

<u>WATAUGA COUNTY, NC</u> <u>BID #</u>	INVITATION FOR BIDS – Aho - 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-1382 Aho-Viper) located at 1388 Sampson Road, Boone, NC 28607.	
E-Mail: marty.randall@1018consulting.com	Using Agency Name: HP-1382 – Aho 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 **3-26-25 ETS Structural Modification 24125019.STR.8180 Rev. 1.** 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)

3-26-25 ETS Structural Modification 24125019.STR.8180 Rev. 1

PRE MODIFICATION INSPECTION REPORT

SITE NAME: AHO - VIPER



Performed By:

Alex Meister
Tower Engineer - Inspections

Charlie Kluth
Tower Engineer - Inspections

Prepared for:



1.0 ASSIGNMENT

Subject – Pre-modification inspection of a 199-ft± self-support tower.

Location – 1388 Sampson Rd, Boone, NC 28607

Structure – 199-ft± Self-Support Tower

Purpose – The objective of the inspection was to determine the existing section dimensions from 180' to 184', 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 180' to 184', 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

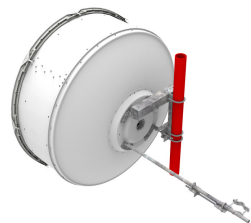
Photograph	Observations and Recommendations
	<u>Item 1 – Tower Section Details</u> Section 10 180'0"±-199'0"± (K bracing right) Bay 1 180'0"±-184'0"± • Leg: SR1.5" Ø • Bay Height: 3.65' • Diagonals: SR1" Ø welded • Horizontal: SR1" Ø welded • Face width: 4'-0"

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	<u>Item 3 – Miscellaneous Obstructions</u> Climbing Pegs • C leg: spacing 2'-6" Climbing Ladder • CA face: width: 1'-3/4", step: 1'-0", J-hooks to horizontal • A-B face has climbing horizontal Waveguide • BC face near B leg • J-hooks and J-plates to diagonals Coax • (1) 1 5/8 FH, (1) 7/8 FH, (1) 1/2 FH, and (1) EU63 attached to waveguide on BC face • EU63 transitions to Dish at 183'. Secured to diagonal on A B face Dish Mount at 183'-0" • Location: C leg • Pipe mount – SO: 8" ○ MP (1) P4.5"Øx5'-0" ○ Stabilizer (2) P2.4"Ø connected to A and B leg • Equipment: (1) RFS PAD8-65AC1S1R • Leg connections: (2) L 5"x3"x3/8"x7 3/4" welded w/ (2) 5/8" Ø U-bolts 1 1/2" C-C

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

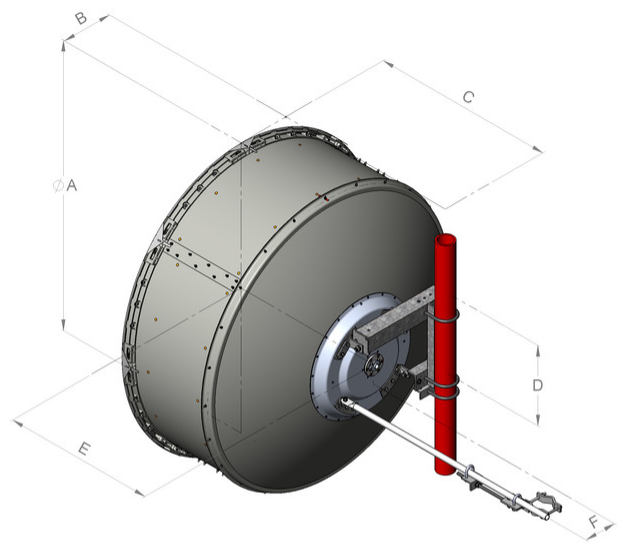
Operating Frequency Band	5.725 – 5.850 GHz
Gain, Mid Band	38.4 dBi
Beamwidth, Horizontal	2 °
Beamwidth, Vertical	2 °

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



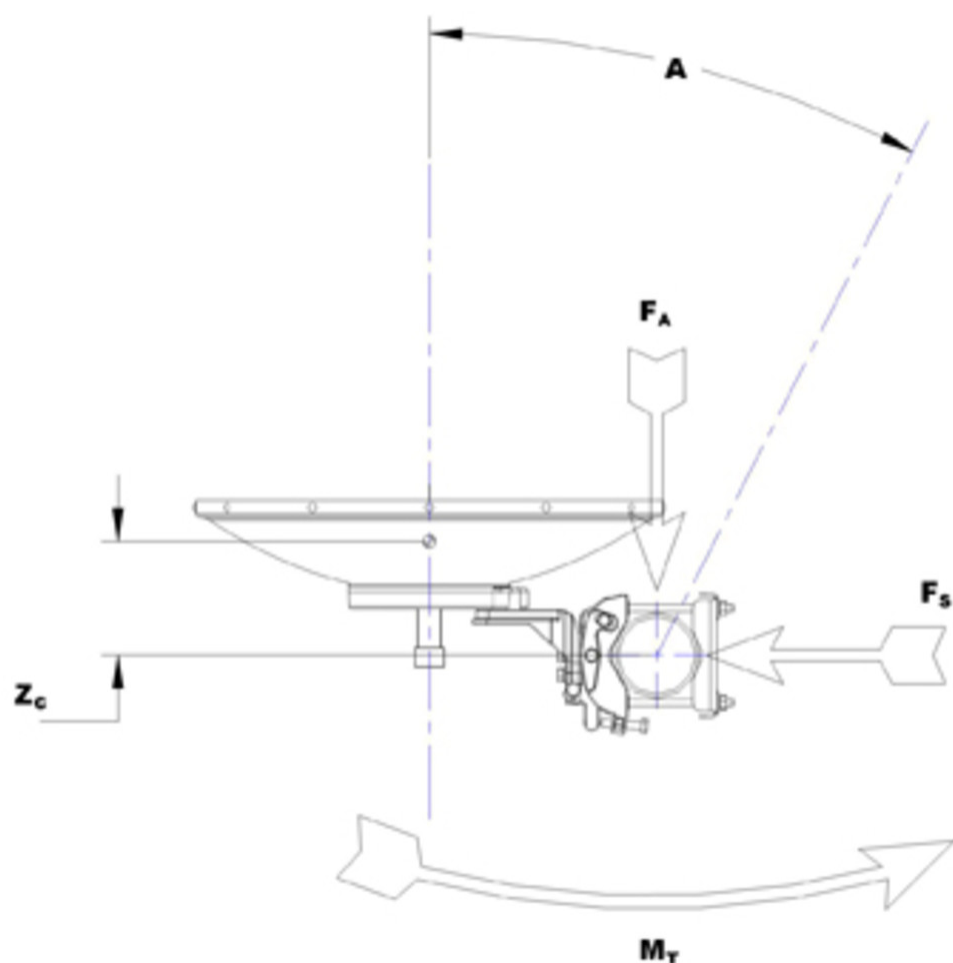
Antenna size, ft (m)	Dimensions in inches (mm)					
	A	B	C	D	E	F
6 (1.8)	74.8 (1899)	13.4 (340)	47.5 (1206)	20.9 (530)	39.4 (1001)	8.4 (214)

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

Twisting Moment (MT)

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

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



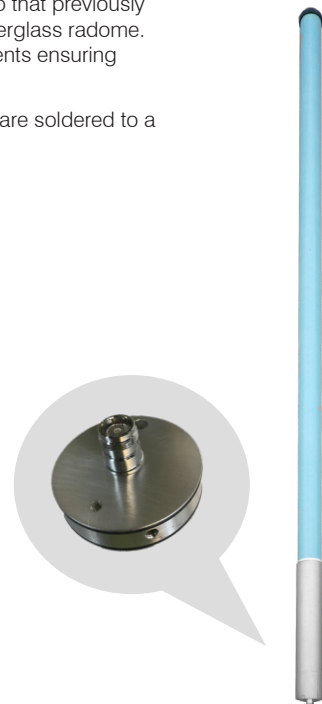
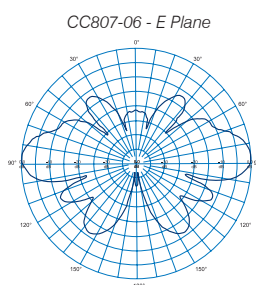
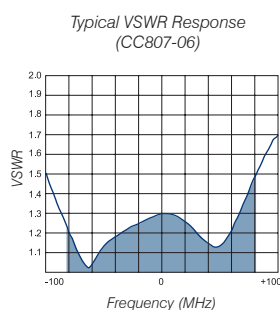
These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

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 (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 26, 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: Aho - Viper

Tower Owner Designation: **NCSHP Site Number:** HP-1382
NCSHP Site Name: Aho - Viper

Engineering Firm Designation: **ETS, PLLC Job Number:** 24125019.STR.8180_Rev. 1

Site Data: **1388 Sampson Road, Boone, Watauga County, NC 28607**
Latitude N 36° 09' 15.91", Longitude W 81° 36' 10.08"
199.0 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:	90.9%	Sufficient Capacity
	Foundation:	80.1%	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

A circular professional engineer seal for the State of North Carolina. The seal contains the text "NORTH CAROLINA", "PROFESSIONAL", "SEAL", and "041389". Overlaid on the seal is a blue ink signature that appears to read "J. Scott Hilgoe". Below the seal, the date "03/26/2025" is handwritten in blue ink.

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tnxTower Output

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Modification Design Drawings

1) INTRODUCTION

This tower is a 199-ft self-supporting tower designed by World Tower Company in August of 2021. This tower was originally designed for an ultimate 3-second gust wind speed of 120 mph per TIA-222-H.

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 Category:	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)
198.0 (Watauga County)	206.0	2	RFI	CC807-11	2	7/8" FH
		2	Tower mounts	Horizontal Mount Pipe/Stabilizer		
	198.0	2	Tower mounts	6-ft Side Arm Mount	1	1/2" FH
	196.0	1	Unknown	TMA (9" x 6" x 5")		
175.0 (Watauga County)	175.0	1	Commscope	HX6-6W-6WH	1	EU63
		1	Tower mount	4" ø x 5-ft Pipe Mount		
160.0 (Watauga County)	168.0	2	RFI	CC807-11	2	1-5/8" FH
	160.0	2	Tower mounts	Horizontal Mount Pipe/Stabilizer		
		2	Tower mounts	6-ft Side Arm Mount		
130.0* (Watauga County)	140.6	1	Commscope	DB224	1	7/8" Coax
		1	Tower mount	Side Arm Mount		
100.0* (Watauga County)	110.6	1	Commscope	DB224	1	7/8" Coax
		1	Tower mount	Side Arm Mount		
80.0* (Watauga County)	80.0	1	Ubiquiti Networks	AM-V5G-Ti	1	CAT5E
		1	Tower Mount	Pipe Mount		

*Reserved Loading.

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)
183.0 (NCSHP)	188.0	1	Unknown	10-ft Ice Shield	-	-
	183.0	1	RFS	PAD8-65AC1S1R	1	EU 63
		1	Tower Mount	5-ft Dish Pipe Mount		
150.0 (NCSHP)	155.0	1	Unknown	10-ft Ice Shield	1	EU 63
	150.0	1	RFS	PAD8-65AC1S1R		
		1	Tower Mount	5-ft Dish Pipe Mount		
130.0* (NCSHP)	130.0	1	RFS	PAD6-65B	2	EW63
		1	RFS	PAD8-65B		
		2	Tower Mount	Pipe Mount		

*Reserved Loading.

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
Tower Modification Drawings	ETS, PLLC (Job No. 24125019.STR.8180)	03/25/2025	Appendix D
Previous Structural Analysis Report	ETS, PLLC (Job No. 24125019.STR.1181)	02/19/2025	On File
L&A Mapping Report	ETS, PLLC (Job No. 24125019.EI.1182)	03/28/2024	On File
Tower & Foundation Design Package	World Tower (Drawing No. C2107-019 R2)	08/23/2021	On File
Tower & Foundation Design Calculations	World Tower (Job No. C2107-019 R2)	08/09/2021	On File
Final A&E Construction Drawings	ETS, PLLC (Job No. 204655.AE.02, Rev. 4)	04/16/2021	On File
Geotechnical Investigation Report	S&ME (Job No. 21108)	04/21/2021	On File

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) The anchor rod projection from supporting surface to bottom of leveling nut has been assumed to be $l_{ar} = 1.25"$.

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	199 - 184.025	Leg	1 1/2	2	-9.03	29.26	30.9	Pass
T2	184.025 - 180	Leg	1 1/2	33	-14.74	29.26	50.4	Pass
T3	180 - 160	Leg	2 1/4	46	-51.01	77.75	65.6	Pass
T4	160 - 140	Leg	2 3/4	76	-97.87	152.99	64.0	Pass
T5	140 - 120	Leg	3	103	-150.19	199.04	75.5	Pass
T6	120 - 100	Leg	3 1/4	130	-198.18	250.37	79.2	Pass
T7	100 - 80	Leg	3 1/2	163	-251.02	306.80	81.8	Pass
T8	80 - 60	Leg	3 3/4	196	-302.05	368.18	82.0	Pass
T9	60 - 40	Leg	4	229	-351.91	434.40	81.0	Pass
T10	40 - 20	Leg	4 1/4	262	-401.10	505.39	79.4 80.6 (b)	Pass
T11	20 - 0	Leg	4 1/4	295	-441.40	505.22	87.4	Pass
T1	199 - 184.025	Diagonal	1	8	-3.20	5.71	56.0	Pass
T2	184.025 - 180	Diagonal	SR 1" Ø + SR 1" Ø (Aho - Viper)	41	-6.29	11.24	55.9	Pass
T3	180 - 160	Diagonal	L2x2x1/4	64	-7.04	17.05	41.3 57.0 (b)	Pass
T4	160 - 140	Diagonal	L2x2x1/4	79	-7.51	13.45	55.8 64.0 (b)	Pass
T5	140 - 120	Diagonal	L2 1/2x2 1/2x1/4	106	-9.25	19.09	48.5 63.6 (b)	Pass
T6	120 - 100	Diagonal	L3x3x1/4	134	-11.77	18.46	63.7 67.3 (b)	Pass
T7	100 - 80	Diagonal	L3x3x1/4	167	-11.75	15.73	74.7	Pass
T8	80 - 60	Diagonal	L3x3x1/4	200	-12.23	13.46	90.9	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T9	60 - 40	Diagonal	L3 1/2 x 3 1/2 x 1/4	233	-12.97	18.62	69.7	Pass
T10	40 - 20	Diagonal	L3 1/2 x 3 1/2 x 1/4	266	-13.84	16.11	85.9	Pass
T11	20 - 0	Diagonal	L3 1/2 x 3 1/2 x 1/4	298	-10.80	13.37	80.8	Pass
T1	199 - 184.025	Horizontal	1	26	-0.38	10.42	3.6	Pass
T2	184.025 - 180	Horizontal	1	35	-2.47	10.42	23.7	Pass
T6	120 - 100	Horizontal	L2 1/2x2 1/2x3/16	132	-3.97	17.98	22.1 39.0 (b)	Pass
T7	100 - 80	Horizontal	L2 1/2x2 1/2x3/16	165	-4.77	16.94	28.1 46.9 (b)	Pass
T8	80 - 60	Horizontal	L2 1/2x2 1/2x3/16	198	-5.47	15.91	34.4 53.8 (b)	Pass
T9	60 - 40	Horizontal	L3x3x3/16	231	-6.10	19.67	31.0 45.6 (b)	Pass
T10	40 - 20	Horizontal	L3x3x3/16	264	-6.95	18.69	37.2 52.0 (b)	Pass
T11	20 - 0	Horizontal	L3 1/2 x 3 1/2 x 1/4	297	-7.65	29.88	25.6 42.9 (b)	Pass
T1	199 - 184.025	Secondary Horizontal	1	24	-0.00	17.56	0.1	Pass
T2	184.025 - 180	Secondary Horizontal	1	44	-0.00	17.56	0.1	Pass
T1	199 - 184.025	Top Girt	1 1/8	5	-0.72	15.91	4.5	Pass
T3	180 - 160	Top Girt	L2x2x3/16	48	-1.06	11.74	9.0 9.9 (b)	Pass
T2	184.025 - 180	Bottom Girt	1	40	-2.21	10.42	21.2	Pass
							Summary	
						Leg (T11)	87.4	Pass
						Diagonal (T8)	90.9	Pass
						Horizontal (T8)	53.8	Pass
						Secondary Horizontal (T1)	0.1	Pass
						Top Girt (T3)	9.9	Pass
						Bottom Girt (T2)	21.2	Pass
						Bolt Checks	80.6	Pass
						Rating =	90.9	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	90.6	Pass
1	Base Foundation (Structural)	0	71.9	Pass
1	Base Foundation (Soil Interaction)	0	80.1	Pass
Structure Rating (max from all components) =				90.9%

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 1-5/8" Coax at 198-ft to be removed.

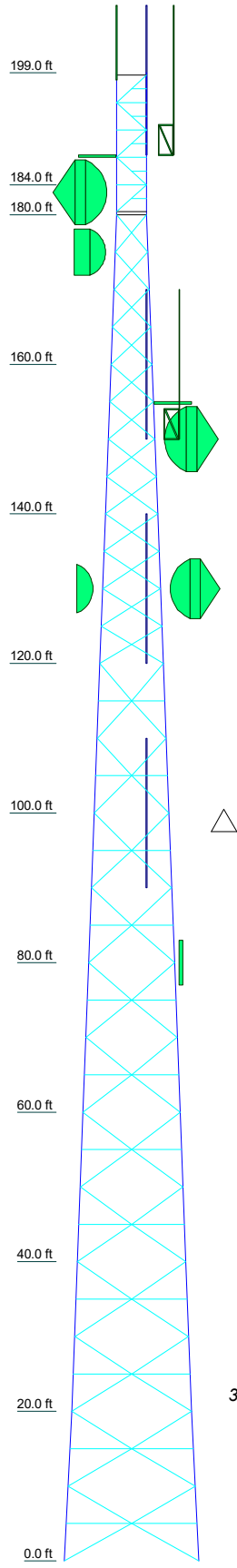
4.2) Dish Antenna Deflection Results

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>
183.00	PAD8-65AC1S1R	43	4.134	0.21	0.10	166152
175.00	HX6-6W-6WH	43	3.770	0.20	0.07	30392
150.00	PAD8-65AC1S1R	43	2.759	0.18	0.06	53897
130.00	PAD6-65B	43	2.053	0.15	0.05	43304

APPENDIX A
TNXTOWER OUTPUT

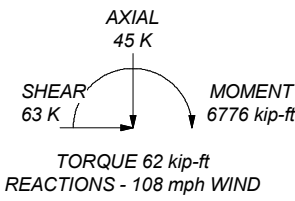
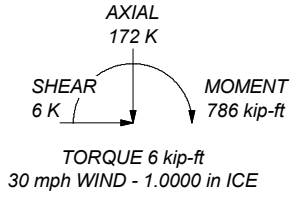
Section	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	SR 4 1/4	SR 4	SR 3 3/4	SR 3 1/2	SR 3 1/4	SR 3	SR 2 3/4	SR 2 1/4	SR 1 1/2	SR 1
Leg Grade	SR 4 1/4									
Diagonals	L3 1/2 x 3 1/2 x 1/4			L3x3x1/4	A572-50			L2x2x1/4	A	SR 1
Diagonal Grade					A36					
Top Girts					N.A.					
Bottom Girts					N.A.			L2x2x3/16	N.A.	SR 1 1/8
Horizontal					L3x3x3/16				B	N.A.
Sec. Horizontals										SR 1
Face Width (ft)	18	16	14.5	13	11.5	10	8.5	7	5.5	4
# Panels @ (ft)						36 @ 5				5 @ 3.65
Weight (K)	28.8	4.8	4.5	4.0	3.4	2.7	1.8	1.4	0.2	0.6



ALL REACTIONS
ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 449 K
SHEAR: 39 K

UPLIFT: -390 K
SHEAR: 34 K



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
5/8-in x 8-ft Lightning Rod	199	10' x 2.375" Horizontal Mount Pipe/Stabilizer	160
Side Arm Mount [SO 303-1]	198	CC807-11	160
Side Arm Mount [SO 303-1]	198	CC807-11	160
10' x 2.375" Horizontal Mount Pipe/Stabilizer	198	Side Arm Mount [SO 303-1]	160
10' x 2.375" Horizontal Mount Pipe/Stabilizer	198	Ice Shield 10'x7"	155
CC807-11	198	PAD8-65AC1S1R	150
CC807-11	198	4.5" x 5-ft Dish Pipe Mount	150
Junction Box (9" x 6" x 5")	196	DB224	130
Ice Shield 10'x7"	188	Pipe Mount [PM 601-1]	130
4.5" x 5-ft Dish Pipe Mount	183	Pipe Mount [PM 602-1]	130
PAD8-65AC1S1R	183	Side Arm Mount [SO 303-1]	130
Pipe Mount [PM 602-1]	175	PAD6-65B	130
HX6-6W-6WH	175	PAD8-65B	130
Side Arm Mount [SO 303-1]	160	DB224	100
10' x 2.375" Horizontal Mount Pipe/Stabilizer	160	Side Arm Mount [SO 303-1]	100
		AM-V5G-Ti	80
		Pipe Mount [PM 601-1]	80

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	SR 1" Ø + SR 1" Ø (Aho - Viper)	B	SR 1

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
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: 90.9%

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

Job:	Aho - Viper		
Project:	ETS, PLLC Job No. 24125019.STR.8180		
Client:	Watauga County	Drawn by:	hicham.anssar
Code:	TIA-222-G	Date:	03/25/25
Path:		Scale:	NTS
		Dwg No.	E-1

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	Client Watauga County	Designed by hicham.anssar

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 199.00 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 4.00 ft at the top and 18.00 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.

Non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

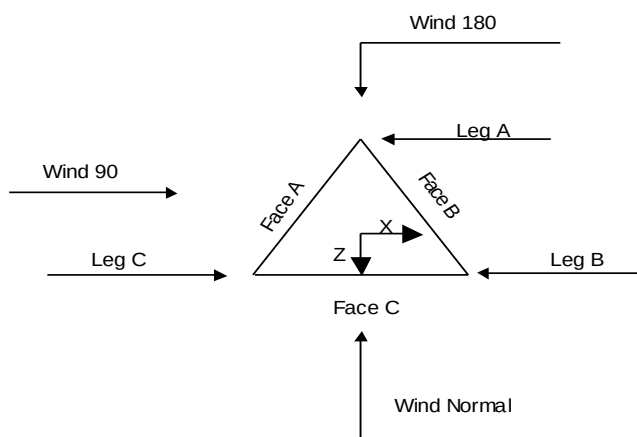
Stress ratio used in tower member design is 1.

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	Retension Guys To Initial Tension	Offset Girt At Foundation
√ Use Code Safety Factors - Guys	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Escalate Ice	√ Use Azimuth Dish Coefficients	√ Include Angle Block Shear Check
Always Use Max Kz	√ Project Wind Area of Appurtenances	Use TIA-222-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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	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	199.00-184.03			4.00	1	14.98
T2	184.03-180.00			4.00	1	4.03
T3	180.00-160.00			4.00	1	20.00
T4	160.00-140.00			5.50	1	20.00
T5	140.00-120.00			7.00	1	20.00
T6	120.00-100.00			8.50	1	20.00
T7	100.00-80.00			10.00	1	20.00
T8	80.00-60.00			11.50	1	20.00
T9	60.00-40.00			13.00	1	20.00
T10	40.00-20.00			14.50	1	20.00
T11	20.00-0.00			16.00	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	199.00-184.03	3.65	K Brace Right	No	Yes+Steps	4.5000	0.0000
T2	184.03-180.00	3.65	K Brace Left	No	Yes+Steps	0.0000	4.5000
T3	180.00-160.00	5.00	X Brace	No	No	0.0000	0.0000
T4	160.00-140.00	5.00	X Brace	No	No	0.0000	0.0000

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	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
T5	140.00-120.00	5.00	X Brace	No	Yes	0.0000	0.0000
T6	120.00-100.00	5.00	Double K	No	Yes	0.0000	0.0000
T7	100.00-80.00	5.00	Double K	No	Yes	0.0000	0.0000
T8	80.00-60.00	5.00	Double K	No	Yes	0.0000	0.0000
T9	60.00-40.00	5.00	Double K	No	Yes	0.0000	0.0000
T10	40.00-20.00	5.00	Double K	No	Yes	0.0000	0.0000
T11	20.00-0.00	5.00	Double K	No	Yes	0.0000	0.0000

Tower Section Geometry (cont'd)

Tower Elevation	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
ft						
T1 199.00-184.03	Solid Round	1 1/2	A572-50 (50 ksi)	Solid Round	1	A36 (36 ksi)
T2 184.03-180.00	Solid Round	1 1/2	A572-50 (50 ksi)	Arbitrary Shape	SR 1" Ø + SR 1" Ø (Aho - Viper)	A36 (36 ksi)
T3 180.00-160.00	Solid Round	2 1/4	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T4 160.00-140.00	Solid Round	2 3/4	A572-50 (50 ksi)	Equal Angle	L2x2x1/4	A36 (36 ksi)
T5 140.00-120.00	Solid Round	3	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T6 120.00-100.00	Solid Round	3 1/4	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T7 100.00-80.00	Solid Round	3 1/2	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T8 80.00-60.00	Solid Round	3 3/4	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T9 60.00-40.00	Solid Round	4	A572-50 (50 ksi)	Equal Angle	L3 1/2 x 3 1/2 x 1/4	A36 (36 ksi)
T10 40.00-20.00	Solid Round	4 1/4	A572-50 (50 ksi)	Equal Angle	L3 1/2 x 3 1/2 x 1/4	A36 (36 ksi)
T11 20.00-0.00	Solid Round	4 1/4	A572-50 (50 ksi)	Equal Angle	L3 1/2 x 3 1/2 x 1/4	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
ft						
T1 199.00-184.03	Solid Round	1 1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T2 184.03-180.00	Equal Angle		A36 (36 ksi)	Solid Round	1	A36 (36 ksi)
T3 180.00-160.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)

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Tower Section Geometry (cont'd)

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 199.00-184.03	None	Flat Bar		A36 (36 ksi)	Solid Round	1	A36 (36 ksi)
T2 184.03-180.00	None	Flat Bar		A36 (36 ksi)	Solid Round	1	A36 (36 ksi)
T6 120.00-100.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 100.00-80.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 80.00-60.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 60.00-40.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T10 40.00-20.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T11 20.00-0.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L3 1/2 x 3 1/2 x 1/4	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T1 199.00-184.03	Solid Round	1	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T2 184.03-180.00	Solid Round	1	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Gusset Area (per face) ft ²	Gusset Thickness in	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 199.00-184.03	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 184.03-180.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 180.00-160.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 160.00-140.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 140.00-120.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 120.00-100.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000

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	Client Watauga County	Designed by hicham.anssar

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
ft	ft ²	in							
100.00-80.00			(36 ksi)						
T8 80.00-60.00	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
T9 60.00-40.00	0.00	0.3750	(36 ksi)	1	1	1	36.0000	36.0000	36.0000
			A36						
T10 40.00-20.00	0.00	0.3750	(36 ksi)	1	1	1	36.0000	36.0000	36.0000
			A36						
T11 20.00-0.00	0.00	0.3750	(36 ksi)	1	1	1	36.0000	36.0000	36.0000
			A36						
			(36 ksi)						

Tower Section Geometry (cont'd)

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors ¹						
				X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace
				X Y	X Y	X Y	X Y	X Y	X Y	X Y
ft										
T1	Yes	Yes	1	1	1	1	1	1	1	1
199.00-184.03				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	0.7	1	1	1	1	1
184.03-180.00				1	0.7	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
180.00-160.00				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
160.00-140.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	0.5	1	1
120.00-100.00				1	1	1	1	0.5	1	1
T7	Yes	Yes	1	1	1	1	1	0.5	1	1
100.00-80.00				1	1	1	1	0.5	1	1
T8	Yes	Yes	1	1	1	1	1	0.5	1	1
80.00-60.00				1	1	1	1	0.5	1	1
T9	Yes	Yes	1	1	1	1	1	0.5	1	1
60.00-40.00				1	1	1	1	0.5	1	1
T10	Yes	Yes	1	1	1	1	1	0.5	1	1
40.00-20.00				1	1	1	1	0.5	1	1
T11	Yes	Yes	1	1	1	1	1	0.5	1	1
20.00-0.00				1	1	1	1	0.5	1	1

¹Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry (cont'd)

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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
T1 199.00-184.03	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	0.75	0.0000	1	0.0000	1
T2 184.03-180.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	0.75	0.0000	1	0.0000	1
T3 180.00-160.00	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
T4 160.00-140.00	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 140.00-120.00	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 120.00-100.00	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 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
T8 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
T9 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
T10 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
T11 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 199.00-184.03	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 184.03-180.00	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 180.00-160.00	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 160.00-140.00	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)

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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	Net Width Deduct in	U	Net Width Deduct in	U
T5 140.00-120.00	0.0000	0.75 (3)	0.0000	0.75 (3)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.75	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)								0.0000	0.75 (4)
	0.0000	0.75 (1)	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 (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)
T6 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	0.75	0.0000	0.75 (1)
	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 (4)	0.0000	0.75 (4)								0.0000	0.75 (4)
T7 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	0.75	0.0000	0.75 (1)
	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 (4)	0.0000	0.75 (4)								0.0000	0.75 (4)
T8 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	0.75	0.0000	0.75 (1)
	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 (4)	0.0000	0.75 (4)								0.0000	0.75 (4)
T9 60.00-40.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.75	0.0000	0.75 (1)
	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 (4)	0.0000	0.75 (4)								0.0000	0.75 (4)
T10 40.00-20.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.75	0.0000	0.75 (1)
	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 (4)	0.0000	0.75 (4)								0.0000	0.75 (4)
T11 20.00-0.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.75	0.0000	0.75 (1)

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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)

Tower Section Geometry (cont'd)

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 199.00-184.03	Flange	0.7500	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
T2 184.03-180.00	Flange	0.7500	4	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
T3 180.00-160.00	Flange	1.0000	4	0.6250	1	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0
T4 160.00-140.00	Flange	1.0000	4	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
T5 140.00-120.00	Flange	1.0000	4	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
T6 120.00-100.00	Flange	1.0000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
T7 100.00-80.00	Flange	1.0000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
T8 80.00-60.00	Flange	1.2500	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
T9 60.00-40.00	Flange	1.2500	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
T10 40.00-20.00	Flange	1.2500	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
T11 20.00-0.00	Flange	1.2500	0	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf

Step Pegs (5/8" SR) 7-in. w/ 30" Step	A	No	No	Ar (CaAa)	40.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49
Step Pegs (5/8" SR) 7-in. w/ 30" Step	B	No	No	Ar (CaAa)	40.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49

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Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Step Pegs (5/8" SR) 7-in. w/ 30" Step	C	No	No	Ar (CaAa)	199.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49
Ladder Rail: PL2x1/4	A	No	No	Af (CaAa)	199.00 - 1.00	0.0000	-0.25	2	2	12.7500 3.0000	2.0000		3.83
Climbing Rung: SR 5/8" (12" Step)	A	No	No	Ar (CaAa)	199.00 - 1.00	0.0000	-0.25	1	1	0.6250	0.6250		1.04
Safety Line 3/8 ***	A	No	No	Ar (CaAa)	199.00 - 1.00	0.0000	-0.25	1	1	0.3750	0.3750		0.22
L2x2x1/8 Feedline Rail	C	No	No	Af (CaAa)	199.00 - 0.00	0.0000	-0.25	2	2	21.7500 2.8404	2.8404		4.52
L1 3/4x1 3/4x1/8 Feedline Rung	C	No	No	Af (CaAa)	199.00 - 0.00	0.0000	-0.25	1	1	1.7500	1.7500		4.52
7/8	C	No	No	Ar (CaAa)	198.00 - 8.00	0.0000	-0.31	2	2	1.1100	1.1100		0.54
1/2	C	No	No	Ar (CaAa)	198.00 - 8.00	0.0000	-0.28	1	1	0.5800	0.5800		0.25
EU 63	C	No	No	Ar (CaAa)	150.00 - 8.00	0.0000	-0.26	2	2	0.5000	2.0300		0.56
EU 63	C	No	No	Ar (CaAa)	183.00 - 150.00	0.0000	-0.26	1	1	2.0300	2.0300		0.56
*** 1 5/8	C	No	No	Ar (CaAa)	160.00 - 8.00	0.0000	-0.2	2	2	0.5000	1.9800		1.04
EU 63	C	No	No	Ar (CaAa)	175.00 - 8.00	0.0000	-0.23	1	1	2.0300	2.0300		0.56
*** EW63	C	No	No	Ar (CaAa)	130.00 - 8.00	0.0000	-0.15	2	2	0.5000	1.5742		0.51
7/8	C	No	No	Ar (CaAa)	100.00 - 8.00	0.0000	-0.18	2	2	0.5000	1.1100		0.54
7/8	C	No	No	Ar (CaAa)	130.00 - 100.00	0.0000	-0.18	1	1	0.5000	1.1100		0.54
CAT5E(1/4) ***	C	No	No	Ar (CaAa)	80.00 - 8.00	0.0000	-0.13	1	1	0.2600	0.2600		0.04

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

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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	199.00-184.03	A	0.000	0.000	11.481	0.000	0.13
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	23.507	0.000	0.24
T2	184.03-180.00	A	0.000	0.000	3.086	0.000	0.04
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	7.003	0.000	0.07
T3	180.00-160.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	38.874	0.000	0.34
T4	160.00-140.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	49.839	0.000	0.39
T5	140.00-120.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	56.128	0.000	0.41
T6	120.00-100.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	60.386	0.000	0.42
T7	100.00-80.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	62.606	0.000	0.43
T8	80.00-60.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	63.126	0.000	0.44
T9	60.00-40.00	A	0.000	0.000	15.333	0.000	0.18
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	63.126	0.000	0.44
T10	40.00-20.00	A	0.000	0.000	16.733	0.000	0.20
		B	0.000	0.000	1.400	0.000	0.02
		C	0.000	0.000	63.126	0.000	0.44
T11	20.00-0.00	A	0.000	0.000	15.967	0.000	0.19
		B	0.000	0.000	1.400	0.000	0.02
		C	0.000	0.000	48.343	0.000	0.38

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	199.00-184.03	A	2.981	0.000	0.000	47.189	0.000	1.06
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	92.523	0.000	1.96
T2	184.03-180.00	A	2.966	0.000	0.000	12.635	0.000	0.28
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	27.733	0.000	0.59
T3	180.00-160.00	A	2.945	0.000	0.000	62.459	0.000	1.39
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	153.054	0.000	3.27
T4	160.00-140.00	A	2.909	0.000	0.000	61.872	0.000	1.36
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	196.287	0.000	3.89
T5	140.00-120.00	A	2.867	0.000	0.000	61.211	0.000	1.34
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	224.428	0.000	4.24
T6	120.00-100.00	A	2.820	0.000	0.000	60.451	0.000	1.30
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	243.333	0.000	4.50
T7	100.00-80.00	A	2.764	0.000	0.000	59.555	0.000	1.26

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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
T8	80.00-60.00	B	2.695	0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	253.215	0.000	4.46
		A		0.000	0.000	58.457	0.000	1.22
		B		0.000	0.000	0.000	0.000	0.00
T9	60.00-40.00	C	2.606	0.000	0.000	260.257	0.000	4.51
		A		0.000	0.000	57.030	0.000	1.16
		B		0.000	0.000	0.000	0.000	0.00
T10	40.00-20.00	C	2.476	0.000	0.000	254.363	0.000	4.30
		A		0.000	0.000	74.977	0.000	1.29
		B		0.000	0.000	20.023	0.000	0.22
T11	20.00-0.00	C	2.219	0.000	0.000	245.789	0.000	4.01
		A		0.000	0.000	66.495	0.000	1.06
		B		0.000	0.000	18.205	0.000	0.18
		C		0.000	0.000	165.106	0.000	2.62

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
T1	199.00-184.03	1.2553	4.2816	-0.4120	4.1526
T2	184.03-180.00	1.6213	4.3232	0.0719	3.1475
T3	180.00-160.00	1.8981	4.5010	0.6468	5.5289
T4	160.00-140.00	3.4366	6.3640	2.1899	8.8351
T5	140.00-120.00	4.1972	7.2338	3.3737	11.2061
T6	120.00-100.00	4.9386	8.4230	4.6387	14.2759
T7	100.00-80.00	5.6227	9.2579	5.4793	16.0132
T8	80.00-60.00	6.0977	10.0101	6.3259	18.0549
T9	60.00-40.00	6.0437	9.8214	6.7092	18.9387
T10	40.00-20.00	6.7676	9.7356	9.0858	17.2542
T11	20.00-0.00	4.8553	7.4113	6.0132	13.7339

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	184.03 - 199.00	0.6000	0.4246
T1	5	Ladder Rail: PL2x1/4	184.03 - 199.00	0.6000	0.4246
T1	6	Climbing Rung: SR 5/8" (12" Step)	184.03 - 199.00	0.6000	0.4246
T1	7	Safety Line 3/8	184.03 - 199.00	0.6000	0.4246
T1	9	L2x2x1/8 Feedline Rail	184.03 - 199.00	0.6000	0.4246
T1	10	L1 3/4x1 3/4x1/8 Feedline Rung	184.03 - 199.00	0.6000	0.4246
T1	12	7/8	184.03 - 198.00	0.6000	0.4246
T1	13	1/2	184.03 -	0.6000	0.4246

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
			198.00		
T2	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	180.00 - 184.03	0.6000	0.3046
T2	5	Ladder Rail: PL2x1/4	180.00 - 184.03	0.6000	0.3046
T2	6	Climbing Rung: SR 5/8" (12" Step)	180.00 - 184.03	0.6000	0.3046
T2	7	Safety Line 3/8	180.00 - 184.03	0.6000	0.3046
T2	9	L2x2x1/8 Feedline Rail	180.00 - 184.03	0.6000	0.3046
T2	10	L1 3/4x1 3/4x1/8 Feedline Rung	180.00 - 184.03	0.6000	0.3046
T2	12	7/8	180.00 - 184.03	0.6000	0.3046
T2	13	1/2	180.00 - 184.03	0.6000	0.3046
T2	15	EU 63	180.00 - 183.00	0.6000	0.3046
T3	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	160.00 - 180.00	0.6000	0.4055
T3	5	Ladder Rail: PL2x1/4	160.00 - 180.00	0.6000	0.4055
T3	6	Climbing Rung: SR 5/8" (12" Step)	160.00 - 180.00	0.6000	0.4055
T3	7	Safety Line 3/8	160.00 - 180.00	0.6000	0.4055
T3	9	L2x2x1/8 Feedline Rail	160.00 - 180.00	0.6000	0.4055
T3	10	L1 3/4x1 3/4x1/8 Feedline Rung	160.00 - 180.00	0.6000	0.4055
T3	12	7/8	160.00 - 180.00	0.6000	0.4055
T3	13	1/2	160.00 - 180.00	0.6000	0.4055
T3	15	EU 63	160.00 - 180.00	0.6000	0.4055
T3	19	EU 63	160.00 - 175.00	0.6000	0.4055
T4	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	140.00 - 160.00	0.6000	0.5061
T4	5	Ladder Rail: PL2x1/4	140.00 - 160.00	0.6000	0.5061
T4	6	Climbing Rung: SR 5/8" (12" Step)	140.00 - 160.00	0.6000	0.5061
T4	7	Safety Line 3/8	140.00 - 160.00	0.6000	0.5061
T4	9	L2x2x1/8 Feedline Rail	140.00 - 160.00	0.6000	0.5061
T4	10	L1 3/4x1 3/4x1/8 Feedline Rung	140.00 - 160.00	0.6000	0.5061
T4	12	7/8	140.00 - 160.00	0.6000	0.5061
T4	13	1/2	140.00 - 160.00	0.6000	0.5061
T4	14	EU 63	140.00 - 150.00	0.6000	0.5061
T4	15	EU 63	150.00 - 160.00	0.6000	0.5061
T4	17	1 5/8	140.00 - 160.00	0.6000	0.5061
T4	19	EU 63	140.00 -	0.6000	0.5061

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T5	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	160.00 120.00 - 140.00	0.6000	0.5391
T5	5	Ladder Rail: PL2x1/4	120.00 - 140.00	0.6000	0.5391
T5	6	Climbing Rung: SR 5/8" (12" Step)	120.00 - 140.00	0.6000	0.5391
T5	7	Safety Line 3/8	120.00 - 140.00	0.6000	0.5391
T5	9	L2x2x1/8 Feedline Rail	120.00 - 140.00	0.6000	0.5391
T5	10	L1 3/4x1 3/4x1/8 Feedline Rung	120.00 - 140.00	0.6000	0.5391
T5	12	7/8	120.00 - 140.00	0.6000	0.5391
T5	13	1/2	120.00 - 140.00	0.6000	0.5391
T5	14	EU 63	120.00 - 140.00	0.6000	0.5391
T5	17	1 5/8	120.00 - 140.00	0.6000	0.5391
T5	19	EU 63	120.00 - 140.00	0.6000	0.5391
T5	21	EW63	120.00 - 130.00	0.6000	0.5391
T5	23	7/8	120.00 - 130.00	0.6000	0.5391
T6	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	100.00 - 120.00	0.6000	0.5999
T6	5	Ladder Rail: PL2x1/4	100.00 - 120.00	0.6000	0.5999
T6	6	Climbing Rung: SR 5/8" (12" Step)	100.00 - 120.00	0.6000	0.5999
T6	7	Safety Line 3/8	100.00 - 120.00	0.6000	0.5999
T6	9	L2x2x1/8 Feedline Rail	100.00 - 120.00	0.6000	0.5999
T6	10	L1 3/4x1 3/4x1/8 Feedline Rung	100.00 - 120.00	0.6000	0.5999
T6	12	7/8	100.00 - 120.00	0.6000	0.5999
T6	13	1/2	100.00 - 120.00	0.6000	0.5999
T6	14	EU 63	100.00 - 120.00	0.6000	0.5999
T6	17	1 5/8	100.00 - 120.00	0.6000	0.5999
T6	19	EU 63	100.00 - 120.00	0.6000	0.5999
T6	21	EW63	100.00 - 120.00	0.6000	0.5999
T6	23	7/8	100.00 - 120.00	0.6000	0.5999
T7	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	80.00 - 100.00	0.6000	0.6000
T7	5	Ladder Rail: PL2x1/4	80.00 - 100.00	0.6000	0.6000
T7	6	Climbing Rung: SR 5/8" (12" Step)	80.00 - 100.00	0.6000	0.6000
T7	7	Safety Line 3/8	80.00 - 100.00	0.6000	0.6000
T7	9	L2x2x1/8 Feedline Rail	80.00 - 100.00	0.6000	0.6000
T7	10	L1 3/4x1 3/4x1/8 Feedline Rung	80.00 - 100.00	0.6000	0.6000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
T7	12	7/8	80.00 - 100.00	0.6000	0.6000
T7	13	1/2	80.00 - 100.00	0.6000	0.6000
T7	14	EU 63	80.00 - 100.00	0.6000	0.6000
T7	17	1 5/8	80.00 - 100.00	0.6000	0.6000
T7	19	EU 63	80.00 - 100.00	0.6000	0.6000
T7	21	EW63	80.00 - 100.00	0.6000	0.6000
T7	22	7/8	80.00 - 100.00	0.6000	0.6000
T8	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	60.00 - 80.00	0.6000	0.6000
T8	5	Ladder Rail: PL2x1/4	60.00 - 80.00	0.6000	0.6000
T8	6	Climbing Rung: SR 5/8" (12" Step)	60.00 - 80.00	0.6000	0.6000
T8	7	Safety Line 3/8	60.00 - 80.00	0.6000	0.6000
T8	9	L2x2x1/8 Feedline Rail	60.00 - 80.00	0.6000	0.6000
T8	10	L1 3/4x1 3/4x1/8 Feedline Rung	60.00 - 80.00	0.6000	0.6000
T8	12	7/8	60.00 - 80.00	0.6000	0.6000
T8	13	1/2	60.00 - 80.00	0.6000	0.6000
T8	14	EU 63	60.00 - 80.00	0.6000	0.6000
T8	17	1 5/8	60.00 - 80.00	0.6000	0.6000
T8	19	EU 63	60.00 - 80.00	0.6000	0.6000
T8	21	EW63	60.00 - 80.00	0.6000	0.6000
T8	22	7/8	60.00 - 80.00	0.6000	0.6000
T8	24	CAT5E(1/4)	60.00 - 80.00	0.6000	0.6000
T9	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	40.00 - 60.00	0.6000	0.6000
T9	5	Ladder Rail: PL2x1/4	40.00 - 60.00	0.6000	0.6000
T9	6	Climbing Rung: SR 5/8" (12" Step)	40.00 - 60.00	0.6000	0.6000
T9	7	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T9	9	L2x2x1/8 Feedline Rail	40.00 - 60.00	0.6000	0.6000
T9	10	L1 3/4x1 3/4x1/8 Feedline Rung	40.00 - 60.00	0.6000	0.6000
T9	12	7/8	40.00 - 60.00	0.6000	0.6000
T9	13	1/2	40.00 - 60.00	0.6000	0.6000
T9	14	EU 63	40.00 - 60.00	0.6000	0.6000
T9	17	1 5/8	40.00 - 60.00	0.6000	0.6000
T9	19	EU 63	40.00 - 60.00	0.6000	0.6000
T9	21	EW63	40.00 - 60.00	0.6000	0.6000
T9	22	7/8	40.00 - 60.00	0.6000	0.6000
T9	24	CAT5E(1/4)	40.00 - 60.00	0.6000	0.6000
T10	2	Step Pegs (5/8" SR) 7-in. w/ 30" Step	20.00 - 40.00	0.6000	0.6000
T10	3	Step Pegs (5/8" SR) 7-in. w/ 30" Step	20.00 - 40.00	0.6000	0.6000
T10	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	20.00 - 40.00	0.6000	0.6000
T10	5	Ladder Rail: PL2x1/4	20.00 - 40.00	0.6000	0.6000
T10	6	Climbing Rung: SR 5/8" (12" Step)	20.00 - 40.00	0.6000	0.6000
T10	7	Safety Line 3/8	20.00 - 40.00	0.6000	0.6000
T10	9	L2x2x1/8 Feedline Rail	20.00 - 40.00	0.6000	0.6000
T10	10	L1 3/4x1 3/4x1/8 Feedline Rung	20.00 - 40.00	0.6000	0.6000
T10	12	7/8	20.00 - 40.00	0.6000	0.6000
T10	13	1/2	20.00 - 40.00	0.6000	0.6000
T10	14	EU 63	20.00 - 40.00	0.6000	0.6000
T10	17	1 5/8	20.00 - 40.00	0.6000	0.6000
T10	19	EU 63	20.00 - 40.00	0.6000	0.6000
T10	21	EW63	20.00 - 40.00	0.6000	0.6000
T10	22	7/8	20.00 - 40.00	0.6000	0.6000
T10	24	CAT5E(1/4)	20.00 - 40.00	0.6000	0.6000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _o No Ice	K _o Ice
T11	2	Step Pegs (5/8" SR) 7-in. w/ 30" Step	0.00 - 20.00	0.6000	0.6000
T11	3	Step Pegs (5/8" SR) 7-in. w/ 30" Step	0.00 - 20.00	0.6000	0.6000
T11	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	0.00 - 20.00	0.6000	0.6000
T11	5	Ladder Rail: PL2x1/4	1.00 - 20.00	0.6000	0.6000
T11	6	Climbing Rung: SR 5/8" (12" Step)	1.00 - 20.00	0.6000	0.6000
T11	7	Safety Line 3/8	1.00 - 20.00	0.6000	0.6000
T11	9	L2x2x1/8 Feedline Rail	0.00 - 20.00	0.6000	0.6000
T11	10	L1 3/4x1 3/4x1/8 Feedline	0.00 - 20.00	0.6000	0.6000
T11	12	Rung 7/8	8.00 - 20.00	0.6000	0.6000
T11	13	1/2	8.00 - 20.00	0.6000	0.6000
T11	14	EU 63	8.00 - 20.00	0.6000	0.6000
T11	17	1 5/8	8.00 - 20.00	0.6000	0.6000
T11	19	EU 63	8.00 - 20.00	0.6000	0.6000
T11	21	EW63	8.00 - 20.00	0.6000	0.6000
T11	22	7/8	8.00 - 20.00	0.6000	0.6000
T11	24	CAT5E(1/4)	8.00 - 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

5/8-in x 8-ft Lightning Rod	C	From Leg	0.00	0.00	199.00	No Ice	0.44	0.44	0.01
			0.00			1/2" Ice	1.15	1.15	0.01
			4.00			1" Ice	1.88	1.88	0.02

Side Arm Mount [SO 303-1]	A	From Leg	3.00	0.00	198.00	No Ice	1.08	5.31	0.12
			0.00			1/2" Ice	1.63	7.57	0.16
			0.00			1" Ice	2.21	9.93	0.22
Side Arm Mount [SO 303-1]	B	From Leg	3.00	0.00	198.00	No Ice	1.08	5.31	0.12
			0.00			1/2" Ice	1.63	7.57	0.16
			0.00			1" Ice	2.21	9.93	0.22
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00	0.00	198.00	No Ice	2.38	0.06	0.04
			0.00			1/2" Ice	3.40	0.12	0.06
			0.00			1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00	0.00	198.00	No Ice	2.38	0.06	0.04
			0.00			1/2" Ice	3.40	0.12	0.06
			0.00			1" Ice	4.45	0.21	0.08
CC807-11	A	From Leg	6.00	0.00	198.00	No Ice	4.71	4.71	0.05
			0.00			1/2" Ice	7.63	7.63	0.09
			8.00			1" Ice	9.40	9.40	0.14
CC807-11	B	From Leg	6.00	0.00	198.00	No Ice	4.71	4.71	0.05
			0.00			1/2" Ice	7.63	7.63	0.09
			8.00			1" Ice	9.40	9.40	0.14
Junction Box (9" x 6" x 5")	B	From Face	0.50	0.00	196.00	No Ice	0.83	0.50	0.03

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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
			0.00			1/2" Ice	0.95	0.59	0.03
			0.00			1" Ice	1.07	0.69	0.04

Ice Shield 10'x7"	C	From Leg	3.00	0.00	188.00	No Ice	7.00	4.90	0.05
			0.00			1/2" Ice	7.71	5.41	0.43
			0.00			1" Ice	8.43	5.93	0.82
4.5" x 5-ft Dish Pipe Mount	C	From Leg	0.67	0.00	183.00	No Ice	1.44	1.44	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09

Ice Shield 10'x7"	B	From Leg	3.00	0.00	155.00	No Ice	7.00	4.90	0.05
			0.00			1/2" Ice	7.71	5.41	0.43
			0.00			1" Ice	8.43	5.93	0.82
4.5" x 5-ft Dish Pipe Mount	B	From Leg	0.67	0.00	150.00	No Ice	1.44	1.44	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09

Side Arm Mount [SO 303-1]	A	From Leg	3.00	0.00	160.00	No Ice	1.08	5.31	0.12
			0.00			1/2" Ice	1.63	7.57	0.16
			0.00			1" Ice	2.21	9.93	0.22
Side Arm Mount [SO 303-1]	B	From Leg	3.00	0.00	160.00	No Ice	1.08	5.31	0.12
			0.00			1/2" Ice	1.63	7.57	0.16
			0.00			1" Ice	2.21	9.93	0.22
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00	0.00	160.00	No Ice	2.38	0.06	0.04
			0.00			1/2" Ice	3.40	0.12	0.06
			0.00			1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00	0.00	160.00	No Ice	2.38	0.06	0.04
			0.00			1/2" Ice	3.40	0.12	0.06
			0.00			1" Ice	4.45	0.21	0.08
CC807-11	A	From Leg	6.00	0.00	160.00	No Ice	4.82	4.82	0.05
			0.00			1/2" Ice	7.63	7.63	0.09
			8.00			1" Ice	9.40	9.40	0.14
CC807-11	B	From Leg	6.00	0.00	160.00	No Ice	4.82	4.82	0.05
			0.00			1/2" Ice	7.63	7.63	0.09
			8.00			1" Ice	9.40	9.40	0.14

Pipe Mount [PM 602-1]	C	From Leg	0.67	0.00	175.00	No Ice	2.78	2.78	0.09
			0.00			1/2" Ice	3.21	3.21	0.11
			0.00			1" Ice	3.64	3.64	0.14

Pipe Mount [PM 601-1]	C	From Leg	0.50	0.00	130.00	No Ice	1.32	1.32	0.07
			0.00			1/2" Ice	1.58	1.58	0.08
			0.00			1" Ice	1.84	1.84	0.09
Pipe Mount [PM 602-1]	B	From Leg	0.50	0.00	130.00	No Ice	2.78	2.78	0.09
			0.00			1/2" Ice	3.21	3.21	0.11
			0.00			1" Ice	3.64	3.64	0.14

Side Arm Mount [SO 303-1]	A	From Leg	3.00	0.00	130.00	No Ice	1.08	5.31	0.12
			0.00			1/2" Ice	1.63	7.57	0.16
			0.00			1" Ice	2.21	9.93	0.22
Side Arm Mount [SO 303-1]	A	From Leg	3.00	0.00	100.00	No Ice	1.08	5.31	0.12
			0.00			1/2" Ice	1.63	7.57	0.16
			0.00			1" Ice	2.21	9.93	0.22
DB224	A	From Leg	6.00	0.00	130.00	No Ice	4.50	4.50	0.04
			0.00			1/2" Ice	6.78	6.78	0.07
			10.60			1" Ice	9.07	9.07	0.12
DB224	A	From Leg	6.00	0.00	100.00	No Ice	4.50	4.50	0.04

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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
			0.00		1/2" Ice	6.78	6.78	0.07
			10.60		1" Ice	9.07	9.07	0.12

Pipe Mount [PM 601-1]	B	From Leg	0.50	0.00	80.00	No Ice	1.32	0.07
			0.00			1/2" Ice	1.58	0.08
			0.00			1" Ice	1.84	0.09
AM-V5G-Ti	B	From Leg	1.00	0.00	80.00	No Ice	0.74	0.01
			0.00			1/2" Ice	0.86	0.01
			0.00			1" Ice	0.99	0.02

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 ft ²	Weight K

PAD8-65AC1S1R	C	Paraboloid w/Radome	From Leg	1.50 0.00 0.00	60.00		183.00	8.62	No Ice 1/2" Ice 1" Ice	58.31 59.45 60.58

PAD8-65AC1S1R	B	Paraboloid w/Radome	From Leg	1.50 0.00 0.00	0.00		150.00	8.62	No Ice 1/2" Ice 1" Ice	58.31 59.45 60.58

HX6-6W-6WH	C	Paraboloid w/Shroud (HP)	From Leg	1.50 0.00 0.00	74.50		175.00	6.23	No Ice 1/2" Ice 1" Ice	30.48 31.30 32.13

PAD6-65B	C	Paraboloid w/o Radome	From Leg	1.50 0.00 0.00	0.00		130.00	6.58	No Ice 1/2" Ice 1" Ice	34.04 34.90 35.77

PAD8-65B	B	Paraboloid w/Radome	From Leg	1.50 0.00 0.00	0.00		130.00	8.00	No Ice 1/2" Ice 1" Ice	50.27 51.32 52.37

Tower Pressures - No Ice

$$G_H = 0.850$$

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	Client	Watauga County	Designed by	hicham.anssar

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 199.00-184.03	191.51	1.451	42	61.772	A	0.000	6.824	3.744	54.86	11.481	0.000
					B	0.000	6.824		54.86	0.000	0.000
					C	0.000	7.470		50.12	23.507	0.000
T2 184.03-180.00	182.01	1.436	42	16.603	A	0.000	2.526	1.006	39.83	3.086	0.000
					B	0.000	2.526		39.83	0.000	0.000
					C	0.000	2.688		37.44	7.003	0.000
T3 180.00-160.00	170.00	1.415	41	98.753	A	9.476	7.507	7.507	44.20	15.333	0.000
					B	9.476	7.507		44.20	0.000	0.000
					C	9.476	7.507		44.20	38.874	0.000
T4 160.00-140.00	150.00	1.378	40	129.587	A	10.286	9.175	9.175	47.15	15.333	0.000
					B	10.286	9.175		47.15	0.000	0.000
					C	10.286	9.175		47.15	49.839	0.000
T5 140.00-120.00	130.00	1.337	39	160.004	A	14.881	10.009	10.009	40.21	15.333	0.000
					B	14.881	10.009		40.21	0.000	0.000
					C	14.881	10.009		40.21	56.128	0.000
T6 120.00-100.00	110.00	1.291	38	190.420	A	16.971	10.843	10.843	38.98	15.333	0.000
					B	16.971	10.843		38.98	0.000	0.000
					C	16.971	10.843		38.98	60.386	0.000
T7 100.00-80.00	90.00	1.238	36	220.837	A	18.647	11.678	11.678	38.51	15.333	0.000
					B	18.647	11.678		38.51	0.000	0.000
					C	18.647	11.678		38.51	62.606	0.000
T8 80.00-60.00	70.00	1.174	34	251.254	A	20.389	12.512	12.512	38.03	15.333	0.000
					B	20.389	12.512		38.03	0.000	0.000
					C	20.389	12.512		38.03	63.126	0.000
T9 60.00-40.00	50.00	1.094	32	281.671	A	26.068	13.346	13.346	33.86	15.333	0.000
					B	26.068	13.346		33.86	0.000	0.000
					C	26.068	13.346		33.86	63.126	0.000
T10 40.00-20.00	30.00	0.982	29	312.088	A	28.233	14.180	14.180	33.43	16.733	0.000
					B	28.233	14.180		33.43	1.400	0.000
					C	28.233	14.180		33.43	63.126	0.000
T11 20.00-0.00	10.00	0.850	25	347.092	A	32.247	14.190	14.190	30.56	15.967	0.000
					B	32.247	14.190		30.56	1.400	0.000
					C	32.247	14.190		30.56	48.343	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 199.00-184.03	191.51	1.451	3	2.9806	69.211	A	0.000	39.827	18.622	46.76	47.189	0.000
						B	0.000	39.827		46.76	0.000	0.000
						C	0.000	44.323		42.01	92.523	0.000
T2 184.03-180.00	182.01	1.436	3	2.9655	18.592	A	0.000	12.928	4.985	38.56	12.635	0.000
						B	0.000	12.928		38.56	0.000	0.000
						C	0.000	14.047		35.49	27.733	0.000
T3 180.00-160.00	170.00	1.415	3	2.9453	108.577	A	9.476	55.071	27.161	42.08	62.459	0.000
						B	9.476	55.071		42.08	0.000	0.000
						C	9.476	55.071		42.08	153.054	0.000
T4 160.00-140.00	150.00	1.378	3	2.9087	139.289	A	10.286	58.505	28.585	41.55	61.872	0.000
						B	10.286	58.505		41.55	0.000	0.000
						C	10.286	58.505		41.55	196.287	0.000
T5 140.00-120.00	130.00	1.337	3	2.8674	169.568	A	14.881	63.278	29.143	37.29	61.211	0.000
						B	14.881	63.278		37.29	0.000	0.000

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Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e ft ²	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
T6 120.00-100.00	110.00	1.291	3	2.8199	199.827	C A B C	14.881 16.971 16.971 16.971	63.278 62.971 62.971 62.971	29.660	37.29 37.10 37.10 37.10	224.428 60.451 0.000 243.333	0.000 0.000 0.000 0.000
T7 100.00-80.00	90.00	1.238	2	2.7638	230.057	A B C	18.647 18.647 18.647	66.084 66.084 66.084	30.120	35.55 35.55 35.55	59.555 0.000 253.215	0.000 0.000 0.000
T8 80.00-60.00	70.00	1.174	2	2.6952	260.245	A B C	20.389 20.389 20.389	68.919 68.919 68.919	30.497	34.15 34.15 34.15	58.457 0.000 260.257	0.000 0.000 0.000
T9 60.00-40.00	50.00	1.094	2	2.6061	290.364	A B C	26.068 26.068 26.068	71.220 71.220 71.220	30.736	31.59 31.59 31.59	57.030 0.000 254.363	0.000 0.000 0.000
T10 40.00-20.00	30.00	0.982	2	2.4763	320.348	A B C	28.233 28.233 28.233	72.411 72.411 72.411	30.704	30.51 30.51 30.51	74.977 20.023 245.789	0.000 0.000 0.000
T11 20.00-0.00	10.00	0.850	2	2.2186	354.497	A B C	32.247 32.247 32.247	69.889 69.889 69.889	29.006	28.40 28.40 28.40	66.495 18.205 165.106	0.000 0.000 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 ft ²	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 199.00-184.03	191.51	1.451	11	61.772	A B C	0.000 0.000 0.000	6.824 6.824 7.470	3.744	54.86 54.86 50.12	11.481 0.000 23.507	0.000 0.000 0.000
T2 184.03-180.00	182.01	1.436	11	16.603	A B C	0.000 0.000 0.000	2.526 2.526 2.688	1.006	39.83 39.83 37.44	3.086 0.000 7.003	0.000 0.000 0.000
T3 180.00-160.00	170.00	1.415	11	98.753	A B C	9.476 9.476 9.476	7.507 7.507 7.507	7.507	44.20 44.20 44.20	15.333 0.000 38.874	0.000 0.000 0.000
T4 160.00-140.00	150.00	1.378	11	129.587	A B C	10.286 10.286 10.286	9.175 9.175 9.175	9.175	47.15 47.15 47.15	15.333 0.000 49.839	0.000 0.000 0.000
T5 140.00-120.00	130.00	1.337	10	160.004	A B C	14.881 14.881 14.881	10.009 10.009 10.009	10.009	40.21 40.21 40.21	15.333 0.000 56.128	0.000 0.000 0.000
T6 120.00-100.00	110.00	1.291	10	190.420	A B C	16.971 16.971 16.971	10.843 10.843 10.843	10.843	38.98 38.98 38.98	15.333 0.000 60.386	0.000 0.000 0.000
T7 100.00-80.00	90.00	1.238	10	220.837	A B C	18.647 18.647 18.647	11.678 11.678 11.678	11.678	38.51 38.51 38.51	15.333 0.000 62.606	0.000 0.000 0.000
T8 80.00-60.00	70.00	1.174	9	251.254	A B C	20.389 20.389 20.389	12.512 12.512 12.512	12.512	38.03 38.03 38.03	15.333 0.000 63.126	0.000 0.000 0.000
T9 60.00-40.00	50.00	1.094	9	281.671	A B C	26.068 26.068 26.068	13.346 13.346 13.346	13.346	33.86 33.86 33.86	15.333 0.000 63.126	0.000 0.000 0.000

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	Client Watauga County	Designed by hicham.anssar

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
T10 40.00-20.00	30.00	0.982	8	312.088	A	28.233	14.180	14.180	33.43	16.733	0.000
T11 20.00-0.00	10.00	0.850	7	347.092	B	28.233	14.180	14.190	33.43	1.400	0.000
					C	28.233	14.180		33.43	63.126	0.000
					A	32.247	14.190		30.56	15.967	0.000
					B	32.247	14.190		30.56	1.400	0.000
					C	32.247	14.190		30.56	48.343	0.000

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 199.00-184.03	0.37	0.60	A	0.11	2.922	42	1	1	3.854	1.13	75.56	C
T2 184.03-180.00	0.10	0.19	B	0.11	2.922	42	1	1	3.854	0.35	86.36	C
			C	0.121	2.881		1	1	4.222			
			A	0.152	2.764		1	1	1.434			
T3 180.00-160.00	0.52	1.37	B	0.152	2.764	41	1	1	1.434	2.36	118.06	C
			C	0.162	2.728		1	1	1.529			
			A	0.172	2.692		1	1	13.756			
T4 160.00-140.00	0.57	1.83	B	0.172	2.692	40	1	1	13.756	2.73	136.32	C
			C	0.172	2.692		1	1	13.756			
			A	0.15	2.771		1	1	15.494			
T5 140.00-120.00	0.59	2.34	B	0.15	2.771	39	1	1	15.494	3.22	160.87	C
			C	0.15	2.771		1	1	15.494			
			A	0.156	2.751		1	1	20.499			
T6 120.00-100.00	0.60	2.67	B	0.156	2.751	38	1	1	20.499	3.43	171.42	C
			C	0.156	2.751		1	1	20.499			
			A	0.146	2.786		1	1	22.935			
T7 100.00-80.00	0.61	3.03	B	0.146	2.786	36	1	1	22.935	3.52	176.23	C
			C	0.137	2.819		1	1	24.947			
			A	0.137	2.819		1	1	24.947			
T8 80.00-60.00	0.61	3.41	B	0.137	2.819	34	1	1	24.947	3.54	177.09	C
			C	0.131	2.843		1	1	27.027			
			A	0.131	2.843		1	1	27.027			
T9 60.00-40.00	0.61	4.05	B	0.131	2.843	32	1	1	27.027	3.74	186.87	C
			C	0.14	2.809		1	1	33.095			
			A	0.14	2.809		1	1	33.095			
T10 40.00-20.00	0.65	4.50	B	0.136	2.824	29	1	1	33.095	3.58	179.20	C
			C	0.136	2.824		1	1	35.670			
			A	0.136	2.824		1	1	35.670			
T11 20.00-0.00	0.59	4.85	B	0.134	2.832	25	1	1	39.879	3.16	158.18	C
			C	0.134	2.832		1	1	39.879			
			A	0.134	2.832		1	1	39.879			
Sum Weight:	5.82	28.82						OTM	2776.87 kip-ft	30.76		

Tower Forces - No Ice - Wind 60 To Face

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	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
T1 199.00-184.03	0.37	0.60	A	0.11	2.922	42	0.8	1	3.854	1.10	73.38	A
			B	0.11	2.922		0.8	1	3.854			
			C	0.121	2.881		0.8	1	4.222			
T2 184.03-180.00	0.10	0.19	A	0.152	2.764	42	0.8	1	1.434	0.34	84.53	A
			B	0.152	2.764		0.8	1	1.434			
			C	0.162	2.728		0.8	1	1.529			
T3 180.00-160.00	0.52	1.37	A	0.172	2.692	41	0.8	1	11.861	2.18	109.10	A
			B	0.172	2.692		0.8	1	11.861			
			C	0.172	2.692		0.8	1	11.861			
T4 160.00-140.00	0.57	1.83	A	0.15	2.771	40	0.8	1	13.437	2.53	126.57	A
			B	0.15	2.771		0.8	1	13.437			
			C	0.15	2.771		0.8	1	13.437			
T5 140.00-120.00	0.59	2.34	A	0.156	2.751	39	0.8	1	17.523	2.95	147.29	A
			B	0.156	2.751		0.8	1	17.523			
			C	0.156	2.751		0.8	1	17.523			
T6 120.00-100.00	0.60	2.67	A	0.146	2.786	38	0.8	1	19.541	3.13	156.27	A
			B	0.146	2.786		0.8	1	19.541			
			C	0.146	2.786		0.8	1	19.541			
T7 100.00-80.00	0.61	3.03	A	0.137	2.819	36	0.8	1	21.218	3.20	160.09	A
			B	0.137	2.819		0.8	1	21.218			
			C	0.137	2.819		0.8	1	21.218			
T8 80.00-60.00	0.61	3.41	A	0.131	2.843	34	0.8	1	22.949	3.20	160.21	A
			B	0.131	2.843		0.8	1	22.949			
			C	0.131	2.843		0.8	1	22.949			
T9 60.00-40.00	0.61	4.05	A	0.14	2.809	32	0.8	1	27.881	3.34	167.00	A
			B	0.14	2.809		0.8	1	27.881			
			C	0.14	2.809		0.8	1	27.881			
T10 40.00-20.00	0.65	4.50	A	0.136	2.824	29	0.8	1	30.024	3.20	159.77	A
			B	0.136	2.824		0.8	1	30.024			
			C	0.136	2.824		0.8	1	30.024			
T11 20.00-0.00	0.59	4.85	A	0.134	2.832	25	0.8	1	33.429	2.78	138.92	A
			B	0.134	2.832		0.8	1	33.429			
			C	0.134	2.832		0.8	1	33.429			
Sum Weight:	5.82	28.82						OTM	2552.88 kip-ft	27.94		

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 199.00-184.03	0.37	0.60	A	0.11	2.922	42	0.85	1	3.854	1.12	74.96	B
			B	0.11	2.922		0.85	1	3.854			
			C	0.121	2.881		0.85	1	4.222			
T2 184.03-180.00	0.10	0.19	A	0.152	2.764	42	0.85	1	1.434	0.35	86.09	B
			B	0.152	2.764		0.85	1	1.434			
			C	0.162	2.728		0.85	1	1.529			
T3 180.00-160.00	0.52	1.37	A	0.172	2.692	41	0.85	1	12.335	2.26	112.87	B
			B	0.172	2.692		0.85	1	12.335			
			C	0.172	2.692		0.85	1	12.335			
T4 160.00-140.00	0.57	1.83	A	0.15	2.771	40	0.85	1	13.951	2.61	130.50	B
			B	0.15	2.771		0.85	1	13.951			
			C	0.15	2.771		0.85	1	13.951			

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	Project ETS, PLLC Job No. 24125019.STR.8180	Date 15:46:29 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
T5 140.00-120.00	0.59	2.34	A	0.156	2.751	39	0.85	1	18.267	3.04	152.14	B
			B	0.156	2.751		0.85	1	18.267			
			C	0.156	2.751		0.85	1	18.267			
T6 120.00-100.00	0.60	2.67	A	0.146	2.786	38	0.85	1	20.390	3.23	161.46	B
			B	0.146	2.786		0.85	1	20.390			
			C	0.146	2.786		0.85	1	20.390			
T7 100.00-80.00	0.61	3.03	A	0.137	2.819	36	0.85	1	22.150	3.31	165.47	B
			B	0.137	2.819		0.85	1	22.150			
			C	0.137	2.819		0.85	1	22.150			
T8 80.00-60.00	0.61	3.41	A	0.131	2.843	34	0.85	1	23.968	3.31	165.71	B
			B	0.131	2.843		0.85	1	23.968			
			C	0.131	2.843		0.85	1	23.968			
T9 60.00-40.00	0.61	4.05	A	0.14	2.809	32	0.85	1	29.185	3.46	173.15	B
			B	0.14	2.809		0.85	1	29.185			
			C	0.14	2.809		0.85	1	29.185			
T10 40.00-20.00	0.65	4.50	A	0.136	2.824	29	0.85	1	31.435	3.31	165.44	B
			B	0.136	2.824		0.85	1	31.435			
			C	0.136	2.824		0.85	1	31.435			
T11 20.00-0.00	0.59	4.85	A	0.134	2.832	25	0.85	1	35.042	2.89	144.36	B
			B	0.134	2.832		0.85	1	35.042			
			C	0.134	2.832		0.85	1	35.042			
Sum Weight:	5.82	28.82						OTM	2635.21 kip-ft	28.89		

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 199.00-184.03	3.02	3.09	A	0.575	1.821	3	1	1	29.013	0.27	18.22	C
			B	0.575	1.821		1	1	29.013			
			C	0.64	1.785		1	1	34.129			
T2 184.03-180.00	0.87	0.87	A	0.695	1.776	3	1	1	10.443	0.08	19.17	C
			B	0.695	1.776		1	1	10.443			
			C	0.756	1.79		1	1	11.963			
T3 180.00-160.00	4.66	6.19	A	0.594	1.808	3	1	1	50.244	0.40	19.89	C
			B	0.594	1.808		1	1	50.244			
			C	0.594	1.808		1	1	50.244			
T4 160.00-140.00	5.25	6.95	A	0.494	1.908	3	1	1	50.170	0.48	24.07	C
			B	0.494	1.908		1	1	50.170			
			C	0.494	1.908		1	1	50.170			
T5 140.00-120.00	5.58	8.54	A	0.461	1.956	3	1	1	56.941	0.54	27.22	C
			B	0.461	1.956		1	1	56.941			
			C	0.461	1.956		1	1	56.941			
T6 120.00-100.00	5.80	9.12	A	0.4	2.064	3	1	1	57.037	0.59	29.58	C
			B	0.4	2.064		1	1	57.037			
			C	0.4	2.064		1	1	57.037			
T7 100.00-80.00	5.72	9.84	A	0.368	2.13	2	1	1	59.824	0.59	29.60	C
			B	0.368	2.13		1	1	59.824			
			C	0.368	2.13		1	1	59.824			
T8 80.00-60.00	5.72	10.53	A	0.343	2.188	2	1	1	62.673	0.59	29.43	C
			B	0.343	2.188		1	1	62.673			
			C	0.343	2.188		1	1	62.673			

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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
T9 60.00-40.00	5.46	12.02	A	0.335	2.207	2	1	1	69.555	0.57	28.58	C
			B	0.335	2.207		1	1	69.555			
			C	0.335	2.207		1	1	69.555			
T10 40.00-20.00	5.52	12.49	A	0.314	2.259	2	1	1	71.931	0.55	27.32	C
			B	0.314	2.259		1	1	71.931			
			C	0.314	2.259		1	1	71.931			
T11 20.00-0.00	3.86	12.48	A	0.288	2.328	2	1	1	73.852	0.42	21.09	C
			B	0.288	2.328		1	1	73.852			
			C	0.288	2.328		1	1	73.852			
Sum Weight:	51.48	92.13						OTM	485.66 kip-ft	5.09		

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 199.00-184.03	3.02	3.09	A	0.575	1.821	3	0.8	1	29.013	0.26	17.61	C
			B	0.575	1.821		0.8	1	29.013			
			C	0.64	1.785		0.8	1	34.129			
T2 184.03-180.00	0.87	0.87	A	0.695	1.776	3	0.8	1	10.443	0.08	18.73	C
			B	0.695	1.776		0.8	1	10.443			
			C	0.756	1.79		0.8	1	11.963			
T3 180.00-160.00	4.66	6.19	A	0.594	1.808	3	0.8	1	48.349	0.39	19.48	A
			B	0.594	1.808		0.8	1	48.349			
			C	0.594	1.808		0.8	1	48.349			
T4 160.00-140.00	5.25	6.95	A	0.494	1.908	3	0.8	1	48.112	0.47	23.62	A
			B	0.494	1.908		0.8	1	48.112			
			C	0.494	1.908		0.8	1	48.112			
T5 140.00-120.00	5.58	8.54	A	0.461	1.956	3	0.8	1	53.964	0.53	26.57	A
			B	0.461	1.956		0.8	1	53.964			
			C	0.461	1.956		0.8	1	53.964			
T6 120.00-100.00	5.80	9.12	A	0.4	2.064	3	0.8	1	53.643	0.58	28.83	A
			B	0.4	2.064		0.8	1	53.643			
			C	0.4	2.064		0.8	1	53.643			
T7 100.00-80.00	5.72	9.84	A	0.368	2.13	2	0.8	1	56.095	0.58	28.78	A
			B	0.368	2.13		0.8	1	56.095			
			C	0.368	2.13		0.8	1	56.095			
T8 80.00-60.00	5.72	10.53	A	0.343	2.188	2	0.8	1	58.595	0.57	28.56	A
			B	0.343	2.188		0.8	1	58.595			
			C	0.343	2.188		0.8	1	58.595			
T9 60.00-40.00	5.46	12.02	A	0.335	2.207	2	0.8	1	64.342	0.55	27.54	A
			B	0.335	2.207		0.8	1	64.342			
			C	0.335	2.207		0.8	1	64.342			
T10 40.00-20.00	5.52	12.49	A	0.314	2.259	2	0.8	1	66.284	0.53	26.28	A
			B	0.314	2.259		0.8	1	66.284			
			C	0.314	2.259		0.8	1	66.284			
T11 20.00-0.00	3.86	12.48	A	0.288	2.328	2	0.8	1	67.403	0.40	20.03	A
			B	0.288	2.328		0.8	1	67.403			
			C	0.288	2.328		0.8	1	67.403			
Sum Weight:	51.48	92.13						OTM	472.95 kip-ft	4.93		

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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 199.00-184.03	3.02	3.09	A	0.575	1.821	3	0.85	1	29.013	0.26	17.41	B
			B	0.575	1.821		0.85	1	29.013			
			C	0.64	1.785		0.85	1	34.129			
T2 184.03-180.00	0.87	0.87	A	0.695	1.776	3	0.85	1	10.443	0.07	18.48	C
			B	0.695	1.776		0.85	1	10.443			
			C	0.756	1.79		0.85	1	11.963			
T3 180.00-160.00	4.66	6.19	A	0.594	1.808	3	0.85	1	48.823	0.40	20.03	B
			B	0.594	1.808		0.85	1	48.823			
			C	0.594	1.808		0.85	1	48.823			
T4 160.00-140.00	5.25	6.95	A	0.494	1.908	3	0.85	1	48.627	0.48	24.14	B
			B	0.494	1.908		0.85	1	48.627			
			C	0.494	1.908		0.85	1	48.627			
T5 140.00-120.00	5.58	8.54	A	0.461	1.956	3	0.85	1	54.708	0.54	27.06	B
			B	0.461	1.956		0.85	1	54.708			
			C	0.461	1.956		0.85	1	54.708			
T6 120.00-100.00	5.80	9.12	A	0.4	2.064	3	0.85	1	54.492	0.59	29.32	B
			B	0.4	2.064		0.85	1	54.492			
			C	0.4	2.064		0.85	1	54.492			
T7 100.00-80.00	5.72	9.84	A	0.368	2.13	2	0.85	1	57.027	0.58	29.20	B
			B	0.368	2.13		0.85	1	57.027			
			C	0.368	2.13		0.85	1	57.027			
T8 80.00-60.00	5.72	10.53	A	0.343	2.188	2	0.85	1	59.615	0.58	28.97	B
			B	0.343	2.188		0.85	1	59.615			
			C	0.343	2.188		0.85	1	59.615			
T9 60.00-40.00	5.46	12.02	A	0.335	2.207	2	0.85	1	65.645	0.56	27.96	B
			B	0.335	2.207		0.85	1	65.645			
			C	0.335	2.207		0.85	1	65.645			
T10 40.00-20.00	5.52	12.49	A	0.314	2.259	2	0.85	1	67.696	0.53	26.69	B
			B	0.314	2.259		0.85	1	67.696			
			C	0.314	2.259		0.85	1	67.696			
T11 20.00-0.00	3.86	12.48	A	0.288	2.328	2	0.85	1	69.015	0.41	20.48	B
			B	0.288	2.328		0.85	1	69.015			
			C	0.288	2.328		0.85	1	69.015			
Sum Weight:	51.48	92.13						OTM	480.02 kip-ft	5.01		

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 199.00-184.03	0.37	0.60	A	0.11	2.922	11	1	1	3.854	0.30	20.28	C
			B	0.11	2.922		1	1	3.854			
			C	0.121	2.881		1	1	4.222			
T2 184.03-180.00	0.10	0.19	A	0.152	2.764	11	1	1	1.434	0.09	23.18	C
			B	0.152	2.764		1	1	1.434			
			C	0.162	2.728		1	1	1.529			

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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
T3 180.00-160.00	0.52	1.37	A	0.172	2.692	11	1	1	13.756	0.63	31.68	C
			B	0.172	2.692		1	1	13.756			
			C	0.172	2.692		1	1	13.756			
T4 160.00-140.00	0.57	1.83	A	0.15	2.771	11	1	1	15.494	0.73	36.59	C
			B	0.15	2.771		1	1	15.494			
			C	0.15	2.771		1	1	15.494			
T5 140.00-120.00	0.59	2.34	A	0.156	2.751	10	1	1	20.567	0.87	43.26	C
			B	0.156	2.751		1	1	20.567			
			C	0.156	2.751		1	1	20.567			
T6 120.00-100.00	0.60	2.67	A	0.146	2.786	10	1	1	23.121	0.92	46.23	C
			B	0.146	2.786		1	1	23.121			
			C	0.146	2.786		1	1	23.121			
T7 100.00-80.00	0.61	3.03	A	0.137	2.819	10	1	1	25.261	0.95	47.66	C
			B	0.137	2.819		1	1	25.261			
			C	0.137	2.819		1	1	25.261			
T8 80.00-60.00	0.61	3.41	A	0.131	2.843	9	1	1	27.469	0.96	48.02	C
			B	0.131	2.843		1	1	27.469			
			C	0.131	2.843		1	1	27.469			
T9 60.00-40.00	0.61	4.05	A	0.14	2.809	9	1	1	33.629	1.01	50.70	C
			B	0.14	2.809		1	1	33.629			
			C	0.14	2.809		1	1	33.629			
T10 40.00-20.00	0.65	4.50	A	0.136	2.824	8	1	1	36.263	0.97	48.64	C
			B	0.136	2.824		1	1	36.263			
			C	0.136	2.824		1	1	36.263			
T11 20.00-0.00	0.59	4.85	A	0.134	2.832	7	1	1	40.280	0.86	42.78	C
			B	0.134	2.832		1	1	40.280			
			C	0.134	2.832		1	1	40.280			
Sum Weight:	5.82	28.82						OTM	748.26 kip-ft	8.31		

Tower Forces - Service - 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 199.00-184.03	0.37	0.60	A	0.11	2.922	11	0.8	1	3.854	0.29	19.69	A
			B	0.11	2.922		0.8	1	3.854			
			C	0.121	2.881		0.8	1	4.222			
T2 184.03-180.00	0.10	0.19	A	0.152	2.764	11	0.8	1	1.434	0.09	22.69	A
			B	0.152	2.764		0.8	1	1.434			
			C	0.162	2.728		0.8	1	1.529			
T3 180.00-160.00	0.52	1.37	A	0.172	2.692	11	0.8	1	11.861	0.59	29.28	A
			B	0.172	2.692		0.8	1	11.861			
			C	0.172	2.692		0.8	1	11.861			
T4 160.00-140.00	0.57	1.83	A	0.15	2.771	11	0.8	1	13.437	0.68	33.97	A
			B	0.15	2.771		0.8	1	13.437			
			C	0.15	2.771		0.8	1	13.437			
T5 140.00-120.00	0.59	2.34	A	0.156	2.751	10	0.8	1	17.591	0.79	39.61	A
			B	0.156	2.751		0.8	1	17.591			
			C	0.156	2.751		0.8	1	17.591			
T6 120.00-100.00	0.60	2.67	A	0.146	2.786	10	0.8	1	19.727	0.84	42.16	A
			B	0.146	2.786		0.8	1	19.727			
			C	0.146	2.786		0.8	1	19.727			

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Section Elevation ft	Add Weight K	Self Weight K	Face	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T7 100.00-80.00	0.61	3.03	A	0.137	2.819	10	0.8	1	21.531	0.87	43.33	A
			B	0.137	2.819		0.8	1	21.531			
			C	0.137	2.819		0.8	1	21.531			
T8 80.00-60.00	0.61	3.41	A	0.131	2.843	9	0.8	1	23.391	0.87	43.49	A
			B	0.131	2.843		0.8	1	23.391			
			C	0.131	2.843		0.8	1	23.391			
T9 60.00-40.00	0.61	4.05	A	0.14	2.809	9	0.8	1	28.416	0.91	45.37	A
			B	0.14	2.809		0.8	1	28.416			
			C	0.14	2.809		0.8	1	28.416			
T10 40.00-20.00	0.65	4.50	A	0.136	2.824	8	0.8	1	30.616	0.87	43.43	A
			B	0.136	2.824		0.8	1	30.616			
			C	0.136	2.824		0.8	1	30.616			
T11 20.00-0.00	0.59	4.85	A	0.134	2.832	7	0.8	1	33.831	0.75	37.61	A
			B	0.134	2.832		0.8	1	33.831			
			C	0.134	2.832		0.8	1	33.831			
Sum Weight:	5.82	28.82						OTM	688.14 kip-ft	7.55		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
T1 199.00-184.03	0.37	0.60	A	0.11	2.922	11	0.85	1	3.854	0.30	20.12	B
			B	0.11	2.922		0.85	1	3.854			
			C	0.121	2.881		0.85	1	4.222			
T2 184.03-180.00	0.10	0.19	A	0.152	2.764	11	0.85	1	1.434	0.09	23.10	B
			B	0.152	2.764		0.85	1	1.434			
			C	0.162	2.728		0.85	1	1.529			
T3 180.00-160.00	0.52	1.37	A	0.172	2.692	11	0.85	1	12.335	0.61	30.29	B
			B	0.172	2.692		0.85	1	12.335			
			C	0.172	2.692		0.85	1	12.335			
T4 160.00-140.00	0.57	1.83	A	0.15	2.771	11	0.85	1	13.951	0.70	35.02	B
			B	0.15	2.771		0.85	1	13.951			
			C	0.15	2.771		0.85	1	13.951			
T5 140.00-120.00	0.59	2.34	A	0.156	2.751	10	0.85	1	18.335	0.82	40.91	B
			B	0.156	2.751		0.85	1	18.335			
			C	0.156	2.751		0.85	1	18.335			
T6 120.00-100.00	0.60	2.67	A	0.146	2.786	10	0.85	1	20.575	0.87	43.56	B
			B	0.146	2.786		0.85	1	20.575			
			C	0.146	2.786		0.85	1	20.575			
T7 100.00-80.00	0.61	3.03	A	0.137	2.819	10	0.85	1	22.464	0.90	44.77	B
			B	0.137	2.819		0.85	1	22.464			
			C	0.137	2.819		0.85	1	22.464			
T8 80.00-60.00	0.61	3.41	A	0.131	2.843	9	0.85	1	24.410	0.90	44.96	B
			B	0.131	2.843		0.85	1	24.410			
			C	0.131	2.843		0.85	1	24.410			
T9 60.00-40.00	0.61	4.05	A	0.14	2.809	9	0.85	1	29.719	0.94	47.02	B
			B	0.14	2.809		0.85	1	29.719			
			C	0.14	2.809		0.85	1	29.719			
T10 40.00-20.00	0.65	4.50	A	0.136	2.824	8	0.85	1	32.028	0.90	44.95	B
			B	0.136	2.824		0.85	1	32.028			
			C	0.136	2.824		0.85	1	32.028			

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
ft	K	K										
T11	0.59	4.85	A	0.134	2.832	7	0.85	1	35.443	0.78	39.07	B
20.00-0.00			B	0.134	2.832		0.85	1	35.443			
			C	0.134	2.832		0.85	1	35.443			
Sum Weight:	5.82	28.82						OTM	710.24 kip-ft	7.81		

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	18.10					
Bracing Weight	10.72					
Total Member Self-Weight	28.82			13.72	-4.88	
Total Weight	37.58			13.72	-4.88	
Wind 0 deg - No Ice		0.65	-38.32	-3938.43	-67.45	15.98
Wind 30 deg - No Ice		17.21	-29.00	-2990.84	-1795.31	38.70
Wind 60 deg - No Ice		30.38	-16.99	-1755.48	-3247.79	38.60
Wind 90 deg - No Ice		34.10	-0.15	26.52	-3695.34	26.73
Wind 120 deg - No Ice		34.86	18.66	1981.73	-3727.17	23.59
Wind 150 deg - No Ice		18.78	31.85	3402.99	-2028.15	6.08
Wind 180 deg - No Ice		0.56	34.81	3678.84	-117.90	-14.97
Wind 210 deg - No Ice		-16.50	28.71	2988.05	1675.09	-33.29
Wind 240 deg - No Ice		-32.73	18.15	1862.28	3395.46	-32.16
Wind 270 deg - No Ice		-33.78	-0.56	-84.10	3613.90	-22.84
Wind 300 deg - No Ice		-31.43	-18.09	-1938.39	3376.38	-24.00
Wind 330 deg - No Ice		-18.83	-32.00	-3368.32	2005.93	-8.19
Member Ice	63.31					
Total Weight Ice	164.77			129.59	-52.56	
Wind 0 deg - Ice		0.05	-5.96	-496.01	-57.26	2.93
Wind 30 deg - Ice		2.87	-4.91	-389.57	-356.46	5.96
Wind 60 deg - Ice		4.94	-2.81	-168.67	-582.55	5.79
Wind 90 deg - Ice		5.70	-0.01	130.59	-668.87	4.30
Wind 120 deg - Ice		5.24	2.91	438.81	-611.59	3.43
Wind 150 deg - Ice		2.99	5.12	672.20	-370.81	1.01
Wind 180 deg - Ice		0.04	5.74	734.92	-61.07	-2.85
Wind 210 deg - Ice		-2.80	4.87	642.69	240.80	-5.56
Wind 240 deg - Ice		-5.03	2.85	428.81	480.52	-5.31
Wind 270 deg - Ice		-5.65	-0.04	122.24	553.88	-4.02
Wind 300 deg - Ice		-5.04	-2.90	-181.18	485.68	-3.46
Wind 330 deg - Ice		-2.99	-5.13	-412.41	264.70	-1.16
Total Weight	37.58			13.72	-4.88	
Wind 0 deg - Service		0.18	-10.38	-1070.57	-19.51	4.44
Wind 30 deg - Service		4.66	-7.86	-814.88	-488.38	10.47
Wind 60 deg - Service		8.23	-4.60	-479.56	-881.96	10.36
Wind 90 deg - Service		9.24	-0.04	3.84	-1003.46	7.09
Wind 120 deg - Service		9.43	5.05	533.72	-1010.62	6.19
Wind 150 deg - Service		5.09	8.63	918.93	-550.87	1.46
Wind 180 deg - Service		0.15	9.43	994.34	-33.05	-4.16
Wind 210 deg - Service		-4.47	7.78	807.57	453.30	-9.02
Wind 240 deg - Service		-8.86	4.92	501.66	918.78	-8.63
Wind 270 deg - Service		-9.16	-0.15	-25.85	978.78	-6.05
Wind 300 deg - Service		-8.51	-4.90	-528.65	913.66	-6.30

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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 330 deg - Service		-5.10	-8.67	-916.18	542.09	-2.03

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
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

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Comb. No.	Description
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	199 - 184.025	Leg	Max Tension	7	8.16	0.04	-0.00
			Max. Compression	10	-9.03	-0.54	0.19
			Max. Mx	8	-7.42	-0.57	0.33
			Max. My	13	0.04	-0.33	-0.58
			Max. Vy	22	0.57	-0.00	0.00
		Diagonal	Max. Vx	14	-0.58	-0.00	-0.00
			Max Tension	14	3.03	0.00	0.00
			Max. Compression	2	-3.20	0.00	0.00
			Max. Mx	32	0.44	0.05	0.00
			Max. My	10	-0.78	0.00	-0.00
		Horizontal	Max. Vy	32	-0.04	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
			Max Tension	22	0.38	0.00	0.00
			Max. Compression	10	-0.38	0.00	0.00
			Max. Mx	33	-0.02	0.04	0.00
		Secondary Horizontal	Max. My	8	0.05	0.00	0.00
			Max. Vy	33	-0.04	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00
			Max Tension	8	0.00	-0.00	-0.00
			Max. Compression	20	-0.00	-0.00	-0.00
		Top Girt	Max. Mx	31	0.00	-0.01	0.00
			Max. My	8	0.00	-0.00	-0.00
			Max. Vy	31	0.02	-0.01	0.00
			Max. Vx	8	0.00	-0.00	-0.00
			Max Tension	14	0.74	0.00	0.00
T2	184.025 - 180	Leg	Max. Compression	2	-0.72	0.00	0.00
			Max. Mx	27	-0.02	0.04	0.00
			Max. My	8	-0.09	0.00	0.00
			Max. Vy	27	-0.04	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00
		Diagonal	Max Tension	7	14.62	0.04	-0.05
			Max. Compression	10	-15.99	-1.18	0.15
			Max. Mx	8	11.59	-1.28	-0.50
			Max. My	12	-0.96	-0.73	-1.09
			Max. Vy	8	3.28	-1.28	-0.50
		Horizontal	Max. Vx	14	2.46	-0.27	-1.07
			Max Tension	8	7.39	0.00	0.00
			Max. Compression	22	-6.29	0.00	0.00
			Max. Mx	34	0.53	0.03	0.00
			Max. My	10	2.71	0.00	-0.00
		Secondary Horizontal	Max. Vy	34	-0.02	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
			Max Tension	22	2.05	0.00	0.00
			Max. Compression	10	-2.47	0.00	0.00
			Max. Mx	33	-0.08	0.04	0.00
		Top Girt	Max. My	8	-2.20	0.00	0.00
			Max. Vy	33	0.04	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00
			Max Tension	8	0.00	-0.00	-0.00
			Max. Compression	20	-0.00	-0.00	-0.00

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T3	180 - 160	Bottom Girt	Max. Mx	31	0.00	-0.01	-0.00
			Max. My	8	0.00	-0.00	-0.00
			Max. Vy	31	0.02	-0.01	-0.00
			Max. Vx	8	0.00	-0.00	-0.00
			Max Tension	2	2.19	0.00	0.00
			Max. Compression	12	-2.21	0.00	0.00
			Max. Mx	26	-0.01	0.04	0.00
			Max. My	8	-2.12	0.00	0.00
			Max. Vy	26	0.04	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00
			Max Tension	23	44.09	-0.02	0.01
			Max. Compression	10	-51.01	0.11	-0.02
		Leg	Max. Mx	10	-20.05	0.95	-0.72
			Max. My	10	8.52	-0.57	-1.38
			Max. Vy	11	0.75	-0.21	0.18
			Max. Vx	12	-1.90	0.02	0.27
		Diagonal	Max Tension	10	6.76	0.00	0.00
			Max. Compression	10	-7.04	0.00	0.00
			Max. Mx	35	0.24	0.04	-0.00
			Max. My	10	-6.73	-0.02	-0.03
		Top Girt	Max. Vy	34	0.04	0.03	0.00
			Max. Vx	10	0.01	0.00	0.00
			Max Tension	11	0.85	0.00	0.00
			Max. Compression	12	-1.06	0.00	0.00
T4	160 - 140	Leg	Max. Mx	26	-0.09	-0.05	0.00
			Max. My	34	-0.10	0.00	0.00
			Max. Vy	26	0.05	0.00	0.00
			Max. Vx	34	-0.00	0.00	0.00
			Max Tension	23	84.45	-0.05	0.02
			Max. Compression	10	-97.87	0.20	0.04
			Max. Mx	10	-97.87	0.20	0.04
			Max. My	22	-39.45	-0.00	0.27
		Diagonal	Max. Vy	22	-1.03	-0.13	0.02
			Max. Vx	16	1.52	0.01	-0.04
			Max Tension	8	7.59	0.00	0.00
			Max. Compression	8	-7.69	0.00	0.00
			Max. Mx	31	0.31	0.05	-0.00
			Max. My	8	-7.65	-0.01	-0.03
			Max. Vy	32	0.05	0.05	-0.00
			Max. Vx	8	0.01	0.00	0.00
T5	140 - 120	Leg	Max Tension	23	131.45	-0.15	0.03
			Max. Compression	10	-150.19	-0.05	0.06
			Max. Mx	10	-109.72	0.20	0.04
			Max. My	6	-73.69	0.03	-0.37
			Max. Vy	8	-1.63	-0.14	-0.07
			Max. Vx	4	-2.06	0.04	0.11
		Diagonal	Max Tension	8	9.27	0.00	0.00
			Max. Compression	8	-9.25	0.00	0.00
			Max. Mx	31	0.50	0.08	0.01
			Max. My	6	-8.24	0.00	-0.03
			Max. Vy	33	0.07	0.07	0.01
			Max. Vx	6	0.01	0.00	0.00
T6	120 - 100	Leg	Max Tension	23	174.67	0.51	0.03
			Max. Compression	10	-198.18	-0.54	-0.03
			Max. Mx	10	-197.99	0.99	0.00
			Max. My	12	-1.33	-0.06	-0.81
			Max. Vy	10	-0.38	0.99	0.00
			Max. Vx	4	-0.26	-0.08	-0.73
		Diagonal	Max Tension	8	12.01	0.00	0.00
			Max. Compression	8	-12.17	0.00	0.00
			Max. Mx	32	0.65	-0.13	0.00

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T7	100 - 80	Horizontal	Max. My	31	-0.06	0.00	0.00
			Max. Vy	32	-0.08	0.00	0.00
			Max. Vx	31	-0.00	0.00	0.00
			Max Tension	22	0.38	0.03	0.01
			Max. Compression	23	-0.56	0.00	-0.00
			Max. Mx	33	0.11	0.08	0.03
		Leg	Max. My	8	-0.29	0.01	0.04
			Max. Vy	33	0.08	0.08	0.03
			Max. Vx	8	-0.01	0.00	0.00
			Max Tension	23	221.71	0.64	0.03
			Max. Compression	10	-251.02	-0.69	-0.03
			Max. Mx	10	-250.79	1.23	0.01
		Diagonal	Max. My	12	-1.96	-0.10	-0.93
			Max. Vy	10	-0.46	1.23	0.01
			Max. Vx	8	0.57	0.04	0.25
			Max Tension	8	11.41	0.00	0.00
			Max. Compression	10	-11.75	0.00	0.00
			Max. Mx	32	0.75	-0.16	0.00
		Horizontal	Max. My	31	-0.07	0.00	0.00
			Max. Vy	32	0.08	0.00	0.00
			Max. Vx	31	-0.00	0.00	0.00
			Max Tension	22	0.47	0.03	0.01
			Max. Compression	23	-0.66	0.01	0.00
			Max. Mx	29	0.11	0.09	0.03
T8	80 - 60	Leg	Max. My	6	-0.56	0.02	0.04
			Max. Vy	29	0.09	0.09	0.03
			Max. Vx	31	-0.01	0.00	0.00
			Max Tension	23	266.25	0.74	0.04
			Max. Compression	10	-302.05	-0.75	-0.05
			Max. Mx	10	-301.80	1.43	0.02
		Diagonal	Max. My	22	-133.05	-0.57	1.07
			Max. Vy	10	-0.54	1.43	0.02
			Max. Vx	22	-0.33	-0.57	1.07
			Max Tension	7	11.60	0.00	0.00
			Max. Compression	10	-12.23	0.00	0.00
			Max. Mx	32	0.77	-0.19	0.00
		Horizontal	Max. My	31	-0.03	0.00	0.01
			Max. Vy	32	0.09	0.00	0.00
			Max. Vx	31	-0.00	0.00	0.00
			Max Tension	22	0.55	0.03	0.01
			Max. Compression	23	-0.72	0.01	0.00
			Max. Mx	33	0.16	0.12	0.04
T9	60 - 40	Leg	Max. My	31	0.03	0.11	0.04
			Max. Vy	33	0.09	0.12	0.04
			Max. Vx	31	-0.01	0.00	0.00
			Max Tension	23	309.13	0.88	0.04
			Max. Compression	10	-351.91	-0.89	-0.03
			Max. Mx	10	-351.63	1.67	0.02
		Diagonal	Max. My	12	-4.39	-0.18	-1.30
			Max. Vy	10	-0.63	1.67	0.02
			Max. Vx	22	-0.38	-0.70	1.29
			Max Tension	7	12.21	0.00	0.00
			Max. Compression	10	-12.97	0.00	0.00
			Max. Mx	32	0.86	-0.25	0.00
		Horizontal	Max. My	31	0.07	0.00	0.01
			Max. Vy	32	-0.11	0.00	0.00
			Max. Vx	31	-0.00	0.00	0.00
			Max Tension	22	0.65	0.00	0.00
			Max. Compression	13	-0.82	0.02	0.02
			Max. Mx	31	0.01	0.16	0.05
			Max. My	31	-0.00	0.16	0.05

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T10	40 - 20	Leg	Max. Vy	33	0.11	0.15	0.05
			Max. Vx	31	-0.01	0.00	0.00
			Max Tension	23	350.85	1.04	0.03
			Max. Compression	10	-401.10	-0.55	-0.02
			Max. Mx	10	-377.19	1.93	0.03
			Max. My	12	-6.07	-0.22	-1.70
		Diagonal	Max. Vy	10	0.73	1.93	0.03
			Max. Vx	12	0.47	-0.22	-1.70
			Max Tension	7	12.83	0.00	0.00
			Max. Compression	10	-13.84	0.00	0.00
			Max. Mx	32	1.04	-0.28	0.00
			Max. My	31	0.28	0.00	0.01
		Horizontal	Max. Vy	32	0.12	0.00	0.00
			Max. Vx	31	0.00	0.00	0.00
			Max Tension	22	0.76	0.00	0.00
			Max. Compression	13	-0.94	0.03	0.02
			Max. Mx	31	-0.01	0.19	0.06
			Max. My	31	-0.02	0.19	0.06
			Max. Vy	33	0.12	0.17	0.06
			Max. Vx	31	-0.01	0.00	0.00
T11	20 - 0	Leg	Max Tension	23	383.68	1.09	0.03
			Max. Compression	10	-441.40	-0.00	0.00
			Max. Mx	10	-422.70	1.81	0.02
			Max. My	12	-7.79	-0.17	-1.85
			Max. Vy	10	0.70	1.81	0.02
			Max. Vx	12	-0.48	-0.17	-1.85
		Diagonal	Max Tension	18	10.13	0.00	0.00
			Max. Compression	18	-10.84	0.00	0.00
			Max. Mx	27	2.11	-0.30	0.00
			Max. My	27	0.98	0.00	-0.01
			Max. Vy	27	0.12	0.00	0.00
			Max. Vx	27	-0.00	0.00	0.00
		Horizontal	Max Tension	22	0.65	0.11	0.02
			Max. Compression	13	-0.87	0.07	0.03
			Max. Mx	31	-0.06	0.27	0.10
			Max. My	35	0.05	0.27	0.10
			Max. Vy	31	0.14	0.27	0.10
			Max. Vx	35	0.02	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	413.90	32.58	-16.90
	Max. H _x	18	413.90	32.58	-16.90
	Max. H _z	7	-368.72	-29.40	14.65
	Min. Vert	7	-368.72	-29.40	14.65
	Min. H _x	7	-368.72	-29.40	14.65
	Min. H _z	18	413.90	32.58	-16.90
Leg B	Max. Vert	10	449.46	-34.30	-18.30
	Max. H _x	23	-389.98	30.32	16.03
	Max. H _z	25	-341.40	25.67	16.45
	Min. Vert	23	-389.98	30.32	16.03
	Min. H _x	10	449.46	-34.30	-18.30
	Min. H _z	10	449.46	-34.30	-18.30
Leg A	Max. Vert	2	421.16	0.71	37.50

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Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. H _x	20	24.05	2.39	1.22
	Max. H _z	2	421.16	0.71	37.50
	Min. Vert	15	-366.80	-0.76	-32.78
	Min. H _x	11	-192.12	-2.30	-17.52
	Min. H _z	15	-366.80	-0.76	-32.78

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	37.58	-0.00	-0.00	13.75	-4.91	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	45.10	1.05	-61.31	-6330.98	-106.41	25.65
0.9 Dead+1.6 Wind 0 deg - No Ice	33.82	1.05	-61.31	-6328.99	-104.86	25.63
1.2 Dead+1.6 Wind 30 deg - No Ice	45.10	27.53	-46.39	-4809.33	-2881.97	62.04
0.9 Dead+1.6 Wind 30 deg - No Ice	33.82	27.53	-46.39	-4808.54	-2877.52	62.01
1.2 Dead+1.6 Wind 60 deg - No Ice	45.10	48.60	-27.18	-2824.93	-5215.23	61.88
0.9 Dead+1.6 Wind 60 deg - No Ice	33.82	48.60	-27.18	-2826.16	-5208.28	61.84
1.2 Dead+1.6 Wind 90 deg - No Ice	45.10	54.55	-0.23	37.51	-5934.23	42.85
0.9 Dead+1.6 Wind 90 deg - No Ice	33.82	54.55	-0.23	33.30	-5926.48	42.82
1.2 Dead+1.6 Wind 120 deg - No Ice	45.10	55.78	29.85	3178.01	-5984.93	37.83
0.9 Dead+1.6 Wind 120 deg - No Ice	33.82	55.78	29.85	3170.55	-5977.23	37.80
1.2 Dead+1.6 Wind 150 deg - No Ice	45.10	30.05	50.96	5460.86	-3256.03	9.75
0.9 Dead+1.6 Wind 150 deg - No Ice	33.82	30.05	50.96	5451.00	-3251.12	9.75
1.2 Dead+1.6 Wind 180 deg - No Ice	45.10	0.90	55.70	5903.85	-187.82	-24.01
0.9 Dead+1.6 Wind 180 deg - No Ice	33.82	0.90	55.70	5893.55	-186.07	-23.99
1.2 Dead+1.6 Wind 210 deg - No Ice	45.10	-26.41	45.94	4794.21	2692.18	-53.38
0.9 Dead+1.6 Wind 210 deg - No Ice	33.82	-26.41	45.94	4785.12	2690.96	-53.36
1.2 Dead+1.6 Wind 240 deg - No Ice	45.10	-52.37	29.03	2985.84	5455.66	-51.61
0.9 Dead+1.6 Wind 240 deg - No Ice	33.82	-52.37	29.03	2978.68	5451.57	-51.57
1.2 Dead+1.6 Wind 270 deg - No Ice	45.10	-54.05	-0.90	-140.57	5807.06	-36.66
0.9 Dead+1.6 Wind 270 deg - No Ice	33.82	-54.04	-0.90	-144.50	5802.48	-36.63
1.2 Dead+1.6 Wind 300 deg - No Ice	45.10	-50.28	-28.94	-3119.09	5425.57	-38.48
0.9 Dead+1.6 Wind 300 deg - No Ice	33.82	-50.28	-28.94	-3119.94	5421.36	-38.46
1.2 Dead+1.6 Wind 330 deg - No Ice	45.10	-30.13	-51.20	-5415.87	3224.09	-13.13

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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
No Ice						
0.9 Dead+1.6 Wind 330 deg - No Ice	33.82	-30.13	-51.20	-5414.40	3222.20	-13.12
1.2 Dead+1.0 Ice+1.0 Temp	172.29	-0.00	-0.00	135.67	-54.97	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	172.29	0.05	-5.96	-501.73	-59.76	2.98
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	172.29	2.87	-4.91	-393.35	-364.74	6.06
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	172.29	4.94	-2.81	-168.25	-595.33	5.92
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	172.29	5.70	-0.01	136.84	-683.36	4.43
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	172.29	5.24	2.91	450.97	-624.84	3.51
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	172.29	2.99	5.12	688.83	-379.43	1.03
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	172.29	0.04	5.74	752.72	-63.75	-2.89
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	172.29	-2.80	4.87	658.72	243.95	-5.66
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	172.29	-5.03	2.85	440.72	488.32	-5.44
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	172.29	-5.65	-0.04	128.23	563.17	-4.14
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	172.29	-5.03	-2.90	-181.00	493.55	-3.54
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	172.29	-2.99	-5.13	-416.58	268.32	-1.18
Dead+Wind 0 deg - Service	37.58	0.18	-10.38	-1060.59	-21.77	4.45
Dead+Wind 30 deg - Service	37.58	4.66	-7.86	-804.09	-492.18	10.48
Dead+Wind 60 deg - Service	37.58	8.23	-4.60	-467.70	-887.08	10.38
Dead+Wind 90 deg - Service	37.58	9.24	-0.04	17.30	-1008.97	7.11
Dead+Wind 120 deg - Service	37.58	9.43	5.05	548.89	-1016.12	6.20
Dead+Wind 150 deg - Service	37.58	5.09	8.63	935.34	-554.89	1.47
Dead+Wind 180 deg - Service	37.58	0.15	9.43	1010.97	-35.41	-4.17
Dead+Wind 210 deg - Service	37.58	-4.47	7.78	823.58	452.51	-9.03
Dead+Wind 240 deg - Service	37.58	-8.86	4.92	516.67	919.51	-8.65
Dead+Wind 270 deg - Service	37.58	-9.16	-0.15	-12.54	979.78	-6.06
Dead+Wind 300 deg - Service	37.58	-8.51	-4.90	-516.97	914.45	-6.31
Dead+Wind 330 deg - Service	37.58	-5.10	-8.67	-905.75	541.66	-2.03

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	-37.58	0.00	0.00	37.58	0.00	0.000%
2	1.05	-45.10	-61.32	-1.05	45.10	61.31	0.004%
3	1.05	-33.82	-61.32	-1.05	33.82	61.31	0.003%
4	27.53	-45.10	-46.39	-27.53	45.10	46.39	0.001%
5	27.53	-33.82	-46.39	-27.53	33.82	46.39	0.003%
6	48.60	-45.10	-27.18	-48.60	45.10	27.18	0.002%
7	48.60	-33.82	-27.18	-48.60	33.82	27.18	0.004%
8	54.55	-45.10	-0.23	-54.55	45.10	0.23	0.002%
9	54.55	-33.82	-0.23	-54.55	33.82	0.23	0.004%
10	55.78	-45.10	29.85	-55.78	45.10	-29.85	0.001%
11	55.78	-33.82	29.85	-55.78	33.82	-29.85	0.003%
12	30.05	-45.10	50.96	-30.05	45.10	-50.96	0.002%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
13	30.05	-33.82	50.96	-30.05	33.82	-50.96	0.004%
14	0.90	-45.10	55.70	-0.90	45.10	-55.70	0.002%
15	0.90	-33.82	55.70	-0.90	33.82	-55.70	0.004%
16	-26.41	-45.10	45.94	26.41	45.10	-45.94	0.001%
17	-26.41	-33.82	45.94	26.41	33.82	-45.94	0.003%
18	-52.37	-45.10	29.03	52.37	45.10	-29.03	0.001%
19	-52.37	-33.82	29.03	52.37	33.82	-29.03	0.003%
20	-54.05	-45.10	-0.90	54.05	45.10	0.90	0.001%
21	-54.05	-33.82	-0.90	54.04	33.82	0.90	0.003%
22	-50.29	-45.10	-28.94	50.28	45.10	28.94	0.002%
23	-50.29	-33.82	-28.94	50.28	33.82	28.94	0.004%
24	-30.13	-45.10	-51.20	30.13	45.10	51.20	0.001%
25	-30.13	-33.82	-51.20	30.13	33.82	51.20	0.003%
26	0.00	-172.29	0.00	0.00	172.29	0.00	0.000%
27	0.05	-172.29	-5.96	-0.05	172.29	5.96	0.000%
28	2.87	-172.29	-4.91	-2.87	172.29	4.91	0.000%
29	4.94	-172.29	-2.81	-4.94	172.29	2.81	0.000%
30	5.70	-172.29	-0.01	-5.70	172.29	0.01	0.000%
31	5.24	-172.29	2.91	-5.24	172.29	-2.91	0.000%
32	2.99	-172.29	5.12	-2.99	172.29	-5.12	0.000%
33	0.04	-172.29	5.74	-0.04	172.29	-5.74	0.000%
34	-2.80	-172.29	4.87	2.80	172.29	-4.87	0.000%
35	-5.03	-172.29	2.85	5.03	172.29	-2.85	0.000%
36	-5.65	-172.29	-0.04	5.65	172.29	0.04	0.000%
37	-5.04	-172.29	-2.90	5.03	172.29	2.90	0.000%
38	-2.99	-172.29	-5.13	2.99	172.29	5.13	0.000%
39	0.18	-37.58	-10.38	-0.18	37.58	10.38	0.001%
40	4.66	-37.58	-7.86	-4.66	37.58	7.86	0.001%
41	8.23	-37.58	-4.60	-8.23	37.58	4.60	0.001%
42	9.24	-37.58	-0.04	-9.24	37.58	0.04	0.001%
43	9.43	-37.58	5.05	-9.43	37.58	-5.05	0.001%
44	5.09	-37.58	8.63	-5.09	37.58	-8.63	0.001%
45	0.15	-37.58	9.43	-0.15	37.58	-9.43	0.001%
46	-4.47	-37.58	7.78	4.47	37.58	-7.78	0.001%
47	-8.86	-37.58	4.92	8.86	37.58	-4.92	0.001%
48	-9.16	-37.58	-0.15	9.16	37.58	0.15	0.001%
49	-8.51	-37.58	-4.90	8.51	37.58	4.90	0.001%
50	-5.10	-37.58	-8.67	5.10	37.58	8.67	0.001%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	10	0.00006273	0.00014951
3	Yes	10	0.00000001	0.00010948
4	Yes	11	0.00000001	0.00006310
5	Yes	10	0.00000001	0.00012036
6	Yes	11	0.00000001	0.00006751
7	Yes	10	0.00005437	0.00013085
8	Yes	11	0.00000001	0.00006547
9	Yes	10	0.00000001	0.00012575
10	Yes	11	0.00000001	0.00006049
11	Yes	10	0.00000001	0.00011355
12	Yes	11	0.00000001	0.00006392
13	Yes	10	0.00005039	0.00012192

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14	Yes	11	0.00000001	0.00006704
15	Yes	10	0.00000001	0.00012967
16	Yes	11	0.00000001	0.00006312
17	Yes	10	0.00000001	0.00012037
18	Yes	11	0.00000001	0.00005887
19	Yes	10	0.00000001	0.00010988
20	Yes	11	0.00000001	0.00006331
21	Yes	10	0.00000001	0.00012068
22	Yes	11	0.00000001	0.00006686
23	Yes	10	0.00005367	0.00012923
24	Yes	11	0.00000001	0.00006305
25	Yes	10	0.00000001	0.00012007
26	Yes	10	0.00000001	0.00014688
27	Yes	11	0.00000001	0.00011925
28	Yes	11	0.00000001	0.00013601
29	Yes	12	0.00000001	0.00006116
30	Yes	12	0.00000001	0.00006938
31	Yes	12	0.00000001	0.00007499
32	Yes	12	0.00000001	0.00007684
33	Yes	12	0.00000001	0.00007484
34	Yes	12	0.00000001	0.00007041
35	Yes	12	0.00000001	0.00006527
36	Yes	12	0.00000001	0.00005686
37	Yes	11	0.00000001	0.00013211
38	Yes	11	0.00000001	0.00011694
39	Yes	10	0.00000001	0.00012675
40	Yes	10	0.00000001	0.00012826
41	Yes	10	0.00000001	0.00013158
42	Yes	10	0.00000001	0.00013134
43	Yes	10	0.00000001	0.00012971
44	Yes	10	0.00000001	0.00013126
45	Yes	10	0.00000001	0.00013172
46	Yes	10	0.00000001	0.00012860
47	Yes	10	0.00000001	0.00012729
48	Yes	10	0.00000001	0.00012928
49	Yes	10	0.00000001	0.00013136
50	Yes	10	0.00000001	0.00012935

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	199 - 184.025	4.864	43	0.22	0.10
T2	184.025 - 180	4.182	43	0.21	0.11
T3	180 - 160	3.995	43	0.21	0.09
T4	160 - 140	3.148	43	0.19	0.06
T5	140 - 120	2.392	43	0.16	0.05
T6	120 - 100	1.741	43	0.14	0.04
T7	100 - 80	1.199	43	0.11	0.03
T8	80 - 60	0.767	43	0.09	0.02
T9	60 - 40	0.438	43	0.06	0.01
T10	40 - 20	0.205	43	0.04	0.01
T11	20 - 0	0.059	43	0.02	0.00

Critical Deflections and Radius of Curvature - Service Wind

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<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>
199.00	5/8-in x 8-ft Lightning Rod	43	4.864	0.22	0.10	177414
198.00	Side Arm Mount [SO 303-1]	43	4.819	0.22	0.10	177414
196.00	Junction Box (9" x 6" x 5")	43	4.729	0.22	0.11	177414
188.00	Ice Shield 10'x7"	43	4.365	0.22	0.11	81356
183.00	PAD8-65AC1S1R	43	4.134	0.21	0.10	166152
175.00	HX6-6W-6WH	43	3.770	0.20	0.07	30392
160.00	Side Arm Mount [SO 303-1]	43	3.148	0.19	0.06	68182
155.00	Ice Shield 10'x7"	43	2.951	0.18	0.06	63156
150.00	PAD8-65AC1S1R	43	2.759	0.18	0.06	53897
130.00	PAD6-65B	43	2.053	0.15	0.05	43304
100.00	Side Arm Mount [SO 303-1]	43	1.199	0.11	0.03	42823
80.00	Pipe Mount [PM 601-1]	43	0.767	0.09	0.02	47631

Maximum Tower Deflections - Design Wind

<i>Section No.</i>	<i>Elevation</i>	<i>Horz. Deflection</i>	<i>Gov. Load Comb.</i>	<i>Tilt</i>	<i>Twist</i>
	<i>ft</i>	<i>in</i>		<i>°</i>	<i>°</i>
T1	199 - 184.025	28.365	10	1.27	0.60
T2	184.025 - 180	24.409	10	1.24	0.64
T3	180 - 160	23.321	10	1.21	0.52
T4	160 - 140	18.398	10	1.09	0.39
T5	140 - 120	14.002	10	0.96	0.31
T6	120 - 100	10.203	10	0.80	0.24
T7	100 - 80	7.033	10	0.65	0.17
T8	80 - 60	4.502	10	0.50	0.13
T9	60 - 40	2.569	10	0.36	0.09
T10	40 - 20	1.207	10	0.23	0.05
T11	20 - 0	0.349	10	0.12	0.03

Critical Deflections and Radius of Curvature - Design 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>
199.00	5/8-in x 8-ft Lightning Rod	10	28.365	1.27	0.60	27811
198.00	Side Arm Mount [SO 303-1]	10	28.104	1.27	0.62	27811
196.00	Junction Box (9" x 6" x 5")	10	27.582	1.27	0.65	27811
188.00	Ice Shield 10'x7"	10	25.475	1.25	0.69	12746
183.00	PAD8-65AC1S1R	10	24.131	1.23	0.61	34044
175.00	HX6-6W-6WH	10	22.016	1.18	0.42	5259
160.00	Side Arm Mount [SO 303-1]	10	18.398	1.09	0.39	12032
155.00	Ice Shield 10'x7"	10	17.254	1.06	0.37	11142
150.00	PAD8-65AC1S1R	10	16.137	1.03	0.35	9492
130.00	PAD6-65B	10	12.023	0.88	0.27	7563
100.00	Side Arm Mount [SO 303-1]	10	7.033	0.65	0.17	7353
80.00	Pipe Mount [PM 601-1]	10	4.502	0.50	0.13	8160

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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
T2	184.025	Leg	A325X	0.7500	4	3.65	29.82	0.123	1	Bolt Tension
T3	180	Leg	A325X	1.0000	4	11.02	53.01	0.208	1	Bolt Tension
		Diagonal	A325X	0.6250	1	6.76	11.86	0.570	1	Member Block Shear
		Top Girt	A325X	0.6250	1	0.88	8.89	0.099	1	Member Block Shear
T4	160	Leg	A325X	1.0000	4	21.11	53.01	0.398	1	Bolt Tension
		Diagonal	A325X	0.6250	1	7.59	11.86	0.640	1	Member Block Shear
T5	140	Leg	A325X	1.0000	4	32.86	53.01	0.620	1	Bolt Tension
		Diagonal	A325X	0.6250	1	9.27	14.58	0.636	1	Member Block Shear
T6	120	Leg	A325X	1.0000	6	29.08	53.01	0.549	1	Bolt Tension
		Diagonal	A325X	0.7500	1	12.01	17.84	0.673	1	Member Bearing
		Horizontal	A325X	0.7500	1	3.97	10.16	0.390	1	Member Block Shear
T7	100	Leg	A325X	1.0000	6	36.91	53.01	0.696	1	Bolt Tension
		Diagonal	A325X	0.7500	1	11.41	17.84	0.640	1	Member Bearing
		Horizontal	A325X	0.7500	1	4.77	10.16	0.469	1	Member Block Shear
T8	80	Leg	A325X>1'	1.2500	6	44.33	72.51	0.611	1	Bolt Tension
		Diagonal	A325X	0.7500	1	11.60	17.84	0.650	1	Member Bearing
		Horizontal	A325X	0.7500	1	5.47	10.16	0.538	1	Member Block Shear
T9	60	Leg	A325X>1'	1.2500	6	51.47	72.51	0.710	1	Bolt Tension
		Diagonal	A325X	0.7500	1	12.21	17.84	0.685	1	Member Bearing
		Horizontal	A325X	0.7500	1	6.10	13.38	0.456	1	Member Bearing
T10	40	Leg	A325X>1'	1.2500	6	58.42	72.51	0.806	1	Bolt Tension
		Diagonal	A325X	0.7500	1	12.83	17.84	0.719	1	Member Bearing
		Horizontal	A325X	0.7500	1	6.95	13.38	0.520	1	Member Bearing
T11	20	Diagonal	A325X	0.7500	1	10.13	17.84	0.568	1	Member Bearing
		Horizontal	A325X	0.7500	1	7.65	17.84	0.429	1	Member Bearing

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	199 - 184.025	1 1/2	14.97	3.65	116.8 K=1.00	1.7672	-9.03	29.26	0.309 ¹
T2	184.025 - 180	1 1/2	4.02	3.65	116.8 K=1.00	1.7672	-14.74	29.26	0.504 ¹
T3	180 - 160	2 1/4	20.02	5.00	106.8 K=1.00	3.9761	-51.01	77.75	0.656 ¹

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T4	160 - 140	2 3/4	20.02	5.00	87.4 K=1.00	5.9396	-97.87	152.99	0.640 ¹
T5	140 - 120	3	20.02	5.00	80.1 K=1.00	7.0686	-150.19	199.04	0.755 ¹
T6	120 - 100	3 1/4	20.02	5.00	73.9 K=1.00	8.2958	-198.18	250.37	0.792 ¹
T7	100 - 80	3 1/2	20.02	5.00	68.6 K=1.00	9.6211	-251.02	306.80	0.818 ¹
T8	80 - 60	3 3/4	20.02	5.00	64.1 K=1.00	11.0447	-302.05	368.18	0.820 ¹
T9	60 - 40	4	20.02	5.00	60.1 K=1.00	12.5664	-351.91	434.40	0.810 ¹
T10	40 - 20	4 1/4	20.02	5.00	56.5 K=1.00	14.1863	-401.10	505.39	0.794 ¹
T11	20 - 0	4 1/4	20.03	5.01	56.6 K=1.00	14.1863	-441.40	505.22	0.874 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	199 - 184.025	1	5.42	5.25	176.3 K=0.70	0.7854	-3.20	5.71	0.560 ¹
T2	184.025 - 180	SR 1" Ø + SR 1" Ø (Aho - Viper)	5.42	5.25	124.6 K=0.70	0.7854	-6.29	11.24	0.559 ¹
T3	180 - 160	L2x2x1/4	6.77	3.25	104.8 K=1.05	0.9380	-7.04	17.05	0.413 ¹
T4	160 - 140	L2x2x1/4	8.45	4.05	124.4 K=1.00	0.9380	-7.51	13.45	0.558 ¹
T5	140 - 120	L2 1/2x2 1/2x1/4	9.70	4.67	115.6 K=1.01	1.1900	-9.25	19.09	0.485 ¹
T6	120 - 100	L3x3x1/4	7.07	6.55	132.7 K=1.00	1.4400	-11.77	18.46	0.637 ¹
T7	100 - 80	L3x3x1/4	7.62	7.09	143.8 K=1.00	1.4400	-11.75	15.73	0.747 ¹
T8	80 - 60	L3x3x1/4	8.20	7.67	155.5 K=1.00	1.4400	-12.23	13.46	0.909 ¹
T9	60 - 40	L3 1/2 x 3 1/2 x 1/4	8.81	8.27	143.1 K=1.00	1.6875	-12.97	18.62	0.697 ¹
T10	40 - 20	L3 1/2 x 3 1/2 x 1/4	9.43	8.89	153.8 K=1.00	1.6875	-13.84	16.11	0.859 ¹
T11	20 - 0	L3 1/2 x 3 1/2 x 1/4	10.30	9.76	168.9 K=1.00	1.6875	-10.80	13.37	0.808 ¹

¹ P_u / φP_n controls

Horizontal Design Data (Compression)

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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	199 - 184.025	1	4.00	3.88	130.2 K=0.70	0.7854	-0.38	10.42	0.036 ¹
T2	184.025 - 180	1	4.00	3.88	130.2 K=0.70	0.7854	-2.47	10.42	0.237 ¹
T6	120 - 100	L2 1/2x2 1/2x3/16	9.63	9.35	96.1 K=0.67	0.9020	-3.97	17.98	0.221 ¹
T7	100 - 80	L2 1/2x2 1/2x3/16	11.13	10.83	101.8 K=0.61	0.9020	-4.77	16.94	0.281 ¹
T8	80 - 60	L2 1/2x2 1/2x3/16	12.63	12.31	107.5 K=0.57	0.9020	-5.47	15.91	0.344 ¹
T9	60 - 40	L3x3x3/16	14.13	13.79	104.1 K=0.59	1.0900	-6.10	19.67	0.310 ¹
T10	40 - 20	L3x3x3/16	15.63	15.27	108.8 K=0.56	1.0900	-6.95	18.69	0.372 ¹
T11	20 - 0	L3 1/2 x 3 1/2 x 1/4	17.50	17.15	107.1 K=0.57	1.6875	-7.65	29.88	0.256 ¹

¹ P_u / φP_n controls

Secondary Horizontal 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	199 - 184.025	1	2.00	1.94	83.9 K=0.90	0.7854	-0.00	17.56	0.000 ¹
T2	184.025 - 180	1	2.00	1.94	83.9 K=0.90	0.7854	-0.00	17.56	0.000 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	199 - 184.025	1 1/8	4.00	3.88	115.7 K=0.70	0.9940	-0.72	15.91	0.045 ¹
T3	180 - 160	L2x2x3/16	4.00	3.52	113.6 K=1.06	0.7150	-1.06	11.74	0.090 ¹

¹ P_u / φP_n controls

Bottom Girt Design Data (Compression)

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
T2	184.025 - 180	1	4.00	3.88	130.2 K=0.70	0.7854	-2.21	10.42	0.212 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	199 - 184.025	1 1/2	14.97	3.65	116.8	1.7672	8.16	79.52	0.103 ¹
T2	184.025 - 180	1 1/2	4.02	0.38	12.0	1.7672	14.62	79.52	0.184 ¹
T3	180 - 160	2 1/4	20.02	5.00	106.8	3.9761	44.09	178.92	0.246 ¹
T4	160 - 140	2 3/4	20.02	5.00	87.4	5.9396	84.45	267.28	0.316 ¹
T5	140 - 120	3	20.02	5.00	80.1	7.0686	131.44	318.09	0.413 ¹
T6	120 - 100	3 1/4	20.02	5.00	73.9	8.2958	174.67	373.31	0.468 ¹
T7	100 - 80	3 1/2	20.02	5.00	68.6	9.6211	221.71	432.95	0.512 ¹
T8	80 - 60	3 3/4	20.02	5.00	64.1	11.0447	266.25	497.01	0.536 ¹
T9	60 - 40	4	20.02	5.00	60.1	12.5664	309.13	565.49	0.547 ¹
T10	40 - 20	4 1/4	20.02	5.00	56.5	14.1863	350.85	638.38	0.550 ¹
T11	20 - 0	4 1/4	20.03	5.01	56.6	14.1863	383.68	638.38	0.601 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	199 - 184.025	1	5.42	5.25	251.8	0.7854	3.03	25.45	0.119 ¹
T2	184.025 - 180	SR 1" Ø + SR 1" Ø (Aho - Viper)	5.42	5.25	178.0	0.7854	7.39	25.45	0.290 ¹
T3	180 - 160	L2x2x1/4	6.77	3.25	66.9	0.5629	6.76	24.49	0.276 ¹
T4	160 - 140	L2x2x1/4	8.15	3.91	79.9	0.5629	7.59	24.49	0.310 ¹
T5	140 - 120	L2 1/2x2 1/2x1/4	9.38	4.51	72.7	0.7519	9.27	32.71	0.283 ¹
T6	120 - 100	L3x3x1/4	6.56	6.04	82.2	0.9159	12.01	39.84	0.301 ¹
T7	100 - 80	L3x3x1/4	7.07	6.55	88.8	0.9159	11.41	39.84	0.286 ¹
T8	80 - 60	L3x3x1/4	8.20	7.67	103.3	0.9159	11.60	39.84	0.291 ¹
T9	60 - 40	L3 1/2 x 3 1/2 x 1/4	8.81	8.27	94.6	1.1016	12.21	47.92	0.255 ¹
T10	40 - 20	L3 1/2 x 3 1/2 x 1/4	9.43	8.89	101.4	1.1016	12.83	47.92	0.268 ¹
T11	20 - 0	L3 1/2 x 3 1/2 x 1/4	9.86	9.33	106.2	1.1016	10.13	47.92	0.212 ¹

¹ P_u / φP_n controls

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Horizontal Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	$\frac{P_u}{\phi P_n}$
T1	199 - 184.025	1	4.00	3.88	186.0	0.7854	0.38	25.45	0.015 ¹
T2	184.025 - 180	1	4.00	3.88	186.0	0.7854	2.05	25.45	0.081 ¹
T6	120 - 100	L2 1/2x2 1/2x3/16	9.63	9.35	72.1	0.5535	3.97	24.08	0.165 ¹
T7	100 - 80	L2 1/2x2 1/2x3/16	11.13	10.83	83.5	0.5535	4.77	24.08	0.198 ¹
T8	80 - 60	L2 1/2x2 1/2x3/16	12.63	12.31	95.0	0.5535	5.47	24.08	0.227 ¹
T9	60 - 40	L3x3x3/16	14.13	13.79	88.1	0.6945	6.10	30.21	0.202 ¹
T10	40 - 20	L3x3x3/16	15.63	15.27	97.6	0.6945	6.95	30.21	0.230 ¹
T11	20 - 0	L3 1/2 x 3 1/2 x 1/4	17.50	17.15	94.3	1.1016	7.65	47.92	0.160 ¹

¹ P_u / φP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	$\frac{P_u}{\phi P_n}$
T1	199 - 184.025	1	2.00	1.94	93.0	0.7854	0.00	25.45	0.000 ¹
T2	184.025 - 180	1	2.00	1.94	93.0	0.7854	0.00	25.45	0.000 ¹

¹ P_u / φP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	$\frac{P_u}{\phi P_n}$
T1	199 - 184.025	1 1/8	4.00	3.88	165.3	0.9940	0.74	32.21	0.023 ¹
T3	180 - 160	L2x2x3/16	4.00	3.52	74.1	0.4308	0.88	18.74	0.047 ¹

¹ P_u / φP_n controls

Bottom Girt Design Data (Tension)

Section No.	Elevation	Size	L	L _u	Kl/r	A	P _u	φP _n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in ²	K	K	$\frac{P_u}{\phi P_n}$
T2	184.025 - 180	1	4.00	3.88	186.0	0.7854	2.19	25.45	0.086 ¹

¹ P_u / φP_n controls

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Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						(T3) Bottom Girt	21.2	Pass
						(T2) Bolt Checks	80.6	Pass
						RATING =	90.9	Pass

Program Version 8.3.1.2 - 12/11/2024 File:C:/Users/hicham.anssar/OneDrive - Engineered Tower Solutions/Desktop/2024/125019_1018_Aho_Mapping
SA/SE/8180_Tower Modification Drawings/Analysis/Tower/Aho - Viper.eri

APPENDIX B
BASE LEVEL DRAWING

Feed Line Plan
20'

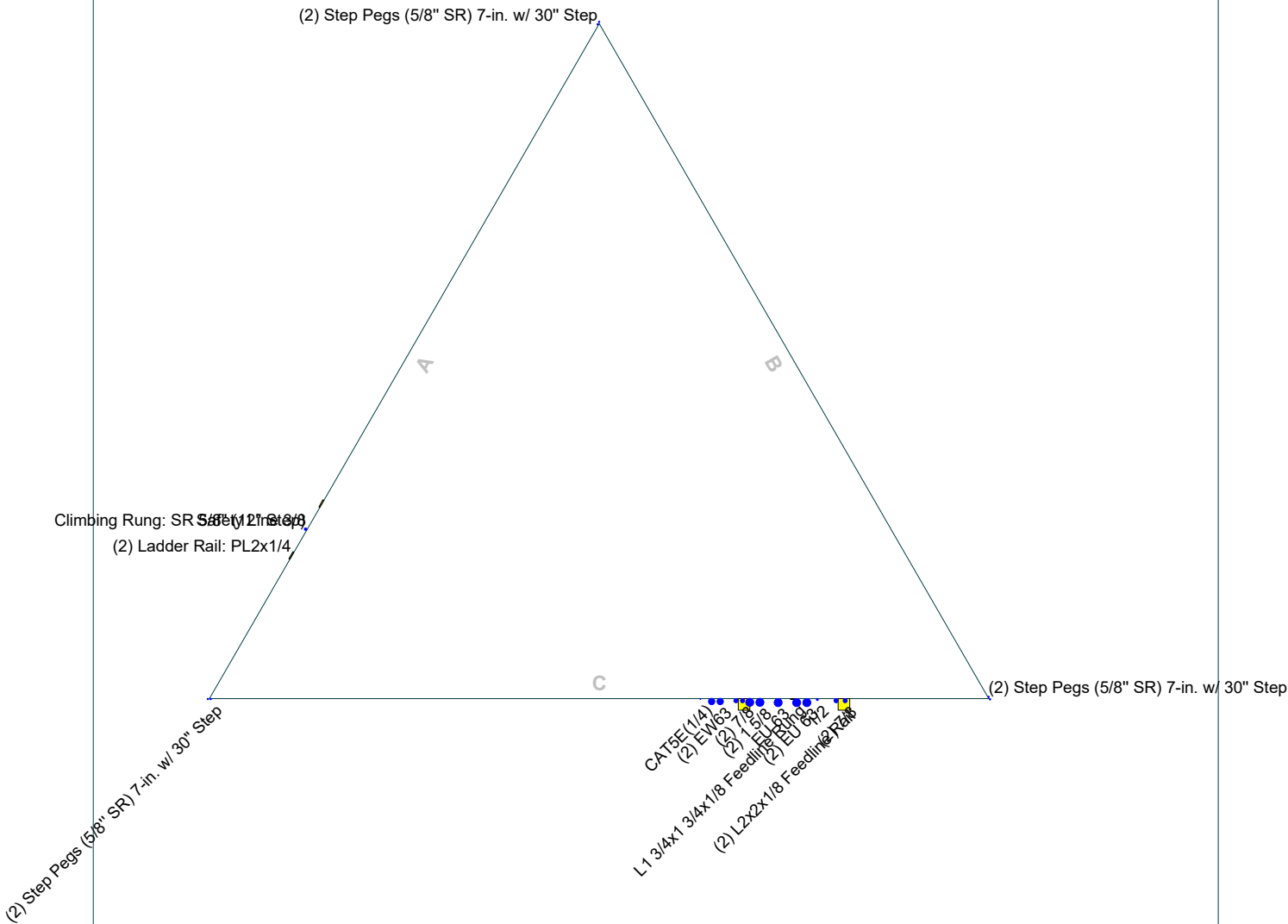
Round

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: **Aho - Viper**

Project: **ETS, PLLC Job No. 24125019.STR.8180**

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

Bolt-On Diagonal Bracing Design

Tower Section	180-184 ft		Notes
P _u	6.29 kip		This calculator follows the procedures and guidelines provided by the Crown Castle Solid Rod Reinforcement Document # ENG-MAP-10254. The intention of this modification is to increase the compression capacity of an existing bracing member by developing a modified radius of gyration, but not allowing an increase in area which would increase it's tension capacity.
Code	H		
ø Factor	0.90		
Allowable Stress Increase	1.00		
F _y	36 ksi		
F _u	58 ksi		
E	29,000 ksi		
Effective Length Factor, "K _{eff} "	0.70		

Member Type	Member	Area (in ²)	Moment of Inertia (in ⁴)	Radius of Gyration (in)	Unbraced Length (in)	K _L /r	$S_{cL} /_{min(re, rp)} \leq K_{nL}u /_{rm}$
Original Member	SR 1" Ø	0.7854	0.0491	0.250	63.00	176.38	-
Additional Member	SR 1" Ø	0.7854	0.0491	0.250	12.00	33.60	Sc, max = 31.18 in
Built-Up Member	SR 1" Ø + SR 1" Ø	0.7854	0.0982	0.354	63.00	124.72	Sufficient

Bolted-On Diagonal Capacity	
r _m	0.354 in
K _{mL} u / _{r.m}	124.72
λ _c	1.40
F _{cm}	15.87 ksi
øP _n	11.22 kip
Compression Capacity	56.1%

Self Support Anchor Rod Capacity

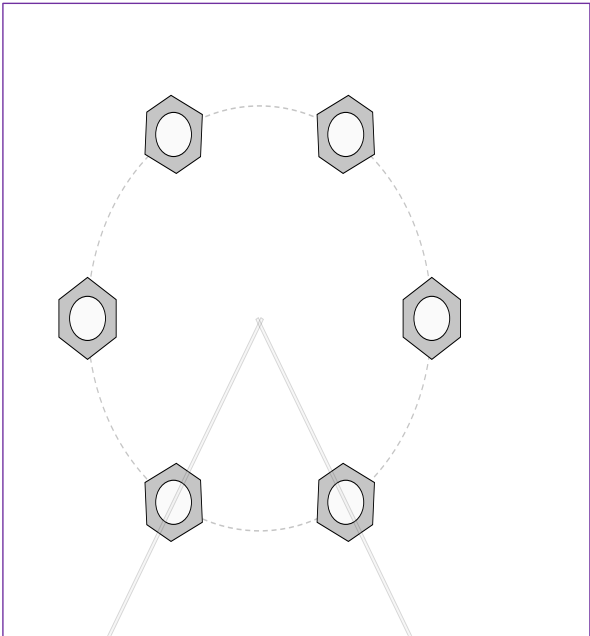
Site Info		
Site #	HP-1382	
Site Name	Aho - Viper	
ETS, PLLC #	24125019.STR.8180	

Analysis Considerations	
TIA-222 Revision	G
Grout Considered:	No
l_{ar} (in)	1.25
Eta Factor, η	0.5

Applied Loads		
	Comp.	Uplift
Axial Force (kips)	449.00	390.00
Shear Force (kips)	39.00	34.00

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)	
(6) 1-1/4" ϕ bolts (F1554-105 N; F_y =105 ksi, F_u =125 ksi)		$Pu_c = 74.83$	$\phi Pn_t = 96.9$ Stress Rating
l_{ar} (in): 1.25		$Vu = 6.5$	$\phi Vn = n/a$ 90.6%
		$Mu = n/a$	$\phi Mn = n/a$ Pass

SST Unit Base Foundation

Site # : HP-1382
 Site Name: Aho - Viper
 ETS, PLLC #: 24125019.STR.8180

TIA-222 Revision: G

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

Superstructure Analysis Reactions		
Global Moment, M :	6776	ft-kips
Global Axial, P :	45	kips
Global Shear, V :	63	kips
Leg Compression, P_{comp} :	449	kips
Leg Comp. Shear, V_{u comp} :	39	kips
Leg Uplift, P_{uplift} :	390	kips
Leg Uplift. Shear, V_{u uplift} :	34	kips
Tower Height, H :	199	ft
Base Face Width, BW :	18	ft
BP Dist. Above Fdn, b_{p dist} :	3	in

Foundation Analysis Checks				
	Capacity	Demand	Rating	Check
<i>Lateral (Sliding) (kips)</i>	200.28	63.00	31.5%	Pass
<i>Bearing Pressure (ksf)</i>	5.63	2.63	46.7%	Pass
<i>Overturning (kip*ft)</i>	9033.54	7232.75	80.1%	Pass
<i>Pier Flexure (Comp.) (kip*ft)</i>	1884.03	204.75	10.9%	Pass
<i>Pier Flexure (Tension) (kip*ft)</i>	848.84	178.50	21.0%	Pass
<i>Pier Compression (kip)</i>	8998.02	460.88	5.1%	Pass
<i>Pad Flexure (kip*ft)</i>	3113.06	2237.73	71.9%	Pass
<i>Pad Shear - 1-way (kips)</i>	602.46	401.89	66.7%	Pass
<i>Pad Shear - Comp 2-way (ksi)</i>	0.201	0.128	63.9%	Pass

Pier Properties		
Pier Shape:	Circular	
Pier Diameter, d_{pier} :	4.0	ft
Ext. Above Grade, E :	1.35	ft
Pier Rebar Size, Sc :	8	
Pier Rebar Quantity, mc :	20	
Pier Tie/Spiral Size, St :	4	
Pier Tie/Spiral Quantity, mt :	9	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier} :	3	in

Structural Rating:	71.9%
Soil Rating:	80.1%

Pad Properties		
Depth, D :	5.65	ft
Pad Width, W₁ :	31.00	ft
Pad Thickness, T :	1.75	ft
Pad Rebar Size (Bottom dir. 2), Sp₂ :	10	
Pad Rebar Quantity (Bottom dir. 2), mp₂ :	36	
Pad Clear Cover, cc_{pad} :	3	in

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

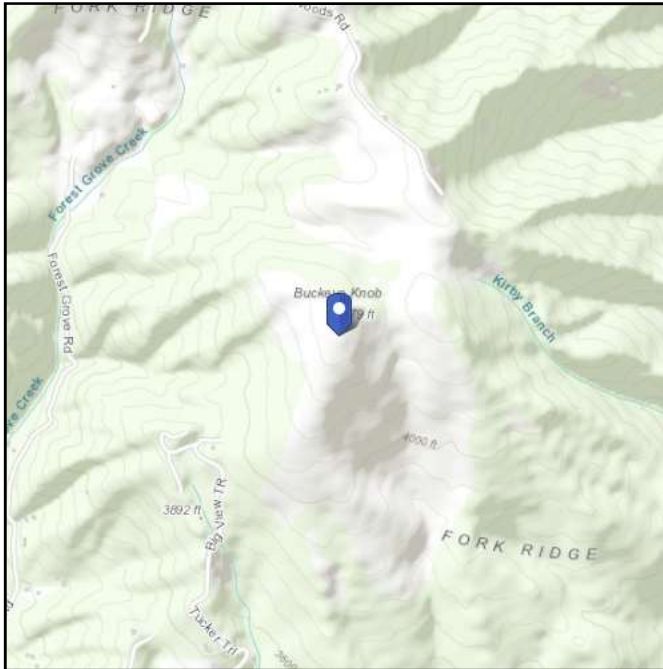
Soil Properties		
Total Soil Unit Weight, γ :	100	pcf
Ultimate Gross Bearing, Q_{ult} :	7.500	ksf
Cohesion, Cu :	0.000	ksf
Friction Angle, φ :	26	degrees
SPT Blow Count, N_{blows} :	6	
Base Friction, μ :	0.3	
Neglected Depth, N :	2.0	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, gw :	N/A	ft

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
10-year MRI	76 Vmph
25-year MRI	84 Vmph
50-year MRI	90 Vmph
100-year MRI	96 Vmph
Special	

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.

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,
Date Accessed: incorporating errata of March 12, 2014
Tue Mar 25 2025



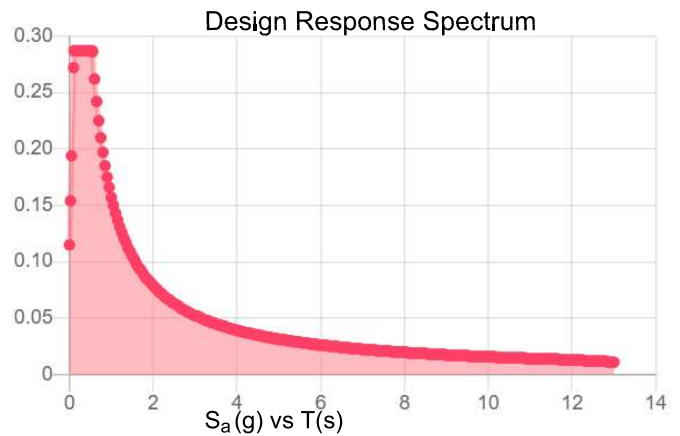
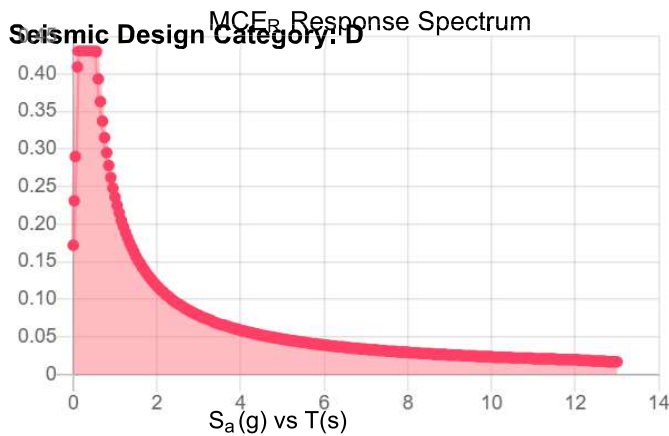
Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (annual exceedance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

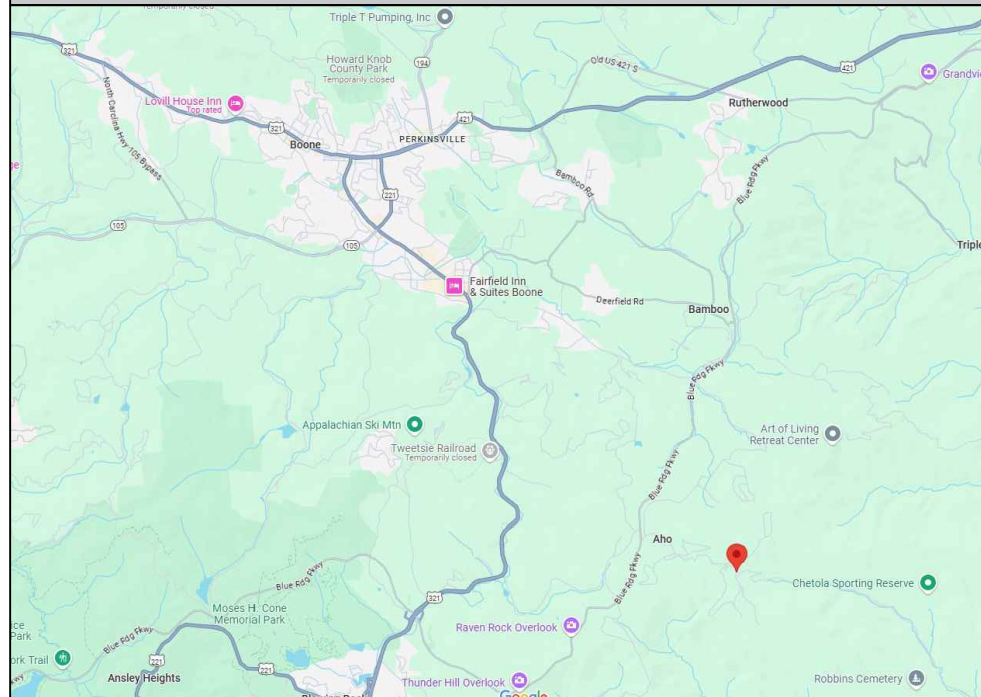
APPENDIX D

MODIFICATION DESIGN DRAWINGS

TOWER MODIFICATION DRAWINGS

SITE INFORMATION	
SITE NAME	AHO - VIPER
SITE NUMBER	HP-1382
SITE ADDRESS	1388 SAMPSON ROAD BOONE, NC 28607 WATAUGA COUNTY
LAT. / LONG.	N 36.154419°, W 81.602800°
ETS JOB#:	24125019.STR.8180
TOWER MANUFACTURER	WORLD TOWER COMPANY
TOWER TYPE	SELF SUPPORT TOWER
TOWER HEIGHT	199.0 FT

LOCATION MAP



DRIVING DIRECTIONS

FROM BOONE, HEAD SOUTHWEST ON GRAND BLVD TOWARD W KING ST (23 FT).
TURN LEFT ONTO US-421 S/W KING ST/U.S. HWY 421 S (2.6 MI). TURN RIGHT ONTO
BAMBOO RD (3.2 MI). TURN LEFT ONTO LITTLE LAUREL RD (246 FT). TURN RIGHT
ONTO BLUE RIDGE PKWY ACCESS (213 FT). TURN RIGHT ONTO BLUE RDG PKWY
(2.7 MI). TURN LEFT ONTO GEORGE HAYES RD (305 FT). CONTINUE STRAIGHT ONTO
SAMPSON RD (1.1 MI). TURN LEFT TO STAY ON SAMPSON RD (0.1 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

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PREPARED FOR:



SITE NAME:

AHO - VIPER

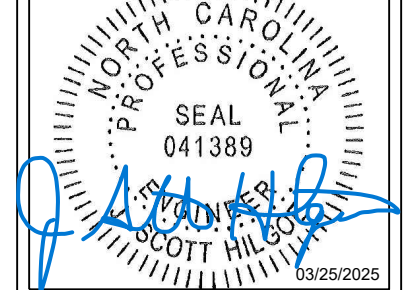
SITE NUMBER:

HP-1382

SITE ADDRESS:
1388 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.602800°

SEAL:  NC #P-1016



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TITLE PAGE

SHEET #	T-1	CURRENT REV #: 0
		ETS #: 24125019.STR.8180

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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PREPARED FOR:



SITE NAME:

AHO - VIPER

SITE NUMBER:

HP-1382

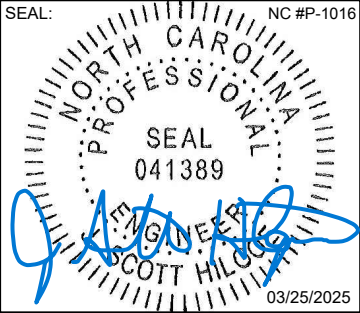
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LATITUDE/LONGITUDE:

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MODIFICATION
INSPECTION
CHECKLIST

SHEET #	N-1	CURRENT REV #: 0
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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.

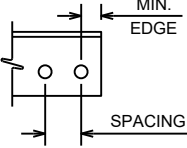
½"	BOLTS UP TO AND INCLUDING 2.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
7⁄8"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO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

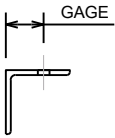
BOLT LENGTHS OVER FOUR DIA. BUT NOT EXCEEDING EIGHT DIA.

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

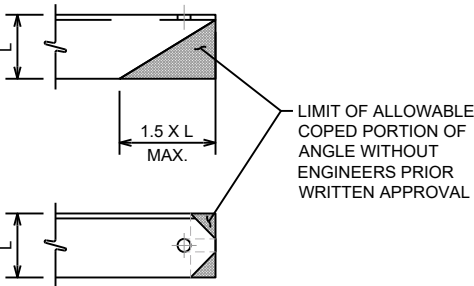
4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

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')	
PRELIMINARY CUT LENGTH	
ESTIMATED LENGTH	
	

ALLOWABLE ANGLE COPE	
	

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SITE NUMBER:

HP-1382

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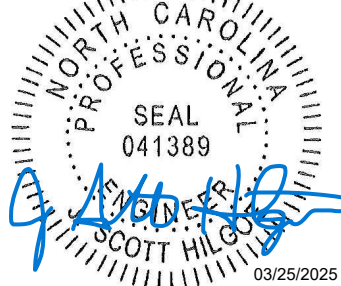
1388 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:

N 36.154419°, W 81.602800°

SEAL:

NC #P-1016



REV	DATE	DETAILS
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DRAWN BY: EDR

CHECKED BY: HA

SHEET TITLE:

PROJECT NOTES

SHEET #

N-2

CURRENT REV #: 0

ETS #: 24125019.STR.8180

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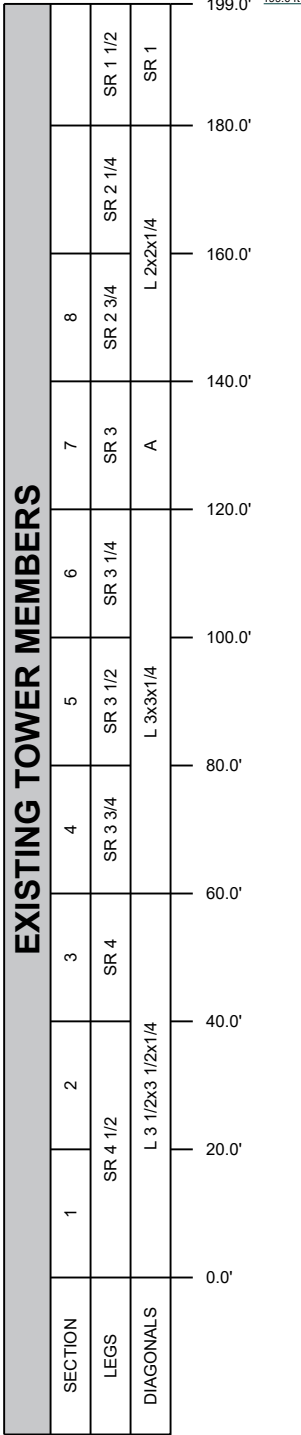


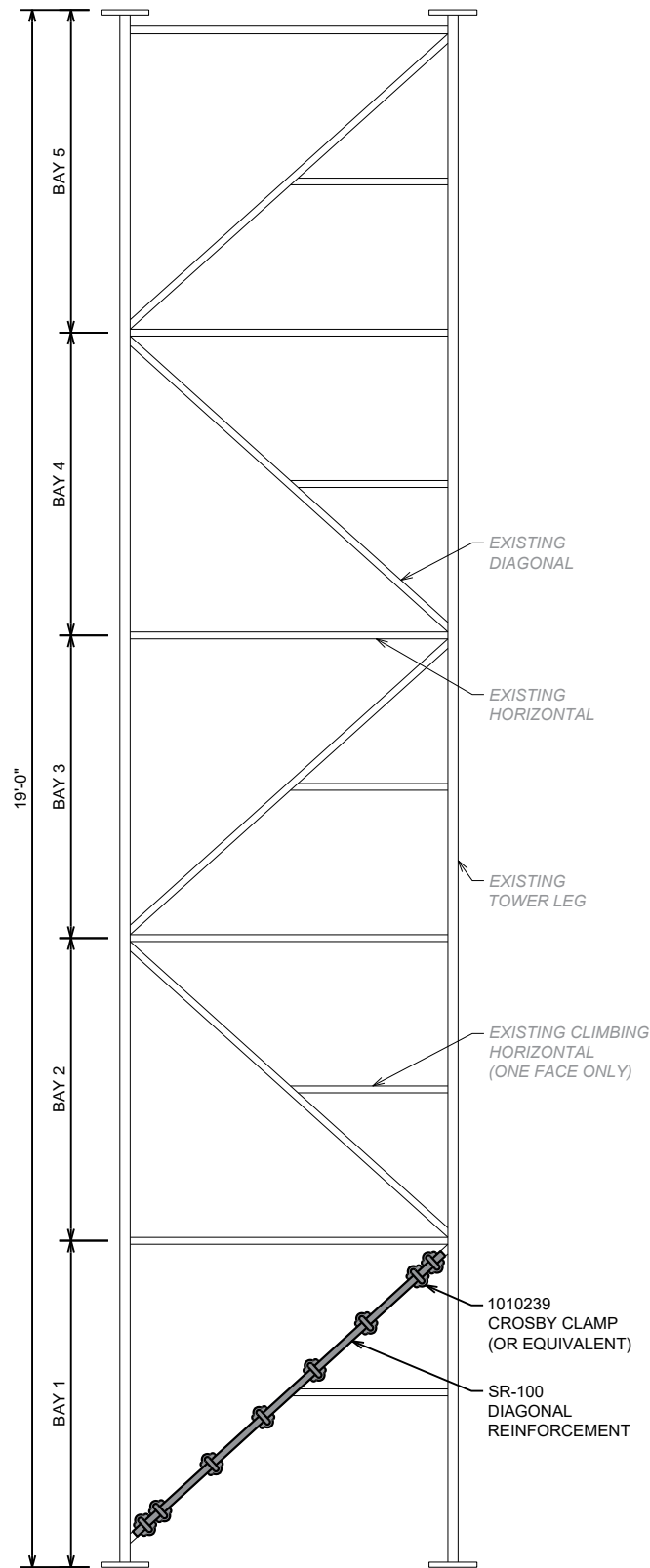
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SHEET TITLE:

BILL OF MATERIALS

SHEET #	BM	CURRENT REV #: 0
		ETS #: 24125019.STR.8180



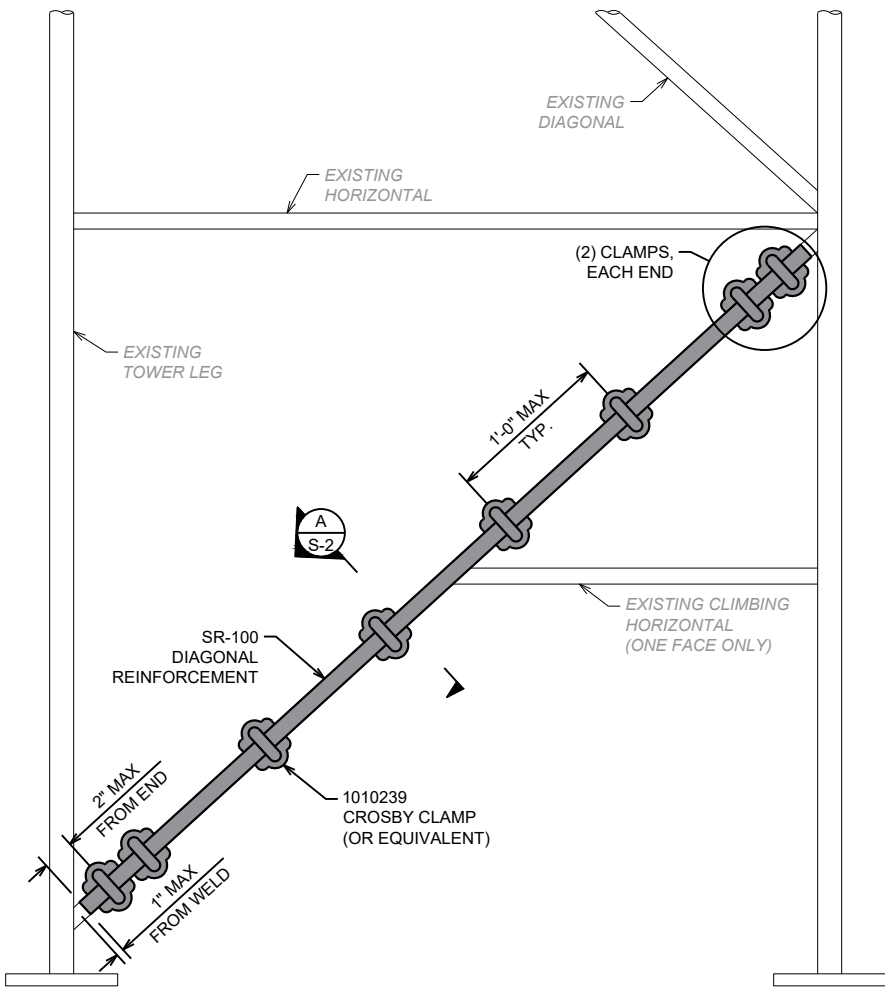


SECTION ELEVATION
SCALE: 7/16" = 1'-0"

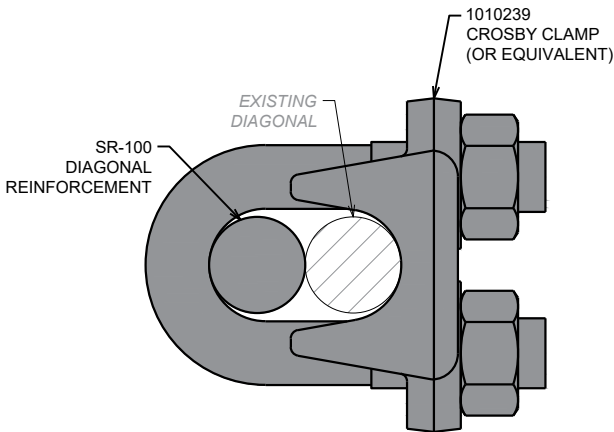
DIAGONAL REINFORCEMENT SCHEDULE											
SECTION	ELEVATION (FT)	BAY	EXISTING DIAGONAL SIZE	PROPOSED REINFORCEMENT				PROPOSED CONNECTION			
				PART NO.	SIZE & GRADE	ESTIMATED LENGTH	QTY.	PART NO.	SIZE	MAX. SPACING	QTY.
10	180.0 - 184.0	1 (OF 5)	SR 1"Ø	SR-100	SR 1"Ø A36	5'-1"±	3	CROSBY G-450 P/N: 1010239	1"Ø CLAMP (OR EQUIVALENT)	12"	24

NOTES:

- IT IS THE CONTRACTORS RESPONSIBILITY TO MEASURE ALL RELEVANT EXISTING MEMBERS PRIOR TO ORDERING MATERIALS.
- PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL FIELD VERIFY ALL LENGTHS.
- 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.



DIAGONAL REINFORCEMENT DETAIL
(ELEVATION VIEW)
SCALE: 1" = 1'-0"



SECTION A
SCALE: 6" = 1'-0"

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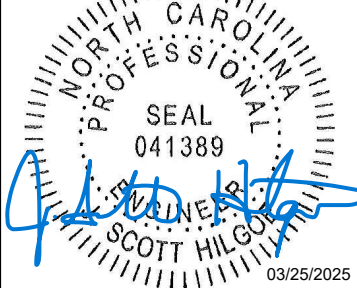
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DRAWN BY: EDR CHECKED BY: HA

SHEET TITLE:

DIAGONAL
REINFORCEMENT
DETAILS

SHEET #	S-2	CURRENT REV #: 0
		ETS #: 24125019.STR.8180



03/19/2024 16:33



03/19/2024 16:33



03/19/2024 16:40



03/19/2024 17:27



03/19/2024 16:38

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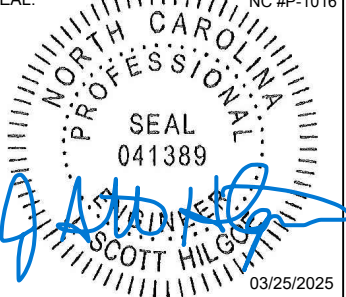
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SHEET TITLE:

PHOTOS