TENTATIVE AGENDA AND MEETING NOTICE
WATAUGA COUNTY BOARD OF COMMISSIONERS
TUESDAY, AUGUST 5, 2025 AT 5:30 PM

WATAUGA COUNTY ADMINISTRATION BUILDING
COMMISSIONERS' BOARD ROOM

TIME	#	TOPIC	PRESENTER	PAGE
5:30	1	CALL REGULAR MEETING TO ORDER		
	2	APPROVAL OF MINUTES ▪ JULY 15, 2025, REGULAR MEETING ▪ JULY 15, 2025, CLOSED SESSION		1
	3	APPROVAL OF THE AUGUST 5, 2025 AGENDA		13
5:35	4	PUBLIC COMMENT ▪ WILL LAST UP TO ONE HOUR, DEPENDING ON THE NUMBER OF SPEAKERS	CHAIRMAN EGGERS	15
5:40	5	LUCKY DOG VINTAGE MARKET - USE OF HUMAN SERVICES LOT	MR. TREVOR SHUE	17
5:45	6	BLUE RIDGE RISING RESOLUTION	MR. RYAN ROBINSON	23
5:50	7	SDR FINAL DEBRIS REMOVAL COST	MR. CHIP PATTERSON	27
6:00	8	WATAUGA COOPERATIVE EXTENSION - PROPOSED COUNTY VEHICLE PURCHASE	MR. JIM HAMILTON	29
6:05	9	MAINTENANCE MATTERS A. UTILITY VEHICLE PURCHASE REQUEST B. CONTRACT RENEWAL FOR RECREATION CENTER HVAC MONITORING	MR. ROBERT MARSH	 33 47
6:10	10	EMERGENCY SERVICES MATTERS A. TOWER CONSTRUCTION AND SITE MODIFICATIONS CONTRACT B. EMERGENCY SERVICES FACILITY TOWER ENGINEERING CONTRACT C. RADIO SYSTEM MAINTENANCE CONTRACT RENEWAL	MR. WILL HOLT	 71 603 609
6:15	11	APPOINTMENT OF MEMBERS TO FIRE APPENDICES COMMITTEE	MR. JASON WALKER	631
6:20	12	SANITATION DEPARTMENT TRAILER PURCHASE REQUEST	MR. CHRIS MARRIOTT	635
6:25	13	MISCELLANEOUS ADMINISTRATIVE MATTERS A. RESOLUTION TO APPROVE AMENDMENT NO. 2 B. PROPOSED HUMAN SERVICES PARKING LOT AND PARKING DECK AGREEMENT WITH APPALACHIAN STATE	MR. DERON GEOUQUE	 641 647
6:30	14	BREAK		657
6:40	15	CLOSED SESSION ▪ ATTORNEY-CLIENT MATTERS PER G. S. § 143-318.11(A)(3) ▪ LAND ACQUISITION PER G.S. § 143-318.11(A)(5) ▪ PERSONNEL MATTERS PER G. S. § 143-318.11(A)(1)		657

TIME	#	TOPIC	PRESENTER	PAGE
6:50	16	POSSIBLE ACTION AFTER CLOSED SESSION		659
6:55	17	ADJOURN		

AGENDA ITEM 2:

APPROVAL OF MINUTES:

July 15, 2025, Regular Meeting
July 15, 2025, Closed Session

DRAFT

MEETING MINUTES
WATAUGA COUNTY BOARD OF COMMISSIONERS
TUESDAY, JULY 15, 2025

The Watauga County Board of Commissioners held a regular meeting on Tuesday, July 15, 2025, at 5:30 P.M. in the Commissioners' Board Room located in the Watauga County Administration Building in Boone, North Carolina.

1. CALL REGULAR MEETING TO ORDER

Chairman Eggers called the meeting to order at 5:30 P.M. The following were present:

PRESENT: Braxton Eggers, Chairman
Todd Castle, Vice-Chairman
Emily Greene, Commissioner
Tim Hodges, Commissioner
Ronnie Marsh, Commissioner
Nathan Miller, County Attorney
Deron Geouque, County Manager
Katie Hancock, Clerk to the Board

Commissioner Hodges offered a prayer and Commissioner Marsh led the Pledge of Allegiance.

2. APPROVAL OF MINUTES

Chairman Eggers presented the June 17, 2025, regular and closed session meeting minutes.

Commissioner Greene, seconded by Vice-Chairman Castle, moved to approve the June 17, 2025, regular meeting minutes as presented.

VOTE: Aye – 5
Nay – 0

Commissioner Greene, seconded by Vice-Chairman Castle, moved to approve the June 17, 2025, closed session minutes as presented.

VOTE: Aye – 5
Nay – 0

3. APPROVAL OF AGENDA

Chairman Eggers called for additions or corrections to the July 15, 2025, agenda.

County Manager Geouque requested the following addition:

- Agenda Item 6 to include the following:

B. Consideration of New Projects for the North Carolina Department of Transportation State Transportation Improvement Plan (STIP 8.0)

Commissioner Marsh, seconded by Commissioner Hodges, moved to approve the July 15, 2025, agenda as amended.

VOTE: Aye – 5
Nay – 0

4. PUBLIC COMMENT

There was no public comment.

5. APPOINTMENT OF CLERK TO THE BOARD

Chairman Eggers reported that Katherine "Katie" Hancock had been hired to fill the vacancy created by the retirement of long-serving Clerk to the Board, Anita Fogle. He proposed that Ms. Hancock be appointed as Clerk to the Board/Administrative Assistant.

Commissioner Hodges, seconded by Commissioner Greene, moved to approve the appointment of Katie Hancock as Clerk to the Board/Administrative Assistant.

VOTE: Aye – 5
Nay – 0

6. PLANNING AND INSPECTIONS MATTERS

A. High Country Rural Planning Organization (RPO) and Watauga County Transportation Projects Overview

Mr. David Graham, Transportation Planner with the High Country Council of Governments, presented an overview of the Rural Planning Organization (RPO) Comprehensive Transportation Plan and Watauga County projects in the State Transportation Improvement Program (STIP).

This presentation was for informational purposes only; therefore, no action was required.

B. Consideration of New Projects for the North Carolina Department of Transportation State Transportation Improvement Plan (STIP 8.0)

Mr. Jason Walker, Planning and Inspections Director, along with Mr. David Graham, Transportation Planner with the High Country Council of Governments, requested that Watauga County submit three highway projects and three bicycle/pedestrian projects from the Holding Tank List for consideration in the upcoming State Transportation Improvement Plan (STIP 8.0). Mr. Walker presented a list of all current projects on the Holding Tank List, along with the top three ranked projects in each category based on a community survey. The following projects received the highest rankings and were recommended for submission.

Highway Projects	Bicycle/Pedestrian Projects
1. **H230697**: NC-194 from US-221/421 to Castle Ford Road Description: Modernize roadway, including construction of center turn lane and sidewalks	1. **B230730**: Middle Fork Greenway, Section 5B Description: From south of Jordan Cook Road to Watauga Medical Center
2. **H090163-A:** US-421 from Tennessee state line to US-321/421 junction near Vilas Description: Widen to multiple lanes	2. **B230735**: Middle Fork Greenway, Section 5C Description: From Payne Branch Park to Goldmine Brank Park
3. **H111013**: NC-105 Bypass from NC-105 to US-321/421 Description: Widen roadway to three lanes with 5-foot paved shoulders to accommodate bicycles	3. **B230668**: Middle Fork Greenway, Section 1B Description: From South of the Blue Ridge Parkway to Chestnut Ridge Parkway

The Board agreed to select the top three highway and bicycle/pedestrian projects as ranked by the community survey.

Vice-Chairman Castle, seconded by Commissioner Greene, moved to approve the submission of the selected projects for consideration in the upcoming State Transportation Improvement Plan (STIP 8.0).

VOTE: Aye – 5
Nay – 0

7. PROPOSED FINAL REVISION TO HOME & COMMUNITY CARE BLOCK GRANT (H&CCBG) FY 2025 ALLOCATION

Ms. Angie Boitnotte, Project on Aging Director, requested that the Board approve a final revision to the FY 2025 Home and Community Care Block Grant (H&CCBG) allocation. The revision involved moving $649 from In-Home Aide Level II to In-Home Aide Level I services. The overall allocation and required local match remained unchanged.

Commissioner Marsh, seconded by Commissioner Hodges, moved to approve the final revision to the FY 2025 Home and Community Care Block Grant (H&CCBG) allocation as presented.

VOTE: Aye – 5
Nay – 0

8. NORTH CAROLINA AMATEUR SPORTS GRANT ACCEPTANCE REQUEST

Ms. Keron Poteat, Parks and Recreation Director, requested that the Board accept a $20,000 grant awarded through North Carolina Amateur Sports.

Vice-Chairman Castle, seconded by Commissioner Greene, moved to accept the $20,000 grant from North Carolina Amateur Sports

VOTE: Aye – 5
Nay – 0

9. K-9 PURCHASE REQUEST

Captain Carolynn Johnson, Watauga County Sheriff's Office, reported that the department recently hired a K-9 Deputy from Avery County to fill a deputy vacancy. Avery County would not release his K-9 unless Watauga County paid $20,000. Captain Johnson stated that the Sheriff's Office secured a private donor willing to contribute the full amount.

Captain Johnson requested that the Board accept the $20,000 donation to purchase the K-9 from Avery County.

Commissioner Marsh, seconded by Vice-Chairman Castle, moved to accept the $20,000 donation for the purchase of the Avery County K-9.

VOTE: Aye – 5
Nay – 0

Upon purchasing the K-9, the County would need to declare the animal as surplus property and approve a private sale to the deputy. This action is authorized under G.S. § 160A-266 and § 160A-267 and was necessary as all existing K-9 positions were filled, and no funds were budgeted for an additional K-9 deputy.

Commissioner Marsh, seconded by Commissioner Greene, moved to declare the K-9 as surplus property.

VOTE: Aye – 5
Nay – 0

Vice-Chairman Castle, seconded by Commissioner Hodges, moved to adopt the Resolution Authorizing the Sale of Personal Property Worth Less Than $30,000 (G.S. § 160A-266; 267) to approve the private sale of the surplus K-9 to the deputy.

VOTE: Aye – 5
Nay – 0

10. EMERGENCY SERVICES MATTERS

A. Hurricane Helene Update

Mr. Will Holt, Emergency Services Director, shared a brief update on Hurricane Helene recovery efforts.

- Most insurance claims have been processed and submitted to FEMA.
- Debris removal is ongoing, with over 400,000 cubic yards cleared from waterways.
- The Private Property Debris Removal program is set to begin soon.
- Initial watershed repair projects have been approved, and over 475 private roads and bridges have been inspected.
- To date, over $540,000 in FEMA reimbursements have been secured.
- The Multi-Agency Resource Center remains open Friday mornings, though usage is low and under review.

Mr. Holt expressed appreciation for the continued partnership with local, state, and federal agencies supporting recovery and resilience efforts.

This update was for informational purposes only; no action was required.

B. Emergency Services Vehicle Purchase

Mr. Holt requested Board approval for one (1) new 2025 F-150 to replace a 2019 model. The total cost, including vehicle and upfit, is $93,499.80.

Commissioner Hodges, seconded by Commissioner Greene, moved to approve the purchase of the 2025 F-150 and upfit in the amount of $93,499.80.

VOTE: Aye – 5
Nay – 0

C. EMS Third-Party Billing Service Agreement

Mr. Holt requested Board approval for a contract with EMS Management & Consultants, Inc. to provide third-party billing services and electronic patient care reporting for the County's new ambulance service. The cost of the service is 7.5% of net collections billed.

Vice-Chairman Castle, seconded by Commissioner Marsh, moved to approve the contract with EMS Management & Consultants, Inc. for third-party billing and patient care reporting services at a rate of 7.5% of net collections.

VOTE: Aye – 5
Nay – 0

D. Request to Purchase EMS Ambulance Mobiles and Portable Radio Equipment

Mr. Holt requested formal Board approval for the purchase of 16 portable radios and 10 mobile radios for use in both existing and incoming EMS vehicles. The total cost of the equipment is $236,182.86.

To avoid a scheduled 7% price increase ($16,532.80), staff placed the order in advance of the meeting.

Commissioner Marsh, seconded by Commissioner Greene, moved to approve the purchase of portable and mobile radios from Motorola in the amount of $236,182.86.

VOTE: Aye – 5
Nay – 0

11. WATAUGA COUNTY PLANNING BOARD'S RECOMMENDATIONS FOR THE FIRE APPENDICES COMMITTEE

Mr. Jason Walker, Planning and Inspections Director, presented the Planning Board's recommendations for the Fire Appendices Committee. A public hearing was held on May 6, 2025, to allow citizen comment regarding the potential repeal of the fire appendices. Following the hearing, a Fire Appendices Committee was formed to review the matter and develop recommendations. Below are the Planning Board's recommendations for committee composition.

Role	Recommended Members
Two Fire Chiefs	Recommendation to come from the Fire Board
Two Commissioners	Internally decided by the Board of Commissioners
County Manager	Deron Geouque
Fire Marshal	Shane Garland
Planning Director	Jason Walker
One Surveyor	1. Alex Crowe 2. Donald McNeil 3. Rick Snider
One Engineer	1. Patrick Warren 2. Derrick Goddard 3. Mike Trew
One Developer	1. Patrick Warren 2. Jeff Fisher 3. Todd Rice 4. Bill Aceto 5. Jay Harrill*
One At-Large Member	1. Mike Wilson 2. Joseph Greer 3. Chuck Campbell 4. George Bartholomew*

** The two individuals marked with an asterisk were recommended after the Planning Board meeting.*
The Planning Board recommended that two commissioners serve on the committee. Chairman Eggers and Commissioner Marsh volunteered to fill those seats.

The Board requested that Mr. Walker contact the individuals recommended for the surveyor, engineer, developer, and at-large positions to confirm their willingness to serve. Once confirmations are received, Mr. Walker will present the finalized list for the Board's review and approval at the next meeting.

This item was presented for the Board's information, and no formal action was required at this time.

12. TAX MATTERS

A. Monthly Collections Report

Mr. Deron Geouque, County Manager, presented the Monthly Collections Report from June 2025 on behalf of Mr. Tyler Rash.

The report was presented for informational purposes only; therefore, no action was required.

B. Refunds and Releases

Mr. Geouque presented the Refunds and Releases Report.

Vice-Chairman Castle, seconded by Commissioner Hodges, moved to accept the Refunds and Releases as presented.

VOTE: Aye – 5
Nay – 0

C. Annual Settlement of the Tax Collector

Pursuant to G.S. § 105-373, an annual settlement of the Tax Collector must be prepared and submitted to the Board of Commissioners for review and approval. Mr. Geouque, on behalf of Mr. Rash, presented the annual settlement.

Commissioner Marsh, seconded by Commissioner Greene, moved to approve the Annual Settlement of the Tax Collector as presented by Mr. Geouque.

VOTE: Aye – 5
Nay – 0

D. Oath to Collect Taxes

Mr. Geouque stated that each year the Board of County Commissioners is required to authorize the Tax Administrator of Watauga County to collect taxes for the upcoming fiscal year.

Commissioner Marsh, seconded by Commissioner Hodges, moved to authorize the Tax Administrator to begin the process of tax collection.

VOTE: Aye – 5
Nay – 0

13. MISCELLANEOUS ADMINISTRATIVE MATTERS

A. Howard Knob Park Proposal for Construction Materials Testing

The Howard Knob Park project required construction materials testing services. Funds had been budgeted to cover the expense. The project required no County funding and was to be paid by the Watauga TDA and grant funds. Staff recommended that the Board, contingent upon County Attorney review, approve the contract with WSP for construction materials testing in the amount of $37,500.

Mr. Nathan Miller, County Attorney, noted concerns with the contract, specifically with Paragraph 7 – "Limitation of Liability" and Paragraph 18 – "Disputes", particularly the litigation clause requiring all disputes to be adjudicated in the state of New York.

Due to these concerns, Commissioner Greene, seconded by Vice-Chairman Castle, moved to table the discussion to allow Mr. Miller time to contact WSP for clarification and possible revisions.

VOTE: Aye – 5
Nay – 0

B. Budget Amendments

Mr. Deron Geouque, Finance Director, presented the budget amendments for approval as included in the Board packet.

Commissioner Marsh, seconded by Vice-Chairman Castle, moved to approve the budget amendments as presented.

VOTE: Aye – 5
Nay – 0

C. Boards and Commissions

AppalCART Board

Appalachian State University recommended the appointment of Mr. Matt Dull, Deputy Chief Operating Officer, to the AppalCART Board, replacing Mr. John Adams, former Interim Chief Financial Officer.

Commissioner Marsh, seconded by Commissioner Hodges, moved to waive the first reading and appoint Mr. Dull to the AppalCART Board.

VOTE: Aye – 5
Nay – 0

CCC&TI Board

Mr. Lowell Younce's term on the Caldwell Community College and Technical Institute Board of Trustees expired on June 30, 2025. Mr. Younce expressed his willingness to continue serving, and the Board of Trustees requested his reappointment.

Commissioner Marsh, seconded by Commissioner Hodges, moved to waive the first reading and reappoint Mr. Younce to the Caldwell Community College and Technical Institute Board of Trustees.

VOTE: Aye – 5
Nay – 0

Jury Commission

Mr. Thomas Broadus Redmon was previously selected for the Jury Commission for the 2025 – 2026 term. Mr. Redmon was willing to continue to serve on the commission.

Commissioner Greene, seconded by Commissioner Marsh, moved to waive the first reading and reappoint Mr. Redmon to the Jury Commission.

VOTE: Aye – 5
Nay – 0

Parks and Recreation Commission

The Recreation Commission Board submitted the following reappointment recommendations and requested that the Board approve the names and waive the first reading requirement.

Name	Representing	Term
Ms. Brittany Bolick	Hardin Park School	Term expired 06/2025; reappointed through 06/2028
Mr. Sam Painter	Valle Crucis School	Term expired 06/2025; reappointed through 06/2028
Ms. Virginia Roseman	Boone Town Council	Annual appointment; serves through 12/2025
Mr. Doug Matheson	Blowing Rock Town Council	Annual appointment; new term through 06/2026
Mr. Ron Henries	WCS Board of Education	Annual appointment; new term through 06/2026

Vice-Chairman Castle, seconded by Commissioner Greene, moved to waive the first reading and approve the names submitted for the Recreation Commission Board.

VOTE: Aye – 5
Nay – 0

D. Announcements

AMOREM scheduled a private open house celebration for the Patient Care Unit of the High Country on Friday, July 25, 2025 from 1:00 PM until 1:45 PM at Archie Carroll Road in Boone, NC. Members of the Board were invited to attend.

14. COMMISSIONER COMMENTS

There were no Commissioner comments.

15. CLOSED SESSION

At 6:57 PM, Vice-Chairman Castle, seconded by Commissioner Greene, made a motion to go into Closed Session pursuant to G.S. § 143-318.11(a)(3) to discuss attorney-client privileged matters, § 143-318.11(a)(5) to consider matters related to land acquisition, and § 143-318.11(a)(1) to discuss personnel matters.

VOTE: Aye – 5
Nay – 0

At 9:33 PM, Vice-Chairman Castle, seconded by Chairman Eggers, moved to resume the open meeting.

VOTE: Aye – 5
Nay – 0

16. ADJOURN

At 9:34 PM, Vice-Chairman Castle, seconded by Chairman Eggers, moved to adjourn the meeting.

VOTE: Aye – 5
Nay – 0

Braxton Eggers, Chairman

ATTEST: Katie Hancock, Clerk to the Board

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AGENDA ITEM 3:

APPROVAL OF THE AUGUST 5, 2025, AGENDA

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AGENDA ITEM 4:

PUBLIC COMMENT

MANAGER'S COMMENTS:

Public Comment will last up to one hour, depending on the number of speakers.

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AGENDA ITEM 5:

LUCKY DOG VINTAGE MARKET – USE OF HUMAN SERVICES LOT

MANAGER'S COMMENTS:

Trevor Shue, organizer of the Lucky Dog Vintage Market, has submitted a request to use the grassy area and parking lot at the Human Services Center for market events on select dates from August 2025 through August 2026. The proposed dates do not conflict with the ASU football schedules and the Watauga County Farmers' Market. The rate to be charged is $200; which is the same as last time.

Staff seeks direction from the Board.

Katie.Hancock

From: Trevor Shue <luckydogvtg@gmail.com>
Sent: Wednesday, July 30, 2025 6:10 PM
To: Board Packet
Subject: Re: Trevor Shue Lucky Dog Vintage Market

I have reviewed the ASU Football schedule, as well as the student schedule for the 2025-2026 year and all of our dates are either on fridays, saturday, or sundays so no interference with the farmers market as well.

On Wed, Jul 30, 2025 at 6:08 PM Trevor Shue <luckydogvtg@gmail.com> wrote:

Here is the information for my request for the board of commissioners, Lucky Dog Vintage Market @ the grassy human services area/parking lot.

2025-2026 Requested Dates

2025
August 23rd
September 20th
October 19th
November 21st

2026
March 21st
April 18th
May 23rd
June 20th
July 18th
August 21st

I have reviewed the ASU Football schedule, as well as the student schedule for

STATE OF NORTH CAROLINA LICENSE AGREEMENT

COUNTY OF WATAUGA

THIS LICENSE AGREEMENT (the "Agreement") is made as of August 5, 2025, by and between Watauga County, a corporate body politic, being hereinafter referred to as the “Licensor,” and Lucky Dog Vintage, being hereinafter referred to as “Licensee”.

STATEMENT OF PURPOSE

WHEREAS, Licensor is the owner of the parking lot and building of the Watauga County Human Services Center located at 132 Poplar Grove Connector, Boone NC 28607, hereinafter referred to as the “Property”); and

WHEREAS, Licensee wants to use the parking lot to host its clothing market on the dates listed in Exhibit A; and

WHEREAS, Licensor and Licensee hereto desire to enter into an agreement to set forth their respective rights and obligations regarding use and maintenance of the Property.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the parties hereto hereby agree as follows:

1. **Grant of License**. Licensor hereby grants to Licensee, subject to all of the terms and conditions hereof, a license to use the Property to host its clothing market on the dates listed in Exhibit A for itself, its clients, customers, patrons, other related invitees and the general public. However, Licensee does not have the rights granted herein to the exclusion of the rights of the Licensor to use the Property in any matter it wishes so long as it does not unreasonably impede the use of the Property by Licensee for the purpose stated herein.

2. **Personal License Only**. It is agreed between Licensor and Licensee that this license is personal to Licensee and shall not inure to the successors or assigns of Licensee.

3. **Licensee Has No Interest or Estate**. Licensee agrees that it does not and shall not claim at any time any interest or estate of any kind or extent whatsoever in the Property, or any portion thereof, by virtue of this license or Licensee’s occupancy or use hereunder and Licensor conveys no interest in the Property to Licensee by this Agreement.

4. **Use of the Property**. The Licensor shall collect the garbage from the containers on the Property at 6:00 PM on the dates listed in Exhibit A, and this License shall automatically terminate at the conclusion of each date’s use. The Licensee shall keep the Property in a good state of repair and in a safe condition during its use on each occasion. Any repairs or other changes made by Licensee shall require the prior consent of Licensor and shall be at the sole cost and expense of Licensee. The Licensee shall pay to Licensor a fee of Two Hundred Dollars ($200.00) per date of use as outlined in Exhibit A for its use of the Property.

5. **Indemnification**. Licensee shall indemnify and hold Licensor, jointly and severally, its agents, servants, employees, invitees, representatives and their respective heirs, successors and assigns, harmless from and against any and all claims, demands, actions, liabilities or expenses concerning bodily injury or death, damage to the Property resulting from, or in any way connected with, the condition or use of the Property by Licensee, its invitees, customers, guests and the general public during the use of the Property. Licensor shall not be liable to Licensee if for any reason whatever Licensee's occupation or use of the Property hereunder shall be hindered or disturbed. Licensee shall be responsible for maintaining a liability insurance policy, at its sole cost and expense, naming the Licensor as named insured, in form and amount mutually agreeable between Licensor and Licensee.

6. **Termination of License.** This License shall commence at 9:00 AM and automatically terminate at 6:00 PM on the dates listed in Exhibit A.

7. **Modification.** The terms, covenants, conditions and provisions of this License Agreement may be extended, abrogated, modified, rescinded or amended in whole or in part only with the consent of the Licensor and Licensee and only in writing.

8. **Applicable Law**. This Agreement shall be governed in all respects by the laws of the State of North Carolina.

9. **Notices**. Any notices or other communications to be given hereunder shall be in writing and shall be deemed to have been given if delivered in person or mailed by United States certified or registered mail, postage prepaid, return receipt requested, to the parties at the following address, or to such other address as shall be given in writing by one party to the other:

   As to Licensor:

   Deron Geouque, County Manager
   Watauga County
   814 West King Street, Room 205
   Boone, NC 28607

   As to Licensee:

   Trevor Shue
   Lucky Dog Vintage
   1167 West King Street
   Boone, NC 28607

10. **Recording**. This Agreement, or Memorandum thereof, shall not be recorded without Licensor's prior written consent, and if recorded Licensee hereby agrees to pay the cost and expense thereof.

11. **Waiver**. No waiver of any condition, covenant or restriction of this Agreement by either party shall be deemed to imply or constitute a further waiver of the same or any other condition or covenant of this Agreement.

12. **Captions**. The captions of the various paragraphs of this Agreement are for convenience only and are not a part of this Agreement and do not in any way limit or amplify the terms and provisions of this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, all as of the day and year first above written.

Licensor:

Watauga County

By: _____
Deron Geouque
County Manager

Licensee:

Lucky Dog Vintage

By: _____
Trevor Shue

Attest:

_____
Katie Hancock
Clerk to the Board of Commissioners

Exhibit A: Market Dates

- August 23, 2025
- September 20, 2025
- October 19, 2025
- November 21, 2025
- March 21, 2026
- April 18, 2026
- May 23, 2026
- June 20, 2026
- July 18, 2026
- August 21, 2026

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AGENDA ITEM 6:

BLUE RIDGE RISING RESOLUTION

MANAGER'S COMMENTS:

Mr. Ryan Robinson, Head of Corporate Responsibility and Community Partnerships for Mast General Store, has requested the Board's consideration of a resolution of support from the Blue Ridge Parkway Foundation. The Foundation is seeking endorsement from the 29 counties along the Parkway corridor as part of a regional effort to advocate for funding that supports unified county interests and Helene Recovery initiatives. To date, 21 counties have adopted the resolution.

Staff seeks direction from the Board.

STATE OF NORTH CAROLINA

COUNTY OF WATAUGA

RESOLUTION IN SUPPORT OF FUNDING FOR REPAIRS AND STRATEGIC IMPLEMENTATION OF BLUE RIDGE RISING ALONG THE BLUE RIDGE PARKWAY

WHEREAS, the Blue Ridge Parkway traverses 469 miles from Afton Mountain in Virginia to the Qualla Boundary in North Carolina and unites these two states' unique mountain cultures and identities with a world-renowned national park that celebrates the places, communities, and people along the Parkway; and

WHEREAS, the Blue Ridge Parkway is the most-visited unit of the national park system, attracting nearly seventeen million visitors each year and contributing significantly to the local and regional economies in Virginia and North Carolina; and

WHEREAS, the Parkway generates approximately $1.4 billion in visitor spending and $1.8 billion in total economic output for the 1,799,000 residents of the surrounding corridor of twenty-nine counties, seven independent Virginia cities, and numerous municipalities in North Carolina and Virginia, including the towns of Buchanan, Fincastle, and Troutville in Botetourt County; and

WHEREAS, the Blue Ridge Parkway Foundation serves as the sole official philanthropic partner to the Blue Ridge Parkway, advocating for necessary funding and resources for the Parkway's maintenance, preservation, and community engagement; and

WHEREAS, the Blue Ridge Rising strategic plan provides a roadmap for the sustainable management and enhancement of the Parkway, ensuring that it continues to serve as a vital resource for environmental education, recreation, tourism, and community connection; and

WHEREAS, Tropical Storm Helene has caused catastrophic damage and loss of life for several communities in western North Carolina and southwest Virginia, including those communities adjacent to the Parkway; and

WHEREAS, repairs are critical to preserving the safety and accessibility of the Parkway and its adjacent communities, which is essential for their economic wellbeing; and

WHEREAS, collaboration among local, state, and federal governments is critical in this response and imperative to secure the necessary funding and policies that will sustain and benefit the communities surrounding the Blue Ridge Parkway; and

WHEREAS, the establishment of a coalition composed of elected officials and community representatives will enhance advocacy efforts and foster a unified regional voice for the Blue Ridge Parkway corridor.

NOW, THEREFORE, BE IT RESOLVED that the Watauga County Board of Commissioners endorses and supports the following:

1. **Funding for Repairs**: Urging state and federal governments to prioritize and allocate funding for repairs along the Blue Ridge Parkway to ensure its continued safety and accessibility;

2. **Implementation of the Blue Ridge Rising Strategic Plan**: Advocating for the full funding and implementation of the Blue Ridge Rising Strategic Plan to enhance visitor experience, preserve natural resources, and promote sustainable tourism along the Parkway;
3. **Collaboration and Support**: Calling upon local, state, and federal officials to collaborate with the Blue Ridge Parkway Foundation and other stakeholders to secure resources and policies that benefit the Parkway and its surrounding communities; and
4. **Coalition Creation**: Supporting the formation of a coalition of elected officials and community representatives dedicated to advocating for the Blue Ridge Parkway, ensuring that the needs and voices of the communities along the corridor are effectively represented.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to relevant local, state, and federal entities, as well as the Blue Ridge Parkway Foundation, to demonstrate our unified support for the Parkway and its vital role in our communities.

ADOPTED this 5th day of August, 2025.

_____
Braxton Eggers, Chairman
Watauga County Board of Commissioners

ATTEST:

_____
Katie Hancock, Clerk to the Board

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AGENDA ITEM 7:

SDR FINAL DEBRIS REMOVAL COST

MANAGER'S COMMENTS:

Southern Disaster Recovery (SDR) has completed all final punch list and quality control items. According to Mr. Patterson, due to data lag and the volume of debris processed from the 2,000-item punch list, the total cost of right-of-way debris removal is $7.2 million. SDR is requesting that the final Not to Exceed (NTE) amount be set at $7,200,000, which is $750,000 more than the previous amount of $6,450,000. There is a lag between work completed and invoicing. SDR has already completed and billed more than the $6,450,000 amount in an effort to eliminate and complete the project. All funds are 100% reimbursable by FEMA. The County Attorney would need to advise on the legal issue regarding the services completed and compensation owed to SDR. Additionally, staff has identified 14 remaining sites for removal.

Staff seeks direction from the Board.

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AGENDA ITEM 8:

WATAUGA COOPERATIVE EXTENSION – PROPOSED COUNTY VEHICLE PURCHASE

MANAGER'S COMMENTS:

Mr. Jim Hamilton, County Extension Director, is requesting the purchase of a county-owned vehicle to support Extension staff travel for farm visits, workshops, meetings, and programming. Due to significant increases in state vehicle lease costs and anticipated reductions in state travel funding, maintaining the current state van lease is no longer cost-effective. The request proposes using unencumbered funds from a currently vacant 4-H agent position to offset the cost of a vehicle purchase, with a preference for a Toyota Sienna due to its passenger and equipment transport capacity.

The request does not include vehicle maintenance and fuel. These expenses will be incorporated now and in next year's budget.

Staff seeks direction from the Board regarding the proposed purchase.

County Vehicle Request for Watauga Cooperative Extension

Extension's state van contract monthly use fees are going up from $307 per month to $460 (with per mile fees after 1000 miles also going from $0.35 to $0.44). Additionally, with expected forthcoming projected state cuts to Extension travel budgets at 20% or more (due to federal cuts), this will significantly reduce our agent's travel capacity for county farm & property visits, meetings, workshops, & trainings. Watauga Extension will have to increase our ***county*** budget significantly for travel to make up for this shortfall. In the past, Watauga Extension has also had access to the county's Soil & Water truck and Parks & Rec vans for additional vehicle options. However, due to increased use of those vehicles by those county departments, 'shared' travel is no longer a viable option.

The current state van in use by Watauga Extension is a 2016, 7 passenger Dodge Caravan with 75,000 miles. Under the new state lease, our annual travel costs for that vehicle will be well over $6,000 ($5,520 per year + $~1,000 mileage fees).

With a county-owned vehicle, NC State travel funding can be more efficiently allocated for agent travel & less additional county budget to subsidize it (we have added $1,000 to our travel line each year over the past three years due to increased costs). Many other county Extension departments have relinquished their state vehicles for this reason and for more cost-efficient options available through county motor pool/vehicle procurement.

Proposed action:

Our 4-H agent recently separated (on July 18). Due to a hiring freeze at NC State, Watauga Extension will have unencumbered budget this fiscal year, as we do not know when the position can be reposted or refilled. My best guess is that it will be at least 6 months (but we realistically feel it will be at least 9).

I propose that the county uses unencumbered budget to purchase a new county vehicle for Extension travel.

Unencumbered Extension budget for 4-H Position for:

11.5 month vacancy: $29,984
6 month vacancy: $15,644
9 month vacancy: $23,466 –(it is my hope we may be able to refill the position in 9 months)

Vehicle options (From NC Sheriff's Association Procurement):

The following is a list of vehicle options from the Sheriff's Association procurement website. https://ncsheriffs.org/procurement/vehicle-motorcycle We would recommend the Toyota Sienna due to its passenger & storage capacity. Staff often transport groups to workshops & programming and seats can be stowed for equipment transport. We would need an additional ~$13,201 to purchase this vehicle with an expected 9-month vacancy with our 4-H agent position.

(Bid 25-11-0912) Item: 124, Toyota, RAV4 Hybrid LE AWD, 4435 $31,365.00

(Bid 25-11-0912) Item: 127, Toyota, Sienna Hybrid LE FWD (8 Passenger), 5402 $36,667.00

(Bid 25-11-0912) Item: 215, Ford, F-150 Super Cab XL 145" WB 6.5` Bed 4×2, X1K $36,725.00

Additional background on state-funded Watauga Extension Travel:

Our Extension state-funded travel allocation covers mileage (when agents use personal vehicles), meal per diem, conference/training registration fees, and lodging costs. Our state van lease & fees ALSO come out of that allocation. Each year, Cooperative Extension (at the state level) determines our office's annual travel budget allocation. In the past, we used to have a 'per agent allocation' (funded by the state) of around $3,500 per agent—and we did not have to request or use any county funds for travel. The entire staff share and frequently use the state van for programs and for longer trips to reduce wear & tear on their personal vehicles. Since 2022, our state travel allocation was set on a post-covid use rate per office. Watauga Extension was given a county total allocation of $12,500---which translates to just over $2,000 per agent. Over the last 3 years, we have had to request additional travel funds from the county to help cover agent travel. With state van fees now going up to over $600 per month, this will effectively cut each agent's travel by more than half and we will have to continue to request even more additional county funds. For these reasons, we want to relinquish the state van and request the purchase of a county vehicle. Owning a county vehicle outright will save us from having to continue to include (and raise) our county line item for travel each year.

Our agents use the state van (and their own personal vehicles) to meet the programming mission of Extension to serve our county residents. Each agent is active in their programming, respective professional associations and attends required trainings (often requiring out-of-county travel) to make sure we are providing optimal services and programming to our county farmers & other clientele. We also transport clientele to a number of programs and workshops throughout the year, using the state van. A new county-owned shared vehicle will pay for itself within 3-4 years. This is our first request for a county vehicle in my 19 year tenure with Watauga Extension.

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AGENDA ITEM 9:

MAINTENANCE MATTERS

A. Utility Vehicle Purchase Request

MANAGER'S COMMENTS:

The FY 2025–2026 budget included funds for the purchase of a Bobcat UW56 utility vehicle, along with a 72" snowplow and 66" brush attachment. This equipment will be used by Maintenance for snow removal at the Courthouse parking lots and parking deck during the winter months, and for general utility purposes the remainder of the year. Mr. Marsh, Maintenance Director, will request the Board award the bid to Bobcat of Charlotte, the lowest responsive bidder, in the amount of $77,230.50. Adequate funds are budgeted to cover the expense.

Board action is requested to approve the purchase of the Bobcat UW56 utility vehicle, snowplow, and brush attachment in the amount of $77,230.50.

WATAUGA COUNTY
MAINTENANCE DEPARTMENT

274 Winklers Creek Road, Suite B, Boone, NC 28607 - Phone (828) 264-1430
Fax (828) 264-1473

TO: Deron Geouque, County Manager

FROM: Robert Marsh, Maintenance Director

DATE: July 22, 2025

RE: Bid Award Request for Utility Vehicle (Revised)

BACKGROUND
The FY 25-26 budget contains money for the purchase of a Bobcat UW56 utility vehicle, 72" snowplow and a 66" brush attachment. This vehicle will be used for snow removal in the small parking lots around the Courthouse and the parking deck in the winter and a general-use utility vehicle in the other months.

Maintenance contacted several Bobcat vendors and also received pricing through the NC Sheriffs Association.

BID RESULTS

Bobcat of Charlotte	$77,230.50
Bobcat of Lenoir	$82,638.93
Logger Shop (Wilkesboro)	$87,788.50

BID RECOMMENDATION
Staff recommends the bid be awarded to Bobcat of Charlotte in the amount of $77,230.50

FISCAL IMPACT
$82,638.93 was approved in the FY 25-26 budget for this purchase.

Bobcat

Product Quotation
Quotation Number: **BM1305184**
Quote Sent Date: **Jul 16, 2025**
Expiration Date: **Aug 15, 2025**

Your Bobcat Contact
Brady Murdoff
Phone:
Email: brady.murdoff@doosan.com

Your Customer Contact

Deliver to
Watauga County Building Maintenance Dept
BOONE, NC, 28607

Bobcat Dealer
Bobcat of Charlotte, Charlotte, NC
4923 BROOKSHIRE BOULEVARD
CHARLOTTE, NC, 28216
JEFFREY GAINER

Bill to
Watauga County Building Maintenance Dept
BOONE, NC, 28607

Item Name	Item Number	Quantity	Price Each	Total
Bobcat UW56	M1225	1	56,406.00	56,406.00
Standard Equipment: Adjustable Vinyl Seats All-Wheel Steer Automatically Activated Glow Plugs Auxiliary Hydraulics Variable Flow with dual direction detent Beverage Holders Bob-Tach Boom Float Cargo Box Support Cruise Control Speed Management Enclosed Cab with HVAC Dual Port USB charger Lower Engine Guard Limited Slip Transaxle Engine and Hydraulic Monitor with Shutdown Front LED Work Lights Full-time Four-Wheel Drive Horsepower Management Roll Over Protective Structure (ROPS) . Meets Requirements of SAE-J1040 & ISO 3471 Falling Object Protective Structure (FOPS) . Meets Requirements of SAE-J1043 & ISO3449, Level I Dome Light Hydraulic Dump Box Instrumentation: Standard 5" Display with Keyless Start, Engine Temperature and Fuel Gauges, Hour meter, RPM and Warning Indicators. Includes maintenance interval notification, fault display, job codes, quick start, and security lockouts. Joystick, Manually Controlled with Lift Arm Float Lift Arm Support Parking Brake, automatic Power Steering with Tilt Steering Wheel Radiator Screen Rear Receiver Hitch Seat Belts, Shoulder Harness Spark Arrestor Muffler Suspension, 4-wheel independent Tires: 27 x 10.5-15 (8 ply), Lug Tread Toolcat Interlock Control System (TICS) Two-Speed Transmission Machine Warranty: 12 Months, unlimited hours Bobcat Engine Warranty: Additional 12 Months or total of 2000 hours after initial 12 month warranty				
Deluxe Road Package *Included:* Deluxe Road Package includes: Backup Alarm, Turn Signals, Flashers, Tail Lights, Brake Lights, Rear view mirror, Side Mirrors, Horn, Rear work lights, and headlights	M1225-P01-C01	1	2,275.00	2,275.00
Attachment Control	M1225-R08-C02	1	196.70	196.70
Engine Block Heater	M1225-A01-C02	1	112.00	112.00

Heavy Duty Battery	M1225-R07-C02	1	80.50	80.50
High Flow Package	M1225-R03-C02	1	1,519.00	1,519.00
Interior Trim	M1225-A01-C04	1	158.20	158.20
Power Bob-Tach	M1225-R14-C03	1	885.50	885.50
Radio Option	M1225-R15-C02	1	415.10	415.10
Rear View Camera	M1225-R20-C01	1	275.80	275.80
Traction Control	M1225-R16-C02	1	487.20	487.20
72" Snow Blade	6905156	1	2,824.01	2,824.01
66" Brushcat (HF)	7233014	1	8,043.48	8,043.48
	Total for Bobcat UW56			73,678.49
UW56 SERVICE MANUAL	7440683ENUS	1	160.00	160.00
	Total for UW56 SERVICE MANUAL			160.00

Quote Total - USD	73,838.49
Dealer P.D.I.	250.00
Tariff Surcharge	1,265.01
Freight Charges	1,400.00
Destination Charges	442.00
Dealer Assembly Charges	35.00
Quote Total - USD	**77,230.50**

Comment:

*Plus applicable taxes. IF Tax Exempt, please include Tax Exempt Certificate with the order.

*Prices per the Sourcewell Contract #020223-CEC

*Sourcewell Member Number (if applicable): _____

*All orders should include 1) Accounts Payable Contact and email address, 2) W9 with correct legal entity name, and 3) Bill to Address.

*Orders may be placed with the contract holder or authorized dealer as allowed by the terms and conditions of the contract. *A Copy of all orders must be provided to Heather.Messmer@Doosan.com.

*Contact Holder Information: Doosan Bobcat North America, Inc. Govt Sales, 250 E Beaton Drive. West Fargo, ND 58078. TID# 38-0425350.

*Payment Terms: Net 60 Days. Credit cards accepted.

*Remittance address: Doosan Bobcat North America, Inc. P. O. Box 74007382, Chicago, IL 60674-7382

Doosan Bobcat North America, Inc. products may be subject up to 26% import/export tariffs. Should this occur, Doosan Bobcat North America, Inc. will pass on the tariff charge on all models, which includes base model, machine options, and consumables/spare parts. The tariff charge percentage range is from 1% to 26% and will be removed should the tariffs be lifted. The exact tariff will be determined by Doosan Bobcat North America, Inc.at the time of order and will not apply to freight or destination charges, sales tax, pre-delivery inspection, setup charges, document fees, transfer costs, finance fees, freight forwarding costs, insurance costs, environmental disposal costs, fuel charges, training, service plans/contracts, warranty escrow, or extended warranty coverage. Doosan

Bobcat North America, Inc. reserves the right to apply a tariff charge greater than 26% if the government implementing the tariff imposes tariff rates that exceed 26%.

Customer acceptance:
Quotation Number:: **BM1305184** Purchase Order:_____

Authorized Signature:

Print:_____ Sign:_____

Date:_____ Email:_____

Addresses

Delivery Address_____

Billing Address (if different from ship to):_____

Tax Exempt: Y ☐ / N ☐

Exempt in the State of:_____

Tax Exempt ID:

Federal:_____

State:_____

Expiration Date:_____

Bobcat

Product Quotation
Quotation Number: **MF1072251**
Quote Sent Date: **May 22, 2025**
Expiration Date: **Jul 21, 2025**

Your Bobcat Contact
Marcella Foss
Phone:
Email: marcella.foss@doosan.com

Your Customer Contact

Deliver to
Watauga County Building Maintenance Dept
X
BOONE, NC, 28607

Bobcat Dealer
Bobcat of Lenoir, Lenoir, NC
555 WILKESBORO BLVD NE
LENOIR, NC, 28645

Bill to
Watauga County Building Maintenance Dept
X
BOONE, NC, 28607

Item Name	Item Number	Quantity	Price Each	Total
Bobcat UW56	M1225	1	65,064.72	65,064.72
Standard Equipment: Adjustable Vinyl Seats All-Wheel Steer Automatically Activated Glow Plugs Auxiliary Hydraulics Variable Flow with dual direction detent Beverage Holders Bob-Tach Boom Float Cargo Box Support Cruise Control Speed Management Enclosed Cab with HVAC Dual Port USB charger Lower Engine Guard Limited Slip Transaxle Engine and Hydraulic Monitor with Shutdown Front LED Work Lights Full-time Four-Wheel Drive Horsepower Management Roll Over Protective Structure (ROPS) . Meets Requirements of SAE-J1040 & ISO 3471 Falling Object Protective Structure (FOPS) . Meets Requirements of SAE-J1043 & ISO3449, Level I Dome Light Hydraulic Dump Box Instrumentation: Standard 5" Display with Keyless Start, Engine Temperature and Fuel Gauges, Hour meter, RPM and Warning Indicators. Includes maintenance interval notification, fault display, job codes, quick start, and security lockouts. Joystick, Manually Controlled with Lift Arm Float Lift Arm Support Parking Brake, automatic Power Steering with Tilt Steering Wheel Radiator Screen Rear Receiver Hitch Seat Belts, Shoulder Harness Spark Arrestor Muffler Suspension, 4-wheel independent Tires: 27 x 10.5-15 (8 ply), Lug Tread Toolcat Interlock Control System (TICS) Two-Speed Transmission Machine Warranty: 12 Months, unlimited hours Bobcat Engine Warranty: Additional 12 Months or total of 2000 hours after initial 12 month warranty				
Deluxe Road Package *Included:* Deluxe Road Package includes: Backup Alarm, Turn Signals, Flashers, Tail Lights, Brake Lights, Rear view mirror, Side Mirrors, Horn, Rear work lights, and headlights	M1225-P01-C01	1	2,482.20	2,482.20
Attachment Control	M1225-R08-C02	1	214.20	214.20

Engine Block Heater	M1225-A01-C02	1	121.80	121.80
Heavy Duty Battery	M1225-R07-C02	1	84.00	84.00
High Flow Package	M1225-R03-C02	1	1,458.24	1,458.24
Interior Trim	M1225-A01-C04	1	180.60	180.60
Power Bob-Tach	M1225-R14-C03	1	966.00	966.00
Radio Option	M1225-R15-C02	1	474.60	474.60
Rear View Camera	M1225-R20-C01	1	315.00	315.00
Traction Control	M1225-R16-C02	1	508.20	508.20
72" Snow Blade	6905156	1	2,676.09	2,676.09
66" Brushcat (HF)	7233014	1	8,093.28	8,093.28
	Total for Bobcat UW56			82,638.93
Parts & Service Manuals	5000000	1	0.00	0.00
	Total for Parts & Service Manuals			0.00

Quote Total - USD	82,638.93
Dealer P.D.I.	0.00
Tariff Surcharge	0.00
Freight Charges	0.00
Dealer Assembly Charges	0.00
Quote Total - USD	**82,638.93**

Comment:

*Prices per the North Carolina Contract #2210A (Construction Equipment).

*Plus applicable taxes. IF Tax Exempt, please include Tax Exempt Certificate with the order.

*Member Number (if applicable): _____

*All orders should include 1) Accounts Payable Contact and email address, 2) W9 with correct legal entity name, and 3) Bill to Address.

*Orders may be placed with the contract holder or authorized dealer as allowed by the terms and conditions of the contract. *A Copy of all orders must be provided to Heather.Messmer@Doosan.com.

*Contact Holder Information: Clark Equipment Company dba Bobcat Company, Govt Sales, 250 E Beaton Drive, West Fargo, ND 58078. TID# 38-0425350.

*Payment Terms: Net 60 Days. Credit cards accepted.

*Remittance address: Clark Equipment Company d/b/a Bobcat Company, P. O. Box 74007382, Chicago, IL 60674-7382

*Questions can be submitted via email to barry.hanson@doosan.com or by phone at: 1-800-965-4232.

Customer acceptance:
Quotation Number:: **MF1072251** Purchase Order:_____

Authorized Signature:

Print:_____ Sign:_____

Date:_____ Email:_____

Addresses

Delivery Address_____

Billing Address (if different from ship to):_____

Tax Exempt: Y ☐ / N ☐

Exempt in the State of:_____

Tax Exempt ID:

Federal:_____

State:_____

Expiration Date:_____

Bobcat

Quotation Number: **BB1316539**
Quote Sent Date: **Jul 23, 2025**
Expiration Date: **Aug 22, 2025**
Prepared By: **Brett Bigham**
Phone: +17047799316
Email: bbigham@loggershop.com

Customer
Watauga County Maintenance Dept.
969 W. King St.
Boone, NC, 28607
Phone: 828-264-1430

Contact
Robert Marsh
Phone: 828-264-1430
Email: robert.marsh@watgov.org

Dealer
Logger Shop Construction & Equipment, Inc., Wilkesboro, NC
5230 US-421
WILKESBORO, NC, 28697

Item Name	Item Number	Quantity	Price Each	Total
Bobcat UW56	M1225	1	65,050.00	65,050.00
Standard Equipment: Adjustable Vinyl Seats All-Wheel Steer Automatically Activated Glow Plugs Auxiliary Hydraulics Variable Flow with dual direction detent Beverage Holders Bob-Tach Boom Float Cargo Box Support Cruise Control Speed Management Enclosed Cab with HVAC Dual Port USB charger Lower Engine Guard Limited Slip Transaxle Engine and Hydraulic Monitor with Shutdown Front LED Work Lights Full-time Four-Wheel Drive Horsepower Management Roll Over Protective Structure (ROPS) . Meets Requirements of SAE-J1040 & ISO 3471 Falling Object Protective Structure (FOPS) . Meets Requirements of SAE-J1043 & ISO3449, Level I Dome Light Hydraulic Dump Box Instrumentation: Standard 5" Display with Keyless Start, Engine Temperature and Fuel Gauges, Hour meter, RPM and Warning Indicators. Includes maintenance interval notification, fault display, job codes, quick start, and security lockouts. Joystick, Manually Controlled with Lift Arm Float Lift Arm Support Parking Brake, automatic Power Steering with Tilt Steering Wheel Radiator Screen Rear Receiver Hitch Seat Belts, Shoulder Harness Spark Arrestor Muffler Suspension, 4-wheel independent Tires: 27 x 10.5-15 (8 ply), Lug Tread Toolcat Interlock Control System (TICS) Two-Speed Transmission Machine Warranty: 12 Months, unlimited hours Bobcat Engine Warranty: Additional 12 Months or total of 2000 hours after initial 12 month warranty				
Deluxe Road Package *Included:* Deluxe Road Package includes: Backup Alarm, Turn Signals, Flashers, Tail Lights, Brake Lights, Rear view mirror, Side Mirrors, Horn, Rear work lights, and headlights	M1225-P01-C01	1	3,250.00	3,250.00
Attachment Control	M1225-R08-C02	1	281.00	281.00
Engine Block Heater	M1225-A01-C02	1	160.00	160.00
Heavy Duty Battery	M1225-R07-C02	1	115.00	115.00
High Flow Package	M1225-R03-C02	1	2,170.00	2,170.00
Interior Trim	M1225-A01-C04	1	226.00	226.00

Power Bob-Tach	M1225-R14-C03	1	1,265.00	1,265.00
Radio Option	M1225-R15-C02	1	593.00	593.00
Rear View Camera	M1225-R20-C01	1	394.00	394.00
Traction Control	M1225-R16-C02	1	696.00	696.00
66" Brushcat (HF)	7233014	1	10,584.00	10,584.00
72" Snow Blade	6905156	1	3,716.00	3,716.00
Government Rebate: US Jul-Aug 2025 (Expires: Aug 31, 2025)		1	3,700.00	- 3,700.00
	Total for Bobcat UW56			84,800.00

Quote Total - USD	84,800.00
Dealer P.D.I.	250.00
Tariff Surcharge	859.00
Freight Charges	1,400.00
Destination Charges	442.00
Dealer Assembly Charges	37.50
Sales total before Taxes	87,788.50
Taxes	0.00
Quote Total - USD	**87,788.50**

Customer acceptance:
Quotation Number:: **BB1316539** Purchase Order:_____

Authorized Signature: _____

Print:_____ Sign:_____

Date:_____ Email:_____ Tax Exempt: Y ☐ / N ☐

Bobcat

Product Quotation
Quotation Number: **BM1305184**
Quote Sent Date: **Jul 16, 2025**
Expiration Date: **Aug 15, 2025**

Your Bobcat Contact
Brady Murdoff
Phone:
Email: brady.murdoff@doosan.com

Your Customer Contact

Deliver to
Watauga County Building Maintenance Dept
BOONE, NC, 28607

Bobcat Dealer
Bobcat of Charlotte, Charlotte, NC
4923 BROOKSHIRE BOULEVARD
CHARLOTTE, NC, 28216
JEFFREY GAINER

Bill to
Watauga County Building Maintenance Dept
BOONE, NC, 28607

Item Name	Item Number	Quantity	Price Each	Total
Bobcat UW56	M1225	1	56,406.00	56,406.00
Standard Equipment: Adjustable Vinyl Seats All-Wheel Steer Automatically Activated Glow Plugs Auxiliary Hydraulics Variable Flow with dual direction detent Beverage Holders Bob-Tach Boom Float Cargo Box Support Cruise Control Speed Management Enclosed Cab with HVAC Dual Port USB charger Lower Engine Guard Limited Slip Transaxle Engine and Hydraulic Monitor with Shutdown Front LED Work Lights Full-time Four-Wheel Drive				
Horsepower Management Roll Over Protective Structure (ROPS) . Meets Requirements of SAE-J1040 & ISO 3471 Falling Object Protective Structure (FOPS) . Meets Requirements of SAE-J1043 & ISO3449, Level I Dome Light Hydraulic Dump Box Instrumentation: Standard 5" Display with Keyless Start, Engine Temperature and Fuel Gauges, Hour meter, RPM and Warning Indicators. Includes maintenance interval notification, fault display, job codes, quick start, and security lockouts. Joystick, Manually Controlled with Lift Arm Float Lift Arm Support Parking Brake, automatic Power Steering with Tilt Steering Wheel Radiator Screen Rear Receiver Hitch Seat Belts, Shoulder Harness Spark Arrestor Muffler Suspension, 4-wheel independent Tires: 27 x 10.5-15 (8 ply), Lug Tread Toolcat Interlock Control System (TICS) Two-Speed Transmission Machine Warranty: 12 Months, unlimited hours Bobcat Engine Warranty: Additional 12 Months or total of 2000 hours after initial 12 month warranty				
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Attachment Control	M1225-R08-C02	1	196.70	196.70
Engine Block Heater	M1225-A01-C02	1	112.00	112.00

Heavy Duty Battery	M1225-R07-C02	1	80.50	80.50
High Flow Package	M1225-R03-C02	1	1,519.00	1,519.00
Interior Trim	M1225-A01-C04	1	158.20	158.20
Power Bob-Tach	M1225-R14-C03	1	885.50	885.50
Radio Option	M1225-R15-C02	1	415.10	415.10
Rear View Camera	M1225-R20-C01	1	275.80	275.80
Traction Control	M1225-R16-C02	1	487.20	487.20
72" Snow Blade	6905156	1	2,824.01	2,824.01
66" Brushcat (HF)	7233014	1	8,043.48	8,043.48
	Total for Bobcat UW56			73,678.49
UW56 SERVICE MANUAL	7440683ENUS	1	160.00	160.00
	Total for UW56 SERVICE MANUAL			160.00

Quote Total - USD	73,838.49
Dealer P.D.I.	250.00
Tariff Surcharge	1,265.01
Freight Charges	1,400.00
Destination Charges	442.00
Dealer Assembly Charges	35.00
Quote Total - USD	**77,230.50**

Comment:

*Plus applicable taxes. IF Tax Exempt, please include Tax Exempt Certificate with the order.

*Prices per the Sourcewell Contract #020223-CEC

*Sourcewell Member Number (if applicable): _____

*All orders should include 1) Accounts Payable Contact and email address, 2) W9 with correct legal entity name, and 3) Bill to Address.

*Orders may be placed with the contract holder or authorized dealer as allowed by the terms and conditions of the contract. *A Copy of all orders must be provided to Heather.Messmer@Doosan.com.

*Contact Holder Information: Doosan Bobcat North America, Inc. Govt Sales, 250 E Beaton Drive, West Fargo, ND 58078. TID# 38-0425350.

*Payment Terms: Net 60 Days. Credit cards accepted.

*Remittance address: Doosan Bobcat North America, Inc. P. O. Box 74007382, Chicago, IL 60674-7382

Doosan Bobcat North America, Inc. products may be subject up to 26% import/export tariffs. Should this occur, Doosan Bobcat North America, Inc. will pass on the tariff charge on all models, which includes base model, machine options, and consumables/spare parts. The tariff charge percentage range is from 1% to 26% and will be removed should the tariffs be lifted. The exact tariff will be determined by Doosan Bobcat North America, Inc.at the time of order and will not apply to freight or destination charges, sales tax, pre-delivery inspection, setup charges, document fees, transfer costs, finance fees, freight forwarding costs, insurance costs, environmental disposal costs, fuel charges, training, service plans/contracts, warranty escrow, or extended warranty coverage. Doosan

Bobcat North America, Inc. reserves the right to apply a tariff charge greater than 26% if the government implementing the tariff imposes tariff rates that exceed 26%.

Customer acceptance:
Quotation Number:: **BM1305184** Purchase Order:_____

Authorized Signature:

Print:_____ Sign:_____

Date:_____ Email:_____

Addresses

Delivery Address_____

Billing Address (if different from ship to):_____

Tax Exempt: Y ☐ / N ☐

Exempt in the State of:_____

Tax Exempt ID:

Federal:_____

State:_____

Expiration Date:_____

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AGENDA ITEM 9:

MAINTENANCE MATTERS

B. Contract Renewal for Recreation Center HVAC Monitoring

MANAGER'S COMMENTS:

The County's contract with Johnson Controls for HVAC monitoring and control at the Recreation Center expired on July 31, 2025. Because the system in place is proprietary, the service cannot be competitively bid. Johnson Controls has submitted a proposal for a three-year renewal at a total cost of $57,200, which reflects a $4,200 decrease from the previous contract. Staff recommends renewing the contract at the proposed amount.

Board action is requested to approve a three-year contract with Johnson Controls in the amount of $57,200.

WATAUGA COUNTY
MAINTENANCE DEPARTMENT

274 Winklers Creek Road, Suite B, Boone, NC 28607 - Phone (828) 264-1430
Fax (828) 264-1473

TO: Deron Geouque, County Manager

FROM: Robert Marsh, Maintenance Director

DATE: July 29, 2025

RE: Recreation Center HVAC Controls

BACKGROUND
The County's contract with Johnson Controls (JCI) for monitoring and control of the HVAC equipment at the Recreation Center expires July 31, 2025. The JCI system is proprietary, and there is no opportunity to competitively bid it with other control contractors. The cost of the new proposal for a three-year contract is a total of $57,200. This is a decrease of $4,200 over the next three years.

RECOMMENDATION
Staff recommends the contract be renewed at the new contract amount of $57,200.

Johnson Controls planned service proposal
Prepared for WATAUGA CO PARKS & RECREATION

Customer
WATAUGA CO PARKS & RECREATION

Local Johnson Controls Office
2898 BOONES CREEK RD
JOHNSON CITY, TN 37615-4975

Agreement Start Date:
08/01/2025

Proposal Date
07/29/2025

Estimate No:
1-1Q3H9V9U

Partnering with you to deliver value-driven solutions

Every day, we transform the environments where people live, work, learn and play. From optimizing building performance to improving safety and enhancing comfort, we are here to power your mission.

A Planned Service Agreement with Johnson Controls provides you with a customized service strategy designed around the needs of your facility. Our approach features a combination of scheduled, predictive and preventative maintenance services that focus on your goals.

As your building technology services partner, Johnson Controls delivers an unmatched service experience delivered by factory-trained, highly skilled technicians who optimize operations of the buildings we work with, creating productive and safe environments for the people within.

By integrating our service expertise with innovative processes and technologies, our value-driven planned service solutions deliver sustainable results, minimize equipment downtime and maximize occupant comfort.

With more than a century of healthy buildings expertise, Johnson Controls leverages technologies to successfully deliver smart solutions to facilities worldwide.

FROST & SULLIVAN

2020 Award | North American Company of the Year for Innovation in Smart Connected Chillers

Johnson Controls was recognized by Frost & Sullivan as the 2020 North American Company of the Year for innovation in the Smart connected Chillers market

Executive summary

Planned service proposal for WATAUGA CO PARKS & RECREATION

Dear Sir:

We value and appreciate your interest in Johnson Controls as a service provider for your building systems and are pleased to provide a value-driven maintenance solution for your facility. The enclosed proposal outlines the Planned Service Agreement we have developed on your facility.

Details are included in the Planned Service Agreement summary (Schedule A), but highlights are as follows:

- In this proposal we are offering a service agreement for 3 Years starting 08/01/2025 and ending 07/31/2028.
- The agreement price for first year is $17,619.00; see Schedule A, Supplemental Price and Payment Terms, for pricing in subsequent years.
- The equipment options and number of visits being provided for each piece of equipment are described in Schedule A, Equipment list.

As a manufacturer of both mechanical and controls systems, Johnson Controls has the expertise and resources to provide proper maintenance and repair services for your facility.

Again, thank you for your interest in Johnson Controls and we look forward to becoming your building technology services partner.

Please contact me if you have any questions.

Sincerely,

Nathan Sisk
Service Manager
(866) 854-4712

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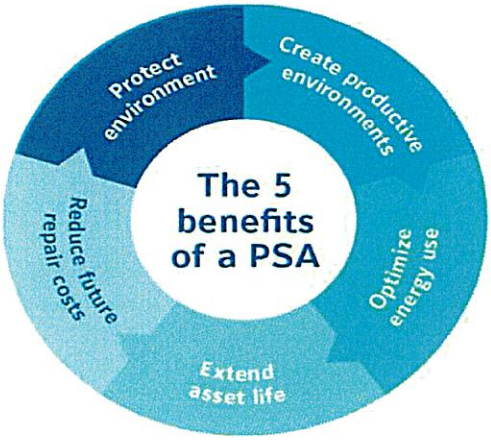
Benefits of planned service

A Planned Service Agreement with Johnson Controls will allow you to optimize your building's facility performance, providing dependability, sustainability and energy efficiency. You'll get a value-driven solution that fits your specific goals, delivered with the attention of a local service company backed by the resources of a global organization.



With this Planned Service Agreement, Johnson Controls can help you achieve the following five objectives:

1. **Identify energy savings Opportunities**
   Since HVAC equipment accounts for a major portion of a building's energy usage, keeping your system performing at optimum levels may lead to a significant reduction in energy costs.
2. **Reduce future repair costs**
   Routine maintenance may maximize the life of your equipment and may reduce equipment breakdowns.
3. **Extend asset life**
   Through proactive, factory-recommended maintenance, the life of your HVAC assets may be extended, maximizing the return on your investment.
4. **Ensure productive environments**
   Whether creating a comfortable place where employees can be productive or controlling a space to meet specialized needs, maintenance can help you achieve an optimal environment for the work that is being accomplished
5. **Promote environmental health and safety**
   When proper indoor conditions and plant requirements are maintained, business outcomes may be improved by minimizing sick leave, reducing accidents, minimizing greenhouse gas emissions and managing refrigerant requirements.

All of the services we perform on your equipment are aligned with "The 5 Values of Planned Maintenance" and our technicians understand how the work they perform can help you accomplish your business objectives.

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Our partnership

Personalized account management

A Planned Service Agreement also provides you with the support of an entire team that knows your site and can closely work with you on budget planning and asset management. Your local Johnson Controls account management team can help guide planned replacement, energy retrofits and other building improvement projects. You'll have peace of mind that an entire team of skilled professionals will be looking out for what is best for your facility and budget.

A culture of safety

Johnson Controls technicians take safety seriously and personally, and integrate it into everything they do. All of our technicians participate in regular and thorough safety training. Because of their personal commitment, we are a leader in the HVAC service industry for workplace safety performance. This means that you do not have to worry about us when we are on your site.

Commitment to customer satisfaction

Throughout the term of your Planned Service Agreement, we will periodically survey you and use your feedback to continue to make improvements to our service processes and products. Our goal is to deliver the most consistent and complete service experience possible. To meet this goal, we've developed and implemented standards and procedures to ensure you receive the ultimate service experience – every time.

Energy & sustainability

A more sustainable world one building at a time – Johnson Controls is a company that started more than 125 years ago with a product that reduced energy use in buildings. We've been saving energy for customers ever since. Today, Johnson Controls is a global leader in creating smart environments where people live, work and play, helping to create a more comfortable, safe and sustainable world.

The value of integrity

Johnson Controls has a long, proud history of integrity. We do what we say we will do and stand behind our commitments. Our good reputation builds trust and loyalty. In recognition for our commitment to ethics across our global operations, we are honored to be named one of the World's Most Ethical Companies by Ethisphere Institute, a leading think tank dedicated to business ethics and corporate social responsibility. In addition, Corporate Responsibility Magazine recognizes Johnson Controls as one of the top companies in its annual "100 Best Corporate Citizens" list.

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Service delivery

As part of the delivery of this Planned Service Agreement, Johnson Controls will dedicate a local customer service agent responsible for having a clear understanding of the agreement scope, and your facility procedures and protocols.

A high-level overview around our service delivery process is outlined below including scheduling, emergency service, on-site paperwork, communication and performing repairs outside of the agreement scope.

Scheduling

Preventative maintenance service will be scheduled using our automated service management system. In advance of the scheduled service visit, our technician is sent a notice of service to a smartphone. Once the technician acknowledges the request, your customer service agent will call or e-mail your on-site contact to let you know the start date and type of service scheduled.

The technician checks in, wears personal protective equipment, performs the task(s) as assigned, checks out with you and asks for a screen capture signature on the smartphone device. A work order is then e-mailed, faxed or printed for your records.

Emergency services

Emergency service can be provided 7 days a week, 24 hours a day, 365 days a year. During normal business hours, emergency service will be coordinated by the customer service agent. After hours, weekends and holidays, the emergency service number transfers to the Johnson Controls after-hours call center and on-call technicians are dispatched as needed.

Johnson Controls is committed to dispatching a technician within hours of receiving your call through the service line. A work order is e-mailed, faxed or printed for your records. Depending on the terms of your agreement, you may incur charges for after hour services.

Communication

A detailed communication plan will be provided to you so you know how often we will provide information to you regarding your Planned Service Agreement. The communication plan will also provide you with your main contacts at Johnson Controls.

Approval process for non-covered items

Johnson Controls will adhere to your procurement process. No work will be performed outside of the agreement scope without prior approval. Johnson Controls will work with you closely to ensure your procurement process is followed before any non-covered item work is started.

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Summary of services and options

Comprehensive and operational inspections

During comprehensive and operational inspections, Johnson Controls will perform routine checks of the equipment for common issues caused by normal wear and tear on the equipment. Additional tests can be run to confirm the equipment's performance.

Routine maintenance, such as lubrication, cleaning and tightening connections, can be performed depending on the type of equipment being serviced. Routine maintenance is one of the keys to the five values of maintenance – it can help identify energy saving opportunities, reduce future repair costs, extend asset life, ensure productive environments, and promote health and safety.

Install Updates supplied with Software Subscription

Our expert technicians will install software upgrades (supplied separately) to keep your system up-to-date. This helps minimize disruptions to your daily operations and staff during the upgrade process. Keeping your software up-to-date allows you to take advantage of the latest features and enhancements, and helps maintain compatibility with the latest technology on the market. Updating the system software is also a best practice to minimize cybersecurity vulnerabilities.

Metasys Software Subscription

We will provide the most recent software release allowed by the hardware and operating systems of your existing computers and servers for the number of years specified. Labor to install the updates is available as an additional option. Keeping your software up-to-date allows you to take advantage of the latest features and enhancements, and helps maintain compatibility with the latest technology on the market. Updating the system software is also a best practice to minimize cybersecurity vulnerabilities.

Operational Visit/Controls System Verification

Based on our expertise and factory recommendations, we will execute routine preventative maintenance and calibrations on the equipment controller for your mechanical equipment. The inspection includes the following tasks:

- Visual inspection of the control panel.
- Review of alarms, points which are offline, out of service and overridden points.
- Local backup of controller program.

Advantages: Provides proactive identification of problems, which helps maintain productive environments, identify energy efficiency opportunities, reduce future repairs and extend the life of your equipment.

Customer Portal / Service Information Access

The Johnson Controls customer portal is the online gateway to easily access various elements of your service information. This real-time, self-service mechanism is just one more way for you to stay in touch with our service within your facilities. Using the internet, you can view service call history by location, monitor agreements, as well as view asset and invoice information.

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Summary

Thank you for considering Johnson Controls as your building technology services partner. The following agreement document includes all the details surrounding your Planned Service Agreement.

With planned service from Johnson Controls, you'll get a value-driven solution that can help optimize your building controls and equipment performance, providing dependability, sustainability and energy efficiency. You'll get a solution that fits your specific goals, delivered with the attention of a local service company backed by the resources of a global organization.

The power behind **your mission**

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Planned Service Agreement

Customer Name :	WATAUGA CO PARKS & RECREATION
Address:	231 COMPLEX DR BOONE,NC 28607
Proposal Date:	07/29/2025
Estimate #:	1-1Q3H9V9U

Scope of Service

Johnson Controls, Inc. ("JCI") and the Customer (collectively the "Parties") agree Preventative Maintenance Services, as defined in Schedule A ("Services"), will be provided by JCI at the Customer's facility. This Planned Service Agreement, the Equipment List, Supplemental Price and Payment Terms, Terms and Conditions, and Schedules attached hereto and incorporated by this reference as if set forth fully herein (collectively the "Agreement"), cover the rights and obligations of both the Customer and JCI.

Extended Service Options for Premium Coverage

If Premium Coverage is selected, on-site repair services to the equipment will be provided as specified in this Agreement for the equipment listed in the attached Equipment List.

Basic Coverage means Scheduled Service Visits, plus Scheduled Service Materials (unless excluded from this Agreement). No parts, equipment, Repair Labor or Repair Materials are provided for under Basic Coverage.

Premium Coverage means Basic Coverage plus Repair Labor, plus Repair Materials (unless excluded from the Agreement). If Customer has ordered Premium Coverage, JCI will inspect the Covered Equipment within forty-five (45) days of the date of this Agreement, or as seasonal or operational conditions permit. JCI will then advise Customer if JCI finds any Covered Equipment not in working order or in need of repair. With Customer's approval, JCI will perform the work necessary to put the Covered Equipment in proper working condition, subject to the terms of this Agreement. Customer will pay for such work at JCI's standard rates for parts and labor in effect at the time that the work is performed. If Customer does not want JCI to perform the work identified as necessary by JCI, any equipment thereby affected will be removed from the list of Covered Equipment, and the Contract Price will be adjusted accordingly. Should Customer not make JCI's recommended repairs or proceed with the modified Premium Coverage, JCI reserves the right to invoice Customer for the cost of the initial equipment inspection.

Extended Service means Services performed outside JCI's normal business hours and is available only if Customer has Premium Coverage. Extended Service is available either 24/5 or 24/7, at Customer's election. The price for Extended Service, if chosen by Customer, is part of the total Contract Price.

Equipment List

Only the equipment listed in the Equipment List will be covered as part of this Agreement. Any changes to the Equipment List must be agreed upon in writing by both Parties.

Term / Automatic Renewal

This Agreement takes effect on 08/01/2025 and will continue until 07/31/2028 ("Original Term"). The Agreement will automatically renew and extend for successive terms equal to the Original Term unless the Customer or JCI gives the other written notice it does not want to renew prior to the end of the then-current term (each a "Renewal Term"). The notice must be delivered at least (90) days prior to the

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end of the Original Term or of any Renewal Term. The Original Term and any Renewal Term may be referred to herein as the "Term". Renewal price adjustments are discussed in the Terms and Conditions.

Refrigerant Charges

Refrigerant is not included under this Agreement and will be billed separately to the Customer by JCI.

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Price and Payment Terms

The total Contract Price for JCI's Services during the first year of the Original Term is $17,619.00. This amount will be paid to JCI in advance in Annual installments. Pricing for each subsequent year of a multiyear Original Term is set forth in the Supplemental Price and Payment Terms. Unless otherwise agreed to by the parties, All payments will be due upon receipt. Renewal price adjustments are set forth in the Terms and Conditions. Any additional taxes, duties, tariffs or similar items imposed prior to shipment will be charged.

Invoices will be sent to the following location:

WATAUGA COUNTY NORTH CAROLINA
274 WINKLERS CREEK RD
STE B
BOONE,NC 28607

To ensure that JCI is compliant with your company's billing requirements, please provide the following information:

PO is required to facilitate billing:

[] No: This signed contract satisfies requirement

[] YES: Please reference this PO number :

AR Invoices are accepted via e-mail:

[] YES: E-mail address to be used :

[] No: Please submit invoices via mail

[] No: Please submit via :

This proposal is valid for thirty days from the proposal date.

JOHNSON CONTROLS Inc.

JCI Manager:	**Customer Manager:**
JCI Manager Signature:	**Customer Manager Signature:**
Title:	**Date:**
Title:	**Date:**

JCI Branch: JOHNSON CONTROLS TRI-CITIES TN CB - 0N0B
Address: 2898 BOONES CREEK RD
JOHNSON CITY,TN 37615-4975
Branch Phone: (866) 854-4712
Branch Email:

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Schedule A - Equipment List

WATAUGA CO PARKS & REC (BOONE)	**231 COMPLEX DR BOONE, NC 28607**

Product: Controls (Controller/End Devices), Air Handling Unit (AHU), Johnson Controls, 0-20 points

Quantity: 3
Coverage Level: Premium

Services Provided

3	Operational
1	Comprehensive

Customer Tag	Manufacturer	Model #	Serial #
AHU CONTROLS (3)			

Product: Controls (Controller/End Devices), Central Heating Plant, Johnson Controls, 0-50 points

Quantity: 1
Coverage Level: Premium

Services Provided

3	Operational
1	Comprehensive

Customer Tag	Manufacturer	Model #	Serial #
CHP CONTROLS (1)			

Product: Controls (Controller/End Devices), Central Heating Plant, Johnson Controls, 0-50 points

Quantity: 2
Coverage Level: Premium

Services Provided

3	Operational
1	Comprehensive

Customer Tag	Manufacturer	Model #	Serial #
CHP CONTROLS (2)			

Product: ROC Monitoring Services - HVAC & BAS

Quantity: 1
Coverage Level: Premium

Services Provided

25	ROC - Level I Operations Setup (# of Points)
1	ROC - Level I Operations (# of Points)

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Customer Tag	Manufacturer	Model #	Serial #
ROC Monitoring			

Product: Controls (Controller/End Devices), Roof Top Unit (RTU), Johnson Controls, 0-20 points

Quantity: 2
Coverage Level: Premium

Services Provided

3	Operational
1	Comprehensive

Customer Tag	Manufacturer	Model #	Serial #
RTU CONTROLS (2)			

Product: Controls Software, Supervisory/Server/UI, Johnson Controls, NxE & LCS

Quantity: 1
Coverage Level: Premium

Services Provided

1	NxE Software Subscription 1-year - Subscription Only (for all NxE's on an NxE Site Dir)
1	Install NxE software (supplied with Software Upgrade/Subscription) - 1 to 5 NxE's

Customer Tag	Manufacturer	Model #	Serial #
SOFTWARE UPGRADE			

Product: Controls (Controller/End Devices), Variable Air Volume (VAV), Johnson Controls, 0-25 points

Quantity: 18
Coverage Level: Premium

Services Provided

3	Operational

Customer Tag	Manufacturer	Model #	Serial #
VAV CONTROLS (18)			

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Equipment tasking

	Controls (Controller/End Devices), Air Handling Unit (AHU), Johnson Controls, 0-20 points
Comprehensive	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Create local back up of existing program and store on on-site computer and on-site media Verify unit is controlling to set points by checking sequences of operations and PID loops Check that the damper actuators, valve actuators, variable speed drives, and protections (as applicable) are responding appropriately to control signals. Notify customer of any issues with those devices Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and negative impacts Identify and notify customer of all current alarms and negative impacts Verify sensor readings and field calibrate critical sensors used in control loops and alarming functions (as sensor type and controller options allow) Visually validate system outputs from the field controller Validate controls safety circuit and alarm verification (coordinate with customer) Tighten electrical connections Check overall condition of panel and perform visual inspection of unit and surrounding area Document tasks performed during visit and report any observations to appropriate customer representative
Operational	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Verify unit is controlling to set points by checking sequences of operations and PID loops Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and negative impacts Identify and notify customer of all current alarms and negative impacts Check overall condition of panel and perform visual inspection of unit and surrounding area Document tasks performed during visit and report any observations to appropriate customer representative

	Controls (Controller/End Devices), Central Heating Plant, Johnson Controls, 0-50 points
Comprehensive	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Create local back up of existing program and store on on-site computer and on-site media Verify unit is controlling to set points by checking sequences of operations and PID loops Check that the damper actuators, valve actuators, variable speed drives, and protections (as applicable) are responding appropriately to control signals. Notify customer of any issues with those devices Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and

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	negative impacts Identify and notify customer of all current alarms and negative impacts Verify sensor readings and field calibrate critical sensors used in control loops and alarming functions (as sensor type and controller options allow) Visually validate system outputs from the field controller Tighten electrical connections Check overall condition of panel and perform visual inspection of unit and surrounding area Document tasks performed during visit and report any observations to appropriate customer representative
Operational	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Verify unit is controlling to set points by checking sequences of operations and PID loops Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and negative impacts Identify and notify customer of all current alarms and negative impacts Check overall condition of panel and perform visual inspection of unit and surrounding area Document tasks performed during visit and report any observations to appropriate customer representative

Controls (Controller/End Devices), Roof Top Unit (RTU), Johnson Controls, 0-20 points

Comprehensive	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Create local back up of existing program and store on on-site computer and on-site media Verify unit is controlling to set points by checking sequences of operations and PID loops Check that the damper actuators, valve actuators, variable speed drives, and protections (as applicable) are responding appropriately to control signals. Notify customer of any issues with those devices Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and negative impacts Identify and notify customer of all current alarms and negative impacts Verify sensor readings and field calibrate critical sensors used in control loops and alarming functions (as sensor type and controller options allow) Visually validate system outputs from the field controller Validate controls safety circuit and alarm verification (coordinate with customer) Tighten electrical connections Check overall condition of panel and perform visual inspection of unit and surrounding area Document tasks performed during visit and report any observations to appropriate customer representative
Operational	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Verify unit is controlling to set points by checking sequences of operations and PID loops Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and negative impacts

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	Identify and notify customer of all current alarms and negative impacts Check overall condition of panel and perform visual inspection of unit and surrounding area Document tasks performed during visit and report any observations to appropriate customer representative
	Controls (Controller/End Devices), Variable Air Volume (VAV), Johnson Controls, 0-25 points
Operational	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Run VAV box flow test Verify unit is controlling to set points by checking sequences of operations and PID loops Identify and notify customer of abnormal point communications Identify and notify customer of current overrides (e.g. out of service) and negative impacts Identify and notify customer of all current alarms and negative impacts Document tasks performed during visit and report any observations to appropriate customer representative
	Controls Software, Supervisory/Server/UI, Johnson Controls, NxE & LCS
Install NxE software (supplied with Software Upgrade/Subscription) - 1 to 5 NxE's	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Upgrade NxE software to latest Metasys release Document tasks performed during visit and report any observations to appropriate customer representative
NxE Software Subscription 1-year - Subscription Only (for all NxE's on an NxE Site Dir)	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Upgrade NxE software to latest Metasys release Document tasks performed during visit and report any observations to appropriate customer representative
	ROC Monitoring Services - HVAC & BAS
ROC - Level I Operations (# of Points)	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Document tasks performed during visit and report any observations to appropriate customer representative
ROC - Level I Operations Setup (# of Points)	All work must be performed in accordance with Johnson Controls safety policies Check with appropriate customer representative for operational deficiencies Document tasks performed during visit and report any observations to appropriate customer representative

Supplemental Price & Payment Terms (Applies to Multi-Year Contracts Only)

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Year	Total Annual Dollar Amount	Payment Frequency
Year1	$17,619.00	Annually
Year2	$19,029.00	Annually
Year3	$20,552.00	Annually

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Special Additions and Exceptions

This agreement includes the following discounts on work outside the scope of the contract. Discounts apply to current pricing and rates and are subject to negotiations.

- Maximum (1) DEU fee per invoice, if applicable.
- Maximum (1) Fuel Surcharge per invoice, if applicable.
- No PPE fees of any kind when invoicing.

**Note: Premium Coverage is during business only (M - F from 8 am - 5 pm) After hours calls are billable/overtime is not covered.

Premium service coverage means that repair or replacement of controls (Metasys) equipment is covered under the agreement. Things considered "acts of God" such as lightening, natural disaster, etc. are not covered. Obsolescence of equipment is not covered under this agreement.

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Johnson Controls Standard Service Terms: One PSA

Terms

These terms cover the services and equipment provided by Johnson Controls. This Agreement includes the proposal, these terms and any referenced links. Conflicts are resolved in that order.

Scope of Work

We will provide the services or equipment described in the proposal. If the services include planned maintenance of equipment, only the equipment set forth in our proposal is covered by our services ("**Covered Equipment**"). Unless otherwise agreed in the proposal, services are performed during our normal working hours, excluding holidays. We reserve the right to modify or substitute materials.

Payment Terms

Services fees are paid annually in advance due 30 days from the invoice date via EFT/ACH, unless stated otherwise. Payment is required before services are performed or equipment is ordered or installed. Failure to pay on time is a breach that permits us to suspend or delay services until full payment is received, without liability, or to terminate this Agreement. Interest may also be charged on unpaid amounts at the lesser of 1.5% per month (19.56% annually) or the highest rate permitted by law. If you require a purchase order to process payments, you must send it to us at least 30 days before the end of a term but you must pay invoices even without a purchase order. No purchase order is required for any emergency services you request.

Prices

Prices do not cover taxes, fees, duties, tariffs, permits and levies or other charges imposed and/or enacted by a government. You are responsible for these items unless you provide an acceptable exemption certificate. If we need to pay any of these items or the exemption certificate is invalid or only covers some of these items, you must reimburse us on demand for the amounts owing. Prices may be adjusted at any time to reflect changes in costs, labor or market conditions. We will try to notify you of any changes in pricing in advance. Additional charges will be required for: (i) changes to these services or the Covered Equipment; (ii) additional services or equipment; (iii) unexpected site conditions or issues with the Covered Equipment; (iv) appointments that are cancelled less than 24 hours beforehand or for service, warranty or alarm calls caused by your error; (v) changes required to comply with laws, codes and regulations ("**Laws**"), including prevailing wage laws; and (vi) costs to notify and dispatch emergency personnel. We may change prices on equipment or parts prior to shipment or installation to reflect increases in costs from raw materials, third party products, any new or additional tariffs, duties, quotas, taxes, the withdrawal of trade agreement concessions or any unforeseen or other extra cost elements.

Limited Warranty

We warrant that services will be performed in a good and workmanlike manner for 90 days from the date of performance. Equipment we provide is also warranted to be free from defect in materials and workmanship for 90 days from installation. No warranty is provided for third-party equipment we install or furnish. Third-party HVAC and controls equipment is provided with the third-party manufacturer's warranty to the extent available. This limited warranty does not cover failures, defects, or damages caused in whole or in part by: (i) misuse, neglect, accident, Force Majeure, changes to your premises, or installation, maintenance or repairs not performed by us; (ii) environmental, electrical or other causes beyond our control; (iii) normal wear and tear or corrosion; (iv) use of unauthorized replacement parts or products or using the equipment for purposes not intended by the manufacturer; or (vi) issues arising from your failure to comply with this Agreement or your obligations. To qualify for warranty consideration, you must notify us in writing of your warranty claim prior to the end of the warranty period, complete all instructions on warranty procedures and provide us with reasonable site access to inspect the equipment and/or perform any

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necessary warranty work. Your sole remedy is to have defective services re-performed or equipment repaired or replaced at our election. **THESE WARRANTIES ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.** You need to determine if our equipment are suitable for your use. You assume all risk and liability from their application and your use.

Warranty service does not cover: (i) system upgrades and replacing obsolete systems, equipment, or consumable parts and components ; (ii) reloading, updating, or maintaining software; (iii) additional costs for access, deinstallation, re-installation and transportation; and (iv) the exclusions set out in the Supplemental Terms. If you call us for warranty service and the problem is due to any of these reasons, we may charge you for the service call even if we do not work on the equipment. We may offer these services at an extra cost.

Customer Obligations

You must provide all relevant information about the equipment and premises, follow all applicable Laws and ensure us safe access. You must operate, test, maintain, and repair the equipment according to manufacturer and our recommendations and notify us immediately of any issues.

In addition, you agree to, (i) obtain necessary licenses and permits and pay related fees and taxes; (ii) provide a suitable environment for the equipment as recommended by us or the manufacturer including heat to avoid freezing; (iii) supply the necessary electrical service, power, heat, heat tracing, water and schematics ; (iv) provide proper water treatment for condensers, cooling towers, and boilers, and protect against environmental issues; (v) set and test alarm systems as recommended by us or the manufacturer; (vi) avoid causing false alarms and reimburse us for any fines or fees; (vii) notify all necessary parties, such as local authorities and monitoring providers, about system testing or repairs; (viii) keep accurate and up-to-date work logs for the equipment; and (ix) take precautions for Covered Equipment failure to prevent injury or property damage. If you do not meet any of these obligations, we are not responsible for equipment breakdowns, repairs, or replacements. We can suspend services until these issues are fixed and charge for any corrective work needed.

For equipment connected to your computer network, we provide and install the software to run the equipment and connect to it based on the network settings you provide. You must provide us with secure access to your computer network as required in our specifications. If we cannot connect to the network or need extra equipment for connectivity, additional charges may apply. Our services do not include changes to the network, security, or firewall settings. You are solely responsible to protect your data, computer network, and products networked or connected to the Internet; and we are not responsible for any loss or damage, as allowed by Law. You should back up data and software before services are performed. You must promptly remove any devices that interfere with the operation of the Covered Equipment.

Insurance

We do not guarantee that services or equipment will prevent risk of loss at your premises or detect all events. You are responsible for any losses and need to rely on your own insurance. You release and waive for yourself and your insurer all subrogation and other rights to recover from us.

Limitations on Liability

Neither we or our suppliers or vendors ("JCI Parties") are liable for special, incidental, consequential, punitive or indirect damages, or for lost profits, revenue, data or business interruption. The total liability of the JCI Parties is limited to $250,000 or 12 months of fees paid to Johnson Controls under this Agreement, whichever is less.

Claims Limitation; Forum; Choice of Law

Disputes may be resolved in court or through arbitration, as determined exclusively by us. Delaware law governs any agreement performed in the U.S., with disputes resolved in Milwaukee, Wisconsin. Ontario law governs any agreement performed in Canada, with disputes resolved in Ontario. Any claims by you must be brought within one year. The parties waive their right to a jury trial.

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Customer Confidential
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Term and Termination

The term of this Agreement is set out in the proposal and renews automatically for successive terms equal to the length of the original term unless either party gives 60 days' prior written notice of termination to the other party before the end of a term or the parties agree in writing on a different length of renewal term. Either party can terminate for cause with 10 days' notice, but only after written notice the defaulting party has 30 days to cure any alleged default. We can terminate immediately if we can no longer service the Covered Equipment for whatever reason including if we stop selling the Covered Equipment, providing the services or if we cannot obtain equipment, parts or support the technologies. We can terminate this Agreement without cause with 60 days' written notice. Upon termination, you must pay all amounts owed and provide access for us to remove any of our property at your premises and reprogram systems. You are responsible for our costs to enforce this. If you end this Agreement early for any reason, you must also pay us 50% of the service charges for the remaining term of this Agreement. You are responsible for our costs to enforce this.

Access and Hazardous Materials

You must provide us with reasonable and safe access to the Covered Equipment. We will follow our health and safety policies and applicable Laws. You must inform us of any hazardous conditions or materials (e.g., mold, asbestos containing materials, biohazards) and you are responsible for resolving, removing and disposal. If we encounter hazardous conditions or materials, we may stop work without liability and you are required to provide us reasonable evidence of abatement before we will restart work. Additional charges will apply if access to a confined space is required.

Force Majeure

We are not in breach or liable for any delays or failures caused, in whole or in part, by any events beyond our control, such as natural disasters, severe weather, public health risks, government actions, cyberattacks, civil disturbances, labor disputes, strikes or shortages of parts or materials ("**Force Majeure**"). You must allow us additional time to perform the services and reimburse us for increased costs due to such events.

Data and Intellectual Property; Digitally Enabled Services

You own your data, but we may use it to perform services and you grant us a perpetual, worldwide, irrevocable, royalty free license to use your building data on a de-identified basis. We retain rights to any intellectual property created. Digital enabled services mean services provided under this Agreement that employ our software and cloud-hosted software offerings and tools. They may include, but are not limited to, (i) remote inspection, (ii) advanced equipment fault detection and diagnostics, and (iii) data dashboarding and health reporting. Digital enabled services may require data collection, and you consent to this.

Software-Digital Solutions

Use of our software, including software to provide digital enabled services and solutions, is governed by our standard terms at https://www.johnsoncontrols.com/techterms. These terms apply to the software you are allowed to use, but we retain ownership and rights to the software, including improvements. If provided as part of our services, third-party software is subject to its own terms.

Privacy

If provided to us, we will process personal data according to our Data Processing Agreement at www.johnsoncontrols.com/dpa and adhere to our privacy notice at https://www.johnsoncontrols.com/privacy. You consent to this processing and will ensure all necessary consents are obtained.

Miscellaneous

Notices must be in writing. This Agreement cannot be assigned without our consent; any assignment without our consent is void. We can assign this Agreement, in whole or in part, or subcontract the work, without notice. Invalid, illegal or unenforceable provisions do not affect the rest of this Agreement. This Agreement is subject to specific supplemental terms located at www.johnsoncontrols.com/legal/one-psa-supplemental-terms. In addition, if you

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request us to perform any work outside the scope of this Agreement, you consent to it being performed subject to our standard customer terms then in effect at www.johnsoncontrols.com/customerterms. This Agreement is the entire contract and supersedes prior written or oral communications and documents, and terms in any purchase order or other documents you later provide are rejected. We may convert this Agreement to an electronic format.

[END OF DOCUMENT]

Johnson Controls Standard Service Terms: One PSA, version 6.12.2025

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AGENDA ITEM 10:

EMERGENCY SERVICES MATTERS

A. Tower Construction and Site Modifications Contract

MANAGER'S COMMENTS:

A Request for Proposals was issued for the construction of a self-supporting tower at the Rich Mountain site and for the necessary modifications at the Aho and Buckeye sites to accommodate additional microwave dishes. Three proposals were received and reviewed. Staff recommends awarding the contract to K-Co Enterprises, Inc., the lowest responsive bidder, with a total cost of $396,909. Both the County's radio system consultant and the primary site contractor have prior experience with K-Co and expressed no concerns. Funds have been budgeted for this work as part of the overall simulcast system project.

Board approval is requested to award a $396,909 contract to K-Co Enterprises, Inc. for tower construction and site modifications.

July 18th, 2025

To: Board of Commissioners

CC: Deron Geouque, County Manager
Katie Hancock, Clerk to the Board

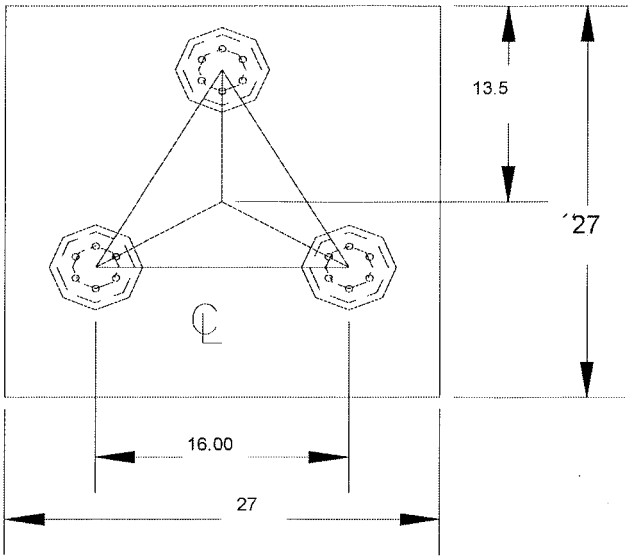
Subject: Bid Award Request for Rich Mountain Tower and additional modifications

Board of Commissioners,

A Request for Proposals was issued for a firm to provide a self-supporting tower as delineated in the tower procurement documents for the Rich Mountain tower site along with the required modifications to the Aho and Buckeye sites for the extra microwave dishes. The County received three proposals from K-Co Enterprises, Inc., Built Construction LLC, and Pittsburg Tower and Tank. After review, staff recommends K-Co Enterprises, Inc. to the Board of Commissioners for your approval as the lowest responsive bidder. Both the County's radio system consultant and the primary contractor for site construction have prior experience with K-Co with no reservations. The cost of the K-Co proposal is $379,500 for the Rich Mountain tower, $5,177 the Aho tower modification, and $12,232 for the Buckeye tower modification. The total cost for this portion of the project is $396,909 and funds have been budgeted in the construction budget for the simulcast system. Commissioner approval is requested.

Respectfully,

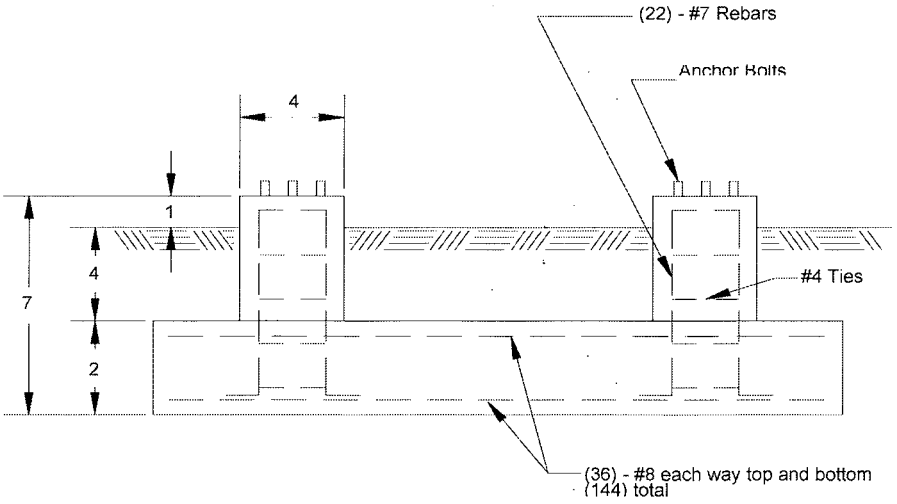
William Holt, MPA, CEM, NREMT-P
Emergency Services Director



60.98CU. YDS.
CONCRETE REQUIRED

NORTH CAROLINA PROFESSIONAL SEAL 034200 ENGINEER KIRK HALL

5-29-2025



GENERAL NOTES

1. CONCRETE TO HAVE 4000 PSI MIN. COMPRESSIVE STRENGTH AFTER 28 DAYS.
2. REINFORCEMENT STEEL IS DEFORMED AND MEETS THE REQUIREMENTS OF ASTM A615 GRADE 60.
3. EMBEDDED STEEL TO HAVE 3" MIN. CONCRETE COVER.
4. DESIGN BASED ON SOILS

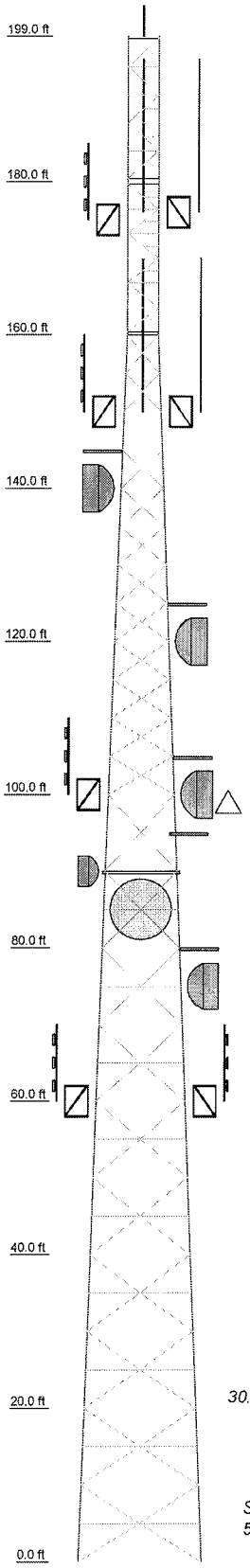
TITLE:

rich mtn

WORLD TOWER COMPANY, INC.

SCALE	DRN.	CKD.	DATE
FILE	DRAWING NO.		

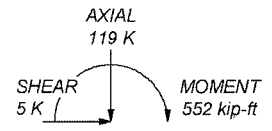
Section	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	SR 4 1/4	SR 4	SR 3 3/4	SR 3 1/2	SR 3 1/4	SR 3	SR 2 3/4	SR 2 1/4	SR 1 1/2	
Leg Grade	A572-50									
Diagonals	L3 1/2x3 1/2x1/4		L3x3x1/4		L2x2x3/16		L1 3/4x1 3/4x3/16		SR 1	
Diagonal Grade	A36									
Top Girts	N.A.						L1 3/4x1 3/4x1/8		SR 1 1/8	
Bottom Girts	N.A.								SR 1	
Horizontals	L3x3x3/16		L2 1/2x2 1/2x3/16		L2x2x3/16		L1 3/4x1 3/4x3/16		SR 3/4	
Sec. Horizontals	N.A.						N.A.		SR 1	
Face Width (ft)	16	14.5	13	11.5	10	8.5	7	5.5	4	
# Panels @ (ft)		32 @ 5						6 @ 3.20833	5 @ 3.65	
Weight (K)	25.7	49	42	37	32	28	21	17	13	8.8



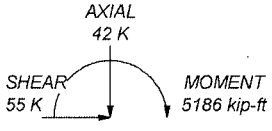
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 388 K
SHEAR: 33 K

UPLIFT: -346 K
SHEAR: 30 K



TORQUE 3 kip-ft
30.00 mph WIND - 0.75 in ICE



TORQUE 40 kip-ft
REACTIONS - 150.00 mph WIND

DESIGNED APPURTENANCE LOADING

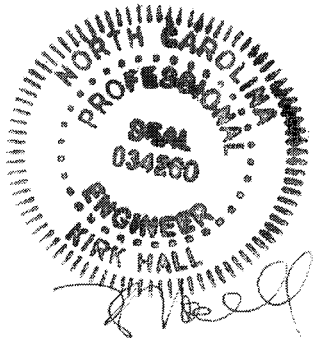
TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8x4'	199	HX6-6W	120
RFI CC807-11 (209" x 3" Dia.)	176	Ice Shield for 6' Dish*	105
RFI CC807-11 (209" x 3" Dia.)	176	Dish Mount	100
6' Pipe Side Arm w/ T.B.*	176	6' Pipe Side Arm w/ T.B.*	100
6' Pipe Side Arm w/ T.B.*	176	Decibel DB220 (127" Dipole)	100
TMA 12" x 12" x 6"	175	HX6-6W	100
6' Pipe Side Arm w/ T.B.*	175	Ice Shield for 4' Dish*	95
Decibel DB220 (127" Dipole)	175	Ice Shield for 8' Dish*	90
RFI CC807-11 (209" x 3" Dia.)	150	Dish Mount	90
RFI CC807-11 (209" x 3" Dia.)	150	4 FT DISH	90
6' Pipe Side Arm w/ T.B.*	150	Dish Mount	85
6' Pipe Side Arm w/ T.B.*	150	HX8-6W-6GF	85
6' Pipe Side Arm w/ T.B.*	150	Ice Shield for 6' Dish*	80
Decibel DB220 (127" Dipole)	150	Dish Mount	75
Ice Shield for 6' Dish*	145	HX6-6W-6WH	75
Dish Mount	140	6' Pipe Side Arm w/ T.B.*	60
HX6-6W	140	6' Pipe Side Arm w/ T.B.*	60
Ice Shield for 6' Dish*	125	Decibel DB220 (127" Dipole)	60
Dish Mount	120	Decibel DB220 (127" Dipole)	60

MATERIAL STRENGTH

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

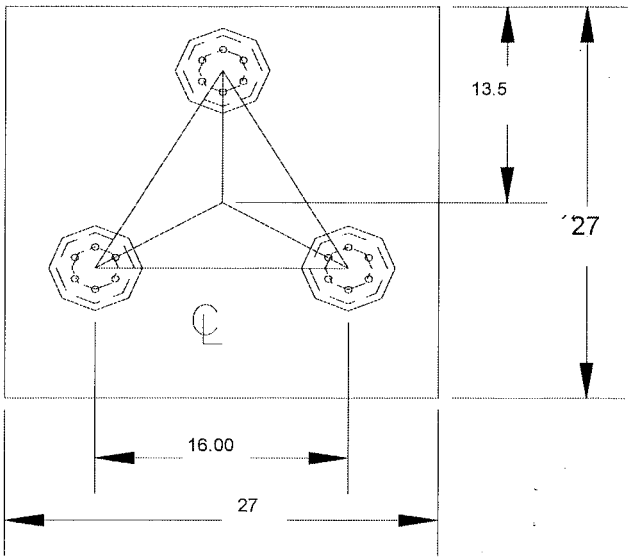
TOWER DESIGN NOTES

1. Tower is located in Watauga County, North Carolina.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 150.00 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 30.00 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60.00 mph wind.
6. Tower Risk Category III and IV.
7. Topographic Category 1 with Crest Height of 0 ft
8. 50' Fall Radius
9. TOWER RATING: 78.5%

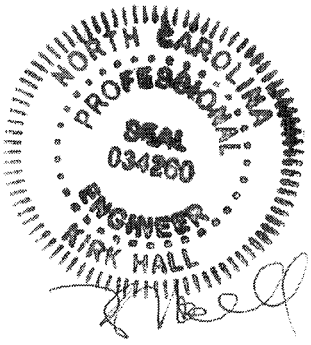


6-11-2025

World Tower Company, Inc.	Job: ***199' WSST Tower / Run C2505-045***	
1213 Compressor Dr	Project: ***Rich Mountain***	
Mayfield, KY	Client:	Drawn by: Cort Walker / App'd:
Phone: 270-247-3642	Code: TIA-222-G	Date: 05/27/25 / Scale: NTS
FAX:	Path: D:\Downloads\C2505-045 R1.eri	Dwg No. E-1



60.98CU. YDS.
CONCRETE REQUIRED



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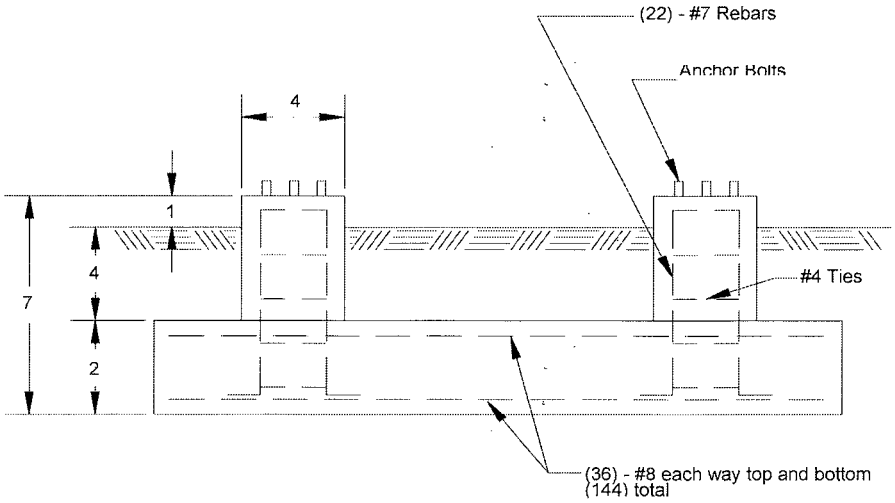

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Diagonal Grade	A36									
Top Girts	N.A.							L1 3/4x1 3/4x1/8	SR 1 1/8	
Bottom Girts	N.A.								SR 1	
Horizontals	L3x3x3/16	L2 1/2x2 1/2x3/16		L2x2x3/16	L1 3/4x1 3/4x3/16		N.A.		SR 3/4	
Sec. Horizontals	N.A.								SR 1	
Face Width (ft)	16	14.5	13	11.5	10	8.5	7	5.5	4	
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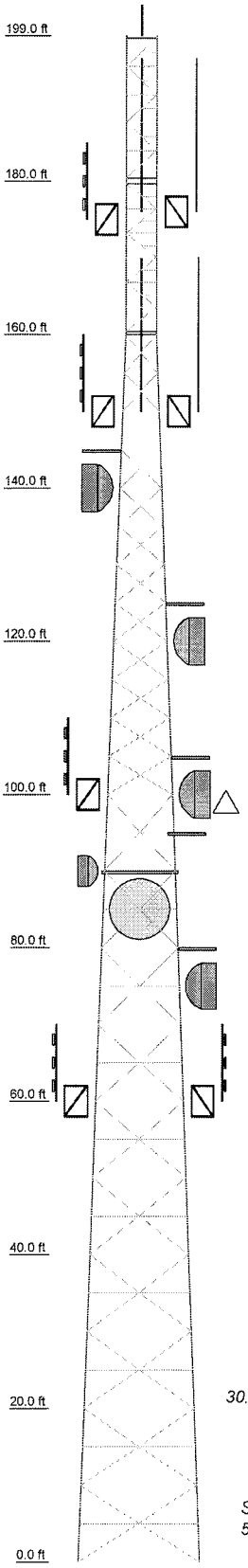

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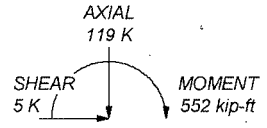

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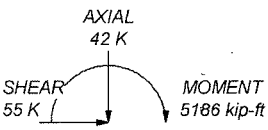

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6' Pipe Side Arm w/ T.B.*	150	HX8-6W-6GF	85
6' Pipe Side Arm w/ T.B.*	150	Ice Shield for 6' Dish*	80
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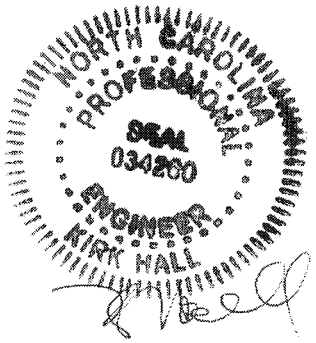


6-11-2025

World Tower Company, Inc. 1213 Compressor Dr Mayfield, KY Phone: 270-247-3642 FAX:	Job: *199' WSST Tower / Run C2505-045*	
	Project: *Rich Mountain*	
	Client:	Drawn by: Cort Walker / App'd:
	Code: TIA-222-G	Date: 05/27/25 / Scale: NTS
	Path: D:\Downloads\C2505-045 R1.eri	Dwg No. E-1

K-Co Enterprises, Inc.

613 Hurricane Creek Rd

Piedmont, SC 29673

Bid for: Rich Mtn Install New Tower Site – Watauga County, NC

814 W King St.

Boone, NC 28607

Please give Ernie Rood a call at 864-947-8704 with any questions.

THE CINCINNATI INSURANCE COMPANY
THE CINCINNATI CASUALTY COMPANY

Fairfield, Ohio

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That THE CINCINNATI INSURANCE COMPANY and THE CINCINNATI CASUALTY COMPANY, corporations organized under the laws of the State of Ohio, and having their principal offices in the City of Fairfield, Ohio (herein collectively called the "Companies"), do hereby constitute and appoint

Brooks M Keys, Jr., J. DuPre Keys, John B Ross, John B Ross, Jr., James G Culwell

of Belton, SC
their true and legal Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and deliver on behalf of the Companies as Surety, any and all bonds, policies, undertakings or other like instruments, as follows:

Five Million Dollars and 00/100 ($5,000,000.00)

This appointment is made under and by authority of the following resolutions adopted by the Boards of Directors of The Cincinnati Insurance Company and The Cincinnati Casualty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the President or any Senior Vice President be hereby authorized, and empowered to appoint Attorneys-in-Fact of the Company to execute any and all bonds, policies, undertakings, or other like instruments on behalf of the Corporation, and may authorize any officer or any such Attorney-in-Fact to affix the corporate seal; and may with or without cause modify or revoke any such appointment or authority. Any such writings so executed by such Attorneys-in-Fact shall be binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company.

RESOLVED, that the signature of the President or any Senior Vice President and the seal of the Company may be affixed by facsimile on any power of attorney granted, and the signature of the Secretary or Assistant Vice-President and the Seal of the Company may be affixed by facsimile to any certificate of any such power and any such power of certificate bearing such facsimile signature and seal shall be valid and binding on the Company. Any such power so executed and sealed and certified by certificate so executed and sealed shall, with respect to any bond or undertaking to which it is attached, continue to be valid and binding on the Company.

IN WITNESS WHEREOF, the Companies have caused these presents to be sealed with their corporate seals, duly attested by their President or any Senior Vice President this 16th day of March, 2021.

THE CINCINNATI INSURANCE COMPANY
THE CINCINNATI CASUALTY COMPANY

STATE OF OHIO)SS:
COUNTY OF BUTLER)

On this 16th day of March, 2021 before me came the above-named President or Senior Vice President of The Cincinnati Insurance Company and The Cincinnati Casualty Company, to me personally known to be the officer described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of said Companies and the corporate seals and the signature of the officer were duly affixed and subscribed to said instrument by the authority and direction of said corporations.

Keith Collett, Attorney at Law
Notary Public – State of Ohio
My commission has no expiration date.
Section 147.03 O.R.C.

I, the undersigned Secretary or Assistant Vice-President of The Cincinnati Insurance Company and The Cincinnati Casualty Company, hereby certify that the above is the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Power of Attorney is still in full force and effect.

Given under my hand and seal of said Companies at Fairfield, Ohio, this day of

BN-1457 (3/21)

THE CINCINNATI INSURANCE COMPANY

Bid Bond

CONTRACTOR (Name, legal status and address):

K-Co Enterprises, Inc.
613 Hurricane Creek Rd
Piedmont, SC 29673

SURETY (Name, legal status and principal place of business):

THE CINCINNATI INSURANCE COMPANY
6200 S. GILMORE ROAD
FAIRFIELD, OHIO 45014-5141

OWNER (Name, legal status and address):
Watauga County
814 King Street
Boone, NC 28607

This document has important legal consequences, Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

BOND AMOUNT:
5% of bid

PROJECT (Name, location or address, and Project number, if any):
provide steel and labor to install on tower upgrade

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond the sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirements shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 13 day of June, 2025

(Witness)	K-Co Enterprises, Inc. *(Principal)* *(Seal)*
	(Title)
(Witness)	**THE CINCINNATI INSURANCE COMPANY** *(Surety)* *(Seal)*
	(Title)

The Company executing this bond vouches that this document conforms to American Institute of Architects Document **A310**, 2010 Edition.
S-2000-AIA (11/10) PUBLIC

Page: 1
Watauga County **BIDDER:** K-Co Enterprises, Inc.

WATAUGA COUNTY, NC **BID #**	**INVITATION FOR BIDS –Rich Mt.**
	Bids will be publicly opened: June 13th, 2025 at 3:00pm
	Questions Due by: June 2nd, 2025
Refer ALL Inquiries to: Marty Randall Telephone No. 828-527-2416	Commodity: Install New Tower Site 759 Fire Tower Road, Boone, North Carolina 28607 with access road per design documents.
E-Mail: marty.randall@1018consulting.com	Using Agency Name: Watauga County Emergency Services
(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 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: K-Co Enterprises, Inc.		FEDERAL ID OR SOCIAL SECURITY NO. 26-1278195	
STREET ADDRESS: 613 Hurricane Creek Rd		P.O. BOX:	ZIP:
CITY & STATE & ZIP: Piedmont, SC 29673		TELEPHONE NUMBER: 864-947-8704	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: Ernest Rood - Project Manager		FAX NUMBER: 864-947-8204	
AUTHORIZED SIGNATURE: Ernest Rood	DATE: 6-12-25	E-MAIL: bids@kcoenterprises.com	

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).

FOR Watauga County, NC USE ONLY

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 re-usable 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.

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

Watauga County, NC Tower Construction Project

Boone, North Carolina

Scope of Work – Watauga County, NC proposes to install a communications tower site per the following specifications at a site in Watauga County, North Carolina. 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 tower 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.

As a minimum, the Tower and Foundation shall be designed to the requirements of ANSI/TIA/EIA-222-G, including released addendums. Design with Geotechnical Report provided, the tower manufacturer shall ensure the proper development of anchor roads and anchorage materials.

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** X **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** X **No**_____

CONTRACTOR REQUIREMENTS

The Contractor shall submit the following items with their bid:

1. A drawing of the tower profile sealed by a **North Carolina Registered Engineer**.
2. A list of all antennas and appurtenances that were considered in the tower and foundation designs.
3. Tower foundation design drawings, with a complete set of **DESIGN CALCULATIONS** showing the reactions of the tower on the foundation, sealed by a **North Carolina Registered Engineer**.
4. The Contractor awarded this project must submit a set of final erection drawings, sealed by a **North Carolina Registered Engineer** to the Contracting Officer and Marty Randall for written approval before starting the project. **If these drawings are submitted on paper they must also be accompanied by digital copies. We must have these drawings in digital format.**
5. The proposal from the tower manufacturer must specifically state that all pricing will be honored for the duration of this contract.
6. Contractor must supply a rigging plan for tower erection. If the contractor intends to use a gin pole for tower erection, then they must provide a copy of their gin pole certification and load charts. All gin pole certifications and load charts must be current, must be sealed by a qualified engineer licensed in the state of North Carolina, and must state they are in compliance with ANSI/TIA-322. All rigging plans must be in compliance with ANSI/TIA-322 and ANSI/ASSE A10.48 and completed by a qualified engineer licensed in the state of North Carolina.
7. Each bid must be accompanied by a bid bond, for an amount equal to 5% of the total base bid, at the time the bid is filed with the County. 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.
8. Performance and payment bonds are required once bid is awarded.

Bids and tower designs that are submitted for opening will be submitted by Watauga County, NC to a Third-party **North Carolina Registered Engineer** for review of design accuracy and compliance before an award can be made. This is the reason for requiring the above-listed items to be sent with the bid response. 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** X **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 required 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.

Bids must be submitted on this form and must reach Watauga County the date specified on Page one, above. All parts of this form must be completed for consideration. **Send two copies of this bid document.**

Understand Bidding Instructions **Yes** X **No**_____

PRE-AWARD ENGINEERING REVIEW

Bids and tower designs submitted for this IFB will be submitted by Watauga County, NC to a third-party engineering firm for design accuracy and compliance with all stipulated standards and building codes before an award can be made. A low responsible bid failing this engineering review will be invalid and the bid will be awarded to the next lowest responsible bidder that meets the Engineering Review requirements.

Understand Pre-Award Engineering Review Process **Yes** X **No**_____

PROJECT DESCRIPTION

This project shall consist of the furnishing and installation of a communications tower, per the following and any attached specifications.

Understand Project Description **Yes** X **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. Contractor must contact Matt Fields ***(matt.fields@ets-pllc.com 919-427-6609)*** at least 2 weeks prior to construction to coordinate the staking of the tower location. 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** X **No**_____

DESIGN CAPACITY REQUIREMENT

The tower must be designed so that when installed with **all loading** as shown in the ANTENNA LOADING REQUIREMENTS TABLE that follows, the tower **superstructure** and **substructure** **shall NOT exceed 95% of its capacity**. If, upon evaluation by a third party, **Engineered Tower Solutions**, the design computes to be at a greater stress level than specified, the bid will not be accepted. Each bidder must provide as part of the bid submission package **design calculations** verifying that this Design Capacity Requirement is met. This tower shall be designed for a 50-ft fall radius per the contract documents. Additionally, each bidder shall record either the **Rated Capacity** and/or the **Percent of Stressed Value** in the space provided below.

Rated Capacity _____ **Percent of Stressed Value** _____

Understand the Design Capacity Requirement. **Yes** X **No**_____

PERMITS

Permits are required for this tower installation. The contractor is responsible for obtaining permits and scheduling inspections with the permitting office. The County is not exempt from permits. Contact Watauga County for permitting information.

Understand the Permit Process **Yes** X **No**_____

FOUNDATION INSPECTION MANAGEMENT

Prior to Construction Start, the Tower Contractor will obtain the services of third party **Engineered Tower Solutions *("ETS")*** to oversee, inspect, and document each phase of the foundation construction to ensure compliance with the Tower Manufacturer's Tower Design Drawings and Specifications. ***(Watauga County, NC has a contract with ETS to perform these inspections with no more than two trips being made by ETS. 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 Matt Fields: (matt.fields@ets-pllc.com 919-427-6609)*** prior to Construction Start, all materials to be used in the construction of the foundation shall be inspected to ensure compliance with the Tower Manufacturer's Tower Design Drawings and Specifications. The Tower Contractor shall immediately report to Marty Randall and the Contracting Officer any deviations found during the on-site pre-construction start inspection and present a correction plan. The Tower Contractor shall provide to Marty Randall and the Contracting Officer, a written report, sealed by

Engineered Tower Solutions that completely documents all results of the foundation oversight and inspection process, including a comprehensive set of digital photographs

Understand the Inspections Management Process **Yes** X **No**_____

CONCRETE: COMPLIANCE WITH MIX SPECIFICATIONS & STRENGTH TESTING

The Tower Contractor will obtain the services of the third party, **Engineered Tower Solutions *("ETS")***, to ensure proper oversight of the concrete pouring process and the inspection and recording of each concrete delivery ticket for compliance with the Tower Manufacturer's Tower Design Drawings and Specifications. The Tower Contractor shall ensure the third party, (***ETS***), takes all steps to ensure competent monitoring of the concrete sampling process used during the concrete pouring process, and to ensure accurate recording of the time of day each sample was taken. ***(Watauga County, NC has a contract with ETS to perform the concrete testing. Fees will be paid by Watauga County, NC. This includes sampling, breaks, and reports. For scheduling, email Matt Fields: (matt.fields@ets-pllc.com 919-427-6609)).*** The Tower Contractor shall provide to Marty Randall and the Contracting Officer, a written report, sealed by (***ETS***) that completely documents the compliance with mix specifications, and a detailed presentation of the concrete testing, to include a comprehensive set of digital photographs.

Understand Concrete Compliance and Testing Process **Yes** X **No**_____

TOWER GROUND INSPECTION

The Tower Ground inspection will be conducted by 10-18 Consulting. Mr. Marty Randall, marty.randall@1018consulting.com Cell 828-527-2416, must be contacted at least 72 hours prior to requiring this inspection.

Understand Grounding Inspection Process **Yes** X **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 Post Construction Inspection Process **Yes** X **No**_____

POST CONSTRUCTION INSPECTION (PCI)

Upon completion of the tower 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 Matt Fields: (matt.fields@ets-pllc.com 919-427-6609)).*** In the event any deviation from the Tower Manufacturer's Design 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** X **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 66585

The Contractor installing the tower 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** X **No**_____

CONSTRUCTION & MATERIALS

The tower shall be constructed of **hot-dipped** galvanized steel with solid round, or angular members. The tower may be either solid weld or knockdown construction. All components of the tower including but not limited to bolts, nuts, mounting

brackets, torque arms, etc. shall, at a minimum, be **hot-dipped** galvanized. The tower shall conform, at a minimum, to the North Carolina Building Code Chart 1606, Basic Wind Speed and any county/jurisdictional specified requirements.

The Tower must have climbing facilities on each tower leg for installation and maintenance. **Tower Contractor must provide and install a safety cable at the climbing ladder.**

Understand Construction and Materials **Yes** X **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** X **No**_____

STRUCTURE SPECIFICATIONS TABLE

Please enter Yes or No that you meet the specification in the Right-hand column

Item	Description	Comply Yes or No
1	Location is 759 Fire Tower Road, Boone NC 28607 Latitude **36.2330639° North** Longitude **-81.6986889° West**	Yes
2	Tower is to be a self-supporting structure.	Yes
3	Tower Height is to be **199-ft AGL with a 50-ft Fall Zone.**	Yes
4	Tower will be positioned on the DCS as indicated in the attached Construction Drawings.	Yes
5	The Tower Structure shall utilize solid round or angle structural steel members. No other materials or shapes will be given consideration. Note all members must be hot dipped galvanized to prevent corrosion.	Yes
6	All structural bolts must meet the ASTM A325 or A490 Specification.	Yes
7	The Tower Contractor will provide all materials to Complete the Tower & Foundation Installation.	Yes
8	The Tower Contractor will build the Foundation and erect the Tower.	Yes
9	The Tower Contractor will provide a detailed set of foundation drawings (sealed by a North Carolina Registered Engineer) showing all details including all rebar sizes and quantities, and concrete volumes. The Tower Contractor shall install the tower foundation. The Tower Contractor may construct the foundation using the most cost-effective method. The type of foundation presented in this Bid shall be designed and constructed in accordance with the Geotechnical Parameters specified in the Subsurface Exploration Report provided by Engineered Tower Solutions. That document is an attachment to this IFB.	Yes
10	Any damage to the access road, thru the housing development, from construction of this tower must be repaired by the contractor so to restore road to the original condition. If there are repairs required to the existing access road in order to construct the tower those repairs must be included in the bid. The contractor is responsible for tower construction. Civil work will be completed by Civil contractor.	Yes
11	All back-fill for grading tower base must be compacted and tamped. This would be 8 inches of fill and adding moisture if need between each tamping.	Yes
12	As a minimum this Tower and Foundation shall be designed to the requirements of ANSI/TIA-222G, including released addendums.	Yes
13	One hot-dipped galvanized expanded metal Vertical Cable/Wave-Guide Ice-Bridge, capable of mounting twenty (20) lines. Waveguide bridge shall be installed between the tower and shelter per the design drawings. The width of the Horizontal Cable/Wave-Guide Ice-Bridge shall be installed by the civil contractor.	Yes
14	The Tower shall have a safety fall protection system incorporating a 3/8" stainless steel cable meeting OSHA/ANSI specifications installed the full height of the structure on one tower leg with full height step pegs. Additionally, step pegs are required on the other two legs to the height of the mid markers.	Yes
15	The Tower Contractor shall install one (1) #2/0 AWG bare tinned copper conductor between the base of each tower leg and a 10-ft ground rod at each tower leg. The top of the ground rod must be at least 3-ft below finished grade. Each of these #2/0 AWG bare tinned copper conductors shall be Exothermically Bonded to the ground rod, tower leg, and tower halo ring. Grounding must be in compliance with Motorola R56 specifications and standards **NOTE: All grounding shall conform to construction drawings.**	Yes

	NOTE: A representative of Watauga County, NC shall inspect the connections to the ground rods prior to filling the trench. This inspection does not eliminate the requirement for installing inspection tubes. The Tower Contractor shall notify the Contracting Officer at least forty-eight (48) hours prior to schedule and conduct this inspection.	Yes
17	The Civil Contractor is responsible for providing and installing a temporary power pole on the site for use during construction. Civil contractor is responsible for removing the temporary power pole once permanent power has been installed at the DCS.	Yes
18	Tower Contractor is required to submit best and final price for this effort. Change orders will only be considered for circumstances or unusual situations not included in the contract documents. Any change orders must be approved in writing before work is started. Customer understands any additional work requested may incur additional costs outside of this contract pricing.	Yes
19	The Tower Contractor shall provide Tinned Copper Ground Bars (TCGBs) capable of attaching a minimum of twenty (20) ground kits. Tower must include a 6' lightning rod at the top of structure. **NOTE: The TCGB shall be mechanically attached directly to the Tower Structure with Stainless Steel Hardware using pre-drilled holes in the Tower Structural Steel provided expressly for this purpose.** The TCGBs shall be installed at approximately ten 10-ft AGL at the base of the cable ladder. The Tower Contractor shall install a sufficient length of #2/0 AWG bare tinned copper conductor between this TCGB and the tower halo ring closest to the cable ladder. A second set of TCGB's to be install at the approx. 150 ft level with the TCGB's bonded to the tower structure. **Exothermic Bonding** shall be used to provide the electrical connections of the #2/0 AWG bare tinned copper conductor to the TCGB and the ground ring.	Yes
20	The Tower Contractor shall provide and install antenna mounts in accordance with the included **Antenna Mount Schedule (AMS)** and **Antenna Loading Requirements**.	Yes
21	The location of the site is as shown on the attached drawings.	Yes
22	Excess soil created from foundation installation must be removed from the site. If soil is suitable, it may be used for backfilling and tower foundation leveling.	Yes
23	**The Tower Contractor shall remove all tower construction materials and debris from the site.**	Yes
24	**Bidding contractors must attend a mandatory pre-bid site walk on June 9th at 11:00AM.**	Yes

ANTENNA MOUNT SCHEDULE (AMS)

Contractor to provide and install the following Antenna Mounts on the Tower

Item #	Antenna Mount Description	Comply Yes or No
1	Two 6-ft standoff sidearm mounts with stabilizer at 176-ft	Yes
2	Two 6-ft standoff sidearm mounts with stabilizer at 155-ft	Yes
3	One Microwave 4.5" pipe mount at 140' with ice shield	Yes
4	One Microwave 4.5" Pipe Mount at 100' with ice shield	Yes
5	One Microwave 4.5" Pipe Mount at 85' with ice shield	Yes
6	One Microwave 4.5" Pipe Mount at 75' with ice shield	Yes

6' standoff mounts must be rated to accommodate listed antennas in Antenna Mounting table. If an alternate mount is used specifications must be provided by the manufacturer.

ANTENNA LOADING REQUIREMENTS:

Refer to the attached TEP Tower Procurement Document for tower specifics, antennas and required loading.

 BIDDER: K-Co Enterprises, Inc.

TOWER COST BREAKDOWN:

1. Total cost of tower materials only — $ 136,000.00

2. Total cost of all other services, including: — $ 243,500.00
   a. **All shipping**
   b. Complete Installation
   c. Engineering Services
   d. All Inspections

3. Total cost to construct the tower with lighting[1]. — $ NA
   (Sum of Item-1 and Item-2, above)

4. Total cost to construct the tower without lighting[2]. — $ 379,500
   (Sum of Item-1 and Item-2, above)

LIST OF ATTACHMENTS

1. Subsurface Exploration Report, prepared by **Engineered Tower Solutions.**
2. Construction Drawings, prepared by **Engineered Tower Solutions.**
3. Bid Document
4. Antenna Datasheets

Call the Contracting Officer prior to the opening date if you did not receive these attachments.

GEOTECHNICAL REPORT OF SUBSURFACE INVESTIGATION

May 20, 2024

PROPOSED SELF SUPPORT TOWER
RICH MOUNTAIN TOWER

759 Fire Tower Road
Boone, NC 28607

36.2331, -81.6986

Prepared for:

NORTH CAROLINA HIGHWAY PATROL

ENGINEERED TOWER SOLUTIONS

NORTH CAROLINA PROFESSIONAL SEAL 051545 ENGINEER JORGE VARELA

Matt Nesbit

Jorge Varela Date: 2024.05.20 20:06:38 -04'00'

Matt Nesbit, E.I.
Geotechnical Engineer I

Jorge Varela, P.E.
Registered NC 051545

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

Project Summary

Item	Description
Project Description	A geotechnical exploration and report have been prepared for this proposed 199-foot self-supported tower. Included in this report are the results of the field exploration and the recommendations for the design of the foundation system.
Site Coordinates	Latitude: 36.2331 Longitude: -81.6986
Site Condition	The proposed tower will be installed at 759 Fire Tower Road in Boone, North Carolina
Frost Depth	Based on the TIA Standard (TIA-222-H), dated October 2017, the recommended design frost penetration depth to be used for Watauga County, NC is 12 inches (0.8 ft).
Groundwater	Groundwater was encountered at 7 feet below ground surface at the time of drilling. Please note that subsurface water levels will fluctuate with seasonal and cyclical temperatures and precipitation and can be higher or lower at other times.
Proposed Foundation	We assume the proposed foundation will be supported with either pad and pier or drilled shaft (caisson).

ENGINEERED TOWER SOLUTIONS

Field Exploration

Item	Description
Date	May 7th, 2024
Number of Borings	3
Location	B-1: Latitude: 36.2332 Longitude: -81.6986 B-2: Latitude: 36.2331 Longitude: -81.6985 B-3: Latitude: 36.2331 Longitude: -81.6986
Equipment Used	550X
Advancement Method	Hollow Stem Auger (HSA) and Rock Coring
Sampling Method	ASTM D-1586 with 1.5 I.D. Split Spoon Sampler ASTM D2113 Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration

Laboratory Classification and Testing

Standard	Description
ASTM D2488	Standard Practice for Description and Identification of Soils

Subsurface Profile

Based on the results of our borings, the soils beneath the surface can be summarized in the table below:

Material Encountered	Description	Consistency / Density
SAND	Brown, moist silty sand with gravel	Loose to Very Dense
PWR	Partially Weathered Rock sampled as silty sand with rock fragments	--
GRANITE	Slightly weathered with close spaced fractures	--

1. Refer to individual boring logs for layer stratification details

Detailed descriptions of conditions encountered at each exploration point are indicated on the individual logs in the Appendix B. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

Groundwater was encountered at 7 feet below ground surface at the time of drilling. Groundwater levels will fluctuate with seasonal and climatic changes and may be different at other times.

Earthwork Recommendations – Equipment Mat

Earthwork is anticipated to include excavations and fill placement. The following sections provide recommendations for use in the preparation of the equipment mat foundation area and access drive.

Site Preparation

The subgrade should be evaluated under the direction of the Geotechnical Engineer. Areas where soft material are present or excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

Fill Material Types

Soil Type	USCS Classification	Acceptable Parameters (for Structural Fill)
Imported Low- to Moderate- Plasticity Soil [2]	CL, ML, SC or SM	All locations and elevations
Sand / Gravel with greater than 12% fines	GW/GP, SW/SP	Crushed stone base course may be used for the access roadway or beneath shallow foundations as a replacement material for overexcavated soils.
Near-Surface On-site soils [2]	SM	On-site soils generally appear suitable for use as fill when they contain at least 12% fines (clay and/or silt) and are compacted at an appropriate moisture content.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Low- to moderate-plasticity cohesive soil or granular soil having at least 12% fines

Fill Compaction Requirements

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used	Same as Structural fill
Minimum Compaction Requirements [1,2]	98% of max. below foundations and within 1 foot of finished pavement subgrade 95% of max. above foundations, below floor slabs, and more than 1 foot below finished pavement subgrade	92% of max.
Water Content Range [1]	Low plasticity cohesive: -2% to +3% of optimum High plasticity cohesive: 0 to +4% of optimum Granular: -3% to +3% of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. High plasticity cohesive fill should not be compacted to more than 100% of standard Proctor maximum dry density.

Excavations

Groundwater was encountered at 7 feet below ground surface at the time of drilling. Although not expected, if encountered in deep trench excavations during construction, groundwater or perched groundwater will require dewatering until backfilling operations are complete.

All excavations that may be required should, at a minimum, comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards to provide stability and safe working conditions.

Slopes

For permanent slopes in unreinforced compacted fill areas, we recommended maximum configurations of 3:1 (Horizontal: Vertical) for the cohesive soils (clay) found at the site.

If steeper slopes are required for site development, stability analyses should be completed to design the grading plan. The face of all slopes should be compacted to the minimum specification for fill embankments. Fill slopes should be overbuilt and trimmed to compacted material.

Earthwork Construction Considerations

The near-surface, on-site soils will lose strength when exposed to moisture. To the extent practical, earthwork should be performed during drier periods of weather. Increased remedial measures due to wet and soft or otherwise unsuitable conditions should be expected if earthwork is performed during colder and wetter periods of weather.

A qualified geotechnical engineer should be retained during the earthwork phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; to monitor proof-rolling, placement and compaction of controlled compacted fills, and backfilling of excavations to the completed subgrade.

Foundations Recommendations

The following recommendations are made based on our review of the test boring data and our past experience with similar projects and subsurface conditions. Ultimate soil strength parameters are presented on table below.

Ultimate Strength Parameters

Boring #	Depth (ft)	Unified Soil Classification	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion (psf)
B-1	0.0 – 2.0	PWR	130	38	--
	2.0 – 4.0	PWR	130	38	--
	4.0 – 6.0	PWR	130	38	--
	6.0 – 8.5	PWR	130	38	--
	8.5 – 34.0	GRANITE	145	45	--
B-2	0.0 – 2.0	SM	105	29	--
	2.0 – 4.0	PWR	130	38	--
	4.0 – 6.0	PWR	130	38	--
	6.0 – 8.5	PWR	130	38	--
	8.5 – 10.0	PWR	130	38	--
B-3	0.0 – 2.0	SM	105	29	--
	2.0 – 4.0	SM	120	30	--
	4.0 – 6.0	SM	130	38	--
	6.0 – 8.0	PWR	130	38	--

1. Groundwater was encountered at 7 feet below ground surface at the time of drilling. Utilize bouyon unit weight below this depth

Based on the subsurface conditions and typical design foundation loads for similar self-support towers, we recommend that either a caisson (drilled shaft) or a pad/pier be used to support the new tower.

Modulus of Subgrade Reaction

A vertical and horizontal modulus of subgrade reaction may be derived using the following equations and soils parameters expressed in the above table:

$$k_{s\text{-}v} = 12 \cdot SF \cdot q_a$$

$$k_{s\text{-}h} = k_{s\text{-}v} \cdot B$$

Where:

q_a = Allowable Bearing Capacity (ksf)
SF = Safety Factor
B = Base width (ft), use 1 if B< 1ft
$k_{s\text{-}v}$ =Vertical Modulus of Subgrade Reaction (kcf)
$k_{s\text{-}h}$ = Horizontal Modulus of Subgrade Reaction (ksf)

Caisson (Drilled Shaft)

Should caissons (drilled shafts) be used, the caissons (drilled shafts) will achieve compressive (downward) and tensile (uplift) resistance through skin friction along the sides of the shafts. In addition to skin friction, bearing resistance at the caisson's tip will contribute to compressive capacity. We recommend the values given the table below be used for this project. Please note the tip bearing capacity and skin frictions are net ultimate and ultimate values respectively. Appropriate factors of safety or resistance factors should be used. Lateral loads can be resisted by the lateral stiffness of the soil. Parameters for analysis of the laterally loaded caisson are also given the table below.

Caisson (Drilled Shaft) Parameters

Boring #	Depth (ft)	Net Ultimate Tip Bearing Capacity (ksf)	Ultimate Skin Friction[1] (ksf)		Lateral Modulus (pci)	ε_{50} (in/in)
			Compressive	Uplift		
B-1	0.0 – 2.0	--	--	--	--	--
	2.0 – 4.0	--	0.2	0.2	125	--
	4.0 – 6.0	--	0.3	0.3	125	--
	6.0 – 8.5	--	0.4	0.4	125	--
	8.5 – 34.0	40	2.3	2.3	125	--
B-2	0.0 – 2.0	--	0.2	0.2	125	--
	2.0 – 4.0	--	0.3	0.3	125	--
	4.0 – 6.0	--	0.3	0.3	125	--
	6.0 – 8.5	--	0.4	0.4	125	--
	8.5 – 10.0	40	0.5	0.5	125	--
B-3	0.0 – 2.0	--	--	--	--	--
	2.0 – 4.0	--	0.2	0.2	60	--
	4.0 – 6.0	--	0.3	0.3	125	--
	6.0 – 8.0	40	0.4	0.4	125	--

1. We recommend the skin friction be ignored for the top 3 ft of the caisson

Based on the subsurface soil conditions, excavations for the caissons (drilled shafts) should be possible using a large, truck-mounted, hydraulic-advanced drill rig. All debris, loose or disturbed soil should be removed from the excavation prior to placing reinforced steel and/or concrete. Reinforcing steel and/or concrete should be placed immediately upon completion of the excavation.

The excavations may be susceptible to caving. Drilling fluid or casing could be used to assist in keeping the drilled hole open. If casing is used, we recommend it be removed from the excavation as concrete is being placed. Continuous vibration or other approved methods should be used during casing withdrawal to reduce the potential for void-space formation within the concrete. If water is

present during concrete placement and/or drilling fluids are used to maintain hole stability, concrete should be pumped or otherwise discharged to the bottom of the hole via a hose or tremie pipe. The end of the hose or tremie pipe must remain below the top surface of any water, drilling fluid and the in-place concrete at all times. Additionally, concrete should be consolidated using vibration methods over the entire length and width of the caissons and the consolidation should be performed only after these fluids are removed and to the extent possible.

Pad & Pier / Single Mat Foundation

If the site has been prepared in accordance with the requirements noted in *Earthwork Recommendations – Equipment Mat,* the tower's foundation capacity can be determined using the soil's bearing capacity, passive pressure resistance, and a sliding friction factor.

Net Ultimate Bearing Capacity and Sliding Friction Factor

Depth[2] (ft)	Net Ultimate Bearing Capacity[1] (psf)	Sliding Friction Factor[1]
0.0 – 2.0	--	--
2.0 – 4.0	7,000	0.35
4.0 – 15.0	11,000	0.55

1. This value is a net ultimate value and an appropriate factor of safety or resistance factor should be used

Ultimate Passive Pressure and Friction Factor

Boring #	Depth (ft)	Ultimate Passive Pressure[1] (psf)[1]
B-1	0.0 – 2.0	0 – 800
	2.0 – 4.0	800 – 1,600
	4.0 – 8.0	1,600 – 3,200
	8.0 – 12.0	3,200 – 4,800
	12.0 – 20.0	4,800 – 11,200

1. Ultimate passive pressure can be interpolated for foundation depths with the depth ranges given

Seismic Parameters

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC)

Seismic Site Classification

Item	Seismic Parameter
2018 International Building Code Seismic Site Classification	D[1]
Design Spectral Response Acceleration Parameters	S_{ds} = 0.273g S_{d1} = 0.133g

1. The IBC seismic site classification is based on the subsurface profile depth of 100 feet. The scope of work did not authorize exploration to a depth of 100 feet. A seismic Site Soil Classification of D should be used if insufficient details are known about the 100-foot soil profile.

LIMITATIONS OF REPORT

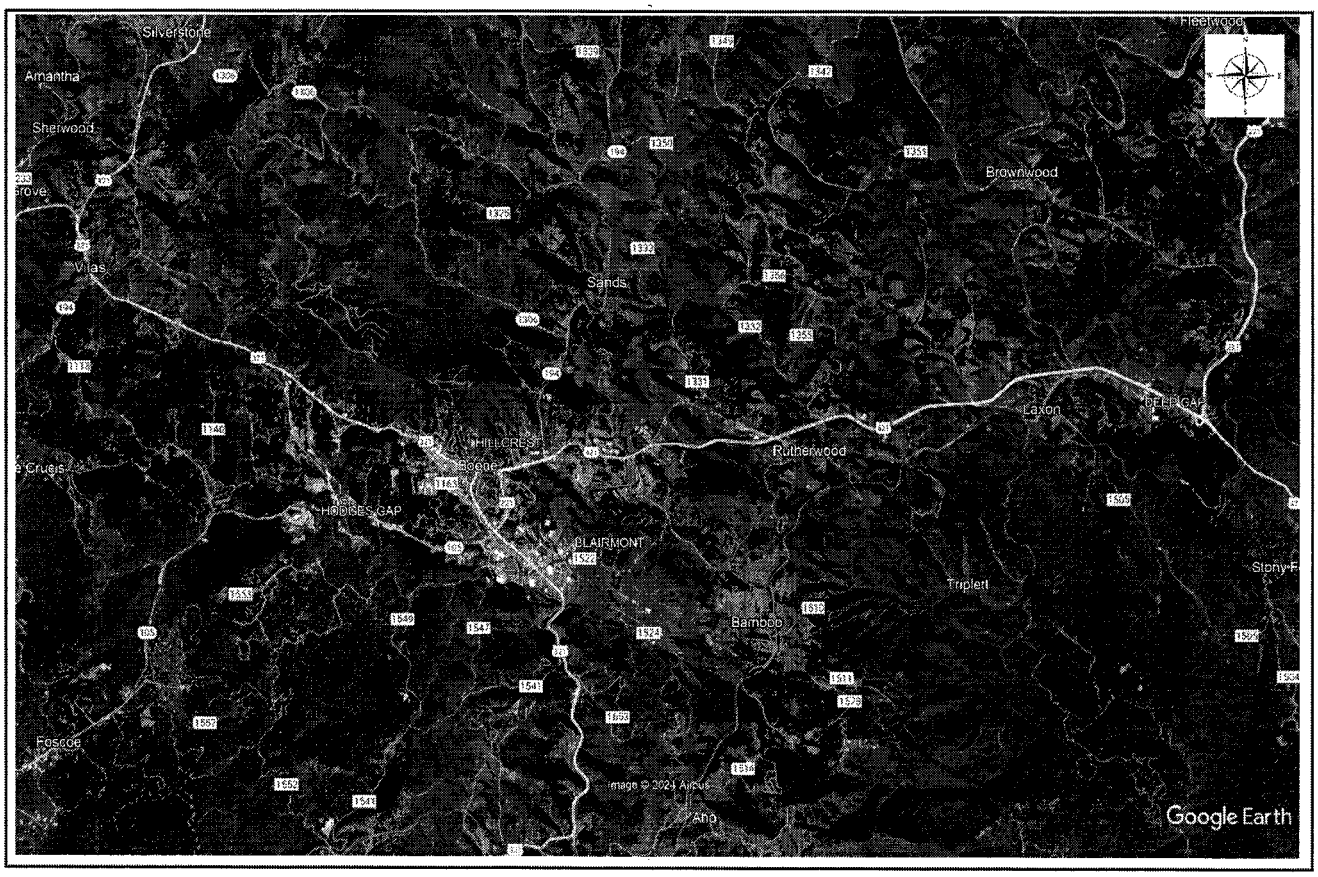
This report has been prepared in accordance with generally accepted geotechnical engineering practices for the specific application of this project. The conclusions in this report are based on the applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analyses and conclusions submitted herein are based, in part, upon the data obtained from the subsurface exploration performed for this analysis. The soil and ground water conditions can vary across the site. Opinions and conclusions are subject to change if new or additional information is submitted for review.

APPENDIX A
LOCATION INFORMATION

SITE LOCATION PLAN
RICH MOUNTAIN TOWER
Job Number: 22110700

ENGINEERED
TOWER SOLUTIONS



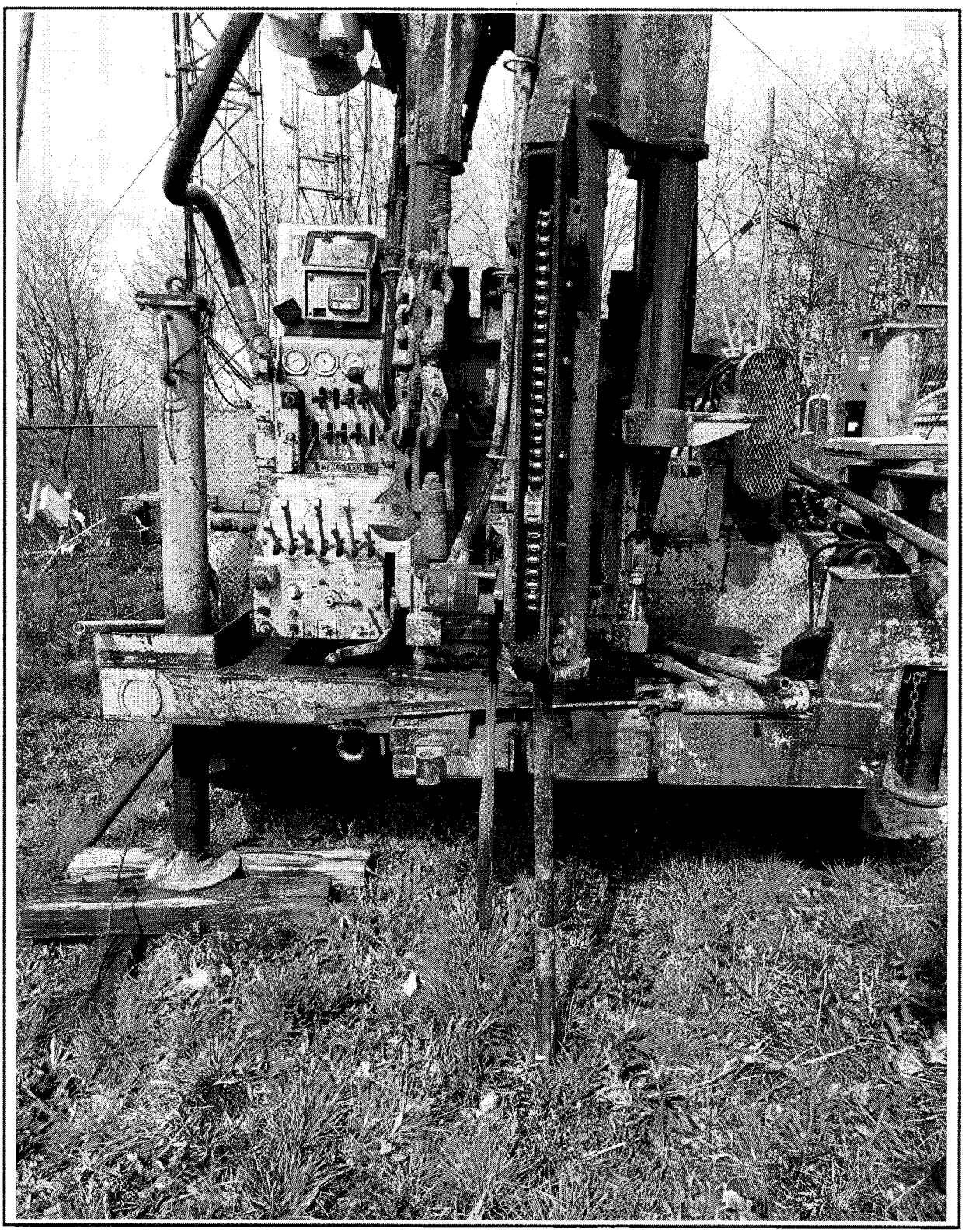
BORING LOCATION PLAN
RICH MOUNTAIN TOWER
Job Number: 22110700

ENGINEERED
TOWER SOLUTIONS

May 20, 2024 | 14

ENGINEERED
TOWER SOLUTIONS

SITE PHOTO
RICH MOUNTAIN TOWER
Job Number: 22110700



APPENDIX B
SOIL TEST BORING

BORING NUMBER B-1

ENGINEERED TOWER SOLUTIONS

CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/6/2024
COORDINATES 36.2332, -81.6986
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 14.70 ft / Elev 4663.30 ft
LOGGED BY M. Nesbit
AT END OF DRILLING 29.10 ft / Elev 4648.90 ft
NOTES
AFTER DRILLING 14.70 ft / Elev 4663.30 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
0		**PARTIALLY WEATHERED ROCK (PWR),** Sampled as silty sand with rock fragments.	SS 1		0-18-50/5"
			SS 2		50/5"
5			SS 3		50/1"
			SS 4		50/0"
10		**GRANITE,** slighly weathered with close spaced fractures.	RC RC-1	100 (83)	
15			RC RC-2	87 (47)	
20			RC RC-3	68 (45)	
25			RC RC-4	92 (62)	
30			RC RC-5	88 (70)	
			RC RC-6	81 (78)	

Bottom of borehole at 34.0 feet.

ETS - BORING W/ROCK CORING 2 - ETS DATABASE_JUN30.GDT - 5/15/24 09:21 - \\ETS.LOCAL\ETS-PUBLIC\2022\110700_RICH MOUNTAIN TOWER\GER\RICH MOUNTAIN TOWER.GPJ

ENGINEERED
TOWER SOLUTIONS

BORING NUMBER B-2

CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/7/2024
COORDINATES 36.2331, -84.6985
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 7.20 ft / Elev 4757.80 ft
LOGGED BY M. Nesbit
AT END OF DRILLING 8.60 ft / Elev 4756.40 ft
NOTES
AFTER DRILLING 7.20 ft / Elev 4757.80 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
0		**SILTY SAND WITH GRAVEL (SM),** brown, moist, dense.	SS 1		1-3-4 (7)
		PARTIALLY WEATHERED ROCK (PWR), Sampled as silty sand with rock fragments.	SS 2		24-50/4"
5			SS 3		50/3"
			SS 4		50/1"
10			SS 5		50/2"

Bottom of borehole at 10.0 feet.

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ENGINEERED
TOWER SOLUTIONS

BORING NUMBER B-3

CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/7/2024
COORDINATES 36.2331, -81.6986
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 7.20 ft / Elev 4668.80 ft
LOGGED BY M. Nesbit
AT END OF DRILLING 7.20 ft / Elev 4668.80 ft
NOTES
AFTER DRILLING 7.20 ft / Elev 4668.80 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
0		**SILTY SAND (SM),** brown, moist, loose to medium dense.	SS 1		0-3-3 (6)
			SS 2		4-5-13 (18)
5		**SILTY SAND (SM),** brown, moist, very dense.	SS 3		16-30-22 (52)
		PARTIALLY WEATHERED ROCK (PWR), Sampled as silty sand with rock fragmentss.	SS 4		34-50/5"
			SS 5		50/0"

Bottom of borehole at 8.5 feet.

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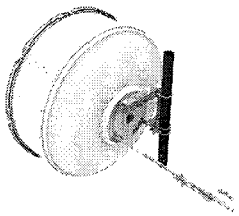
HX6-6W

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

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

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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

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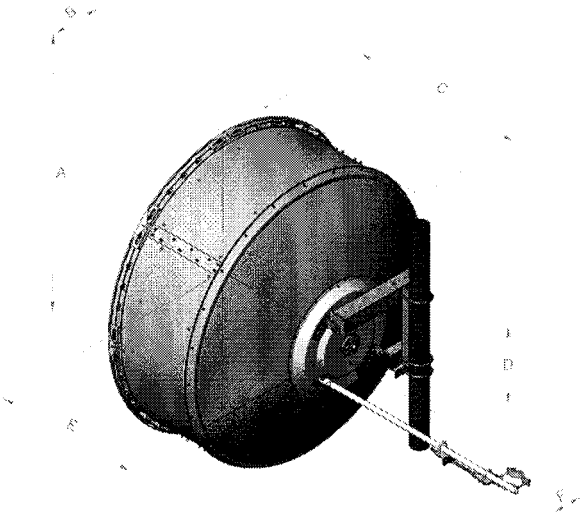
Antenna Dimensions and Mounting Information



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

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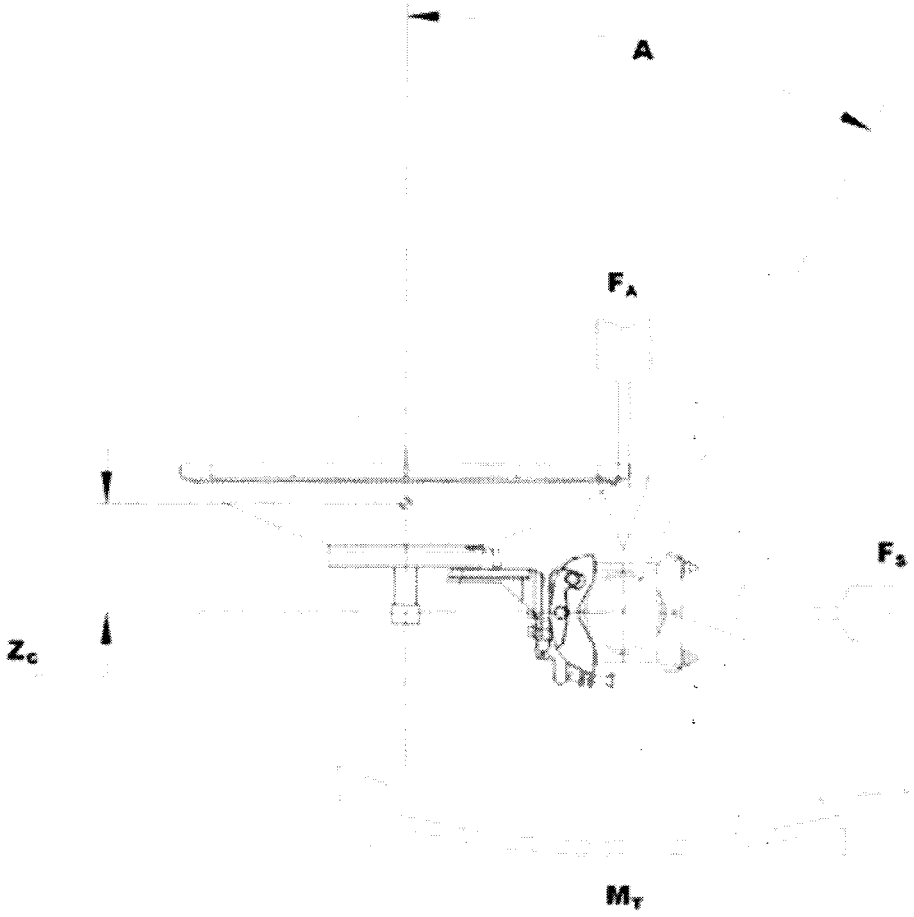
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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

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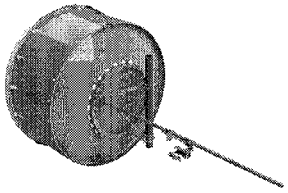
HX8-6W

Base Product



2.4m | 8ft ValuLine® High Performance, High XPD Antenna, dual-polarized, 5.925 – 7.125 GHz

Product Classification

Product Type	Microwave antenna

General Specifications

Antenna Type	HX - ValuLine® High Performance, High XPD Antenna, dual-polarized
Polarization	Dual
Side Struts, Included	1
Side Struts, Optional	4

Dimensions

Diameter, nominal	2.4 m | 8 ft

Electrical Specifications

Operating Frequency Band	5.925 – 7.125 GHz
Gain, Low Band	40.8 dBi
Gain, Mid Band	41.6 dBi
Gain, Top Band	42.4 dBi
Boresite Cross Polarization Discrimination (XPD)	33 dB
Front-to-Back Ratio	70 dB
Beamwidth, Horizontal	1.3 °
Beamwidth, Vertical	1.3 °
Return Loss	26 dB
VSWR	1.1
Radiation Pattern Envelope Reference (RPE)	7389
Electrical Compliance	ACMA FX03_6b, 6p7b | ETSI 302 217 Class 3 | IC 3059A | IC 3064A | US FCC Part 101A | US FCC Part 74A

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HX8-6W

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	40.7 dBi
Beamwidth, Horizontal	1.3 °
Beamwidth, Vertical	1.3 °

Mechanical Specifications

Compatible Mounting Pipe Diameter	115 mm | 4.5 in
Fine Azimuth Adjustment Range	±5°
Fine Elevation Adjustment Range	±5°
Wind Speed, operational	201 km/h | 124.896 mph
Wind Speed, survival	200 km/h | 124.274 mph

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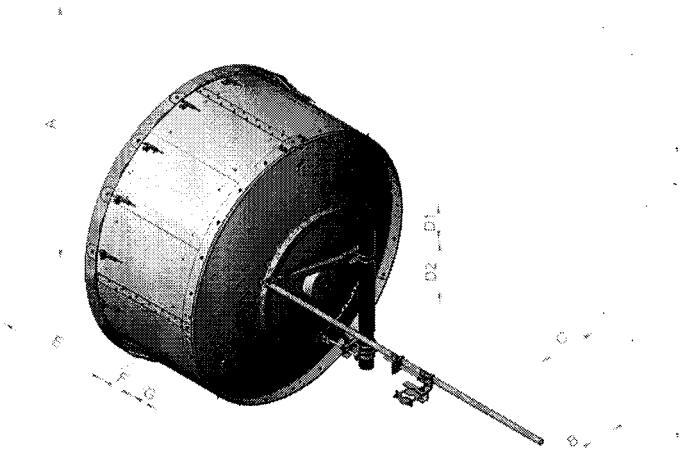
HX8-6W

Antenna Dimensions and Mounting Information

HX8



Dimensions in inches (mm)

Antenna size, ft (m)	A	B	C	D1	D2	E	F	G
8 (2.4)	95.1 (2416)	8.0 (203)	22.5 (572)	14.1 (357)	23.6 (600)	42.4 (1078)	12.1 (306)	10.3 (262)

Wind Forces at Wind Velocity Survival Rating

Axial Force (FA)	10599 N | 2,382.751 lbf
Angle α for MT Max	-140 °
Side Force (FS)	4594 N | 1,032.773 lbf
Twisting Moment (MT)	-6518 N-m | -57,689.16 in lb
Force on Inboard Strut Side	11263 N | 2,532.024 lbf
Zcg without Ice	532 mm | 20.945 in
Zcg with 1/2 in (12 mm) Radial Ice	675 mm | 26.575 in
Weight with 1/2 in (12 mm) Radial Ice	342 kg | 753.98 lb

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HX8-6W

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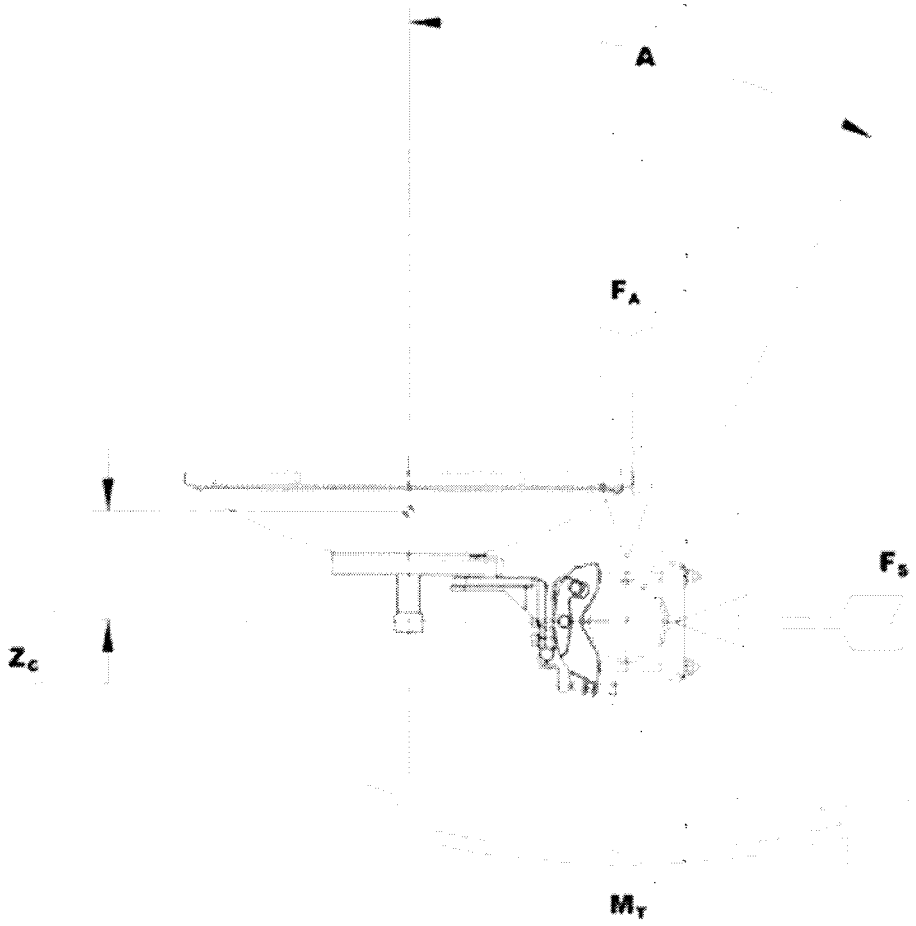
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	187 kg | 412.264 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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

Twisting Moment (MT)

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

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ENGINEERED
TOWER SOLUTIONS

Site Name:	Rich Mountain Tower
Site Address:	759 Fire Tower Road, Boone, NC 28607
Latitude:	36.2330639 °
Longitude:	-81.6986889°
Structure Type:	Proposed 199.0-ft Self Support Tower
Contact Information:	Contact the owner with questions regarding the content of this Document. All questions or concerns shall be directed to the contact stipulated in the Bid Document.
Design Capacity:	The tower shall be designed so that, once installed with all loading as shown in Table 1 - Design Antenna/Coax Loading, the tower superstructure and substructure shall **NOT exceed 95% of its capacity**. If, upon evaluation, the design computes to be at a greater stress level than specified the bid will not be accepted. All bidders must provide design calculations verifying that this Design Capacity Requirement is met; see "Deliverables" for details.
Materials:	Tower structures shall utilize structural steel round or polygonal poles only. No other materials or shapes shall be given consideration. Structural bolts must meet the ASTM A325 specification, or equivalent if approved by the design engineer of record.
Design Fall Radius:	☐ No Fall Radius Required ☒ Fall Radius Required from Centerline of Tower: 50-ft
Standard:	☒ As a minimum, all towers shall be designed to the requirements of ANSI/TIA-222-G, including released addendums
Design Wind Speed:	☒ 150 mph ultimate 3-second gust wind speed (converted to an equivalent 116 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 Residential Building Code (2015 IBC) and ASCE 7-10.
Structure Class:	☐ Structure Class I – Low Hazard ☐ Structure Class II – Significant Hazard (Default) ☒ Structure Class III – Substantial Hazard
Risk Category:	☐ Risk Category I – Low Hazard ☐ Risk Category II – Moderate Hazard (Default) ☐ Risk Category III – Substantial Hazard ☒ Risk Category IV – Essential Hazard (Essential Communications)
Topographic Category:	☒ Category I – No abrupt changes in general topography (Topographic effects are already considered in the prescribed windspeed above per the 2018 NCBC Chapter 3). ☐ Category II – Structures located at or near the crest of an escarpment ☐ Category III – Structures located in the upper half of a hill ☐ Category IV – Structures located in the upper half of a ridge ☐ Category V – Wind speed up criteria based on a site-specific investigation (see attached)
Exposure Category:	☐ Exposure B – Urban and Suburban Areas ☒ Exposure C – Open Terrain where Exposure B or D does not apply. ☐ Exposure D – Flat, Unobstructed Shorelines
Design Ice Loading:	☐ ANSI/TIA-222-H: x.xx inch escalating with a xx mph 3 second gust wind speed ☒ ANSI/TIA-222-G: 0.75 inch escalating with a 30 mph 3 second gust wind speed ☐ ANSI/TIA/EIA-222-F: x.xx inch escalating with an xx mph fastest mile wind speed

Seismic:
- ☒ Seismic Ss: 0.263 / Seismic S1: 0.097 / Seismic TL: 12
- ☐ Ss exceeds 1.0. Seismic loads shall be evaluated in accordance with the Standard

Tower Finish:
- ☒ Galvanized
- ☐ Painted per FAA Advisory Circular AC 70/7460-1K
- ☐ Painted per Local Requirements

All structural steel products shall be hot dip galvanized in accordance with ASTM A123 specifications. Tower manufacturer shall produce documentation verifying the appropriate galvanizing process is utilized. All steel hardware shall be galvanized in accordance with ASTM A153 or ASTM B695 specifications.

Tower Lights:
- ☐ Not Required
- ☒ Tower lighting system with E2 Avian Compliant Obstruction Lighting System (white strobes by day, and red lights at night). Beacons and Obstruction lights shall be all LED and Dual Red/White medium intensity and shall meet the requirements of FAA Advisory Circular AC 70/7460-1K. Towers 200-ft to 350-ft
- ☐ Tower lighting system with E2 Avian Compliant Obstruction Lighting System (white strobes by day, and red lights at night). Beacons and Obstruction lights shall be all LED and Dual Red/White medium intensity and shall meet the requirements of FAA Advisory Circular AC 70/7460-1K. A lighting system by Drake Lighting, that complies with the FAA regulation, is required. Towers over 350-ft

Grounding:
- ☒ Grounding, lightning protection, and surge protection systems shall be installed as required in compliance with R56 specifications and the construction documents. Coordinate with the Duke Energy bid administrator for the portion of tower grounding scope of work as shown in the construction documents. Minimum of the tower ground ring, connections from the ring to the tower, the bottom tower ground bar, and the connection from the tower ground ring to the bottom ground bar shall be included.

Climbing Facilities:
- ☐ Not Required
- ☒ A safety fall protection system incorporating a 3/8" diameter stainless steel cable meeting OSHA/ANSI specifications shall be installed the full height of the structure one tower leg and another full height cable on a full height face mounted external ladder. Additionally, step pegs are required on the other two legs to the height of the mid markers.
- ☐ A safety fall protection system incorporating a 3/8" diameter stainless steel cable meeting OSHA/ANSI specifications shall be installed the full height of the pole with full height step pegs.

Ice Bridge:
- ☒ Not required; Another contractor to provide
- ☐ Provide an option for Ice Bridge

Transmission Ladder:
- ☐ Not required; carrier to provide
- ☒ Provide (1) Transmission Ladder. Include "per foot" pricing.

Foundation:
- ☐ Provide Preliminary Design using Presumptive Soil Parameters per the TIA-222-G Standard (Annex F). A Geotechnical Report will be provided later for the final foundation design.
- ☒ Design with Geotechnical Report provided. In accordance with ANSI/TIA-222-G, Annex A, Section A.9.0, the tower manufacturer shall ensure the proper development of anchor rods and anchorage materials.

Antenna Mounts:
- ☐ Not required; Antenna Mounts provided by carrier.
- ☒ Provide mounts per Table 1 – Design Antenna/Coax Loading

Additional Design Requirements

Structural Guidelines:

All leg capacities for lattice towers shall be computed utilizing a global effective length factor (K) of 1.0. All leg capacities shall be calculated utilizing the working points between panel points. Utilizing the side (gusset) plate length to reduce the un-braced length of the leg is not permitted. Leg members must consist only of steel solid rod and angle members. Tubular steel leg members are not permitted (Not applicable to monopoles).

For round leg latticed towers, bracing member capacities shall be calculated considering the effective length to be the span between the weld lines of the gusset plates at the face of the round legs for both out-of-plane and in-plane buckling modes (Not applicable to monopoles).

Hardened galvanized flat washers (ASTM F436) shall only be used in fully tensioned bolted connections and connections that utilize oversized or slotted holes.

Linear Appurtenances:

The tower analysis model shall include all feed lines, feed line ladders, step pegs, climbing ladder and safety climb.

Discrete Appurtenances:

Effective Projected Area (EPA)A for antennas shall be determined according to TIA-222-G, Section 2.6.9.2, Design Wind Force on Appurtenances. If antenna or mount areas are specified, the provided values shall be used in lieu of calculated values. If height, width, and depth dimensions are provided by the antenna manufacturer, the panel shall be treated as a flat rectangular panel. Force coefficients shall be determined based on antenna aspect ratios and multiplied by the projected areas to calculate front and side EPAs.

Wind tunnel test results shall NOT be used unless the results have been provided to ETS and proposed effective areas have been approved. Back-calculating wind areas from published antenna manufacturer's wind loads are prohibited.

Deliverables: [Once awarded, Final Deliverables shall bear the seal of a North Carolina Professional Engineer]

A PDF softcopy of all deliverables shall be sent to ETS for recording purposes. All tower designs shall be complete with the following:

- General Notes
- Profile drawing (with tower reactions, design drawings, materials grades and referenced codes and standards shall be clearly shown)
- Foundation design drawings
- Supporting design calculations for tower and foundation
- Listing of main structural members
- Mount documentation specifically showing total EPA

ENGINEERED
TOWER SOLUTIONS

Table 1 - Design Antenna/Coax Loading

PROPOSED ANTENNA SCHEDULE								
OWNER	**QTY.**	**SIZE (FT)**	**TYPE**	**MANUFACTURER - ANTENNA MODEL NUMBER**	**ANTENNA AZIMUTH**	**MOUNT ELEVATION**	**LEG**	**CABLE (QTY.) TYPE**
WATAUGA COUNTY	1	-	OMNI	RFS - CCB07-11	-	175'-0"	A	(1) 7/8" & (1) 1/2"
WATAUGA COUNTY	1	-	OMNI	RFS - CCB07-11	-	175'-0"	B	(1) 7/8"
WATAUGA COUNTY	1	-	TTA	TTA	-	175'-0"	-	-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	OMNI	RFS - CCB07-11	-	150'-0"	A	(1) 1-5/8"
WATAUGA COUNTY	1	-	OMNI	RFS - CCB07-11	-	150'-0"	B	(1) 1-5/8"
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO BUCKEYE	COMMSCOPE - HX6-6W-6WH	316°	140'-0"	C	(1) EW63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO WATAUGA CO TRAN STA	COMMSCOPE - HX6-6W-6WH	104°	100'-0"	B	(1) EW63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO PHOENIX	COMMSCOPE - HX6-6W-6WX	36.6°	85'-0"	A	(1) EW63
WATAUGA COUNTY	1	-	DISH TO HAWKS NEST	COMMSCOPE - HX6-6W-6WX	227°	75'-0"	B	(1) EW63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note 1: Builder will supply side arms (4) with side struts (4) for only the omni and dipole antennas listed as current. However, engineer shall design the tower so that all omni and dipole antennas, including future, have side arms with side struts considered in the design loading (9 total).

Note 2: Builder will supply pipe mounts (4), high wind kits (4), and ice shields (4) for only the dish antennas listed as current. However, engineer shall design the tower so that all dish antennas, including future, have pipe mounts, high wind kits, and ice shields considered in the design loading (6 total).

ENGINEERED
TOWER SOLUTIONS

Appendix A

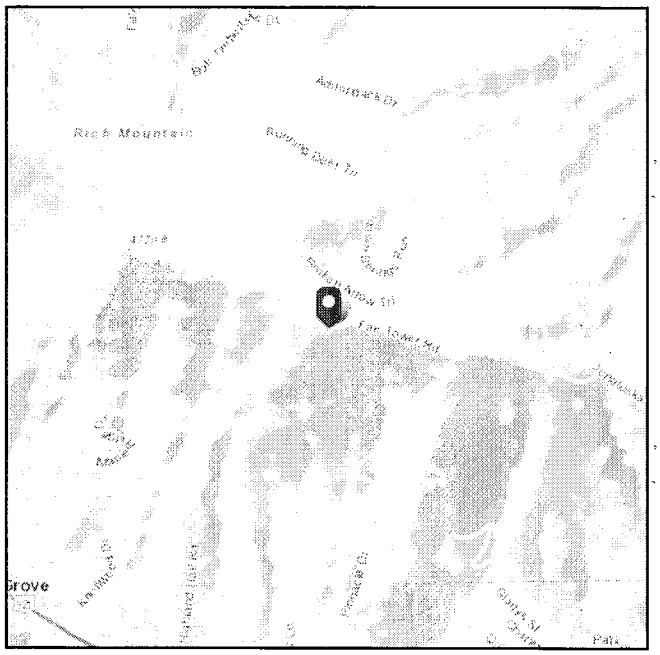
Verification of Design Loads

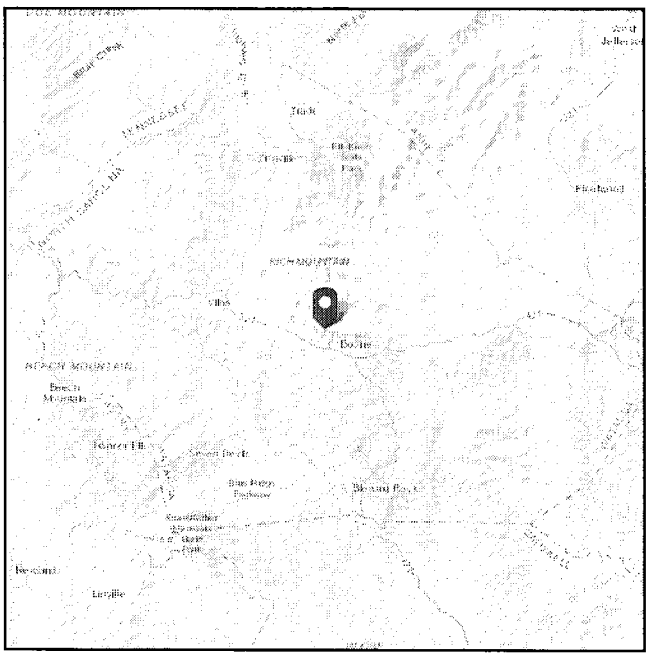
ASCE Hazards Report

Address:
No Address at This Location

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

Latitude: 36.233064
Longitude: -81.698689
Elevation: 4667.74622517496 ft (NAVD 88)





Wind

Results:

Wind Speed	120 Vmph	150 mph ultimate 3-second wind speed (converted to an equivalent 116 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 Residential Building Code Chapter 3. Topographic effects are already considered per 2018 NCBC. 116 mph nominal wind speed to be used with Structural Class III Importance Factor of 1.15 and Topographic Category 1.
10-year MRI	76 Vmph	
25-year MRI	84 Vmph	
50-year MRI	90 Vmph	
100-year MRI	96 Vmph	
Special		Special Wind Region -- Mountainous terrain, gorges, and special wind regions shown in Fig. 26.5-1 shall be examined for unusual wind conditions. The Authority Having Jurisdiction shall, if necessary, adjust the values given in Fig. 26.5-1 to account for higher local wind speeds. Such adjustment shall be based on meteorological information and an estimate of the basic wind speed obtained in accordance with the provisions in Section 26.5.3.

Data Source: ASCE/SEI 7-10, Fig. 26.5-1B and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014
Date Accessed: Fri Apr 04 2025

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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.

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Seismic

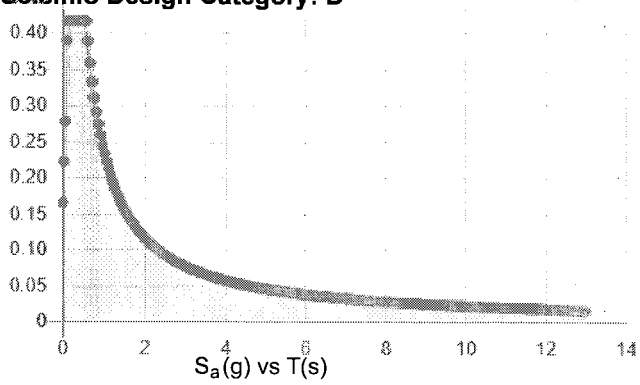
Site Soil Class: D - Stiff Soil

Results:

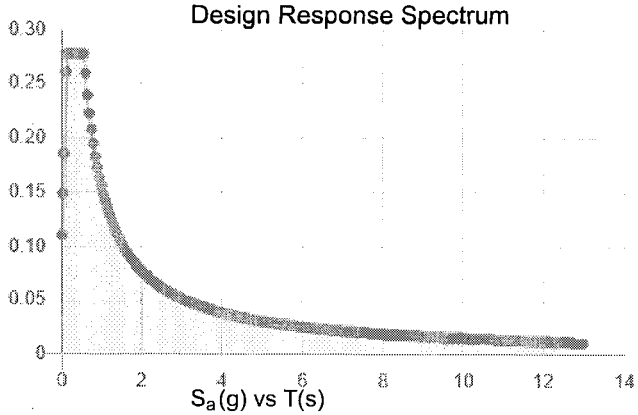
S_S :	0.263	S_{D1} :	0.156
S_1 :	0.097	T_L :	12
F_a :	1.59	PGA :	0.137
F_v :	2.4	PGA_M :	0.209
S_{MS} :	0.418	F_{PGA} :	1.526
S_{M1} :	0.234	I_e :	1.5
S_{DS} :	0.278		

Seismic Design Category: D

MCE_R Response Spectrum



Design Response Spectrum



Data Accessed: **Fri Apr 04 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.

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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:	Fri Apr 04 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.

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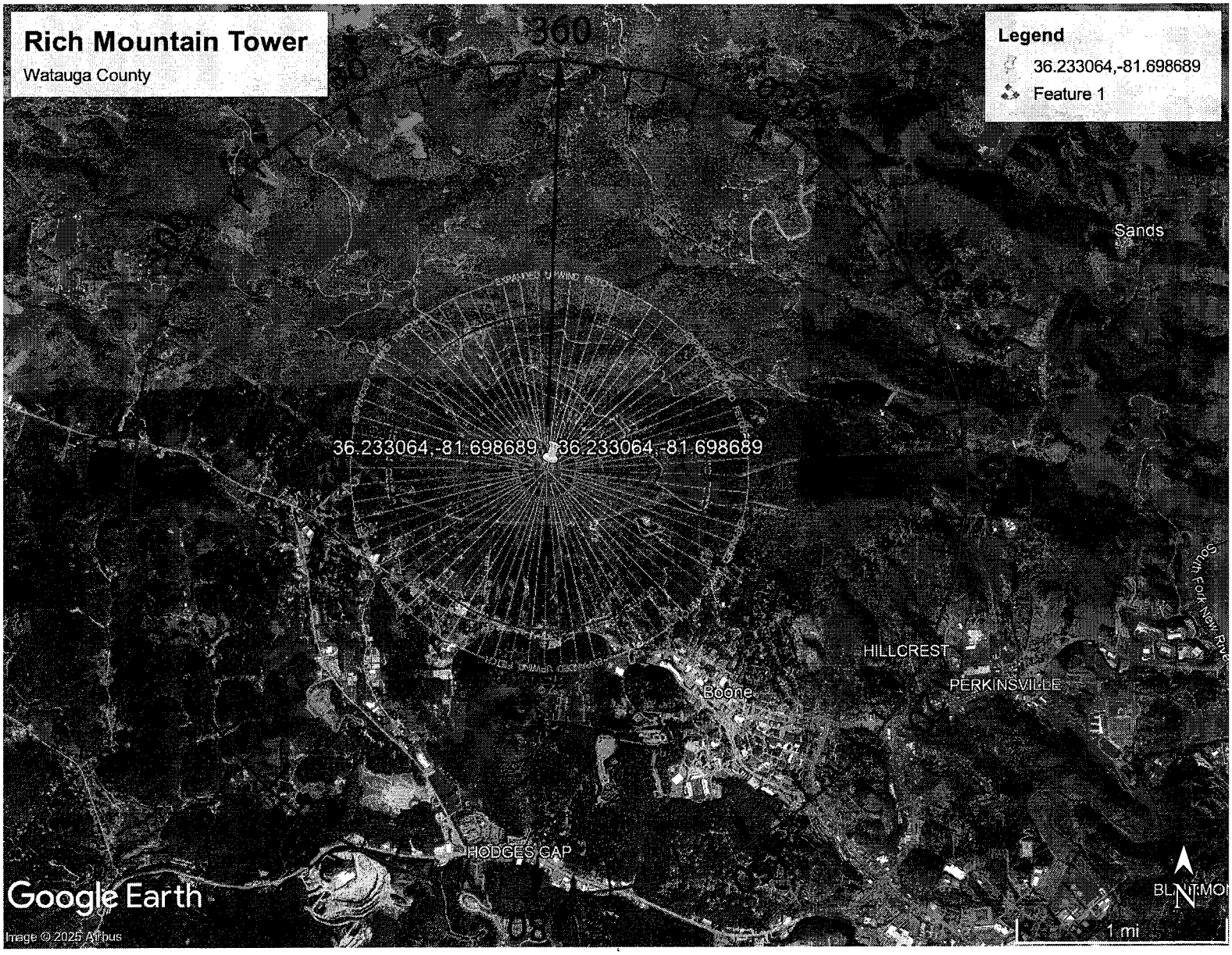
TOWER SOLUTIONS

Appendix B

Site Vicinity and Location Map


Rich Mountain Tower
Watauga County
Legend
36.233064,-81.698689
Feature 1
360
Sands
36.233064,-81.698689
36.233064,-81.698689
South Fork New River
HILLCREST
PERKINSVILLE
Boone
HODGES GAP
Google Earth
Image © 2025 Airbus
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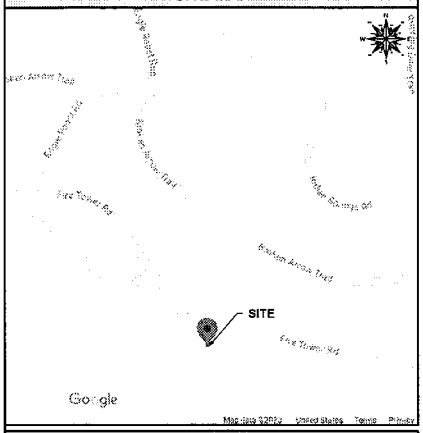
1 mi

SITE MAP



GENERAL NOTES

THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION, THEREFORE HANDICAP ACCESS IS NOT REQUIRED FOR ROUTINE MAINTENANCE. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE. NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.

SCOPE OF WORK

PROPOSED SCOPE OF WORK INCLUDES: INSTALLING A NEW 199'-0" SELF SUPPORT TOWER, INSTALLING A NEW VFP, MODEL 7459, METAL EQUIPMENT SHELTER WITH A SLAB MOUNTED ICE SHIELD; ADJUSTING THE EXISTING FENCE AND ADDING ADDITIONAL FENCE AROUND THE COMPOUND; ADDING PARKING / TURN-A-ROUND AREA.

CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE FOLLOWING CODES:

- 2018 N.C. BUILDING CODE (2015 IBC W/ AMENDMENTS)
- 2018 N.C. EXISTING BUILDING CODE (2015 IEBC W/ AMENDMENTS)
- 2018 N.C. FIRE CODE (2015 IFC W/ AMENDMENTS)
- 2018 N.C. FUEL GAS CODE (2015 IFGC W/ AMENDMENTS)
- 2018 N.C. MECHANICAL CODE (2015 IMC W/ AMENDMENTS)
- 2018 N.C. PLUMBING CODE (2015 IPC W/ AMENDMENTS)
- 2020 N.C. ELECTRICAL CODE (2020 NEC)

811 Know what's below. Call before you dig.

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE & LONGITUDE:
N 36° 13' 59.03", W 81° 41' 55.28"

INDEX OF SHEETS

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GN-4 TO GN-6	NC APPENDIX B I THRU V
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C-1.1	DETAILED SITE PLAN
C-1.2	DIMENSIONED SITE PLAN
C-2	TOWER ELEVATION
C-3.1	ANTENNA SCHEDULE
C-3.2 TO C-3.4	ANTENNA LAYOUTS
C-4.1	SHELTER DETAILS
C-4.2	SHELTER & ICE SHIELD DETAILS
C-4.3	SHELTER FOUNDATION DETAILS
C-4.4	GENERATOR & GEN. FOUNDATION DETAILS
C-4.5	ICE BRIDGE DETAILS
C-4.6	SURFACE & SLOPE DETAILS
C-4.7	FENCE DETAILS
C-4.8	SILT FENCE DETAILS
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E-4	PANEL SCHEDULES
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G-2.1	GROUNDING DETAILS I
G-2.2	GROUNDING DETAILS II

SITE PHOTO

SITE SUMMARY

SITE TYPE:	NEW CONSTRUCTION
STRUCTURE TYPE:	SELF SUPPORT
STRUCTURE OWNER:	WATAUGA COUNTY
STRUCTURE HEIGHT (AGL):	199'-0"
OCCUPANCY TYPE:	UTILITY & MISCELLANEOUS (U)
STRUCTURE LATITUDE:	N 36° 13' 59.03" (36.2330639°)
STRUCTURE LONGITUDE:	W 81° 41' 55.28" (-81.6986889°)
JURISDICTION:	WATAUGA COUNTY
COUNTY:	WATAUGA
PARCEL ID:	2901440447000
GROUND ELEV. (NAVD 88):	4867.62'±

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-792-2715
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
TITLE PAGE

SHEET # T-1 | CURRENT REV # 3 | ETS # 22110700

GENERAL NOTES

1. ALL SITE WORK SHALL BE COMPLETED AS INDICATED ON THE DRAWINGS AND CARRIER PROJECT SPECIFICATIONS.
2. GENERAL CONTRACTOR SHALL VISIT THE SITE AND SHALL FAMILIARIZE THEMSELVES WITH ALL CONDITIONS AFFECTING THE PROPOSED WORK AND SHALL MAKE PROVISIONS. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH ALL CONTRACT DOCUMENTS, FIELD CONDITIONS, DIMENSIONS, AND SHALL CONFIRM THAT THE WORK MAY BE ACCOMPLISHED AS SHOWN PRIOR TO PROCEEDING WITH CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. GENERAL CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF WORK.
4. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES, AND APPLICABLE REGULATIONS.
5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED IN THESE DRAWINGS.
6. PLANS ARE NOT TO BE SCALED, THESE PLANS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY UNLESS OTHERWISE NOTED. DIMENSIONS SHOWN ARE TO FINISHED SURFACES UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS THE MINIMUM REQUIRED CLEARANCE. THEREFORE, IT IS CRITICAL TO FIELD VERIFY DIMENSIONS. SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A CLARIFICATION FROM THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK. DETAILS ARE INTENDED TO SHOW DESIGN INTENT. MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF WORK AND PREPARED BY THE ENGINEER PRIOR TO PROCEEDING WITH WORK.
7. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN IN THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE ENGINEER PRIOR TO PROCEEDING.
9. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF WORK AREA, ADJACENT AREAS AND BUILDING OCCUPANTS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL OSHA REQUIREMENTS AND THE LOCAL JURISDICTION.
10. GENERAL CONTRACTOR SHALL COORDINATE WORK AND SCHEDULE WORK ACTIVITIES WITH OTHER DISCIPLINES.
11. ERECTION SHALL BE DONE IN WORKMANLIKE MANNER BY COMPETENT EXPERIENCED WORKMEN IN ACCORDANCE WITH APPLICABLE CODES AND THE BEST ACCEPTED PRACTICE. ALL MEMBERS SHALL BE LAID PLUMB AND TRUE AS INDICATED IN THE DRAWINGS.
12. SEAL PENETRATIONS THROUGH FIRE RATED AREAS WITH UL LISTED MATERIALS APPROVED BY LOCAL JURISDICTION. CONTRACTOR SHALL KEEP AREA CLEAN, HAZARD FREE, AND DISPOSE OF ALL DEBRIS.
13. THE SCOPE OF WORK FOR THIS PROJECT IS REPRESENTED BY DARK SHADED LINES AND NOTES. CONTRACTOR SHALL NOTIFY THE GENERAL CONTRACTOR OF ANY EXISTING CONDITIONS THAT DEVIATE FROM THE DRAWINGS PRIOR TO BEGINNING CONSTRUCTION.
14. CONTRACTOR SHALL PROVIDE WRITTEN NOTICE TO THE CONSTRUCTION MANAGER 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
15. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER.
16. THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.
17. GENERAL CONTRACTOR SHALL COORDINATE AND MAINTAIN ACCESS FOR ALL TRADES AND CONTRACTORS TO THE SITE AND/OR BUILDING.
18. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR SECURITY OF THE SITE FOR THE DURATION OF CONSTRUCTION UNTIL JOB COMPLETION.
19. THE GENERAL CONTRACTOR SHALL MAINTAIN IN GOOD CONDITION ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS ON THE PREMISES AT ALL TIMES.
20. THE GENERAL CONTRACTOR SHALL PROVIDE PORTABLE FIRE EXTINGUISHERS WITH A RATING OF NO LESS THAN 2-A OR 2-A 10-B:C AND SHALL BE WITHIN 25 FEET OF TRAVEL DISTANCE TO ALL PORTIONS OF WHERE THE WORK IS BEING COMPLETED DURING CONSTRUCTION.

GENERAL NOTES (CONTINUED)

21. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY THE ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR THE WORKING CREW, THIS SHALL INCLUDE BUT NOT BE LIMITED TO A) FALL PROTECTION, B) CONFINED SPACE, C) ELECTRICAL SAFETY, AND D) TRENCHING & EXCAVATION.
22. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED, CAPPED, PLUGGED OR OTHERWISE DISCONNECTED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, AS DIRECTED BY THE RESPONSIBLE ENGINEER, AND SUBJECT TO THE APPROVAL OF THE OWNER AND/OR LOCAL UTILITIES.
23. THE AREAS OF THE OWNER'S PROPERTY DISTURBED BY THE WORK AND NOT COVERED BY THE TOWER, EQUIPMENT OR DRIVEWAY, SHALL BE GRADED TO A UNIFORM SLOPE, AND STABILIZED TO PREVENT EROSION.
24. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE FEDERAL AND LOCAL JURISDICTION FOR EROSION AND SEDIMENT CONTROL.
25. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUNDING. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
26. THE SUBGRADE SHALL BE BROUGHT TO A SMOOTH UNIFORM GRADE AND COMPACTED TO 95 PERCENT STANDARD PROCTOR DENSITY UNDER PAVEMENT AND STRUCTURES AND 90 PERCENT STANDARD PROCTOR DENSITY IN OPEN SPACE. ALL TRENCHES IN PUBLIC RIGHT OF WAY SHALL BE BACKFILLED WITH FLOWABLE FILL OR OTHER MATERIAL PRE-APPROVED BY THE LOCAL JURISDICTION.
27. ALL NECESSARY RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN A LAWFUL MANNER.
28. ALL BROCHURES, OPERATING AND MAINTENANCE MANUALS, CATALOGS, SHOP DRAWINGS, AND OTHER DOCUMENTS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR AT COMPLETION OF CONSTRUCTION AND PRIOR TO PAYMENT.
29. CONTRACTOR SHALL SUBMIT A COMPLETE SET OF AS-BUILT REDLINES TO THE GENERAL CONTRACTOR UPON COMPLETION OF PROJECT AND PRIOR TO FINAL PAYMENT.
30. CONTRACTOR SHALL LEAVE PREMISES IN A CLEAN CONDITION.
31. THE PROPOSED FACILITY WILL BE UNMANNED AND DOES NOT REQUIRE POTABLE WATER OR SEWER SERVICE, AND IS NOT FOR HUMAN HABITAT (NO HANDICAP ACCESS REQUIRED).
32. STRUCTURE IS LIMITED TO PERIODIC MAINTENANCE AND INSPECTION, APPROXIMATELY 2 TIMES PER MONTH, BY CARRIER TECHNICIANS.
33. NO OUTDOOR STORAGE OR SOLID WASTE CONTAINERS ARE PROPOSED.
34. ALL MATERIAL SHALL BE FURNISHED AND WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST CARRIER GROUNDING STANDARD. IN CASE OF A CONFLICT BETWEEN THE CONSTRUCTION SPECIFICATION AND THE DRAWINGS, THE DRAWINGS SHALL GOVERN.
35. CONTRACTORS SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS REQUIRED FOR CONSTRUCTION. IF CONTRACTOR CANNOT OBTAIN A PERMIT, THEY MUST NOTIFY THE GENERAL CONTRACTOR IMMEDIATELY.
36. CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
37. INFORMATION SHOWN ON THESE DRAWINGS WAS OBTAINED FROM SITE VISITS AND/OR DRAWINGS PROVIDED BY THE SITE OWNER. CONTRACTORS SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
38. ALL CABLE INSTALLATIONS TO FOLLOW MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.
39. NO WHITE STROBE LIGHTS ARE PERMITTED. LIGHTING IF REQUIRED, WILL MEET FAA STANDARDS AND REQUIREMENTS.

ANTENNA MOUNTING NOTES

1. ALL STEEL MATERIALS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS", UNLESS NOTED OTHERWISE.
2. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC-COATING (HOT-DIP) ON IRON AND STEEL HARDWARE", UNLESS NOTED OTHERWISE.
3. DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.
4. ALL ANTENNA MOUNTS SHALL BE INSTALLED WITH LOCK NUTS, DOUBLE NUTS AND SHALL BE TORQUED TO MANUFACTURER'S RECOMMENDATIONS.
5. CONTRACTOR SHALL INSTALL ANTENNA PER MANUFACTURER'S RECOMMENDATION FOR INSTALLATION AND GROUNDING.
6. PRIOR TO SETTING ANTENNA AZIMUTHS AND DOWNTILTS, ANTENNA CONTRACTOR SHALL CHECK THE ANTENNA MOUNT FOR TIGHTNESS AND ENSURE THAT THEY ARE PLUMB. ANTENNA AZIMUTHS SHALL BE SET FROM TRUE NORTH AND BE ORIENTED WITHIN +/- 5% AS DEFINED BY THE RFDS. ANTENNA DOWNTILTS SHALL BE WITHIN +/- 0.5% AS DEFINED BY THE RFDS. REFER TO ND-00246.

TORQUE REQUIREMENTS

1. ALL RF CONNECTIONS SHALL BE TIGHTENED BY A TORQUE WRENCH.
2. ALL RF CONNECTIONS, GROUNDING HARDWARE AND ANTENNA HARDWARE SHALL HAVE A TORQUE MARK INSTALLED IN A CONTINUOUS STRAIGHT LINE FROM BOTH SIDES OF THE CONNECTION.
3. RF CONNECTION BOTH SIDES OF THE CONNECTOR.
4. GROUNDING AND ANTENNA HARDWARE ON THE NUT SIDE STARTING FROM THE THREADS TO THE SOLID SURFACE. EXAMPLE OF SOLID SURFACE: GROUND BAR, ANTENNA BRACKET METAL.
5. ALL 8M ANTENNA HARDWARE SHALL BE TIGHTENED TO 9 LB-FT (12 NM).
6. ALL 12M ANTENNA HARDWARE SHALL BE TIGHTENED TO 43 LB-FT (58 NM).
7. ALL GROUNDING HARDWARE SHALL BE TIGHTENED UNTIL THE LOCK WASHER COLLAPSES AND THE GROUNDING HARDWARE IS NO LONGER LOOSE.
8. ALL DIN TYPE CONNECTIONS SHALL BE TIGHTENED TO 18-22 LB-FT (24.4-29.8 NM).
9. ALL N TYPE CONNECTIONS SHALL BE TIGHTENED TO 15-20 LB-IN (1.7-2.3 NM).

COAXIAL CABLE NOTES

1. TYPES AND SIZES OF THE ANTENNA CABLE ARE BASED ON ESTIMATED LENGTHS. PRIOR TO ORDERING CABLE, CONTRACTOR SHALL VERIFY ACTUAL LENGTH BASED ON CONSTRUCTION LAYOUT AND NOTIFY THE PROJECT MANAGER IF ACTUAL LENGTHS EXCEED ESTIMATED LENGTHS.
2. CONTRACTOR SHALL VERIFY THE DOWN-TILT OF EACH ANTENNA WITH A DIGITAL LEVEL.
3. CONTRACTOR SHALL CONFIRM COAX COLOR CODING PRIOR TO CONSTRUCTION. REFER TO "ANTENNA SYSTEM LABELING STANDARD" ND-00027 LATEST VERSION.
4. ALL JUMPERS TO THE ANTENNAS SHALL BE 1/2" DIA. LDF AND SHALL NOT EXCEED 6'-0".
5. ALL COAXIAL CABLE SHALL BE SECURED TO THE DESIGNED SUPPORT STRUCTURE, IN AN APPROVED MANNER, AT DISTANCES NOT TO EXCEED 4'-0" OC.
6. CONTRACTOR SHALL FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS REGARDING BOTH THE INSTALLATION AND GROUNDING OF ALL COAXIAL CABLES, CONNECTORS, ANTENNAS, AND ALL OTHER EQUIPMENT.
7. CONTRACTOR SHALL WEATHERPROOF ALL ANTENNA CONNECTORS WITH SELF AMALGAMATING TAPE. WEATHERPROOFING SHALL BE COMPLETED IN STRICT ACCORDANCE WITH INDUSTRY STANDARDS.

GENERAL CABLE AND EQUIPMENT NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY ANTENNA, TMAS, DIPLEXERS, AND COAX CONFIGURATION, MAKE AND MODELS PRIOR TO INSTALLATION.
2. ALL CONNECTIONS FOR HANGERS, SUPPORTS, BRACING, ETC. SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
3. CONTRACTOR SHALL REFERENCE THE STRUCTURAL ANALYSIS/DESIGN DRAWINGS FOR DIRECTIONS ON CABLE DISTRIBUTION/ROUTING.

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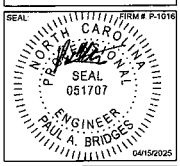

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SHEET TITLE:
GENERAL NOTES I

SHEET # **GN-1** | CURRENT REV # 3 | ETS # 22110700

GENERAL CABLE AND EQUIPMENT NOTES

1. ALL OUTDOOR RF CONNECTORS/CONNECTIONS SHALL BE WEATHERPROOFED, EXCEPT THE RET CONNECTORS. USING BUTYL TAPE AFTER INSTALLATION AND FINAL CONNECTIONS ARE MADE. BUTYL TAPE SHALL HAVE A MINIMUM OF ONE-HALF TAPE WIDTH OVERLAP ON EACH TURN AND EACH LAYER SHALL BE WRAPPED THREE TIMES. WEATHERPROOFING SHALL BE SMOOTH WITHOUT BUCKLING. BUTYL BLEEDING IS NOT ALLOWED.
2. IF REQUIRED TO PAINT ANTENNAS AND/OR COAX:
   - 2.1. TEMPERATURE SHALL BE ABOVE 50° F.
   - 2.2. PAINT COLOR MUST BE APPROVED BY BUILDING OWNER/LANDLORD.
   - 2.3. FOR REGULATED TOWERS, FAA/FCC APPROVED PAINT IS REQUIRED.
   - 2.4. DO NOT PAINT OVER COLOR CODING OR ON EQUIPMENT MODEL NUMBERS.
3. ALL PROPOSED GROUND BAR DOWNLEADS ARE TO BE TERMINATED TO THE EXISTING ADJACENT GROUND BAR DOWNLEADS A MINIMUM DISTANCE OF 4'-0" BELOW GROUND BAR. TERMINATIONS MAY BE EXOTHERMIC OR COMPRESSION.
4. ALL CONNECTIONS FOR HANGERS, SUPPORTS, BRACING, ETC. SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATION & RECOMMENDATIONS,NO BOLT THREADS TO PROTRUDE MORE THAN 1-1/2" [.038M].
5. 90 SHORT SWEEPS UNDER ANTENNA ARM. ALL CABLES MUST ONLY TRANSITION ON THE INSIDE OR BOTTOM OF ARMS (NO CABLE ON TOP OF ARMS).
6. USE 90 CONNECTOR AT CABLE CONNECTION TO ANTENNAS.
7. PLACE GPS ON ARM WITH SOUTHERN SKY EXPOSURE AT MINIMUM 6' [1.83] FROM TRANSMIT ANTENNA, WHICH IS 24" [.61M] AWAY FROM CENTER OF POLE.
8. USE 1/2" [.013M] CABLE ON ANTENNAS UNLESS OTHERWISE SPECIFIED.
9. FILL VOID AROUND CABLES AT CONDUIT OPENING WITH FOAM SEALANT TO PREVENT WATER INTRUSION.

FIBER & POWER CABLE MOUNTING

1. THE FIBER OPTIC TRUNK CABLES SHALL BE INSTALLED INTO CONDUITS, CHANNEL CABLE TRAYS, OR CABLE TRAY. WHEN INSTALLING FIBER OPTIC TRUNK CABLES INTO A CABLE TRAY SYSTEM, THEY SHALL BE INSTALLED INTO AN INTER DUCT AND A PARTITION BARRIER SHALL BE INSTALLED BETWEEN THE 600 VOLT CABLES AND THE INTER DUCT IN ORDER TO SEGREGATE CABLE TYPES. OPTIC FIBER TRUNK CABLES SHALL HAVE APPROVED CABLE RESTRAINTS EVERY (60) SIXTY FEET AND SECURELY FASTENED TO THE CABLE TRAY SYSTEM. NFPA 70 (NEC) ARTICLE 770 RULES SHALL APPLY.
2. THE TYPE TC-ER CABLES SHALL BE INSTALLED INTO CONDUITS, CHANNEL CABLE TRAYS, OR CABLE TRAY AND SHALL BE SECURED AT INTERVALS NOT EXCEEDING (6) SIX FEET, AN EXCEPTION: WHERE TYPE TC-ER CABLES ARE NOT SUBJECT TO PHYSICAL DAMAGE, CABLES SHALL BE PERMITTED TO MAKE A TRANSITION BETWEEN CONDUITS, CHANNEL CABLE TRAYS, OR CABLE TRAY WHICH ARE SERVING UTILIZATION EQUIPMENT OR DEVICES. A DISTANCE (6) SIX FEET SHALL NOT BE EXCEEDED WITHOUT CONTINUOUS SUPPORTING. NFPA 70 (NEC) ARTICLES 336 AND 392 RULES SHALL APPLY.
3. WHEN INSTALLING OPTIC FIBER TRUNK CABLES OR TYPE TC-ER CABLES INTO CONDUITS, NFPA 70 (NEC) ARTICLE 300 RULES SHALL APPLY.

NOT USED

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SHEET TITLE:
GENERAL NOTES II

SHEET # GN-2 | CURRENT REV # 3
ETS # 22110700

ABBREVIATIONS

ABC	AGGREGATE BASE COURSE
ABS	AIR BREAK SWITCH
A.C.	ASBESTOS CEMENT
A/C	AIR CONDITIONING
A.D.	AREA DRAIN
A.F.F.	ABOVE FINISHED FLOOR
ALT.	ALTERNATE
ALUM.	ALUMINUM
AMP.	AMPERES
A.O.	ACCESS OPENING
APPROX.	APPROXIMATELY
ARCH.	ARCHITECTURAL
ASPH.	ASPHALT
A.T.P.	ANTI-TERRORISM FORCE PROTECTION
A.W.W.A.	AMERICAN WATER WORKS ASSOCIATION
BLDG.	BUILDING
BM.	BENCH MARK
BOC	BACK OF CURB
BOL	BOLLARD
BRG.	BEARING
BVC	BEGIN VERTICAL CURVE
BVCE	BEGIN VERTICAL CURVE ELEVATION
BVCS	BEGIN VERTICAL CURVE STATION
C&G	CURB AND GUTTER
CATV	CABLE TELEVISION
CAP.	CAPACITY
C.B.	CATCH BASIN
CBL	CABLE
CEM.	CEMENT
CER.	CERAMIC
C.F.M.	CUBIC FEET/MINUTE
C.F.S.	CUBIC FEET/SECOND
C.I.	CURB INLET
C.I.P.	CAST IRON PIPE
CIRC.	CIRCULATING
C.J.	CONSTRUCTION JOINT/CONTRACTION JOINT
C.L.	CENTER LINE
C.M.	CONCRETE MONUMENT
C.M.P.	CONCRETE METAL PIPE
C.M.U.	CONCRETE MASONRY UNIT
C.O.	CLEAN OUT
COL.	COLUMN
CONC.	CONCRETE
COND.	CONDENSATE
CONN.	CONNECTION
CONST.	CONSTRUCTION
CONT.	CONTINUOUS
COR	CONTRACTING OFFICERS REPRESENTATIVE
C.TO C.	CENTER TO CENTER
C.Y.	CUBIC YARD
DET.	DETAIL
DI	DROP INLET
DIA.	DIAMETER
DIFF.	DIFFUSER
DIM.	DIMENSION
D.I.P.	DUCTILE IRON PIPE
DISC.	DISCONNECT
D.J.	DUMMY JOINT
DN.	DOWN
DR.	DRAIN
D.S.	DOWN SPOUT
DW	DOMESTIC WATER
DWG.(S)	DRAWING(S)
EA.	EACH
E.F.	EXHAUST FAN
EG.	EXISTING GRADE
E.I.P.	EXISTING IRON PIPE
E.J.	EXPANSION JOINT
ELEC.	ELECTRIC
EL.	ELEVATION
E.M.	ELECTRIC METER
EOP	EDGE OF PAVEMENT
EQUIP.	EQUIPMENT
EVC	END VERTICAL CURVE
EVCE	END VERTICAL CURVE ELEVATION
EVCS	END VERTICAL CURVE STATION
EXH.	EXHAUST
EXP.JT.	EXPANSION JOINT
EXT.	EXTERIOR
EX./EXIST.	EXISTING
FC	FACE OF CURB
F.D.	FLOOR DRAIN
F.D.C.	FIRE DEPARTMENT CONNECTION
F.E.S.	FLARED END SECTION
F.F.E.	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FIN.	FINISH FLOOR
FM	FORCE MAIN
FOC	FACE OF CURB
FT.	FOOT, FEET
FTG.	FOOTING
GA	GAGE
GAL.	GALLON
GALV.	GALVANIZED
GC	GENERAL CONTRACTOR
G.F.E.	GOVERNMENT FURNISHED EQUIPMENT
GIS	GEOGRAPHIC INFORMATION SYSTEM
GL	GAS LINE
GM	GAS METER
G.P.H.	GALLONS/HOUR
G.P.M.	GALLONS/MINUTE
GND.	GROUND
GOVT	GOVERNMENT
GV	GATE VALVE
GW	GUY WIRE
HC	HANDICAP
HCP	HANDICAP PARKING
HCR	HANDICAP RAMP
HDW	HEADWALL
HP	HIGH POINT
HSS	HIGH STRENGTH STEEL
HT	HEIGHT
HYD	HYDRANT
ID.	INSIDE DIAMETER
INTX.	INTERSECTION
INV.	INVERT
ISL	ISLAND
ITL.	INDEPENDENT TESTING LABORATORY
J.B.	JUNCTION BOX
JCT.	JUNCTION
JSOC	JOINT SPECIAL OPERATIONS COMMAND
JT.	JOINT
K	K VALVE
KVA	KILOVOLT AMPERE
KW	KILOWATT
L	LENGTH
LF	LINEAR FEET
LGT	LIGHT
LP	LIGHT POLE
LT	LEFT
MAX	MAXIMUM
MED	MEDIAN
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
MON	MONUMENT
MTL	METAL
MW	MONITOR WELL / MICROWAVE
M.U.T.C.D	MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
N/A	NOT APPLICABLE
NAD 27	NORTH AMERICAN DATUM 1927
NAD 83	NORTH AMERICAN DATUM 1983
NBL	NORTH BOUND LINE
NC	NORMAL CROWN
NEMA	NATIONAL ELECTRICAL MANUFACTURES ASSOCIATION
NIC	NOT IN CONTRACT
NIP	NEW IRON PIPE
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
O.V.	OUTSIDE DIAMETER
OH	OVERHEAD
OHE	OVERHEAD ELECTRIC
ONUS.	OLD NORTH UTILITY SERVICE
OVH	OVERHANG
PA	PARKING AREA
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PED	PEDESTAL
PER.	PERIMETER
PGL	PROPOSED GRADE LINE
PI	POINT OF INTERSECTION
PINC	POINT OF INTERSECTION ON CURVE
PIV	POST INDICATOR VALVE
PIV ELEV	POINT OF VERTICAL INTERSECTION ELEVATION
PLT	PLATE
PSF	POUNDS PER SQUARE FOOT
PSF	POUNDS/SQUARE FOOT
PSI	POUNDS/SQUARE INCH
PIV STA	POINT OF VERTICAL INTERSECTION STATION
PT	POINT
PVMT	PAVEMENT
RAD.	RADIUS
RCP	REINFORCED CONCRETE PIPE
REINF.	REINFORCING
REQ.	REQUIRED
REV	REVISED
R.P.Z.	REDUCED PRESSURE ZONE
RT	RIGHT
R/W	RIGHT OF WAY
RWM	RIGHT OF WAY MONUMENT
SAN	SANITARY SEWER
SB	SOIL BORING
SCH	SCHEDULE
SET	SET BACK
SF	SQUARE FEET
SHT	SHEET
SIA	SIAMESE CONNECTION
SIG	SIGNAL
SOTF	SECURITY OPERATIONS TRAINING FACILITY
SP	SIGNAL POLE
SPECS	SPECIFICATIONS
SQFT	SQUARE FEET
SR	STATE ROAD
SS	SANITARY SEWER
ST.	STATION
STD.	STANDARD
STM	STORM
STL	STEEL
SW	SIDEWALK
SWM	STORMWATER MANAGEMENT
T	TANGENT
TBM	TEMPORARY BENCHMARK
TERR	TERRA COTTA PIPE
TEL	TELEPHONE
TOC	TOP OF CURB
TOB	TOP OF BANK
TOS	TOP OF SLOPE
TOW	TOP OF WALL
TP	TELEPHONE POLE
TRANS	TRANSFORMER
TYP.	TYPICAL
U/C	UNDER CONSTRUCTION
U/G	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
UP	UTILITY POLE
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VIF	VERIFY IN FIELD
WL	WATER LINE
WM	WATER METER
WSEL	WATER SURFACE ELEVATION
WV	WATER VALVE
WTR	WATER
WWF	WIRE WELD FABRIC

LINETYPES

- PARENT PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- EASEMENT
- LEASE AREA
- R/W — RIGHT OF WAY
- SF — SILT FENCE
- X — X — CHAIN-LINK FENCE
- UGW — UNDERGROUND WATER
- UGP — UGP — UNDERGROUND POWER
- OHP — OVERHEAD POWER
- ACP — ALTERNATING CURRENT POWER
- DCP — DIRECT CURRENT POWER
- FO/DC — FIBER/DC POWER COMPOSITE CABLE
- HYBRID — HYBRID CABLE
- UGF — UGF — UNDERGROUND FIBER
- OHF — OVERHEAD FIBER
- MMF — MULTI-MODE FIBER
- SMF — SINGLE-MODE FIBER
- SM6 — FIBER TRUNK - 6 STRAND
- SM12 — FIBER TRUNK - 12 STRAND
- SM24 — FIBER TRUNK - 24 STRAND
- SM48 — FIBER TRUNK - 48 STRAND
- SM96 — FIBER TRUNK - 96 STRAND
- SM144 — FIBER TRUNK - 144 STRAND
- SM288 — FIBER TRUNK - 288 STRAND
- GND — GROUND WIRE
- GAS — GAS LINE
- ETH — ETHERNET CABLE
- CAT6 — CAT6 CABLE
- CAT5 — CAT5 CABLE
- ALM — ALARM CABLE
- C — CONDUIT
- COAX — COAX FEEDLINE
- TFT-402 — COAX FEEDLINE / JUMPER - TFT-402
- PTS1-50 — COAX FEEDLINE / JUMPER - PTS1-50
- LMR-240 — COAX FEEDLINE / JUMPER - LMR-240
- LDF4-50 — COAX FEEDLINE / JUMPER - LDF4-50
- LDF1-50 — COAX FEEDLINE / JUMPER - LDF1-50
- HL4RPV — COAX FEEDLINE / JUMPER - HL4RPV
- FSJ4-50 — COAX FEEDLINE / JUMPER - FSJ4-50
- FSJ1-50 — COAX FEEDLINE / JUMPER - FSJ1-50
- AL4RPV — COAX FEEDLINE / JUMPER - AL4RPV

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PREPARED FOR

SITE NAME
RICH MOUNTAIN TOWER

SITE ADDRESS
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE
36.2330639°, -81.6956869°

SEAL: FIRM # P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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SHEET TITLE:
GENERAL NOTES III

SHEET # GN-3 | CURRENT REV # 3 | ETS # 22110700

2018 APPENDIX B
BUILDING CODE SUMMARY
FOR ALL COMMERCIAL PROJECTS
(EXCEPT 1 AND 2-FAMILY DWELLINGS AND TOWNHOUSES)
(Reproduce the following data on the building plans sheet 1 or 2)

Name of Project: RICH MOUNTAIN TOWER
Address: 759 FIRE TOWER ROAD, BOONE, NC Zip Code 28607
Owner/Authorized Agent: WATAUGA COUNTY Phone # ( ) - E-Mail
Owned By: ☒ City/County ☐ Private ☐ State
Code Enforcement Jurisdiction: ☐ City ☒ County WATAUGA ☐ State

CONTACT:

DESIGNER	FIRM	NAME	LICENSE #	TELEPHONE #	E-MAIL
Architectural				( )	
Civil	Engineered Tower Solutions, PLLC	Paul A. Bridges	051707	(336) 830-1680	Paul.Bridges@ets-pllc.com
Electrical				( )	
Fire Alarm				( )	
Plumbing				( )	
Mechanical				( )	
Sprinkler-Standpipe				( )	
Structural				( )	
Retaining Walls >5' High				( )	
Other				( )	

("Others" should include firms and individuals such as truss, precast, pre-engineered, interior designers, etc.)

2018 NC CODE FOR: ☒ New Construction ☐ Addition ☐ Renovation
☐ 1st Time Interior Completion
☐ Shell/Core
Phased Construction – Shell/Core
☐ Renovation

2018 NC EXISTING BUILDING CODE: ☒ Prescriptive ☐ Repair ☐ Chapter 14
Alteration: ☐ Level I ☐ Level II ☐ Level III
☐ Historic Property ☐ Change of Use

CONSTRUCTED:(date) _____ ORIGINAL OCCUPANCY(S) (Ch. 3):_____
RENOVATED: (date) _____ CURRENT OCCUPANCY(S) (Ch. 3):_____

RISK CATEGORY (table 1604,5) Current: ☐ I ☐ II ☐ III ☒ IV
Proposed: ☐ I ☐ II ☐ III ☐ IV

BASIC BUILDING DATA
Construction Type: (check all that apply) ☐ I-A ☐ I-B ☐ II-A ☐ II-B ☐ III-A ☐ III-B ☐ IV ☐ V-A ☐ V-B
Sprinklers: ☒ No ☐ Partial ☐ Yes ☐ NFPA 13 ☐ NFPA 13R ☐ NFPA 13D
Standpipes: ☒ No ☐ Yes Class ☐ I ☐ II ☐ III ☐ Wet ☐ Dry
Fire District: ☒ No ☐ Yes (Primary) **Flood Hazard Area:** ☒ No ☐ Yes
Special Inspections Required: ☒ No ☐ Yes

2018 NC Administrative Code and Policies — Appendix B for Building

NOTE
THE PROJECT SITE IS NOT LOCATED IN ANY FLOOD HAZARD AREAS OR FUTURE CONDITIONS FLOOD HAZARD AREAS, AS SHOWN ON FEMA MAP NUMBER 3710290100J, DATED 12/3/2009.

2018 NC Administrative Code and Policies — Appendix B for Building

Gross Building Area:

FLOOR	EXISTING (SQ FT)	NEW (SQ FT)	RENO/ALTER (SQ.FT)	SUB-TOTAL
3rd Floor				
2nd Floor				
Mezzanine				
1st Floor	0	219	0	219
Basement				
TOTAL	0	219	0	219

ALLOWABLE AREA

Primary Occupancy Classification: SELECT ONE
Assembly ☐ A-1 ☐ A-2 ☐ A-3 ☐ A-4 ☐ A-5
Business ☐
Educational ☐
Factory ☐ F-1 Moderate ☐ F-2 Low
Hazardous ☐ H-1 Detonate ☐ H-2 Deflagrate ☐ H-3 Combust ☐ H-4 Health ☐ H-5 HPM
Institutional ☐ I-1 Condition ☐ 1 ☐ 2
☐ 1-2 Condition ☐ 1 2 ☐
☐ 1-3 Condition ☐ 1 2 ☐ 3 ☐ 4 ☐ 5 ☐
☐ 1-4
Mercantile ☐
Residential ☐ R-1 ☐ R-2 ☐ R-3 ☐ R-4
Storage ☐ S-1 Moderate ☐ S-2 Low ☐ High-piled
☐ Parking Garage ☐ Open ☐ Enclosed ☐ Repair Garage
Utility and Miscellaneous ☒

Accessory Occupancy Classification(s): _____
Incidental Uses (Table 509): _____
Special Uses (Chapter 4 – List Code Sections): _____
Special Provisions: (Chapter 5 – List Code Sections): _____
Mixed Occupancy: ☒ No ☐ Yes Separation: ____ Hr. Exception: _____
☐ Non-Separated Use (508.3)
The required type of construction for the building shall be determined by applying the height and area limitations for each of the applicable occupancies to the entire building. The most restrictive type of construction, so determined, shall apply to the entire building.
☐ Separated Use (508.4) -
See below for area calculations for each story, the area of the occupancy shall be such that the sum of the ratios of the actual floor area of each use divided by the allowable floor area for each use shall not exceed 1.

$$\frac{\text{Actual Area of Occupancy A}}{\text{Allowable Area of Occupancy A}} + \frac{\text{Actual Area of Occupancy B}}{\text{Allowable Area of Occupancy B}} \leq 1$$

_____ + _____ + ... = _____ ≤ 1.00

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SEAL — FIRM # P-1018
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SHEET TITLE
NC APPENDIX B I

SHEET # GN-4 CURRENT REV # 3 ETS # 22110700

STORY NO.	DESCRIPTION AND USE	(A) BLDG AREA PER STORY (ACTUAL)	(B) TABLE 506.2[4] AREA	(C) AREA FOR FRONTAGE INCREASE[1,2]	(D) ALLOWABLE AREA PER STORY OR UNLIMITED[2,5]
1	Equip. Shelter	216	5,500	N/A	5,500

1 Frontage area increases from Section 506.3 are computed thus:
a. Perimeter which fronts a public way or open space having 20 feet minimum width = _____ (F)
b. Total Building Perimeter = _____ (P)
c. Ratio (F/P) = _____ (F/P)
d. W = Minimum width of public way = _____ (W)
e. Percent of frontage increase I_f = 100 [F/P - 0.25] x W/30 = _____ (%)
2 Unlimited area applicable under conditions of Section 507.
3 Maximum Building Area = total number of stories in the building x D (maximum 3 stories) (506.2).
4 The maximum area of open parking garages must comply with Table 406.5.4
5 Frontage increase is based on the unsprinklered area value in Table 506.2.

ALLOWABLE HEIGHT

	ALLOWABLE (TABLE 503)	SHOWN ON PLANS	CODE REFERENCE[1]
Building Height in Feet (Table 504.3)[2]	40	9'-2 ½"	2018
Building Height in Stories (Table 504.4)[3]	1	1	2018

1 Provide code reference if the "Shown on Plans" quantity is not based on Table 504.3 or 504.4.
2 The maximum height of air traffic control towers must comply with Table 412.3.1
3 The maximum height of open parking garages must comply with Table 406.5.4

FIRE PROTECTION REQUIREMENTS

BUILDING ELEMENT	FIRE SEPARATION DISTANCE (FEET)	RATING REQ'D	RATING PROVIDED (WE_____ * REDUCTION)	DETAIL # AND SHEET #	DESIGN # FOR RATED ASSEMBLY	SHEET # FOR RATED PENETRATION	SHEET # FOR RATED JOINTS
Structural Frame, including columns, girders, trusses		N/A					
Bearing Walls							
Exterior							
North	B	1	2	VFP DWG 207459 SHEET 1			
East	B	1	2				
West	B	1	2				
South	B	1	2				
Interior		N/A					
Nonbearing Walls and Partitions		N/A					
Exterior walls							
North		N/A					
East		N/A					
West		N/A					
South		N/A					
Interior walls and partitions		N/A					
Floor Construction including supporting beams and joists	B	0	2	VFP DWG 207459 SHEET 1			
Floor Ceiling Assembly		N/A					
Column Supporting Floors		N/A					
Roof Construction, including supporting beams and joists		N/A					
Roof Ceiling Assembly		N/A					
Column Supporting Roof		N/A					
Shaft Enclosures - Exit		N/A					
Shaft Enclosures - Other		N/A					
Corridor Separation		N/A					
Occupancy/Fire Barrier Separation		N/A					
Party/Fire Wall Separation		N/A					
Smoke Barrier Separation		N/A					
Smoke Partition		N/A					
Tenant/Dwelling Unit/ Sleeping Unit Separation		N/A					
Incidental Use Separation		N/A					

* Indicate section number permitting reduction

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SHEET TITLE:
NC APPENDIX B II

SHEET # GN-5 | CURRENT REV # 3 | ETS # 22110700

PERCENTAGE OF WALL OPENING CALCULATIONS

FIRE SEPARATION DISTANCE (FEET FROM PROPERTY LINES)	DEGREES OF OPENINGS PROTECTION (TABLE 705.8)	ALLOWABLE AREA (%)	ACTUAL SHOWN ON PLANS (%)

LIFE SAFETY SYSTEM REQUIREMENTS

Emergency Lighting: ☐ No ☒ Yes
Exit Signs: ☐ No ☒ Yes
Fire Alarm: ☒ No ☐ Yes
Smoke Detection Systems: ☐ No ☒ Yes ☐ Partial _____
Carbon Monoxide Detection: ☒ No ☐ Yes

LIFE SAFETY PLAN REQUIREMENTS

Life Safety Plan Sheet #: _____

- ☐ Fire and/or smoke rated wall locations (Chapter 7)
- ☐ Assumed and real property line locations (if not on the site plan)
- ☐ Exterior wall opening area with respect to distance to assumed property lines (705.8)
- ☐ Occupancy use for each area as it relates to occupant load calculation (Table 1004.1.2)
- ☐ Occupant loads for each area
- ☐ Exit sign location (1013)
- ☐ Exit access travel distances (1017)
- ☐ Common path of travel distances (1006.2.1 & 2006.3.2(1))
- ☐ Dead end lengths (1020.4)
- ☐ Clear exit widths for each exit door
- ☐ Maximum calculated occupant load capacity each exit door can accommodate based on egress width (1005.3)
- ☐ Actual occupant load for each exit door
- ☐ A separate schematic plan indicating where fire rated floor/ceiling and/or roof structure is provided for purposes of occupancy separation.
- ☐ Location of doors with panic hardware (1010.1.10)
- ☐ Location of doors with delayed egress locks and the amount of delay (1010.1.9.7)
- ☐ Location of doors with electromagnetic egress locks (1010.1.9.9)
- ☐ Location of doors equipped with hold-open devices
- ☐ Location of emergency escape windows (1030)
- ☐ The square footage of each fire area (202)
- ☐ The square footage of each smoke compartment for Occupancy Classification I-2 (407.5)
- ☐ Note any code exceptions or table notes that may have been utilized regarding the items above

PREFABRICATED SHELTER SECTION NOT APPLICABLE

ACCESSIBLE DWELLING UNITS (SECTION 1107)

UNIT CLASSIFICATION	TOTAL UNITS	ACCESSIBLE UNITS REQUIRED	ACCESSIBLE UNITS PROVIDED	TYPE A UNITS REQUIRED	TYPE A UNITS PROVIDED	TYPE B UNITS REQUIRED	TYPE B UNITS PROVIDED	TOTAL ACCESSIBLE UNITS PROVIDED

ACCESSIBLE PARKING (SECTION 1106)

LOT OR PARKING AREA	TOTAL # OF PARKING SPACES		# OF ACCESSIBLE SPACES PROVIDED		TOTAL # ACCESSIBLE PROVIDED
	REQUIRED	PROVIDED	96" SPACES	132" SPACES	
TOTAL					

PLUMBING FIXTURE REQUIREMENTS (TABLE 2902.1)

USE		WATERCLOSETS			URINALS	LAVATORIES			SHOWERS /TUBS	DRINKING FOUNTAINS	
		MALE	FEMALE	UNISEX		MALE	FEMALE	UNISEX		REGULAR	ACCESSIBLE
SPACE	EXIST'G										
	NEW										
	REQ'D										

SPECIAL APPROVALS

Special approval: (Local Jurisdiction, Department of Insurance, SCO, DPI, DHHS, ICC, etc., describe below)

_____

_____

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SHEET TITLE
NC APPENDIX B III

SHEET # GN-6 | CURRENT REV # 3 | ETS #: 22110700

ENERGY SUMMARY

ENERGY REQUIREMENTS:
The following data shall be considered minimum and any special attribute required to meet the North Carolina Energy Conservation Code shall also be provided. Each Designer shall furnish the required portions of the project information for the plan data sheet. If performance method, state the annual energy cost for the standard reference design vs annual energy cost for the proposed design.

Existing building envelope complies with code: ☐ No ☐ Yes (The remainder of this section is not applicable)

Exempt Building: ☐ No ☐ Yes (Provide Code or Statutory reference) _____

Climate Zone: ☐ 3A ☐ 4A ☐ 5A

Method of Compliance: Energy Code ☐ Performance ☒ Prescriptive
ASHRAE 90.1 ☐ Performance ☐ Prescriptive
(If "Other" specify source here) _____

THERMAL ENVELOPE (Prescriptive method only)

Roof/ceiling Assembly (each assembly)
Description of assembly: _____
U-Value of total assembly: _____
R-Value of insulation: _____
Skylights in each assembly: _____
U-Value of skylight: _____
Total square footage of skylights in each assembly: _____

Exterior Walls (each assembly)
Description of assembly: _____
U-Value of total assembly: _____
R-Value of insulation: _____
Openings (windows or doors with glazing)
U-Value of assembly: _____
Solar heat gain coefficient: _____
Projection factor: _____
Door R-Values: _____

Walls below grade (each assembly)
Description of assembly: N/A
U-Value of total assembly: _____
R-Value of insulation: _____

Floors over unconditioned space (each assembly)
Description of assembly: N/A
U-Value of total assembly: _____
R-Value of insulation: _____

Floors slab on grade
Description of assembly: _____
U-Value of total assembly: _____
R-Value of insulation: _____
Horizontal/Vertical requirement: _____
Slab Heated: _____

2018 APPENDIX B
BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS
STRUCTURAL DESIGN
(PROVIDE ON THE STRUCTURAL SHEETS IF APPLICABLE)

DESIGN LOADS:

Importance Factors: Snow (I_s) _____
Seismic (I_E) _____

Live Loads: Roof _____ psf
Mezzanine _____ psf
Floor _____ psf

Ground Snow Load: _____ psf

Wind Load: Ultimate Wind Speed _____
Exposure Category _____ (ASCE-7)

PENDING STRUCTURAL ANALYSIS

SEISMIC DESIGN CATEGORY: ☐A ☐B ☐C ☐D
Provide the following Seismic

Risk Category (TA ☐I ☐II ☐III ☐IV
Spectral Response S_{DS} _____ %g S_1 _____ %g
Site Classification (AS ☐A ☐B ☐C ☐D ☐E ☐F
Data Source: ☐Field Test ☐Presumptive ☐Historical Data
Basic structural system ☐Bearing Wall ☐Dual w/Special Moment Frame
☐Building Frame ☐Dual w/Intermediate R/C or Special Steel
☐Moment Frame ☐Inverted Pendulum
Analysis Procedure: ☐Simplified ☐Equivalent Lateral Force ☐Dynamic
Architectural, Mechanical, Components anchored? ☐ Yes ☐ No ☐ N/A

LATERAL DESIGN CONTROL: Earthquake ☐ Wind ☐

SOIL BEARING CAPACITIES:
Field Test (provide copy of test report) _____ psf
Presumptive Bearing capacity _____ psf
Pile size, type, and capacity _____

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SHEET TITLE
NC APPENDIX B IV

SHEET # GN-7 | CURRENT REV # 3 | ETS # 22110700

2018 APPENDIX B
BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS
MECHANICAL DESIGN
(PROVIDE ON THE MECHANICL SHEETS IF APPLICABLE)

MECHANICAL SUMMARY

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT

Thermal Zone
winter dry bulb: _____
summer dry bulb: _____

Interior design conditions
winter dry bulb: _____
summer dry bulb: _____
relative humidity: _____

Building heating load: _____

Building cooling load: _____

Mechanical Spacing Conditioning System
Unitary
description of unit: BARD: W24A*-A6SXW4XXJ
heating efficiency: 9.00 EER
cooling efficiency: 9.00 EER
size category of unit: 24,000 BTUH

Boiler
Size category. If oversized, state reason.: _____

Chiller
Size category. If oversized, state reason.: _____

List equipment efficiencies: _____

2018 APPENDIX B
BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS
ELECTRICAL DESIGN
(PROVIDE ON THE ELECTRICAL SHEETS IF APPLICABLE)

ELECTRICAL SUMMARY

ELECTRICAL SYSTEM AND EQUIPMENT

Method of Compliance: Energy Code: ☐ Performance ☒ Prescriptive
ASHRAE 90.1: ☐ Performance ☐ Prescriptive

Lighting schedule (each fixture type)
lamp type required in fixture: 32W FL
number of lamps in fixture: 2
ballast type used in the fixture: ELEC
number of ballasts in fixture: 2
total wattage per fixture: 60
total interior wattage specified vs. allowed (whole building or space by space)
500 vs 231 (ONLY LIT WHEN OCCUPIED)
total exterior wattage specified vs. allowed

Additional Efficiency Package Options
(When using the 2018 NCECC; not required for ASHRAE 90.1)
☒ C406.2 More Efficient HVAC Equipment Performance
☒ C406.3 Reduced Lighting Power Density
☐ C406.4 Enhanced Digital Lighting Controls
☐ C406.5 On-Site Renewable Energy
☐ C406.6 Dedicated Outdoor Air System
☐ C406.7 Reduced Energy Use in Service Water Heating

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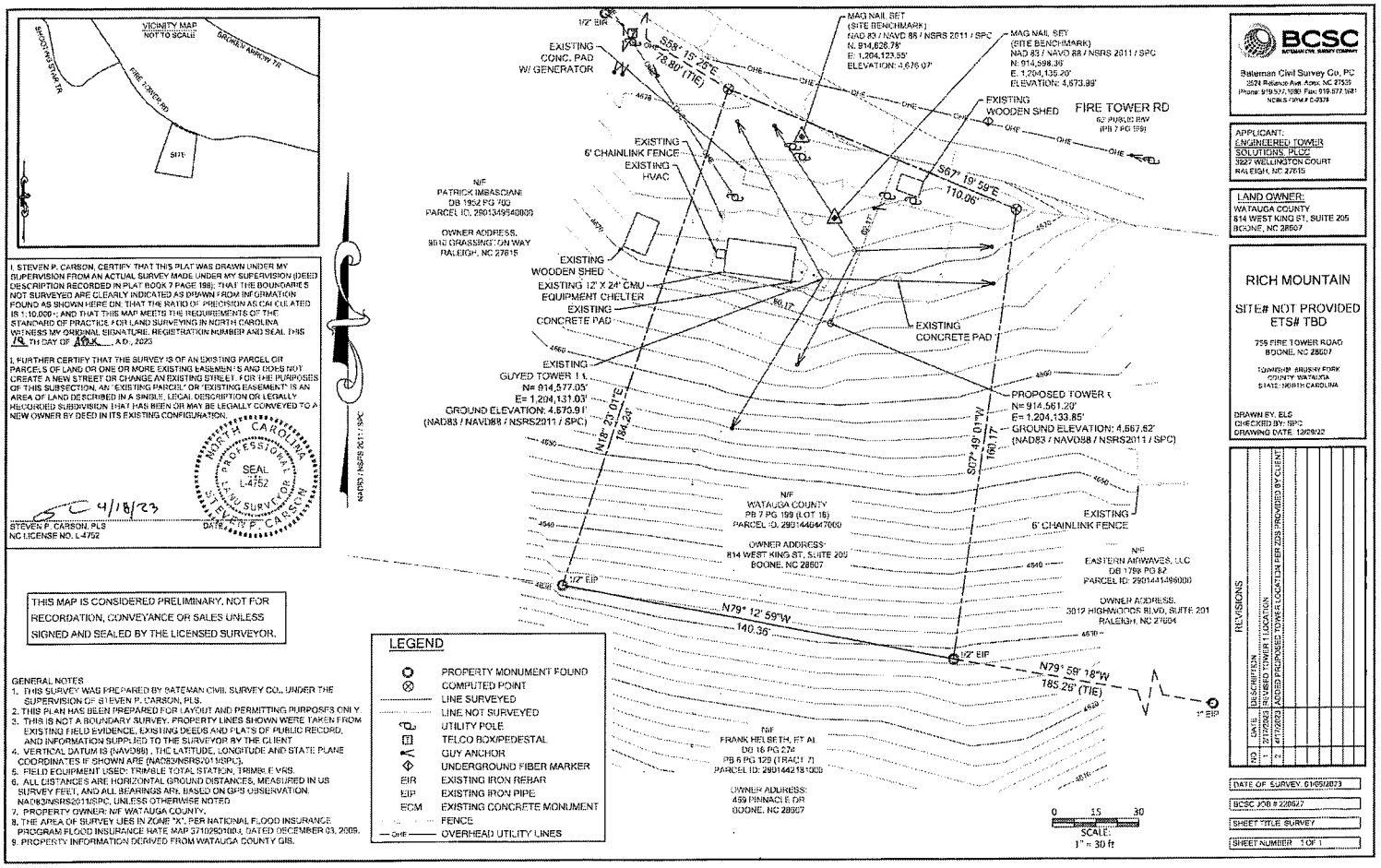
SHEET TITLE:
NC APPENDIX B V

SHEET # GN-8 | CURRENT REV # 3
ETS #: 22110700



I, STEVEN P. CARSON, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN PLAT BOOK 7 PAGE 199); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND AS SHOWN HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+; AND THAT THIS MAP MEETS THE REQUIREMENTS OF THE STANDARD OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 19 TH DAY OF APRIL, A.D., 2023

I FURTHER CERTIFY THAT THE SURVEY IS OF AN EXISTING PARCEL OR PARCELS OF LAND OR ONE OR MORE EXISTING EASEMENTS AND DOES NOT CREATE A NEW STREET OR CHANGE AN EXISTING STREET. FOR THE PURPOSES OF THIS SUBSECTION, AN "EXISTING PARCEL OR "EXISTING EASEMENT" IS AN AREA OF LAND DESCRIBED IN A SINGLE, LEGAL DESCRIPTION OR LEGALLY RECORDED SUBDIVISION THAT HAS BEEN OR MAY BE LEGALLY CONVEYED TO A NEW OWNER BY DEED IN ITS EXISTING CONFIGURATION.

NORTH CAROLINA PROFESSIONAL SEAL L-4752 LAND SURVEYOR STEVEN P. CARSON

SC 4/18/23

STEVEN P. CARSON, PLS
NC LICENSE NO. L-4752
DATE

THIS MAP IS CONSIDERED PRELIMINARY, NOT FOR RECORDATION, CONVEYANCE OR SALES UNLESS SIGNED AND SEALED BY THE LICENSED SURVEYOR.

GENERAL NOTES
1. THIS SURVEY WAS PREPARED BY BATEMAN CIVIL SURVEY CO., UNDER THE SUPERVISION OF STEVEN P. CARSON, PLS.
2. THIS PLAN HAS BEEN PREPARED FOR LAYOUT AND PERMITTING PURPOSES ONLY.
3. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES SHOWN WERE TAKEN FROM EXISTING FIELD EVIDENCE, EXISTING DEEDS AND PLATS OF PUBLIC RECORD, AND INFORMATION SUPPLIED TO THE SURVEYOR BY THE CLIENT.
4. VERTICAL DATUM IS (NAVD88) , THE LATITUDE, LONGITUDE AND STATE PLANE COORDINATES IF SHOWN ARE (NAD83/NSRS2011/SPC).
5. FIELD EQUIPMENT USED: TRIMBLE TOTAL STATION, TRIMBLE VRS.
6. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES, MEASURED IN US SURVEY FEET, AND ALL BEARINGS ARE BASED ON GPS OBSERVATION. NAD83(NSRS2011)SPC, UNLESS OTHERWISE NOTED
7. PROPERTY OWNER: N/F WATAUGA COUNTY.
8. THE AREA OF SURVEY LIES IN ZONE "X", PER NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP 3710250100J, DATED DECEMBER 03, 2009.
9. PROPERTY INFORMATION DERIVED FROM WATAUGA COUNTY GIS.

LEGEND

○	PROPERTY MONUMENT FOUND
⊗	COMPUTED POINT
	LINE SURVEYED
	LINE NOT SURVEYED
	UTILITY POLE
	TELCO BOX/PEDESTAL
	GUY ANCHOR
	UNDERGROUND FIBER MARKER
EIR	EXISTING IRON REBAR
EIP	EXISTING IRON PIPE
ECM	EXISTING CONCRETE MONUMENT
	FENCE
— OHE —	OVERHEAD UTILITY LINES

BCSC
BATEMAN CIVIL SURVEY COMPANY

Bateman Civil Survey Co. PC
3524 Reliance Ave. Apex, NC 27539
Phone: 919.577.1080 Fax: 919.577.1081
NCBELS FIRM # C-0879

APPLICANT:
ENGINEERED TOWER SOLUTIONS, PLLC
3927 WELLINGTON COURT
RALEIGH, NC 27615

LAND OWNER:
WATAUGA COUNTY
814 WEST KING ST, SUITE 205
BOONE, NC 28607

RICH MOUNTAIN

SITE# NOT PROVIDED
ETS# TBD

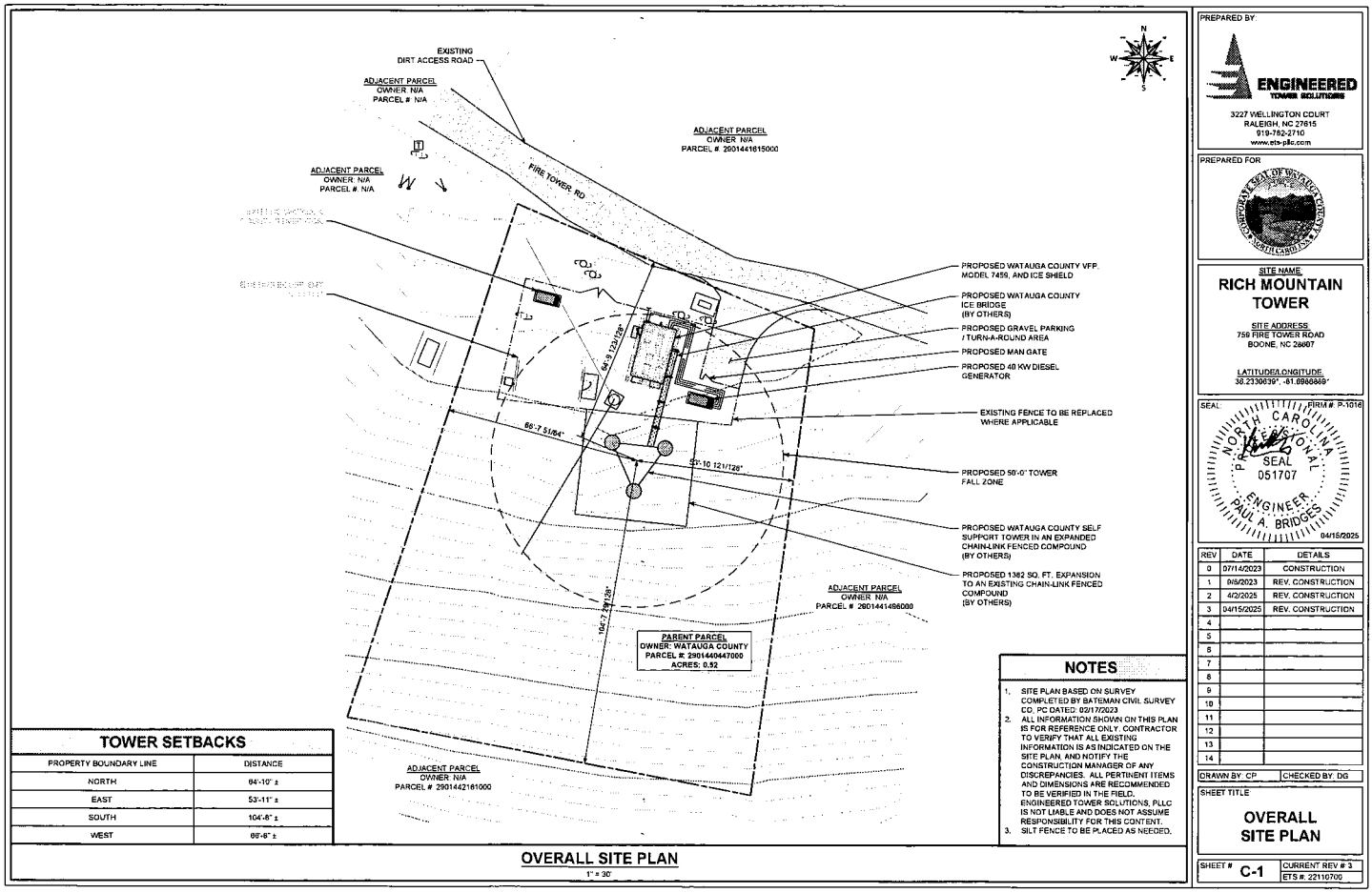
759 FIRE TOWER ROAD
BOONE, NC 28607

TOWNSHIP: BRUSHY FORK
COUNTY: WATAUGA
STATE: NORTH CAROLINA

DRAWN BY: ELB
CHECKED BY: SPC
DRAWING DATE: 12/29/22

REVISIONS			
NO	DATE	DESCRIPTION	
1	2/17/2023	REVISED TOWER LOCATION	
2	4/17/2023	ADDED PROPOSED TOWER LOCATION PER ZDS PROVIDED BY CLIENT	

DATE OF SURVEY: 01/05/2023
BCSC JOB # 220627
SHEET TITLE: SURVEY
SHEET NUMBER: 1 OF 1



TOWER SETBACKS

PROPERTY BOUNDARY LINE	DISTANCE
NORTH	84'-10" ±
EAST	53'-11" ±
SOUTH	104'-8" ±
WEST	66'-8" ±

NOTES

1. SITE PLAN BASED ON SURVEY COMPLETED BY BATEMAN CIVIL SURVEY CO. PC DATED: 02/17/2023
2. ALL INFORMATION SHOWN ON THIS PLAN IS FOR REFERENCE ONLY. CONTRACTOR TO VERIFY THAT ALL EXISTING INFORMATION IS AS INDICATED ON THE SITE PLAN, AND NOTIFY THE CONSTRUCTION MANAGER OF ANY DISCREPANCIES. ALL PERTINENT ITEMS AND DIMENSIONS ARE RECOMMENDED TO BE VERIFIED IN THE FIELD. ENGINEERED TOWER SOLUTIONS, PLLC IS NOT LIABLE AND DOES NOT ASSUME RESPONSIBILITY FOR THIS CONTENT.
3. SILT FENCE TO BE PLACED AS NEEDED.

OVERALL SITE PLAN
1" = 30'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330039°, -81.6968869°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 051707 PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	09/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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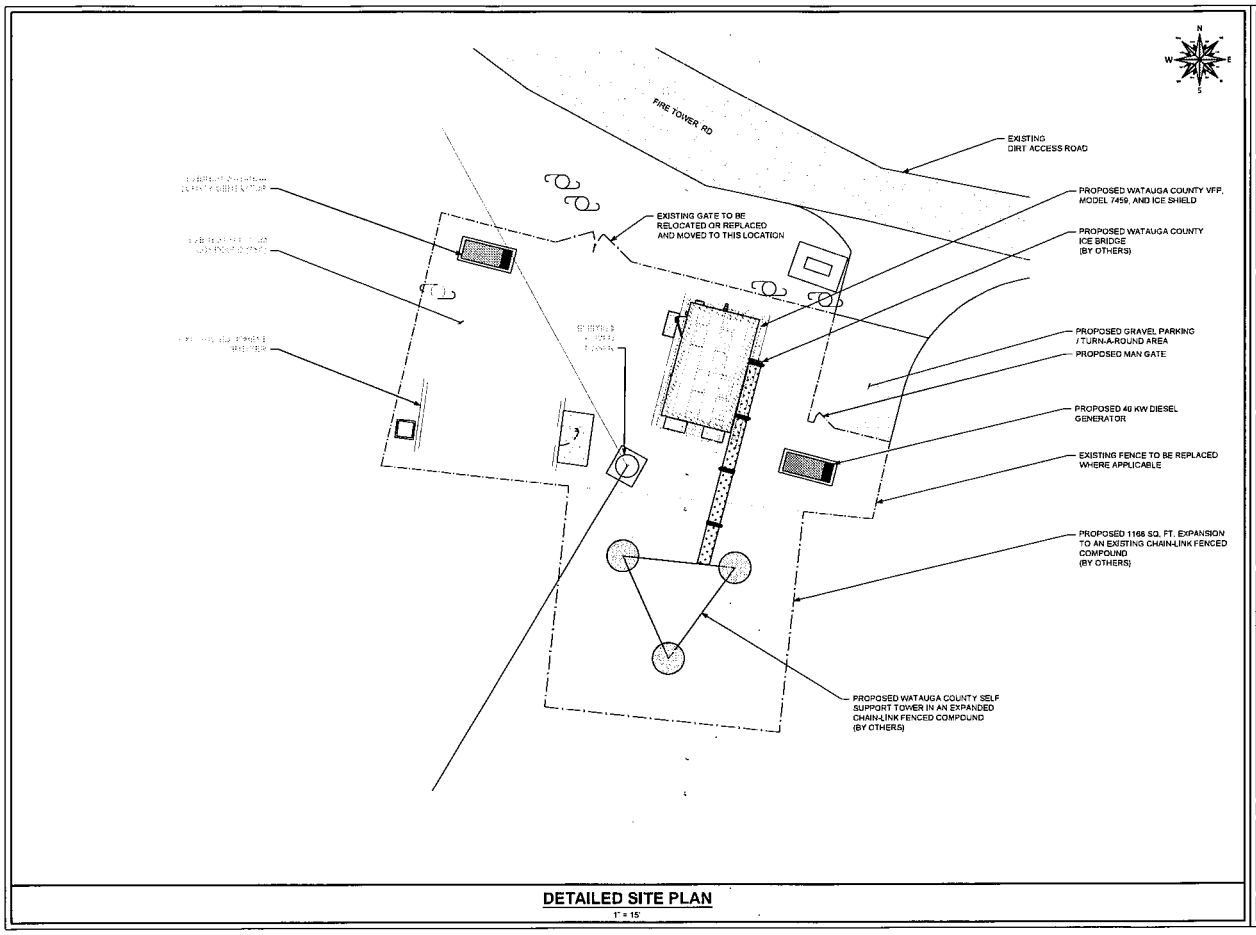
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE
OVERALL SITE PLAN

SHEET # C-1 | CURRENT REV # 3
ETS #: 22110700



DETAILED SITE PLAN

1" = 15'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2718
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6988889°

SEAL: FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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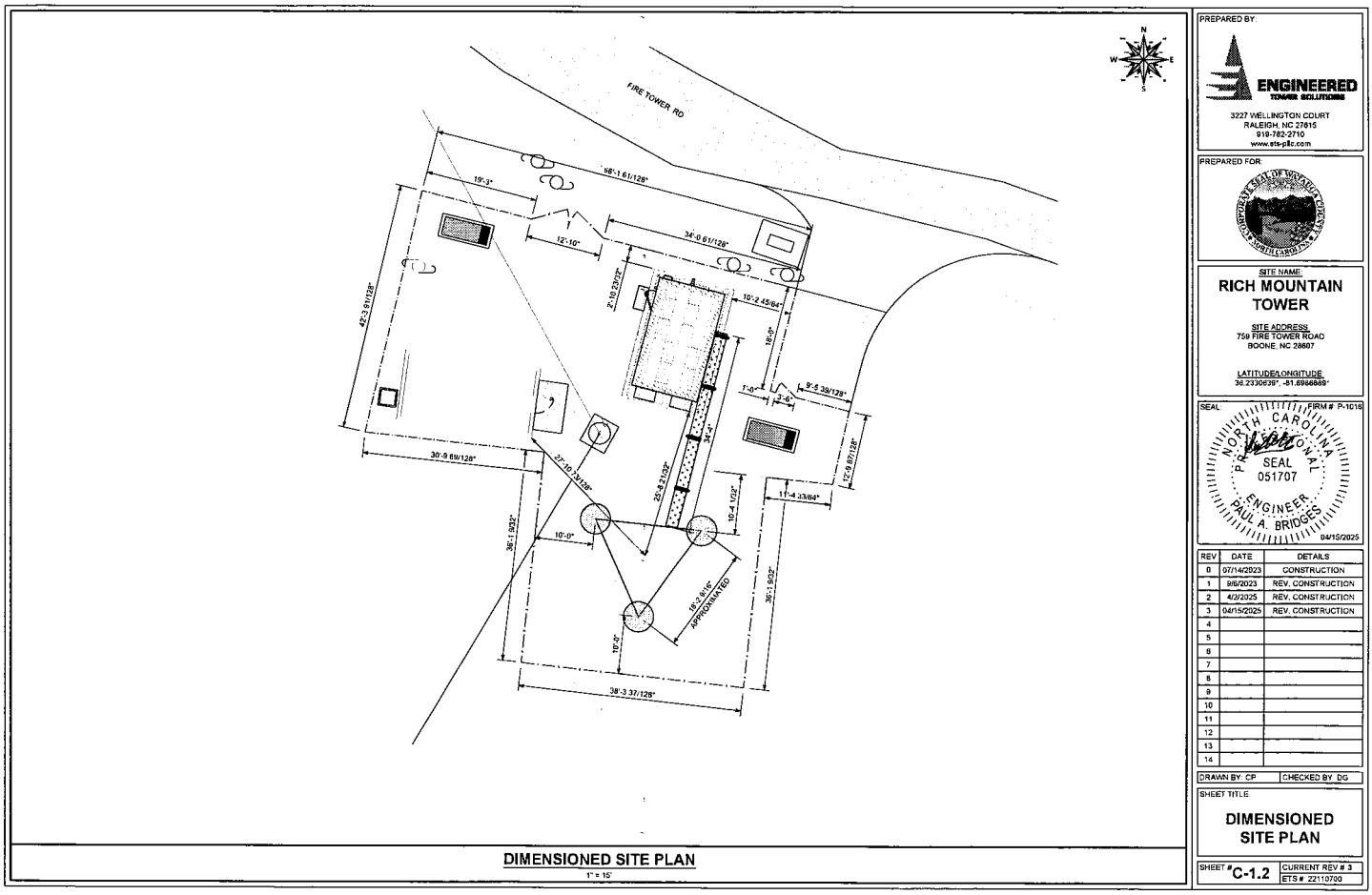
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

DETAILED SITE PLAN

SHEET # C-1.1 | CURRENT REV # 3
ETS #: 22110700



DIMENSIONED SITE PLAN

1" = 15'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6988889°

SEAL: FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
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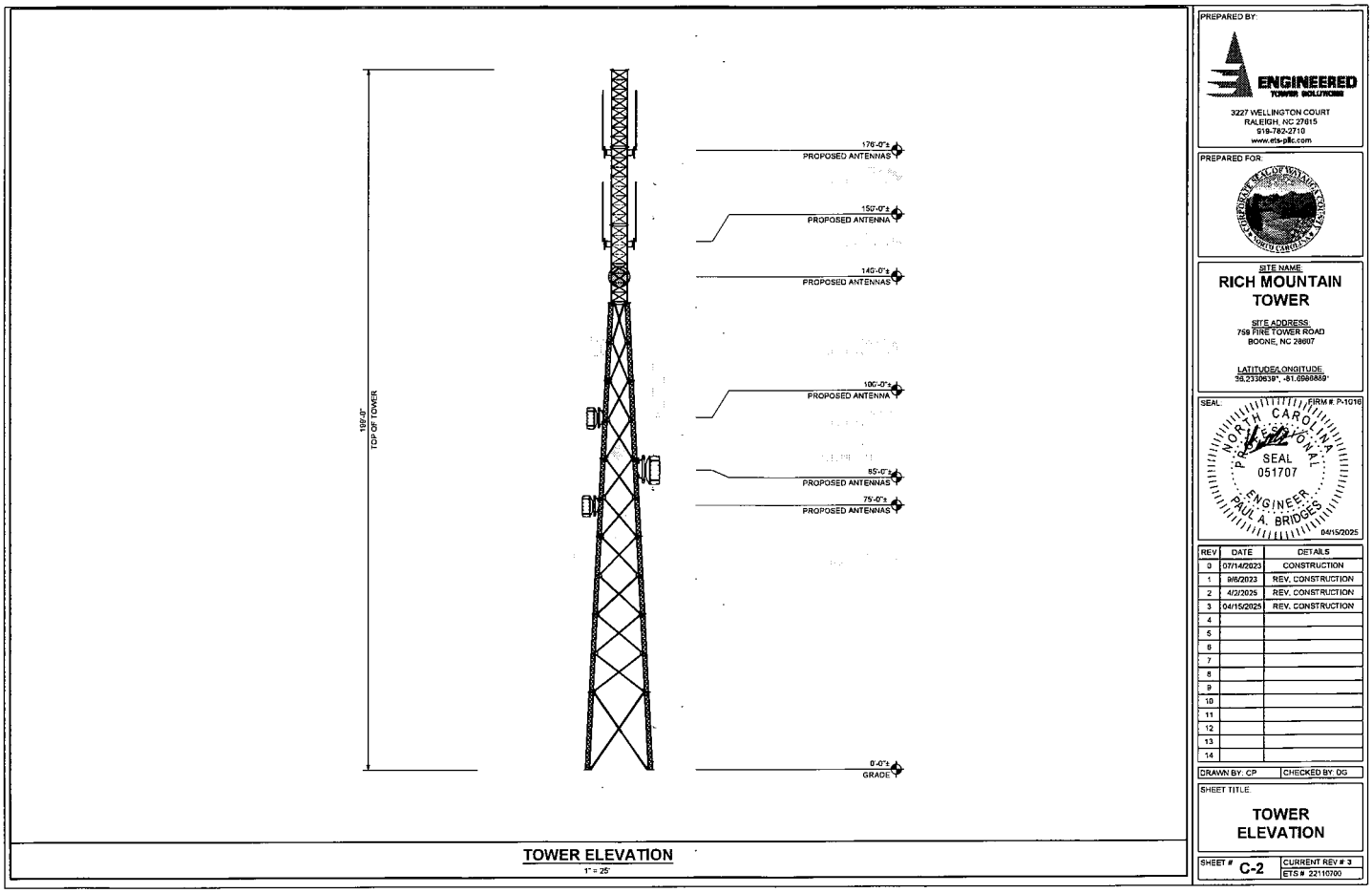
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

DIMENSIONED SITE PLAN

SHEET # C-1.2 | CURRENT REV # 3
ETS # 22110700



TOWER ELEVATION
1" = 25'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-0710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6088889°

SEAL:

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

FIRM #: P-1016

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
TOWER ELEVATION

SHEET # C-2 | CURRENT REV # 3 | ETS # 22110700

PROPOSED ANTENNA SCHEDULE

OWNER	QTY.	SIZE (FT)	TYPE	MANUFACTURER - ANTENNA MODEL NUMBER	ANTENNA AZIMUTH	MOUNT ELEVATION	LEG	CABLE (QTY.) TYPE
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	178'-0"	A	(1) 7/8" & (1) 1/2"
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	176'-0"	B	(1) 7/8"
WATAUGA COUNTY	1	-	TTA	TTA	--	175'-0"		--
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	150'-0"	A	(1) 1-5/8"
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	150'-0"	B	(1) 1-5/8"
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO BUCKEYE	COMMSCOPE - HX6-6W-6WH	318°	140'-0"	C	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO WATAUGA CO TRAN. STA.	COMMSCOPE - HX6-6W-6WH	104°	100'-0"	B	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO PHEONIX	COMMSCOPE - HX8-8W-8HW	36.6°	85'-0"	A	(1) EU63
WATAUGA COUNTY	1	-	DISH TO HAWKS NEST	COMMSCOPE - HX6-6W-6HW	227°	75'-0"	B	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:
- VERIFY FINAL DESIGN AND LOADING WITH MOTOROLA PRIOR TO CONSTRUCTION
- VERIFY FINAL DESIGN AND LOADING WITH STRUCTURAL ANALYSIS PRIOR TO CONSTRUCTION
- GRAY TEXT = FUTURE LOADING
- ALL DISHES WILL HAVE AN ICE SHIELD ABOVE THEM

PROPOSED ANTENNA SCHEDULE
N.T.S.

PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME
RICH MOUNTAIN TOWER

SITE ADDRESS
750 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE
36.2330635°, -81.6988889°

SEAL — FIRM # P-1018
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 051707 PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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3	04/15/2025	REV. CONSTRUCTION
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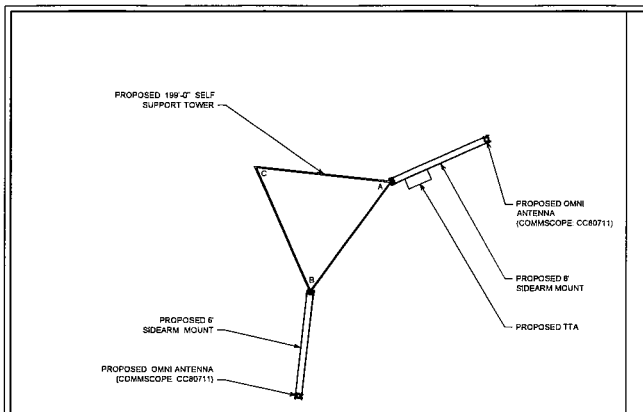
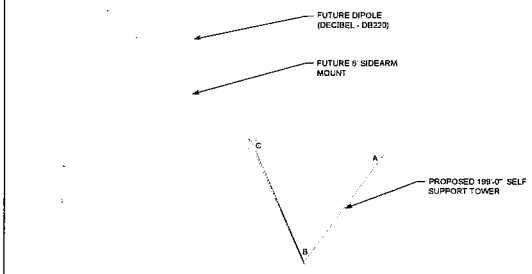
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
ANTENNA SCHEDULE

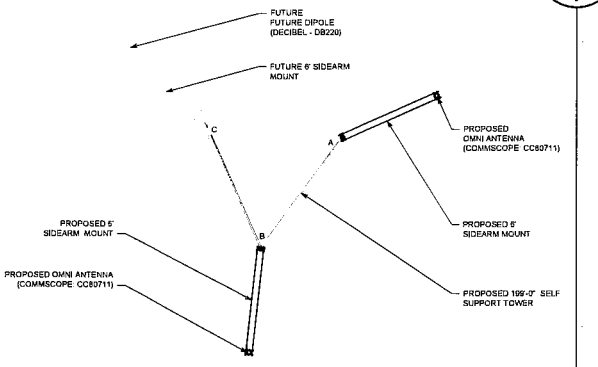
SHEET # C-3.1 | CURRENT REV # 3 | ETS # 22110700



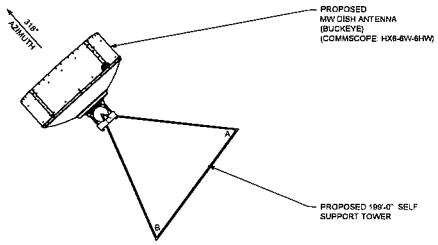
ANTENNA LAYOUT @ 176'
3/16" = 1'-0"



ANTENNA LAYOUT @ 175'
3/16" = 1'-0"



ANTENNA LAYOUT @ 150'
3/16" = 1'-0"



ANTENNA LAYOUT @ 140'
3/16" = 1'-0"

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2230639°, -81.6989889°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
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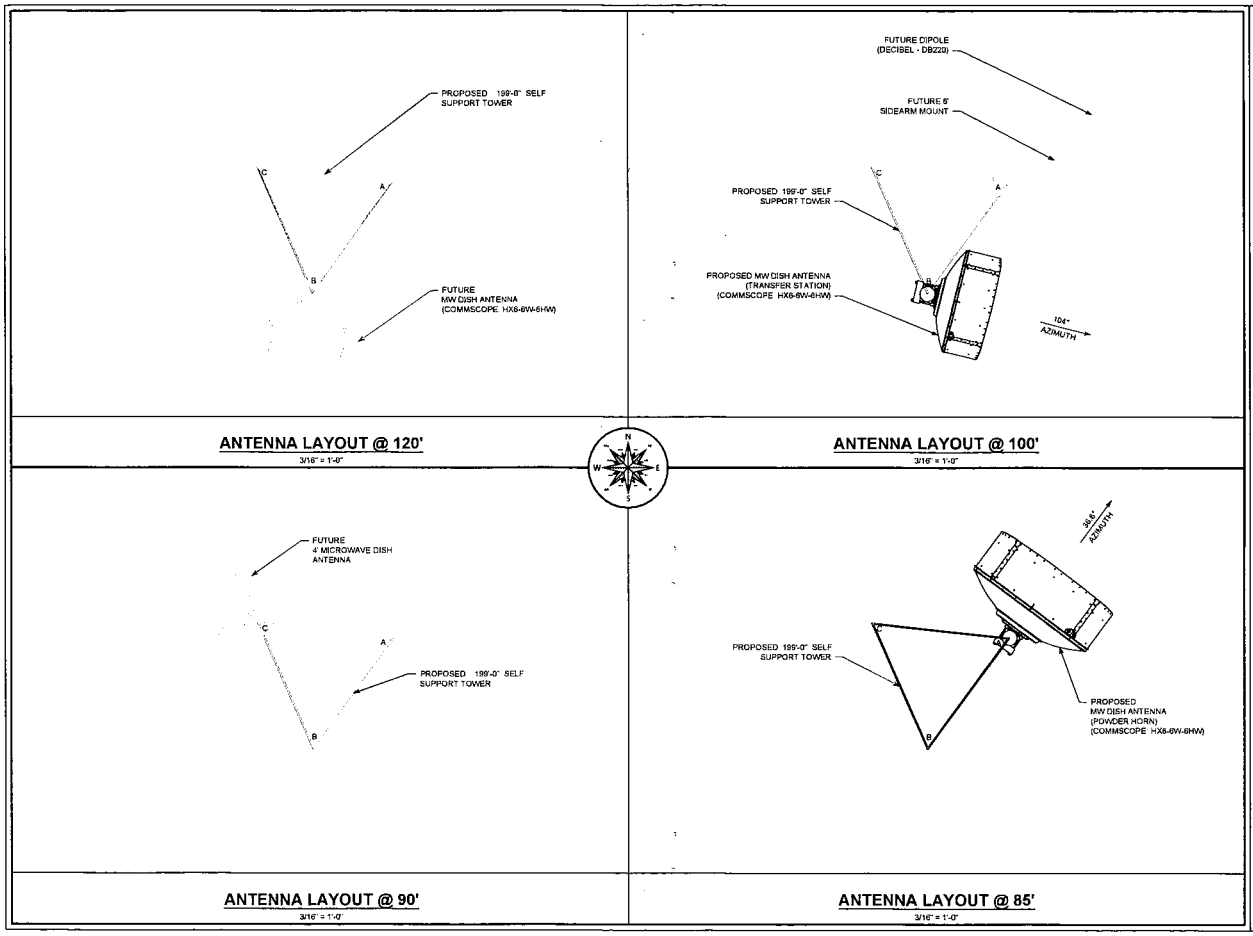
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
ANTENNA LAYOUTS

SHEET # C-3.2 | CURRENT REV # 3 | ETS # 22110700



PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-0710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.23306836°, -81.6686886°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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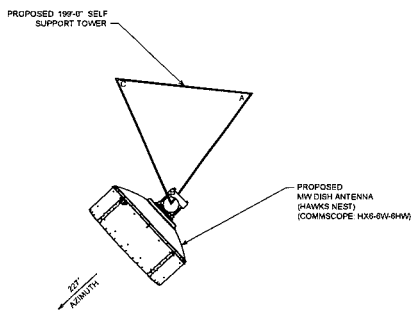
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE

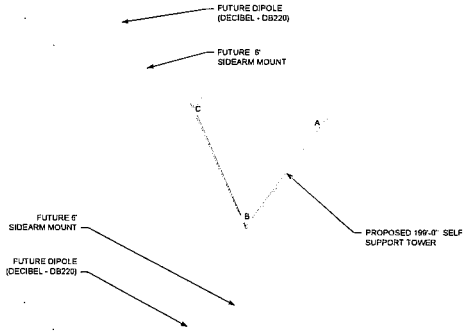
ANTENNA LAYOUTS

SHEET # C-3.3 | CURRENT REV # 3
ETS # 22110700



ANTENNA LAYOUT @ 75'

3/16" = 1'-0"



ANTENNA LAYOUT @ 60'

3/16" = 1'-0"

NOT USED

N.T.S.

NOT USED

N.T.S.

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6988689°

SEAL: FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
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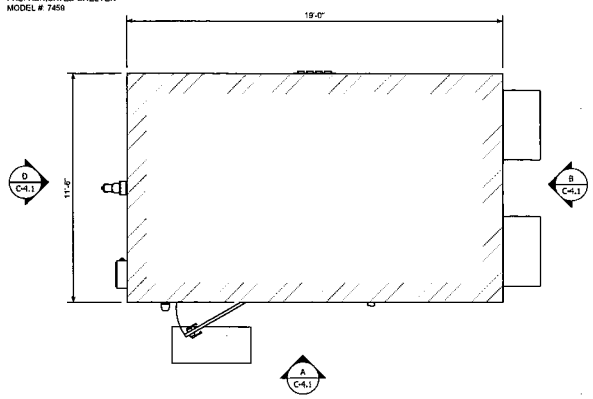
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

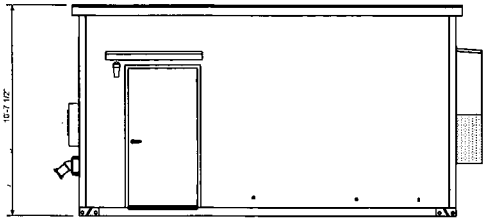
ANTENNA LAYOUTS

SHEET # C-3.4 | CURRENT REV # 3 | ETS # 22110700

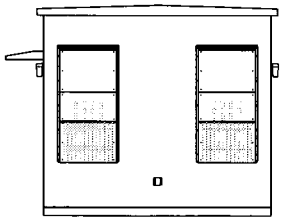
VFP: 11'-6" x 18'-0"
- PREFABRICATED SHELTER
- MODEL # 7459



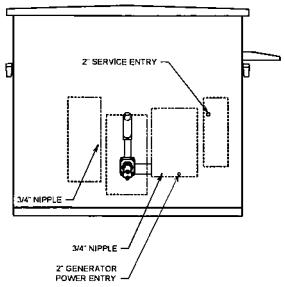
PLAN VIEW
N.T.S.



ELEVATION A
N.T.S.



ELEVATION B
N.T.S.



ELEVATION D
N.T.S.

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330635°, -81.6988889°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 051707 PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
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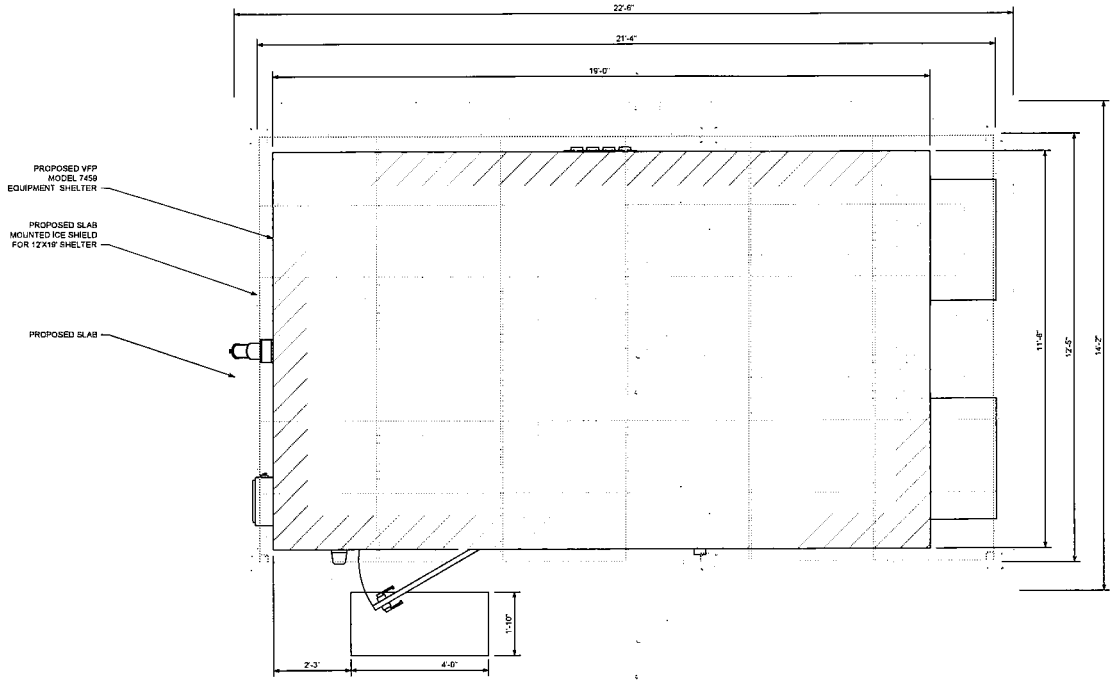
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
SHELTER DETAILS

SHEET # C-4.1 | CURRENT REV # 3 | ETS #: 22110700



SHELTER & ICE SHIELD DETAILS

3/8" = 1'-0"

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6988889°

SEAL

FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
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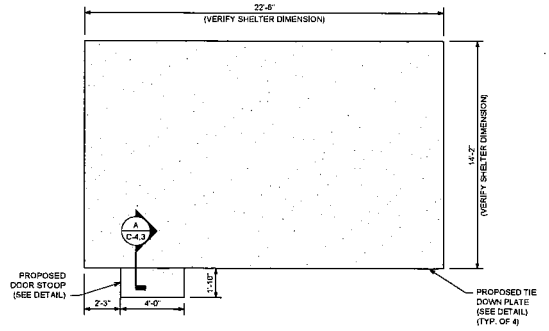
SHEET TITLE:

SHELTER & ICE SHIELD DETAILS

SHEET # C-4.2 | CURRENT REV # 3 | ETS # 22110700

NOTES
- SURFACE OF FINISHED SLAB SHALL BE LEVEL AND FLAT WITHIN 1/4"
- CONTRACTOR TO VERIFY WITH MANUFACTURER ACTUAL DIMENSIONS OF SHELTER PRIOR TO LAYING FOUNDATION
- SEE SHEET GN-3 FOR CONCRETE AND FOUNDATION NOTES



SHELTER CONCRETE FOUNDATION PLAN
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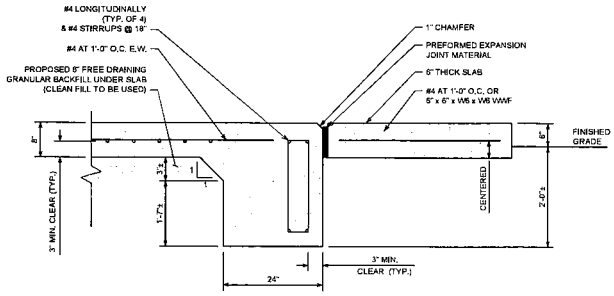

SECTION A DETAIL
N.T.S.

NOT USED
N.T.S.

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SEAL — FIRM # P-1016
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04/15/2025

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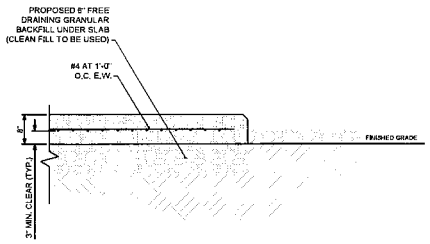
SHEET TITLE
SHELTER FOUNDATION DETAILS

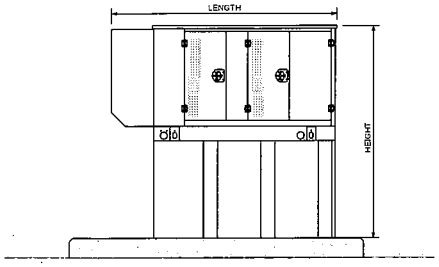
SHEET # C-4.3 | CURRENT REV # 3 | ETS # 22110700



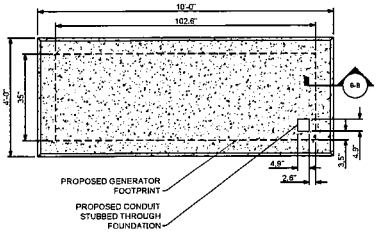
SECTION B-B

GENERAC - SG056
- DIESEL GENERATOR
- STANDARD ENCLOSURE
- 510 GALLON TANK

HEIGHT	WIDTH	DEPTH	WEIGHT
93.00"	47.00"	117.00"	3663 LBS

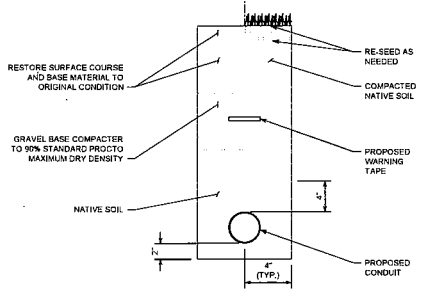


GENERATOR PAD ELEVATION
N.T.S.



SECTION FOR USE UNDER PAVEMENT OR VEHICLE TRAFFIC AREAS

SECTION FOR USE UNDER GRASS OR BARE GROUND AREAS



TRENCH DETAIL
N.T.S.

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FIRM #: P-1018
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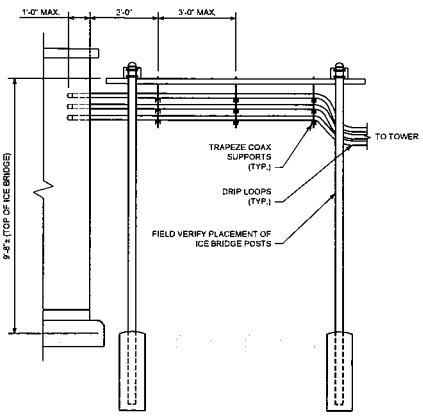
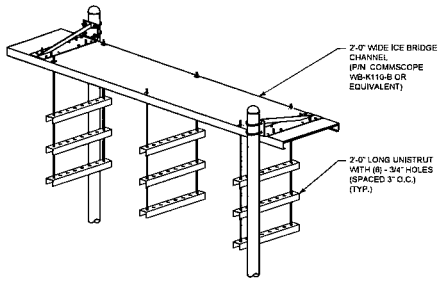
SHEET TITLE:
GENERATOR AND GEN. FOUNDATION DETAILS

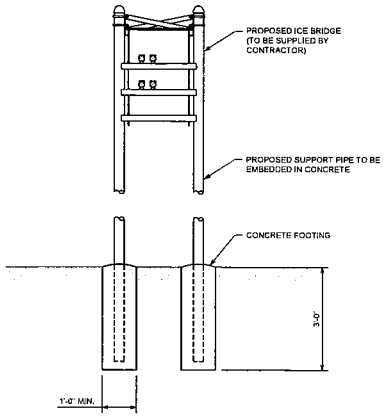
SHEET # C-4.4 | CURRENT REV # 3 | ETS # 22110700



ICE BRIDGE DETAIL
N.T.S.



ISOMETRIC VIEW
N.T.S.



SIDE VIEW
N.T.S.

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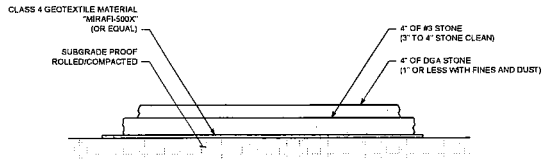
SHEET TITLE:
ICE BRIDGE DETAILS

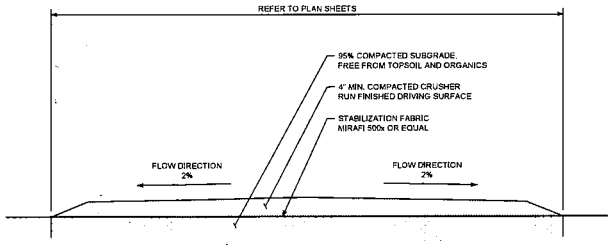
SHEET # C-4.5 | CURRENT REV # 3
ETS # 22110700

NOTES
1. CLEAR AND GRUB EXISTING VEGETATION.
2. MAINTAIN EXISTING DRAINAGE PATTERNS.
3. MINIMUM OF 6" OF 1-1/2" CRUSHED ROCK.
4. MIRAFI 500X (OR EQUIVALENT) GEOTEXTILE FABRIC.
5. SUBGRADE TO BE COMPACTED TO 95% DENSITY (MINIMUM) STANDARD PROCTOR DENSITY.
6. USE OF SWALES AND/OR DRAINAGE DITCHES FOR PROPER WATER RUNOFF AS NEEDED.
7. AGGREGATE IS BASED ON STANDARD AASHTO.
8. SLOPE NOT TO EXCEED 1/4" PER FOOT TO MAX. GRADE OF 6" FROM CENTER OF COMPOUND TO EACH FENCE LINE.

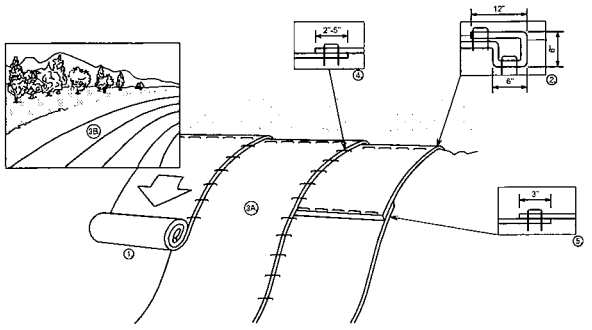


COMPOUND SURFACING
N.T.S.

NOTES
- SEE ALL EXISTING SUBGRADE AND CRUSHER RUN GRAVEL SURFACING SHALL BE COMPACTED TO 95% MINIMUM STANDARD PROCTOR DENSITY AS SPECIFIED BY ASTM D698 AND AASHTO T99.
- THE CONTRACTOR IS REQUIRED TO TEST AND SUBMIT COMPACTION TEST RESULTS FOR ALL EXISTING SUBGRADE AND CRUSHER RUN GRAVEL SURFACING IN THE CLOSEOUT PACKAGE SUPPLIED TO AMERICAN TOWER.
- CONTRACTOR SHALL VERIFY DITCH LOCATIONS (IF REQUIRED) WITH SITE GRADING PLANS.
- ROAD CROSS SECTION VARIES. CONTRACTOR SHALL REVIEW GRADING PLAN FOR CROSS SLOPE AREAS. MAINTAIN A MINIMUM 2% CROSS SLOPE.



ACCESS DRIVE SECTION
N.T.S.



SLOPE INSTALLATION
N.T.S.

GRADING AND DRAINAGE NOTES:
1. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREA.
2. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
3. GRASSED AREAS DISTURBED BY THE WORK OF THIS CONTRACT SHALL BE GRADED TO UNIFORM SLOPE, FERTILIZED, SEEDED AND COVERED WITH MULCH.
4. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES SHALL BE IN CONFORMANCE WITH THE NORTH CAROLINA GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.
5. AUTHORIZATION FOR ACCESS TO AND WORK WITHIN PUBLIC ROAD R.O.W. SHALL BE OBTAINED BY THE CONTRACTOR. THE CONTRACTOR SHALL ADHERE TO ALL SPECIAL REQUIREMENTS SPECIFIED IN THE AUTHORIZATION.
6. ALL OTHER VEGETATIVE COVER DAMAGED OR REMOVED DURING CONSTRUCTION ACTIVITIES SHALL BE REPLACED IN KIND BY THE CONTRACTOR (UNLESS OTHERWISE NOTED).
7. ALL MATERIALS AND METHODS OF CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE AUTHORITY HAVING JURISDICTION AND THE STATE OF NORTH CAROLINA STANDARDS AND SPECIFICATIONS.
8. CONTRACTOR SHALL HAVE NORTH CAROLINA ONE CALL (1-800-632-4949) LOCATE ALL EXISTING UTILITIES PRIOR TO BEGINNING CONSTRUCTION.
9. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL EXISTING UTILITIES AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES OR CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

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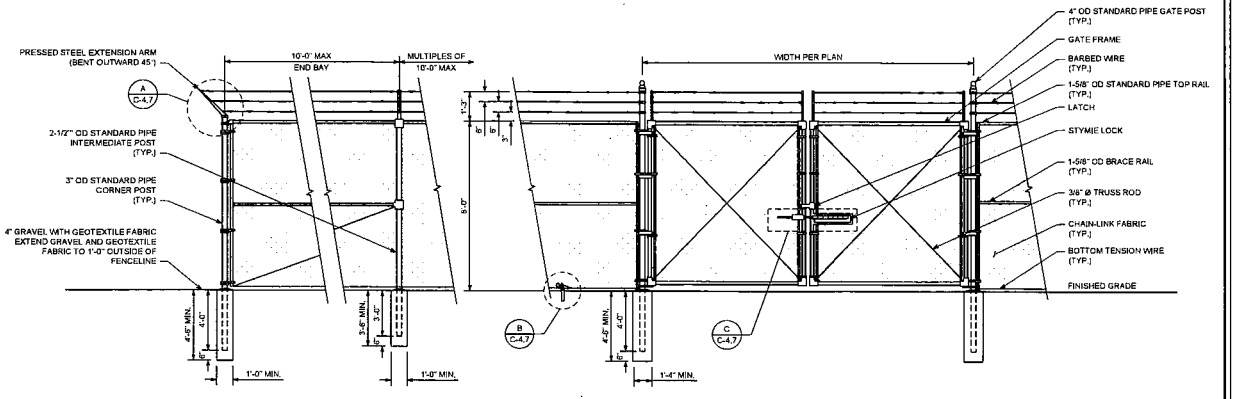
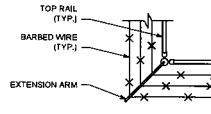
SHEET TITLE:
SURFACE & SLOPE DETAILS

SHEET # C-4.6 | CURRENT REV # 3 | ETS # 22110700

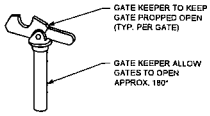


FENCE & DOUBLE SWING GATE DETAIL

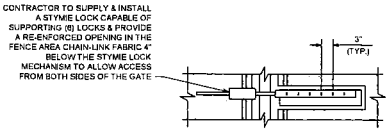
N.T.S.



DETAIL A
TYPICAL FENCE CORNER



DETAIL B
GATE KEEPER



DETAIL C
STYMIE LOCK

FENCE & STYMIE LOCK DETAILS

N.T.S.

NOTES

1. ALL MATERIAL AND HARDWARE FOR THE CHAIN-LINK FENCE SHALL BE A HOT DIP GALVANIZED FINISH.
2. CHAIN-LINK FABRIC TO BE 6'-0" HIGH, 9 GA. WIRE, 2" MESH WITH TWISTED SELVAGE TOP AND BOTTOM (PER ASTM A392).
3. BARBED WIRE TO CONSIST OF 3 NO. 12-1/2" GA. GALVANIZED STEEL WORE WITH 4-POINT BARBS OF NO. 14 GA. GALVANIZED STEEL.
4. POST, RAIL AND GATE FITTINGS TO BE PRESSED STEEL OR MALLEABLE CASTING (PER ASTM A153).
5. ALL POSTS SHALL HAVE WEATHER CAPS INSTALLED.
6. POSTS TO SET IN 3,000 PSI CONCRETE. BOTTOM OF CONCRETE TO BE 6" MIN. FROM BOTTOM OF POST.
7. TIE WIRES TO BE 9 GA. ALUMINUM SPACES AT 12" OC POSTS/GATES AND 24" OC RAILS/WIRE.
8. TENSION BARS TO BE 3/16" x 3/4" CARBON STEEL ATTACHED TO TERMINAL POSTS BY MEANS OF BEVELED EDGE BANDS.
9. PROVIDE (2) GATE KEEPER HOLD OPEN DEVICES FOR SWING GATES. GATE KEEPERS TO ALLOW GATES TO OPEN APPROXIMATELY 180 DEGREES.
10. CONTRACTOR TO SUPPLY AND INSTALL A STYMIELOCK CAPABLE OF SUPPORTING (6) LOCKS AND PROVIDE A RE-ENFORCED OPENING IN THE CHAIN-LINK FENCE AREA FABRIC OF 4" BELOW THE STYMIE LOCK MECHANISM TO ALLOW ACCESS FROM BOTH SIDES OF THE GATE.
11. SITE OWNER / CARRIER TO PROVIDE A STANDARD LOCK FOR THE GATE.
12. ALL FENCE POST FOUNDATIONS SHALL BE ROUNDED AT TOP AS SHOWN TO DIVERT WATER AWAY FROM THE POSTS.
13. THE FABRIC SHALL BE SET SO THERE IS NO GAP BETWEEN THE CHAIN-LINK FENCE FABRIC AND THE FINISHED GRADE.
15. 4" OD STANDARD PIPE FOR GATE POSTS.
16. 3" OD STANDARD PIPE FOR ALL CORNER AND END POSTS.
17. 2-1/2" OD STANDARD PIPE FOR ALL INTERMEDIATE POSTS.

NOTES

N.T.S.

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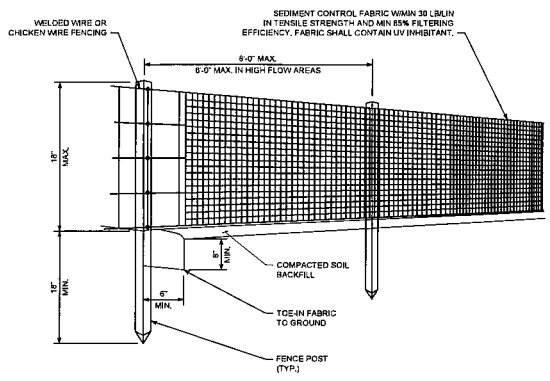
SHEET TITLE:
FENCE DETAILS

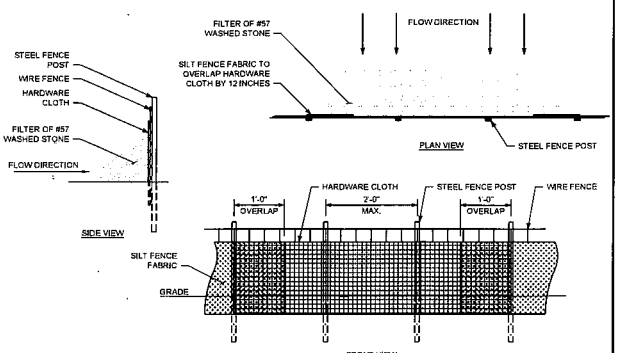
SHEET # C-4.7 | CURRENT REV # 3 | ETS #: 22110700

NOTES:
- SEE SILT FENCE NOTES



SILT FENCE
N.T.S.

NOTES:
- APPLICABLE FOR DRAINAGE AREAS NO MORE THAN 1/4 ACRE.
- USE AS A REPAIR OF SILT FENCE FAILURES.
- BURY WIRE FENCE, HARDWARE CLOTH, AND SILT FENCE FABRIC 8 INCHES.



TEMPORARY SILT FENCE OUTLET
N.T.S.

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SILT FENCE NOTES:

1. CONSTRUCT THE SILT FENCE OF FILTER CLOTH WITH A MINIMUM TENSILE STRENGTH OF 50 LB/LIN IN.
2. SILT FENCE HEIGHT SHALL BE A MINIMUM OF 15 INCHES ABOVE GROUND HEIGHT, BUT SHALL NOT EXCEED 16 INCHES.
3. CONSTRUCT SILT FENCE OF A CONTINUOUS ROLL CUT THE LENGTH OF THE BARRIER TO AVOID JOINTS. FABRIC TO BE FASTENED SECURELY TO FENCE POSTS WITH 1 INCH STAPLES OR TIE WIRES.
4. SUPPORT FABRIC WITH WOVEN WIRE MESH 14.5 GAUGE, 6" MAX. MESH OPENING. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH 1 INCH STAPLES OR TIE WIRES.
5. POSTS FOR SEDIMENT FENCES SHALL BE 4 INCH DIAMETER PINE, 2 INCH DIAMETER OAK OR 1.33 LB/LINEAR FOOT STEEL. MINIMUM LENGTH SHALL BE 4 POSTS SHALL BE SPACED NO MORE THAN 8 FEET APART AND THEY SHALL BE DRIVEN INTO THE GROUND A MINIMUM OF 18 INCHES.
6. EXCAVATE A TRENCH APPROXIMATELY 4 INCHES WIDE AND 8 INCHES DEEP ALONG THE PROPOSED LINE OF POSTS AND UP SLOPE FROM THE BARRIER. BACKFILL THE TRENCH WITH COMPACTED SOIL OR GRAVEL PLACED OVER THE FILTER FABRIC.
7. DO NOT ATTACH FILTER FABRIC TO EXISTING FENCES, TREES, ETC.
8. REMOVE FENCING FOLLOWING STABILIZATION OF SLOPES AND ALL DISTURBED AREAS.

NOT USED
N.T.S.

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SHEET TITLE:
SILT FENCE DETAILS

SHEET # C-4.8 | CURRENT REV # 3 | ETS # 22110700

ELECTRICAL NOTES

1. SCOPE

   A. SHALL INCLUDE ALL LABOR, MATERIALS AND APPLIANCES REQUIRED FOR THE FURNISHING, INSTALLING AND TESTING, COMPLETE AND READY FOR OPERATION OF ALL WORK SHOWN ON THE DRAWING AS SPECIFIED HEREIN

   A.a. ELECTRIC SERVICE
   A.b. CONDUIT AND RACEWAY
   A.c. CONDUCTORS
   A.d. MISCELLANEOUS MATERIALS
   A.e. TELEPHONE CONDUITS
   A.f. LIGHTNING ARRESTING SYSTEM

2. CODES

   A. THE INSTALLATION SHALL COMPLY WITH ALL LAWS APPLYING TO ELECTRICAL INSTALLATION IN EFFECT WITH THE REGULATIONS OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL SAFETY CODE AND THE ICC, ADMINISTRATIVE RULES WITH THE NATIONAL ELECTRIC CODE, AND ANY LOCAL CODES AND ORDINANCES WITH THE REGULATION OF THE SERVING UTILITY COMPANY. ALL PERMITS REQUIRED SHALL BE OBTAINED AND, AFTER COMPLETION OF WORK, THE OWNER SHALL BE FURNISHED A CERTIFICATE OF FINAL INSPECTION AND APPROVAL.

3. TESTING

   A. UPON COMPLETION OF THE INSTALLATION, OPERATE AND ADJUST ALL EQUIPMENT AND SYSTEMS TO MEET SPECIFIED PERFORMANCE REQUIREMENTS. ALL TESTING SHALL BE DONE BY QUALIFIED PERSONNEL.

4. GUARANTEE

   A. IN ADDITION TO THE GUARANTEE OF THE EQUIPMENT BY THE MANUFACTURER, EACH PIECE OF EQUIPMENT SPECIFIED HEREIN SHALL ALSO BE GUARANTEED FOR DEFECTS OF MATERIAL OR WORKMANSHIP OCCURRING DURING A PERIOD OF ONE (1) YEAR FROM FINAL ACCEPTANCE OF THE WORK BY THE OWNER, WITHOUT EXPENSE TO THE OWNER. ALL WARRANTEE CERTIFICATES & GUARANTEES FURNISHED BY THE MANUFACTURERS SHALL BE TURNED OVER TO THE OWNER.

5. COORDINATION

   A. TOWER SUBCONTRACTOR SHALL COORDINATE ALL WORK WITH THE POWER AND TELEPHONE COMPANIES AND SHALL COMPLY WITH ALL SERVICE REQUIREMENTS OF EACH UTILITY COMPANY, IF REQUIRED.

6. EXAMINATION OF SITE

   A. PRIOR TO BEGINNING WORK, THE TOWER SUBCONTRACTOR SHALL VISIT THE SITE OF THE JOB AND SHALL FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING THE ELECTRICAL INSTALLATION AND SHALL MAKE PROVISIONS AS TO THE COST THEREOF. FAILURE TO COMPLY WITH THE INTENT OF THIS PARAGRAPH WILL IN NO WAY RELIEVE THE TOWER SUBCONTRACTOR OF PERFORMING ALL WORK NECESSARY FOR A COMPLETE AND WORKING SYSTEM OR SYSTEMS.

7. CUTTING, PATCHING AND EXCAVATION

   A. COORDINATION OF ALL SLEEVES, CHASES, ETC., WILL BE REQUIRED PRIOR TO THE CONSTRUCTION OF ANY PORTION OF THE WORK. ALL CUTTING AND PATCHING OF WALLS, PARTITIONS, FLOORS, AND CHASES IN CONCRETE, WOOD, STEEL OR MASONRY SHALL BE DONE AS PROVIDED ON THE DRAWINGS.

   B. ALL NECESSARY EXCAVATIONS AND BACKFILLING INCIDENTAL TO THE WORK UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWING SHALL BE PROVIDED BY THIS CONTRACTOR.

   C. SEAL ALL PENETRATION THROUGH WALL AND FLOORS WITH APPROVED GROUT.

8. RACEWAYS

   A. ALL CONDUCTORS SHALL BE INSTALLED IN CONDUIT. ALL CONDUIT SHALL BE GALVANIZED RIGID CONDUIT OR SCH40 PVC, AS INDICATED ON THE DRAWINGS.

   B. WHERE INSTALLED ON EXTERIORS AND EXPOSED TO DAMAGE, ALL CONDUIT SHALL BE GALVANIZED RIGID CONDUIT. ALUMINUM CONDUIT SHALL NOT BE ALLOWED.

   C. CONCEALED CONDUIT IN WALLS OR INTERIOR SPACES ABOVE GRADE MAY BE EMT.

   D. UNDERGROUND CONDUITS SHALL BE GALVANIZED RIGID CONDUIT OR SCHEDULE 40 PVC AS INDICATED ON THE DRAWINGS.

   E. ALL CONDUIT RUNS SHALL USE APPROVED COUPLINGS AND CONNECTORS. PROVIDE INSULATED BUSHING FOR ALL CONDUIT TERMINATIONS. ALL CONDUIT RUNS IN A WET LOCATION SHALL HAVE WATERPROOF FITTINGS.

   F. PROVIDE SUPPORTS FOR ALL CONDUITS IN ACCORDANCE WITH NEC REQUIREMENTS. ALL CONDUITS SHALL BE SIZED AS REQUIRED BY NEC.

   G. BURIAL DEPTH OF ALL CONDUITS SHALL BE AS REQUIRED BY CODE FOR EACH SPECIFIC CONDUIT TYPE AND APPLICATION.

   H. CONDUIT ROUTES ARE SCHEMATIC. TOWER SUBCONTRACTOR SHALL FIELD VERIFY BEFORE BID. COORDINATE ROUTE WITH WIRELESS CARRIER AND BUILDING OWNER.

9. EXTERIOR CONDUIT

   A. ALL EXPOSED CONDUIT SHALL BE NEATLY INSTALLED AND RUN PARALLEL OR PERPENDICULAR TO STRUCTURAL ELEMENTS. SUPPORTS AND MOUNTING HARDWARE SHALL BE HOT DIPPED GALVANIZED STEEL

   B. SCHEDULE 40 ELECTRICAL CONDUIT WILL BE BURIED TO A DEPTH OF AT LEAST 3 FEET. METALLIC CAUTION TAPE OR NONMETALLIC CAUTION TAPE WITH 12 AWG TRACING WIRE, WILL BE BURIED TO A DEPTH OF 2 FEET. TRENCHES WILL BE TAMPED AT 12 INCH INTERVALS TO PRECLUDE FUTURE SINKING. TOPSOIL WILL BE PRESERVED AND REPLACED. ALL DISTURBED AREAS SHALL BE RE-SEEDED AND STRAWED PER THE FORT BRAGG SEEDING SPECIFICATION. PULL CORDS WILL BE TIED OFF ON BOTH ENDS OF THE CONDUIT RUNS.

10. EQUIPMENT

   A. ALL DISCONNECT SWITCHES SHALL BE SERVICE ENTRANCE RATED, HEAVY DUTY TYPE.

   B. NEW CIRCUIT BREAKERS SHALL BE RATED TO WITHSTAND THE MAXIMUM AVAILABLE FAULT CURRENT AS DETERMINED BY THE LOCAL UTILITY. TOWER SUBCONTRACTOR SHALL VERIFY MAXIMUM AVAILABLE FAULT CURRENT, AND COORDINATE INSTALLATION WITH THE LOCAL UTILITY BEFORE STARTING WORK.

11. CONDUCTORS

   A. FURNISH AND INSTALL CONDUCTORS CALLED FOR IN THE DRAWINGS. ALL CONDUCTORS SHALL HAVE TYPE THWN (MIN) (75 DEGREE) INSULATION, RATED FOR 600 VOLTS.

   B. ALL CONDUCTORS SHALL BE UL LISTED AND SHALL BE PROVIDED AND INSTALLED AS FOLLOWS:

   B.a. MINIMUM WIRE SIZE SHALL BE #12 AWG.

   B.b. ALL CONDUCTORS SIZE #8 AND LARGER SHALL BE STRANDED. CONDUCTORS SIZED #10 AND SMALLER MAY BE SOLID OR STRANDED.

   B.c. CONNECTION FOR #10 AWG AND SMALLER SHALL BE BY TWISTING TIGHT AND INSTALLING INSULATED PRESSURE OR WIRE NUT CONNECTIONS.

   B.d. CONNECTION FOR #8 AWG AND LARGER SHALL BE BY USE OF STEEL CRIMP-ON SLEEVES WITH NYLON INSULATOR.

   C. ALL CONDUCTORS SHALL BE COLOR CODED IN ACCORDANCE WITH NEC STANDARDS.

   D. THE RACEWAY SYSTEM SHALL BE COMPLETE BEFORE INSTALLING CONDUCTORS.

12. PENETRATIONS

   E. TOWER SUBCONTRACTOR SHALL COMPLY WITH UL PENETRATION DETAILS FOR PENETRATIONS OF ALL RATED WALLS, ROOF, ETC.

GROUNDING NOTES

1. ALL ELECTRICAL NEUTRALS, RACEWAYS AND NON-CURRENT CARRYING PARTS OF ELECTRICAL EQUIPMENT AND ASSOCIATED ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH NEC ARTICLE 250. THIS SHALL INCLUDE NEUTRAL CONDUCTORS, CONDUITS, SUPPORTS, CABINETS, BOXES, GROUND BUSSES, ETC. THE NEUTRAL CONDUCTOR FOR EACH SYSTEM SHALL BE GROUNDED BY ONE POINT ONLY.
2. PROVIDE GROUND CONDUCTOR IN ALL RACEWAYS.
3. PROVIDE BONDING AND GROUND TO MEET NFPA 780 - LIGHTNING PROTECTION AS A MINIMUM.
4. ALL GROUNDING SHALL BE INSTALLED IN ACCORDANCE WITH MOTOROLA R-56 GUIDELINES, SECTION 4.

ABBREVIATIONS

A	AMPERE
AFG	ABOVE FINISHED GRADE
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BCW	BARE COPPER WIRE
BFG	BELOW FINISHED GRADE
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
DISC	DISCONNECT
EMT	ELECTRIC METALLIC TUBING
FSC	FLEXIBLE STEEL CONDUIT
GEN	GENERATOR
GPS	GLOBAL POSITIONING SYSTEM
GRC	GALVANIZED RIGID CONDUIT
KA	KILO AMP
KW	KILOWATTS
NEC	NATIONAL ELECTRIC CODE
PH	PHASE
PNL	PANEL
PNLBD	PANELBOARD
PVC	POLYVINYL CHLORIDE
RGS	RIGID GALVANIZED STEEL
SCCR	SHORT CIRCUIT CURRENT RATING
SW	SWITCH
UL	UNDERWRITERS LABORATORIES
V	VOLTAGE
VA	VOLTAGE AMP
W	WATTS
XFMR	TRANSFORMER
XMTR	TRANSMITTER

LEGEND

- EXISTING UTILITY POLE
- LIGHT
- RECEPTACLE
- BREAKER
- TRANSFORMER
- METER
- PANEL
- DISCONNECT
- FUSED DISCONNECT
- LIGHTNING ARRESTOR
- GENERATOR
- GROUND
- GROUND TO NEUTRAL BOND
- GROUND ROD
- GROUND ROD WITH INSPECTION WELL
- CADWELD BOND
- MECHANICAL BOND
- COMPRESSION BOND

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330939°, -81.6986889°

SEAL — FIRM # P-1018
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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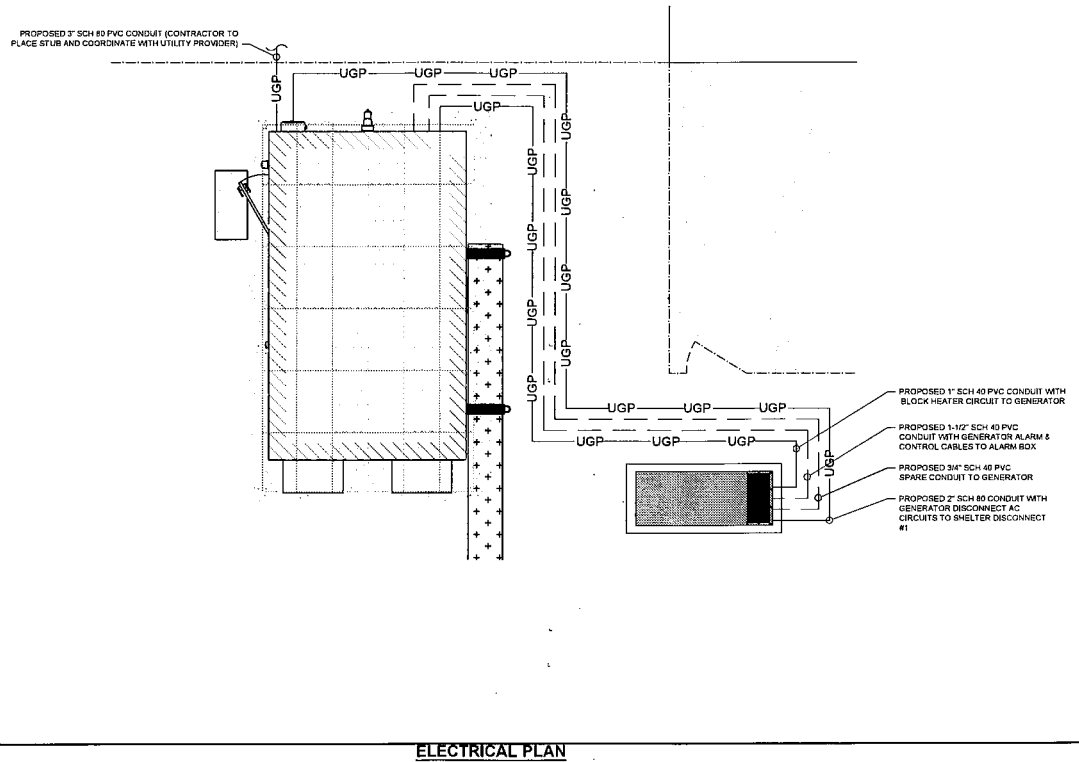
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE
ELECTRICAL NOTES

SHEET # E-1 | CURRENT REV # 3 | ETS # 22110700



ELECTRICAL PLAN

3/16" = 1'-0"

PREPARED BY:

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PREPARED FOR:

SITE NAME:
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SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6990889°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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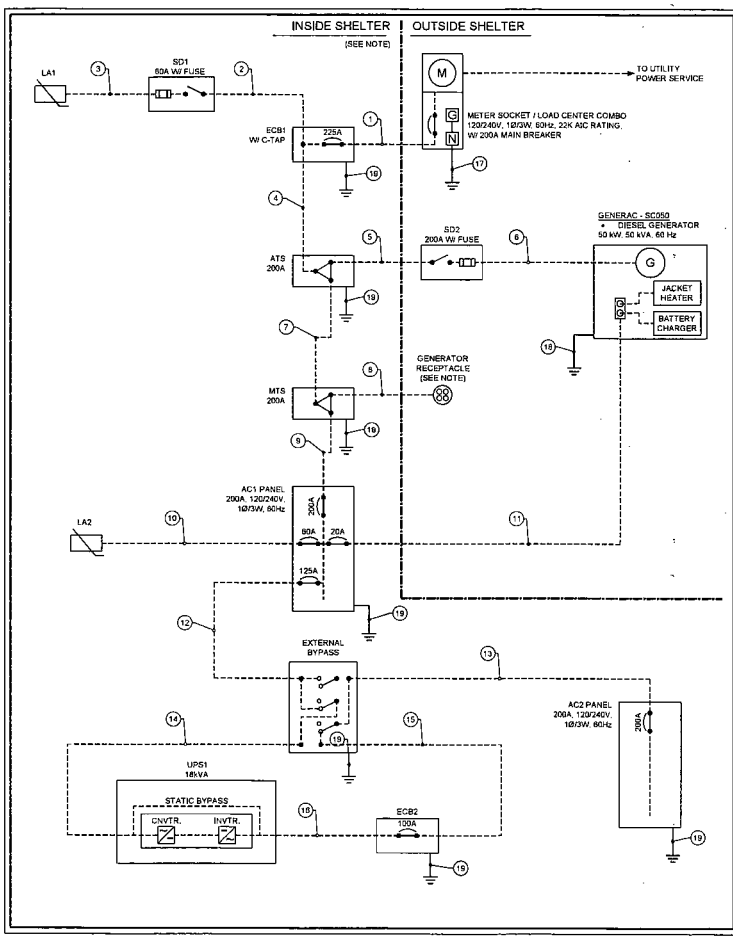
SHEET TITLE:
ELECTRICAL PLAN

SHEET # **E-2** | CURRENT REV # 3
ETS #: 22110700



CIRCUIT SCHEDULE

	FROM	TO	CONDUCTOR
1	METER / LOAD CENTER	ENCLOSURE W/ CIRCUIT BREAKER (ECB1)	(3) #3/0 + (1) #6 G
2	ENCLOSURE W/ CIRCUIT BREAKER (ECB1)	SERVICE DISCONNECT (SD1)	(3) #4 AWG + (1) #10 G
3	SERVICE DISCONNECT (SD1)	LIGHTNING ARRESTOR (LA1)	(3) #4 AWG + (1) #10 G
4	ENCLOSURE W/ CIRCUIT BREAKER (ECB1)	AUTOMATIC TRANSFER SWITCH	(3) #3/0 + (1) #6 G
5	AUTOMATIC TRANSFER SWITCH	SERVICE DISCONNECT (SD2)	(3) #3/0 + (1) #6 G
6	SERVICE DISCONNECT (SD2)	GENERATOR	(3) 300 kcmil + (1) #4 G
7	AUTOMATIC TRANSFER SWITCH	MANUAL TRANSFER SWITCH	(3) #3/0 + (1) #6 G
8	MANUAL TRANSFER SWITCH	GENERATOR RECEPTACLE	(3) #3/0 + (1) #2/0 G
9	MANUAL TRANSFER SWITCH	LOAD CENTER "UTILITY PP1"	(3) #3/0 + (1) #6 G
10	LOAD CENTER "UTILITY PP1"	LIGHTNING ARRESTOR (LA2)	(3) #4 AWG + (1) #6 G
11	LOAD CENTER "UTILITY PP1"	GENERATOR JACKET HEATER & BATTERY CHARGER RECEPTACLE	(2) #12 AWG + (1) #6 G
12	LOAD CENTER "UTILITY PP1"	EXTERNAL BYPASS	(3) #1 AWG + (1) #6 G
13	EXTERNAL BYPASS	LOAD CENTER "TECH PP2"	(3) #1 AWG + (1) #6 G
14	EXTERNAL BYPASS	UNINTERRUPTED POWER SYSTEM (UPS1)	(3) #1 AWG + (1) #6 G
15	EXTERNAL BYPASS	ENCLOSURE W/ CIRCUIT BREAKER (ECB2)	(3) #1 AWG + (1) #6 G
16	ENCLOSURE W/ CIRCUIT BREAKER (ECB2)	UNINTERRUPTED POWER SYSTEM (UPS1)	(3) #1 AWG + (1) #6 G
17	METER / LOAD CENTER (NEUTRAL & GROUND BOND)	SERVICE ENTRANCE GROUND ROD (BONDED TO SHELTER GROUND RING)	#2 AWG BTSC
18	GENERATOR	GROUND RING	#2 AWG BTSC
19	INTERNAL EQUIPMENT	ISOLATED PHASE GROUND RING	#6 AWG GREEN

NOTES

1. ONE-LINE DIAGRAM & WIRE SIZING PER VFP, INC. SHELTER DRAWING NO. 207459.
2. ALL EQUIPMENT INSIDE SHELTER, INCLUDING ALL GROUNDING IS PRE-INSTALLED AND WIRED BY VFP, INC. CONTACT VFP, INC. ENGINEER OF RECORD IF THERE ARE ANY DISCREPANCIES.
3. THE SHORT-CIRCUIT RATING OF THE TRANSFER EQUIPMENT, BASED ON THE SPECIFIC OVERCURRENT PROTECTIVE DEVICE TYPE AND SETTING PROTECTING THE TRANSFER EQUIPMENT (CAN VARY BETWEEN THE UTILITY AND GENERATOR CONNECTIONS) MUST BE FIELD MARKED ON THE EXTERIOR OF THE TRANSFER EQUIPMENT PER NEC ARTICLE 701.5(D).
4. SERVICE EQUIPMENT MUST BE LEGIBLY MARKED IN THE FIELD WITH THE MAXIMUM AVAILABLE FAULT CURRENT PER NEC ARTICLE 110.24(A). THE FIELD MARKING MUST INCLUDE THE DATE OF WHEN THE FAULT CURRENT CALCULATION WAS PERFORMED AND MUST BE ABLE TO WITHSTAND THE SURROUNDING ENVIRONMENT.
5. ENSURE ALL REQUIRED SIGNS PER NEC ARTICLE 701.7 ARE INSTALLED.
6. LEGALLY REQUIRED STANDBY SYSTEM OVERCURRENT DEVICES MUST BE SELECTIVELY COORDINATED WITH ALL SUPPLY-SIDE OVERCURRENT PROTECTIVE DEVICES PER NEC ARTICLE ARTICLE 701.27.
7. SERVICE ENTRANCE RATED METER / LOAD CENTER MUST HAVE GROUND BOND BETWEEN NEUTRAL AND GROUND, AND BE CODE COMPLIANT CONTAINING UNDERWRITERS LABORATORIES UL-891 AND UL-1008 LABELS, AND MEET NEC AND LOCAL CODES.
8. GENERATOR RECEPTACLE: PROVIDE WARNING SIGN TO BE PLACED BY THE GENERATOR INLET THAT STATES, "WARNING: FOR CONNECTION OF A NONSEPARATELY DERIVED (FLOATING NEUTRAL) SYSTEM ONLY." DO NOT BOND NEUTRAL TO GROUND IN GENERATOR.
9. REFER TO VFP, INC. SHELTER DRAWINGS NO. 207459 FOR ALL ALARM CABLE SCHEMATICS AND CONNECTION DETAILS.
10. LOAD IS NOT TO EXCEED 200A. ELECTRICAL CONTRACTOR TO VERIFY LOAD. IF LOAD DOES EXCEED 200A, CONTRACTOR TO CONTACT VFP, INC. ENGINEER OF RECORD.
11. ALL EXTERIOR ENCLOSURES TO BE NEMA 3 RATED.
12. ALL ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE.
13. ALL ELECTRICAL MATERIALS, DEVICES, APPLIANCES, AND EQUIPMENT SHALL BE LABELED/LISTED BY UL OR A NORTH CAROLINA APPROVED THIRD PARTY TESTING AGENCY.
14. SUBCONTRACTOR TO LEAVE EXTRA PULL TAPE FOR FUTURE CABLE INSTALL BY OTHERS.
15. SEE SHEETS E-4.1 & E-4.2 FOR PANEL SCHEDULES.
16. SEE SHEET E-2 FOR ROUTES.

PREPARED BY:

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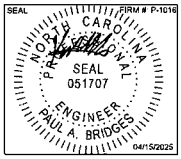
SEAL



FIRM # P-1016

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

ELECTRICAL ONE-LINE DIAGRAM

SHEET # **E-3**

CURRENT REV # 3
ETS # 22110706

AC 1 LOAD SCHEDULE

120/240V, 200A MCB, 1-PHASE, 3-WIRE, NEMA 3R, SURFACE MOUNTED, ON SHELTER WALL

NOTES	CIR #	DESCRIPTION	AMPS	POLES	DEMAND LOAD	A	B	DEMAND LOAD	POLES	AMPS	DESCRIPTION	CIR #	NOTES
(P)(1)(2)	1	LIGHTNING ARRESTOR	60	2	0.06	3.8		3.72	2	40	ACH2	2	(P)(1)(2)
(P)(1)(2)	3				0.06		3.8	3.72				4	(P)(1)(2)
(P)(1)(2)	5	ACH1	40	2	3.72	4.3		0.54	1	20	INTERIOR RCPTS	6	(P)(1)(2)
(P)(1)(2)	7				3.72		3.8	0.12	1	20	SMOKE DETECTOR	8	(P)(1)(2)
(P)(1)(2)	9	INTERIOR RCPTS	20	1	0.72	5.7		4.95	2	125	UPS BYPASS SWITCH	10	(P)(1)(2)
(P)(1)(2)	11	EMERGENCY / EXIT LIGHT	20	1	0.27		5.2	4.95				12	(P)(1)(2)
(P)(1)(2)	13	EXTERIOR RCPT	20	1	0.18	0.4		0.18	2	30	TWIST-LOCK	14	(P)(1)(2)
(P)(1)(2)	15	EXTERIOR LIGHT	20	1	0.10		0.3	0.18				16	(P)(1)(2)
(P)(1)(2)	17	GENERATOR	20	2	0.84	1.0		0.18	2	30	TWIST-LOCK	18	(P)(1)(2)
(P)(1)(2)	19				0.84		1.0	0.18				20	(P)(1)(2)
(P)(1)(2)	21	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	22	(P)(1)(2)
(P)(1)(2)	23	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	24	(P)(1)(2)
(P)(1)(2)	25	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	26	(P)(1)(2)
(P)(1)(2)	27	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	28	(P)(1)(2)
(P)(1)(2)	29	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	30	(P)(1)(2)
(P)(1)(2)	31	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	32	(P)(1)(2)
(P)(1)(2)	33	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	34	(P)(1)(2)
(P)(1)(2)	35	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	36	(P)(1)(2)
(P)(1)(2)	37	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	38	(P)(1)(2)
(P)(1)(2)	39	COIL FOR BATTERY CHARGER	20	1	2.50		2.5	0.00	1	20	SPARE	40	(P)(1)(2)
(P)(1)(2)	41	COIL FOR BATTERY CHARGER	20	1	2.50	2.5		0.00	1	20	SPARE	42	(P)(1)(2)

A	B	TOTAL	
17.6	16.5	34.2	Total Panel Load (kW)
		38.4	Total Panel Rated Capacity (kW)
		4.2	Total Panel Rated Spare Capacity (kW)
		147	Panel Amps

NOTES:

(1) FURNISH AND INSTALL TYPE WRITTEN PANEL SCHEDULE AS APPROPRIATE PER NEC.
(2) LOADS CALCULATED FROM VFP 207459 DRAWINGS
(P) PROPOSED EQUIPMENT; INSTALL PER NEC

AC1 PANEL SCHEDULE
N.T.S.

NOT USED
N.T.S.

AC2 LOAD SCHEDULE

120/240V, 200A MCB, 1-PHASE, 3-WIRE, NEMA 3R, SURFACE MOUNTED, ON SHELTER WALL

NOTES	CIR #	DESCRIPTION	AMPS	POLES	DEMAND LOAD	A	B	DEMAND LOAD	POLES	AMPS	DESCRIPTION	CIR #	NOTES
(P)(1)(2)	1	EQUIPMENT, RCPT #1	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #2	2	(P)(1)(2)
(P)(1)(2)	3	EQUIPMENT, RCPT #3	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #4	4	(P)(1)(2)
(P)(1)(2)	5	EQUIPMENT, RCPT #5	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #6	6	(P)(1)(2)
(P)(1)(2)	7	EQUIPMENT, RCPT #7	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #8	8	(P)(1)(2)
(P)(1)(2)	9	EQUIPMENT, RCPT #9	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #10	10	(P)(1)(2)
(P)(1)(2)	11	EQUIPMENT, RCPT #11	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #12	12	(P)(1)(2)
(P)(1)(2)	13	EQUIPMENT, RCPT #13	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #14	14	(P)(1)(2)
(P)(1)(2)	15	EQUIPMENT, RCPT #15	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #16	16	(P)(1)(2)
(P)(1)(2)	17	(PDU1) RCPT #1	20	1	0.36	0.7		0.36	1	20	(PDU1), RCPT #2	18	(P)(1)(2)
(P)(1)(2)	19	(PDU1) RCPT #3	20	1	0.36		0.7	0.36	1	20	(PDU1), RCPT #4	20	(P)(1)(2)
(P)(1)(2)	21	(PDU1) RCPT #5	20	1	0.36	0.7		0.36	1	20	(PDU1), RCPT #6	22	(P)(1)(2)
(P)(1)(2)	23	(PDU1) RCPT #7	20	1	0.36		0.7	0.36	1	20	(PDU1), RCPT #8	24	(P)(1)(2)
(P)(1)(2)	25	(PDU2) RCPT #1	20	1	0.36	0.7		0.36	1	20	(PDU2), RCPT #2	26	(P)(1)(2)
(P)(1)(2)	27	(PDU2) RCPT #3	20	1	0.36		0.7	0.36	1	20	(PDU2), RCPT #4	28	(P)(1)(2)
(P)(1)(2)	29	(PDU2) RCPT #5	20	1	0.36	0.7		0.36	1	20	(PDU2), RCPT #6	30	(P)(1)(2)
(P)(1)(2)	31	(PDU2) RCPT #7	20	1	0.36		0.7	0.36	1	20	(PDU2), RCPT #8	32	(P)(1)(2)
(P)(1)(2)	33	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	34	(P)(1)(2)
(P)(1)(2)	35	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	36	(P)(1)(2)
(P)(1)(2)	37	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	38	(P)(1)(2)
(P)(1)(2)	39	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	40	(P)(1)(2)
(P)(1)(2)	41	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	42	(P)(1)(2)

A	B	TOTAL	
5.8	5.8	11.5	Total Panel Load (kW)
		38.4	Total Panel Rated Capacity (kW)
		26.9	Total Panel Rated Spare Capacity (kW)
		48	Panel Amps

NOTES:

(1) FURNISH AND INSTALL TYPE WRITTEN PANEL SCHEDULE AS APPROPRIATE PER NEC.
(2) LOADS CALCULATED FROM VFP 207459 DRAWINGS
(P) PROPOSED EQUIPMENT; INSTALL PER NEC

AC2 PANEL SCHEDULE
N.T.S.

NOT USED
N.T.S.

PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plic.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6968889°

SEAL: FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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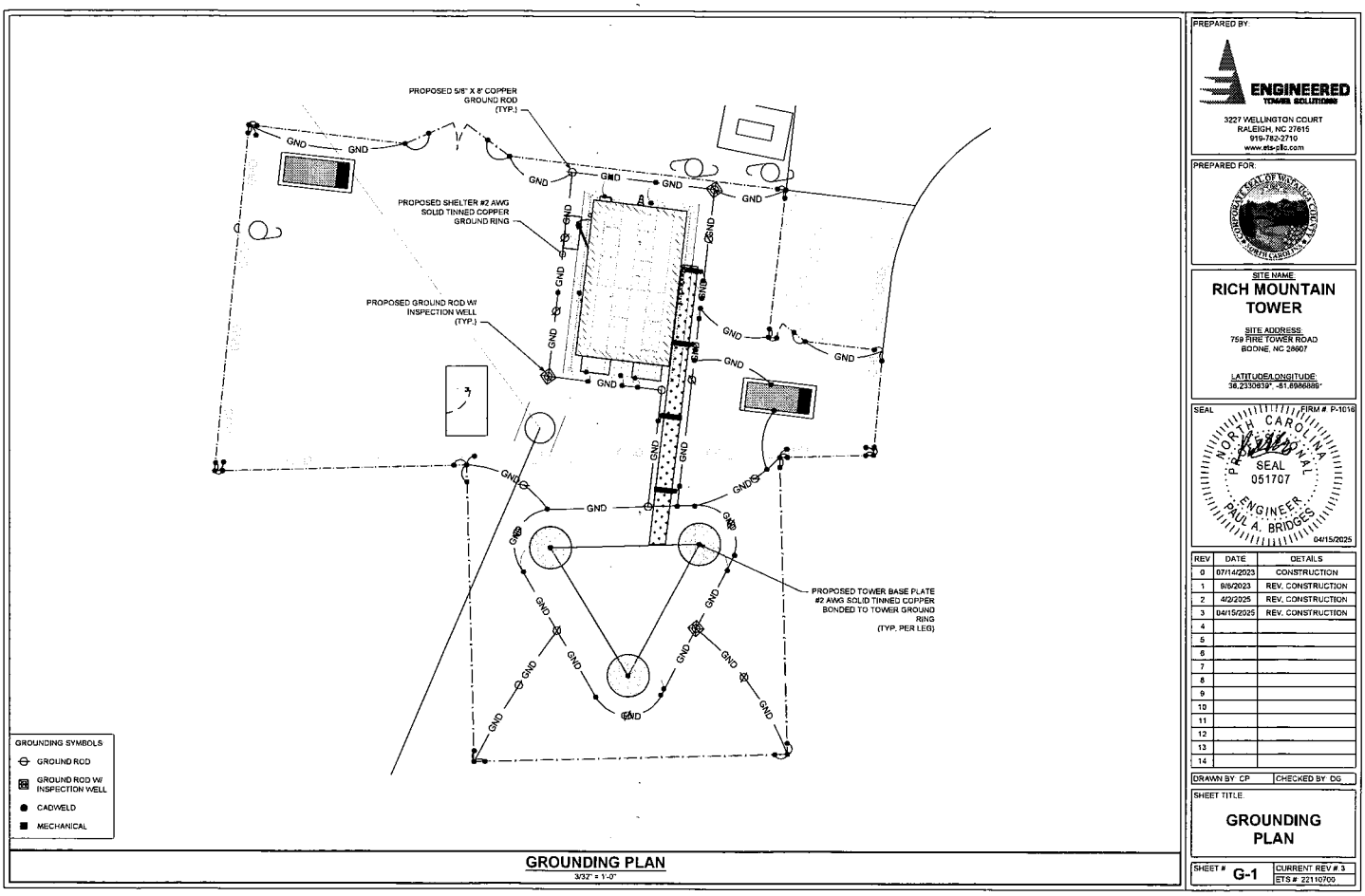
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
PANEL SCHEDULES

SHEET # E-4 | CURRENT REV # 3 | ETS # 22110700



GROUNDING PLAN
3/32" = 1'-0"

PREPARED BY:

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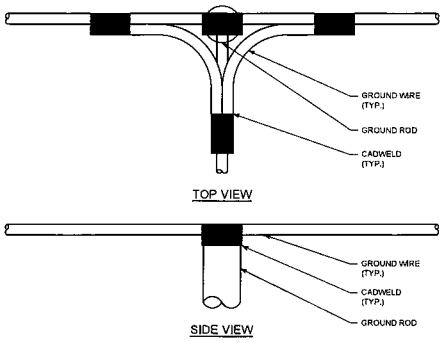
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
GROUNDING PLAN

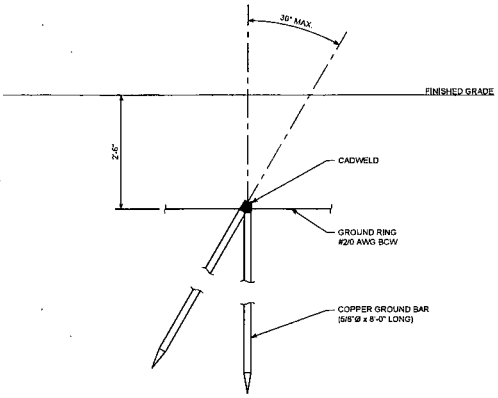
SHEET # G-1 | CURRENT REV # 3
ETS # 22110700

NOTES:
- MINIMUM SPACING OF 1'-0" BETWEEN ALL CADWELDS



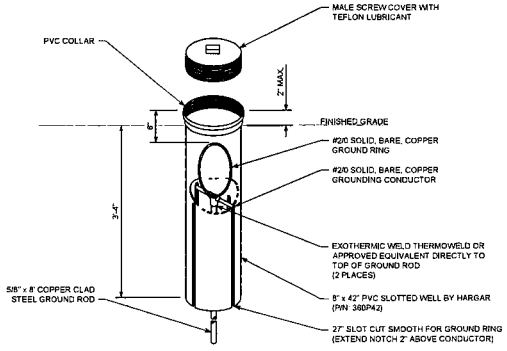
CADWELD GROUNDING DETAIL

N.T.S.



COPPER-CLAD STEEL GROUND ROD

N.T.S.



GROUND ROD WITH INSPECTION WELL

N.T.S.

1. GROUNDING ELECTRODES SHALL BE CONNECTED IN A RING USING #2 AWG SOLID TINNED BARE WIRE. THE TOP OF THE GROUND RODS AND THE RING CONDUCTOR SHALL BE 30 INCHES BELOW FINISHED GRADE OR BELOW FROST LINE, WHICHEVER IS GREATER. GROUNDING ELECTRODES SHALL BE INSTALLED A MINIMUM SPACING OF 16'-0"
2. BONDING OF THE GROUNDED CONDUCTOR (NEUTRAL) AND THE GROUNDING CONDUCTOR SHALL BE AT THE SERVICE DISCONNECTING MEANS. BONDING JUMPER SHALL BE INSTALLED PER N.E.C. ARTICLE 250.30
3. CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER WHEN THE GROUNDING SYSTEM IS COMPLETE. THE CONSTRUCTION MANAGER SHALL INSPECT THE GROUNDING SYSTEM PRIOR TO BACKFILLING.
4. GROUND RINGS SHALL BE INSTALLED IN DIRECT CONTACT WITH THE EARTH AT A DEPTH OF 30 INCHES BELOW THE EARTH'S SURFACE WHEREVER POSSIBLE, OR BELOW THE FROST LINE, WHICHEVER IS DEEPER (ANSI T1.334-2002, SECTION 5.3.1 AND NFPA 70-2005, ARTICLE 250.53)
   A. BUILDING GROUND RINGS SHALL BE INSTALLED AT LEAST 3 FEET FROM THE BUILDING FOUNDATION AND SHOULD BE INSTALLED BEYOND THE DRIP LINE OF THE ROOF. IT IS RECOMMENDED THAT THE BUILDING GROUND RING AND GROUND RODS BE POSITIONED 2 FEET TO 6 FEET OUTSIDE OF THE DRIP LINE OF THE BUILDING OR STRUCTURE TO ENSURE THAT PRECIPITATION WETS THE EARTH AROUND THE GROUND RING AND RODS (MIL-HDBK-419A AND MIL-STD-188-124B)
   B. TOWER GROUND RINGS SHALL BE INSTALLED AT LEAST 2 FEET FROM THE TOWER FOUNDATION (ANSI T1.334-2002, SECTION 5.3.1)
5. BOND PPC AND EQUIPMENT ENCLOSURES TO BURIED GROUNDING CONDUCTOR. USE A NEMA DRILLED TWO-HOLE CONNECTOR FOR BONDS TO EQUIPMENT ENCLOSURES. USE AN APPROVED CONDUIT CLAMP FOR CONNECTIONS TO SERVICE CONDUITS. EXOTHERMICALLY WELD CONNECTIONS TO GROUNDING CONDUCTOR.
6. 5/8" x 8'-0" LONG GROUND ROD. SPACING BETWEEN RODS, AS SHOWN (NON-LINEAR). PROVIDE TEE TYPE EXOTHERMIC WELD TO BOND GROUND ROD TO BURIED GROUND RING, TYPICAL FOR ALL GROUND RODS SHOWN AROUND TOWER. SEE GROUND ROD INSPECTION SLEEVE DETAIL.
7. BOND ALL EXTERIOR CONDUITS, PIPES AND CYLINDRICAL METALLIC OBJECTS WITH A PENN-UNION GT SERIES CLAMP, BLACKBURN GUV SERIES CLAMP OR A BURNDY GAR 3900BU SERIES CLAMP.
8. BEFORE AND AFTER INSTALLATION IS COMPLETED IN CONFORMANCE WITH THESE DRAWINGS AND THE STANDARD SPECIFICATIONS, THE CONTRACTOR SHALL CONFIRM THE IMPEDANCE (GROUND RESISTANCE) TO EARTH AND BETWEEN GROUNDING CIRCUITS. THE GROUNDING SYSTEM IS EXPECTED TO PROVIDE FOR A MAXIMUM EARTH RESISTANCE OF 5 OHMS. THE CONTRACTOR SHALL NOTIFY THE OWNER PRIOR TO ALL TESTING AND SHALL FURTHER NOTIFY THE OWNER IN THE EVENT THE EARTH RESISTANCE IS GREATER THAN 10 OHMS. USE 3 POINT FALL OF POTENTIAL METHOD.
9. ALL GROUNDING CONNECTIONS SHALL BE MADE WITH CADWELDS U.N.O.
10. CONTRACTOR SHALL FIELD VERIFY THE LOCATION OF EXISTING UNDERGROUND UTILITIES. HAND DIG IN THIS VICINITY TO PROTECT FROM DAMAGE.
11. ALL BENDS ON THE GROUND CONDUCTOR TO BE MADE WITH A MINIMUM 8" RADIUS. BENDS ARE NOT TO EXCEED 90° PER NFPA 780-2004, SECTION 4.9.5 AND ANSI T1.313-2003.
12. GROUNDING SHALL BE IN ACCORDANCE WITH THE FOLLOWING MOTOROLA R56 STANDARD PRACTICES (AS REQUIRED): (GENERAL CONTRACTOR SHALL CONFIRM LATEST STANDARDS)
    A. SSEO 3.018.02.004 BONDING, GROUNDING AND TRANSIENT PROTECTION
    B. SSEO 3.018.10.002 SITE RESISTANCE TO EARTH TESTING
    C. REFER TO DETAILS FOR ADDITIONAL INFORMATION AND REQUIREMENTS
13. CONTRACTOR SHALL TEST EXISTING GROUND RING FOR TOWER BEFORE START OF AND AFTER COMPLETION OF CONSTRUCTION TO VERIFY LESS THAN 5 OHMS RESISTANCE.

PREPARED BY:
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3227 WELLINGTON COURT
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www.ets-plc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

SEAL
FIRM # P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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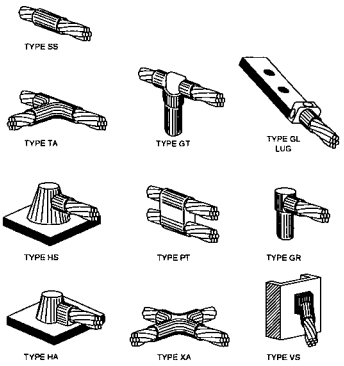
DRAWN BY: CP | CHECKED BY: DG

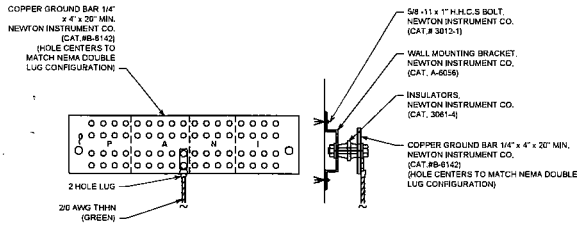
SHEET TITLE
GROUNDING DETAILS I

SHEET # G-2.1 | CURRENT REV # 3 | ETS # 22110700



STANDARD CADWELD DETAILS
N.T.S.

NOTES:
- COPPER BUS BAR (17 RUNS, 0.75", 0.815" OR 1" VARIABLE SPACING) WITH 2 HOLE LUG AND 2/0 AWG CU PIGTAIL
- TWO HOLE LUGS SHALL BE USED
- FOR MASTER GROUND BAR (INSIDE SHELTER), USE #2/0 AWG THHN (GREEN) CONDUCTOR
- ALL EXTERNAL GROUND BARS SHALL BE TINNED
- PAINT SCHEME ONLY APPLIES TO MASTER GROUND BAR



STANDARD GROUND BAR DETAIL
N.T.S.

NOT USED
N.T.S.

NOT USED
N.T.S.

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SITE NAME:
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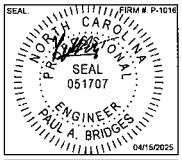
36.2330636°, -81.6966889°

SEAL: FIRM # P-1016



04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
GROUNDING DETAILS II

SHEET # **G-2.2** | CURRENT REV # 3
ETS #: 221107.00

800 MHz Corporate Collinear Antennas

746-870 MHz

CC807 Series

RFI TECHNOLOGY SOLUTIONS

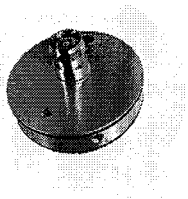
These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

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 from 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.

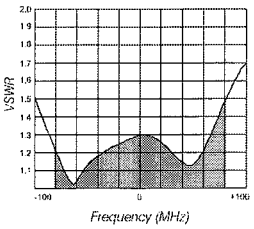
Gain is maximised and side lobes reduced dramatically. In a patented design approach the individual dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.

Features:

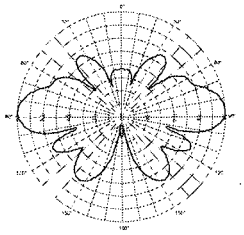
- 500W Continuous Power rating for CC807-11, CC807-08, CC807-06
- -150dBc Passive Intermodulation (PIM) rating
- 25 kW Peak Instantaneous (PIP) rating
- Extraordinary bandwidth characteristics with superior pattern control
- DC grounding on all elements for the ultimate in lightning protection and dissipation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



Typical VSWR Response (CC807-06)



CC807-06 - E Plane



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	Full Band			
VSWR *(Return Loss)*	< 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 (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length *mm (inches)*		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter *mm (inches)*		76 (3)			
Weight *kg (lbs)*		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight *kg (lbs)*		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions *mm (inches)*	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 *cm² (ft²)*	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 *N* (100 mph lbs)		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating *km/h (mph)*	No Ice	>240 (>150)			
Torque @ 160km/h *Nm* (100mph ft-lbs)		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.

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UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
ANTENNA STRUCTURE REGISTRATION

OWNER: Engineered Tower Solutions, PLLC

FCC Registration Number (FRN): 0028400505

ATTN: Eric Dickerson **Engineered Tower Solutions, PLLC** **3227 Wellington Ct** **Raleigh, NC 27615**	**Antenna Structure Registration Number** **1327000** **Issue Date** **01/10/2024**
Location of Antenna Structure **759 Fire Tower Road** **Boone, NC 28607** **County: WATAUGA**	**Ground Elevation (AMSL)** **1423.0 meters** **Overall Height Above Ground (AGL)** **61.0 meters**
Latitude **36- 13- 58.8 N** **Longitude** **081- 41- 55.3 W** **NAD83**	**Overall Height Above Mean Sea Level (AMSL)** **1484.0 meters**
Center of Array Coordinates **N/A**	**Type of Structure** **LTOWER** **Lattice Tower**
Painting and Lighting Requirements: **FAA Chapters 4, 8, 15** **Paint and Light in Accordance with FAA Circular Number 70/7460-1M** **Conditions:**	

This registration is effective upon completion of the described antenna structure and notification to the Commission. **YOU MUST NOTIFY THE COMMISSION WITHIN 5 DAYS OF COMPLETION OF CONSTRUCTION OR CANCELLATION OF YOUR PROJECT, please file FCC Form 854.** To file electronically, connect to the antenna structure registration system by pointing your web browser to https://www.fcc.gov/antenna-structure-registration. Electronic filing is required. Use purpose code "NT" for notification of completion of construction; use purpose code "CA" to cancel your registration.

The Antenna Structure Registration is not an authorization to construct radio facilities or transmit radio signals. It is necessary that all radio equipment on this structure be covered by a valid FCC license or construction permit.

You must immediately provide a copy of this Registration to all tenant licensees and permittees sited on the structure described on this Registration (although not required, you may want to use Certified Mail to obtain proof of receipt), and *display* your Registration Number at the site. See reverse for important information about the Commission's Antenna Structure Registration rules.

FCC 854R
June 2021

You must comply with all applicable FCC obstruction marking and lighting requirements, as set forth in Part 17 of the Commission's Rules (47 C.F.R. Part 17). These rules include, but are not limited to:

- ***Posting the Registration Number:*** The Antenna Structure Registration Number must be displayed in a conspicuous place so that it is readily visible near the base of the antenna structure. Materials used to display the Registration Number must be weather-resistant and of sufficient size to be easily seen at the base of the antenna structure. Exceptions exist for certain historic structures. See 47 C.F.R. 17.4(g)-(h).

- ***Inspecting lights and equipment:*** The obstruction lighting must be observed at least every 24 hours in order to detect any outages or malfunctions. Lighting equipment, indicators, and associated devices must be inspected at least once every three months.

- ***Reporting outages and malfunctions:*** When any top steady-burning light or a flashing light (in any position) burns out or malfunctions, the outage must be reported to the nearest FAA Flight Service Station, unless corrected within 30 minutes. The FAA must again be notified when the light is restored. The owner must also maintain a log of these outages and malfunctions.

- ***Maintaining assigned painting:*** The antenna structure must be repainted as often as necessary to maintain good visibility.

- ***Complying with environmental rules:*** If you certified that grant of this registration would not have a significant environmental impact, you must nevertheless maintain all pertinent records and be ready to provide documentation supporting this certification and compliance with the rules, in the event that such information is requested by the Commission pursuant to 47 C.F.R. 1.1307(d).

- ***Updating information:*** The owner must notify the FCC of proposed modifications to this structure; of any change in ownership; or, within 30 days of dismantlement of the structure.

Copies of the Code of Federal Regulations (which contain the FCC's antenna structure registration rules, 47 C.F.R Part 17) are available from the Government Printing Office (GPO). To purchase CFR volumes, call (202) 512-1800. For GPO Customer Service, call (202) 512-1803. For additional FCC information, consult the Antenna Homepage on the internet at https://www.fcc.gov/antenna-structure-registration or call (877) 480-3201 (TTY 717-338-2824).

DB224-A

1-port omni exposed dipole antenna, 150–160 MHz, 360° HPBW, fixed electrical tilt

- Broad response
- Two-piece mast for ease of shipping

General Specifications

Antenna Type	Omni
Band	Single band
Color	Silver
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Performance Note	Outdoor usage
Radiator Material	Aluminum
RF Connector Interface	N Male
RF Connector Location	Bottom
RF Connector Quantity, low band	1
RF Connector Quantity, total	1

Dimensions

Length	6477 mm | 255 in
Net Weight, without mounting kit	15.9 kg | 35.053 lb

Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	150 – 160 MHz
Polarization	Vertical

Electrical Specifications

Frequency Band, MHz	**150–160**
Gain, dBi	8.1
Beamwidth, Horizontal, degrees	360
Beamwidth, Vertical, degrees	16

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COMMSCOPE®

DB224-A

Beam Tilt, degrees	0
VSWR | Return loss, dB	1.5 | 14.0
Input Power per Port, maximum, watts	500

Mechanical Specifications

Wind Loading @ Velocity, maximum	560.5 N @ 100 mph (126.0 lbf @ 100 mph)
Wind Speed, maximum	130 km/h (81 mph)

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

Included Products

DB365-OS	–	Pipe Mounting Kit that consists of two clamps for mounting antennas to round members 1.25 - 3.5 in (35 - 89 mm) OD round members.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

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COMMSCOPE®

BIDDER: K-Co Enterprises, Inc.

WATAUGA COUNTY, NC **BID #**	**INVITATION FOR BIDS –Rich Mt.**
	Bids will be publicly opened: June 13th, 2025 at 3:00pm
	Questions Due by: June 2nd, 2025
Refer ALL Inquiries to: Marty Randall Telephone No. 828-527-2416	Commodity: Install New Tower Site 759 Fire Tower Road, Boone, North Carolina 28607 with access road per design documents.
E-Mail: marty.randall@1018consulting.com	Using Agency Name: Watauga County Emergency Services
(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 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: K-Co Enterprises, Inc.		FEDERAL ID OR SOCIAL SECURITY NO. 26-1278195	
STREET ADDRESS: 613 Hurricane Creek Rd		P.O. BOX:	ZIP:
CITY & STATE & ZIP: Piedmont, SC 29673		TELEPHONE NUMBER: 864-947-8704	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: Ernest Rood - Project Manager		FAX NUMBER: 864-947-8204	
AUTHORIZED SIGNATURE: Ernest Rood	DATE: 6-12-25	E-MAIL: bids@kcoenterprises.com	

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).

FOR Watauga County, NC USE ONLY

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 re-usable 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.

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

Watauga County, NC Tower Construction Project

Boone, North Carolina

Scope of Work – Watauga County, NC proposes to install a communications tower site per the following specifications at a site in Watauga County, North Carolina. 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 tower 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.

As a minimum, the Tower and Foundation shall be designed to the requirements of ANSI/TIA/EIA-222-G, including released addendums. Design with Geotechnical Report provided, the tower manufacturer shall ensure the proper development of anchor roads and anchorage materials.

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** X **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** X **No**_____

CONTRACTOR REQUIREMENTS

The Contractor shall submit the following items with their bid:

1. A drawing of the tower profile sealed by a **North Carolina Registered Engineer**.
2. A list of all antennas and appurtenances that were considered in the tower and foundation designs.
3. Tower foundation design drawings, with a complete set of **DESIGN CALCULATIONS** showing the reactions of the tower on the foundation, sealed by a **North Carolina Registered Engineer**.
4. The Contractor awarded this project must submit a set of final erection drawings, sealed by a **North Carolina Registered Engineer** to the Contracting Officer and Marty Randall for written approval before starting the project. **If these drawings are submitted on paper they must also be accompanied by digital copies. We must have these drawings in digital format.**
5. The proposal from the tower manufacturer must specifically state that all pricing will be honored for the duration of this contract.
6. Contractor must supply a rigging plan for tower erection. If the contractor intends to use a gin pole for tower erection, then they must provide a copy of their gin pole certification and load charts. All gin pole certifications and load charts must be current, must be sealed by a qualified engineer licensed in the state of North Carolina, and must state they are in compliance with ANSI/TIA-322. All rigging plans must be in compliance with ANSI/TIA-322 and ANSI/ASSE A10.48 and completed by a qualified engineer licensed in the state of North Carolina.
7. Each bid must be accompanied by a bid bond, for an amount equal to 5% of the total base bid, at the time the bid is filed with the County. 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.
8. Performance and payment bonds are required once bid is awarded.

Bids and tower designs that are submitted for opening will be submitted by Watauga County, NC to a Third-party **North Carolina Registered Engineer** for review of design accuracy and compliance before an award can be made. This is the reason for requiring the above-listed items to be sent with the bid response. 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** X **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 required 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.

Bids must be submitted on this form and must reach Watauga County the date specified on Page one, above. All parts of this form must be completed for consideration. **Send two copies of this bid document.**

Understand Bidding Instructions **Yes** X **No**_____

PRE-AWARD ENGINEERING REVIEW

Bids and tower designs submitted for this IFB will be submitted by Watauga County, NC to a third-party engineering firm for design accuracy and compliance with all stipulated standards and building codes before an award can be made. A low responsible bid failing this engineering review will be invalid and the bid will be awarded to the next lowest responsible bidder that meets the Engineering Review requirements.

Understand Pre-Award Engineering Review Process **Yes** X **No**_____

PROJECT DESCRIPTION

This project shall consist of the furnishing and installation of a communications tower, per the following and any attached specifications.

Understand Project Description **Yes** X **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. Contractor must contact Matt Fields ***(matt.fields@ets-pllc.com 919-427-6609)*** at least 2 weeks prior to construction to coordinate the staking of the tower location. 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** X **No**_____

DESIGN CAPACITY REQUIREMENT

The tower must be designed so that when installed with **all loading** as shown in the ANTENNA LOADING REQUIREMENTS TABLE that follows, the tower **superstructure** and **substructure** **shall NOT exceed 95% of its capacity**. If, upon evaluation by a third party, **Engineered Tower Solutions**, the design computes to be at a greater stress level than specified, the bid will not be accepted. Each bidder must provide as part of the bid submission package **design calculations** verifying that this Design Capacity Requirement is met. This tower shall be designed for a 50-ft fall radius per the contract documents. Additionally, each bidder shall record either the **Rated Capacity** and/or the **Percent of Stressed Value** in the space provided below.

Rated Capacity _____ **Percent of Stressed Value** _____

Understand the Design Capacity Requirement. **Yes** X **No**_____

PERMITS

Permits are required for this tower installation. The contractor is responsible for obtaining permits and scheduling inspections with the permitting office. The County is not exempt from permits. Contact Watauga County for permitting information.

Understand the Permit Process **Yes** X **No**_____

FOUNDATION INSPECTION MANAGEMENT

Prior to Construction Start, the Tower Contractor will obtain the services of third party **Engineered Tower Solutions** ***("ETS")*** to oversee, inspect, and document each phase of the foundation construction to ensure compliance with the Tower Manufacturer's Tower Design Drawings and Specifications. ***(Watauga County, NC has a contract with ETS to perform these inspections with no more than two trips being made by ETS. 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 Matt Fields: (matt.fields@ets-pllc.com 919-427-6609)*** prior to Construction Start, all materials to be used in the construction of the foundation shall be inspected to ensure compliance with the Tower Manufacturer's Tower Design Drawings and Specifications. The Tower Contractor shall immediately report to Marty Randall and the Contracting Officer any deviations found during the on-site pre-construction start inspection and present a correction plan. The Tower Contractor shall provide to Marty Randall and the Contracting Officer, a written report, sealed by

Engineered Tower Solutions that completely documents all results of the foundation oversight and inspection process, including a comprehensive set of digital photographs

Understand the Inspections Management Process **Yes** X **No**_____

CONCRETE: COMPLIANCE WITH MIX SPECIFICATIONS & STRENGTH TESTING

The Tower Contractor will obtain the services of the third party, **Engineered Tower Solutions *("ETS")***, to ensure proper oversight of the concrete pouring process and the inspection and recording of each concrete delivery ticket for compliance with the Tower Manufacturer's Tower Design Drawings and Specifications. The Tower Contractor shall ensure the third party, (***ETS***), takes all steps to ensure competent monitoring of the concrete sampling process used during the concrete pouring process, and to ensure accurate recording of the time of day each sample was taken. ***(Watauga County, NC has a contract with ETS to perform the concrete testing. Fees will be paid by Watauga County, NC. This includes sampling, breaks, and reports. For scheduling, email Matt Fields: (matt.fields@ets-pllc.com 919-427-6609)).*** The Tower Contractor shall provide to Marty Randall and the Contracting Officer, a written report, sealed by (***ETS***) that completely documents the compliance with mix specifications, and a detailed presentation of the concrete testing, to include a comprehensive set of digital photographs.

Understand Concrete Compliance and Testing Process **Yes** X **No**_____

TOWER GROUND INSPECTION

The Tower Ground inspection will be conducted by 10-18 Consulting. Mr. Marty Randall, marty.randall@1018consulting.com Cell 828-527-2416, must be contacted at least 72 hours prior to requiring this inspection.

Understand Grounding Inspection Process **Yes** X **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 Post Construction Inspection Process **Yes** X **No**_____

POST CONSTRUCTION INSPECTION (PCI)

Upon completion of the tower 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 Matt Fields: (matt.fields@ets-pllc.com 919-427-6609)).*** In the event any deviation from the Tower Manufacturer's Design 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** X **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 66585

The Contractor installing the tower 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** X **No**_____

CONSTRUCTION & MATERIALS

The tower shall be constructed of **hot-dipped** galvanized steel with solid round, or angular members. The tower may be either solid weld or knockdown construction. All components of the tower including but not limited to bolts, nuts, mounting

brackets, torque arms, etc. shall, at a minimum, be **hot-dipped** galvanized. The tower shall conform, at a minimum, to the North Carolina Building Code Chart 1606, Basic Wind Speed and any county/jurisdictional specified requirements.

The Tower must have climbing facilities on each tower leg for installation and maintenance. **Tower Contractor must provide and install a safety cable at the climbing ladder.**

Understand Construction and Materials **Yes** X **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** X **No**_____

STRUCTURE SPECIFICATIONS TABLE

Please enter Yes or No that you meet the specification in the Right-hand column

Item	Description	Comply Yes or No
1	Location is 759 Fire Tower Road, Boone NC 28607 Latitude **36.2330639° North** Longitude **-81.6986889° West**	Yes
2	Tower is to be a self-supporting structure.	Yes
3	Tower Height is to be **199-ft AGL with a 50-ft Fall Zone.**	Yes
4	Tower will be positioned on the DCS as indicated in the attached Construction Drawings.	Yes
5	The Tower Structure shall utilize solid round or angle structural steel members. No other materials or shapes will be given consideration. Note all members must be hot dipped galvanized to prevent corrosion.	Yes
6	All structural bolts must meet the ASTM A325 or A490 Specification.	Yes
7	The Tower Contractor will provide all materials to Complete the Tower & Foundation Installation.	Yes
8	The Tower Contractor will build the Foundation and erect the Tower.	Yes
9	The Tower Contractor will provide a detailed set of foundation drawings (sealed by a North Carolina Registered Engineer) showing all details including all rebar sizes and quantities, and concrete volumes. The Tower Contractor shall install the tower foundation. The Tower Contractor may construct the foundation using the most cost-effective method. The type of foundation presented in this Bid shall be designed and constructed in accordance with the Geotechnical Parameters specified in the Subsurface Exploration Report provided by Engineered Tower Solutions. That document is an attachment to this IFB.	Yes
10	Any damage to the access road, thru the housing development, from construction of this tower must be repaired by the contractor so to restore road to the original condition. If there are repairs required to the existing access road in order to construct the tower those repairs must be included in the bid. The contractor is responsible for tower construction. Civil work will be completed by Civil contractor.	Yes
11	All back-fill for grading tower base must be compacted and tamped. This would be 8 inches of fill and adding moisture if need between each tamping.	Yes
12	As a minimum this Tower and Foundation shall be designed to the requirements of ANSI/TIA-222G, including released addendums.	Yes
13	One hot-dipped galvanized expanded metal Vertical Cable/Wave-Guide Ice-Bridge, capable of mounting twenty (20) lines. Waveguide bridge shall be installed between the tower and shelter per the design drawings. The width of the Horizontal Cable/Wave-Guide Ice-Bridge shall be installed by the civil contractor.	Yes
14	The Tower shall have a safety fall protection system incorporating a 3/8" stainless steel cable meeting OSHA/ANSI specifications installed the full height of the structure on one tower leg with full height step pegs. Additionally, step pegs are required on the other two legs to the height of the mid markers.	Yes
15	The Tower Contractor shall install one (1) #2/0 AWG bare tinned copper conductor between the base of each tower leg and a 10-ft ground rod at each tower leg. The top of the ground rod must be at least 3-ft below finished grade. Each of these #2/0 AWG bare tinned copper conductors shall be Exothermically Bonded to the ground rod, tower leg, and tower halo ring. Grounding must be in compliance with Motorola R56 specifications and standards **NOTE: All grounding shall conform to construction drawings.**	Yes

	NOTE: A representative of Watauga County, NC shall inspect the connections to the ground rods prior to filling the trench. This inspection does not eliminate the requirement for installing inspection tubes. The Tower Contractor shall notify the Contracting Officer at least forty-eight (48) hours prior to schedule and conduct this inspection.	Yes
17	The Civil Contractor is responsible for providing and installing a temporary power pole on the site for use during construction. Civil contractor is responsible for removing the temporary power pole once permanent power has been installed at the DCS.	Yes
18	Tower Contractor is required to submit best and final price for this effort. Change orders will only be considered for circumstances or unusual situations not included in the contract documents. Any change orders must be approved in writing before work is started. Customer understands any additional work requested may incur additional costs outside of this contract pricing.	Yes
19	The Tower Contractor shall provide Tinned Copper Ground Bars (TCGBs) capable of attaching a minimum of twenty (20) ground kits. Tower must include a 6' lightning rod at the top of structure. **NOTE: The TCGB shall be mechanically attached directly to the Tower Structure with Stainless Steel Hardware using pre-drilled holes in the Tower Structural Steel provided expressly for this purpose.** The TCGBs shall be installed at approximately ten 10-ft AGL at the base of the cable ladder. The Tower Contractor shall install a sufficient length of #2/0 AWG bare tinned copper conductor between this TCGB and the tower halo ring closest to the cable ladder. A second set of TCGB's to be install at the approx. 150 ft level with the TCGB's bonded to the tower structure. **Exothermic Bonding** shall be used to provide the electrical connections of the #2/0 AWG bare tinned copper conductor to the TCGB and the ground ring.	Yes
20	The Tower Contractor shall provide and install antenna mounts in accordance with the included **Antenna Mount Schedule (AMS)** and **Antenna Loading Requirements**.	Yes
21	The location of the site is as shown on the attached drawings.	Yes
22	Excess soil created from foundation installation must be removed from the site. If soil is suitable, it may be used for backfilling and tower foundation leveling.	Yes
23	**The Tower Contractor shall remove all tower construction materials and debris from the site.**	Yes
24	**Bidding contractors must attend a mandatory pre-bid site walk on June 9th at 11:00AM.**	Yes

ANTENNA MOUNT SCHEDULE (AMS)

Contractor to provide and install the following Antenna Mounts on the Tower

Item #	Antenna Mount Description	Comply Yes or No
1	Two 6-ft standoff sidearm mounts with stabilizer at 176-ft	Yes
2	Two 6-ft standoff sidearm mounts with stabilizer at 155-ft	Yes
3	One Microwave 4.5" pipe mount at 140' with ice shield	Yes
4	One Microwave 4.5" Pipe Mount at 100' with ice shield	Yes
5	One Microwave 4.5" Pipe Mount at 85' with ice shield	Yes
6	One Microwave 4.5" Pipe Mount at 75' with ice shield	Yes

6' standoff mounts must be rated to accommodate listed antennas in Antenna Mounting table. If an alternate mount is used specifications must be provided by the manufacturer.

ANTENNA LOADING REQUIREMENTS:

Refer to the attached TEP Tower Procurement Document for tower specifics, antennas and required loading.

 BIDDER: K-Co Enterprises, Inc.

TOWER COST BREAKDOWN:

1. Total cost of tower materials only — $ 136,000.00

2. Total cost of all other services, including: — $ 243,500.00
   a. **All shipping**
   b. Complete Installation
   c. Engineering Services
   d. All Inspections

3. Total cost to construct the tower with lighting[1]. — $ NA
   (Sum of Item-1 and Item-2, above)

4. Total cost to construct the tower without lighting[2]. — $ 379,500
   (Sum of Item-1 and Item-2, above)

LIST OF ATTACHMENTS

1. Subsurface Exploration Report, prepared by **Engineered Tower Solutions.**
2. Construction Drawings, prepared by **Engineered Tower Solutions.**
3. Bid Document
4. Antenna Datasheets

Call the Contracting Officer prior to the opening date if you did not receive these attachments.

GEOTECHNICAL REPORT OF SUBSURFACE INVESTIGATION

May 20, 2024

PROPOSED SELF SUPPORT TOWER
RICH MOUNTAIN TOWER

759 Fire Tower Road
Boone, NC 28607

36.2331, -81.6986

Prepared for:

NORTH CAROLINA HIGHWAY PATROL

ENGINEERED TOWER SOLUTIONS

NORTH CAROLINA PROFESSIONAL SEAL 051545 ENGINEER JORGE VARELA

Matt Nesbit

Jorge Varela Date: 2024.05.20 20:06:38 -04'00'

Matt Nesbit, E.I.
Geotechnical Engineer I

Jorge Varela, P.E.
Registered NC 051545

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

ENGINEERED TOWER SOLUTIONS

Project Summary

Item	Description
Project Description	A geotechnical exploration and report have been prepared for this proposed 199-foot self-supported tower. Included in this report are the results of the field exploration and the recommendations for the design of the foundation system.
Site Coordinates	Latitude: 36.2331 Longitude: -81.6986
Site Condition	The proposed tower will be installed at 759 Fire Tower Road in Boone, North Carolina.
Frost Depth	Based on the TIA Standard (TIA-222-H), dated October 2017, the recommended design frost penetration depth to be used for Watauga County, NC is 12 inches (0.8 ft).
Groundwater	Groundwater was encountered at 7 feet below ground surface at the time of drilling. Please note that subsurface water levels will fluctuate with seasonal and cyclical temperatures and precipitation and can be higher or lower at other times.
Proposed Foundation	We assume the proposed foundation will be supported with either pad and pier or drilled shaft (caisson).

ENGINEERED
TOWER SOLUTIONS

Field Exploration

Item	Description
Date	May 7th, 2024
Number of Borings	3
Location	B-1: Latitude: 36.2332 Longitude: -81.6986 B-2: Latitude: 36.2331 Longitude: -81.6985 B-3: Latitude: 36.2331 Longitude: -81.6986
Equipment Used	550X
Advancement Method	Hollow Stem Auger (HSA) and Rock Coring
Sampling Method	ASTM D-1586 with 1.5 I.D. Split Spoon Sampler ASTM D2113 Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration

Laboratory Classification and Testing

Standard	Description
ASTM D2488	Standard Practice for Description and Identification of Soils

Subsurface Profile

Based on the results of our borings, the soils beneath the surface can be summarized in the table below:

Material Encountered	Description	Consistency / Density
SAND	Brown, moist silty sand with gravel	Loose to Very Dense
PWR	Partially Weathered Rock sampled as silty sand with rock fragments	--
GRANITE	Slightly weathered with close spaced fractures	--

1. Refer to individual boring logs for layer stratification details

Detailed descriptions of conditions encountered at each exploration point are indicated on the individual logs in the Appendix B. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

Groundwater was encountered at 7 feet below ground surface at the time of drilling. Groundwater levels will fluctuate with seasonal and climatic changes and may be different at other times.

Earthwork Recommendations – Equipment Mat

Earthwork is anticipated to include excavations and fill placement. The following sections provide recommendations for use in the preparation of the equipment mat foundation area and access drive.

Site Preparation

The subgrade should be evaluated under the direction of the Geotechnical Engineer. Areas where soft material are present or excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

ENGINEERED TOWER SOLUTIONS

Fill Material Types

Soil Type	USCS Classification	Acceptable Parameters (for Structural Fill)
Imported Low- to Moderate- Plasticity Soil [2]	CL, ML, SC or SM	All locations and elevations
Sand / Gravel with greater than 12% fines	GW/GP, SW/SP	Crushed stone base course may be used for the access roadway or beneath shallow foundations as a replacement material for overexcavated soils.
Near-Surface On-site soils [2]	SM	On-site soils generally appear suitable for use as fill when they contain at least 12% fines (clay and/or silt) and are compacted at an appropriate moisture content.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Low- to moderate-plasticity cohesive soil or granular soil having at least 12% fines

Fill Compaction Requirements

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used	Same as Structural fill
Minimum Compaction Requirements [1, 2]	98% of max. below foundations and within 1 foot of finished pavement subgrade 95% of max. above foundations, below floor slabs, and more than 1 foot below finished pavement subgrade	92% of max.
Water Content Range [1]	Low plasticity cohesive: -2% to +3% of optimum High plasticity cohesive: 0 to +4% of optimum Granular: -3% to +3% of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698).
2. High plasticity cohesive fill should not be compacted to more than 100% of standard Proctor maximum dry density.

Excavations

Groundwater was encountered at 7 feet below ground surface at the time of drilling. Although not expected, if encountered in deep trench excavations during construction, groundwater or perched groundwater will require dewatering until backfilling operations are complete.

All excavations that may be required should, at a minimum, comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards to provide stability and safe working conditions.

Slopes

For permanent slopes in unreinforced compacted fill areas, we recommended maximum configurations of 3:1 (Horizontal: Vertical) for the cohesive soils (clay) found at the site.

If steeper slopes are required for site development, stability analyses should be completed to design the grading plan. The face of all slopes should be compacted to the minimum specification for fill embankments. Fill slopes should be overbuilt and trimmed to compacted material.

Earthwork Construction Considerations

The near-surface, on-site soils will lose strength when exposed to moisture. To the extent practical, earthwork should be performed during drier periods of weather. Increased remedial measures due to wet and soft or otherwise unsuitable conditions should be expected if earthwork is performed during colder and wetter periods of weather.

A qualified geotechnical engineer should be retained during the earthwork phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; to monitor proof-rolling, placement and compaction of controlled compacted fills, and backfilling of excavations to the completed subgrade.

Foundations Recommendations

The following recommendations are made based on our review of the test boring data and our past experience with similar projects and subsurface conditions. Ultimate soil strength parameters are presented on table below.

Ultimate Strength Parameters

Boring #	Depth (ft)	Unified Soil Classification	Total Unit Weight (pcf)	Friction Angle (degrees)	Cohesion (psf)
B-1	0.0 – 2.0	PWR	130	38	--
	2.0 – 4.0	PWR	130	38	--
	4.0 – 6.0	PWR	130	38	--
	6.0 – 8.5	PWR	130	38	--
	8.5 – 34.0	GRANITE	145	45	--
B-2	0.0 – 2.0	SM	105	29	--
	2.0 – 4.0	PWR	130	38	--
	4.0 – 6.0	PWR	130	38	--
	6.0 – 8.5	PWR	130	38	--
	8.5 – 10.0	PWR	130	38	--
B-3	0.0 – 2.0	SM	105	29	--
	2.0 – 4.0	SM	120	30	--
	4.0 – 6.0	SM	130	38	--
	6.0 – 8.0	PWR	130	38	--

1. Groundwater was encountered at 7 feet below ground surface at the time of drilling. Utilize bouyon unit weight below this depth

Based on the subsurface conditions and typical design foundation loads for similar self-support towers, we recommend that either a caisson (drilled shaft) or a pad/pier be used to support the new tower.

Modulus of Subgrade Reaction

A vertical and horizontal modulus of subgrade reaction may be derived using the following equations and soils parameters expressed in the above table:

$$k_{s\text{-}v} = 12 \cdot SF \cdot q_a$$

$$k_{s\text{-}h} = k_{s\text{-}v} \cdot B$$

Where:

q_a = Allowable Bearing Capacity (ksf)
SF = Safety Factor
B = Base width (ft), use 1 if B< 1ft
$k_{s\text{-}v}$ =Vertical Modulus of Subgrade Reaction (kcf)
$k_{s\text{-}h}$ = Horizontal Modulus of Subgrade Reaction (ksf)

Caisson (Drilled Shaft)

Should caissons (drilled shafts) be used, the caissons (drilled shafts) will achieve compressive (downward) and tensile (uplift) resistance through skin friction along the sides of the shafts. In addition to skin friction, bearing resistance at the caisson's tip will contribute to compressive capacity. We recommend the values given the table below be used for this project. Please note the tip bearing capacity and skin frictions are net ultimate and ultimate values respectively. Appropriate factors of safety or resistance factors should be used. Lateral loads can be resisted by the lateral stiffness of the soil. Parameters for analysis of the laterally loaded caisson are also given the table below.

Caisson (Drilled Shaft) Parameters

Boring #	Depth (ft)	Net Ultimate Tip Bearing Capacity (ksf)	Ultimate Skin Friction[1] (ksf)		Lateral Modulus (pci)	ε_{50} (in/in)
			Compressive	Uplift		
B-1	0.0 – 2.0	--	--	--	--	--
	2.0 – 4.0	--	0.2	0.2	125	--
	4.0 – 6.0	--	0.3	0.3	125	--
	6.0 – 8.5	--	0.4	0.4	125	--
	8.5 – 34.0	40	2.3	2.3	125	--
B-2	0.0 – 2.0	--	0.2	0.2	125	--
	2.0 – 4.0	--	0.3	0.3	125	--
	4.0 – 6.0	--	0.3	0.3	125	--
	6.0 – 8.5	--	0.4	0.4	125	--
	8.5 – 10.0	40	0.5	0.5	125	--
B-3	0.0 – 2.0	--	--	--	--	--
	2.0 – 4.0	--	0.2	0.2	60	--
	4.0 – 6.0	--	0.3	0.3	125	--
	6.0 – 8.0	40	0.4	0.4	125	--

1. We recommend the skin friction be ignored for the top 3 ft of the caisson

Based on the subsurface soil conditions, excavations for the caissons (drilled shafts) should be possible using a large, truck-mounted, hydraulic-advanced drill rig. All debris, loose or disturbed soil should be removed from the excavation prior to placing reinforced steel and/or concrete. Reinforcing steel and/or concrete should be placed immediately upon completion of the excavation.

The excavations may be susceptible to caving. Drilling fluid or casing could be used to assist in keeping the drilled hole open. If casing is used, we recommend it be removed from the excavation as concrete is being placed. Continuous vibration or other approved methods should be used during casing withdrawal to reduce the potential for void-space formation within the concrete. If water is

present during concrete placement and/or drilling fluids are used to maintain hole stability, concrete should be pumped or otherwise discharged to the bottom of the hole via a hose or tremie pipe. The end of the hose or tremie pipe must remain below the top surface of any water, drilling fluid and the in-place concrete at all times. Additionally, concrete should be consolidated using vibration methods over the entire length and width of the caissons and the consolidation should be performed only after these fluids are removed and to the extent possible.

Pad & Pier / Single Mat Foundation

If the site has been prepared in accordance with the requirements noted in *Earthwork Recommendations – Equipment Mat,* the tower's foundation capacity can be determined using the soil's bearing capacity, passive pressure resistance, and a sliding friction factor.

Net Ultimate Bearing Capacity and Sliding Friction Factor

Depth[2] (ft)	Net Ultimate Bearing Capacity[1] (psf)	Sliding Friction Factor[1]
0.0 – 2.0	--	--
2.0 – 4.0	7,000	0.35
4.0 – 15.0	11,000	0.55

1. This value is a net ultimate value and an appropriate factor of safety or resistance factor should be used

Ultimate Passive Pressure and Friction Factor

Boring #	Depth (ft)	Ultimate Passive Pressure[1] (psf)[1]
B-1	0.0 – 2.0	0 – 800
	2.0 – 4.0	800 – 1,600
	4.0 – 8.0	1,600 – 3,200
	8.0 – 12.0	3,200 – 4,800
	12.0 – 20.0	4,800 – 11,200

1. Ultimate passive pressure can be interpolated for foundation depths with the depth ranges given

Seismic Parameters

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC)

Seismic Site Classification

Item	Seismic Parameter
2018 International Building Code Seismic Site Classification	D[1]
Design Spectral Response Acceleration Parameters	S_{ds} = 0.273g S_{d1} = 0.133g

1. The IBC seismic site classification is based on the subsurface profile depth of 100 feet. The scope of work did not authorize exploration to a depth of 100 feet. A seismic Site Soil Classification of D should be used if insufficient details are known about the 100-foot soil profile.

LIMITATIONS OF REPORT

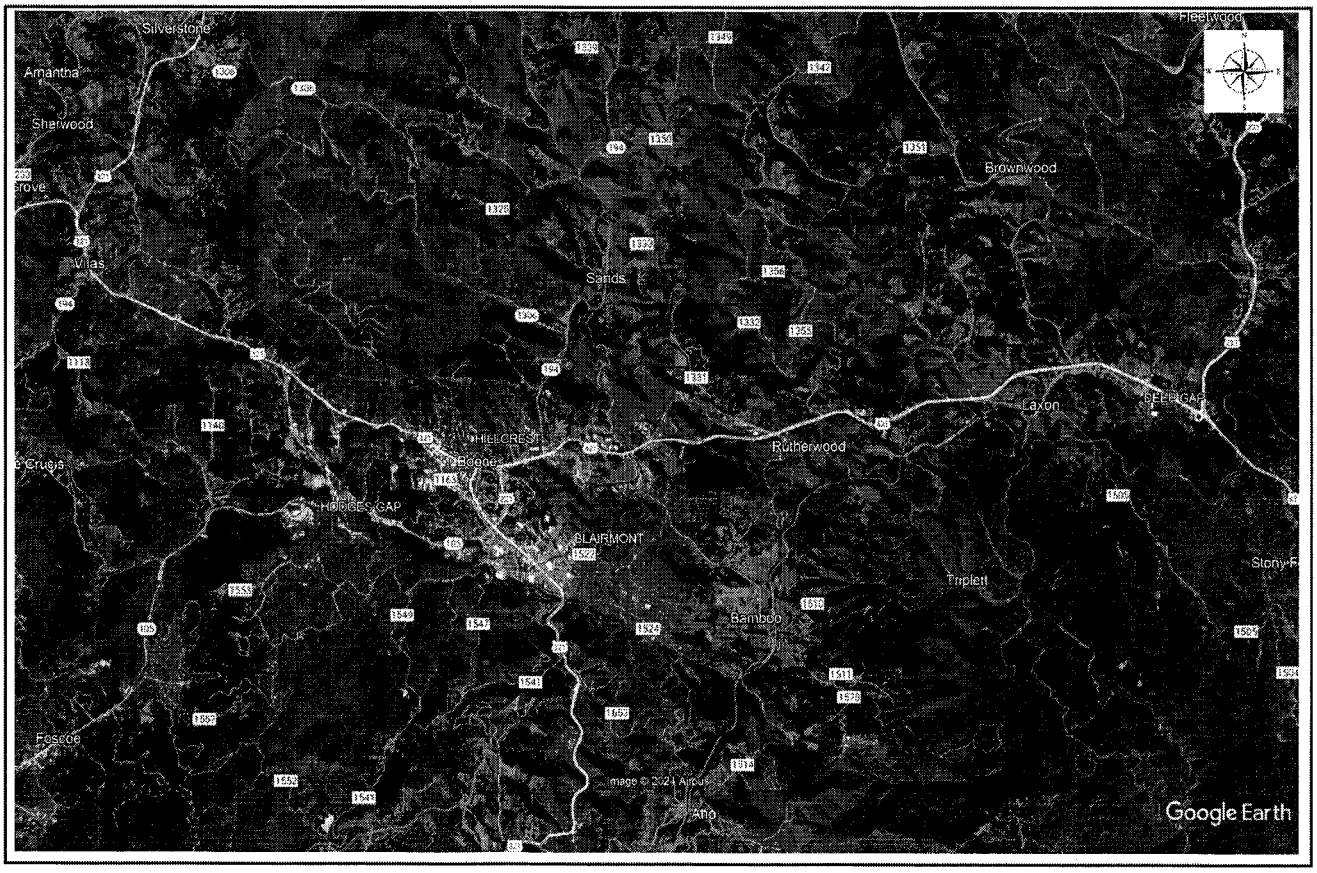
This report has been prepared in accordance with generally accepted geotechnical engineering practices for the specific application of this project. The conclusions in this report are based on the applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

The analyses and conclusions submitted herein are based, in part, upon the data obtained from the subsurface exploration performed for this analysis. The soil and ground water conditions can vary across the site. Opinions and conclusions are subject to change if new or additional information is submitted for review.

APPENDIX A
LOCATION INFORMATION

SITE LOCATION PLAN
RICH MOUNTAIN TOWER
Job Number: 22110700

ENGINEERED TOWER SOLUTIONS



May 20, 2024 | 13

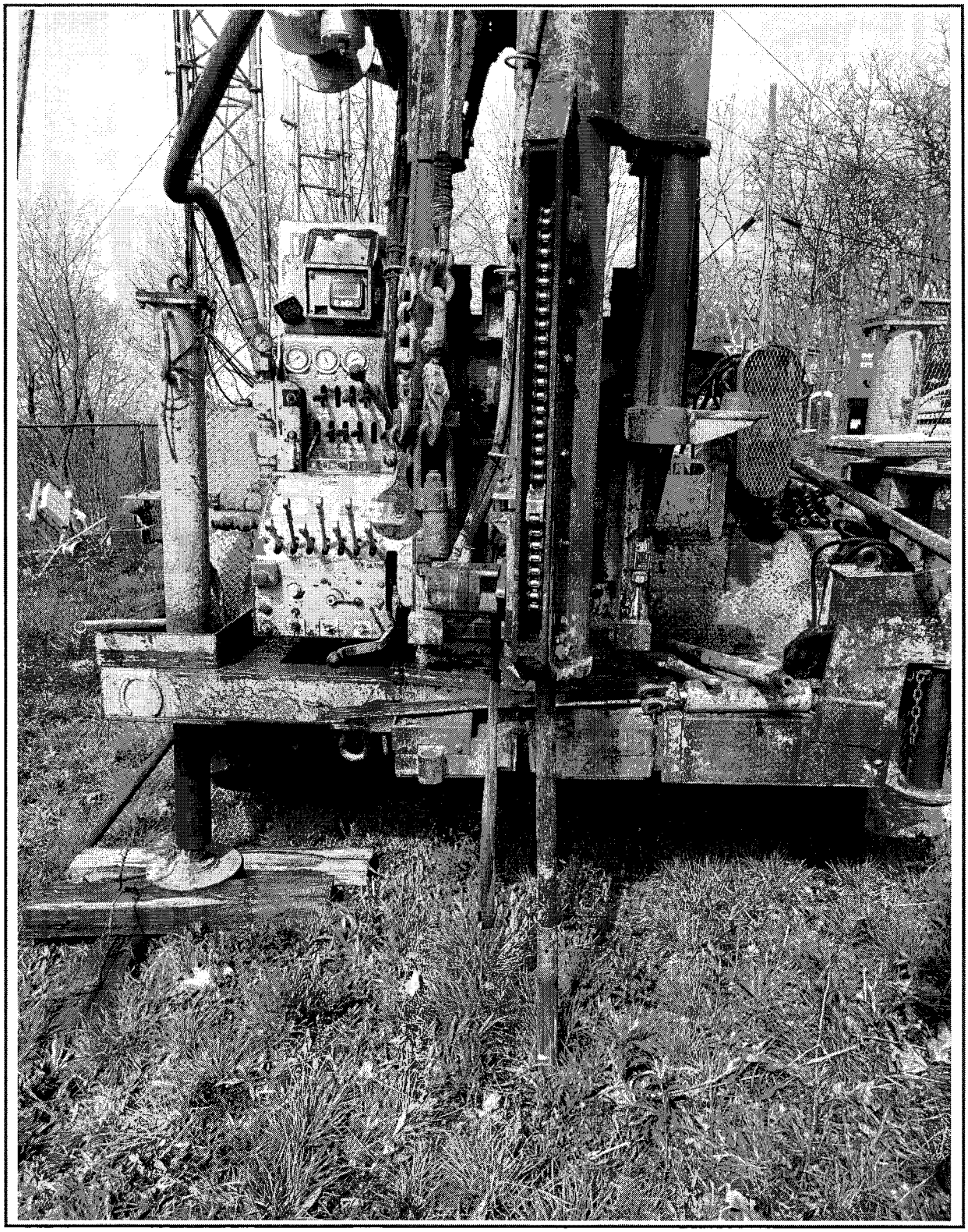
BORING LOCATION PLAN
RICH MOUNTAIN TOWER
Job Number: 22110700

ENGINEERED
TOWER SOLUTIONS

May 20, 2024 | 14

SITE PHOTO
RICH MOUNTAIN TOWER
Job Number: 22110700

ENGINEERED
TOWER SOLUTIONS



APPENDIX B
SOIL TEST BORING

BORING NUMBER B-1

ENGINEERED TOWER SOLUTIONS

CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/6/2024
COORDINATES 36.2332, -81.6986
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 14.70 ft / Elev 4663.30 ft
LOGGED BY M. Nesbit
AT END OF DRILLING 29.10 ft / Elev 4648.90 ft
NOTES
AFTER DRILLING 14.70 ft / Elev 4663.30 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
0		**PARTIALLY WEATHERED ROCK (PWR),** Sampled as silty sand with rock fragments.	SS 1		0-18-50/5"
			SS 2		50/5"
5			SS 3		50/1"
			SS 4		50/0"
10		**GRANITE,** slighly weathered with close spaced fractures.	RC RC-1	100 (83)	
15			RC RC-2	87 (47)	
20			RC RC-3	68 (45)	
25			RC RC-4	92 (62)	
30			RC RC-5	88 (70)	
			RC RC-6	81 (78)	

Bottom of borehole at 34.0 feet.

ETS - BORING W/ROCK CORING 2 - ETS DATABASE_JUN30.GDT - 5/15/24 09:21 - \\ETS.LOCAL\ETS-PUBLIC\2022\110700_RICH MOUNTAIN TOWER\GE\RICH MOUNTAIN TOWER.GPJ

ENGINEERED
TOWER SOLUTIONS

BORING NUMBER B-2

CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/7/2024
COORDINATES 36.2331, -84.6985
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 7.20 ft / Elev 4757.80 ft
LOGGED BY M. Nesbit
AT END OF DRILLING 8.60 ft / Elev 4756.40 ft
NOTES
AFTER DRILLING 7.20 ft / Elev 4757.80 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
0		**SILTY SAND WITH GRAVEL (SM),** brown, moist, dense.	SS 1		1-3-4 (7)
		PARTIALLY WEATHERED ROCK (PWR), Sampled as silty sand with rock fragments.	SS 2		24-50/4"
5			SS 3		50/3"
			SS 4		50/1"
10			SS 5		50/2"

Bottom of borehole at 10.0 feet.

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BORING NUMBER B-3

ENGINEERED TOWER SOLUTIONS

CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/7/2024
COORDINATES 36.2331, -81.6986
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 7.20 ft / Elev 4668.80 ft
LOGGED BY M. Nesbit
AT END OF DRILLING 7.20 ft / Elev 4668.80 ft
NOTES
AFTER DRILLING 7.20 ft / Elev 4668.80 ft

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
0		**SILTY SAND (SM),** brown, moist, loose to medium dense.	SS 1		0-3-3 (6)
			SS 2		4-5-13 (18)
5		**SILTY SAND (SM),** brown, moist, very dense.	SS 3		16-30-22 (52)
		PARTIALLY WEATHERED ROCK (PWR), Sampled as silty sand with rock fragmentss.	SS 4		34-50/5"
			SS 5		50/0"

Bottom of borehole at 8.5 feet.

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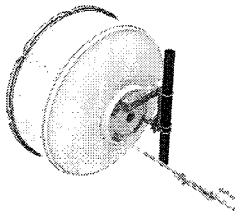
HX6-6W

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

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

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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

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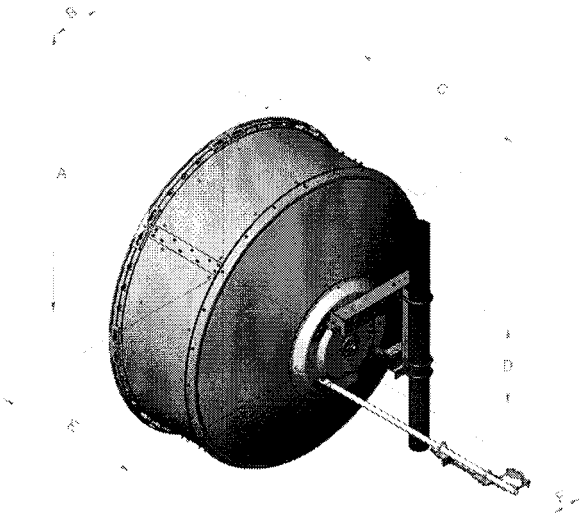
HX6-6W

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

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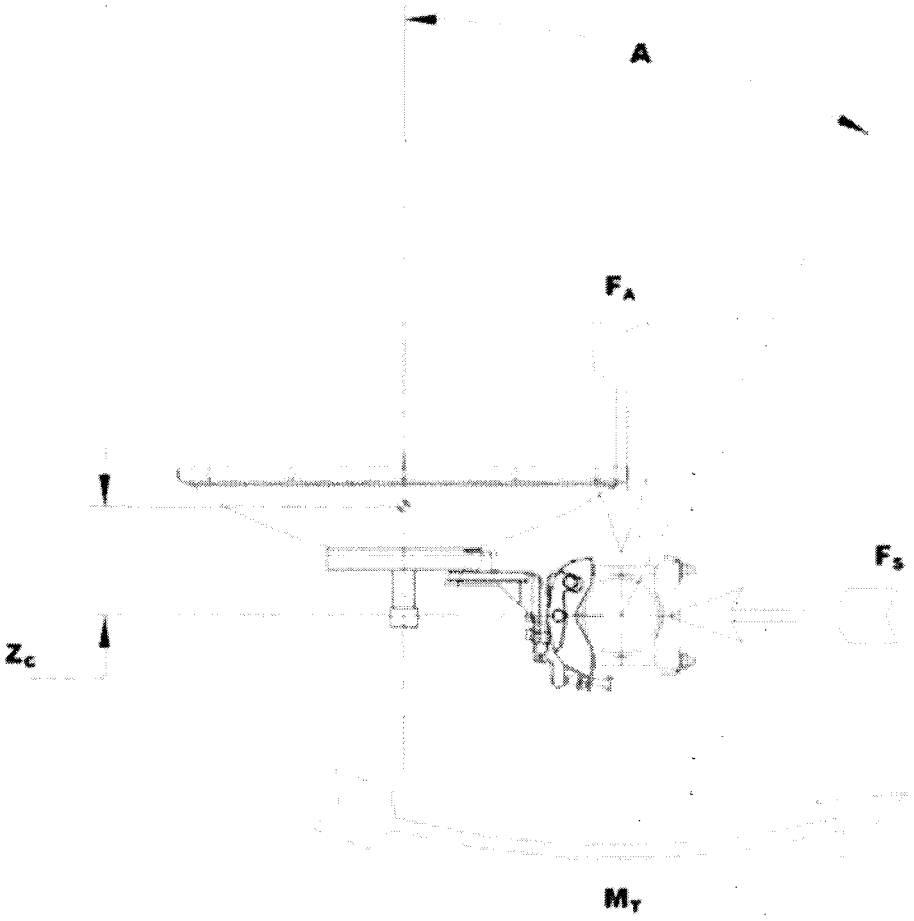
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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

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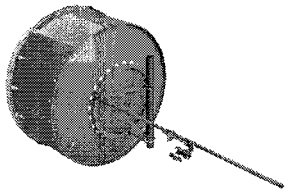
HX8-6W

Base Product



2.4m | 8ft ValuLine® High Performance, High XPD Antenna, dual-polarized, 5.925 – 7.125 GHz

Product Classification

Product Type	Microwave antenna

General Specifications

Antenna Type	HX - ValuLine® High Performance, High XPD Antenna, dual-polarized
Polarization	Dual
Side Struts, Included	1
Side Struts, Optional	4

Dimensions

Diameter, nominal	2.4 m | 8 ft

Electrical Specifications

Operating Frequency Band	5.925 – 7.125 GHz
Gain, Low Band	40.8 dBi
Gain, Mid Band	41.6 dBi
Gain, Top Band	42.4 dBi
Boresite Cross Polarization Discrimination (XPD)	33 dB
Front-to-Back Ratio	70 dB
Beamwidth, Horizontal	1.3 °
Beamwidth, Vertical	1.3 °
Return Loss	26 dB
VSWR	1.1
Radiation Pattern Envelope Reference (RPE)	7389
Electrical Compliance	ACMA FX03_6b, 6p7b | ETSI 302 217 Class 3 | IC 3059A | IC 3064A | US FCC Part 101A | US FCC Part 74A

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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	40.7 dBi
Beamwidth, Horizontal	1.3 °
Beamwidth, Vertical	1.3 °

Mechanical Specifications

Compatible Mounting Pipe Diameter	115 mm | 4.5 in
Fine Azimuth Adjustment Range	±5°
Fine Elevation Adjustment Range	±5°
Wind Speed, operational	201 km/h | 124.896 mph
Wind Speed, survival	200 km/h | 124.274 mph

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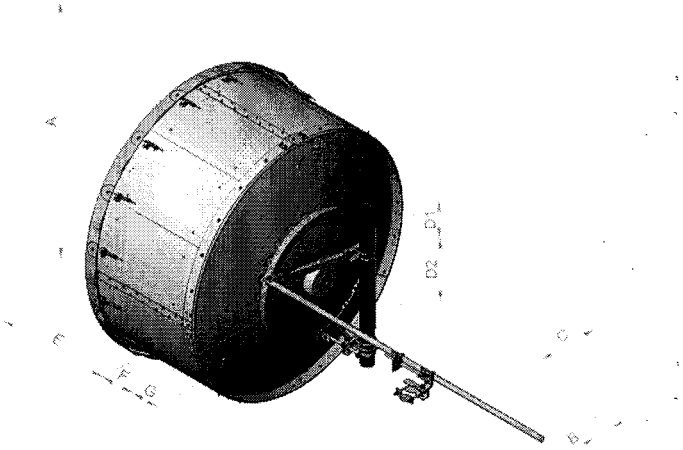
HX8-6W

Antenna Dimensions and Mounting Information

HX8



Dimensions in inches (mm)								
Antenna size, ft (m)	A	B	C	D1	D2	E	F	G
8 (2.4)	95.1 (2416)	8.0 (203)	22.5 (572)	14.1 (357)	23.6 (600)	42.4 (1078)	12.1 (306)	10.3 (262)

Wind Forces at Wind Velocity Survival Rating

Axial Force (FA)	10599 N | 2,382.751 lbf
Angle α for MT Max	-140 °
Side Force (FS)	4594 N | 1,032.773 lbf
Twisting Moment (MT)	-6518 N-m | -57,689.16 in lb
Force on Inboard Strut Side	11263 N | 2,532.024 lbf
Zcg without Ice	532 mm | 20.945 in
Zcg with 1/2 in (12 mm) Radial Ice	675 mm | 26.575 in
Weight with 1/2 in (12 mm) Radial Ice	342 kg | 753.98 lb

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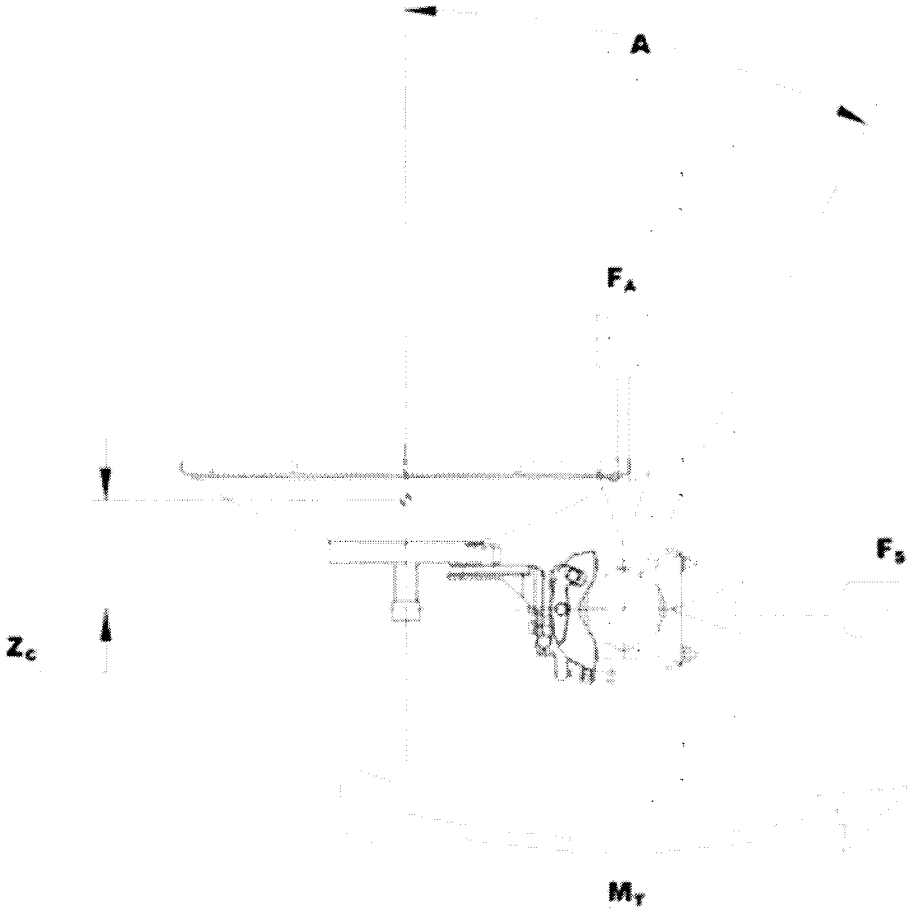
HX8-6W

Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	187 kg | 412.264 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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HX8-6W

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Front-to-Back Ratio	Denotes highest radiation relative to the main beam, at 180° ±40°, 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.
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Wind Speed, operational	For VHLP(X), SHP(X), HX and USX antennas, the wind speed where the maximum antenna deflection is 0.3 x 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

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COMMSCOPE®

HX8-6W

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

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ENGINEERED
TOWER SOLUTIONS

Site Name:	Rich Mountain Tower
Site Address:	759 Fire Tower Road, Boone, NC 28607
Latitude:	36.2330639 °
Longitude:	-81.6986889°
Structure Type:	Proposed 199.0-ft Self Support Tower
Contact Information:	Contact the owner with questions regarding the content of this Document. All questions or concerns shall be directed to the contact stipulated in the Bid Document.
Design Capacity:	The tower shall be designed so that, once installed with all loading as shown in Table 1 - Design Antenna/Coax Loading, the tower superstructure and substructure shall **NOT exceed 95% of its capacity**. If, upon evaluation, the design computes to be at a greater stress level than specified the bid will not be accepted. All bidders must provide design calculations verifying that this Design Capacity Requirement is met; see "Deliverables" for details.
Materials:	Tower structures shall utilize structural steel round or polygonal poles only. No other materials or shapes shall be given consideration. Structural bolts must meet the ASTM A325 specification, or equivalent if approved by the design engineer of record.
Design Fall Radius:	☐ No Fall Radius Required ☒ Fall Radius Required from Centerline of Tower: 50-ft
Standard:	☒ As a minimum, all towers shall be designed to the requirements of ANSI/TIA-222-G, including released addendums
Design Wind Speed:	☒ 150 mph ultimate 3-second gust wind speed (converted to an equivalent 116 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 Residential Building Code (2015 IBC) and ASCE 7-10.
Structure Class:	☐ Structure Class I – Low Hazard ☐ Structure Class II – Significant Hazard (Default) ☒ Structure Class III – Substantial Hazard
Risk Category:	☐ Risk Category I – Low Hazard ☐ Risk Category II – Moderate Hazard (Default) ☐ Risk Category III – Substantial Hazard ☒ Risk Category IV – Essential Hazard (Essential Communications)
Topographic Category:	☒ Category I – No abrupt changes in general topography (Topographic effects are already considered in the prescribed windspeed above per the 2018 NCBC Chapter 3). ☐ Category II – Structures located at or near the crest of an escarpment ☐ Category III – Structures located in the upper half of a hill ☐ Category IV – Structures located in the upper half of a ridge ☐ Category V – Wind speed up criteria based on a site-specific investigation (see attached)
Exposure Category:	☐ Exposure B – Urban and Suburban Areas ☒ Exposure C – Open Terrain where Exposure B or D does not apply. ☐ Exposure D – Flat, Unobstructed Shorelines
Design Ice Loading:	☐ ANSI/TIA-222-H: x.xx inch escalating with a xx mph 3 second gust wind speed ☒ ANSI/TIA-222-G: 0.75 inch escalating with a 30 mph 3 second gust wind speed ☐ ANSI/TIA/EIA-222-F: x.xx inch escalating with an xx mph fastest mile wind speed

Seismic:
- ☒ Seismic Ss: 0.263 / Seismic S1: 0.097 / Seismic TL: 12
- ☐ Ss exceeds 1.0. Seismic loads shall be evaluated in accordance with the Standard

Tower Finish:
- ☒ Galvanized
- ☐ Painted per FAA Advisory Circular AC 70/7460-1K
- ☐ Painted per Local Requirements

All structural steel products shall be hot dip galvanized in accordance with ASTM A123 specifications. Tower manufacturer shall produce documentation verifying the appropriate galvanizing process is utilized. All steel hardware shall be galvanized in accordance with ASTM A153 or ASTM B695 specifications

Tower Lights:
- ☐ Not Required
- ☒ Tower lighting system with E2 Avian Compliant Obstruction Lighting System (white strobes by day, and red lights at night). Beacons and Obstruction lights shall be all LED and Dual Red/White medium intensity and shall meet the requirements of FAA Advisory Circular AC 70/7460-1K. Towers 200-ft to 350-ft
- ☐ Tower lighting system with E2 Avian Compliant Obstruction Lighting System (white strobes by day, and red lights at night). Beacons and Obstruction lights shall be all LED and Dual Red/White medium intensity and shall meet the requirements of FAA Advisory Circular AC 70/7460-1K. A lighting system by Drake Lighting, that complies with the FAA regulation, is required. Towers over 350-ft

Grounding:
- ☒ Grounding, lightning protection, and surge protection systems shall be installed as required in compliance with R56 specifications and the construction documents. Coordinate with the Duke Energy bid administrator for the portion of tower grounding scope of work as shown in the construction documents. Minimum of the tower ground ring, connections from the ring to the tower, the bottom tower ground bar, and the connection from the tower ground ring to the bottom ground bar shall be included.

Climbing Facilities:
- ☐ Not Required
- ☒ A safety fall protection system incorporating a 3/8" diameter stainless steel cable meeting OSHA/ANSI specifications shall be installed the full height of the structure one tower leg and another full height cable on a full height face mounted external ladder. Additionally, step pegs are required on the other two legs to the height of the mid markers.
- ☐ A safety fall protection system incorporating a 3/8" diameter stainless steel cable meeting OSHA/ANSI specifications shall be installed the full height of the pole with full height step pegs.

Ice Bridge:
- ☒ Not required; Another contractor to provide
- ☐ Provide an option for Ice Bridge

Transmission Ladder:
- ☐ Not required; carrier to provide
- ☒ Provide (1) Transmission Ladder. Include "per foot" pricing.

Foundation:
- ☐ Provide Preliminary Design using Presumptive Soil Parameters per the TIA-222-G Standard (Annex F). A Geotechnical Report will be provided later for the final foundation design.
- ☒ Design with Geotechnical Report provided. In accordance with ANSI/TIA-222-G, Annex A, Section A.9.0, the tower manufacturer shall ensure the proper development of anchor rods and anchorage materials.

Antenna Mounts:
- ☐ Not required; Antenna Mounts provided by carrier.
- ☒ Provide mounts per Table 1 – Design Antenna/Coax Loading

Additional Design Requirements

Structural Guidelines:

All leg capacities for lattice towers shall be computed utilizing a global effective length factor (K) of 1.0. All leg capacities shall be calculated utilizing the working points between panel points. Utilizing the side (gusset) plate length to reduce the un-braced length of the leg is not permitted. Leg members must consist only of steel solid rod and angle members. Tubular steel leg members are not permitted (Not applicable to monopoles).

For round leg latticed towers, bracing member capacities shall be calculated considering the effective length to be the span between the weld lines of the gusset plates at the face of the round legs for both out-of-plane and in-plane buckling modes (Not applicable to monopoles).

Hardened galvanized flat washers (ASTM F436) shall only be used in fully tensioned bolted connections and connections that utilize oversized or slotted holes.

Linear Appurtenances:

The tower analysis model shall include all feed lines, feed line ladders, step pegs, climbing ladder and safety climb.

Discrete Appurtenances:

Effective Projected Area (EPA)A for antennas shall be determined according to TIA-222-G, Section 2.6.9.2, Design Wind Force on Appurtenances. If antenna or mount areas are specified, the provided values shall be used in lieu of calculated values. If height, width, and depth dimensions are provided by the antenna manufacturer, the panel shall be treated as a flat rectangular panel. Force coefficients shall be determined based on antenna aspect ratios and multiplied by the projected areas to calculate front and side EPAs.

Wind tunnel test results shall NOT be used unless the results have been provided to ETS and proposed effective areas have been approved. Back-calculating wind areas from published antenna manufacturer's wind loads are prohibited.

Deliverables: [Once awarded, Final Deliverables shall bear the seal of a North Carolina Professional Engineer]

A PDF softcopy of all deliverables shall be sent to ETS for recording purposes. All tower designs shall be complete with the following:

- General Notes
- Profile drawing (with tower reactions, design drawings, materials grades and referenced codes and standards shall be clearly shown)
- Foundation design drawings
- Supporting design calculations for tower and foundation
- Listing of main structural members
- Mount documentation specifically showing total EPA

ENGINEERED
TOWER SOLUTIONS

Table 1 - Design Antenna/Coax Loading

PROPOSED ANTENNA SCHEDULE								
OWNER	QTY.	SIZE (FT)	TYPE	MANUFACTURER - ANTENNA MODEL NUMBER	ANTENNA AZIMUTH	MOUNT ELEVATION	LEG	CABLE (QTY.) TYPE
WATAUGA COUNTY	1	-	OMNI	RFI - CCB67-11	-	178'-0"	A	(1) 7/8" & (1) 1/2"
WATAUGA COUNTY	1	-	OMNI	RFI - CCB67-11	-	178'-0"	B	(1) 7/8"
WATAUGA COUNTY	1	-	TTA	- TTA	-	175'-0"	-	-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	OMNI	RFI - CCB67-11	-	150'-0"	A	(1) 1-5/8"
WATAUGA COUNTY	1	-	OMNI	RFI - CCB67-11	-	150'-0"	B	(1) 1-5/8"
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO BUCKEYE	COMMSCOPE - HX6-6W-6WH	318°	140'-0"	C	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO WATAUGA CO TRAN STA	COMMSCOPE - HX6-6W-6WH	104°	100'-0"	B	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO PHEONIX	COMMSCOPE - HX6-6W-6HW	36.6°	85'-0"	A	(1) EU63
WATAUGA COUNTY	1	-	DISH TO HAWKS NEST	COMMSCOPE - HX6-6W-6HW	227°	75'-0"	B	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note 1: Builder will supply side arms (4) with side struts (4) for only the omni and dipole antennas listed as current. However, engineer shall design the tower so that all omni and dipole antennas, including future, have side arms with side struts considered in the design loading (9 total).

Note 2: Builder will supply pipe mounts (4), high wind kits (4), and ice shields (4) for only the dish antennas listed as current. However, engineer shall design the tower so that all dish antennas, including future, have pipe mounts, high wind kits, and ice shields considered in the design loading (6 total).

Appendix A

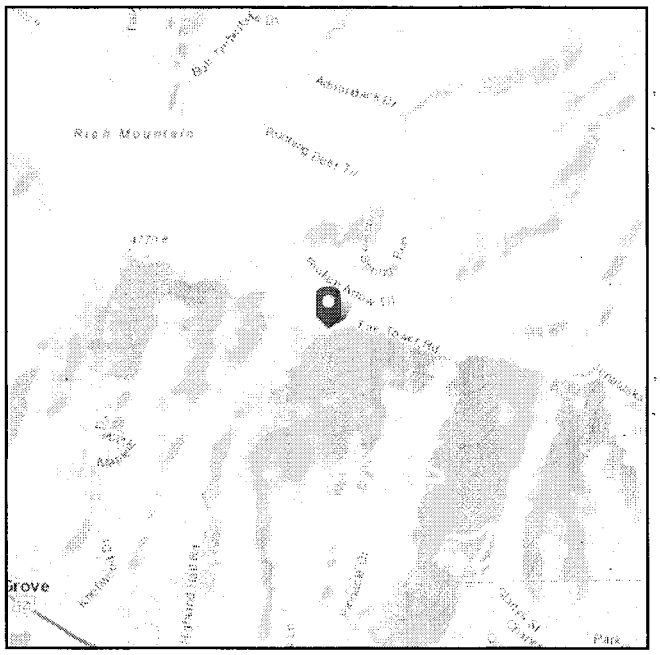
Verification of Design Loads

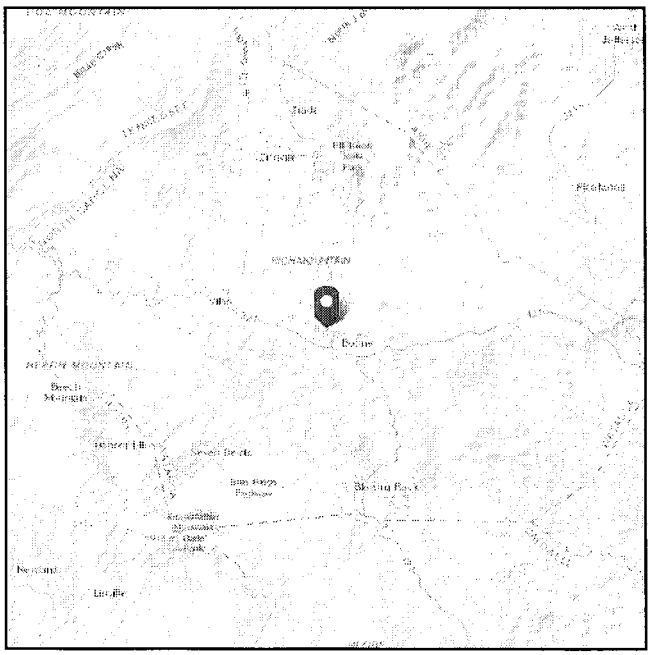
ASCE Hazards Report

Address:
No Address at This Location

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

Latitude: 36.233064
Longitude: -81.698689
Elevation: 4667.74622517496 ft (NAVD 88)





Wind

Results:

Wind Speed	120 Vmph	150 mph ultimate 3-second wind speed (converted to an equivalent 116 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 Residential Building Code Chapter 3. Topographic effects are already considered per 2018 NCBC. 116 mph nominal wind speed to be used with Structural Class III Importance Factor of 1.15 and Topographic Category 1.
10-year MRI	76 Vmph	
25-year MRI	84 Vmph	
50-year MRI	90 Vmph	
100-year MRI	96 Vmph	
Special		Special Wind Region -- Mountainous terrain, gorges, and special wind regions shown in Fig. 26.5-1 shall be examined for unusual wind conditions. The Authority Having Jurisdiction shall, if necessary, adjust the values given in Fig. 26.5-1 to account for higher local wind speeds. Such adjustment shall be based on meteorological information and an estimate of the basic wind speed obtained in accordance with the provisions in Section 26.5.3.

Data Source: ASCE/SEI 7-10, Fig. 26.5-1B and Figs. CC-1–CC-4, and Section 26.5.2, incorporating errata of March 12, 2014
Date Accessed: Fri Apr 04 2025

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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.

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Seismic

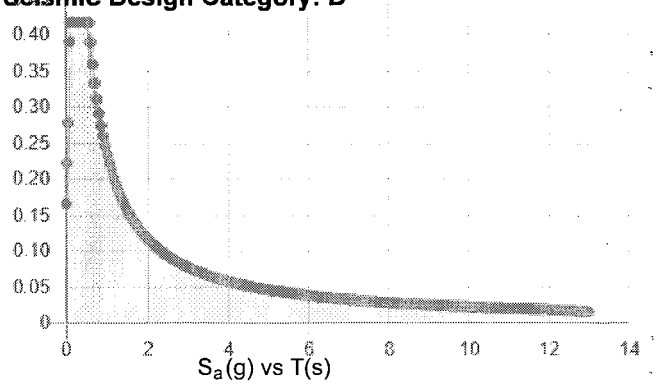
Site Soil Class: D - Stiff Soil

Results:

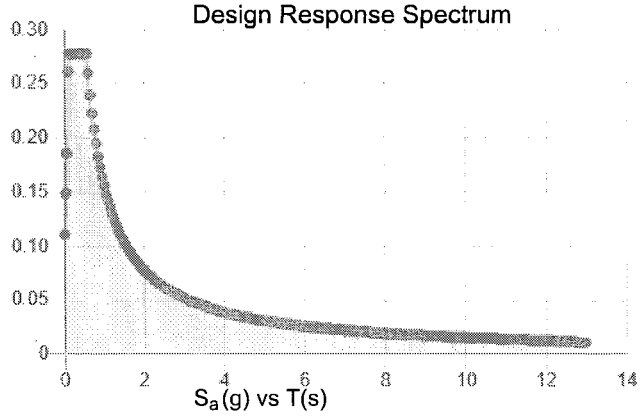
S_S :	0.263	S_{D1} :	0.156
S_1 :	0.097	T_L :	12
F_a :	1.59	PGA :	0.137
F_v :	2.4	PGA_M :	0.209
S_{MS} :	0.418	F_{PGA} :	1.526
S_{M1} :	0.234	I_e :	1.5
S_{DS} :	0.278		

Seismic Design Category: D

MCE_R Response Spectrum



Design Response Spectrum



Data Accessed: **Fri Apr 04 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.

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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:	Fri Apr 04 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.

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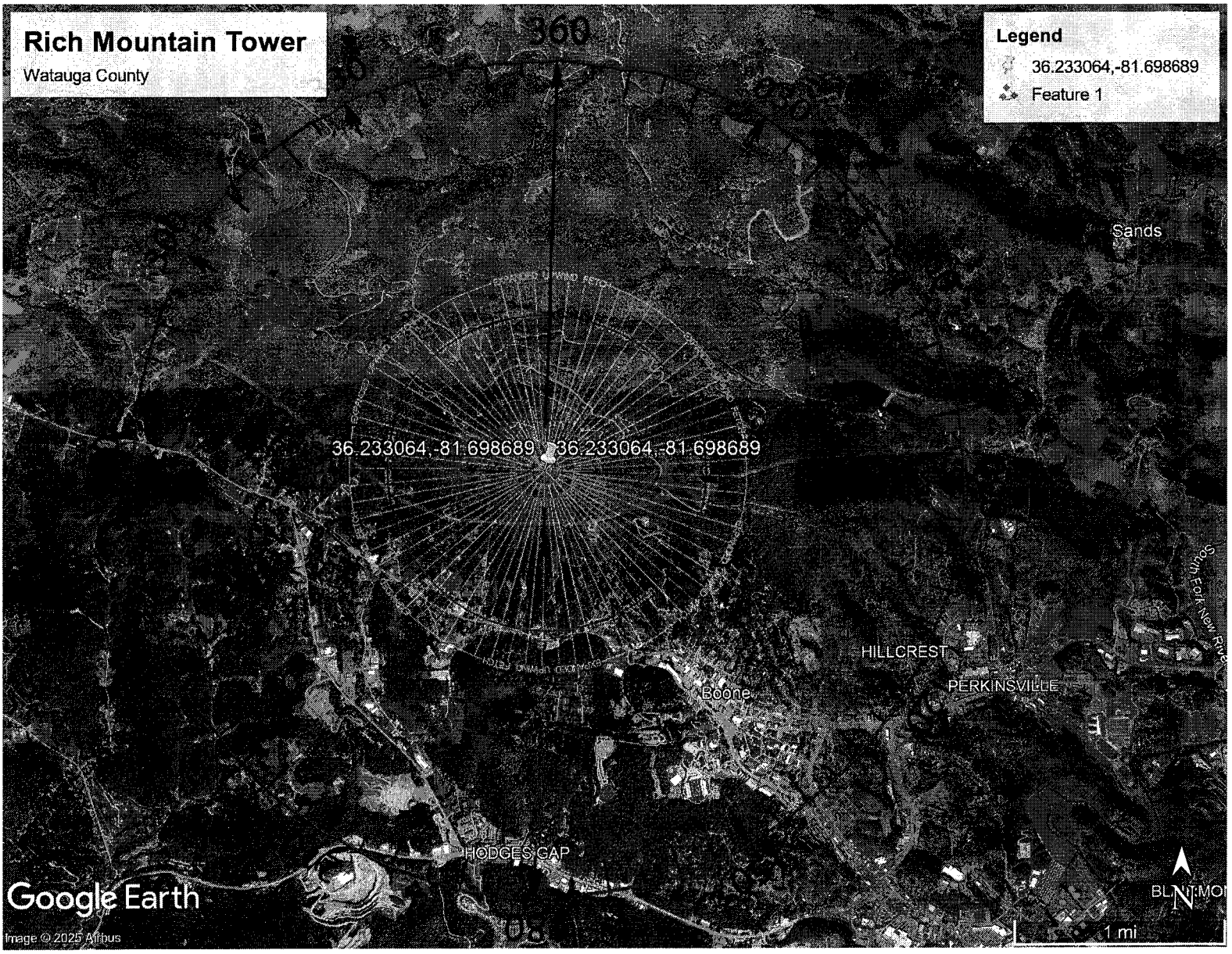
Appendix B

Site Vicinity and Location Map


Rich Mountain Tower
Watauga County
Legend
36.233064,-81.698689
Feature 1
360
Sands
36.233064,-81.698689
36.233064,-81.698689
HILLCREST
PERKINSVILLE
Boone
HODGES GAP
Google Earth
Image © 2025 Airbus
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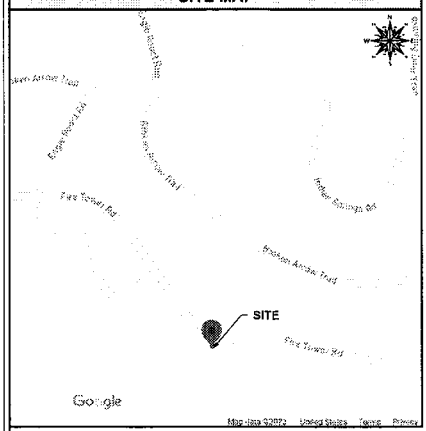
SITE MAP



GENERAL NOTES

THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION, THEREFORE HANDICAP ACCESS IS NOT REQUIRED FOR ROUTINE MAINTENANCE, THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE, NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.

SCOPE OF WORK

PROPOSED SCOPE OF WORK INCLUDES: INSTALLING A NEW 199'-0" SELF SUPPORT TOWER. INSTALLING A NEW VFP, MODEL 7459, METAL EQUIPMENT SHELTER WITH A SLAB MOUNTED ICE SHIELD. ADJUSTING THE EXISTING FENCE AND ADDING ADDITIONAL FENCE AROUND THE COMPOUND. ADDING PARKING / TURN-A-ROUND AREA.

CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE FOLLOWING CODES.

- 2018 N.C. BUILDING CODE (2015 IBC W/ AMENDMENTS)
- 2018 N.C. EXISTING BUILDING CODE (2015 IEBC W/ AMENDMENTS)
- 2018 N.C. FIRE CODE (2015 IFC W/ AMENDMENTS)
- 2018 N.C. FUEL GAS CODE (2015 IFGC W/ AMENDMENTS)
- 2018 N.C. MECHANICAL CODE (2015 IMC W/ AMENDMENTS)
- 2018 N.C. PLUMBING CODE (2015 IPC W/ AMENDMENTS)
- 2020 N.C. ELECTRICAL CODE (2020 NEC)

811 Know what's below. Call before you dig.

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE & LONGITUDE:
N 36° 13' 59.03", W 81° 41' 55.28"

INDEX OF SHEETS

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GN-4 TO GN-6	NC APPENDIX B I THRU V
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C-1.1	DETAILED SITE PLAN
C-1.2	DIMENSIONED SITE PLAN
C-2	TOWER ELEVATION
C-3.1	ANTENNA SCHEDULE
C-3.2 TO C-3.4	ANTENNA LAYOUTS
C-4.1	SHELTER DETAILS
C-4.2	SHELTER & ICE SHIELD DETAILS
C-4.3	SHELTER FOUNDATION DETAILS
C-4.4	GENERATOR & GEN. FOUNDATION DETAILS
C-4.5	ICE BRIDGE DETAILS
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E-4	PANEL SCHEDULES
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G-2.1	GROUNDING DETAILS I
G-2.2	GROUNDING DETAILS II

SITE PHOTO

SITE SUMMARY

SITE TYPE:	NEW CONSTRUCTION
STRUCTURE TYPE:	SELF SUPPORT
STRUCTURE OWNER:	WATAUGA COUNTY
STRUCTURE HEIGHT (AGL):	199'-0"
OCCUPANCY TYPE:	UTILITY & MISCELLANEOUS (U)
STRUCTURE LATITUDE:	N 36° 13' 59.03" (36.2330639°)
STRUCTURE LONGITUDE:	W 81° 41' 55.28" (-81.6986889°)
JURISDICTION:	WATAUGA COUNTY
COUNTY:	WATAUGA
PARCEL ID:	2901440447500
GROUND ELEV. (NAVD 88):	4667.62±

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639° -81.6986889°

SEAL: FIRM #: P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: CG

SHEET TITLE:
TITLE PAGE

SHEET # T-1 | CURRENT REV #: 3 | ETS #: 22110700

GENERAL NOTES

1. ALL SITE WORK SHALL BE COMPLETED AS INDICATED ON THE DRAWINGS AND CARRIER PROJECT SPECIFICATIONS.
2. GENERAL CONTRACTOR SHALL VISIT THE SITE AND SHALL FAMILIARIZE THEMSELVES WITH ALL CONDITIONS AFFECTING THE PROPOSED WORK AND SHALL MAKE PROVISIONS. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARIZING THEMSELVES WITH ALL CONTRACT DOCUMENTS. FIELD CONDITIONS, DIMENSIONS, AND SHALL CONFIRM THAT THE WORK MAY BE ACCOMPLISHED AS SHOWN PRIOR TO PROCEEDING WITH CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.
3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS AND ORDINANCES. GENERAL CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF WORK.
4. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES, AND APPLICABLE REGULATIONS.
5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED IN THESE DRAWINGS.
6. PLANS ARE NOT TO BE SCALED. THESE PLANS ARE INTENDED TO BE A DIAGRAMMATIC OUTLINE ONLY UNLESS OTHERWISE NOTED. DIMENSIONS SHOWN ARE TO FINISHED SURFACES UNLESS OTHERWISE NOTED. SPACING BETWEEN EQUIPMENT IS THE MINIMUM REQUIRED CLEARANCE. THEREFORE, IT IS CRITICAL TO FIELD VERIFY DIMENSIONS. SHOULD THERE BE ANY QUESTIONS REGARDING THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A CLARIFICATION FROM THE ENGINEER PRIOR TO PROCEEDING WITH THE WORK. DETAILS ARE INTENDED TO SHOW DESIGN INTENT. MODIFICATIONS MAY BE REQUIRED TO SUIT JOB DIMENSIONS OR CONDITIONS AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF WORK AND PREPARED BY THE ENGINEER PRIOR TO PROCEEDING WITH WORK.
7. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN IN THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE ENGINEER PRIOR TO PROCEEDING.
9. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF WORK AREA, ADJACENT AREAS AND BUILDING OCCUPANTS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL OSHA REQUIREMENTS AND THE LOCAL JURISDICTION.
10. GENERAL CONTRACTOR SHALL COORDINATE WORK AND SCHEDULE WORK ACTIVITIES WITH OTHER DISCIPLINES.
11. ERECTION SHALL BE DONE IN WORKMANLIKE MANNER BY COMPETENT EXPERIENCED WORKMEN IN ACCORDANCE WITH APPLICABLE CODES AND THE BEST ACCEPTED PRACTICE. ALL MEMBERS SHALL BE LAID PLUMB AND TRUE AS INDICATED IN THE DRAWINGS.
12. SEAL PENETRATIONS THROUGH FIRE RATED AREAS WITH UL LISTED MATERIALS APPROVED BY LOCAL JURISDICTION. CONTRACTOR SHALL KEEP AREA CLEAN, HAZARD FREE, AND DISPOSE OF ALL DEBRIS.
13. THE SCOPE OF WORK FOR THIS PROJECT IS REPRESENTED BY DARK SHADED LINES AND NOTES. CONTRACTOR SHALL NOTIFY THE GENERAL CONTRACTOR OF ANY EXISTING CONDITIONS THAT DEVIATE FROM THE DRAWINGS PRIOR TO BEGINNING CONSTRUCTION.
14. CONTRACTOR SHALL PROVIDE WRITTEN NOTICE TO THE CONSTRUCTION MANAGER 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
15. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER.
16. THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.
17. GENERAL CONTRACTOR SHALL COORDINATE AND MAINTAIN ACCESS FOR ALL TRADES AND CONTRACTORS TO THE SITE AND/OR BUILDING.
18. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR SECURITY OF THE SITE FOR THE DURATION OF CONSTRUCTION UNTIL JOB COMPLETION.
19. THE GENERAL CONTRACTOR SHALL MAINTAIN IN GOOD CONDITION ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS ON THE PREMISES AT ALL TIMES.
20. THE GENERAL CONTRACTOR SHALL PROVIDE PORTABLE FIRE EXTINGUISHERS WITH A RATING OF NO LESS THAN 2-A OR 2-A 10-B:C AND SHALL BE WITHIN 25 FEET OF TRAVEL DISTANCE TO ALL PORTIONS OF WHERE THE WORK IS BEING COMPLETED DURING CONSTRUCTION.

GENERAL NOTES (CONTINUED)

21. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES SHALL BE PROTECTED AT ALL TIMES. AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY THE ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR THE WORKING CREW. THIS SHALL INCLUDE BUT NOT BE LIMITED TO A) FALL PROTECTION, B) CONFINED SPACE, C) ELECTRICAL SAFETY, AND D) TRENCHING & EXCAVATION.
22. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED, CAPPED, PLUGGED OR OTHERWISE DISCONNECTED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, AS DIRECTED BY THE RESPONSIBLE ENGINEER, AND SUBJECT TO THE APPROVAL OF THE OWNER AND/OR LOCAL UTILITIES.
23. THE AREAS OF THE OWNER'S PROPERTY DISTURBED BY THE WORK AND NOT COVERED BY THE TOWER, EQUIPMENT OR DRIVEWAY, SHALL BE GRADED TO A UNIFORM SLOPE, AND STABILIZED TO PREVENT EROSION.
24. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO THE EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE FEDERAL AND LOCAL JURISDICTION FOR EROSION AND SEDIMENT CONTROL.
25. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUNDING, FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
26. THE SUBGRADE SHALL BE BROUGHT TO A SMOOTH UNIFORM GRADE AND COMPACTED TO 95 PERCENT STANDARD PROCTOR DENSITY UNDER PAVEMENT AND STRUCTURES AND 90 PERCENT STANDARD PROCTOR DENSITY IN OPEN SPACE. ALL TRENCHES IN PUBLIC RIGHT OF WAY SHALL BE BACKFILLED WITH FLOWABLE FILL OR OTHER MATERIAL PRE-APPROVED BY THE LOCAL JURISDICTION.
27. ALL NECESSARY RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN A LAWFUL MANNER.
28. ALL BROCHURES, OPERATING AND MAINTENANCE MANUALS, CATALOGS, SHOP DRAWINGS, AND OTHER DOCUMENTS SHALL BE TURNED OVER TO THE GENERAL CONTRACTOR AT COMPLETION OF CONSTRUCTION AND PRIOR TO PAYMENT.
29. CONTRACTOR SHALL SUBMIT A COMPLETE SET OF AS-BUILT REDLINES TO THE GENERAL CONTRACTOR UPON COMPLETION OF PROJECT AND PRIOR TO FINAL PAYMENT.
30. CONTRACTOR SHALL LEAVE PREMISES IN A CLEAN CONDITION.
31. THE PROPOSED FACILITY WILL BE UNMANNED AND DOES NOT REQUIRE POTABLE WATER OR SEWER SERVICE, AND IS NOT FOR HUMAN HABITAT (NO HANDICAP ACCESS REQUIRED).
32. STRUCTURE IS LIMITED TO PERIODIC MAINTENANCE AND INSPECTION, APPROXIMATELY 2 TIMES PER MONTH, BY CARRIER TECHNICIANS.
33. NO OUTDOOR STORAGE OR SOLID WASTE CONTAINERS ARE PROPOSED.
34. ALL MATERIAL SHALL BE FURNISHED AND WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST CARRIER GROUNDING STANDARD. IN CASE OF A CONFLICT BETWEEN THE CONSTRUCTION SPECIFICATION AND THE DRAWINGS, THE DRAWINGS SHALL GOVERN.
35. CONTRACTORS SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS REQUIRED FOR CONSTRUCTION. IF CONTRACTOR CANNOT OBTAIN A PERMIT, THEY MUST NOTIFY THE GENERAL CONTRACTOR IMMEDIATELY.
36. CONTRACTOR SHALL REMOVE ALL TRASH AND DEBRIS FROM THE SITE ON A DAILY BASIS.
37. INFORMATION SHOWN ON THESE DRAWINGS WAS OBTAINED FROM SITE VISITS AND/OR DRAWINGS PROVIDED BY THE SITE OWNER. CONTRACTORS SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
38. ALL CABLE INSTALLATIONS TO FOLLOW MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.
39. NO WHITE STROBE LIGHTS ARE PERMITTED. LIGHTING IF REQUIRED, WILL MEET FAA STANDARDS AND REQUIREMENTS.

ANTENNA MOUNTING NOTES

1. ALL STEEL MATERIALS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS", UNLESS NOTED OTHERWISE.
2. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC-COATING (HOT-DIP) ON IRON AND STEEL HARDWARE", UNLESS NOTED OTHERWISE.
3. DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY COLD GALVANIZING IN ACCORDANCE WITH ASTM A780.
4. ALL ANTENNA MOUNTS SHALL BE INSTALLED WITH LOCK NUTS, DOUBLE NUTS AND SHALL BE TORQUED TO MANUFACTURER'S RECOMMENDATIONS.
5. CONTRACTOR SHALL INSTALL ANTENNA PER MANUFACTURER'S RECOMMENDATION FOR INSTALLATION AND GROUNDING.
6. PRIOR TO SETTING ANTENNA AZIMUTHS AND DOWNTILTS, ANTENNA CONTRACTOR SHALL CHECK THE ANTENNA MOUNT FOR TIGHTNESS AND ENSURE THAT THEY ARE PLUMB. ANTENNA AZIMUTHS SHALL BE SET FROM TRUE NORTH AND BE ORIENTED WITHIN +/- 5% AS DEFINED BY THE RFDS. ANTENNA DOWNTILTS SHALL BE WITHIN +/- 0.5% AS DEFINED BY THE RFDS. REFER TO ND-00246.

TORQUE REQUIREMENTS

1. ALL RF CONNECTIONS SHALL BE TIGHTENED BY A TORQUE WRENCH.
2. ALL RF CONNECTIONS, GROUNDING HARDWARE AND ANTENNA HARDWARE SHALL HAVE A TORQUE MARK INSTALLED IN A CONTINUOUS STRAIGHT LINE FROM BOTH SIDES OF THE CONNECTION.
3. RF CONNECTION BOTH SIDES OF THE CONNECTOR.
4. GROUNDING AND ANTENNA HARDWARE ON THE NUT SIDE STARTING FROM THE THREADS TO THE SOLID SURFACE. EXAMPLE OF SOLID SURFACE: GROUND BAR, ANTENNA BRACKET METAL.
5. ALL 8M ANTENNA HARDWARE SHALL BE TIGHTENED TO 9 LB-FT (12 NM).
6. ALL 12M ANTENNA HARDWARE SHALL BE TIGHTENED TO 43 LB-FT (58 NM).
7. ALL GROUNDING HARDWARE SHALL BE TIGHTENED UNTIL THE LOCK WASHER COLLAPSES AND THE GROUNDING HARDWARE IS NO LONGER LOOSE.
8. ALL DIN TYPE CONNECTIONS SHALL BE TIGHTENED TO 18-22 LB-FT (24.4-29.8 NM).
9. ALL N TYPE CONNECTIONS SHALL BE TIGHTENED TO 15-20 LB-IN (1.7-2.3 NM).

COAXIAL CABLE NOTES

1. TYPES AND SIZES OF THE ANTENNA CABLE ARE BASED ON ESTIMATED LENGTHS. PRIOR TO ORDERING CABLE, CONTRACTOR SHALL VERIFY ACTUAL LENGTH BASED ON CONSTRUCTION LAYOUT AND NOTIFY THE PROJECT MANAGER IF ACTUAL LENGTHS EXCEED ESTIMATED LENGTHS.
2. CONTRACTOR SHALL VERIFY THE DOWN-TILT OF EACH ANTENNA WITH A DIGITAL LEVEL.
3. CONTRACTOR SHALL CONFIRM COAX COLOR CODING PRIOR TO CONSTRUCTION. REFER TO "ANTENNA SYSTEM LABELING STANDARD" ND-00027 LATEST VERSION.
4. ALL JUMPERS TO THE ANTENNAS SHALL BE 1/2" DIA. LDF AND SHALL NOT EXCEED 6'-0".
5. ALL COAXIAL CABLE SHALL BE SECURED TO THE DESIGNED SUPPORT STRUCTURE, IN AN APPROVED MANNER, AT DISTANCES NOT TO EXCEED 4'-0" OC.
6. CONTRACTOR SHALL FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS REGARDING BOTH THE INSTALLATION AND GROUNDING OF ALL COAXIAL CABLES, CONNECTORS, ANTENNAS, AND ALL OTHER EQUIPMENT.
7. CONTRACTOR SHALL WEATHERPROOF ALL ANTENNA CONNECTORS WITH SELF AMALGAMATING TAPE. WEATHERPROOFING SHALL BE COMPLETED IN STRICT ACCORDANCE WITH INDUSTRY STANDARDS.

GENERAL CABLE AND EQUIPMENT NOTES

1. CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY ANTENNA, TMAS, DIPLEXERS, AND COAX CONFIGURATION, MAKE AND MODELS PRIOR TO INSTALLATION.
2. ALL CONNECTIONS FOR HANGERS, SUPPORTS, BRACING, ETC, SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
3. CONTRACTOR SHALL REFERENCE THE STRUCTURAL ANALYSIS/DESIGN DRAWINGS FOR DIRECTIONS ON CABLE DISTRIBUTION/ROUTING.

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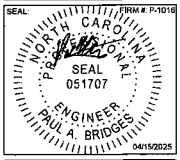

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
GENERAL NOTES I

SHEET # GN-1 | CURRENT REV # 3 | ETS # 22110700

GENERAL CABLE AND EQUIPMENT NOTES

1. ALL OUTDOOR RF CONNECTORS/CONNECTIONS SHALL BE WEATHERPROOFED, EXCEPT THE RET CONNECTORS. USING BUTYL TAPE AFTER INSTALLATION AND FINAL CONNECTIONS ARE MADE. BUTYL TAPE SHALL HAVE A MINIMUM OF ONE-HALF TAPE WIDTH OVERLAP ON EACH TURN AND EACH LAYER SHALL BE WRAPPED THREE TIMES. WEATHERPROOFING SHALL BE SMOOTH WITHOUT BUCKLING. BUTYL BLEEDING IS NOT ALLOWED.
2. IF REQUIRED TO PAINT ANTENNAS AND/OR COAX:
   - 2.1. TEMPERATURE SHALL BE ABOVE 50° F.
   - 2.2. PAINT COLOR MUST BE APPROVED BY BUILDING OWNER/LANDLORD.
   - 2.3. FOR REGULATED TOWERS, FAA/FCC APPROVED PAINT IS REQUIRED.
   - 2.4. DO NOT PAINT OVER COLOR CODING OR ON EQUIPMENT MODEL NUMBERS.
3. ALL PROPOSED GROUND BAR DOWNLEADS ARE TO BE TERMINATED TO THE EXISTING ADJACENT GROUND BAR DOWNLEADS A MINIMUM DISTANCE OF 4'-0" BELOW GROUND BAR. TERMINATIONS MAY BE EXOTHERMIC OR COMPRESSION.
4. ALL CONNECTIONS FOR HANGERS, SUPPORTS, BRACING, ETC. SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATION & RECOMMENDATIONS.NO BOLT THREADS TO PROTRUDE MORE THAN 1-1/2" [.038M].
5. 90 SHORT SWEEPS UNDER ANTENNA ARM. ALL CABLES MUST ONLY TRANSITION ON THE INSIDE OR BOTTOM OF ARMS (NO CABLE ON TOP OF ARMS).
6. USE 90 CONNECTOR AT CABLE CONNECTION TO ANTENNAS.
7. PLACE GPS ON ARM WITH SOUTHERN SKY EXPOSURE AT MINIMUM 6' [1.83] FROM TRANSMIT ANTENNA, WHICH IS 24" [.61M] AWAY FROM CENTER OF POLE.
8. USE 1/2" [.013M] CABLE ON ANTENNAS UNLESS OTHERWISE SPECIFIED.
9. FILL VOID AROUND CABLES AT CONDUIT OPENING WITH FOAM SEALANT TO PREVENT WATER INTRUSION.

FIBER & POWER CABLE MOUNTING

1. THE FIBER OPTIC TRUNK CABLES SHALL BE INSTALLED INTO CONDUITS, CHANNEL CABLE TRAYS, OR CABLE TRAY. WHEN INSTALLING FIBER OPTIC TRUNK CABLES INTO A CABLE TRAY SYSTEM, THEY SHALL BE INSTALLED INTO AN INTER DUCT AND A PARTITION BARRIER SHALL BE INSTALLED BETWEEN THE 600 VOLT CABLES AND THE INTER DUCT IN ORDER TO SEGREGATE CABLE TYPES. OPTIC FIBER TRUNK CABLES SHALL HAVE APPROVED CABLE RESTRAINTS EVERY (60) SIXTY FEET AND SECURELY FASTENED TO THE CABLE TRAY SYSTEM. NFPA 70 (NEC) ARTICLE 770 RULES SHALL APPLY.
2. THE TYPE TC-ER CABLES SHALL BE INSTALLED INTO CONDUITS, CHANNEL CABLE TRAYS, OR CABLE TRAY AND SHALL BE SECURED AT INTERVALS NOT EXCEEDING (6) SIX FEET. AN EXCEPTION: WHERE TYPE TC-ER CABLES ARE NOT SUBJECT TO PHYSICAL DAMAGE, CABLES SHALL BE PERMITTED TO MAKE A TRANSITION BETWEEN CONDUITS, CHANNEL CABLE TRAYS, OR CABLE TRAY WHICH ARE SERVING UTILIZATION EQUIPMENT OR DEVICES. A DISTANCE (6) SIX FEET SHALL NOT BE EXCEEDED WITHOUT CONTINUOUS SUPPORTING, NFPA 70 (NEC) ARTICLES 336 AND 392 RULES SHALL APPLY.
3. WHEN INSTALLING OPTIC FIBER TRUNK CABLES OR TYPE TC-ER CABLES INTO CONDUITS, NFPA 70 (NEC) ARTICLE 300 RULES SHALL APPLY.

NOT USED

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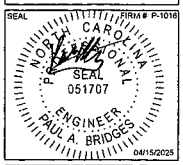

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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
GENERAL NOTES II

SHEET # **GN-2** | CURRENT REV # 3 | ETS # 22110700

ABBREVIATIONS

ABC	AGGREGATE BASE COURSE	FT.	FOOT, FEET	RT	RIGHT
ABS	AIR BREAK SWITCH	FTG.	FOOTING	R/W	RIGHT OF WAY
A.C.	ASBESTOS CEMENT	GA	GAGE	RWM	RIGHT OF WAY MONUMENT
A/C	AIR CONDITIONING	GAL.	GALLON	SAN	SANITARY SEWER
A.D.	AREA DRAIN	GALV.	GALVANIZED	SB	SOIL BORING
A.F.F.	ABOVE FINISHED FLOOR	GC	GENERAL CONTRACTOR	SCH	SCHEDULE
ALT.	ALTERNATE	G.F.E.	GOVERNMENT FURNISHED EQUIPMENT	SET	SETBACK
ALUM.	ALUMINUM	GIS	GEOGRAPHIC INFORMATION SYSTEM	SF	SQUARE FEET
AMP.	AMPERES	GL	GAS LINE	SHT	SHEET
A.O.	ACCESS OPENING	GM	GAS METER	SIA	SIAMESE CONNECTION
APPROX.	APPROXIMATELY	G.P.H.	GALLONS/HOUR	SIG	SIGNAL
ARCH.	ARCHITECTURAL	G.P.M.	GALLONS/MINUTE	SOTF	SECURITY OPERATIONS TRAINING FACILITY
ASPH.	ASPHALT	GND.	GROUND	SP	SIGNAL POLE
A.T.P.	ANTI-TERRORISM FORCE PROTECTION	GOVT	GOVERNMENT	SPECS	SPECIFICATIONS
A.W.W.A.	AMERICAN WATER WORKS ASSOCIATION	GV	GATE VALVE	SQFT	SQUARE FEET
BLDG.	BUILDING	GW	GUY WIRE	SR	STATE ROAD
BM.	BENCH MARK	HC	HANDICAP	SS	SANITARY SEWER
BOC	BACK OF CURB	HCP	HANDICAP PARKING	ST.	STATION
BOL	BOLLARD	HCR	HANDICAP RAMP	STD.	STANDARD
BRG.	BEARING	HDW	HEADWALL	STM	STORM
BVC	BEGIN VERTICAL CURVE	HP	HIGH POINT	STL	STEEL
BVCE	BEGIN VERTICAL CURVE ELEVATION	HSS	HIGH STRENGTH STEEL	SW	SIDEWALK
BVCS	BEGIN VERTICAL CURVE STATION	HT	HEIGHT	SWM	STORMWATER MANAGEMENT
C&G	CURB AND GUTTER	HYD	HYDRANT	T	TANGENT
CATV	CABLE TELEVISION	ID.	INSIDE DIAMETER	TBM	TEMPORARY BENCHMARK
CAP.	CAPACITY	INTX.	INTERSECTION	TERR	TERRA COTTA PIPE
C.B.	CATCH BASIN	INV.	INVERT	TEL	TELEPHONE
CBL	CABLE	ISL.	ISLAND	TOC	TOP OF CURB
CEM.	CEMENT	ITL.	INDEPENDENT TESTING LABORATORY	TOB	TOP OF BANK
CER.	CERAMIC	J.B.	JUNCTION BOX	TOS	TOP OF SLOPE
C.F.M.	CUBIC FEET/MINUTE	JCT.	JUNCTION	TOW	TOP OF WALL
C.F.S.	CUBIC FEET/SECOND	JSOC	JOINT SPECIAL OPERATIONS COMMAND	TP	TELEPHONE POLE
C.I.	CURB INLET	JT.	JOINT	TRANS	TRANSFORMER
C.I.P.	CAST IRON PIPE	K	K VALVE	TYP.	TYPICAL
CIRC.	CIRCULATING	KVA	KILOVOLT AMPERE	UIC	UNDER CONSTRUCTION
C.A.	CONSTRUCTION JOINT/CONTRACTION JOINT	KW	KILOWATT	U/G	UNDERGROUND
C.L.	CENTER LINE	L	LENGTH	UNO	UNLESS NOTED OTHERWISE
C.M.	CONCRETE MONUMENT	LF	LINEAR FEET	UP	UTILITY POLE
C.M.P.	CONCRETE METAL PIPE	LGT	LIGHT	VC	VERTICAL CURVE
C.M.U.	CONCRETE MASONRY UNIT	LP	LIGHT POLE	VCP	VITRIFIED CLAY PIPE
C.O.	CLEAN OUT	LT	LEFT	VIF	VERIFY IN FIELD
COL.	COLUMN	MAX	MAXIMUM	WL	WATER LINE
CONC.	CONCRETE	MED	MEDIAN	WM	WATER METER
COND.	CONDENSATE	MH	MANHOLE	WSEL	WATER SURFACE ELEVATION
CONN.	CONNECTION	MIN	MINIMUM	WV	WATER VALVE
CONST.	CONSTRUCTION	MJ	MECHANICAL JOINT	WTR	WATER
CONT.	CONTINUOUS	MON	MONUMENT	WWF	WIRE WELD FABRIC
COR	CONTRACTING OFFICERS REPRESENTATIVE	MTL	METAL		
C.TO C.	CENTER TO CENTER	MW	MONITOR WELL / MICROWAVE		
C.Y.	CUBIC YARD	M.U.T.C.D	MANUAL ON UNIFORM TRAFFIC CONTROL		
DET.	DETAIL		DEVICES		
DI	DROP INLET	N/A	NOT APPLICABLE		
DIA.	DIAMETER	NAD 27	NORTH AMERICAN DATUM 1927		
DIFF.	DIFFUSER	NAD 83	NORTH AMERICAN DATUM 1983		
DIM.	DIMENSION	NBL	NORTH BOUND LINE		
D.I.P.	DUCTILE IRON PIPE	NC	NORMAL CROWN		
DISC.	DISCONNECT	NEMA	NATIONAL ELECTRICAL MANUFACTURES ASSOCIATION		
D.A.	DUMMY JOINT				
DN.	DOWN	NIC	NOT IN CONTRACT		
DR.	DRAIN	NIP	NEW IRON PIPE		
D.S.	DOWN SPOUT	N.T.S.	NOT TO SCALE		
DW	DOMESTIC WATER	O.U.	ON CENTER		
DWG.(S)	DRAWING(S)	O.V.	OUTSIDE DIAMETER		
EA.	EACH	OH	OVERHEAD		
E.F.	EXHAUST FAN	OHE	OVERHEAD ELECTRIC		
EG.	EXISTING GRADE	ONUS.	OLD NORTH UTILITY SERVICE		
E.I.P.	EXISTING IRON PIPE	OVH	OVERHANG		
E.J.	EXPANSION JOINT	P/A	PARKING AREA		
ELEC.	ELECTRIC	PC	POINT OF CURVATURE		
EL.	ELEVATION	PCC	POINT OF COMPOUND CURVATURE		
E.M.	ELECTRIC METER	PED	PEDESTAL		
EOP	EDGE OF PAVEMENT	PER.	PERIMETER		
EQUIP.	EQUIPMENT	PGL	PROPOSED GRADE LINE		
EVC	END VERTICAL CURVE	PI	POINT OF INTERSECTION		
EVCE	END VERTICAL CURVE ELEVATION	PINC	POINT OF INTERSECTION ON CURVE		
EVCS	END VERTICAL CURVE STATION	PIV	POST INDICATOR VALVE		
EXH.	EXHAUST	PIV ELEV	POINT OF VERTICAL INTERSECTION ELEVATION		
EXP.JT.	EXPANSION JOINT	PLT	PLATE		
EXT.	EXTERIOR	PSF	POUNDS PER SQUARE FOOT		
EX./EXIST.	EXISTING	PSF	POUNDS/SQUARE FOOT		
FC	FACE OF CURB	PSI	POUNDS/SQUARE INCH		
F.D.	FLOOR DRAIN	PIV STA	POINT OF VERTICAL INTERSECTION STATION		
F.D.C.	FIRE DEPARTMENT CONNECTION	PT	POINT		
F.E.S.	FLARED END SECTION	PVMT	PAVEMENT		
F.F.E.	FINISHED FLOOR ELEVATION	RAD.	RADIUS		
FG	FINISHED GRADE	RCP	REINFORCED CONCRETE PIPE		
FH	FIRE HYDRANT	REINF.	REINFORCING		
FIN.	FINISH FLOOR	REQ.	REQUIRED		
FM	FORCE MAIN	REV	REVISED		
FOC	FACE OF CURB	R.P.Z.	REDUCED PRESSURE ZONE		

LINETYPES

- PARENT PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- EASEMENT
- LEASE AREA
- R/W — RIGHT OF WAY
- SF — SILT FENCE
- X — X — CHAIN-LINK FENCE
- UGW — UNDERGROUND WATER
- UGP — UGP — UNDERGROUND POWER
- OHP — OVERHEAD POWER
- ACP — ALTERNATING CURRENT POWER
- DCP — DIRECT CURRENT POWER
- FO/DC — FIBER/DC POWER COMPOSITE CABLE
- HYBRID — HYBRID CABLE
- UGF — UGF — UNDERGROUND FIBER
- OHF — OVERHEAD FIBER
- MMF — MULTI-MODE FIBER
- SMF — SINGLE-MODE FIBER
- SM6 — FIBER TRUNK - 6 STRAND
- SM12 — FIBER TRUNK - 12 STRAND
- SM24 — FIBER TRUNK - 24 STRAND
- SM48 — FIBER TRUNK - 48 STRAND
- SM96 — FIBER TRUNK - 96 STRAND
- SM144 — FIBER TRUNK - 144 STRAND
- SM288 — FIBER TRUNK - 288 STRAND
- GND — GROUND WIRE
- GAS — GAS LINE
- ETH — ETHERNET CABLE
- CAT6 — CAT6 CABLE
- CAT5 — CAT5 CABLE
- ALM — ALARM CABLE
- C — CONDUIT
- COAX — COAX FEEDLINE
- TFT-402 — COAX FEEDLINE / JUMPER - TFT-402
- PTS1-50 — COAX FEEDLINE / JUMPER - PTS1-50
- LMR-240 — COAX FEEDLINE / JUMPER - LMR-240
- LDF4-50 — COAX FEEDLINE / JUMPER - LDF4-50
- LDF1-50 — COAX FEEDLINE / JUMPER - LDF1-50
- HL4RPV — COAX FEEDLINE / JUMPER - HL4RPV
- FSJ4-50 — COAX FEEDLINE / JUMPER - FSJ4-50
- FSJ1-50 — COAX FEEDLINE / JUMPER - FSJ1-50
- AL4RPV — COAX FEEDLINE / JUMPER - AL4RPV

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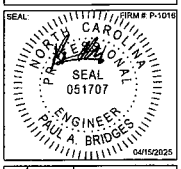
SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330839°, -81.6966889°

SEAL:



FIRM # P-1016

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/6/2023	REV, CONSTRUCTION
2	4/2/2025	REV, CONSTRUCTION
3	04/15/2025	REV, CONSTRUCTION
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SHEET TITLE:
GENERAL NOTES III

SHEET # GN-3 | CURRENT REV # 3 | ETS #: 22110700

2018 APPENDIX B
BUILDING CODE SUMMARY
FOR ALL COMMERCIAL PROJECTS
(EXCEPT 1 AND 2-FAMILY DWELLINGS AND TOWNHOUSES)
(Reproduce the following data on the building plans sheet 1 or 2)

Name of Project: RICH MOUNTAIN TOWER
Address: 759 FIRE TOWER ROAD, BOONE, NC Zip Code 28607
Owner/Authorized Agent: WATAUGA COUNTY Phone # ( ) - E-Mail
Owned By: ☒ City/County ☐ Private ☐ State
Code Enforcement Jurisdiction: ☐ City ☒ County WATAUGA ☐ State

CONTACT:

DESIGNER	FIRM	NAME	LICENSE #	TELEPHONE #	E-MAIL
Architactural				( )	
Civil	Engineered Tower Solutions, PLLC	Paul A. Bridges	051707	(336) 830-1600	Paul.Bridges@ets-pllc.com
Electrical				( )	
Fire Alarm				( )	
Plumbing				( )	
Mechanical				( )	
Sprinkler-Standpipe				( )	
Structural				( )	
Retaining Walls >5' High				( )	
Other				( )	

("Others" should include firms and individuals such as truss, precast, pre-engineered, interior designers, etc.)

2018 NC CODE FOR: ☒ New Construction ☐ Addition ☐ Renovation
☐ 1st Time Interior Completion
☐ Shell/Core
Phased Construction – Shell/Core
☐ Renovation

2018 NC EXISTING BUILDING CODE: ☒ Prescriptive ☐ Repair ☐ Chapter 14
Alteration: ☐ Level I ☐ Level II ☐ Level III
☐ Historic Property ☐ Change of Use
CONSTRUCTED:(date) _____ ORIGINAL OCCUPANCY(S) (Ch. 3):_____
RENOVATED: (date) _____ CURRENT OCCUPANCY(S) (Ch. 3):_____
RISK CATEGORY (table 1604.5) **Current:** ☐ I ☐ II ☐ III ☒ IV
Proposed: ☐ I ☐ II ☐ III ☐ IV

BASIC BUILDING DATA
Construction Type: (check all that apply) ☐ I-A ☐ I-B ☐ II-A ☐ II-B ☐ III-A ☐ III-B ☐ IV ☐ V-A ☐ V-B
Sprinklers: ☒ No ☐ Partial ☐ Yes ☐ NFPA 13 ☐ NFPA 13R ☐ NFPA 13D
Standpipes: ☒ No ☐ Yes Class ☐ I ☐ II ☐ III ☐ Wet ☐ Dry
Fire District: ☒ No ☐ Yes (Primary) **Flood Hazard Area:** ☒ No ☐ Yes
Special Inspections Required: ☒ No ☐ Yes

2018 NC Administrative Code and Policies Appendix B for Building

NOTE:
THE PROJECT SITE IS NOT LOCATED IN ANY FLOOD HAZARD AREAS OR FUTURE CONDITIONS FLOOD HAZARD AREAS, AS SHOWN ON FEMA MAP NUMBER 3710280100J, DATED 12/3/2009.

2018 NC Administrative Code and Policies 8 Appendix B for Building

Gross Building Area:

FLOOR	EXISTING (SQ FT)	NEW (SQ FT)	RENO/ALTER (SQ.FT)	SUB-TOTAL
3rd Floor				
2nd Floor				
Mezzanine				
1st Floor	0	219	0	219
Basement				
TOTAL	0	219	0	219

ALLOWABLE AREA

Primary Occupancy Classification: SELECT ONE
Assembly ☐ A-1 ☐ A-2 ☐ A-3 ☐ A-4 ☐ A-5
Business ☐
Educational ☐
Factory ☐ F-1 Moderate ☐ F-2 Low
Hazardous ☐ H-1 Detonate ☐ H-2 Deflagrate ☐ H-3 Combust ☐ H-4 Health ☐ H-5 HPM
Institutional ☐ I-1 Condition ☐ 1 ☐ 2
☐ 1-2 Condition ☐ 1 ☐ 2
☐ 1-3 Condition ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
☐ 1-4
Mercantile ☐
Residential ☐ R-1 ☐ R-2 ☐ R-3 ☐ R-4
Storage ☐ S-1 Moderate ☐ S-2 Low ☐ High-piled
☐ Parking Garage ☐ Open ☐ Enclosed ☐ Repair Garage
Utility and Miscellaneous ☒

Accessory Occupancy Classification(s): _____
Incidental Uses (Table 509): _____
Special Uses (Chapter 4 – List Code Sections): _____
Special Provisions: (Chapter 5 – List Code Sections): _____
Mixed Occupancy: ☒ No ☐ Yes Separation: ____ Hr. Exception: _____

☐ Non-Separated Use (508.3)
The required type of construction for the building shall be determined by applying the height and area limitations for each of the applicable occupancies to the entire building. The most restrictive type of construction, so determined, shall apply to the entire building.

☐ Separated Use (508.4) -
See below for area calculations for each story, the area of the occupancy shall be such that the sum of the ratios of the actual floor area of each use divided by the allowable floor area for each use shall not exceed 1.

$$\frac{\text{Actual Area of Occupancy A}}{\text{Allowable Area of Occupancy A}} + \frac{\text{Actual Area of Occupancy B}}{\text{Allowable Area of Occupancy B}} \leq 1$$

_____ + _____ + ... = _____ ≤ 1.00

2018 NC Administrative Code and Policies 9 Appendix B for Building

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ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR

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RICH MOUNTAIN TOWER
SITE ADDRESS
759 FIRE TOWER ROAD
BOONE, NC 28607
LATITUDE/LONGITUDE
36.23306639°, -81.6986889°

SEAL FIRM # P-1018
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 051707 PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
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SHEET TITLE
NC APPENDIX B I

SHEET # **GN-4** CURRENT REV # 3
ETS # 22110700

STORY NO.	DESCRIPTION AND USE	(A) BLDG AREA PER STORY (ACTUAL)	(B) TABLE 506.2[1] AREA	(C) AREA FOR FRONTAGE INCREASE[1,5]	(D) ALLOWABLE AREA PER STORY OR UNLIMITED[2,3]
1	Equip. Shelter	219	5,500	N/A	5,500

1 Frontage area increases from Section 506.3 are computed thus:
a. Perimeter which fronts a public way or open space having 20 feet minimum width = _____ (F)
b. Total Building Perimeter = _____ (P)
c. Ratio (F/P) = _____ (F/P)
d. W = Minimum width of public way = _____ (W)
e. Percent of frontage increase I_f = 100 [F/P - 0.25] x W/30 = _____ (%)
2 Unlimited area applicable under conditions of Section 507.
3 Maximum Building Area = total number of stories in the building x D (maximum 3 stories) (506.2).
4 The maximum area of open parking garages must comply with Table 406.5.4
5 Frontage increase is based on the unsprinklered area value in Table 506.2.

ALLOWABLE HEIGHT

	ALLOWABLE (TABLE 503)	SHOWN ON PLANS	CODE REFERENCE[1]
Building Height in Feet (Table 504.3)[2]	40	6'-2 $\frac{1}{2}$"	2018
Building Height in Stories (Table 504.4)[3]	1	1	2018

1 Provide code reference if the "Shown on Plans" quantity is not based on Table 504.3 or 504.4.
2 The maximum height of air traffic control towers must comply with Table 412.3.1
3 The maximum height of open parking garages must comply with Table 406.5.4

FIRE PROTECTION REQUIREMENTS

BUILDING ELEMENT	FIRE SEPARATION DISTANCE (FEET)	RATING REQ'D	RATING PROVIDED (WP_____* REDUCTION)	DETAIL # AND SHEET #	DESIGN # FOR RATED ASSEMBLY	SHEET # FOR RATED PENETRATION	SHEET # FOR RATED JOINTS
Structural Frame, including columns, girders, trusses		N/A					
Bearing Walls							
Exterior							
North	8	1	2	VFP DWG 207459 SHEET 1			
East	8	1	2				
West	8	1	2				
South	8	1	2				
Interior		N/A					
Nonbearing Walls and Partitions		N/A					
Exterior walls							
North		N/A					
East		N/A					
West		N/A					
South		N/A					
Interior walls and partitions		N/A					
Floor Construction including supporting beams and joists	8	0	2	VFP DWG 207459 SHEET 1			
Floor Ceiling Assembly		N/A					
Column Supporting Floors		N/A					
Roof Construction, including supporting beams and joists		N/A					
Roof Ceiling Assembly		N/A					
Column Supporting Roof		N/A					
Shaft Enclosures - Exit		N/A					
Shaft Enclosures - Other		N/A					
Corridor Separation		N/A					
Occupancy/Fire Barrier Separation		N/A					
Party/Fire Wall Separation		N/A					
Smoke Barrier Separation		N/A					
Smoke Partition		N/A					
Tenant/Dwelling Unit/ Sleeping Unit Separation		N/A					
Incidental Use Separation		N/A					

* Indicate section number permitting reduction

2018 NC Administrative Code and Policies Appendix B for Building

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NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
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SHEET TITLE
NC APPENDIX B II

SHEET # GN-5 | CURRENT REV # 3 | ETS # 22110700

PERCENTAGE OF WALL OPENING CALCULATIONS

FIRE SEPARATION DISTANCE (FEET FROM PROPERTY LINES	DEGREES OF OPENINGS PROTECTION (TABLE 705.8)	ALLOWABLE AREA (%)	ACTUAL SHOWN ON PLANS (%)

LIFE SAFETY SYSTEM REQUIREMENTS

Emergency Lighting: ☐ No ☒ Yes
Exit Signs: ☐ No ☒ Yes
Fire Alarm: ☒ No ☐ Yes
Smoke Detection Systems: ☐ No ☒ Yes ☐ Partial_____
Carbon Monoxide Detection: ☒ No ☐ Yes

LIFE SAFETY PLAN REQUIREMENTS

Life Safety Plan Sheet #: _____

- ☐ Fire and/or smoke rated wall locations (Chapter 7)
- ☐ Assumed and real property line locations (if not on the site plan)
- ☐ Exterior wall opening area with respect to distance to assumed property lines (705.8)
- ☐ Occupancy use for each area as it relates to occupant load calculation (Table 1004.1.2)
- ☐ Occupant loads for each area
- ☐ Exit sign location (1013)
- ☐ Exit access travel distances (1017)
- ☐ Common path of travel distances (1006.2.1 & 2006.3.2(1))
- ☐ Dead end lengths (1020.4)
- ☐ Clear exit widths for each exit door
- ☐ Maximum calculated occupant load capacity each exit door can accommodate based on egress width (1005.3)
- ☐ Actual occupant load for each exit door
- ☐ A separate schematic plan indicating where fire rated floor/ceiling and/or roof structure is provided for purposes of occupancy separation.
- ☐ Location of doors with panic hardware (1010.1.10)
- ☐ Location of doors with delayed egress locks and the amount of delay (1010.1.9.7)
- ☐ Location of doors with electromagnetic egress locks (1010.1.9.9)
- ☐ Location of doors equipped with hold-open devices
- ☐ Location of emergency escape windows (1030)
- ☐ The square footage of each fire area (202)
- ☐ The square footage of each smoke compartment for Occupancy Classification I-2 (407.5)
- ☐ Note any code exceptions or table notes that may have been utilized regarding the items above

PREFABRICATED SHELTER SECTION NOT APPLICABLE

ACCESSIBLE DWELLING UNITS (SECTION 1107)

UNIT CLASSIFICATION	TOTAL UNITS	ACCESSIBLE UNITS REQUIRED	ACCESSIBLE UNITS PROVIDED	TYPE A UNITS REQUIRED	TYPE A UNITS PROVIDED	TYPE B UNITS REQUIRED	TYPE B UNITS PROVIDED	TOTAL ACCESSIBLE UNITS PROVIDED

ACCESSIBLE PARKING (SECTION 1106)

LOT OR PARKING AREA	TOTAL # OF PARKING SPACES		# OF ACCESSIBLE SPACES PROVIDED		TOTAL # ACCESSIBLE PROVIDED
	REQUIRED	PROVIDED	96" SPACES	132" SPACES	
TOTAL					

PLUMBING FIXTURE REQUIREMENTS (TABLE 2902.1)

USE		WATERCLOSETS			URINALS	LAVATORIES			SHOWERS /TUBS	DRINKING FOUNTAINS	
		MALE	FEMALE	UNISEX		MALE	FEMALE	UNISEX		REGULAR	ACCESSIBLE
SPACE	EXIST'G										
	NEW										
	REQ'D										

SPECIAL APPROVALS

Special approval: (Local Jurisdiction, Department of Insurance, SCO, DPI, DHHS, ICC, etc., describe below)

_____

_____

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SEAL: FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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SHEET TITLE:
NC APPENDIX B III

SHEET # GN-6 | CURRENT REV # 3 | ETS # 22110700

ENERGY SUMMARY

ENERGY REQUIREMENTS:
The following data shall be considered minimum and any special attribute required to meet the North Carolina Energy Conservation Code shall also be provided. Each Designer shall furnish the required portions of the project information for the plan data sheet. If performance method, state the annual energy cost for the standard reference design vs annual energy cost for the proposed design.

Existing building envelope complies with code: ☐ No ☐ Yes (The remainder of this section is not applicable)

Exempt Building: ☐ No ☐ Yes (Provide Code or Statutory reference) _____

Climate Zone: ☐ 3A ☐ 4A ☐ 5A

Method of Compliance: Energy Code ☐ Performance ☒ Prescriptive
ASHRAE 90.1 ☐ Performance ☐ Prescriptive
(If "Other" specify source here) _____

THERMAL ENVELOPE (Prescriptive method only)

Roof/ceiling Assembly (each assembly)
- Description of assembly: _____
- U-Value of total assembly: _____
- R-Value of insulation: _____
- Skylights in each assembly: _____
- U-Value of skylight: _____
- Total square footage of skylights in each assembly: _____

Exterior Walls (each assembly)
- Description of assembly: _____
- U-Value of total assembly: _____
- R-Value of insulation: _____
- Openings (windows or doors with glazing)
  - U-Value of assembly: _____
  - Solar heat gain coefficient: _____
  - Projection factor: _____
  - Door R-Values: _____

Walls below grade (each assembly)
- Description of assembly: N/A
- U-Value of total assembly: _____
- R-Value of insulation: _____

Floors over unconditioned space (each assembly)
- Description of assembly: N/A
- U-Value of total assembly: _____
- R-Value of insulation: _____

Floors slab on grade
- Description of assembly: _____
- U-Value of total assembly: _____
- R-Value of insulation: _____
- Horizontal/Vertical requirement: _____
- Slab Heated: _____

2018 APPENDIX B
BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS
STRUCTURAL DESIGN
(PROVIDE ON THE STRUCTURAL SHEETS IF APPLICABLE)

DESIGN LOADS:

Importance Factors: Snow (I_s) _____
Seismic (I_e) _____

Live Loads: Roof _____ psf
Mezzanine _____ psf
Floor _____ psf

Ground Snow Load: _____ psf

Wind Load: Ultimate Wind Speed _____
Exposure Category _____ (ASCE-7)

PENDING STRUCTURAL ANALYSIS

SEISMIC DESIGN CATEGORY: ☐ A ☐ B ☐ C ☐ D
Provide the following Seismic:
Risk Category (Table 1604.5): ☐ I ☐ II ☐ III ☐ IV
Spectral Response: S_{DS} _____ %g S_1 _____ %g
Site Classification (ASCE 7): ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F
Data source: ☐ Field Test ☐ Presumptive ☐ Historical Data
Basic structural system: ☐ Bearing Wall ☐ Dual w/Special Moment Frame ☐ Building Frame ☐ Dual w/Intermediate R/C or Special Steel ☐ Moment Frame ☐ Inverted Pendulum
Analysis Procedure: ☐ Simplified ☐ Equivalent Lateral Force ☐ Dynamic
Architectural, Mechanical, Components anchored? ☐ Yes ☐ No ☐ N/A

LATERAL DESIGN CONTROL: Earthquake ☐ Wind ☐

SOIL BEARING CAPACITIES:
Field Test (provide copy of test report) _____ psf
Presumptive Bearing capacity _____ psf
Pile size, type, and capacity _____

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SHEET TITLE
NC APPENDIX B IV

SHEET # **GN-7** | CURRENT REV # 3 | ETS # 22110709

2018 APPENDIX B
BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS
MECHANICAL DESIGN
(PROVIDE ON THE MECHANICL SHEETS IF APPLICABLE)

MECHANICAL SUMMARY

MECHANICAL SYSTEMS, SERVICE SYSTEMS AND EQUIPMENT

Thermal Zone
winter dry bulb: _____
summer dry bulb: _____

Interior design conditions
winter dry bulb: _____
summer dry bulb: _____
relative humidity: _____

Building heating load: _____

Building cooling load: _____

Mechanical Spacing Conditioning System
Unitary
description of unit: BARD: W24A*-A05XW4XXJ
heating efficiency: 9.00 EER
cooling efficiency: 9.00 EER
size category of unit: 24,000 BTUH
Boiler
Size category, If oversized, state reason.: _____
Chiller
Size category, If oversized, state reason.: _____

List equipment efficiencies: _____

2018 APPENDIX B
BUILDING CODE SUMMARY FOR ALL COMMERCIAL PROJECTS
ELECTRICAL DESIGN
(PROVIDE ON THE ELECTRICAL SHEETS IF APPLICABLE)

ELECTRICAL SUMMARY

ELECTRICAL SYSTEM AND EQUIPMENT

Method of Compliance: Energy Code: ☐ Performance ☒ Prescriptive
ASHRAE 90.1: ☐ Performance ☐ Prescriptive

Lighting schedule (each fixture type)
lamp type required in fixture: 32W FL
number of lamps in fixture: 2
ballast type used in the fixture: ELEC
number of ballasts in fixture: 2
total wattage per fixture: 60
total interior wattage specified vs. allowed (whole building or space by space)
500 vs 331 (ONLY LIT WHEN OCCUPIED)
total exterior wattage specified vs. allowed

Additional Efficiency Package Options
(When using the 2018 NCECC; not required for ASHRAE 90.1)
☒ C406.2 More Efficient HVAC Equipment Performance
☒ C406.3 Reduced Lighting Power Density
☐ C406.4 Enhanced Digital Lighting Controls
☐ C406.5 On-Site Renewable Energy
☐ C406.6 Dedicated Outdoor Air System
☐ C406.7 Reduced Energy Use in Service Water Heating

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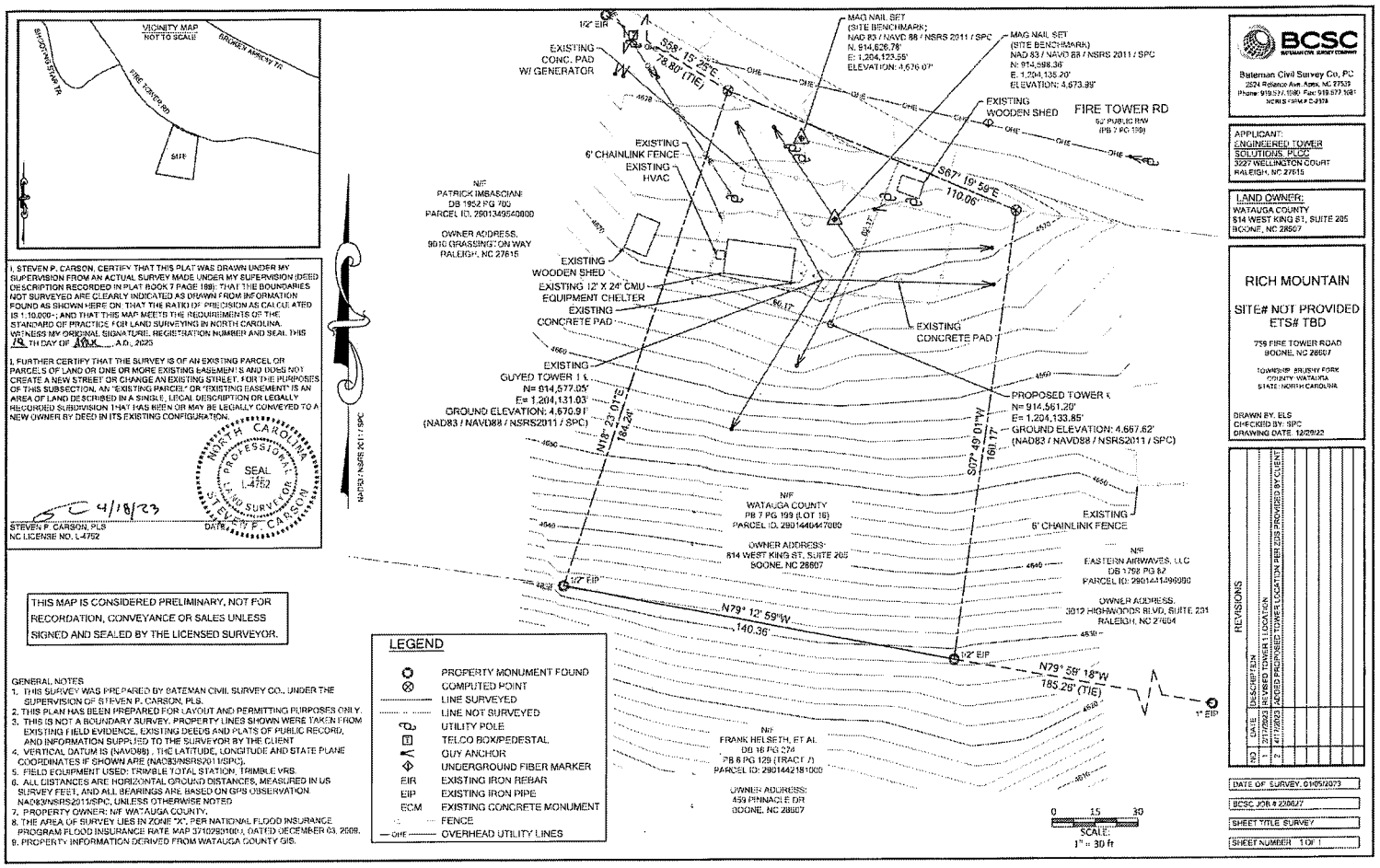
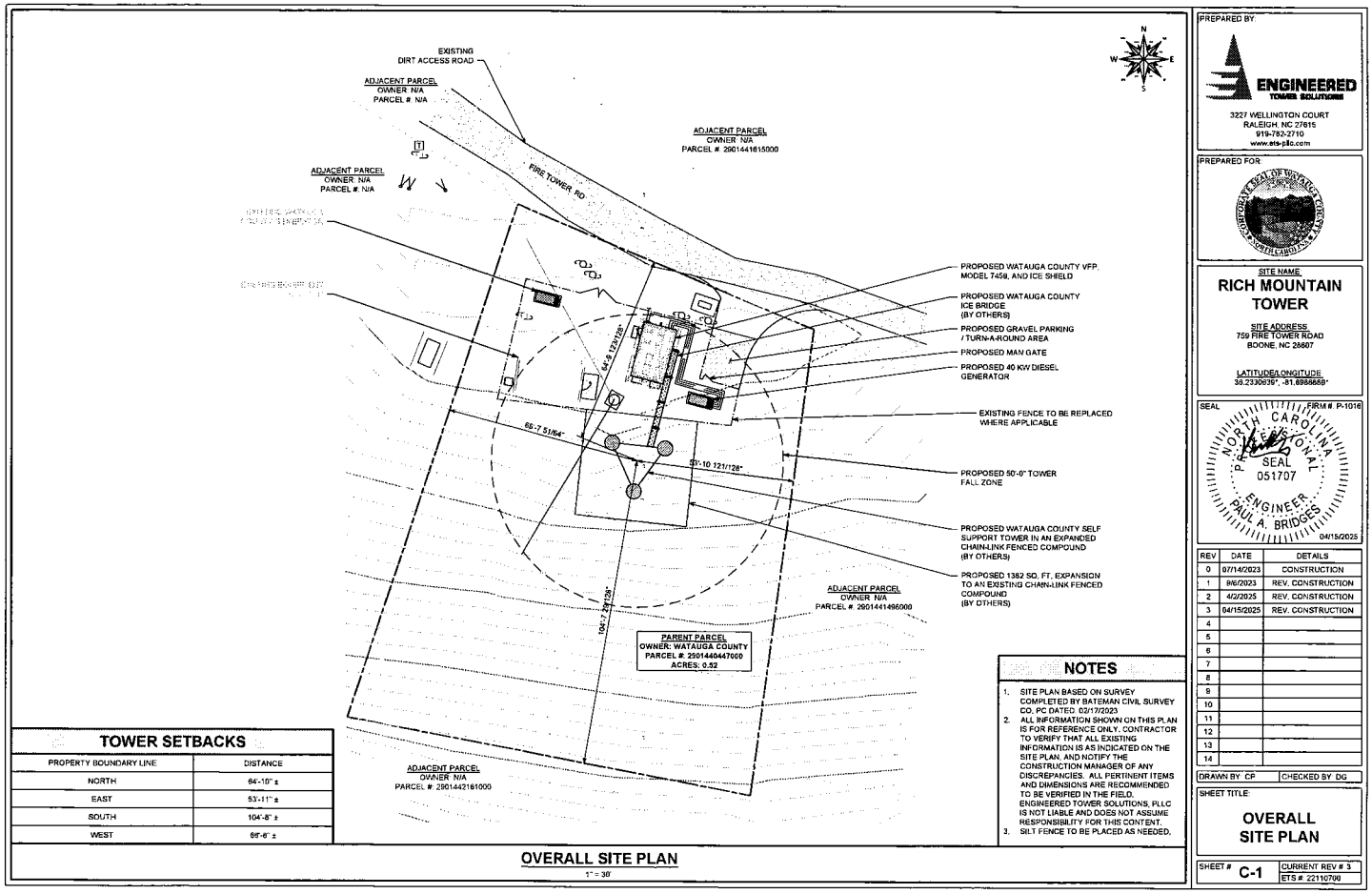
SHEET TITLE:
NC APPENDIX B V

SHEET # GN-8 | CURRENT REV # 3
ETS # 22110700


VICINITY MAP
NOT TO SCALE
BROKEN AGRICULTURE TR
FIRE TOWER RD
SITE
I, STEVEN P. CARSON, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN PLAT BOOK 7 PAGE 199); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND AS SHOWN HERE ON; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+; AND THAT THIS MAP MEETS THE REQUIREMENTS OF THE STANDARD OF PRACTICE FOR LAND SURVEYING IN NORTH CAROLINA. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL, THIS 18 TH DAY OF MAR , A.D., 2023
I, FURTHER CERTIFY THAT THE SURVEY IS OF AN EXISTING PARCEL OR PARCELS OF LAND OR ONE OR MORE EXISTING EASEMENTS AND DOES NOT CREATE A NEW STREET OR CHANGE AN EXISTING STREET. FOR THE PURPOSES OF THIS SUBSECTION, AN "EXISTING PARCEL" OR "EXISTING EASEMENT" IS AN AREA OF LAND DESCRIBED IN A SINGLE, LEGAL DESCRIPTION OR LEGALLY RECORDED SUBDIVISION THAT HAS BEEN OR MAY BE LEGALLY CONVEYED TO A NEW OWNER BY DEED IN ITS EXISTING CONFIGURATION.
NORTH CAROLINA PROFESSIONAL SEAL L-4752 LAND SURVEYOR STEVEN P. CARSON
SC 4/18/23
STEVEN P. CARSON, PLS
NC LICENSE NO. L-4752
DATE
NAD83 / NSRS 2011 / SPC
1/2" EIR
EXISTING CONC. PAD W/ GENERATOR
S55° 15' 25"E
78.80' (TIE)
MAG NAIL SET (SITE BENCHMARK) NAD 83 / NAVD 88 / NSRS 2011 / SPC N: 914,626.78' E: 1,204,123.55' ELEVATION: 4,676.07'
MAG NAIL SET (SITE BENCHMARK) NAD 83 / NAVD 88 / NSRS 2011 / SPC N: 914,598.36' E: 1,204,135.20' ELEVATION: 4,673.89'
EXISTING WOODEN SHED
FIRE TOWER RD
62' PUBLIC R/W (PB 7 PG 199)
EXISTING 6' CHAINLINK FENCE
EXISTING HVAC
N/F PATRICK IMBASCIANE DB 1952 PG 760 PARCEL ID: 2901349540000
OWNER ADDRESS: 9616 GRASSINGTON WAY RALEIGH, NC 27615
S67° 19' 58"E
110.06'
EXISTING WOODEN SHED
EXISTING 12' X 24' CMU EQUIPMENT CHELTER
EXISTING CONCRETE PAD
EXISTING GUYED TOWER 1
N= 914,577.85'
E= 1,204,131.03'
GROUND ELEVATION: 4,670.9'
(NAD83 / NAVD88 / NSRS2011 / SPC)
N18° 23' 01"E
184.20'
EXISTING CONCRETE PAD
PROPOSED TOWER
N= 914,561.20'
E= 1,204,133.85'
GROUND ELEVATION: 4,667.62'
(NAD83 / NAVD88 / NSRS2011 / SPC)
S27° 49' 01"W
161.17'
N/F WATAUGA COUNTY PB 7 PG 199 (LOT 16) PARCEL ID: 2901440447000
OWNER ADDRESS: 814 WEST KING ST, SUITE 205 BOONE, NC 28607
EXISTING 6' CHAINLINK FENCE
N/F EASTERN AIRWAVES, LLC DB 1792 PG 82 PARCEL ID: 2901441996900
OWNER ADDRESS: 3012 HIGHWOODS BLVD, SUITE 201 RALEIGH, NC 27604
1/2" EIP
N79° 12' 59"W
140.36'
N79° 58' 18"W
185.26' (TIE)
1" EIP
N/F FRANK HELSETH, ET AL DB 16 PG 274 PB 6 PG 129 (TRACT J) PARCEL ID: 2901442181000
OWNER ADDRESS: 459 PINNACLE DR BOONE, NC 28607
THIS MAP IS CONSIDERED PRELIMINARY, NOT FOR RECORDATION, CONVEYANCE OR SALES UNLESS SIGNED AND SEALED BY THE LICENSED SURVEYOR.
LEGEND
PROPERTY MONUMENT FOUND
COMPUTED POINT
LINE SURVEYED
LINE NOT SURVEYED
UTILITY POLE
TELCO BOX/PEDESTAL
GUY ANCHOR
UNDERGROUND FIBER MARKER
EIR EXISTING IRON REBAR
EIP EXISTING IRON PIPE
ECM EXISTING CONCRETE MONUMENT
FENCE
OHE OVERHEAD UTILITY LINES
GENERAL NOTES
1. THIS SURVEY WAS PREPARED BY BATEMAN CIVIL SURVEY CO., UNDER THE SUPERVISION OF STEVEN P. CARSON, PLS.
2. THIS PLAN HAS BEEN PREPARED FOR LAYOUT AND PERMITTING PURPOSES ONLY.
3. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES SHOWN WERE TAKEN FROM EXISTING FIELD EVIDENCE, EXISTING DEEDS AND PLATS OF PUBLIC RECORD, AND INFORMATION SUPPLIED TO THE SURVEYOR BY THE CLIENT.
4. VERTICAL DATUM IS (NAVD88) . THE LATITUDE, LONGITUDE AND STATE PLANE COORDINATES IF SHOWN ARE (NAD83/NSRS2011/SPC).
5. FIELD EQUIPMENT USED: TRIMBLE TOTAL STATION, TRIMBLE VRS.
6. ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES, MEASURED IN US SURVEY FEET, AND ALL BEARINGS ARE BASED ON GPS OBSERVATION NAD83/NSRS2011/SPC, UNLESS OTHERWISE NOTED.
7. PROPERTY OWNER: N/F WATAUGA COUNTY.
8. THE AREA OF SURVEY LIES IN ZONE "X", PER NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP 3710592100 J, DATED DECEMBER 03, 2009.
9. PROPERTY INFORMATION DERIVED FROM WATAUGA COUNTY GIS.
0 15 30
SCALE: 1" = 30 ft
BCSC
Bateman Civil Survey Co, PC
2624 Reliance Ave, Apex, NC 27539
Phone: 919.577.1080 Fax: 919.577.1081
NCBELS FIRM # C-2378
APPLICANT: ENGINEERED TOWER SOLUTIONS, PLLC 3227 WELLINGTON COURT RALEIGH, NC 27615
LAND OWNER: WATAUGA COUNTY 814 WEST KING ST, SUITE 205 BOONE, NC 28607
RICH MOUNTAIN
SITE# NOT PROVIDED
ETS# TBD
759 FIRE TOWER ROAD BOONE, NC 28607
TOWNSHIP: BRUSHY FORK COUNTY: WATAUGA STATE: NORTH CAROLINA
DRAWN BY: ELS
CHECKED BY: SPC
DRAWING DATE: 12/29/22
REVISIONS
NO | DATE | DESCRIPTION
1 | 2/7/2023 | REVISED TOWER 1 LOCATION
2 | 4/17/2023 | ADDED PROPOSED TOWER LOCATION PER ZDS PROVIDED BY CLIENT
DATE OF SURVEY: 01/05/2023
BCSC JOB # 226027
SHEET TITLE: SURVEY
SHEET NUMBER: 1 OF 1



TOWER SETBACKS

PROPERTY BOUNDARY LINE	DISTANCE
NORTH	64'-10" ±
EAST	53'-11" ±
SOUTH	104'-8" ±
WEST	66'-6" ±

NOTES

1. SITE PLAN BASED ON SURVEY COMPLETED BY BATEMAN CIVIL SURVEY CO., PC DATED: 02/17/2023.
2. ALL INFORMATION SHOWN ON THIS PLAN IS FOR REFERENCE ONLY. CONTRACTOR TO VERIFY THAT ALL EXISTING INFORMATION IS AS INDICATED ON THE SITE PLAN, AND NOTIFY THE CONSTRUCTION MANAGER OF ANY DISCREPANCIES. ALL PERTINENT ITEMS AND DIMENSIONS ARE RECOMMENDED TO BE VERIFIED IN THE FIELD. ENGINEERED TOWER SOLUTIONS, PLLC IS NOT LIABLE AND DOES NOT ASSUME RESPONSIBILITY FOR THIS CONTENT.
3. SILT FENCE TO BE PLACED AS NEEDED.

OVERALL SITE PLAN

1" = 30'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330036°, -81.6956889°

SEAL

FIRM # P-1018

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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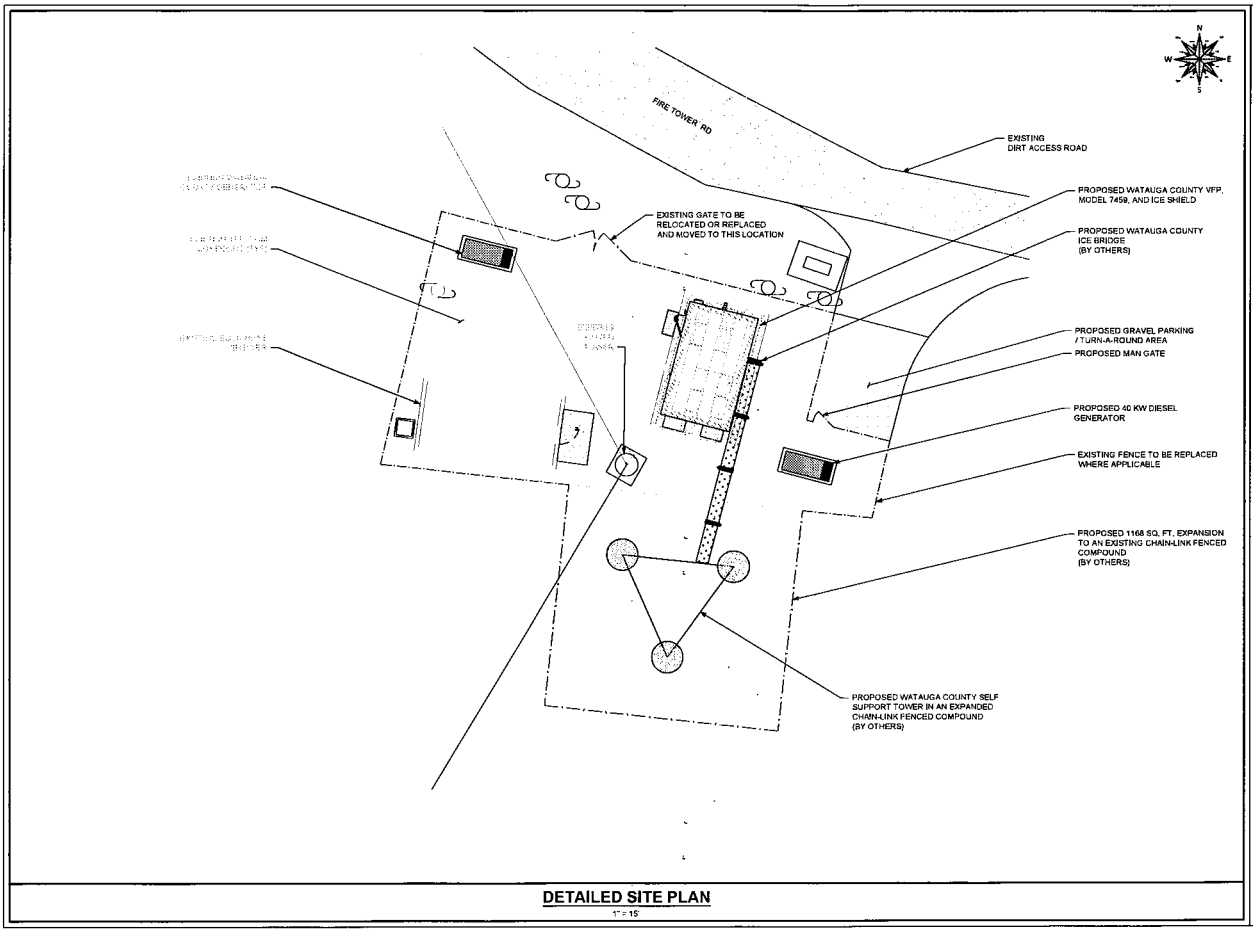
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
OVERALL SITE PLAN

SHEET # C-1 | CURRENT REV # 3 | ETS # 22110700



DETAILED SITE PLAN

1" = 15'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plic.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.23306767°, -81.6969809°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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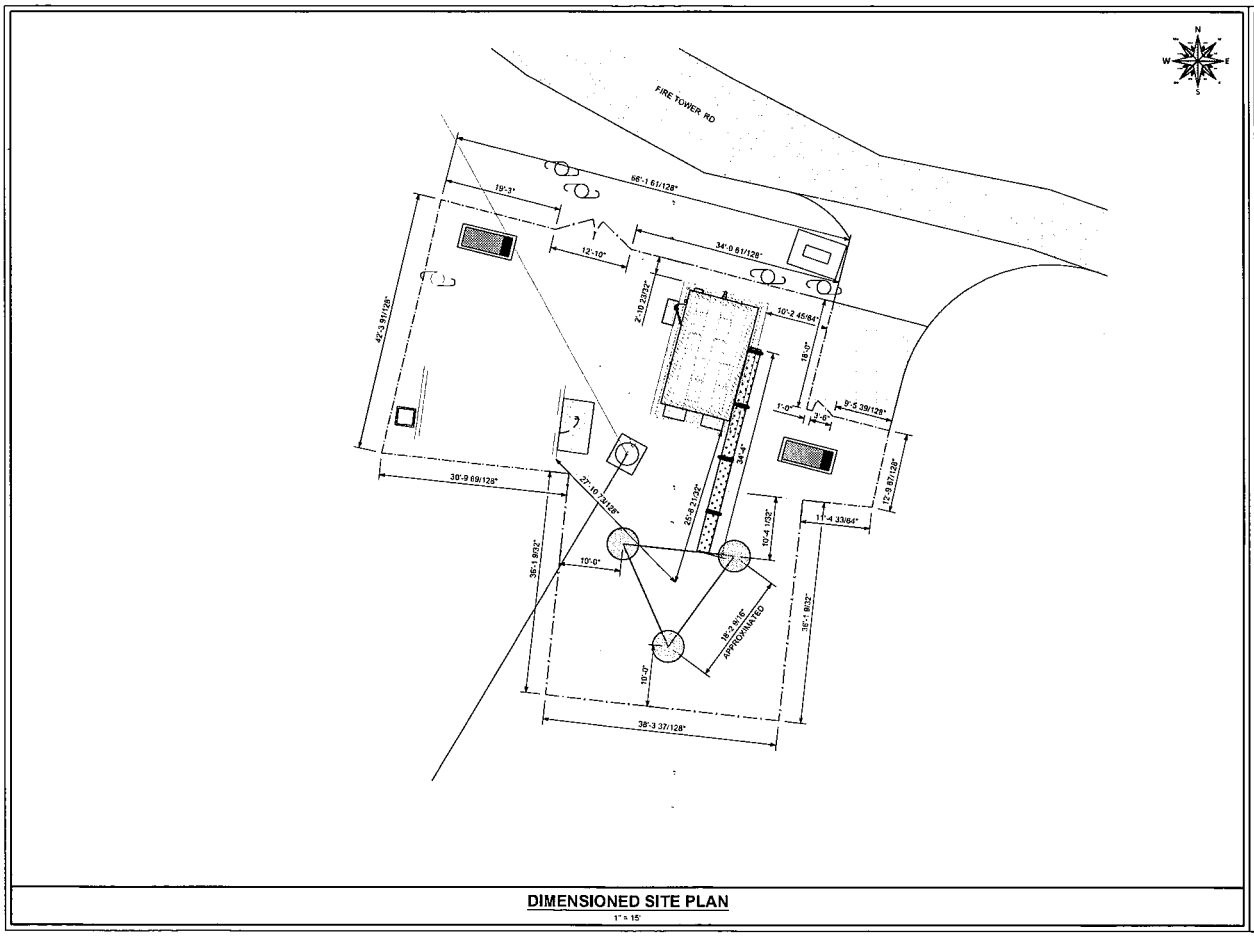
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
DETAILED SITE PLAN

SHEET # C-1.1 | CURRENT REV # 3 | ETS # 22110700



DIMENSIONED SITE PLAN

1" = 15'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.23306390°, -81.6966689°

SEAL

FIRM #: P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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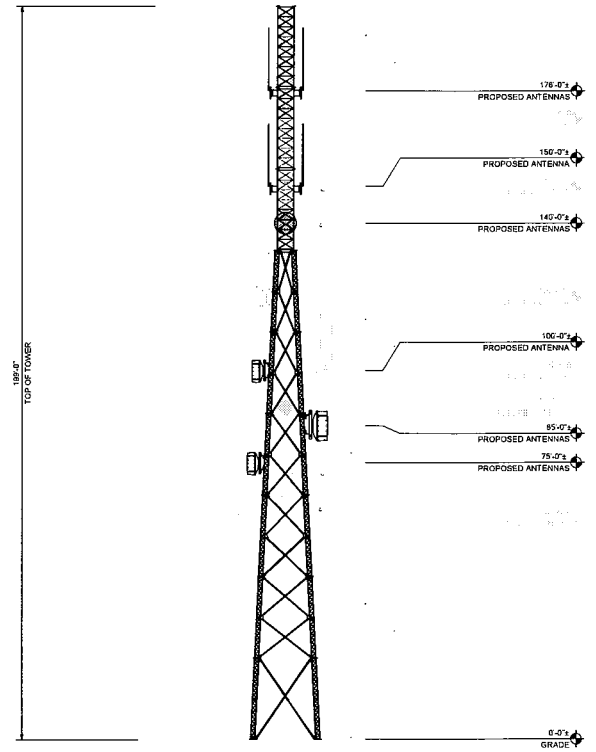
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE

DIMENSIONED SITE PLAN

SHEET # C-1.2 | CURRENT REV # 3 | ETS # 22110700



TOWER ELEVATION

1" = 25'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
SCONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.8988840°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/8/2023	REV. CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: OG

SHEET TITLE:
TOWER ELEVATION

SHEET # C-2 | CURRENT REV # 3
ETS #: 22110700

PROPOSED ANTENNA SCHEDULE

OWNER	QTY.	SIZE (FT)	TYPE	MANUFACTURER - ANTENNA MODEL NUMBER	ANTENNA AZIMUTH	MOUNT ELEVATION	LEG	CABLE (QTY.) TYPE
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	176'-0"	A	(1) 7/8" & (1) 1/2"
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	176'-0"	B	(1) 7/8"
WATAUGA COUNTY	1	-	TTA	TTA	--	175'-0"	--	--
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	150'-0"	A	(1) 1-5/8"
WATAUGA COUNTY	1	-	OMNI	RFI - CC807-11	--	150'-0"	B	(1) 1-5/8"
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO BUCKEYE	COMMSCOPE - HX6-6W-6WH	318°	140'-0"	C	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	--	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO WATAUGA CO TRAN. STA.	COMMSCOPE - HX6-6W-6WH	104°	100'-0"	B	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WATAUGA COUNTY	1	-	DISH TO PHOENIX	COMMSCOPE - HX6-6W-6HW	36.5°	85'-0"	A	(1) EU63
WATAUGA COUNTY	1	-	DISH TO HAWKS NEST	COMMSCOPE - HX6-6W-6HW	227°	75'-0"	B	(1) EU63
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES:
- VERIFY FINAL DESIGN AND LOADING WITH MOTOROLA PRIOR TO CONSTRUCTION
- VERIFY FINAL DESIGN AND LOADING WITH STRUCTURAL ANALYSIS PRIOR TO CONSTRUCTION
- GRAY TEXT = FUTURE LOADING
- ALL DISHES WILL HAVE AN ICE SHIELD ABOVE THEM

PROPOSED ANTENNA SCHEDULE
N.T.S.

PREPARED BY
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plic.com

PREPARED FOR

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.23306939°, -81.6986869°

SEAL — FIRM # P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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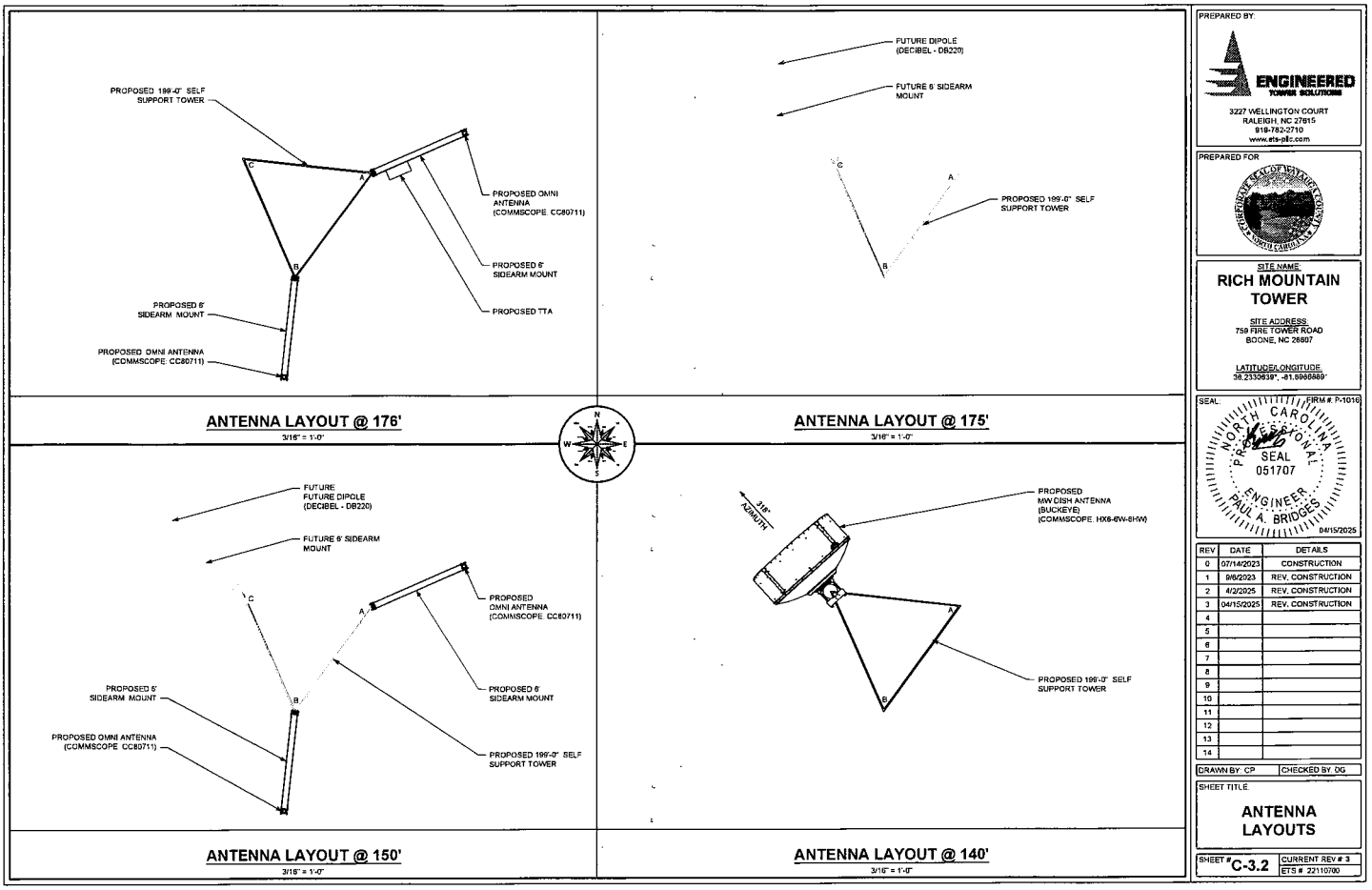
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE
ANTENNA SCHEDULE

SHEET # C-3.1 | CURRENT REV # 3 | ETS # 22110700



PREPARED BY:

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3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330939°, -81.5968889°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 051707 PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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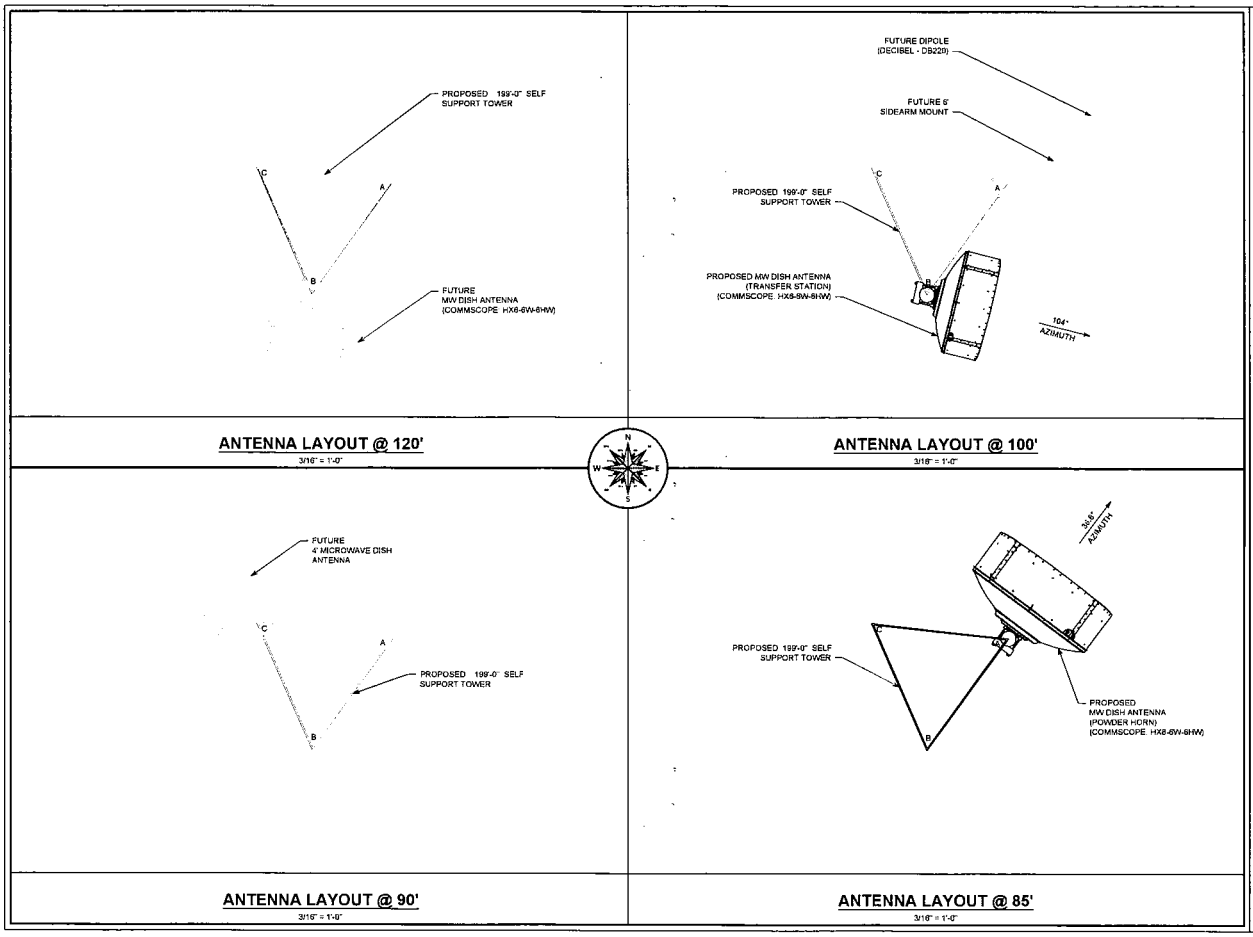
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
ANTENNA LAYOUTS

SHEET # C-3.2 | CURRENT REV # 3
ETS # 22110700



PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6868689°

SEAL
FIRM #: P-1018
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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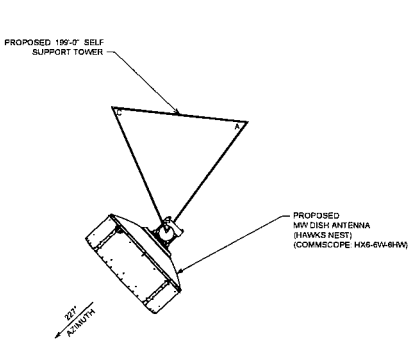
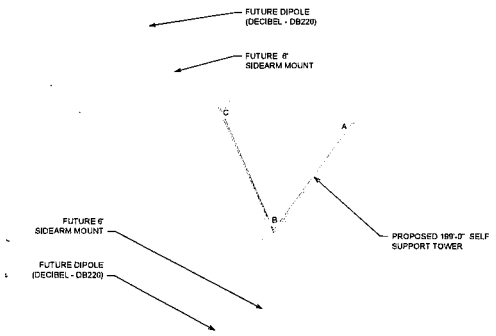
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE
ANTENNA LAYOUTS

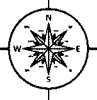
SHEET # C-3.3 | CURRENT REV # 3 | ETS # 22110700



ANTENNA LAYOUT @ 75'
3/16" = 1'-0"



ANTENNA LAYOUT @ 60'
3/16" = 1'-0"



NOT USED
N.T.S.

NOT USED
N.T.S.

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plic.com

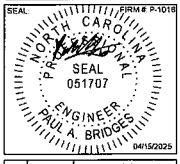
PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639° -81.6088889°

SEAL: FIRM # P-1018



REV	DATE	DETAILS
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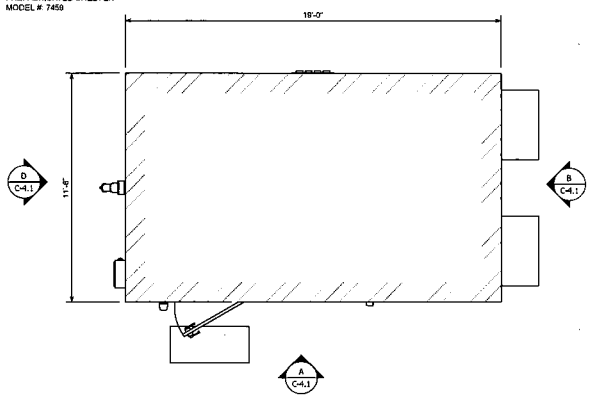
DRAWN BY: CP | CHECKED BY: DG

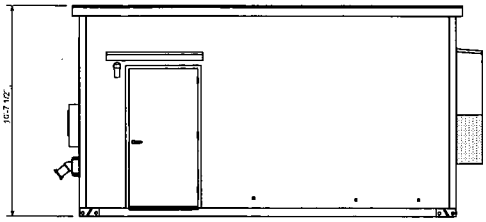
SHEET TITLE:
ANTENNA LAYOUTS

SHEET # C-3.4 | CURRENT REV # 3 | ETS # 2211070

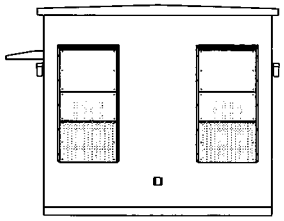
VFP: 11'-6" x 18'-0"
- PREFABRICATED SHELTER
- MODEL # 7459



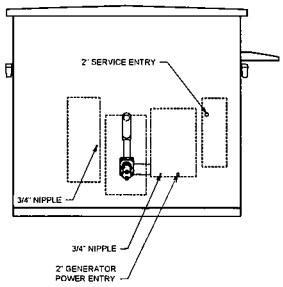
PLAN VIEW
N.T.S.



ELEVATION A
N.T.S.



ELEVATION B
N.T.S.



ELEVATION D
N.T.S.

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
758 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.5066869°

SEAL — FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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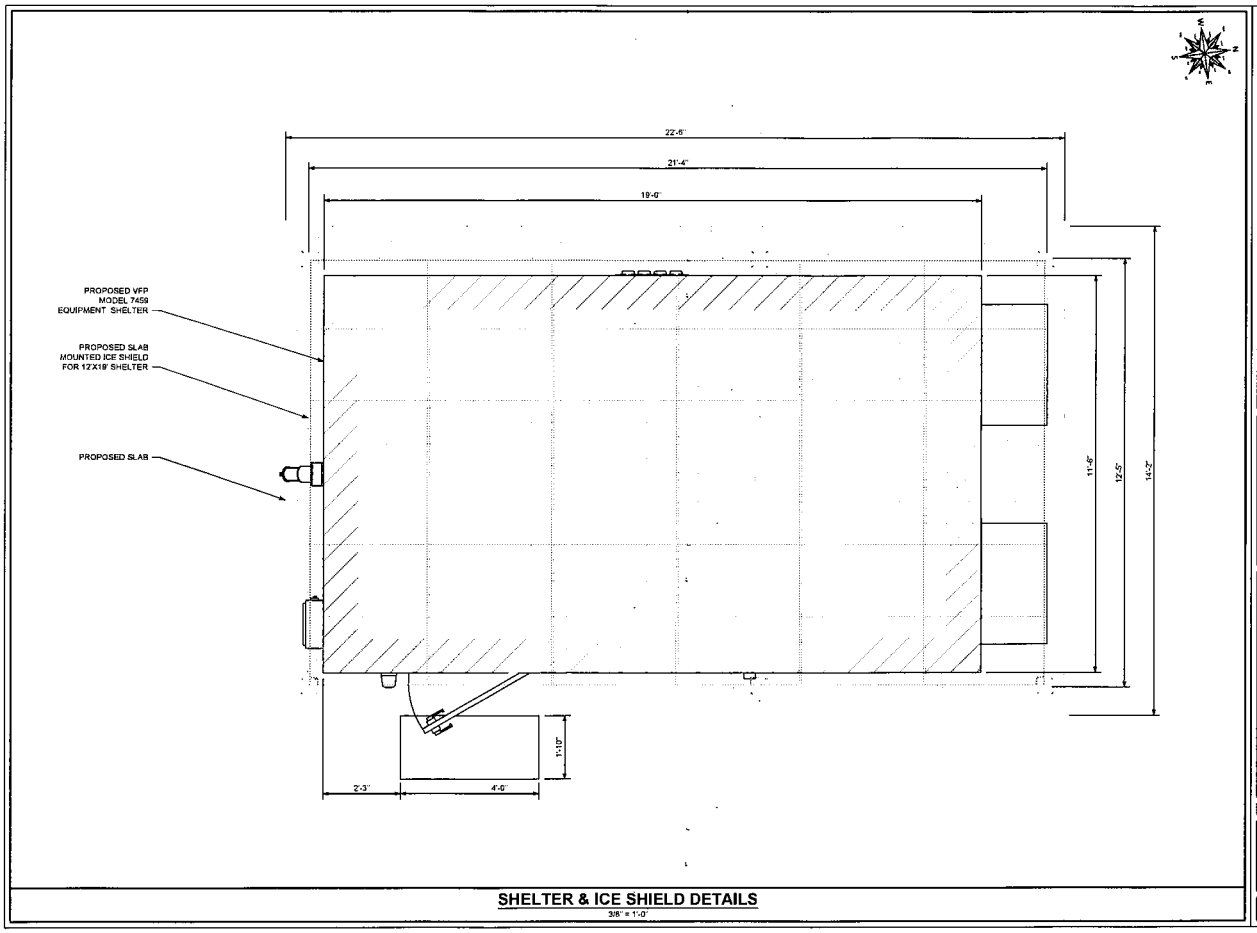
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
SHELTER DETAILS

SHEET # C-4.1 | CURRENT REV # 3 | ETS # 22110700



SHELTER & ICE SHIELD DETAILS

3/8" = 1'-0"

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plic.com

PREPARED FOR:

SITE NAME:

RICH MOUNTAIN TOWER

SITE ADDRESS:
758 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330839°, -81.6989889°

SEAL:

FIRM #: P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES

04/15/2025

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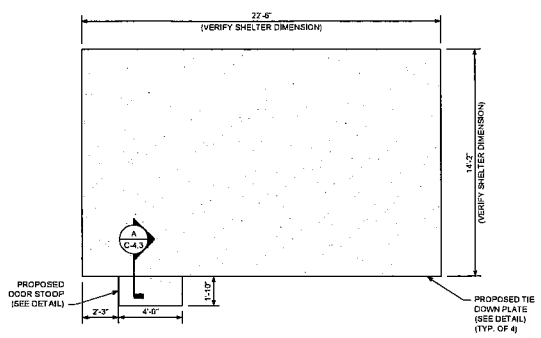
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

SHELTER & ICE SHIELD DETAILS

SHEET # C-4.2 | CURRENT REV # 3 | ETS # 22110700

NOTES
- SURFACE OF FINISHED SLAB SHALL BE LEVEL AND FLAT WITHIN 1/4"
- CONTRACTOR TO VERIFY WITH MANUFACTURER ACTUAL DIMENSIONS OF SHELTER PRIOR TO LAYING FOUNDATION
- SEE SHEET GN-3 FOR CONCRETE AND FOUNDATION NOTES



SHELTER CONCRETE FOUNDATION PLAN
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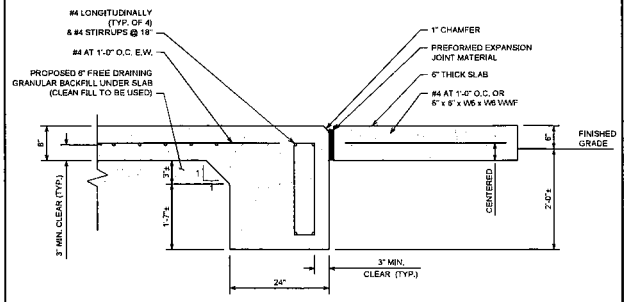

SECTION A DETAIL
N.T.S.

NOT USED
N.T.S.

PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2130939°, -81.6966889°

SEAL: FIRM # P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
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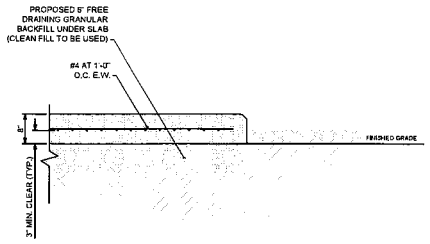
SHEET TITLE:
SHELTER FOUNDATION DETAILS

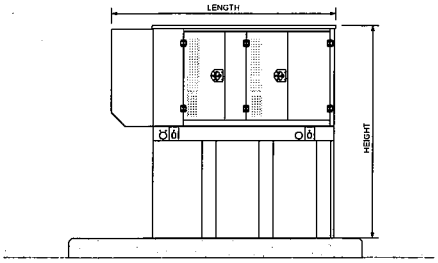
SHEET # **C-4.3** | CURRENT REV # 3 | ETS # 22110700



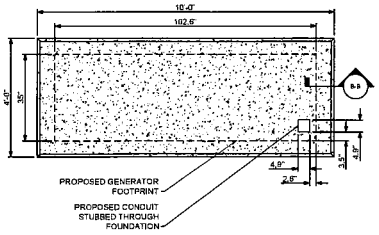
SECTION B-B

GENERAC - SD050
- DIESEL GENERATOR
- STANDARD ENCLOSURE
- 510 GALLON TANK

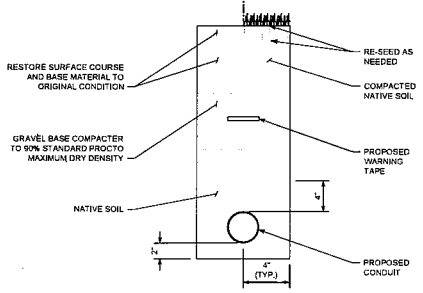
HEIGHT	WIDTH	DEPTH	WEIGHT
93.00"	47.00"	117.00"	3663 LBS



GENERATOR PAD ELEVATION
N.T.S.



SECTION FOR USE UNDER PAVEMENT OR VEHICLE TRAFFIC AREAS | SECTION FOR USE UNDER GRASS OR BARE GROUND AREAS



TRENCH DETAIL
N.T.S.

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PREPARED FOR:

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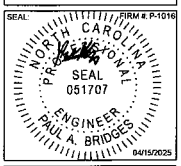
36.2330939°, -81.6988889°

SEAL: FIRM #: P-1016



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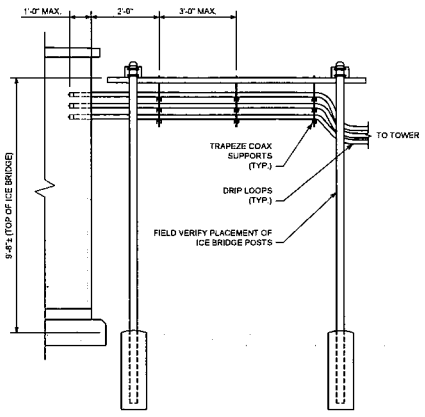
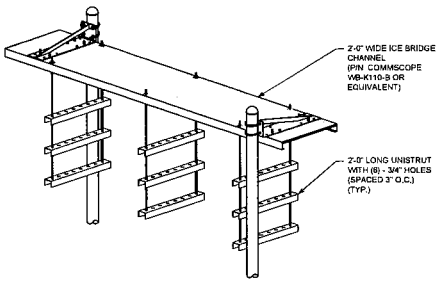
SHEET TITLE:
GENERATOR AND GEN. FOUNDATION DETAILS

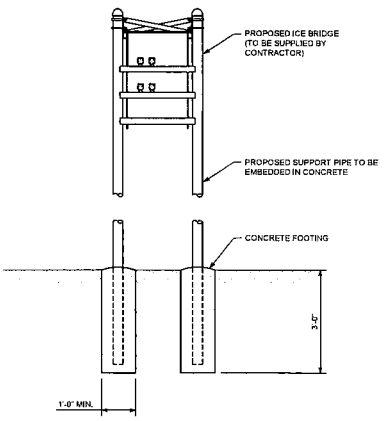
SHEET # C-4.4 | CURRENT REV # 3 | ETS # 22110700



ICE BRIDGE DETAIL
N.T.S.



ISOMETRIC VIEW
N.T.S.



SIDE VIEW
N.T.S.

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PREPARED FOR

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SEAL
FIRM # P-1018
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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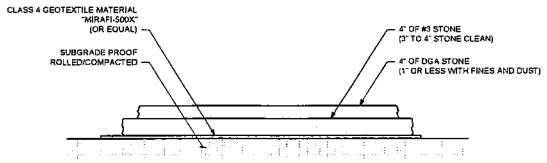
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
ICE BRIDGE DETAILS

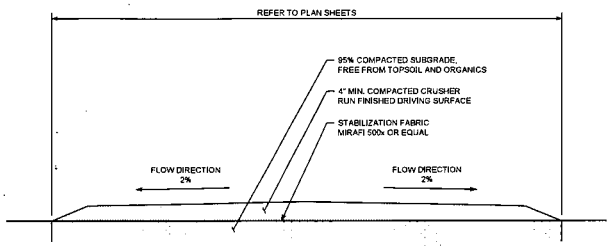
SHEET # C-4.5 | CURRENT REV # 3 | ETS #: 22110700

NOTES:
1. CLEAR AND GRUB EXISTING VEGETATION.
2. MAINTAIN EXISTING DRAINAGE PATTERNS.
3. MINIMUM OF 6" OF 1-1/2" CRUSHED ROCK.
4. MIRAFI 500X (OR EQUIVALENT) GEOTEXTILE FABRIC.
5. SUBGRADE TO BE COMPACTED TO 95% DENSITY (MINIMUM) STANDARD PROCTOR DENSITY.
6. USE OF SWALES AND/OR DRAINAGE DITCHES FOR PROPER WATER RUNOFF AS NEEDED.
7. AGGREGATE IS BASED ON STANDARD AASHTO.
8. SLOPE NOT TO EXCEED 1/4" PER FOOT TO MAX. GRADE OF 6" FROM CENTER OF COMPOUND TO EACH FENCE LINE.

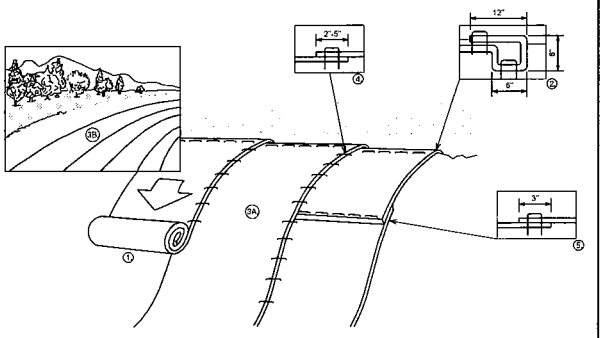


COMPOUND SURFACING
N.T.S.

NOTES:
- SEE ALL EXISTING SUBGRADE AND CRUSHER RUN GRAVEL SURFACING SHALL BE COMPACTED TO 95% MINIMUM STANDARD PROCTOR DENSITY AS SPECIFIED BY ASTM D698 AND AASHTO T99.
- THE CONTRACTOR IS REQUIRED TO TEST AND SUBMIT COMPACTION TEST RESULTS FOR ALL EXISTING SUBGRADE AND CRUSHER RUN GRAVEL SURFACING IN THE CLOSEOUT PACKAGE SUPPLIED TO AMERICAN TOWER.
- CONTRACTOR SHALL VERIFY DITCH LOCATIONS (IF REQUIRED) WITH SITE GRADING PLANS.
- ROAD CROSS SECTION VARIES; CONTRACTOR SHALL REVIEW GRADING PLAN FOR CROSS SLOPE AREAS. MAINTAIN A MINIMUM 2% CROSS SLOPE.



ACCESS DRIVE SECTION
N.T.S.



SLOPE INSTALLATION
N.T.S.

GRADING AND DRAINAGE NOTES:
1. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREA.
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3. GRASSED AREAS DISTURBED BY THE WORK OF THIS CONTRACT SHALL BE GRADED TO UNIFORM SLOPE, FERTILIZED, SEEDED AND COVERED WITH MULCH.
4. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES SHALL BE IN CONFORMANCE WITH THE NORTH CAROLINA GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.
5. AUTHORIZATION FOR ACCESS TO AND WORK WITHIN PUBLIC ROAD R.O.W. SHALL BE OBTAINED BY THE CONTRACTOR. THE CONTRACTOR SHALL ADHERE TO ALL SPECIAL REQUIREMENTS SPECIFIED IN THE AUTHORIZATION.
6. ALL OTHER VEGETATIVE COVER DAMAGED OR REMOVED DURING CONSTRUCTION ACTIVITIES SHALL BE REPLACED IN KIND BY THE CONTRACTOR (UNLESS OTHERWISE NOTED).
7. ALL MATERIALS AND METHODS OF CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE AUTHORITY HAVING JURISDICTION AND THE STATE OF NORTH CAROLINA STANDARDS AND SPECIFICATIONS.
8. CONTRACTOR SHALL HAVE NORTH CAROLINA ONE CALL (1-800-632-4949) LOCATE ALL EXISTING UTILITIES PRIOR TO BEGINNING CONSTRUCTION.
9. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL EXISTING UTILITIES AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES OR CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

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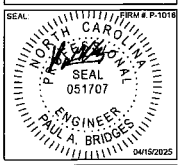
SEAL: FIRM #: P-1018



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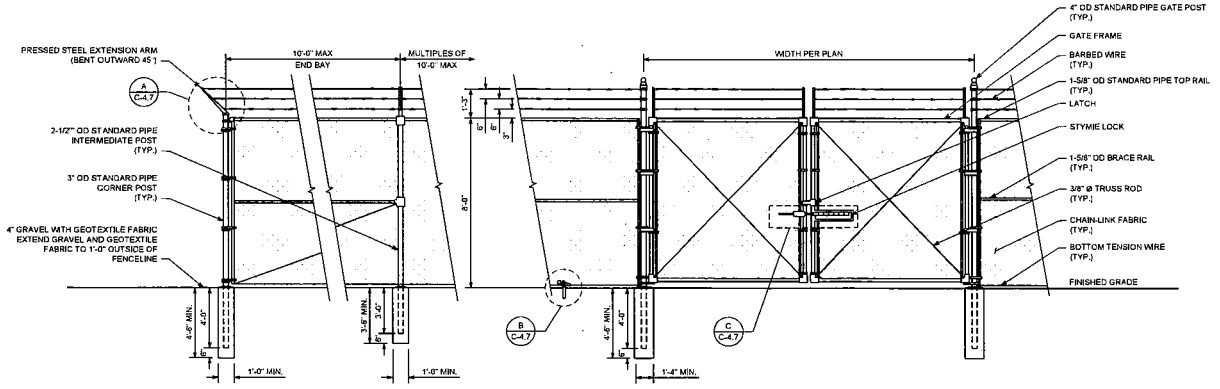
SHEET TITLE:
SURFACE & SLOPE DETAILS

SHEET # C-4.6 | CURRENT REV # 3
ETS #: 22110700



FENCE & DOUBLE SWING GATE DETAIL

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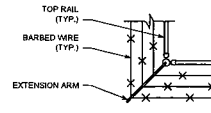
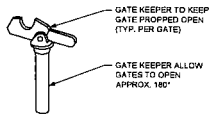
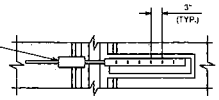


DETAIL A
TYPICAL FENCE CORNER



DETAIL B
GATE KEEPER

CONTRACTOR TO SUPPLY & INSTALL A STYMIE LOCK CAPABLE OF SUPPORTING (6) LOCKS & PROVIDE A RE-ENFORCED OPENING IN THE FENCE AREA CHAIN-LINK FABRIC 4" BELOW THE STYMIE LOCK MECHANISM TO ALLOW ACCESS FROM BOTH SIDES OF THE GATE



DETAIL C
STYMIE LOCK

FENCE & STYMIE LOCK DETAILS

N.T.S.

NOTES:

1. ALL MATERIAL AND HARDWARE FOR THE CHAIN-LINK FENCE SHALL BE A HOT DIP GALVANIZED FINISH.
2. CHAIN-LINK FABRIC TO BE 6'-0" HIGH, 9 GA. WIRE, 2" MESH WITH TWISTED SELVAGE TOP AND BOTTOM (PER ASTM A392).
3. BARBED WIRE TO CONSIST OF 3 NO, 12-1/2" GA. GALVANIZED STEEL WORE WITH 4-POINT BARBS OF NO. 14 GA. GALVANIZED STEEL.
4. POST, RAIL AND GATE FITTINGS TO BE PRESSED STEEL OR MALLEABLE CASTING (PER ASTM A153).
5. ALL POSTS SHALL HAVE WEATHER CAPS INSTALLED.
6. POSTS TO SET IN 3,000 PSI CONCRETE. BOTTOM OF CONCRETE TO BE 6" MIN. FROM BOTTOM OF POST.
7. TIE WIRES TO BE 9 GA. ALUMINUM SPACES AT 12" OC POSTS/GATES AND 24" OC RAILS/MRE.
8. TENSION BARS TO BE 3/16" x 3/4" CARBON STEEL ATTACHED TO TERMINAL POSTS BY MEANS OF BEVELED EDGE BANDS.
9. PROVIDE (2) GATE KEEPER HOLD OPEN DEVICES FOR SWING GATES. GATE KEEPERS TO ALLOW GATES TO OPEN APPROXIMATELY 180 DEGREES.
10. CONTRACTOR TO SUPPLY AND INSTALL A STYMIELOCK CAPABLE OF SUPPORTING (6) LOCKS AND PROVIDE A RE-ENFORCED OPENING IN THE CHAIN-LINK FENCE AREA FABRIC OF 4" BELOW THE STYMIE LOCK MECHANISM TO ALLOW ACCESS FROM BOTH SIDES OF THE GATE.
11. SITE OWNER / CARRIER TO PROVIDE A STANDARD LOCK FOR THE GATE.
12. ALL FENCE POST FOUNDATIONS SHALL BE ROUNDED AT TOP AS SHOWN TO DIVERT WATER AWAY FROM THE POSTS.
13. THE FABRIC SHALL BE SET SO THERE IS NO GAP BETWEEN THE CHAIN-LINK FENCE FABRIC AND THE FINISHED GRADE.
15. 4" OD STANDARD PIPE FOR GATE POSTS.
16. 3" OD STANDARD PIPE FOR ALL CORNER AND END POSTS.
17. 2-1/2" OD STANDARD PIPE FOR ALL INTERMEDIATE POSTS.

NOTES

N.T.S.

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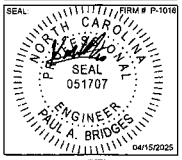

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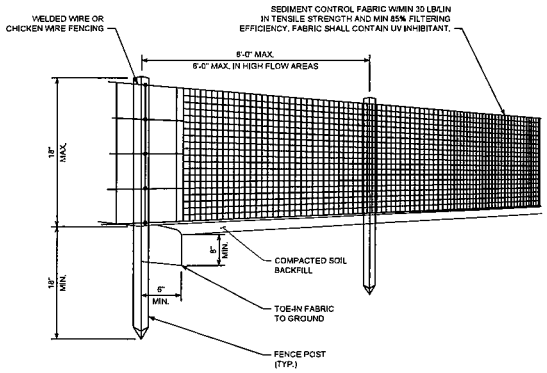
SHEET TITLE:
FENCE DETAILS

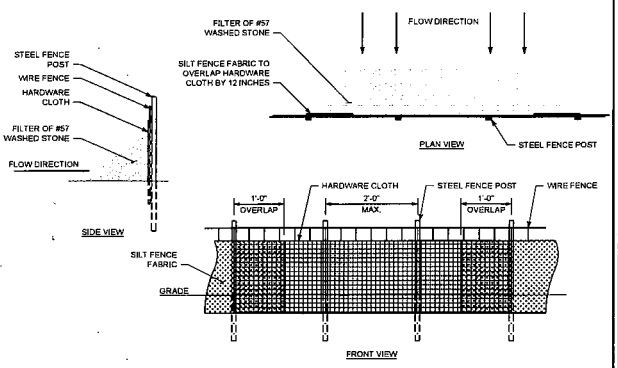
SHEET # C-4.7 | CURRENT REV # 3 | ETS # 22110700

NOTES
- SEE SILT FENCE NOTES



SILT FENCE
N.T.S.

NOTES
- APPLICABLE FOR DRAINAGE AREAS NO MORE THAN 1/4 ACRE.
- USE AS A REPAIR OF SILT FENCE FAILURES.
- BURY WIRE FENCE, HARDWARE CLOTH, AND SILT FENCE FABRIC 8 INCHES.



TEMPORARY SILT FENCE OUTLET
N.T.S.

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3. GRASSED AREAS DISTURBED BY THE WORK OF THIS CONTRACT SHALL BE GRADED TO UNIFORM SLOPE, FERTILIZED, SEEDED AND COVERED WITH MULCH.
4. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES SHALL BE IN CONFORMANCE WITH THE NORTH CAROLINA GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL.
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SILT FENCE NOTES:
1. CONSTRUCT THE SILT FENCE OF FILTER CLOTH WITH A MINIMUM TENSILE STRENGTH OF 50 LB/LIN IN.
2. SILT FENCE HEIGHT SHALL BE A MINIMUM OF 15 INCHES ABOVE GROUND HEIGHT, BUT SHALL NOT EXCEED 18 INCHES.
3. CONSTRUCT SILT FENCE OF A CONTINUOUS ROLL CUT THE LENGTH OF THE BARRIER TO AVOID JOINTS. FABRIC TO BE FASTENED SECURELY TO FENCE POSTS WITH 1 INCH STAPLES OR TIE WIRES.
4. SUPPORT FABRIC WITH WOVEN WIRE MESH 14.5 GAUGE, 6" MAX. MESH OPENING. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH 1 INCH STAPLES OR TIE WIRES.
5. POSTS FOR SEDIMENT FENCES SHALL BE 4 INCH DIAMETER PINE, 2 INCH DIAMETER OAK OR 1.33 LB/LINEAR FOOT STEEL. MINIMUM LENGTH SHALL BE 4 POSTS SHALL BE SPACED NO MORE THAN 8 FEET APART AND THEY SHALL BE DRIVEN INTO THE GROUND A MINIMUM OF 16 INCHES.
6. EXCAVATE A TRENCH APPROXIMATELY 4 INCHES WIDE AND 8 INCHES DEEP ALONG THE PROPOSED LINE OF POSTS AND UP SLOPE FROM THE BARRIER. BACKFILL THE TRENCH WITH COMPACTED SOIL OR GRAVEL PLACED OVER THE FILTER FABRIC.
7. DO NOT ATTACH FILTER FABRIC TO EXISTING FENCES, TREES, ETC.
8. REMOVE FENCING FOLLOWING STABILIZATION OF SLOPES AND ALL DISTURBED AREAS.

NOT USED
N.T.S.

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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
SILT FENCE DETAILS

SHEET # C-4.8 | CURRENT REV # 3 | ETS # 22110700

ELECTRICAL NOTES

1. SCOPE

   A. SHALL INCLUDE ALL LABOR, MATERIALS AND APPLIANCES REQUIRED FOR THE FURNISHING, INSTALLING AND TESTING, COMPLETE AND READY FOR OPERATION OF ALL WORK SHOWN ON THE DRAWING AS SPECIFIED HEREIN

   A.a. ELECTRIC SERVICE
   A.b. CONDUIT AND RACEWAY
   A.c. CONDUCTORS
   A.d. MISCELLANEOUS MATERIALS
   A.e. TELEPHONE CONDUITS
   A.f. LIGHTNING ARRESTING SYSTEM

2. CODES

   A. THE INSTALLATION SHALL COMPLY WITH ALL LAWS APPLYING TO ELECTRICAL INSTALLATION IN EFFECT WITH THE REGULATIONS OF THE LATEST EDITION OF THE NATIONAL ELECTRICAL SAFETY CODE AND THE ICC, ADMINISTRATIVE RULES WITH THE NATIONAL ELECTRIC CODE, AND ANY LOCAL CODES AND ORDINANCES WITH THE REGULATION OF THE SERVING UTILITY COMPANY. ALL PERMITS REQUIRED SHALL BE OBTAINED AND, AFTER COMPLETION OF WORK, THE OWNER SHALL BE FURNISHED A CERTIFICATE OF FINAL INSPECTION AND APPROVAL.

3. TESTING

   A. UPON COMPLETION OF THE INSTALLATION, OPERATE AND ADJUST ALL EQUIPMENT AND SYSTEMS TO MEET SPECIFIED PERFORMANCE REQUIREMENTS. ALL TESTING SHALL BE DONE BY QUALIFIED PERSONNEL.

4. GUARANTEE

   A. IN ADDITION TO THE GUARANTEE OF THE EQUIPMENT BY THE MANUFACTURER, EACH PIECE OF EQUIPMENT SPECIFIED HEREIN SHALL ALSO BE GUARANTEED FOR DEFECTS OF MATERIAL OR WORKMANSHIP OCCURRING DURING A PERIOD OF ONE (1) YEAR FROM FINAL ACCEPTANCE OF THE WORK BY THE OWNER, WITHOUT EXPENSE TO THE OWNER ALL WARRANTEE CERTIFICATES & GUARANTEES FURNISHED BY THE MANUFACTURERS SHALL BE TURNED OVER TO THE OWNER.

5. COORDINATION

   A. TOWER SUBCONTRACTOR SHALL COORDINATE ALL WORK WITH THE POWER AND TELEPHONE COMPANIES AND SHALL COMPLY WITH ALL SERVICE REQUIREMENTS OF EACH UTILITY COMPANY, IF REQUIRED.

6. EXAMINATION OF SITE

   A. PRIOR TO BEGINNING WORK, THE TOWER SUBCONTRACTOR SHALL VISIT THE SITE OF THE JOB AND SHALL FAMILIARIZE HIMSELF WITH ALL CONDITIONS AFFECTING THE ELECTRICAL INSTALLATION AND SHALL MAKE PROVISIONS AS TO THE COST THEREOF. FAILURE TO COMPLY WITH THE INTENT OF THIS PARAGRAPH WILL IN NO WAY RELIEVE THE TOWER SUBCONTRACTOR OF PERFORMING ALL WORK NECESSARY FOR A COMPLETE AND WORKING SYSTEM OR SYSTEMS.

7. CUTTING, PATCHING AND EXCAVATION

   A. COORDINATION OF ALL SLEEVES, CHASES, ETC., WILL BE REQUIRED PRIOR TO THE CONSTRUCTION OF ANY PORTION OF THE WORK. ALL CUTTING AND PATCHING OF WALLS, PARTITIONS, FLOORS, AND CHASES IN CONCRETE, WOOD, STEEL OR MASONRY SHALL BE DONE AS PROVIDED ON THE DRAWINGS.

   B. ALL NECESSARY EXCAVATIONS AND BACKFILLING INCIDENTAL TO THE WORK UNLESS SPECIFICALLY NOTED OTHERWISE ON THE DRAWING SHALL BE PROVIDED BY THIS CONTRACTOR.

   C. SEAL ALL PENETRATION THROUGH WALL AND FLOORS WITH APPROVED GROUT.

8. RACEWAYS

   A. ALL CONDUCTORS SHALL BE INSTALLED IN CONDUIT. ALL CONDUIT SHALL BE GALVANIZED RIGID CONDUIT OR SCH40 PVC, AS INDICATED ON THE DRAWINGS.

   B. WHERE INSTALLED ON EXTERIORS AND EXPOSED TO DAMAGE, ALL CONDUIT SHALL BE GALVANIZED RIGID CONDUIT. ALUMINUM CONDUIT SHALL NOT BE ALLOWED.

   C. CONCEALED CONDUIT IN WALLS OR INTERIOR SPACES ABOVE GRADE MAY BE EMT.

   D. UNDERGROUND CONDUITS SHALL BE GALVANIZED RIGID CONDUIT OR SCHEDULE 40 PVC AS INDICATED ON THE DRAWINGS.

   E. ALL CONDUIT RUNS SHALL USE APPROVED COUPLINGS AND CONNECTORS. PROVIDE INSULATED BUSHING FOR ALL CONDUIT TERMINATIONS. ALL CONDUIT RUNS IN A WET LOCATION SHALL HAVE WATERPROOF FITTINGS.

   F. PROVIDE SUPPORTS FOR ALL CONDUITS IN ACCORDANCE WITH NEC REQUIREMENTS. ALL CONDUITS SHALL BE SIZED AS REQUIRED BY NEC.

   G. BURIAL DEPTH OF ALL CONDUITS SHALL BE AS REQUIRED BY CODE FOR EACH SPECIFIC CONDUIT TYPE AND APPLICATION.

   H. CONDUIT ROUTES ARE SCHEMATIC. TOWER SUBCONTRACTOR SHALL FIELD VERIFY BEFORE BID, COORDINATE ROUTE WITH WIRELESS CARRIER AND BUILDING OWNER.

9. EXTERIOR CONDUIT

   A. ALL EXPOSED CONDUIT SHALL BE NEATLY INSTALLED AND RUN PARALLEL OR PERPENDICULAR TO STRUCTURAL ELEMENTS. SUPPORTS AND MOUNTING HARDWARE SHALL BE HOT DIPPED GALVANIZED STEEL

   B. SCHEDULE 40 ELECTRICAL CONDUIT WILL BE BURIED TO A DEPTH OF AT LEAST 3 FEET. METALLIC CAUTION TAPE, OR NONMETALLIC CAUTION TAPE WITH 12 AWG TRACING WIRE, WILL BE BURIED TO A DEPTH OF 2 FEET. TRENCHES WILL BE TAMPED AT 12 INCH INTERVALS TO PRECLUDE FUTURE SINKING. TOPSOIL WILL BE PRESERVED AND REPLACED. ALL DISTURBED AREAS SHALL BE RE-SEEDED AND STRAWED PER THE FORT BRAGG SEEDING SPECIFICATION. PULL CORDS WILL BE TIED OFF ON BOTH ENDS OF THE CONDUIT RUNS.

10. EQUIPMENT

   A. ALL DISCONNECT SWITCHES SHALL BE SERVICE ENTRANCE RATED, HEAVY DUTY TYPE.

   B. NEW CIRCUIT BREAKERS SHALL BE RATED TO WITHSTAND THE MAXIMUM AVAILABLE FAULT CURRENT AS DETERMINED BY THE LOCAL UTILITY. TOWER SUBCONTRACTOR SHALL VERIFY MAXIMUM AVAILABLE FAULT CURRENT, AND COORDINATE INSTALLATION WITH THE LOCAL UTILITY BEFORE STARTING WORK.

11. CONDUCTORS

   A. FURNISH AND INSTALL CONDUCTORS CALLED FOR IN THE DRAWINGS. ALL CONDUCTORS SHALL HAVE TYPE THWN (MIN) (75 DEGREE) INSULATION, RATED FOR 600 VOLTS.

   B. ALL CONDUCTORS SHALL BE UL LISTED AND SHALL BE PROVIDED AND INSTALLED AS FOLLOWS:

   B.a. MINIMUM WIRE SIZE SHALL BE #12 AWG.

   B.b. ALL CONDUCTORS SIZE #8 AND LARGER SHALL BE STRANDED. CONDUCTORS SIZED #10 AND SMALLER MAY BE SOLID OR STRANDED.

   B.c. CONNECTION FOR #10 AWG AND SMALLER SHALL BE BY TWISTING TIGHT AND INSTALLING INSULATED PRESSURE OR WIRE NUT CONNECTIONS.

   B.d. CONNECTION FOR #8 AWG AND LARGER SHALL BE BY USE OF STEEL CRIMP-ON SLEEVES WITH NYLON INSULATOR.

   C. ALL CONDUCTORS SHALL BE COLOR CODED IN ACCORDANCE WITH NEC STANDARDS.

   D. THE RACEWAY SYSTEM SHALL BE COMPLETE BEFORE INSTALLING CONDUCTORS.

12. PENETRATIONS

   E. TOWER SUBCONTRACTOR SHALL COMPLY WITH UL PENETRATION DETAILS FOR PENETRATIONS OF ALL RATED WALLS, ROOF, ETC.

GROUNDING NOTES

1. ALL ELECTRICAL NEUTRALS, RACEWAYS AND NON-CURRENT CARRYING PARTS OF ELECTRICAL EQUIPMENT AND ASSOCIATED ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH NEC ARTICLE 250. THIS SHALL INCLUDE NEUTRAL CONDUCTORS, CONDUITS, SUPPORTS, CABINETS, BOXES, GROUND BUSSES, ETC. THE NEUTRAL CONDUCTOR FOR EACH SYSTEM SHALL BE GROUNDED BY ONE POINT ONLY.
2. PROVIDE GROUND CONDUCTOR IN ALL RACEWAYS.
3. PROVIDE BONDING AND GROUND TO MEET NFPA 780 - LIGHTNING PROTECTION AS A MINIMUM.
4. ALL GROUNDING SHALL BE INSTALLED IN ACCORDANCE WITH MOTOROLA R-56 GUIDELINES, SECTION 4.

ABBREVIATIONS

A	AMPERE
AFG	ABOVE FINISHED GRADE
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BCW	BARE COPPER WIRE
BFG	BELOW FINISHED GRADE
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
DISC	DISCONNECT
EMT	ELECTRIC METALLIC TUBING
FSC	FLEXIBLE STEEL CONDUIT
GEN	GENERATOR
GPS	GLOBAL POSITIONING SYSTEM
GRC	GALVANIZED RIGID CONDUIT
KA	KILO AMP
KW	KILOWATTS
NEC	NATIONAL ELECTRIC CODE
PH	PHASE
PNL	PANEL
PNLBD	PANELBOARD
PVC	POLYVINYL CHLORIDE
RGS	RIGID GALVANIZED STEEL
SCCR	SHORT CIRCUIT CURRENT RATING
SW	SWITCH
UL	UNDERWRITERS LABORATORIES
V	VOLTAGE
VA	VOLTAGE AMP
W	WATTS
XFMR	TRANSFORMER
XMTR	TRANSMITTER

LEGEND

- EXISTING UTILITY POLE
- LIGHT
- RECEPTACLE
- BREAKER
- TRANSFORMER
- METER
- PANEL
- DISCONNECT
- FUSED DISCONNECT
- LIGHTNING ARRESTOR
- GENERATOR
- GROUND
- GROUND TO NEUTRAL BOND
- GROUND ROD
- GROUND ROD WITH INSPECTION WELL
- CADWELD BOND
- MECHANICAL BOND
- COMPRESSION BOND

PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2336639°, -81.6988889°

SEAL: FIRM # P-1016

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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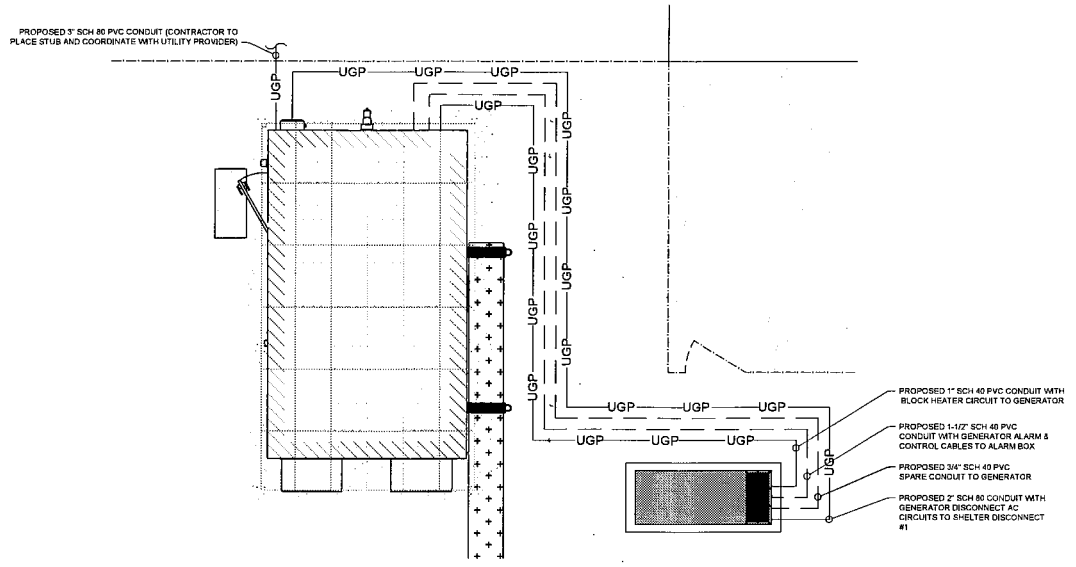
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE
ELECTRICAL NOTES

SHEET # **E-1** | CURRENT REV # 3 | ETS # 22110703



ELECTRICAL PLAN

3/16" = 1'-0"

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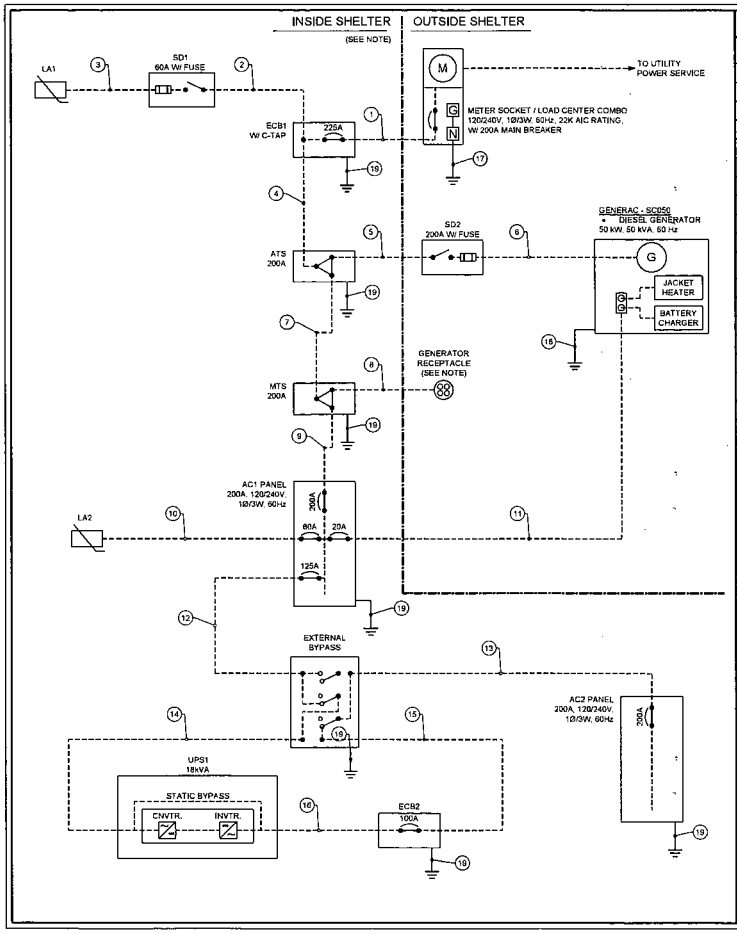
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
ELECTRICAL PLAN

SHEET # **E-2** | CURRENT REV # 3 | ETS # 22110709



CIRCUIT SCHEDULE

	FROM	TO	CONDUCTOR
1	METER / LOAD CENTER	ENCLOSURE W/ CIRCUIT BREAKER (ECB1)	(3) #3/0 + (1) #6 G
2	ENCLOSURE W/ CIRCUIT BREAKER (ECB1)	SERVICE DISCONNECT (SD1)	(3) #4 AWG + (1) #10 G
3	SERVICE DISCONNECT (SD1)	LIGHTNING ARRESTOR (LA1)	(3) #4 AWG + (1) #10 G
4	ENCLOSURE W/ CIRCUIT BREAKER (ECB1)	AUTOMATIC TRANSFER SWITCH	(3) #3/0 + (1) #6 G
5	AUTOMATIC TRANSFER SWITCH	SERVICE DISCONNECT (SD2)	(3) #3/0 + (1) #6 G
6	SERVICE DISCONNECT (SD2)	GENERATOR	(3) 300 kcmil + (1) #4 G
7	AUTOMATIC TRANSFER SWITCH	MANUAL TRANSFER SWITCH	(3) #3/0 + (1) #6 G
8	MANUAL TRANSFER SWITCH	GENERATOR RECEPTACLE	(3) #3/0 + (1) #2/0 G
9	MANUAL TRANSFER SWITCH	LOAD CENTER "UTILITY PP1"	(3) #3/0 + (1) #6 G
10	LOAD CENTER "UTILITY PP1"	LIGHTNING ARRESTOR (LA2)	(3) #4 AWG + (1) #6 G
11	LOAD CENTER "UTILITY PP1"	GENERATOR JACKET HEATER & BATTERY CHARGER RECEPTACLE	(2) #12 AWG + (1) #6 G
12	LOAD CENTER "UTILITY PP1"	EXTERNAL BYPASS	(3) #1 AWG + (1) #6 G
13	EXTERNAL BYPASS	LOAD CENTER "TECH PP2"	(3) #1 AWG + (1) #6 G
14	EXTERNAL BYPASS	UNINTERRUPTED POWER SYSTEM (UPS1)	(3) #1 AWG + (1) #6 G
15	EXTERNAL BYPASS	ENCLOSURE W/ CIRCUIT BREAKER (ECB2)	(3) #1 AWG + (1) #6 G
16	ENCLOSURE W/ CIRCUIT BREAKER (ECB2)	UNINTERRUPTED POWER SYSTEM (UPS1)	(3) #1 AWG + (1) #6 G
17	METER / LOAD CENTER (NEUTRAL & GROUND BOND)	SERVICE ENTRANCE GROUND ROD (BONDED TO SHELTER GROUND RING)	#2 AWG BTSC
18	GENERATOR	GROUND RING	#2 AWG BTSC
19	INTERNAL EQUIPMENT	ISOLATED PHASE GROUND RING	#6 AWG GREEN

NOTES

1. ONE-LINE DIAGRAM & WIRE SIZING PER VFP, INC. SHELTER DRAWING NO. 207459.
2. ALL EQUIPMENT INSIDE SHELTER, INCLUDING ALL GROUNDING IS PRE-INSTALLED AND WIRED BY VFP, INC. CONTACT VFP, INC. ENGINEER OF RECORD IF THERE ARE ANY DISCREPANCIES.
3. THE SHORT-CIRCUIT RATING OF THE TRANSFER EQUIPMENT, BASED ON THE SPECIFIC OVERCURRENT PROTECTIVE DEVICE TYPE AND SETTING PROTECTING THE TRANSFER EQUIPMENT (CAN VARY BETWEEN THE UTILITY AND GENERATOR CONNECTIONS) MUST BE FIELD MARKED ON THE EXTERIOR OF THE TRANSFER EQUIPMENT PER NEC ARTICLE 701.5(D).
4. SERVICE EQUIPMENT MUST BE LEGIBLY MARKED IN THE FIELD WITH THE MAXIMUM AVAILABLE FAULT CURRENT PER NEC ARTICLE 110.24(A). THE FIELD MARKING MUST INCLUDE THE DATE OF WHEN THE FAULT CURRENT CALCULATION WAS PERFORMED AND MUST BE ABLE TO WITHSTAND THE SURROUNDING ENVIRONMENT.
5. ENSURE ALL REQUIRED SIGNS PER NEC ARTICLE 701.7 ARE INSTALLED.
6. LEGALLY REQUIRED STANDBY SYSTEM OVERCURRENT DEVICES MUST BE SELECTIVELY COORDINATED WITH ALL SUPPLY-SIDE OVERCURRENT PROTECTIVE DEVICES PER NEC ARTICLE ARTICLE 701.27.
7. SERVICE ENTRANCE RATED METER / LOAD CENTER MUST HAVE GROUND BOND BETWEEN NEUTRAL AND GROUND, AND BE CODE COMPLIANT CONTAINING UNDERWRITERS LABORATORIES UL-891 AND UL-1008 LABELS, AND MEET NEC AND LOCAL CODES.
8. GENERATOR RECEPTACLE: PROVIDE WARNING SIGN TO BE PLACED BY THE GENERATOR INLET THAT STATES, "WARNING: FOR CONNECTION OF A NONSEPARATELY DERIVED (FLOATING NEUTRAL) SYSTEM ONLY." DO NOT BOND NEUTRAL TO GROUND IN GENERATOR.
9. REFER TO VFP, INC. SHELTER DRAWINGS NO. 207459 FOR ALL ALARM CABLE SCHEMATICS AND CONNECTION DETAILS.
10. LOAD IS NOT TO EXCEED 200A. ELECTRICAL CONTRACTOR TO VERIFY LOAD. IF LOAD DOES EXCEED 200A, CONTRACTOR TO CONTACT VFP, INC. ENGINEER OF RECORD.
11. ALL EXTERIOR ENCLOSURES TO BE NEMA 3 RATED.
12. ALL ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE.
13. ALL ELECTRICAL MATERIALS, DEVICES, APPLIANCES AND EQUIPMENT SHALL BE LABELED/LISTED BY UL OR A NORTH CAROLINA APPROVED THIRD PARTY TESTING AGENCY.
14. SUBCONTRACTOR TO LEAVE EXTRA PULL TAPE FOR FUTURE CABLE INSTALL BY OTHERS.
15. SEE SHEETS E-4.1 & E-4.2 FOR PANEL SCHEDULES.
16. SEE SHEET E-2 FOR ROUTES.

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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
ELECTRICAL ONE-LINE DIAGRAM

SHEET # E-3 | CURRENT REV # 3 | ETS # 22110700

AC 1 LOAD SCHEDULE

120/240V, 200A MCB, 1-PHASE, 3-WIRE, NEMA 3R, SURFACE MOUNTED, ON SHELTER WALL

NOTES	CIR #	DESCRIPTION	AMPS	POLES	DEMAND LOAD	A	B	DEMAND LOAD	POLES	AMPS	DESCRIPTION	CIR #	NOTES
(P)(1)(2)	1	LIGHTNING ARRESTOR	60	2	0.06	3.8		3.72	2	60	ACH2	2	(P)(1)(2)
(P)(1)(2)	3				0.06		3.8	3.72				4	(P)(1)(2)
(P)(1)(2)	5	ACH1	40	2	3.72	4.3		0.54	1	20	INTERIOR RCPTS	6	(P)(1)(2)
(P)(1)(2)	7				3.72		3.8	0.12	1	20	SMOKE DETECTOR	8	(P)(1)(2)
(P)(1)(2)	9	INTERIOR RCPTS	20	1	0.72	5.7		4.95	2	125	UPS BYPASS SWITCH	10	(P)(1)(2)
(P)(1)(2)	11	EMERGENCY / EXIT LIGHT	20	1	0.27		5.2	4.95				12	(P)(1)(2)
(P)(1)(2)	13	EXTERIOR RCPT	20	1	0.18	0.4		0.18	2	30	TWIST-LOCK	14	(P)(1)(2)
(P)(1)(2)	15	EXTERIOR LIGHT	20	1	0.18		0.3	0.18				16	(P)(1)(2)
(P)(1)(2)	17	GENERATOR	20	2	0.84	1.0		0.18	2	30	TWIST-LOCK	18	(P)(1)(2)
(P)(1)(2)	19				0.84		1.0	0.18				20	(P)(1)(2)
(P)(1)(2)	21	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	22	(P)(1)(2)
(P)(1)(2)	23	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	24	(P)(1)(2)
(P)(1)(2)	25	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	26	(P)(1)(2)
(P)(1)(2)	27	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	28	(P)(1)(2)
(P)(1)(2)	29	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	30	(P)(1)(2)
(P)(1)(2)	31	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	32	(P)(1)(2)
(P)(1)(2)	33	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	34	(P)(1)(2)
(P)(1)(2)	35	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	36	(P)(1)(2)
(P)(1)(2)	37	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	38	(P)(1)(2)
(P)(1)(2)	39	COIL FOR BATTERY CHARGER	20	1	2.90		2.5	0.00	1	20	SPARE	40	(P)(1)(2)
(P)(1)(2)	41	COIL FOR BATTERY CHARGER	20	1	2.90	2.5		0.00	1	20	SPARE	42	(P)(1)(2)
						A	B	TOTAL					
						17.6	16.6	34.2	Total Panel Load (kW)				
								38.4	Total Panel Rated Capacity (kW)				
								4.2	Total Panel Rated Spare Capacity (kW)				
								147	Panel Amps				

NOTES:
(1) FURNISH AND INSTALL TYPE WRITTEN PANEL SCHEDULE AS APPROPRIATE PER NEC.
(2) LOADS CALCULATED FROM VFP 207498 DRAWINGS
(P) PROPOSED EQUIPMENT; INSTALL PER NEC

AC1 PANEL SCHEDULE
N.T.S.

NOT USED
N.T.S.

AC2 LOAD SCHEDULE

120/240V, 200A MCB, 1-PHASE, 3-WIRE, NEMA 3R, SURFACE MOUNTED, ON SHELTER WALL

NOTES	CIR #	DESCRIPTION	AMPS	POLES	DEMAND LOAD	A	B	DEMAND LOAD	POLES	AMPS	DESCRIPTION	CIR #	NOTES
(P)(1)(2)	1	EQUIPMENT, RCPT #1	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #2	2	(P)(1)(2)
(P)(1)(2)	3	EQUIPMENT, RCPT #3	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #4	4	(P)(1)(2)
(P)(1)(2)	5	EQUIPMENT, RCPT #5	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #6	6	(P)(1)(2)
(P)(1)(2)	7	EQUIPMENT, RCPT #7	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #8	8	(P)(1)(2)
(P)(1)(2)	9	EQUIPMENT, RCPT #9	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #10	10	(P)(1)(2)
(P)(1)(2)	11	EQUIPMENT, RCPT #11	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #12	12	(P)(1)(2)
(P)(1)(2)	13	EQUIPMENT, RCPT #13	20	1	0.36	0.7		0.36	1	20	EQUIPMENT, RCPT #14	14	(P)(1)(2)
(P)(1)(2)	15	EQUIPMENT, RCPT #15	20	1	0.36		0.7	0.36	1	20	EQUIPMENT, RCPT #16	16	(P)(1)(2)
(P)(1)(2)	17	(PDU1) RCPT #1	20	1	0.36	0.7		0.36	1	20	(PDU1), RCPT #2	18	(P)(1)(2)
(P)(1)(2)	19	(PDU1) RCPT #3	20	1	0.36		0.7	0.36	1	20	(PDU1), RCPT #4	20	(P)(1)(2)
(P)(1)(2)	21	(PDU1) RCPT #5	20	1	0.36	0.7		0.36	1	20	(PDU1), RCPT #6	22	(P)(1)(2)
(P)(1)(2)	23	(PDU1) RCPT #7	20	1	0.36		0.7	0.36	1	20	(PDU1), RCPT #8	24	(P)(1)(2)
(P)(1)(2)	25	(PDU2) RCPT #1	20	1	0.36	0.7		0.36	1	20	(PDU2), RCPT #2	26	(P)(1)(2)
(P)(1)(2)	27	(PDU2) RCPT #3	20	1	0.36		0.7	0.36	1	20	(PDU2), RCPT #4	28	(P)(1)(2)
(P)(1)(2)	29	(PDU2) RCPT #5	20	1	0.36	0.7		0.36	1	20	(PDU2), RCPT #6	30	(P)(1)(2)
(P)(1)(2)	31	(PDU2) RCPT #7	20	1	0.36		0.7	0.36	1	20	(PDU2), RCPT #8	32	(P)(1)(2)
(P)(1)(2)	33	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	34	(P)(1)(2)
(P)(1)(2)	35	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	36	(P)(1)(2)
(P)(1)(2)	37	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	38	(P)(1)(2)
(P)(1)(2)	39	SPARE	20	1	0.00		0.0	0.00	1	20	SPARE	40	(P)(1)(2)
(P)(1)(2)	41	SPARE	20	1	0.00	0.0		0.00	1	20	SPARE	42	(P)(1)(2)
						A	B	TOTAL					
						5.8	5.8	11.5	Total Panel Load (kW)				
								38.4	Total Panel Rated Capacity (kW)				
								26.9	Total Panel Rated Spare Capacity (kW)				
								48	Panel Amps				

NOTES:
(1) FURNISH AND INSTALL TYPE WRITTEN PANEL SCHEDULE AS APPROPRIATE PER NEC.
(2) LOADS CALCULATED FROM VFP 207450 DRAWINGS
(P) PROPOSED EQUIPMENT; INSTALL PER NEC

AC2 PANEL SCHEDULE
N.T.S.

NOT USED
N.T.S.

PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.nts-pllc.com

PREPARED FOR

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

SEAL: FIRM # P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/8/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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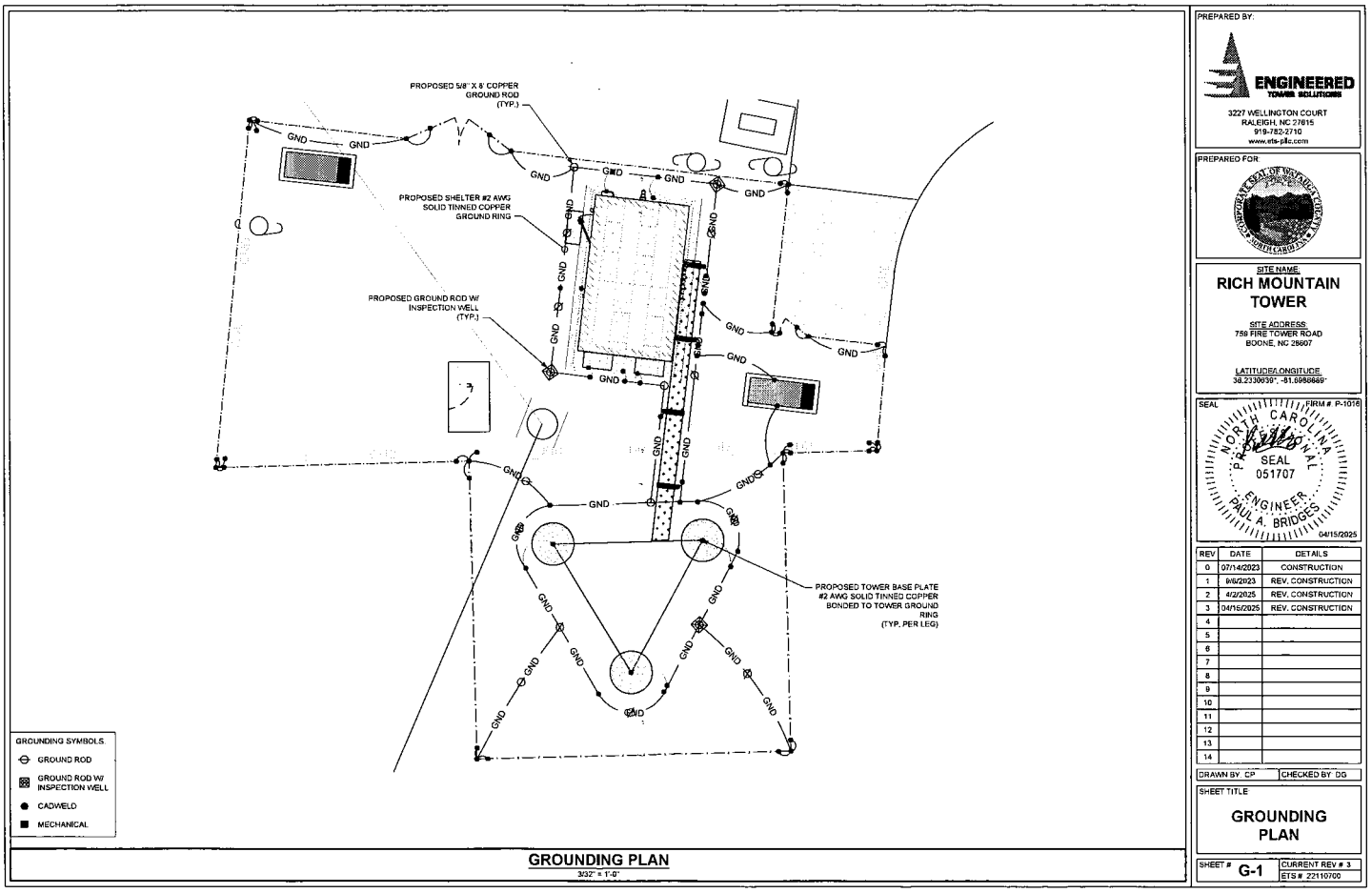
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
PANEL SCHEDULES

SHEET # E-4 | CURRENT REV # 3 | ETS # 22110700



GROUNDING PLAN

3/32" = 1'-0"

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
758 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/ONGITUDE:
36.2330659°, -81.5980669°

SEAL — FIRM # P-1018

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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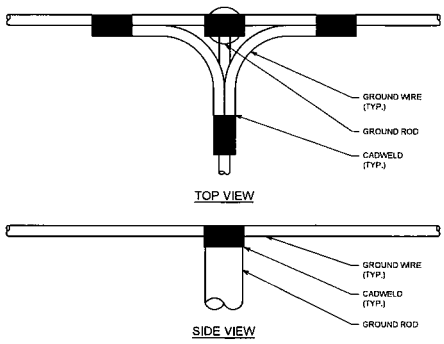
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
GROUNDING PLAN

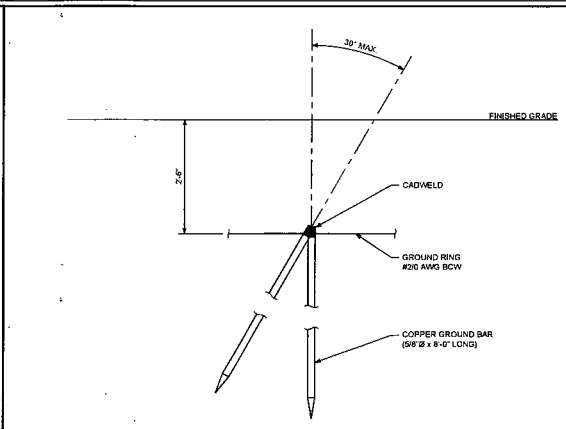
SHEET # **G-1** | CURRENT REV # 3 | ETS # 22110700

NOTES:
- MINIMUM SPACING OF 1'-0" BETWEEN ALL CADWELDS



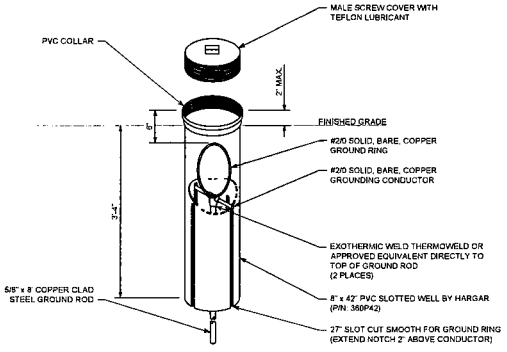
CADWELD GROUNDING DETAIL

N.T.S.



COPPER-CLAD STEEL GROUND ROD

N.T.S.



GROUND ROD WITH INSPECTION WELL

N.T.S.

1. GROUNDING ELECTRODES SHALL BE CONNECTED IN A RING USING #2 AWG SOLID TINNED BARE WIRE. THE TOP OF THE GROUND RODS AND THE RING CONDUCTOR SHALL BE 30 INCHES BELOW FINISHED GRADE OR BELOW FROST LINE, WHICHEVER IS GREATER. GROUNDING ELECTRODES SHALL BE INSTALLED A MINIMUM SPACING OF 16'-0"
2. BONDING OF THE GROUNDED CONDUCTOR (NEUTRAL) AND THE GROUNDING CONDUCTOR SHALL BE AT THE SERVICE DISCONNECTING MEANS. BONDING JUMPER SHALL BE INSTALLED PER N.E.C. ARTICLE 250.30
3. CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER WHEN THE GROUNDING SYSTEM IS COMPLETE. THE CONSTRUCTION MANAGER SHALL INSPECT THE GROUNDING SYSTEM PRIOR TO BACKFILLING.
4. GROUND-RINGS SHALL BE INSTALLED IN DIRECT CONTACT WITH THE EARTH AT A DEPTH OF 30 INCHES BELOW THE EARTH'S SURFACE WHEREVER POSSIBLE, OR BELOW THE FROST LINE, WHICHEVER IS DEEPER (ANSI T1.334-2002, SECTION 5.3.1 AND NFPA 70-2005, ARTICLE 250.53)
   A. BUILDING GROUND RINGS SHALL BE INSTALLED AT LEAST 3 FEET FROM THE BUILDING FOUNDATION AND SHOULD BE INSTALLED BEYOND THE DRIP LINE OF THE ROOF. IT IS RECOMMENDED THAT THE BUILDING GROUND RING AND GROUND RODS BE POSITIONED 2 FEET TO 6 FEET OUTSIDE OF THE DRIP LINE OF THE BUILDING OR STRUCTURE TO ENSURE THAT PRECIPITATION WETS THE EARTH AROUND THE GROUND RING AND RODS (MIL-HDBK-419A AND MIL-STD-188-124B)
   B. TOWER GROUND RINGS SHALL BE INSTALLED AT LEAST 2 FEET FROM THE TOWER FOUNDATION (ANSI T1.334-2002, SECTION 5.3.1)
5. BOND PPC AND EQUIPMENT ENCLOSURES TO BURIED GROUNDING CONDUCTOR. USE A NEMA DRILLED TWO-HOLE CONNECTOR FOR BONDS TO EQUIPMENT ENCLOSURES. USE AN APPROVED CONDUIT CLAMP FOR CONNECTIONS TO SERVICE CONDUITS. EXOTHERMICALLY WELD CONNECTIONS TO GROUNDING CONDUCTOR.
6. 5/8" x 8'-0" LONG GROUND ROD. SPACING BETWEEN RODS, AS SHOWN (NON-LINEAR). PROVIDE TEE TYPE EXOTHERMIC WELD TO BOND GROUND ROD TO BURIED GROUND RING, TYPICAL FOR ALL GROUND RODS SHOWN AROUND TOWER. SEE GROUND ROD INSPECTION SLEEVE DETAIL.
7. BOND ALL EXTERIOR CONDUITS, PIPES AND CYLINDRICAL METALLIC OBJECTS WITH A PENN-UNION GT SERIES CLAMP, BLACKBURN GUV SERIES CLAMP OR A BURNDY GAR 3900/3U SERIES CLAMP.
8. BEFORE AND AFTER INSTALLATION IS COMPLETED IN CONFORMANCE WITH THESE DRAWINGS AND THE STANDARD SPECIFICATIONS, THE CONTRACTOR SHALL CONFIRM THE IMPEDANCE (GROUND RESISTANCE) TO EARTH AND BETWEEN GROUNDING CIRCUITS. THE GROUNDING SYSTEM IS EXPECTED TO PROVIDE FOR A MAXIMUM EARTH RESISTANCE OF 5 OHMS. THE CONTRACTOR SHALL NOTIFY THE OWNER PRIOR TO ALL TESTING AND SHALL FURTHER NOTIFY THE OWNER IN THE EVENT THE EARTH RESISTANCE IS GREATER THAN 10 OHMS. USE 3 POINT FALL OF POTENTIAL METHOD.
9. ALL GROUNDING CONNECTIONS SHALL BE MADE WITH CADWELDS U.N.O.
10. CONTRACTOR SHALL FIELD VERIFY THE LOCATION OF EXISTING UNDERGROUND UTILITIES. HAND DIG IN THIS VICINITY TO PROTECT FROM DAMAGE.
11. ALL BENDS ON THE GROUND CONDUCTOR TO BE MADE WITH A MINIMUM 8" RADIUS. BENDS ARE NOT TO EXCEED 90° PER NFPA 780-2004, SECTION 4.9.5 AND ANSI T1.313-2003.
12. GROUNDING SHALL BE IN ACCORDANCE WITH THE FOLLOWING MOTOROLA R56 STANDARD PRACTICES (AS REQUIRED): (GENERAL CONTRACTOR SHALL CONFIRM LATEST STANDARDS)
    A. 68E03.016.02.004 BONDING, GROUNDING AND TRANSIENT PROTECTION
    B. 68E03.016.10.002 SITE RESISTANCE TO EARTH TESTING
    C. REFER TO DETAILS FOR ADDITIONAL INFORMATION AND REQUIREMENTS
13. CONTRACTOR SHALL TEST EXISTING GROUND RING FOR TOWER BEFORE START OF AND AFTER COMPLETION OF CONSTRUCTION TO VERIFY LESS THAN 5 OHMS RESISTANCE.

PREPARED BY:

ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6966889°

SEAL — FIRM # P-1019

NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
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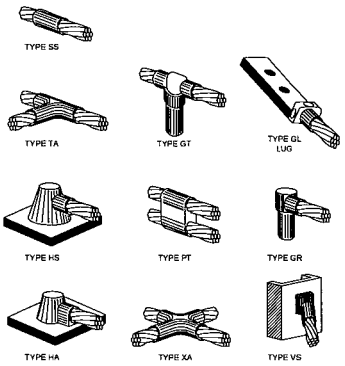
DRAWN BY: CP | CHECKED BY: DG

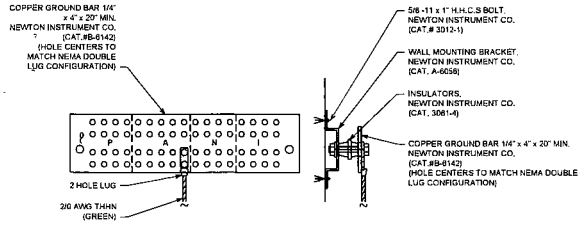
SHEET TITLE:
GROUNDING DETAILS I

SHEET # G-2.1 | CURRENT REV # 3 | ETS # 22110700



STANDARD CADWELD DETAILS
N.T.S.

NOTES
- COPPER BUS BAR (17 RUNS, 0.75", 0.815" OR 1" VARIABLE SPACING) WITH 2 HOLE LUG AND 2/0 AWG CU PIGTAIL
- TWO HOLE LUGS SHALL BE USED
- FOR MASTER GROUND BAR (INSIDE SHELTER), USE #2/0 AWG THHN (GREEN) CONDUCTOR
- ALL EXTERNAL GROUND BARS SHALL BE TINNED
- PAINT SCHEME ONLY APPLIES TO MASTER GROUND BAR



STANDARD GROUND BAR DETAIL
N.T.S.

NOT USED
N.T.S.

NOT USED
N.T.S.

PREPARED BY:
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3227 WELLINGTON COURT
RALEIGH, NC 27615
919-782-2710
www.ets-plic.com

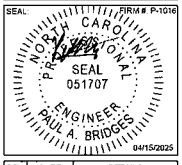
PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2350835°, -81.6988888°

SEAL: FIRM # P-1016



REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	8/8/2023	REV. CONSTRUCTION
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DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
GROUNDING DETAILS II

SHEET # **G-2.2** | CURRENT REV # 3
ETS # 22110700

800 MHz Corporate Collinear Antennas

746-870 MHz

CC807 Series

RFI TECHNOLOGY SOLUTIONS

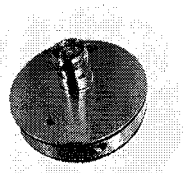
These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

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 from 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.

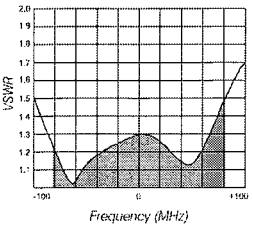
Gain is maximised and side lobes reduced dramatically. In a patented design approach the individual dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.

Features:

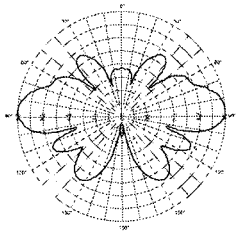
- 500W Continuous Power rating for CC807-11, CC807-08, CC807-06
- -150dBc Passive Intermodulation (PIM) rating
- 25 kW Peak Instantaneous (PIP) rating
- Extraordinary bandwidth characteristics with superior pattern control
- DC grounding on all elements for the ultimate in lightning protection and dissipation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



Typical VSWR Response (CC807-06)



CC807-06 - E Plane



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	Full Band			
VSWR *(Return Loss)*	< 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 (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length *mm (inches)*		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter *mm (inches)*		76 (3)			
Weight *kg (lbs)*		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight *kg (lbs)*		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions *mm (inches)*	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 *cm² (ft²)*	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 *N* (100 mph lbs)		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating *km/h (mph)*	No Ice	>240 (>150)			
Torque @ 160km/h *Nm* (100mph ft-lbs)		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.

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UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION
ANTENNA STRUCTURE REGISTRATION

OWNER: Engineered Tower Solutions, PLLC

FCC Registration Number (FRN): 0028400505

ATTN: Eric Dickerson **Engineered Tower Solutions, PLLC** **3227 Wellington Ct** **Raleigh, NC 27615**	**Antenna Structure Registration Number** **1327000** **Issue Date** **01/10/2024**
Location of Antenna Structure **759 Fire Tower Road** **Boone, NC 28607** **County: WATAUGA**	**Ground Elevation (AMSL)** **1423.0 meters** **Overall Height Above Ground (AGL)** **61.0 meters**
Latitude **36- 13- 58.8 N** **Longitude** **081- 41- 55.3 W** **NAD83**	**Overall Height Above Mean Sea Level (AMSL)** **1484.0 meters**
Center of Array Coordinates **N/A**	**Type of Structure** **LTOWER** **Lattice Tower**

Painting and Lighting Requirements:

FAA Chapters 4, 8, 15

Paint and Light in Accordance with FAA Circular Number 70/7460-1M

Conditions:

This registration is effective upon completion of the described antenna structure and notification to the Commission. **YOU MUST NOTIFY THE COMMISSION WITHIN 5 DAYS OF COMPLETION OF CONSTRUCTION OR CANCELLATION OF YOUR PROJECT, please file FCC Form 854.** To file electronically, connect to the antenna structure registration system by pointing your web browser to https://www.fcc.gov/antenna-structure-registration. Electronic filing is required. Use purpose code "NT" for notification of completion of construction; use purpose code "CA" to cancel your registration.

The Antenna Structure Registration is not an authorization to construct radio facilities or transmit radio signals. It is necessary that all radio equipment on this structure be covered by a valid FCC license or construction permit.

You must immediately provide a copy of this Registration to all tenant licensees and permittees sited on the structure described on this Registration (although not required, you may want to use Certified Mail to obtain proof of receipt), and *display* your Registration Number at the site. See reverse for important information about the Commission's Antenna Structure Registration rules.

FCC 854R
June 2021

You must comply with all applicable FCC obstruction marking and lighting requirements, as set forth in Part 17 of the Commission's Rules (47 C.F.R. Part 17). These rules include, but are not limited to:

- ***Posting the Registration Number:*** The Antenna Structure Registration Number must be displayed in a conspicuous place so that it is readily visible near the base of the antenna structure. Materials used to display the Registration Number must be weather-resistant and of sufficient size to be easily seen at the base of the antenna structure. Exceptions exist for certain historic structures. See 47 C.F.R. 17.4(g)-(h).

- ***Inspecting lights and equipment:*** The obstruction lighting must be observed at least every 24 hours in order to detect any outages or malfunctions. Lighting equipment, indicators, and associated devices must be inspected at least once every three months.

- ***Reporting outages and malfunctions:*** When any top steady-burning light or a flashing light (in any position) burns out or malfunctions, the outage must be reported to the nearest FAA Flight Service Station, unless corrected within 30 minutes. The FAA must again be notified when the light is restored. The owner must also maintain a log of these outages and malfunctions.

- ***Maintaining assigned painting:*** The antenna structure must be repainted as often as necessary to maintain good visibility.

- ***Complying with environmental rules:*** If you certified that grant of this registration would not have a significant environmental impact, you must nevertheless maintain all pertinent records and be ready to provide documentation supporting this certification and compliance with the rules, in the event that such information is requested by the Commission pursuant to 47 C.F.R. 1.1307(d).

- ***Updating information:*** The owner must notify the FCC of proposed modifications to this structure; of any change in ownership; or, within 30 days of dismantlement of the structure.

Copies of the Code of Federal Regulations (which contain the FCC's antenna structure registration rules, 47 C.F.R Part 17) are available from the Government Printing Office (GPO). To purchase CFR volumes, call (202) 512-1800. For GPO Customer Service, call (202) 512-1803. For additional FCC information, consult the Antenna Homepage on the internet at https://www.fcc.gov/antenna-structure-registration or call (877) 480-3201 (TTY 717-338-2824).

DB224-A

1-port omni exposed dipole antenna, 150–160 MHz, 360° HPBW, fixed electrical tilt

- Broad response
- Two-piece mast for ease of shipping

General Specifications

Antenna Type	Omni
Band	Single band
Color	Silver
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Performance Note	Outdoor usage
Radiator Material	Aluminum
RF Connector Interface	N Male
RF Connector Location	Bottom
RF Connector Quantity, low band	1
RF Connector Quantity, total	1

Dimensions

Length	6477 mm | 255 in
Net Weight, without mounting kit	15.9 kg | 35.053 lb

Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	150 – 160 MHz
Polarization	Vertical

Electrical Specifications

Frequency Band, MHz	**150–160**
Gain, dBi	8.1
Beamwidth, Horizontal, degrees	360
Beamwidth, Vertical, degrees	16

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COMMSCOPE®

DB224-A

Beam Tilt, degrees	0
VSWR | Return loss, dB	1.5 | 14.0
Input Power per Port, maximum, watts	500

Mechanical Specifications

Wind Loading @ Velocity, maximum	560.5 N @ 100 mph (126.0 lbf @ 100 mph)
Wind Speed, maximum	130 km/h (81 mph)

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system

Included Products

DB365-OS	–	Pipe Mounting Kit that consists of two clamps for mounting antennas to round members 1.25 - 3.5 in (35 - 89 mm) OD round members.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

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COMMSCOPE®

K-Co Enterprises, Inc.

613 Hurricane Creek Rd

Piedmont, SC 29673

Bid for: Aho Tower Modification – Watauga County, NC

814 W King St.

Boone, NC 28607

Please give Ernie Rood a call at 864-947-8704 with any questions.

THE CINCINNATI INSURANCE COMPANY
THE CINCINNATI CASUALTY COMPANY

Fairfield, Ohio

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That THE CINCINNATI INSURANCE COMPANY and THE CINCINNATI CASUALTY COMPANY, corporations organized under the laws of the State of Ohio, and having their principal offices in the City of Fairfield, Ohio (herein collectively called the "Companies"), do hereby constitute and appoint

Brooks M Keys, Jr., J. DuPre Keys, John B Ross, John B Ross, Jr., James G Culwell

of Belton, SC
their true and legal Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and deliver on behalf of the Companies as Surety, any and all bonds, policies, undertakings or other like instruments, as follows:

Five Million Dollars and 00/100 ($5,000,000.00)

This appointment is made under and by authority of the following resolutions adopted by the Boards of Directors of The Cincinnati Insurance Company and The Cincinnati Casualty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the President or any Senior Vice President be hereby authorized, and empowered to appoint Attorneys-in-Fact of the Company to execute any and all bonds, policies, undertakings, or other like instruments on behalf of the Corporation, and may authorize any officer or any such Attorney-in-Fact to affix the corporate seal; and may with or without cause modify or revoke any such appointment or authority. Any such writings so executed by such Attorneys-in-Fact shall be binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company.

RESOLVED, that the signature of the President or any Senior Vice President and the seal of the Company may be affixed by facsimile on any power of attorney granted, and the signature of the Secretary or Assistant Vice-President and the Seal of the Company may be affixed by facsimile to any certificate of any such power and any such power of certificate bearing such facsimile signature and seal shall be valid and binding on the Company. Any such power so executed and sealed and certified by certificate so executed and sealed shall, with respect to any bond or undertaking to which it is attached, continue to be valid and binding on the Company.

IN WITNESS WHEREOF, the Companies have caused these presents to be sealed with their corporate seals, duly attested by their President or any Senior Vice President this 16th day of March, 2021.

THE CINCINNATI INSURANCE COMPANY
THE CINCINNATI CASUALTY COMPANY

STATE OF OHIO)SS:
COUNTY OF BUTLER)

On this 16th day of March, 2021 before me came the above-named President or Senior Vice President of The Cincinnati Insurance Company and The Cincinnati Casualty Company, to me personally known to be the officer described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of said Companies and the corporate seals and the signature of the officer were duly affixed and subscribed to said instrument by the authority and direction of said corporations.

Keith Collett, Attorney at Law
Notary Public – State of Ohio
My commission has no expiration date.
Section 147.03 O.R.C.

I, the undersigned Secretary or Assistant Vice-President of The Cincinnati Insurance Company and The Cincinnati Casualty Company, hereby certify that the above is the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Power of Attorney is still in full force and effect.

Given under my hand and seal of said Companies at Fairfield, Ohio, this day of

BN-1457 (3/21)

THE CINCINNATI INSURANCE COMPANY

Bid Bond

CONTRACTOR (Name, legal status and address):

K-Co Enterprises, Inc.
613 Hurricane Creek Rd
Piedmont, SC 29673

SURETY (Name, legal status and principal place of business):

THE CINCINNATI INSURANCE COMPANY
6200 S. GILMORE ROAD
FAIRFIELD, OHIO 45014-5141

OWNER (Name, legal status and address):
Watauga County
814 King Street
Boone, NC 28607

This document has important legal consequences, Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

BOND AMOUNT:
5% of bid

PROJECT (Name, location or address, and Project number, if any):
provide steel and labor to install steel upgrade

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond the sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirements shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 13 day of June, 2025

	K-Co Enterprises, Inc.
(Witness)	*(Principal)* *(Seal)*
	(Title)
Ashlea E Kobylarski	**THE CINCINNATI INSURANCE COMPANY**
(Witness)	*(Surety)* *(Seal)*
	(Title)

The Company executing this bond vouches that this document conforms to American Institute of Architects Document **A310**, 2010 Edition.
S-2000-AIA (11/10) PUBLIC

Watauga County BIDDER: K-Co Enterprises, Inc.

TOWER MOD BREAKDOWN:

1. Total cost of tower modification materials only $ 1407.00

2. Total cost of tower modification labor only $ 3,770.00

3. Total cost of tower modification $ 5177.00

BIDDER: K-Co Enterprises, Inc.

WATAUGA COUNTY, NC **BID #**	**INVITATION FOR BIDS – Aho - Viper**
	Bids will be publicly opened: June 13th, 2025 at 3:00pm
	Questions Due by: June 2nd, 2025
Refer ALL 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: K-Co Enterprises, Inc.		FEDERAL ID OR SOCIAL SECURITY NO. 26-1278195	
STREET ADDRESS: 613 Hurricane Creek Rd.		P.O. BOX:	ZIP:
CITY & STATE & ZIP: Piedmont, SC 29673		TELEPHONE NUMBER: 864-947-8704	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: Ernest Rood - Project Manager		FAX NUMBER: 864-947-8204	
AUTHORIZED SIGNATURE: Ernest Rood	DATE: 6-11-25	E-MAIL: bids@kcoenterprises.com	

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).

FOR Watauga County, NC USE ONLY

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 re-usable 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.

DELIVERED BY US POSTAL SERVICE	**DELIVERED BY ANY OTHER MEANS** **SEND SUCH AS FEDX, UPS, ETC. FOR NEXT DAY**
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** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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 66585

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** X **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** X **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** X **No**_____

TOWER MODIFICATION DRAWINGS (SOW)

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

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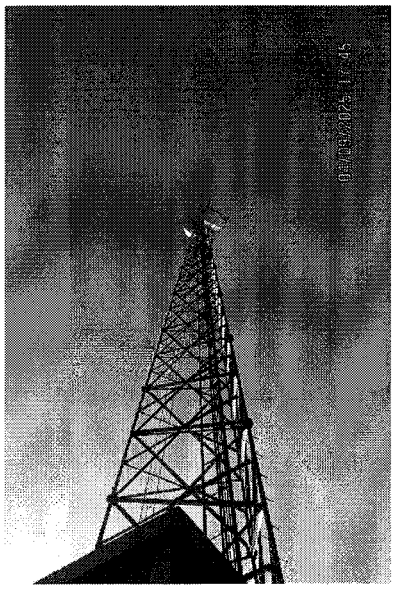
PRE MODIFICATION INSPECTION REPORT

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

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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

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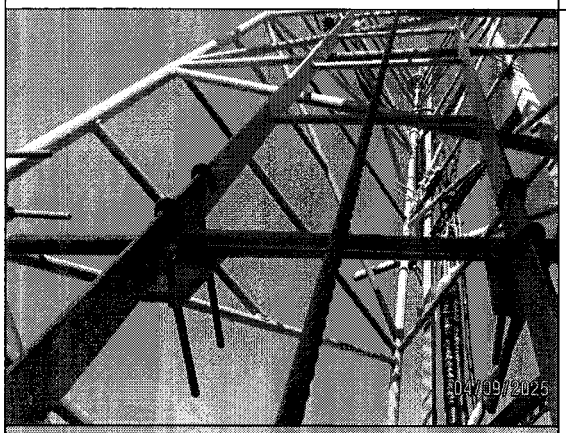
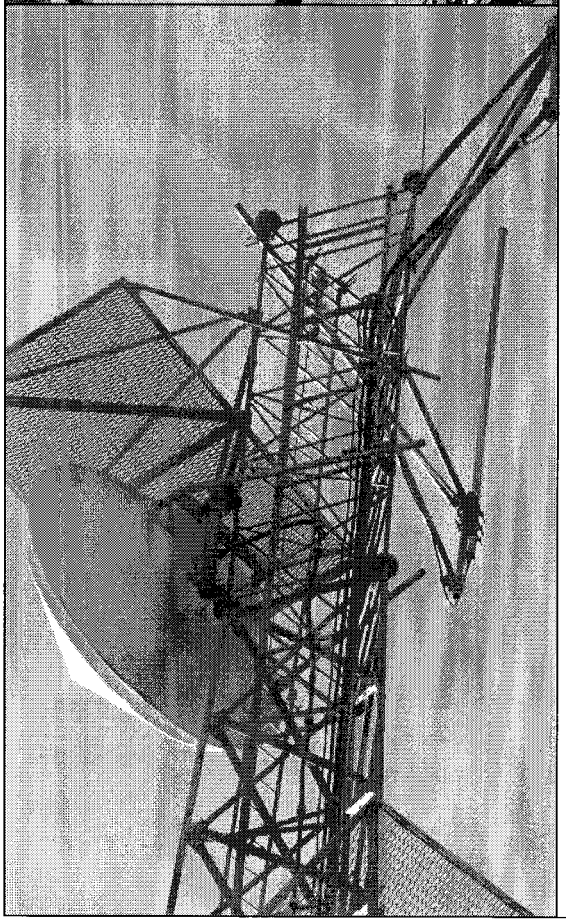
EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
 	**Item 1 – Tower Section Details** **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"

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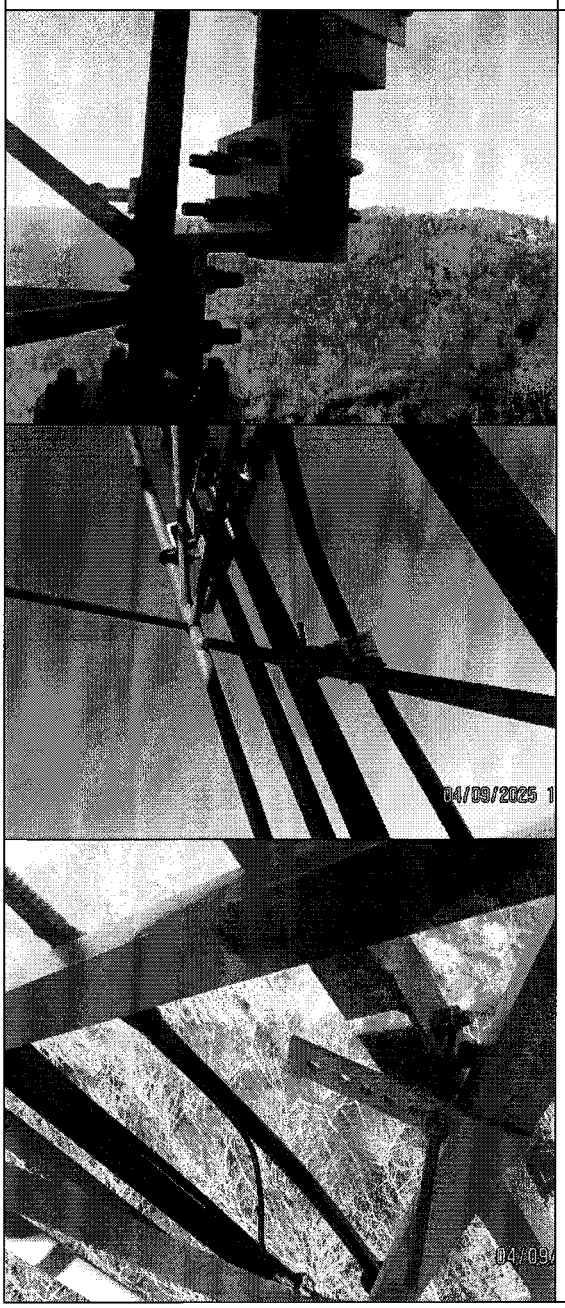
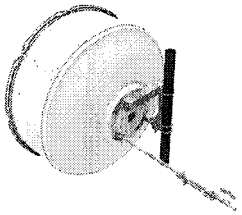
TOWER SOLUTIONS

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	**Item 3 – Miscellaneous Obstructions** **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" o MP (1) P4.5"Øx5'-0" o 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

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

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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

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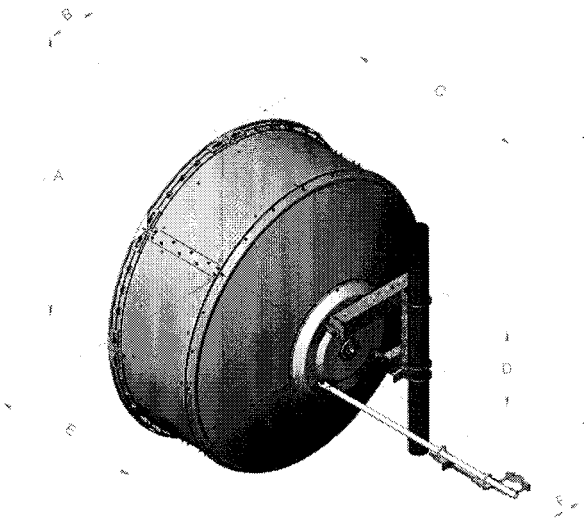
Antenna Dimensions and Mounting Information



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

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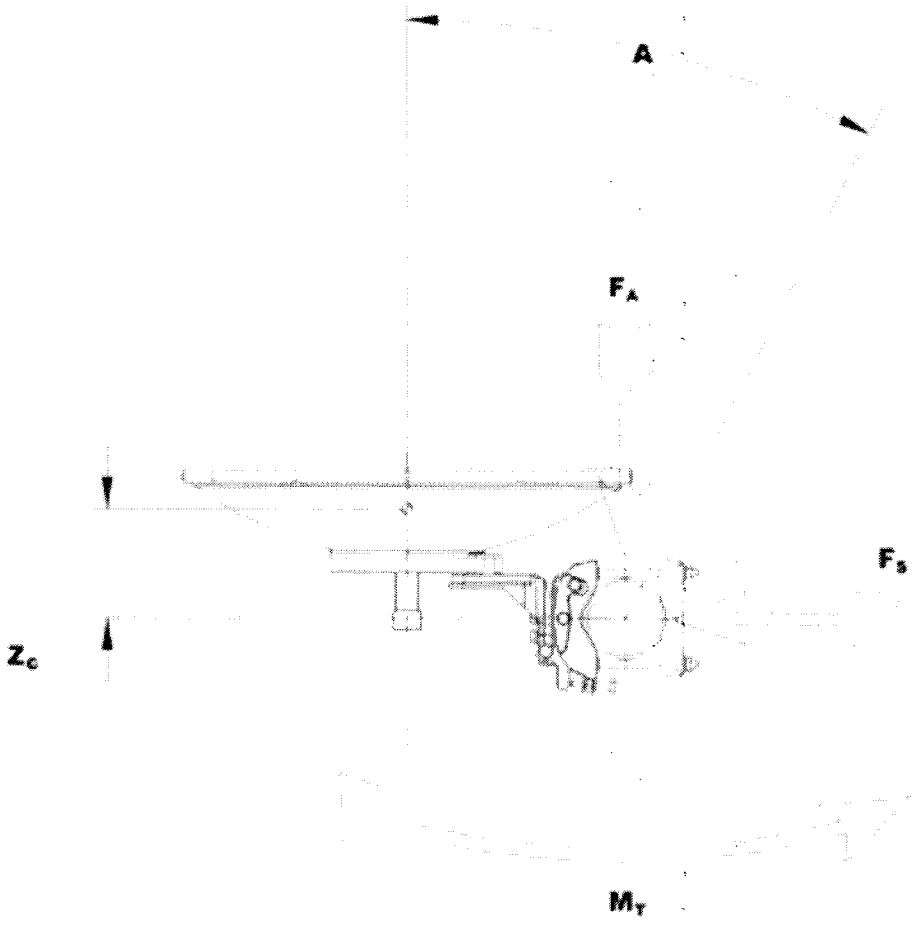
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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HX6-6W

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

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800 MHz Corporate Collinear Antennas

746-870 MHz

CC807 Series

RFI TECHNOLOGY SOLUTIONS

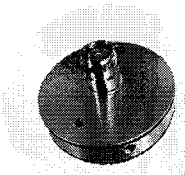
These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

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 from 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.

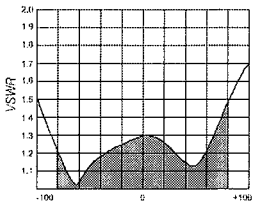
Gain is maximised and side lobes reduced dramatically. In a patented design approach the individual dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.

Features:

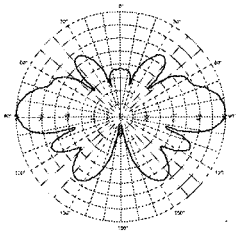
- 500W Continuous Power rating for CC807-11, CC807-08, CC807-06
- -150dBc Passive Intermodulation (PIM) rating
- 25 kW Peak Instantaneous (PIP) rating
- Extraordinary bandwidth characteristics with superior pattern control
- DC grounding on all elements for the ultimate in lightning protection and dissipation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



Typical VSWR Response (CC807-06)



CC807-06 - E Plane



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	Full Band			
VSWR *(Return Loss)*	< 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 (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length *mm (inches)*		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter *mm (inches)*		76 (3)			
Weight *kg (lbs)*		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight *kg (lbs)*		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions *mm (inches)*	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 cm^2 *(ft²)*	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 *N* (100 mph lbs)		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating *km/h (mph)*	No Ice	>240 (>150)			
Torque @ 160km/h *Nm* (100mph ft-lbs)		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.

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Date: **March 26, 2025**

ENGINEERED TOWER SOLUTIONS

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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**

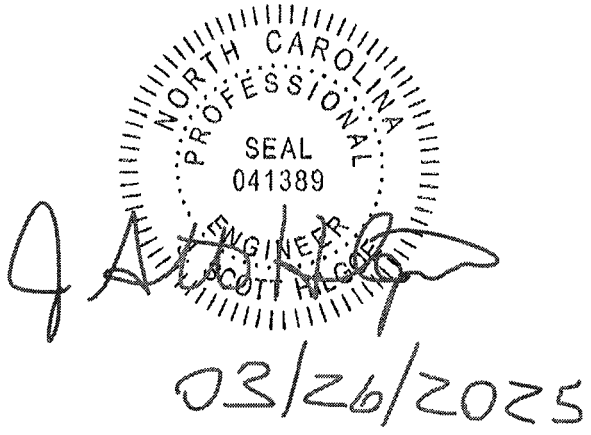
This analysis utilizes an ultimate 3-second gust wind speed of 140 mph (converted to an equivalent 108 mph nominal 3-second gust wind speed per Section 1609.3.1 for use with TIA-222 G) as required by the 2018 North Carolina State Building Code (2015 IBC). Applicable Standard references and design criteria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



03/26/2025

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tnxTower Output

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APPENDIX D
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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**	**Ubiquiri 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 Iar= 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

tnxTower Report – version 8.3.1.2

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:

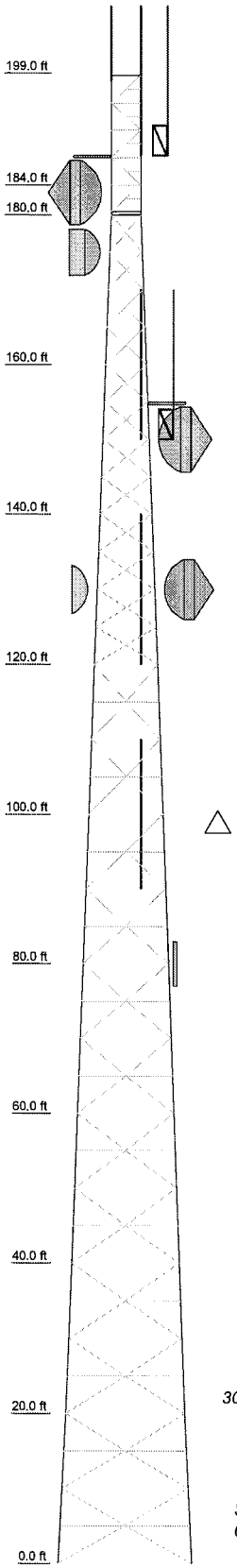
Critical Deflections and Radius of Curvature - Service Wind

Elevation *ft*	*Appurtenance*	*Gov. Load Comb.*	*Deflection* *in*	*Tilt* °	*Twist* °	*Radius of Curvature* *ft*
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

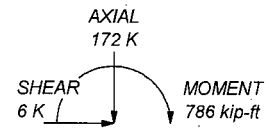
Section	T11	T10	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	SR 4 1/4		SR 4	SR 3 3/4	SR 3 1/2	SR 3 1/4	SR 3	SR 2 3/4	SR 2 1/4		SR 1 1/2
Leg Grade	A572-50										
Diagonals	L3 1/2 x 3 1/2 x 1/4			L3x3x1/4		L2 1/2x2 1/2x1/4		L2x2x1/4		A	SR 1
Diagonal Grade	A36										
Top Girts	N.A.								L2x2x3/16	N.A.	SR 1 1/8
Bottom Girts	N.A.									B	N.A.
Horizontals	L3 1/2 x 3 1/2 x 1/4		L3x3x3/16		L2 1/2x2 1/2x3/16		N.A.				SR 1
Sec. Horizontals	N.A.										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	3.0	2.7	2.3	1.8	1.4	0.2 / 0.6



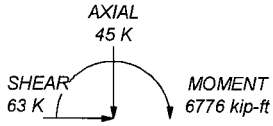
ALL REACTIONS ARE FACTORED

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

UPLIFT: -390 K
SHEAR: 34 K



TORQUE 6 kip-ft
30 mph WIND - 1.0000 in ICE



TORQUE 62 kip-ft
REACTIONS - 108 mph WIND

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	App'd:
Code: TIA-222-G	Date: 03/25/25	Scale: NTS
Path:		Dwg No. E-1

tnxTower	Job: Aho - Viper	Page: 1 of 44
Engineered Tower Solutions, PLLC *3227 Wellington Ct.* *Raleigh, NC 27615* *Phone: (919) 782-2710* *FAX: 919-782-2710*	Project: ETS, PLLC Job No. 24125019.STR.8180	Date: 15:46:29 03/25/25
	Client: Watauga County	Designed by: hicham.anssar

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 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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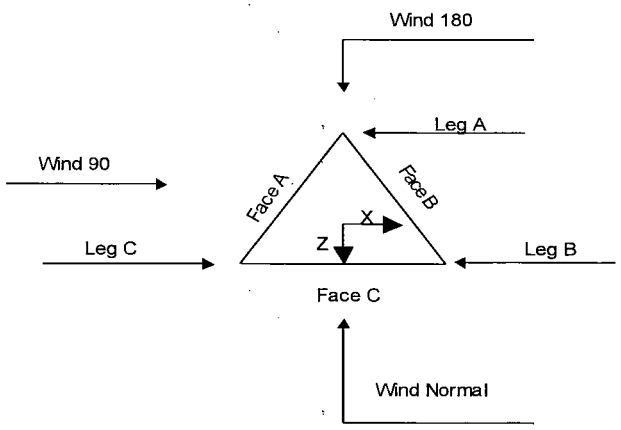

Triangular Tower

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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Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset 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 ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
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 ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
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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Tower Elevation ft	Gusset Area (per face) ft²	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
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
			(36 ksi)						
T9 60.00-40.00	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
			(36 ksi)						
T10 40.00-20.00	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
			(36 ksi)						
T11 20.00-0.00	0.00	0.3750	A36	1	1	1	36.0000	36.0000	36.0000
			(36 ksi)						

Tower Section Geometry *(cont'd)*

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

[1]*Note: 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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	Client: Watauga County	Designed by: hicham.anssar

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
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	U	Net Width Deduct in	U	Net Width Deduct in	U
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
T5 140.00-120.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
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	0.0000	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)
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	0.0000	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)
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	0.0000	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)
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	0.0000	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)
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	0.0000	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)
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	0.0000	0.75 (1)	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	Flange	0.7500	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
199.00-184.03		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
T2	Flange	0.7500	4	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
184.03-180.00		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
T3	Flange	1.0000	4	0.6250	1	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0
180.00-160.00		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
T4	Flange	1.0000	4	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
160.00-140.00		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
T5	Flange	1.0000	4	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
140.00-120.00		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
T6	Flange	1.0000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
120.00-100.00		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
T7	Flange	1.0000	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
100.00-80.00		A325X		A325X		A325X		A325N		A325N		A325X		A325N	
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
		A325X>1"		A325X		A325X		A325N		A325N		A325X		A325N	
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
		A325X>1"		A325X		A325X		A325N		A325N		A325X		A325N	
T10	Flange	1.2500	6	0.7500	1	0.6250	0	0.6250	0	0.6250	0	0.7500	1	0.6250	0
40.00-20.00		A325X>1"		A325X		A325X		A325N		A325N		A325X		A325N	
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
		A325X>1"		A325X		A325X		A325N		A325N		A325X		A325N	

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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	Client: Watauga County	Designed by: hicham.anssar

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_AA_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_AA_A In Face ft^2	C_AA_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_AA_A In Face ft^2	C_AA_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_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	253.215	0.000	4.46
T8	80.00-60.00	A	2.695	0.000	0.000	58.457	0.000	1.22
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	260.257	0.000	4.51
T9	60.00-40.00	A	2.606	0.000	0.000	57.030	0.000	1.16
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	254.363	0.000	4.30
T10	40.00-20.00	A	2.476	0.000	0.000	74.977	0.000	1.29
		B		0.000	0.000	20.023	0.000	0.22
		C		0.000	0.000	245.789	0.000	4.01
T11	20.00-0.00	A	2.219	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	120.00 - 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

tnxTower	Job: Aho - Viper	Page: 14 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125019.STR.8180	Date: 15:46:29 03/25/25
	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
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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	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
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 Rung	0.00 - 20.00	0.6000	0.6000
T11	12	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 ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_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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	Client: Watauga County	Designed by: hicham.anssar

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_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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	Client: Watauga County	Designed by: hicham.anssar

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1/2" 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	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
AM-V5G-Ti	B	From Leg	1.00	0.00	80.00	No Ice	0.74	0.41	0.01
			0.00			1/2" Ice	0.86	0.51	0.01
			0.00			1" Ice	0.99	0.62	0.02
***									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / 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	60.00		183.00	8.62	No Ice	58.31	0.29
				0.00					1/2" Ice	59.45	0.59
				0.00					1" Ice	60.58	0.90
***											
PAD8-65AC1S1R	B	Paraboloid w/Radome	From Leg	1.50	0.00		150.00	8.62	No Ice	58.31	0.29
				0.00					1/2" Ice	59.45	0.59
				0.00					1" Ice	60.58	0.90
***											
HX6-6W-6WH	C	Paraboloid w/Shroud (HP)	From Leg	1.50	74.50		175.00	6.23	No Ice	30.48	0.19
				0.00					1/2" Ice	31.30	0.35
				0.00					1" Ice	32.13	0.51
***											
PAD6-65B	C	Paraboloid w/o Radome	From Leg	1.50	0.00		130.00	6.58	No Ice	34.04	0.19
				0.00					1/2" Ice	34.90	0.36
				0.00					1" Ice	35.77	0.54
***											
PAD8-65B	B	Paraboloid w/Radome	From Leg	1.50	0.00		130.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.32	0.55
				0.00					1" Ice	52.37	0.81
***											

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 ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	191.51	1.451	42	61.772	A	0.000	6.824	3.744	54.86	11.481	0.000
199.00-184.03					B	0.000	6.824		54.86	0.000	0.000
					C	0.000	7.470		50.12	23.507	0.000
T2	182.01	1.436	42	16.603	A	0.000	2.526	1.006	39.83	3.086	0.000
184.03-180.00					B	0.000	2.526		39.83	0.000	0.000
					C	0.000	2.688		37.44	7.003	0.000
T3	170.00	1.415	41	98.753	A	9.476	7.507	7.507	44.20	15.333	0.000
180.00-160.00					B	9.476	7.507		44.20	0.000	0.000
					C	9.476	7.507		44.20	38.874	0.000
T4	150.00	1.378	40	129.587	A	10.286	9.175	9.175	47.15	15.333	0.000
160.00-140.00					B	10.286	9.175		47.15	0.000	0.000
					C	10.286	9.175		47.15	49.839	0.000
T5	130.00	1.337	39	160.004	A	14.881	10.009	10.009	40.21	15.333	0.000
140.00-120.00					B	14.881	10.009		40.21	0.000	0.000
					C	14.881	10.009		40.21	56.128	0.000
T6	110.00	1.291	38	190.420	A	16.971	10.843	10.843	38.98	15.333	0.000
120.00-100.00					B	16.971	10.843		38.98	0.000	0.000
					C	16.971	10.843		38.98	60.386	0.000
T7	90.00	1.238	36	220.837	A	18.647	11.678	11.678	38.51	15.333	0.000
100.00-80.00					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	30.00	0.982	29	312.088	A	28.233	14.180	14.180	33.43	16.733	0.000
40.00-20.00					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 ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	191.51	1.451	3	2.9806	69.211	A	0.000	39.827	18.622	46.76	47.189	0.000
199.00-184.03						B	0.000	39.827		46.76	0.000	0.000
						C	0.000	44.323		42.01	92.523	0.000
T2	182.01	1.436	3	2.9655	18.592	A	0.000	12.928	4.985	38.56	12.635	0.000
184.03-180.00						B	0.000	12.928		38.56	0.000	0.000
						C	0.000	14.047		35.49	27.733	0.000
T3	170.00	1.415	3	2.9453	108.577	A	9.476	55.071	27.161	42.08	62.459	0.000
180.00-160.00						B	9.476	55.071		42.08	0.000	0.000
						C	9.476	55.071		42.08	153.054	0.000
T4	150.00	1.378	3	2.9087	139.289	A	10.286	58.505	28.585	41.55	61.872	0.000
160.00-140.00						B	10.286	58.505		41.55	0.000	0.000
						C	10.286	58.505		41.55	196.287	0.000
T5	130.00	1.337	3	2.8674	169.568	A	14.881	63.278	29.143	37.29	61.211	0.000
140.00-120.00						B	14.881	63.278		37.29	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	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	14.881	63.278		37.29	224.428	0.000
T6 120.00-100.00	110.00	1.291	3	2.8199	199.827	A	16.971	62.971	29.660	37.10	60.451	0.000
						B	16.971	62.971		37.10	0.000	0.000
						C	16.971	62.971		37.10	243.333	0.000
T7 100.00-80.00	90.00	1.238	2	2.7638	230.057	A	18.647	66.084	30.120	35.55	59.555	0.000
						B	18.647	66.084		35.55	0.000	0.000
						C	18.647	66.084		35.55	253.215	0.000
T8 80.00-60.00	70.00	1.174	2	2.6952	260.245	A	20.389	68.919	30.497	34.15	58.457	0.000
						B	20.389	68.919		34.15	0.000	0.000
						C	20.389	68.919		34.15	260.257	0.000
T9 60.00-40.00	50.00	1.094	2	2.6061	290.364	A	26.068	71.220	30.736	31.59	57.030	0.000
						B	26.068	71.220		31.59	0.000	0.000
						C	26.068	71.220		31.59	254.363	0.000
T10 40.00-20.00	30.00	0.982	2	2.4763	320.348	A	28.233	72.411	30.704	30.51	74.977	0.000
						B	28.233	72.411		30.51	20.023	0.000
						C	28.233	72.411		30.51	245.789	0.000
T11 20.00-0.00	10.00	0.850	2	2.2186	354.497	A	32.247	69.889	29.006	28.40	66.495	0.000
						B	32.247	69.889		28.40	18.205	0.000
						C	32.247	69.889		28.40	165.106	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 199.00-184.03	191.51	1.451	11	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	11	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	11	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	11	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	10	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	10	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	10	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	9	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	9	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

tnxTower	Job: Aho - Viper	Page: 20 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T10	30.00	0.982	8	312.088	A	28.233	14.180	14.180	33.43	16.733	0.000
40.00-20.00					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	7	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 Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	42	1	1	3.854	1.13	75.56	C
199.00-184.03			B	0.11	2.922		1	1	3.854			
			C	0.121	2.881		1	1	4.222			
T2	0.10	0.19	A	0.152	2.764	42	1	1	1.434	0.35	86.36	C
184.03-180.00			B	0.152	2.764		1	1	1.434			
			C	0.162	2.728		1	1	1.529			
T3	0.52	1.37	A	0.172	2.692	41	1	1	13.756	2.36	118.06	C
180.00-160.00			B	0.172	2.692		1	1	13.756			
			C	0.172	2.692		1	1	13.756			
T4	0.57	1.83	A	0.15	2.771	40	1	1	15.494	2.73	136.32	C
160.00-140.00			B	0.15	2.771		1	1	15.494			
			C	0.15	2.771		1	1	15.494			
T5	0.59	2.34	A	0.156	2.751	39	1	1	20.499	3.22	160.87	C
140.00-120.00			B	0.156	2.751		1	1	20.499			
			C	0.156	2.751		1	1	20.499			
T6	0.60	2.67	A	0.146	2.786	38	1	1	22.935	3.43	171.42	C
120.00-100.00			B	0.146	2.786		1	1	22.935			
			C	0.146	2.786		1	1	22.935			
T7	0.61	3.03	A	0.137	2.819	36	1	1	24.947	3.52	176.23	C
100.00-80.00			B	0.137	2.819		1	1	24.947			
			C	0.137	2.819		1	1	24.947			
T8	0.61	3.41	A	0.131	2.843	34	1	1	27.027	3.54	177.09	C
80.00-60.00			B	0.131	2.843		1	1	27.027			
			C	0.131	2.843		1	1	27.027			
T9	0.61	4.05	A	0.14	2.809	32	1	1	33.095	3.74	186.87	C
60.00-40.00			B	0.14	2.809		1	1	33.095			
			C	0.14	2.809		1	1	33.095			
T10	0.65	4.50	A	0.136	2.824	29	1	1	35.670	3.58	179.20	C
40.00-20.00			B	0.136	2.824		1	1	35.670			
			C	0.136	2.824		1	1	35.670			
T11	0.59	4.85	A	0.134	2.832	25	1	1	39.879	3.16	158.18	C
20.00-0.00			B	0.134	2.832		1	1	39.879			
			C	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

tnxTower	Job: Aho - Viper	Page: 21 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	42	0.8	1	3.854	1.10	73.38	A
199.00-184.03			B	0.11	2.922		0.8	1	3.854			
			C	0.121	2.881		0.8	1	4.222			
T2	0.10	0.19	A	0.152	2.764	42	0.8	1	1.434	0.34	84.53	A
184.03-180.00			B	0.152	2.764		0.8	1	1.434			
			C	0.162	2.728		0.8	1	1.529			
T3	0.52	1.37	A	0.172	2.692	41	0.8	1	11.861	2.18	109.10	A
180.00-160.00			B	0.172	2.692		0.8	1	11.861			
			C	0.172	2.692		0.8	1	11.861			
T4	0.57	1.83	A	0.15	2.771	40	0.8	1	13.437	2.53	126.57	A
160.00-140.00			B	0.15	2.771		0.8	1	13.437			
			C	0.15	2.771		0.8	1	13.437			
T5	0.59	2.34	A	0.156	2.751	39	0.8	1	17.523	2.95	147.29	A
140.00-120.00			B	0.156	2.751		0.8	1	17.523			
			C	0.156	2.751		0.8	1	17.523			
T6	0.60	2.67	A	0.146	2.786	38	0.8	1	19.541	3.13	156.27	A
120.00-100.00			B	0.146	2.786		0.8	1	19.541			
			C	0.146	2.786		0.8	1	19.541			
T7	0.61	3.03	A	0.137	2.819	36	0.8	1	21.218	3.20	160.09	A
100.00-80.00			B	0.137	2.819		0.8	1	21.218			
			C	0.137	2.819		0.8	1	21.218			
T8	0.61	3.41	A	0.131	2.843	34	0.8	1	22.949	3.20	160.21	A
80.00-60.00			B	0.131	2.843		0.8	1	22.949			
			C	0.131	2.843		0.8	1	22.949			
T9	0.61	4.05	A	0.14	2.809	32	0.8	1	27.881	3.34	167.00	A
60.00-40.00			B	0.14	2.809		0.8	1	27.881			
			C	0.14	2.809		0.8	1	27.881			
T10	0.65	4.50	A	0.136	2.824	29	0.8	1	30.024	3.20	159.77	A
40.00-20.00			B	0.136	2.824		0.8	1	30.024			
			C	0.136	2.824		0.8	1	30.024			
T11	0.59	4.85	A	0.134	2.832	25	0.8	1	33.429	2.78	138.92	A
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	42	0.85	1	3.854	1.12	74.96	B
199.00-184.03			B	0.11	2.922		0.85	1	3.854			
			C	0.121	2.881		0.85	1	4.222			
T2	0.10	0.19	A	0.152	2.764	42	0.85	1	1.434	0.35	86.09	B
184.03-180.00			B	0.152	2.764		0.85	1	1.434			
			C	0.162	2.728		0.85	1	1.529			
T3	0.52	1.37	A	0.172	2.692	41	0.85	1	12.335	2.26	112.87	B
180.00-160.00			B	0.172	2.692		0.85	1	12.335			
			C	0.172	2.692		0.85	1	12.335			
T4	0.57	1.83	A	0.15	2.771	40	0.85	1	13.951	2.61	130.50	B
160.00-140.00			B	0.15	2.771		0.85	1	13.951			
			C	0.15	2.771		0.85	1	13.951			

tnxTower	Job: Aho - Viper	Page: 22 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T5	0.59	2.34	A	0.156	2.751	39	0.85	1	18.267	3.04	152.14	B
140.00-120.00			B	0.156	2.751		0.85	1	18.267			
			C	0.156	2.751		0.85	1	18.267			
T6	0.60	2.67	A	0.146	2.786	38	0.85	1	20.390	3.23	161.46	B
120.00-100.00			B	0.146	2.786		0.85	1	20.390			
			C	0.146	2.786		0.85	1	20.390			
T7	0.61	3.03	A	0.137	2.819	36	0.85	1	22.150	3.31	165.47	B
100.00-80.00			B	0.137	2.819		0.85	1	22.150			
			C	0.137	2.819		0.85	1	22.150			
T8	0.61	3.41	A	0.131	2.843	34	0.85	1	23.968	3.31	165.71	B
80.00-60.00			B	0.131	2.843		0.85	1	23.968			
			C	0.131	2.843		0.85	1	23.968			
T9	0.61	4.05	A	0.14	2.809	32	0.85	1	29.185	3.46	173.15	B
60.00-40.00			B	0.14	2.809		0.85	1	29.185			
			C	0.14	2.809		0.85	1	29.185			
T10	0.65	4.50	A	0.136	2.824	29	0.85	1	31.435	3.31	165.44	B
40.00-20.00			B	0.136	2.824		0.85	1	31.435			
			C	0.136	2.824		0.85	1	31.435			
T11	0.59	4.85	A	0.134	2.832	25	0.85	1	35.042	2.89	144.36	B
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	3.02	3.09	A	0.575	1.821	3	1	1	29.013	0.27	18.22	C
199.00-184.03			B	0.575	1.821		1	1	29.013			
			C	0.64	1.785		1	1	34.129			
T2	0.87	0.87	A	0.695	1.776	3	1	1	10.443	0.08	19.17	C
184.03-180.00			B	0.695	1.776		1	1	10.443			
			C	0.756	1.79		1	1	11.963			
T3	4.66	6.19	A	0.594	1.808	3	1	1	50.244	0.40	19.89	C
180.00-160.00			B	0.594	1.808		1	1	50.244			
			C	0.594	1.808		1	1	50.244			
T4	5.25	6.95	A	0.494	1.908	3	1	1	50.170	0.48	24.07	C
160.00-140.00			B	0.494	1.908		1	1	50.170			
			C	0.494	1.908		1	1	50.170			
T5	5.58	8.54	A	0.461	1.956	3	1	1	56.941	0.54	27.22	C
140.00-120.00			B	0.461	1.956		1	1	56.941			
			C	0.461	1.956		1	1	56.941			
T6	5.80	9.12	A	0.4	2.064	3	1	1	57.037	0.59	29.58	C
120.00-100.00			B	0.4	2.064		1	1	57.037			
			C	0.4	2.064		1	1	57.037			
T7	5.72	9.84	A	0.368	2.13	2	1	1	59.824	0.59	29.60	C
100.00-80.00			B	0.368	2.13		1	1	59.824			
			C	0.368	2.13		1	1	59.824			
T8	5.72	10.53	A	0.343	2.188	2	1	1	62.673	0.59	29.43	C
80.00-60.00			B	0.343	2.188		1	1	62.673			
			C	0.343	2.188		1	1	62.673			

tnxTower	Job: Aho - Viper	Page: 23 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T9	5.46	12.02	A	0.335	2.207	2	1	1	69.555	0.57	28.58	C
60.00-40.00			B	0.335	2.207		1	1	69.555			
			C	0.335	2.207		1	1	69.555			
T10	5.52	12.49	A	0.314	2.259	2	1	1	71.931	0.55	27.32	C
40.00-20.00			B	0.314	2.259		1	1	71.931			
			C	0.314	2.259		1	1	71.931			
T11	3.86	12.48	A	0.288	2.328	2	1	1	73.852	0.42	21.09	C
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	3.02	3.09	A	0.575	1.821	3	0.8	1	29.013	0.26	17.61	C
199.00-184.03			B	0.575	1.821		0.8	1	29.013			
			C	0.64	1.785		0.8	1	34.129			
T2	0.87	0.87	A	0.695	1.776	3	0.8	1	10.443	0.08	18.73	C
184.03-180.00			B	0.695	1.776		0.8	1	10.443			
			C	0.756	1.79		0.8	1	11.963			
T3	4.66	6.19	A	0.594	1.808	3	0.8	1	48.349	0.39	19.48	A
180.00-160.00			B	0.594	1.808		0.8	1	48.349			
			C	0.594	1.808		0.8	1	48.349			
T4	5.25	6.95	A	0.494	1.908	3	0.8	1	48.112	0.47	23.62	A
160.00-140.00			B	0.494	1.908		0.8	1	48.112			
			C	0.494	1.908		0.8	1	48.112			
T5	5.58	8.54	A	0.461	1.956	3	0.8	1	53.964	0.53	26.57	A
140.00-120.00			B	0.461	1.956		0.8	1	53.964			
			C	0.461	1.956		0.8	1	53.964			
T6	5.80	9.12	A	0.4	2.064	3	0.8	1	53.643	0.58	28.83	A
120.00-100.00			B	0.4	2.064		0.8	1	53.643			
			C	0.4	2.064		0.8	1	53.643			
T7	5.72	9.84	A	0.368	2.13	2	0.8	1	56.095	0.58	28.78	A
100.00-80.00			B	0.368	2.13		0.8	1	56.095			
			C	0.368	2.13		0.8	1	56.095			
T8	5.72	10.53	A	0.343	2.188	2	0.8	1	58.595	0.57	28.56	A
80.00-60.00			B	0.343	2.188		0.8	1	58.595			
			C	0.343	2.188		0.8	1	58.595			
T9	5.46	12.02	A	0.335	2.207	2	0.8	1	64.342	0.55	27.54	A
60.00-40.00			B	0.335	2.207		0.8	1	64.342			
			C	0.335	2.207		0.8	1	64.342			
T10	5.52	12.49	A	0.314	2.259	2	0.8	1	66.284	0.53	26.28	A
40.00-20.00			B	0.314	2.259		0.8	1	66.284			
			C	0.314	2.259		0.8	1	66.284			
T11	3.86	12.48	A	0.288	2.328	2	0.8	1	67.403	0.40	20.03	A
20.00-0.00			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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	Client: Watauga County	Designed by: hicham.anssar

Tower Forces - With Ice - 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 ft²	F K	w plf	Ctrl. Face
T1	3.02	3.09	A	0.575	1.821	3	0.85	1	29.013	0.26	17.41	B
199.00-184.03			B	0.575	1.821		0.85	1	29.013			
			C	0.64	1.785		0.85	1	34.129			
T2	0.87	0.87	A	0.695	1.776	3	0.85	1	10.443	0.07	18.48	C
184.03-180.00			B	0.695	1.776		0.85	1	10.443			
			C	0.756	1.79		0.85	1	11.963			
T3	4.66	6.19	A	0.594	1.808	3	0.85	1	48.823	0.40	20.03	B
180.00-160.00			B	0.594	1.808		0.85	1	48.823			
			C	0.594	1.808		0.85	1	48.823			
T4	5.25	6.95	A	0.494	1.908	3	0.85	1	48.627	0.48	24.14	B
160.00-140.00			B	0.494	1.908		0.85	1	48.627			
			C	0.494	1.908		0.85	1	48.627			
T5	5.58	8.54	A	0.461	1.956	3	0.85	1	54.708	0.54	27.06	B
140.00-120.00			B	0.461	1.956		0.85	1	54.708			
			C	0.461	1.956		0.85	1	54.708			
T6	5.80	9.12	A	0.4	2.064	3	0.85	1	54.492	0.59	29.32	B
120.00-100.00			B	0.4	2.064		0.85	1	54.492			
			C	0.4	2.064		0.85	1	54.492			
T7	5.72	9.84	A	0.368	2.13	2	0.85	1	57.027	0.58	29.20	B
100.00-80.00			B	0.368	2.13		0.85	1	57.027			
			C	0.368	2.13		0.85	1	57.027			
T8	5.72	10.53	A	0.343	2.188	2	0.85	1	59.615	0.58	28.97	B
80.00-60.00			B	0.343	2.188		0.85	1	59.615			
			C	0.343	2.188		0.85	1	59.615			
T9	5.46	12.02	A	0.335	2.207	2	0.85	1	65.645	0.56	27.96	B
60.00-40.00			B	0.335	2.207		0.85	1	65.645			
			C	0.335	2.207		0.85	1	65.645			
T10	5.52	12.49	A	0.314	2.259	2	0.85	1	67.696	0.53	26.69	B
40.00-20.00			B	0.314	2.259		0.85	1	67.696			
			C	0.314	2.259		0.85	1	67.696			
T11	3.86	12.48	A	0.288	2.328	2	0.85	1	69.015	0.41	20.48	B
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	11	1	1	3.854	0.30	20.28	C
199.00-184.03			B	0.11	2.922		1	1	3.854			
			C	0.121	2.881		1	1	4.222			
T2	0.10	0.19	A	0.152	2.764	11	1	1	1.434	0.09	23.18	C
184.03-180.00			B	0.152	2.764		1	1	1.434			
			C	0.162	2.728		1	1	1.529			

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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T3	0.52	1.37	A	0.172	2.692	11	1	1	13.756	0.63	31.68	C
180.00-160.00			B	0.172	2.692		1	1	13.756			
			C	0.172	2.692		1	1	13.756			
T4	0.57	1.83	A	0.15	2.771	11	1	1	15.494	0.73	36.59	C
160.00-140.00			B	0.15	2.771		1	1	15.494			
			C	0.15	2.771		1	1	15.494			
T5	0.59	2.34	A	0.156	2.751	10	1	1	20.567	0.87	43.26	C
140.00-120.00			B	0.156	2.751		1	1	20.567			
			C	0.156	2.751		1	1	20.567			
T6	0.60	2.67	A	0.146	2.786	10	1	1	23.121	0.92	46.23	C
120.00-100.00			B	0.146	2.786		1	1	23.121			
			C	0.146	2.786		1	1	23.121			
T7	0.61	3.03	A	0.137	2.819	10	1	1	25.261	0.95	47.66	C
100.00-80.00			B	0.137	2.819		1	1	25.261			
			C	0.137	2.819		1	1	25.261			
T8	0.61	3.41	A	0.131	2.843	9	1	1	27.469	0.96	48.02	C
80.00-60.00			B	0.131	2.843		1	1	27.469			
			C	0.131	2.843		1	1	27.469			
T9	0.61	4.05	A	0.14	2.809	9	1	1	33.629	1.01	50.70	C
60.00-40.00			B	0.14	2.809		1	1	33.629			
			C	0.14	2.809		1	1	33.629			
T10	0.65	4.50	A	0.136	2.824	8	1	1	36.263	0.97	48.64	C
40.00-20.00			B	0.136	2.824		1	1	36.263			
			C	0.136	2.824		1	1	36.263			
T11	0.59	4.85	A	0.134	2.832	7	1	1	40.280	0.86	42.78	C
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	11	0.8	1	3.854	0.29	19.69	A
199.00-184.03			B	0.11	2.922		0.8	1	3.854			
			C	0.121	2.881		0.8	1	4.222			
T2	0.10	0.19	A	0.152	2.764	11	0.8	1	1.434	0.09	22.69	A
184.03-180.00			B	0.152	2.764		0.8	1	1.434			
			C	0.162	2.728		0.8	1	1.529			
T3	0.52	1.37	A	0.172	2.692	11	0.8	1	11.861	0.59	29.28	A
180.00-160.00			B	0.172	2.692		0.8	1	11.861			
			C	0.172	2.692		0.8	1	11.861			
T4	0.57	1.83	A	0.15	2.771	11	0.8	1	13.437	0.68	33.97	A
160.00-140.00			B	0.15	2.771		0.8	1	13.437			
			C	0.15	2.771		0.8	1	13.437			
T5	0.59	2.34	A	0.156	2.751	10	0.8	1	17.591	0.79	39.61	A
140.00-120.00			B	0.156	2.751		0.8	1	17.591			
			C	0.156	2.751		0.8	1	17.591			
T6	0.60	2.67	A	0.146	2.786	10	0.8	1	19.727	0.84	42.16	A
120.00-100.00			B	0.146	2.786		0.8	1	19.727			
			C	0.146	2.786		0.8	1	19.727			

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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7	0.61	3.03	A	0.137	2.819	10	0.8	1	21.531	0.87	43.33	A
100.00-80.00			B	0.137	2.819		0.8	1	21.531			
			C	0.137	2.819		0.8	1	21.531			
T8	0.61	3.41	A	0.131	2.843	9	0.8	1	23.391	0.87	43.49	A
80.00-60.00			B	0.131	2.843		0.8	1	23.391			
			C	0.131	2.843		0.8	1	23.391			
T9	0.61	4.05	A	0.14	2.809	9	0.8	1	28.416	0.91	45.37	A
60.00-40.00			B	0.14	2.809		0.8	1	28.416			
			C	0.14	2.809		0.8	1	28.416			
T10	0.65	4.50	A	0.136	2.824	8	0.8	1	30.616	0.87	43.43	A
40.00-20.00			B	0.136	2.824		0.8	1	30.616			
			C	0.136	2.824		0.8	1	30.616			
T11	0.59	4.85	A	0.134	2.832	7	0.8	1	33.831	0.75	37.61	A
20.00-0.00			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 ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	11	0.85	1	3.854	0.30	20.12	B
199.00-184.03			B	0.11	2.922		0.85	1	3.854			
			C	0.121	2.881		0.85	1	4.222			
T2	0.10	0.19	A	0.152	2.764	11	0.85	1	1.434	0.09	23.10	B
184.03-180.00			B	0.152	2.764		0.85	1	1.434			
			C	0.162	2.728		0.85	1	1.529			
T3	0.52	1.37	A	0.172	2.692	11	0.85	1	12.335	0.61	30.29	B
180.00-160.00			B	0.172	2.692		0.85	1	12.335			
			C	0.172	2.692		0.85	1	12.335			
T4	0.57	1.83	A	0.15	2.771	11	0.85	1	13.951	0.70	35.02	B
160.00-140.00			B	0.15	2.771		0.85	1	13.951			
			C	0.15	2.771		0.85	1	13.951			
T5	0.59	2.34	A	0.156	2.751	10	0.85	1	18.335	0.82	40.91	B
140.00-120.00			B	0.156	2.751		0.85	1	18.335			
			C	0.156	2.751		0.85	1	18.335			
T6	0.60	2.67	A	0.146	2.786	10	0.85	1	20.575	0.87	43.56	B
120.00-100.00			B	0.146	2.786		0.85	1	20.575			
			C	0.146	2.786		0.85	1	20.575			
T7	0.61	3.03	A	0.137	2.819	10	0.85	1	22.464	0.90	44.77	B
100.00-80.00			B	0.137	2.819		0.85	1	22.464			
			C	0.137	2.819		0.85	1	22.464			
T8	0.61	3.41	A	0.131	2.843	9	0.85	1	24.410	0.90	44.96	B
80.00-60.00			B	0.131	2.843		0.85	1	24.410			
			C	0.131	2.843		0.85	1	24.410			
T9	0.61	4.05	A	0.14	2.809	9	0.85	1	29.719	0.94	47.02	B
60.00-40.00			B	0.14	2.809		0.85	1	29.719			
			C	0.14	2.809		0.85	1	29.719			
T10	0.65	4.50	A	0.136	2.824	8	0.85	1	32.028	0.90	44.95	B
40.00-20.00			B	0.136	2.824		0.85	1	32.028			
			C	0.136	2.824		0.85	1	32.028			

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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
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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	Client: Watauga County	Designed by: hicham.anssar

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 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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	Client: Watauga County	Designed by: hicham.anssar

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
			Max. Vx	14	-0.58	-0.00	-0.00
		Diagonal	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
			Max. Vy	32	-0.04	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
		Horizontal	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
			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
		Secondary Horizontal	Max Tension	8	0.00	-0.00	-0.00
			Max. Compression	20	-0.00	-0.00	-0.00
			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
		Top Girt	Max Tension	14	0.74	0.00	0.00
			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
T2	184.025 - 180	Leg	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
			Max. Vx	14	2.46	-0.27	-1.07
		Diagonal	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
			Max. Vy	34	-0.02	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
		Horizontal	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
			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
		Secondary Horizontal	Max Tension	8	0.00	-0.00	-0.00
			Max. Compression	20	-0.00	-0.00	-0.00

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	Client: Watauga County	Designed by: hicham.anssar

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			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
		Bottom Girt	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
T3	180 - 160	Leg	Max Tension	23	44.09	-0.02	0.01
			Max. Compression	10	-51.01	0.11	-0.02
			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
			Max. Vy	34	0.04	0.03	0.00
			Max. Vx	10	0.01	0.00	0.00
		Top Girt	Max Tension	11	0.85	0.00	0.00
			Max. Compression	12	-1.06	0.00	0.00
			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
T4	160 - 140	Leg	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
			Max. Vy	22	-1.03	-0.13	0.02
			Max. Vx	16	1.52	0.01	-0.04
		Diagonal	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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	Client: Watauga County	Designed by: hicham.anssar

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			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
		Horizontal	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
			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
T7	100 - 80	Leg	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
			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
		Diagonal	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
			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
		Horizontal	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
			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
T8	80 - 60	Leg	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
			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
		Diagonal	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
			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
		Horizontal	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
			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
T9	60 - 40	Leg	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
			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
		Diagonal	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
			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
		Horizontal	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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	Client: Watauga County	Designed by: hicham.anssar

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	33	0.11	0.15	0.05
			Max. Vx	31	-0.01	0.00	0.00
T10	40 - 20	Leg	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
			Max. Vy	10	0.73	1.93	0.03
			Max. Vx	12	0.47	-0.22	-1.70
		Diagonal	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
			Max. Vy	32	0.12	0.00	0.00
			Max. Vx	31	0.00	0.00	0.00
		Horizontal	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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	Client: Watauga County	Designed by: hicham.anssar

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 -	45.10	-30.13	-51.20	-5415.87	3224.09	-13.13

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	Client: Watauga County	Designed by: hicham.anssar

Load Combination	Vertical K	Shear$_x$ K	Shear$_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
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

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
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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	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
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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Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
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

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
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	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	
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] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

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	
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] $P_u / \phi P_n$ controls

Horizontal Design Data (Compression)

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	Client: Watauga County	Designed by: hicham.anssar

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
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] $P_u / \phi P_n$ 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] $P_u / \phi P_n$ 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] $P_u / \phi P_n$ controls

Bottom Girt Design Data (Compression)

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	Client: Watauga County	Designed by: hicham.anssar

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	
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	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	
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	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	
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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	Client: Watauga County	Designed by: hicham.anssar

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	
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] $P_u / \phi P_n$ 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	
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] $P_u / \phi P_n$ 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	
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] $P_u / \phi P_n$ 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	
T2	184.025 - 180	1	4.00	3.88	186.0	0.7854	2.19	25.45	0.086 [1]

[1] $P_u / \phi P_n$ controls

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	Client: Watauga County	Designed by: hicham.anssar

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{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
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	9.9	Pass

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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**

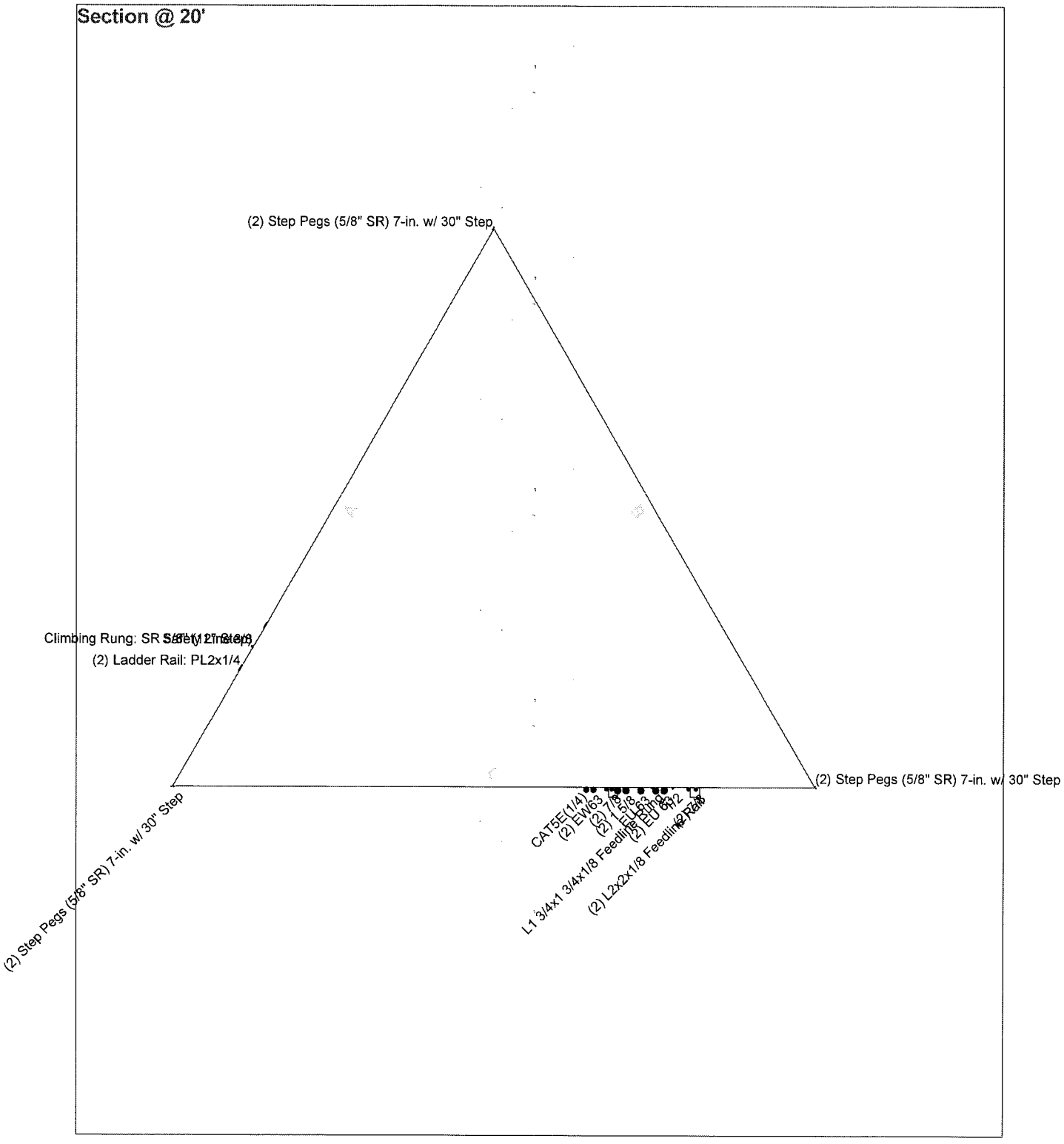
Program Version 8.3.1.2 - 12/11/2024 File:C:/Users/hicham.anssar/OneDrive - Engineered Tower Solutions/Desktop/2024/125019_1018_Aho_Mapping SA/SE/8180_Tower Modification Drawings/Analysis/Tower/Aho - Viper.eri

APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan
20'

_____ Round _____ Flat _____ App In Face ..... App Out Face



Engineered Tower Solutions, PLLC	Job: ***Aho - Viper***		
3227 Wellington Ct.	Project: ***ETS, PLLC Job No. 24125019.STR.8180***		
Raleigh, NC 27615	Client: Watauga County	Drawn by: nicham.anssar	App'd:
Phone: (919) 782-2710	Code: TIA-222-G	Date: 03/25/25	Scale: NTS
FAX: 919-782-2710	Path:		Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

Bolt-On Diagonal Bracing Design

Tower Section	180-184 ft
P_u	6.29 kip
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

Notes

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.

Member Type	Member	Area (in^2)	Moment of Inertia (in^4)	Radius of Gyration (in)	Unbraced Length (in)	KL/r	$Sc/r_{min(re\ rp)} \leq KmLu/r_m$
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
$KmLu/r_m$	124.72
λ_c	1.40
F_{crm}	15.87 ksi
øPn	11.22 kip
Compression Capacity	56.1%

Self Support Anchor Rod Capacity

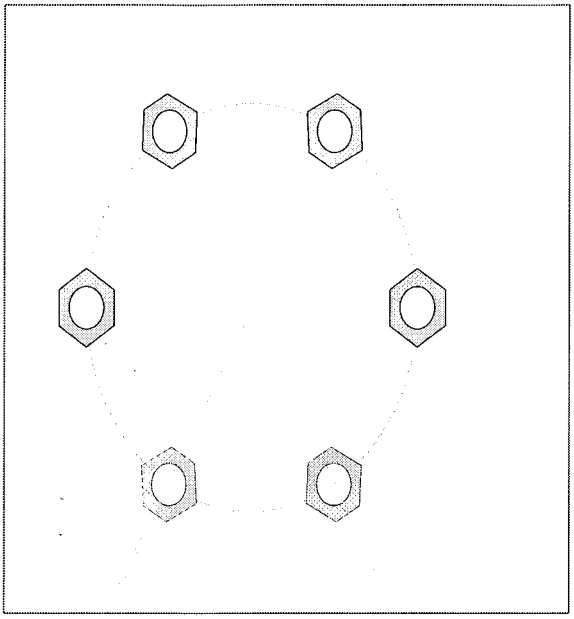
Site Info	
Site #	HP-1382
Site Name	Aho - Viper
ETS, PLLC #	24125019.STR.8180

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

Anchor Rod Data

(6) 1-1/4" ø bolts (F1554-105 N; Fy=105 ksi, Fu=125 ksi)

l_{ar} (in): 1.25

Analysis Results

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

Pu_c = 74.83	ϕPn_t = 96.9	**Stress Rating**
Vu = 6.5	ϕVn = n/a	**90.6%**
Mu = n/a	ϕMn = 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, bp_{dist}:	3	in

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

Pier Properties		
Pier Shape:	Circular	
Pier Diameter, **dpier**:	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, W_1:	31.00	ft
Pad Thickness, **T**:	1.75	ft
Pad Rebar Size (Bottom dir. 2), Sp_2:	10	
Pad Rebar Quantity (Bottom dir. 2), mp_2:	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

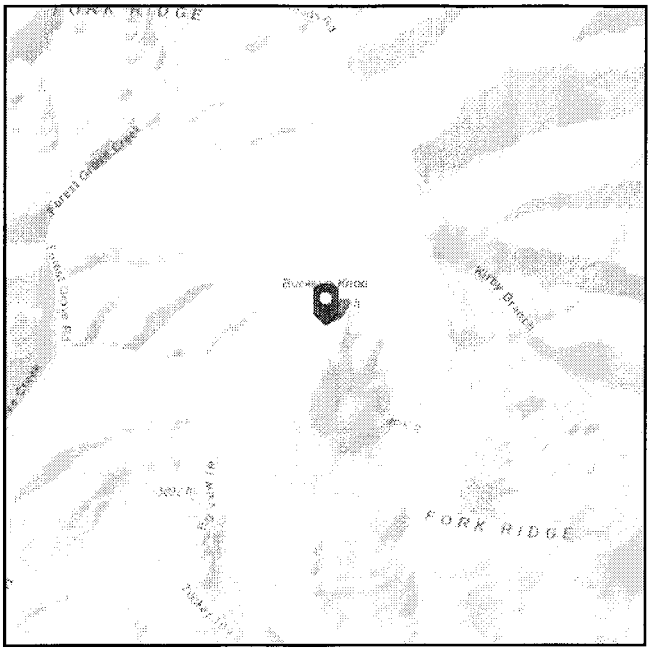
Soil Properties		
Total Soil Unit Weight, γ:	100	pcf
Ultimate Gross Bearing, Qult:	7.500	ksf
Cohesion, **Cu**:	0.000	ksf
Friction Angle, φ:	26	degrees
SPT Blow Count, N_{blows}:	6	
Base Friction, μ:	0.3	
Neglected Depth, **N**:	2.0	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	N/A	ft

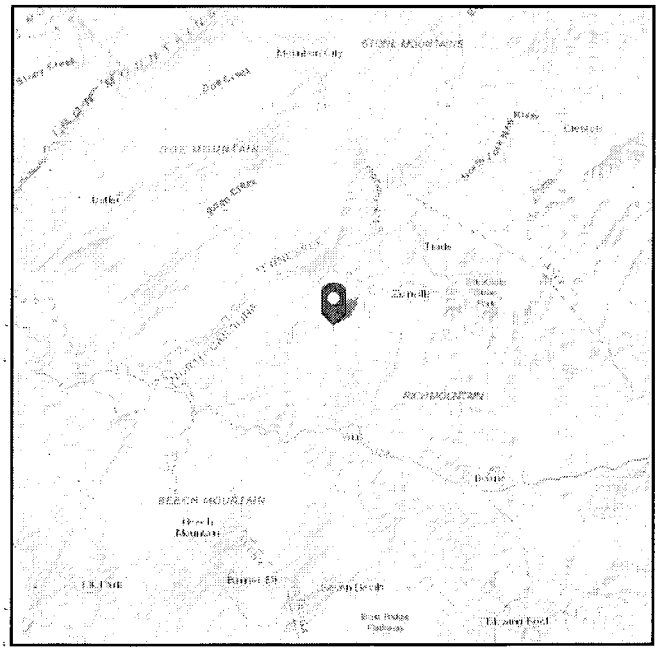
ASCE Hazards Report

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

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

ASCE
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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.

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Seismic

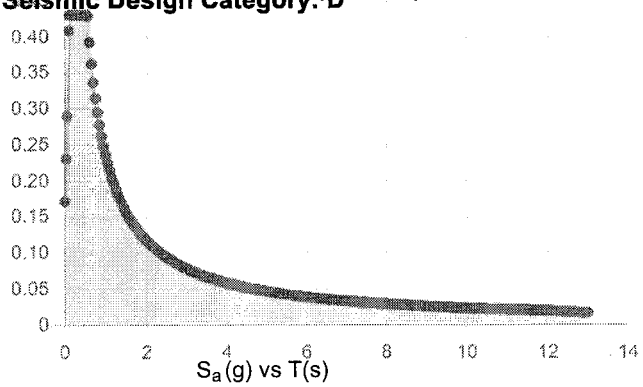
Site Soil Class: D - Stiff Soil

Results:

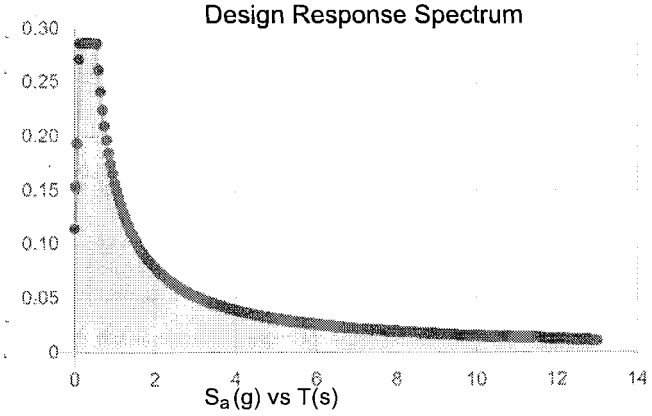
S_S :	0.272	S_{D1} :	0.157
S_1 :	0.098	T_L :	12
F_a :	1.582	PGA :	0.145
F_v :	2.4	PGA_M :	0.219
S_{MS} :	0.431	F_{PGA} :	1.51
S_{M1} :	0.236	I_e :	1.5
S_{DS} :	0.287		

Seismic Design Category: D

MCE_R Response Spectrum



Design Response Spectrum



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.

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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

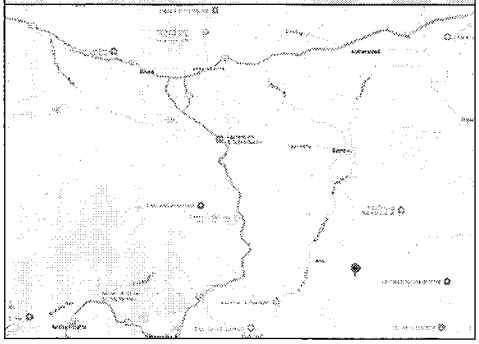
MODIFICATION DESIGN DRAWINGS

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 SW/KING ST/U.S. HWY 421 S (2.8 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.

SCAN CODE FOR DIRECTIONS

PROJECT CONTACTS

1. CLIENT REPRESENTATIVE

   MARTY RANDALL

   10-16 CONSULTING
   MOBILE: (828) 527-2416

   MARTY.RANDALL@1016CONSULTING.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 $500 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

SHEET #	REV. (DATE)	DESCRIPTION
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N-1	0 - 03/25/2025	MODIFICATION INSPECTION CHECKLIST
N-2	0 - 03/25/2025	PROJECT NOTES
BM	0 - 03/25/2025	BILL OF MATERIALS
S-1	0 - 03/25/2025	TOWER ELEVATION AND MODIFICATION SCHEDULE
S-2	0 - 03/25/2025	DIAGONAL REINFORCEMENT DETAILS
P-1	0 - 03/25/2025	PHOTOS
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PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

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

NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER J. SCOTT HILGOE 03/25/2025

REV	DATE	DETAILS
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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	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK: SOIL COMPACTION	FOUNDATION SOIL COMPACTION SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK: BEARING CAPACITY	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	MICROPILE/ROCK ANCHOR	MICROPILES/ROCK ANCHORS SHALL BE INSPECTED BY THE FOUNDATION INSPECTION VENDOR AND SHALL BE INCLUDED AS PART OF THE FOUNDATION INSPECTION REPORT. ADDITIONAL TESTING AND/OR INSPECTION REQUIREMENTS ARE NOTED IN THE PROJECT NOTES.
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.

PREPARED BY:
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SEAL: NC #P-1016
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 041389 SCOTT HILLIARD
03/25/2025

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SHEET TITLE:
MODIFICATION INSPECTION CHECKLIST

SHEET # N-1 | CURRENT REV #: 0 | ETS # 24125019,STR,6180

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 A568 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	+⅓ TURN BEYOND SNUG TIGHT
⅝"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
⅞"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 INCH LENGTH	+⅓ 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
⅝"	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
⅞"	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

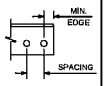
4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

NOMINAL HOLE DIMENSIONS

BOLT DIAMETER	STANDARD HOLE	SHORT SLOT
½	9/16	9/16 x 11/16
⅝	11/16	11/16 X ¾
¾	13/16	13/16 X 1
⅞	15/16	15/16 X 1⅛
1	1 1/16	1 1/16 X 1 5/16

BOLT EDGE AND SPACING

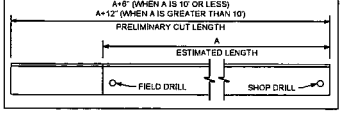
BOLT DIAMETER	MIN EDGE	SPACING
½	¾	1½
⅝	1⅛	1⅝
¾	1¼	2¼
⅞	1½	2⅝
1	1¾	3



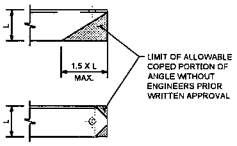
WORKABLE GAGES

LEG LENGTH	GAGE
4	2½
3½	2
3	1¾
2½	1⅜
2	1⅛
1¾	1

MEMBER LENGTHS



ALLOWABLE ANGLE COPE



PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
p: 919-792-2710, f: 919-435-0831
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

AHO - VIPER

SITE NUMBER:

HP-1382

SITE ADDRESS:
1388 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.692800°

SEAL: NC #P-1016

NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILLIARD

03/25/2025

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE

PROJECT NOTES

SHEET # N-2 | CURRENT REV #: 0 | ETS # 24125016.STR.6160

BILL OF MATERIALS

QUANTITY REQUIRED	MANUFACTURER	PART NUMBER	DESCRIPTION	LENGTH	DETAIL SHEET #	PART WEIGHT (LB)	TOTAL WEIGHT (LB)	NOTES
			DIAGONAL REINFORCEMENT MATERIALS & HARDWARE					
3	-	SR-100	SR 1"Ø A36	5'-1"±	S-2	13.59	40.77	
24	CROSBY	1010236	1"Ø G-450 CLAMP	-	S-2	2.52	60.48	

FACEWIDTH	
ELEVATION (FT)	FACEWIDTH (FT)
0.0	18.0
160.0	4.0
199.0	4.0

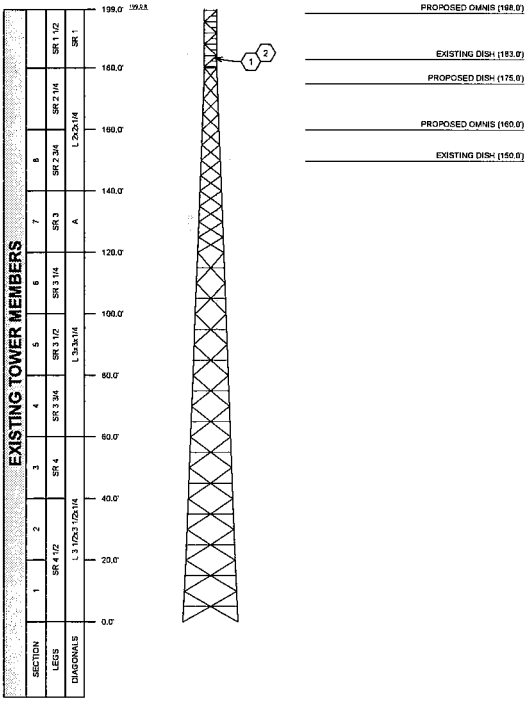
MATERIAL KEY	
A	L 2 1/2x2 1/2x1/4

MODIFICATION SCHEDULE

NO.	MODIFICATION DESCRIPTION	ELEVATIONS (FT.)	DETAIL SHEET #
1	PRIOR TO MATERIAL ORDERS, FABRICATION, AND CONSTRUCTION OF DESIGN DETAILED WITHIN THESE DRAWINGS, ETS REQUIRES THAT A PRE-MOD VISIT AND MAPPING OF AREAS OF THE STRUCTURE THAT INTERACT WITH THE PROPOSED MODIFICATIONS BE COMPLETED TO VERIFY IN FIELD ALL MATERIALS BEING PROPOSED. ETS IS AVAILABLE TO QUOTE SAID PRE-MOD MAPPING VIA EMAIL AT MAPPINGS@ETS-PLLC.COM. HOWEVER, IN ADDITION TO THE PRE-MOD MAPPING, THE CONTRACTOR MUST ALSO PERFORM A PRE-MOD VISIT TO THE SITE PRIOR TO MATERIAL ORDERS AS THE CONTRACTOR IS ULTIMATELY RESPONSIBLE TO ENSURE THE DESIGN IS CONSTRUCTIBLE.	160.0 - 184.0	-
2	REINFORCE EXISTING DIAGONALS.	160.0 - 184.0	S-2

NOTES:

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



TOWER ELEVATION
SCALE: 1" = 30'

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

PREPARED FOR

SITE NAME:
AHO - VIPER

SITE NUMBER:
HP-1382

SITE ADDRESS:
1398 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.602800°

SEAL: NC #P-1016
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILDER
03/25/2025

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
TOWER ELEVATION AND MODIFICATION SCHEDULE

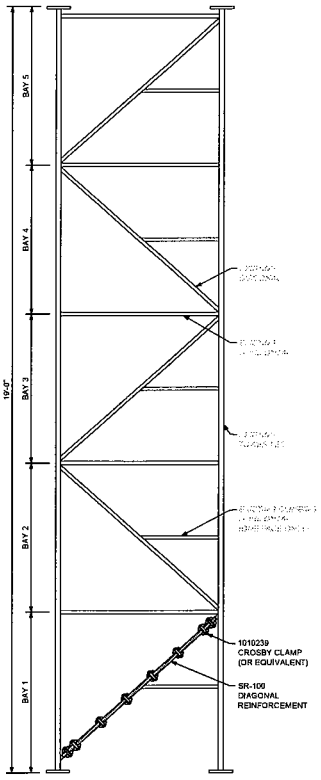
SHEET #: **S-1** | CURRENT REV #: 0 | ETS #: 24125019_STR_6180

DIAGONAL REINFORCEMENT SCHEDULE

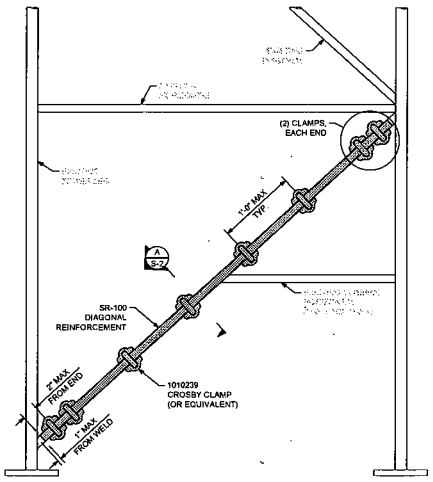
SECTION	ELEVATION (FT)	BAY	EXISTING DIAGONAL SIZE	PROPOSED REINFORCEMENT				PROPOSED CONNECTION			
				PART NO.	SIZE & GRADE	ESTIMATED LENGTH	QTY.	PART NO.	SIZE	MAX. SPACING	QTY.
10	180.0 - 184.0	1 (OF 5)	SR 1"Ø	SR-100	SR 1"Ø A36	5'-1"±	3	CROSBY G-450 P/N: 1010239	1"Ø CLAMP (OR EQUIVALENT)	12"	24

NOTES:

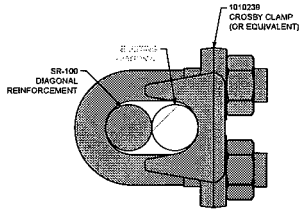
1. IT IS THE CONTRACTORS RESPONSIBILITY TO MEASURE ALL RELEVANT EXISTING MEMBERS PRIOR TO ORDERING MATERIALS.
2. PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL FIELD VERIFY ALL LENGTHS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE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



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



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



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

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

PREPARED FOR:

SITE NAME:
AHO - VIPER

SITE NUMBER:
HP-1382

SITE ADDRESS:
1388 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.602600°

SEAL: NC #P-1016
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILCOURT
03/25/2025

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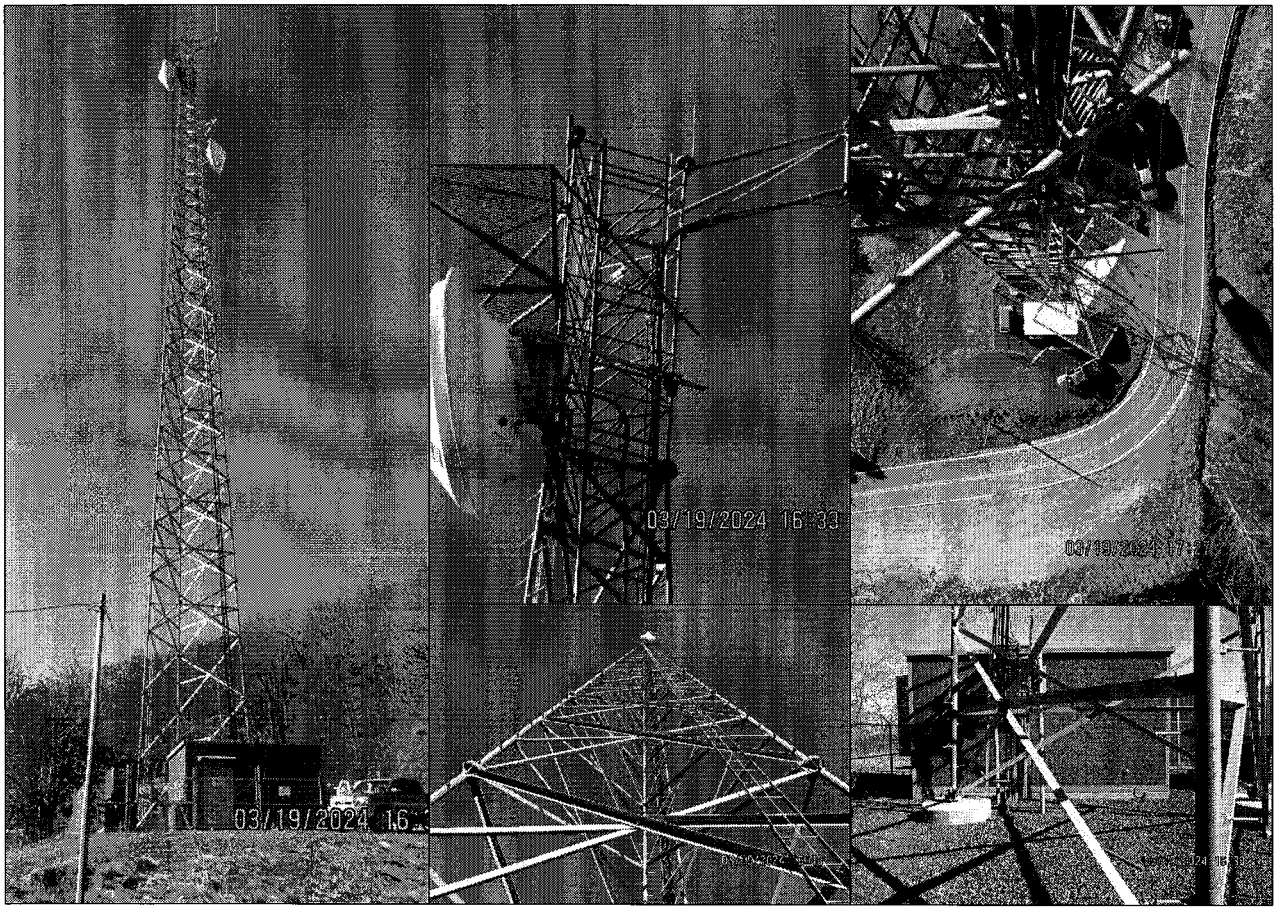
DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
DIAGONAL REINFORCEMENT DETAILS

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



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PREPARED FOR:

SITE NAME:

AHO - VIPER

SITE NUMBER:

HP-1382

SITE ADDRESS:
1368 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.602800°

SEAL: NC #P-1016

NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGEMAN

03/25/2025

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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:

PHOTOS

SHEET # P-1 | CURRENT REV #: 0 | ETS #: 24125019.STR.8160

Watauga County BIDDER: K-Co Enterprises, Inc.

TOWER MOD BREAKDOWN:

1. Total cost of tower modification materials only $ 1407.00

2. Total cost of tower modification labor only $ 3,770.00

3. Total cost of tower modification $ 5177.00

Page: 1
Watauga County **BIDDER:** K-Co Enterprises, Inc.

WATAUGA COUNTY, NC **BID #**	**INVITATION FOR BIDS – Aho - Viper**
	Bids will be publicly opened: June 13th, 2025 at 3:00pm
	Questions Due by: June 2nd, 2025
Refer ALL 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: K-Co Enterprises, Inc.		FEDERAL ID OR SOCIAL SECURITY NO. 26-1278195	
STREET ADDRESS: 613 Hurricane Creek Rd.		P.O. BOX:	ZIP:
CITY & STATE & ZIP: Piedmont, SC 29673		TELEPHONE NUMBER: 864-947-8704	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: Ernest Rood - Project Manager		FAX NUMBER: 864-947-8204	
AUTHORIZED SIGNATURE: Ernest Rood	DATE: 6-11-25	E-MAIL: bids@kcoenterprises.com	

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).

FOR Watauga County, NC USE ONLY

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 re-usable 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.

DELIVERED BY US POSTAL SERVICE	DELIVERED BY ANY OTHER MEANS SEND SUCH AS FEDX, UPS, ETC. FOR NEXT DAY
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** X **No** _____

 BIDDER: K-Co Enterprises, Inc.

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** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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 66585

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** X **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** X **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** X **No**_____

TOWER MODIFICATION DRAWINGS (SOW)

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

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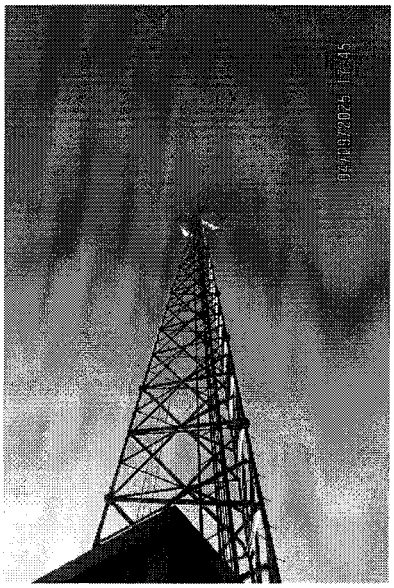
PRE MODIFICATION INSPECTION REPORT

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

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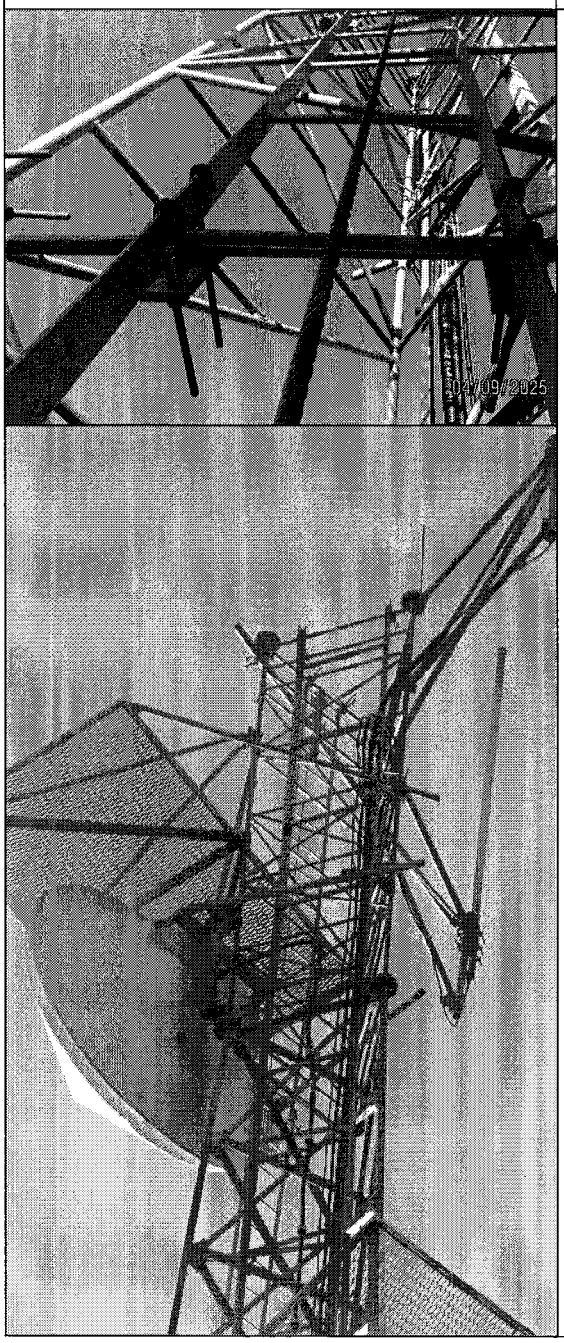
EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	**Item 1 – Tower Section Details** **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"

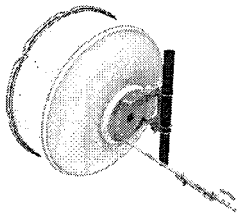
ENGINEERED
TOWER SOLUTIONS

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	Item 3 – Miscellaneous Obstructions **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" o MP (1) P4.5"Øx5'-0" o 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

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

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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

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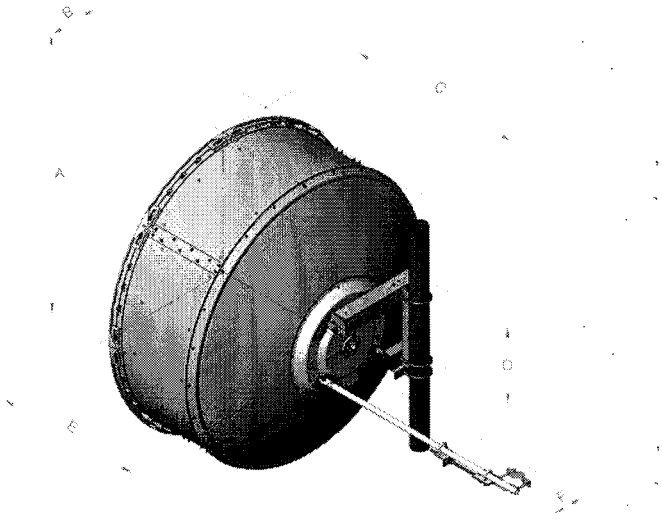
Antenna Dimensions and Mounting Information



Dimensions in inches (mm)

Antenna size, ft (m)	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

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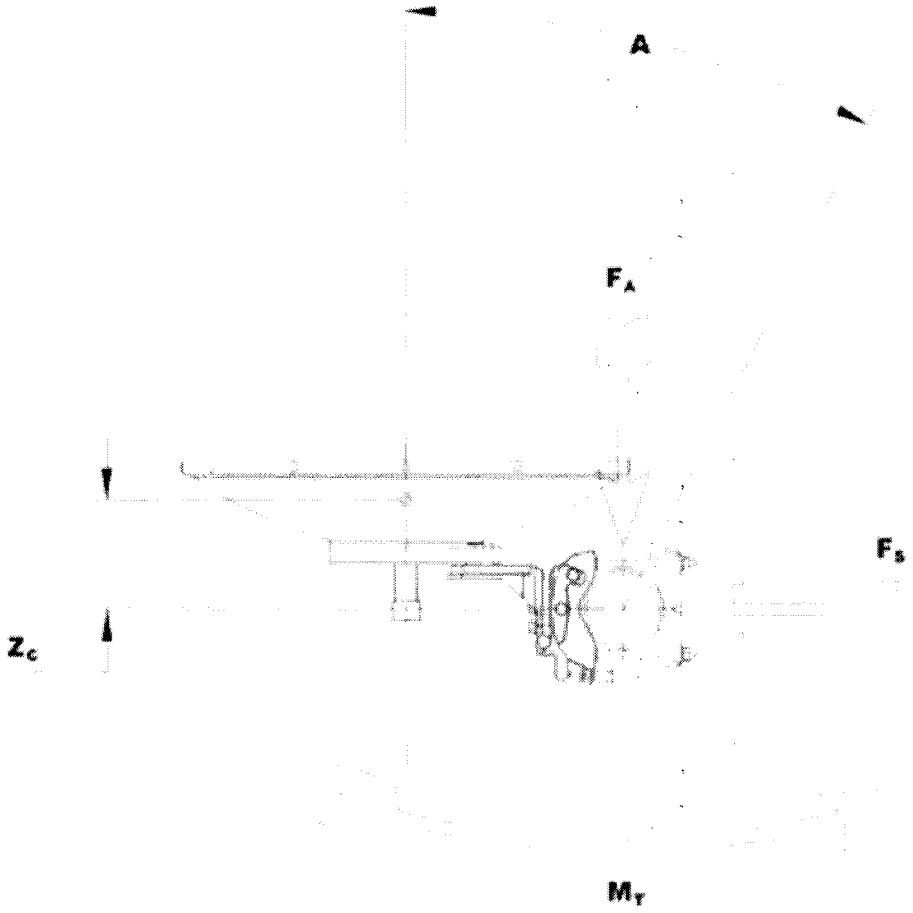
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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

Twisting Moment (MT)

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

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800 MHz Corporate Collinear Antennas

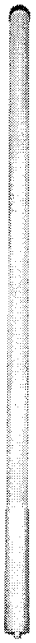
746-870 MHz

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 from 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.

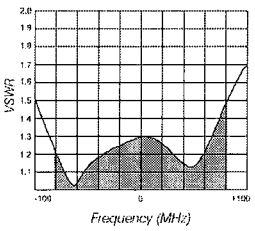
Gain is maximised and side lobes reduced dramatically. In a patented design approach the individual dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.



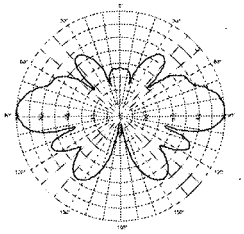
Features:

- 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.

Typical VSWR Response (CC807-06)



CC807-06 - E Plane



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	Full Band			
VSWR *(Return Loss)*	< 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 (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length *mm (inches)*		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter *mm (inches)*		76 (3)			
Weight *kg (lbs)*		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight *kg (lbs)*		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions *mm (inches)*	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 *cm² (ft²)*	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 *N* (100 mph lbs)		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating *km/h (mph)*	No Ice	>240 (>150)			
Torque @ 160km/h *Nm* (100mph ft-lbs)		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.

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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**

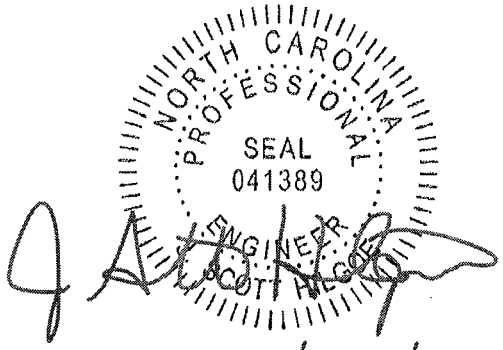
This analysis utilizes an ultimate 3-second gust wind speed of 140 mph (converted to an equivalent 108 mph nominal 3-second gust wind speed per Section 1609.3.1 for use with TIA-222 G) as required by the 2018 North Carolina State Building Code (2015 IBC). Applicable Standard references and design criteria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



03/26/2025

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APPENDIX A
tnxTower Output

APPENDIX B
Base Level Drawing

APPENDIX C
Additional Calculations

APPENDIX D
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**	**Ubiquiri 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 lar= 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

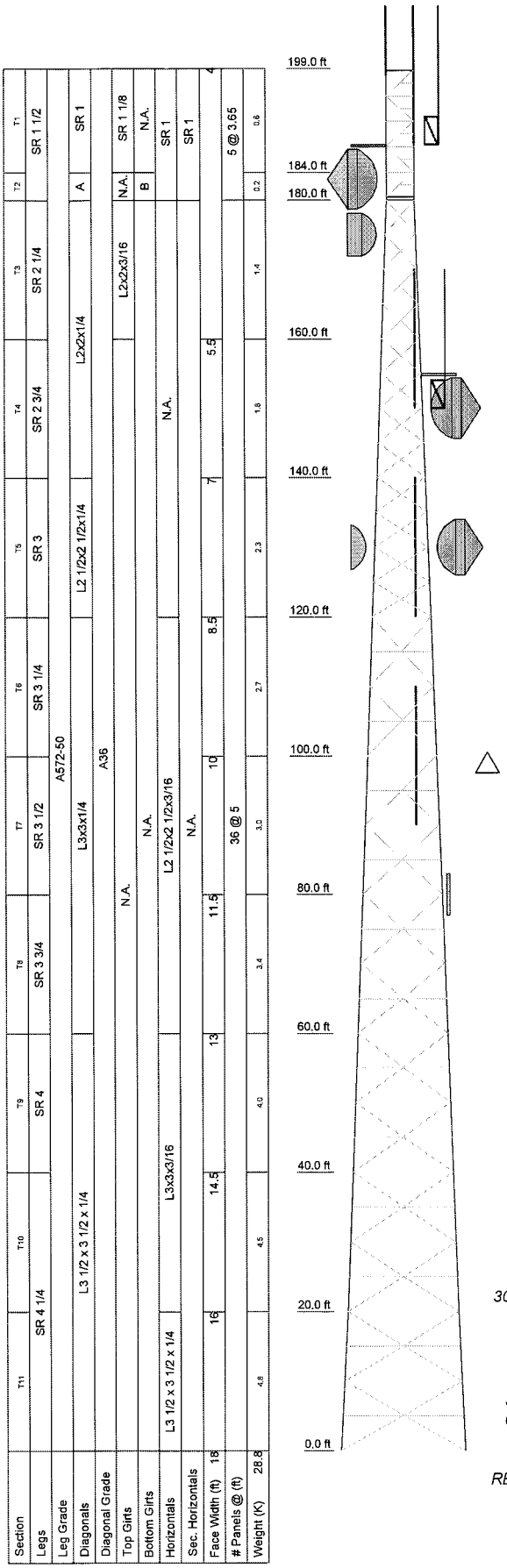
The results of the tilt and twist values for a 60 mph 3-second gust service wind speed per the TIA-222-G standard are given below:

Critical Deflections and Radius of Curvature - Service Wind

Elevation *ft*	*Appurtenance*	*Gov. Load Comb.*	*Deflection* *in*	*Tilt* °	*Twist* °	*Radius of Curvature* *ft*
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



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

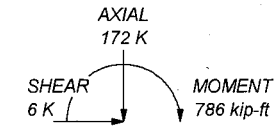
TOWER DESIGN NOTES

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%

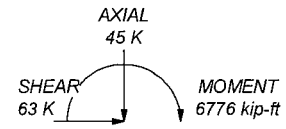
ALL REACTIONS ARE FACTORED

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

UPLIFT: -390 K
SHEAR: 34 K



TORQUE 6 kip-ft
30 mph WIND - 1.0000 in ICE



TORQUE 62 kip-ft
REACTIONS - 108 mph WIND

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

Job: *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-1

tnxTower	Job: Aho - Viper	Page: 1 of 44
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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		

tnxTower	Job: Aho - Viper	Page: 2 of 44
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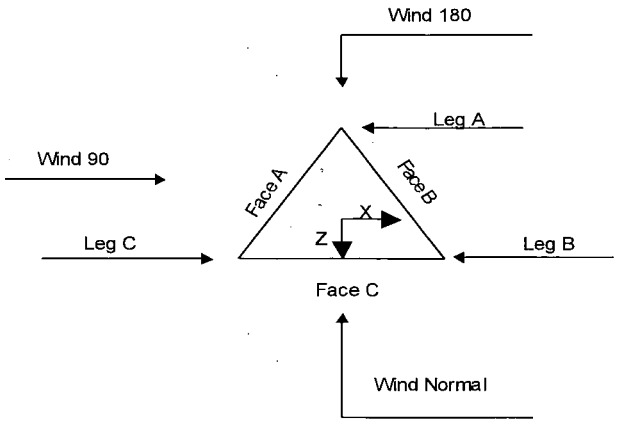

Triangular Tower

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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Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125019.STR.8180	Date: 15:46:29 03/25/25
	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset 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 ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
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 ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
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)

tnxTower	Job: Aho - Viper	Page: 4 of 44
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	Client: Watauga County	Designed by: hicham.anssar

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	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft^2	in					in	in	in
100.00-80.00			(36 ksi)						
T8 80.00-60.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 60.00-40.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T10 40.00-20.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T11 20.00-0.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X / Y	K Brace Diags X / Y	Single Diags X / Y	Girts X / Y	Horiz. X / Y	Sec. Horiz. X / Y	Inner Brace 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

[1]*Note: 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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	Client: Watauga County	Designed by: hicham.anssar

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
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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	Client: Watauga County	Designed by: hicham.anssar

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
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
T5 140.00-120.00	0.0000	0.75 (1)	0.0000	0.75 (1)	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75 (1)	0.0000	0.75 (1)
	0.0000	0.75 (2)	0.0000	0.75 (2)							0.0000	0.75 (2)	0.0000	0.75 (2)
	0.0000	0.75 (3)	0.0000	0.75 (3)							0.0000	0.75 (3)	0.0000	0.75 (3)
	0.0000	0.75 (4)	0.0000	0.75 (4)							0.0000	0.75 (4)	0.0000	0.75 (4)
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	0.0000	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)
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	0.0000	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)
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	0.0000	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)
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	0.0000	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)
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	0.0000	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)
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	0.0000	0.75 (1)	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 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T2 184.03-180.00	Flange	0.7500 A325X	4	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T3 180.00-160.00	Flange	1.0000 A325X	4	0.6250 A325X	1	0.6250 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T4 160.00-140.00	Flange	1.0000 A325X	4	0.6250 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T5 140.00-120.00	Flange	1.0000 A325X	4	0.6250 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0
T6 120.00-100.00	Flange	1.0000 A325X	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	1	0.6250 A325N	0
T7 100.00-80.00	Flange	1.0000 A325X	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	1	0.6250 A325N	0
T8 80.00-60.00	Flange	1.2500 A325X>1"	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	1	0.6250 A325N	0
T9 60.00-40.00	Flange	1.2500 A325X>1"	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	1	0.6250 A325N	0
T10 40.00-20.00	Flange	1.2500 A325X>1"	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	1	0.6250 A325N	0
T11 20.00-0.00	Flange	1.2500 A325X>1"	0	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	1	0.6250 A325N	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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	Client: Watauga County	Designed by: hicham.anssar

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_AA_A ft^2/ft	Weight plf
***								

Feed Line/Linear Appurtenances Section Areas

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	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
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_AA_A In Face ft^2	C_AA_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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	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	253.215	0.000	4.46
T8	80.00-60.00	A	2.695	0.000	0.000	58.457	0.000	1.22
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	260.257	0.000	4.51
T9	60.00-40.00	A	2.606	0.000	0.000	57.030	0.000	1.16
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	254.363	0.000	4.30
T10	40.00-20.00	A	2.476	0.000	0.000	74.977	0.000	1.29
		B		0.000	0.000	20.023	0.000	0.22
		C		0.000	0.000	245.789	0.000	4.01
T11	20.00-0.00	A	2.219	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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	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			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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	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			160.00		
T5	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	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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	Client: Watauga County	Designed by: hicham.anssar

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
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_a No Ice	K_a 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 Rung	0.00 - 20.00	0.6000	0.6000
T11	12	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 ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***										
5/8-in x 8-ft Lightning Rod	C	From Leg	0.00	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	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	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	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	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	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	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	0.00	196.00	No Ice	0.83	0.50	0.03

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	Client: Watauga County	Designed by: hicham.anssar

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1/2" 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

tnxTower	Job: Aho - Viper	Page: 17 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125019.STR.8180	Date: 15:46:29 03/25/25
	Client: Watauga County	Designed by: hicham.anssar

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1/2" 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	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
AM-V5G-Ti	B	From Leg	1.00	0.00	80.00	No Ice	0.74	0.41	0.01
			0.00			1/2" Ice	0.86	0.51	0.01
			0.00			1" Ice	0.99	0.62	0.02
***									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / 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	60.00		183.00	8.62	No Ice	58.31	0.29
				0.00					1/2" Ice	59.45	0.59
				0.00					1" Ice	60.58	0.90
***											
PAD8-65AC1S1R	B	Paraboloid w/Radome	From Leg	1.50	0.00		150.00	8.62	No Ice	58.31	0.29
				0.00					1/2" Ice	59.45	0.59
				0.00					1" Ice	60.58	0.90
***											
HX6-6W-6WH	C	Paraboloid w/Shroud (HP)	From Leg	1.50	74.50		175.00	6.23	No Ice	30.48	0.19
				0.00					1/2" Ice	31.30	0.35
				0.00					1" Ice	32.13	0.51
***											
PAD6-65B	C	Paraboloid w/o Radome	From Leg	1.50	0.00		130.00	6.58	No Ice	34.04	0.19
				0.00					1/2" Ice	34.90	0.36
				0.00					1" Ice	35.77	0.54
***											
PAD8-65B	B	Paraboloid w/Radome	From Leg	1.50	0.00		130.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.32	0.55
				0.00					1" Ice	52.37	0.81
***											

Tower Pressures - No Ice

$G_H = 0.850$

tnxTower	Job: Aho - Viper	Page: 18 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	191.51	1.451	42	61.772	A	0.000	6.824	3.744	54.86	11.481	0.000
199.00-184.03					B	0.000	6.824		54.86	0.000	0.000
					C	0.000	7.470		50.12	23.507	0.000
T2	182.01	1.436	42	16.603	A	0.000	2.526	1.006	39.83	3.086	0.000
184.03-180.00					B	0.000	2.526		39.83	0.000	0.000
					C	0.000	2.688		37.44	7.003	0.000
T3	170.00	1.415	41	98.753	A	9.476	7.507	7.507	44.20	15.333	0.000
180.00-160.00					B	9.476	7.507		44.20	0.000	0.000
					C	9.476	7.507		44.20	38.874	0.000
T4	150.00	1.378	40	129.587	A	10.286	9.175	9.175	47.15	15.333	0.000
160.00-140.00					B	10.286	9.175		47.15	0.000	0.000
					C	10.286	9.175		47.15	49.839	0.000
T5	130.00	1.337	39	160.004	A	14.881	10.009	10.009	40.21	15.333	0.000
140.00-120.00					B	14.881	10.009		40.21	0.000	0.000
					C	14.881	10.009		40.21	56.128	0.000
T6	110.00	1.291	38	190.420	A	16.971	10.843	10.843	38.98	15.333	0.000
120.00-100.00					B	16.971	10.843		38.98	0.000	0.000
					C	16.971	10.843		38.98	60.386	0.000
T7	90.00	1.238	36	220.837	A	18.647	11.678	11.678	38.51	15.333	0.000
100.00-80.00					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	30.00	0.982	29	312.088	A	28.233	14.180	14.180	33.43	16.733	0.000
40.00-20.00					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 ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	191.51	1.451	3	2.9806	69.211	A	0.000	39.827	18.622	46.76	47.189	0.000
199.00-184.03						B	0.000	39.827		46.76	0.000	0.000
						C	0.000	44.323		42.01	92.523	0.000
T2	182.01	1.436	3	2.9655	18.592	A	0.000	12.928	4.985	38.56	12.635	0.000
184.03-180.00						B	0.000	12.928		38.56	0.000	0.000
						C	0.000	14.047		35.49	27.733	0.000
T3	170.00	1.415	3	2.9453	108.577	A	9.476	55.071	27.161	42.08	62.459	0.000
180.00-160.00						B	9.476	55.071		42.08	0.000	0.000
						C	9.476	55.071		42.08	153.054	0.000
T4	150.00	1.378	3	2.9087	139.289	A	10.286	58.505	28.585	41.55	61.872	0.000
160.00-140.00						B	10.286	58.505		41.55	0.000	0.000
						C	10.286	58.505		41.55	196.287	0.000
T5	130.00	1.337	3	2.8674	169.568	A	14.881	63.278	29.143	37.29	61.211	0.000
140.00-120.00						B	14.881	63.278		37.29	0.000	0.000

tnxTower	Job: Aho - Viper	Page: 19 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	14.881	63.278		37.29	224.428	0.000
T6	110.00	1.291	3	2.8199	199.827	A	16.971	62.971	29.660	37.10	60.451	0.000
120.00-100.00						B	16.971	62.971		37.10	0.000	0.000
						C	16.971	62.971		37.10	243.333	0.000
T7 100.00-80.00	90.00	1.238	2	2.7638	230.057	A	18.647	66.084	30.120	35.55	59.555	0.000
						B	18.647	66.084		35.55	0.000	0.000
						C	18.647	66.084		35.55	253.215	0.000
T8 80.00-60.00	70.00	1.174	2	2.6952	260.245	A	20.389	68.919	30.497	34.15	58.457	0.000
						B	20.389	68.919		34.15	0.000	0.000
						C	20.389	68.919		34.15	260.257	0.000
T9 60.00-40.00	50.00	1.094	2	2.6061	290.364	A	26.068	71.220	30.736	31.59	57.030	0.000
						B	26.068	71.220		31.59	0.000	0.000
						C	26.068	71.220		31.59	254.363	0.000
T10 40.00-20.00	30.00	0.982	2	2.4763	320.348	A	28.233	72.411	30.704	30.51	74.977	0.000
						B	28.233	72.411		30.51	20.023	0.000
						C	28.233	72.411		30.51	245.789	0.000
T11 20.00-0.00	10.00	0.850	2	2.2186	354.497	A	32.247	69.889	29.006	28.40	66.495	0.000
						B	32.247	69.889		28.40	18.205	0.000
						C	32.247	69.889		28.40	165.106	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	191.51	1.451	11	61.772	A	0.000	6.824	3.744	54.86	11.481	0.000
199.00-184.03					B	0.000	6.824		54.86	0.000	0.000
					C	0.000	7.470		50.12	23.507	0.000
T2	182.01	1.436	11	16.603	A	0.000	2.526	1.006	39.83	3.086	0.000
184.03-180.00					B	0.000	2.526		39.83	0.000	0.000
					C	0.000	2.688		37.44	7.003	0.000
T3	170.00	1.415	11	98.753	A	9.476	7.507	7.507	44.20	15.333	0.000
180.00-160.00					B	9.476	7.507		44.20	0.000	0.000
					C	9.476	7.507		44.20	38.874	0.000
T4	150.00	1.378	11	129.587	A	10.286	9.175	9.175	47.15	15.333	0.000
160.00-140.00					B	10.286	9.175		47.15	0.000	0.000
					C	10.286	9.175		47.15	49.839	0.000
T5	130.00	1.337	10	160.004	A	14.881	10.009	10.009	40.21	15.333	0.000
140.00-120.00					B	14.881	10.009		40.21	0.000	0.000
					C	14.881	10.009		40.21	56.128	0.000
T6	110.00	1.291	10	190.420	A	16.971	10.843	10.843	38.98	15.333	0.000
120.00-100.00					B	16.971	10.843		38.98	0.000	0.000
					C	16.971	10.843		38.98	60.386	0.000
T7	90.00	1.238	10	220.837	A	18.647	11.678	11.678	38.51	15.333	0.000
100.00-80.00					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	9	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	9	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

tnxTower	Job: Aho - Viper	Page: 20 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T10	30.00	0.982	8	312.088	A	28.233	14.180	14.180	33.43	16.733	0.000
40.00-20.00					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	7	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 Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	42	1	1	3.854	1.13	75.56	C
199.00-184.03			B	0.11	2.922		1	1	3.854			
			C	0.121	2.881		1	1	4.222			
T2	0.10	0.19	A	0.152	2.764	42	1	1	1.434	0.35	86.36	C
184.03-180.00			B	0.152	2.764		1	1	1.434			
			C	0.162	2.728		1	1	1.529			
T3	0.52	1.37	A	0.172	2.692	41	1	1	13.756	2.36	118.06	C
180.00-160.00			B	0.172	2.692		1	1	13.756			
			C	0.172	2.692		1	1	13.756			
T4	0.57	1.83	A	0.15	2.771	40	1	1	15.494	2.73	136.32	C
160.00-140.00			B	0.15	2.771		1	1	15.494			
			C	0.15	2.771		1	1	15.494			
T5	0.59	2.34	A	0.156	2.751	39	1	1	20.499	3.22	160.87	C
140.00-120.00			B	0.156	2.751		1	1	20.499			
			C	0.156	2.751		1	1	20.499			
T6	0.60	2.67	A	0.146	2.786	38	1	1	22.935	3.43	171.42	C
120.00-100.00			B	0.146	2.786		1	1	22.935			
			C	0.146	2.786		1	1	22.935			
T7	0.61	3.03	A	0.137	2.819	36	1	1	24.947	3.52	176.23	C
100.00-80.00			B	0.137	2.819		1	1	24.947			
			C	0.137	2.819		1	1	24.947			
T8	0.61	3.41	A	0.131	2.843	34	1	1	27.027	3.54	177.09	C
80.00-60.00			B	0.131	2.843		1	1	27.027			
			C	0.131	2.843		1	1	27.027			
T9	0.61	4.05	A	0.14	2.809	32	1	1	33.095	3.74	186.87	C
60.00-40.00			B	0.14	2.809		1	1	33.095			
			C	0.14	2.809		1	1	33.095			
T10	0.65	4.50	A	0.136	2.824	29	1	1	35.670	3.58	179.20	C
40.00-20.00			B	0.136	2.824		1	1	35.670			
			C	0.136	2.824		1	1	35.670			
T11	0.59	4.85	A	0.134	2.832	25	1	1	39.879	3.16	158.18	C
20.00-0.00			B	0.134	2.832		1	1	39.879			
			C	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

tnxTower	Job: Aho - Viper	Page: 21 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	42	0.8	1	3.854	1.10	73.38	A
199.00-184.03			B	0.11	2.922		0.8	1	3.854			
			C	0.121	2.881		0.8	1	4.222			
T2	0.10	0.19	A	0.152	2.764	42	0.8	1	1.434	0.34	84.53	A
184.03-180.00			B	0.152	2.764		0.8	1	1.434			
			C	0.162	2.728		0.8	1	1.529			
T3	0.52	1.37	A	0.172	2.692	41	0.8	1	11.861	2.18	109.10	A
180.00-160.00			B	0.172	2.692		0.8	1	11.861			
			C	0.172	2.692		0.8	1	11.861			
T4	0.57	1.83	A	0.15	2.771	40	0.8	1	13.437	2.53	126.57	A
160.00-140.00			B	0.15	2.771		0.8	1	13.437			
			C	0.15	2.771		0.8	1	13.437			
T5	0.59	2.34	A	0.156	2.751	39	0.8	1	17.523	2.95	147.29	A
140.00-120.00			B	0.156	2.751		0.8	1	17.523			
			C	0.156	2.751		0.8	1	17.523			
T6	0.60	2.67	A	0.146	2.786	38	0.8	1	19.541	3.13	156.27	A
120.00-100.00			B	0.146	2.786		0.8	1	19.541			
			C	0.146	2.786		0.8	1	19.541			
T7	0.61	3.03	A	0.137	2.819	36	0.8	1	21.218	3.20	160.09	A
100.00-80.00			B	0.137	2.819		0.8	1	21.218			
			C	0.137	2.819		0.8	1	21.218			
T8	0.61	3.41	A	0.131	2.843	34	0.8	1	22.949	3.20	160.21	A
80.00-60.00			B	0.131	2.843		0.8	1	22.949			
			C	0.131	2.843		0.8	1	22.949			
T9	0.61	4.05	A	0.14	2.809	32	0.8	1	27.881	3.34	167.00	A
60.00-40.00			B	0.14	2.809		0.8	1	27.881			
			C	0.14	2.809		0.8	1	27.881			
T10	0.65	4.50	A	0.136	2.824	29	0.8	1	30.024	3.20	159.77	A
40.00-20.00			B	0.136	2.824		0.8	1	30.024			
			C	0.136	2.824		0.8	1	30.024			
T11	0.59	4.85	A	0.134	2.832	25	0.8	1	33.429	2.78	138.92	A
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	42	0.85	1	3.854	1.12	74.96	B
199.00-184.03			B	0.11	2.922		0.85	1	3.854			
			C	0.121	2.881		0.85	1	4.222			
T2	0.10	0.19	A	0.152	2.764	42	0.85	1	1.434	0.35	86.09	B
184.03-180.00			B	0.152	2.764		0.85	1	1.434			
			C	0.162	2.728		0.85	1	1.529			
T3	0.52	1.37	A	0.172	2.692	41	0.85	1	12.335	2.26	112.87	B
180.00-160.00			B	0.172	2.692		0.85	1	12.335			
			C	0.172	2.692		0.85	1	12.335			
T4	0.57	1.83	A	0.15	2.771	40	0.85	1	13.951	2.61	130.50	B
160.00-140.00			B	0.15	2.771		0.85	1	13.951			
			C	0.15	2.771		0.85	1	13.951			

tnxTower	Job: Aho - Viper	Page: 22 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T5	0.59	2.34	A	0.156	2.751	39	0.85	1	18.267	3.04	152.14	B
140.00-120.00			B	0.156	2.751		0.85	1	18.267			
			C	0.156	2.751		0.85	1	18.267			
T6	0.60	2.67	A	0.146	2.786	38	0.85	1	20.390	3.23	161.46	B
120.00-100.00			B	0.146	2.786		0.85	1	20.390			
			C	0.146	2.786		0.85	1	20.390			
T7	0.61	3.03	A	0.137	2.819	36	0.85	1	22.150	3.31	165.47	B
100.00-80.00			B	0.137	2.819		0.85	1	22.150			
			C	0.137	2.819		0.85	1	22.150			
T8	0.61	3.41	A	0.131	2.843	34	0.85	1	23.968	3.31	165.71	B
80.00-60.00			B	0.131	2.843		0.85	1	23.968			
			C	0.131	2.843		0.85	1	23.968			
T9	0.61	4.05	A	0.14	2.809	32	0.85	1	29.185	3.46	173.15	B
60.00-40.00			B	0.14	2.809		0.85	1	29.185			
			C	0.14	2.809		0.85	1	29.185			
T10	0.65	4.50	A	0.136	2.824	29	0.85	1	31.435	3.31	165.44	B
40.00-20.00			B	0.136	2.824		0.85	1	31.435			
			C	0.136	2.824		0.85	1	31.435			
T11	0.59	4.85	A	0.134	2.832	25	0.85	1	35.042	2.89	144.36	B
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	3.02	3.09	A	0.575	1.821	3	1	1	29.013	0.27	18.22	C
199.00-184.03			B	0.575	1.821		1	1	29.013			
			C	0.64	1.785		1	1	34.129			
T2	0.87	0.87	A	0.695	1.776	3	1	1	10.443	0.08	19.17	C
184.03-180.00			B	0.695	1.776		1	1	10.443			
			C	0.756	1.79		1	1	11.963			
T3	4.66	6.19	A	0.594	1.808	3	1	1	50.244	0.40	19.89	C
180.00-160.00			B	0.594	1.808		1	1	50.244			
			C	0.594	1.808		1	1	50.244			
T4	5.25	6.95	A	0.494	1.908	3	1	1	50.170	0.48	24.07	C
160.00-140.00			B	0.494	1.908		1	1	50.170			
			C	0.494	1.908		1	1	50.170			
T5	5.58	8.54	A	0.461	1.956	3	1	1	56.941	0.54	27.22	C
140.00-120.00			B	0.461	1.956		1	1	56.941			
			C	0.461	1.956		1	1	56.941			
T6	5.80	9.12	A	0.4	2.064	3	1	1	57.037	0.59	29.58	C
120.00-100.00			B	0.4	2.064		1	1	57.037			
			C	0.4	2.064		1	1	57.037			
T7	5.72	9.84	A	0.368	2.13	2	1	1	59.824	0.59	29.60	C
100.00-80.00			B	0.368	2.13		1	1	59.824			
			C	0.368	2.13		1	1	59.824			
T8	5.72	10.53	A	0.343	2.188	2	1	1	62.673	0.59	29.43	C
80.00-60.00			B	0.343	2.188		1	1	62.673			
			C	0.343	2.188		1	1	62.673			

tnxTower	Job: Aho - Viper	Page: 23 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T9	5.46	12.02	A	0.335	2.207	2	1	1	69.555	0.57	28.58	C
60.00-40.00			B	0.335	2.207		1	1	69.555			
			C	0.335	2.207		1	1	69.555			
T10	5.52	12.49	A	0.314	2.259	2	1	1	71.931	0.55	27.32	C
40.00-20.00			B	0.314	2.259		1	1	71.931			
			C	0.314	2.259		1	1	71.931			
T11	3.86	12.48	A	0.288	2.328	2	1	1	73.852	0.42	21.09	C
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	3.02	3.09	A	0.575	1.821	3	0.8	1	29.013	0.26	17.61	C
199.00-184.03			B	0.575	1.821		0.8	1	29.013			
			C	0.64	1.785		0.8	1	34.129			
T2	0.87	0.87	A	0.695	1.776	3	0.8	1	10.443	0.08	18.73	C
184.03-180.00			B	0.695	1.776		0.8	1	10.443			
			C	0.756	1.79		0.8	1	11.963			
T3	4.66	6.19	A	0.594	1.808	3	0.8	1	48.349	0.39	19.48	A
180.00-160.00			B	0.594	1.808		0.8	1	48.349			
			C	0.594	1.808		0.8	1	48.349			
T4	5.25	6.95	A	0.494	1.908	3	0.8	1	48.112	0.47	23.62	A
160.00-140.00			B	0.494	1.908		0.8	1	48.112			
			C	0.494	1.908		0.8	1	48.112			
T5	5.58	8.54	A	0.461	1.956	3	0.8	1	53.964	0.53	26.57	A
140.00-120.00			B	0.461	1.956		0.8	1	53.964			
			C	0.461	1.956		0.8	1	53.964			
T6	5.80	9.12	A	0.4	2.064	3	0.8	1	53.643	0.58	28.83	A
120.00-100.00			B	0.4	2.064		0.8	1	53.643			
			C	0.4	2.064		0.8	1	53.643			
T7	5.72	9.84	A	0.368	2.13	2	0.8	1	56.095	0.58	28.78	A
100.00-80.00			B	0.368	2.13		0.8	1	56.095			
			C	0.368	2.13		0.8	1	56.095			
T8	5.72	10.53	A	0.343	2.188	2	0.8	1	58.595	0.57	28.56	A
80.00-60.00			B	0.343	2.188		0.8	1	58.595			
			C	0.343	2.188		0.8	1	58.595			
T9	5.46	12.02	A	0.335	2.207	2	0.8	1	64.342	0.55	27.54	A
60.00-40.00			B	0.335	2.207		0.8	1	64.342			
			C	0.335	2.207		0.8	1	64.342			
T10	5.52	12.49	A	0.314	2.259	2	0.8	1	66.284	0.53	26.28	A
40.00-20.00			B	0.314	2.259		0.8	1	66.284			
			C	0.314	2.259		0.8	1	66.284			
T11	3.86	12.48	A	0.288	2.328	2	0.8	1	67.403	0.40	20.03	A
20.00-0.00			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		

tnxTower	Job: Aho - Viper	Page: 24 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125019.STR.8180	Date: 15:46:29 03/25/25
	Client: Watauga County	Designed by: hicham.anssar

Tower Forces - With Ice - 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 ft²	F K	w plf	Ctrl. Face
T1	3.02	3.09	A	0.575	1.821	3	0.85	1	29.013	0.26	17.41	B
199.00-184.03			B	0.575	1.821		0.85	1	29.013			
			C	0.64	1.785		0.85	1	34.129			
T2	0.87	0.87	A	0.695	1.776	3	0.85	1	10.443	0.07	18.48	C
184.03-180.00			B	0.695	1.776		0.85	1	10.443			
			C	0.756	1.79		0.85	1	11.963			
T3	4.66	6.19	A	0.594	1.808	3	0.85	1	48.823	0.40	20.03	B
180.00-160.00			B	0.594	1.808		0.85	1	48.823			
			C	0.594	1.808		0.85	1	48.823			
T4	5.25	6.95	A	0.494	1.908	3	0.85	1	48.627	0.48	24.14	B
160.00-140.00			B	0.494	1.908		0.85	1	48.627			
			C	0.494	1.908		0.85	1	48.627			
T5	5.58	8.54	A	0.461	1.956	3	0.85	1	54.708	0.54	27.06	B
140.00-120.00			B	0.461	1.956		0.85	1	54.708			
			C	0.461	1.956		0.85	1	54.708			
T6	5.80	9.12	A	0.4	2.064	3	0.85	1	54.492	0.59	29.32	B
120.00-100.00			B	0.4	2.064		0.85	1	54.492			
			C	0.4	2.064		0.85	1	54.492			
T7	5.72	9.84	A	0.368	2.13	2	0.85	1	57.027	0.58	29.20	B
100.00-80.00			B	0.368	2.13		0.85	1	57.027			
			C	0.368	2.13		0.85	1	57.027			
T8	5.72	10.53	A	0.343	2.188	2	0.85	1	59.615	0.58	28.97	B
80.00-60.00			B	0.343	2.188		0.85	1	59.615			
			C	0.343	2.188		0.85	1	59.615			
T9	5.46	12.02	A	0.335	2.207	2	0.85	1	65.645	0.56	27.96	B
60.00-40.00			B	0.335	2.207		0.85	1	65.645			
			C	0.335	2.207		0.85	1	65.645			
T10	5.52	12.49	A	0.314	2.259	2	0.85	1	67.696	0.53	26.69	B
40.00-20.00			B	0.314	2.259		0.85	1	67.696			
			C	0.314	2.259		0.85	1	67.696			
T11	3.86	12.48	A	0.288	2.328	2	0.85	1	69.015	0.41	20.48	B
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	11	1	1	3.854	0.30	20.28	C
199.00-184.03			B	0.11	2.922		1	1	3.854			
			C	0.121	2.881		1	1	4.222			
T2	0.10	0.19	A	0.152	2.764	11	1	1	1.434	0.09	23.18	C
184.03-180.00			B	0.152	2.764		1	1	1.434			
			C	0.162	2.728		1	1	1.529			

tnxTower	Job: Aho - Viper	Page: 25 of 44
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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T3	0.52	1.37	A	0.172	2.692	11	1	1	13.756	0.63	31.68	C
180.00-160.00			B	0.172	2.692		1	1	13.756			
			C	0.172	2.692		1	1	13.756			
T4	0.57	1.83	A	0.15	2.771	11	1	1	15.494	0.73	36.59	C
160.00-140.00			B	0.15	2.771		1	1	15.494			
			C	0.15	2.771		1	1	15.494			
T5	0.59	2.34	A	0.156	2.751	10	1	1	20.567	0.87	43.26	C
140.00-120.00			B	0.156	2.751		1	1	20.567			
			C	0.156	2.751		1	1	20.567			
T6	0.60	2.67	A	0.146	2.786	10	1	1	23.121	0.92	46.23	C
120.00-100.00			B	0.146	2.786		1	1	23.121			
			C	0.146	2.786		1	1	23.121			
T7	0.61	3.03	A	0.137	2.819	10	1	1	25.261	0.95	47.66	C
100.00-80.00			B	0.137	2.819		1	1	25.261			
			C	0.137	2.819		1	1	25.261			
T8	0.61	3.41	A	0.131	2.843	9	1	1	27.469	0.96	48.02	C
80.00-60.00			B	0.131	2.843		1	1	27.469			
			C	0.131	2.843		1	1	27.469			
T9	0.61	4.05	A	0.14	2.809	9	1	1	33.629	1.01	50.70	C
60.00-40.00			B	0.14	2.809		1	1	33.629			
			C	0.14	2.809		1	1	33.629			
T10	0.65	4.50	A	0.136	2.824	8	1	1	36.263	0.97	48.64	C
40.00-20.00			B	0.136	2.824		1	1	36.263			
			C	0.136	2.824		1	1	36.263			
T11	0.59	4.85	A	0.134	2.832	7	1	1	40.280	0.86	42.78	C
20.00-0.00			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	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	11	0.8	1	3.854	0.29	19.69	A
199.00-184.03			B	0.11	2.922		0.8	1	3.854			
			C	0.121	2.881		0.8	1	4.222			
T2	0.10	0.19	A	0.152	2.764	11	0.8	1	1.434	0.09	22.69	A
184.03-180.00			B	0.152	2.764		0.8	1	1.434			
			C	0.162	2.728		0.8	1	1.529			
T3	0.52	1.37	A	0.172	2.692	11	0.8	1	11.861	0.59	29.28	A
180.00-160.00			B	0.172	2.692		0.8	1	11.861			
			C	0.172	2.692		0.8	1	11.861			
T4	0.57	1.83	A	0.15	2.771	11	0.8	1	13.437	0.68	33.97	A
160.00-140.00			B	0.15	2.771		0.8	1	13.437			
			C	0.15	2.771		0.8	1	13.437			
T5	0.59	2.34	A	0.156	2.751	10	0.8	1	17.591	0.79	39.61	A
140.00-120.00			B	0.156	2.751		0.8	1	17.591			
			C	0.156	2.751		0.8	1	17.591			
T6	0.60	2.67	A	0.146	2.786	10	0.8	1	19.727	0.84	42.16	A
120.00-100.00			B	0.146	2.786		0.8	1	19.727			
			C	0.146	2.786		0.8	1	19.727			

tnxTower	Job: Aho - Viper	Page: 26 of 44
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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7	0.61	3.03	A	0.137	2.819	10	0.8	1	21.531	0.87	43.33	A
100.00-80.00			B	0.137	2.819		0.8	1	21.531			
			C	0.137	2.819		0.8	1	21.531			
T8	0.61	3.41	A	0.131	2.843	9	0.8	1	23.391	0.87	43.49	A
80.00-60.00			B	0.131	2.843		0.8	1	23.391			
			C	0.131	2.843		0.8	1	23.391			
T9	0.61	4.05	A	0.14	2.809	9	0.8	1	28.416	0.91	45.37	A
60.00-40.00			B	0.14	2.809		0.8	1	28.416			
			C	0.14	2.809		0.8	1	28.416			
T10	0.65	4.50	A	0.136	2.824	8	0.8	1	30.616	0.87	43.43	A
40.00-20.00			B	0.136	2.824		0.8	1	30.616			
			C	0.136	2.824		0.8	1	30.616			
T11	0.59	4.85	A	0.134	2.832	7	0.8	1	33.831	0.75	37.61	A
20.00-0.00			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 ft²	F K	w plf	Ctrl. Face
T1	0.37	0.60	A	0.11	2.922	11	0.85	1	3.854	0.30	20.12	B
199.00-184.03			B	0.11	2.922		0.85	1	3.854			
			C	0.121	2.881		0.85	1	4.222			
T2	0.10	0.19	A	0.152	2.764	11	0.85	1	1.434	0.09	23.10	B
184.03-180.00			B	0.152	2.764		0.85	1	1.434			
			C	0.162	2.728		0.85	1	1.529			
T3	0.52	1.37	A	0.172	2.692	11	0.85	1	12.335	0.61	30.29	B
180.00-160.00			B	0.172	2.692		0.85	1	12.335			
			C	0.172	2.692		0.85	1	12.335			
T4	0.57	1.83	A	0.15	2.771	11	0.85	1	13.951	0.70	35.02	B
160.00-140.00			B	0.15	2.771		0.85	1	13.951			
			C	0.15	2.771		0.85	1	13.951			
T5	0.59	2.34	A	0.156	2.751	10	0.85	1	18.335	0.82	40.91	B
140.00-120.00			B	0.156	2.751		0.85	1	18.335			
			C	0.156	2.751		0.85	1	18.335			
T6	0.60	2.67	A	0.146	2.786	10	0.85	1	20.575	0.87	43.56	B
120.00-100.00			B	0.146	2.786		0.85	1	20.575			
			C	0.146	2.786		0.85	1	20.575			
T7	0.61	3.03	A	0.137	2.819	10	0.85	1	22.464	0.90	44.77	B
100.00-80.00			B	0.137	2.819		0.85	1	22.464			
			C	0.137	2.819		0.85	1	22.464			
T8	0.61	3.41	A	0.131	2.843	9	0.85	1	24.410	0.90	44.96	B
80.00-60.00			B	0.131	2.843		0.85	1	24.410			
			C	0.131	2.843		0.85	1	24.410			
T9	0.61	4.05	A	0.14	2.809	9	0.85	1	29.719	0.94	47.02	B
60.00-40.00			B	0.14	2.809		0.85	1	29.719			
			C	0.14	2.809		0.85	1	29.719			
T10	0.65	4.50	A	0.136	2.824	8	0.85	1	32.028	0.90	44.95	B
40.00-20.00			B	0.136	2.824		0.85	1	32.028			
			C	0.136	2.824		0.85	1	32.028			

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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
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
			Max. Vx	14	-0.58	-0.00	-0.00
		Diagonal	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
			Max. Vy	32	-0.04	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
		Horizontal	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
			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
		Secondary Horizontal	Max Tension	8	0.00	-0.00	-0.00
			Max. Compression	20	-0.00	-0.00	-0.00
			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
		Top Girt	Max Tension	14	0.74	0.00	0.00
			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
T2	184.025 - 180	Leg	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
			Max. Vx	14	2.46	-0.27	-1.07
		Diagonal	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
			Max. Vy	34	-0.02	0.00	0.00
			Max. Vx	10	0.00	0.00	0.00
		Horizontal	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
			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
		Secondary Horizontal	Max Tension	8	0.00	-0.00	-0.00
			Max. Compression	20	-0.00	-0.00	-0.00

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	Client: Watauga County	Designed by: hicham.anssar

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			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
		Bottom Girt	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
T3	180 - 160	Leg	Max Tension	23	44.09	-0.02	0.01
			Max. Compression	10	-51.01	0.11	-0.02
			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
			Max. Vy	34	0.04	0.03	0.00
			Max. Vx	10	0.01	0.00	0.00
		Top Girt	Max Tension	11	0.85	0.00	0.00
			Max. Compression	12	-1.06	0.00	0.00
			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
T4	160 - 140	Leg	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
			Max. Vy	22	-1.03	-0.13	0.02
			Max. Vx	16	1.52	0.01	-0.04
		Diagonal	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
			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
		Horizontal	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
			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
T7	100 - 80	Leg	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
			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
		Diagonal	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
			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
		Horizontal	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
			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
T8	80 - 60	Leg	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
			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
		Diagonal	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
			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
		Horizontal	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
			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
T9	60 - 40	Leg	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
			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
		Diagonal	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
			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
		Horizontal	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
			Max. Vy	33	0.11	0.15	0.05
			Max. Vx	31	-0.01	0.00	0.00
T10	40 - 20	Leg	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
			Max. Vy	10	0.73	1.93	0.03
			Max. Vx	12	0.47	-0.22	-1.70
		Diagonal	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
			Max. Vy	32	0.12	0.00	0.00
			Max. Vx	31	0.00	0.00	0.00
		Horizontal	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 -	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

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
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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	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
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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Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
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

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
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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	Client: Watauga County	Designed by: hicham.anssar

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	
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] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

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	
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] $P_u / \phi P_n$ controls

Horizontal Design Data (Compression)

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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	
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] $P_u / \phi P_n$ controls

Secondary Horizontal Design Data (Compression)

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	
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] $P_u / \phi P_n$ controls

Top Girt Design Data (Compression)

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	
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] $P_u / \phi P_n$ controls

Bottom Girt Design Data (Compression)

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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	
T2	184.025 - 180	1	4.00	3.88	130.2 K=0.70	0.7854	-2.21	10.42	0.212 [1]

[1] $P_u / \phi P_n$ controls

Tension Checks

Leg 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	
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] $P_u / \phi P_n$ controls

Diagonal 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	
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] $P_u / \phi P_n$ 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	
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] $P_u / \phi P_n$ 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	
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] $P_u / \phi P_n$ 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	
T1	199 - 184.025	I 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] $P_u / \phi P_n$ 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	
T2	184.025 - 180	1	4.00	3.88	186.0	0.7854	2.19	25.45	0.086 [1]

[1] $P_u / \phi P_n$ controls

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Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{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
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	9.9	Pass

tnxTower	Job: Aho - Viper	Page: 44 of 44
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125019.STR.8180	Date: 15:46:29 03/25/25
	Client: Watauga County	Designed by: hicham.anssar

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

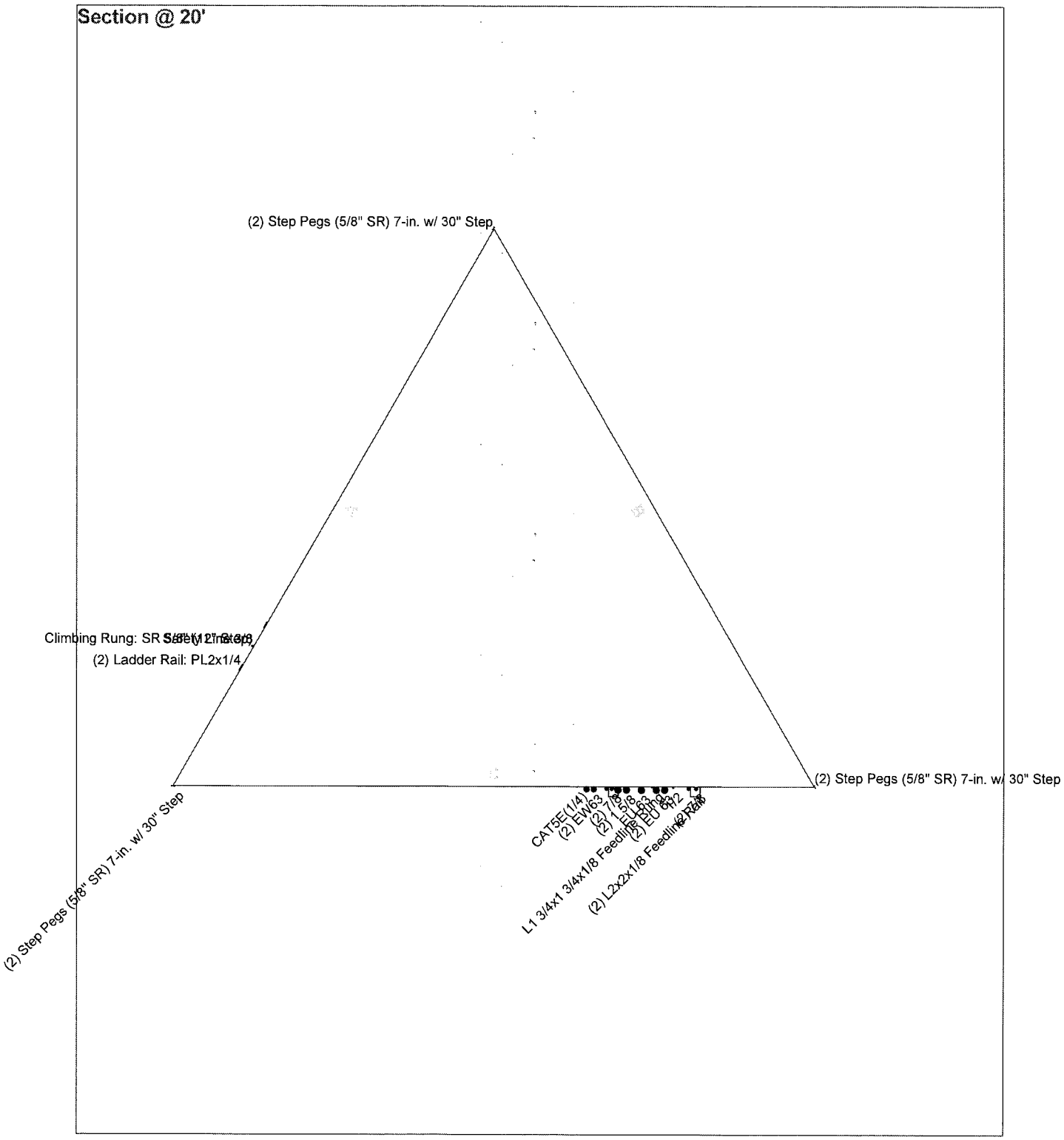
APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan
20'

_____ Round _____ Flat _____ App In Face ..... App Out Face

2025-08-05 BCC Meeting



Engineered Tower Solutions, PLLC	Job: ***Aho - Viper***		
3227 Wellington Ct.	Project: ***ETS, PLLC Job No. 24125019.STR.8180***		
Raleigh, NC 27615	Client: Watauga County	Drawn by: hicham.anssar	App'd:
Phone: (919) 782-2710	Code: TIA-222-G	Date: 03/25/25	Scale: NTS
FAX: 919-782-2710	Path:		Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

Bolt-On Diagonal Bracing Design

Tower Section	180-184 ft
P_u	6.29 kip
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

Notes

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.

Member Type	Member	Area (in^2)	Moment of Inertia (in^4)	Radius of Gyration (in)	Unbraced Length (in)	kL/r	$Sc/r_{min(re\ rp)} \leq K_m L_u/r_m$
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
$K_m L_u/r_m$	124.72
λ_c	1.40
F_{cm}	15.87 ksi
øPn	11.22 kip
Compression Capacity	56.1%

Self Support Anchor Rod Capacity

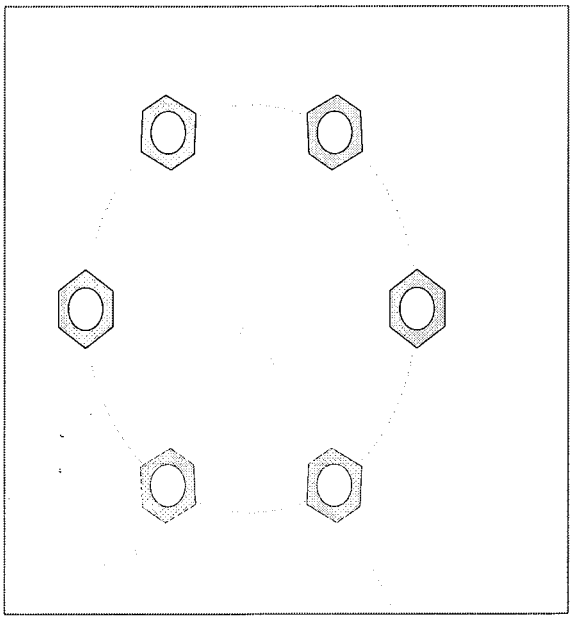
Site Info	
Site #	HP-1382
Site Name	Aho - Viper
ETS, PLLC #	24125019.STR.8180

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

Anchor Rod Data

(6) 1-1/4" ø bolts (F1554-105 N; Fy=105 ksi, Fu=125 ksi)

l_{ar} (in): 1.25

Analysis Results

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

Pu_c = 74.83	ϕPn_t = 96.9	**Stress Rating**
Vu = 6.5	ϕVn = n/a	**90.6%**
Mu = n/a	ϕMn = n/a	Pass

Analysis Date: 3/25/2025

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, bp_{dist}:	3	in

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

Pier Properties		
Pier Shape:	Circular	
Pier Diameter, **dpier**:	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, W_1:	31.00	ft
Pad Thickness, **T**:	1.75	ft
Pad Rebar Size (Bottom dir. 2), Sp_2:	10	
Pad Rebar Quantity (Bottom dir. 2), mp_2:	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

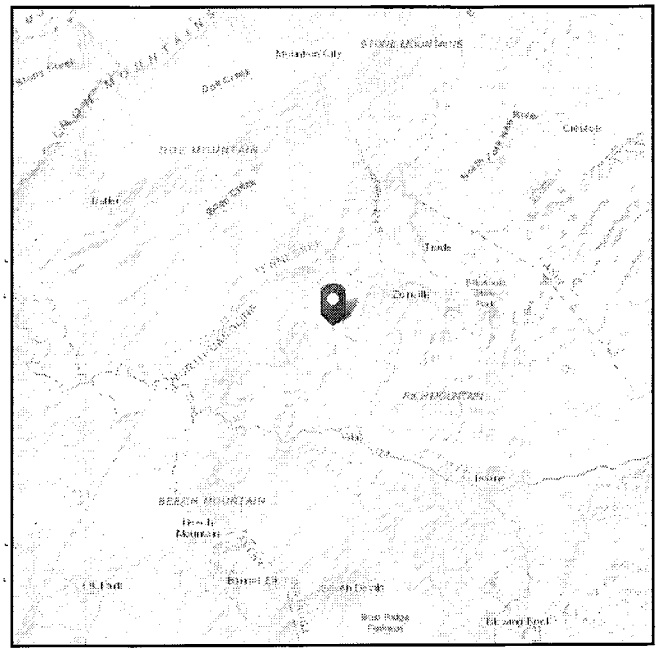
Soil Properties		
Total Soil Unit Weight, γ:	100	pcf
Ultimate Gross Bearing, Qult:	7.500	ksf
Cohesion, **Cu**:	0.000	ksf
Friction Angle, φ:	26	degrees
SPT Blow Count, N_{blows}:	6	
Base Friction, μ:	0.3	
Neglected Depth, **N**:	2.0	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	N/A	ft

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

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

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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.

ASCE
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Seismic

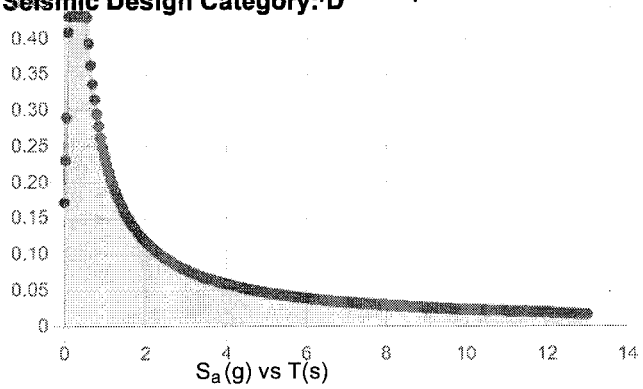
Site Soil Class: D - Stiff Soil

Results:

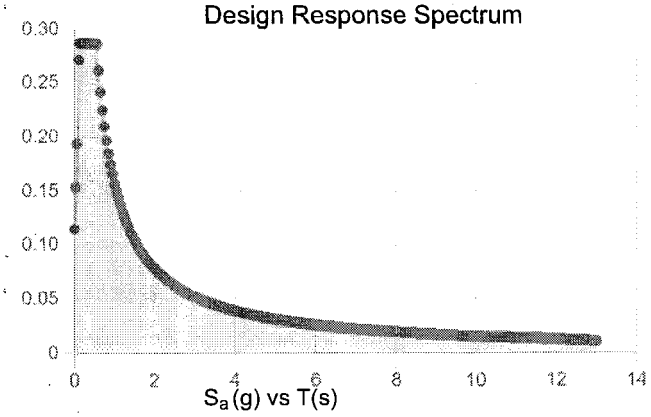
S_S :	0.272	S_{D1} :	0.157
S_1 :	0.098	T_L :	12
F_a :	1.582	PGA :	0.145
F_v :	2.4	PGA_M :	0.219
S_{MS} :	0.431	F_{PGA} :	1.51
S_{M1} :	0.236	I_e :	1.5
S_{DS} :	0.287		

Seismic Design Category: D

MCE_R Response Spectrum



Design Response Spectrum



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.

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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

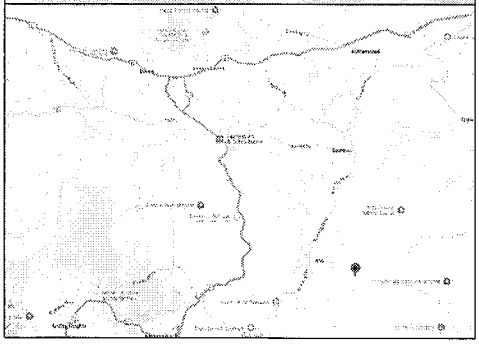
MODIFICATION DESIGN DRAWINGS

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.8160
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 (248 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.

SCAN CODE FOR DIRECTIONS

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

SHEET #	REV. (DATE)	DESCRIPTION
T-1	0 - 03/25/2025	TITLE PAGE
N-1	0 - 03/25/2025	MODIFICATION INSPECTION CHECKLIST
N-2	0 - 03/25/2025	PROJECT NOTES
BM	0 - 03/25/2025	BILL OF MATERIALS
S-1	0 - 03/25/2025	TOWER ELEVATION AND MODIFICATION SCHEDULE
S-2	0 - 03/25/2025	DIAGONAL REINFORCEMENT DETAILS
P-1	0 - 03/25/2025	PHOTOS
-	-	-
-	-	-
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-	-	-

PREPARED BY:

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

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
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER J. SCOTT HILGOE
03/25/2025

REV	DATE	DETAILS
0	03/25/2025	FOR CONSTRUCTION
1		
2		
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE
TITLE PAGE

SHEET # T-1 | CURRENT REV # 0 | ETS # 24125019.STR.8160

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	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK: SOIL COMPACTION	FOUNDATION SOIL COMPACTION SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK: BEARING CAPACITY	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	MICROPILE/ROCK ANCHOR	MICROPILES/ROCK ANCHORS SHALL BE INSPECTED BY THE FOUNDATION INSPECTION VENDOR AND SHALL BE INCLUDED AS PART OF THE FOUNDATION INSPECTION REPORT. ADDITIONAL TESTING AND/OR INSPECTION REQUIREMENTS ARE NOTED IN THE PROJECT NOTES.
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

SITE ADDRESS:
1398 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.602800°

SEAL: NC #P-1016
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 041389 SCOTT HILDER
03/25/2025

REV	DATE	DETAILS
0	03/25/2025	FOR CONSTRUCTION
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
MODIFICATION INSPECTION CHECKLIST

SHEET # **N-1** | CURRENT REV # 0 | ETS # 24125019.STR.8180

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 CUALITY 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	+⅓ TURN BEYOND SNUG TIGHT
⅝"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
⅞"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 INCH LENGTH	+⅓ 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
⅝"	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
⅞"	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

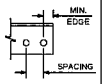
4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

NOMINAL HOLE DIMENSIONS

BOLT DIAMETER	STANDARD HOLE	SHORT SLOT
½	9/16	9/16 x 11/16
⅝	11/16	11/16 X ⅞
¾	13/16	13/16 X 1
⅞	15/16	15/16 X 1⅛
1	1⅛	1⅛ X 1⅜

BOLT EDGE AND SPACING

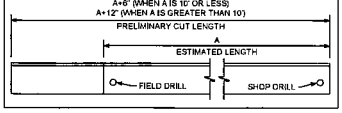
BOLT DIAMETER	MIN EDGE	SPACING
½	⅞	1½
⅝	1⅛	1⅞
¾	1¼	2½
⅞	1⅝	2⅝
1	1¾	3



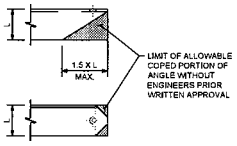
WORKABLE GAGES

LEG LENGTH	GAGE
4	2½
3½	2
3	1¾
2½	1⅜
2	1⅛
1¾	1

MEMBER LENGTHS



ALLOWABLE ANGLE COPE



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SEAL — NC #P-1016
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILDEBRAN
03/25/2025

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

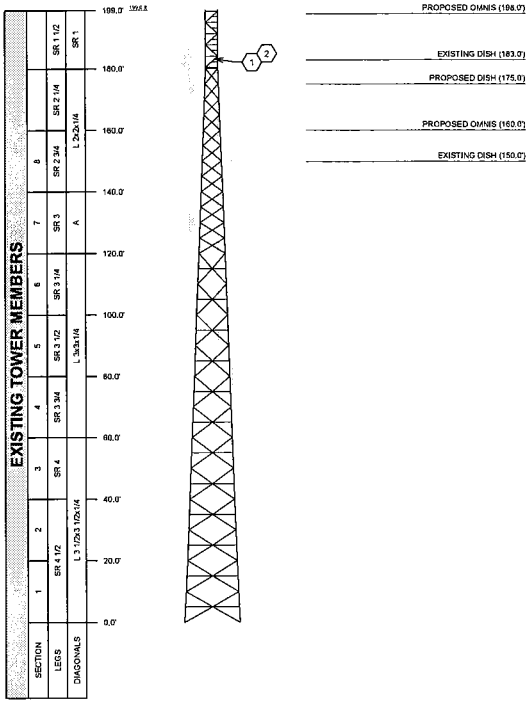
BILL OF MATERIALS

QUANTITY REQUIRED	MANUFACTURER	PART NUMBER	DESCRIPTION	LENGTH	DETAIL SHEET #	PART WEIGHT (LB)	TOTAL WEIGHT (LB)	NOTES
			DIAGONAL REINFORCEMENT MATERIALS & HARDWARE					
3	-	SR-100	SR 1"Ø A36	5'-1"±	S-2	13.59	40.77	
24	CROSBY	1010239	1"Ø G-450 CLAMP	-	S-2	2.52	60.48	

FACEWIDTH	
ELEVATION (FT)	FACEWIDTH (FT)
0.0	18.0
180.0	4.0
199.0	4.0

MATERIAL KEY	
A	L 2 1/2x2 1/2x1/4

MODIFICATION SCHEDULE			
NO.	MODIFICATION DESCRIPTION	ELEVATIONS (FT.)	DETAIL SHEET #
1	PRIOR TO MATERIAL ORDERS, FABRICATION, AND CONSTRUCTION OF DESIGN DETAILED WITHIN THESE DRAWINGS, ETS REQUIRES THAT A PRE-MOD VISIT AND MAPPING OF AREAS OF THE STRUCTURE THAT INTERACT WITH THE PROPOSED MODIFICATIONS BE COMPLETED TO VERIFY IN FIELD ALL MATERIALS BEING PROPOSED. ETS IS AVAILABLE TO QUOTE SAID PRE-MOD MAPPING VIA EMAIL AT MAPPINGS@ETS-PLLC.COM. HOWEVER, IN ADDITION TO THE PRE-MOD MAPPING, THE CONTRACTOR MUST ALSO PERFORM A PRE-MOD VISIT TO THE SITE PRIOR TO MATERIAL ORDERS AS THE CONTRACTOR IS ULTIMATELY RESPONSIBLE TO ENSURE THE DESIGN IS CONSTRUCTIBLE.	180.0 - 184.0	-
2	REINFORCE EXISTING DIAGONALS.	160.0 - 164.0	S-2



TOWER ELEVATION

SCALE: 1" = 30'

NOTES:

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

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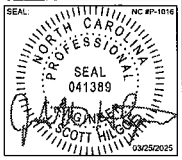

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
TOWER ELEVATION AND MODIFICATION SCHEDULE

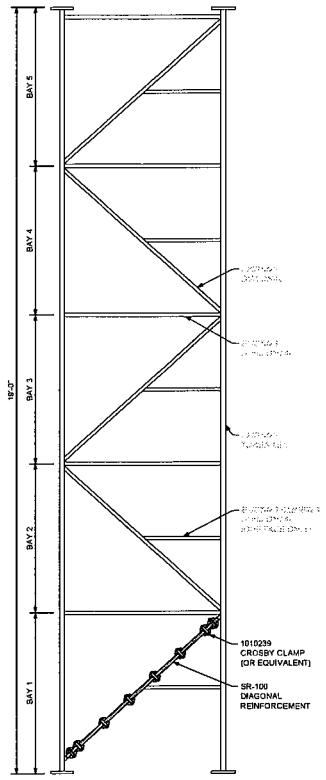
SHEET # **S-1** | CURRENT REV #: 0 | ETS # 24125016.STR.6180

DIAGONAL REINFORCEMENT SCHEDULE

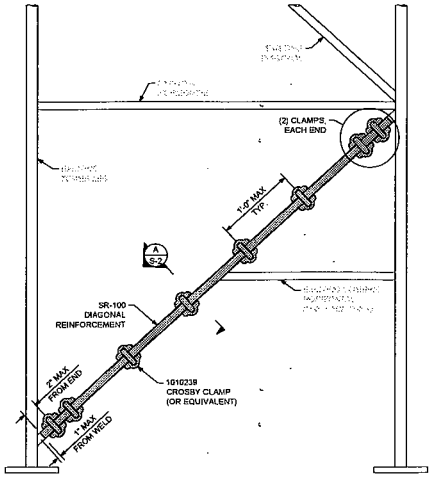
SECTION	ELEVATION (FT)	BAY	EXISTING DIAGONAL SIZE	PROPOSED REINFORCEMENT				PROPOSED CONNECTION			
				PART NO.	SIZE & GRADE	ESTIMATED LENGTH	QTY.	PART NO.	SIZE	MAX. SPACING	QTY.
10	180.0 - 184.0	1 (OF 5)	SR 1"Ø	SR-100	SR 1"Ø A36	5'-1"±	3	CROSBY G-450 P/N: 1010239	1"Ø CLAMP (OR EQUIVALENT)	12"	24

NOTES:

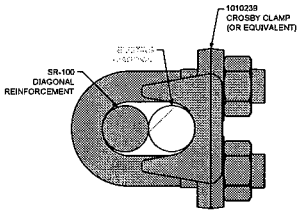
1. IT IS THE CONTRACTORS RESPONSIBILITY TO MEASURE ALL RELEVANT EXISTING MEMBERS PRIOR TO ORDERING MATERIALS.
2. PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL FIELD VERIFY ALL LENGTHS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE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



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



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



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

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

SITE NAME:
AHO - VIPER

SITE NUMBER:
HP-1382

SITE ADDRESS:
1388 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154415°, W 81.662800°

SEAL: NC #P-1016

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

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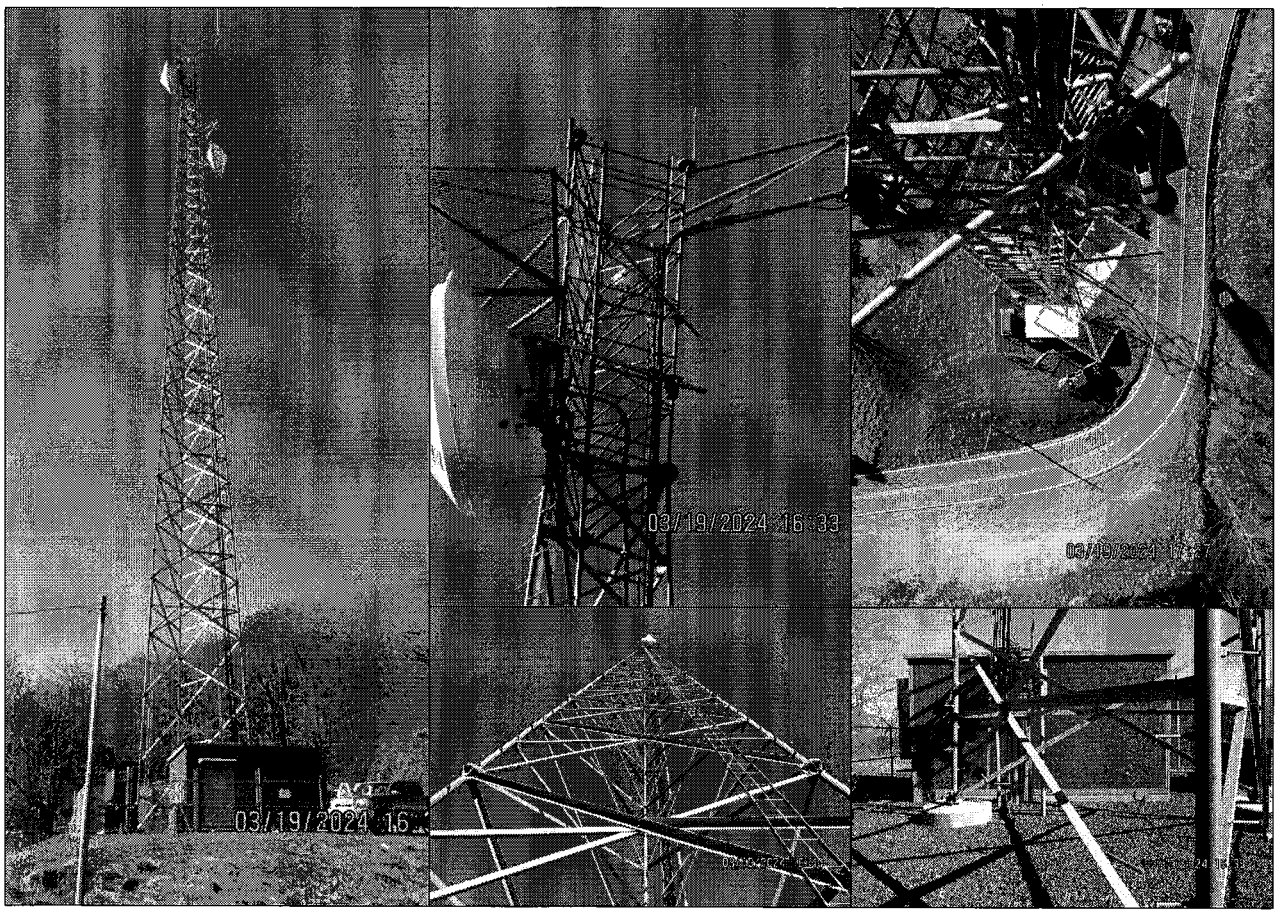
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
DIAGONAL REINFORCEMENT DETAILS

SHEET # S-2 | CURRENT REV #: 0 | ETS #: 241250189.STR.6180



PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
o 919-782-2710, f 919-435-0831
www.ets-pllc.com

PREPARED FOR:

SITE NAME:

AHO - VIPER

SITE NUMBER:

HP-1382

SITE ADDRESS:
1388 SAMPSON ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
N 36.154419°, W 81.602600°

SEAL: NC #P-1016

NORTH CAROLINA PROFESSIONAL SEAL 041389 SCOTT HILDRETH

03/25/2025

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

DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE

PHOTOS

SHEET # **P-1** | CURRENT REV # 0 | ETS # 24125G19,STR,8180

K-Co Enterprises, Inc.

613 Hurricane Creek Rd

Piedmont, SC 29673

Bid for: Buckeye Tower Modification – Watauga County, NC

814 W King St.

Boone, NC 28607

Please give Ernie Rood a call at 864-947-8704 with any questions.

THE CINCINNATI INSURANCE COMPANY
THE CINCINNATI CASUALTY COMPANY

Fairfield, Ohio

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That THE CINCINNATI INSURANCE COMPANY and THE CINCINNATI CASUALTY COMPANY, corporations organized under the laws of the State of Ohio, and having their principal offices in the City of Fairfield, Ohio (herein collectively called the "Companies"), do hereby constitute and appoint

Brooks M Keys, Jr., J. DuPre Keys, John B Ross, John B Ross, Jr., James G Culwell

of Belton, SC
their true and legal Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and deliver on behalf of the Companies as Surety, any and all bonds, policies, undertakings or other like instruments, as follows:

Five Million Dollars and 00/100 ($5,000,000.00)

This appointment is made under and by authority of the following resolutions adopted by the Boards of Directors of The Cincinnati Insurance Company and The Cincinnati Casualty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the President or any Senior Vice President be hereby authorized, and empowered to appoint Attorneys-in-Fact of the Company to execute any and all bonds, policies, undertakings, or other like instruments on behalf of the Corporation, and may authorize any officer or any such Attorney-in-Fact to affix the corporate seal; and may with or without cause modify or revoke any such appointment or authority. Any such writings so executed by such Attorneys-in-Fact shall be binding upon the Company as if they had been duly executed and acknowledged by the regularly elected officers of the Company.

RESOLVED, that the signature of the President or any Senior Vice President and the seal of the Company may be affixed by facsimile on any power of attorney granted, and the signature of the Secretary or Assistant Vice-President and the Seal of the Company may be affixed by facsimile to any certificate of any such power and any such power of certificate bearing such facsimile signature and seal shall be valid and binding on the Company. Any such power so executed and sealed and certified by certificate so executed and sealed shall, with respect to any bond or undertaking to which it is attached, continue to be valid and binding on the Company.

IN WITNESS WHEREOF, the Companies have caused these presents to be sealed with their corporate seals, duly attested by their President or any Senior Vice President this 16th day of March, 2021.

THE CINCINNATI INSURANCE COMPANY
THE CINCINNATI CASUALTY COMPANY

STATE OF OHIO)SS:
COUNTY OF BUTLER)

On this 16th day of March, 2021 before me came the above-named President or Senior Vice President of The Cincinnati Insurance Company and The Cincinnati Casualty Company, to me personally known to be the officer described herein, and acknowledged that the seals affixed to the preceding instrument are the corporate seals of said Companies and the corporate seals and the signature of the officer were duly affixed and subscribed to said instrument by the authority and direction of said corporations.

Keith Collett, Attorney at Law
Notary Public – State of Ohio
My commission has no expiration date.
Section 147.03 O.R.C.

I, the undersigned Secretary or Assistant Vice-President of The Cincinnati Insurance Company and The Cincinnati Casualty Company, hereby certify that the above is the Original Power of Attorney issued by said Companies, and do hereby further certify that the said Power of Attorney is still in full force and effect.

Given under my hand and seal of said Companies at Fairfield, Ohio, this day of ,

BN-1457 (3/21)

THE CINCINNATI INSURANCE COMPANY

Bid Bond

CONTRACTOR (Name, legal status and address):

K-Co Enterprises, Inc.
613 Hurricane Creek Rd
Piedmont, SC 29673

SURETY (Name, legal status and principal place of business):

THE CINCINNATI INSURANCE COMPANY
6200 S. GILMORE ROAD
FAIRFIELD, OHIO 45014-5141

OWNER (Name, legal status and address):
Watauga County
814 King Street
Boone, NC 28607

This document has important legal consequences, Consultation with an attorney is encouraged with respect to its completion or modification.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

BOND AMOUNT:
5% of bid

PROJECT (Name, location or address, and Project number, if any):
provide steel and labor to install on tower upgrade

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond the sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirements shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 13 day of June, 2025

	K-Co Enterprises, Inc.
(Witness)	*(Principal)* *(Seal)*
	(Title)
Ashlea E Kobulnicki	**THE CINCINNATI INSURANCE COMPANY**
(Witness)	*(Surety)* *(Seal)*
	(Title)

The Company executing this bond vouches that this document conforms to American Institute of Architects Document **A310**, 2010 Edition.
S-2000-AIA (11/10) PUBLIC

Watauga County BIDDER: K-Co Enterprises, Inc.

TOWER MOD BREAKDOWN:

1. Total cost of tower modification materials only $ 1690.00

2. Total cost of tower modification labor only $ 10,542.00

3. Total cost of tower modification $ 12,232.00

BIDDER: K-Co Enterprises, Inc.

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

NOTICE TO BIDDERS

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

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

EXECUTION

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

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

Late bids are not acceptable.

BIDDER: K-Co Enterprises, Inc.		FEDERAL ID OR SOCIAL SECURITY NO. 26-1278195	
STREET ADDRESS: 613 Hurricane Creek Rd.		P.O. BOX:	ZIP:
CITY & STATE & ZIP: Piedmont, SC 29673		TELEPHONE NUMBER: 864-947-8704	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: Ernest Rood, Project Manager		FAX NUMBER: 864-947-8204	
AUTHORIZED SIGNATURE: Ernest Rood	DATE: 6-11-25	E-MAIL: bids@kcoenterprises.com	

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).

FOR Watauga County, NC USE ONLY

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 re-usable 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.

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

Watauga County, NC Tower Construction Project

Watauga County, North Carolina

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

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

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

Understand all requirements in the Scope of Work **Yes** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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 66585

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** X **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** X **No**_____

EROSION CONTROL

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

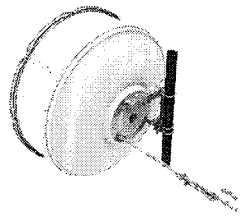
Understand Erosion Control Methods and responsibilities **Yes** X **No**_____

TOWER MODIFICATION DRAWINGS (SOW)

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

HX6-6W

Base Product



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

Product Classification

Product Type	Microwave antenna
Product Brand	ValuLine®

General Specifications

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

Dimensions

Diameter, nominal	1.8 m | 6 ft

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

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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

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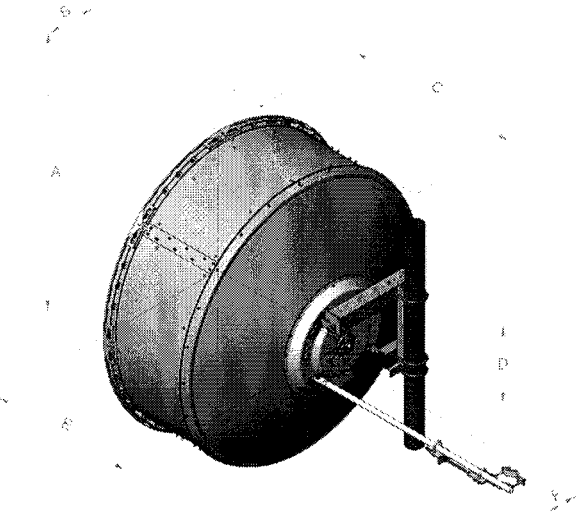
Antenna Dimensions and Mounting Information



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

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HX6-6W

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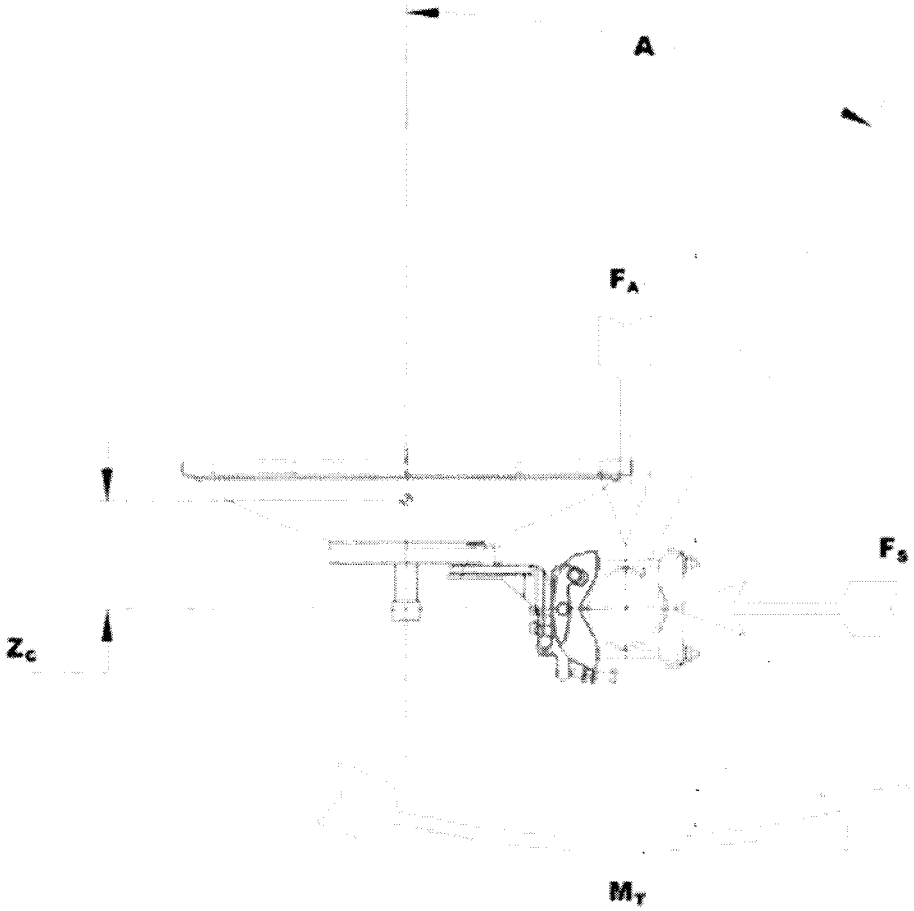
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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HX6-6W

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

Twisting Moment (MT)

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

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800 MHz Corporate Collinear Antennas

746-870 MHz

CC807 Series

RFI TECHNOLOGY SOLUTIONS

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.

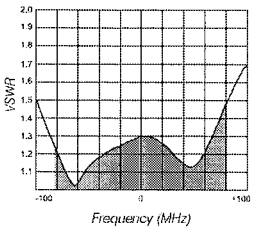
The true corporate feed of these arrays maintains total pattern integrity over a very broad operating and width, similar to that previously available only in exposed dipole configurations. This is now achieved in the preferred from factor of a fully enclosed fiberglass radome. The corporate collinears 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.

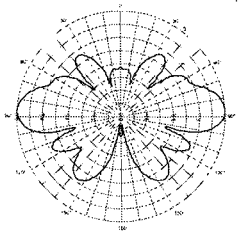
Features:

- 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.

Typical VSWR Response (CC807-06)



CC807-06 - E Plane



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	Full Band			
VSWR *(Return Loss)*	< 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 (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length *mm (inches)*		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter *mm (inches)*		76 (3)			
Weight *kg (lbs)*		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight *kg (lbs)*		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions *mm (inches)*	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 cm^2 (ft^2)	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 *N* (100 mph lbs)		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating *km/h (mph)*	No Ice	>240 (>150)			
Torque @ 160km/h *Nm* (100mph ft-lbs)		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.

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ENGINEERED
TOWER SOLUTIONS

Date: **March 25, 2025**

Marty Randall
10-18 Consulting
Cell: 828-527-2416
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Engineered Tower Solutions, PLLC
3227 Wellington Court
Raleigh, NC 27615
(919) 782-2710

Subject:	**Structural Modification Analysis Report**
Carrier Designation:	***Watauga County* Reconfiguration** **Carrier Site Name:** Buckeye Mt. - Viper
Tower Owner Designation:	***NCSHP* Site Number:** HP-1343 ***NCSHP* Site Name:** Buckeye Mt. - Viper
Engineering Firm Designation:	***ETS, PLLC* Job Number:** 24125017.STR.8177
Site Data:	**2542 Forest Grove Road, Vilas, Watauga County, NC 28698** **Latitude *N 36° 18' 57.89"*, Longitude *W 81° 47' 29.44"*** **150.0 Foot – Self Support Tower**

Dear Marty Randall,

Engineered Tower Solutions, PLLC is pleased to submit this **"Structural Modification Analysis Report"** to determine the structural integrity of the above-mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

Modified Structure W/ Final Equipment Configuration:

Tower:	**85.9%**	**Sufficient Capacity**
Foundation:	**60.3%**	**Sufficient Capacity**

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

Structural analysis prepared by:

Hicham Anssar
Structural Engineer I

Respectfully submitted by:

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

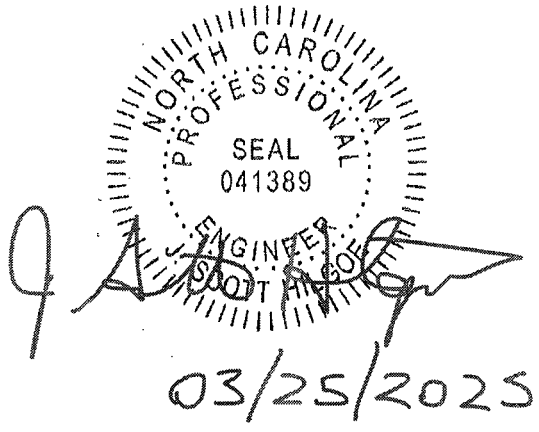

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Table 4 - Section Capacity (Summary)
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4.2) Dish Antenna Deflection Results

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tnxTower Output

APPENDIX B
Base Level Drawing

APPENDIX C
Additional Calculations

APPENDIX D
Modification Design Drawings

1) INTRODUCTION

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

2) ANALYSIS CRITERIA

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

Table 1 - Proposed Equipment Configuration

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

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
147.0 (NCSHP)	155.0	1	Unknow	15-ft Omni	2	7/8"
	150.0	1	Unknow	4-ft Omni		
	147.0	1	Unknow	Junction Box (9" x 6" x 6")	1	1/2"
		3	Tower Mounts	Horizontal Mount Pipe/Stabilizer		
		3	Tower Mounts	6-ft Side Arm Mount		
117.0 (NCSHP)	125.0	1	Unknow	15-ft Omni	1	1-5/8"
	120.0	1	Unknow	4-ft Omni		
	117.0	2	Tower Mounts	Horizontal Mount Pipe/Stabilizer	1	7/8"
		2	Tower Mounts	6-ft Side Arm Mount		
117.0 (Watauga County)	**123.0**	**1**	**Unknow**	**10-ft Dipole ***	**1**	**1/2" ***
	117.0	1	Tower Mount	Horizontal Mount Pipe/Stabilizer		
		1	Tower Mount	6-ft Side Arm Mount		
80.0 (Watauga County)	**92.0**	**1**	**Unknown**	**6-ft Dish Ice Shield****	**-**	**-**
	80.0	**1**	**Tower Mount**	**5-ft Dish Pipe Mount *****	**1**	**EW63 *****
		1	**Commscope**	**PL6-65-PXA *****		
80.0 (Unknown)	80.0	1	Tower Mount	5-ft Empty Pipe Mount	-	-
79.0 (NCSHP)	86.0	1	Unknown	8-ft Ice Shield	-	-
	79.0	1	Tower Mount	5-ft Dish Pipe Mount	1	EW63
		1	Commscope	PL6-65-PXA		

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

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

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

3.1) Analysis Method

tnxTower (version 8.3.1.2), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

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

3.2) Assumptions

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

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

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

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	75.5	Pass
1	Base Foundation (Structural)	0	42.6	Pass
1	Base Foundation (Soil Interaction)	0	60.3	Pass

Structure Rating (max from all components) =	85.9%

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

4.1) Recommendations

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

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

Loading Changes:

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

4.2) Dish Antenna Deflection Results

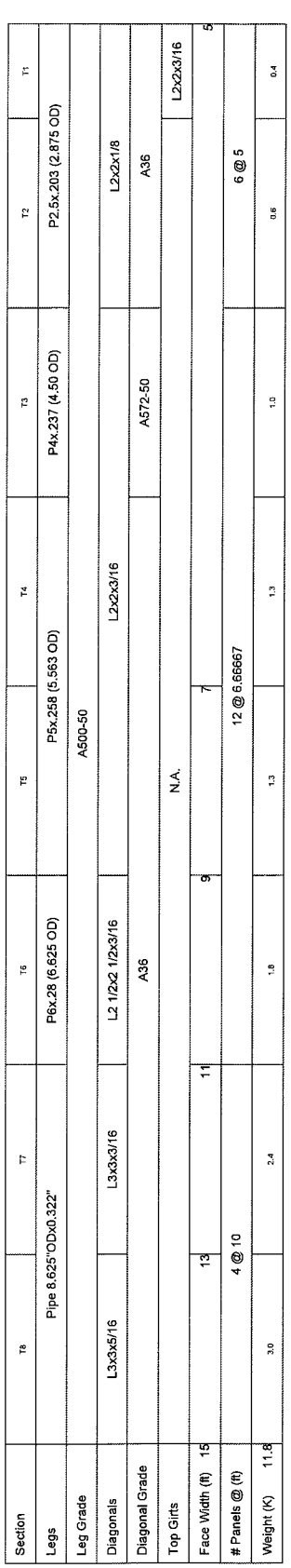
The results of the tilt and twist values for a 60 mph 3-second gust service wind speed per the TIA-222-G standard are given below:

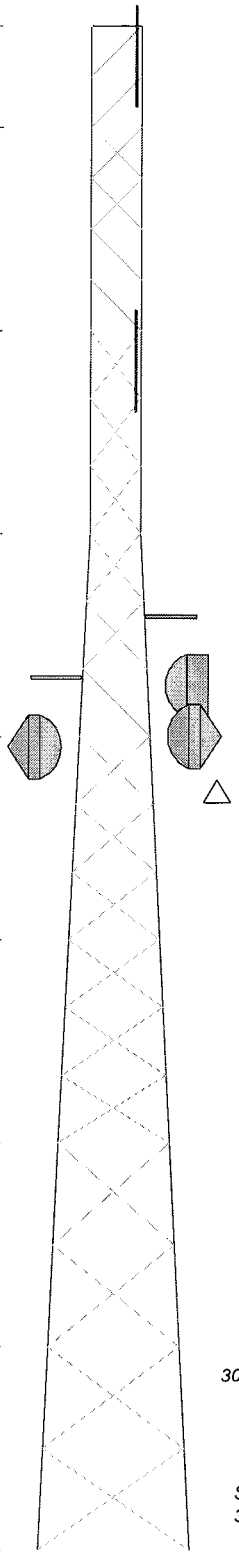
Critical Deflections and Radius of Curvature - Service Wind

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	*°*	*°*	*ft*
85.00	HX6-6W-6WH	44	0.894	0.11	0.03	33414
80.00	PL6-65-PXA	44	0.781	0.10	0.03	35799
79.00	PL6-65-PXA	44	0.759	0.10	0.03	35910

APPENDIX A

TNXTOWER OUTPUT





DESIGNED APPURTENANCE LOADING

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

MATERIAL STRENGTH

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

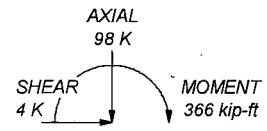
TOWER DESIGN NOTES

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

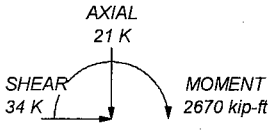
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 212 K
SHEAR: 22 K

UPLIFT: -185 K
SHEAR: 19 K



TORQUE 4 kip-ft
30 mph WIND - 1.0000 in ICE



TORQUE 27 kip-ft
REACTIONS - 108 mph WIND

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

Job:	***Buckeye Mt. - Viper***		
Project:	***ETS, PLLC Job No. 24125017.STR.8177***		
Client: Watauga County	Drawn by: hicham.anssar	App'd:	
Code: TIA-222-G	Date: 03/25/25	Scale: NTS	
Path:		Dwg No. E-1	

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

Tower Input Data

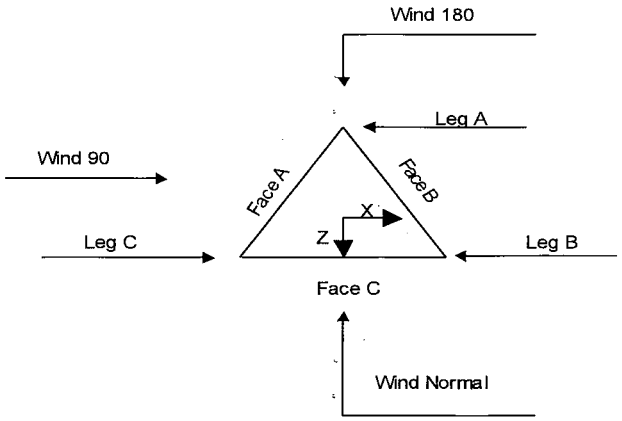
The main tower is a 3x free standing tower with an overall height of 150.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 5.00 ft at the top and 15.00 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 108 mph.
Structure Class III.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 30 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Assume Legs Pinned	√ Calculate Redundant Bracing Forces
Consider Moments - Horizontals	√ Assume Rigid Index Plate	Ignore Redundant Members in FEA
Consider Moments - Diagonals	√ Use Clear Spans For Wind Area	√ SR Leg Bolts Resist Compression
Use Moment Magnification	√ Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
√ Use Code Stress Ratios	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		

tnxTower	Job: Buckeye Mt. - Viper	Page: 2 of 33
Engineered Tower Solutions, PLLC 3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125017.STR.8177	Date: 15:00:36 03/25/25
	Client: Watauga County	Designed by: hicham.anssar



Triangular Tower

Tower Section Geometry

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

Tower Section Geometry *(cont'd)*

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

tnxTower	Job: Buckeye Mt. - Viper	Page: 3 of 33
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	Client: Watauga County	Designed by: hicham.anssar

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	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 150.00-140.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 140.00-120.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 120.00-100.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 100.00-80.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

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Tower Elevation ft	Gusset Area (per face) ft²	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
T5 80.00-60.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 60.00-40.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 40.00-20.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 20.00-0.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	Single Diags X	Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
T1	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
150.00-140.00				1	1	1	1	1	1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1	1	1	1	1	1
T3	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1	1	1	1	1	1
T4	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1	1	1	1	1	1
T5	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1	1	1	1	1	1
T6	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1	1	1	1	1	1
T7	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1	1	1	1	1	1
T8 20.00-0.00	Yes	No	1	1	1	1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1	1	1

[1]*Note: 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)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1	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
150.00-140.00														
T2	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
140.00-120.00														
T3	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
120.00-100.00														

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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
T4 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

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

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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	U	Net Width Deduct in	U	Net Width Deduct in	U
T6 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	0.0000	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)
T7 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	0.0000	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)
T8 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	0.0000	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)

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 150.00-140.00	Flange	0.7500 A325N	4	0.7500 A325N	1	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 140.00-120.00	Flange	0.7500 A325N	4	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 120.00-100.00	Flange	0.7500 A325N	6	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 100.00-80.00	Flange	0.7500 A325N	8	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 80.00-60.00	Flange	0.7500 A325N	8	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 60.00-40.00	Flange	1.0000 A325N	8	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

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Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T7 40.00-20.00	Flange	1.0000 A325N	8	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 20.00-0.00	Flange	0.7500 A325N	0	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	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)	80.00 - 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)	80.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49
Step Pegs (5/8" SR) 7-in. w/ 30" Step	C	No	No	Ar (CaAa)	150.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49
Ladder Rail: PL3x1/4	C	No	No	Af (CaAa)	150.00 - 0.00	0.0000	0	2	2	12.0420 3.0000	3.0000		3.83
Climbing Rung: SR 5/8" (12" Step)	C	No	No	Ar (CaAa)	150.00 - 0.00	0.0000	0	1	1	0.6250	0.6250		1.04
Safety Line 3/8	C	No	No	Ar (CaAa)	150.00 - 0.00	0.0000	0	1	1	0.3750	0.3750		0.22
***													
Feedline Ladder (Af)	A	No	No	Af (CaAa)	150.00 - 0.00	0.0000	-0.32	1	1	3.0000	3.5000		8.40
1 5/8	A	No	No	Ar (CaAa)	117.00 - 10.00	0.0000	-0.4	1	1	1.9800	1.9800		1.04
7/8	A	No	No	Ar (CaAa)	147.00 - 10.00	0.0000	-0.38	1	1	1.1100	1.1100		0.54
1/2	A	No	No	Ar (CaAa)	147.00 - 10.00	0.0000	-0.36	1	1	0.5800	0.5800		0.25
EW63	A	No	No	Ar (CaAa)	80.00 - 10.00	0.0000	-0.34	1	1	1.5742	1.5742		0.51
7/8	A	No	No	Ar (CaAa)	147.00 - 117.00	0.0000	-0.31	1	1	1.1100	1.1100		0.54
7/8	A	No	No	Ar (CaAa)	117.00 - 10.00	0.0000	-0.31	2	2	0.5000 1.1100	1.1100		0.54
EW63	A	No	No	Ar (CaAa)	79.00 - 10.00	0.0000	-0.26	1	1	1.5742	1.5742		0.51
***													
7/8	A	No	No	Ar (CaAa)	147.00 - 10.00	0.0000	-0.22	1	1	1.1100	1.1100		0.54
EU 63	A	No	No	Ar (CaAa)	85.00 - 10.00	0.0000	-0.2	1	1	2.0300	2.0300		0.56
***													

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Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight plf
***								

Feed Line/Linear Appurtenances Section Areas

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

Feed Line/Linear Appurtenances Section Areas - With Ice

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

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	Client: Watauga County	Designed by: hicham.anssar

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

Feed Line Center of Pressure

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

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	140.00 - 150.00	0.6000	0.3876
T1	5	Ladder Rail: PL3x1/4	140.00 - 150.00	0.6000	0.3876
T1	6	Climbing Rung: SR 5/8" (12" Step)	140.00 - 150.00	0.6000	0.3876
T1	7	Safety Line 3/8	140.00 - 150.00	0.6000	0.3876
T1	9	Feedline Ladder (Af)	140.00 - 150.00	0.6000	0.3876
T1	11	7/8	140.00 - 147.00	0.6000	0.3876
T1	12	1/2	140.00 - 147.00	0.6000	0.3876
T1	14	7/8	140.00 - 147.00	0.6000	0.3876
T1	19	7/8	140.00 - 147.00	0.6000	0.3876
T2	4	Step Pegs (5/8" SR) 7-in. w/	120.00 -	0.6000	0.4454

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

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

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***									
20'x3" pipe	A	From Centroid-Leg	2.25 0.00 10.00	0.00	149.00	No Ice 1/2" Ice 1" Ice	5.65 8.03 10.08	5.65 8.03 10.08	0.05 0.09 0.15
5/8-in x 4-ft Lightning Rod	A	From Centroid-Leg	2.50 0.00 1.00	0.00	159.00	No Ice 1/2" Ice 1" Ice	0.25 0.66 0.97	0.25 0.66 0.97	0.00 0.01 0.01
***									
Side Arm Mount [SO 303-3]	B	None		0.00	147.00	No Ice 1/2" Ice 1" Ice	7.67 11.04 14.57	7.67 11.04 14.57	0.34 0.48 0.65
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	C	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
3" x 4' Omni	A	From Leg	6.00 0.00 3.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	1.04 1.44 1.68	1.04 1.44 1.68	0.04 0.05 0.06
3" dia x 15-ft Omni Antenna	B	From Leg	6.00 0.00 8.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	4.25 6.03 7.58	4.25 6.03 7.58	0.04 0.07 0.11
CC807-11	C	From Leg	6.00 0.00 9.20	0.00	147.00	No Ice 1/2" Ice 1" Ice	4.86 7.63 9.40	4.86 7.63 9.40	0.05 0.09 0.14
Junction Box (9" x 6" x 6")	A	From Face	0.50 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	0.83 0.95 1.07	0.50 0.59 0.69	0.03 0.03 0.04
***									
Side Arm Mount [SO 303-3]	B	None		0.00	117.00	No Ice 1/2" Ice 1" Ice	7.67 11.04 14.57	7.67 11.04 14.57	0.34 0.48 0.65
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00 0.00 0.00	0.00	117.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00 0.00	0.00	117.00	No Ice 1/2" Ice	2.38 3.40	0.06 0.12	0.04 0.06

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	C	From Leg	0.00	0.00	117.00	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
3" x 4' Omni	A	From Leg	6.00	0.00	117.00	No Ice	1.04	1.04	0.04
			0.00			1/2" Ice	1.44	1.44	0.05
			3.00			1" Ice	1.68	1.68	0.06
3" dia x 15-ft Omni Antenna	C	From Leg	6.00	0.00	117.00	No Ice	4.35	4.35	0.04
			0.00			1/2" Ice	6.03	6.03	0.07
			8.00			1" Ice	7.58	7.58	0.11
CC807-11	B	From Leg	6.00	0.00	117.00	No Ice	4.98	4.98	0.05
			0.00			1/2" Ice	7.63	7.63	0.09
			9.20			1" Ice	9.40	9.40	0.14
***									
4.5" x 5-ft Dish Pipe Mount	B	From Leg	1.33	0.00	80.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
6' Dish Ice Shield	B	From Leg	3.00	0.00	92.00	No Ice	7.72	7.72	0.31
			0.00			1/2" Ice	11.08	11.08	0.53
			0.00			1" Ice	14.44	14.41	0.78
4.5" x 5-ft Dish Pipe Mount	B	From Leg	1.33	0.00	85.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
***									
4.5" x 5-ft Dish Pipe Mount	C	From Leg	1.33	0.00	79.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
8' Dish Ice Shield	C	From Leg	3.00	0.00	86.00	No Ice	8.67	8.67	0.38
			0.00			1/2" Ice	11.10	11.10	0.66
			0.00			1" Ice	13.32	13.53	0.97
***									
4.5" x 5-ft Dish Pipe Mount	A	From Leg	1.33	0.00	80.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
***									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
***											
PL6-65-PXA	B	Paraboloid w/Radome	From Leg	2.00	50.00		80.00	6.36	No Ice	31.75	0.16
				0.00					1/2" Ice	32.59	0.33
				0.00					1" Ice	33.43	0.50
***											
PL6-65-PXA	C	Paraboloid w/Radome	From Leg	2.00	10.00		79.00	6.36	No Ice	31.75	0.16
				0.00					1/2" Ice	32.59	0.33
				0.00					1" Ice	33.43	0.50

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Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
***											
HX6-6W-6WH	B	Paraboloid w/Shroud (HP)	From Leg	2.00 0.00 0.00	48.00		85.00	6.23	No Ice 1/2" Ice 1" Ice	30.48 31.30 32.13	0.19 0.35 0.51
***											

Tower Pressures - No Ice

$G_H = 0.850$

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

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	145.00	1.369	3	2.8988	57.227	A	5.282	29.765	14.454	41.24	30.602	0.000
150.00-140.00						B	5.282	29.765		41.24	0.000	0.000
						C	5.282	29.765		41.24	45.694	0.000
T2	130.00	1.337	3	2.8674	114.350	A	8.976	54.438	28.699	45.26	76.834	0.000
140.00-120.00						B	8.976	54.438		45.26	0.000	0.000

tnxTower	Job: Buckeye Mt. - Viper	Page: 15 of 33
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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	8.976	54.438		45.26	90.662	0.000
T3	110.00	1.291	3	2.8199	116.900	A	7.708	55.536	33.799	53.44	100.195	0.000
120.00-100.00						B	7.708	55.536		53.44	0.000	0.000
						C	7.708	55.536		53.44	89.566	0.000
T4 100.00-80.00	90.00	1.238	2	2.7638	138.508	A	8.284	59.925	37.030	54.29	106.750	0.000
						B	8.284	59.925		54.29	0.000	0.000
						C	8.284	59.925		54.29	88.274	0.000
T5 80.00-60.00	70.00	1.174	2	2.6952	178.279	A	9.816	63.030	36.572	50.20	164.689	0.000
						B	9.816	63.030		50.20	21.569	0.000
						C	9.816	63.030		50.20	86.693	0.000
T6 60.00-40.00	50.00	1.094	2	2.6061	219.753	A	14.199	69.127	39.523	47.43	161.275	0.000
						B	14.199	69.127		47.43	20.939	0.000
						C	14.199	69.127		47.43	84.636	0.000
T7 40.00-20.00	30.00	0.982	2	2.4763	262.658	A	14.690	69.585	45.334	53.79	155.295	0.000
						B	14.690	69.585		53.79	20.023	0.000
						C	14.690	69.585		53.79	81.644	0.000
T8 20.00-0.00	10.00	0.850	2	2.2186	301.798	A	16.326	67.761	43.614	51.87	91.085	0.000
						B	16.326	67.761		51.87	18.205	0.000
						C	16.326	67.761		51.87	75.704	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	145.00	1.369	11	52.396	A	5.282	4.792	4.792	47.57	8.570	0.000
150.00-140.00					B	5.282	4.792		47.57	0.000	0.000
					C	5.282	4.792		47.57	11.700	0.000
T2	130.00	1.337	10	104.792	A	8.976	9.583	9.583	51.64	19.487	0.000
140.00-120.00					B	8.976	9.583		51.64	0.000	0.000
					C	8.976	9.583		51.64	23.400	0.000
T3	110.00	1.291	10	107.500	A	7.708	15.000	15.000	66.06	24.740	0.000
120.00-100.00					B	7.708	15.000		66.06	0.000	0.000
					C	7.708	15.000		66.06	23.400	0.000
T4	90.00	1.238	10	129.283	A	8.284	18.574	18.574	69.16	26.682	0.000
100.00-80.00					B	8.284	18.574		69.16	0.000	0.000
					C	8.284	18.574		69.16	23.400	0.000
T5 80.00-60.00	70.00	1.174	9	169.283	A	9.816	18.574	18.574	65.42	37.266	0.000
					B	9.816	18.574		65.42	1.400	0.000
					C	9.816	18.574		65.42	23.400	0.000
T6 60.00-40.00	50.00	1.094	9	211.055	A	14.199	22.120	22.120	60.90	37.424	0.000
					B	14.199	22.120		60.90	1.400	0.000
					C	14.199	22.120		60.90	23.400	0.000
T7 40.00-20.00	30.00	0.982	8	254.393	A	14.690	28.798	28.798	66.22	37.424	0.000
					B	14.690	28.798		66.22	1.400	0.000
					C	14.690	28.798		66.22	23.400	0.000
T8 20.00-0.00	10.00	0.850	7	294.393	A	16.326	28.798	28.798	63.82	25.245	0.000
					B	16.326	28.798		63.82	1.400	0.000
					C	16.326	28.798		63.82	23.400	0.000

tnxTower	Job: Buckeye Mt. - Viper	Page: 16 of 33
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	Client: Watauga County	Designed by: hicham.anssar

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	40	1	1	8.019	1.04	103.51	C
150.00-140.00			B	0.192	2.622		1	1	8.019			
			C	0.192	2.622		1	1	8.019			
T2	0.40	0.63	A	0.177	2.674	39	1	1	14.443	1.96	97.81	C
140.00-120.00			B	0.177	2.674		1	1	14.443			
			C	0.177	2.674		1	1	14.443			
T3	0.43	1.01	A	0.211	2.559	38	1	1	15.346	2.00	99.97	C
120.00-100.00			B	0.211	2.559		1	1	15.346			
			C	0.211	2.559		1	1	15.346			
T4	0.44	1.27	A	0.208	2.57	36	1	1	16.957	2.08	104.16	C
100.00-80.00			B	0.208	2.57		1	1	16.957			
			C	0.208	2.57		1	1	16.957			
T5	0.50	1.34	A	0.168	2.707	34	1	1	18.243	2.35	117.57	C
80.00-60.00			B	0.168	2.707		1	1	18.243			
			C	0.168	2.707		1	1	18.243			
T6	0.51	1.81	A	0.172	2.692	32	1	1	23.717	2.59	129.26	C
60.00-40.00			B	0.172	2.692		1	1	23.717			
			C	0.172	2.692		1	1	23.717			
T7	0.51	2.41	A	0.171	2.696	29	1	1	27.063	2.54	127.19	C
40.00-20.00			B	0.171	2.696		1	1	27.063			
			C	0.171	2.696		1	1	27.063			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	1	1	28.432	2.17	108.37	C
			B	0.153	2.759		1	1	28.432			
			C	0.153	2.759		1	1	28.432			
Sum Weight:	3.44	11.79						OTM	1203.66 kip-ft	16.72		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	40	0.8	1	6.963	0.94	94.11	A
150.00-140.00			B	0.192	2.622		0.8	1	6.963			
			C	0.192	2.622		0.8	1	6.963			
T2	0.40	0.63	A	0.177	2.674	39	0.8	1	12.648	1.80	89.84	A
140.00-120.00			B	0.177	2.674		0.8	1	12.648			
			C	0.177	2.674		0.8	1	12.648			
T3	0.43	1.01	A	0.211	2.559	38	0.8	1	13.804	1.87	93.65	A
120.00-100.00			B	0.211	2.559		0.8	1	13.804			
			C	0.211	2.559		0.8	1	13.804			
T4	0.44	1.27	A	0.208	2.57	36	0.8	1	15.301	1.95	97.62	A
100.00-80.00			B	0.208	2.57		0.8	1	15.301			
			C	0.208	2.57		0.8	1	15.301			
T5	0.50	1.34	A	0.168	2.707	34	0.8	1	16.280	2.20	109.83	A
80.00-60.00			B	0.168	2.707		0.8	1	16.280			
			C	0.168	2.707		0.8	1	16.280			
T6	0.51	1.81	A	0.172	2.692	32	0.8	1	20.877	2.38	118.89	A
60.00-40.00			B	0.172	2.692		0.8	1	20.877			
			C	0.172	2.692		0.8	1	20.877			

tnxTower	Job: Buckeye Mt. - Viper	Page: 17 of 33
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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7	0.51	2.41	A	0.171	2.696	29	0.8	1	24.125	2.35	117.54	A
40.00-20.00			B	0.171	2.696		0.8	1	24.125			
			C	0.171	2.696		0.8	1	24.125			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	0.8	1	25.166	1.98	98.87	A
			B	0.153	2.759		0.8	1	25.166			
			C	0.153	2.759		0.8	1	25.166			
Sum Weight:	3.44	11.79						OTM	1114.74 kip-ft	15.47		

Tower Forces - No Ice - 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 ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	40	0.85	1	7.227	1.01	100.60	B
150.00-140.00			B	0.192	2.622		0.85	1	7.227			
			C	0.192	2.622		0.85	1	7.227			
T2	0.40	0.63	A	0.177	2.674	39	0.85	1	13.097	1.92	95.88	B
140.00-120.00			B	0.177	2.674		0.85	1	13.097			
			C	0.177	2.674		0.85	1	13.097			
T3	0.43	1.01	A	0.211	2.559	38	0.85	1	14.189	1.99	99.67	B
120.00-100.00			B	0.211	2.559		0.85	1	14.189			
			C	0.211	2.559		0.85	1	14.189			
T4	0.44	1.27	A	0.208	2.57	36	0.85	1	15.715	2.07	103.61	B
100.00-80.00			B	0.208	2.57		0.85	1	15.715			
			C	0.208	2.57		0.85	1	15.715			
T5	0.50	1.34	A	0.168	2.707	34	0.85	1	16.771	2.31	115.58	B
80.00-60.00			B	0.168	2.707		0.85	1	16.771			
			C	0.168	2.707		0.85	1	16.771			
T6	0.51	1.81	A	0.172	2.692	32	0.85	1	21.587	2.50	125.04	B
60.00-40.00			B	0.172	2.692		0.85	1	21.587			
			C	0.172	2.692		0.85	1	21.587			
T7	0.51	2.41	A	0.171	2.696	29	0.85	1	24.859	2.46	123.15	B
40.00-20.00			B	0.171	2.696		0.85	1	24.859			
			C	0.171	2.696		0.85	1	24.859			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	0.85	1	25.983	2.08	103.80	B
			B	0.153	2.759		0.85	1	25.983			
			C	0.153	2.759		0.85	1	25.983			
Sum Weight:	3.44	11.79						OTM	1182.42 kip-ft	16.34		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	1	1	27.655	0.18	17.53	C

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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
150.00-140.00			B	0.612	1.797		1	1	27.655			
			C	0.612	1.797		1	1	27.655			
T2	3.40	5.22	A	0.555	1.839	3	1	1	47.949	0.35	17.53	C
140.00-120.00			B	0.555	1.839		1	1	47.949			
			C	0.555	1.839		1	1	47.949			
T3	3.69	5.44	A	0.541	1.852	3	1	1	47.026	0.36	17.76	C
120.00-100.00			B	0.541	1.852		1	1	47.026			
			C	0.541	1.852		1	1	47.026			
T4	3.73	6.01	A	0.492	1.91	2	1	1	49.090	0.38	18.77	C
100.00-80.00			B	0.492	1.91		1	1	49.090			
			C	0.492	1.91		1	1	49.090			
T5	4.91	6.38	A	0.409	2.047	2	1	1	50.156	0.48	23.84	C
80.00-60.00			B	0.409	2.047		1	1	50.156			
			C	0.409	2.047		1	1	50.156			
T6	4.68	7.80	A	0.379	2.107	2	1	1	57.575	0.48	23.79	C
60.00-40.00			B	0.379	2.107		1	1	57.575			
			C	0.379	2.107		1	1	57.575			
T7	4.35	8.24	A	0.321	2.242	2	1	1	56.837	0.43	21.43	C
40.00-20.00			B	0.321	2.242		1	1	56.837			
			C	0.321	2.242		1	1	56.837			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	1	1	56.478	0.32	16.12	C
			B	0.279	2.354		1	1	56.478			
			C	0.279	2.354		1	1	56.478			
Sum Weight:	29.19	50.45						OTM	217.11 kip-ft	2.96		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	0.8	1	26.599	0.17	17.10	A
150.00-140.00			B	0.612	1.797		0.8	1	26.599			
			C	0.612	1.797		0.8	1	26.599			
T2	3.40	5.22	A	0.555	1.839	3	0.8	1	46.154	0.34	17.16	A
140.00-120.00			B	0.555	1.839		0.8	1	46.154			
			C	0.555	1.839		0.8	1	46.154			
T3	3.69	5.44	A	0.541	1.852	3	0.8	1	45.484	0.35	17.45	A
120.00-100.00			B	0.541	1.852		0.8	1	45.484			
			C	0.541	1.852		0.8	1	45.484			
T4	3.73	6.01	A	0.492	1.91	2	0.8	1	47.433	0.37	18.45	A
100.00-80.00			B	0.492	1.91		0.8	1	47.433			
			C	0.492	1.91		0.8	1	47.433			
T5	4.91	6.38	A	0.409	2.047	2	0.8	1	48.193	0.47	23.45	A
80.00-60.00			B	0.409	2.047		0.8	1	48.193			
			C	0.409	2.047		0.8	1	48.193			
T6	4.68	7.80	A	0.379	2.107	2	0.8	1	54.735	0.46	23.25	A
60.00-40.00			B	0.379	2.107		0.8	1	54.735			
			C	0.379	2.107		0.8	1	54.735			
T7	4.35	8.24	A	0.321	2.242	2	0.8	1	53.899	0.42	20.89	A
40.00-20.00			B	0.321	2.242		0.8	1	53.899			
			C	0.321	2.242		0.8	1	53.899			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	0.8	1	53.213	0.31	15.58	A

tnxTower	Job: Buckeye Mt. - Viper	Page: 19 of 33
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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			B	0.279	2.354		0.8	1	53.213			
			C	0.279	2.354		0.8	1	53.213			
Sum Weight:	29.19	50.45						OTM	212.73 kip-ft	2.90		

Tower Forces - With Ice - 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 ft²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	0.85	1	26.863	0.17	17.36	B
150.00-140.00			B	0.612	1.797		0.85	1	26.863			
			C	0.612	1.797		0.85	1	26.863			
T2	3.40	5.22	A	0.555	1.839	3	0.85	1	46.602	0.35	17.43	B
140.00-120.00			B	0.555	1.839		0.85	1	46.602			
			C	0.555	1.839		0.85	1	46.602			
T3	3.69	5.44	A	0.541	1.852	3	0.85	1	45.870	0.36	17.79	B
120.00-100.00			B	0.541	1.852		0.85	1	45.870			
			C	0.541	1.852		0.85	1	45.870			
T4	3.73	6.01	A	0.492	1.91	2	0.85	1	47.847	0.38	18.83	B
100.00-80.00			B	0.492	1.91		0.85	1	47.847			
			C	0.492	1.91		0.85	1	47.847			
T5	4.91	6.38	A	0.409	2.047	2	0.85	1	48.684	0.48	23.90	B
80.00-60.00			B	0.409	2.047		0.85	1	48.684			
			C	0.409	2.047		0.85	1	48.684			
T6	4.68	7.80	A	0.379	2.107	2	0.85	1	55.445	0.47	23.72	B
60.00-40.00			B	0.379	2.107		0.85	1	55.445			
			C	0.379	2.107		0.85	1	55.445			
T7	4.35	8.24	A	0.321	2.242	2	0.85	1	54.634	0.43	21.32	B
40.00-20.00			B	0.321	2.242		0.85	1	54.634			
			C	0.321	2.242		0.85	1	54.634			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	0.85	1	54.030	0.32	15.93	B
			B	0.279	2.354		0.85	1	54.030			
			C	0.279	2.354		0.85	1	54.030			
Sum Weight:	29.19	50.45						OTM	216.68 kip-ft	2.95		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	11	1	1	8.028	0.28	27.80	C
150.00-140.00			B	0.192	2.622		1	1	8.028			
			C	0.192	2.622		1	1	8.028			
T2	0.40	0.63	A	0.177	2.674	10	1	1	14.447	0.53	26.25	C
140.00-120.00			B	0.177	2.674		1	1	14.447			

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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 ft²	F K	w plf	Ctrl. Face
			C	0.177	2.674		1	1	14.447			
T3	0.43	1.01	A	0.211	2.559	10	1	1	16.356	0.56	27.94	C
120.00-100.00			B	0.211	2.559		1	1	16.356			
			C	0.211	2.559		1	1	16.356			
T4	0.44	1.27	A	0.208	2.57	10	1	1	18.980	0.60	30.10	C
100.00-80.00			B	0.208	2.57		1	1	18.980			
			C	0.208	2.57		1	1	18.980			
T5	0.50	1.34	A	0.168	2.707	9	1	1	20.396	0.68	33.83	C
80.00-60.00			B	0.168	2.707		1	1	20.396			
			C	0.168	2.707		1	1	20.396			
T6	0.51	1.81	A	0.172	2.692	9	1	1	26.556	0.75	37.48	C
60.00-40.00			B	0.172	2.692		1	1	26.556			
			C	0.172	2.692		1	1	26.556			
T7	0.51	2.41	A	0.171	2.696	8	1	1	29.748	0.73	36.50	C
40.00-20.00			B	0.171	2.696		1	1	29.748			
			C	0.171	2.696		1	1	29.748			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	1	1	31.650	0.63	31.60	C
			B	0.153	2.759		1	1	31.650			
			C	0.153	2.759		1	1	31.650			
Sum Weight:	3.44	11.79						OTM	337.28 kip-ft	4.75		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	11	0.8	1	6.972	0.25	25.28	A
150.00-140.00			B	0.192	2.622		0.8	1	6.972			
			C	0.192	2.622		0.8	1	6.972			
T2	0.40	0.63	A	0.177	2.674	10	0.8	1	12.652	0.48	24.12	A
140.00-120.00			B	0.177	2.674		0.8	1	12.652			
			C	0.177	2.674		0.8	1	12.652			
T3	0.43	1.01	A	0.211	2.559	10	0.8	1	14.815	0.52	26.25	A
120.00-100.00			B	0.211	2.559		0.8	1	14.815			
			C	0.211	2.559		0.8	1	14.815			
T4	0.44	1.27	A	0.208	2.57	10	0.8	1	17.323	0.57	28.34	A
100.00-80.00			B	0.208	2.57		0.8	1	17.323			
			C	0.208	2.57		0.8	1	17.323			
T5	0.50	1.34	A	0.168	2.707	9	0.8	1	18.433	0.64	31.75	A
80.00-60.00			B	0.168	2.707		0.8	1	18.433			
			C	0.168	2.707		0.8	1	18.433			
T6	0.51	1.81	A	0.172	2.692	9	0.8	1	23.716	0.69	34.69	A
60.00-40.00			B	0.172	2.692		0.8	1	23.716			
			C	0.172	2.692		0.8	1	23.716			
T7	0.51	2.41	A	0.171	2.696	8	0.8	1	26.810	0.68	33.91	A
40.00-20.00			B	0.171	2.696		0.8	1	26.810			
			C	0.171	2.696		0.8	1	26.810			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	0.8	1	28.384	0.58	29.05	A
			B	0.153	2.759		0.8	1	28.384			
			C	0.153	2.759		0.8	1	28.384			
Sum Weight:	3.44	11.79						OTM	313.42 kip-ft	4.42		

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	Client: Watauga County	Designed by: hicham.anssar

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 ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	11	0.85	1	7.236	0.27	27.02	B
150.00-140.00			B	0.192	2.622		0.85	1	7.236			
			C	0.192	2.622		0.85	1	7.236			
T2	0.40	0.63	A	0.177	2.674	10	0.85	1	13.101	0.51	25.74	B
140.00-120.00			B	0.177	2.674		0.85	1	13.101			
			C	0.177	2.674		0.85	1	13.101			
T3	0.43	1.01	A	0.211	2.559	10	0.85	1	15.200	0.56	27.86	B
120.00-100.00			B	0.211	2.559		0.85	1	15.200			
			C	0.211	2.559		0.85	1	15.200			
T4	0.44	1.27	A	0.208	2.57	10	0.85	1	17.738	0.60	29.95	B
100.00-80.00			B	0.208	2.57		0.85	1	17.738			
			C	0.208	2.57		0.85	1	17.738			
T5	0.50	1.34	A	0.168	2.707	9	0.85	1	18.923	0.67	33.30	B
80.00-60.00			B	0.168	2.707		0.85	1	18.923			
			C	0.168	2.707		0.85	1	18.923			
T6	0.51	1.81	A	0.172	2.692	9	0.85	1	24.426	0.73	36.34	B
60.00-40.00			B	0.172	2.692		0.85	1	24.426			
			C	0.172	2.692		0.85	1	24.426			
T7	0.51	2.41	A	0.171	2.696	8	0.85	1	27.545	0.71	35.42	B
40.00-20.00			B	0.171	2.696		0.85	1	27.545			
			C	0.171	2.696		0.85	1	27.545			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	0.85	1	29.201	0.61	30.37	B
			B	0.153	2.759		0.85	1	29.201			
			C	0.153	2.759		0.85	1	29.201			
Sum Weight:	3.44	11.79						OTM	331.59 kip-ft	4.65		

Force Totals

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

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

Load Combinations

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	150 - 140	Leg	Max Tension	23	3.79	0.26	0.06
			Max. Compression	18	-4.64	-0.02	0.00
			Max. Mx	8	1.22	0.44	-0.05
			Max. My	3	0.65	-0.00	-0.41
			Max. Vy	20	-0.38	0.28	0.05
			Max. Vx	2	-0.35	-0.00	0.25
		Diagonal	Max Tension	22	1.38	0.00	0.00
			Max. Compression	10	-1.43	0.00	0.00
			Max. Mx	33	0.22	0.03	-0.00
			Max. My	11	1.26	0.00	-0.00
			Max. Vy	33	-0.04	0.03	-0.00
			Max. Vx	11	-0.00	0.00	0.00
		Top Girt	Max Tension	23	0.03	0.00	0.00
			Max. Compression	27	-0.04	0.00	0.00
			Max. Mx	26	-0.04	-0.07	0.00
			Max. Vy	26	-0.06	0.00	0.00
T2	140 - 120	Leg	Max Tension	15	21.90	0.01	-0.05
			Max. Compression	2	-24.42	-0.01	0.18
			Max. Mx	10	10.59	-0.22	-0.20
			Max. My	24	-1.15	0.15	0.26
			Max. Vy	10	0.09	-0.22	-0.20
			Max. Vx	24	-0.10	0.15	0.26
		Diagonal	Max Tension	10	2.70	0.00	0.00
			Max. Compression	10	-2.73	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
			Max. Mx	35	0.24	0.03	0.00
			Max. My	11	2.69	0.01	-0.00
			Max. Vy	35	-0.04	0.03	0.00
			Max. Vx	11	-0.00	0.00	0.00
T3	120 - 100	Leg	Max Tension	15	54.88	0.02	-0.09
			Max. Compression	2	-60.47	-0.01	0.90
			Max. Mx	10	-59.95	-0.84	-0.31
			Max. My	2	-60.47	-0.01	0.90
			Max. Vy	8	0.31	-0.53	-0.04
			Max. Vx	2	-0.29	-0.01	0.60
		Diagonal	Max Tension	23	5.76	0.03	-0.00
			Max. Compression	10	-6.12	0.00	0.00
			Max. Mx	35	0.33	0.04	-0.00
			Max. My	25	-4.53	-0.03	0.01
			Max. Vy	35	-0.04	0.04	-0.00
			Max. Vx	25	0.00	0.00	0.00
T4	100 - 80	Leg	Max Tension	15	79.21	-0.76	-0.04
			Max. Compression	2	-87.24	1.03	-0.31
			Max. Mx	2	-79.58	1.03	-0.31
			Max. My	25	-1.71	-0.00	1.07
			Max. Vy	2	0.73	1.03	-0.31
			Max. Vx	4	-1.11	-0.14	-1.05
		Diagonal	Max Tension	7	4.20	0.00	0.00
			Max. Compression	18	-4.42	0.00	0.00
			Max. Mx	33	0.05	0.05	-0.01
			Max. My	10	-3.68	-0.01	-0.01
			Max. Vy	33	0.05	0.05	-0.01
			Max. Vx	31	0.00	0.00	0.00
T5	80 - 60	Leg	Max Tension	15	107.69	-0.55	-0.01
			Max. Compression	2	-120.69	0.83	0.01
			Max. Mx	3	-120.03	0.83	0.02
			Max. My	12	-3.72	-0.03	-0.90
			Max. Vy	3	0.85	0.83	-0.00
			Max. Vx	5	-1.31	-0.07	-0.79
		Diagonal	Max Tension	8	5.68	0.00	0.00
			Max. Compression	8	-5.65	0.00	0.00
			Max. Mx	33	0.09	0.07	0.01
			Max. My	31	-0.04	0.07	-0.01
			Max. Vy	33	0.06	0.07	0.01
			Max. Vx	31	0.00	0.00	0.00
T6	60 - 40	Leg	Max Tension	15	133.76	-0.77	-0.02
			Max. Compression	2	-151.51	1.35	0.02
			Max. Mx	2	-151.51	1.35	0.02
			Max. My	25	-1.87	-0.01	1.21
			Max. Vy	3	-0.17	1.35	0.02
			Max. Vx	12	0.20	0.01	-1.21
		Diagonal	Max Tension	8	5.43	0.00	0.00
			Max. Compression	10	-5.57	0.00	0.00
			Max. Mx	33	0.32	0.10	-0.01
			Max. My	37	-0.39	0.09	0.01
			Max. Vy	33	0.08	0.10	-0.01
			Max. Vx	37	-0.00	0.00	0.00
T7	40 - 20	Leg	Max Tension	15	155.69	-1.33	-0.03
			Max. Compression	2	-177.66	2.41	0.04
			Max. Mx	2	-177.66	2.41	0.04
			Max. My	25	-2.05	-0.08	2.33
			Max. Vy	29	0.31	-1.78	-0.01
			Max. Vx	25	0.35	-0.08	2.33
		Diagonal	Max Tension	8	6.40	0.00	0.00
			Max. Compression	10	-6.88	0.00	0.00
			Max. Mx	33	0.87	0.16	0.02

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	Client Watauga County	**Designed by** hicham.anssar

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

Maximum Reactions

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

Tower Mast Reaction Summary

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

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	Client: Watauga County	Designed by: hicham.anssar

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

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	Client: Watauga County	Designed by: hicham.anssar

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

Solution Summary

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

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

Maximum Tower Deflections - Service Wind

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

Critical Deflections and Radius of Curvature - Service Wind

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

Maximum Tower Deflections - Design Wind

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

Critical Deflections and Radius of Curvature - Design Wind

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

Bolt Design Data

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

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

Compression Checks

Leg Design Data (Compression)

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

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

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

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

Section No.	Elevation	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	
T7	40 - 20	L3x3x3/16	16.01	7.70	155.0 K=1.00	1.0900	-6.88	10.25	0.671 [1]
T8	20 - 0	L3x3x5/16	17.62	8.51	173.4 K=1.00	1.7800	-7.81	13.38	0.583 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation	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	
T1	150 - 140	L2x2x3/16	5.00	4.47	136.1 K=1.00	0.7150	-0.08	8.72	0.009 [1]

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation	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	
T1	150 - 140	P2.5x.203 (2.875 OD)	10.00	5.00	63.3	1.7040	3.79	76.68	0.049 [1]
T2	140 - 120	P2.5x.203 (2.875 OD)	20.00	5.00	63.3	1.7040	21.90	76.68	0.286 [1]
T3	120 - 100	P4x.237 (4.50 OD)	20.00	6.67	53.0	3.1741	54.88	142.83	0.384 [1]
T4	100 - 80	P5x.258 (5.563 OD)	20.03	6.68	42.7	4.2999	79.21	193.49	0.409 [1]
T5	80 - 60	P5x.258 (5.563 OD)	20.03	6.68	42.7	4.2999	107.69	193.49	0.557 [1]
T6	60 - 40	P6x.28 (6.625 OD)	20.03	6.68	35.7	5.5813	133.76	251.16	0.533 [1]
T7	40 - 20	Pipe 8.625"ODx0.322"	20.03	10.02	40.9	8.3993	155.69	377.97	0.412 [1]
T8	20 - 0	Pipe 8.625"ODx0.322"	20.03	10.02	40.9	8.3993	178.33	377.97	0.472 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation	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	
T1	150 - 140	L2x2x1/8	7.07	3.23	64.5	0.2812	1.38	12.23	0.113 [1]
T2	140 - 120	L2x2x1/8	7.07	3.23	64.5	0.2812	2.70	12.23	0.220 [1]
T3	120 - 100	L2x2x3/16	8.33	3.72	75.0	0.4132	5.76	20.14	0.286 [1]
T4	100 - 80	L2x2x3/16	9.43	4.49	89.9	0.4132	4.20	17.97	0.234 [1]

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

Section No.	Elevation	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	
T5	80 - 60	L2x2x3/16	9.91	4.75	95.1	0.4132	5.68	17.97	0.316 [1]
T6	60 - 40	L2 1/2x2 1/2x3/16	12.02	5.75	90.8	0.5535	5.43	24.08	0.226 [1]
T7	40 - 20	L3x3x3/16	16.01	7.70	100.5	0.6593	6.40	28.68	0.223 [1]
T8	20 - 0	L3x3x5/16	17.62	8.51	112.9	1.0713	6.96	46.60	0.149 [1]

[1] $P_u / \phi P_n$ 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	
T1	150 - 140	L2x2x3/16	5.00	4.47	92.6	0.4132	0.08	17.97	0.004 [1]

[1] $P_u / \phi P_n$ controls

Section Capacity Table

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

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

Program Version 8.3.1.2 - 12/11/2024 File:C:/Users/hicham.anssar/OneDrive - Engineered Tower Solutions/Desktop/125017_1018_Buckeye_Mapping Geo SA/SE/8177_Tower Modification Drawings/Analysis/Tower/Buckeye Mt. - Viper.eri

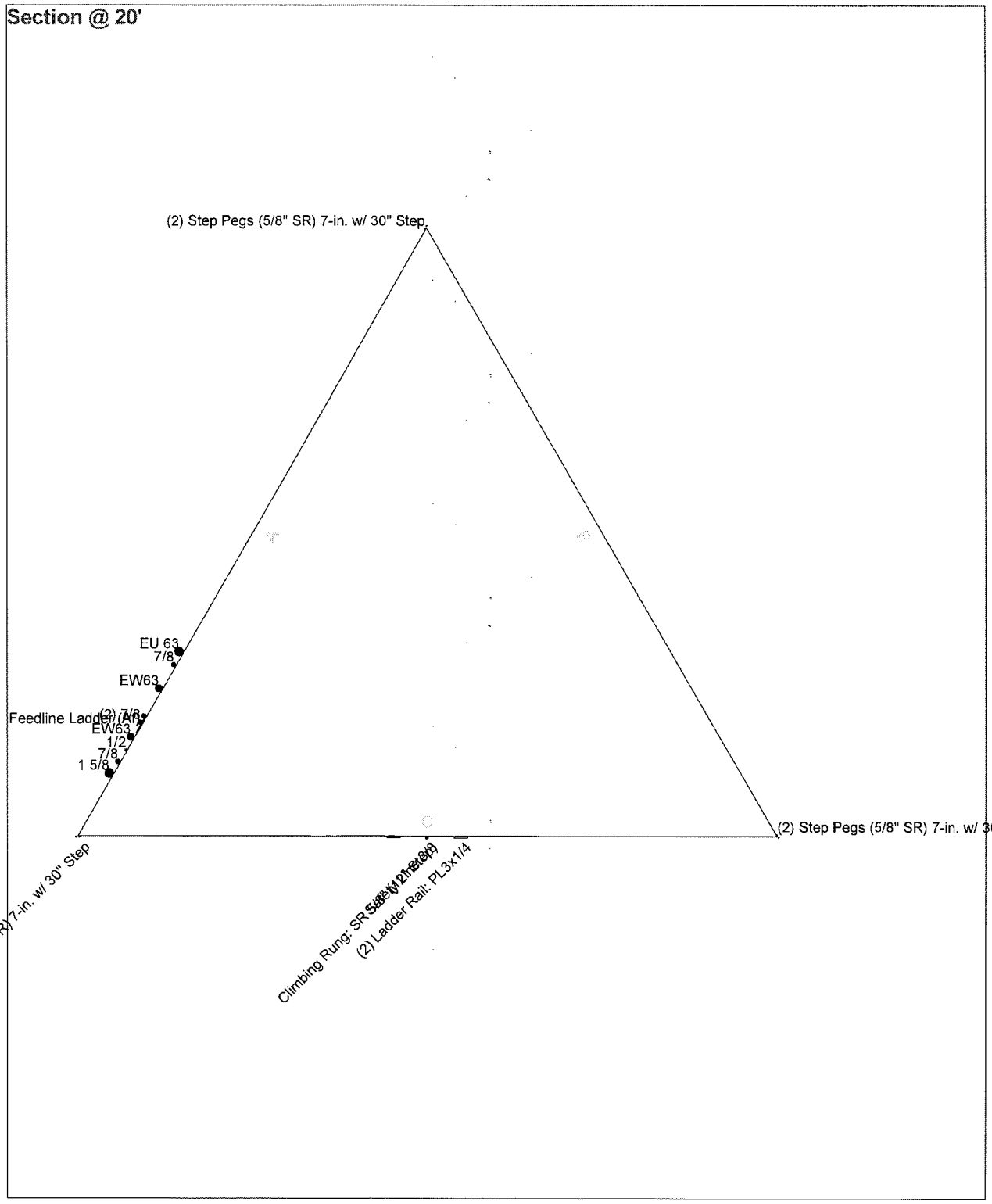
APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan
20'

_____ Round _____ Flat _____ App In Face _____ App Out Face

2025-08-05 BCC Meeting



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

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

APPENDIX C

ADDITIONAL CALCULATIONS

Self Support Anchor Rod Capacity

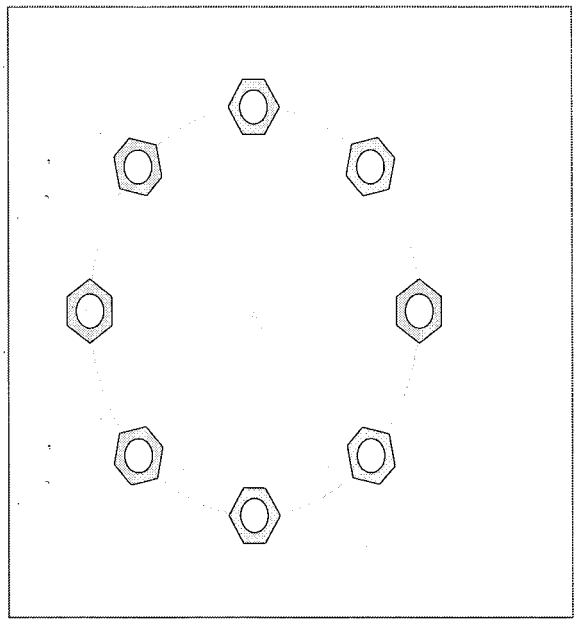
Site Info	
Site #	HP-1343
Site Name	Buckeye Mt. - Viper
ETS, PLLC #	24125017.STR.8177

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

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

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

**Anchor Rod Eccentricity Applied*



Connection Properties

Anchor Rod Data

(8) 1" ø bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi)

l_{ar} (in): 0

Analysis Results

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

Pu_t = 23.13	ϕPn_t = 36.36	**Stress Rating**
Vu = 2.38	ϕVn = n/a	**75.5%**
Mu = n/a	ϕMn = n/a	Pass

Analysis Date: 3/25/2025

SST Unit Base Foundation

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

TIA-222 Revision: G

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

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

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

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

Structural Rating:	**42.6%**
Soil Rating:	**60.3%**

Pad Properties		
Depth, **D**:	6.75	ft
Pad Width, W_1:	24.00	ft
Pad Thickness, **T**:	1.75	ft
Pad Rebar Size (Bottom dir. 2), Sp_2:	7	
Pad Rebar Quantity (Bottom dir. 2), mp_2:	43	
Pad Clear Cover, cc_{pad}:	3	in

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

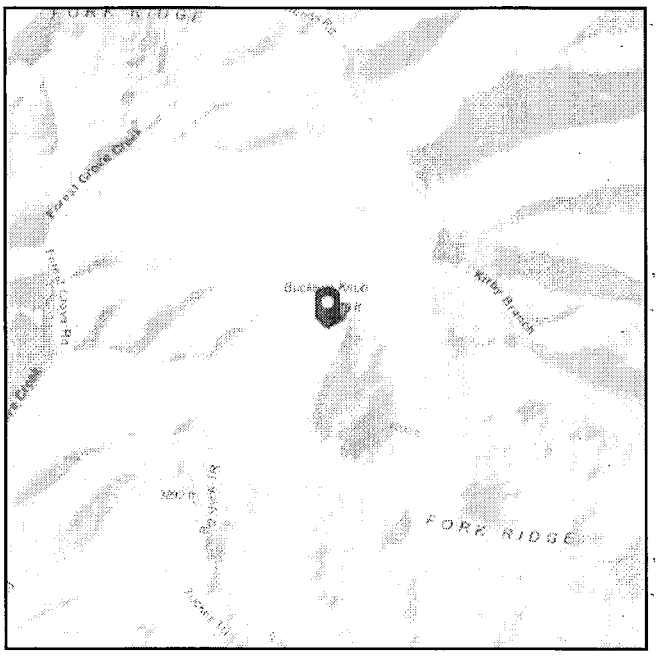
Soil Properties		
Total Soil Unit Weight, γ:	110	pcf
Ultimate Net Bearing, Qnet:	5.000	ksf
Cohesion, **Cu**:	0.000	ksf
Friction Angle, φ:	30	degrees
SPT Blow Count, N_{blows}:	12	
Base Friction, μ:	0.35	
Neglected Depth, **N**:	2.0	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	N/A	ft

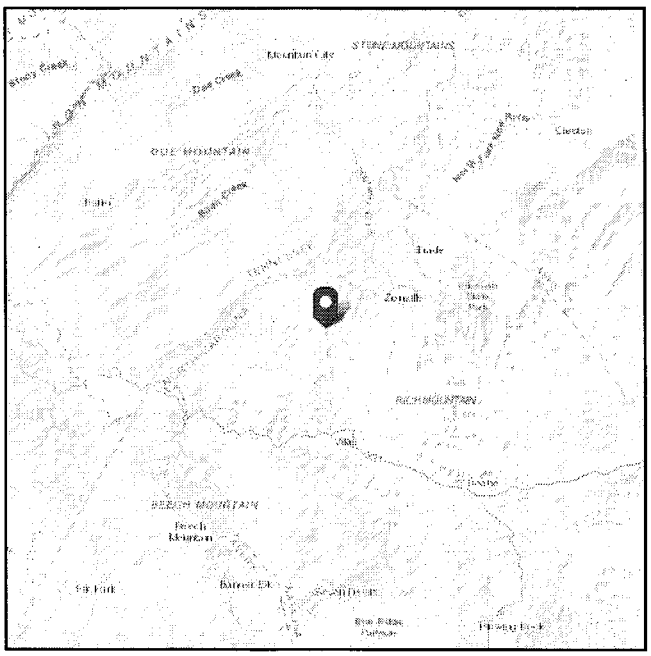
ASCE Hazards Report

Address:
No Address at This Location

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

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





Wind

Results:

Wind Speed	~~120 Vmph~~
10-year MRI	76 Vmph
25-year MRI	84 Vmph
50-year MRI	90 Vmph
100-year MRI	96 Vmph
Special	Special Wind Region -- Mountainous terrain, gorges, and special wind regions shown in Fig. 26.5-1 shall be examined for unusual wind conditions. The Authority Having Jurisdiction shall, if necessary, adjust the values given in Fig. 26.5-1 to account for higher local wind speeds. Such adjustment shall be based on meteorological information and an estimate of the basic wind speed obtained in accordance with the provisions in Section 26.5.3.

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.

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

ASCE
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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.

ASCE
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Seismic

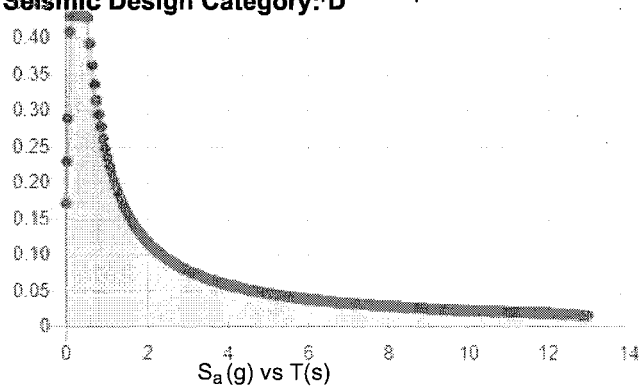
Site Soil Class: D - Stiff Soil

Results:

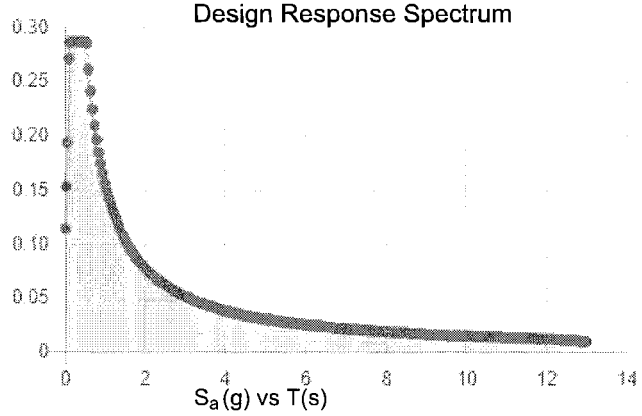
S_S :	0.272	S_{D1} :	0.157
S_1 :	0.098	T_L :	12
F_a :	1.582	PGA :	0.145
F_v :	2.4	PGA_M :	0.219
S_{MS} :	0.431	F_{PGA} :	1.51
S_{M1} :	0.236	I_e :	1.5
S_{DS} :	0.287		

Seismic Design Category: D

MCE_R Response Spectrum



Design Response Spectrum



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.

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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.

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APPENDIX D

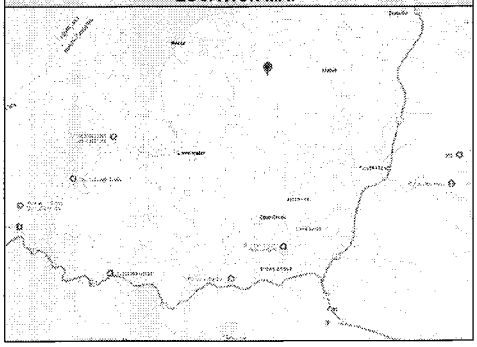
MODIFICATION DESIGN DRAWINGS

TOWER MODIFICATION DRAWINGS

SITE INFORMATION

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

LOCATION MAP



DRIVING DIRECTIONS

FROM VILAS, HEAD SOUTH ON ABBY LN TOWARD US-321 SUS-421 S (125 FT), SHARP RIGHT ONTO US-321 N/US-421 N (10.2 MI), TURN LEFT ONTO BULLDOG RD (3.8 MI), TURN LEFT ONTO N FORK RD (0.8 MI), CONTINUE STRAIGHT ONTO FORK RIDGE RD (1.4 MI), TURN LEFT ONTO BUCKEYE RIDGE RD/WOODS RD (0.7 MI), TURN RIGHT ONTO FORK RIDGE RD (0.4 MI), TOWER WILL BE ON THE RIGHT.

SCAN CODE FOR DIRECTIONS

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, 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	-

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PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698
LATITUDE/LONGITUDE:
N 36.316081° W 81.791511°

SEAL — NC #P-1018

NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER J. SCOTT HILGOE
03/25/2025

REV	DATE	DETAILS
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SHEET TITLE:
TITLE PAGE

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

MI CHECKLIST

REQUIRED	REPORT ITEM	BRIEF DESCRIPTION
PRE-CONSTRUCTION		
N/A	EOR APPROVED SHOP DRAWINGS	ONCE THE PRE-MODIFICATION MAPPING IS COMPLETE AND PRIOR TO FABRICATION, THE CONTRACTOR SHALL PROVIDE DETAILED ASSEMBLY DRAWINGS AND/OR SHOP DRAWINGS ALONG WITH EOR RFI FORM DETAILING ANY CHANGES FROM THE ORIGINAL DESIGN TO THE EOR FOR REVIEW AND APPROVAL.
N/A	FABRICATION INSPECTION	A LETTER FROM THE FABRICATOR, STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THE CONTRACT DOCUMENTS, SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR CERTIFIED WELD INSPECTION	A CWI SHALL INSPECT ALL WELDING PERFORMED ON STRUCTURAL MEMBERS DURING FABRICATION. A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	MATERIAL TEST REPORTS (MTR)	MATERIAL TEST REPORTS SHALL BE PROVIDED FOR MATERIAL USED. MTRS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR NDE INSPECTION REPORT	CRITICAL SHOP WELDS THAT REQUIRE TESTING ARE NOTED ON THESE CONTRACT DRAWINGS. A CERTIFIED NDT INSPECTOR SHALL PERFORM NON-DESTRUCTIVE EXAMINATION AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	NDE OF MONOPOLE BASE PLATE	A NDE OF THE POLE TO BASE PLATE CONNECTION IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PACKING SLIPS	PACKING/SHIPPING LIST FOR ALL MATERIAL USED DURING CONSTRUCTION OF THE MODIFICATION.
ADDITIONAL TESTING AND INSPECTIONS:		
N/A		
CONSTRUCTION		
N/A	FOUNDATION INSPECTIONS	A VISUAL OBSERVATION OF THE EXCAVATION AND REBAR SHALL BE PERFORMED BEFORE PLACING THE CONCRETE. A VISUAL OBSERVATION OF THE REBAR SHALL BE PERFORMED BEFORE PLACING THE EPOXY. A SEALED WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	CONCRETE COMP. STRENGTH AND SLUMP TEST	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK SOIL COMPACTION	FOUNDATION SOIL COMPACTION SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK BEARING CAPACITY	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	MICROPILE/ROCK ANCHOR	MICROPILES/ROCK ANCHORS SHALL BE INSPECTED BY THE FOUNDATION INSPECTION VENDOR AND SHALL BE INCLUDED AS PART OF THE FOUNDATION INSPECTION REPORT. ADDITIONAL TESTING AND/OR INSPECTION REQUIREMENTS ARE NOTED IN THE PROJECT NOTES.
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:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28692
LATITUDE/LONGITUDE:
N 36.316081° W 81.791511°

SEAL — NC #P-1816
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGART
03/25/2025

REV	DATE	DETAILS
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DRAWN BY: EOR | CHECKED BY: HA

SHEET TITLE:
MODIFICATION INSPECTION CHECKLIST

SHEET # **N-1** | CURRENT REV.#: 0 | ETS #: 2412S017_STR.B177

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	+⅓ TURN BEYOND SNUG TIGHT
⅝"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
⅞"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
BOLT LENGTHS OVER FOUR DIA. BUT NOT EXCEEDING EIGHT DIA.		
½"	BOLTS 2.25 TO 4.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT
⅝"	BOLTS 2.75 TO 5.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT
¾"	BOLTS 3.25 TO 6.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT
⅞"	BOLTS 3.75 TO 7.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT
1"	BOLTS 4.25 TO 8.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT

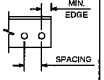
4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

NOMINAL HOLE DIMENSIONS

BOLT DIAMETER	STANDARD HOLE	SHORT SLOT
½	9/16	9/16 x 1 1/16
⅝	11/16	11/16 X 7/8
¾	13/16	13/16 X 1
⅞	15/16	15/16 X 1 3/16
1	1 1/16	1 1/16 X 1 5/16

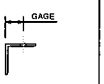
BOLT EDGE AND SPACING

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

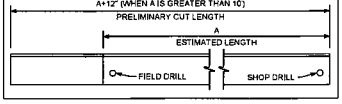


WORKABLE GAGES

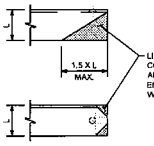
LEG LENGTH	GAGE
4	2½
3½	2
3	1¾
2½	1⅜
2	1⅛
1¾	1



MEMBER LENGTHS



ALLOWABLE ANGLE COPE



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

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28692
LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL
NC #F-1616
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGEMAN
03/25/2025

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
PROJECT NOTES

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

BILL OF MATERIALS

QUANTITY REQUIRED	MANUFACTURER	PART NUMBER	DESCRIPTION	LENGTH	DETAIL SHEET #	PART WEIGHT (LB)	TOTAL WEIGHT (LB)	NOTES
			DIAGONAL REPLACEMENT MATERIALS & HARDWARE					
18	-	L-1	L 2"x2"x3/16" A572-50	8'-0"±	S-3	20.50	369.00	
45	-	-	3/4"Ø A325X W/ HHN, LKW, FW	2"	S-3	0.58	26.10	
						TOTAL WEIGHT (LB):	395.10	PAGE 1 OF 1

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
o. 919-782-2710, f. 919-435-0831
www.eta-plic.com

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28692

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC #P-1614

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

REV	DATE	DETAILS
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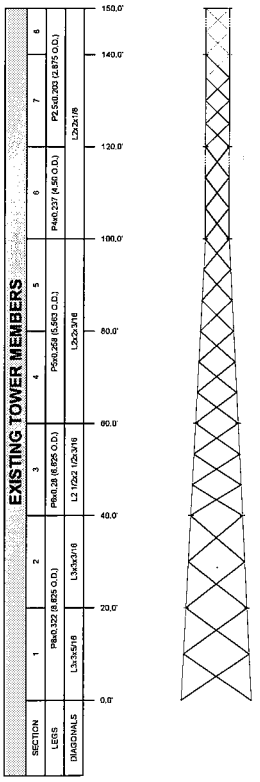
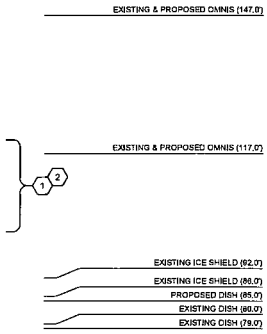
DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE
BILL OF MATERIALS

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





TOWER ELEVATION
SCALE: 1" = 20'

FACEWIDTH

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

MODIFICATION SCHEDULE

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

NOTES:

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

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

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28692
LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL
NC #P-1614
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGO
03/25/2025

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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
TOWER ELEVATION AND MODIFICATION SCHEDULE

SHEET # **S-1** | CURRENT REV.# 0
ETS.# 2412507,STR.8177

SITE PLAN
APPROX. SCALE: 1" = 100'

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28692

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL NC #A-1916

NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGER

03/25/2025

REV.	DATE	DETAILS
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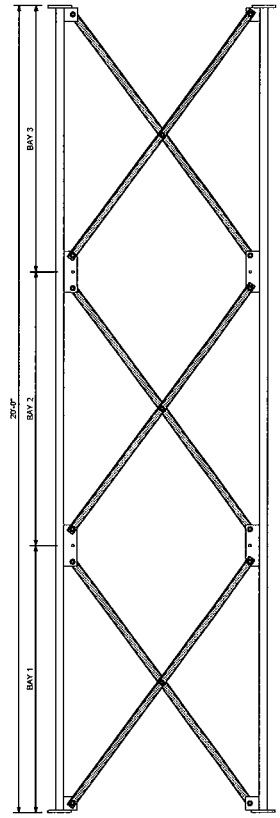
DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
SITE PLAN

SHEET # **S-2** | CURRENT REV.# 0 | ETS # 24125017.STR.6177



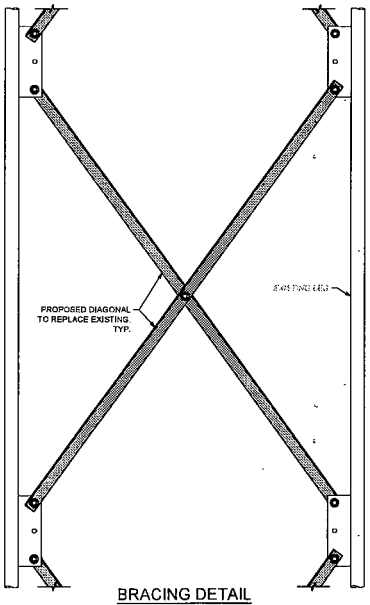
SECTION ELEVATION
SCALE: 7/16" = 1'-0"

BRACING SCHEDULE

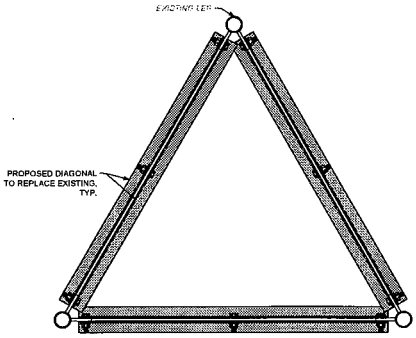
SECTION	ELEVATION (FT)	BAY	EXISTING DIAGONAL SIZE	PROPOSED BRACING				PROPOSED CONNECTION	
				PART NO.	SIZE & GRADE	ESTIMATED LENGTH	QTY.	SIZE & GRADE	QTY.
8	100.0 - 120.0	1-3 (OF 3)	L 2"x2"x1/8"	L-1	L 2"x2"x3/16" A572-50	6'-0"±	18	3/4"Ø x 2" A325X W/ HHN, LKW, FW	45

NOTES:

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



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



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

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

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698
LATITUDE/LONGITUDE:
N 36.310091°, W 81.791511°

SEAL:
NC #P-1018
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGOS 03/25/2025

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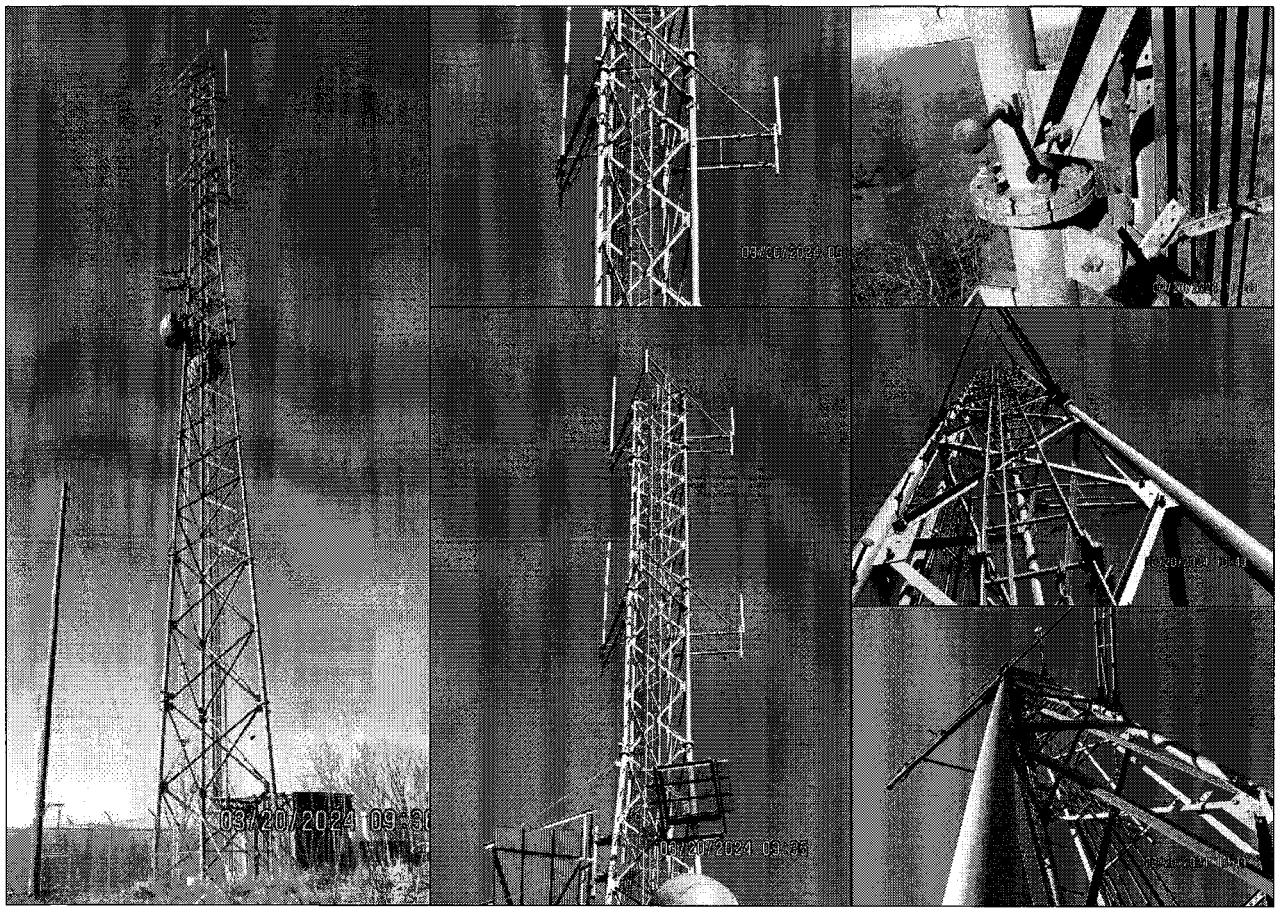
DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
DIAGONAL REPLACEMENT DETAILS

SHEET # S-3 | CURRENT REV # 0 | ETS # 24125017.STR.9177



PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
o: 919-792-2710, f: 919-435-0631
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC #P-1016
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGENFELD
03/25/2025

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

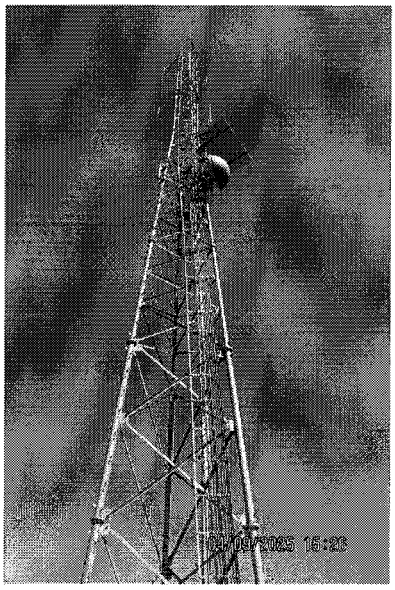
SHEET TITLE
PHOTOS

SHEET # P-1 | CURRENT REV # 0
ETS # 24125017.STR.6177

ENGINEERED
TOWER SOLUTIONS

PRE MODIFICATION INSPECTION REPORT

SITE NAME: BUCKEYE MT. - VIPER



Performed By:

Alex Meister
Tower Engineer - Inspections

Charlie Kluth
Tower Engineer - Inspections

Prepared for:

1.0 ASSIGNMENT

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

Location – 2542 Forest Grove Rd, Vilas, NC 28692

Structure – 150-ft± Self-Support Tower

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

2.0 SCOPE OF SERVICES

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

3.0 PARTICIPATING PERSONNEL

Representatives:	Mr. Marty Randall 10-18 Consulting (828) 527-2416
Consulting Engineers:	Mr. Alex Meister Mr. Charlie Kluth Engineered Tower Solutions, PLLC (ETS) 3227 Wellington Ct. Raleigh, NC 27615 (919) 782-2710

4.0 BACKGROUND INFORMATION

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

5.0 INVESTIGATION

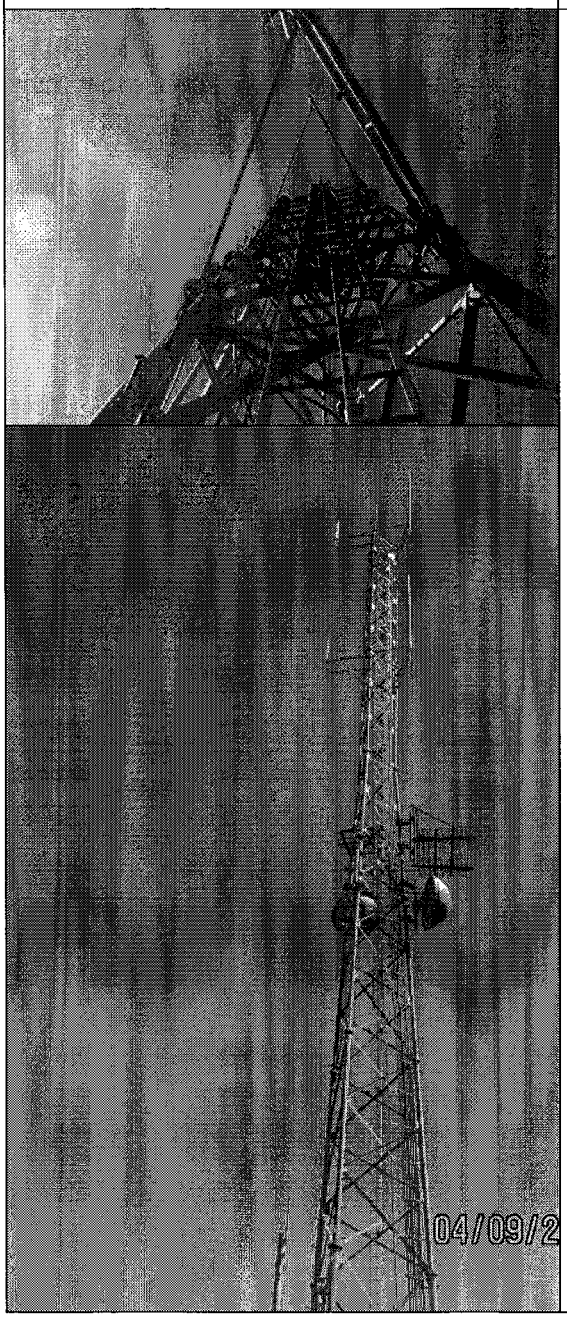
Pre Modification Inspection – Alex Meister and Charlie Kluth performed the inspection on April 9, 2025. For the purpose of this inspection, the tower legs were named by letter according to the magnetic azimuth defined by a line from the center of tower to the leg. "A" leg is the leg closest to magnetic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

6.0 RESULTS

1. Tower Section Details
2. Miscellaneous Obstructions

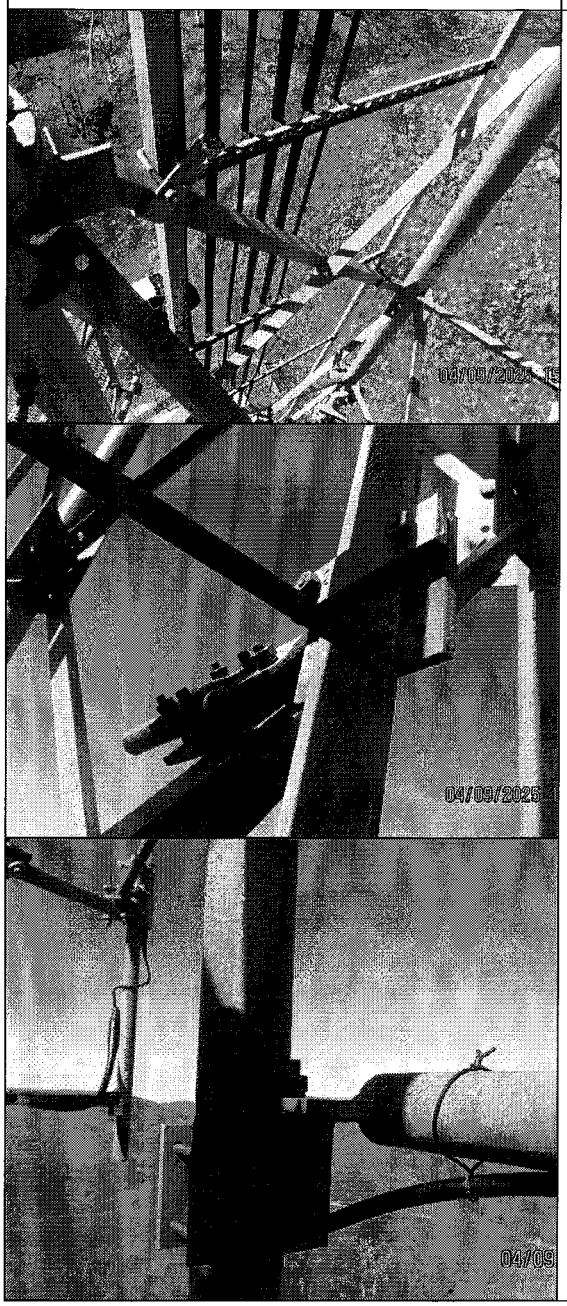
ENGINEERED
TOWER SOLUTIONS

EXECUTIVE SUMMARY

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

ENGINEERED TOWER SOLUTIONS

EXECUTIVE SUMMARY

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

Watauga County BIDDER: K-Co Enterprises, Inc.

TOWER MOD BREAKDOWN:

1. Total cost of tower modification materials only $ 1690.00

2. Total cost of tower modification labor only $ 10,542.00

3. Total cost of tower modification $ 12,232.00

Watauga County **BIDDER:** K-Co Enterprises, Inc.

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

NOTICE TO BIDDERS

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

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

EXECUTION

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

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

Late bids are not acceptable.

BIDDER: K-Co Enterprises, Inc.		FEDERAL ID OR SOCIAL SECURITY NO. 26-1278195	
STREET ADDRESS: 613 Hurricane Creek Rd.		P.O. BOX:	ZIP:
CITY & STATE & ZIP: Piedmont, SC 29673		TELEPHONE NUMBER: 864-947-8704	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: Ernest Rood, Project Manager		FAX NUMBER: 864-947-8204	
AUTHORIZED SIGNATURE: Ernest Rood	DATE: 6-11-25	E-MAIL: bids@kcoenterprises.com	

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).

FOR Watauga County, NC USE ONLY

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 re-usable 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.

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

Watauga County, NC Tower Construction Project

Watauga County, North Carolina

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

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

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

Understand all requirements in the Scope of Work **Yes** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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** X **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 66585

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** X **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** X **No**_____

EROSION CONTROL

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

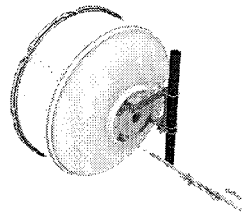
Understand Erosion Control Methods and responsibilities **Yes** X **No**_____

TOWER MODIFICATION DRAWINGS (SOW)

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

HX6-6W

Base Product



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

Product Classification

Product Type	Microwave antenna
Product Brand	ValuLine®

General Specifications

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

Dimensions

Diameter, nominal	1.8 m | 6 ft

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

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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

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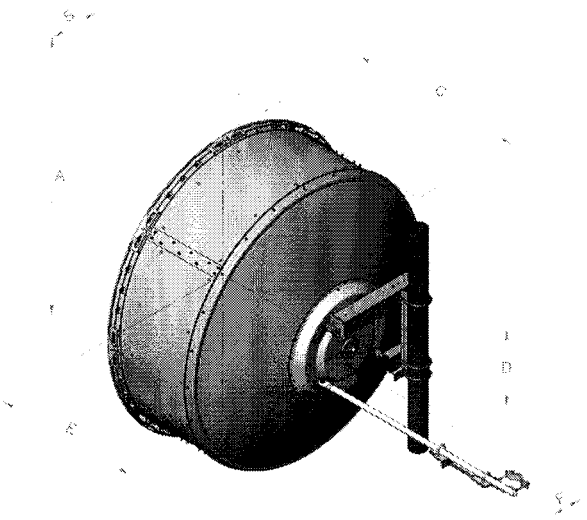
Antenna Dimensions and Mounting Information



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

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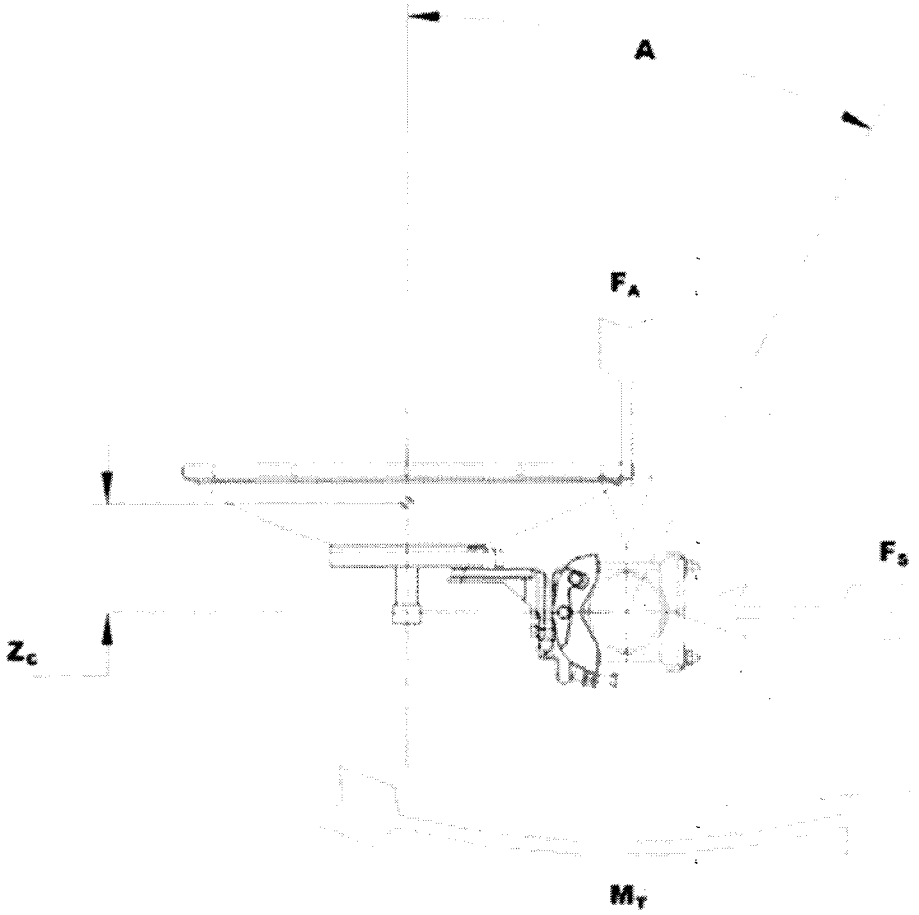
Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Weight, net	85 kg | 187.393 lb

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2015	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.

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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° ±40°, 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 +/-1° 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 x 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

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

Twisting Moment (MT)

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

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800 MHz Corporate Collinear Antennas

746-870 MHz

CC807 Series

RFI TECHNOLOGY SOLUTIONS

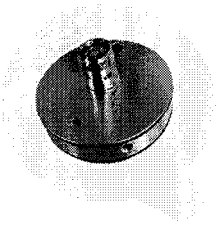
These industry leading PIM and PIP rated collinear arrays allow site operators to combine, with complete integrity, a large number of communications services into a single, low profile collinear antenna array.

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 from 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.

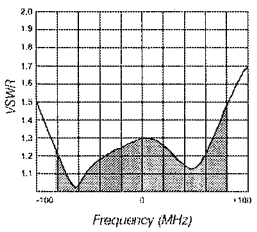
Gain is maximised and side lobes reduced dramatically. In a patented design approach the individual dipole elements are soldered to a brass support tube which is directly connected to the mounting tube and the lightning spike at the top of the antenna.

Features:

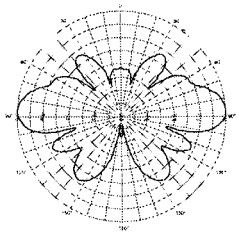
- 500W Continuous Power rating for CC807-11, CC807-08, CC807-06
- -150dBc Passive Intermodulation (PIM) rating
- 25 kW Peak Instantaneous (PIP) rating
- Extraordinary bandwidth characteristics with superior pattern control
- DC grounding on all elements for the ultimate in lightning protection and dissipation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



Typical VSWR Response (CC807-06)



CC807-06 - E Plane



Electrical Specifications

Model Number	CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Nominal Gain *dBd (dBi)*	3 (5.1)	6 (8.1)	8 (10.1)	10.5 (12.6)
Frequency *MHz*	746 - 870			
Tuned Bandwidth *MHz*	Full Band			
VSWR *(Return Loss)*	< 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 (2x20W) *dBc*	-150			
Peak Instantaneous Power *kW*	25			

Mechanical

Model Number		CC807-03-P	CC807-06-P	CC807-08-P	CC807-11-P
Construction		Sky blue fibreglass radome			
Length *mm (inches)*		1203 (47)	1741 (69)	2817 (111)	5219 (205)
Radome Diameter *mm (inches)*		76 (3)			
Weight *kg (lbs)*		4 (9)	7 (16)	12(27)	22 (49)
Shipping Weight *kg (lbs)*		8 (18)	11 (25)	18 (40)	30 (66)
Shipping Dimensions *mm (inches)*	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 cm^2 (ft^2)	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 *N* (100 mph lbs)		96 (22)	150 (34)	276 (62)	540 (121)
Wind Gust Rating *km/h (mph)*	No Ice	>240 (>150)			
Torque @ 160km/h *Nm* (100mph ft-lbs)		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.

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Date: **March 25, 2025**

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10-18 Consulting
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marty.randall@1018consulting.com

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

Subject:	**Structural Modification Analysis Report**
Carrier Designation:	***Watauga County* Reconfiguration** **Carrier Site Name:** Buckeye Mt. - Viper
Tower Owner Designation:	***NCSHP* Site Number:** HP-1343 ***NCSHP* Site Name:** Buckeye Mt. - Viper
Engineering Firm Designation:	***ETS, PLLC* Job Number:** 24125017.STR.8177
Site Data:	**2542 Forest Grove Road, Vilas, Watauga County, NC 28698** **Latitude *N 36° 18' 57.89"*, Longitude *W 81° 47' 29.44"*** **150.0 Foot – Self Support Tower**

Dear Marty Randall,

Engineered Tower Solutions, PLLC is pleased to submit this **"Structural Modification Analysis Report"** to determine the structural integrity of the above-mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

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

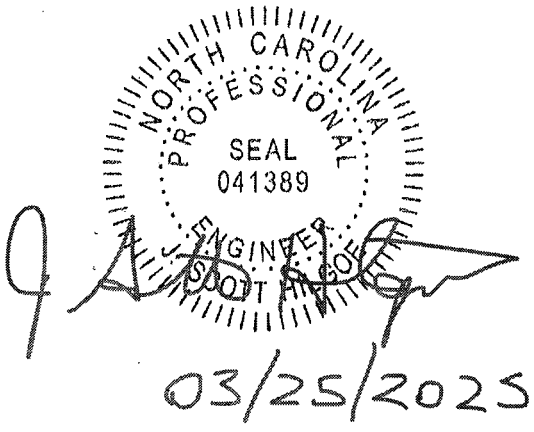
This analysis utilizes an ultimate 3-second gust wind speed of 140 mph (converted to an equivalent 108 mph nominal 3-second gust wind speed per Section 1609.3.1 for use with TIA-222 G) as required by the 2018 North Carolina State Building Code (2015 IBC). Applicable Standard references and design criteria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

Structural analysis prepared by:

Hicham Anssar
Structural Engineer I

Respectfully submitted by:

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



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APPENDIX A
tnxTower Output

APPENDIX B
Base Level Drawing

APPENDIX C
Additional Calculations

APPENDIX D
Modification Design Drawings

1) INTRODUCTION

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

2) ANALYSIS CRITERIA

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

Table 1 - Proposed Equipment Configuration

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

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
147.0 (NCSHP)	155.0	1	Unknow	15-ft Omni	2	7/8"
	150.0	1	Unknow	4-ft Omni		
	147.0	1	Unknow	Junction Box (9" x 6" x 6")	1	1/2"
		3	Tower Mounts	Horizontal Mount Pipe/Stabilizer		
		3	Tower Mounts	6-ft Side Arm Mount		
117.0 (NCSHP)	125.0	1	Unknow	15-ft Omni	1	1-5/8"
	120.0	1	Unknow	4-ft Omni		
	117.0	2	Tower Mounts	Horizontal Mount Pipe/Stabilizer	1	7/8"
		2	Tower Mounts	6-ft Side Arm Mount		
117.0 (Watauga County)	**123.0**	**1**	**Unknow**	**10-ft Dipole ***	**1**	**1/2" ***
	117.0	1	Tower Mount	Horizontal Mount Pipe/Stabilizer		
		1	Tower Mount	6-ft Side Arm Mount		
80.0 (Watauga County)	**92.0**	**1**	**Unknown**	**6-ft Dish Ice Shield****	**-**	**-**
	80.0	**1**	**Tower Mount**	**5-ft Dish Pipe Mount *****	**1**	**EW63 *****
		1	**Commscope**	**PL6-65-PXA *****		
80.0 (Unknown)	80.0	1	Tower Mount	5-ft Empty Pipe Mount	-	-
79.0 (NCSHP)	86.0	1	Unknown	8-ft Ice Shield	-	-
	79.0	1	Tower Mount	5-ft Dish Pipe Mount	1	EW63
		1	Commscope	PL6-65-PXA		

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

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

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

3.1) Analysis Method

tnxTower (version 8.3.1.2), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

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

3.2) Assumptions

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

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

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

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	75.5	Pass
1	Base Foundation (Structural)	0	42.6	Pass
1	Base Foundation (Soil Interaction)	0	60.3	Pass

Structure Rating (max from all components) =	**85.9%**

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

4.1) Recommendations

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

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

Loading Changes:

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

4.2) Dish Antenna Deflection Results

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

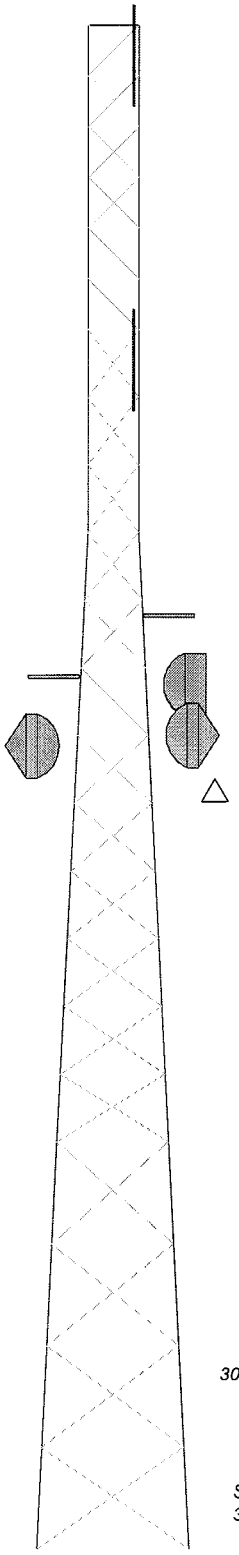
Critical Deflections and Radius of Curvature - Service Wind

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	*°*	*°*	*ft*
85.00	HX6-6W-6WH	44	0.894	0.11	0.03	33414
80.00	PL6-65-PXA	44	0.781	0.10	0.03	35799
79.00	PL6-65-PXA	44	0.759	0.10	0.03	35910

APPENDIX A

TNXTOWER OUTPUT

Section	T8	T7	T6	T5	T4	T3	T2	T1
Legs	Pipe 8.625"ODx0.322"		P6x.28 (6.625 OD)	P5x.258 (5.563 OD)		P4x.237 (4.50 OD)	P2.5x.203 (2.875 OD)	
Leg Grade	A500-50							
Diagonals	L3x3x5/16	L3x3x3/16	L2 1/2x2 1/2x3/16	L2x2x3/16		A572-50	L2x2x1/8	
Diagonal Grade	A36						A36	
Top Girts	N.A.							L2x2x3/16
Face Width (ft)	15	13	11	9	7	5		
# Panels @ (ft)	4 @ 10		12 @ 6.66667			6 @ 5		
Weight (K)	11.8	3.0	2.4	1.8	1.3	1.3	1.0	0.6	0.4



DESIGNED APPURTENANCE LOADING

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

MATERIAL STRENGTH

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

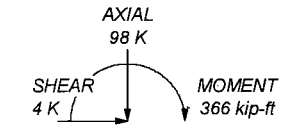
TOWER DESIGN NOTES

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

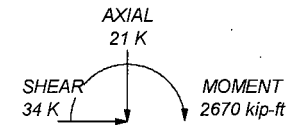
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 212 K
SHEAR: 22 K

UPLIFT: -185 K
SHEAR: 19 K



TORQUE 4 kip-ft
30 mph WIND - 1.0000 in ICE



TORQUE 27 kip-ft
REACTIONS - 108 mph WIND

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

Job: **Buckeye Mt. - Viper**		
Project: ***ETS, PLLC Job No. 24125017.STR.8177***		
Client: Watauga County	Drawn by: hicham.anssar	App'd:
Code: TIA-222-G	Date: 03/25/25	Scale: NTS
Path:		Dwg No. E-1

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

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 150.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 5.00 ft at the top and 15.00 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 108 mph.
Structure Class III.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 30 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Assume Legs Pinned	√ Calculate Redundant Bracing Forces
Consider Moments - Horizontals	√ Assume Rigid Index Plate	Ignore Redundant Members in FEA
Consider Moments - Diagonals	√ Use Clear Spans For Wind Area	√ SR Leg Bolts Resist Compression
Use Moment Magnification	√ Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
√ Use Code Stress Ratios	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		

tnxTower	Job: Buckeye Mt. - Viper	Page: 2 of 33
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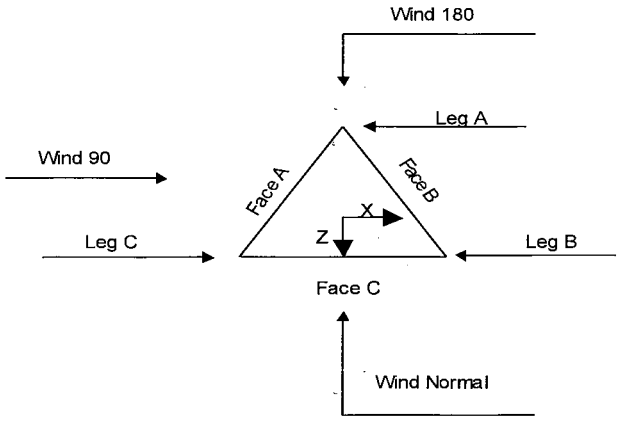

Triangular Tower

Tower Section Geometry

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

Tower Section Geometry *(cont'd)*

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

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

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	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 150.00-140.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 140.00-120.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 120.00-100.00	0.00	0.2500	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 100.00-80.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

tnxTower

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Job	Page
Buckeye Mt. - Viper	4 of 33
Project	**Date**
ETS, PLLC Job No. 24125017.STR.8177	15:00:36 03/25/25
Client	**Designed by**
Watauga County	hicham.anssar

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
T5 80.00-60.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 60.00-40.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 40.00-20.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 20.00-0.00	0.00	0.3750	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	No	1	1	1	1	1	1	1	1
150.00-140.00				1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1
T3	Yes	No	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1
T4	Yes	No	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1
T5	Yes	No	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1
T6	Yes	No	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1
T7	Yes	No	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1
T8 20.00-0.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

[1]*Note: 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)*

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	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
150.00-140.00														
T2	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
140.00-120.00														
T3	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
120.00-100.00														

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	Client: Watauga County	Designed by: hicham.anssar

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

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

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	Client: Watauga County	Designed by: hicham.anssar

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
T6 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	0.0000	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)
T7 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	0.0000	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)
T8 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	0.0000	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)

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 150.00-140.00	Flange	0.7500 A325N	4	0.7500 A325N	1	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 140.00-120.00	Flange	0.7500 A325N	4	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 120.00-100.00	Flange	0.7500 A325N	6	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 100.00-80.00	Flange	0.7500 A325N	8	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 80.00-60.00	Flange	0.7500 A325N	8	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 60.00-40.00	Flange	1.0000 A325N	8	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

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	Client: Watauga County	Designed by: hicham.anssar

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.
T7 40.00-20.00	Flange	1.0000 A325N	8	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 20.00-0.00	Flange	0.7500 A325N	0	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	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)	80.00 - 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)	80.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49
Step Pegs (5/8" SR) 7-in. w/ 30" Step	C	No	No	Ar (CaAa)	150.00 - 0.00	0.0000	0.5	2	2	0.3500	0.3500		0.49
Ladder Rail: PL3x1/4	C	No	No	Af (CaAa)	150.00 - 0.00	0.0000	0	2	2	12.0420 3.0000	3.0000		3.83
Climbing Rung: SR 5/8" (12" Step)	C	No	No	Ar (CaAa)	150.00 - 0.00	0.0000	0	1	1	0.6250	0.6250		1.04
Safety Line 3/8	C	No	No	Ar (CaAa)	150.00 - 0.00	0.0000	0	1	1	0.3750	0.3750		0.22
***													
Feedline Ladder (Af)	A	No	No	Af (CaAa)	150.00 - 0.00	0.0000	-0.32	1	1	3.0000	3.5000		8.40
1 5/8	A	No	No	Ar (CaAa)	117.00 - 10.00	0.0000	-0.4	1	1	1.9800	1.9800		1.04
7/8	A	No	No	Ar (CaAa)	147.00 - 10.00	0.0000	-0.38	1	1	1.1100	1.1100		0.54
1/2	A	No	No	Ar (CaAa)	147.00 - 10.00	0.0000	-0.36	1	1	0.5800	0.5800		0.25
EW63	A	No	No	Ar (CaAa)	80.00 - 10.00	0.0000	-0.34	1	1	1.5742	1.5742		0.51
7/8	A	No	No	Ar (CaAa)	147.00 - 117.00	0.0000	-0.31	1	1	1.1100	1.1100		0.54
7/8	A	No	No	Ar (CaAa)	117.00 - 10.00	0.0000	-0.31	2	2	0.5000 1.1100	1.1100		0.54
EW63	A	No	No	Ar (CaAa)	79.00 - 10.00	0.0000	-0.26	1	1	1.5742	1.5742		0.51
***													
7/8	A	No	No	Ar (CaAa)	147.00 - 10.00	0.0000	-0.22	1	1	1.1100	1.1100		0.54
EU 63	A	No	No	Ar (CaAa)	85.00 - 10.00	0.0000	-0.2	1	1	2.0300	2.0300		0.56
***													

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Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight plf
***								

Feed Line/Linear Appurtenances Section Areas

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

Feed Line/Linear Appurtenances Section Areas - With Ice

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

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

Feed Line Center of Pressure

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

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	4	Step Pegs (5/8" SR) 7-in. w/ 30" Step	140.00 - 150.00	0.6000	0.3876
T1	5	Ladder Rail: PL3x1/4	140.00 - 150.00	0.6000	0.3876
T1	6	Climbing Rung: SR 5/8" (12" Step)	140.00 - 150.00	0.6000	0.3876
T1	7	Safety Line 3/8	140.00 - 150.00	0.6000	0.3876
T1	9	Feedline Ladder (Af)	140.00 - 150.00	0.6000	0.3876
T1	11	7/8	140.00 - 147.00	0.6000	0.3876
T1	12	1/2	140.00 - 147.00	0.6000	0.3876
T1	14	7/8	140.00 - 147.00	0.6000	0.3876
T1	19	7/8	140.00 - 147.00	0.6000	0.3876
T2	4	Step Pegs (5/8" SR) 7-in. w/	120.00 -	0.6000	0.4454

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

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

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***									
20'x3" pipe	A	From Centroid-Leg	2.25 0.00 10.00	0.00	149.00	No Ice 1/2" Ice 1" Ice	5.65 8.03 10.08	5.65 8.03 10.08	0.05 0.09 0.15
5/8-in x 4-ft Lightning Rod	A	From Centroid-Leg	2.50 0.00 1.00	0.00	159.00	No Ice 1/2" Ice 1" Ice	0.25 0.66 0.97	0.25 0.66 0.97	0.00 0.01 0.01
***									
Side Arm Mount [SO 303-3]	B	None		0.00	147.00	No Ice 1/2" Ice 1" Ice	7.67 11.04 14.57	7.67 11.04 14.57	0.34 0.48 0.65
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	C	From Leg	0.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
3" x 4' Omni	A	From Leg	6.00 0.00 3.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	1.04 1.44 1.68	1.04 1.44 1.68	0.04 0.05 0.06
3" dia x 15-ft Omni Antenna	B	From Leg	6.00 0.00 8.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	4.25 6.03 7.58	4.25 6.03 7.58	0.04 0.07 0.11
CC807-11	C	From Leg	6.00 0.00 9.20	0.00	147.00	No Ice 1/2" Ice 1" Ice	4.86 7.63 9.40	4.86 7.63 9.40	0.05 0.09 0.14
Junction Box (9" x 6" x 6")	A	From Face	0.50 0.00 0.00	0.00	147.00	No Ice 1/2" Ice 1" Ice	0.83 0.95 1.07	0.50 0.59 0.69	0.03 0.03 0.04
***									
Side Arm Mount [SO 303-3]	B	None		0.00	117.00	No Ice 1/2" Ice 1" Ice	7.67 11.04 14.57	7.67 11.04 14.57	0.34 0.48 0.65
10' x 2.375" Horizontal Mount Pipe/Stabilizer	A	From Leg	0.00 0.00 0.00	0.00	117.00	No Ice 1/2" Ice 1" Ice	2.38 3.40 4.45	0.06 0.12 0.21	0.04 0.06 0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	B	From Leg	0.00 0.00	0.00	117.00	No Ice 1/2" Ice	2.38 3.40	0.06 0.12	0.04 0.06

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	Client: Watauga County	Designed by: hicham.anssar

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	4.45	0.21	0.08
10' x 2.375" Horizontal Mount Pipe/Stabilizer	C	From Leg	0.00	0.00	117.00	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
3" x 4' Omni	A	From Leg	6.00	0.00	117.00	No Ice	1.04	1.04	0.04
			0.00			1/2" Ice	1.44	1.44	0.05
			3.00			1" Ice	1.68	1.68	0.06
3" dia x 15-ft Omni Antenna	C	From Leg	6.00	0.00	117.00	No Ice	4.35	4.35	0.04
			0.00			1/2" Ice	6.03	6.03	0.07
			8.00			1" Ice	7.58	7.58	0.11
CC807-11	B	From Leg	6.00	0.00	117.00	No Ice	4.98	4.98	0.05
			0.00			1/2" Ice	7.63	7.63	0.09
			9.20			1" Ice	9.40	9.40	0.14
***									
4.5" x 5-ft Dish Pipe Mount	B	From Leg	1.33	0.00	80.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
6' Dish Ice Shield	B	From Leg	3.00	0.00	92.00	No Ice	7.72	7.72	0.31
			0.00			1/2" Ice	11.08	11.08	0.53
			0.00			1" Ice	14.44	14.41	0.78
4.5" x 5-ft Dish Pipe Mount	B	From Leg	1.33	0.00	85.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
***									
4.5" x 5-ft Dish Pipe Mount	C	From Leg	1.33	0.00	79.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
8' Dish Ice Shield	C	From Leg	3.00	0.00	86.00	No Ice	8.67	8.67	0.38
			0.00			1/2" Ice	11.10	11.10	0.66
			0.00			1" Ice	13.32	13.53	0.97
***									
4.5" x 5-ft Dish Pipe Mount	A	From Leg	1.33	0.00	80.00	No Ice	1.43	1.43	0.05
			0.00			1/2" Ice	2.08	2.08	0.07
			0.00			1" Ice	2.40	2.40	0.09
***									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
***											
PL6-65-PXA	B	Paraboloid w/Radome	From Leg	2.00	50.00		80.00	6.36	No Ice	31.75	0.16
				0.00					1/2" Ice	32.59	0.33
				0.00					1" Ice	33.43	0.50
***											
PL6-65-PXA	C	Paraboloid w/Radome	From Leg	2.00	10.00		79.00	6.36	No Ice	31.75	0.16
				0.00					1/2" Ice	32.59	0.33
				0.00					1" Ice	33.43	0.50

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	Client: Watauga County	Designed by: hicham.anssar

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
***											
HX6-6W-6WH	B	Paraboloid w/Shroud (HP)	From Leg	2.00 0.00 0.00	48.00		85.00	6.23	No Ice 1/2" Ice 1" Ice	30.48 31.30 32.13	0.19 0.35 0.51
***											

Tower Pressures - No Ice

$G_H = 0.850$

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

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	145.00	1.369	3	2.8988	57.227	A	5.282	29.765	14.454	41.24	30.602	0.000
150.00-140.00						B	5.282	29.765		41.24	0.000	0.000
						C	5.282	29.765		41.24	45.694	0.000
T2	130.00	1.337	3	2.8674	114.350	A	8.976	54.438	28.699	45.26	76.834	0.000
140.00-120.00						B	8.976	54.438		45.26	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	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	8.976	54.438		45.26	90.662	0.000
T3 120.00-100.00	110.00	1.291	3	2.8199	116.900	A	7.708	55.536	33.799	53.44	100.195	0.000
						B	7.708	55.536		53.44	0.000	0.000
						C	7.708	55.536		53.44	89.566	0.000
T4 100.00-80.00	90.00	1.238	2	2.7638	138.508	A	8.284	59.925	37.030	54.29	106.750	0.000
						B	8.284	59.925		54.29	0.000	0.000
						C	8.284	59.925		54.29	88.274	0.000
T5 80.00-60.00	70.00	1.174	2	2.6952	178.279	A	9.816	63.030	36.572	50.20	164.689	0.000
						B	9.816	63.030		50.20	21.569	0.000
						C	9.816	63.030		50.20	86.693	0.000
T6 60.00-40.00	50.00	1.094	2	2.6061	219.753	A	14.199	69.127	39.523	47.43	161.275	0.000
						B	14.199	69.127		47.43	20.939	0.000
						C	14.199	69.127		47.43	84.636	0.000
T7 40.00-20.00	30.00	0.982	2	2.4763	262.658	A	14.690	69.585	45.334	53.79	155.295	0.000
						B	14.690	69.585		53.79	20.023	0.000
						C	14.690	69.585		53.79	81.644	0.000
T8 20.00-0.00	10.00	0.850	2	2.2186	301.798	A	16.326	67.761	43.614	51.87	91.085	0.000
						B	16.326	67.761		51.87	18.205	0.000
						C	16.326	67.761		51.87	75.704	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 150.00-140.00	145.00	1.369	11	52.396	A	5.282	4.792	4.792	47.57	8.570	0.000
					B	5.282	4.792		47.57	0.000	0.000
					C	5.282	4.792		47.57	11.700	0.000
T2 140.00-120.00	130.00	1.337	10	104.792	A	8.976	9.583	9.583	51.64	19.487	0.000
					B	8.976	9.583		51.64	0.000	0.000
					C	8.976	9.583		51.64	23.400	0.000
T3 120.00-100.00	110.00	1.291	10	107.500	A	7.708	15.000	15.000	66.06	24.740	0.000
					B	7.708	15.000		66.06	0.000	0.000
					C	7.708	15.000		66.06	23.400	0.000
T4 100.00-80.00	90.00	1.238	10	129.283	A	8.284	18.574	18.574	69.16	26.682	0.000
					B	8.284	18.574		69.16	0.000	0.000
					C	8.284	18.574		69.16	23.400	0.000
T5 80.00-60.00	70.00	1.174	9	169.283	A	9.816	18.574	18.574	65.42	37.266	0.000
					B	9.816	18.574		65.42	1.400	0.000
					C	9.816	18.574		65.42	23.400	0.000
T6 60.00-40.00	50.00	1.094	9	211.055	A	14.199	22.120	22.120	60.90	37.424	0.000
					B	14.199	22.120		60.90	1.400	0.000
					C	14.199	22.120		60.90	23.400	0.000
T7 40.00-20.00	30.00	0.982	8	254.393	A	14.690	28.798	28.798	66.22	37.424	0.000
					B	14.690	28.798		66.22	1.400	0.000
					C	14.690	28.798		66.22	23.400	0.000
T8 20.00-0.00	10.00	0.850	7	294.393	A	16.326	28.798	28.798	63.82	25.245	0.000
					B	16.326	28.798		63.82	1.400	0.000
					C	16.326	28.798		63.82	23.400	0.000

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	Client: Watauga County	Designed by: hicham.anssar

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	40	1	1	8.019	1.04	103.51	C
150.00-140.00			B	0.192	2.622		1	1	8.019			
			C	0.192	2.622		1	1	8.019			
T2	0.40	0.63	A	0.177	2.674	39	1	1	14.443	1.96	97.81	C
140.00-120.00			B	0.177	2.674		1	1	14.443			
			C	0.177	2.674		1	1	14.443			
T3	0.43	1.01	A	0.211	2.559	38	1	1	15.346	2.00	99.97	C
120.00-100.00			B	0.211	2.559		1	1	15.346			
			C	0.211	2.559		1	1	15.346			
T4	0.44	1.27	A	0.208	2.57	36	1	1	16.957	2.08	104.16	C
100.00-80.00			B	0.208	2.57		1	1	16.957			
			C	0.208	2.57		1	1	16.957			
T5	0.50	1.34	A	0.168	2.707	34	1	1	18.243	2.35	117.57	C
80.00-60.00			B	0.168	2.707		1	1	18.243			
			C	0.168	2.707		1	1	18.243			
T6	0.51	1.81	A	0.172	2.692	32	1	1	23.717	2.59	129.26	C
60.00-40.00			B	0.172	2.692		1	1	23.717			
			C	0.172	2.692		1	1	23.717			
T7	0.51	2.41	A	0.171	2.696	29	1	1	27.063	2.54	127.19	C
40.00-20.00			B	0.171	2.696		1	1	27.063			
			C	0.171	2.696		1	1	27.063			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	1	1	28.432	2.17	108.37	C
			B	0.153	2.759		1	1	28.432			
			C	0.153	2.759		1	1	28.432			
Sum Weight:	3.44	11.79						OTM	1203.66 kip-ft	16.72		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	40	0.8	1	6.963	0.94	94.11	A
150.00-140.00			B	0.192	2.622		0.8	1	6.963			
			C	0.192	2.622		0.8	1	6.963			
T2	0.40	0.63	A	0.177	2.674	39	0.8	1	12.648	1.80	89.84	A
140.00-120.00			B	0.177	2.674		0.8	1	12.648			
			C	0.177	2.674		0.8	1	12.648			
T3	0.43	1.01	A	0.211	2.559	38	0.8	1	13.804	1.87	93.65	A
120.00-100.00			B	0.211	2.559		0.8	1	13.804			
			C	0.211	2.559		0.8	1	13.804			
T4	0.44	1.27	A	0.208	2.57	36	0.8	1	15.301	1.95	97.62	A
100.00-80.00			B	0.208	2.57		0.8	1	15.301			
			C	0.208	2.57		0.8	1	15.301			
T5	0.50	1.34	A	0.168	2.707	34	0.8	1	16.280	2.20	109.83	A
80.00-60.00			B	0.168	2.707		0.8	1	16.280			
			C	0.168	2.707		0.8	1	16.280			
T6	0.51	1.81	A	0.172	2.692	32	0.8	1	20.877	2.38	118.89	A
60.00-40.00			B	0.172	2.692		0.8	1	20.877			
			C	0.172	2.692		0.8	1	20.877			

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	Client: Watauga County	Designed by: hicham.anssar

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7	0.51	2.41	A	0.171	2.696	29	0.8	1	24.125	2.35	117.54	A
40.00-20.00			B	0.171	2.696		0.8	1	24.125			
			C	0.171	2.696		0.8	1	24.125			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	0.8	1	25.166	1.98	98.87	A
			B	0.153	2.759		0.8	1	25.166			
			C	0.153	2.759		0.8	1	25.166			
Sum Weight:	3.44	11.79						OTM	1114.74 kip-ft	15.47		

Tower Forces - No Ice - 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 ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	40	0.85	1	7.227	1.01	100.60	B
150.00-140.00			B	0.192	2.622		0.85	1	7.227			
			C	0.192	2.622		0.85	1	7.227			
T2	0.40	0.63	A	0.177	2.674	39	0.85	1	13.097	1.92	95.88	B
140.00-120.00			B	0.177	2.674		0.85	1	13.097			
			C	0.177	2.674		0.85	1	13.097			
T3	0.43	1.01	A	0.211	2.559	38	0.85	1	14.189	1.99	99.67	B
120.00-100.00			B	0.211	2.559		0.85	1	14.189			
			C	0.211	2.559		0.85	1	14.189			
T4	0.44	1.27	A	0.208	2.57	36	0.85	1	15.715	2.07	103.61	B
100.00-80.00			B	0.208	2.57		0.85	1	15.715			
			C	0.208	2.57		0.85	1	15.715			
T5	0.50	1.34	A	0.168	2.707	34	0.85	1	16.771	2.31	115.58	B
80.00-60.00			B	0.168	2.707		0.85	1	16.771			
			C	0.168	2.707		0.85	1	16.771			
T6	0.51	1.81	A	0.172	2.692	32	0.85	1	21.587	2.50	125.04	B
60.00-40.00			B	0.172	2.692		0.85	1	21.587			
			C	0.172	2.692		0.85	1	21.587			
T7	0.51	2.41	A	0.171	2.696	29	0.85	1	24.859	2.46	123.15	B
40.00-20.00			B	0.171	2.696		0.85	1	24.859			
			C	0.171	2.696		0.85	1	24.859			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	25	0.85	1	25.983	2.08	103.80	B
			B	0.153	2.759		0.85	1	25.983			
			C	0.153	2.759		0.85	1	25.983			
Sum Weight:	3.44	11.79						OTM	1182.42 kip-ft	16.34		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	1	1	27.655	0.18	17.53	C

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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 ft²	F K	w plf	Ctrl. Face
150.00-140.00			B	0.612	1.797		1	1	27.655			
			C	0.612	1.797		1	1	27.655			
T2	3.40	5.22	A	0.555	1.839	3	1	1	47.949	0.35	17.53	C
140.00-120.00			B	0.555	1.839		1	1	47.949			
			C	0.555	1.839		1	1	47.949			
T3	3.69	5.44	A	0.541	1.852	3	1	1	47.026	0.36	17.76	C
120.00-100.00			B	0.541	1.852		1	1	47.026			
			C	0.541	1.852		1	1	47.026			
T4	3.73	6.01	A	0.492	1.91	2	1	1	49.090	0.38	18.77	C
100.00-80.00			B	0.492	1.91		1	1	49.090			
			C	0.492	1.91		1	1	49.090			
T5	4.91	6.38	A	0.409	2.047	2	1	1	50.156	0.48	23.84	C
80.00-60.00			B	0.409	2.047		1	1	50.156			
			C	0.409	2.047		1	1	50.156			
T6	4.68	7.80	A	0.379	2.107	2	1	1	57.575	0.48	23.79	C
60.00-40.00			B	0.379	2.107		1	1	57.575			
			C	0.379	2.107		1	1	57.575			
T7	4.35	8.24	A	0.321	2.242	2	1	1	56.837	0.43	21.43	C
40.00-20.00			B	0.321	2.242		1	1	56.837			
			C	0.321	2.242		1	1	56.837			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	1	1	56.478	0.32	16.12	C
			B	0.279	2.354		1	1	56.478			
			C	0.279	2.354		1	1	56.478			
Sum Weight:	29.19	50.45						OTM	217.11 kip-ft	2.96		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	0.8	1	26.599	0.17	17.10	A
150.00-140.00			B	0.612	1.797		0.8	1	26.599			
			C	0.612	1.797		0.8	1	26.599			
T2	3.40	5.22	A	0.555	1.839	3	0.8	1	46.154	0.34	17.16	A
140.00-120.00			B	0.555	1.839		0.8	1	46.154			
			C	0.555	1.839		0.8	1	46.154			
T3	3.69	5.44	A	0.541	1.852	3	0.8	1	45.484	0.35	17.45	A
120.00-100.00			B	0.541	1.852		0.8	1	45.484			
			C	0.541	1.852		0.8	1	45.484			
T4	3.73	6.01	A	0.492	1.91	2	0.8	1	47.433	0.37	18.45	A
100.00-80.00			B	0.492	1.91		0.8	1	47.433			
			C	0.492	1.91		0.8	1	47.433			
T5	4.91	6.38	A	0.409	2.047	2	0.8	1	48.193	0.47	23.45	A
80.00-60.00			B	0.409	2.047		0.8	1	48.193			
			C	0.409	2.047		0.8	1	48.193			
T6	4.68	7.80	A	0.379	2.107	2	0.8	1	54.735	0.46	23.25	A
60.00-40.00			B	0.379	2.107		0.8	1	54.735			
			C	0.379	2.107		0.8	1	54.735			
T7	4.35	8.24	A	0.321	2.242	2	0.8	1	53.899	0.42	20.89	A
40.00-20.00			B	0.321	2.242		0.8	1	53.899			
			C	0.321	2.242		0.8	1	53.899			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	0.8	1	53.213	0.31	15.58	A

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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 ft²	F K	w plf	Ctrl. Face
			B	0.279	2.354		0.8	1	53.213			
			C	0.279	2.354		0.8	1	53.213			
Sum Weight:	29.19	50.45						OTM	212.73 kip-ft	2.90		

Tower Forces - With Ice - 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 ft²	F K	w plf	Ctrl. Face
T1	1.56	2.99	A	0.612	1.797	3	0.85	1	26.863	0.17	17.36	B
150.00-140.00			B	0.612	1.797		0.85	1	26.863			
			C	0.612	1.797		0.85	1	26.863			
T2	3.40	5.22	A	0.555	1.839	3	0.85	1	46.602	0.35	17.43	B
140.00-120.00			B	0.555	1.839		0.85	1	46.602			
			C	0.555	1.839		0.85	1	46.602			
T3	3.69	5.44	A	0.541	1.852	3	0.85	1	45.870	0.36	17.79	B
120.00-100.00			B	0.541	1.852		0.85	1	45.870			
			C	0.541	1.852		0.85	1	45.870			
T4	3.73	6.01	A	0.492	1.91	2	0.85	1	47.847	0.38	18.83	B
100.00-80.00			B	0.492	1.91		0.85	1	47.847			
			C	0.492	1.91		0.85	1	47.847			
T5	4.91	6.38	A	0.409	2.047	2	0.85	1	48.684	0.48	23.90	B
80.00-60.00			B	0.409	2.047		0.85	1	48.684			
			C	0.409	2.047		0.85	1	48.684			
T6	4.68	7.80	A	0.379	2.107	2	0.85	1	55.445	0.47	23.72	B
60.00-40.00			B	0.379	2.107		0.85	1	55.445			
			C	0.379	2.107		0.85	1	55.445			
T7	4.35	8.24	A	0.321	2.242	2	0.85	1	54.634	0.43	21.32	B
40.00-20.00			B	0.321	2.242		0.85	1	54.634			
			C	0.321	2.242		0.85	1	54.634			
T8 20.00-0.00	2.85	8.35	A	0.279	2.354	2	0.85	1	54.030	0.32	15.93	B
			B	0.279	2.354		0.85	1	54.030			
			C	0.279	2.354		0.85	1	54.030			
Sum Weight:	29.19	50.45						OTM	216.68 kip-ft	2.95		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	11	1	1	8.028	0.28	27.80	C
150.00-140.00			B	0.192	2.622		1	1	8.028			
			C	0.192	2.622		1	1	8.028			
T2	0.40	0.63	A	0.177	2.674	10	1	1	14.447	0.53	26.25	C
140.00-120.00			B	0.177	2.674		1	1	14.447			

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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 ft²	F K	w plf	Ctrl. Face
			C	0.177	2.674		1	1	14.447			
T3	0.43	1.01	A	0.211	2.559	10	1	1	16.356	0.56	27.94	C
120.00-100.00			B	0.211	2.559		1	1	16.356			
			C	0.211	2.559		1	1	16.356			
T4	0.44	1.27	A	0.208	2.57	10	1	1	18.980	0.60	30.10	C
100.00-80.00			B	0.208	2.57		1	1	18.980			
			C	0.208	2.57		1	1	18.980			
T5	0.50	1.34	A	0.168	2.707	9	1	1	20.396	0.68	33.83	C
80.00-60.00			B	0.168	2.707		1	1	20.396			
			C	0.168	2.707		1	1	20.396			
T6	0.51	1.81	A	0.172	2.692	9	1	1	26.556	0.75	37.48	C
60.00-40.00			B	0.172	2.692		1	1	26.556			
			C	0.172	2.692		1	1	26.556			
T7	0.51	2.41	A	0.171	2.696	8	1	1	29.748	0.73	36.50	C
40.00-20.00			B	0.171	2.696		1	1	29.748			
			C	0.171	2.696		1	1	29.748			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	1	1	31.650	0.63	31.60	C
			B	0.153	2.759		1	1	31.650			
			C	0.153	2.759		1	1	31.650			
Sum Weight:	3.44	11.79						OTM	337.28 kip-ft	4.75		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	11	0.8	1	6.972	0.25	25.28	A
150.00-140.00			B	0.192	2.622		0.8	1	6.972			
			C	0.192	2.622		0.8	1	6.972			
T2	0.40	0.63	A	0.177	2.674	10	0.8	1	12.652	0.48	24.12	A
140.00-120.00			B	0.177	2.674		0.8	1	12.652			
			C	0.177	2.674		0.8	1	12.652			
T3	0.43	1.01	A	0.211	2.559	10	0.8	1	14.815	0.52	26.25	A
120.00-100.00			B	0.211	2.559		0.8	1	14.815			
			C	0.211	2.559		0.8	1	14.815			
T4	0.44	1.27	A	0.208	2.57	10	0.8	1	17.323	0.57	28.34	A
100.00-80.00			B	0.208	2.57		0.8	1	17.323			
			C	0.208	2.57		0.8	1	17.323			
T5	0.50	1.34	A	0.168	2.707	9	0.8	1	18.433	0.64	31.75	A
80.00-60.00			B	0.168	2.707		0.8	1	18.433			
			C	0.168	2.707		0.8	1	18.433			
T6	0.51	1.81	A	0.172	2.692	9	0.8	1	23.716	0.69	34.69	A
60.00-40.00			B	0.172	2.692		0.8	1	23.716			
			C	0.172	2.692		0.8	1	23.716			
T7	0.51	2.41	A	0.171	2.696	8	0.8	1	26.810	0.68	33.91	A
40.00-20.00			B	0.171	2.696		0.8	1	26.810			
			C	0.171	2.696		0.8	1	26.810			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	0.8	1	28.384	0.58	29.05	A
			B	0.153	2.759		0.8	1	28.384			
			C	0.153	2.759		0.8	1	28.384			
Sum Weight:	3.44	11.79						OTM	313.42 kip-ft	4.42		

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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 ft²	F K	w plf	Ctrl. Face
T1	0.20	0.35	A	0.192	2.622	11	0.85	1	7.236	0.27	27.02	B
150.00-140.00			B	0.192	2.622		0.85	1	7.236			
			C	0.192	2.622		0.85	1	7.236			
T2	0.40	0.63	A	0.177	2.674	10	0.85	1	13.101	0.51	25.74	B
140.00-120.00			B	0.177	2.674		0.85	1	13.101			
			C	0.177	2.674		0.85	1	13.101			
T3	0.43	1.01	A	0.211	2.559	10	0.85	1	15.200	0.56	27.86	B
120.00-100.00			B	0.211	2.559		0.85	1	15.200			
			C	0.211	2.559		0.85	1	15.200			
T4	0.44	1.27	A	0.208	2.57	10	0.85	1	17.738	0.60	29.95	B
100.00-80.00			B	0.208	2.57		0.85	1	17.738			
			C	0.208	2.57		0.85	1	17.738			
T5	0.50	1.34	A	0.168	2.707	9	0.85	1	18.923	0.67	33.30	B
80.00-60.00			B	0.168	2.707		0.85	1	18.923			
			C	0.168	2.707		0.85	1	18.923			
T6	0.51	1.81	A	0.172	2.692	9	0.85	1	24.426	0.73	36.34	B
60.00-40.00			B	0.172	2.692		0.85	1	24.426			
			C	0.172	2.692		0.85	1	24.426			
T7	0.51	2.41	A	0.171	2.696	8	0.85	1	27.545	0.71	35.42	B
40.00-20.00			B	0.171	2.696		0.85	1	27.545			
			C	0.171	2.696		0.85	1	27.545			
T8 20.00-0.00	0.46	2.97	A	0.153	2.759	7	0.85	1	29.201	0.61	30.37	B
			B	0.153	2.759		0.85	1	29.201			
			C	0.153	2.759		0.85	1	29.201			
Sum Weight:	3.44	11.79						OTM	331.59 kip-ft	4.65		

Force Totals

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

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

Load Combinations

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

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

Maximum Member Forces

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

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	Client: Watauga County	Designed by: hicham.anssar

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

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	Client: Watauga County	Designed by: hicham.anssar

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

Maximum Reactions

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

Tower Mast Reaction Summary

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

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

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

Solution Summary

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

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	Client: Watauga County	Designed by: hicham.anssar

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

Maximum Tower Deflections - Service Wind

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

Critical Deflections and Radius of Curvature - Service Wind

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

Maximum Tower Deflections - Design Wind

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

Critical Deflections and Radius of Curvature - Design Wind

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

Bolt Design Data

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

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

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

Compression Checks

Leg Design Data (Compression)

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

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

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

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

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Compression)

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

[1] $P_u / \phi P_n$ controls

Tension Checks

Leg Design Data (Tension)

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

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Tension)

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

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

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

[1] $P_u / \phi P_n$ controls

Top Girt Design Data (Tension)

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

[1] $P_u / \phi P_n$ controls

Section Capacity Table

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

Program Version 8.3.1.2 - 12/11/2024 File:C:/Users/hicham.anssar/OneDrive - Engineered Tower Solutions/Desktop/125017_1018_Buckeye_Mapping Geo SA/SE/8177_Tower Modification Drawings/Analysis/Tower/Buckeye Mt. - Viper.eri

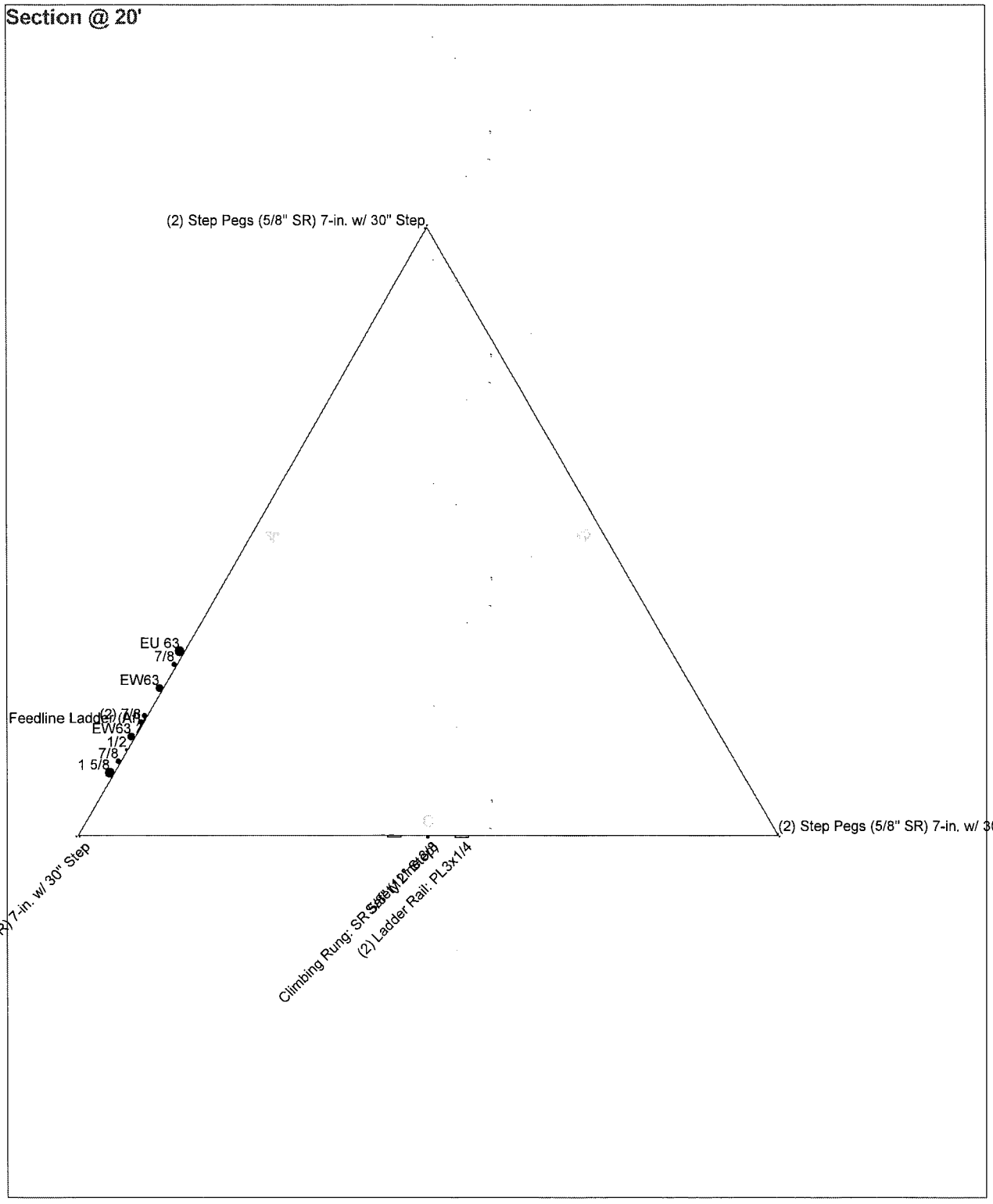
APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan

20'

_____ Round _____ Flat _____ App In Face _____ App Out Face



Engineered Tower Solutions, PLLC	Job: Buckeye Mt. - Viper		
3227 Wellington Ct. Raleigh, NC 27615 Phone: (919) 782-2710 FAX: 919-782-2710	Project: ETS, PLLC Job No. 24125017.STR.8177		
	Client: Watauga County	Drawn by: hicham.anssar	App'd:
	Code: TIA-222-G	Date: 03/25/25	Scale: NTS
	Path:		Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

Self Support Anchor Rod Capacity

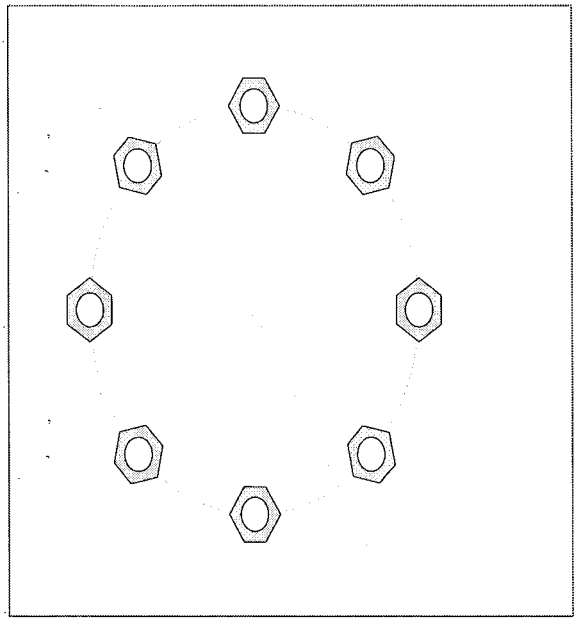
Site Info	
Site #	HP-1343
Site Name	Buckeye Mt. - Viper
ETS, PLLC #	24125017.STR.8177

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

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

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

**Anchor Rod Eccentricity Applied*



Connection Properties

Anchor Rod Data

(8) 1" ø bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi)

l_{ar} (in): 0

Analysis Results

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

Pu_t = 23.13	ϕPn_t = 36.36	**Stress Rating**
Vu = 2.38	ϕVn = n/a	**75.5%**
Mu = n/a	ϕMn = n/a	Pass

Analysis Date: 3/25/2025

SST Unit Base Foundation

Site # :	HP-1343
Site Name:	Buckeye Mt. - Viper
ETS, PLLC #:	24125017.STR.8177
TIA-222 Revision:	G

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

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

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

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

Structural Rating:	**42.6%**
Soil Rating:	**60.3%**

Pad Properties		
Depth, **D**:	6.75	ft
Pad Width, W_1:	24.00	ft
Pad Thickness, **T**:	1.75	ft
Pad Rebar Size (Bottom dir. 2), Sp_2:	7	
Pad Rebar Quantity (Bottom dir. 2), mp_2:	43	
Pad Clear Cover, cc_{pad}:	3	in

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

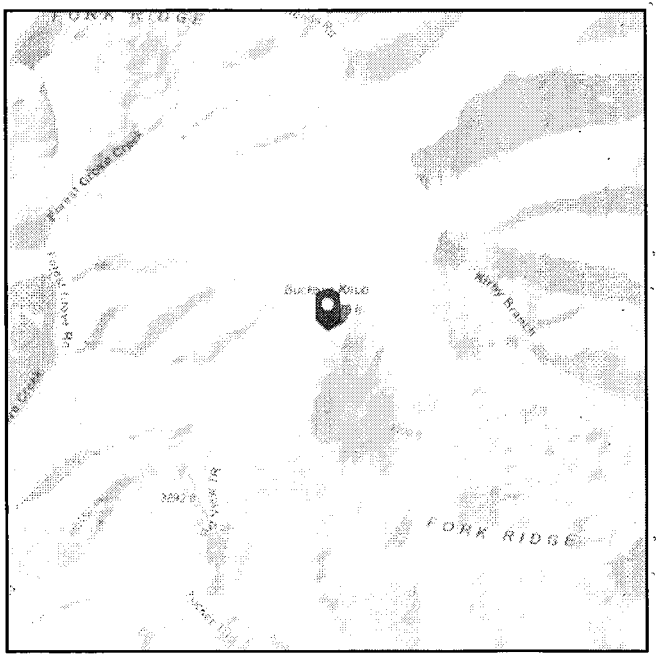
Soil Properties		
Total Soil Unit Weight, γ:	110	pcf
Ultimate Net Bearing, Qnet:	5.000	ksf
Cohesion, **Cu**:	0.000	ksf
Friction Angle, φ:	30	degrees
SPT Blow Count, N_{blows}:	12	
Base Friction, μ:	0.35	
Neglected Depth, **N**:	2.0	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	N/A	ft

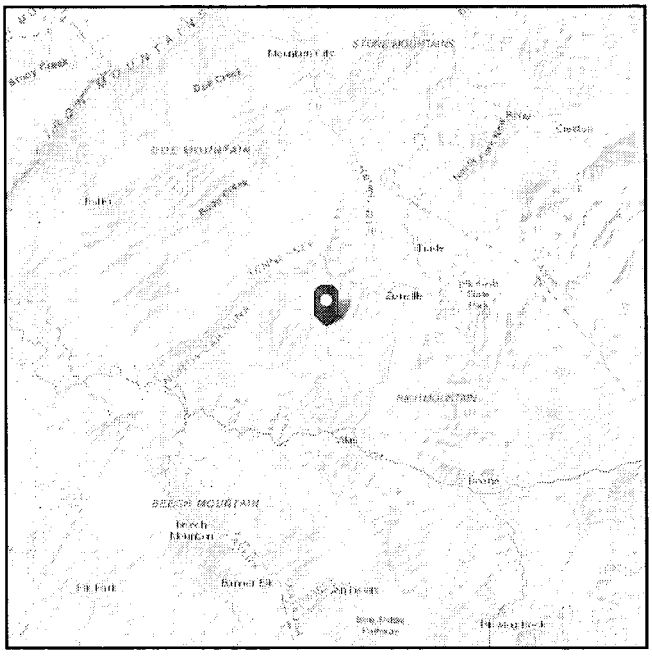
ASCE Hazards Report

Address:
No Address at This Location

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

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





Wind

Results:

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

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

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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.

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Seismic

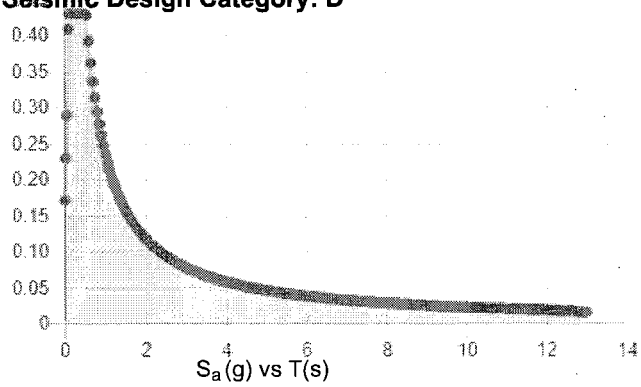
Site Soil Class: D - Stiff Soil

Results:

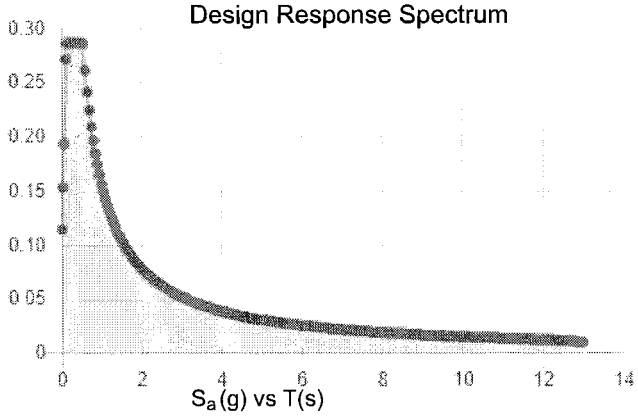
S_S :	0.272	S_{D1} :	0.157
S_1 :	0.098	T_L :	12
F_a :	1.582	PGA :	0.145
F_v :	2.4	PGA_M :	0.219
S_{MS} :	0.431	F_{PGA} :	1.51
S_{M1} :	0.236	I_e :	1.5
S_{DS} :	0.287		

Seismic Design Category: D

MCE_R Response Spectrum



Design Response Spectrum



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.

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Ice

Results:

Ice Thickness:	0.75 in.
Concurrent Temperature:	15 F
Gust Speed	30 mph
Data Source:	Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8
Date Accessed:	Tue Mar 25 2025

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

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

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

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

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

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

APPENDIX D

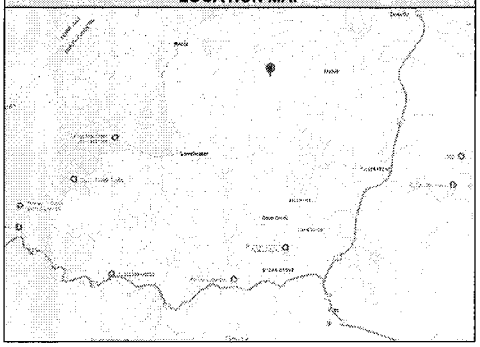
MODIFICATION DESIGN DRAWINGS

TOWER MODIFICATION DRAWINGS

SITE INFORMATION

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

LOCATION MAP



DRIVING DIRECTIONS

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

SCAN CODE FOR DIRECTIONS

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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N-2	0 - 03/25/2025	PROJECT NOTES
BM	0 - 03/25/2025	BILL OF MATERIALS
S-1	0 - 03/25/2025	TOWER ELEVATION AND MODIFICATION SCHEDULE
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P-1	0 - 03/25/2025	PHOTOS
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PREPARED BY:

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

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SEAL: NC #P-1016
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER J. SCOTT HILGOE
03/25/2025

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TITLE PAGE

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

MI CHECKLIST

REQUIRED	REPORT ITEM	BRIEF DESCRIPTION
PRE-CONSTRUCTION		
N/A	EOR APPROVED SHOP DRAWINGS	ONCE THE PRE-MODIFICATION MAPPING IS COMPLETE AND PRIOR TO FABRICATION, THE CONTRACTOR SHALL PROVIDE DETAILED ASSEMBLY DRAWINGS AND/OR SHOP DRAWINGS ALONG WITH EOR RFI FORM DETAILING ANY CHANGES FROM THE ORIGINAL DESIGN TO THE EOR FOR REVIEW AND APPROVAL.
N/A	FABRICATION INSPECTION	A LETTER FROM THE FABRICATOR, STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THE CONTRACT DOCUMENTS, SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR CERTIFIED WELD INSPECTION	A CWI SHALL INSPECT ALL WELDING PERFORMED ON STRUCTURAL MEMBERS DURING FABRICATION. A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	MATERIAL TEST REPORTS (MTR)	MATERIAL TEST REPORTS SHALL BE PROVIDED FOR MATERIAL USED. MTRS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR NDE INSPECTION REPORT	CRITICAL SHOP WELDS THAT REQUIRE TESTING ARE NOTED ON THESE CONTRACT DRAWINGS. A CERTIFIED NDT INSPECTOR SHALL PERFORM NON-DESTRUCTIVE EXAMINATION AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	NDE OF MONOPOLE BASE PLATE	A NDE OF THE POLE TO BASE PLATE CONNECTION IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PACKING SLIPS	PACKING/SHIPPING LIST FOR ALL MATERIAL USED DURING CONSTRUCTION OF THE MODIFICATION.
ADDITIONAL TESTING AND INSPECTIONS:		
N/A		
CONSTRUCTION		
N/A	FOUNDATION INSPECTIONS	A VISUAL OBSERVATION OF THE EXCAVATION AND REBAR SHALL BE PERFORMED BEFORE PLACING THE CONCRETE. A VISUAL OBSERVATION OF THE REBAR SHALL BE PERFORMED BEFORE PLACING THE EPOXY. A SEALED WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	CONCRETE COMP. STRENGTH AND SLUMP TEST	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK: SOIL COMPACTION	FOUNDATION SOIL COMPACTION SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	EARTHWORK: BEARING CAPACITY	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY AN APPROVED FOUNDATION INSPECTOR AND RESULTS INCLUDED AS PART OF THE FOUNDATION REPORT.
N/A	MICROPILE/ROCK ANCHOR	MICROPILES/ROCK ANCHORS SHALL BE INSPECTED BY THE FOUNDATION INSPECTION VENDOR AND SHALL BE INCLUDED AS PART OF THE FOUNDATION INSPECTION REPORT. ADDITIONAL TESTING AND/OR INSPECTION REQUIREMENTS ARE NOTED IN THE PROJECT NOTES.
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.

PREPARED BY:
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NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILDEBRAN
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SHEET TITLE:
MODIFICATION INSPECTION CHECKLIST

SHEET #: **N-1**
CURRENT REV #: 0
ETS #: 241250177.STR.6177

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	+⅓ TURN BEYOND SNUG TIGHT
⅝"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
⅞"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 INCH LENGTH	+⅔ 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
⅝"	BOLTS 2.75 TO 5.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS 3.25 TO 6.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT
⅞"	BOLTS 3.75 TO 7.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT
1"	BOLTS 4.25 TO 8.0 INCH LENGTH	+⅔ TURN BEYOND SNUG TIGHT

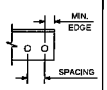
4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

NOMINAL HOLE DIMENSIONS

BOLT DIAMETER	STANDARD HOLE	SHORT SLOT
½	9/16	9/16 x 11/16
⅝	11/16	11/16 X ⅞
¾	13/16	13/16 X 1
⅞	15/16	15/16 X 1⅛
1	1 1/16	1 1/16 X 1 5/16

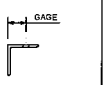
BOLT EDGE AND SPACING

BOLT DIAMETER	MIN EDGE	SPACING
½	¾	1½
⅝	1"	1¼
¾	1¼	2½
⅞	1½	2¾
1	1¾	3

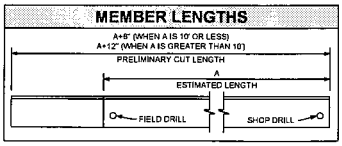


WORKABLE GAGES

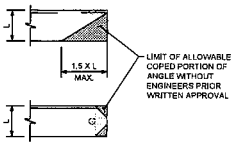
LEG LENGTH	GAGE
4	2½
3½	2
3	1¾
2½	1⅜
2	1⅛
1¾	1



MEMBER LENGTHS



ALLOWABLE ANGLE COPE



PREPARED BY:

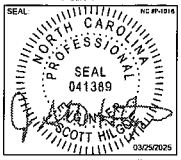
ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
p. 919-790-2710 f. 919-435-0631
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698
LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC #P-1016



03/25/2025

REV	DATE	DETAILS
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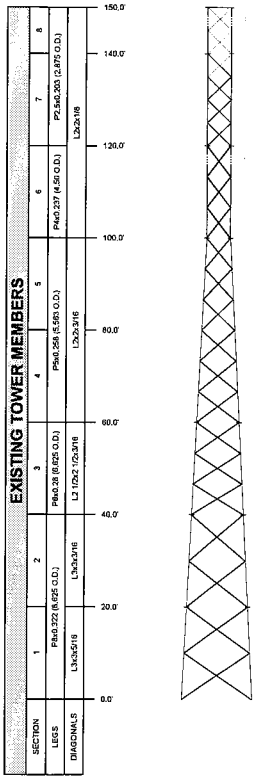
DRAWN BY: EDR | CHECKED BY: HA

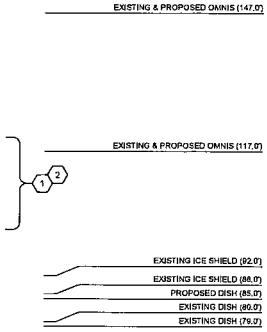
SHEET TITLE:
PROJECT NOTES

SHEET # **N-2** | CURRENT REV # 0 | ETS # 24125017.STR.6177

BILL OF MATERIALS

QUANTITY REQUIRED	MANUFACTURER	PART NUMBER	DESCRIPTION	LENGTH	DETAIL SHEET #	PART WEIGHT (LB)	TOTAL WEIGHT (LB)	NOTES
			DIAGONAL REPLACEMENT MATERIALS & HARDWARE					
16	-	L-1	L 2"x2"x3/16" A572-50	8'-0"±	S-3	20.50	389.00	
45	-	-	3/4"Ø A325X W/ HHN, LKW, FW	2"	S-3	0.58	26.10	





TOWER ELEVATION
SCALE: 1" = 20'

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

MODIFICATION SCHEDULE

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

NOTES:

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

PREPARED BY:
ENGINEERED TOWER SOLUTIONS
3227 WELLINGTON COURT
RALEIGH, NC 27615
o: 919-752-2710, f: 919-435-0631
www.ets-pllc.com

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698
LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL:
NC #P-1016
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGOUR
03/25/2025

REV	DATE	DETAILS
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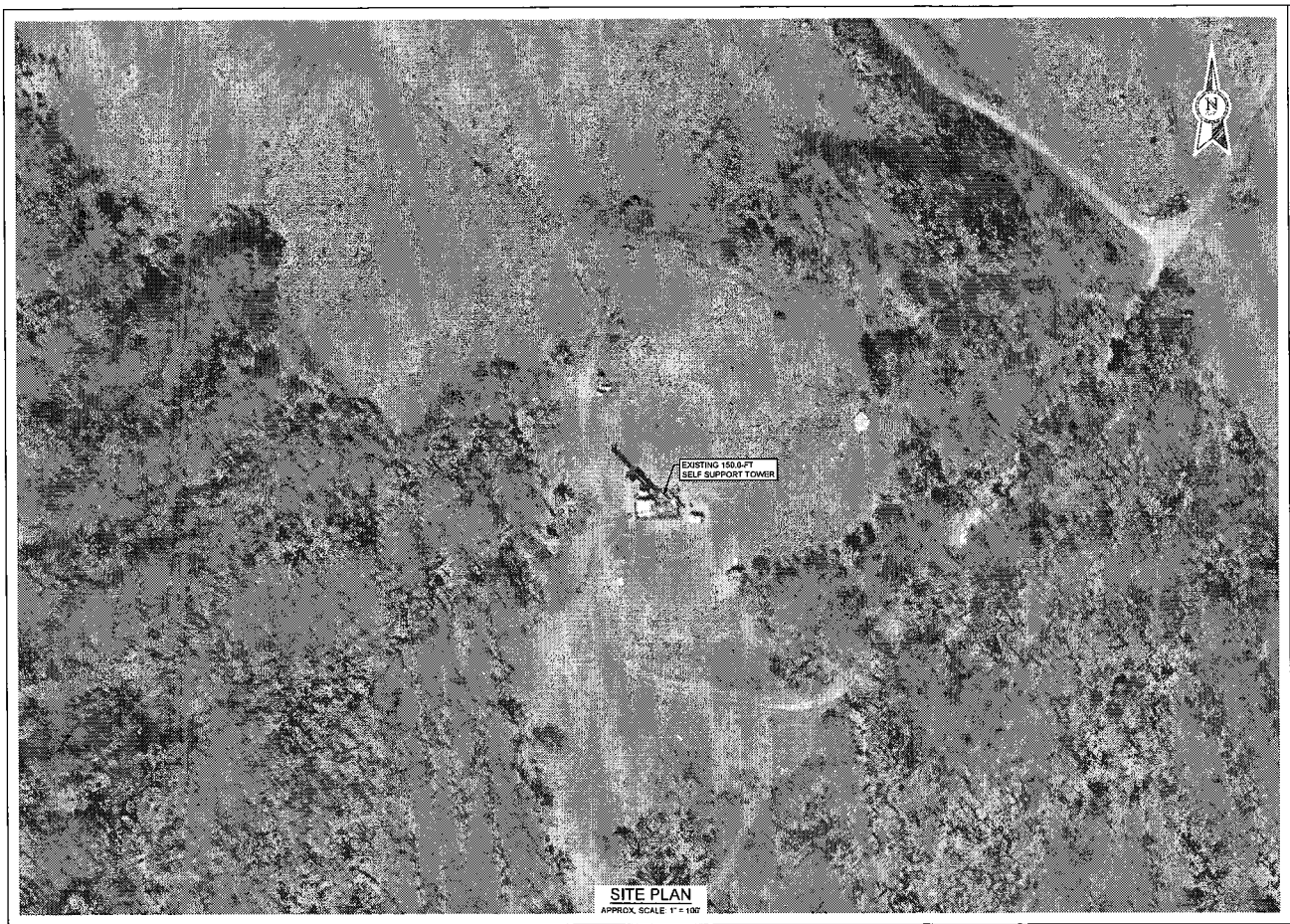
DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
TOWER ELEVATION AND MODIFICATION SCHEDULE

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



SITE PLAN
APPROX. SCALE: 1" = 100'

PREPARED BY:

ENGINEERED
TOWER SOLUTIONS

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

PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698
LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL: NC 041389

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

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
SITE PLAN

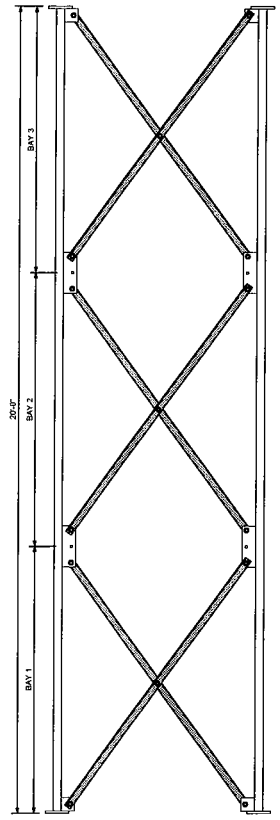
SHEET # **S-2** | CURRENT REV #: 0
ETS # 24125017.STR.6177

BRACING SCHEDULE

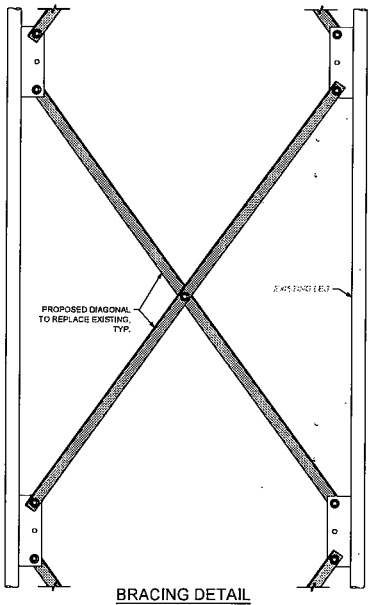
SECTION	ELEVATION (FT)	BAY	EXISTING DIAGONAL SIZE	PROPOSED BRACING				PROPOSED CONNECTION	
				PART NO.	SIZE & GRADE	ESTIMATED LENGTH	QTY.	SIZE & GRADE	QTY.
6	100.0 - 120.0	1-3 (OF 3)	L 2"x2"x1/8"	L-1	L 2"x2"x3/16" A572-50	8'-0"±	16	3/4"Ø x2" A325X W/ HHN, LKW, FW	45

NOTES:

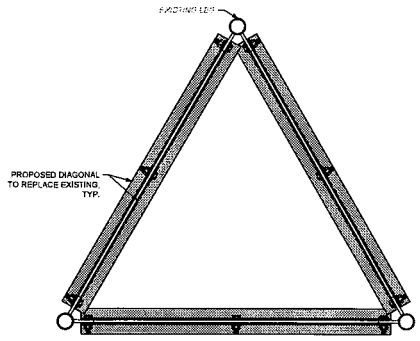
1. IT IS THE CONTRACTORS RESPONSIBILITY TO MEASURE ALL RELEVANT EXISTING MEMBERS PRIOR TO ORDERING MATERIALS.
2. PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL FIELD VERIFY ALL LENGTHS.
3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE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



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



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



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

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

3227 WELLINGTON COURT
RALEIGH, NC 27615
o: 919-782-2710, f: 919-435-0631
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PREPARED FOR:

SITE NAME:
BUCKEYE MT. - VIPER
SITE NUMBER:
HP-1343
SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28698
LATITUDE/LONGITUDE:
N 36.316081° W 81.791511°

SEAL — NC #P-1816
NORTH CAROLINA PROFESSIONAL SEAL 041389 ENGINEER SCOTT HILGER
03/25/2025

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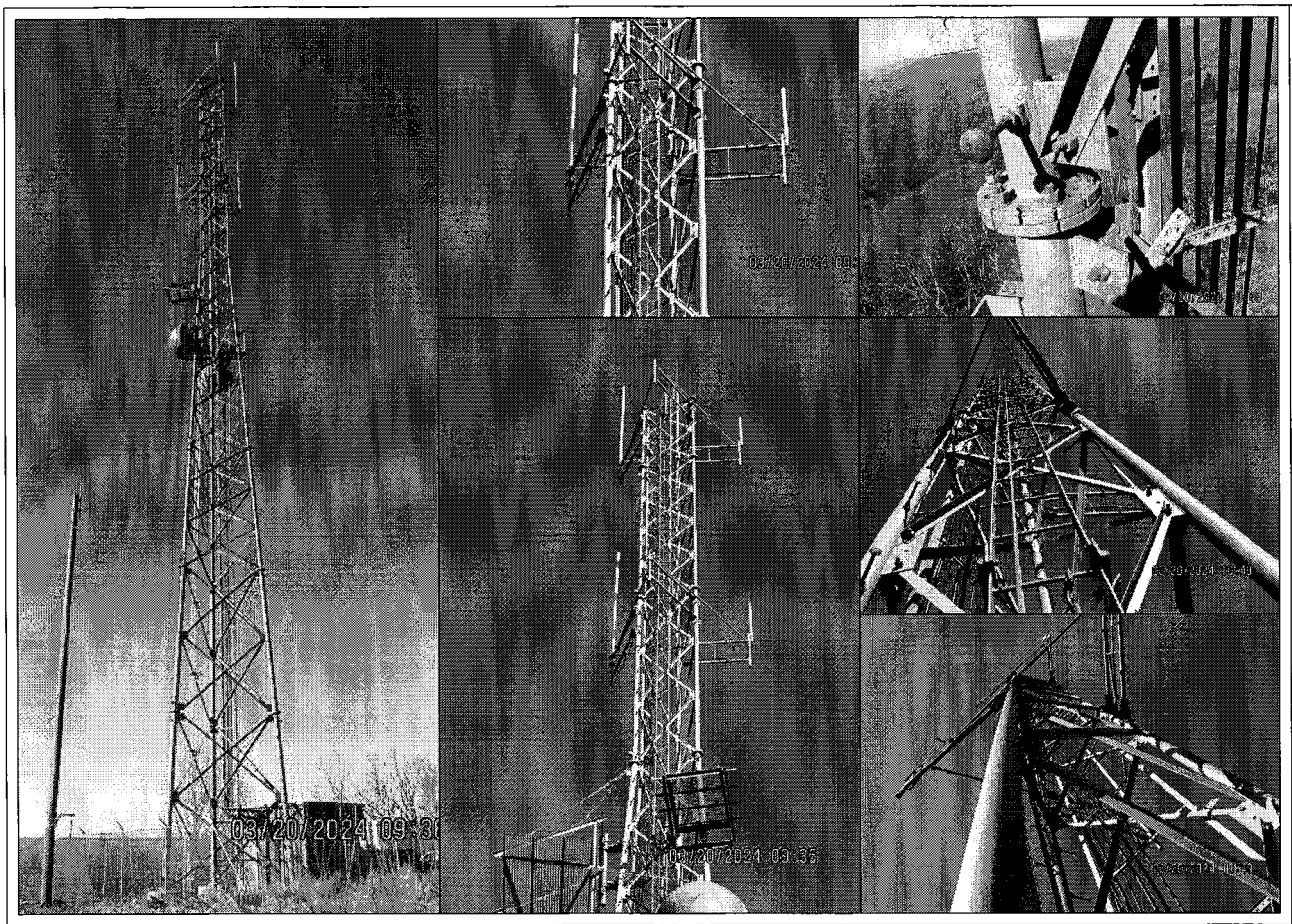
DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE:
DIAGONAL REPLACEMENT DETAILS

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



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ENGINEERED TOWER SOLUTIONS

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RALEIGH, NC 27615
o. 919-782-2710, f. 919-435-0831
www.ets-pllc.com

PREPARED FOR

SITE NAME:
BUCKEYE MT. - VIPER

SITE NUMBER:
HP-1343

SITE ADDRESS:
2542 FOREST GROVE ROAD
VILAS, NC 28692

LATITUDE/LONGITUDE:
N 36.316081°, W 81.791511°

SEAL NC #P-1016

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

REV	DATE	DETAILS
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DRAWN BY: EDR | CHECKED BY: HA

SHEET TITLE
PHOTOS

SHEET # **P-1** | CURRENT REV # 0
ETS # 2412017.STR.0177

ENGINEERED
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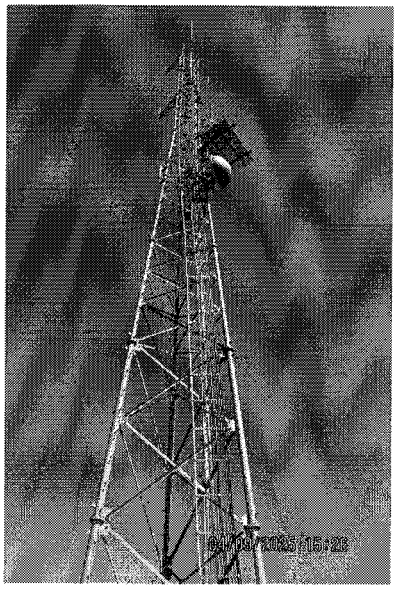
PRE MODIFICATION INSPECTION REPORT

SITE NAME: BUCKEYE MT. - VIPER



Performed By:

Alex Meister
Tower Engineer - Inspections

Charlie Kluth
Tower Engineer - Inspections

Prepared for:

1.0 ASSIGNMENT

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

Location – 2542 Forest Grove Rd, Vilas, NC 28692

Structure – 150-ft± Self-Support Tower

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

2.0 SCOPE OF SERVICES

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

3.0 PARTICIPATING PERSONNEL

Representatives:	Mr. Marty Randall 10-18 Consulting (828) 527-2416
Consulting Engineers:	Mr. Alex Meister Mr. Charlie Kluth Engineered Tower Solutions, PLLC (ETS) 3227 Wellington Ct. Raleigh, NC 27615 (919) 782-2710

4.0 BACKGROUND INFORMATION

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

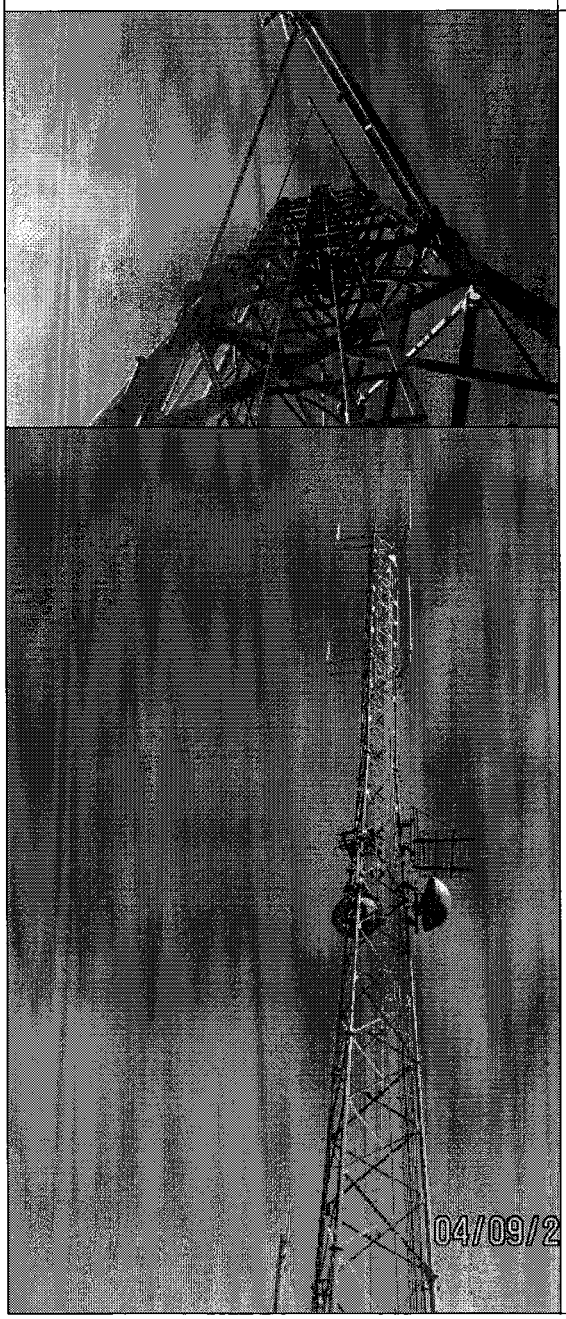
5.0 INVESTIGATION

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

6.0 RESULTS

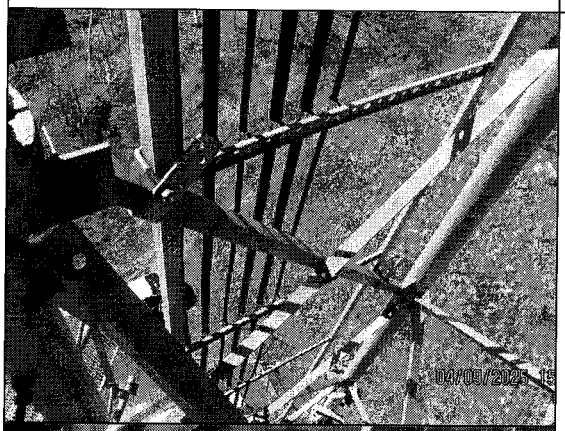
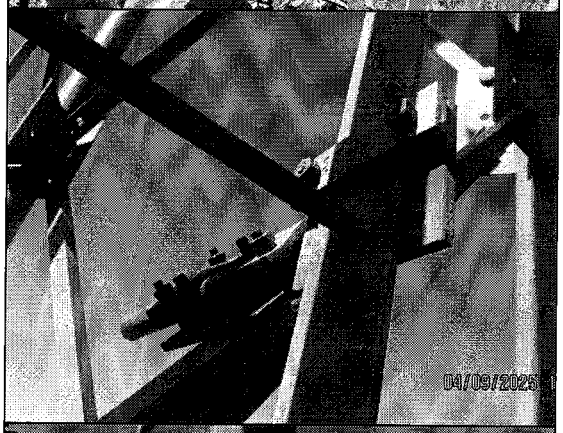
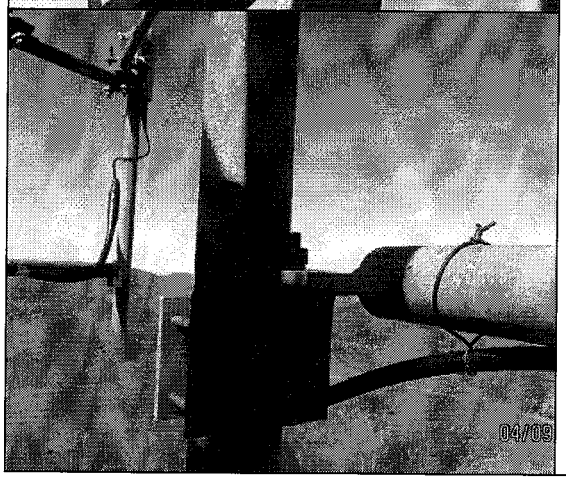
1. Tower Section Details
2. Miscellaneous Obstructions

EXECUTIVE SUMMARY

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

ENGINEERED
TOWER SOLUTIONS

EXECUTIVE SUMMARY

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

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AGENDA ITEM 10:

EMERGENCY SERVICES MATTERS

B. Emergency Services Facility Tower Engineering Contract

MANAGER'S COMMENTS:

As part of the development of the new Emergency Services Facility, a communications tower is required to connect to the public safety radio system. A quote of $45,000 was received from Engineered Tower Solutions (ETS) for engineering services and management of the administrative approval process. ETS is a vendor on State contract and has already conducted a preliminary site walk and met with Greene Construction, Inc. to coordinate efforts. Adequate funds for this work have been budgeted.

Board approval is requested to authorize the $45,000 agreement with ETS for tower engineering and administrative services.

July 18th, 2025

To: Board of Commissioners

CC: Deron Geouque, County Manager
Katie Hancock, Clerk to the Board

Subject: Quote for engineering and administrative approvals of new facility tower

Board of Commissioners,

The new Emergency Services Facility will have a communications tower to connect to the public safety radio system. A quote was obtained from Engineered Towered Solutions (ETS) for the engineering costs along with the administrative approval process management in the amount of $45,000. ETS is on State contract for tower construction and has conducted a preliminary site walk to gather information for this quote and has met Greene Construction, Inc. staff who they will be coordinating closely with. Funds have been budgeted for this project and your approval is requested.

Respectfully,

William Holt, MPA, CEM, NREMT-P
Emergency Services Director

	Contract #: 150694-ETS Engineering			
	Site Name:	Emergency Services Center		
	County:	Watauga		
	Address:	TBD		

#	Rawland:	Qty	Unit Cost	Extended cost
1	Site Visit	2	$1,500.00	$3,000.00
2	Partial Boundary Survey with Topography and 1A	1	$5,500.00	$5,500.00
3	Geotechnical/Resistivity Report (per boring location)	1	$4,500.00	$4,500.00
4	Geotechnical Clearing -- Moderate Access		$2,750.00	$0.00
4a	Geotechnical Clearing -- Difficult Access		$3,500.00	$0.00
5	Site Zoning and Construction Drawings (ZD's)	1	$1,750.00	$1,750.00
6	Detailed (DOI) Construction Drawings (CD's)	1	$3,750.00	$3,750.00
7	FCC NEPA Checklist w/SHPO	1	$5,500.00	$5,500.00
8	Tower Manufacturer Selection	1	$1,500.00	$1,500.00
9	Tower bid document	1	$1,100.00	$1,100.00
10	Tower bid review for up to 3 bids	1	$1,000.00	$1,000.00
11	Cost to restake Tower prior to Construction	2	$2,250.00	$4,500.00
12	Construction: Foundation Inspection	1	$2,375.00	$2,375.00
13	Construction: Concrete testing (per site visit)	1	$1,875.00	$1,875.00
14	Post construction inspection	1	$2,500.00	$2,500.00
15	Construction: Bearing Check		$3,000.00	$0.00
16	Construction: Soil Compaction Testing		$3,000.00	$0.00
17	Construction: Private Utility Locates		$2,700.00	$0.00
18	Construction: Lease Exhibit		$1,500.00	$0.00
				$38,850.00
	Collocation:			
19	Structural Analysis		$1,500.00	$0.00
20	Appurtenance Mapping		$2,450.00	$0.00
21	Tower Mapping		$2,850.00	$0.00
22	FCC Collocation NEPA		$3,500.00	$0.00
23	30-Day Electrical Load Study with Data Loggers for SCO		$2,750.00	$0.00
				$0.00
	Tower Modification:			
24	Pre-mod mapping		$2,500.00	$0.00
25	Modification design/drawings - standard		$3,500.00	$0.00
26	Modification design/drawings - extensive		$6,000.00	$0.00
27	Foundation mapping		$3,500.00	$0.00
28	Geotechnical investigation (1 soil bore up to 60' depth on SS, 4 soil bores up to 20' for guyed towers)		$4,500.00	$0.00
29	Geo: addition of rock coring or deep foundation		$2,000.00	$0.00
30	Foundation drawings		$2,000.00	$0.00
31	Temporary loading letter		$600.00	$0.00
32	PMI		$2,650.00	$0.00
33	Foundation construction inspection		$3,500.00	$0.00
34	Cracked Foundation Mapping		$3,500.00	$0.00

35	Construction Materials Testing (CMT) Foundation Inspection (existing foundation)		$2,375.00	$0.00
36	CWI Inspection (includes before, during, and after inspections per AWS guidelines)		$3,500.00	$0.00
37	NDE Weld Inspection		$1,850.00	$0.00
38	Rebar Mapping		$3,750.00	$0.00
39	Partial Boundary Survey with Topography		$4,600.00	$0.00
40	1A Letter		$900.00	$0.00
				$0.00
	Other tasks:			
41	DHS EHP		$3,000.00	$0.00
42	DHS - EA/ESA		$5,500.00	$0.00
43	NEPA EA	1	$3,250.00	$3,250.00
44	Centerline Easement survey		$5,500.00	$0.00
45	Botantist site inspection and report on USFS land		$3,500.00	$0.00
46	Wildlife biologist inspection and report on USFS land		$3,500.00	$0.00
47	Balloon Test		$3,500.00	$0.00
48	Legal Description per State Property Office Requirements	1	$2,000.00	$2,000.00
49	Ownership Right of Access to Site		$1,000.00	$0.00
50	Site Candidate Information Package (SCIP)		$3,500.00	$0.00
51	Construction Monitoring at USFS sites (daily rate)		$1,250.00	$0.00
52	Public Notice	1	$900.00	$900.00
53	Tribal Reimbursement Fee (TCNS) - standard		$3,000.00	$0.00
54	Tribal Reimbursement Fee (TCNS) - moderate		$8,000.00	$0.00
55	Tribal Reimbursement Fee (TCNS) - extensive		$14,000.00	$0.00
56	Class IV Rigging Plan - standard		$1,500.00	$0.00
57	Class IV Rigging Plan - extensive		$3,000.00	$0.00
58	TIA Maintenance Drawings		$1,250.00	$0.00
59	EOR Review		$900.00	$0.00
60	Mount Analysis		$1,000.00	$0.00
61	Platform Design Drawings		$2,500.00	$0.00
62	Retaining Wall Design Drawings -- height less than 10-ft		$4,000.00	$0.00
63	Retaining Wall Design Drawings -- height greater than 10-ft, but less than 25-ft		$7,500.00	$0.00
64	Stormwater Control Measure Inspection		$1,375.00	$0.00
65	Special Use Permit - site plan		$1,750.00	$0.00
66	Special Use Permit - (1) staff member in attendance at 1 meeting		$1,250.00	$0.00
				$6,150.00
	Mobilization			
67	East Zone		$600.00	$0.00
68	Central Zone		$350.00	$0.00
69	West Zone		$850.00	$0.00
				$0.00
	TIA Inspection - Self-supporting tower			

70	0' - 250'		$1,900.00	$0.00
71	250' - 500'		$2,150.00	$0.00
72	501' and above		$2,400.00	$0.00
				$0.00
	TIA Inspection - Guyed tower			
73	0' - 300'		$1,900.00	$0.00
74	301' - 600'		$2,150.00	$0.00
75	601' - 1,000'		$3,250.00	$0.00
				$0.00
	Guyed tower re-tensioning & re-plumbing			
76	0' - 300'		$3,750.00	$0.00
77	301' - 600'		$4,750.00	$0.00
78	601' - 1,000'		$7,750.00	$0.00
				$0.00
			Total Cost	**$45,000.00**

Note: mobilization cost assessed by zone per week

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AGENDA ITEM 10:

EMERGENCY SERVICES MATTERS

C. Radio System Maintenance Contract Renewal

MANAGER'S COMMENTS:

The annual maintenance contracts for the County's public safety radio systems are due for renewal. Mobile Communications America has submitted a renewal quote totaling $111,512.31, which covers maintenance for the communications center systems ($65,412.99), tower site equipment ($38,260.68), and mobile radio units ($7,838.64). This is a continuation of the existing contract, and funds are available for this purpose.

Board approval is requested to authorize the renewal of the maintenance contracts with Mobile Communications America in the amount of $111,512.31.

July 18th, 2025

To: Board of Commissioners

CC: Deron Geouque, County Manager
Katie Hancock, Clerk to the Board

Subject: Quote for engineering and administrative approvals of new facility tower

Board of Commissioners,

Please consider my request for $111,512.31 for the renewal of three maintenance contracts with Mobile Communications America. This contract covers the maintenance agreement for all of our radio systems in the communications centers ($65,412.99), at each tower site ($38,260.68), and mobile equipment ($7,838.64). This is a renewal of the current contract and funds are available for this purpose.

Respectfully,

William Holt, MPA, CEM, NREMT-P
Emergency Services Director

MOTOROLA SOLUTIONS

SERVICE AGREEMENT

500 W Monroe Street
Chicago, IL. 60661
(888) 325-9336

Quote Number : QUOTE-3035403
Contract Number: USC000602956
Contract Modifier: R06-MAR-2025 19:31:42

Date:03/06/2025

Company Name:	WATAUGA COUNTY SHERIFF'S DEPT
Attn:	
Billing Address:	184 HODGES GAP ROAD
City, State, Zip:	BOONE, NC 28607
Customer Contact:	Will Holt
Phone:	3369720145

Required P.O. :
PO # :
Customer # :1036494285
Bill to Tag # :
Contract Start Date :01-Jul-2025
Contract End Date :30-Jun-2026
Payment Cycle :ANNUALLY

Qty	Service Name	Service Description	Monthly Ext	Extended Amt
	LSV01S01107A	ASTRO SYSTEM ESSENTIAL PLUS PACKAGE	$2,369.02	$28,428.28
		--- DISPATCH		
		--- ONSITE SYS SUPPORT-STD		
		--- PREVENTIVE MAINTENANCE1		
		--- REPAIR AND RETURN		
		--- SECURITY UPDATE SERVICE		
		--- SYSTEM TECH SUPPORT		
		--- ADVANCE EXCHANGE		
		--- NETWORK MONITORING		
		--- REMOTE SUS MGT		
	LSV01S01107A	ASTRO SYSTEM ESSENTIAL PLUS PACKAGE	$3,082.06	$36,984.71
		--- DISPATCH		
		--- ONSITE SYS SUPPORT-STD		
		--- PREVENTIVE MAINTENANCE1		
		--- REPAIR AND RETURN		
		--- SECURITY UPDATE SERVICE		
		--- SYSTEM TECH SUPPORT		
		--- ADVANCE EXCHANGE		
		--- NETWORK MONITORING		
		--- REMOTE SUS MGT		

Subtotal - Recurring Services	$5,451.08	$65,412.99
Subtotal - One-Time Event Services	$0.00	$0.00
Total	$5,451.08	$65,412.99

THIS SERVICE AMOUNT IS SUBJECT TO STATE AND LOCAL TAXING JURISDICTIONS WHERE APPLICABLE, TO BE VERIFIED BY MOTOROLA

SPECIAL INSTRUCTIONS:

MOTOROLA SOLUTIONS

SERVICE AGREEMENT

500 W Monroe Street
Chicago, IL. 60661
(888) 325-9336

Quote Number : QUOTE-3035403
Contract Number: USC000602956
Contract Modifier: R06-MAR-2025 19:31:42

I have received Applicable Statements of Work which describe the Services and cybersecurity services provided on this Agreement. Motorola's Terms and Conditions, including the Cybersecurity Online Terms Acknowledgement, are attached hereto and incorporate the Cyber Addendum (available at https://www.motorolasolutions.com/en_us/managed-support-services/cybersecurity.html) by reference. By signing below Customer acknowledges these terms and conditions govern all Services under this Service Agreement.

AUTHORIZED CUSTOMER SIGNATURE	TITLE	DATE
CUSTOMER (PRINT NAME)		
MOTOROLA REPRESENTATIVE(SIGNATURE)	TITLE	DATE
Amber Seibert	704-657-2122	
MOTOROLA REPRESENTATIVE(PRINT NAME)	PHONE	

Company Name :	WATAUGA COUNTY SHERIFF'S DEPT
Contract Number :	USC000602956
Contract Modifier :	R06-MAR-2025 19:31:42
Contract Start Date :	01-Jul-2025
Contract End Date :	30-Jun-2026

MOTOROLA SOLUTIONS

SERVICE AGREEMENT

500 W Monroe Street
Chicago, IL. 60661
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Quote Number : QUOTE-3035403
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Service Terms and Conditions

Motorola Solutions Inc. ("Motorola") and the customer named in this Agreement ("Customer") hereby agree as follows:

Section 1. APPLICABILITY
These Maintenance Service Terms and Conditions apply to service contracts whereby Motorola will provide to Customer either (1) maintenance, support, or other services under a Motorola Service Agreement, or (2) installation services under a Motorola Installation Agreement.

Section 2. DEFINITIONS AND INTERPRETATION
2.1 "Agreement" means these Maintenance Service Terms and Conditions; the cover page for the Service Agreement or the Installation Agreement, as applicable; and any other attachments, all of which are incorporated herein by this reference. In interpreting this Agreement and resolving any ambiguities, these Maintenance Service Terms and Conditions take precedence over any cover page, and the cover page takes precedence over any attachments, unless the cover page or attachment states otherwise.

2.2 "Equipment" means the equipment that is specified in the attachments or is subsequently added to this Agreement.

2.3 "Services" means those installation, maintenance, support, training, and other services described in this Agreement.

Section 3. ACCEPTANCE
Customer accepts these Maintenance Service Terms and Conditions and agrees to pay the prices set forth in the Agreement. This Agreement becomes binding only when accepted in writing by Motorola. The term of this Agreement begins on the "Start Date" indicated in this Agreement.

Section 4. SCOPE OF SERVICES
4.1 Motorola will provide the Services described in this Agreement or in a more detailed statement of work or other document attached to this Agreement. At Customer's request, Motorola may also provide additional services at Motorola's then-applicable rates for the services.

4.2 If Motorola is providing Services for Equipment, Motorola parts or parts of equal quality will be used; the Equipment will be serviced at levels set forth in the manufacturer's product manuals; and routine service procedures that are prescribed by Motorola will be followed

4.3 If Customer purchases from Motorola additional equipment that becomes part of the same system as the initial Equipment, the additional equipment may be added to this Agreement and will be billed at the applicable rates after the warranty for that additional equipment expires.

4.4 All Equipment must be in good working order on the Start Date or when additional equipment is added to the Agreement. Upon reasonable request by Motorola, Customer will provide a complete serial and model number list of the Equipment. Customer must promptly notify Motorola in writing when any Equipment is lost, damaged, stolen or taken out of service. Customer's obligation to pay Service fees for this Equipment will terminate at the end of the month in which Motorola receives the written notice.

4.5 Customer must specifically identify any Equipment that is labeled intrinsically safe for use in hazardous environments.

4.6 If Equipment cannot, in Motorola's reasonable opinion, be properly or economically serviced for any reason, Motorola may modify the scope of Services related to that Equipment; remove that Equipment from the Agreement; or increase the price to Service that Equipment.

4.7 Customer must promptly notify Motorola of any Equipment failure. Motorola will respond to Customer's notification in a manner consistent with the level of Service purchased as indicated in this.

Section 5. EXCLUDED SERVICES
5.1 Service excludes the repair or replacement of Equipment that has become defective or damaged from use in other than the normal, customary, intended, and authorized manner; use not in compliance with applicable industry standards; excessive wear and tear; or accident, liquids, power surges, neglect, acts of God or other force majeure events.

5.2 Unless specifically included in this Agreement, Service excludes items that are consumed in the normal operation of the Equipment, such as batteries or magnetic tapes.; upgrading or reprogramming Equipment; accessories, belt clips, battery chargers, custom or special products, modified units, or software; and repair or maintenance of any transmission line, antenna, microwave equipment, tower or tower lighting, duplexer, combiner, or multicoupler. Motorola has no obligations for any transmission medium, such as telephone lines, computer networks, the internet or the worldwide web, or for Equipment malfunction caused by the transmission medium.

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Quote Number : QUOTE-3035403
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Contract Modifier: R06-MAR-2025 19:31:42

5.3 This Agreement pricing provided does not take into account prevailing wage requirement. Should prevailing wage regulations be applicable to this project, the pricing shall be subject to change to reflect compliance with those regulations.

Section 6. TIME AND PLACE OF SERVICE

Service will be provided at the location specified in this Agreement. When Motorola performs service at Customer's location, Customer will provide Motorola, at no charge, a non-hazardous work environment with adequate shelter, heat, light, and power and with full and free access to the Equipment. Waivers of liability from Motorola or its subcontractors will not be imposed as a site access requirement. Customer will provide all information pertaining to the hardware and software elements of any system with which the Equipment is interfacing so that Motorola may perform its Services. Unless otherwise stated in this Agreement, the hours of Service will be 8:30 a.m. to 4:30 p.m., local time, excluding weekends and holidays. Unless otherwise stated in this Agreement, the price for the Services exclude any charges or expenses associated with helicopter or other unusual access requirements; if these charges or expenses are reasonably incurred by Motorola in rendering the Services, Customer agrees to reimburse Motorola for those charges and expenses.

Section 7. CUSTOMER CONTACT

Customer will provide Motorola with designated points of contact (list of names and phone numbers) that will be available twenty-four (24) hours per day, seven (7) days per week, and an escalation procedure to enable Customer's personnel to maintain contact, as needed, with Motorola.

Section 8. INVOICING AND PAYMENT

8.1 Customer affirms that a purchase order or notice to proceed is not required for the duration of this service contract and will appropriate funds each year through the contract end date. Unless alternative payment terms are stated in this Agreement, Motorola will invoice Customer in advance for each payment period. All other charges will be billed monthly, and Customer must pay each invoice in U.S. dollars within twenty (20) days of the invoice date

8.2 Customer will reimburse Motorola for all property taxes, sales and use taxes, excise taxes, and other taxes or assessments that are levied as a result of Services rendered under this Agreement (except income, profit, and franchise taxes of Motorola) by any governmental entity. The Customer will pay all invoices as received from Motorola. At the time of execution of this Agreement, the Customer will provide all necessary reference information to include on invoices for payment in accordance with this Agreement.

8.3 For multi-year service agreements, at the end of the first year of the Agreement and each year thereafter, a CPI percentage change calculation shall be performed using the U.S.Department of Labor, Consumer Price Index, all Items, Unadjusted Urban Areas (CPI-U). Should the annual inflation rate increase greater than 3% during the previous year, Motorola shall have the right to increase all future maintenance prices by the CPI increase amount exceeding 3%. All items, not seasonally adjusted shall be used as the measure of CPI for this price adjustment. Measurement will take place once the annual average for the new year has been posted by the Bureau of Labor Statistics. For purposes of illustration, if in year 5 the CPI reported an increase of 8%, Motorola may increase the Year 6 price by 5% (8%-3% base).

Section 9. WARRANTY

Motorola warrants that its Services under this Agreement will be free of defects in materials and workmanship for a period of ninety (90) days from the date the performance of the Services are completed. In the event of a breach of this warranty, Customer's sole remedy is to require Motorola to re-perform the non-conforming Service or to refund, on a pro-rata basis, the fees paid for the non-conforming Service. MOTOROLA DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Section 10. DEFAULT/TERMINATION

10.1 If either party defaults in the performance of this Agreement, the other party will give to the non-performing party a written and detailed notice of the default. The non-performing party will have thirty (30) days thereafter to provide a written plan to cure the default that is acceptable to the other party and begin implementing the cure plan immediately after plan approval. If the non-performing party fails to provide or implement the cure plan, then the injured party, in addition to any other rights available to it under law, may immediately terminate this Agreement effective upon giving a written notice of termination to the defaulting party.

10.2 Any termination of this Agreement will not relieve either party of obligations previously incurred pursuant to this Agreement, including payments which may be due and owing at the time of termination. All sums owed by Customer to Motorola will become due and payable immediately upon termination of this Agreement. Upon the effective date of termination, Motorola will have no further obligation to provide Services.

10.3 If the Customer terminates this Agreement before the end of the Term, for any reason other than Motorola default, then the Customer will pay to Motorola an early termination fee equal to the discount applied to the last three (3) years of Service payments for the original Term.

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SERVICE AGREEMENT

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Section 11. LIMITATION OF LIABILITY
Except for personal injury or death, Motorola's total liability, whether for breach of contract, warranty, negligence, strict liability in tort, or otherwise, will be limited to the direct damages recoverable under law, but not to exceed the price of twelve (12) months of Service provided under this Agreement. ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, THEY AGREE THAT MOTOROLA WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOOD WILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS AGREEMENT OR THE PERFORMANCE OF SERVICES BY MOTOROLA PURSUANT TO THIS AGREEMENT. No action for contract breach or otherwise relating to the transactions contemplated by this Agreement may be brought more than one (1) year after the accrual of the cause of action, except for money due upon an open account. This limitation of liability will survive the expiration or termination of this Agreement and applies notwithstanding any contrary provision.

Section 12. EXCLUSIVE TERMS AND CONDITIONS
12.1 This Agreement supersedes all prior and concurrent agreements and understandings between the parties, whether written or oral, related to the Services, and there are no agreements or representations concerning the subject matter of this Agreement except for those expressed herein. The Agreement may not be amended or modified except by a written agreement signed by authorized representatives of both parties.

12.2 Customer agrees to reference this Agreement on any purchase order issued in furtherance of this Agreement, however, an omission of the reference to this Agreement will not affect its applicability. In no event will either party be bound by any terms contained in a Customer purchase order, acknowledgement, or other writings unless: the purchase order, acknowledgement, or other writing specifically refers to this Agreement; clearly indicate the intention of both parties to override and modify this Agreement; and the purchase order, acknowledgement, or other writing is signed by authorized representatives of both parties.

Section 13. PROPRIETARY INFORMATION; CONFIDENTIALITY; INTELLECTUAL PROPERTY RIGHTS
13.1 Any information or data in the form of specifications, drawings, reprints, technical information or otherwise furnished to Customer under this Agreement will remain Motorola's property, will be deemed proprietary, will be kept confidential, and will be promptly returned at Motorola's request. Customer may not disclose, without Motorola's written permission or as required by law, any confidential information or data to any person, or use confidential information or data for any purpose other than performing its obligations under this Agreement. The obligations set forth in this Section survive the expiration or termination of this Agreement.

13.2 Unless otherwise agreed in writing, no commercial or technical information disclosed in any manner or at any time by Customer to Motorola will be deemed secret or confidential. Motorola will have no obligation to provide Customer with access to its confidential and proprietary information, including cost and pricing data.

13.3 This Agreement does not grant directly or by implication, estoppel, or otherwise, any ownership right or license under any Motorola patent, copyright, trade secret, or other intellectual property, including any intellectual property created as a result of or related to the Equipment sold or Services performed under this Agreement.

Section 14. FCC LICENSES AND OTHER AUTHORIZATIONS
Customer is solely responsible for obtaining licenses or other authorizations required by the Federal Communications Commission or any other federal, state, or local government agency and for complying with all rules and regulations required by governmental agencies. Neither Motorola nor any of its employees is an agent or representative of Customer in any governmental matters.

Section 15. COVENANT NOT TO EMPLOY
During the term of this Agreement and continuing for a period of two (2) years thereafter, Customer will not hire, engage on contract, solicit the employment of, or recommend employment to any third party of any employee of Motorola or its subcontractors without the prior written authorization of Motorola. This provision applies only to those employees of Motorola or its subcontractors who are responsible for rendering services under this Agreement. If this provision is found to be overly broad under applicable law, it will be modified as necessary to conform to applicable law.

Section 16. MATERIALS, TOOLS AND EQUIPMENT
All tools, equipment, dies, gauges, models, drawings or other materials paid for or furnished by Motorola for the purpose of this Agreement will be and remain the sole property of Motorola. Customer will safeguard all such property while it is in Customer's custody or control, be liable for any loss or damage to this property, and return it to Motorola upon request. This property will be held by Customer for Motorola's use without charge and may be removed from Customer's premises by Motorola at any time without restriction.

Section 17. GENERAL TERMS
17.1 If any court renders any portion of this Agreement unenforceable, the remaining terms will continue in full force and effect.

MOTOROLA SOLUTIONS

SERVICE AGREEMENT

500 W Monroe Street
Chicago, IL. 60661
(888) 325-9336

Quote Number : QUOTE-3035403
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17.2 This Agreement and the rights and duties of the parties will be interpreted in accordance with the laws of the State in which the Services are performed.

17.3 Failure to exercise any right will not operate as a waiver of that right, power, or privilege.

17.4 Neither party is liable for delays or lack of performance resulting from any causes that are beyond that party's reasonable control, such as strikes, material shortages, or acts of God.

17.5 Motorola may subcontract any of the work, but subcontracting will not relieve Motorola of its duties under this Agreement.

17.6 Except as provided herein, neither Party may assign this Agreement or any of its rights or obligations hereunder without the prior written consent of the other Party, which consent will not be unreasonably withheld. Any attempted assignment, delegation, or transfer without the necessary consent will be void. Notwithstanding the foregoing, Motorola may assign this Agreement to any of its affiliates or its right to receive payment without the prior consent of Customer. In addition, in the event Motorola separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Motorola may, without the prior written consent of the other Party and at no additional cost to Motorola, assign this Agreement such that it will continue to benefit the Separated Business and its affiliates (and Motorola and its affiliates, to the extent applicable) following the Separation Event.

17.7 THIS AGREEMENT WILL RENEW, FOR AN ADDITIONAL ONE (1) YEAR TERM, ON EVERY ANNIVERSARY OF THE START DATE UNLESS EITHER THE COVER PAGE SPECIFICALLY STATES A TERMINATION DATE OR ONE PARTY NOTIFIES THE OTHER IN WRITING OF ITS INTENTION TO DISCONTINUE THE AGREEMENT NOT LESS THAN THIRTY (30) DAYS OF THAT ANNIVERSARY DATE. At the anniversary date, Motorola may adjust the price of the Services to reflect its current rates.

17.8 If Motorola provides Services after the termination or expiration of this Agreement, the terms and conditions in effect at the time of the termination or expiration will apply to those Services and Customer agrees to pay for those services on a time and materials basis at Motorola's then effective hourly rates.

17.9 This Agreement may be executed in one or more counterparts, all of which shall be considered part of the Agreement. The parties may execute this Agreement in writing, or by electronic signature, and any such electronic signature shall have the same legal effect as a handwritten signature for the purposes of validity, enforceability and admissibility. In addition, an electronic signature, a true and correct facsimile copy or computer image of this Agreement shall be treated as and shall have the same effect as an original signed copy of this document.

Revised Sept 03, 2022

MOTOROLA SOLUTIONS

SERVICE AGREEMENT

500 W Monroe Street
Chicago, IL. 60661
(888) 325-9336

Quote Number : QUOTE-3035403
Contract Number: USC000602956
Contract Modifier: R06-MAR-2025 19:31:42

Cybersecurity Online Terms Acknowledgement

This Cybersecurity Online Terms Acknowledgement (this "Acknowledgement") is entered into between Motorola Solutions, Inc. ("Motorola") and the entity set forth in the signature block below ("Customer").

1. Applicability and Self Deletion. This Cybersecurity Online Terms Acknowledgement applies to the extent cybersecurity products and services, including Remote Security Update Service, Security Update Service, and Managed Detection & Response subscription services, are purchased by or otherwise provided to Customer, including through bundled or integrated offerings or otherwise.
NOTE: This Acknowledgement is self deleting if not applicable under this Section 1.

2. Online Terms Acknowledgement. The Parties acknowledge and agree that the terms of the *Cyber Subscription Renewals and Integrations Addendum* available at http://www.motorolasolutions.com/cyber-renewals-integrations are incorporated in and form part of the Parties' agreement as it relates to any cybersecurity products or services sold or provided to Customer. By signing the signature block below, Customer certifies that it has read and agrees to the provisions set forth and linked on-line in this Acknowledgement. To the extent Customer is unable to access the above referenced online terms for any reason, Customer may request a paper copy from Motorola. The signatory to this Acknowledgement represents and warrants that he or she has the requisite authority to bind Customer to this Acknowledgement and referenced online terms.

3. Entire Agreement. This Acknowledgement supplements any and all applicable and existing agreements and supersedes any contrary terms as it relates to Customer's purchase of cybersecurity products and services. This Acknowledgement and referenced terms constitute the entire agreement of the parties regarding the subject matter hereof and as set out in the referenced terms, and supersedes all previous agreements, proposals, and understandings, whether written or oral, relating to this subject matter.

4. Execution and Amendments. This Acknowledgement may be executed in multiple counterparts, and will have the same legal force and effect as if the Parties had executed it as a single document. The Parties may sign in writing or by electronic signature. An electronic signature, facsimile copy, or computer image of a signature, will be treated, and will have the same effect as an original signature, and will have the same effect, as an original signed copy of this document. This Acknowledgement may be amended or modified only by a written instrument signed by authorized representatives of both Parties.
The Parties hereby enter into this Acknowledgement as of the last signature date below.

Revised Sept 03, 2022

EXHIBIT A: System Configuration

Customer Name:	Watauga County
Customer Number:	1036494285
Contract Number:	USC000602956
Start Date:	1-Jul-25
End Date:	30-Jun-26
System ID:	SZ01FC2D20/SZ01FC2D30

QTY	Equipment Description		Price
2	Dispatch Sites		
8	MCC7500E Consoles		
2	AIS		
6	CCGW		
		Total	**$65,412.99**

SERVICE LEVEL AGREEMENT

MCA Office: Charlotte, NC

This Service Level Agreement (this “Agreement”) is entered into by and between Mobile Communications America, Inc. a Delaware corporation (“MCA”) and the entity listed below as Customer (referred to herein as, “Customer”) as of the effective date listed below.

Effective Date: 7/1/2025
Customer: Watauga County
Customer Address:

WHEREAS, the undersigned (collectivey, the "Parties" and each, individually, a "Party") desire to enter into this Agreement to set forth the terms and conditions for the services to be provided by MCA as it applies to maintenance service, parts and labor for the equipment and/or systems as described in Attachment A. Beginning on the effective date of this Agreement, MCA agrees to provide maintenance service to keep covered equipment in good working order.

Summary of Services:

End Date:	6/30/2026	("Initial Term")
Monthly Price:	$3,188.39	
Annual Price:	$38,260.68	(*State/Local taxes NOT included*)
Billing Frequency:	Annual	

By signing this Agreement, Customer agrees to accept maintenance service for the listed equipment, per Attachment A, according to the specified terms and conditions of the Agreement. Customer also agrees to provide full, free and safe access to the equipment and/or systems covered by this Agreement. Services provided hereunder do not assure uninterrupted operation of the Equipment or service and MCA is not responsible for failure to render covered service due to causes beyond its control. This Agreement is valid only if signed by an authorized representative or officer of MCA and Customer.

ENTIRE AGREEMENT: This Agreement, together with the SOWs and any Attachments attached thereto, from time to time, sets forth the entire agreement and understanding between the Parties and supersedes all prior negotiations, agreements and understandings with respect to the subject matter of this Agreement. No representations, statements, or inducements, oral or written, not contained herein shall bind either Party. This Agreement may only be amended by a written document duly executed between the Parties. The Customer acknowledges that the Customer has read this entire Agreement, understands it, and agrees to be bound by its terms and conditions.

Customer	MCA
Signature:	Signature:
Name(print) & Title:	Name(print) & Title:
Date:	Date:

TERMS AND CONDITIONS

NORMAL WORKING HOURS: Normal working hours shall be from 8:00 AM to 5:00 PM, Monday through Friday, except holidays, in the time zone of the Customer location receiving the

SERVICE: MCA will perform such repairs as may be required to restore Equipment to their normal operating level, provided that such repairs are necessitated by the failure of the Equipment due to normal usage. Non-fixed Equipment shall be serviced at an MCA shop during normal working hours. Travel charges and expenses incurred by MCA at the request of the Customer to resolve a malfunction of the Equipment that is not covered under this Agreement shall be billable to the Customer at current MCA rates. For emergency service or other service performed at Customer's request outside of normal working hours, for equipment not covered under this Agreement or for Equipment whose failure was due to causes not considered to be "normal usage," Customer will be billed for the service at the then current MCA rates for each occurrence.

PREMIER SERVICE OPTION: If Customer has elected to purchase the Premier Service Option, emergency service is included at no additional charge per occurrence, provided that all other terms of this Agreement are satisfied. Emergency service is provided 24 hours per day, seven days per week. Customers not electing the Premier Service Option shall pay an additional charge for emergency service rendered at current MCA rates for each occurrence.

UNSUPPORTED EQUIPMENT. From time to time manufacturers discontinue or cease to support equipment, which MCA cannot control . In the event that equipment covered by this by this contract is discontinued or no longer supported by the manufacturer ("Obsolete Equipment"), MCA's recommendation is that the Obsolete Equipment be replaced. In the event that Customer elects not to replace the Obsolete Equipment, MCA will provide its best efforts to repair and maintain the Obsolete Equipment but makes no guarantees or warranties that the Obsolete Equipment will continue to function as intended, or that firmware updates will be available to ensure that the Obsolete Equipment can communicate properly with other equipment in Customer's system. In the event MCA is unable to repair the Obsolete Equipment or the cost of repair in MCA's opinion makes repairing the equipment impractical, MCA will notify the Customer the equipment is non-repairable and remove it from the service agreement.

REPLACEMENT PARTS: MCA will replace parts and components of the Equipment on an exchange basis when failure is due to the normal and proper use of the Equipment. Parts or equipment exchanged back to MCA during maintenance service become the property of MCA.

PREVENTIVE MAINTENANCE: MCA will inspect the Equipment and make such repairs, adjustments, and replacements of parts and components as may be necessary to maintain the Equipment in normal operating condition provided that such services and maintenance are necessitated by normal usage of the Equipment. Inspections and preventive maintenance service will be provided by MCA during normal working hours at the locations specified. All preventive maintenance inspections will be scheduled for mutual convenience and may be performed during remedial service.

LIMITATIONS: MCA reserves the right to inspect any equipment or service prior to its inclusion under the terms of this Agreement. MCA may at its sole discretion require that said equipment or system be restored to proper operating specifications at Customer's expense prior to its being covered under this Agreement. Should Equipment not meet specifications to provide service or MCA, at its sole discretion, declares Equipment to be unserviceable, MCA will provide an Exhibit outlining audit and test results. In such case, MCA's sole responsibility is to remove such Equipment from the billing under this Agreement.

EXCLUDED SERVICES: The following services are not included under the terms of this Agreement. The repair of Equipment, replacement of parts, or any additional service labor due to accident, abuse, disaster, neglect, misuse, physical damage, liquid damage, damage by lightning or other Acts of God, service by personnel other than those authorized by MCA, alterations, modifications, attachments, accessories (other than those specifically designed for use with the particular piece of Equipment), use of Equipment with unauthorized batteries and/or power supplies or reprogramming by other than MCA personnel. Travel charges and expenses incurred by MCA at the request of the Customer to resolve a malfunction of equipment or systems not covered under this Agreement shall be billable to the Customer at current MCA rates. If MCA finds that any Equipment has been altered or repaired by others, such Equipment shall not be covered by this Agreement and any services shall be billable to the Customer at current MCA rates.

RENEWALS: After the Initial Term, this Agreement shall automatically renew for additional one-year periods, with an annual price increase of 5%, unless Customer provides a notice of termination at least thirty (30) days prior to expiration of the then-current Term.

WARRANTY: MCA warrants that it will perform the services using personnel of required skill, experience and qualifications and in a professional and workmanlike manner in accordance with generally recognized industry standards for similar services and shall devote adequate resources to meet its obligations under this Agreement. EXCEPT FOR THE WARRANTY SET FORTH IN THIS PARAGRAPH, MCA MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE SERVICES, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; OR (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY OF TITLE; OR (D) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.

PAYMENT: Payment shall be due and payable thirty (30) days from the date of invoice. Payment shall not be withheld on account of any claim by Customer against MCA. If Customer disputes any portion of a MCA invoice, Customer shall pay the undisputed portion when due and the Parties shall work to resolve the dispute within thirty (30) days. Nonpayment or delay in payment by Customer shall be considered a breach of the Agreement. If the financial condition of the Customer at any time does not, in MCA's sole discretion, justify continuance of performance, MCA may require full or partial payment from the Customer in advance. In the event of bankruptcy or insolvency of the Customer, or in the event any proceedings are brought by or against the Customer under any bankruptcy or insolvency laws, MCA shall be entitled to cancel any Services then outstanding and shall receive reimbursement for any expenses incurred by it in connection with such cancellation and any applicable cancellation charges.

TAXES: Applicable taxes will be billed to the Customer and the Customer hereby agrees to pay said taxes, unless the Customer has provided a current tax exemption certificate.

CUSTOMER DEFAULT: Upon any default by Customer under this Agreement, including the refusal to accept conforming Services, MCA may exercise all remedies to which MCA may be entitled at law or in equity, including specific performance. Additionally, MCA may declare all sums due or to become due hereunder immediately due and payable, and MCA shall be entitled to recover all reasonable collection costs incurred, including legal interest. In addition, for non-disputed payments not received within thirty (30) days of the invoice date, a late fee not exceeding the lower of one and a half percent (1.5%) per month or the maximum rate allowed by law shall be assessed on any past due invoice balance. In the event of Customer's default, MCA shall not be obligated to continue performing Services hereunder. Upon Customer default, MCA may at its sole discretion suspend or cancel any outstanding, unfulfilled Services of Customer under this Agreement.

TERMINATION: Customer may, upon thirty (30) days' written notice to MCA, terminate this Agreement for convenience, provided the Customer shall be liable for any third-party costs incurred and outstanding payments to MCA for maintenance services provided. With the exception of the Customer's liability for any and all payments outstanding under this Agreement, neither the Customer nor MCA shall retain any liability for any performance under this Agreement on any date following the expiration of this Agreement.

COVENANT NOT TO SOLICIT: MCA expends considerable resources including money, time, training, etc. to properly train and educate its employees. MCA experiences considerable financial and other harm when its employees are recruited and hired by customers. Therefore, Customer agrees to not recruit or solicit any MCA employee during the term of this Agreement and for a period of two (2) years thereafter. In consideration of MCA performing its services under this Agreement, Customer acknowledges MCA's damages in such event and agrees to pay as liquidated damages for breach of this Section a one-time payment equal to five hundred (500) times the then standard technician hourly billable rate, which is currently $200/hour. Customer expends considerable resources including money, time, training, etc. to properly train and educate its employees. Customer experiences considerable financial and other harm when its employees are recruited and hired by vendors. Therefore, MCA agrees to not recruit or solicit any Customer employee during the term of this Agreement and for a period of two (2) years thereafter. MCA acknowledges Customer's damages in such event and agrees to pay as liquidated damages for breach of this Section a one-time payment equal to five hundred (500) times the then MCA's standard technician hourly billable rate, which is currently $200/hour.

MCA INSURANCE: MCA agrees to carry $1,000,000 per occurrence general liability insurance and applicable worker's compensation insurance.

CUSTOMER INSURANCE: Customer shall maintain all necessary and appropriate policies of insurance in respect of its obligations under this Agreement. Comprehensive General Liability and Property Insurance for liability, casualty, fire, theft, and property damage under which Customer is named as insured and which shall on a primary and non-contributing basis cover any loss or damage MCA's services are intended to detect to one hundred percent of the insurable value or potential risk. The parties intend that the Customer assume all potential risk and damage that may arise by reason of failure of the equipment, or MCA's services and that Customer will look to its own insurance carrier for any loss or assume the risk of loss. MCA shall not be responsible for any portion of any loss or damage which is recovered or recoverable by Customer from insurance covering such loss or damage or for such loss or damage against which Customer is indemnified or insured. Customer and all those claiming rights under Customer waive all rights against MCA and its subcontractors for loss or damages caused by perils intended to be detected by MCA's services or covered by insurance to be obtained by Customer, except such rights as Customer or others may have to the proceeds of insurance. Customer on its behalf and any insurance carrier waives any right of subrogation Customer's insurance carrier may otherwise have against MCA or MCA's subcontractors arising out of this Agreement or the relation of the parties hereto.

NO CHANGES: Except as previously described, no changes, alteration or modification of this Agreement may be made without the express written consent of both parties.

ASSIGNMENT: Customer shall not assign in whole or in part this Agreement or any interest therein or any rights hereunder without the written consent of MCA, which shall not be unreasonably withheld or delayed. Any such assignment without consent shall be void. Notwithstanding the foregoing, MCA may assign this Agreement or any other agreement between the Parties, without consent in whole or in part, for the purposes of corporate reconstruction, reorganization, or analogous proceeding, or to (a) any affiliate; or (b) a third party in the event of a merger, recapitalization, conversion, consolidation, other business combination or sale of all or substantially all of the assets of MCA to such third party.

GOVERNING LAW AND VENUE: This Agreement is governed by and construed in accordance with the laws of the State of South Carolina without regard to its rules governing conflicts of law. This Agreement shall be binding upon and inure to the benefit of each Party and its respective heirs, successors and assigns. Should any part of this Agreement, for any reason, be declared invalid by a court of competent jurisdiction, such determination shall not affect the validity of any remaining portion, and such remaining portion shall remain in full force and effect. The Parties shall attempt to resolve all disputes arising out of this Agreement in a spirit of cooperation without formal proceedings. Any dispute which cannot be so resolved (other than the collection of money due on unpaid invoices) shall be subject to arbitration upon written demand of either party. Arbitration shall take place in Spartanburg, South Carolina, and shall be the exclusive forum for resolving the dispute, controversy, or claim. The arbitration shall take place before an arbitration panel chosen as follows: The parties shall each choose an arbitrator, and the two (2) arbitrators shall choose a third (3rd) arbitrator and determine the third (3rd) arbitrator's compensation. Each party shall have one (1) veto over the choice of the third (3rd) arbitrator. The three (3) arbitrators shall schedule an informal proceeding, hear the arguments, and decide the matter by secret majority vote. Unless the arbitrators decide otherwise, each party shall pay the costs of its own arbitrator and shall pay half of the other costs of the arbitration proceeding. The award or decision of the arbitrator shall state the reasons upon which the award or decision is based and shall be final and binding upon the Parties. The prevailing Party shall be entitled to compensation for the expense of the arbitration, including, but not limited to, the award of attorneys' fees, at the discretion of the arbitrator. The award shall be enforceable before any court of competent jurisdiction upon the application to such court by either Party. Each Party irrevocably and unconditionally waives any right to a trial by jury in respect to any legal action arising from this Agreement or any other agreement between the Parties.

EXCULPATORY CLAUSE: Both Parties agree that MCA is not an insurer, and no insurance coverage is offered herein. The equipment and MCA's services are designed to detect and reduce certain risks of loss, though MCA does not guarantee that no loss or damage will occur. No equipment provided by MCA is represented to be medical grade, FDA approved, or intended for use by a healthcare professional or healthcare facility or to diagnose, treat, cure or prevent disease or medical condition unless explicitly stated in the SOW and no equipment or services are intended to diagnose, treat, cure, prevent, mitigate or minimize the likelihood of communicable disease, infectious agent, bacteria, virus or illness. MCA is not assuming liability, and, therefore, Customer agrees MCA shall not be liable to Customer or any other third party, and Customer covenants not to sue MCA, for any loss, economic or non-economic, business loss or interruption, consequential damages, in contract or tort, data corruption or inability to retrieve data, personal injury, health condition or property damage sustained by Customer or others as a result of equipment failure, human error, burglary, theft, hold-up, fire, smoke, water, any communicable disease, infectious agent, bacteria, virus, illness or any other cause whatsoever, regardless of whether or not such loss or damage was caused by or contributed to by MCA's breach of contract, negligent performance to any degree in furtherance of this Agreement , any extra contractual or legal duty, strict products liability, or negligent failure to perform any obligation pursuant to this Agreement or any other legal duty, except for gross negligence and willful misconduct.

LIMITATION OF LIABILITY: MCA SHALL NOT BE LIABLE TO CUSTOMER OR TO ANY THIRD PARTY FOR ANY LOSS OF USE, REVENUE OR PROFIT, DAMAGE OR LOSS OF OTHER PROPERTY OR EQUIPMENT OR SYSTEMS OR FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, EXEMPLARY, SPECIAL OR PUNITIVE DAMAGES WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, REGARDLESS OF WHETHER SUCH DAMAGES WERE FORESEEABLE AND WHETHER OR NOT MCA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND NOTWITHSTANDING THE FAILURE OF ANY AGREED OR OTHER REMEDY OF ITS ESSENTIAL PURPOSE. THE LIABILITY OF MCA WITH RESPECT TO ANY OF ITS OBLIGATIONS HEREUNDER, INCLUDING SERVICE, SALE, DELIVERY, RESALE, INSTALLATION OR THE TECHNICAL DIRECTION OF INSTALLATION, REPAIR OR USE OF ANY ITEM COVERED BY OR FURNISHED HEREUNDER, WHETHER SUCH LIABILITIES ARE FOUNDED IN CONTRACT, IN TORT, UNDER ANY WARRANTY, OR OTHERWISE, SHALL NOT EXCEED THE PRICE PAID TO MCA WITH RESPECT TO THE SERVICE GIVING RISE TO THE CLAIM. NO ACTION SHALL BE BROUGHT FOR ANY BREACH OF THIS AGREEMENT MORE THAN ONE (1) YEAR AFTER THE ACCRUAL OF SUCH CAUSE OF ACTION EXCEPT FOR MONEY DUE UPON OPEN ACCOUNT.

INDEMNIFICATION: Customer agrees to indemnify, defend, and hold harmless MCA, its officers, directors, employees, and agents (collectively, the "Indemnified Party") from and against any and all liabilities, losses, damages, expenses, liens, claims, demands, actions, judgments, settlements, interest, awards, penalties, fines costs, and expenses, including, without limitation, reasonable attorneys' fees, costs of collection, costs of recovering insurance, and costs of enforcing this indemnification provision (collectively "Claims") arising out of or related to any negligent act or omission of the Customer in connection with the performance of the Services under each SOW . For avoidance of doubt, Customer agrees to indemnify, defend and hold harmless MCA from any failure to mitigate or respond or detect any communicable disease, infectious agent, bacteria or virus.

ATTORNEYS' FEES: Should any dispute arise between the parties regarding the interpretation, application, effect or enforcement of the Agreement, the prevailing party in any legal or arbitration proceedings commenced to resolve the dispute shall be entitled to costs and reasonable attorney's fees incurred in said legal proceeding.

NOTICES: All notices given by one party to the other under this Agreement must be delivered by: (a) hand delivery, (b) certified mail, return receipt requested, (c) nationally recognized overnight courier service, or (d) facsimile, to the other party's respective address given in the preamble to the Agreement.

SEVERABILITY: If any provision or part-provision of this Agreement is or becomes invalid, illegal, or unenforceable, it shall be deemed modified to the minimum extent necessary to make it valid, legal and enforceable. If such modification is not possible, the relevant provision or part-provision shall be deemed deleted. Any modification to or deletion of a provision or part-provision

COUNTERPARTS: The Agreement may be executed in counterparts, which together constitute one and the same agreement. A facsimile copy or computer image, such as a PDF or tiff image, of a signature shall be treated as and shall have the same effect as an original signature. In addition, a true and correct facsimile copy or computer image of the Agreement shall be treated as and shall have the same effect as an original signed copy of this document.

Equipment and Coverage Details - Attachment A

Repeater	12
Channel 5 Base	1
Battery Chargers for Repeater	2
Control Station	17
Consolettes	15
Tone Remote	1
XTL Mobile (Viper Rescue)	1
Tone Remote Adapter	2

Best Effort Provided on Unsupported Equipment

4-Hour Onsite Response Time for Emergency Failures 24/7

Annual Preventative Maintenance Inspection

Special Instructions

Statements of Work - Attachment B

MCA 8 x 5 Coverage	MCA 24 x 7 Coverage
Subscriber support includes repair. It is the customer's responsibility to get the subscriber to their local MCA facility and ensure MCA has the current programming files on hand. It is MCA's responsibility to: • Triage the device • Ship to the depot if repair cannot be addressed locally • Track repair status • Receive the device back from the depot • Confirm that the radio has been repaired and is programmed to the customer's specifications • Communicate to the customer their device is fixed. Infrastructure support includes M-F 8X5 response to all issues arising from infrastructure, infrastructure cabling and antenna systems. Issues that result from power failure, force majeure, or tampering are excluded from this service. Removal of infrastructure equipment for warranty repair is the responsibility of MCA. Repair of cabling and antenna systems is not a part of this service. After hours support is available upon request but is not covered under this service. Additional charges would apply at after hour rates. One annual Preventative Maintenance check of the covered equipment. Subscriber Preventative Maintenance includes but not limited to visual inspection of radio, realignment back to factory specifications (transmit power out, transmit frequency error, transmit deviation, and receive sensitivity), and check of battery date code. One annual firmware update of the covered equipment will be completed at the time of the preventative maintenance check.	Subscriber support includes repair. It is the customer's responsibility to get the subscriber to their local MCA facility and ensure MCA has the current programming files on hand. It is MCA's responsibility to: • Triage the device • Ship to the depot if repair cannot be addressed locally • Track repair status • Receive the device back from the depot • Confirm that the radio has been repaired and is programmed to the customer's specifications • Communicate to the customer their device is fixed. Infrastructure support includes 24 x 7 response to all issues arising from infrastructure, infrastructure cabling and antenna systems. Issues that result from power failure, force majeure, or tampering are excluded from this service. Removal of infrastructure equipment for warranty repair is the responsibility of MCA. Repair of cabling and antenna systems is not a part of this service. After hours support is available upon request but is not covered under this service. Additional charges would apply at after hour rates. One annual Preventative Maintenance check of the covered equipment. Subscriber Preventative Maintenance includes but not limited to visual inspection of radio, realignment back to factory specifications (transmit power out, transmit frequency error, transmit deviation, and receive sensitivity), and check of battery date code. One annual firmware update of the covered equipment will be completed at the time of the preventative maintenance check.

SERVICE LEVEL AGREEMENT

MCA Office: Charlotte, NC

This Service Level Agreement (this “Agreement”) is entered into by and between Mobile Communications America, Inc. a Delaware corporation (“MCA”) and the entity listed below as Customer (referred to herein as, “Customer”) as of the effective date listed below.

Effective Date: 7/1/2025
Customer: Watauga County
Customer Address:

WHEREAS, the undersigned (collectivey, the "Parties" and each, individually, a "Party") desire to enter into this Agreement to set forth the terms and conditions for the services to be provided by MCA as it applies to maintenance service, parts and labor for the equipment and/or systems as described in Attachment A. Beginning on the effective date of this Agreement, MCA agrees to provide maintenance service to keep covered equipment in good working order.

Summary of Services:

End Date: 6/30/2026 ("Initial Term")
Monthly Price: $653.22
Annual Price: $7,838.64 (*State/Local taxes NOT included*)
Billing Frequency: Annual

By signing this Agreement, Customer agrees to accept maintenance service for the listed equipment, per Attachment A, according to the specified terms and conditions of the Agreement. Customer also agrees to provide full, free and safe access to the equipment and/or systems covered by this Agreement. Services provided hereunder do not assure uninterrupted operation of the Equipment or service and MCA is not responsible for failure to render covered service due to causes beyond its control. This Agreement is valid only if signed by an authorized representative or officer of MCA and Customer.

ENTIRE AGREEMENT: This Agreement, together with the SOWs and any Attachments attached thereto, from time to time, sets forth the entire agreement and understanding between the Parties and supersedes all prior negotiations, agreements and understandings with respect to the subject matter of this Agreement. No representations, statements, or inducements, oral or written, not contained herein shall bind either Party. This Agreement may only be amended by a written document duly executed between the Parties. The Customer acknowledges that the Customer has read this entire Agreement, understands it, and agrees to be bound by its terms and conditions.

Signature: _____ Customer	Signature: _____ MCA
Name(print) & Title: _____	Name(print) & Title: _____
Date: _____	Date: _____

TERMS AND CONDITIONS

NORMAL WORKING HOURS: Normal working hours shall be from 8:00 AM to 5:00 PM, Monday through Friday, except holidays, in the time zone of the Customer location receiving the

SERVICE: MCA will perform such repairs as may be required to restore Equipment to their normal operating level, provided that such repairs are necessitated by the failure of the Equipment due to normal usage. Non-fixed Equipment shall be serviced at an MCA shop during normal working hours. Travel charges and expenses incurred by MCA at the request of the Customer to resolve a malfunction of the Equipment that is not covered under this Agreement shall be billable to the Customer at current MCA rates. For emergency service or other service performed at Customer's request outside of normal working hours, for equipment not covered under this Agreement or for Equipment whose failure was due to causes not considered to be "normal usage," Customer will be billed for the service at the then current MCA rates for each occurrence.

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PREVENTIVE MAINTENANCE: MCA will inspect the Equipment and make such repairs, adjustments, and replacements of parts and components as may be necessary to maintain the Equipment in normal operating condition provided that such services and maintenance are necessitated by normal usage of the Equipment. Inspections and preventive maintenance service will be provided by MCA during normal working hours at the locations specified. All preventive maintenance inspections will be scheduled for mutual convenience and may be performed during remedial service.

LIMITATIONS: MCA reserves the right to inspect any equipment or service prior to its inclusion under the terms of this Agreement. MCA may at its sole discretion require that said equipment or system be restored to proper operating specifications at Customer's expense prior to its being covered under this Agreement. Should Equipment not meet specifications to provide service or MCA, at its sole discretion, declares Equipment to be unserviceable, MCA will provide an Exhibit outlining audit and test results. In such case, MCA's sole responsibility is to remove such Equipment from the billing under this Agreement.

EXCLUDED SERVICES: The following services are not included under the terms of this Agreement. The repair of Equipment, replacement of parts, or any additional service labor due to accident, abuse, disaster, neglect, misuse, physical damage, liquid damage, damage by lightning or other Acts of God, service by personnel other than those authorized by MCA, alterations, modifications, attachments, accessories (other than those specifically designed for use with the particular piece of Equipment), use of Equipment with unauthorized batteries and/or power supplies or reprogramming by other than MCA personnel. Travel charges and expenses incurred by MCA at the request of the Customer to resolve a malfunction of equipment or systems not covered under this Agreement shall be billable to the Customer at current MCA rates. If MCA finds that any Equipment has been altered or repaired by others, such Equipment shall not be covered by this Agreement and any services shall be billable to the Customer at current MCA rates.

RENEWALS: After the Initial Term, this Agreement shall automatically renew for additional one-year periods, with an annual price increase of 5%, unless Customer provides a notice of termination at least thirty (30) days prior to expiration of the then-current Term.

WARRANTY: MCA warrants that it will perform the services using personnel of required skill, experience and qualifications and in a professional and workmanlike manner in accordance with generally recognized industry standards for similar services and shall devote adequate resources to meet its obligations under this Agreement. EXCEPT FOR THE WARRANTY SET FORTH IN THIS PARAGRAPH, MCA MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE SERVICES, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; OR (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY OF TITLE; OR (D) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.

PAYMENT: Payment shall be due and payable thirty (30) days from the date of invoice. Payment shall not be withheld on account of any claim by Customer against MCA. If Customer disputes any portion of a MCA invoice, Customer shall pay the undisputed portion when due and the Parties shall work to resolve the dispute within thirty (30) days. Nonpayment or delay in payment by Customer shall be considered a breach of the Agreement. If the financial condition of the Customer at any time does not, in MCA's sole discretion, justify continuance of performance, MCA may require full or partial payment from the Customer in advance. In the event of bankruptcy or insolvency of the Customer, or in the event any proceedings are brought by or against the Customer under any bankruptcy or insolvency laws, MCA shall be entitled to cancel any Services then outstanding and shall receive reimbursement for any expenses incurred by it in connection with such cancellation and any applicable cancellation charges.

TAXES: Applicable taxes will be billed to the Customer and the Customer hereby agrees to pay said taxes, unless the Customer has provided a current tax exemption certificate.

CUSTOMER DEFAULT: Upon any default by Customer under this Agreement, including the refusal to accept conforming Services, MCA may exercise all remedies to which MCA may be entitled at law or in equity, including specific performance. Additionally, MCA may declare all sums due or to become due hereunder immediately due and payable, and MCA shall be entitled to recover all reasonable collection costs incurred, including legal interest. In addition, for non-disputed payments not received within thirty (30) days of the invoice date, a late fee not exceeding the lower of one and a half percent (1.5%) per month or the maximum rate allowed by law shall be assessed on any past due invoice balance. In the event of Customer's default, MCA shall not be obligated to continue performing Services hereunder. Upon Customer default, MCA may at its sole discretion suspend or cancel any outstanding, unfulfilled Services of Customer under this Agreement.

TERMINATION: Customer may, upon thirty (30) days' written notice to MCA, terminate this Agreement for convenience, provided the Customer shall be liable for any third-party costs incurred and outstanding payments to MCA for maintenance services provided. With the exception of the Customer's liability for any and all payments outstanding under this Agreement, neither the Customer nor MCA shall retain any liability for any performance under this Agreement on any date following the expiration of this Agreement.

COVENANT NOT TO SOLICIT: MCA expends considerable resources including money, time, training, etc. to properly train and educate its employees. MCA experiences considerable financial and other harm when its employees are recruited and hired by customers. Therefore, Customer agrees to not recruit or solicit any MCA employee during the term of this Agreement and for a period of two (2) years thereafter. In consideration of MCA performing its services under this Agreement, Customer acknowledges MCA's damages in such event and agrees to pay as liquidated damages for breach of this Section a one-time payment equal to five hundred (500) times the then standard technician hourly billable rate, which is currently $200/hour. Customer expends considerable resources including money, time, training, etc. to properly train and educate its employees. Customer experiences considerable financial and other harm when its employees are recruited and hired by vendors. Therefore, MCA agrees to not recruit or solicit any Customer employee during the term of this Agreement and for a period of two (2) years thereafter. MCA acknowledges Customer's damages in such event and agrees to pay as liquidated damages for breach of this Section a one-time payment equal to five hundred (500) times the then MCA's standard technician hourly billable rate, which is currently $200/hour.

MCA INSURANCE: MCA agrees to carry $1,000,000 per occurrence general liability insurance and applicable worker's compensation insurance.

CUSTOMER INSURANCE: Customer shall maintain all necessary and appropriate policies of insurance in respect of its obligations under this Agreement. Comprehensive General Liability and Property Insurance for liability, casualty, fire, theft, and property damage under which Customer is named as insured and which shall on a primary and non-contributing basis cover any loss or damage MCA's services are intended to detect to one hundred percent of the insurable value or potential risk. The parties intend that the Customer assume all potential risk and damage that may arise by reason of failure of the equipment, or MCA's services and that Customer will look to its own insurance carrier for any loss or assume the risk of loss. MCA shall not be responsible for any portion of any loss or damage which is recovered or recoverable by Customer from insurance covering such loss or damage or for such loss or damage against which Customer is indemnified or insured. Customer and all those claiming rights under Customer waive all rights against MCA and its subcontractors for loss or damages caused by perils intended to be detected by MCA's services or covered by insurance to be obtained by Customer, except such rights as Customer or others may have to the proceeds of insurance. Customer on its behalf and any insurance carrier waives any right of subrogation Customer's insurance carrier may otherwise have against MCA or MCA's subcontractors arising out of this Agreement or the relation of the parties hereto.

NO CHANGES: Except as previously described, no changes, alteration or modification of this Agreement may be made without the express written consent of both parties.

ASSIGNMENT: Customer shall not assign in whole or in part this Agreement or any interest therein or any rights hereunder without the written consent of MCA, which shall not be unreasonably withheld or delayed. Any such assignment without consent shall be void. Notwithstanding the foregoing, MCA may assign this Agreement or any other agreement between the Parties, without consent in whole or in part, for the purposes of corporate reconstruction, reorganization, or analogous proceeding, or to (a) any affiliate; or (b) a third party in the event of a merger, recapitalization, conversion, consolidation, other business combination or sale of all or substantially all of the assets of MCA to such third party.

GOVERNING LAW AND VENUE: This Agreement is governed by and construed in accordance with the laws of the State of South Carolina without regard to its rules governing conflicts of law. This Agreement shall be binding upon and inure to the benefit of each Party and its respective heirs, successors and assigns. Should any part of this Agreement, for any reason, be declared invalid by a court of competent jurisdiction, such determination shall not affect the validity of any remaining portion, and such remaining portion shall remain in full force and effect. The Parties shall attempt to resolve all disputes arising out of this Agreement in a spirit of cooperation without formal proceedings. Any dispute which cannot be so resolved (other than the collection of money due on unpaid invoices) shall be subject to arbitration upon written demand of either party. Arbitration shall take place in Spartanburg, South Carolina, and shall be the exclusive forum for resolving the dispute, controversy, or claim. The arbitration shall take place before an arbitration panel chosen as follows: The parties shall each choose an arbitrator, and the two (2) arbitrators shall choose a third (3rd) arbitrator and determine the third (3rd) arbitrator's compensation. Each party shall have one (1) veto over the choice of the third (3rd) arbitrator. The three (3) arbitrators shall schedule an informal proceeding, hear the arguments, and decide the matter by secret majority vote. Unless the arbitrators decide otherwise, each party shall pay the costs of its own arbitrator and shall pay half of the other costs of the arbitration proceeding. The award or decision of the arbitrator shall state the reasons upon which the award or decision is based and shall be final and binding upon the Parties. The prevailing Party shall be entitled to compensation for the expense of the arbitration, including, but not limited to, the award of attorneys' fees, at the discretion of the arbitrator. The award shall be enforceable before any court of competent jurisdiction upon the application to such court by either Party. Each Party irrevocably and unconditionally waives any right to a trial by jury in respect to any legal action arising from this Agreement or any other agreement between the Parties.

EXCULPATORY CLAUSE: Both Parties agree that MCA is not an insurer, and no insurance coverage is offered herein. The equipment and MCA's services are designed to detect and reduce certain risks of loss, though MCA does not guarantee that no loss or damage will occur. No equipment provided by MCA is represented to be medical grade, FDA approved, or intended for use by a healthcare professional or healthcare facility or to diagnose, treat, cure or prevent disease or medical condition unless explicitly stated in the SOW and no equipment or services are intended to diagnose, treat, cure, prevent, mitigate or minimize the likelihood of communicable disease, infectious agent, bacteria, virus or illness. MCA is not assuming liability, and, therefore, Customer agrees MCA shall not be liable to Customer or any other third party, and Customer covenants not to sue MCA, for any loss, economic or non-economic, business loss or interruption, consequential damages, in contract or tort, data corruption or inability to retrieve data, personal injury, health condition or property damage sustained by Customer or others as a result of equipment failure, human error, burglary, theft, hold-up, fire, smoke, water, any communicable disease, infectious agent, bacteria, virus, illness or any other cause whatsoever, regardless of whether or not such loss or damage was caused by or contributed to by MCA's breach of contract, negligent performance to any degree in furtherance of this Agreement , any extra contractual or legal duty, strict products liability, or negligent failure to perform any obligation pursuant to this Agreement or any other legal duty, except for gross negligence and willful misconduct.

LIMITATION OF LIABILITY: MCA SHALL NOT BE LIABLE TO CUSTOMER OR TO ANY THIRD PARTY FOR ANY LOSS OF USE, REVENUE OR PROFIT, DAMAGE OR LOSS OF OTHER PROPERTY OR EQUIPMENT OR SYSTEMS OR FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, EXEMPLARY, SPECIAL OR PUNITIVE DAMAGES WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, REGARDLESS OF WHETHER SUCH DAMAGES WERE FORESEEABLE AND WHETHER OR NOT MCA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND NOTWITHSTANDING THE FAILURE OF ANY AGREED OR OTHER REMEDY OF ITS ESSENTIAL PURPOSE. THE LIABILITY OF MCA WITH RESPECT TO ANY OF ITS OBLIGATIONS HEREUNDER, INCLUDING SERVICE, SALE, DELIVERY, RESALE, INSTALLATION OR THE TECHNICAL DIRECTION OF INSTALLATION, REPAIR OR USE OF ANY ITEM COVERED BY OR FURNISHED HEREUNDER, WHETHER SUCH LIABILITIES ARE FOUNDED IN CONTRACT, IN TORT, UNDER ANY WARRANTY, OR OTHERWISE, SHALL NOT EXCEED THE PRICE PAID TO MCA WITH RESPECT TO THE SERVICE GIVING RISE TO THE CLAIM. NO ACTION SHALL BE BROUGHT FOR ANY BREACH OF THIS AGREEMENT MORE THAN ONE (1) YEAR AFTER THE ACCRUAL OF SUCH CAUSE OF ACTION EXCEPT FOR MONEY DUE UPON OPEN ACCOUNT.

INDEMNIFICATION: Customer agrees to indemnify, defend, and hold harmless MCA, its officers, directors, employees, and agents (collectively, the "Indemnified Party") from and against any and all liabilities, losses, damages, expenses, liens, claims, demands, actions, judgments, settlements, interest, awards, penalties, fines costs, and expenses, including, without limitation, reasonable attorneys' fees, costs of collection, costs of recovering insurance, and costs of enforcing this indemnification provision (collectively "Claims") arising out of or related to any negligent act or omission of the Customer in connection with the performance of the Services under each SOW . For avoidance of doubt, Customer agrees to indemnify, defend and hold harmless MCA from any failure to mitigate or respond or detect any communicable disease, infectious agent, bacteria or virus.

ATTORNEYS' FEES: Should any dispute arise between the parties regarding the interpretation, application, effect or enforcement of the Agreement, the prevailing party in any legal or arbitration proceedings commenced to resolve the dispute shall be entitled to costs and reasonable attorney's fees incurred in said legal proceeding.

NOTICES: All notices given by one party to the other under this Agreement must be delivered by: (a) hand delivery, (b) certified mail, return receipt requested, (c) nationally recognized overnight courier service, or (d) facsimile, to the other party's respective address given in the preamble to the Agreement.

SEVERABILITY: If any provision or part-provision of this Agreement is or becomes invalid, illegal, or unenforceable, it shall be deemed modified to the minimum extent necessary to make it valid, legal and enforceable. If such modification is not possible, the relevant provision or part-provision shall be deemed deleted. Any modification to or deletion of a provision or part-provision

COUNTERPARTS: The Agreement may be executed in counterparts, which together constitute one and the same agreement. A facsimile copy or computer image, such as a PDF or tiff image, of a signature shall be treated as and shall have the same effect as an original signature. In addition, a true and correct facsimile copy or computer image of the Agreement shall be treated as and shall have the same effect as an original signed copy of this document.

Equipment and Coverage Details - Attachment A

APX7000	15
APX8000	37
XTS2500	16
APX Mobile	10
Motorola Mobile	42

Annual Preventative Maintenance Inspection

Special Instructions

Statements of Work - Attachment B

MCA 8 x 5 Coverage	MCA 24 x 7 Coverage
Subscriber support includes repair. It is the customer's responsibility to get the subscriber to their local MCA facility and ensure MCA has the current programming files on hand. It is MCA's responsibility to: • Triage the device • Ship to the depot if repair cannot be addressed locally • Track repair status • Receive the device back from the depot • Confirm that the radio has been repaired and is programmed to the customer's specifications • Communicate to the customer their device is fixed. Infrastructure support includes M-F 8X5 response to all issues arising from infrastructure, infrastructure cabling and antenna systems. Issues that result from power failure, force majeure, or tampering are excluded from this service. Removal of infrastructure equipment for warranty repair is the responsibility of MCA. Repair of cabling and antenna systems is not a part of this service. After hours support is available upon request but is not covered under this service. Additional charges would apply at after hour rates. One annual Preventative Maintenance check of the covered equipment. Subscriber Preventative Maintenance includes but not limited to visual inspection of radio, realignment back to factory specifications (transmit power out, transmit frequency error, transmit deviation, and receive sensitivity), and check of battery date code. One annual firmware update of the covered equipment will be completed at the time of the preventative maintenance check.	Subscriber support includes repair. It is the customer's responsibility to get the subscriber to their local MCA facility and ensure MCA has the current programming files on hand. It is MCA's responsibility to: • Triage the device • Ship to the depot if repair cannot be addressed locally • Track repair status • Receive the device back from the depot • Confirm that the radio has been repaired and is programmed to the customer's specifications • Communicate to the customer their device is fixed. Infrastructure support includes 24 x 7 response to all issues arising from infrastructure, infrastructure cabling and antenna systems. Issues that result from power failure, force majeure, or tampering are excluded from this service. Removal of infrastructure equipment for warranty repair is the responsibility of MCA. Repair of cabling and antenna systems is not a part of this service. After hours support is available upon request but is not covered under this service. Additional charges would apply at after hour rates. One annual Preventative Maintenance check of the covered equipment. Subscriber Preventative Maintenance includes but not limited to visual inspection of radio, realignment back to factory specifications (transmit power out, transmit frequency error, transmit deviation, and receive sensitivity), and check of battery date code. One annual firmware update of the covered equipment will be completed at the time of the preventative maintenance check.

AGENDA ITEM 11:

APPOINTMENT OF MEMBERS TO FIRE APPENDICES COMMITTEE

MANAGER'S COMMENTS:

At the Board's request during the previous meeting, Planning and Inspections Director Jason Walker followed up with the individuals nominated by the Planning Board to serve on the Fire Appendices Committee. All nominees representing the surveyor, engineer, developer, and at-large categories have confirmed their willingness to serve. A final list of recommended individuals is attached. One representative from each category will need to be selected. Once appointments are made, staff will notify the selected individuals accordingly.

Staff seeks direction from the Board regarding appointments.

WATAUGA COUNTY

Department of Planning & Inspections

126 Poplar Grove Connector Suite 201 • Boone, North Carolina 28607 (828) 265-8043
TTY 1-800-735-2962
Voice 1-800-735-8262
or 711
FAX (828) 265-8080

Memorandum

Date: July 30, 2025
To: Watauga County Board of Commissioners
Deron Geouque, County Manager
From: Jason Walker, Director of Planning & Inspections
Re: Fire Appendices Committee

I have contacted the individuals nominated by the Planning Board regarding their willingness to serve on the Fire Appendices Committee. All have confirmed their interest in participating.

Attached is the final list of recommended individuals. One member from each group (surveyor, engineer, developer, and at-large) will need to be selected to serve on the committee.

Once the selections are made, I will notify the chosen individuals accordingly.

FIRE APPENDICES COMMITTEE

Two Commissioners
Braxton Eggers
Ronnie Marsh

Two Fire Chiefs
Chief Matt Aldridge, Foscoe Fire Dept
Chief Steve Marks, Cove Creek Fire Dept (Chair of Fire Commission)
(Both recommended by the Watauga County Fire Commission)

County Manager
Deron Geouque

Fire Marshall
Shane Garland

Planning Director
Jason Walker

The individuals below have been nominated and indicated their willingness to serve on the committee. At this time, we need to select one member from each category.

One Surveyor
1. Donald McNeil
2. Rick Snyder

One Engineer
1. Patrick Warren
2. Derek Goddard
3. Mike Trew

One Developer
1. Todd Rice
2. Bill Aceto
3. Jay Harrill

One At-Large Member
1. Mike Wilson
2. Joseph Greer
3. Chuck Campbell
4. Jeff Fisher
5. George Bartholomew

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AGENDA ITEM 12:

SANITATION DEPARTMENT TRAILER PURCHASE REQUEST

MANAGER'S COMMENTS:

Operations Services Director Chris Marriott has submitted a request to purchase a 2026 Clement Monstar trailer for use by the Sanitation Department in hauling scrap metal for recycling. This trailer will replace an older, homemade unit that has become structurally unsound and unsafe for road use.

Staff solicited and evaluated eight quotes from six vendors for both new and used trailers. Based on age, payload capacity, and overall value, staff recommends the purchase of the 2026 Clement Monstar from Trailer Specialist, Inc. of Concord, NC, at a cost of $88,953. The vendor has agreed to hold the trailer until August 6, 2025, pending Board approval. Upon purchase, the old trailer will be sold to a scrapyard for recycling.

Sufficient funds are available in the FY 2026 Sanitation Department budget under.

Board action is requested to approve the purchase of the 2026 Clement Monstar trailer in the amount of $88,953 from Trailer Specialist, Inc.

WATAUGA COUNTY

SANITATION DEPARTMENT

336 Landfill Road – Boone, NC 28607 – (828) 264-5305
TDD 1-800-735-2962 – Voice 1-800-735-8262 – FAX (828) 264-3230

July 23, 2025

To: Deron Geouque, County Manager

From: Chris Marriott, Operations Services Director

Subject: Sanitation Equipment Purchase Request

Please see attached quote, for procurement of a 2026 Clement Monstar Trailer for the Watauga County Sanitation Department. The Monstar Trailer will be primarily utilized for hauling of scrap metal for recycling. This trailer will replace an old 'homemade' hauling trailer that has been bowed-out and is becoming unsafe for roadway transport.

Staff reached out for quotes for both new and used trailers that could be utilized for hauling scrap metal. Six different companies were provided a total of eight (8) quotes for the purchase of a trailer suitable for hauling scrap metal. The Sanitation Department evaluated the following quotes for the best value to the department; they were ranked as follows:

Company	Product	Price
Trailer Specialist, Inc. (Concord, NC)	2026 Clement Monstar (89 yd)	$88,953
Pinnacle Trailers (Spartanburg, SC)	2023 Manac (65 yd)	$65,900
Trailer Specialist, Inc.	2016 Clement Scrapstar MK3 (64 yd)	$47,000
Trailer Specialist, Inc.	2026 Clement Scrapstar MK2 (62 yd)	$86,240
Southeast Utility Trailer (Garner, NC)	2025 MAC Hardox AR450 (109 yd)	$114,303.20
MTM (Kewanee, IL)	2022 MTM TN768 (56 yd)	$55,000.00
Benlee (Romulus, MI)	2026 Gondola (non-dump)	$83,415.36
Construction Trailer Specialists (Sikeston, Mo)	2025 ScrapMaster (65 yd)	$71,571

Considering the age, payload, and price of each of the available trailers, staff recommends the 2026 Clement Monstar. The vendor, Trailer Specialist, has agreed to hold the trailer until August 6th for board approval. The trailer is location in Concord, NC. Sanitation staff would be able to pick up after approval and the issuance of a purchase order.

The current metal hauling trailer would be sold to the scrapyard for recycling once the new trailer is ready for pick up.

Staff requests Board of Commissioner's approval to purchase a 2026 Clement Monstar scrap trailer from Trailer Specialist, Inc. based in Concord, NC.

Sufficient funds are available in the FY2026 Landfill Operations budget in the line item of Capital Outlay-other[667420-455002] within the Sanitation Department.

Please let me know if you have any questions or concerns. Thank you in advance for your consideration.

TRAILER SPECIALISTS, INC.

3219 Cornelius Street, Charlotte, North Carolina 28206
Phone (704) 377-4108, Fax (704) 377-9044
Email: Harmonrlg@Trailerspecialists.com

DATE	TERMS	EST. SHIP	SALESMAN
07/15/25	Balance due at delivery	In Stock	Harmon Gibson

QUOTE FOR: Chris Marriott
336 707 4777
Chris.marriott@watgov.org

QUANTITY	DESCRIPTION	PRICE
1	2026 CLEMENT MONSTAR	
	FRAMELESS STEEL END DUMP FOR THE HEAVY SCRAP INDUSTRY	
	FLOOR, SIDES & TAIL GATE 3/16" AR500 STEEL CONSTRUCTION	
	FRONT HEADER 3/16" AR450 STEEL CONSTRUCTION	
	40FT LONG - 102" WIDE - 101" SIDE HEIGHT	
	89 CUBIC YARD CAPACITY	
	50,000 LB SINGLE POINT SUSPENSION	
	22.5 RADIAL TIRES ON HUB PILOTED STEEL DISC RIMS	
	2S1M ABS / SEALED LIGHTS & HARNESS	
	INVERTED HOIST - NO DOG HOUSE	
	REAR ALUMINUM FENDERS / TWO SPEED LEGS	
	SIDE SWING TAILGATE / Clement BLACK URETHANE TOP COAT	
	Mountain Electric flip tarp	
	Estimated weight: 18,600lbs +/- 3%	

FOB: Charlotte

PER UNIT	$	79,592.00
FET		included
FREIGHT		included
Total	**$**	**88,953.00**

Customer's Signature

MONSTAR
CLEMENT
CLEMENT
CLEMENT

MONSTAR

AGENDA ITEM 13:

MISCELLANEOUS ADMINISTRATIVE MATTERS

A. Resolution to Approve Amendment No. 2

MANAGER'S COMMENTS:

Finance Director Deron Geouque will present a request for the Board to approve Amendment No. 2 to the North Carolina Cash Flow Loan Agreement and the accompanying resolution. Under the terms of the original agreement, any FEMA reimbursements received by the County were required to be remitted to the State within five business days.

The proposed amendment modifies the repayment structure, allowing the County to repay the loan over a five-year period according to the original repayment schedule, rather than remitting funds immediately upon receipt.

Board action is requested to approve Cash Flow Loan Amendment No. 2 and the associated resolution.

W A T A U G A C O U N T Y
FINANCE OFFICE

814 West King St., Room 216 - Boone, NC 28607 - Phone (828) 265-8007 Fax (828) 265-8006

M E M O R A N D U M

TO: **Deron Geouque, County Manager**
FROM: **Deidre Guy, Assistant Finance Director**
SUBJECT: **Cash Flow Loan Amendment no. 2**
DATE: **July 18, 2025**

Attached please find the North Carolina Cash Flow Loan Amendment no. 2 and resolution. Under the original Cash Flow Loan Agreement, any funds received from FEMA would have to be remitted to the state within 5 business days. This amendment will modify the terms and would allow the County to repay the loans over 5 years with the original repayment schedule.

Board approval is requested to approve the Cash Flow Loan Amendment no.2 and the resolution.

This Amendment has been pre-audited as required
by the Local Government Budget and Fiscal Control Act

_____

Finance Officer

AMENDMENT NO. 2
to
Loan Agreement between the State of North Carolina
(by and through the North Carolina Department of State Treasurer)
and the County of Watauga, North Carolina

This amendment ("Amendment") to the above-identified agreement is hereby made and entered into by the State of North Carolina, by and through the North Carolina Department of State Treasurer ("NCDST"), and the County of Watauga, North Carolina ("Recipient"), as of the effective date established hereinbelow.

RECITALS

A. Pursuant to the Hurricane Helene Cash Flow Loan Program created by the North Carolina General Assembly under the Disaster Recovery Act of 2024 – Part II, NCDST and Recipient entered the above-identified agreement to establish terms and conditions governing NCDST's disbursement of loan proceeds to Recipient (the "Loan Agreement").

B. The terms of the Loan Agreement require Recipient to seek alternative sources of funding—namely, federal funding support, insurance proceeds, and private donations (generally, "Alternative Funding")—to pay for the disaster response activities on which Recipient's loan origination was based.

C. On May 28, 2025, NCDST and Recipient entered an amendment to the Loan Agreement ("Amendment No. 1"), which permitted Recipient to receive FEMA Public Assistance Expedited Project Funding without triggering an obligation to repay the equivalent amount of loan proceeds to NCDST immediately thereafter. Amendment No. 1 to the Loan Agreement also eliminated the requirement that Recipient "promptly" repay other forms of Alternative Funding upon Recipient's receipt of such funding.

D. While Amendment No. 1 to the Loan Agreement permitted Recipient to receive FEMA Public Assistance Expedited Project Funding without triggering an obligation to repay the equivalent amount of loan proceeds to NCDST immediately thereafter, it did not have the effect of modifying Recipient's repayment obligations relative to other sources of federal funding obtained by Recipient.

E. At the time the parties entered Amendment No. 1, NCDST was unaware of certain facts and circumstances concerning the nature and timing of the federal funding support available to Recipient, aside from FEMA Public Assistance Expedited Project Funding. In light of those facts and circumstances, NCDST has determined that the provisions of the Loan Agreement requiring Recipient to repay loan proceeds within five business days each time Recipient receives federal funding support are likely to have the unintended consequence of restricting, rather than securing, the cashflow liquidity available to Recipient in the months and years ahead, defeating the very purpose of the Cashflow Loan Program.

F. In light of the above, and as provided in Section 10. of the Loan Agreement (concerning amendments), NCDST and Recipient now wish to modify those provisions of the Loan Agreement pertaining to the repayment obligations of Recipient in connection with its receipt of federal funding generally.

NOW, THEREFORE, in consideration of the mutual promises set forth herein, the Parties do hereby agree as follows:

1. Modifications to Loan Agreement.

(a) Subsection e. to Section 3. of the Loan Agreement, as amended by Amendment No. 1 to the Loan Agreement, is hereby deleted in its entirety and replaced with the underlined text appearing below:

e. RECIPIENT agrees to deliver repayment installments of the loan proceeds in the amounts and by the dates set forth in the Repayment Terms recited on Page 1 above, which are hereby incorporated by reference. Further, RECIPIENT understands and agrees that all loan proceeds provided to RECIPIENT under this Agreement must be repaid no later than the earlier of the following two dates: the five-year anniversary of the Loan Date; or (b) June 30, 2030.

(b) Subsection g. to Section 3. of the Loan Agreement, as amended by Amendment No. 1 to the Loan Agreement, is hereby amended by deleting the stricken text and inserting the underlined text appearing below:

g. As provided in the Authorizing Act:

(i) ~~RECIPIENT agrees to deliver repayment installments of the loan proceeds in the amounts and by the dates set forth in the Repayment Terms recited on Page 1 above, which are hereby incorporated by reference. Further, RECIPIENT understands and agrees that all loan proceeds provided to RECIPIENT under this Agreement must be repaid no later than the earlier of the following two dates: (a) the five-year anniversary of the Loan Date; or (b) June 30, 3030.~~RESERVED.

(ii) RECIPIENT shall use best efforts and take all reasonable steps to obtain alternative funds that cover the losses or needs for which the loan proceeds are being provided, including funds from insurance policies in effect, available federal aid, and private donations. RECIPIENT understands and agrees that the loan proceeds paid to RECIPIENT pursuant to this Agreement are in excess of any funds received by RECIPIENT from any of the following: (a) settlement of a claim for loss or damage covered under RECIPIENT's applicable insurance policy in effect; (b) federal aid; or (c) private donations.

(iii) If RECIPIENT obtains alternative funds pursuant to subdivision (ii) of this subsection g., then RECIPIENT shall remit such funds to NCDST ~~in accordance with the provisions of 3.e. above.~~ as soon as reasonably practicable thereafter, but no later than the earlier of the two dates established in subsection e. to this Section 3. Notwithstanding the preceding sentence, RECIPIENT shall not be required to repay to NCDST any amount in excess over the amount of loan proceeds provided under this Agreement.

2. Effect of Amendment.

(a) Except as expressly provided herein, all terms, conditions and provisions of the Loan Agreement shall remain in full force and effect and are hereby ratified and confirmed by Recipient.

(b) This Amendment No. 2 is not intended to modify any term, condition or provision contained in any of the loan documents associated with RECIPIENT's Loan Agreement (the "Associated Loan Documents"). All terms, conditions and provisions of the Associated Loan Documents shall remain in full force and effect, modified only to the extent necessary to accomplish the purposes of this Amendment.

(c) On and after the effective date hereof, unless the context clearly requires otherwise, any reference to the Loan Agreement contained in the Associated Loan Documents or in the Loan Agreement itself shall be interpreted as a reference to the Loan Agreement as amended by Amendment No. 1 to Loan Agreement and this Amendment No. 2 to Loan Agreement.

3. **Effective Date.** The provisions of this Amendment shall become effective upon the date on which NCDST has received the following:

(a) This Amendment, duly executed and delivered by Recipient and NCDST; and

(b) A certified copy of a resolution authorizing execution of this Amendment substantially in the form of Exhibit A, duly executed and delivered by RECIPIENT.

4. **Counterparts.** This Amendment may be executed in counterparts, each of which shall be deemed an original but all of which shall constitute one and the same instrument. One or more counterparts of this Amendment may be delivered by facsimile or in Portable Document Format (PDF) sent by electronic mail, with such delivery having the same effect as delivery of an original counterpart. Signatures provided by facsimile transmission, in PDF sent by electronic mail, or by electronic signature such as DocuSign, shall be deemed to be original signatures.

IN WITNESS WHEREOF, each of the Parties hereto has caused its duly authorized representative, as applicable, to execute this Amendment Number One as of the dates written below.

North Carolina Department of State Treasurer	**County of Watauga, North Carolina**
Name: _____	Name: _____
Title: _____	Title: _____
Signature: _____	Signature: _____
Date: _____	Date: _____

EXHIBIT A

RESOLUTION TO APPROVE AMENDMENT NO. 2 TO LOAN AGREEMENT BETWEEN THE STATE OF NORTH CAROLINA (BY AND THROUGH THE NORTH CAROLINA DEPARTMENT OF STATE TREASURER) AND THE COUNTY OF WATAUGA, NORTH CAROLINA

WITNESSETH:

WHEREAS, the County of Watauga (the "County) previously approved and entered into a loan agreement ("Loan Agreement") and promissory note with the State of North Carolina, by and through the North Carolina Department of State Treasurer ("NCDST"), in connection with the Hurricane Helene Cash Flow Loan Program created by the North Carolina General Assembly under the Disaster Recovery Act of 2024 – Part II **(**Session Law 2024-53, as amended by Session Law 2024-57); and

WHEREAS, on May 28, 2025, NCDST and the County entered an amendment to the Loan Agreement, which permitted the County to receive FEMA Public Assistance Expedited Project Funding without triggering an obligation to repay the equivalent amount of loan proceeds to NCDST immediately thereafter; and

WHEREAS, NCDST has since agreed to further modify the repayment terms of the Loan Agreement to account for the County's receipt of "Alternative Funding" in general (as that term is defined in the Amendment), towards the end of maximizing the cashflow liquidity available to the County for disaster response activities in the months and years ahead ("Amendment No. 2 to Loan Agreement").

NOW, THEREFORE, BE IT RESOLVED BY County of Watauga, North Carolina:

1. That the Amendment No. 2 to Loan Agreement presented by the North Carolina Department of State Treasurer is hereby approved.

2. That the Watauga Board of County Commissioner's Chairman is authorized to execute the attached Amendment to Loan Agreement (or one substantially equivalent thereto) and to take such other actions as necessary to secure disaster recovery loan funding from the State of North Carolina.

Adopted, this the _____ day of _____, _____

Watauga Board of County Commissioners' Chairman

By: _____
Braxton Eggers
Chairman

ATTEST:

_____
Katie Hancock
Clerk

AGENDA ITEM 13:

MISCELLANEOUS ADMINISTRATIVE MATTERS

B. Proposed Human Services Parking Lot and Parking Deck Agreement with Appalachian State University

MANAGER'S COMMENTS:

Appalachian State University is requesting renewal of the use agreement for the parking lot at 132 Poplar Grove Road Connector and the parking deck at 140 N. Water Street to support pre- and postgame football operations.

Two versions of the agreement have been drafted:

- **Two-Year Agreement**: Term from September 6, 2025, through December 20, 2026.
- **Three-Year Agreement**: Term from September 6, 2025, through December 20, 2027.

Under both agreements, the University would pay the County a lump sum of $10,000 per year for the Human Services Lot and 50% of net revenue generated from game day parking at the parking deck. The University would be responsible for event security, towing unauthorized vehicles, providing portable restrooms, and ensuring the lots are returned to their original or better condition following each event.

The primary difference between the two options is the term of the agreement. The University has expressed interest in a longer-term arrangement for planning purposes.

Staff seeks Board direction.

WATAUGA COUNTY, NORTH CAROLINA

and

APPALACHIAN STATE UNIVERSITY

USE AGREEMENT

THIS USE AGREEMENT ("Agreement"), made and entered into as of the second signature below ("Execution Date") by and between Watauga County ("County"), and Appalachian State University, a constituent institution of the University of North Carolina ("University"). Watauga County and Appalachian State University may each be referred to herein individually as a "Party" or collectively as the "Parties."

WITNESSETH:

WHEREAS, Appalachian State University desires to utilize the parking lot at 132 Poplar Grove Road Connector and parking deck at 140 N. Water Street as set forth below;

WHEREAS, the Board of County Commissioners has resolved to allow Appalachian State University use of the parking lot at 132 Poplar Grove Road Connector and parking deck at 140 N. Water Street for the term set forth below; and

NOW, THEREFORE, subject to the terms and conditions hereinafter set forth, said County does hereby agree to allow University to use parking spaces marked by lines in paved lots in the parking lot located at 132 Poplar Grove Road Connector and parking deck at 140 N. Water Street, Boone, lying and being in Watauga County, North Carolina.

The terms and conditions of this Agreement are as follows:

1. **TERM**: The parking lot located at 132 Poplar Grove Road Connector and parking deck at 140 N. Water Street shall be available to University for the pre- and postgame events during the 2025 football season. Such dates and times shall be determined in accordance with University's football schedule. Notice of game dates and times shall be provided to the County prior to the event. The term of this Agreement shall extend from September 6, 2025 through December 20, 2026.

2. **PAYMENTS:** University shall pay to the County for the use of said lot the sum of Ten Thousand Dollars ($10,000) in one lump sum payment, annually, for the use of the premises. Such payment shall be made every year before the start of the first event. Additionally, the University shall pay a License Fee of 50% of net sales to the County from game day parking revenue generated from the parking deck at 140 N. Water Street. License Fee from sales related to the parking deck shall be paid within 30 days of the conclusion of each season The University shall be responsible for providing security on the dates of use during the term of this Agreement and for removing all unauthorized vehicles. University is responsible for ensuring that no individuals shall enter any structures or buildings located on the premises. County shall provide a parking pass to each individual who pays for the use of the parking facilities, which shall include indemnification language. University shall also provide portajohns for use at the lot on event dates.

3. **USE OF PREMISES:** The premises shall not be used for any illegal purposes, nor in any manner to create any nuisance or trespass, nor in any manner to vitiate the insurance or increase the rate of insurance on the premises. University agrees there shall be no tailgating, no consumption of alcohol, no open flame, and no picnicking at the parking lot located at 132 Poplar Grove Road Connector and parking deck at 140 N. Water Street. The University shall only use the agreed-upon space for the parking of vehicles for the football game festivities and for the purposes as set forth above, and shall be responsible for providing employees of the University who will secure the premises, the occupants, and the property during the time period of this Agreement and until the property is vacated by any and all persons, vehicles, or remnants of use by University, its sub-University, assigns and authorized or unauthorized users. Upon the end of this Agreement, University shall return the premises to an equal to or better-than condition than it was as of the start date of the Agreement. Specifically, the University shall be responsible for towing unauthorized users of the space. University shall bear the sole cost of removal and towing for any vehicle left on the premises at the termination of the Agreement.

4. **ALTERATIONS:** The University shall not paint or decorate the premises or make any alterations, additions or improvements in or to the premises without the County's prior written consent, and then only in a workmanlike manner using materials and contractors approved by the County. All such work shall be done at the University's expense and at such times and in such manner as the County may approve. All alterations, additions, and improvements upon the premises, made by either the County or the University, shall become the property of the County and shall remain upon and become a part of the premises at the end of the use.

5. **INDEMNIFICATION:** To the extent permitted by law, University agrees to indemnify and hold harmless County from any liability arising from any breach of contract or any other action related to, or incidental to, the performance of this contract. The parties to this Agreement agree that nothing in this Agreement constitutes a waiver of University's sovereign immunity, and that University's obligations in this paragraph shall be limited to the extent and manner of recovery provided in North Carolina's State Tort Claims Act, N.C. Gen. Stat.§ 143-291, *et. seq.*

6. **INSURANCE:** University represents and warrants that it is self-insured with respect to tort claims and shall remain self-insured therefor to the extent permitted by North Carolina law for the entire term of this Agreement. A certificate of insurance shall be provided to the County upon request.

7. **DESTRUCTION OF OR DAMAGES TO PREMISES:** If the premises are destroyed by storm, fire, lightening, earthquake or other casualty, or if the spaces become unavailable or unusable for any reason whatsoever, this Agreement shall terminate as of the date of such destruction or unavailability and Agreement shall be accounted for as between the County and the University as of that date. If the premises are damaged, but not wholly destroyed by any such casualties, payment shall abate in such proportion as effective use of the premises has been affected.

8. **GOVERNMENT ORDERS:** University agrees to comply promptly with all requirements of any legally constituted public authority made necessary by reason of University's use of the premises or any other person/entity's use of the premises on University's behalf. In the event a governmental authority, private action, or any other event occurs, which imposes a requirement upon the County, which would result in a hardship to County to remedy, the County may declare this Agreement void and the term of this

Agreement shall cease.

9. **EVENTS OF DEFAULT:** The happening of any one or more of the following events (hereinafter any one of which may be refe1red to as "Event of Default") during the term of this Agreement, shall constitute a breach of this Agreement on the part of the University;

   (a) University fails to make payments as provided for herein;

   (b) University fails to comply with or abide by and perform any other obligation imposed upon University under this Agreement; or any unlawful or unauthorized use of the premises occurs, as set forth in paragraph above, entitled "Use of Premises."

   (c) A permanent receiver is appointed for University's property and such receiver is not removed within sixty (60) days after written notice from County to University to obtain such removal;

   (d) University, either voluntarily or involuntarily, takes advantage of any debt or relief proceedings under any present or future law, whereby the payment or any part thereof is, or is proposed to be reduced or payment thereof deferred;

   (e) University makes an assignment for benefit of creditors;

   (f) Any other violation of the terms and conditions of the Agreement.

10. **TERMINATION**: Either Party to this Agreement may terminate this Agreement at any time, and for any reason, by providing thirty (30) days notice to the other party.

11. **COUNTY'S ENTRY OF PREMISES:** At any time during University's use, County or any representative of County may enter the premises to inspect the premises, exhibit it to prospective University/Purchasers, and to make repairs.

12. **NOTICES:** All notices required or permitted under this Agreement shall be in writing and shall be personally delivered to or sent by U.S. certified mail, return receipt requested, postage prepaid. Notices to University shall be delivered or sent to the address shown at the beginning of this Agreement with a copy sent to Appalachian State University, Office of General Counsel, Attn: General Counsel, ASU Box 32126, Boone, North Carolina 28608-2126.

13. **NO BAILMENT CREATED:** No bailment is created by this agreement, and County assumes no liability, whatsoever, for any vehicle, any person located therein, any personal property on the premises, or any item in a vehicle, or any person being in or parked on the premises except to the extent that any such damage or injury occurs due to the negligence or intentional acts of County or its officers, employees or agents. Nothing in this Agreement shall constitute a waiver of the County's governmental immunity.

14. **ENTIRE AGREEMENT:** This Agreement contains the entire agreement of the parties hereto, and no representations, inducements, promises or agreements, oral or otherwise, between the parties, not embodied herein shall be of any force or effect. This Agreement may not be modified except by a writing signed by all of the parties hereto. This Agreement shall supersede any prior agreement

made between the parties, relating to the subject matter of this agreement, whether oral or in writing.

15. **NONWAIVER:** Failure of the County to insist upon strict compliance with the Agreement at any point shall not be construed as a waiver of any terms contained in his Agreement or prohibit full enforcement of the rights contained in the Agreement herein.

16. **ASSIGNMENT:** The University shall not assign this Agreement or sublet the premises in whole or in part.

17. **GENERAL RULES AND REGULATIONS:**

    (a) No boats, trailers, or campers shall be parked in the parking area;

    (b) No trash or personal property shall be left on the property. University Agreements the spaces as designated herein only. Any trash, vehicles or personal property left on the premises will be removed at the University's expense.

    (c) Portable toilet facilities shall be provided by the University at its sole expense in both parking lot locations in amounts sufficient for the comfort of those utilizing the premises.

IN TESTIMONY WHEREOF, the said parties of the first and second part herein, have hereunto set their hands and affixed their seals, the day and year first above written.

WATAUGA COUNTY	**APPALACHIAN STATE UNIVERSITY**
_____	_____
By: Deron Geouque County Manager	By: Doug Gillin Director of Athletics
_____	_____
Date Signed	Date Signed

WATAUGA COUNTY, NORTH CAROLINA

and

APPALACHIAN STATE UNIVERSITY

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WHEREAS, the Board of County Commissioners has resolved to allow Appalachian State University use of the parking lot at 132 Poplar Grove Road Connector and parking deck at 140 N. Water Street for the term set forth below; and

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made between the parties, relating to the subject matter of this agreement, whether oral or in writing.

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IN TESTIMONY WHEREOF, the said parties of the first and second part herein, have hereunto set their hands and affixed their seals, the day and year first above written.

WATAUGA COUNTY	**APPALACHIAN STATE UNIVERSITY**
_____	_____
By: Deron Geouque County Manager	By: Doug Gillin Director of Athletics
_____	_____
Date Signed	Date Signed

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AGENDA ITEM 14:

BREAK

AGENDA ITEM 15:

CLOSED SESSION

Attorney-Client Matters – G.S. § 143-318.11(a)(3)
Land Acquisition – G.S. § 143-318.11(a)(5)
Personnel Matters – G.S. § 143-318.11(a)(1)

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AGENDA ITEM 16:

POSSIBLE ACTION AFTER CLOSED SESSION