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

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

ACCEPTANCE OF BID

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

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**_____ **No**_____

CONTRACTING OFFICER

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

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

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

Understand the Contact information as listed above **Yes_____** **No_____**

CONTRACTOR REQUIREMENTS

The Contractor shall submit the following items with their bid:

1. 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_____** **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **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**_____ **No**_____

CONTRACTOR LICENSES

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

NC General Contractors License Number_____

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

Understand Requirements for Contractor Licenses **Yes**_____ **No**_____

CONSTRUCTION & MATERIALS

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**_____ **No**_____

EROSION CONTROL

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

Understand Erosion Control Methods and responsibilities **Yes**_____ **No**_____

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**	
2	Tower is to be a self-supporting structure.	
3	Tower Height is to be **199-ft AGL with a 50-ft Fall Zone.**	
4	Tower will be positioned on the DCS as indicated in the attached Construction Drawings.	
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.	
6	All structural bolts must meet the ASTM A325 or A490 Specification.	
7	The Tower Contractor will provide all materials to Complete the Tower & Foundation Installation.	
8	The Tower Contractor will build the Foundation and erect the Tower.	
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.	
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.	
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.	
12	As a minimum this Tower and Foundation shall be designed to the requirements of ANSI/TIA-222G, including released addendums.	
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.	
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.	
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.**	

	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.	
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.	
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.	
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.	
20	The Tower Contractor shall provide and install antenna mounts in accordance with the included **Antenna Mount Schedule (AMS)** and **Antenna Loading Requirements**.	
21	The location of the site is as shown on the attached drawings.	
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.	
23	**The Tower Contractor shall remove all tower construction materials and debris from the site.**	
24	**Bidding contractors must attend a mandatory pre-bid site walk on June 9th at 11:00AM.**	

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	
2	Two 6-ft standoff sidearm mounts with stabilizer at 155-ft	
3	One Microwave 4.5" pipe mount at 140' with ice shield	
4	One Microwave 4.5" Pipe Mount at 100' with ice shield	
5	One Microwave 4.5" Pipe Mount at 85' with ice shield	
6	One Microwave 4.5" Pipe Mount at 75' with ice shield	

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.

TOWER COST BREAKDOWN:

1. Total cost of tower materials only $_____

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

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

4. Total cost to construct the tower without lighting[2]. $_____
   (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:

ENGINEERED
TOWER SOLUTIONS

NORTH CAROLINA PROFESSIONAL SEAL 051545 ENGINEER JORGE VARELA

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).

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.

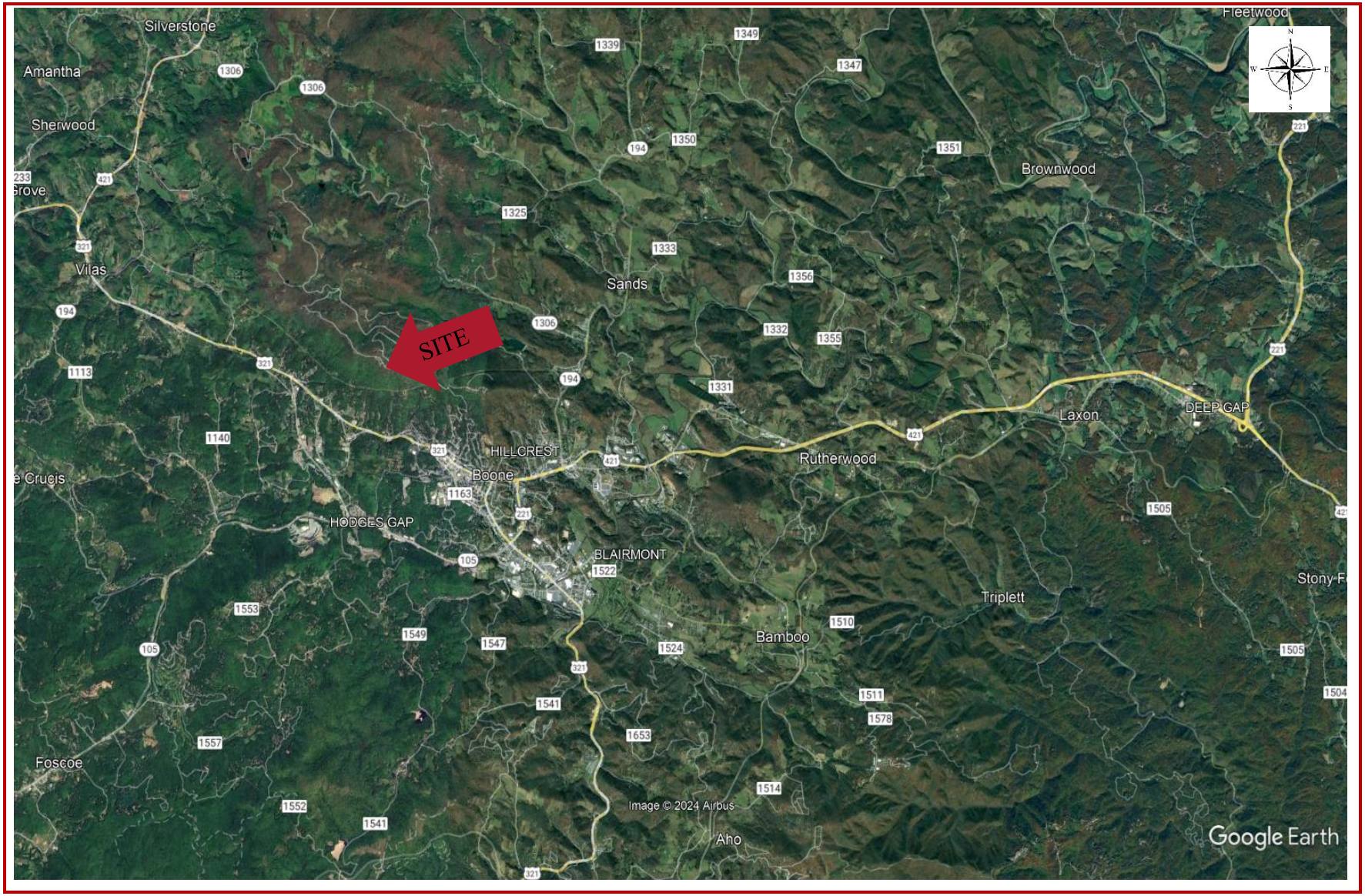
The analyses and conclusions submitted herein are based, in part, upon the data obtained from the subsurface exploration performed for this analysis. The soil and ground water conditions can vary across the site. Opinions and conclusions are subject to change if new or additional information is submitted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

APPENDIX A
LOCATION INFORMATION

SITE LOCATION PLAN

RICH MOUNTAIN TOWER

Job Number: 22110700



BORING LOCATION PLAN
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\GE\RICH MOUNTAIN TOWER.GPJ

BORING NUMBER B-2

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, -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.

BORING NUMBER B-3

ENGINEERED TOWER SOLUTIONS

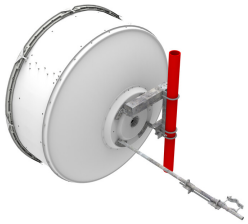
CLIENT Watauga County
PROJECT NAME Rich Mountain Tower
PROJECT NUMBER 22110700
PROJECT LOCATION 759 Fire Tower Road, Boone, NC 28607
DATE 5/7/2024
COORDINATES 36.2331, -81.6986
DRILLING METHOD Hollow Stem Auger (HSA) and Rock Coring
GROUND WATER LEVELS:
DRILLING EQUIPMENT 550X
AT TIME OF DRILLING 7.20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

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

Cross Polarization Discrimination (XPD) Electrical Compliance	ETSI EN 302217 XPD Category 2

Electrical Specifications, Band 2

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

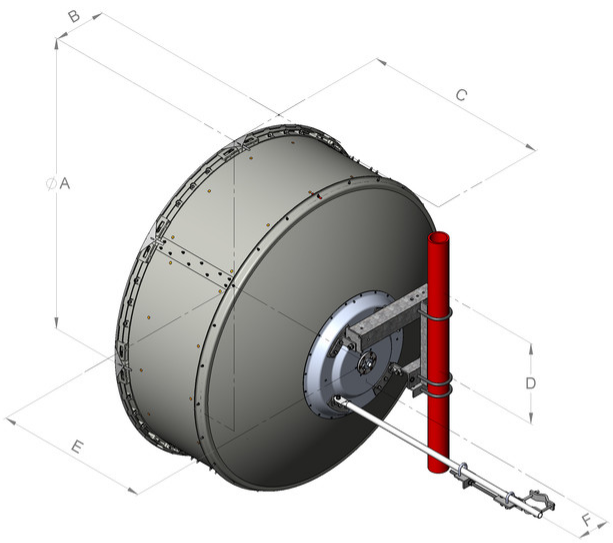
Mechanical Specifications

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

HX6-6W

Antenna Dimensions and Mounting Information

HX6



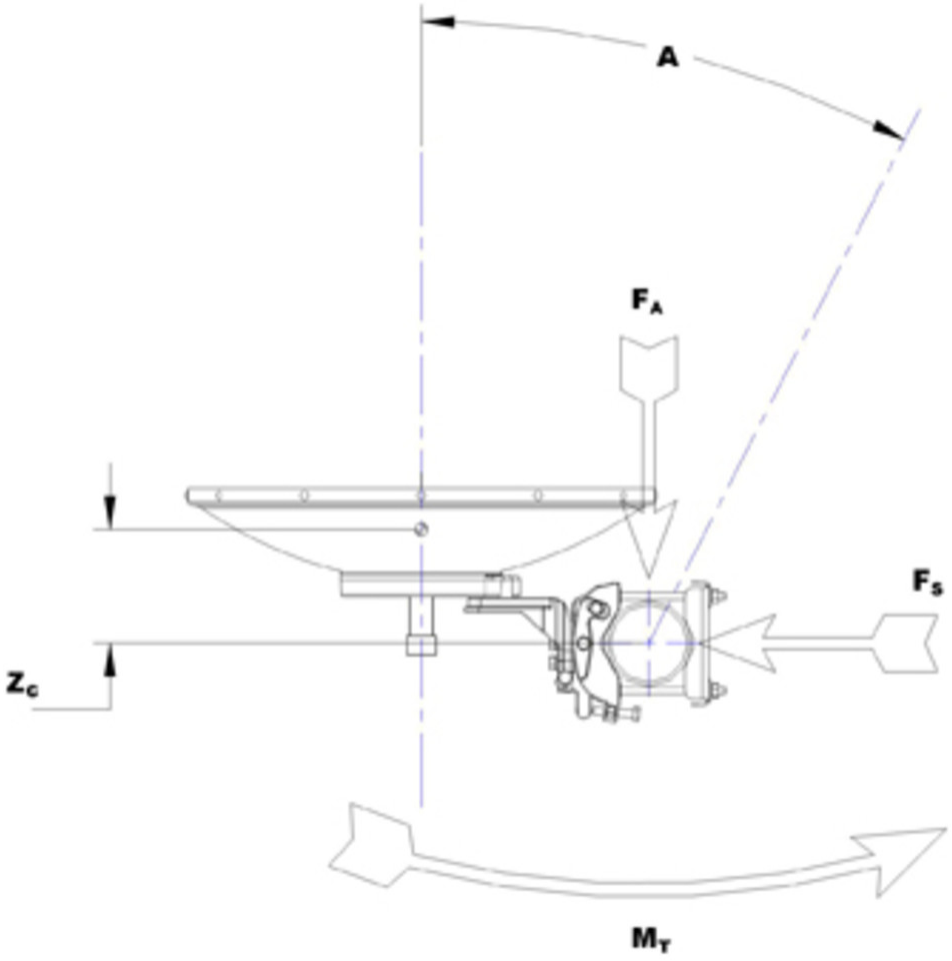
Dimensions in inches (mm)						
Antenna size, ft (m)	A	B	C	D	E	F
6 (1.8)	74.8 (1899)	13.4 (340)	47.5 (1206)	20.9 (530)	39.4 (1001)	8.4 (214)

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

HX6-6W

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

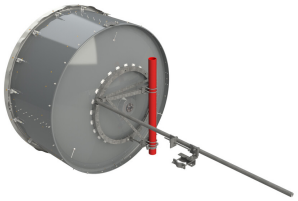
Operating Frequency Band	Bands correspond with CCIR recommendations or common allocations used throughout the world. Other ranges can be accommodated on special order.

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

	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.

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

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 °

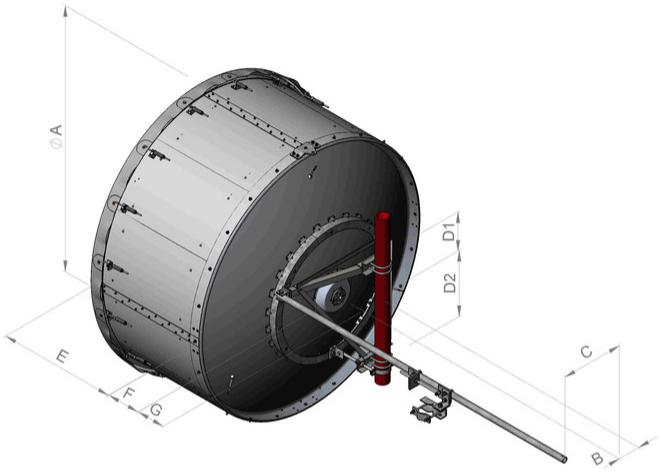
Mechanical Specifications

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

HX8-6W

Antenna Dimensions and Mounting Information

HX8

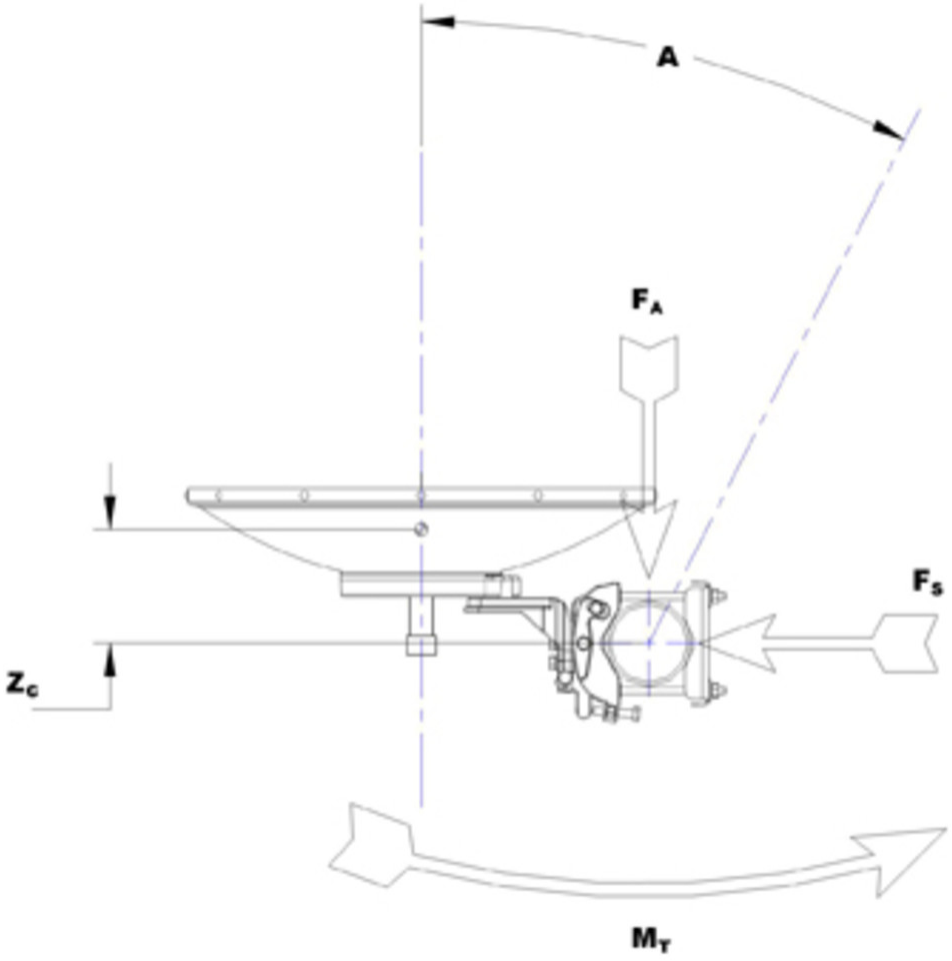


Dimensions in inches (mm)								
Antenna size, ft (m)	A	B	C	D1	D2	E	F	G
8 (2.4)	95.1 (2416)	8.0 (203)	22.5 (572)	14.1 (357)	23.6 (600)	42.4 (1078)	12.1 (306)	10.3 (262)

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

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.

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

	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.

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

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 - 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"	--	--
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	175'-0"	C	(1) 7/8"
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"
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	150'-0"	C	(1) 7/8"
WATAUGA COUNTY	1	-	DISH TO BUCKEYE	COMMSCOPE - HX6-6W-6WH	318°	140'-0"	C	(1) EU63
WATAUGA COUNTY (FUTURE)	1	-	DISH	COMMSCOPE - HX8-6W-WH	--	120-0"	B	(1) EU63
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	100'-0"	A	(1) 7/8"
WATAUGA COUNTY	1	-	DISH TO WATAUGA CO TRAN. STA.	COMMSCOPE - HX6-6W-6WH	104°	100'-0"	B	(1) EU63
WATAUGA COUNTY (FUTURE)	1	-	DISH	4' MICROWAVE DISH	--	90'-0"	C	(1) EU63
WATAUGA COUNTY	1	-	DISH TO PHEONIX	COMMSCOPE - HX8-6W-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
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	60'-0"	B	(1) 7/8"
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	60'-0"	C	(1) 7/8"

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

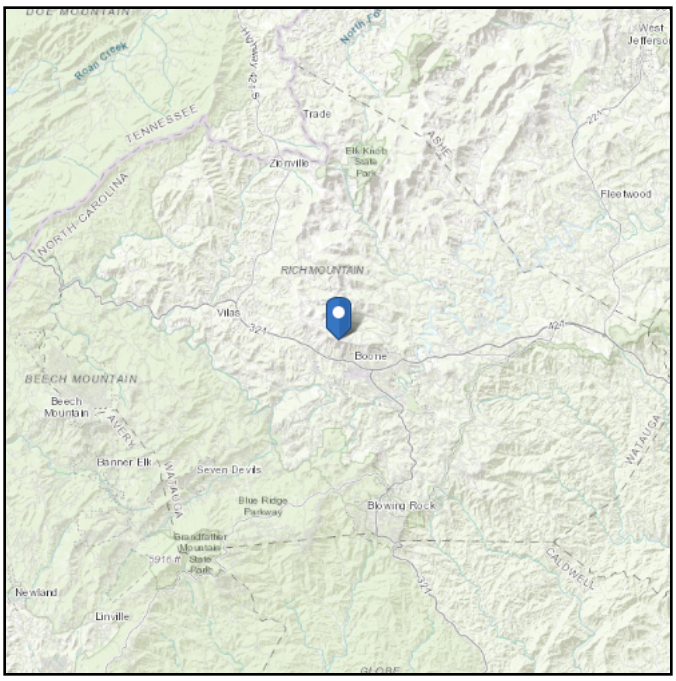
Verification of Design Loads

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
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.

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.

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

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.

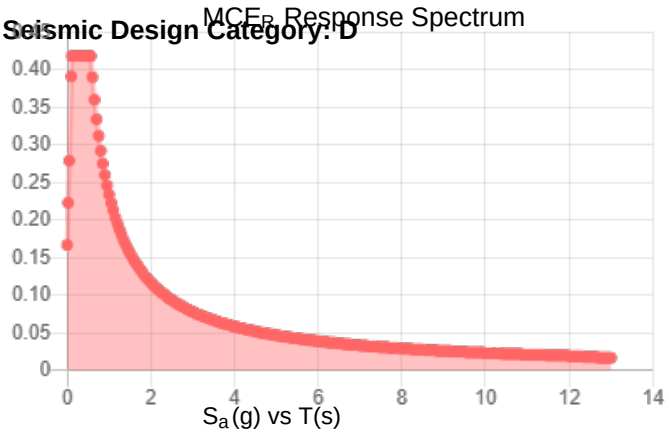
Seismic

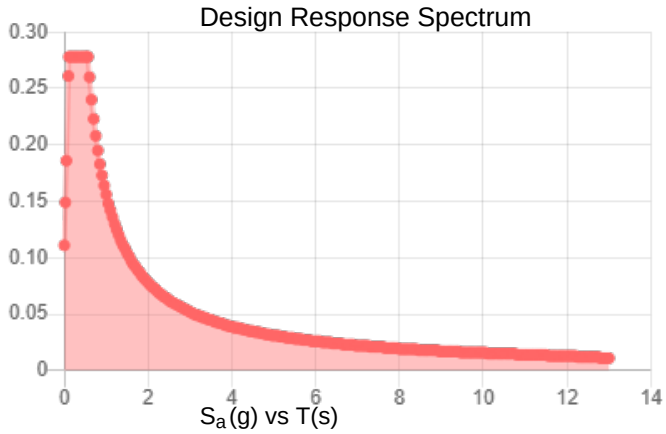
Site Soil Class: D - Stiff Soil

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





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.

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

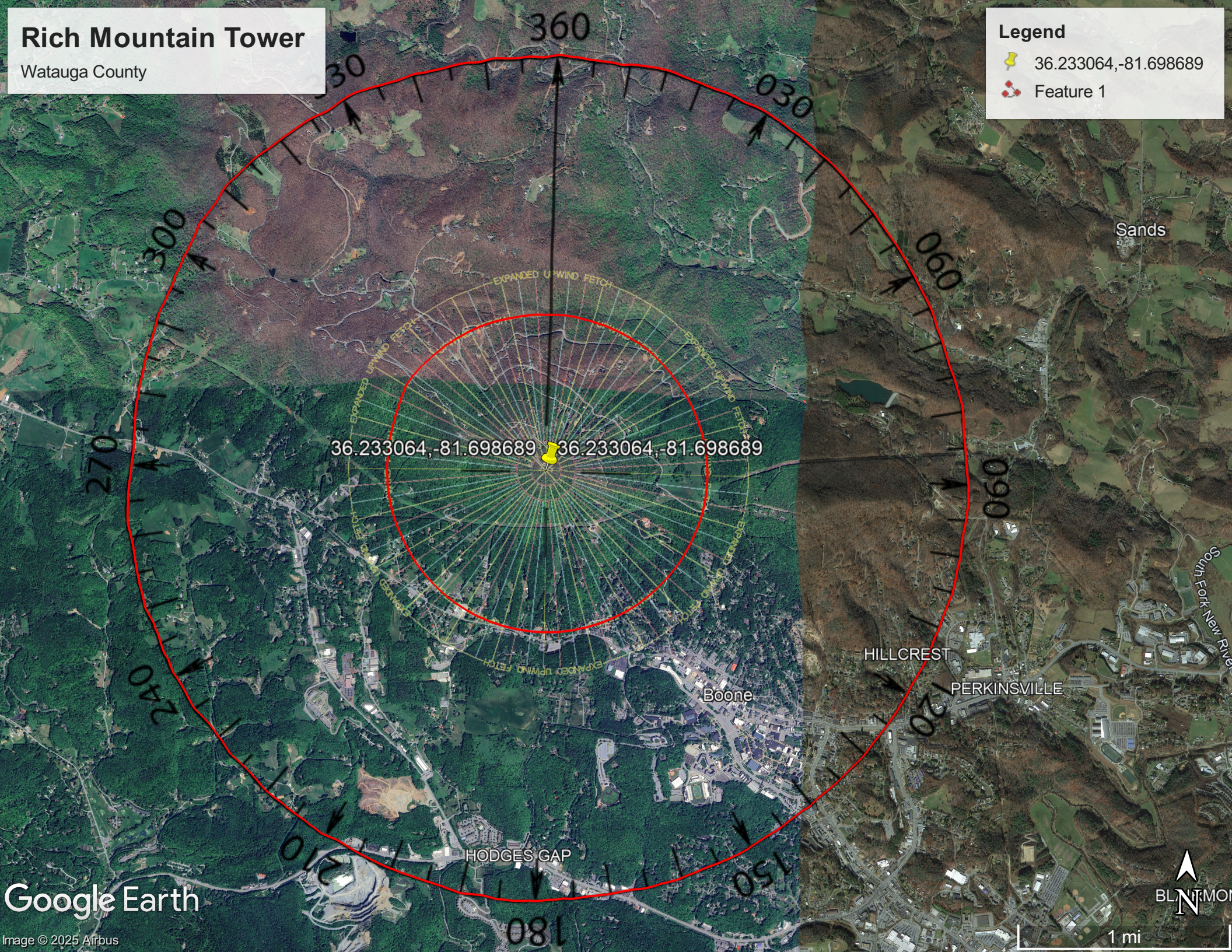
Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

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

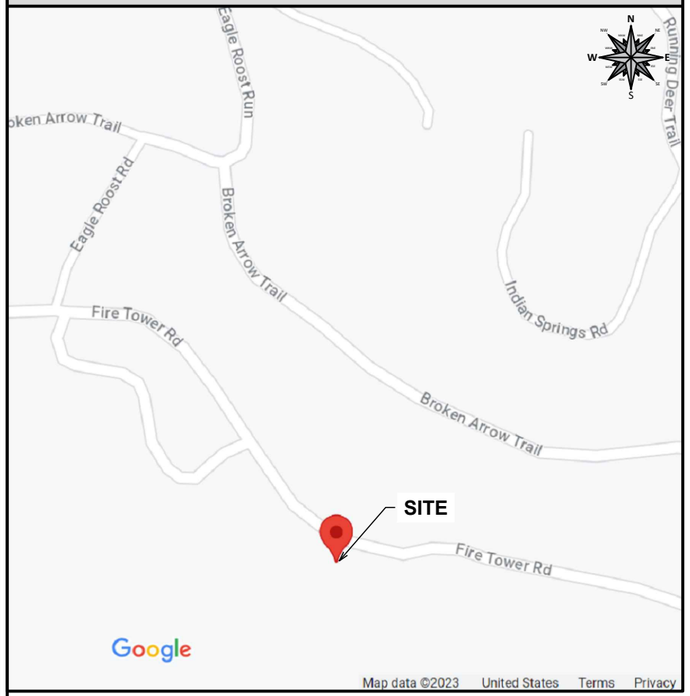
Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from 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.

Appendix B

Site Vicinity and Location Map


Rich Mountain Tower
Watauga County
Legend
36.233064,-81.698689
Feature 1
360
030
060
090
120
150
180
210
240
270
300
330
EXPANDED UPWIND FETCH
36.233064,-81.698689
36.233064,-81.698689
Sands
HILLCREST
PERKINSVILLE
Boone
HODGES GAP
South Fork New Rive
N
1 mi
Google Earth
Image © 2025 Airbus

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

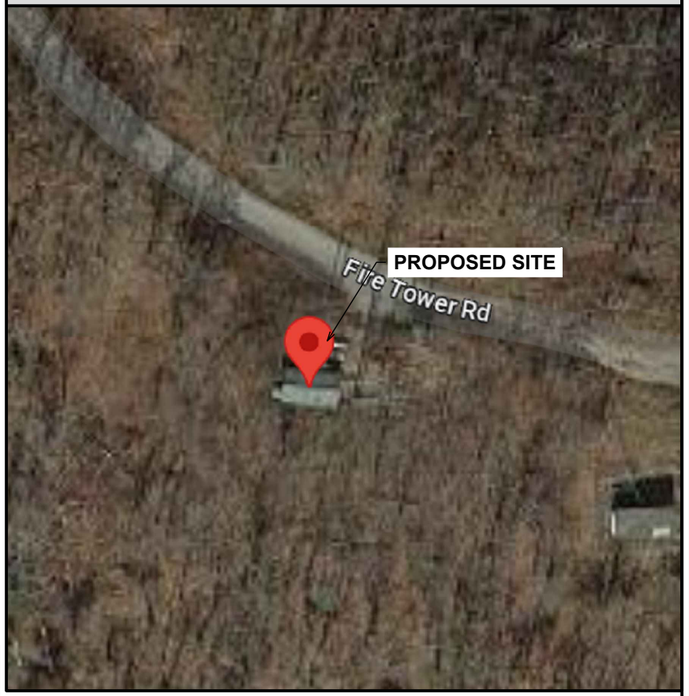
SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

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

INDEX OF SHEETS

T-1	TITLE PAGE
GN-1 TO GN-3	GENERAL NOTES I THRU III
GN-4 TO GN-8	NC APPENDIX B I THRU V
1 OF 1	SURVEY
C-1	OVERALL SITE PLAN
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
E-1	ELECTRICAL NOTES
E-2	ELECTRICAL PLAN
E-3	ELECTRICAL ONE-LINE DIAGRAM
E-4	PANEL SCHEDULES
G-1	GROUNDING PLAN
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):	4667.62'±

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA 1849

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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 80 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.

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	9/6/2023	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: 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

NOT USED

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

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.A.	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.A.	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
GOV'T	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.U.	ON CENTER
O.V.	OUTSIDE DIAMETER
OH	OVERHEAD
OHE	OVERHEAD ELECTRIC
ONUS.	OLD NORTH UTILITY SERVICE
OVH	OVERHANG
P/A	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	SETBACK
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

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

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) 830-1660	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

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.

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

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 ENGINEER SEAL 051707 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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP CHECKED BY: DG

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[1,5]	(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	9'-2 1/2"	2018
Building Height in Stories (Table 504.4)[3]	1	1	2018

1 Provide code reference if the "Show 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 (W/_____* 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

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	9/6/2023	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: DG

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)

2018 NC Administrative Code and Policies Appendix B for Building

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	9/6/2023	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: DG

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: ☐ B ☐ C ☐ D
Provide the following Seismic
Risk Category (Tab ☐ II ☐ III ☐ IV
Spectral Response Ss_____ %g S1_____ %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 _____

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	9/6/2023	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: DG

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*-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)
600 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

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

PREPARED FOR:
CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

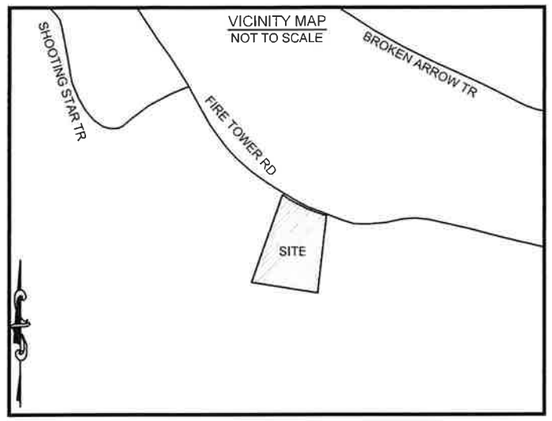
SEAL: FIRM #: P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

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 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 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

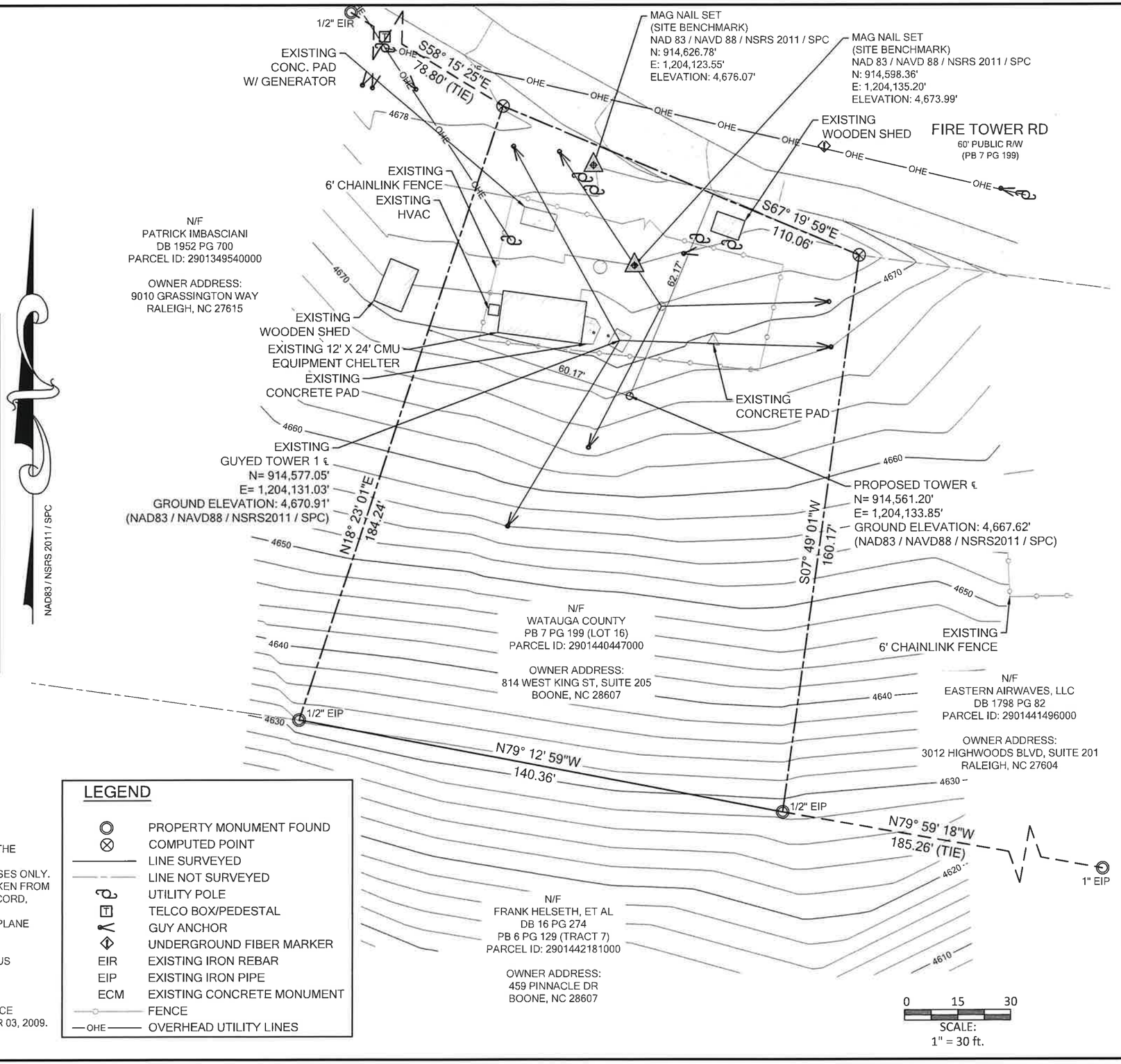
SC 4/18/23

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 3710290100J, 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
T	TELCO BOX/PEDESTAL
	GUY ANCHOR
	UNDERGROUND FIBER MARKER
EIR	EXISTING IRON REBAR
EIP	EXISTING IRON PIPE
ECM	EXISTING CONCRETE MONUMENT
——o——	FENCE
—OHE—	OVERHEAD UTILITY LINES

0 15 30
SCALE:
1" = 30 ft.

BCSC
BATEMAN CIVIL SURVEY COMPANY
Bateman Civil Survey Co, PC
2524 Reliance Ave, Apex, NC 27539
Phone: 919.577.1080 Fax: 919.577.1081
NCBLS FIRM # C-2378

APPLICANT:
ENGINEERED TOWER SOLUTIONS, PLCC
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

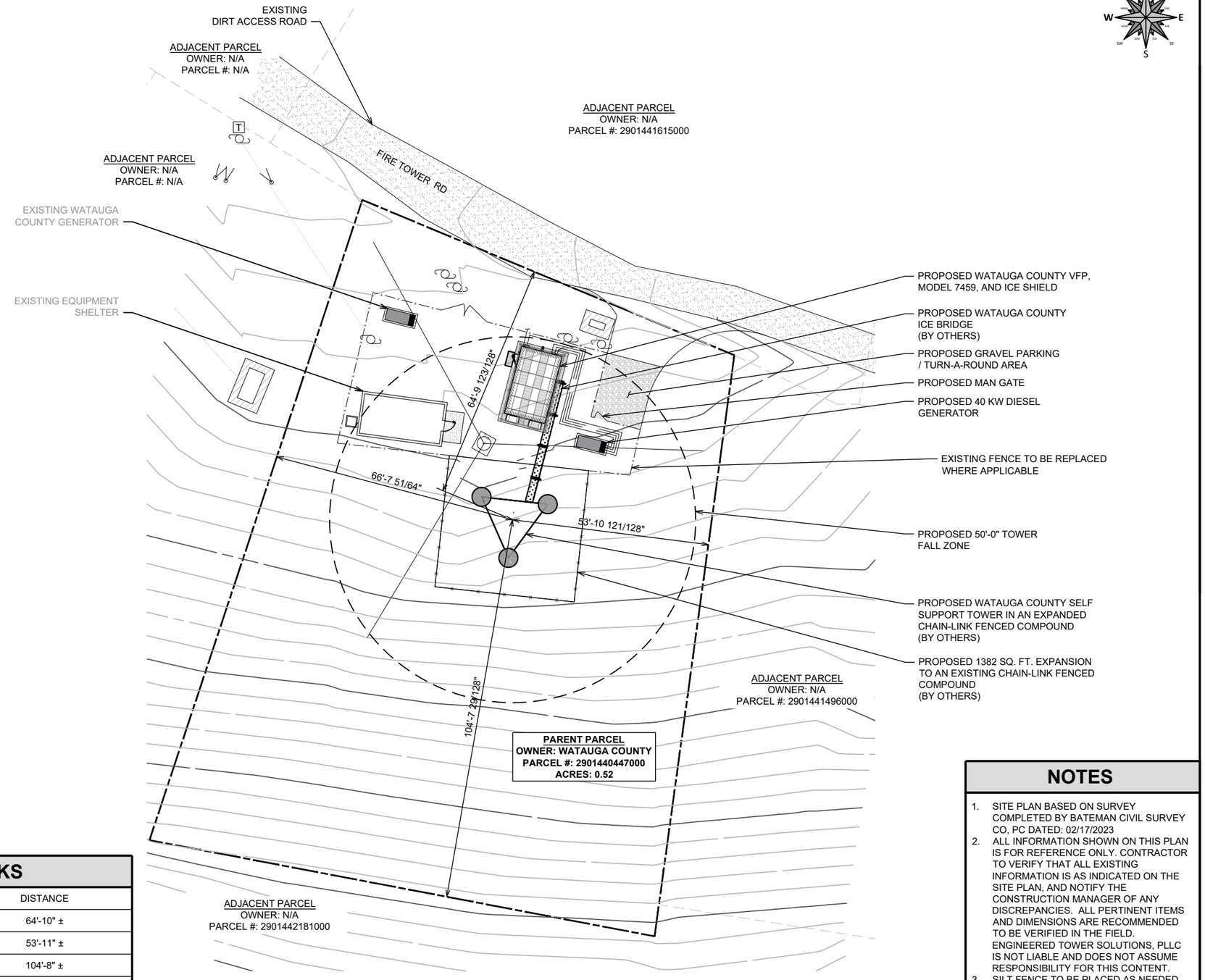
NO.	DATE	DESCRIPTION
1	2/17/2023	REVISED TOWER 1 LOCATION
2	4/17/2023	ADDED PROPOSED TOWER LOCATION PER ZDS PROVIDED BY CLIENT

DATE OF SURVEY: 01/05/2023

BCSC JOB # 220627

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'-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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

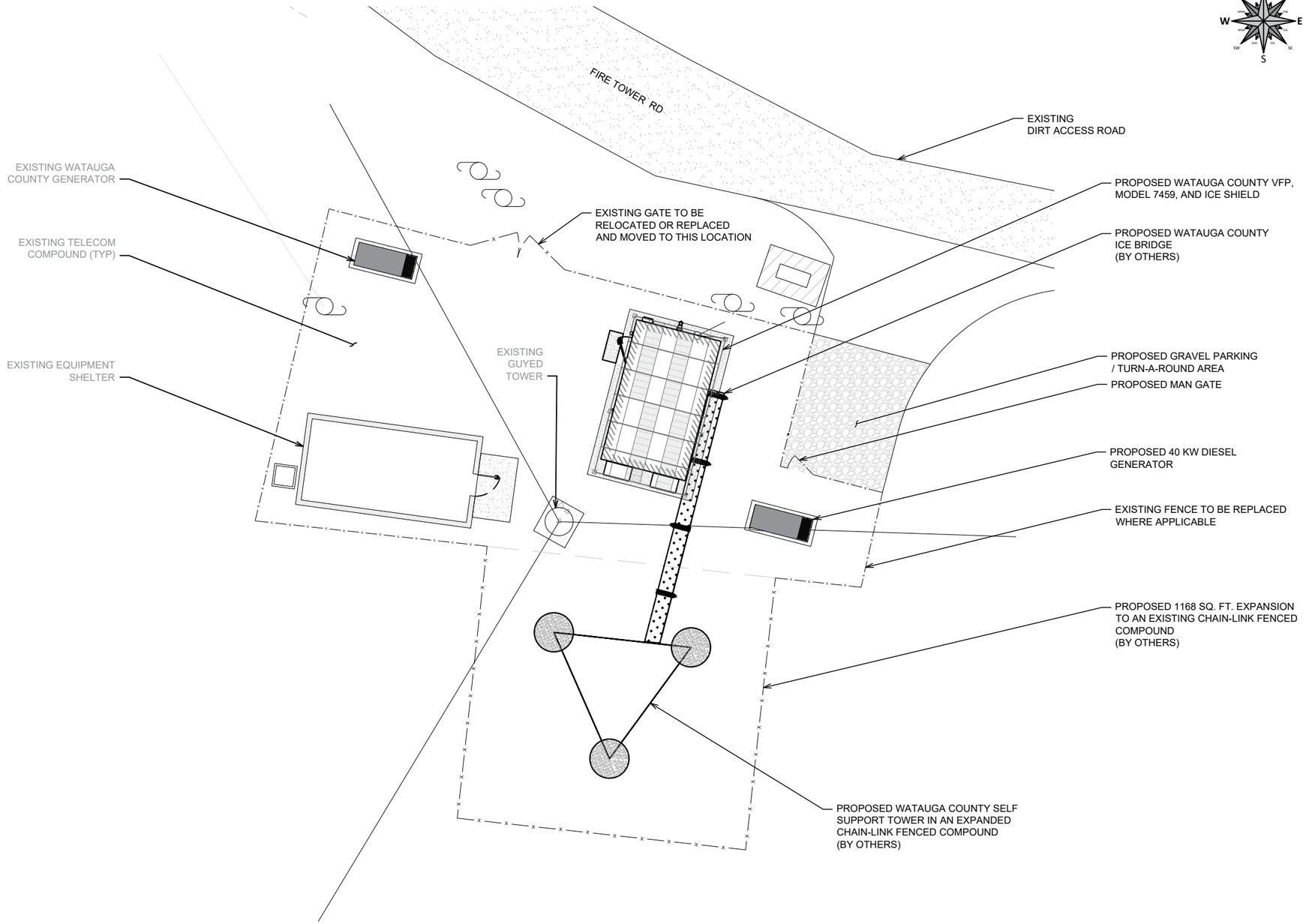
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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-pllc.com

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

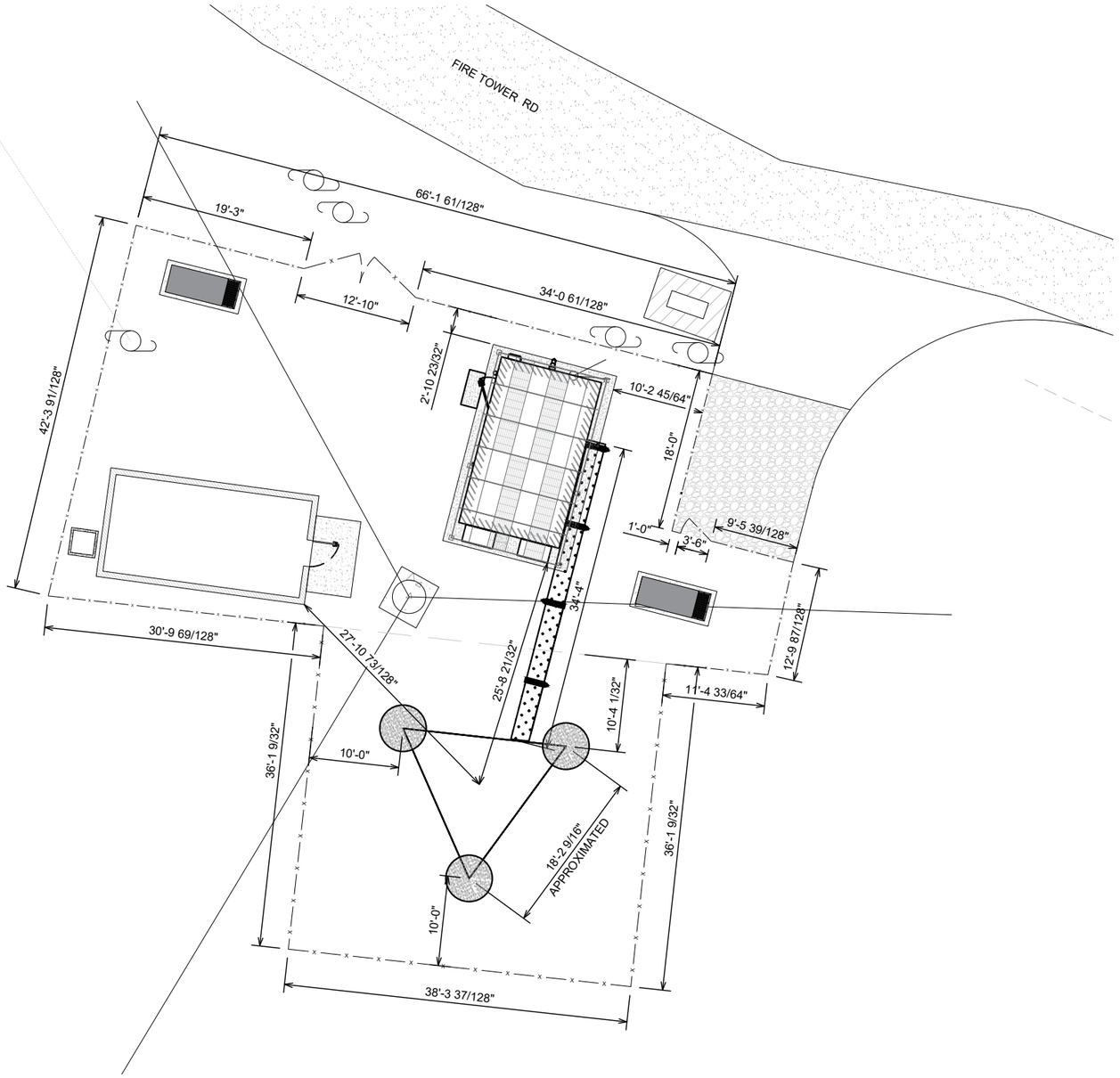
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

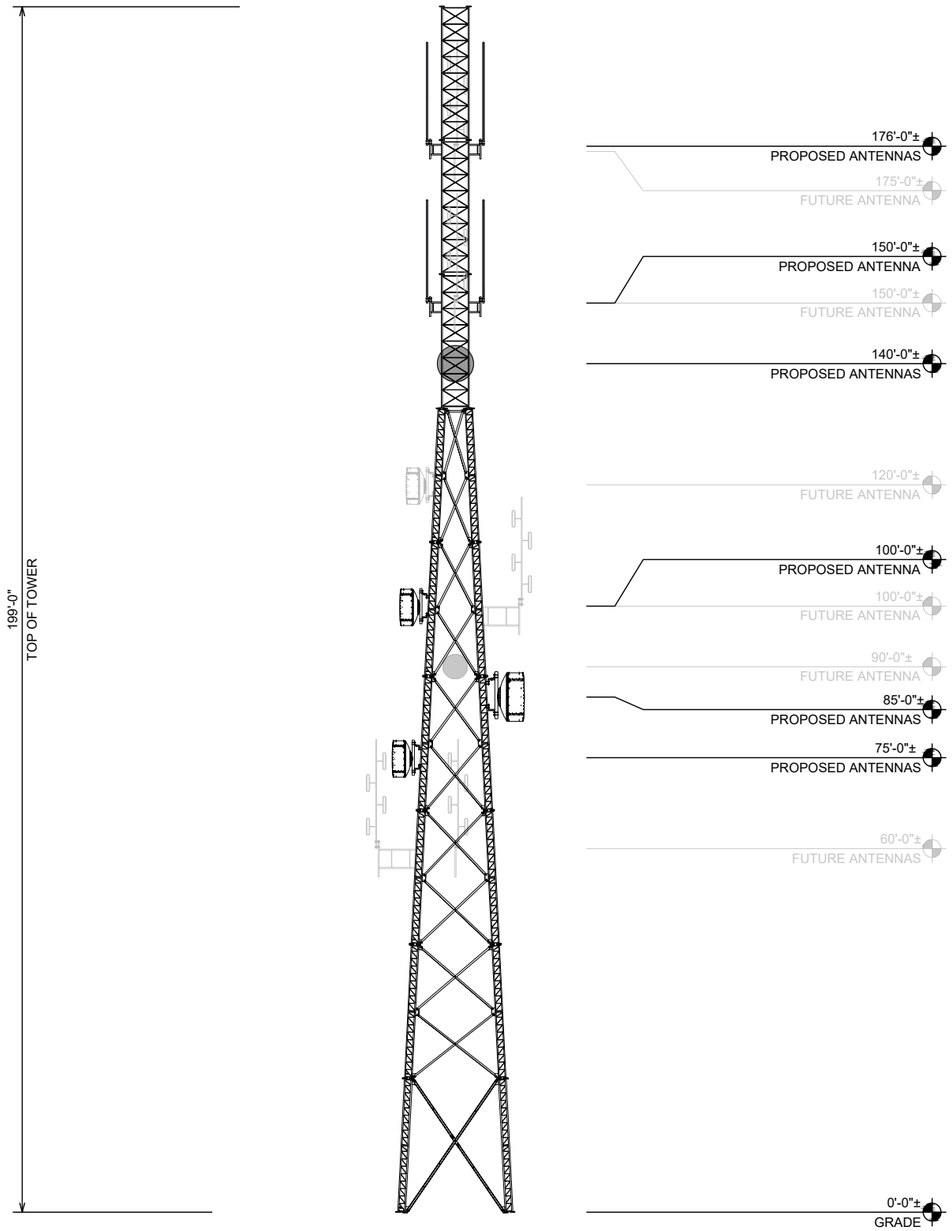
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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	--	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"	--	--
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	175'-0"	C	(1) 7/8"
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"
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	150'-0"	C	(1) 7/8"
WATAUGA COUNTY	1	-	DISH TO BUCKEYE	COMMSCOPE - HX6-6W-6WH	318°	140'-0"	C	(1) EU63
WATAUGA COUNTY (FUTURE)	1	-	DISH	COMMSCOPE - HX8-6W-WH	--	120-0"	B	(1) EU63
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	100'-0"	A	(1) 7/8"
WATAUGA COUNTY	1	-	DISH TO WATAUGA CO TRAN. STA.	COMMSCOPE - HX6-6W-6WH	104°	100'-0"	B	(1) EU63
WATAUGA COUNTY (FUTURE)	1	-	DISH	4" MICROWAVE DISH	--	90'-0"	C	(1) EU63
WATAUGA COUNTY	1	-	DISH TO PHEONIX	COMMSCOPE - HX8-6W-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
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	60'-0"	B	(1) 7/8"
WATAUGA COUNTY (FUTURE)	1	-	DIPOLE	DECIBEL - DB220	--	60'-0"	C	(1) 7/8"

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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

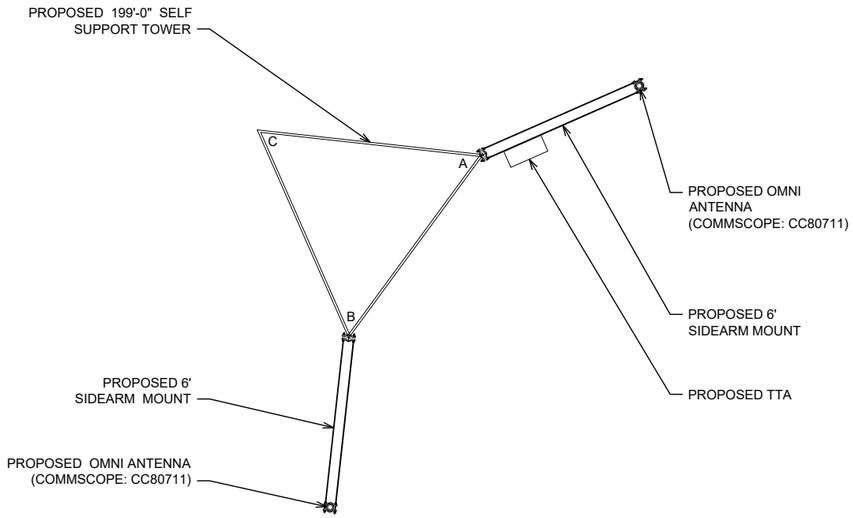
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

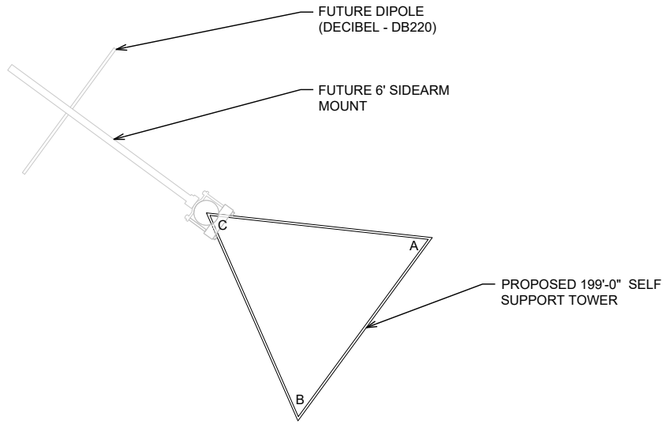
ANTENNA SCHEDULE

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



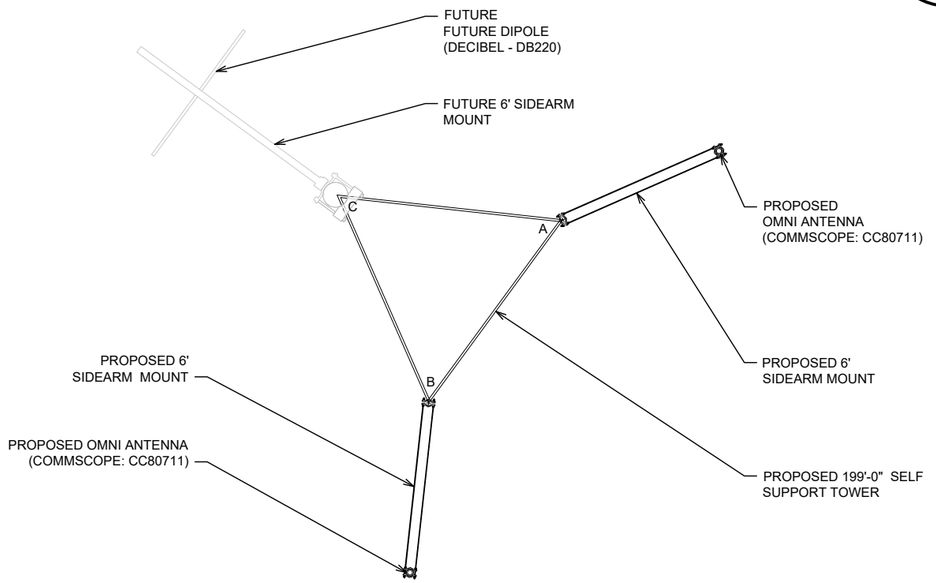
ANTENNA LAYOUT @ 176'

3/16" = 1'-0"



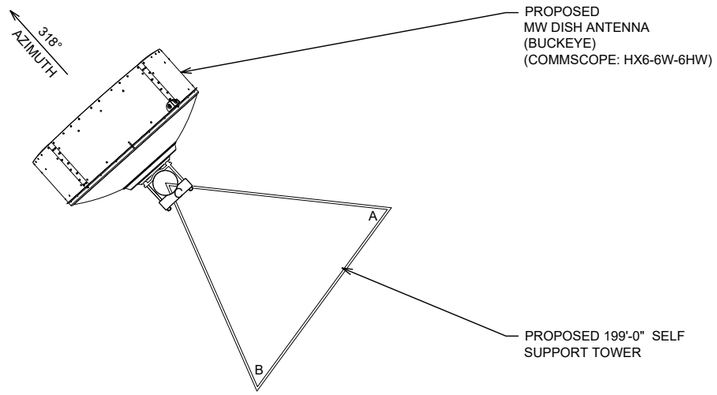
ANTENNA LAYOUT @ 175'

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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA 1849

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 ENGINEER SEAL 051707 PAUL A. BRIDGES

04/15/2025

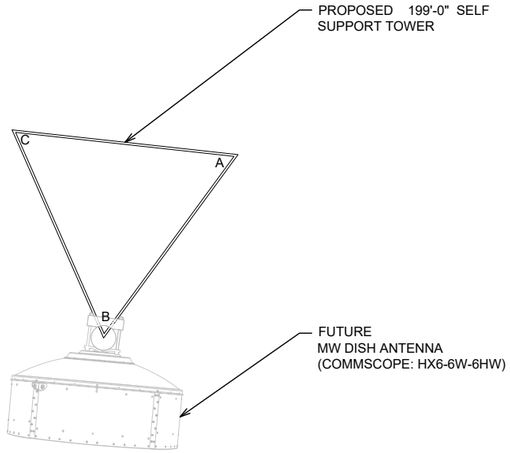
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP	CHECKED BY: DG

SHEET TITLE:

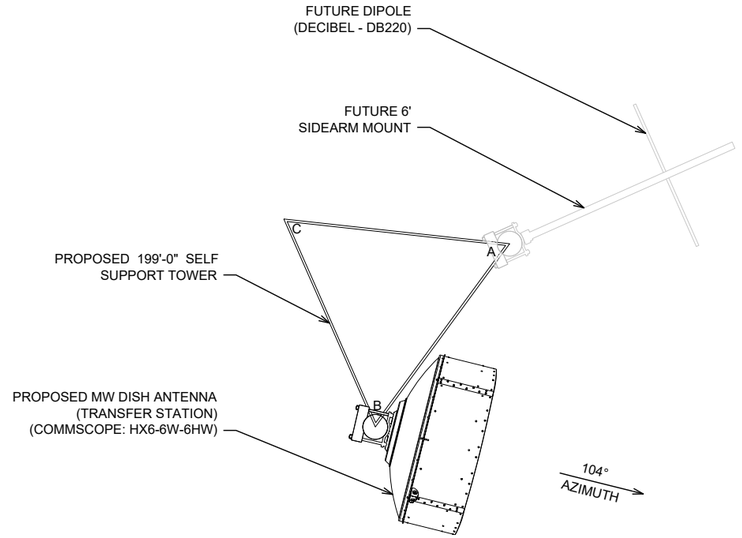
ANTENNA LAYOUTS

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



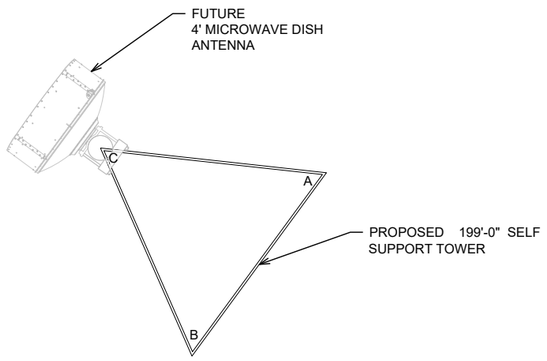
ANTENNA LAYOUT @ 120'

3/16" = 1'-0"



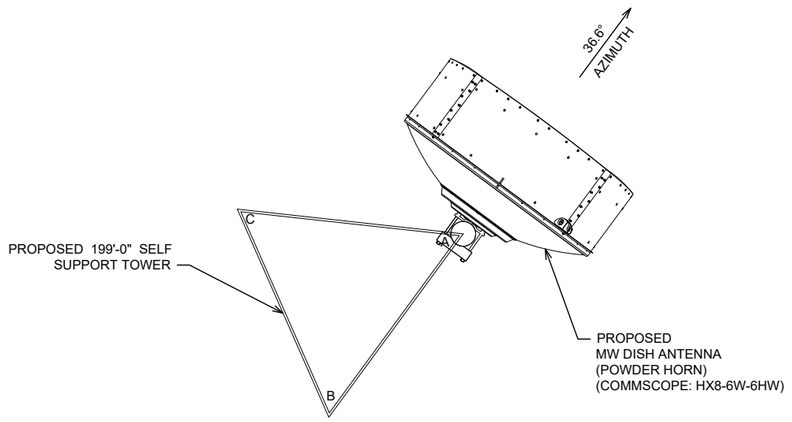
ANTENNA LAYOUT @ 100'

3/16" = 1'-0"



ANTENNA LAYOUT @ 90'

3/16" = 1'-0"



ANTENNA LAYOUT @ 85'

3/16" = 1'-0"

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

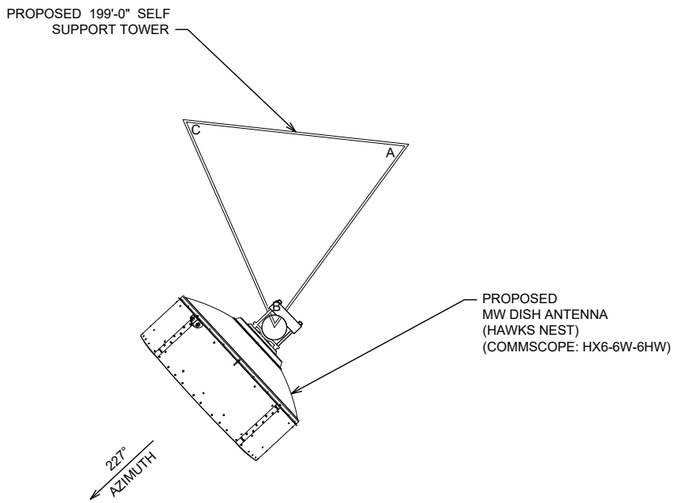
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

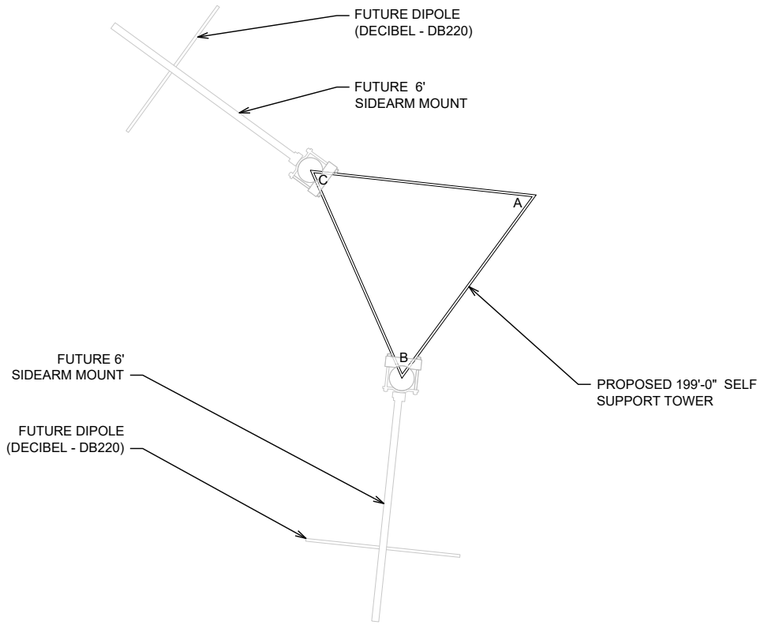
ANTENNA LAYOUTS

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



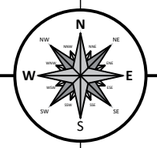
ANTENNA LAYOUT @ 75'

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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

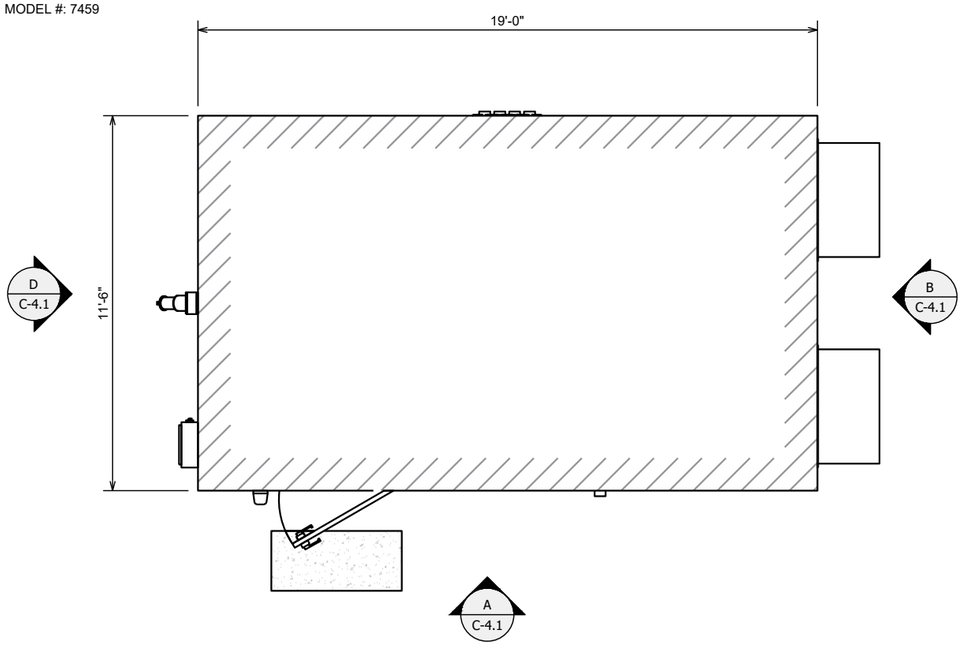
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

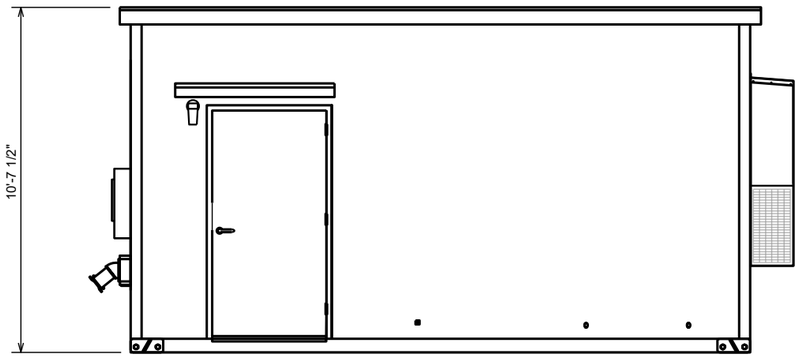
ANTENNA LAYOUTS

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

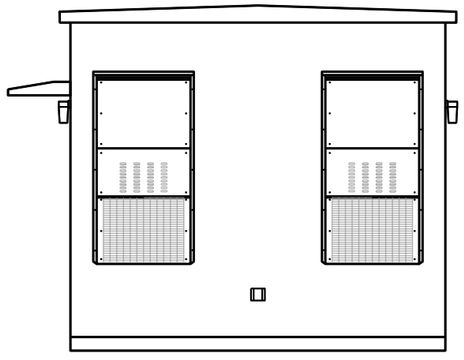
VFP: 11'-6" x 19'-0"
- PREFABRICATED SHELTER
- MODEL #: 7459



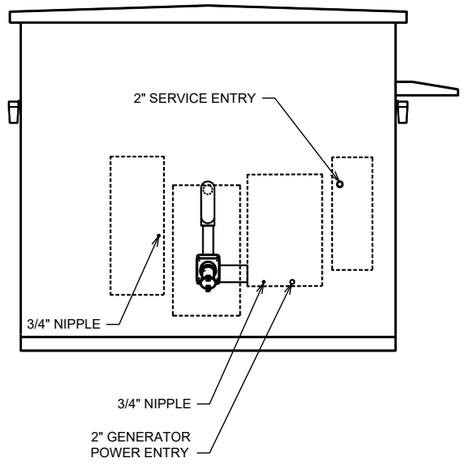
PLAN VIEW
N.T.S.



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:
CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

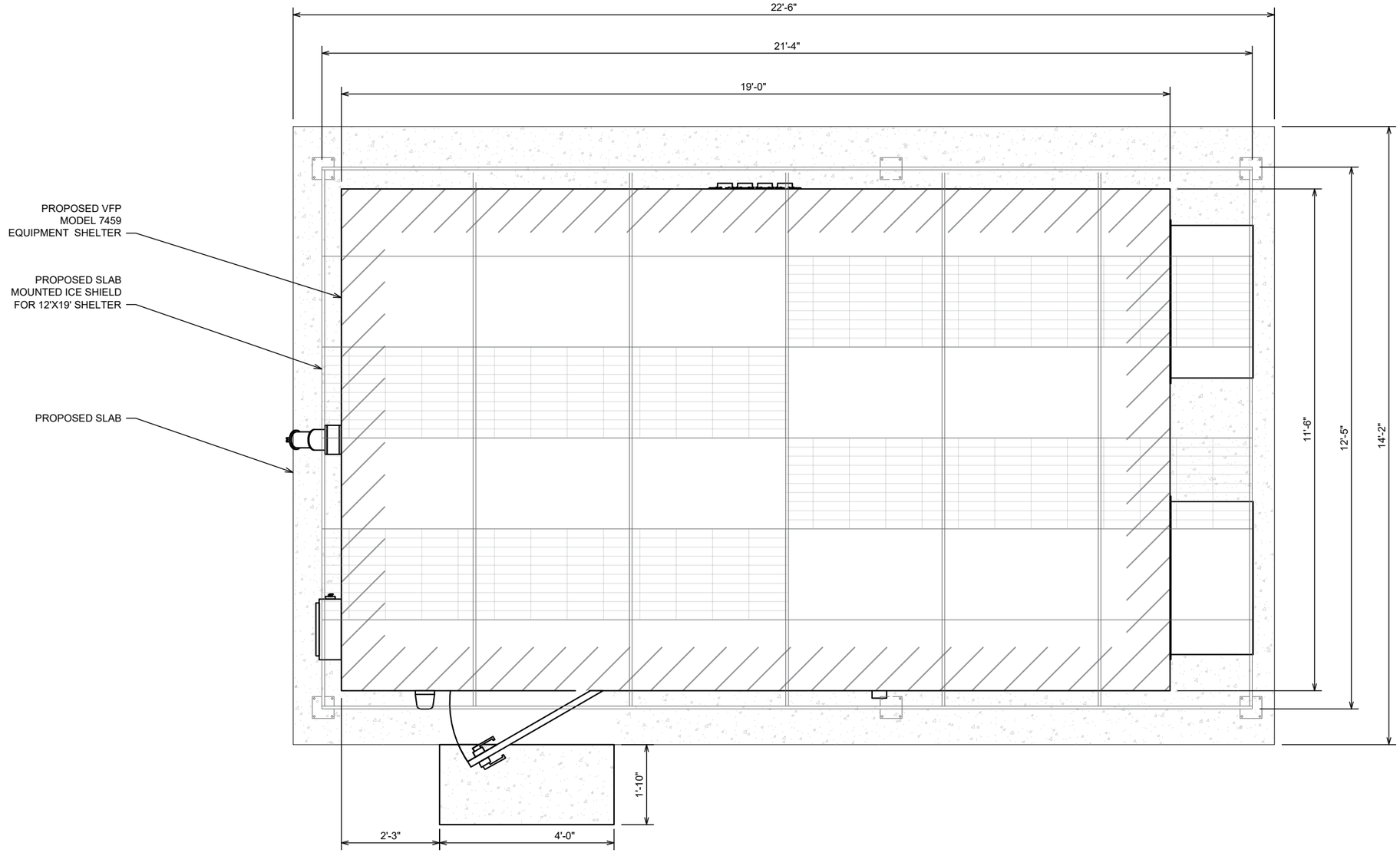
SEAL: FIRM #: P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

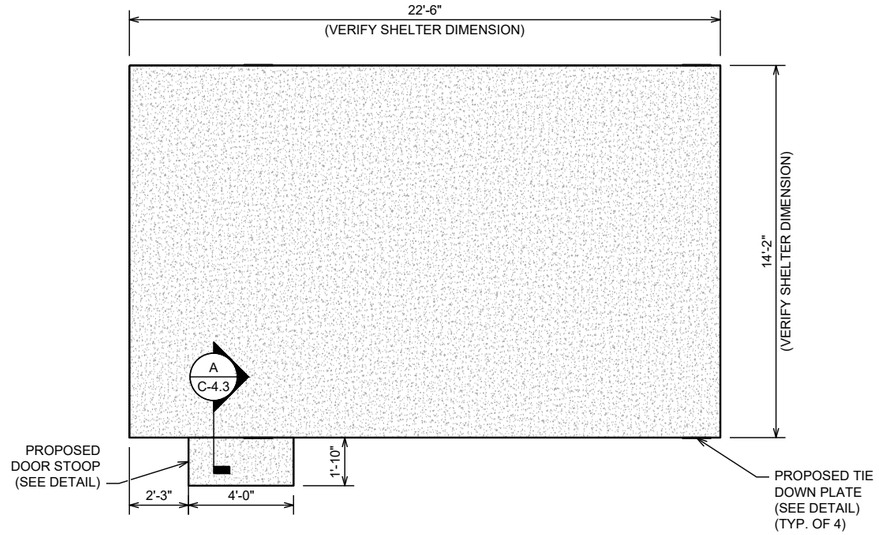
DRAWN BY: CP	CHECKED BY: DG

SHEET TITLE:

SHELTER & ICE SHIELD DETAILS

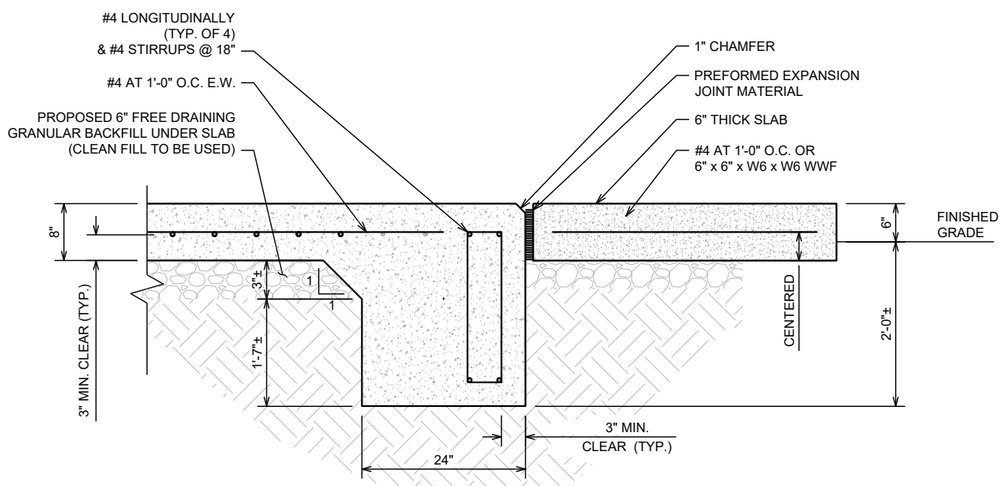
SHEET # C-4.2	CURRENT REV #: 3
	ETS #: 22110700

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
N.T.S.

NOT USED
N.T.S.



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:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

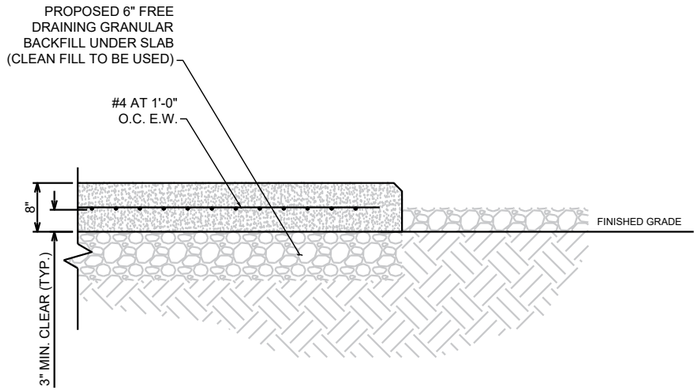
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP	CHECKED BY: DG

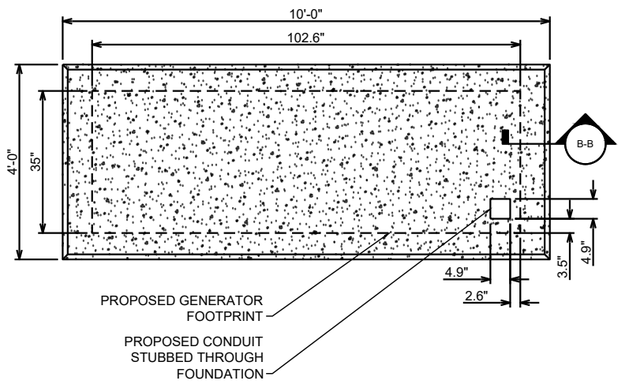
SHEET TITLE:

SHELTER FOUNDATION DETAILS

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

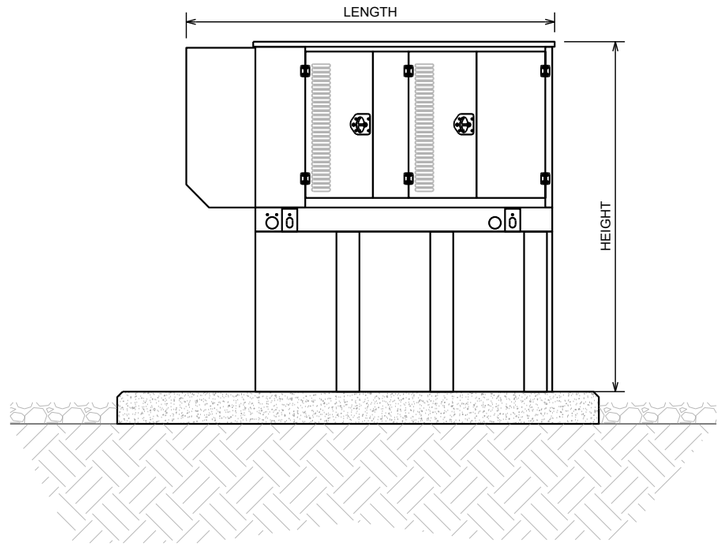


SECTION B-B



GENERAC - SD050
- DIESEL GENERATOR
- STANDARD ENCLOSURE
- 510 GALLON TANK

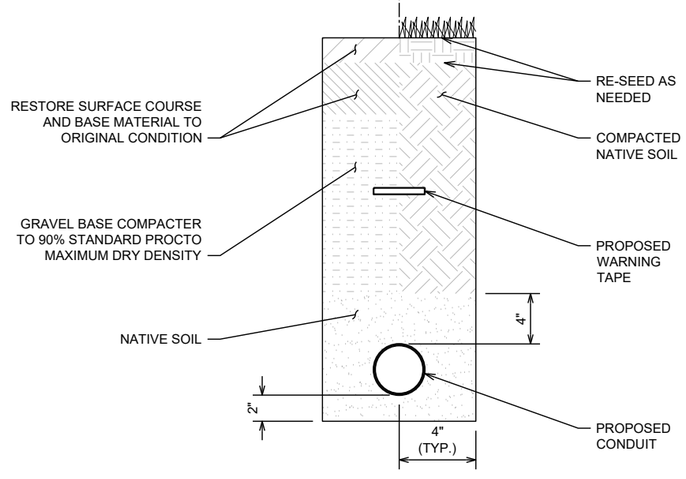
HEIGHT	WIDTH	DEPTH	WEIGHT
93.00"	47.00"	117.00"	3663 LBS



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.

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

PREPARED FOR:
CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

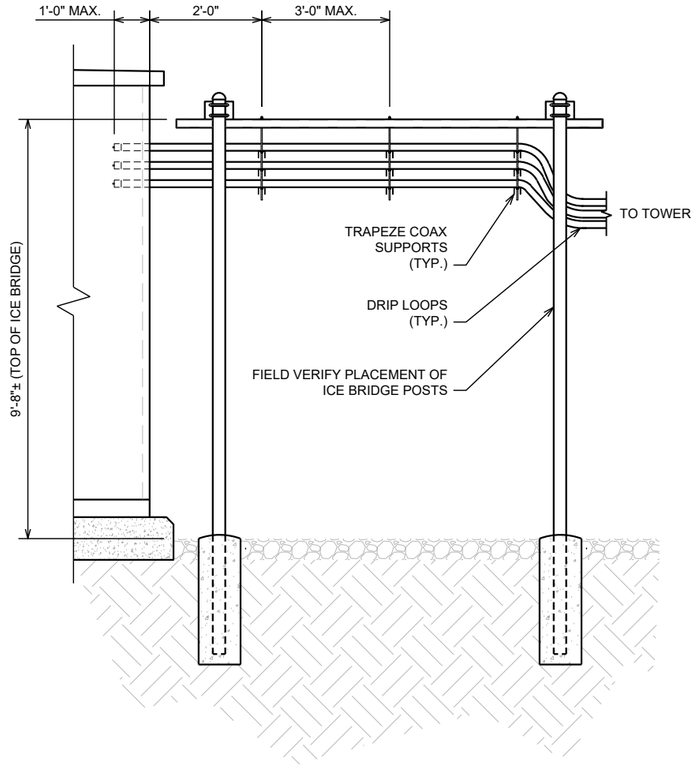
SEAL: FIRM #: P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

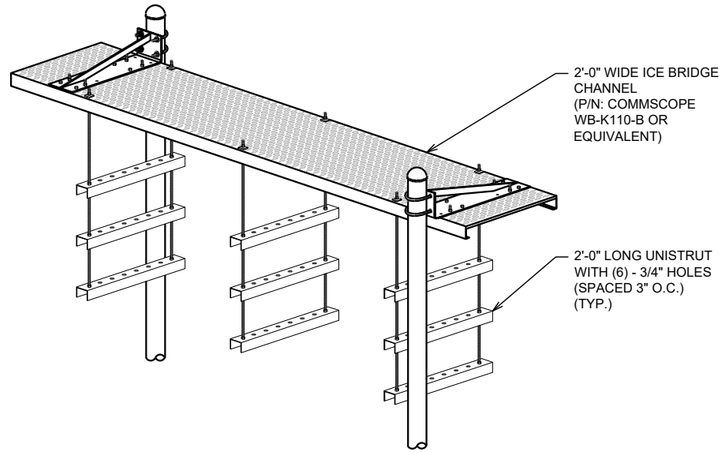
SHEET TITLE:
GENERATOR AND GEN. FOUNDATION DETAILS

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



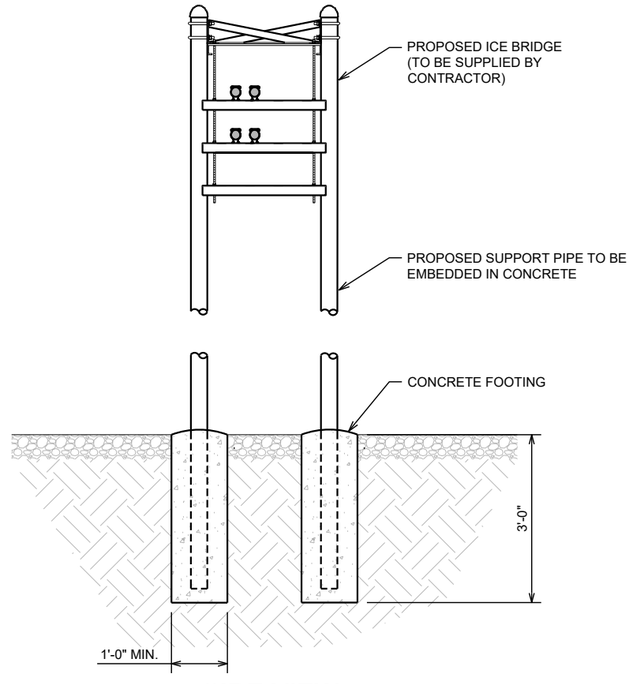
ICE BRIDGE DETAIL

N.T.S.



ISOMETRIC VIEW

N.T.S.



SIDE VIEW

N.T.S.

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

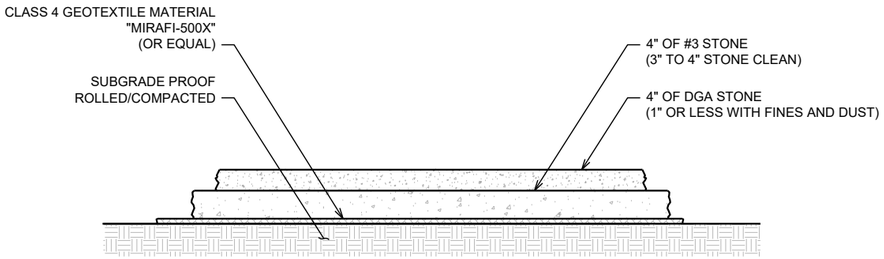
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

ICE BRIDGE DETAILS

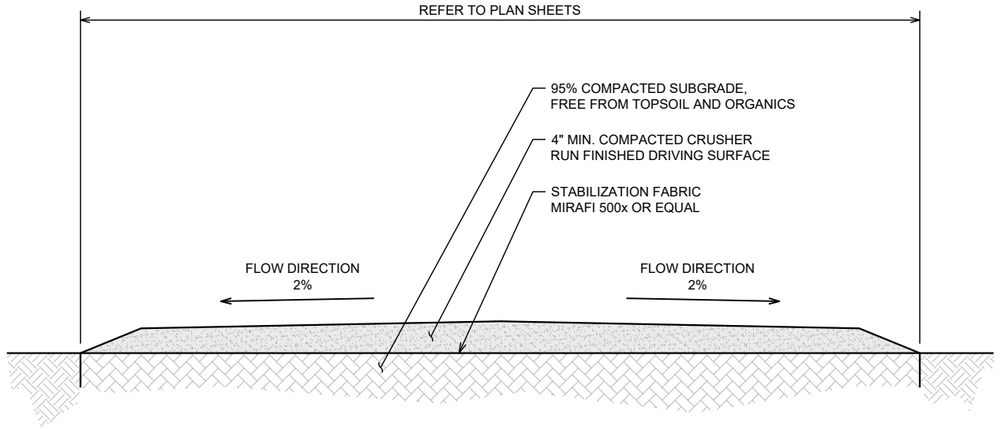
SHEET # **C-4.5** | CURRENT REV #: **3** | ETS #: 22110700

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 PROPES 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.

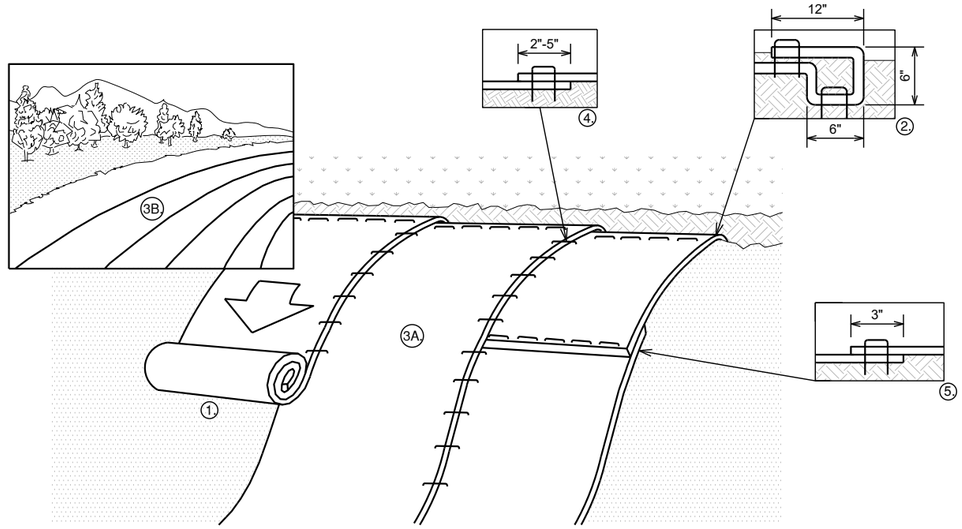


COMPOUND SURFACING
N.T.S.

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.

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

PREPARED FOR:
CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

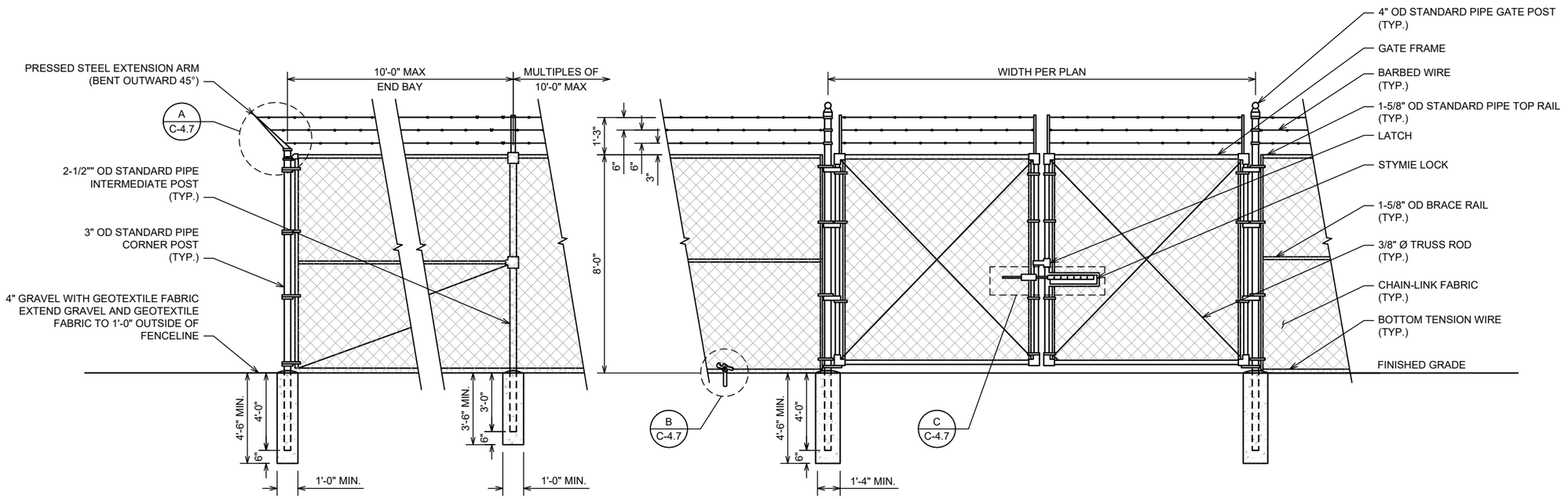
SEAL: FIRM #: P-1016
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

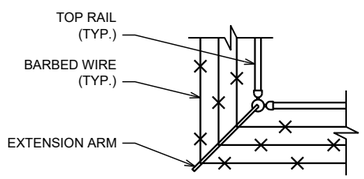
SHEET TITLE:
SURFACE & SLOPE DETAILS

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

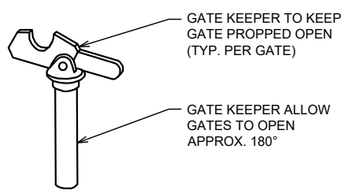


FENCE & DOUBLE SWING GATE DETAIL

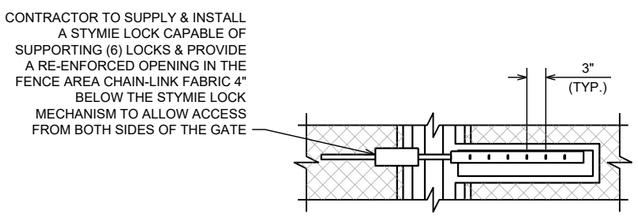
N.T.S.



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 8'-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.

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

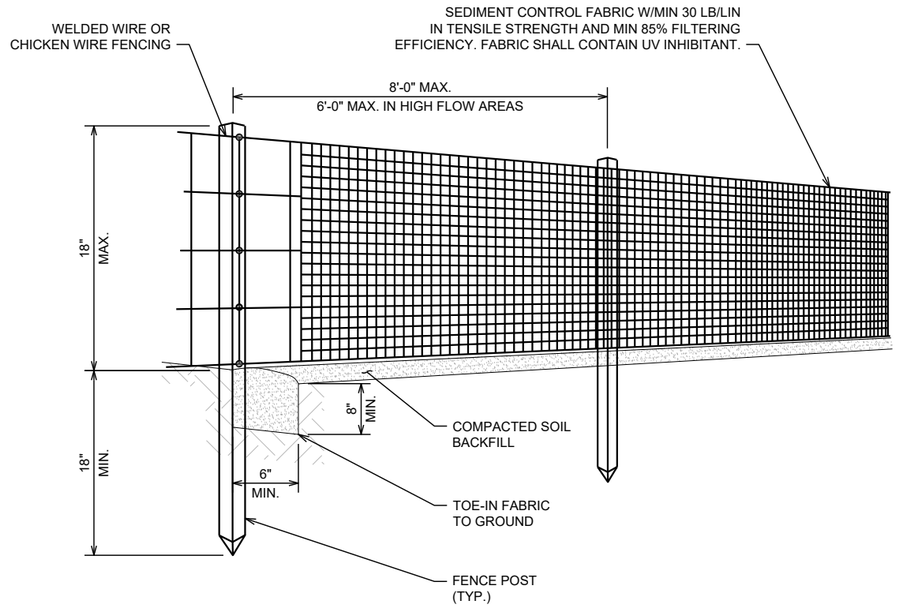
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:
FENCE DETAILS

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

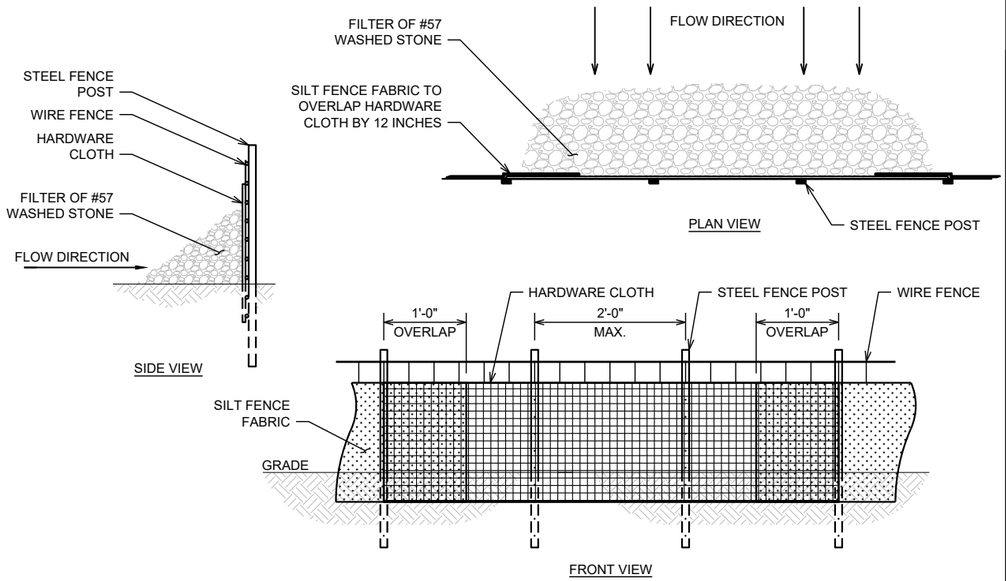
NOTES:
- SEE SILT FENCE NOTES



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 6 INCHES.



TEMPORARY SILT FENCE OUTLET

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.

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 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.

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

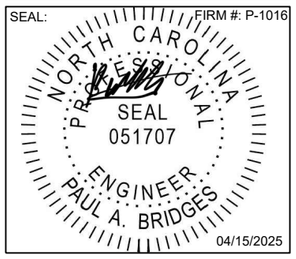
PREPARED FOR:

SITE NAME:
RICH MOUNTAIN TOWER

SITE ADDRESS:
759 FIRE TOWER ROAD
BOONE, NC 28607

LATITUDE/LONGITUDE:
36.2330639°, -81.6986889°

SEAL: FIRM #: P-1016



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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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-pllc.com

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

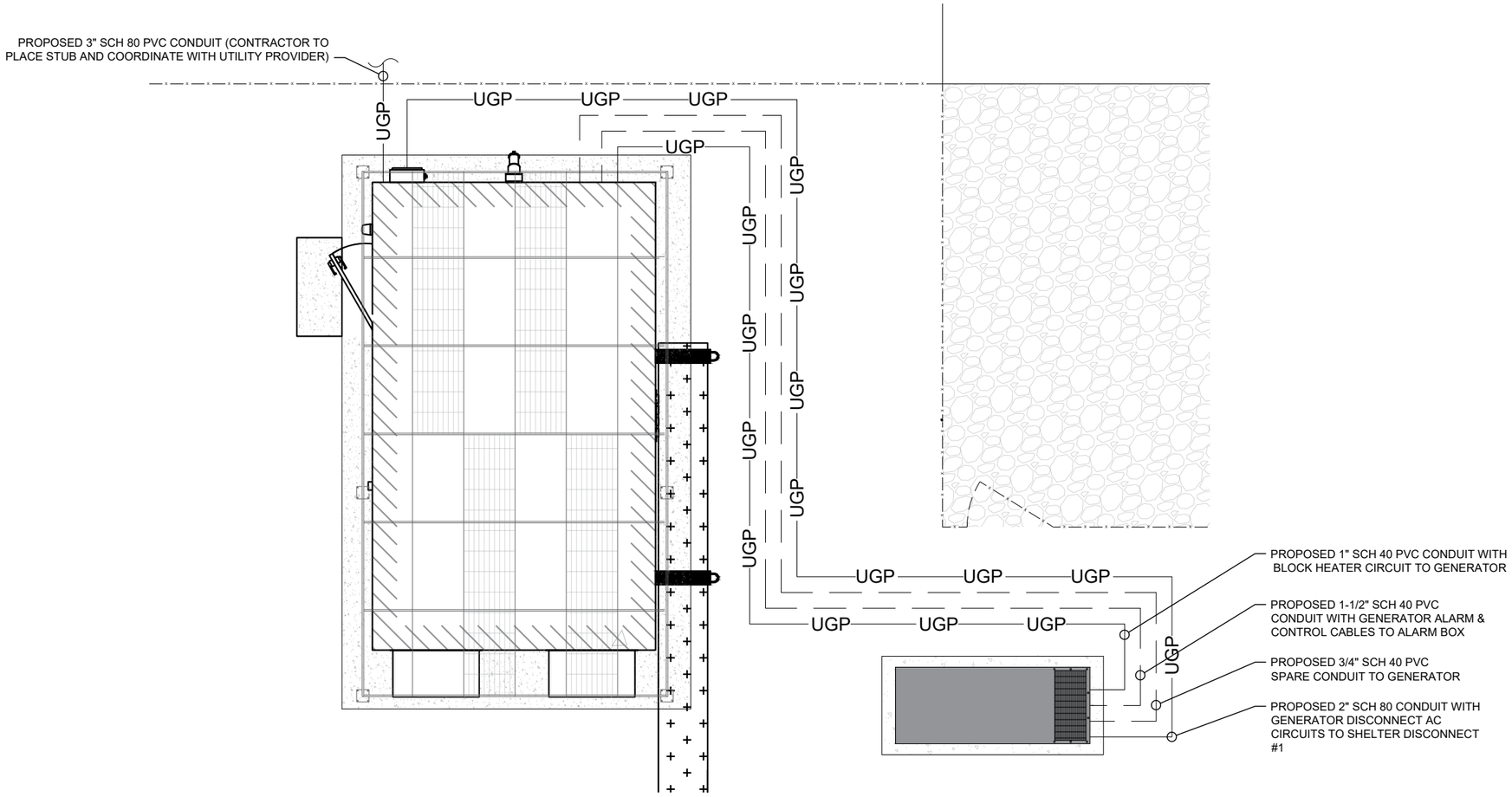
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

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:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

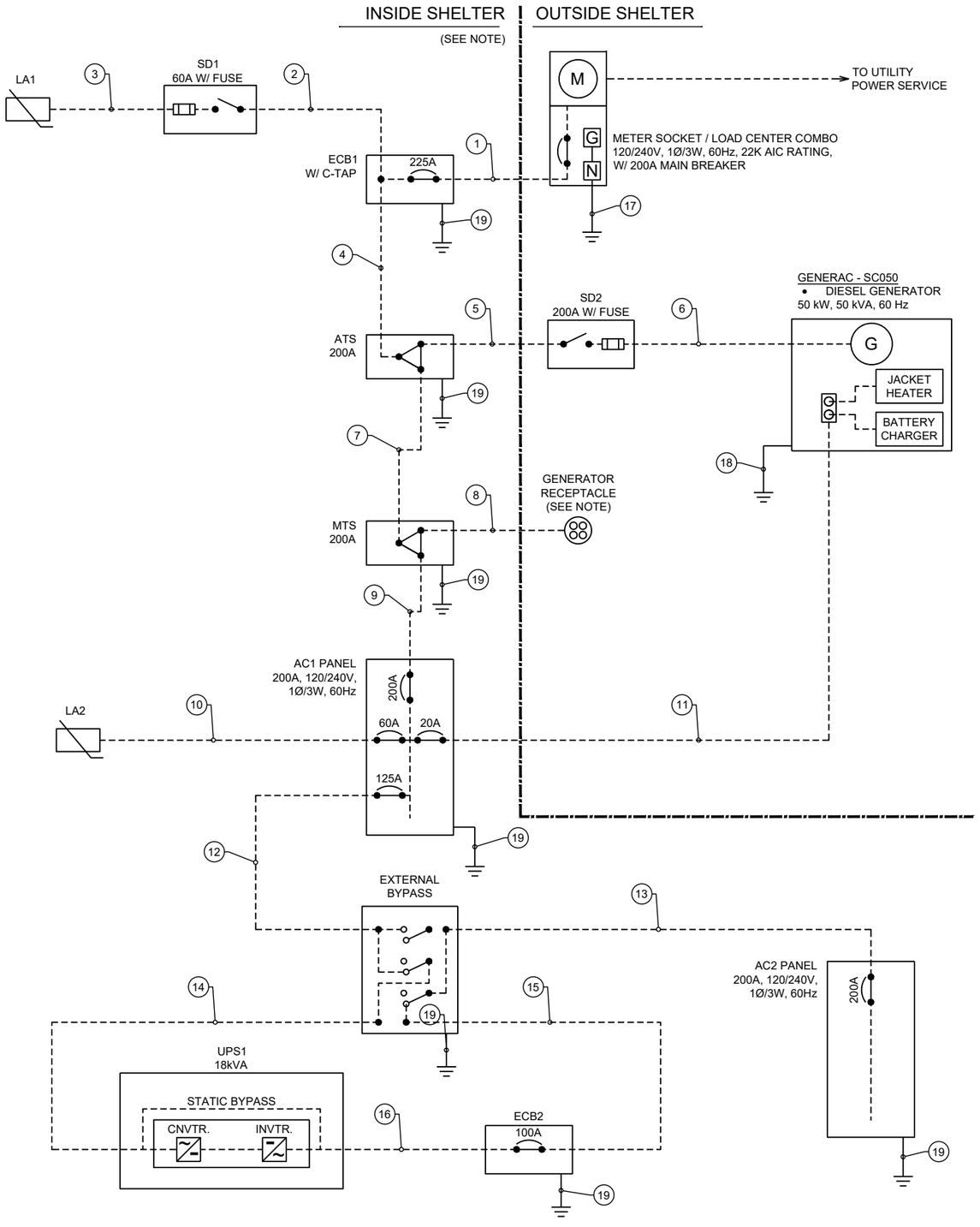
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

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:

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	9/6/2023	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: 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	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	**EMERCENCY / 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	16.6	**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 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-pllc.com

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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

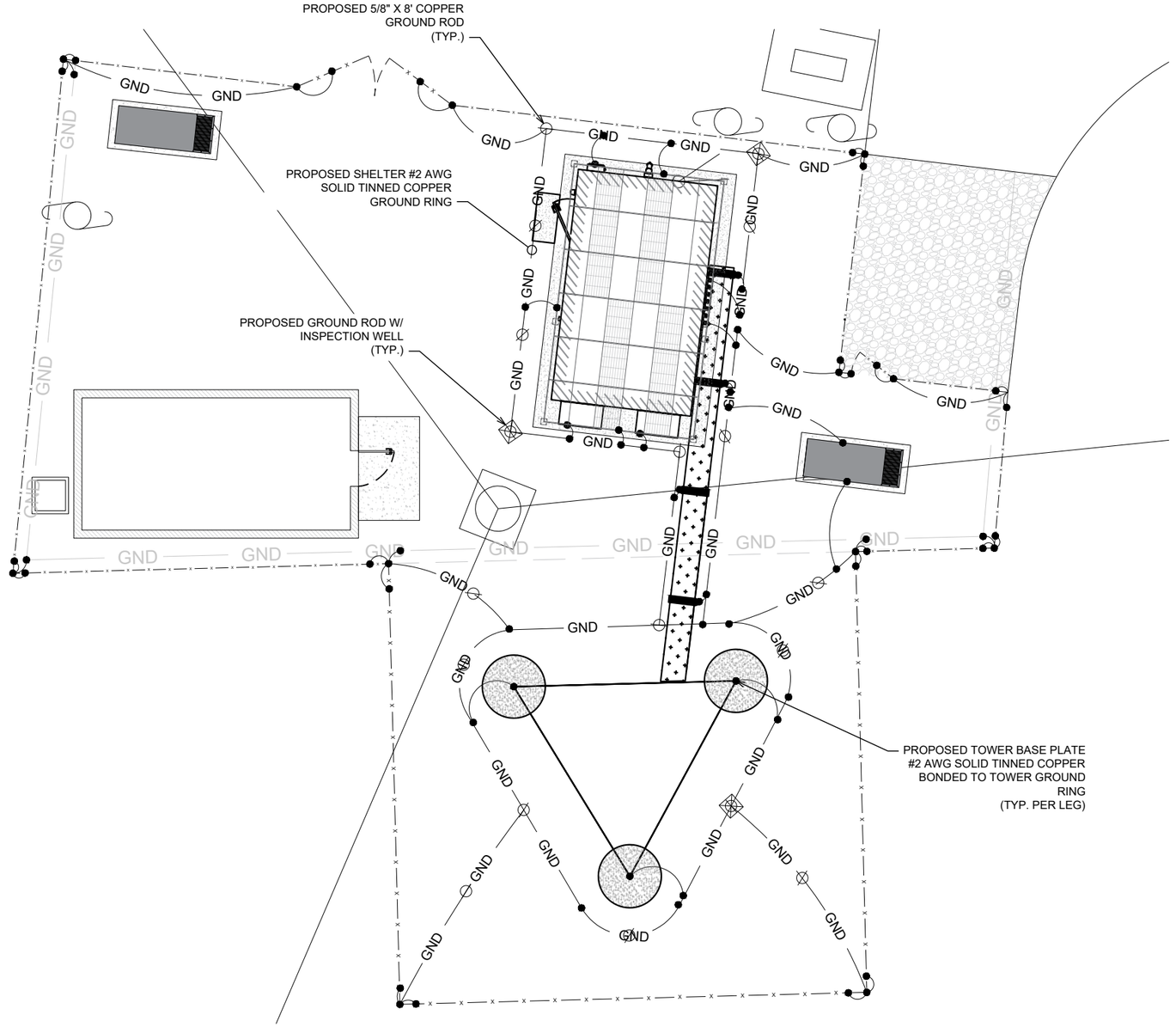
REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	REV. CONSTRUCTION
2	4/2/2025	REV. CONSTRUCTION
3	04/15/2025	REV. CONSTRUCTION
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

PANEL SCHEDULES

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



GROUNDING SYMBOLS:

- GROUND ROD
- GROUND ROD W/ INSPECTION WELL
- CADWELD
- MECHANICAL

GROUNDING PLAN

3/32" = 1'-0"

PREPARED BY:

ENGINEERED TOWER SOLUTIONS

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

PREPARED FOR:

CORPORATE SEAL OF WATAUGA COUNTY NORTH CAROLINA

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
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

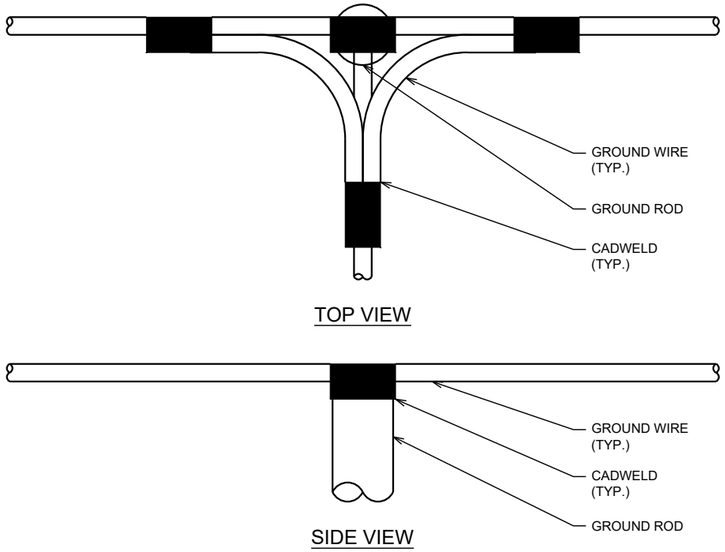
DRAWN BY: CP | CHECKED BY: DG

SHEET TITLE:

GROUNDING PLAN

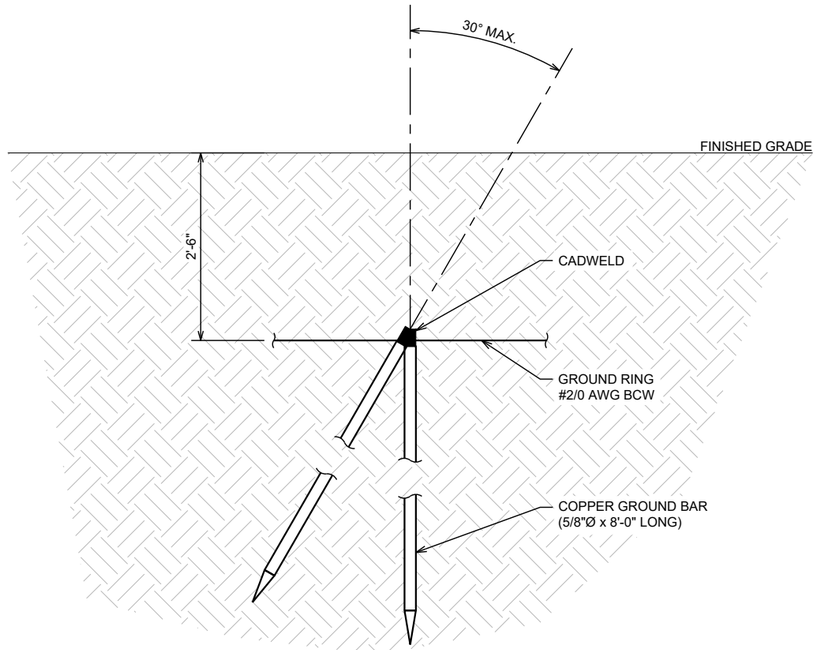
SHEET # **G-1** | CURRENT REV #: **3** | ETS #: 22110700

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



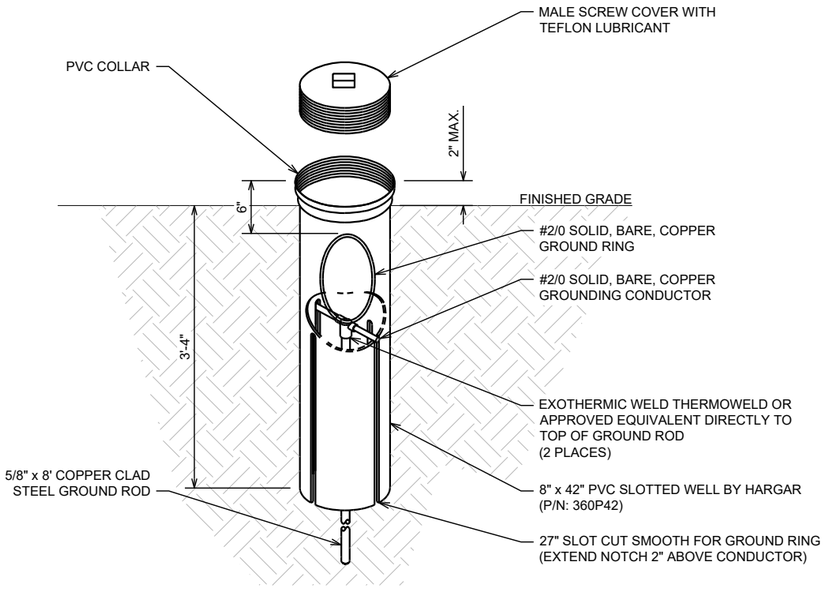
CADWELD GROUNDING DETAIL

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:
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

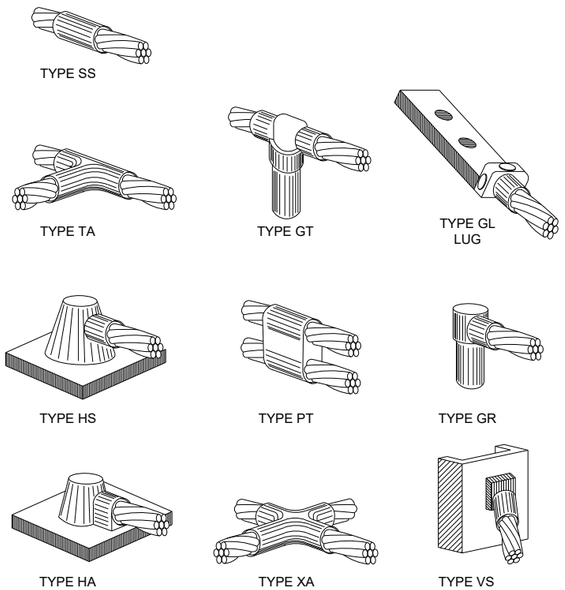
NORTH CAROLINA PROFESSIONAL SEAL 051707 ENGINEER PAUL A. BRIDGES
04/15/2025

REV	DATE	DETAILS
0	07/14/2023	CONSTRUCTION
1	9/6/2023	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: DG

SHEET TITLE:
GROUNDING DETAILS I

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

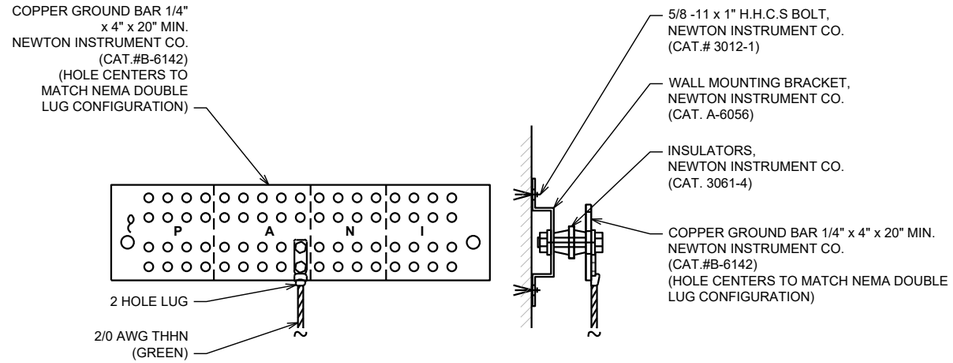


STANDARD CADWELD DETAILS

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
- PANI 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:

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	9/6/2023	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: 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

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.

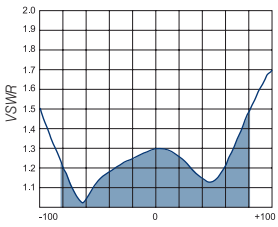
The true corporate feed of these arrays maintains total pattern integrity over a very broad operating and width, similar to that previously available only in exposed dipole configurations. This is now achieved in the preferred from factor of a fully enclosed fiberglass radome. The corporate collinears 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.

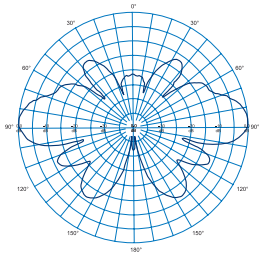
Features:

- 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.

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 **Longitude** **36- 13- 58.8 N** **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.

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

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