAVD 88)



Wind

Results:

Wind Speed	120 Vmph	140 Vmph for elevations between 3500 ft and 4500 ft, Topographic effects do not need to be considered with the required wind speeds per Jurisdiction guidances.
10-year MRI	76 Vmph	
25-year MRI	84 Vmph	
50-year MRI	90 Vmph	
100-year MRI	96 Vmph	
Special	Special Wind Region -- Mountainous terrain, gorges, and special wind regions shown in Fig. 26.5-1 shall be examined for unusual wind conditions. The Authority Having Jurisdiction shall, if necessary, adjust the values given in Fig. 26.5-1 to account for higher local wind speeds. Such adjustment shall be based on meteorological information and an estimate of the basic wind speed obtained in accordance with the provisions in Section 26.5.3.	

Data Source: ASCE/SEI 7-10, Fig. 26.5-1B and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014
Date Accessed: Tue Mar 25 2025



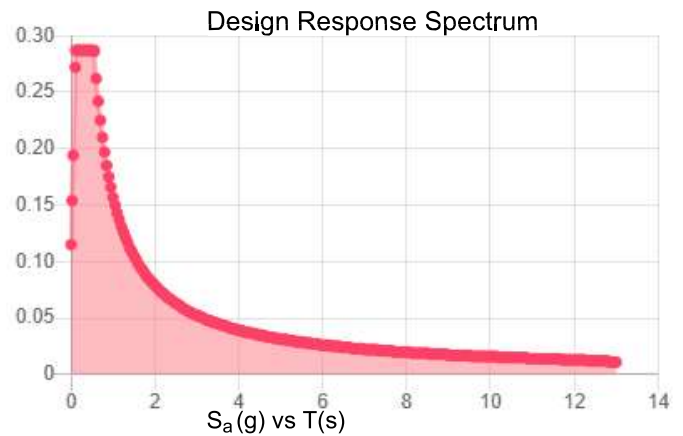
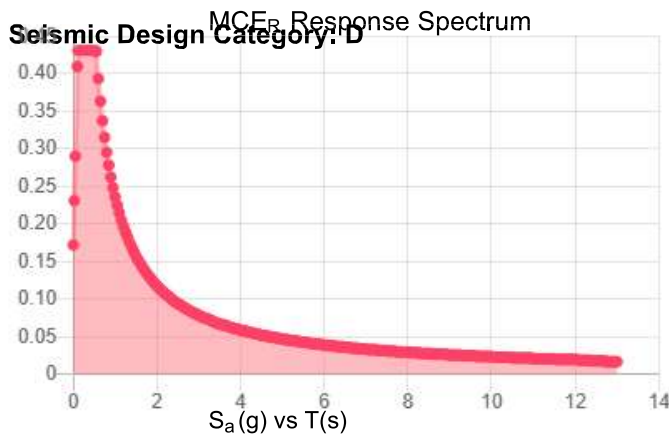
Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (annual exceedance probability = 0.000588, MRI = 1,700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2.

Site Soil Class: D - Stiff Soil

Results:

S_s :	0.272	S_{D1} :	0.157
S_1 :	0.098	T_L :	12
F_a :	1.582	PGA :	0.145
F_v :	2.4	PGA_M :	0.219
S_{MS} :	0.431	F_{PGA} :	1.51
S_{M1} :	0.236	I_e :	1.5
S_{DS} :	0.287		



Data Accessed: Tue Mar 25 2025

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

Ice

Results:

Ice Thickness: 0.75 in.

Concurrent Temperature: 15 F

Gust Speed 30 mph

Data Source: Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8

Date Accessed: Tue Mar 25 2025

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

In the Appalachian Mountains, ice thicknesses may vary significantly over short distances.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-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.

The ASCE Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE Hazard Tool.

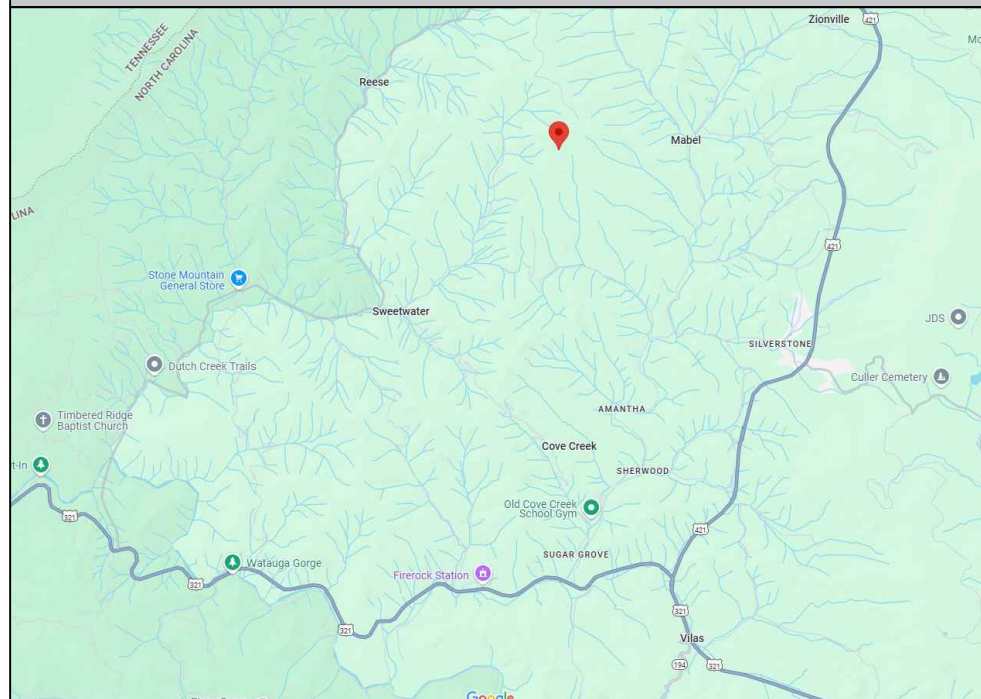
APPENDIX D

MODIFICATION DESIGN DRAWINGS

TOWER MODIFICATION DRAWINGS

SITE INFORMATION	
SITE NAME	BUCKEYE MT. - VIPER
SITE NUMBER	HP-1343
SITE ADDRESS	2542 FOREST GROVE ROAD VILAS, NC 28698 WATAUGA COUNTY
LAT. / LONG.	N 36.316081°, W 81.791511°
ETS JOB#:	24125017.STR.8177
TOWER MANUFACTURER	VALMONT
TOWER TYPE	SELF SUPPORT TOWER
TOWER HEIGHT	150.0 FT

LOCATION MAP



DRIVING DIRECTIONS

FROM VILAS, HEAD SOUTH ON ABBY LN TOWARD US-321 S/US-421 S (125 FT).
SHARP RIGHT ONTO US-321 N/US-421 N (10.2 MI). TURN LEFT ONTO BULLDOG RD
(3.0 MI). TURN LEFT ONTO N FORK RD (0.8 MI). CONTINUE STRAIGHT ONTO FORK
RIDGE RD (1.4 MI). TURN LEFT ONTO BUCKEYE RIDGE RD/WOOD'S RD (0.7 MI). TURN
RIGHT ONTO FORK RIDGE RD (0.4 MI). TOWER WILL BE ON THE RIGHT.



PROJECT CONTACTS

1. CLIENT REPRESENTATIVE

MARTY RANDALL

10-18 CONSULTING
MOBILE: (828) 527-2416

MARTY.RANDALL@1018CONSULTING.COM
2. CONSTRUCTION MANAGER
TBD
3. ENGINEER OF RECORD (EOR)

J. SCOTT HILGOE, P.E.

3227 WELLINGTON CT.
RALEIGH, NC 27615
OFFICE: (919) 782-2710

SCOTT.HILGOE@ETS-PLLC.COM

ETS OFFERS REVIEW OF CONTRACTOR-PREPARED CLASS IV RIGGING PLANS FOR A FEE. CONTACT RIGGING@ETS-PLLC.COM FOR PRICING AT TIMELINE.

NOTE FOR CONTRACTOR:

EOR HAS COMPLETED THIS DESIGN CAREFULLY TO ENSURE SUFFICIENT DETAILS ARE PROVIDED FOR AN EFFECTIVE AND CONSTRUCTIBLE DESIGN BASED ON THE AVAILABLE INFORMATION AT THE TIME OF THE DESIGN. IF NEW INFORMATION BECOMES AVAILABLE, INCLUDING INFORMATION GLEANED FROM THE PRE-MOD MAPPING AND / OR CONTRACTOR VISIT, EOR IS AVAILABLE TO REVIEW THIS PRIOR TO MATERIAL ORDERS, FABRICATION, OR CONSTRUCTION OF DESIGN. HOWEVER, ANY DEVIATION FROM THIS DESIGN SHALL REQUIRE EOR APPROVAL AS WELL AS FULL DOCUMENTATION OF SAID CHANGES. ETS RESERVES THE RIGHT TO CHARGE THE CONTRACTOR AN EOR CONSULTING FEE OF \$900 TO COVER TIME AND EFFORT OF EXAMINING SAID CHANGES FOR POSSIBLE APPROVAL. ADDITIONAL FEE MAY BE REQUIRED FOR PRODUCING REVISED SEALED DESIGN DRAWINGS. EXAMPLES OF ITEMS TRIGGERING EOR CONSULTING FEE OF \$900 INCLUDE BUT ARE NOT LIMITED TO: EVALUATION OF MOVING REINFORCEMENTS TO DIFFERENT POSITIONS, PROVIDING ALTERNATE OPTIONS, APPROVING MATERIAL SIZES OR GRADES THAT DIFFER FROM THOSE LISTED IN DESIGN DRAWINGS, ADDRESSING INTERFERENCE ISSUES, APPROVING COPING OR EDGE DISTANCES BEYOND THE TOLERANCES LISTED IN DESIGN DRAWINGS, RESOLVING QUESTIONS RELATED TO FOUNDATION MODIFICATION INTERFERENCES / CHANGES, AND REVIEW / RESOLUTION OF MODIFICATION INSPECTION DEFICIENCIES.

NOTE: ETS MAY WITHHOLD RESOLUTION OF CONTRACTOR / FIELD QUESTIONS PENDING PAYMENT OR PO# FOR PAYMENT OF THE \$900 EOR CONSULTING FEE.

CODE COMPLIANCE

THIS REINFORCEMENT DESIGN IS BASED ON THE REQUIREMENTS OF TIA STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES USING:

TIA CODE	TIA-222-G
BUILDING CODE	2018 NORTH CAROLINA STATE BUILDING CODE (2015 IBC)
NOMINAL WIND SPEED	108 MPH (AS REQUIRED BY WATAUGA COUNTY)
ICE THICKNESS	1.00 IN
WIND SPEED WITH ICE	30 MPH
SERVICE LOAD WIND SPEED	60 MPH
EXPOSURE CATEGORY	C
STRUCTURE CLASS	III
TOPOGRAPHIC CATEGORY	1
SPECIAL NOTES	-

SHEET INDEX

[illegible]

PREPARED BY:



3227 WELLINGTON COURT
RALEIGH, NC 27615
o: 919-782-2710, f: 919-435-0631
www.ets-pllc.com

PREPARED FOR:

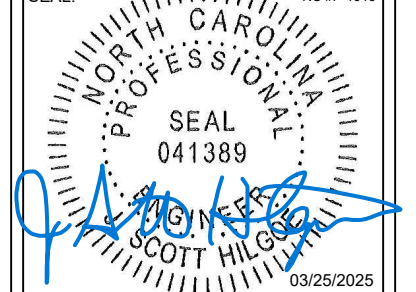


SITE NAME:
**BUCKEYE MT. -
VIPER**

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC #P-1016

REV	DATE	DETAILS
0	03/25/2025	FOR CONSTRUCTION
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: EDR	CHECKED BY: HA
---------------	----------------

SHEET TITLE:

TITLE PAGE

SHEET #	T-1	CURRENT REV #: 0
		ETS #: 24125017.STR.8177

MI CHECKLIST		
REQUIRED	REPORT ITEM	BRIEF DESCRIPTION
PRE-CONSTRUCTION		
N/A	EOR APPROVED SHOP DRAWINGS	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.
N/A	FABRICATION INSPECTION	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.
N/A	FABRICATOR CERTIFIED WELD INSPECTION	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.
X	MATERIAL TEST REPORTS (MTR)	MATERIAL TEST REPORTS SHALL BE PROVIDED FOR MATERIAL USED. MTRS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR NDE INSPECTION REPORT	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.
N/A	NDE OF MONOPOLE BASE PLATE	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	PACKING/SHIPPING LIST FOR ALL MATERIAL USED DURING CONSTRUCTION OF THE MODIFICATION.
ADDITIONAL TESTING AND INSPECTIONS:		
N/A		
CONSTRUCTION		
N/A	FOUNDATION INSPECTIONS	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.
	N/A	CONCRETE COMP. STRENGTH AND SLUMP TEST
	N/A	EARTHWORK: SOIL COMPACTION
	N/A	EARTHWORK: BEARING CAPACITY
	N/A	MICROPILE/ROCK ANCHOR
N/A	POST-INSTALLED ANCHOR ROD VERIFICATION	POST INSTALLED ANCHOR ROD VERIFICATION SHALL BE PERFORMED IN ACCORDANCE WITH REQUIREMENTS AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	BASE PLATE GROUT VERIFICATION	THE GENERAL CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE MI INSPECTOR THAT CERTIFIES THAT THE GROUT WAS REMOVED AND/OR INSTALLED IN ACCORDANCE WITH APPLICABLE REQUIREMENTS FOR INCLUSION IN THE MI REPORT.
N/A	FIELD CERTIFIED WELD INSPECTION	A CERTIFIED WELD INSPECTOR SHALL INSPECT AND TEST FIELD WELDS PER THE WELDING NOTES ON SHEET N-2. A REPORT SHALL BE PROVIDED. NDE OF FIELD WELDS SHALL BE PERFORMED AS REQUIRED BY APPLICABLE STANDARDS AND CONTRACT DOCUMENTS. THE NDE REPORT SHALL BE INCLUDED IN THE CWI REPORT.
N/A	FIELD NDE	A NDE OF THE FIELD WELDS AND ANY ADDITIONAL NDE REQUIREMENTS NOTED IN THESE DESIGN DOCUMENTS.
X	ON-SITE COLD GALVANIZING VERIFICATION	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.
N/A	TENSION TWIST AND PLUMB	THE GENERAL CONTRACTOR SHALL PROVIDE A REPORT IN ACCORDANCE WITH APPLICABLE STANDARDS DOCUMENTING TENSION TWIST AND PLUMB.
N/A	TOWER PLUMB DELIVERABLES	THE CONTRACTOR SHALL PROVIDE WRITTEN AND PHOTOGRAPHIC DOCUMENTATION TO THE MI INSPECTOR VERIFYING THE TOWER PLUMB CONDITION.
N/A	CANISTER DRAWINGS	THE CONTRACTOR SHALL SUBMIT A LEGIBLE COPY OF ANY FINAL FABRICATION OR PARTS DRAWINGS PROVIDED BY THE CANISTER VENDOR.
X	GC AS-BUILT DRAWINGS	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:		
N/A		
POST-CONSTRUCTION		
X	CONSTRUCTION COMPLIANCE LETTER	A LETTER FROM THE GENERAL CONTRACTOR STATING THAT THE WORKMANSHIP WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THESE CONTRACT DRAWINGS.
N/A	POST-INSTALLED ANCHOR ROD PULL TESTS	POST-INSTALLED ANCHOR RODS SHALL BE TESTED BY AN APPROVED PULL TEST INSPECTOR AND A REPORT SHALL BE PROVIDED INDICATING TESTING RESULTS.
X	PHOTOGRAPHS	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.
N/A	BOLT HOLE INSTALLATION VERIFICATION REPORT	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	FINAL PUNCH LIST INDICATING ALL NONCONFORMANCE(S) IDENTIFIED AND THE FINAL RESOLUTION/APPROVAL.
X	MI INSPECTOR RECORD DRAWING(S)	THE MI INSPECTOR SHALL OBSERVE AND REPORT ANY DISCREPANCIES BETWEEN THE CONTRACTOR'S REDLINE DRAWING AND THE ACTUAL COMPLETED INSTALLATION.
ADDITIONAL TESTING AND INSPECTIONS:		
N/A		

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 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 POINT OF CONTACT 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 POINT OF CONTACT (POC).

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 SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS.
- 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.

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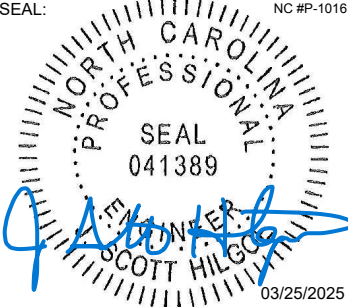
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LATITUDE/LONGITUDE:
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1		
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DRAWN BY: EDR

CHECKED BY: HA

SHEET TITLE:

MODIFICATION INSPECTION CHECKLIST

SHEET # **N-1**

CURRENT REV #: **0**
ETS #: 24125017.STR.8177

GENERAL NOTES:

1. ALL REFERENCES TO THE OWNER IN THESE DOCUMENTS SHALL BE CONSIDERED WATAUGA COUNTY OR ITS DESIGNATED REPRESENTATIVE.
2. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST HAVE CONSIDERABLE EXPERIENCE IN PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTANCE OF THIS ASSIGNMENT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICIENT EXPERIENCE AND ABILITY, THAT HE IS KNOWLEDGEABLE OF THE WORK TO BE PERFORMED AND THAT HE IS PROPERLY LICENSED AND PROPERLY REGISTERED TO DO THIS WORK IN THE STATE OF NORTH CAROLINA.
3. WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE 2018 NORTH CAROLINA STATE BUILDING CODE (2015 IBC).
4. UNLESS SHOWN OR NOTED OTHERWISE ON THE CONTRACT DRAWINGS, OR IN THE SPECIFICATIONS, THE FOLLOWING NOTES SHALL APPLY TO THE MATERIALS LISTED HEREIN, AND TO THE PROCEDURES TO BE USED ON THIS PROJECT.
5. ALL HARDWARE ASSEMBLY MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED EXACTLY AND SHALL SUPERSEDE ANY CONFLICTING NOTES ENCLOSED HEREIN.
6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO INSURE THE SAFETY OF THE STRUCTURE AND IT'S COMPONENT PARTS DURING ERECTION AND/OR FIELD MODIFICATIONS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF TEMPORARY BRACING, GUYS OR TIE DOWNS THAT MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER THE COMPLETION OF THE PROJECT.
7. ALL DIMENSIONS, ELEVATIONS, AND EXISTING CONDITIONS SHOWN ON THE DRAWINGS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BEGINNING ANY MATERIALS ORDERING, FABRICATION OR CONSTRUCTION WORK ON THIS PROJECT. CONTRACTOR SHALL NOT SCALE CONTRACT DRAWINGS IN LIEU OF FIELD VERIFICATIONS. ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND THE OWNER'S ENGINEER. THE DISCREPANCIES MUST BE RESOLVED BEFORE THE CONTRACTOR IS TO PROCEED WITH THE WORK. THE CONTRACT DOCUMENTS DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE OWNER AND/OR THE ENGINEER SHALL NOT INCLUDE INSPECTION OF THE PROTECTIVE MEASURES OR THE PROCEDURES.
8. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT THIS PROJECT AND RELATED WORK COMPLIES WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK.
10. ACCESS TO THE PROPOSED WORK SITE MAY BE RESTRICTED. THE CONTRACTOR SHALL COORDINATE INTENDED CONSTRUCTION ACTIVITY, INCLUDING WORK SCHEDULE AND MATERIALS ACCESS, WITH THE RESIDENT LEASING AGENT FOR APPROVAL.
11. ALL PERMITS THAT MUST BE OBTAINED ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE RESPONSIBLE FOR ABIDING BY ALL CONDITIONS AND REQUIREMENTS OF THE PERMITS.
12. IF APPLICABLE, ALL CONCRETE WORK SHALL COMPLY TO LOCAL CODES AND THE ACI 318-19, "BUILDING REQUIREMENTS FOR STRUCTURAL CONCRETE".
13. 24 HOURS PRIOR TO THE BEGINNING OF ANY CONSTRUCTION, THE CONTRACTOR MUST NOTIFY THE APPLICABLE JURISDICTIONAL (STATE, COUNTY OR CITY) ENGINEER.

WELDING NOTES:

1. ALL WELDING SHALL BE IN ACCORDANCE WITH THE AWS D1.1/D1.1M: 2015 "STRUCTURAL WELDING CODE-STEEL".
2. ALL WELDING SHALL BE PERFORMED BY AWS CERTIFIED WELDERS.
3. CONTRACTOR SHALL RETAIN AN AWS CERTIFIED WELD INSPECTOR TO PERFORM VISUAL INSPECTIONS ON FIELD WELDS. A LETTER AND REPORT SHALL BE ISSUED TO THE CONTRACTOR. CONTRACTOR SHALL SUBMIT LETTER AND REPORT TO TOWER OWNER.
4. GRIND THE SURFACE ADJACENT TO THE WELD FOR A DISTANCE OF 2" MINIMUM ALL AROUND. GRIND THE SURFACE OF THE ROD TO BE INSTALLED FOR A DISTANCE OF 2" MINIMUM ALL AROUND THE AREA TO BE WELDED. ENSURE BOTH AREAS ARE 100% FREE OF ALL GALVANIZING. SURFACES TO BE WELDED SHALL BE FREE FROM SCALE, SLAG, RUST, MOISTURE, GREASE OR ANY OTHER FOREIGN MATERIAL THAT WOULD PREVENT PROPER WELDING.
5. DO NOT WELD IF THE TEMPERATURE OF THE STEEL IN THE VICINITY OF THE WELD AREA IS BELOW 0°F. WHEN THE TEMPERATURE IS BETWEEN 0°F AND 32°F, PREHEAT AND MAINTAIN THE STEEL IN THE VICINITY OF THE WELD AREA AT 70°F DURING THE WELDING PROCESS.
6. DO NOT WELD ON WET OR FROST-COVERED SURFACES & PROVIDE ADEQUATE PROTECTION FROM HIGH WINDS.
7. FOR ALL WELDING, USE E70XX ELECTRODES.
8. AFTER FINAL INSPECTION, THE AREA OF THE WELDS, THE INSTALLATION AND ALL SURFACES DAMAGED BY WELDING OR GRINDING SHALL RECEIVE A COLD-GALVANIZED COATING. THIS COATING SHALL BE APPLIED BY BRUSH. THE GALVANIZING COMPOUND SHALL CONTAIN A MINIMUM OF 95% ± PURE ZINC. THE FINISHED COATING SHALL BE A MINIMUM THICKNESS OF 3 MILS.

STRUCTURAL STEEL NOTES:

1. THE FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC SPECIFICATION FOR MANUAL OF STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN, 15TH EDITION.
2. UNLESS OTHERWISE NOTED, ALL STRUCTURAL ELEMENTS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

A. STRUCTURAL STEEL:

• ANGLE: ASTM A36

• PIPE/TUBE: ASTM A53 GR. B (FY = 42 KSI)

• PLATE: ASTM A36 (SELF SUPPORTING AND GUYED TOWERS)

• PLATE: ASTM A572-65 (MONOPOLE)

• GUYED WIRES: ASTM A475 (EHS CABLES)

• GUYED WIRES: ASTM A586 OR A603 (BRIDGE STRAND)

B. ALL BOLTS, ASTM A325 TYPE I GALVANIZED HIGH STRENGTH BOLTS.

C. ALL U-BOLTS, ASTM A193 GRADE B7

D. ALL NUTS, ASTM A563 CARBON AND ALLOY STEEL NUTS.

E. ALL WASHERS, ASTM F436 HARDENED STEEL WASHERS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE WITH AISC SPECIFICATION FOR MANUAL OF STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN, 15TH EDITION.
4. HOLES SHALL NOT BE FLAME CUT THRU STEEL UNLESS APPROVED BY THE ENGINEER.
5. HOT-DIP GALVANIZE ALL ITEMS UNLESS OTHERWISE NOTED, AFTER FABRICATION WHERE PRACTICABLE. GALVANIZING: ASTM A123, ASTM, A153/A153M OR ASTM A653/A653M, G90, AS APPLICABLE.
6. REPAIR DAMAGED SURFACES WITH GALVANIZING REPAIR METHOD AND PAINT CONFORMING TO ASTM A780 OR BY APPLICATION OF STICK OR THICK PASTED MATERIAL SPECIFICALLY DESIGNED FOR REPAIR OF GALVANIZING. CLEAN AREAS TO BE REPAIRED AND REMOVE SLAG FROM WELDS. HEAT SURFACES TO WHICH STICK OR PASTE MATERIAL IS APPLIED, WITH A TORCH TO A TEMPERATURE SUFFICIENT TO MELT THE METALLICS IN STICK OR PASTED; SPREAD MOLTEN MATERIAL UNIFORMLY OVER SURFACES TO BE COATED AND WIPE OFF EXCESS MATERIAL.
7. A NUT LOCKING DEVICE SHALL BE INSTALLED ON ALL PROPOSED AND/OR REPLACED BOLTS.
8. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXCLUDE THE THREADS FROM THE SHEAR PLANE.
9. 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.
10. GALVANIZED ASTM A325 BOLTS SHALL NOT BE REUSED.

BOLT TIGHTENING PROCEDURE:

1. CONNECTION BOLTS SUBJECT TO DIRECT TENSION SHALL BE INSTALLED AND TIGHTENED AS PER SECTION 8.2 OF THE AISC SPECIFICATION FOR STRUCTURAL JOINTS USING A325 OR A490 BOLTS, LOCATED IN THE AISC MANUAL OF STEEL CONSTRUCTION. THE INSTALLATION PROCEDURE IS PARAPHRASED AS FOLLOWS:
2. FASTENERS SHALL BE INSTALLED IN PROPERLY ALIGNED HOLES AND TIGHTENED BY ONE OF THE METHODS DESCRIBED IN SUBSECTION 8.2.1 THROUGH 8.2.4.
- 8.2.1 TURN-OF-THE-NUT TIGHTENING
- BOLTS SHALL BE INSTALLED IN ALL HOLES OF THE CONNECTION AND BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1, UNTIL ALL THE BOLTS ARE SIMULTANEOUSLY SNUG TIGHT AND THE CONNECTION IS FULLY COMPACTED. FOLLOWING THIS INITIAL OPERATION ALL BOLTS IN THE CONNECTION SHALL BE TIGHTENED FURTHER BY THE APPLICABLE AMOUNT OF ROTATION SPECIFIED ABOVE. DURING THE TIGHTENING OPERATION THERE SHALL BE NO ROTATION OF THE PART NOT TURNED BY THE WRENCH. TIGHTENING SHALL PROGRESS SYSTEMATICALLY FROM THE MOST RIGID PART OF THE JOINT IN A MANNER THAT WILL MINIMIZE RELAXATION OF PREVIOUSLY PRETENSIONED BOLTS.

3. TIGHTEN CONNECTION BOLTS BY AISC - "TURN OF THE NUT" METHOD, USING THE CHART BELOW.

BOLT LENGTHS UP TO AND INCLUDING FOUR DIA.

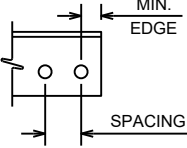
½"	BOLTS UP TO AND INCLUDING 2.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
7⁄8"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT

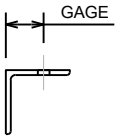
BOLT LENGTHS OVER FOUR DIA. BUT NOT EXCEEDING EIGHT DIA.

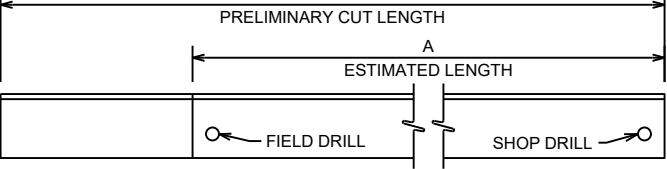
½"	BOLTS 2.25 TO 4.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS 2.75 TO 5.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS 3.25 TO 6.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
7⁄8"	BOLTS 3.75 TO 7.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
1"	BOLTS 4.25 TO 8.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT

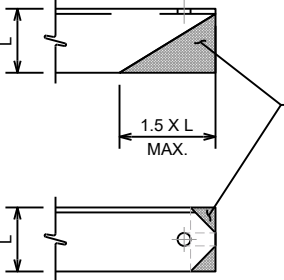
4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

NOMINAL HOLE DIMENSIONS		
BOLT DIAMETER	STANDARD HOLE	SHORT SLOT
½	⅝	⅝ X 1⅛
⅝	1⅛	1⅛ X ⅞
¾	1⅜	1⅜ X 1
7⁄8	1⅝	1⅝ X 1⅛
1	1⅞	1⅞ X 1⅝

BOLT EDGE AND SPACING			
BOLT DIAMETER	MIN EDGE	SPACING	
½	⅞	1½	
⅝	1⅛	1⅞	
¾	1¼	2¼	
7⁄8	1½	2⅝	
1	1¾	3	

WORKABLE GAGES		
LEG LENGTH	GAGE	
4	2½	
3½	2	
3	1¾	
2½	1⅝	
2	1⅜	
1¾	1	

MEMBER LENGTHS	
A+6" (WHEN A IS 10' OR LESS) A+12" (WHEN A IS GREATER THAN 10')	
	

ALLOWABLE ANGLE COPE	
	
LIMIT OF ALLOWABLE COPED PORTION OF ANGLE WITHOUT ENGINEERS PRIOR WRITTEN APPROVAL	

PREPARED BY:



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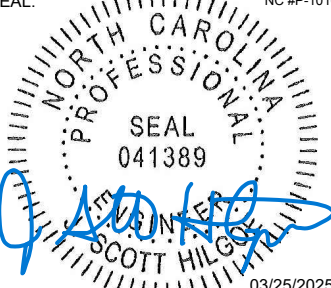
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03/25/2025

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DRAWN BY: EDR	CHECKED BY: HA
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SHEET TITLE:

PROJECT NOTES

SHEET #	N-2	CURRENT REV #: 0
		ETS #: 24125017.STR.8177

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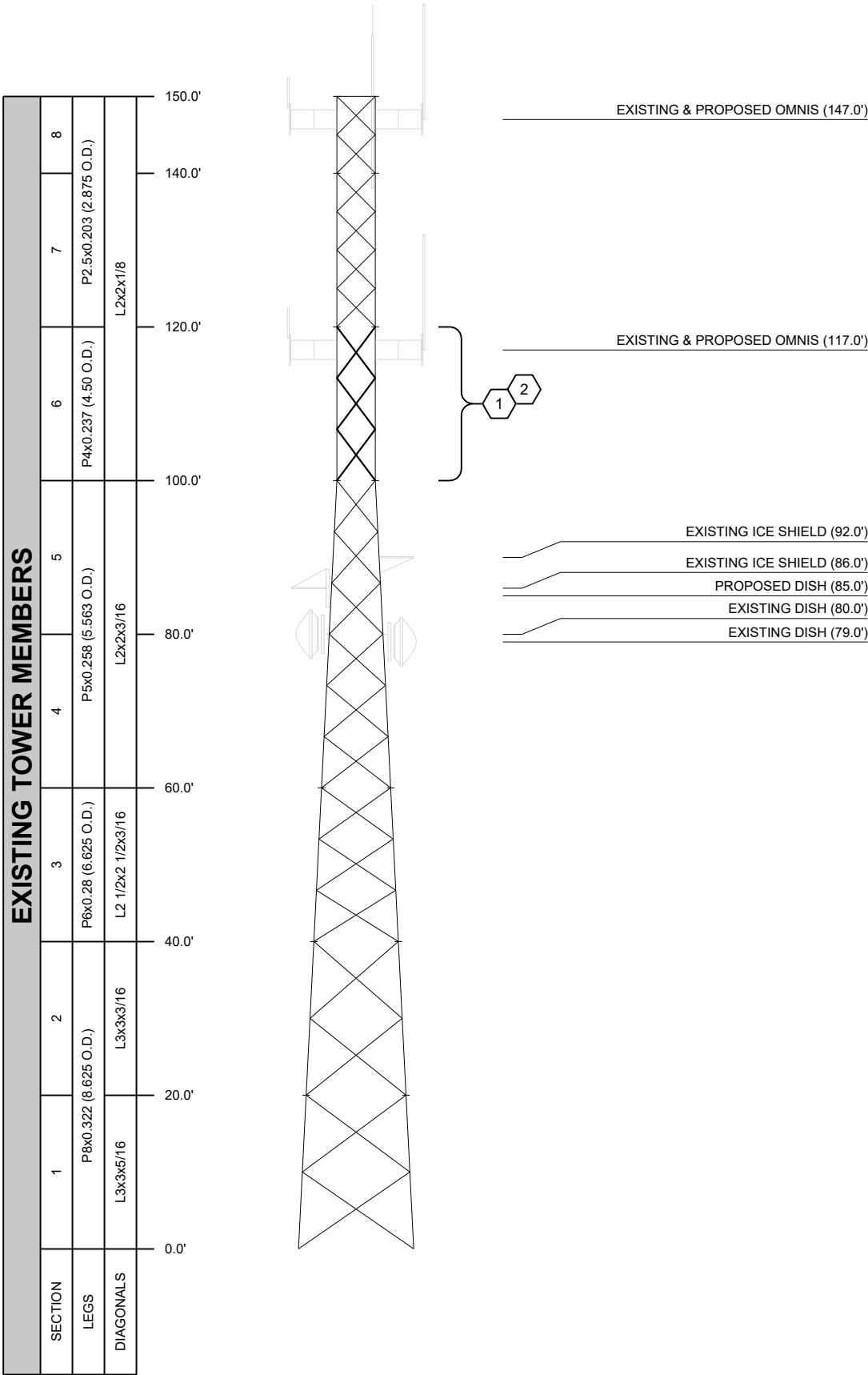
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SHEET TITLE: _____

BILL OF MATERIALS

SHEET #	BM	CURRENT REV #: 0
		ETS #: 24125017.STR.8177

EXISTING TOWER MEMBERS



FACEWIDTH	
ELEVATION (FT)	FACEWIDTH (FT)
0.0	15.0
100.0	5.0
150.0	5.0

MODIFICATION SCHEDULE			
NO.	MODIFICATION DESCRIPTION	ELEVATIONS (FT.)	DETAIL SHEET #
1	PRIOR TO MATERIAL ORDERS, FABRICATION, AND CONSTRUCTION OF DESIGN DETAILED WITHIN THESE DRAWINGS, ETS REQUIRES THAT A PRE-MOD VISIT AND MAPPING OF AREAS OF THE STRUCTURE THAT INTERACT WITH THE PROPOSED MODIFICATIONS BE COMPLETED TO VERIFY IN FIELD ALL MATERIALS BEING PROPOSED. ETS IS AVAILABLE TO QUOTE SAID PRE-MOD MAPPING VIA EMAIL AT MAPPINGS@ETS-PLLC.COM. HOWEVER, IN ADDITION TO THE PRE-MOD MAPPING, THE CONTRACTOR MUST ALSO PERFORM A PRE-MOD VISIT TO THE SITE PRIOR TO MATERIAL ORDERS AS THE CONTRACTOR IS ULTIMATELY RESPONSIBLE TO ENSURE THE DESIGN IS CONSTRUCTIBLE.	100.0 - 120.0	-
2	REPLACE EXISTING DIAGONALS.	100.0 - 120.0	S-3

NOTES:

- ANTENNAS AND OTHER APPURTENANCES MAY NEED TO BE TEMPORARILY REMOVED OR MOVED DURING MODIFICATION INSTALLATION.
- FIELD VERIFICATION OF ALL MEASUREMENTS REQUIRED PRIOR TO FABRICATION.

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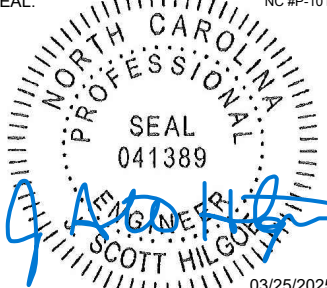
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DRAWN BY: EDR

CHECKED BY: HA

SHEET TITLE:

TOWER ELEVATION AND MODIFICATION SCHEDULE

SHEET #	S-1	CURRENT REV #: 0
		ETS #: 24125017.STR.8177

TOWER ELEVATION

SCALE: 1" = 20'



SITE PLAN
APPROX. SCALE: 1" = 100'

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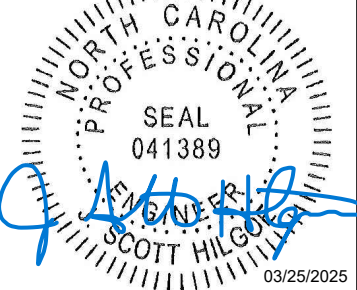
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BUCKEYE MT. - VIPER

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC #P-1016



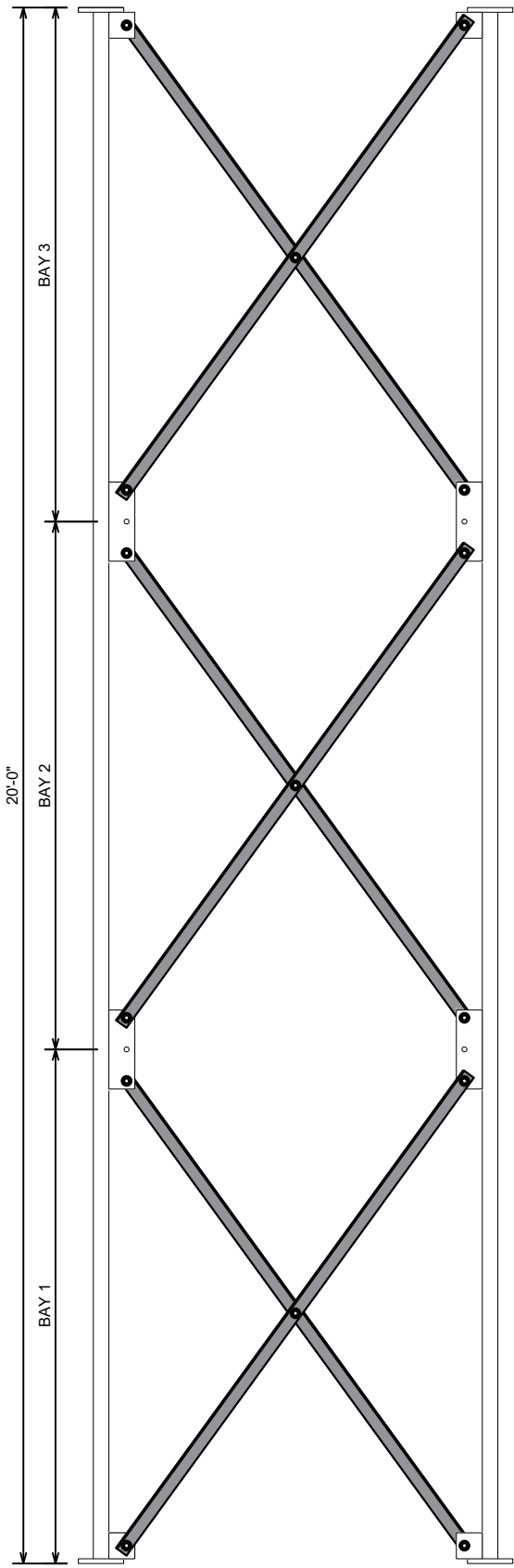
REV	DATE	DETAILS
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DRAWN BY: EDR CHECKED BY: HA

SHEET TITLE:

SITE PLAN

SHEET # **S-2** CURRENT REV #: **0**
ETS #: 24125017.STR.8177

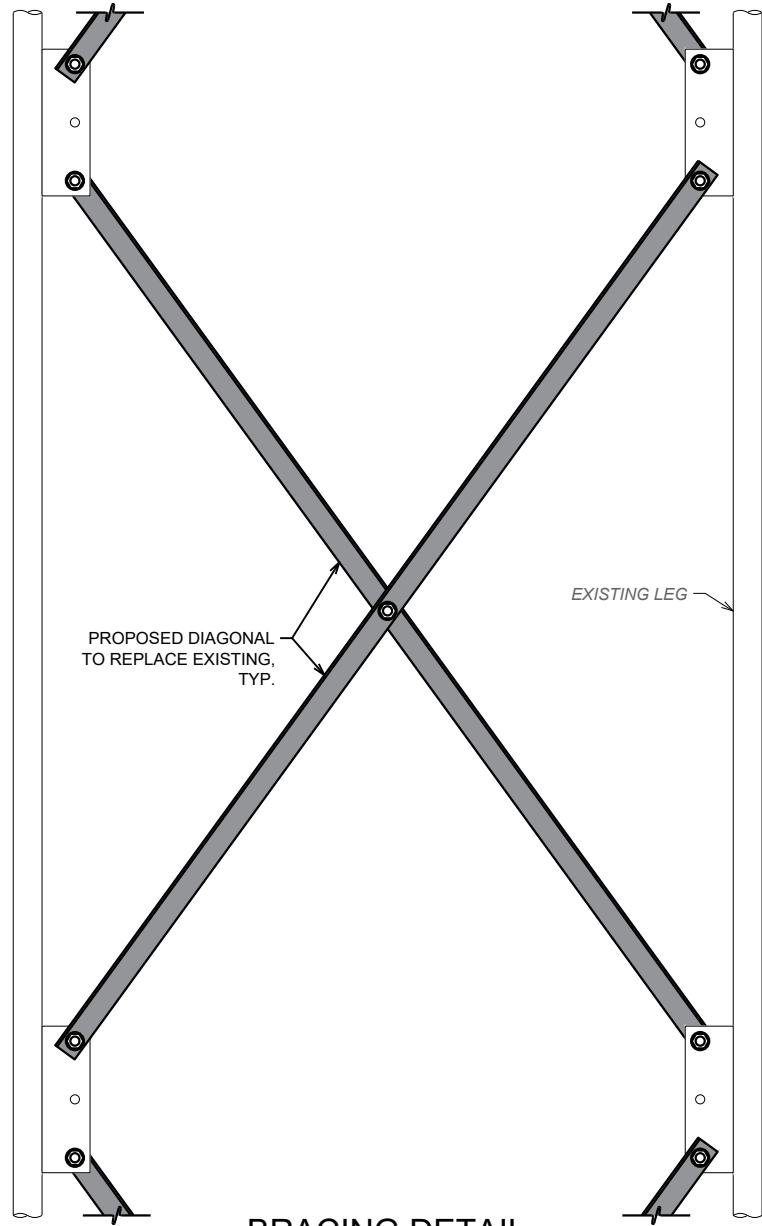


SECTION ELEVATION
SCALE: 7/16" = 1'-0"

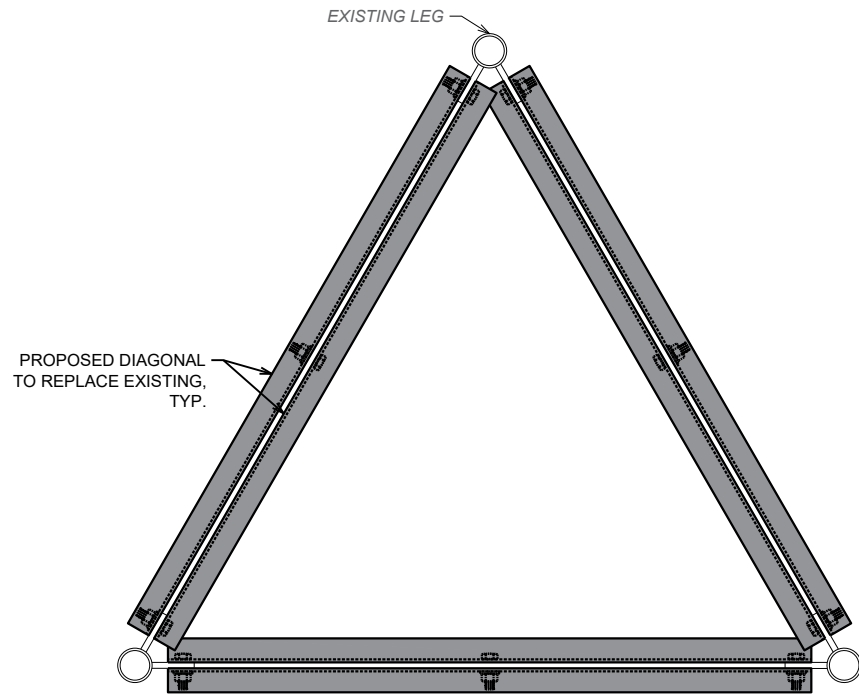
BRACING SCHEDULE									
SECTION	ELEVATION (FT)	BAY	EXISTING DIAGONAL SIZE	PROPOSED BRACING				PROPOSED CONNECTION	
				PART NO.	SIZE & GRADE	ESTIMATED LENGTH	QTY.	SIZE & GRADE	QTY.
6	100.0 - 120.0	1-3 (OF 3)	L 2"x2"x1/8"	L-1	L 2"x2"x3/16" A572-50	8'-0"±	18	3/4"Øx2" A325X W/ HHN, LKW, FW	45

NOTES:

1. IT IS THE CONTRACTORS RESPONSIBILITY TO MEASURE ALL RELEVANT EXISTING MEMBERS PRIOR TO ORDERING MATERIALS.
2. PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL FIELD VERIFY ALL LENGTHS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE WITH AISC SPECIFICATION FOR MANUAL OF STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN 15TH EDITION.
4. SEE SHEET N-2 FOR BOLT MINIMUM EDGE DISTANCE AND WORKABLE GAGE.



BRACING DETAIL
(ELEVATION VIEW)
SCALE: 3/4" = 1'-0"



BRACING DETAIL
(PLAN VIEW)
SCALE: 3/4" = 1'-0"

PREPARED BY:



3227 WELLINGTON COURT
RALEIGH, NC 27615
o: 919-782-2710, f: 919-435-0631
www.ets-pllc.com

PREPARED FOR:

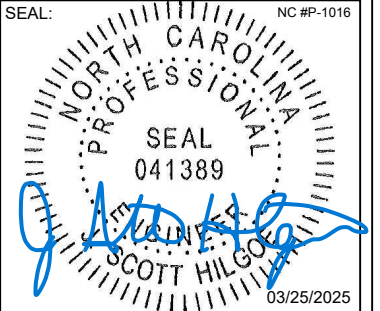


SITE NAME:
**BUCKEYE MT. -
VIPER**

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°



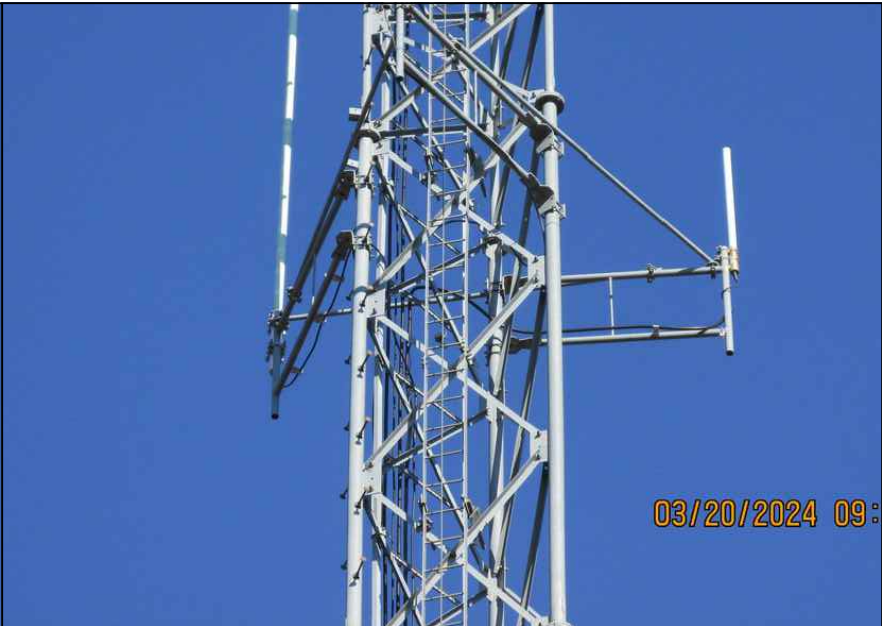
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DRAWN BY: EDR CHECKED BY: HA

SHEET TITLE:

**DIAGONAL
REPLACEMENT
DETAILS**

SHEET # **S-3** CURRENT REV #: 0
ETS #: 24125017.STR.8177



PREPARED BY:



**ENGINEERED
TOWER SOLUTIONS**

3227 WELLINGTON COURT
RALEIGH, NC 27615
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PREPARED FOR:



CORPORATE SEAL OF WATAUGA COUNTY
NORTH CAROLINA

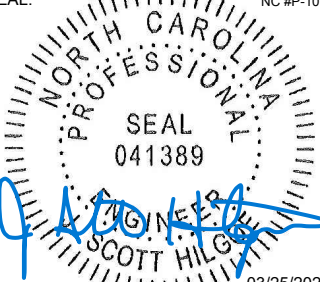
SITE NAME:
**BUCKEYE MT. -
VIPER**

SITE NUMBER:
HP-1343

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2542 FOREST GROVE ROAD
VILAS, NC 28698

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC #P-1016



NORTH CAROLINA
PROFESSIONAL
SEAL
041389
SCOTT HILGERT
ENGINEER
03/25/2025

REV	DATE	DETAILS
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DRAWN BY: EDR CHECKED BY: HA

SHEET TITLE:

PHOTOS

PRE MODIFICATION INSPECTION REPORT

SITE NAME: BUCKEYE MT. - VIPER



Performed By:

Alex Meister
Tower Engineer - Inspections

Charlie Kluth
Tower Engineer - Inspections

Prepared for:



1.0 ASSIGNMENT

Subject – Pre-modification inspection of a 150-ft± self-support tower.

Location – 2542 Forest Grove Rd, Vilas, NC 28692

Structure – 150-ft± Self-Support Tower

Purpose – The objective of the inspection was to determine the existing section dimensions from 100' to 120', and to perform a visual inspection of existing conditions and potential issues that may take place during the tower modification.

2.0 SCOPE OF SERVICES

- 1) Perform a pre-modification inspection
- 2) Prepare a report of observations and recommendations

3.0 PARTICIPATING PERSONNEL

Representatives: Mr. Marty Randall
10-18 Consulting
(828) 527-2416

Consulting Engineers: Mr. Alex Meister
Mr. Charlie Kluth
Engineered Tower Solutions, PLLC (ETS)
3227 Wellington Ct.
Raleigh, NC 27615
(919) 782-2710

4.0 BACKGROUND INFORMATION

Watauga County requested that ETS conduct a pre modification inspection of the tower. The objective of the inspection was to determine the existing section dimensions from 100' to 120', and to perform a visual inspection of existing conditions and potential issues that may take place during the tower modification.

5.0 INVESTIGATION

Pre Modification Inspection – Alex Meister and Charlie Kluth performed the inspection on April 9, 2025. For the purpose of this inspection, the tower legs were named by letter according to the magnetic azimuth defined by a line from the center of tower to the leg. “A” leg is the leg closest to magnetic north, followed clockwise by “B” and “C.”

6.0 RESULTS

1. Tower Section Details
2. Miscellaneous Obstructions

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	<u>Item 1 – Tower Section Details</u> Section 6 - 100'0"±-120'0"± (tapered 3 panel X bracing) • Leg: P4.5"Øx0.237" • Bottom Flange: PL 10 1/4"Øx7/8" w/ (6) 3/4"Ø bolts • Top Flange: PL 9 1/4"Øx3/4" w/ (4) 3/4"Ø bolts • Section Height: 20'-0" O-O • Diagonals: L2"x2"x1/8" w/ (1) 3/4"Ø EB and (1) 5/8"Ø CB • Gusset: 1/4" THK

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	Item 3 – Miscellaneous Obstructions Climbing Pegs - C leg: spacing 2'-6" Climbing Ladder - BC face: width: 1'-1/2", step: 1'-0", J-hooks and J-plates to diagonals Waveguide - CA face near C leg - J-hooks and J-plates to diagonals
	Coax (1) 1 5/8 FHSM, (1) 7/8 FHSM, (1) 1/2 FHSM, (2) 7/8 FH, and (1) 1/2 FH attached to waveguide on CA face
	Omni Mount at 117'-0" - Location: All legs - SO mount – SO: 6'-0" - Arm: (2) P2.4"Ø, VSep.: 2'-6" - Bracing (1) SR 3/4"Ø (Vert.) - MP (1) P2.4"Øx0.153"x4'-0" - Equipment: - A leg: (1) Unknown 3"Øx4'-0" Omni - B leg: (1) Unknown 10'-0"x2 Element Dipole - C leg: (1) Unknown 3"Øx15'-0" Omni - Leg connections: (1) BPL 7"x6"x1/2" and (1) BPL 6.75"x5"x3/8"x7" w/(4) 1/2"Ø bolts @ 4" C-C V, 5" C-C H - Stabilizer SR1.25"Ø connected back to diagonal members at 117'