STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION OF CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS FOR A DECLARATORY RULING ON THE NEED TO OBTAIN A SITING COUNCIL CERTIFICATE FOR THE MODIFICATION OF AN EXISTING TELECOMMUNICATIONS FACILITY AT 194 MOUNT PARNASSUS ROAD, EAST HADDAM, CONNECTICUT	:	PETITION NO. ____
	:	FEBRUARY 22, 2024

PETITION FOR A DECLARATORY RULING:
INSTALLATION HAVING NO
SUBSTANTIAL ADVERSE ENVIRONMENTAL EFFECT

I. Introduction

Pursuant to Sections 16-50j-38 and 16-50j-39 of the Regulations of Connecticut State Agencies ("R.C.S.A."), Cellco Partnership d/b/a Verizon Wireless ("Cellco") (collectively the "Petitioners") hereby petitions the Connecticut Siting Council (the "Council") for a declaratory ruling ("Petition") that no Certificate of Environmental Compatibility and Public Need ("Certificate") is required under Section 16-50k(a) of the Connecticut General Statutes ("C.G.S.") to modify the existing wireless telecommunications facility at 194 Mount Parnassus Road (Route 434) in East Haddam, Connecticut. The proposed facility modifications involve a 40-foot extension of the existing 121-foot lattice tower and the installation of Cellco's antennas and remote radio heads at the 146-foot level of the extended tower. Cellco's radio equipment, a battery cabinet and a diesel-fuel back-up generator would be installed on the ground adjacent to the tower and within the existing fenced compound. If approved, the modified facility would allow Cellco to provide its customers and emergency service providers with enhanced wireless services in central portions of East Haddam, in areas unserved or underserved today. Cellco has identified this cell site as its "East Haddam 3 Facility".

II. Factual Background

On February 19, 2015, the Siting Council approved Petition No. 1130, a request by the State of Connecticut ("State") Department of Emergency Services and Public Protection ("DESPP") to replace the existing 120-foot monopole tower with a new 120-foot lattice tower at 194 Mount Parnassus Road (Route 434) in East Haddam (the "Property"). (*See* Petition No. 1130 Staff Report included in Attachment 1). The Property is owned by the State and is used for emergency communications purposes. An existing paved access driveway extends from Mount Parnassus Road to the existing communications facility. (*See* Site Aerial Photograph included in Attachment 2).

The existing tower is shared by the DESPP and the Town of East Haddam with antennas located at various levels. Radio equipment associated with the existing antennas is located in an equipment shelter near the base of the tower.

Cellco is licensed to provide wireless telecommunications services in the 700 MHz, 850 MHz, 1900 MHz, 2100 MHz, 3550 MHz, 3600 MHz, and 3700 MHz (5G) frequency ranges in East Haddam and throughout the State of Connecticut. Cellco's wireless service in central portions of East Haddam is currently provided by four (4) existing macro-cell facilities, identified as *Salem CT*, a tower at 399 West Road in Salem, CT; *Chester*, a tower at 49 Wig Hill Road in Chester, CT; *East Haddam* CT, a tower at 135 Honey Hill Road in East Haddam; and *East Haddam 2* CT, a tower at 33 Neptune Avenue in Moodus (East Haddam), CT. Coverage Plots showing the extent of wireless service from these existing cell sites in Cellco's 700 MHz "base" frequencies alone, and together with service from the proposed East Haddam 3 Facility are included in Attachment 3. As indicated on these plots, Cellco currently provides little or no reliable wireless service along significant portions of Routes 434 (Mount Parnassus Road) and local roads in the surrounding area in its 700 MHz operating frequencies. The proposed East Haddam 3 Facility would allow Cellco to fill these gaps, improve wireless service in the area overall and also provide some capacity relief to its adjacent Salem cell site.

III. Proposed East Haddam 3 Facility Modifications

To accommodate Cellco's need for improved wireless services in the area, Cellco proposes to extend the existing lattice tower by 40-feet. If approved, Cellco will install twelve (12) antennas and remote radio heads ("RRHs") on the extended tower at a centerline height of 146 feet above ground level. Cellco would install an equipment cabinet, a battery cabinet and diesel-fueled back-up generator all on the ground adjacent to the tower, within the existing fenced compound. Project plans and specification for Cellco's proposed antennas, remote radio heads ("RRHs") and backup generator for the modified wireless facility showing all proposed site improvements are included in Attachment 4. Included in Attachment 5 is a Structural Analysis Report ("SA") and an Antenna Mount Analysis Report ("MA") confirming that the existing tower, tower foundation, and Cellco's proposed new antenna mounting system can support Cellco's proposed modifications.

IV. Discussion

A. The Proposed Facility Modifications Will Not Have A Substantial Adverse Environmental Effect

The Public Utility Environmental Standards Act (the "Act"), C.G.S. § 16-50g et seq., provides for the orderly and environmentally compatible development of telecommunications towers in the state to avoid "a significant impact on the environment and ecology of the State of

Connecticut." C.G.S. § 16-50g. To achieve these goals, the Act established the Council, and requires a Certificate of Environmental Compatibility and Public Need for the construction of cellular telecommunication towers "that may, as determined by the council, have a substantial adverse environmental effect". C.G.S. § 16-50k(a).

1. Physical Environmental Effects

Cellco respectfully submits that the proposed facility modifications will not involve a significant alteration in the physical and environmental characteristics of the Property or the surrounding area. Cellco will install two equipment cabinets and a back-up generator within the limits of the existing fenced facility compound. No tree clearing or facility expansion is required to accommodate Cellco's ground-based equipment or the proposed tower extension.

2. Visual Effects

As discussed in numerous other Council filings, visual impact of a tower is often the most significant and, in many cases, the only discernible environmental effect associated with such facilities. To assess these conditions, Cellco, through its consultants, All-Points Technologies ("APT") assessed the visual impact of the existing lattice tower and compared it to the visual impact of the proposed 161-foot lattice tower described in the Petition. A copy of APT's Visibility Analysis is included in Attachment 6.

The Visibility Analysis concludes that the upper portion of the modified lattice tower is not highly visible beyond the immediate vicinity of the Property. The open steel weave of the lattice tower, combined with the rolling and wooded terrain within the two-mile radius study area, serve to minimize the visibility of the extended structure. The taller tower may be more prominent in areas where the existing tower is visible, but no new areas of visibility are created by the proposed tower extension. Overall, year-round visibility of the extended tower will increase from approximately 12-acres for the existing structure to approximately 23 acres for the extended tower or 0.28% of the two-mile study area. Seasonal visibility of the extended tower would occur over approximately 94 acres or 1.116% of the two-mile radius study area.

3. Compliance with Radio Frequency Emissions Standards

Cumulative radio frequency ("RF") emissions from the proposed replacement tower will not exceed the Maximum Permissible Exposure ("MPE") standards adopted by the Federal Communications Commission ("FCC"). Included in Attachment 7 is a Calculated Radio Frequency Emissions Report conforming that the existing State and municipal antennas together with the proposed Cellco antennas will operate well within MPE standards established by the FCC.

4. FAA Summary Report

Included in Attachment 8 of this Petition is a Federal Airways and Airspace Summary Report (the "Summary Report"). The Summary Report recommends that the FAA be notified of the existing structure and of the proposed extended structure to determine if obstruction marking and lighting is required. Cellco will make the appropriate FAA notice filing if the Council approves the tower extension. A copy of the FAA notification and the FAA's final determination will be provided to the Council upon receipt.

In sum, the effect of the modified facility on the environment would be minimal and limited, rather than significant. This stands in contrast to typical proposals for new towers that frequently must be located on properties with no other approved towers, or with no development at all. Thus, the proposed tower extension would not present a substantial adverse environmental effect and is not a modification for which the General Assembly intended to require a Certificate under C.G.S. § 16-50k(a).

B. Notice to the Town of East Haddam, Property Owner and Abutting Landowners

On February 22, 2024, a copy of this Petition was sent to East Haddam's First Selectman Irene M. Haines, Land Use Administrator, James Ventres and the State of Connecticut, the Property owner. Included in Attachment 9 is a copy of the letters sent to Ms. Haines, Mr. Ventres, and the State of Connecticut.

Notice of Cellco's intent to file the Petition together with a copy of the Petition was also sent to those owners whose land abuts the Property. A sample abutter's notice letter, and the list of those abutting landowners who were sent notice of the Petition is included in Attachment 10.

C. A Conclusion That the Proposed Facility Modifications Will Not Have a Substantial Adverse Environmental Effect Would Be Consistent With Siting Council Precedent

The Council has previously determined, under similar circumstances, that the extension of an existing tower would have no substantial adverse environmental effect, does not require a Certificate and, most importantly, is preferable to the construction of a new tower in this area.

V. Conclusion

Based on the information provided above, Cellco respectfully requests that the Council issue a determination in the form of a declaratory ruling that the 40-foot extension of the existing tower at the Property (from 121 feet to 161 feet), and the installation of Cellco antennas and RRHs on a mounting assembly at the 146-foot level and the installation of the radio equipment and a backup generator in the existing facility compound will not have a substantial adverse environmental effect and does not require the issuance of a Certificate of Environmental Compatibility and Public Need pursuant to § 16-50k of the General Statutes.

Respectfully submitted,

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

By ______________________________

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597
(860) 275-8200
Attorney for the Petitioner

ATTACHMENT 1

Petition No. 1130
DESPP
East Haddam, Connecticut
Staff Report
February 19, 2015

On December 23, 2014, the Connecticut Siting Council (Council) received a petition from the Connecticut Department of Emergency Services and Public Protection (DESPP) for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the replacement of an existing 120-foot tall monopole tower with a self-supporting lattice tower of the same height. The tower site is at 194 Mount Parnassus Road in East Haddam, Connecticut. Council members Phil Ashton and Larry Levesque with Siting Analyst David Martin and Supervising Siting Analyst Christina Walsh visited the site on February 4, 2015 to review the proposal. Brian Benito and Matt Valleau represented DESPP at the field review. Craig Mansfield, the Emergency Management Director of the Town of East Haddam, was also present.

The existing 120-foot monopole was erected prior to the 1960s and currently hosts antennas of the DESPP and the Department of Transportation (DOT). DESPP is now working with DOT and the Town of East Haddam to upgrade their respective public safety telecommunications systems. The three parties are interested in using the Mt. Parnassus Road site, but the existing tower is structurally deficient and not capable of supporting all of the anticipated antenna systems. DESPP seeks to replace the existing monopole with a 120-foot lattice tower, designed to the Revision G tower standard that could accommodate all of the intended antenna systems as well potentially hosting commercial wireless antenna systems in the future. A lattice tower would provide the stability needed by DESPP to maintain microwave links between its adjacent sites. This location would also provide much improved public safety coverage for the Town of East Haddam, which encompasses a large area with topography that is difficult for wireless telecommunications.

In addition to replacing the existing tower, DESPP would replace an existing 80 square foot equipment building with an 882 square foot equipment building that would be used by each of the three parties. The new equipment building would include a 70 kW generator, which would provide back up power for all three tower users. The generator would run on propane, which would be supplied from an 1,800 gallon propane tank to be buried at the site.

The new tower and equipment building would be enclosed by an eight-foot tall chain link fence within a compound area of approximately 6,500 square feet. When asked, the DESPP representatives said they could specify a small mesh size to make climbing the fence more difficult.

DESPP submitted its plans to the State Historic Preservation Office for its review. SHPO determined that no historic properties would be affected by the proposal. A review of the Natural Diversity Data Base map for East Haddam indicates that no State or Federal Listed Species occur in the vicinity of the site.

The area around the Mount Parnassus site is heavily wooded with sparse single family residential development. The existing tower is scarcely visible amid the trees, so much so that Council representatives drove past it even though they were looking for it. The replacement tower, although it would present a broader profile, will be set further back from the road and should not be significantly more visible, even to the nearest neighbors.

DESPP calculates that the power density of the antennas to be located on the replacement tower would equal approximately 2.5% of the FCC's Maximum Permissible Emissions limit.

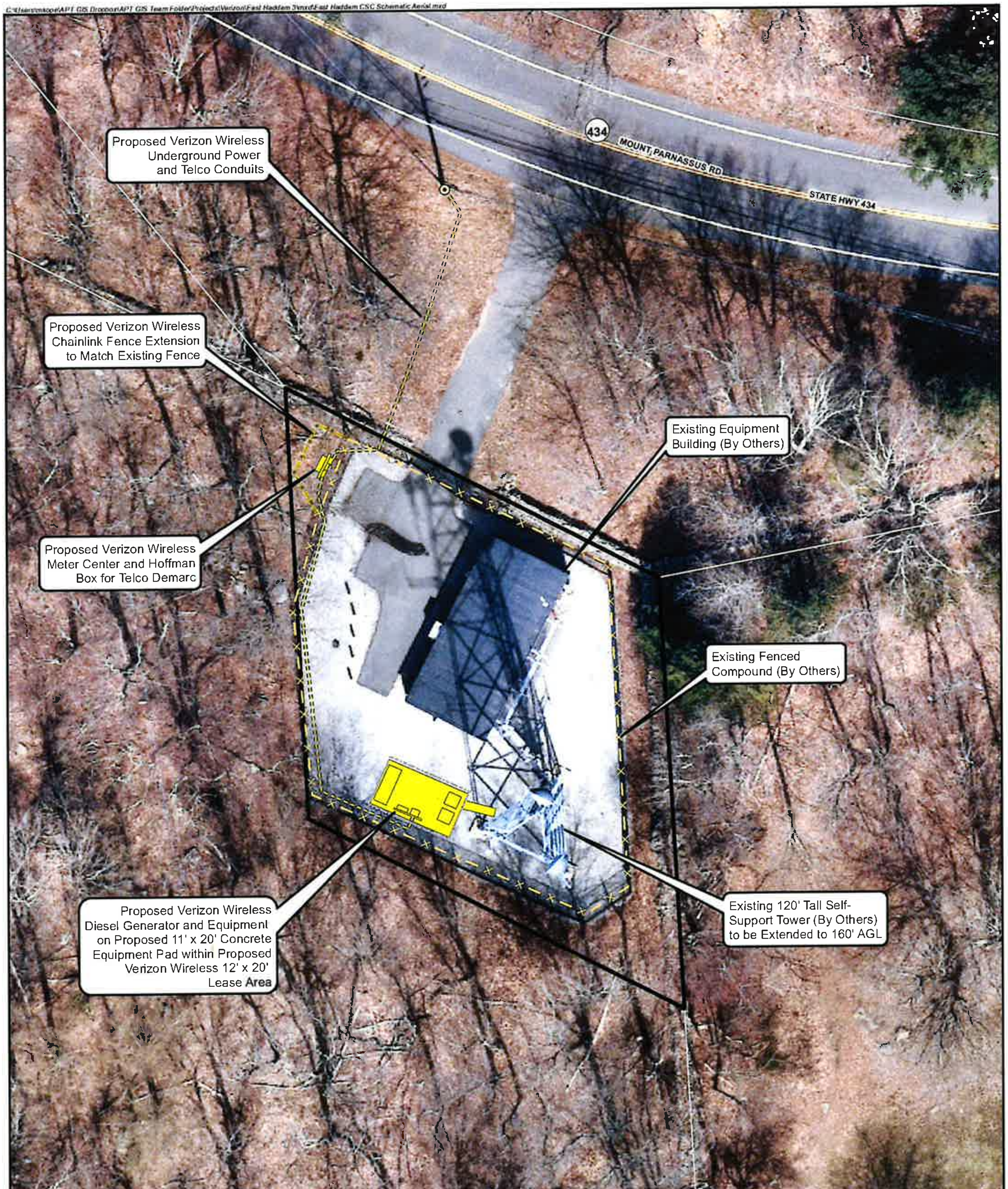
For this petition, DESPP notified the Town and abutting property owners. No comments have been received from any neighbors. The Town fully endorses the proposal.

This proposed tower replacement is not expected to have any substantial adverse environmental effects. Staff recommends approval with the condition that the Council shall be notified in writing when the existing tower is removed and the new self-supporting lattice tower is operational.

Aerial view of tower site vicinity

View of existing monopole

ATTACHMENT 2



Legend

- Existing Compound (By Others)
- Proposed Verizon Wireless Lease Area
- Proposed Verizon Wireless Equipment
- Proposed Verizon Wireless Fence Extension
- Proposed Verizon Wireless Conduit
- Existing Utility Pole (By Others)
- Subject Property
- Approximate Parcel Boundary

Map Notes:
Base Map Source: 2023 Nearmap Aerial Imagery
Map Scale: 1 inch = 30 feet
Map Date: January 2024

30 15 0 30 Feet

N

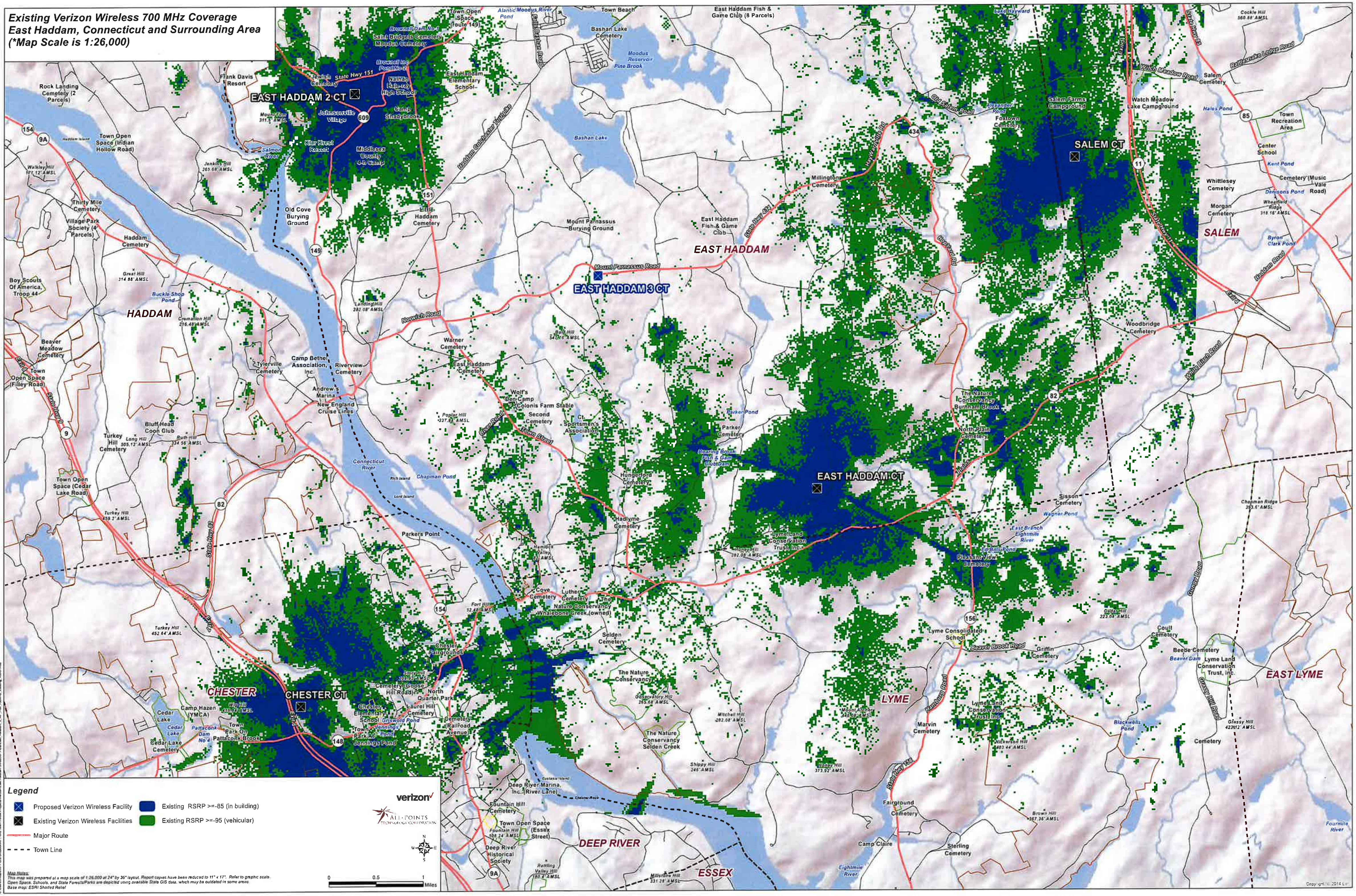
Site Schematic

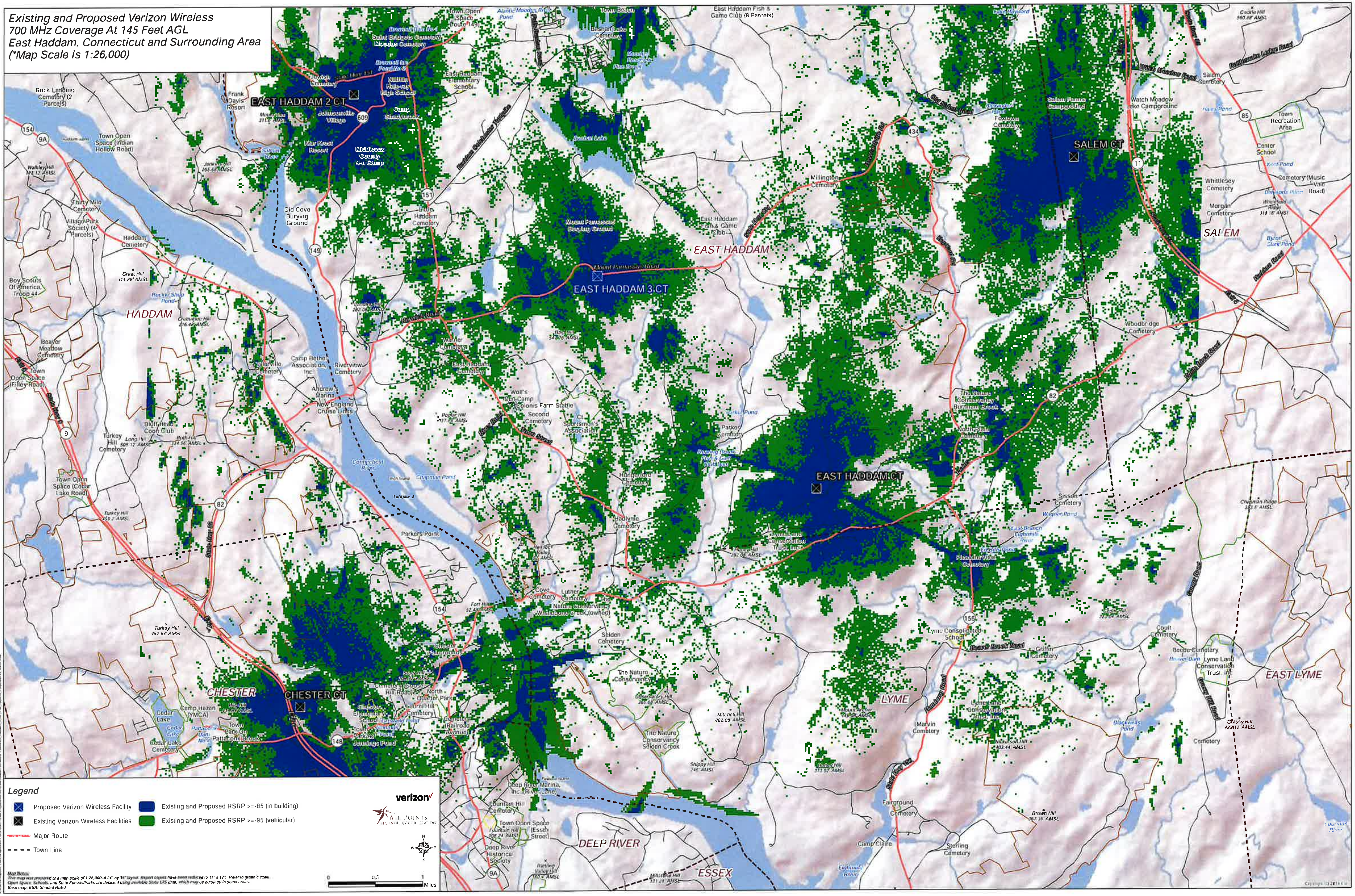
Proposed Wireless Telecommunications Facility
East Haddam 3 CT
194 Mt Parnassus Road
East Haddam, Connecticut

verizon

ALL-POINTS TECHNOLOGY CORPORATION

ATTACHMENT 3


Existing Verizon Wireless 700 MHz Coverage
East Haddam, Connecticut and Surrounding Area
(*Map Scale is 1:26,000)
EAST HADDAM 2 CT
EAST HADDAM 3 CT
EAST HADDAM CT
SALEM CT
CHESTER CT
EAST HADDAM
HADDAM
SALEM
CHESTER
LYME
EAST LYME
DEEP RIVER
ESSEX
Legend
Proposed Verizon Wireless Facility
Existing Verizon Wireless Facilities
Existing RSRP >=-85 (in building)
Existing RSRP >=-95 (vehicular)
Major Route
Town Line
verizon
ALL-POINTS
Map Notes:
This map was prepared at a map scale of 1:26,000 at 24" by 36" layout. Report copies have been reduced to 11" x 17". Refer to graphic scale.
Open Space, Schools, and State Forests/Parks are depicted using available State GIS data, which may be outdated in some areas.
Base map: ESRI Shaded Relief
0
0.5
1
Miles



Existing and Proposed Verizon Wireless
700 MHz Coverage At 145 Feet AGL
East Haddam, Connecticut and Surrounding Area
(*Map Scale is 1:26,000)
EAST HADDAM 2 CT
EAST HADDAM 3 CT
EAST HADDAM CT
SALEM CT
CHESTER CT
EAST HADDAM
HADDAM
SALEM
CHESTER
LYME
EAST LYME
DEEP RIVER
ESSEX
Legend
Proposed Verizon Wireless Facility
Existing Verizon Wireless Facilities
Major Route
Town Line
Existing and Proposed RSRP >=-85 (in building)
Existing and Proposed RSRP >=-95 (vehicular)
verizon
ALL-POINTS TECHNOLOGY CORPORATION
N
W
E
S
0
0.5
1
Miles
Map Notes:
This map was prepared at a map scale of 1:26,000 at 24" by 36" layout. Report copies have been reduced to 11" x 17". Refer to graphic scale.
Open Space, Schools, and State Forests/Parks are depicted using available State GIS data, which may be outdated in some areas.
Base map: ESRI Shaded Road

ATTACHMENT 4

verizon

SITE NAME: EAST HADDAM 3 CT
LOCATION CODE (PSLC): 300023
PROJECT ID: 17133983
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

PERMITTING

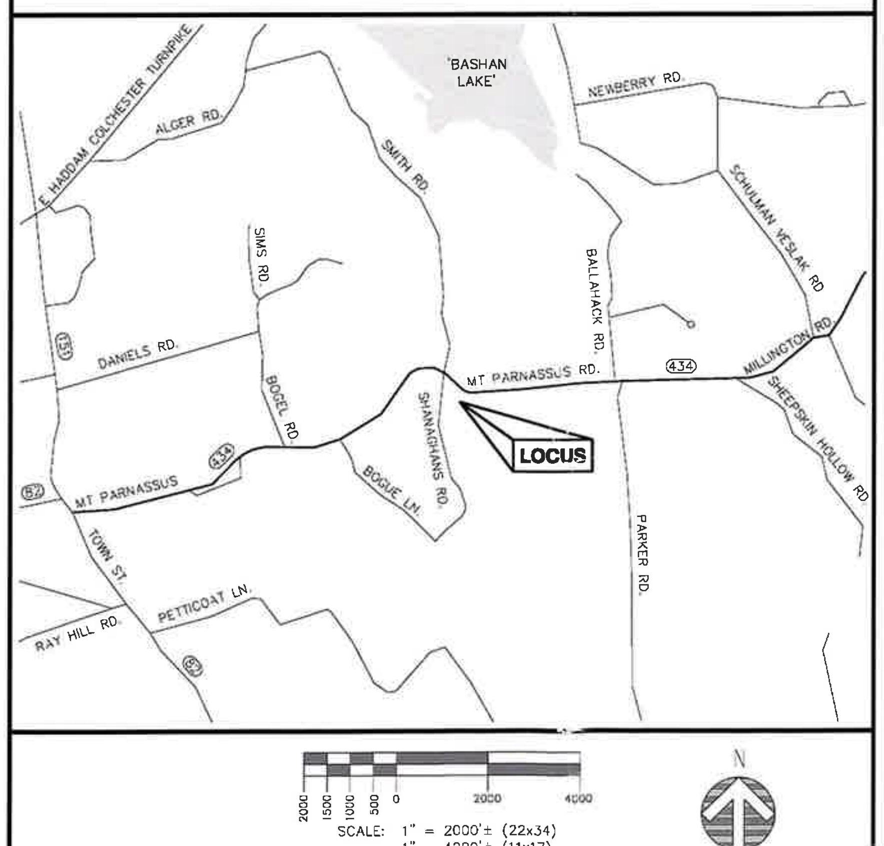
DRAWING INDEX

SHEET	DESCRIPTION	REVISION
T-1	TITLE SHEET	1
Z-1	OVERALL SITE PLAN	1
Z-2	COMPOUND PLAN AND ELEVATION	1
D-1 TO D-3	DETAILS	1

GENERAL NOTES

1. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE ENGINEER & OWNER REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.
2. ALL UNDERGROUND UTILITY INFORMATION WAS DETERMINED FROM SURFACE INVESTIGATIONS AND EXISTING PLANS OF RECORD. THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES IN THE FIELD PRIOR TO ANY SITE WORK. CALL DIG-SAFE (888) 344-7233 (OR 811) 72-HOURS PRIOR TO ANY EXCAVATION.
3. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE LATEST VERIZON WIRELESS CONSTRUCTION GUIDELINES.
4. NEW CONSTRUCTION WILL CONFORM TO ALL APPLICABLE CODES AND ORDINANCES:
   BUILDING CODE: 2022 CONNECTICUT STATE BUILDING CODE (IBC 2021) AND AMENDMENTS
   ELECTRICAL CODE: 2020 NEC (NFPA-70) WITH CONNECTICUT AMENDMENTS
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE PASSING ANTENNA MOUNT ANALYSIS REPORT BY CENTEK ENGINEERING DATED OCTOBER 9, 2023.
6. REFER TO PASSING STRUCTURAL ANALYSIS BY CENTEK ENGINEERING DATED OCTOBER 6, 2023.
7. THE CONSTRUCTION SHOWN HEREIN MAY REQUIRE SPECIAL INSPECTIONS UNDER THE STATE BUILDING CODE. APPLICANT/CONTRACTOR SHALL VERIFY WITH THE AUTHORITIES HAVING JURISDICTION (AHJ) PRIOR TO CONSTRUCTION AND ENGAGE THE INSPECTOR AND/OR APPROPRIATE 3RD PARTIES AS MAY BE REQUIRED.

VICINITY MAP



PROJECT INFORMATION

SITE TYPE:	CO-LOCATION ON EXISTING SELF-SUPPORT TOWER TO BE EXTENDED
SITE NAME:	EAST HADDAM 3 CT
LOCATION CODE (PSLC):	300023
FUZE ID:	17133983
RFDS DATE:	08/01/23 REV1
SITE ADDRESS:	194 MT PARNASSUS ROAD EAST HADDAM, CT 06423
COUNTY:	MIDDLESEX
PARCEL #:	039-064
TOWER LATITUDE:	41° 28' 12.04"± N (41.470012°± N) (RECORD SURVEY 1-A)
TOWER LONGITUDE:	72° 24' 39.83"± W (72.411064°± W) (RECORD SURVEY 1-A)
TOWER GROUND ELEV.:	595.0'± (AMSL) (RECORD SURVEY 1-A)
DATUM:	NAD83/NAVD88
STRUCTURE HEIGHT: HIGHEST APPURTENANCE:	161'± (TOP OF SELF-SUPPORT TOWER) 165'± (TOP OF LIGHTNING ROD)
PROPERTY OWNER:	N/F STATE OF CONNECTICUT 2800 BERLIN TURNPIKE NEWINGTON, CT 06131
TOWER OWNER:	STATE OF CONNECTICUT
TOWER OWNER ADDRESS:	STATE OF CONNECTICUT PUBLIC SAFETY DEPT. 1111 COUNTRY CLUB ROAD MIDDLETOWN, CT 06457
APPLICANT:	CELLCO PARTNERSHIP, A DELAWARE GENERAL PARTNERSHIP, dba VERIZON WIRELESS 20 ALEXANDER DRIVE, SECOND FLOOR WALLINGFORD, CT 06492
SITE ENGINEER:	PROTERRA DESIGN GROUP, LLC 4 BAY ROAD BUILDING A, SUITE 200 HADLEY, MA 01035 (413) 320-4918

ProTerra
DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph: (413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

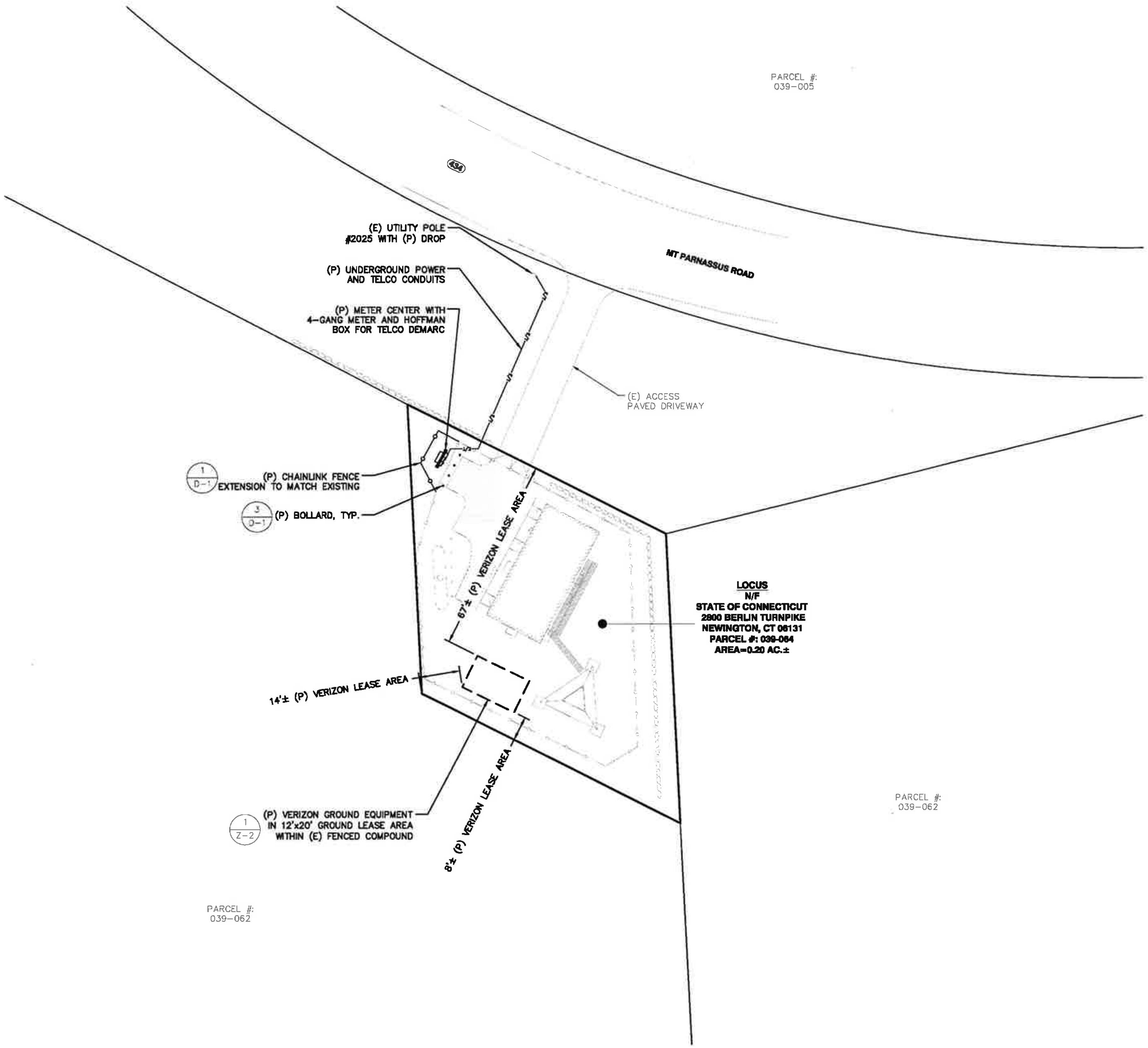
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
STATE OF CONNECTICUT
No. 20102
2/6/24

DATE:	02/06/24
DRAWN:	TBD/PN
CHECK:	JMM/TEJ
SCALE:	SEE PLAN
JOB NO.:	13-030

SHEET TITLE:
TITLE SHEET

T-1



OVERALL SITE PLAN (1/Z-1)
SCALE: 1"=20' (22x34)
1"=40' (11x17)

(E) EXISTING
(P) PROPOSED
(F) FUTURE

GENERAL NOTES

1. THE TYPE, DIMENSIONS, MOUNTING HARDWARE, AND POSITIONS OF ALL PROJECT OWNER'S EQUIPMENT ARE SHOWN IN ILLUSTRATIVE FASHION. ACTUAL HARDWARE DETAILS AND FINAL LOCATIONS MAY DIFFER SLIGHTLY FROM WHAT IS SHOWN.
2. THE PROJECT OWNER'S PCS FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. THE DESIGN OF THE TOWER, FOUNDATION AND ANTENNA MOUNTING HARDWARE WILL MEET THE ANSI/EIA/TIA-222-H STANDARDS FOR STRUCTURAL STEEL ANTENNA SUPPORTING STRUCTURES AND STATE BUILDING CODE REQUIREMENTS. DETAILED CONSTRUCTION DRAWINGS AND STRUCTURAL CALCULATIONS WILL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED WITH A BUILDING PERMIT APPLICATION FOR REVIEW AND APPROVAL BY THE LOCAL BUILDING CODE ENFORCEMENT OFFICIAL.
4. ONCE THE FACILITY BECOMES FULLY OPERATIONAL, NORMAL AND ROUTINE MAINTENANCE BY TOWER OWNER'S AND CARRIER'S TECHNICIANS WILL BE PERFORMED. THE ESTIMATED VEHICULAR TRAFFIC GENERATED BY THESE VISITS IS PREDICTED TO BE LESS THAN THE TYPICAL TRAFFIC GENERATED BY A SINGLE-FAMILY DWELLING.
5. THE PROPOSED INSTALLATION WILL BE CO-LOCATED ON A EXISTING MONOPOLE TOWER AND WITHIN AN EXISTING FENCED COMPOUND. IT HAS BEEN ASSUMED THAT THE EXISTING TOWER AND COMPOUND WAS LAWFULLY APPROVED BY THE AUTHORITIES HAVING JURISDICTION.
6. THE PROPOSED INSTALLATION TO BE IN COMPLIANCE WITH BUILDING CODE 2022 CONNECTICUT STATE BUILDING CODE (IBC 2021) AND AMENDMENTS.

REFERENCES

STATE OF CONNECTICUT CTS EAST HADDAM REMOTE SITE ENHANCEMENT (SITE #52) DEPARTMENT OF EMERGENCY SERVICES AND PUBLIC PROTECTION (DESPP) 90% CONSTRUCTION DOCUMENTS SUBMISSION NOVEMBER 25, 2014.

PROPERTY/TOPOGRAPHY SURVEY – PLAN PREPARED BY MILONE & MACBROOM DATED JULY 1, 2014.

ZONING INFORMATION – 'ZONING REGULATIONS EAST HADDAM CONNECTICUT' REVISED TO: APRIL 1, 2023 AND EAST HADDAM ZONING MAP – 2021 CONTAINED THEREIN.

RECORD 1-A TOWER BY NORTHEAST SURVEY CONSULTANTS PC CERTIFICATION BY CHARLES G. GIDMAN, PLS-CT DATED SEPTEMBER 25, 2023.

WETLAND: TOWN OF EAST HADDAM CT ONLINE GIS WETLANDS MAP (HTTPS://WWW.AXISGIS.COM/EAST_HADDAMCT/)

TELECOMMUNICATION FACILITY SURVEY: LIMITED COMPASS & TAPE SURVEY PERFORMED BY PROTERRA DESIGN GROUP, LLC ON JULY 6, 2023.

PROTERRA DESIGN GROUP, LLC DID NOT PERFORM AN ON-THE-GROUND SURVEY IN CONJUNCTION WITH THIS PROJECT. THE PLAN IS INTENDED FOR CO-LOCATION OF WIRELESS INFRASTRUCTURE WITHIN AN EXISTING FENCED COMPOUND & LAWFULLY CONSTRUCTED SELF-SUPPORT TOWER. THE PLAN SHALL BE USED FOR NO OTHER PURPOSE.

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph:(413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 184 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

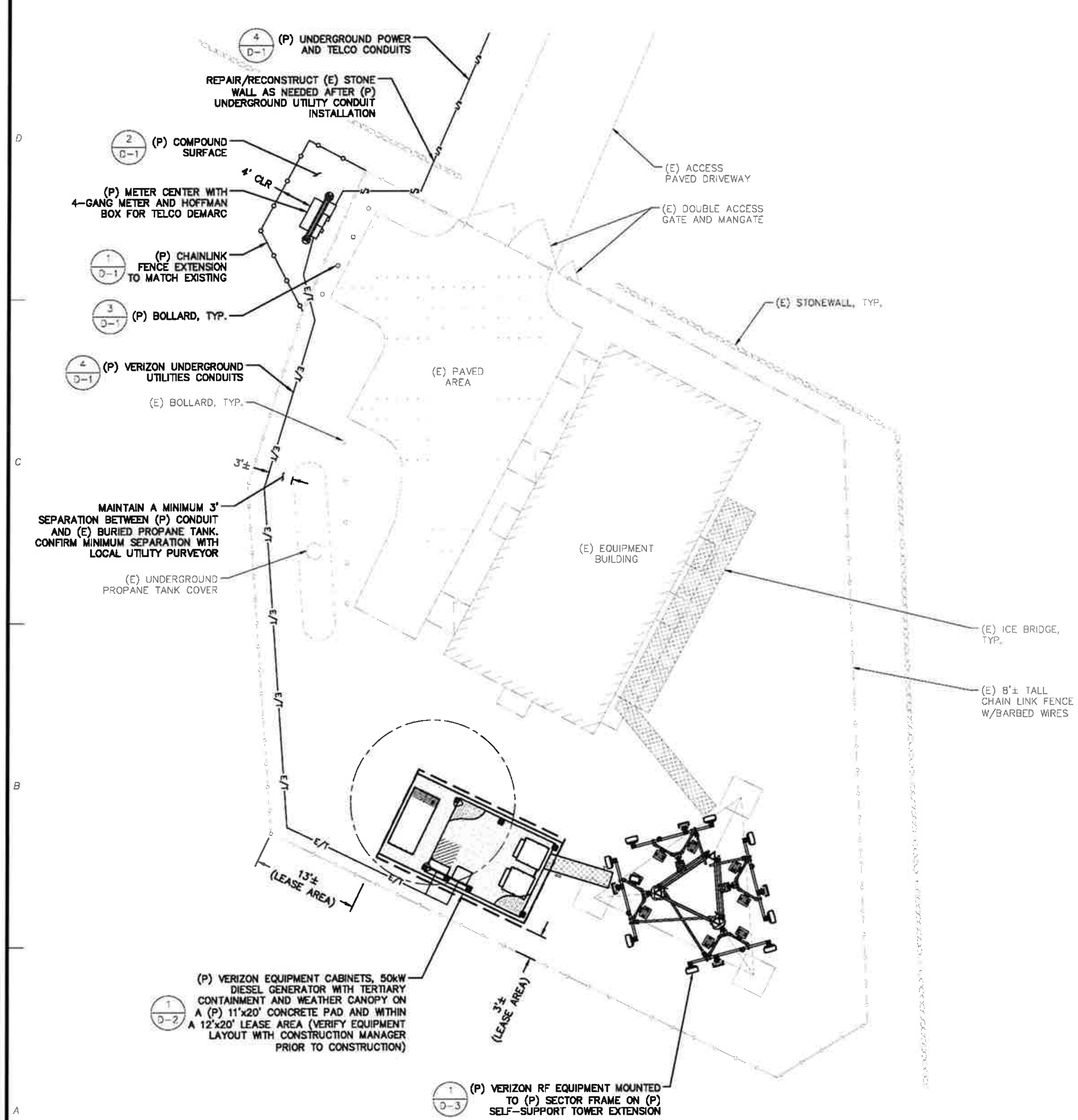
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
d/b/a VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
STATE OF CONNECTICUT No. 22192
2/6/24

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:

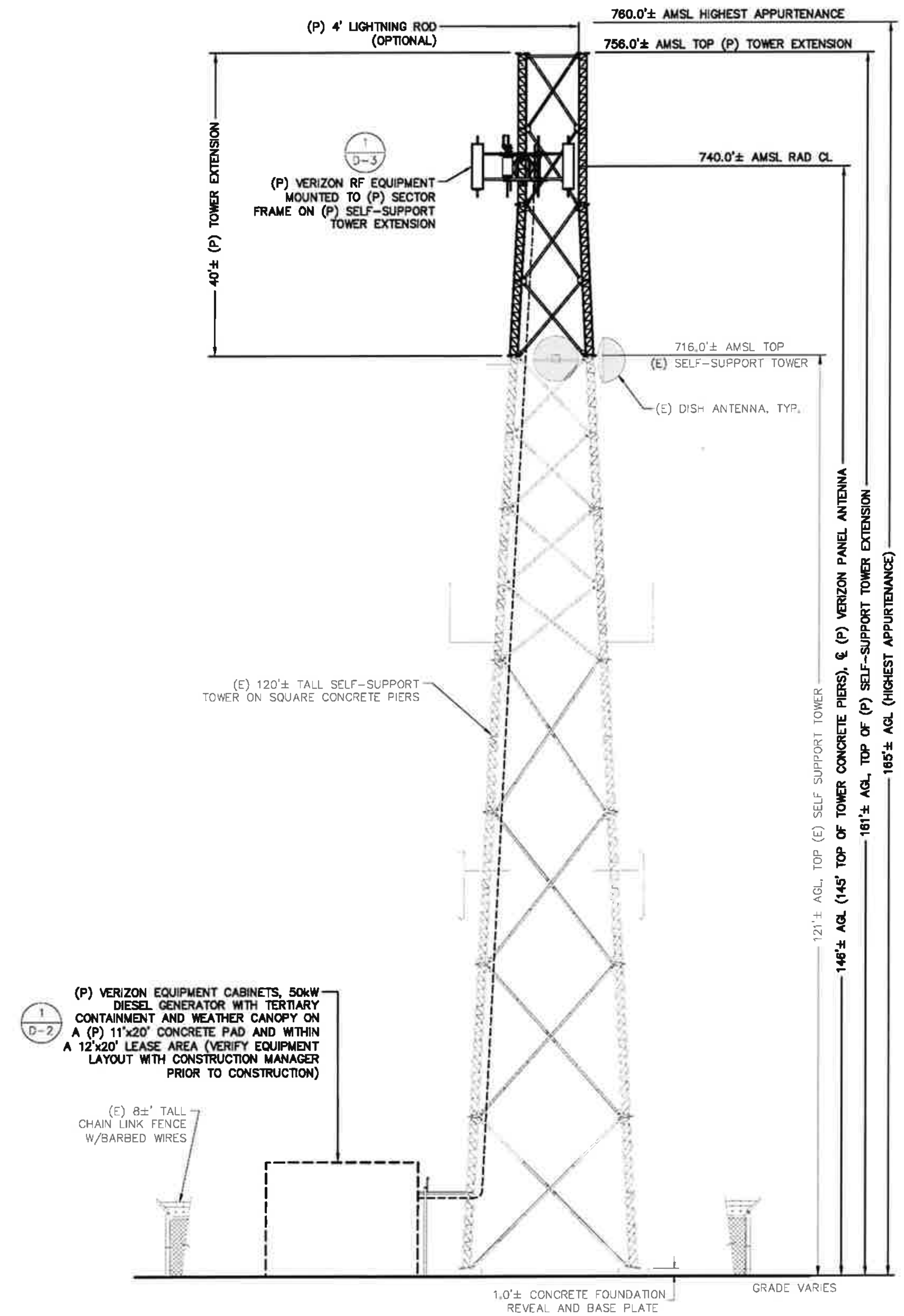
OVERALL SITE PLAN

Z-1



COMPOUND PLAN 1 / Z-2
SCALE: 1"=8' (22x34) 1"=16' (11x17)

(E) EXISTING
(P) PROPOSED
(F) FUTURE



TOWER GROUND ELEVATION: 595.0'± (AMSL)
(RECORD SURVEY 1A BY NORTHEAST SURVEY CONSULTANTS PC)

SOUTHWEST ELEVATION 2 / Z-2
SCALE: 1"=10' (22x34) 1"=20' (11x17)

(E) = EXISTING
(P) = PROPOSED

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph: (413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 104 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

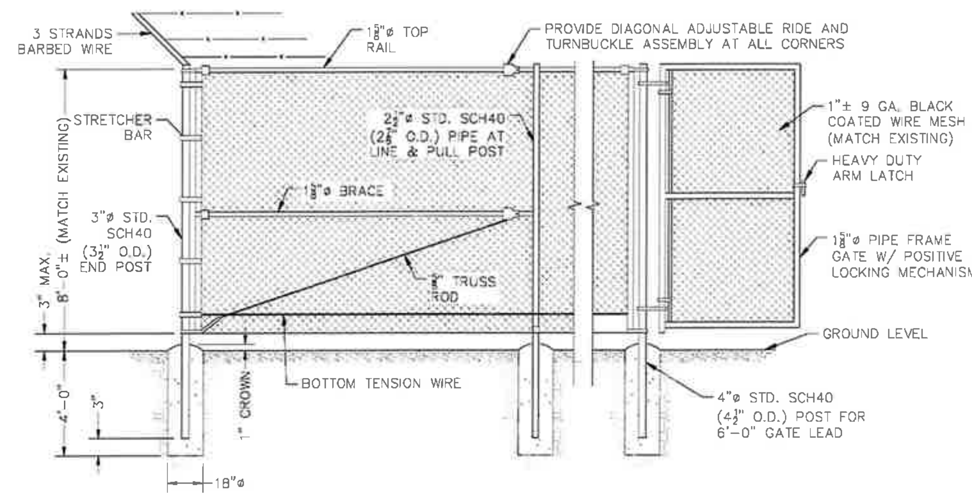
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
d/b/a VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030

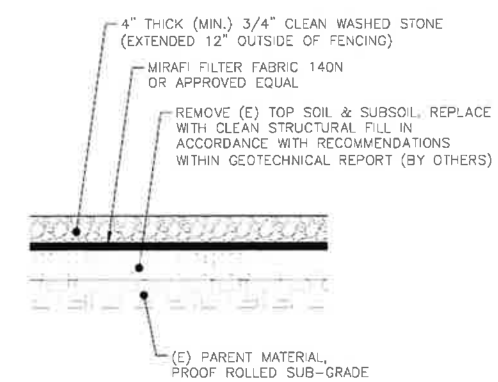
SHEET TITLE:
COMPOUND PLAN & ELEVATION

Z-2



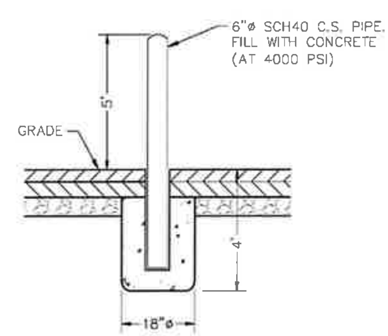
CHAIN LINK FENCE (1, D-1)

SCALE: NONE



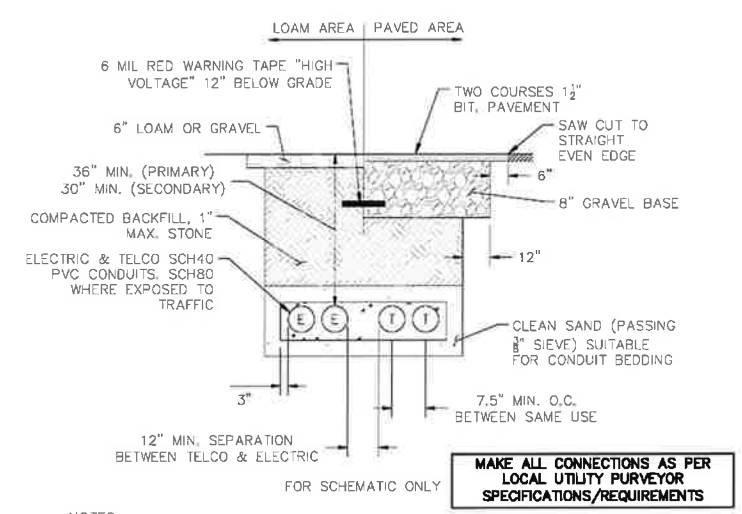
COMPOUND SURFACE (2, D-1)

SCALE: NONE



BOLLARD (3, D-1)

SCALE: NONE



NOTES:
1. MAKE ALL CONNECTIONS AS PER UTILITY COMPANY AND NEC REQUIREMENTS.
2. CONCRETE ENCASE PER THE REQUIREMENTS OF THE UTILITY COMPANY OR WHERE MIN. COVER OVER CONDUIT IS REDUCED BY SITE CONDITIONS.
3. VERIFY CONDUIT SIZE WITH NEC.

BURIED CONDUIT SECTION (4, D-1)

SCALE: NONE

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph:(413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/22/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 184 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

APPLICANT:
BELL ATLANTIC MOBILE SYSTEMS, LLC
d/b/a VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

verizon

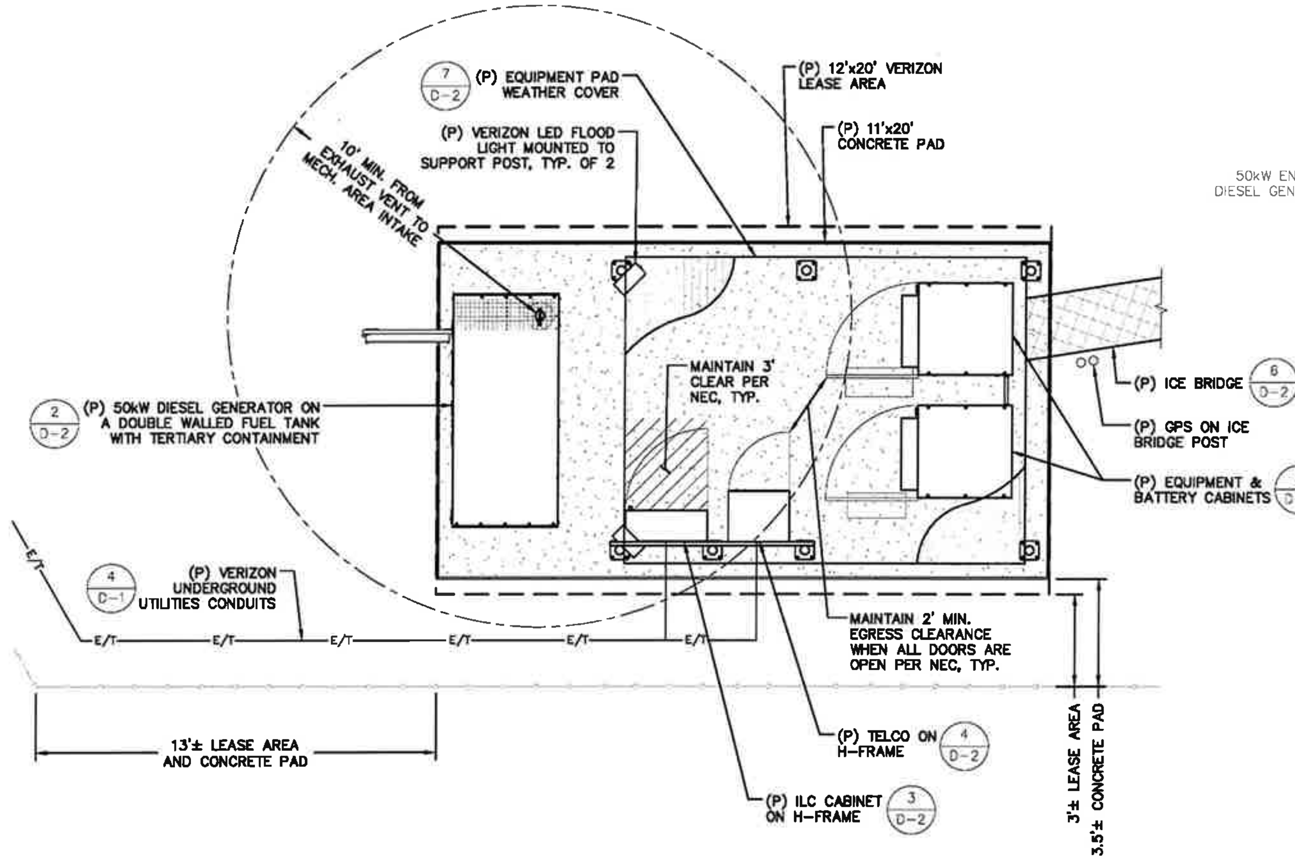
STAMP:

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030

SHEET TITLE:

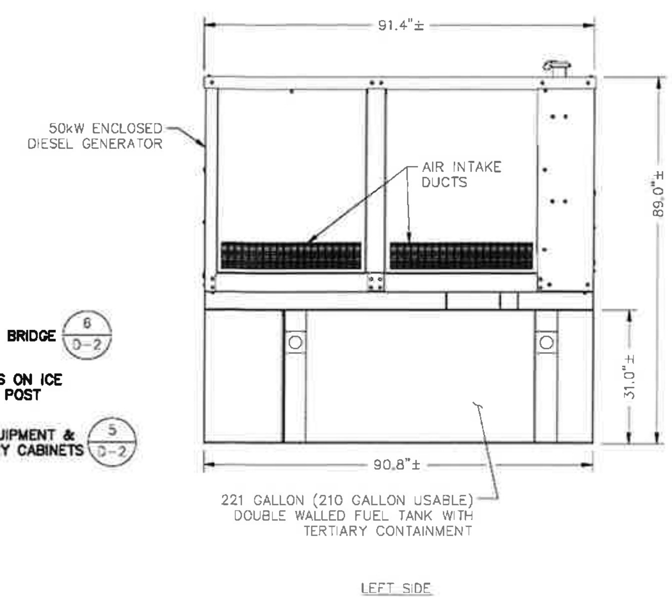
DETAILS

D-1



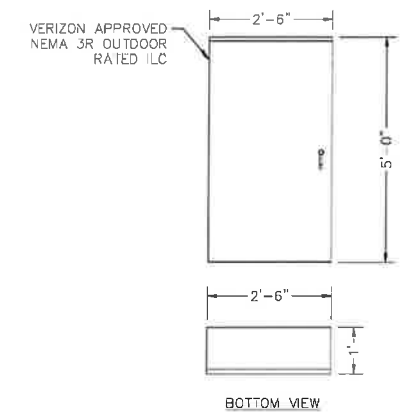
EQUIPMENT LAYOUT PLAN (1/D-2)

SCALE: 1"-3' (22x34)
1"-6' (11x17)



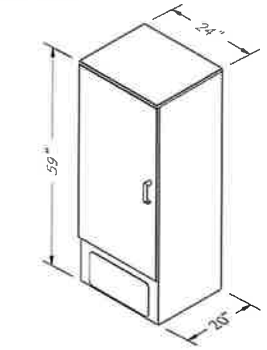
50kW AC GENERATOR WITH TERTIARY CONTAIMENT (2/D-2)

SCALE: NONE



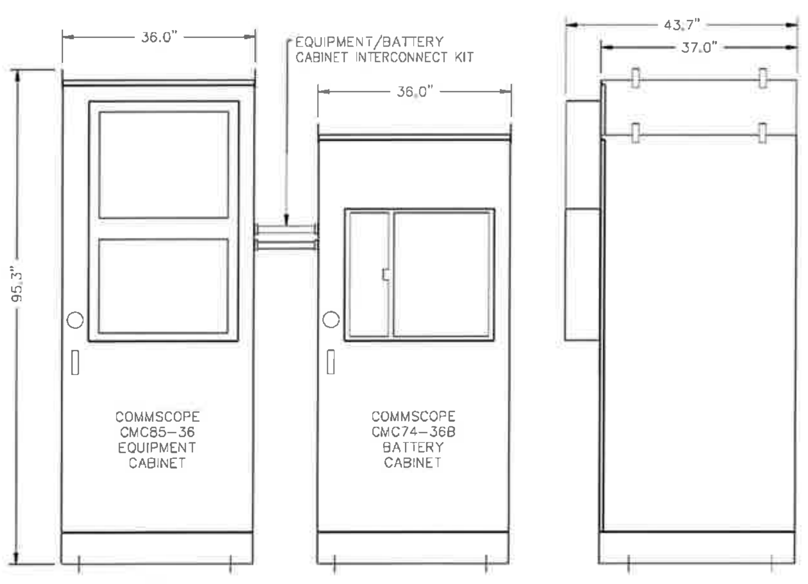
INTEGRATED LOAD CENTER (ILC) CABINET (3/D-2)

SCALE: NONE



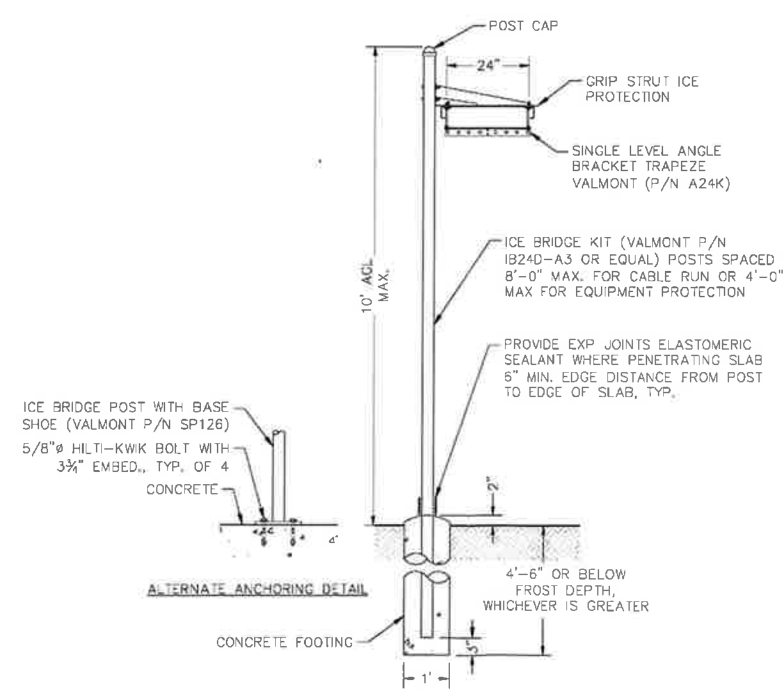
TELCO CABINET (4/D-2)

SCALE: NONE



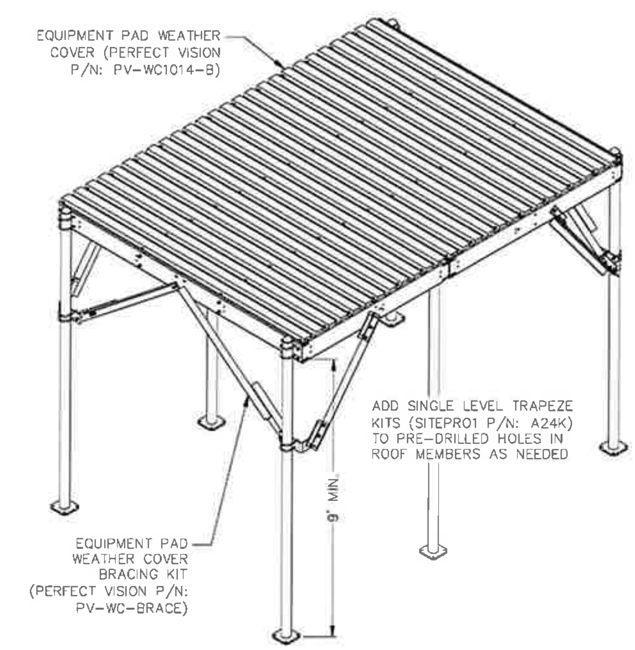
EQUIPMENT & BATTERY CABINET DETAIL (5/D-2)

SCALE: NONE



ICE BRIDGE DETAIL (6/D-2)

SCALE: NONE



EQUIPMENT PAD WEATHER COVER DETAIL (7/D-2)

SCALE: NONE

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph:(413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

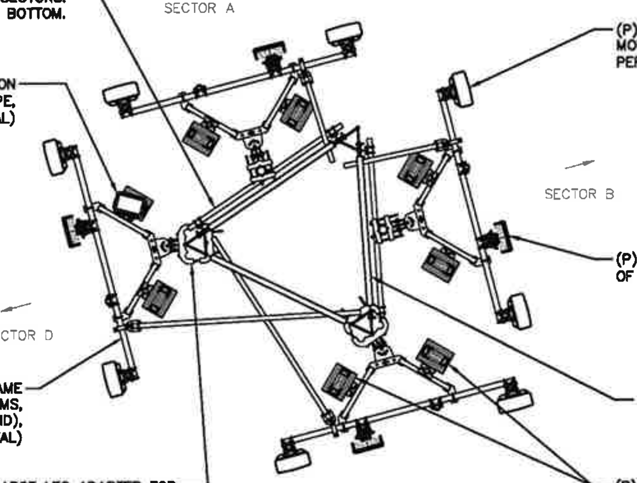
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
2/6/24

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:

DETAILS

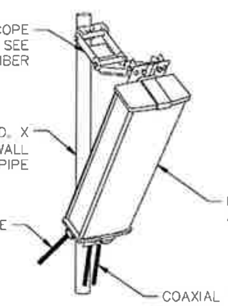
D-2



ANTENNA PLAN

SCALE: 1"=4' (22x34) 1"=8' (11x17) — 1/D-3

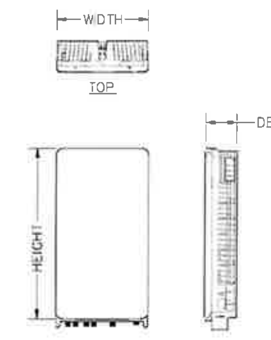
4 2 0 4 8



MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT	MOUNT BRACKET
COMMSCOPE NHH-45B-R2B	72.0"	18.0"	7.0"	74±lbs.	BSAMNT-3 (3 MOUNTING BRACKETS PER KIT)

PANEL ANTENNA DETAIL

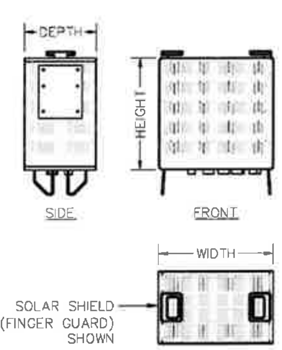
SCALE: NONE — 2/D-3



MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
MT6413-77A - ANTENNA	28.9"±	15.8"±	5.5"±	57±lbs.

L-SUB6 ANTENNA DETAIL

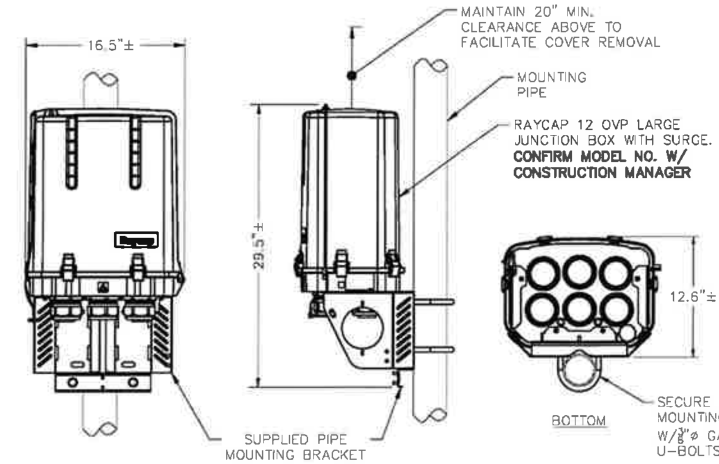
SCALE: NONE — 3/D-3



MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
SAMSUNG ORAN RRH (RF4461d-13A)	14.96"	14.96"	10.24"	79±lbs.
SAMSUNG B2/B66a ORAN RRH (RF4439d-25A)	14.96"	14.96"	10.04"	75±lbs.

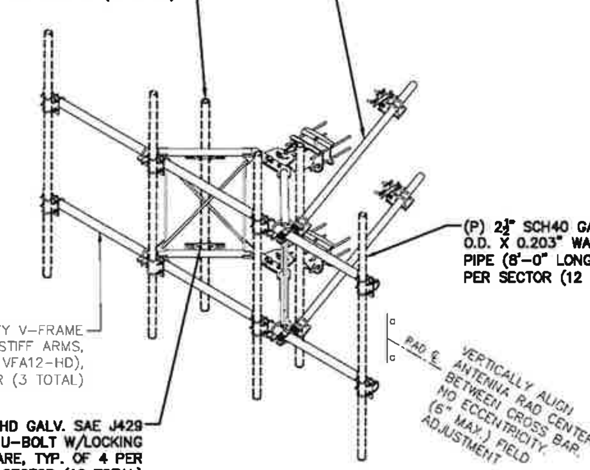
RRH DETAIL

SCALE: NONE — 4/D-3



LARGE JUNCTION BOX WITH SURGE PIPE MOUNTING DETAIL

SCALE: NONE — 5/D-3



SECTOR FRAME DETAIL

SCALE: NONE — 6/D-3

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph:(413) 320-4918

CONSULTANTS:

REVISIONS

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300028
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
STATE OF CONNECTICUT — THOMAS E. JOHNSON — PROFESSIONAL ENGINEER
2/6/24

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:

DETAILS

D-3

NHH-45B-R2B

6-port sector antenna, 2x 698–896 and 4x 1695–2360 MHz, 45° HPBW, 2x RETs and 2x SBTs. Both high bands share the same electrical tilt.

- Narrow beamwidth capacity antenna for higher level of densification and enhanced data throughput
- Internal SBT on low and high band allow remote RET control from the radio over the RF jumper cable
- Separate RS-485 RET input/output for low and high band
- One LB RET and one HB RET. Both high bands are controlled by one RET to ensure same tilt level for 4x Rx or 4x MIMO

General Specifications

Antenna Type	Sector
Band	Multiband
Color	Light gray
Grounding Type	RF connector body grounded to reflector and mounting bracket
Performance Note	Outdoor usage | Wind loading figures are validated by wind tunnel measurements described in white paper WP-112534-EN
Radome Material	Fiberglass, UV resistant
Radiator Material	Aluminum | Low loss circuit board
Reflector Material	Aluminum
RF Connector Interface	4.3-10 Female
RF Connector Location	Bottom
RF Connector Quantity, high band	4
RF Connector Quantity, low band	2
RF Connector Quantity, total	6

Remote Electrical Tilt (RET) Information

RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	2 female | 2 male
Input Voltage	10–30 Vdc
Internal Bias Tee	Port 1 | Port 3
Internal RET	High band (1) | Low band (1)

COMMSCOPE®

NHH-45B-R2B

Power Consumption, idle state, maximum	1 W
Power Consumption, normal conditions, maximum	10 W
Protocol	3GPP/AISG 2.0 (Single RET)

Dimensions

Width	457 mm | 17.992 in
Depth	178 mm | 7.008 in
Length	1829 mm | 72.008 in
Net Weight, without mounting kit	33.4 kg | 73.634 lb

Array Layout

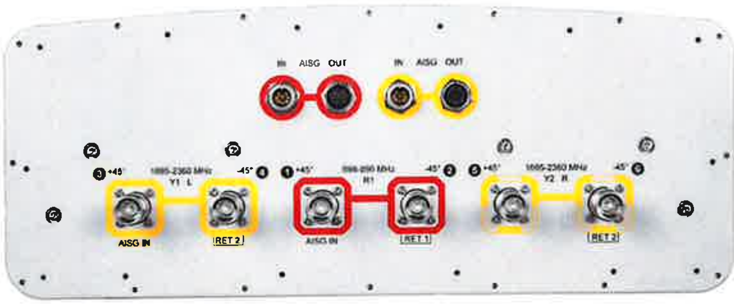
Left Right
Bottom

Array	Freq (MHz)	Conns	RET (SRET)	AISG RET UID
R1	698-896	1-2	1	ANxxxxxxxxxxxxxxxx1
Y1	1695-2360	3-4	2	ANxxxxxxxxxxxxxxxx2
Y2	1695-2360	5-6		

(Sizes of colored boxes are not true depictions of array sizes)

Port Configuration

NHH-45B-R2B



Electrical Specifications

Impedance	50 ohm
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Polarization	±45°
Total Input Power, maximum	800 W @ 50 °C

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain, dBi	16.8	17.5	19.3	19.9	20.3	20.8
Beamwidth, Horizontal, degrees	48	43	45	43	41	39
Beamwidth, Vertical, degrees	12.5	11.4	5.8	5.4	5	4.5
Beam Tilt, degrees	2–14	2–14	0–8	0–8	0–8	0–8
USLS (First Lobe), dB	19	22	18	18	18	17
Front-to-Back Ratio at 180°, dB	34	39	37	38	40	38
Isolation, Cross Polarization, dB	25	25	25	25	25	25
Isolation, Inter-band, dB	30	30	28	28	28	28
VSWR | Return loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0

COMMSCOPE®

PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	300	300	300	300	300	250

Electrical Specifications, BASTA

Frequency Band, MHz	**698–806**	**806–896**	**1695–1880**	**1850–1990**	**1920–2200**	**2300–2360**
Gain by all Beam Tilts, average, dBi	16.5	17.2	19.1	19.8	20.2	20.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.4	±0.5	±0.4	±0.4	±0.3
Gain by Beam Tilt, average, dBi	2 ° | 16.5 8 ° | 16.6 14 ° | 16.3	2 ° | 17.3 8 ° | 17.4 14 ° | 16.9	0 ° | 19.0 4 ° | 19.2 8 ° | 19.0	0 ° | 19.7 4 ° | 19.9 8 ° | 19.7	0 ° | 20.0 4 ° | 20.2 8 ° | 20.2	0 ° | 20.6 4 ° | 20.9 8 ° | 20.6
Beamwidth, Horizontal Tolerance, degrees	±1.5	±2.8	±1.8	±1	±2.7	±1.4
Beamwidth, Vertical Tolerance, degrees	±0.7	±0.6	±0.3	±0.2	±0.3	±0.1
USLS, beampeak to 20° above beampeak, dB	19	23	16	17	16	16
Front-to-Back Total Power at 180° ± 30°, dB	24	24	29	31	33	33
CPR at Boresight, dB	25	26	19	20	18	17
CPR at Sector, dB	6	4	10	10	8	16

Mechanical Specifications

Effective Projective Area (EPA), frontal	1 m² | 10.764 ft²
Effective Projective Area (EPA), lateral	0.21 m² | 2.26 ft²
Wind Loading @ Velocity, frontal	1,065.0 N @ 150 km/h (239.4 lbf @ 150 km/h)
Wind Loading @ Velocity, lateral	220.0 N @ 150 km/h (49.5 lbf @ 150 km/h)
Wind Loading @ Velocity, maximum	1,065.0 N @ 150 km/h (239.4 lbf @ 150 km/h)
Wind Loading @ Velocity, rear	935.0 N @ 150 km/h (210.2 lbf @ 150 km/h)
Wind Speed, maximum	241 km/h | 149.75 mph

Packaging and Weights

Width, packed	608 mm | 23.937 in
Depth, packed	346 mm | 13.622 in
Length, packed	1970 mm | 77.559 in
Weight, gross	55.8 kg | 123.018 lb

COMMSCOPE®

NHH-45B-R2B

Regulatory Compliance/Certifications

Agency	Classification
CHINA-ROHS	Above maximum concentration value
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
ROHS	Compliant/Exempted

Included Products

BSAMNT-3 – Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

BSAMNT-M – Middle Downtilt Mounting Kit for Long Antennas for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor bracket set.

* Footnotes

Performance Note Severe environmental conditions may degrade optimum performance

COMMSCOPE®

C-band 64T64R

SAMSUNG

Gen 2

Gen 2 : Higher conducted power radio with reduced size/volume/weight vs Gen 1 and also SOC embedded for flexibility to support new features

※ Preliminary Design: External appearance and mechanical design can be subject to change

Gen 2. 64T64R C-band MMU Dimensions	
Size (WxHxD)	400 x 734 x 140 mm (15.75 x 28.90 x 5.51 inch)
Weight	26kg (57.3 lb)

Item	Gen 2 64T64R (MT6413-77A)
Air Technology	NR n77/TDD
Frequency	3700 – 3980 MHz
IBW	200 MHz
OBW	200 MHz
Carrier Bandwidth	20(HW ready)/40/60/80/100 MHz
# of Carriers	2 carriers
Layer	DL : 16L, UL : 16RX (8L)
RF Chain	64T64R
Antenna Configuration	4V16H with 192 AE
EIRP	80.5 dBm @320W (55 dBm + 25.5 dBi)
Conductive Power	320W
Spectrum Analyzer	TX/RX support
RX Sensitivity	Typical -97.8dBm @(1Rx, 18.36MHz with 30kHz,51RBs)
Modulation	DL 256QAM support, (DL 1024QAM with 1~2dB power back-off)
Function Split	DL/UL option 7-2x
Input Power	-48 VDC (-38 VDC to -57 VDC)
Power Consumption	1,287W (100% load, room temp.)
Size (WHD)	**400 x 734 x 140 mm (15.75 x 28.90 x 5.51 inch)**
Volume	**41.1L**
Weight	**26kg (57.3 lb)**
Operating Temperature	-40°C - 55°C (w/o solar load)
Cooling	Natural convection
Unwanted Emission	3GPP 38.104 FCC 47 CFR 27.53 : < -13dBm/MHz < -40 dBm/MHz @ above 4 GHz <-50 dBm /MHz @ 4,040 ~ 4,050 MHz, <-60 dBm /MHz @ above 4,050 MHz
Optic Interface	15km, 4 ports (25Gbps x 4), SFP28, single mode, Bi-di (Option: Duplex)
Mounting Options	Pole, wall
NB-IoT	Not support
External Alarm	4RX
Fronthaul Interface	eCPRI

SAMSUNG

AWS/PCS MACRO RADIO

DUAL-BAND AND HIGH POWER FOR MACRO COVERAGE

Samsung's future proof dual-band radio is designed to help effectively increase the coverage areas in wireless networks. This AWS/PCS 4T4R dual-band radio has 4Tx/4Rx to 2Tx/2Rx RF chains options and a total output power of 320W, making it ideal for macro sites.

Model Code	RF4439d-25A

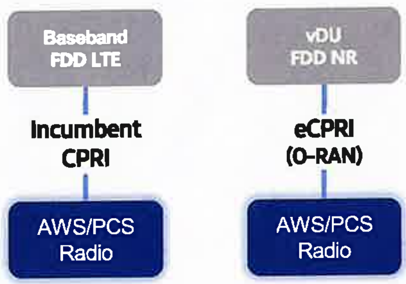
Homepage
samsungnetworks.com

Youtube
www.youtube.com/samsung5g

Points of Differentiation

Continuous Migration

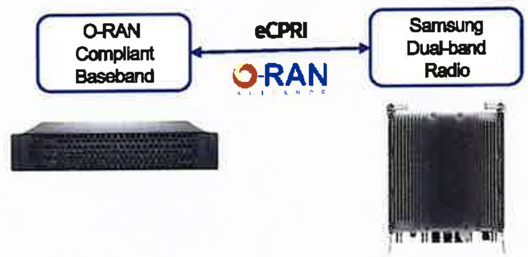
Samsung's AWS/PCS macro radio can support each incumbent CPRI interface as well as advanced eCPRI interfaces. This feature provides installable options for both legacy LTE networks and added NR networks.



O-RAN Compliant

A standardized O-RAN radio can help in implementing cost-effective networks, which are capable of sending more data without compromising additional investments.

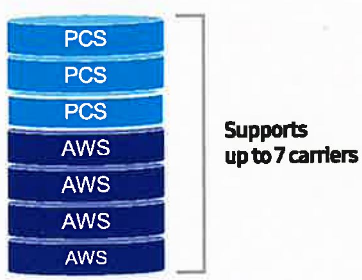
Samsung's state-of-the-art O-RAN technology will help accelerate the effort toward constructing a solid O-RAN ecosystem.



Optimum Spectrum Utilization

The number of required carriers varies according to site (region). Supporting many carriers is essential for using all frequencies that the operator has available.

The new AWS/PCS dual-band radio can support up to 3 carriers in the PCS (1.9GHz) band and 4 carriers in the AWS (2.1GHz) band, respectively.



Brand New Features in a Compact Size

Samsung's AWS/PCS macro radio offers several features, such as dual connectivity for baseband for both CDU and vDU, O-RAN capability, more carriers and an enlarged PCS spectrum, combined into an incumbent radio volume of 36.8L.

Technical Specifications

Item	Specification
Tech	LTE / NR
Brand	B25(PCS), B66(AWS)
Frequency Band	DL: 1930 – 1995MHz, UL: 1850 – 1915MHz DL: 2110 – 2200MHz, UL: 1710 – 1780MHz
RF Power	(B25) 4 × 40W or 2 × 60W (B66) 4 × 60W or 2 × 80W
IBW/OBW	(B25) 65MHz / 30MHz (B66) DL 90MHz, UL 70MHz / 60MHz
Installation	Pole, Wall
Size/ Weight	14.96 x 14.96 x 10.04inch (36.8L) / 74.7lb

700/850 4T4R Macro 320W ORU - New Filter (RF4461d-13A)

SAMSUNG

Specifications

Item	Specification	
Air Interface	LTE, NR(HW resource ready)	
Band	Band13 (700MHz)	Band5 (850MHz)
Frequency	DL: 746~756MHz UL: 777~787MHz	DL: 869~894MHz UL: 824~849MHz
IBW	10MHz	25MHz
OBW	10MHz	25MHz
Carrier Bandwidth	LTE/NR 5*/10MHz	LTE 5/10MHz NR 5/10/15/20MHz
# of carriers	2C*	3C
Total # of carriers	4C + B13 (SDL) 1C	
RF Chain	4T4R/2T4R/2T2R/1T2R 2T2R+2T2R bi-sector	
RF Output Power	Total : 320W	
	4 x 40W or 2 x 60W	4 x 40W or 2 x 60W
Spectrum Analyzer	TX/RX Support	
RX Sensitivity	Typ. -104.5dBm @1Rx (25RBs 5MHz)	
Modulation	256QAM support, (1024QAM with 1~2dB power back-off)	
Input Power	-48VDC (-38VDC to -57VDC)	
Power Consumption	1,165 Watt @ 100% RF load, room temperature	
Size (WHD)	380 x 380 x 260 mm (14.96 x 14.96 x 10.23 inch)	
Volume	37.5 L	
Weight (W/o Solar Shield & finger guard)	35.9 kg (79.1 lb)	
Operating Temperature	-40℃ (-40℉) ~ 55℃ (131℉) (Without solar load)	
Cooling	Natural convection	
Unwanted Emission	3GPP 36.104	3GPP 36.104
	FCC 47 CFR 27.53 c), f)	FCC 47 CFR 22.917
	-	-69 dBm/100 kHz per path @ 896 ~901MHz
CPRI Cascade	Not supported	
Optic Interface	20km, 2 ports (9.8Gbps x 2), SFP+, single mode, Duplex (Option: Bi-di)	
RET & TMA Interface	AISG 3.0	
Bias-T	4 ports (2 ports per band)	
Mounting Options	Pole, wall	
NB-IoT	2GB+2IB or 4IB	2SA+2GB or 2GB+2IB or 4GB
PIM Cancellation	Support	
# of antenna port	4	
External Alarm	4	
Fronthaul Interface	Opt. 8 CPRI / Opt. 7-2x selectable (not simultaneous support)	
CPRI compression	Not Support	

* 5MHz supporting in B13(700MHz) depends on 3GPP std. and UE capability.
External filters in interferer and victim sides for Mexican boarder to support 5MHz service need to be considered
** Finger guard is not needed.

KOHLER.

Model: 50REOZK

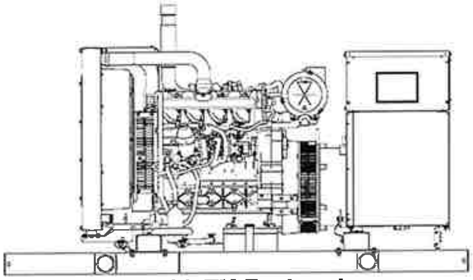
208-600 V **Diesel**

ISO 9001 KOHLER. NATIONALLY REGISTERED

Tier 3 EPA-Certified for Stationary Emergency Applications

Ratings Range

		60 Hz
Standby:	**kW**	44-52
	kVA	44-65
Prime:	**kW**	40-47
	kVA	40-58



Model with TM Engine shown

Generator Set Ratings

				130°C Rise Standby Rating		105°C Rise Prime Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
4P7BX	120/208	3	60	51/63	176	46/57	159
	127/220	3	60	51/63	167	46/57	150
	120/240	3	60	49/61	147	44/55	132
	120/240	1	60	44/44	183	40/40	166
	139/240	3	60	51/63	153	46/57	138
	220/380	3	60	49/61	93	45/56	85
	277/480	3	60	51/63	76	46/57	69
	347/600	3	60	51/63	61	46/57	55
4P8X	120/208	3	60	52/65	180	47/58	163
	127/220	3	60	52/65	170	47/58	154
	120/240	3	60	50/62	150	45/56	135
	120/240	1	60	50/50	208	45/45	187
	139/240	3	60	52/65	156	47/58	141
	220/380	3	60	52/65	98	47/58	89
	277/480	3	60	52/65	78	47/58	70
	347/600	3	60	52/65	62	47/58	56
4P10X	120/208	3	60	52/65	180	47/58	163
	127/220	3	60	52/65	170	47/58	154
	120/240	3	60	50/62	150	45/56	135
	120/240	1	60	50/50	208	45/45	187
	139/240	3	60	52/65	156	47/58	141
	220/380	3	60	52/65	98	47/58	89
	277/480	3	60	52/65	78	47/58	70
	347/600	3	60	52/65	62	47/58	56
4Q7BX	120/240	1	60	48/48	200	43/43	179
4Q8X	120/240	1	60	50/50	208	45/45	187
4Q10X	120/240	1	60	50/50	208	45/45	187

RATINGS: All three-phase units are rated at 0.8 power factor. All single-phase units are rated at 1.0 power factor. *Standby Ratings:* Standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. *Prime Power Ratings:* At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For limited running time and continuous ratings, consult the factory. Obtain the technical information bulletin (TIB-101) for ratings guidelines, complete ratings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- The generator set engine is certified to meet the Environmental Protection Agency (EPA) emergency stationary emissions requirements.
- A one-year limited warranty covers all generator set systems and components. Two- and five-year extended limited warranties are also available.
- Alternator features:
  - The unique Fast-Response® X excitation system delivers excellent voltage response and short-circuit capability using a rare-earth, permanent magnet (PM)-excited alternator.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Kohler designed controllers for one-source system integration and remote communication. See Controllers on page 3.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - The generator set for 49-state applications is equipped with the KDI 3404 TM engine. The generator set that is CARB compliant/California South Coast Air Quality Management District (SCAQMD) pre-certified is equipped with the KDI 3404 TCR engine.

Alternator Specifications

Specifications	Alternator
Manufacturer	Kohler
Type	4-Pole, Rotating-Field
Exciter type	Brushless, Rare-Earth Permanent Magnet
Leads: quantity, type	12, Reconnectable 4, 110-120/220-240 V
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H
Temperature rise	130°C, Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Voltage regulation, no-load to full-load	Controller Dependent
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby Current

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Windings are vacuum-impregnated with epoxy varnish for dependability and long life.
- Superior voltage waveform from a two-thirds pitch stator and skewed rotor.

Specifications		Alternator
Peak motor starting kVA:		(35% dip for voltages below)
480 V	4P7BX (12 lead)	180
480 V	4P8X (12 lead)	261
480 V	4P10X (12 lead)	275
240 V	4Q7BX (4 lead)	113
240 V	4Q8X (4 lead)	121
240 V	4Q10X (4 lead)	144

Application Data

Engine

Engine Specifications	49-State Engine	California SCAQMD
Manufacturer	Kohler Diesel	
Engine model	KDI 3404TM	KDI 3404TCR
Engine type	4-Cycle, Turbocharged	
Cylinder arrangement	4 Inline	
Displacement, L (cu. in.)	3.4 (207)	
Bore and stroke, mm (in.)	96 x 116 (3.28 x 4.57)	
Compression ratio	18.5:1	17.0:1
Piston speed, m/min. (ft./min.)	418 (1371)	510 (1673)
Main bearings: quantity, type	5, Replaceable Insert	
Rated rpm	1800	
Max. power at rated rpm, kWm (BHP)	64 (86)	70 (94)
Cylinder head material	Cast Iron	
Crankshaft material	Cast Iron	
Valve material:		
Intake	Chromium-Silicon Steel	
Exhaust	Chromium Steel	
Governor: type, make/model	Mech. (or Electronic *)	Electronic
Frequency regulation, no-load to full-load	Droop, 5% (or Isochr. *)	Isochronous
Frequency regulation, steady state	±0.5%	±0.28%
Frequency	Fixed	
Air cleaner type, all models	Dry	

* Requires available electronic governor option

Exhaust

Exhaust System	49-State Engine	California SCAQMD
Exhaust manifold type	Dry	
Exhaust flow at rated kW, m^3/min. (cfm)	8.8 (310)	
Exhaust temperature at rated kW, dry exhaust, °C (°F)	490 (914)	471 (880)
Minimum/maximum allowable back pressure, kPa (in. Hg)	6 (1.8)/ 9 (2.7)	8 (2.4)/ 13.5 (4.0)
Exhaust outlet size at engine hookup, mm (in.)	63.5 (2.5)	

Engine Electrical

Engine Electrical System	49-State Engine	California SCAQMD
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	12	
Ampere rating	90	
Starter motor rated voltage (DC)	12	
Battery, recommended cold cranking amps (CCA):		
Quantity, CCA rating	One, 650	
Battery voltage (DC)	12	

Fuel

Fuel System	49-State Engine	California SCAQMD
Fuel supply line, min. ID, mm (in.)	8.0 (0.31)	
Fuel return line, min. ID, mm (in.)	6.0 (0.25)	
Max. lift, engine-driven fuel pump, m (ft.)	6.0 (20.0)	3.7 (12.1)
Max. fuel flow, Lph (gph)	46 (12.2)	87.4 (23.1)
Max. return line restriction, kPa (in. Hg)	20 (5.9)	17.7 (5.2)
Fuel filter		
Prefilter	74 Microns	
Primary/Water Separator	5 Microns @ 98% Efficiency	5 Microns @ 95% Efficiency
Recommended fuel	#2 Ultra Low Sulfur Diesel	

Lubrication

Lubricating System	49-State Engine	California SCAQMD
Type	Full Pressure	
Oil pan capacity, L (qt.) §	15.3 (16.2)	
Oil pan capacity with filter, L (qt.) §	15.6 (16.5)	
Oil filter: quantity, type §	1, Cartridge	
Oil cooler	Water-Cooled	

§ Kohler recommends the use of Kohler Genuine oil and filters.

Application Data

Cooling

Radiator System	49-State Engine	California SCAQMD
Ambient temperature, °C (°F) *	50 (122)	
Engine jacket water capacity, L (gal.)	4.5 (1.19)	
Radiator system capacity, including engine, L (gal.)	12.3 (3.2)	
Engine jacket water flow, Lpm (gpm)	125 (33)	120 (32)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	37.8 (2207)	41.3 (2352)
Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)	12 (682)	8.4(477)
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	597 (23.5)	
Fan, kWm (HP)	1.8 (2.3)	
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

* Enclosure reduces ambient temperature capability by 5°C (9°F).

Operation Requirements

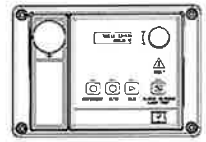
Air Requirements	49-State Engine	California SCAQMD
Radiator-cooled cooling air, m^3/min. (scfm) †	96.3 (3400)	
Combustion air, m^3/min. (cfm)	4.8 (170)	4.0 (140)
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	13.2 (750)	
Alternator, kW (Btu/min.)	7.6 (435)	
Max. air intake restriction, kPa (in. Hg)	5.2 (1.54)	4.2 (1.24)

† Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Fuel Consumption	49-State Engine
Diesel, Lph (gph) at % load	**Standby Rating**
100%	17.4 (4.6)
75%	13.2 (3.5)
50%	9.1 (2.4)
25%	5.3 (1.4)
Diesel, Lph (gph) at % load	**Prime Rating**
100%	16.1 (4.2)
75%	12.1 (3.2)
50%	8.3 (2.2)
25%	4.9 (1.3)

Fuel Consumption	Calif. SCAQMD Engine
Diesel, Lph (gph) at % load	**Standby Rating**
100%	15.2 (4.0)
75%	11.6 (3.1)
50%	8.0 (2.1)
25%	4.6 (1.2)
Diesel, Lph (gph) at % load	**Prime Rating**
100%	12.3 (3.2)
75%	10.6 (2.8)
50%	6.6 (1.7)
25%	4.1 (1.1)

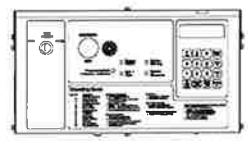
Controllers



APM402 Controller
Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.

- Digital display and menu control provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or serial configuration
- Controller supports Modbus® protocol
- Integrated hybrid voltage regulator with ±0.5% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-161 for additional controller features and accessories.



(Available with the 49-State generator set only.)

Decision-Maker® 550 Controller
Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities.

- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-46 for additional controller features and accessories.

Modbus® is a registered trademark of Schneider Electric.

KOHLER.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-457-4441, Fax 920-459-1646
For the nearest sales and service outlet in the US and Canada, phone 1-800-544-2444
KOHLERPower.com

Additional Standard Features

- Air Cleaner, Heavy Duty
- Alternator Protection
- Battery Rack and Cables
- Open Crankcase Ventilation
- Oil Drain and Coolant Drain with Hose Barb
- Oil Drain Extension (with narrow skid and enclosure models only)
- Operation and Installation Literature
- Radiator Drain Extension (with enclosure models only)
- Stainless Steel Fasteners on Enclosure (with enclosure models only)

Available Options

Approvals and Listings

- ☐ CSA Certified
- ☐ IBC Seismic Certification
- ☐ UL2200 Listing

Enclosed Unit

- ☐ Sound Enclosure (with enclosed critical silencer)
- ☐ Weather Enclosure (with enclosed critical silencer)
- ☐ Stainless Steel Latches and Hinges

Open Unit

- ☐ Exhaust Silencer, Critical (kit: PA-324470)
- ☐ Flexible Exhaust Connector, Stainless Steel

Fuel System

- ☐ Flexible Fuel Lines
- ☐ Fuel Pressure Gauge (Available with 49-state engine only)
- ☐ Subbase Fuel Tanks

Controller

- ☐ 15-Relay Dry Contact (SCAQMD engine with APM402 controller only)
- ☐ Common Failure Relay (550 controller only)
- ☐ Communication Products and PC Software (550 controller only)
- ☐ Customer Connection (550 controller only)
- ☐ Dry Contact (isolated alarm) (550 controller only)
- ☐ Two Input/Five Output Module (49-state engine with APM402 controller only)
- ☐ Key Switch (SCAQMD engine with APM402 controller only)
- ☐ Manual Speed Adjust (requires Electronic Governor or SCAQMD engine)
- ☐ Remote Annunciator Panel
- ☐ Remote Emergency Stop
- ☐ Run Relay

Cooling System

- ☐ Block Heater (1000 W, 110-120 V) Required for ambient temperatures below 0°C (32°F).
- ☐ Radiator Duct Flange

Electrical System

- ☐ Alternator Strip Heater
- ☐ Battery
- ☐ Battery Charger, Equalize/Float Type
- ☐ Battery Heater
- ☐ Electronic Governor
- ☐ Line Circuit Breaker (NEMA type 1 enclosure)
- ☐ Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)

Miscellaneous

- ☐ Air Cleaner Restriction Indicator
- ☐ Engine Fluids Added
- ☐ Rated Power Factor Testing
- ☐ Rodent Guards

Literature

- ☐ General Maintenance
- ☐ NFPA 110
- ☐ Overhaul
- ☐ Production

Warranty

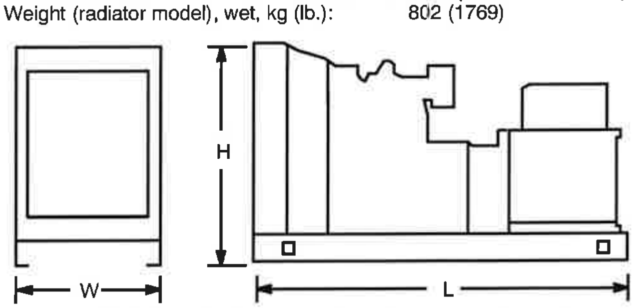
- ☐ 2-Year Basic Limited Warranty
- ☐ 5-Year Basic Limited Warranty
- ☐ 5-Year Comprehensive Limited Warranty

Other Options

- ☐ ____________________
- ☐ ____________________
- ☐ ____________________
- ☐ ____________________
- ☐ ____________________

Dimensions and Weights

Overall Size, L x W x H, mm (in.):
Wide Skid: 2300 x 1040 x 1133 (90.6 x 41.0 x 44.6)
Narrow Skid: 1875 x 780 x 1067 (73.8 x 30.7 x 42.0)
Weight (radiator model), wet, kg (lb.): 802 (1769)

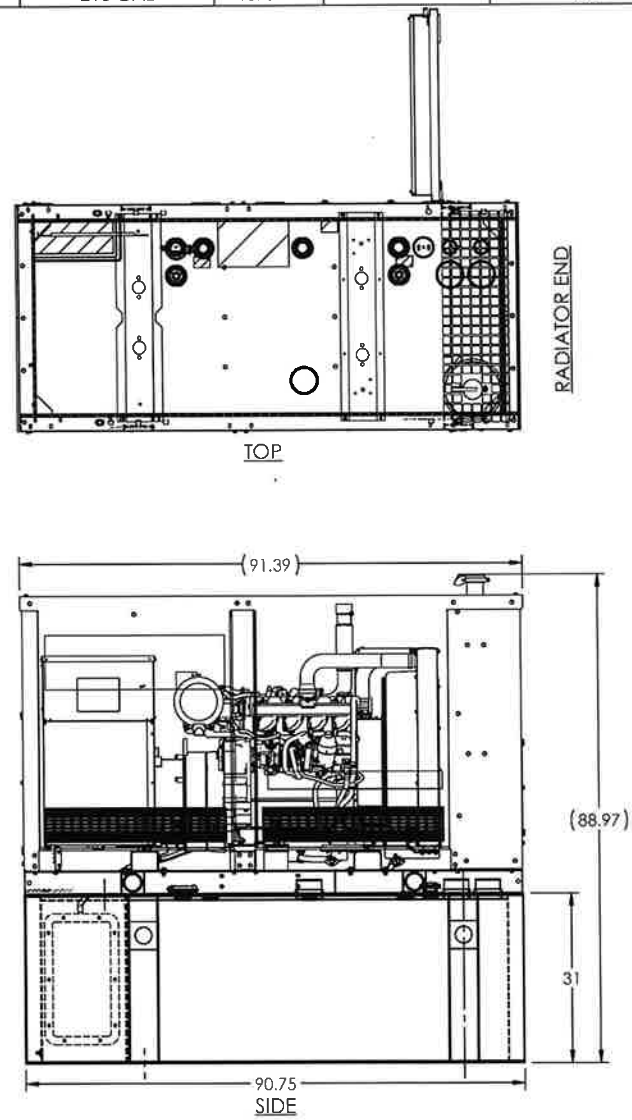


NOTE: This drawing is provided for reference only and should not be used for planning installation. Contact your local distributor for more detailed information.

DISTRIBUTED BY:

JOB #	TANK CAPACITY ACTUAL	TANK CAPACITY USEABLE	TANK WEIGHT	GENSET MODEL	GENSET FOOTPRINT
34744	221 GAL	210 GAL	1575 LBS	50REOZK SAE	41" X 90.6"

APPROVED BY: **DATE:**



REV.	REVISIONS DESCRIPTION	DATE	BY

GLOBAL POWER COMPONENTS
www.globalpowercomponents.com

FILE NO. MH18481 MH46743 MH25279

THIRD ANGLE PROJECTION

CUSTOMER NAME: KOHLER COMPANY
JOB REFERENCE: ES-88579
DRAWING REFERENCE: 15 34517

DATE: 2/8/2021
DRAWN BY: CAH

DESCRIPTION: **SUBBASE TANK WITH RUPTURE BASINS & CORNER STUB UP**

SIZE: B
DWG. NO. **15-34744**
REV.
SCALE: 1:22
SHEET 8 OF 8

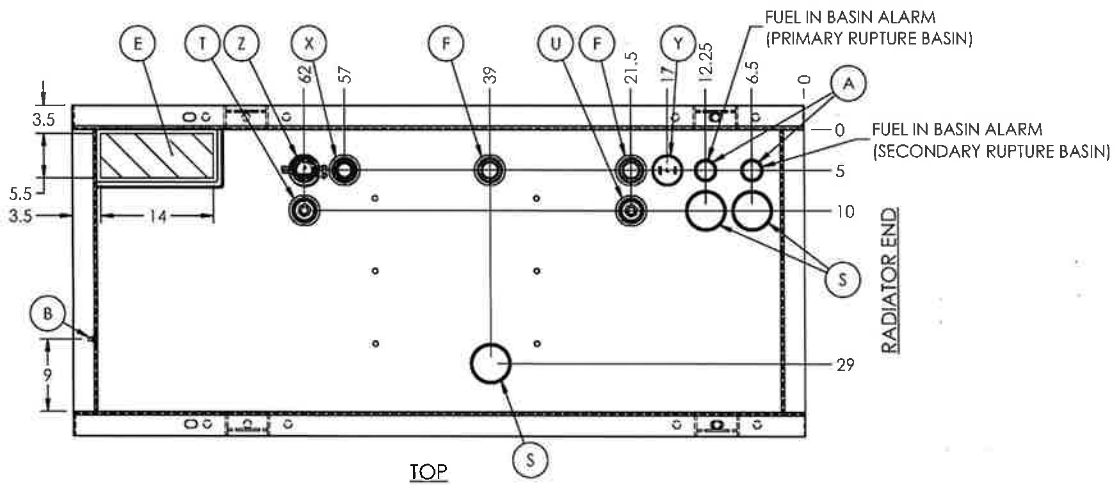
JOB #	TANK CAPACITY ACTUAL	TANK CAPACITY USEABLE	TANK WEIGHT	GENSET MODEL	GENSET FOOTPRINT
34744	221 GAL	210 GAL	1575 LBS	50REOZK SAE	41" X 90.6"

APPROVED BY: **DATE:**

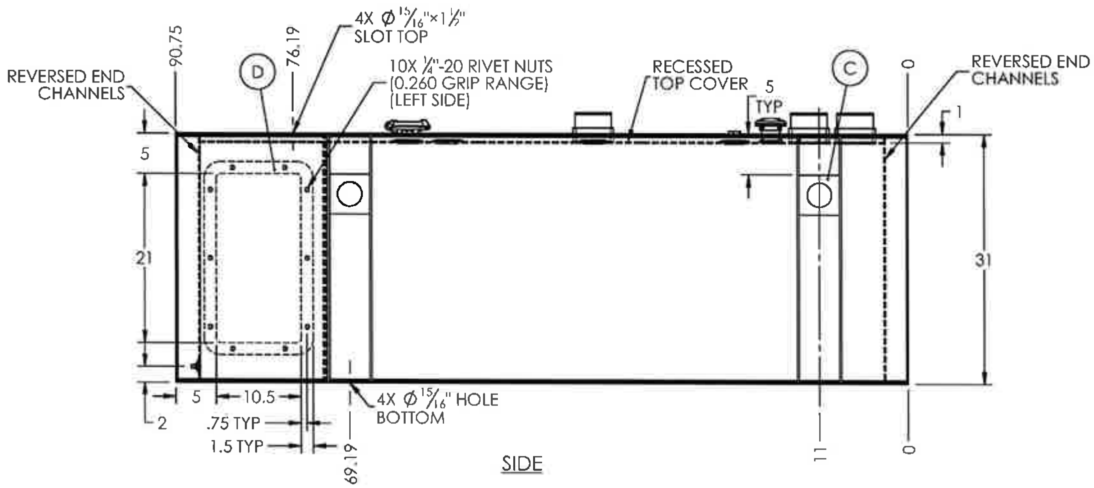
BILL OF MATERIALS

ITEM	PART NUMBER	DESCRIPTION	QTY.
S	3164	H. COUPLING, 4", EMERGENCY VENT	3
T	3650R	FLANGE, 2", FUEL RETURN W/ 1/2" DIP TUBE	1
U	3650S	FLANGE, 2", FUEL SUPPLY W/ 1/2" DIP TUBE	1
X	1002	FLANGE, 2", 2"×1-1/2" REDUCING BUSHING SPIRAL FUEL LEVEL GAUGE (SET AT 29")	1
	1002-TS	SPIRAL TWINSITE ADAPTER #P5639S02543	1
Y	3152	H. COUPLING, 2", STANDARD VENT CAP	1
Z	3005	FLANGE, 2", LOCKING FILL PORT	1
A	4300	H. COUPLING, 2", FUEL IN BASIN ALARM	2
B	3502	FLANGE, 1/2", BASIN DRAIN	1
C	8410	1/4" FLUSH MOUNT LIFTING PLATE	4
D	8002	REMOVABLE STUB UP ACCESS PANEL	1
E	4003	CORNER ELECTRICAL STUB UP	1
F	3195	FLANGE, 2", EXTRA FITTING W/ PLUG	2
	4210	RECESSED TOP COVER (FLUID CONTAINMENT), 1"	1
SPECIAL		TRIPLE WALL TERTIARY CONTAINMENT	
PAINT COLOR		GLOSS BLACK (9638)	

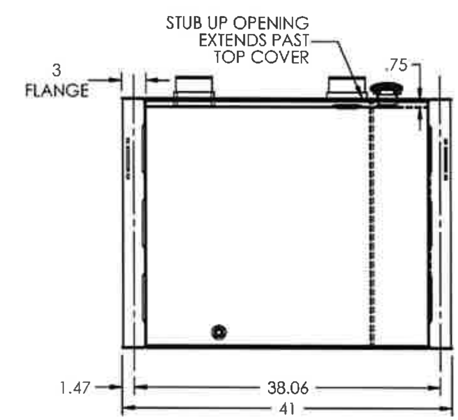
NOTE:
1) TWINSITE ADAPTER USED IN LIEU OF FUEL LEVEL ALARM FLOATS
2) FIRST GEN END TOP SLOT SET IS OFFSET FROM GUSSETS
3) WELD RECESSED TOP COVER FOR FLUID CONTAINMENT



TOP



SIDE



END

REV.	REVISIONS DESCRIPTION	DATE	BY

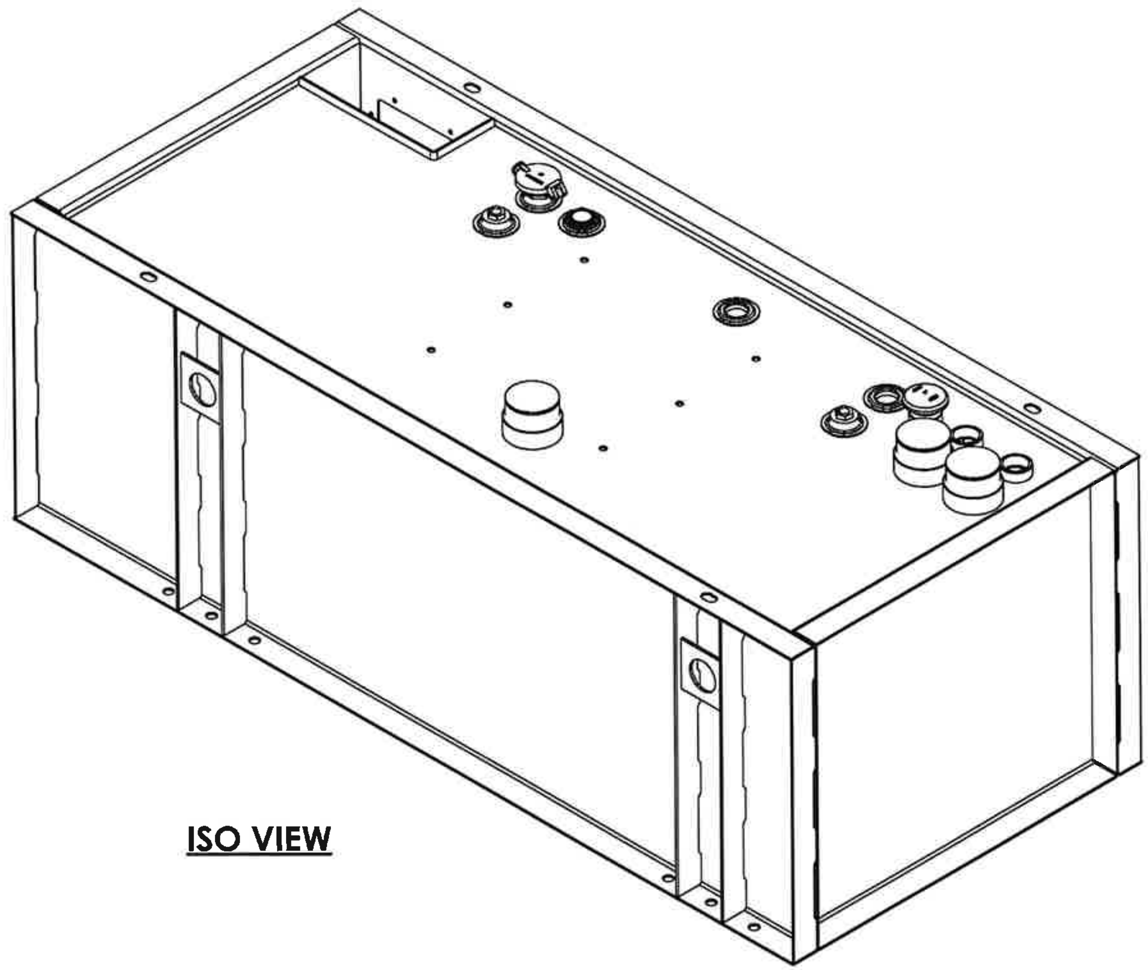
GLOBAL POWER COMPONENTS

CUSTOMER NAME: KOHLER COMPANY
JOB REFERENCE: ES 88579
DRAWING REFERENCE: 15 34517

DATE: 2/8/2021
DRAWN BY: CAH
DESCRIPTION: **SUBBASE TANK WITH RUPTURE BASINS & CORNER STUB UP**
SIZE: B
DWG. NO. **15-34744**
SCALE: 1:15
REV.
SHEET 2 OF 8

JOB # 34744

APPROVED BY: **DATE:**



ISO VIEW

GLOBAL POWER COMPONENTS 2320 S. 5th St. MILWAUKEE, WI 53219 PH (414) 475 3000 FAX (414) 475 3441 www.globalpowercomponents.com	Underwriters Laboratories Inc. Listed FILE NO. MH18481 MH46740 MH25279	CUSTOMER NAME: KOHLER COMPANY JOB REFERENCE: ES 88579 DRAWING REFERENCE: 15 34517*	DATE: 2/8/2021 DRAWN BY: CAH DESCRIPTION: SUBBASE TANK WITH RUPTURE BASINS ISO VIEW SIZE: B DWG. NO. 15-34744 REV. SCALE: 1:10 SHEET 3 OF 8

ATTACHMENT 5

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

160' Lattice Tower

Verizon Antenna Installation

CSP Tower Ref: #52

194 MT Parnassus Road
East Haddam, CT

CENTEK Project No. 23134.00

Date: October 6, 2023

Max Stress Ratio = 61%

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Prepared for:

Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation by Verizon on the existing lattice tower located in East Haddam, Connecticut.

The host tower is a 120-ft, three legged, lattice tower originally designed and manufactured by Valmont. File no. 265482 dated June 21, 2016. The tower geometry, structure member sizes and foundation information were taken from the aforementioned design documents.

Antenna and appurtenance inventory was taken from an existing tower inventory provided by the CSP, a field visit conducted by Centek personnel and information provided by Verizon.

The tower consists of six (6) existing and two (2) proposed vertical sections consisting of steel solid round truss legs conforming to ASTM A572-58 and steel angle lateral bracing. The vertical tower sections are connected by bolted flange plates with the diagonal and horizontal bracing to legs consisting of bolted connections. The width of the tower face is 8-ft at the top and 22-ft at the bottom.

Antenna and Appurtenance Summary

The existing and proposed loads considered in the analysis consist of the following:

Antenna Type	Carrier	Mount	Antenna Elevation	Cable
(1) Lightning Rod	Tower (relocated)	Leg Mount	160'	N/A
(4) Samsung MT6413-77A (8) Commscope NHH-45B-R2B (4) Samsung RF4439d-25A (4) Samsung RF4461d-13A (1) OVP-RC2DC-3315-PF-48	**Verizon (Proposed)**	**(4) V-frames**	**145'**	**(2) 6x12 Fiber Cables**
(1) PA6-65 dish	CSP (existing)	Pipe Mount	120'	(1) WEP65 Cable
(1) PA6-65 dish	CSP (existing)	Pipe Mount	120'	(1) WEP65 Cable
(3) SC479-HF1LDF Omni (1) 432E-83101T TTA	CSP (existing)	10-ft T-Frame	120'	(3) 1-5/8" coax cable (1) 1/2" coax cable
(1) WPA-80080-4CF Panel (2) SC479-HF1LDF Omni (1) ANT450-F6 Omni (1) 432E-83101T TTA	CSP (existing)	10-ft T-Frame	120'	(3) 1-5/8" coax cable (1) 7/8" coax cable (1) 1/2" coax cable
(2) DB-810 Omni	CSP (Future)	Pipe Mount	120'	(2) 1-5/8" coax cable
(1) ANT150F2 Antenna	VS/QV (existing)	6' Side Arm Mount	100'	(1) 7/8" coax cable

Antenna Type	Carrier	Mount	Antenna Elevation	Cable
(1) ANT450F6 Antenna	VS/QV (existing)	6' Side Arm Mount	85'	(1) 7/8" coax cable
(1) SD314 Antenna	VS/QV (existing)	6' Side Arm Mount	85'	(1) 7/8" coax cable
(1) ANT150F2 Antenna	VS/QV (existing)	6' Side Arm Mount	80'	(1) 7/8" coax cable
(1) 531-70 Dipole	DOT (existing)	2' Side Arm Mount	55'	(1) 1/2" coax cable
(1) 531-70 Dipole	East Haddam (existing)	2' Side Arm Mount	55'	(1) 1/2" coax cable
(1) 531-70 Dipole	East Haddam (existing)	2' Side Arm Mount	55'	(1) 1/2" coax cable
(1) ANT150F2 Antenna	East Haddam (existing)	2' Side Arm Mount	25'	(1) 1/2" coax cable
(1) ANT150F2 Antenna (inverted)	VS/QV (existing)	Shared with mount above	20'	(1) 1/2" coax cable

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables should be routed as specified in section 3 of this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower, and the model assumes that the tower members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-H entitled "Structural Standard for Antenna Support Structures, Antennas and Small Wind Turbine Support Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix P of the CSBC[1] and the wind speed data available in the TIA-222-H Standard.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-H, gravity loads of the tower structure and its components, and the application of 1.0" radial ice on the tower structure and its components.

Load Cases:	Load Case 1; 135 mph (Risk Cat IV) wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix P of the 2022 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.00" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-H]*
	Load Case 3; 90 mph wind speed w/ 0.5" radial ice plus gravity load – used in calculation of tower twist and sway.	*[TIA-222-F used for calculation of tower twist and sway per the requirements of the CSP]*

[1] The 2021 International Building Code as amended by the 2022 Connecticut State Building Code (CSBC).

Tower Capacity

- Calculated stresses **were found to be within allowable limits**.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T1)	140.0' - 160.0'	60.9%	**PASS**
Diagonal (T4)	80.0' - 100.0'	52.5%	**PASS**
Top Girt (T3)	100.0' - 120.0'	12.1%	**PASS**

- The tower combined deflection **was found to be within allowable limits**.

Deflection Criteria	Proposed (degrees)	Allowable (degrees)	Result
Sway (Tilt)	0.4012	n/a	**n/a**
Twist	0.1476	n/a	**n/a**
Combined	0.5488	0.75	**PASS**

TIA-222-F standard used for calculation of tower twist and sway per the requirements of the CSP.

Foundation and Anchors

The existing foundation consists of a (3) 4.0-ft diameter x 3.25-ft long reinforced concrete piers supported on a 36-ft square x 2.25-ft thick mat. The base of the tower is connected to the foundation by means of (12) 1.25"∅ anchor bolts per leg embedded into the concrete foundation structure.

- The tower reactions developed from the governing Load Case were used in the verification of the foundation and anchor bolts:

Load Effect	Proposed Tower Reactions
Leg Shear	30 kips
Leg Compression	254 kips
Leg Tension	214 kips
Base Moment	4,528 ft-kips
Base Shear	49 kips

- The anchor bolts **were found** to be within allowable limits.

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Tension and Shear	18.5%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	(percentage of capacity)	Result
Reinforced Concrete Pad and Piers	Overturning	31%	**PASS**
	Bearing	22%	**PASS**

Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed antenna configuration.

The analysis is based, in part, on the information provided to this office by Verizon and the CSP. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

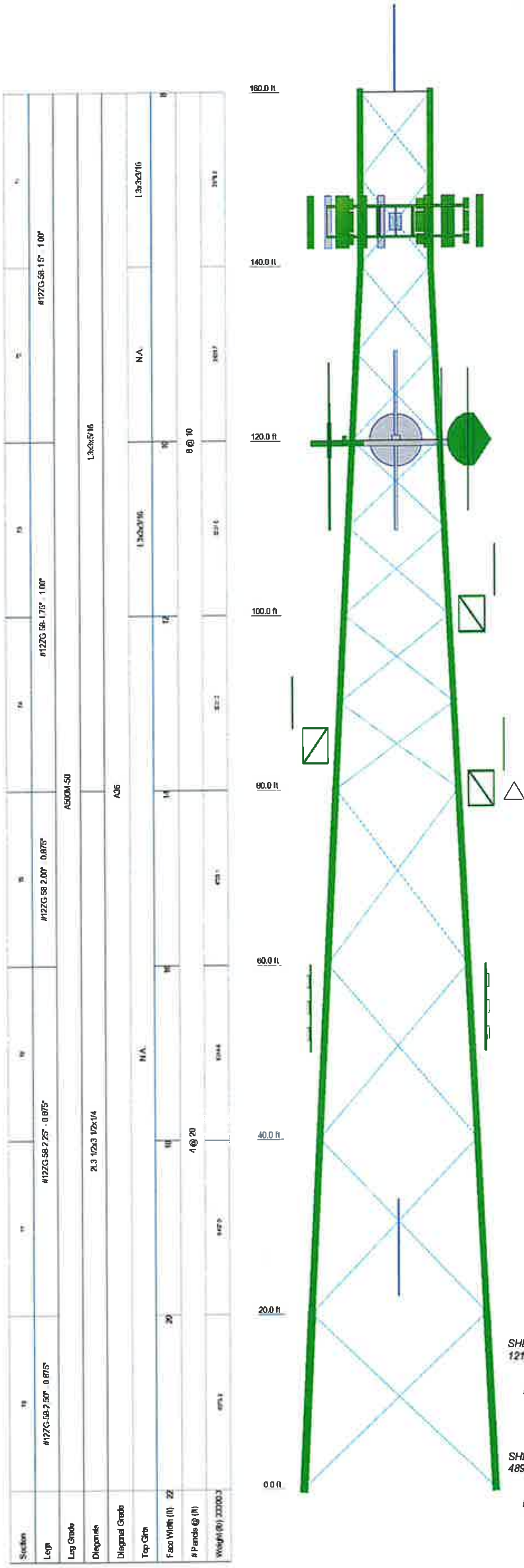
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly RISA Tower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-H standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10-ft Lighting Rod	160	TX-RX 432E-83I-01T	120
MT6413 77A (Verizon Proposed)	145	10 ft T-Frame	120
NHH-45B-R2B (Verizon Proposed)	145	DB810K (Future)	120
NHH-45B-R2B (Verizon Proposed)	145	DB810K (Future)	120
MT6413 77A (Verizon Proposed)	145	WPA 80080/4CF	120
NHH-45B-R2B (Verizon Proposed)	145	ANT450F6	120
NHH-45B-R2B (Verizon Proposed)	145	SC479-HF1LDF (Inverted)	120
MT6413-77A (Verizon Proposed)	145	SC479-HF1LDF (Inverted)	120
NHH-45B-R2B (Verizon Proposed)	145	TX-RX 432E-83I-01T	120
NHH-45B-R2B (Verizon Proposed)	145	10 ft T-Frame	120
MT6413 77A (Verizon Proposed)	145	SC479-HF1LDF	120
NHH-45B-R2B (Verizon Proposed)	145	PA6-65	120
NHH-45B-R2B (Verizon Proposed)	145	PA6-65	120
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	ANT150F2	100
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	6' Standoff Arm	100
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	SO314	85
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	6' Standoff Arm	85
RF4461d-13A (Verizon Proposed)	145	ANT450F6	65
RF4461d-13A (Verizon Proposed)	145	6' Standoff Arm	65
RF4461d-13A (Verizon Proposed)	145	6' Standoff Arm	80
RF4461d-13A (Verizon Proposed)	145	ANT150F2	80
RC2DC-3315-PF-48 (Verizon Proposed)	145	2 ft Stand Off	55
SitePro VFA12-HD (Verizon Proposed)	145	531-70HD	55
SitePro VFA12-HD (Verizon Proposed)	145	531-70HD	55
SitePro VFA12 HD (Verizon Proposed)	145	531-70HD	55
SitePro VFA12-HD (Verizon Proposed)	145	2-ft Stand Off	25
SC479-HF1LDF (Inverted)	120	ANT150F2	25
SC479-HF1LDF (Inverted)	120	ANT150F2 (Inverted)	20

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500M-58	58 ksi	70 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 135 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category IV.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 60.9%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 254436 lb
SHEAR: 30069 lb

UPLIFT: -214307 lb
SHEAR: 26442 lb

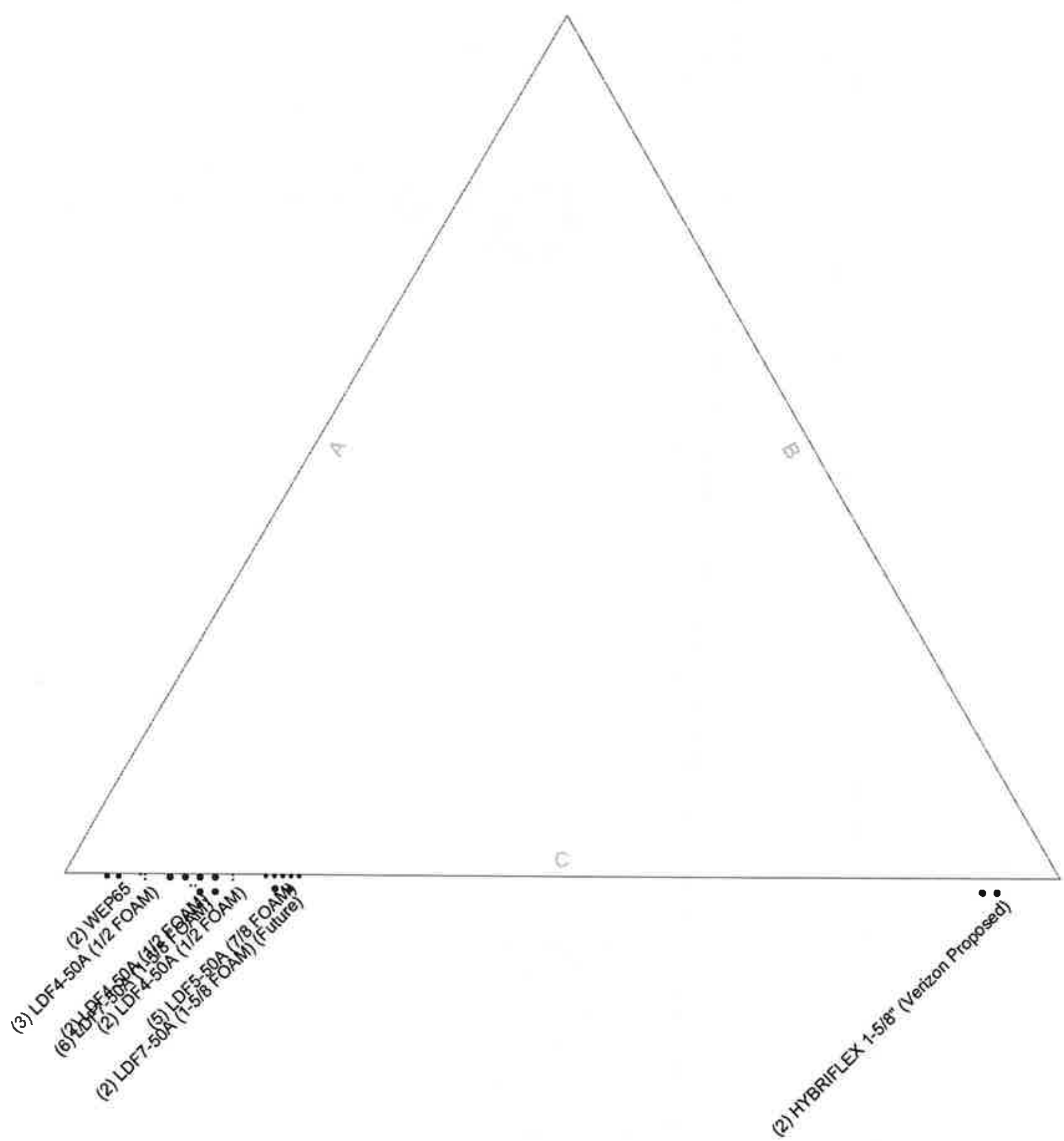
AXIAL 101405 lb
SHEAR 12100 lb
MOMENT 1152 kip-ft
TORQUE 19 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 50323 lb
SHEAR 48921 lb
MOMENT 4528 kip-ft
TORQUE 57 kip-ft
REACTIONS - 135 mph WIND

Centek Engineering Inc.	Job: 23134.00 - East Haddam		
63-2 North Branford Rd.	Project: 160-ft Lattice Tower (CSP #52)		
Branford, CT 06405	Client: Verizon	Drawn by: TJL	App'd:
Phone: (203) 488-0580	Code: TIA-222-H	Date: 10/09/23	Scale: NTS
FAX: (203) 488-8587	Path:		Dwg No. E-1

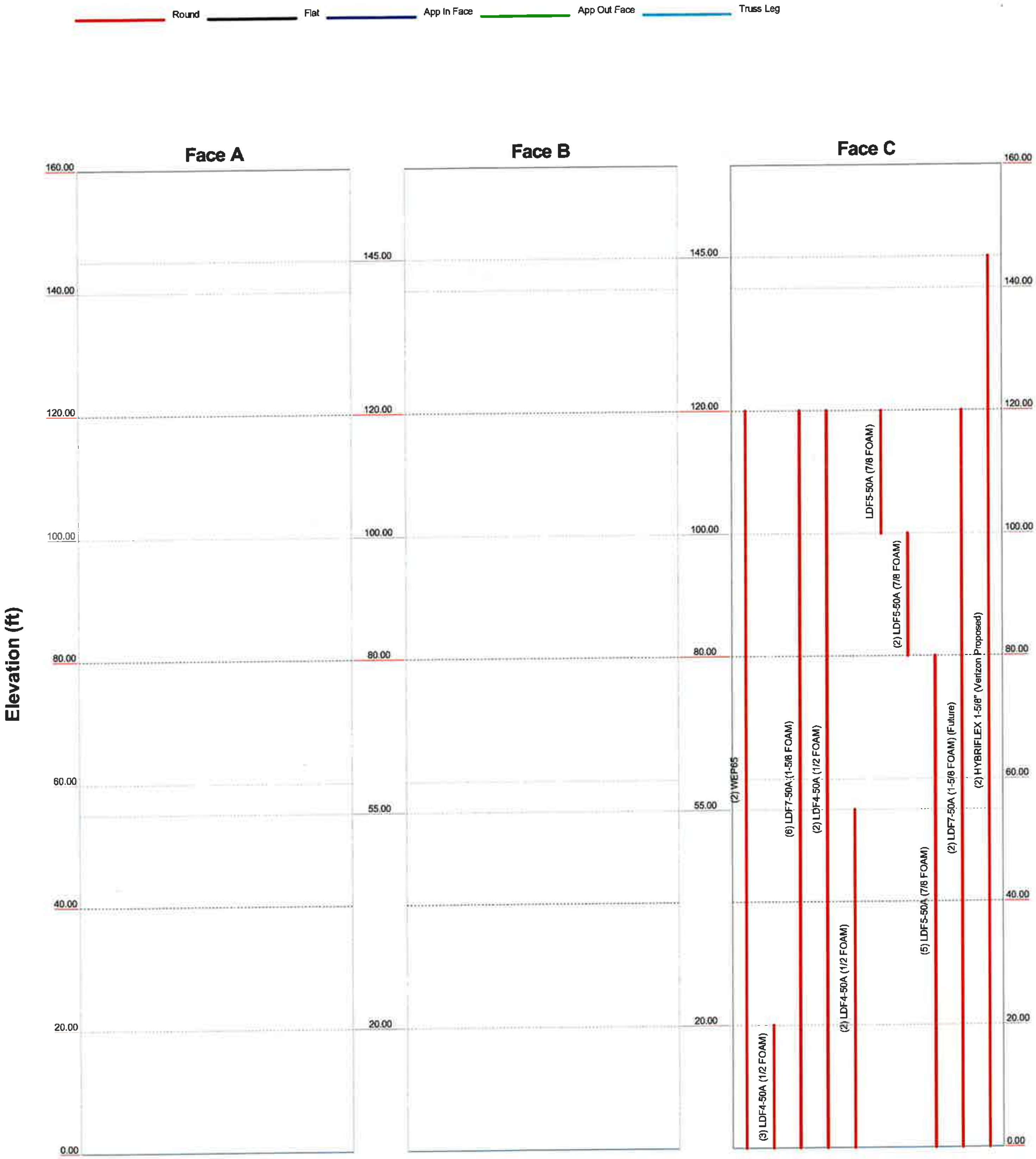
Feed Line Plan

Round   Flat   App In Face   App Out Face   Truss-Leg



Centek Engineering Inc.	Job: ***23134.00 - East Haddam***		
63-2 North Branford Rd.	Project: ***160-ft Lattice Tower (CSP #52)***		
Branford, CT 06405	Client: Verizon	Drawn by: TJL	App'd:
Phone: (203) 488-0580	Code: TIA-222-H	Date: 10/06/23	Scale: NTS
FAX: (203) 488-8587	Path:		Dwg No. E-7

Feed Line Distribution Chart
0' - 160'



Centek Engineering Inc.	Job: 23134.00 - East Haddam		
63-2 North Branford Rd.	Project: 160-ft Lattice Tower (CSP #52)		
Branford, CT 06405	Client: Verizon	Drawn by: TJL	App'd:
Phone: (203) 488-0580	Code: TIA-222-H	Date: 10/06/23	Scale: NTS
FAX: (203) 488-8587	Path:		Dwg No. E-7

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 160.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 8.00 ft at the top and 22.00 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

- Tower base elevation above sea level: 0.00 ft.
- Basic wind speed of 135 mph.
- Risk Category IV.
- Exposure Category C.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.00 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

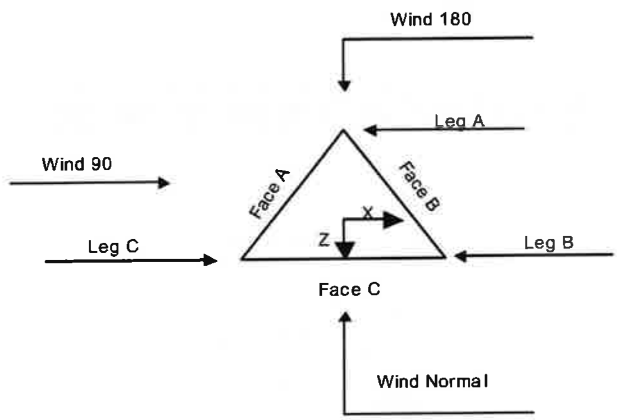
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
√ Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
√ SR Members Have Cut Ends
SR Members Are Concentric

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
Retension Guys To Initial Tension
√ Bypass Mast Stability Checks
Use Azimuth Dish Coefficients
Project Wind Area of Appurt.
Autocalc Torque Arm Areas
Add IBC .6D+W Combination
√ Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing
Treat Feed Line Bundles As Cylinder
Ignore KL/ry For 60 Deg. Angle Legs

Use ASCE 10 X-Brace Ly Rules
√ Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
√ SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feed Line Torque
√ Include Angle Block Shear Check
Use TIA-222-H Bracing Resist. Exemption
Use TIA-222-H Tension Splice Exemption

Poles

Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets
Pole Without Linear Attachments
Pole With Shroud Or No Appurtenances
Outside and Inside Corner Radii Are Known



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	160.00-140.00			8.00	1	20.00
T2	140.00-120.00			8.00	1	20.00
T3	120.00-100.00			10.00	1	20.00
T4	100.00-80.00			12.00	1	20.00
T5	80.00-60.00			14.00	1	20.00
T6	60.00-40.00			16.00	1	20.00
T7	40.00-20.00			18.00	1	20.00
T8	20.00-0.00			20.00	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	160.00-140.00	10.00	X Brace	No	No	0.0000	0.0000
T2	140.00-120.00	10.00	X Brace	No	No	0.0000	0.0000
T3	120.00-100.00	10.00	X Brace	No	No	0.0000	0.0000
T4	100.00-80.00	10.00	X Brace	No	Yes	0.0000	0.0000
T5	80.00-60.00	20.00	X Brace	No	No	0.0000	0.0000
T6	60.00-40.00	20.00	X Brace	No	No	0.0000	0.0000
T7	40.00-20.00	20.00	X Brace	No	No	0.0000	0.0000

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 160.00-140.00	Truss Leg	#12ZG-58-1.5" - 1.00"	A500M-58 (58 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T2 140.00-120.00	Truss Leg	#12ZG-58-1.5" - 1.00"	A500M-58 (58 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T3 120.00-100.00	Truss Leg	#12ZG-58-1.75" - 1.00"	A500M-58 (58 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T4 100.00-80.00	Truss Leg	#12ZG-58-1.75" - 1.00"	A500M-58 (58 ksi)	Equal Angle	L3x3x5/16	A36 (36 ksi)
T5 80.00-60.00	Truss Leg	#12ZG-58-2.00" - 0.875"	A500M-58 (58 ksi)	Double Angle	2L3 1/2x3 1/2x1/4	A36 (36 ksi)
T6 60.00-40.00	Truss Leg	#12ZG-58-2.25" - 0.875"	A500M-58 (58 ksi)	Double Angle	2L3 1/2x3 1/2x1/4	A36 (36 ksi)
T7 40.00-20.00	Truss Leg	#12ZG-58-2.25" - 0.875"	A500M-58 (58 ksi)	Double Angle	2L3 1/2x3 1/2x1/4	A36 (36 ksi)
T8 20.00-0.00	Truss Leg	#12ZG-58-2.50" - 0.875"	A500M-58 (58 ksi)	Double Angle	2L3 1/2x3 1/2x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 160.00-140.00	Equal Angle	L3x3x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 120.00-100.00	Equal Angle	L3x3x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T4 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

	Truss-Leg K Factors					
	Truss-Legs Used As Leg Members			Truss-Legs Used As Inner Members		
Tower Elevation ft	Leg Panels	X Brace Diagonals	Z Brace Diagonals	Leg Panels	X Brace Diagonals	Z Brace Diagonals
T1 160.00-140.00	1	0.5	0.85	1	0.5	0.85
T2 140.00-120.00	1	0.5	0.85	1	0.5	0.85
T3 120.00-100.00	1	0.5	0.85	1	0.5	0.85

	Truss-Leg K Factors					
	Truss-Legs Used As Leg Members			Truss-Legs Used As Inner Members		
Tower Elevation ft	Leg Panels	X Brace Diagonals	Z Brace Diagonals	Leg Panels	X Brace Diagonals	Z Brace Diagonals
T4 100.00-80.00	1	0.5	0.85	1	0.5	0.85
T5 80.00-60.00	1	0.5	0.85	1	0.5	0.85
T6 60.00-40.00	1	0.5	0.85	1	0.5	0.85
T7 40.00-20.00	1	0.5	0.85	1	0.5	0.85
T8 20.00-0.00	1	0.5	0.85	1	0.5	0.85

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 160.00-140.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 140.00-120.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 120.00-100.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 100.00-80.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 80.00-60.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 60.00-40.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 40.00-20.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 20.00-0.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 160.00-140.00	Flange	1.0000 A325N	6	1.0000 A325N	1	1.0000 A325N	1	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 140.00-120.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 120.00-100.00	Flange	1.2500 A325N	6	1.0000 A325N	1	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 100.00-80.00	Flange	1.2500 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 80.00-60.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 60.00-40.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 40.00-20.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 20.00-0.00	Flange	1.2500 F1554-105	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
WEP65	C	No	No	Ar (CaAa)	120.00 - 0.00	0.0000	0.45	2	2	1.5836	1.5836		0.53
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	20.00 - 0.00	0.0000	0.42	3	2	0.6300	0.6300		0.15
LDF7-50A (1-5/8 FOAM)	C	No	No	Ar (CaAa)	120.00 - 0.00	0.0000	0.37	6	4	1.9800	1.9800		0.82
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	120.00 - 0.00	3.0000	0.37	2	2	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM)	C	No	No	Ar (CaAa)	55.00 - 0.00	0.0000	0.33	2	1	0.6300	0.6300		0.15
LDF5-50A (7/8 FOAM)	C	No	No	Ar (CaAa)	120.00 - 100.00	0.0000	0.28	1	1	1.0900	1.0900		0.33
LDF5-50A (7/8 FOAM)	C	No	No	Ar (CaAa)	100.00 - 80.00	0.0000	0.28	2	2	1.0900	1.0900		0.33
LDF5-50A (7/8 FOAM)	C	No	No	Ar (CaAa)	80.00 - 0.00	0.0000	0.28	5	5	1.0900	1.0900		0.33
LDF7-50A (1-5/8 FOAM) (Future)	C	No	No	Ar (CaAa)	120.00 - 0.00	3.0000	0.28	2	2	1.9800	1.9800		0.82
HYBRIFLEX 1-5/8" (Verizon Proposed)	C	No	No	Ar (CaAa)	145.00 - 0.00	3.0000	-0.43	2	2	1.9800	1.9800		1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	160.00-140.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	1.980	0.000	19.00
T2	140.00-120.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	7.920	0.000	76.00
T3	120.00-100.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	50.634	0.000	241.00
T4	100.00-80.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	52.814	0.000	247.60
T5	80.00-60.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	59.354	0.000	267.40
T6	60.00-40.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	61.244	0.000	271.90
T7	40.00-20.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	61.874	0.000	273.40
T8	20.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	65.654	0.000	282.40

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	160.00-140.00	A	1.454	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	6.318	0.000	81.17
T2	140.00-120.00	A	1.434	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	25.133	0.000	320.94
T3	120.00-100.00	A	1.410	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	141.354	0.000	1807.16
T4	100.00-80.00	A	1.382	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	150.477	0.000	1842.00
T5	80.00-60.00	A	1.348	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	164.072	0.000	1995.16
T6	60.00-40.00	A	1.303	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	172.661	0.000	2039.33
T7	40.00-20.00	A	1.238	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	173.058	0.000	1985.95
T8	20.00-0.00	A	1.109	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
		C		0.000	0.000	181.514	0.000	1924.50

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	160.00-140.00	0.6699	0.5517	0.9532	0.7526
T2	140.00-120.00	2.8900	2.3325	4.5043	3.4977
T3	120.00-100.00	-8.2568	11.4611	-10.7031	15.4270
T4	100.00-80.00	-10.0405	13.6336	-13.3877	18.6728
T5	80.00-60.00	-12.8138	16.7579	-16.7707	22.5786
T6	60.00-40.00	-14.3559	18.4617	-19.6391	25.5818
T7	40.00-20.00	-15.7617	20.1512	-21.7180	27.9884
T8	20.00-0.00	-18.1255	22.1717	-25.8003	31.1967

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	10	HYBRIFLEX 1-5/8"	140.00 - 145.00	0.6000	0.4922
T2	10	HYBRIFLEX 1-5/8"	120.00 - 140.00	0.6000	0.5515
T3	1	WEP65	100.00 - 120.00	0.6000	0.5930
T3	3	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.5930
T3	4	LDF4-50A (1/2 FOAM)	100.00 - 120.00	0.6000	0.5930
T3	6	LDF5-50A (7/8 FOAM)	100.00 - 120.00	0.6000	0.5930
T3	9	LDF7-50A (1-5/8 FOAM)	100.00 - 120.00	0.6000	0.5930
T3	10	HYBRIFLEX 1-5/8"	100.00 - 120.00	0.6000	0.5930
T4	1	WEP65	80.00 - 100.00	0.6000	0.6000
T4	3	LDF7-50A (1-5/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T4	4	LDF4-50A (1/2 FOAM)	80.00 - 100.00	0.6000	0.6000
T4	7	LDF5-50A (7/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T4	9	LDF7-50A (1-5/8 FOAM)	80.00 - 100.00	0.6000	0.6000
T4	10	HYBRIFLEX 1-5/8"	80.00 - 100.00	0.6000	0.6000
T5	1	WEP65	60.00 - 80.00	0.6000	0.6000
T5	3	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T5	4	LDF4-50A (1/2 FOAM)	60.00 - 80.00	0.6000	0.6000
T5	8	LDF5-50A (7/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T5	9	LDF7-50A (1-5/8 FOAM)	60.00 - 80.00	0.6000	0.6000
T5	10	HYBRIFLEX 1-5/8"	60.00 - 80.00	0.6000	0.6000
T6	1	WEP65	40.00 - 60.00	0.6000	0.6000
T6	3	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T6	4	LDF4-50A (1/2 FOAM)	40.00 - 60.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T6	5	LDF4-50A (1/2 FOAM)	40.00 - 55.00	0.6000	0.6000
T6	8	LDF5-50A (7/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T6	9	LDF7-50A (1-5/8 FOAM)	40.00 - 60.00	0.6000	0.6000
T6	10	HYBRIFLEX 1-5/8"	40.00 - 60.00	0.6000	0.6000
T7	1	WEP65	20.00 - 40.00	0.6000	0.6000
T7	3	LDF7-50A (1-5/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T7	4	LDF4-50A (1/2 FOAM)	20.00 - 40.00	0.6000	0.6000
T7	5	LDF4-50A (1/2 FOAM)	20.00 - 40.00	0.6000	0.6000
T7	8	LDF5-50A (7/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T7	9	LDF7-50A (1-5/8 FOAM)	20.00 - 40.00	0.6000	0.6000
T7	10	HYBRIFLEX 1-5/8"	20.00 - 40.00	0.6000	0.6000
T8	1	WEP65	0.00 - 20.00	0.6000	0.6000
T8	2	LDF4-50A (1/2 FOAM)	0.00 - 20.00	0.6000	0.6000
T8	3	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T8	4	LDF4-50A (1/2 FOAM)	0.00 - 20.00	0.6000	0.6000
T8	5	LDF4-50A (1/2 FOAM)	0.00 - 20.00	0.6000	0.6000
T8	8	LDF5-50A (7/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T8	9	LDF7-50A (1-5/8 FOAM)	0.00 - 20.00	0.6000	0.6000
T8	10	HYBRIFLEX 1-5/8"	0.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
SC479-HF1LDF	A	From Leg	3.00 0.00 3.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	4.37 6.54 8.04	4.37 6.54 8.04	34.00 69.82 114.98
SC479-HF1LDF (Inverted)	A	From Leg	3.00 0.00 -3.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	4.37 6.54 8.04	4.37 6.54 8.04	34.00 69.82 114.98
SC479-HF1LDF (Inverted)	A	From Leg	3.00 0.00 -3.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	4.37 6.54 8.04	4.37 6.54 8.04	34.00 69.82 114.98
TX/RX 432E-83I-01T	A	From Leg	1.00 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	1.20 1.34 1.48	0.75 0.86 0.98	25.00 36.55 50.34
10-ft T-Frame	A	From Leg	2.00 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice 1" Ice	13.60 17.50 21.40	13.60 17.50 21.40	378.00 530.00 682.00
SD314	A	From Leg	6.00 0.00 5.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	3.17 5.02 6.87	3.17 5.02 6.87	21.00 44.00 67.00
6' Standoff Arm	A	From Leg	3.00 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice 1" Ice	2.40 2.83 3.26	0.13 0.18 0.24	50.00 71.81 99.00
531-70HD	A	From Leg	2.00 0.00 0.00	0.0000	55.00	No Ice 1/2" Ice 1" Ice	6.00 6.90 7.80	6.00 6.90 7.80	40.00 50.00 60.00
2-ft Stand Off	A	From Leg	1.00 0.00	0.0000	55.00	No Ice 1/2" Ice	1.07 1.62	1.07 1.62	20.00 28.00

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		*C_AA_A Front* ft²	*C_AA_A Side* ft²	*Weight* lb
			0.00			1" Ice	2.17	2.17	36.00
ANT150F2	A	From Leg	2.00	0.0000	25.00	No Ice	1.30	1.30	16.00
			0.00			1/2" Ice	1.60	1.60	20.80
			5.00			1" Ice	1.90	1.90	25.60
ANT150F2 (Inverted)	A	From Leg	2.00	0.0000	20.00	No Ice	1.30	1.30	16.00
			0.00			1/2" Ice	1.60	1.60	20.80
			5.00			1" Ice	1.90	1.90	25.60
2-ft Stand Off	A	From Leg	1.00	0.0000	25.00	No Ice	1.07	1.07	20.00
			0.00			1/2" Ice	1.62	1.62	28.00
			0.00			1" Ice	2.17	2.17	36.00
DB810K (Future)	B	From Leg	2.00	0.0000	120.00	No Ice	4.08	4.08	35.00
			3.00			1/2" Ice	5.73	5.73	65.18
			0.00			1" Ice	7.41	7.41	105.73
DB810K (Future)	B	From Leg	2.00	0.0000	120.00	No Ice	4.08	4.08	35.00
			-3.00			1/2" Ice	5.73	5.73	65.18
			0.00			1" Ice	7.41	7.41	105.73
ANT150F2	B	From Leg	6.00	0.0000	100.00	No Ice	1.30	1.30	16.00
			0.00			1/2" Ice	1.60	1.60	20.80
			5.00			1" Ice	1.90	1.90	25.60
6' Standoff Arm	B	From Leg	3.00	0.0000	100.00	No Ice	2.40	0.13	50.00
			0.00			1/2" Ice	2.83	0.18	71.81
			0.00			1" Ice	3.26	0.24	99.00
ANT150F2	B	From Leg	6.00	0.0000	80.00	No Ice	1.30	1.30	16.00
			0.00			1/2" Ice	1.60	1.60	20.80
			5.00			1" Ice	1.90	1.90	25.60
6' Standoff Arm	B	From Leg	3.00	0.0000	80.00	No Ice	2.40	0.13	50.00
			0.00			1/2" Ice	2.83	0.18	71.81
			0.00			1" Ice	3.26	0.24	99.00
531-70HD	B	From Leg	2.00	0.0000	55.00	No Ice	6.00	6.00	40.00
			0.00			1/2" Ice	6.90	6.90	50.00
			0.00			1" Ice	7.80	7.80	60.00
WPA-80080/4CF	C	From Leg	3.00	0.0000	120.00	No Ice	4.71	2.25	10.00
			0.00			1/2" Ice	5.03	2.55	37.83
			0.00			1" Ice	5.35	2.85	69.94
ANT450F6	C	From Leg	3.00	0.0000	120.00	No Ice	1.86	1.86	21.00
			0.00			1/2" Ice	2.67	2.67	35.05
			5.00			1" Ice	3.30	3.30	54.27
SC479-HF1LDF (Inverted)	C	From Leg	3.00	0.0000	120.00	No Ice	4.37	4.37	34.00
			0.00			1/2" Ice	6.54	6.54	69.82
			-3.00			1" Ice	8.04	8.04	114.98
SC479-HF1LDF (Inverted)	C	From Leg	3.00	0.0000	120.00	No Ice	4.37	4.37	34.00
			0.00			1/2" Ice	6.54	6.54	69.82
			-3.00			1" Ice	8.04	8.04	114.98
TX/RX 432E-83I-01T	C	From Leg	1.00	0.0000	120.00	No Ice	1.20	0.75	25.00
			0.00			1/2" Ice	1.34	0.86	36.55
			0.00			1" Ice	1.48	0.98	50.34
10-ft T-Frame	C	From Leg	2.00	0.0000	120.00	No Ice	13.60	13.60	378.00
			0.00			1/2" Ice	17.50	17.50	530.00
			0.00			1" Ice	21.40	21.40	682.00
ANT450F6	C	From Leg	6.00	0.0000	85.00	No Ice	1.86	1.86	21.00
			0.00			1/2" Ice	2.67	2.67	35.05
			5.00			1" Ice	3.30	3.30	54.27
6' Standoff Arm	C	From Leg	3.00	0.0000	85.00	No Ice	2.40	0.13	50.00
			0.00			1/2" Ice	2.83	0.18	71.81
			0.00			1" Ice	3.26	0.24	99.00
531-70HD	C	From Leg	2.00	0.0000	55.00	No Ice	6.00	6.00	40.00
			0.00			1/2" Ice	6.90	6.90	50.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.00			1" Ice	7.80	7.80	60.00
MT6413-77A	C	From Face	3.00	0.0000	145.00	No Ice	3.79	1.46	60.00
(Verizon Proposed)			-3.00			1/2" Ice	4.04	1.65	84.38
			0.00			1" Ice	4.30	1.85	112.21
NHH-45B-R2B	C	From Face	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			-6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
NHH-45B-R2B	C	From Face	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
MT6413-77A	A	From Face	3.00	0.0000	145.00	No Ice	3.79	1.46	60.00
(Verizon Proposed)			-3.00			1/2" Ice	4.04	1.65	84.38
			0.00			1" Ice	4.30	1.85	112.21
NHH-45B-R2B	A	From Face	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			-6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
NHH-45B-R2B	A	From Face	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
MT6413-77A	B	From Leg	3.00	0.0000	145.00	No Ice	3.79	1.46	60.00
(Verizon Proposed)			-3.00			1/2" Ice	4.04	1.65	84.38
			0.00			1" Ice	4.30	1.85	112.21
NHH-45B-R2B	B	From Leg	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			-6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
NHH-45B-R2B	B	From Leg	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
MT6413-77A	C	From Leg	3.00	0.0000	145.00	No Ice	3.79	1.46	60.00
(Verizon Proposed)			-3.00			1/2" Ice	4.04	1.65	84.38
			0.00			1" Ice	4.30	1.85	112.21
NHH-45B-R2B	C	From Leg	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			-6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
NHH-45B-R2B	C	From Leg	3.00	0.0000	145.00	No Ice	11.40	5.28	0.08
(Verizon Proposed)			6.00			1/2" Ice	11.89	5.74	65.67
			0.00			1" Ice	12.38	6.20	137.75
RF4439d-25A (B2/B66A RRH)	C	From Face	3.00	0.0000	145.00	No Ice	1.88	1.25	75.00
(Verizon Proposed)			-3.00			1/2" Ice	2.05	1.39	93.34
			2.00			1" Ice	2.22	1.54	114.47
RF4439d-25A (B2/B66A RRH)	A	From Face	3.00	0.0000	145.00	No Ice	1.88	1.25	75.00
(Verizon Proposed)			-3.00			1/2" Ice	2.05	1.39	93.34
			2.00			1" Ice	2.22	1.54	114.47
RF4439d-25A (B2/B66A RRH)	B	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.25	75.00
(Verizon Proposed)			-3.00			1/2" Ice	2.05	1.39	93.34
			2.00			1" Ice	2.22	1.54	114.47
RF4439d-25A (B2/B66A RRH)	C	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.25	75.00
(Verizon Proposed)			-3.00			1/2" Ice	2.05	1.39	93.34
			2.00			1" Ice	2.22	1.54	114.47
RF4461d-13A	C	From Face	3.00	0.0000	145.00	No Ice	1.87	1.28	80.00
(Verizon Proposed)			-3.00			1/2" Ice	2.03	1.42	98.51
			-2.00			1" Ice	2.21	1.57	119.81
RF4461d-13A	A	From Face	3.00	0.0000	145.00	No Ice	1.87	1.28	80.00
(Verizon Proposed)			-3.00			1/2" Ice	2.03	1.42	98.51
			-2.00			1" Ice	2.21	1.57	119.81
RF4461d-13A	B	From Leg	3.00	0.0000	145.00	No Ice	1.87	1.28	80.00
(Verizon Proposed)			-3.00			1/2" Ice	2.03	1.42	98.51

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			-2.00			1" Ice	2.21	1.57	119.81
RF4461d-13A (Verizon Proposed)	C	From Leg	3.00 -3.00 -2.00	0.0000	145.00	No Ice 1/2" Ice 1" Ice	1.87 2.03 2.21	1.28 1.42 1.57	80.00 98.51 119.81
RC2DC-3315-PF-48 (Verizon Proposed)	A	From Leg	1.00 0.00 0.00	0.0000	145.00	No Ice 1/2" Ice 1" Ice	3.01 3.23 3.46	1.96 2.15 2.35	25.00 51.21 80.79
SitePro VFA12-HD (Verizon Proposed)	C	From Face	1.00 0.00 0.00	0.0000	145.00	No Ice 1/2" Ice 1" Ice	21.00 25.00 29.00	21.00 25.00 29.00	750.00 900.00 1050.00
SitePro VFA12-HD (Verizon Proposed)	A	From Face	1.00 0.00 0.00	0.0000	145.00	No Ice 1/2" Ice 1" Ice	21.00 25.00 29.00	21.00 25.00 29.00	750.00 900.00 1050.00
SitePro VFA12-HD (Verizon Proposed)	B	From Leg	1.00 0.00 0.00	0.0000	145.00	No Ice 1/2" Ice 1" Ice	21.00 25.00 29.00	21.00 25.00 29.00	750.00 900.00 1050.00
SitePro VFA12-HD (Verizon Proposed)	C	From Leg	1.00 0.00 0.00	0.0000	145.00	No Ice 1/2" Ice 1" Ice	21.00 25.00 29.00	21.00 25.00 29.00	750.00 900.00 1050.00
10-ft Lighting Rod	A	From Leg	1.00 0.00 5.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	1.00 2.02 3.05	1.00 2.02 3.05	40.00 49.26 64.89

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight lb
PA6-65	A	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	Worst		120.00	6.00	No Ice 1/2" Ice 1" Ice	28.30 30.00 31.70	744.00 1000.00 1256.00
PA6-65	B	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	Worst		120.00	6.00	No Ice 1/2" Ice 1" Ice	28.30 30.00 31.70	744.00 1000.00 1256.00

Truss-Leg Properties

Section Designation	Area in²	Area Ice in²	Self Weight lb	Ice Weight lb	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in²
#12ZG-58-1.5" - 1.00"	2303.0530	6015.7699	552.82	825.57	7.9967	20.8881	5.3014
#12ZG-58-1.5" - 1.00"	2303.0530	6001.0711	552.82	802.23	7.9967	20.8371	5.3014
#12ZG-58-1.75" -	2421.2670	6056.1760	678.44	735.74	8.4072	21.0284	7.2158

Section Designation	Area in²	Area Ice in²	Self Weight lb	Ice Weight lb	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in²
1.00"							
#12ZG-58-1.75" - 1.00"	2421.2670	6036.2507	678.44	710.75	8.4072	20.9592	7.2158
#12ZG-58-2.00" - 0.875"	2556.3970	6083.8542	998.16	728.08	8.8764	21.1245	9.4248
#12ZG-58-2.25" - 0.875"	2686.5516	6124.1363	1165.70	702.94	9.3283	21.2644	11.9282
#12ZG-58-2.25" - 0.875"	2686.5516	6077.9773	1165.70	650.68	9.3283	21.1041	11.9282
#12ZG-58-2.50" - 0.875"	2826.7749	6058.3446	1354.97	568.88	9.8152	21.0359	14.7262

222-H Verification Constants

Constant	Value
K_d	0.85
Ice Thickness Importance Factor	1.25
Z_g	900
α	9.5
K_{zmin}	0.85
K_c	n/a
K_t	1
f	1
K_e	1

222-H Section Verification ArRr By Element

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
T1 160.00-140.00	1	#12ZG-58-1.5" - 1.00"	105.621	102.182	C	0.217	0.508	13.328	34.813	7.699	23.996
	1	#12ZG-58-1.5" - 1.00"	105.621	102.182	A	0.217	0.508	13.328	34.813	7.699	23.996
	2	#12ZG-58-1.5" - 1.00"	105.621	102.182	C	0.217	0.508	13.328	34.813	7.699	23.996
	2	#12ZG-58-1.5" - 1.00"	105.621	102.182	B	0.217	0.508	13.328	34.813	7.699	23.996
	3	#12ZG-58-1.5" - 1.00"	105.621	102.182	B	0.217	0.508	13.328	34.813	7.699	23.996
	3	#12ZG-58-1.5" - 1.00"	105.621	102.182	A	0.217	0.508	13.328	34.813	7.699	23.996
					A		Sum:	26.656	69.627	15.398	47.992
					B			26.656	69.627	15.398	47.992
					C			26.656	69.627	15.398	47.992
T2 140.00-120.00	19	#12ZG-58-1.5" - 1.00"	104.042	100.409	C	0.191	0.448	13.350	34.786	7.649	22.908
	19	#12ZG-58-1.5" - 1.00"	104.042	100.409	A	0.191	0.448	13.350	34.786	7.649	22.908
	20	#12ZG-58-1.5" - 1.00"	104.042	100.409	C	0.191	0.448	13.350	34.786	7.649	22.908
	20	#12ZG-58-1.5" - 1.00"	104.042	100.409	B	0.191	0.448	13.350	34.786	7.649	22.908

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
	21	#12ZG-58-1.5" - 1.00"	104.042	100.409	B	0.191	0.448	13.350	34.786	7.649	22.908
	21	#12ZG-58-1.5" - 1.00"	104.042	100.409	A	0.191	0.448	13.350	34.786	7.649	22.908
					A		Sum:	26.700	69.573	15.298	45.816
					B			26.700	69.573	15.298	45.816
					C			26.700	69.573	15.298	45.816
T3 120.00-100.00	34	#12ZG-58-1.75" - 1.00"	107.476	99.564	C	0.18	0.407	14.035	35.106	8.019	22.444
	34	#12ZG-58-1.75" - 1.00"	107.476	99.564	A	0.18	0.407	14.035	35.106	8.019	22.444
	35	#12ZG-58-1.75" - 1.00"	107.476	99.564	C	0.18	0.407	14.035	35.106	8.019	22.444
	35	#12ZG-58-1.75" - 1.00"	107.476	99.564	B	0.18	0.407	14.035	35.106	8.019	22.444
	36	#12ZG-58-1.75" - 1.00"	107.476	99.564	B	0.18	0.407	14.035	35.106	8.019	22.444
	36	#12ZG-58-1.75" - 1.00"	107.476	99.564	A	0.18	0.407	14.035	35.106	8.019	22.444
					A		Sum:	28.071	70.211	16.038	44.887
					B			28.071	70.211	16.038	44.887
					C			28.071	70.211	16.038	44.887
T4 100.00-80.00	52	#12ZG-58-1.75" - 1.00"	105.23	97.162	C	0.153	0.345	14.035	34.990	7.970	21.485
	52	#12ZG-58-1.75" - 1.00"	105.23	97.162	A	0.153	0.345	14.035	34.990	7.970	21.485
	53	#12ZG-58-1.75" - 1.00"	105.23	97.162	C	0.153	0.345	14.035	34.990	7.970	21.485
	53	#12ZG-58-1.75" - 1.00"	105.23	97.162	B	0.153	0.345	14.035	34.990	7.970	21.485
	54	#12ZG-58-1.75" - 1.00"	105.23	97.162	B	0.153	0.345	14.035	34.990	7.970	21.485
	54	#12ZG-58-1.75" - 1.00"	105.23	97.162	A	0.153	0.345	14.035	34.990	7.970	21.485
					A		Sum:	28.071	69.980	15.939	42.971
					B			28.071	69.980	15.939	42.971
					C			28.071	69.980	15.939	42.971
T5 80.00-60.00	67	#12ZG-58-2.00" - 0.875"	108.202	95.372	C	0.134	0.289	14.819	35.266	8.389	21.000
	67	#12ZG-58-2.00" - 0.875"	108.202	95.372	A	0.134	0.289	14.819	35.266	8.389	21.000
	68	#12ZG-58-2.00" - 0.875"	108.202	95.372	C	0.134	0.289	14.819	35.266	8.389	21.000
	68	#12ZG-58-2.00" - 0.875"	108.202	95.372	B	0.134	0.289	14.819	35.266	8.389	21.000
	69	#12ZG-58-2.00" - 0.875"	108.202	95.372	B	0.134	0.289	14.819	35.266	8.389	21.000
	69	#12ZG-58-2.00" - 0.875"	108.202	95.372	A	0.134	0.289	14.819	35.266	8.389	21.000
					A		Sum:	29.637	70.532	16.777	42.000
					B			29.637	70.532	16.777	42.000
					C			29.637	70.532	16.777	42.000
T6 60.00-40.00	76	#12ZG-58-2.25" - 0.875"	109.754	92.663	C	0.125	0.261	15.573	35.500	8.806	20.868
	76	#12ZG-58-2.25" - 0.875"	109.754	92.663	A	0.125	0.261	15.573	35.500	8.806	20.868
	77	#12ZG-58-2.25" - 0.875"	109.754	92.663	C	0.125	0.261	15.573	35.500	8.806	20.868
	77	#12ZG-58-2.25" - 0.875"	109.754	92.663	B	0.125	0.261	15.573	35.500	8.806	20.868

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
	78	#12ZG-58-2.25" - 0.875"	109.754	92.663	B	0.125	0.261	15.573	35.500	8.806	20.868
	78	#12ZG-58-2.25" - 0.875"	109.754	92.663	A	0.125	0.261	15.573	35.500	8.806	20.868
					A		Sum:	31.146	70.999	17.613	41.735
					B			31.146	70.999	17.613	41.735
					C			31.146	70.999	17.613	41.735
T7 40.00-20.00	85	#12ZG-58-2.25" - 0.875"	104.008	87.15	C	0.115	0.237	15.573	35.232	8.797	20.499
	85	#12ZG-58-2.25" - 0.875"	104.008	87.15	A	0.115	0.237	15.573	35.232	8.797	20.499
	86	#12ZG-58-2.25" - 0.875"	104.008	87.15	C	0.115	0.237	15.573	35.232	8.797	20.499
	86	#12ZG-58-2.25" - 0.875"	104.008	87.15	B	0.115	0.237	15.573	35.232	8.797	20.499
	87	#12ZG-58-2.25" - 0.875"	104.008	87.15	B	0.115	0.237	15.573	35.232	8.797	20.499
	87	#12ZG-58-2.25" - 0.875"	104.008	87.15	A	0.115	0.237	15.573	35.232	8.797	20.499
					A		Sum:	31.146	70.464	17.595	40.998
					B			31.146	70.464	17.595	40.998
					C			31.146	70.464	17.595	40.998
T8 20.00-0.00	94	#12ZG-58-2.50" - 0.875"	101.803	80.809	C	0.11	0.216	16.386	35.118	9.253	20.277
	94	#12ZG-58-2.50" - 0.875"	101.803	80.809	A	0.11	0.216	16.386	35.118	9.253	20.277
	95	#12ZG-58-2.50" - 0.875"	101.803	80.809	C	0.11	0.216	16.386	35.118	9.253	20.277
	95	#12ZG-58-2.50" - 0.875"	101.803	80.809	B	0.11	0.216	16.386	35.118	9.253	20.277
	96	#12ZG-58-2.50" - 0.875"	101.803	80.809	B	0.11	0.216	16.386	35.118	9.253	20.277
	96	#12ZG-58-2.50" - 0.875"	101.803	80.809	A	0.11	0.216	16.386	35.118	9.253	20.277
					A		Sum:	32.772	70.236	18.506	40.554
					B			32.772	70.236	18.506	40.554
					C			32.772	70.236	18.506	40.554

222-H Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 160.00-140.00	150.00		1.378	1	1		55	A	0.217	15.398
								B	0.217	15.398
								C	0.217	15.398
T2 140.00-120.00	130.00		1.337	1	1		53	A	0.191	15.298
								B	0.191	15.298
								C	0.191	15.298
T3 120.00-100.00	110.00		1.291	1	1		51	A	0.18	16.038
								B	0.18	16.038
								C	0.18	16.038

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
T4 100.00-80.00	90.00		1.238	1	1		49	A	0.153	15.939
								B	0.153	15.939
								C	0.153	15.939
T5 80.00-60.00	70.00		1.174	1	1		47	A	0.134	16.777
								B	0.134	16.777
								C	0.134	16.777
T6 60.00-40.00	50.00		1.094	1	1		43	A	0.125	17.613
								B	0.125	17.613
								C	0.125	17.613
T7 40.00-20.00	30.00		0.982	1	1		39	A	0.115	17.595
								B	0.115	17.595
								C	0.115	17.595
T8 20.00-0.00	10.00		0.85	1	1		34	A	0.11	18.506
								B	0.11	18.506
								C	0.11	18.506

222-H Section Verification Tables - Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
T1 160.00-140.00	150.00	150.00	1.378	1	1	1.4543	7	A	0.508	56.650
								B	0.508	56.650
								C	0.508	56.650
T2 140.00-120.00	130.00	130.00	1.337	1	1	1.4337	7	A	0.448	53.346
								B	0.448	53.346
								C	0.448	53.346
T3 120.00-100.00	110.00	110.00	1.291	1	1	1.4099	7	A	0.407	54.364
								B	0.407	54.364
								C	0.407	54.364
T4 100.00-80.00	90.00	90.00	1.238	1	1	1.3819	7	A	0.345	51.538
								B	0.345	51.538
								C	0.345	51.538
T5 80.00-60.00	70.00	70.00	1.174	1	1	1.3476	6	A	0.289	48.243
								B	0.289	48.243
								C	0.289	48.243
T6 60.00-40.00	50.00	50.00	1.094	1	1	1.3030	6	A	0.261	48.044
								B	0.261	48.044
								C	0.261	48.044
T7 40.00-20.00	30.00	30.00	0.982	1	1	1.2381	5	A	0.237	47.276
								B	0.237	47.276
								C	0.237	47.276
T8 20.00-0.00	10.00	10.00	0.85	1	1	1.1093	5	A	0.216	46.452
								B	0.216	46.452
								C	0.216	46.452

222-H Section Verification Tables - Service

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft^2
T1 160.00-140.00	150.00		1.378	1	1		11	A	0.217	15.398

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
								B	0.217	15.398
								C	0.217	15.398
T2 140.00-120.00	130.00		1.337	1	1		10	A	0.191	15.298
								B	0.191	15.298
								C	0.191	15.298
T3 120.00-100.00	110.00		1.291	1	1		10	A	0.18	16.038
								B	0.18	16.038
								C	0.18	16.038
T4 100.00-80.00	90.00		1.238	1	1		10	A	0.153	15.939
								B	0.153	15.939
								C	0.153	15.939
T5 80.00-60.00	70.00		1.174	1	1		9	A	0.134	16.777
								B	0.134	16.777
								C	0.134	16.777
T6 60.00-40.00	50.00		1.094	1	1		9	A	0.125	17.613
								B	0.125	17.613
								C	0.125	17.613
T7 40.00-20.00	30.00		0.982	1	1		8	A	0.115	17.595
								B	0.115	17.595
								C	0.115	17.595
T8 20.00-0.00	10.00		0.85	1	1		7	A	0.11	18.506
								B	0.11	18.506
								C	0.11	18.506

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 160.00-140.00	150.00	1.378	55	182.500	A	12.955	26.656	26.656	67.29	0.000	0.000
					B	12.955	26.656		67.29	0.000	0.000
					C	12.955	26.656		67.29	1.980	0.000
T2 140.00-120.00	130.00	1.337	53	202.528	A	11.964	26.700	26.700	69.06	0.000	0.000
					B	11.964	26.700		69.06	0.000	0.000
					C	11.964	26.700		69.06	7.920	0.000
T3 120.00-100.00	110.00	1.291	51	242.945	A	15.770	28.071	28.071	64.03	0.000	0.000
					B	15.770	28.071		64.03	0.000	0.000
					C	15.770	28.071		64.03	50.634	0.000
T4 100.00-80.00	90.00	1.238	49	282.945	A	15.144	28.071	28.071	64.96	0.000	0.000
					B	15.144	28.071		64.96	0.000	0.000
					C	15.144	28.071		64.96	52.814	0.000
T5 80.00-60.00	70.00	1.174	47	323.362	A	13.615	29.637	29.637	68.52	0.000	0.000
					B	13.615	29.637		68.52	0.000	0.000
					C	13.615	29.637		68.52	59.354	0.000
T6 60.00-40.00	50.00	1.094	43	363.780	A	14.415	31.146	31.146	68.36	0.000	0.000
					B	14.415	31.146		68.36	0.000	0.000
					C	14.415	31.146		68.36	61.244	0.000
T7 40.00-20.00	30.00	0.982	39	403.780	A	15.249	31.146	31.146	67.13	0.000	0.000
					B	15.249	31.146		67.13	0.000	0.000
					C	15.249	31.146		67.13	61.874	0.000
T8 20.00-0.00	10.00	0.85	34	444.197	A	16.115	32.772	32.772	67.04	0.000	0.000
					B	16.115	32.772		67.04	0.000	0.000
					C	16.115	32.772		67.04	65.654	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 160.00-140.00	150.00	1.378	7	1.4543	187.348	A	12.955	82.188	69.627	73.18	0.000	0.000
						B	12.955	82.188		73.18	0.000	0.000
						C	12.955	82.188		73.18	6.318	0.000
T2 140.00-120.00	130.00	1.337	7	1.4337	207.313	A	11.964	81.008	69.573	74.83	0.000	0.000
						B	11.964	81.008		74.83	0.000	0.000
						C	11.964	81.008		74.83	25.133	0.000
T3 120.00-100.00	110.00	1.291	7	1.4099	247.651	A	15.770	85.034	70.211	69.65	0.000	0.000
						B	15.770	85.034		69.65	0.000	0.000
						C	15.770	85.034		69.65	141.354	0.000
T4 100.00-80.00	90.00	1.238	7	1.3819	287.557	A	15.144	83.932	69.980	70.63	0.000	0.000
						B	15.144	83.932		70.63	0.000	0.000
						C	15.144	83.932		70.63	150.477	0.000
T5 80.00-60.00	70.00	1.174	6	1.3476	327.860	A	13.615	81.017	70.532	74.53	0.000	0.000
						B	13.615	81.017		74.53	0.000	0.000
						C	13.615	81.017		74.53	164.072	0.000
T6 60.00-40.00	50.00	1.094	6	1.3030	368.129	A	14.415	81.733	70.999	73.84	0.000	0.000
						B	14.415	81.733		73.84	0.000	0.000
						C	14.415	81.733		73.84	172.661	0.000
T7 40.00-20.00	30.00	0.982	5	1.2381	407.912	A	15.249	81.253	70.464	73.02	0.000	0.000
						B	15.249	81.253		73.02	0.000	0.000
						C	15.249	81.253		73.02	173.058	0.000
T8 20.00-0.00	10.00	0.85	5	1.1093	447.899	A	16.115	80.452	70.236	72.73	0.000	0.000
						B	16.115	80.452		72.73	0.000	0.000
						C	16.115	80.452		72.73	181.514	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 160.00-140.00	150.00	1.378	11	182.500	A	12.955	26.656	26.656	67.29	0.000	0.000
					B	12.955	26.656		67.29	0.000	0.000
					C	12.955	26.656		67.29	1.980	0.000
T2 140.00-120.00	130.00	1.337	10	202.528	A	11.964	26.700	26.700	69.06	0.000	0.000
					B	11.964	26.700		69.06	0.000	0.000
					C	11.964	26.700		69.06	7.920	0.000
T3 120.00-100.00	110.00	1.291	10	242.945	A	15.770	28.071	28.071	64.03	0.000	0.000
					B	15.770	28.071		64.03	0.000	0.000
					C	15.770	28.071		64.03	50.634	0.000
T4 100.00-80.00	90.00	1.238	10	282.945	A	15.144	28.071	28.071	64.96	0.000	0.000
					B	15.144	28.071		64.96	0.000	0.000
					C	15.144	28.071		64.96	52.814	0.000
T5 80.00-60.00	70.00	1.174	9	323.362	A	13.615	29.637	29.637	68.52	0.000	0.000
					B	13.615	29.637		68.52	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	13.615	29.637		68.52	59.354	0.000
T6 60.00-40.00	50.00	1.094	9	363.780	A	14.415	31.146	31.146	68.36	0.000	0.000
					B	14.415	31.146		68.36	0.000	0.000
					C	14.415	31.146		68.36	61.244	0.000
T7 40.00-20.00	30.00	0.982	8	403.780	A	15.249	31.146	31.146	67.13	0.000	0.000
					B	15.249	31.146		67.13	0.000	0.000
					C	15.249	31.146		67.13	61.874	0.000
T8 20.00-0.00	10.00	0.85	7	444.197	A	16.115	32.772	32.772	67.04	0.000	0.000
					B	16.115	32.772		67.04	0.000	0.000
					C	16.115	32.772		67.04	65.654	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	55	1	1	28.354	3401.56	170.08	C
			B	0.217	2.54		1	1	28.354			
			C	0.217	2.54		1	1	28.354			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	53	1	1	27.262	3442.71	172.14	C
			B	0.191	2.627		1	1	27.262			
			C	0.191	2.627		1	1	27.262			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	51	1	1	31.807	5008.72	250.44	C
			B	0.18	2.663		1	1	31.807			
			C	0.18	2.663		1	1	31.807			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	49	1	1	31.083	4903.91	245.20	C
			B	0.153	2.761		1	1	31.083			
			C	0.153	2.761		1	1	31.083			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	47	1	1	30.393	4816.05	240.80	C
			B	0.134	2.832		1	1	30.393			
			C	0.134	2.832		1	1	30.393			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	43	1	1	32.028	4737.65	236.88	C
			B	0.125	2.865		1	1	32.028			
			C	0.125	2.865		1	1	32.028			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	39	1	1	32.843	4388.15	219.41	C
			B	0.115	2.905		1	1	32.843			
			C	0.115	2.905		1	1	32.843			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	34	1	1	34.620	4029.13	201.46	C
			B	0.11	2.924		1	1	34.620			
			C	0.11	2.924		1	1	34.620			
Sum Weight:	1678.70	33300.33						OTM	2696.04 kip-ft	34727.88		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	19.00	2678.27	A	0.217	2.54	55	0.825	1	26.087	3133.98	156.70	C

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	q_z *psf*	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
160.00-140.00			B	0.217	2.54		0.825	1	26.087			
			C	0.217	2.54		0.825	1	26.087			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	53	0.825	1	25.168	3194.76	159.74	C
			B	0.191	2.627		0.825	1	25.168			
			C	0.191	2.627		0.825	1	25.168			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	51	0.825	1	29.048	4688.88	234.44	C
			B	0.18	2.663		0.825	1	29.048			
			C	0.18	2.663		0.825	1	29.048			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	49	0.825	1	28.433	4598.53	229.93	C
			B	0.153	2.761		0.825	1	28.433			
			C	0.153	2.761		0.825	1	28.433			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	47	0.825	1	28.010	4548.98	227.45	C
			B	0.134	2.832		0.825	1	28.010			
			C	0.134	2.832		0.825	1	28.010			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	43	0.825	1	29.505	4471.21	223.56	C
			B	0.125	2.865		0.825	1	29.505			
			C	0.125	2.865		0.825	1	29.505			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	39	0.825	1	30.175	4131.48	206.57	C
			B	0.115	2.905		0.825	1	30.175			
			C	0.115	2.905		0.825	1	30.175			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	34	0.825	1	31.800	3792.87	189.64	C
			B	0.11	2.924		0.825	1	31.800			
			C	0.11	2.924		0.825	1	31.800			
Sum Weight:	1678.70	33300.33						OTM	2518.92 kip-ft	32560.70		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	q_z *psf*	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	55	0.8	1	25.763	3095.76	154.79	C
			B	0.217	2.54		0.8	1	25.763			
			C	0.217	2.54		0.8	1	25.763			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	53	0.8	1	24.869	3159.34	157.97	C
			B	0.191	2.627		0.8	1	24.869			
			C	0.191	2.627		0.8	1	24.869			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	51	0.8	1	28.653	4643.19	232.16	C
			B	0.18	2.663		0.8	1	28.653			
			C	0.18	2.663		0.8	1	28.653			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	49	0.8	1	28.054	4554.91	227.75	C
			B	0.153	2.761		0.8	1	28.054			
			C	0.153	2.761		0.8	1	28.054			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	47	0.8	1	27.670	4510.82	225.54	C
			B	0.134	2.832		0.8	1	27.670			
			C	0.134	2.832		0.8	1	27.670			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	43	0.8	1	29.145	4433.15	221.66	C
			B	0.125	2.865		0.8	1	29.145			
			C	0.125	2.865		0.8	1	29.145			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	39	0.8	1	29.794	4094.82	204.74	C
			B	0.115	2.905		0.8	1	29.794			
			C	0.115	2.905		0.8	1	29.794			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	34	0.8	1	31.398	3759.12	187.96	C

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
			B	0.11	2.924		0.8	1	31.398			
			C	0.11	2.924		0.8	1	31.398			
Sum Weight:	1678.70	33300.33						OTM	2493.62 kip-ft	32251.10		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	55	0.85	1	26.410	3172.21	158.61	C
			B	0.217	2.54		0.85	1	26.410			
			C	0.217	2.54		0.85	1	26.410			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	53	0.85	1	25.467	3230.18	161.51	C
			B	0.191	2.627		0.85	1	25.467			
			C	0.191	2.627		0.85	1	25.467			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	51	0.85	1	29.442	4734.57	236.73	C
			B	0.18	2.663		0.85	1	29.442			
			C	0.18	2.663		0.85	1	29.442			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	49	0.85	1	28.812	4642.16	232.11	C
			B	0.153	2.761		0.85	1	28.812			
			C	0.153	2.761		0.85	1	28.812			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	47	0.85	1	28.350	4587.13	229.36	C
			B	0.134	2.832		0.85	1	28.350			
			C	0.134	2.832		0.85	1	28.350			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	43	0.85	1	29.865	4509.27	225.46	C
			B	0.125	2.865		0.85	1	29.865			
			C	0.125	2.865		0.85	1	29.865			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	39	0.85	1	30.556	4168.15	208.41	C
			B	0.115	2.905		0.85	1	30.556			
			C	0.115	2.905		0.85	1	30.556			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	34	0.85	1	32.203	3826.62	191.33	C
			B	0.11	2.924		0.85	1	32.203			
			C	0.11	2.924		0.85	1	32.203			
Sum Weight:	1678.70	33300.33						OTM	2544.23 kip-ft	32870.29		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 160.00-140.00	81.17	6953.50	A	0.508	1.89	7	1	1	69.605	858.31	42.92	C
			B	0.508	1.89		1	1	69.605			
			C	0.508	1.89		1	1	69.605			
T2 140.00-120.00	320.94	6656.50	A	0.448	1.976	7	1	1	65.310	883.88	44.19	C
			B	0.448	1.976		1	1	65.310			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
			C	0.448	1.976		1	1	65.310			
T3 120.00-100.00	1807.16	7471.73	A	0.407	2.05	7	1	1	70.134	1359.00	67.95	C
			B	0.407	2.05		1	1	70.134			
			C	0.407	2.05		1	1	70.134			
T4 100.00-80.00	1842.00	7236.58	A	0.345	2.184	7	1	1	66.682	1350.46	67.52	C
			B	0.345	2.184		1	1	66.682			
			C	0.345	2.184		1	1	66.682			
T5 80.00-60.00	1995.16	8975.12	A	0.289	2.327	6	1	1	61.858	1315.78	65.79	C
			B	0.289	2.327		1	1	61.858			
			C	0.289	2.327		1	1	61.858			
T6 60.00-40.00	2039.33	9509.36	A	0.261	2.404	6	1	1	62.459	1283.49	64.17	C
			B	0.261	2.404		1	1	62.459			
			C	0.261	2.404		1	1	62.459			
T7 40.00-20.00	1985.95	9425.41	A	0.237	2.478	5	1	1	62.524	1175.43	58.77	C
			B	0.237	2.478		1	1	62.524			
			C	0.237	2.478		1	1	62.524			
T8 20.00-0.00	1924.50	9695.52	A	0.216	2.545	5	1	1	62.566	1053.83	52.69	C
			B	0.216	2.545		1	1	62.566			
			C	0.216	2.545		1	1	62.566			
Sum Weight:	11996.20	65923.71						OTM	716.76 kip-ft	9280.18		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 160.00-140.00	81.17	6953.50	A	0.508	1.89	7	0.825	1	67.338	831.00	41.55	C
			B	0.508	1.89		0.825	1	67.338			
			C	0.508	1.89		0.825	1	67.338			
T2 140.00-120.00	320.94	6656.50	A	0.448	1.976	7	0.825	1	63.217	858.29	42.91	C
			B	0.448	1.976		0.825	1	63.217			
			C	0.448	1.976		0.825	1	63.217			
T3 120.00-100.00	1807.16	7471.73	A	0.407	2.05	7	0.825	1	67.374	1325.22	66.26	C
			B	0.407	2.05		0.825	1	67.374			
			C	0.407	2.05		0.825	1	67.374			
T4 100.00-80.00	1842.00	7236.58	A	0.345	2.184	7	0.825	1	64.032	1317.33	65.87	C
			B	0.345	2.184		0.825	1	64.032			
			C	0.345	2.184		0.825	1	64.032			
T5 80.00-60.00	1995.16	8975.12	A	0.289	2.327	6	0.825	1	59.476	1285.68	64.28	C
			B	0.289	2.327		0.825	1	59.476			
			C	0.289	2.327		0.825	1	59.476			
T6 60.00-40.00	2039.33	9509.36	A	0.261	2.404	6	0.825	1	59.937	1252.81	62.64	C
			B	0.261	2.404		0.825	1	59.937			
			C	0.261	2.404		0.825	1	59.937			
T7 40.00-20.00	1985.95	9425.41	A	0.237	2.478	5	0.825	1	59.856	1145.39	57.27	C
			B	0.237	2.478		0.825	1	59.856			
			C	0.237	2.478		0.825	1	59.856			
T8 20.00-0.00	1924.50	9695.52	A	0.216	2.545	5	0.825	1	59.746	1025.62	51.28	C
			B	0.216	2.545		0.825	1	59.746			
			C	0.216	2.545		0.825	1	59.746			
Sum Weight:	11996.20	65923.71						OTM	697.82 kip-ft	9041.35		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	81.17	6953.50	A	0.508	1.89	7	0.8	1	67.014	827.10	41.35	C
			B	0.508	1.89		0.8	1	67.014			
			C	0.508	1.89		0.8	1	67.014			
T2 140.00-120.00	320.94	6656.50	A	0.448	1.976	7	0.8	1	62.918	854.64	42.73	C
			B	0.448	1.976		0.8	1	62.918			
			C	0.448	1.976		0.8	1	62.918			
T3 120.00-100.00	1807.16	7471.73	A	0.407	2.05	7	0.8	1	66.980	1320.39	66.02	C
			B	0.407	2.05		0.8	1	66.980			
			C	0.407	2.05		0.8	1	66.980			
T4 100.00-80.00	1842.00	7236.58	A	0.345	2.184	7	0.8	1	63.653	1312.60	65.63	C
			B	0.345	2.184		0.8	1	63.653			
			C	0.345	2.184		0.8	1	63.653			
T5 80.00-60.00	1995.16	8975.12	A	0.289	2.327	6	0.8	1	59.135	1281.38	64.07	C
			B	0.289	2.327		0.8	1	59.135			
			C	0.289	2.327		0.8	1	59.135			
T6 60.00-40.00	2039.33	9509.36	A	0.261	2.404	6	0.8	1	59.576	1248.43	62.42	C
			B	0.261	2.404		0.8	1	59.576			
			C	0.261	2.404		0.8	1	59.576			
T7 40.00-20.00	1985.95	9425.41	A	0.237	2.478	5	0.8	1	59.475	1141.10	57.05	C
			B	0.237	2.478		0.8	1	59.475			
			C	0.237	2.478		0.8	1	59.475			
T8 20.00-0.00	1924.50	9695.52	A	0.216	2.545	5	0.8	1	59.343	1021.59	51.08	C
			B	0.216	2.545		0.8	1	59.343			
			C	0.216	2.545		0.8	1	59.343			
Sum Weight:	11996.20	65923.71						OTM	695.11 kip-ft	9007.23		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	81.17	6953.50	A	0.508	1.89	7	0.85	1	67.662	834.90	41.74	C
			B	0.508	1.89		0.85	1	67.662			
			C	0.508	1.89		0.85	1	67.662			
T2 140.00-120.00	320.94	6656.50	A	0.448	1.976	7	0.85	1	63.516	861.95	43.10	C
			B	0.448	1.976		0.85	1	63.516			
			C	0.448	1.976		0.85	1	63.516			
T3 120.00-100.00	1807.16	7471.73	A	0.407	2.05	7	0.85	1	67.768	1330.05	66.50	C
			B	0.407	2.05		0.85	1	67.768			
			C	0.407	2.05		0.85	1	67.768			
T4 100.00-80.00	1842.00	7236.58	A	0.345	2.184	7	0.85	1	64.410	1322.06	66.10	C
			B	0.345	2.184		0.85	1	64.410			
			C	0.345	2.184		0.85	1	64.410			
T5	1995.16	8975.12	A	0.289	2.327	6	0.85	1	59.816	1289.98	64.50	C

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
80.00-60.00			B	0.289	2.327		0.85	1	59.816			
			C	0.289	2.327		0.85	1	59.816			
T6 60.00-40.00	2039.33	9509.36	A	0.261	2.404	6	0.85	1	60.297	1257.19	62.86	C
			B	0.261	2.404		0.85	1	60.297			
			C	0.261	2.404		0.85	1	60.297			
T7 40.00-20.00	1985.95	9425.41	A	0.237	2.478	5	0.85	1	60.237	1149.68	57.48	C
			B	0.237	2.478		0.85	1	60.237			
			C	0.237	2.478		0.85	1	60.237			
T8 20.00-0.00	1924.50	9695.52	A	0.216	2.545	5	0.85	1	60.149	1029.65	51.48	C
			B	0.216	2.545		0.85	1	60.149			
			C	0.216	2.545		0.85	1	60.149			
Sum Weight:	11996.20	65923.71						OTM	700.52 kip-ft	9075.46		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	11	1	1	28.354	671.91	33.60	C
			B	0.217	2.54		1	1	28.354			
			C	0.217	2.54		1	1	28.354			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	10	1	1	27.262	680.04	34.00	C
			B	0.191	2.627		1	1	27.262			
			C	0.191	2.627		1	1	27.262			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	10	1	1	31.807	989.38	49.47	C
			B	0.18	2.663		1	1	31.807			
			C	0.18	2.663		1	1	31.807			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	10	1	1	31.083	968.67	48.43	C
			B	0.153	2.761		1	1	31.083			
			C	0.153	2.761		1	1	31.083			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	9	1	1	30.393	951.32	47.57	C
			B	0.134	2.832		1	1	30.393			
			C	0.134	2.832		1	1	30.393			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	9	1	1	32.028	935.83	46.79	C
			B	0.125	2.865		1	1	32.028			
			C	0.125	2.865		1	1	32.028			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	8	1	1	32.843	866.79	43.34	C
			B	0.115	2.905		1	1	32.843			
			C	0.115	2.905		1	1	32.843			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	7	1	1	34.620	795.88	39.79	C
			B	0.11	2.924		1	1	34.620			
			C	0.11	2.924		1	1	34.620			
Sum Weight:	1678.70	33300.33						OTM	532.55 kip-ft	6859.83		

Tower Forces - Service - Wind 45 To Face

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	q_z *psf*	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	11	0.825	1	26.087	619.06	30.95	C
			B	0.217	2.54		0.825	1	26.087			
			C	0.217	2.54		0.825	1	26.087			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	10	0.825	1	25.168	631.06	31.55	C
			B	0.191	2.627		0.825	1	25.168			
			C	0.191	2.627		0.825	1	25.168			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	10	0.825	1	29.048	926.20	46.31	C
			B	0.18	2.663		0.825	1	29.048			
			C	0.18	2.663		0.825	1	29.048			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	10	0.825	1	28.433	908.35	45.42	C
			B	0.153	2.761		0.825	1	28.433			
			C	0.153	2.761		0.825	1	28.433			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	9	0.825	1	28.010	898.56	44.93	C
			B	0.134	2.832		0.825	1	28.010			
			C	0.134	2.832		0.825	1	28.010			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	9	0.825	1	29.505	883.20	44.16	C
			B	0.125	2.865		0.825	1	29.505			
			C	0.125	2.865		0.825	1	29.505			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	8	0.825	1	30.175	816.10	40.80	C
			B	0.115	2.905		0.825	1	30.175			
			C	0.115	2.905		0.825	1	30.175			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	7	0.825	1	31.800	749.21	37.46	C
			B	0.11	2.924		0.825	1	31.800			
			C	0.11	2.924		0.825	1	31.800			
Sum Weight:	1678.70	33300.33						OTM	497.57 kip-ft	6431.74		

Tower Forces - Service - Wind 60 To Face

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	q_z *psf*	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	11	0.8	1	25.763	611.51	30.58	C
			B	0.217	2.54		0.8	1	25.763			
			C	0.217	2.54		0.8	1	25.763			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	10	0.8	1	24.869	624.07	31.20	C
			B	0.191	2.627		0.8	1	24.869			
			C	0.191	2.627		0.8	1	24.869			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	10	0.8	1	28.653	917.17	45.86	C
			B	0.18	2.663		0.8	1	28.653			
			C	0.18	2.663		0.8	1	28.653			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	10	0.8	1	28.054	899.73	44.99	C
			B	0.153	2.761		0.8	1	28.054			
			C	0.153	2.761		0.8	1	28.054			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	9	0.8	1	27.670	891.03	44.55	C
			B	0.134	2.832		0.8	1	27.670			
			C	0.134	2.832		0.8	1	27.670			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	9	0.8	1	29.145	875.68	43.78	C
			B	0.125	2.865		0.8	1	29.145			
			C	0.125	2.865		0.8	1	29.145			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	8	0.8	1	29.794	808.85	40.44	C
			B	0.115	2.905		0.8	1	29.794			
			C	0.115	2.905		0.8	1	29.794			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	7	0.8	1	31.398	742.54	37.13	C
			B	0.11	2.924		0.8	1	31.398			
			C	0.11	2.924		0.8	1	31.398			
Sum Weight:	1678.70	33300.33						OTM	492.57 kip-ft	6370.59		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 160.00-140.00	19.00	2678.27	A	0.217	2.54	11	0.85	1	26.410	626.61	31.33	C
			B	0.217	2.54		0.85	1	26.410			
			C	0.217	2.54		0.85	1	26.410			
T2 140.00-120.00	76.00	2639.67	A	0.191	2.627	10	0.85	1	25.467	638.06	31.90	C
			B	0.191	2.627		0.85	1	25.467			
			C	0.191	2.627		0.85	1	25.467			
T3 120.00-100.00	241.00	3230.97	A	0.18	2.663	10	0.85	1	29.442	935.22	46.76	C
			B	0.18	2.663		0.85	1	29.442			
			C	0.18	2.663		0.85	1	29.442			
T4 100.00-80.00	247.60	3231.19	A	0.153	2.761	10	0.85	1	28.812	916.97	45.85	C
			B	0.153	2.761		0.85	1	28.812			
			C	0.153	2.761		0.85	1	28.812			
T5 80.00-60.00	267.40	4725.12	A	0.134	2.832	9	0.85	1	28.350	906.10	45.30	C
			B	0.134	2.832		0.85	1	28.350			
			C	0.134	2.832		0.85	1	28.350			
T6 60.00-40.00	271.90	5314.76	A	0.125	2.865	9	0.85	1	29.865	890.72	44.54	C
			B	0.125	2.865		0.85	1	29.865			
			C	0.125	2.865		0.85	1	29.865			
T7 40.00-20.00	273.40	5407.03	A	0.115	2.905	8	0.85	1	30.556	823.34	41.17	C
			B	0.115	2.905		0.85	1	30.556			
			C	0.115	2.905		0.85	1	30.556			
T8 20.00-0.00	282.40	6073.32	A	0.11	2.924	7	0.85	1	32.203	755.88	37.79	C
			B	0.11	2.924		0.85	1	32.203			
			C	0.11	2.924		0.85	1	32.203			
Sum Weight:	1678.70	33300.33						OTM	502.56 kip-ft	6492.90		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	21474.07					
Bracing Weight	11826.26					
Total Member Self-Weight	33300.33			11.10	3.14	
Total Weight	41935.67			11.10	3.14	

Load Case	*Vertical Forces* *lb*	*Sum of Forces X* *lb*	*Sum of Forces Z* *lb*	*Sum of Overturning Moments, M_x* *kip-ft*	*Sum of Overturning Moments, M_z* *kip-ft*	*Sum of Torques* *kip-ft*
Wind 0 deg - No Ice		0.00	-48921.16	-4496.78	3.14	-34.65
Wind 30 deg - No Ice		23531.79	-40758.25	-3761.37	-2174.89	-7.17
Wind 45 deg - No Ice		33060.05	-33060.05	-3051.21	-3059.17	7.80
Wind 60 deg - No Ice		40222.01	-23222.19	-2141.63	-3725.50	22.24
Wind 90 deg - No Ice		47063.57	0.00	11.10	-4352.93	45.69
Wind 120 deg - No Ice		42366.97	24460.58	2265.04	-3900.80	56.89
Wind 135 deg - No Ice		33935.73	33935.73	3144.98	-3130.74	56.81
Wind 150 deg - No Ice		23531.79	40758.25	3783.57	-2174.89	52.85
Wind 180 deg - No Ice		0.00	46444.38	4316.56	3.14	34.65
Wind 210 deg - No Ice		-23531.79	40758.25	3783.57	2181.17	7.17
Wind 225 deg - No Ice		-33060.05	33060.05	3073.41	3065.45	-7.80
Wind 240 deg - No Ice		-42366.97	24460.58	2265.04	3907.08	-22.24
Wind 270 deg - No Ice		-47063.57	0.00	11.10	4359.21	-45.69
Wind 300 deg - No Ice		-40222.01	-23222.19	-2141.63	3731.78	-56.89
Wind 315 deg - No Ice		-33060.05	-33060.05	-3051.21	3065.45	-56.81
Wind 330 deg - No Ice		-23531.79	-40758.25	-3761.37	2181.17	-52.85
Member Ice	32623.38					
Total Weight Ice	93017.72			64.83	46.20	
Wind 0 deg - Ice		0.00	-12099.82	-1007.49	46.20	-12.11
Wind 30 deg - Ice		5947.55	-10301.47	-849.76	-481.84	-2.93
Wind 45 deg - Ice		8386.99	-8386.99	-680.02	-698.65	2.12
Wind 60 deg - Ice		10242.37	-5913.43	-460.51	-863.71	7.03
Wind 90 deg - Ice		11895.11	0.00	64.83	-1009.88	15.10
Wind 120 deg - Ice		10478.75	6049.91	600.98	-882.46	19.13
Wind 135 deg - Ice		8483.49	8483.49	817.33	-706.30	19.24
Wind 150 deg - Ice		5947.55	10301.47	979.41	-481.84	18.04
Wind 180 deg - Ice		0.00	11826.87	1115.49	46.20	12.11
Wind 210 deg - Ice		-5947.55	10301.47	979.41	574.23	2.93
Wind 225 deg - Ice		-8386.99	8386.99	809.67	791.04	-2.12
Wind 240 deg - Ice		-10478.75	6049.91	600.98	974.85	-7.03
Wind 270 deg - Ice		-11895.11	0.00	64.83	1102.27	-15.10
Wind 300 deg - Ice		-10242.37	-5913.43	-460.51	956.10	-19.13
Wind 315 deg - Ice		-8386.99	-8386.99	-680.02	791.04	-19.24
Wind 330 deg - Ice		-5947.55	-10301.47	-849.76	574.23	-18.04
Total Weight	41935.67			11.10	3.14	
Wind 0 deg - Service		0.00	-9693.53	-890.96	0.21	-6.94
Wind 30 deg - Service		4663.30	-8077.07	-745.22	-431.79	-1.55
Wind 45 deg - Service		6551.66	-6551.66	-604.38	-607.20	1.40
Wind 60 deg - Service		7971.15	-4602.14	-423.97	-739.39	4.26
Wind 90 deg - Service		9326.60	0.00	3.04	-863.80	8.92
Wind 120 deg - Service		8394.84	4846.76	450.04	-774.02	11.19
Wind 135 deg - Service		6724.63	6724.63	624.59	-621.34	11.21
Wind 150 deg - Service		4663.30	8077.07	751.30	-431.79	10.47
Wind 180 deg - Service		0.00	9204.29	857.06	0.21	6.94
Wind 210 deg - Service		-4663.30	8077.07	751.30	432.22	1.55
Wind 225 deg - Service		-6551.66	6551.66	610.46	607.63	-1.40
Wind 240 deg - Service		-8394.84	4846.76	450.04	774.44	-4.26
Wind 270 deg - Service		-9326.60	0.00	3.04	864.23	-8.92
Wind 300 deg - Service		-7971.15	-4602.14	-423.97	739.82	-11.19
Wind 315 deg - Service		-6551.66	-6551.66	-604.38	607.63	-11.21
Wind 330 deg - Service		-4663.30	-8077.07	-745.22	432.22	-10.47

Load Combinations

Comb. No.	*Description*

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 45 deg - No Ice
7	0.9 Dead+1.0 Wind 45 deg - No Ice
8	1.2 Dead+1.0 Wind 60 deg - No Ice
9	0.9 Dead+1.0 Wind 60 deg - No Ice
10	1.2 Dead+1.0 Wind 90 deg - No Ice
11	0.9 Dead+1.0 Wind 90 deg - No Ice
12	1.2 Dead+1.0 Wind 120 deg - No Ice
13	0.9 Dead+1.0 Wind 120 deg - No Ice
14	1.2 Dead+1.0 Wind 135 deg - No Ice
15	0.9 Dead+1.0 Wind 135 deg - No Ice
16	1.2 Dead+1.0 Wind 150 deg - No Ice
17	0.9 Dead+1.0 Wind 150 deg - No Ice
18	1.2 Dead+1.0 Wind 180 deg - No Ice
19	0.9 Dead+1.0 Wind 180 deg - No Ice
20	1.2 Dead+1.0 Wind 210 deg - No Ice
21	0.9 Dead+1.0 Wind 210 deg - No Ice
22	1.2 Dead+1.0 Wind 225 deg - No Ice
23	0.9 Dead+1.0 Wind 225 deg - No Ice
24	1.2 Dead+1.0 Wind 240 deg - No Ice
25	0.9 Dead+1.0 Wind 240 deg - No Ice
26	1.2 Dead+1.0 Wind 270 deg - No Ice
27	0.9 Dead+1.0 Wind 270 deg - No Ice
28	1.2 Dead+1.0 Wind 300 deg - No Ice
29	0.9 Dead+1.0 Wind 300 deg - No Ice
30	1.2 Dead+1.0 Wind 315 deg - No Ice
31	0.9 Dead+1.0 Wind 315 deg - No Ice
32	1.2 Dead+1.0 Wind 330 deg - No Ice
33	0.9 Dead+1.0 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service

Comb. No.	Description
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	160 - 140	Leg	Max Tension	9	3407.47	-1.89	-0.42
			Max. Compression	46	-8111.62	0.89	0.08
			Max. Mx	8	392.98	4.55	-0.68
			Max. My	30	-4403.30	0.85	-7.07
			Max. Vy	24	-1547.63	2.82	0.63
			Max. Vx	14	2001.26	-0.51	-2.51
		Diagonal	Max Tension	29	4352.56	0.00	0.00
			Max. Compression	12	-4634.90	0.00	0.00
			Max. Mx	43	676.12	0.06	-0.00
			Max. My	28	-3135.12	0.02	0.01
			Max. Vy	43	-44.48	0.06	-0.00
			Max. Vx	28	-1.63	0.00	0.00
		Top Girt	Max Tension	9	237.95	0.00	0.00
			Max. Compression	2	-321.83	0.00	0.00
			Max. Mx	34	-120.19	-0.12	0.00
			Max. My	14	27.33	0.00	0.00
			Max. Vy	34	58.29	0.00	0.00
			Max. Vx	14	-0.00	0.00	0.00
T2	140 - 120	Leg	Max Tension	19	27758.43	-0.36	0.07
			Max. Compression	24	-34721.03	1.75	0.24
			Max. Mx	24	-20227.61	2.82	0.63
			Max. My	14	623.58	-0.51	-2.51
			Max. Vy	24	459.18	2.82	0.63
			Max. Vx	26	-467.32	-0.26	-2.32
		Diagonal	Max Tension	10	7339.83	0.00	0.00
			Max. Compression	10	-7444.27	0.00	0.00
			Max. Mx	44	801.03	0.08	0.01
			Max. My	26	-7337.16	0.01	0.03
			Max. Vy	44	54.50	0.08	0.01
			Max. Vx	26	-6.19	0.00	0.00
T3	120 - 100	Leg	Max Tension	19	58281.21	-1.60	-0.05
			Max. Compression	24	-70895.41	1.73	-0.00
			Max. Mx	24	-50298.77	1.75	0.24
			Max. My	16	-6486.09	-0.03	-2.62
			Max. Vy	18	-1957.67	-1.27	-0.01
			Max. Vx	10	1938.58	0.18	-0.70
		Diagonal	Max Tension	10	8616.98	0.00	0.00
			Max. Compression	10	-8522.99	0.00	0.00
			Max. Mx	43	1511.02	0.10	-0.01
			Max. My	10	-8404.40	0.01	-0.02
			Max. Vy	43	63.84	0.10	-0.01
			Max. Vx	41	4.00	0.00	0.00
		Top Girt	Max Tension	18	517.14	0.00	0.00
			Max. Compression	25	-274.47	0.00	0.00
			Max. Mx	34	288.42	-0.18	0.00
			Max. My	41	306.18	0.00	0.01
			Max. Vy	34	70.91	0.00	0.00
			Max. Vx	41	-2.05	0.00	0.00
T4	100 - 80	Leg	Max Tension	19	91081.82	-2.51	-0.04

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	24	-107745.28	3.54	0.08
			Max. Mx	12	-107536.23	3.54	-0.40
			Max. My	16	-7985.45	0.00	-3.79
			Max. Vy	38	382.52	-2.19	-0.06
			Max. Vx	16	650.34	0.00	-3.79
		Diagonal	Max Tension	10	8894.90	0.00	0.00
			Max. Compression	10	-9079.75	0.00	0.00
			Max. Mx	43	1844.12	0.12	-0.02
			Max. My	26	-8669.91	0.02	0.03
			Max. Vy	43	72.72	0.12	-0.02
			Max. Vx	48	-4.41	0.00	0.00
T5	80 - 60	Leg	Max Tension	19	112463.09	-3.38	-0.32
			Max. Compression	24	-131866.25	3.03	0.18
			Max. Mx	8	108696.83	-3.60	-0.21
			Max. My	16	-9434.67	-0.40	-6.18
			Max. Vy	3	436.18	3.54	0.31
			Max. Vx	14	639.65	-1.27	-6.10
		Diagonal	Max Tension	10	12975.21	0.00	0.00
			Max. Compression	12	-13766.92	0.00	0.00
			Max. Mx	43	1073.40	-0.39	0.06
			Max. My	26	-13330.42	-0.05	-0.09
			Max. Vy	43	-139.46	-0.39	0.06
			Max. Vx	48	11.21	0.00	0.00
T6	60 - 40	Leg	Max Tension	19	144157.91	-3.50	-0.31
			Max. Compression	24	-169577.95	5.28	0.12
			Max. Mx	12	-169350.51	5.29	-0.39
			Max. My	16	-10499.37	-0.40	-6.18
			Max. Vy	8	-526.49	-3.60	-0.21
			Max. Vx	16	-913.61	-0.40	-6.18
		Diagonal	Max Tension	10	13823.89	0.00	0.00
			Max. Compression	10	-14013.69	0.00	0.00
			Max. Mx	43	3857.19	-0.41	-0.07
			Max. My	42	3437.06	-0.41	0.07
			Max. Vy	43	-151.22	-0.41	-0.07
			Max. Vx	48	-10.73	0.00	0.00
T7	40 - 20	Leg	Max Tension	19	173093.68	-4.66	-0.27
			Max. Compression	24	-203992.13	3.15	0.12
			Max. Mx	12	-202236.69	5.29	-0.39
			Max. My	16	-14254.53	-0.59	-8.55
			Max. Vy	38	-442.19	-3.75	-0.05
			Max. Vx	16	822.15	-0.59	-8.55
		Diagonal	Max Tension	10	13629.47	0.00	0.00
			Max. Compression	10	-13995.98	0.00	0.00
			Max. Mx	43	620.25	-0.52	0.08
			Max. My	26	-13659.06	-0.12	-0.10
			Max. Vy	43	-167.13	-0.52	0.08
			Max. Vx	48	11.85	0.00	0.00
T8	20 - 0	Leg	Max Tension	19	200394.89	-3.90	-0.32
			Max. Compression	24	-237151.30	-0.00	-0.00
			Max. Mx	8	195977.49	-4.05	-0.16
			Max. My	16	-15086.31	-0.59	-8.55
			Max. Vy	8	-559.15	-4.05	-0.16
			Max. Vx	16	-855.69	-0.59	-8.55
		Diagonal	Max Tension	10	14272.70	0.00	0.00
			Max. Compression	10	-14796.09	0.00	0.00
			Max. Mx	44	4408.41	-0.48	-0.08
			Max. My	41	3565.53	-0.48	0.08
			Max. Vy	44	-168.11	-0.48	-0.08
			Max. Vx	41	10.93	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	24	254435.74	26327.43	-14525.32
	Max. H_x	24	254435.74	26327.43	-14525.32
	Max. H_z	7	-206962.20	-21851.75	13460.34
	Min. Vert	9	-213390.31	-23162.33	12702.64
	Min. H_x	9	-213390.31	-23162.33	12702.64
	Min. H_z	22	237355.85	23765.65	-14576.41
Leg B	Max. Vert	12	254091.95	-26773.99	-13740.18
	Max. H_x	29	-213647.97	23623.38	11914.24
	Max. H_z	31	-207220.88	22499.79	12342.03
	Min. Vert	29	-213647.97	23623.38	11914.24
	Min. H_x	12	254091.95	-26773.99	-13740.18
	Min. H_z	14	242153.85	-24985.42	-13839.65
Leg A	Max. Vert	2	253211.46	-903.12	30041.81
	Max. H_x	25	-106449.00	2703.10	-13497.20
	Max. H_z	2	253211.46	-903.12	30041.81
	Min. Vert	19	-214307.23	913.32	-26426.13
	Min. H_x	8	129316.44	-2565.00	14904.95
	Min. H_z	19	-214307.23	913.32	-26426.13

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	41935.67	0.00	-0.00	11.10	3.14	-0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	50322.80	-0.01	-48920.82	-4504.73	3.83	-34.66
0.9 Dead+1.0 Wind 0 deg - No Ice	37742.10	-0.01	-48920.93	-4505.52	2.89	-34.66
1.2 Dead+1.0 Wind 30 deg - No Ice	50322.80	23531.48	-40757.92	-3767.66	-2179.19	-7.15
0.9 Dead+1.0 Wind 30 deg - No Ice	37742.10	23531.53	-40758.02	-3768.87	-2178.90	-7.14
1.2 Dead+1.0 Wind 45 deg - No Ice	50322.80	33059.64	-33059.74	-3055.89	-3065.50	7.84
0.9 Dead+1.0 Wind 45 deg - No Ice	37742.10	33059.72	-33059.82	-3057.49	-3064.70	7.83
1.2 Dead+1.0 Wind 60 deg - No Ice	50322.80	40221.54	-23221.91	-2144.22	-3733.36	22.28
0.9 Dead+1.0 Wind 60 deg - No Ice	37742.10	40221.64	-23221.97	-2146.34	-3732.17	22.27
1.2 Dead+1.0 Wind 90 deg - No Ice	50322.80	47063.13	0.12	13.45	-4362.19	45.74
0.9 Dead+1.0 Wind 90 deg - No Ice	37742.10	47063.24	0.12	10.10	-4360.65	45.72
1.2 Dead+1.0 Wind 120 deg - No Ice	50322.80	42366.67	24460.42	2272.49	-3908.97	56.95
0.9 Dead+1.0 Wind 120 deg - No Ice	37742.10	42366.76	24460.48	2267.87	-3907.70	56.93
1.2 Dead+1.0 Wind 135 deg - No Ice	50322.80	33935.51	33935.42	3154.40	-3137.16	56.86

Load Combination	Vertical lb	Shear$_x$ lb	Shear$_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
0.9 Dead+1.0 Wind 135 deg - No Ice	37742.10	33935.59	33935.50	3149.28	-3136.32	56.85
1.2 Dead+1.0 Wind 150 deg - No Ice	50322.80	23531.65	40757.82	3794.43	-2179.15	52.90
0.9 Dead+1.0 Wind 150 deg - No Ice	37742.10	23531.71	40757.92	3788.93	-2178.85	52.89
1.2 Dead+1.0 Wind 180 deg - No Ice	50322.80	-0.00	46443.83	4328.60	3.82	34.66
0.9 Dead+1.0 Wind 180 deg - No Ice	37742.10	-0.00	46443.95	4322.80	2.88	34.66
1.2 Dead+1.0 Wind 210 deg - No Ice	50322.80	-23531.66	40757.81	3794.38	2186.76	7.15
0.9 Dead+1.0 Wind 210 deg - No Ice	37742.10	-23531.71	40757.91	3788.89	2184.58	7.14
1.2 Dead+1.0 Wind 225 deg - No Ice	50322.80	-33059.85	33059.75	3082.64	3073.03	-7.83
0.9 Dead+1.0 Wind 225 deg - No Ice	37742.10	-33059.93	33059.82	3077.55	3070.35	-7.83
1.2 Dead+1.0 Wind 240 deg - No Ice	50322.80	-42366.67	24460.41	2272.45	3916.55	-22.28
0.9 Dead+1.0 Wind 240 deg - No Ice	37742.10	-42366.77	24460.47	2267.82	3913.39	-22.27
1.2 Dead+1.0 Wind 270 deg - No Ice	50322.80	-47063.13	0.12	13.45	4369.74	-45.74
0.9 Dead+1.0 Wind 270 deg - No Ice	37742.10	-47063.24	0.12	10.10	4366.32	-45.72
1.2 Dead+1.0 Wind 300 deg - No Ice	50322.80	-40221.55	-23221.91	-2144.18	3740.94	-56.95
0.9 Dead+1.0 Wind 300 deg - No Ice	37742.10	-40221.64	-23221.97	-2146.30	3737.87	-56.93
1.2 Dead+1.0 Wind 315 deg - No Ice	50322.80	-33059.64	-33059.74	-3055.84	3073.12	-56.86
0.9 Dead+1.0 Wind 315 deg - No Ice	37742.10	-33059.72	-33059.82	-3057.44	3070.42	-56.85
1.2 Dead+1.0 Wind 330 deg - No Ice	50322.80	-23531.48	-40757.92	-3767.63	2186.83	-52.90
0.9 Dead+1.0 Wind 330 deg - No Ice	37742.10	-23531.54	-40758.02	-3768.83	2184.64	-52.89
1.2 Dead+1.0 Ice+1.0 Temp	101404.86	0.01	-0.01	67.30	47.02	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	101404.86	0.01	-12099.61	-1009.72	47.03	-12.13
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	101404.86	5947.44	-10301.29	-851.29	-483.38	-2.93
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	101404.86	8386.83	-8386.84	-680.78	-701.16	2.13
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	101404.86	10242.18	-5913.34	-460.29	-866.95	7.05
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	101404.86	11894.89	-0.01	67.40	-1013.79	15.15
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	101404.86	10478.57	6049.78	605.95	-885.79	19.19
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	101404.86	8483.34	8483.31	823.26	-708.85	19.29
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	101404.86	5947.45	10301.24	986.07	-483.38	18.08
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	101404.86	0.01	11826.61	1122.75	47.02	12.13
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	101404.86	-5947.43	10301.24	986.06	577.42	2.93
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	101404.86	-8386.82	8386.80	815.56	795.20	-2.13

Load Combination	Vertical lb	Shear$_x$ lb	Shear$_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	101404.86	-10478.55	6049.78	606.04	979.97	-7.05
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	101404.86	-11894.87	-0.01	67.39	1107.83	-15.15
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	101404.86	-10242.15	-5913.33	-460.29	961.01	-19.19
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	101404.86	-8386.81	-8386.84	-680.78	795.21	-19.29
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	101404.86	-5947.42	-10301.29	-851.29	577.44	-18.08
Dead+Wind 0 deg - Service	41935.67	0.00	-9693.46	-884.58	3.15	-6.94
Dead+Wind 30 deg - Service	41935.67	4663.26	-8077.01	-738.54	-429.67	-1.54
Dead+Wind 45 deg - Service	41935.67	6551.60	-6551.61	-597.43	-605.38	1.41
Dead+Wind 60 deg - Service	41935.67	7971.08	-4602.11	-416.69	-737.86	4.26
Dead+Wind 90 deg - Service	41935.67	9326.52	0.00	11.14	-862.50	8.93
Dead+Wind 120 deg - Service	41935.67	8394.78	4846.73	459.00	-772.56	11.20
Dead+Wind 135 deg - Service	41935.67	6724.58	6724.58	633.89	-619.59	11.22
Dead+Wind 150 deg - Service	41935.67	4663.27	8077.00	760.84	-429.68	10.48
Dead+Wind 180 deg - Service	41935.67	-0.00	9204.21	866.77	3.15	6.94
Dead+Wind 210 deg - Service	41935.67	-4663.27	8077.00	760.79	435.97	1.54
Dead+Wind 225 deg - Service	41935.67	-6551.61	6551.60	619.73	611.73	-1.41
Dead+Wind 240 deg - Service	41935.67	-8394.78	4846.73	458.99	778.86	-4.26
Dead+Wind 270 deg - Service	41935.67	-9326.52	0.00	11.14	868.79	-8.93
Dead+Wind 300 deg - Service	41935.67	-7971.08	-4602.11	-416.69	744.16	-11.20
Dead+Wind 315 deg - Service	41935.67	-6551.60	-6551.61	-597.42	611.68	-11.22
Dead+Wind 330 deg - Service	41935.67	-4663.26	-8077.01	-738.56	436.00	-10.48

Solution Summary

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
1	-0.00	-41935.67	0.00	-0.00	41935.67	0.00	0.000%
2	0.00	-50322.80	-48921.16	0.01	50322.80	48920.82	0.000%
3	0.00	-37742.10	-48921.16	0.01	37742.10	48920.93	0.000%
4	23531.79	-50322.80	-40758.25	-23531.48	50322.80	40757.92	0.001%
5	23531.79	-37742.10	-40758.25	-23531.53	37742.10	40758.02	0.001%
6	33060.05	-50322.80	-33060.05	-33059.64	50322.80	33059.74	0.001%
7	33060.05	-37742.10	-33060.05	-33059.72	37742.10	33059.82	0.001%
8	40222.01	-50322.80	-23222.19	-40221.54	50322.80	23221.91	0.001%
9	40222.01	-37742.10	-23222.19	-40221.64	37742.10	23221.97	0.001%
10	47063.57	-50322.80	-0.00	-47063.13	50322.80	-0.12	0.001%
11	47063.57	-37742.10	-0.00	-47063.24	37742.10	-0.12	0.001%
12	42366.97	-50322.80	24460.58	-42366.67	50322.80	-24460.42	0.000%
13	42366.97	-37742.10	24460.58	-42366.76	37742.10	-24460.48	0.000%
14	33935.73	-50322.80	33935.73	-33935.51	50322.80	-33935.42	0.001%
15	33935.73	-37742.10	33935.73	-33935.59	37742.10	-33935.50	0.000%
16	23531.79	-50322.80	40758.25	-23531.65	50322.80	-40757.82	0.001%
17	23531.79	-37742.10	40758.25	-23531.71	37742.10	-40757.92	0.001%
18	0.00	-50322.80	46444.38	0.00	50322.80	-46443.83	0.001%
19	0.00	-37742.10	46444.38	0.00	37742.10	-46443.95	0.001%
20	-23531.79	-50322.80	40758.25	23531.66	50322.80	-40757.81	0.001%
21	-23531.79	-37742.10	40758.25	23531.71	37742.10	-40757.91	0.001%
22	-33060.05	-50322.80	33060.05	33059.85	50322.80	-33059.75	0.001%
23	-33060.05	-37742.10	33060.05	33059.93	37742.10	-33059.82	0.000%
24	-42366.97	-50322.80	24460.58	42366.67	50322.80	-24460.41	0.000%
25	-42366.97	-37742.10	24460.58	42366.77	37742.10	-24460.47	0.000%
26	-47063.57	-50322.80	-0.00	47063.13	50322.80	-0.12	0.001%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
27	-47063.57	-37742.10	-0.00	47063.24	37742.10	-0.12	0.001%
28	-40222.01	-50322.80	-23222.19	40221.55	50322.80	23221.91	0.001%
29	-40222.01	-37742.10	-23222.19	40221.64	37742.10	23221.97	0.001%
30	-33060.05	-50322.80	-33060.05	33059.64	50322.80	33059.74	0.001%
31	-33060.05	-37742.10	-33060.05	33059.72	37742.10	33059.82	0.001%
32	-23531.79	-50322.80	-40758.25	23531.48	50322.80	40757.92	0.001%
33	-23531.79	-37742.10	-40758.25	23531.54	37742.10	40758.02	0.001%
34	0.00	-101404.86	0.00	-0.01	101404.86	0.01	0.000%
35	0.00	-101404.86	-12099.82	-0.01	101404.86	12099.61	0.000%
36	5947.55	-101404.86	-10301.47	-5947.44	101404.86	10301.29	0.000%
37	8386.99	-101404.86	-8386.99	-8386.83	101404.86	8386.84	0.000%
38	10242.37	-101404.86	-5913.43	-10242.18	101404.86	5913.34	0.000%
39	11895.11	-101404.86	-0.00	-11894.89	101404.86	0.01	0.000%
40	10478.75	-101404.86	6049.91	-10478.57	101404.86	-6049.78	0.000%
41	8483.49	-101404.86	8483.49	-8483.34	101404.86	-8483.31	0.000%
42	5947.55	-101404.86	10301.47	-5947.45	101404.86	-10301.24	0.000%
43	0.00	-101404.86	11826.87	-0.01	101404.86	-11826.61	0.000%
44	-5947.55	-101404.86	10301.47	5947.43	101404.86	-10301.24	0.000%
45	-8386.99	-101404.86	8386.99	8386.82	101404.86	-8386.80	0.000%
46	-10478.75	-101404.86	6049.91	10478.55	101404.86	-6049.78	0.000%
47	-11895.11	-101404.86	-0.00	11894.87	101404.86	0.01	0.000%
48	-10242.37	-101404.86	-5913.43	10242.15	101404.86	5913.33	0.000%
49	-8386.99	-101404.86	-8386.99	8386.81	101404.86	8386.84	0.000%
50	-5947.55	-101404.86	-10301.47	5947.42	101404.86	10301.29	0.000%
51	0.00	-41935.67	-9693.53	-0.00	41935.67	9693.46	0.000%
52	4663.30	-41935.67	-8077.07	-4663.26	41935.67	8077.01	0.000%
53	6551.66	-41935.67	-6551.66	-6551.60	41935.67	6551.61	0.000%
54	7971.15	-41935.67	-4602.14	-7971.08	41935.67	4602.11	0.000%
55	9326.60	-41935.67	0.00	-9326.52	41935.67	-0.00	0.000%
56	8394.84	-41935.67	4846.76	-8394.78	41935.67	-4846.73	0.000%
57	6724.63	-41935.67	6724.63	-6724.58	41935.67	-6724.58	0.000%
58	4663.30	-41935.67	8077.07	-4663.27	41935.67	-8077.00	0.000%
59	-0.00	-41935.67	9204.29	0.00	41935.67	-9204.21	0.000%
60	-4663.30	-41935.67	8077.07	4663.27	41935.67	-8077.00	0.000%
61	-6551.66	-41935.67	6551.66	6551.61	41935.67	-6551.60	0.000%
62	-8394.84	-41935.67	4846.76	8394.78	41935.67	-4846.73	0.000%
63	-9326.60	-41935.67	0.00	9326.52	41935.67	-0.00	0.000%
64	-7971.15	-41935.67	-4602.14	7971.08	41935.67	4602.11	0.000%
65	-6551.66	-41935.67	-6551.66	6551.60	41935.67	6551.61	0.000%
66	-4663.30	-41935.67	-8077.07	4663.26	41935.67	8077.01	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00005378
3	Yes	4	0.00000001	0.00003553
4	Yes	4	0.00000001	0.00007540
5	Yes	4	0.00000001	0.00005755
6	Yes	4	0.00000001	0.00008712
7	Yes	4	0.00000001	0.00006864
8	Yes	4	0.00000001	0.00009151
9	Yes	4	0.00000001	0.00007276
10	Yes	4	0.00000001	0.00007572
11	Yes	4	0.00000001	0.00005804

12	Yes	4	0.00000001	0.00005380
13	Yes	4	0.00000001	0.00003558
14	Yes	4	0.00000001	0.00006095
15	Yes	4	0.00000001	0.00004300
16	Yes	4	0.00000001	0.00007525
17	Yes	4	0.00000001	0.00005725
18	Yes	4	0.00000001	0.00009163
19	Yes	4	0.00000001	0.00007283
20	Yes	4	0.00000001	0.00007548
21	Yes	4	0.00000001	0.00005760
22	Yes	4	0.00000001	0.00006129
23	Yes	4	0.00000001	0.00004342
24	Yes	4	0.00000001	0.00005377
25	Yes	4	0.00000001	0.00003552
26	Yes	4	0.00000001	0.00007574
27	Yes	4	0.00000001	0.00005805
28	Yes	4	0.00000001	0.00009157
29	Yes	4	0.00000001	0.00007280
30	Yes	4	0.00000001	0.00008706
31	Yes	4	0.00000001	0.00006851
32	Yes	4	0.00000001	0.00007522
33	Yes	4	0.00000001	0.00005725
34	Yes	4	0.00000001	0.00001225
35	Yes	4	0.00000001	0.00010994
36	Yes	4	0.00000001	0.00011142
37	Yes	4	0.00000001	0.00011394
38	Yes	4	0.00000001	0.00011536
39	Yes	4	0.00000001	0.00011454
40	Yes	4	0.00000001	0.00011545
41	Yes	4	0.00000001	0.00011791
42	Yes	4	0.00000001	0.00012127
43	Yes	4	0.00000001	0.00012543
44	Yes	4	0.00000001	0.00012255
45	Yes	4	0.00000001	0.00011964
46	Yes	4	0.00000001	0.00011928
47	Yes	4	0.00000001	0.00011958
48	Yes	4	0.00000001	0.00012074
49	Yes	4	0.00000001	0.00011891
50	Yes	4	0.00000001	0.00011544
51	Yes	4	0.00000001	0.00005232
52	Yes	4	0.00000001	0.00005561
53	Yes	4	0.00000001	0.00005788
54	Yes	4	0.00000001	0.00005885
55	Yes	4	0.00000001	0.00005574
56	Yes	4	0.00000001	0.00005275
57	Yes	4	0.00000001	0.00005395
58	Yes	4	0.00000001	0.00005644
59	Yes	4	0.00000001	0.00005940
60	Yes	4	0.00000001	0.00005619
61	Yes	4	0.00000001	0.00005381
62	Yes	4	0.00000001	0.00005274
63	Yes	4	0.00000001	0.00005581
64	Yes	4	0.00000001	0.00005897
65	Yes	4	0.00000001	0.00005801
66	Yes	4	0.00000001	0.00005594

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	1.484	62	0.0727	0.0200
T2	140 - 120	1.177	62	0.0718	0.0185
T3	120 - 100	0.880	62	0.0646	0.0124
T4	100 - 80	0.612	62	0.0556	0.0096
T5	80 - 60	0.389	62	0.0427	0.0069
T6	60 - 40	0.221	62	0.0310	0.0050
T7	40 - 20	0.104	62	0.0207	0.0032
T8	20 - 0	0.026	62	0.0094	0.0015

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	10-ft Lighting Rod	62	1.484	0.0727	0.0200	Inf
145.00	MT6413-77A	62	1.253	0.0726	0.0193	701761
120.00	PA6-65	62	0.880	0.0646	0.0124	158382
100.00	ANT150F2	62	0.612	0.0556	0.0096	107200
85.00	SD314	62	0.440	0.0460	0.0075	87862
80.00	ANT150F2	62	0.389	0.0427	0.0069	83912
55.00	531-70HD	62	0.188	0.0285	0.0045	100254
25.00	ANT150F2	62	0.041	0.0121	0.0019	80473
20.00	ANT150F2	62	0.026	0.0094	0.0015	73481

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	7.388	24	0.3579	0.1021
T2	140 - 120	5.876	24	0.3544	0.0941
T3	120 - 100	4.401	24	0.3223	0.0636
T4	100 - 80	3.064	24	0.2774	0.0490
T5	80 - 60	1.949	24	0.2135	0.0351
T6	60 - 40	1.108	24	0.1552	0.0252
T7	40 - 20	0.520	24	0.1036	0.0161
T8	20 - 0	0.132	24	0.0470	0.0078

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	10-ft Lighting Rod	24	7.388	0.3579	0.1021	910222
145.00	MT6413-77A	24	6.253	0.3576	0.0985	303406
120.00	PA6-65	24	4.401	0.3223	0.0636	33009
100.00	ANT150F2	24	3.064	0.2774	0.0490	21552
85.00	SD314	24	2.203	0.2300	0.0385	17594
80.00	ANT150F2	24	1.949	0.2135	0.0351	16795

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
55.00	531-70HD	24	0.941	0.1423	0.0230	20134
25.00	ANT150F2	24	0.204	0.0608	0.0098	16132
20.00	ANT150F2	24	0.132	0.0470	0.0078	14753

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load per Bolt lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325N	1.0000	6	567.91	54517.00	0.010 ✔	1	Bolt Tension
		Diagonal	A325N	1.0000	1	4352.56	16939.50	0.257 ✔	1	Member Block Shear
		Top Girt	A325N	1.0000	1	237.95	10163.70	0.023 ✔	1	Member Block Shear
T2	140	Leg	A325N	1.0000	6	4626.41	54517.00	0.085 ✔	1	Bolt Tension
		Diagonal	A325N	1.0000	1	7339.83	16939.50	0.433 ✔	1	Member Block Shear
T3	120	Leg	A325N	1.2500	6	9713.53	87219.80	0.111 ✔	1	Bolt Tension
		Diagonal	A325N	1.0000	1	8616.98	16939.50	0.509 ✔	1	Member Block Shear
		Top Girt	A325N	1.0000	1	1229.48	10163.70	0.121 ✔	1	Member Block Shear
T4	100	Leg	A325N	1.2500	6	15180.30	87219.80	0.174 ✔	1	Bolt Tension
		Diagonal	A325N	1.0000	1	8894.90	16939.50	0.525 ✔	1	Member Block Shear
T5	80	Leg	A325N	1.0000	12	9371.92	54517.00	0.172 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	12975.20	29580.00	0.439 ✔	1	Member Bearing
T6	60	Leg	A325N	1.0000	12	12013.20	54517.00	0.220 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	13823.90	29580.00	0.467 ✔	1	Member Bearing
T7	40	Leg	A325N	1.0000	12	14424.50	54517.00	0.265 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	13629.50	29580.00	0.461 ✔	1	Member Bearing
T8	20	Leg	F1554-105	1.2500	12	16699.60	90854.00	0.184 ✔	1	Bolt Tension
		Diagonal	A325N	0.8750	1	14272.70	29580.00	0.483 ✔	1	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in²	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	#12ZG-58-1.5" - 1.00"	20.00	10.00	37.5 K=1.00	5.3014	-8111.62	245621.00	0.033 [1] ✔
T2	140 - 120	#12ZG-58-1.5" - 1.00"	20.03	10.02	37.5 K=1.00	5.3014	-34721.00	245621.00	0.141 [1] ✔
T3	120 - 100	#12ZG-58-1.75" - 1.00"	20.03	10.02	31.9 K=1.00	7.2158	-70895.40	345601.00	0.205 [1] ✔
T4	100 - 80	#12ZG-58-1.75" - 1.00"	20.03	10.02	31.9 K=1.00	7.2158	-107745.00	345601.00	0.312 [1] ✔
T5	80 - 60	#12ZG-58-2.00" - 0.875"	20.03	20.03	48.8 K=1.00	9.4248	-131866.00	401936.00	0.328 [1] ✔
T6	60 - 40	#12ZG-58-2.25" - 0.875"	20.03	20.03	48.8 K=1.00	11.9282	-169578.00	508981.00	0.333 [1] ✔
T7	40 - 20	#12ZG-58-2.25" - 0.875"	20.03	20.03	48.8 K=1.00	11.9282	-203992.00	508981.00	0.401 [1] ✔
T8	20 - 0	#12ZG-58-2.50" - 0.875"	20.03	20.03	48.7 K=1.00	14.7262	-237151.00	628758.00	0.377 [1] ✔

[1] P_u / ϕP_n controls

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	ϕP_n lb	A in²	V_u lb	ϕV_n lb	Stress Ratio
T1	160 - 140	0.5	1.46	119.3	276735.00	0.1963	2057.68	3381.46	0.609 ✔
T2	140 - 120	0.5	1.46	119.3	276735.00	0.1963	475.18	3381.46	0.141 ✔
T3	120 - 100	0.5	1.44	117.6	376667.00	0.1963	2010.15	3471.55	0.580 ✔
T4	100 - 80	0.5	1.44	117.6	376667.00	0.1963	650.85	3471.55	0.189 ✔
T5	80 - 60	0.5	1.39	113.2	491973.00	0.1963	657.72	3759.23	0.177 ✔
T6	60 - 40	0.5	1.38	112.2	622654.00	0.1963	929.88	3804.69	0.246 ✔
T7	40 - 20	0.5	1.38	112.2	622654.00	0.1963	832.11	3804.69	0.220 ✔
T8	20 - 0	0.5	1.36	111.2	768708.00	0.1963	878.16	3849.52	0.230 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in²	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L3x3x5/16	12.81	5.44	113.1 K=1.02	1.7800	-4634.90	38321.80	0.121 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T2	140 - 120	L3x3x5/16	13.80	6.37	129.8 K=1.00	1.7800	-6819.41	30261.30	0.225 [1] ✔
T3	120 - 100	L3x3x5/16	15.24	7.12	145.1 K=1.00	1.7800	-8522.99	24188.40	0.352 [1] ✔
T4	100 - 80	L3x3x5/16	16.80	7.92	161.4 K=1.00	1.7800	-8807.84	19549.20	0.451 [1] ✔
T5	80 - 60	2L3 1/2x3 1/2x1/4	25.01	12.35	136.0 K=1.00	3.3800	-13766.90	52307.80	0.263 [1] ✔
T6	60 - 40	2L3 1/2x3 1/2x1/4	26.26	12.98	142.9 K=1.00	3.3800	-14013.70	47397.70	0.296 [1] ✔
T7	40 - 20	2L3 1/2x3 1/2x1/4	27.59	13.65	150.2 K=1.00	3.3800	-13996.00	42867.70	0.326 [1] ✔
T8	20 - 0	2L3 1/2x3 1/2x1/4	29.01	14.35	158.0 K=1.00	3.3800	-14796.10	38750.20	0.382 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L3x3x3/16	8.00	6.67	134.2 K=1.00	1.0900	-321.83	17315.60	0.019 [1] ✔
T3	120 - 100	L3x3x3/16	10.00	8.67	174.5 K=1.00	1.0900	-1229.48	10245.90	0.120 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	#12ZG-58-1.5" - 1.00"	20.00	10.00	37.5	5.3014	3407.47	276735.00	0.012 [1] ✔
T2	140 - 120	#12ZG-58-1.5" - 1.00"	20.03	10.02	37.5	5.3014	27758.40	276735.00	0.100 [1] ✔
T3	120 - 100	#12ZG-58-1.75" - 1.00"	20.03	10.02	31.9	7.2158	58281.20	376667.00	0.155 [1] ✔
T4	100 - 80	#12ZG-58-1.75" - 1.00"	20.03	10.02	31.9	7.2158	91081.80	376667.00	0.242 [1] ✔
T5	80 - 60	#12ZG-58-2.00" - 0.875"	20.03	20.03	48.8	9.4248	112463.00	491973.00	0.229 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T6	60 - 40	#12ZG-58-2.25" - 0.875"	20.03	20.03	48.8	11.9282	144158.00	622654.00	0.232 [1] ✔
T7	40 - 20	#12ZG-58-2.25" - 0.875"	20.03	20.03	48.8	11.9282	173094.00	622654.00	0.278 [1] ✔
T8	20 - 0	#12ZG-58-2.50" - 0.875"	20.03	20.03	48.7	14.7262	200395.00	768708.00	0.261 [1] ✔

[1] P_u / ϕP_n controls

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	ϕP_n lb	A in^2	V_u lb	ϕV_n lb	Stress Ratio
T1	160 - 140	0.5	1.46	119.3	276735.00	0.1963	2057.68	3381.46	0.609 ✔
T2	140 - 120	0.5	1.46	119.3	276735.00	0.1963	475.18	3381.46	0.141 ✔
T3	120 - 100	0.5	1.44	117.6	376667.00	0.1963	2010.15	3471.55	0.580 ✔
T4	100 - 80	0.5	1.44	117.6	376667.00	0.1963	650.85	3471.55	0.189 ✔
T5	80 - 60	0.5	1.39	113.2	491973.00	0.1963	657.72	3759.23	0.177 ✔
T6	60 - 40	0.5	1.38	112.2	622654.00	0.1963	929.88	3804.69	0.246 ✔
T7	40 - 20	0.5	1.38	112.2	622654.00	0.1963	832.11	3804.69	0.220 ✔
T8	20 - 0	0.5	1.36	111.2	768708.00	0.1963	878.16	3849.52	0.230 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L3x3x5/16	12.81	5.44	72.9	1.0713	4352.56	46602.80	0.093 [1] ✔
T2	140 - 120	L3x3x5/16	13.13	6.06	81.0	1.0713	7339.83	46602.80	0.157 [1] ✔
T3	120 - 100	L3x3x5/16	15.24	7.12	94.9	1.0713	8616.98	46602.80	0.185 [1] ✔
T4	100 - 80	L3x3x5/16	16.80	7.92	105.3	1.0713	8894.90	46602.80	0.191 [1] ✔
T5	80 - 60	2L3 1/2x3 1/2x1/4	25.01	12.35	137.7	2.1600	12975.20	93960.00	0.138 [1] ✔
T6	60 - 40	2L3 1/2x3 1/2x1/4	26.26	12.98	144.5	2.1600	13823.90	93960.00	0.147 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T7	40 - 20	2L3 1/2x3 1/2x1/4	27.59	13.65	151.9	2.1600	13629.50	93960.00	0.145 [1] ✔
T8	20 - 0	2L3 1/2x3 1/2x1/4	29.01	14.35	159.7	2.1600	14272.70	93960.00	0.152 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

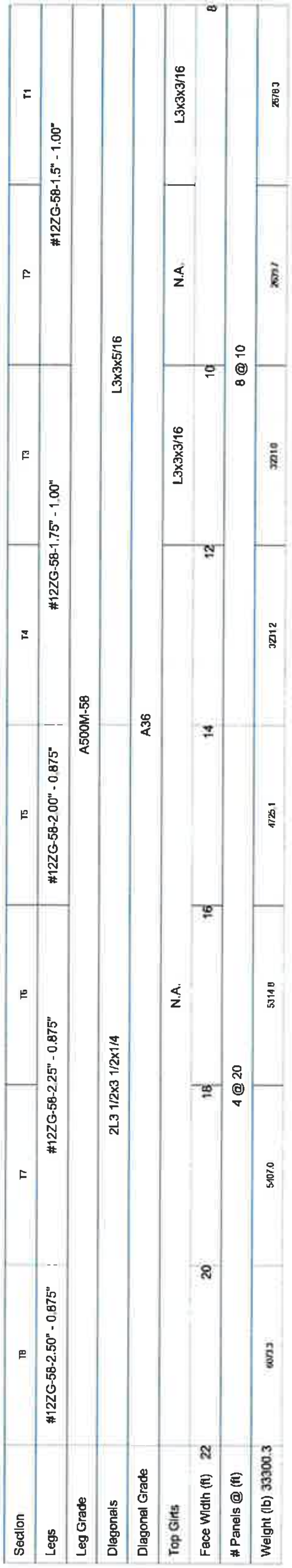
Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	160 - 140	L3x3x3/16	8.00	6.67	89.5	0.6593	237.95	28679.40	0.008 [1] ✔
T3	120 - 100	L3x3x3/16	10.00	8.67	115.0	0.6593	1229.48	28679.40	0.043 [1] ✔

[1] P_u / ϕP_n controls

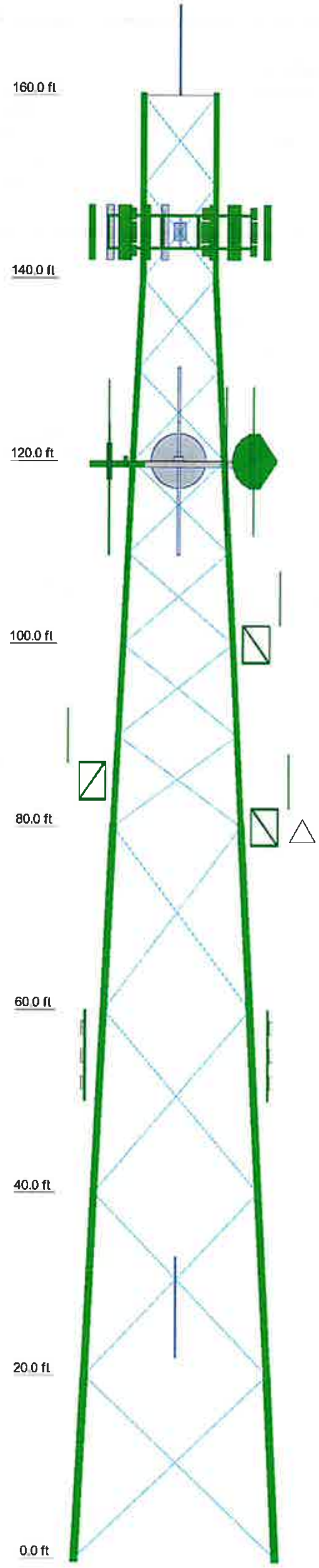
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T1	160 - 140	Leg	#12ZG-58-1.5" - 1.00"	1	-8111.62	245621.00	60.9	Pass
T2	140 - 120	Leg	#12ZG-58-1.5" - 1.00"	19	-34721.00	245621.00	14.1	Pass
T3	120 - 100	Leg	#12ZG-58-1.75" - 1.00"	36	-50370.10	345601.00	58.0	Pass
T4	100 - 80	Leg	#12ZG-58-1.75" - 1.00"	52	-107745.00	345601.00	31.2	Pass
T5	80 - 60	Leg	#12ZG-58-2.00" - 0.875"	67	-131866.00	401936.00	32.8	Pass
T6	60 - 40	Leg	#12ZG-58-2.25" - 0.875"	76	-169578.00	508981.00	33.3	Pass
T7	40 - 20	Leg	#12ZG-58-2.25" - 0.875"	85	-203992.00	508981.00	40.1	Pass
T8	20 - 0	Leg	#12ZG-58-2.50" - 0.875"	94	-237151.00	628758.00	37.7	Pass
T1	160 - 140	Diagonal	L3x3x5/16	8	-4634.90	38321.80	12.1 25.7 (b)	Pass
T2	140 - 120	Diagonal	L3x3x5/16	23	-6819.41	30261.30	22.5 43.3 (b)	Pass
T3	120 - 100	Diagonal	L3x3x5/16	41	-8522.99	24188.40	35.2 50.9 (b)	Pass
T4	100 - 80	Diagonal	L3x3x5/16	56	-8807.84	19549.20	45.1 52.5 (b)	Pass
T5	80 - 60	Diagonal	2L3 1/2x3 1/2x1/4	71	-13766.90	52307.80	26.3 43.9 (b)	Pass
T6	60 - 40	Diagonal	2L3 1/2x3 1/2x1/4	80	-14013.70	47397.70	29.6 46.7 (b)	Pass
T7	40 - 20	Diagonal	2L3 1/2x3 1/2x1/4	89	-13996.00	42867.70	32.6 46.1 (b)	Pass
T8	20 - 0	Diagonal	2L3 1/2x3 1/2x1/4	98	-14796.10	38750.20	38.2 48.3 (b)	Pass
T1	160 - 140	Top Girt	L3x3x3/16	4	-321.83	17315.60	1.9 2.3 (b)	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T3	120 - 100	Top Girt	L3x3x3/16	39	-1229.48	10245.90	12.0 12.1 (b)	Pass
							Summary	
						Leg (T1)	60.9	Pass
						Diagonal (T4)	52.5	Pass
						Top Girt (T3)	12.1	Pass
						Bolt Checks	52.5	Pass
						RATING =	**60.9**	**Pass**



Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Face Width (ft)	# Panels @ (ft)	Weight (lb) 33300.3
T1	#12ZG-58-1.5" - 1.00"	A500M-58	L3x3x5/16	A36	L3x3x3/16	8	8 @ 10	2678.3
T2					N.A.			2679.7
T3	#12ZG-58-1.75" - 1.00"				L3x3x3/16	10		3221.0
T4			2L3 1/2x3 1/2x1/4			12		3221.2
T5	#12ZG-58-2.00" - 0.875"					14		4725.1
T6					N.A.	16	4 @ 20	5314.8
T7	#12ZG-58-2.25" - 0.875"					18		5407.0
T8	#12ZG-58-2.50" - 0.875"					20		6073.3
						22		



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10-ft Lighting Rod	160	SC479-HF1LDF (Inverted)	120
MT6413-77A (Verizon Proposed)	145	SC479-HF1LDF (Inverted)	120
NHH-45B-R2B (Verizon Proposed)	145	TX/RX 432E-83I-01T	120
NHH-45B-R2B (Verizon Proposed)	145	10-ft T-Frame	120
MT6413-77A (Verizon Proposed)	145	DB810K (Future)	120
NHH-45B-R2B (Verizon Proposed)	145	DB810K (Future)	120
NHH-45B-R2B (Verizon Proposed)	145	WPA-80080/4CF	120
MT6413-77A (Verizon Proposed)	145	ANT450F6	120
NHH-45B-R2B (Verizon Proposed)	145	SC479-HF1LDF (Inverted)	120
NHH-45B-R2B (Verizon Proposed)	145	SC479-HF1LDF (Inverted)	120
MT6413-77A (Verizon Proposed)	145	TX/RX 432E-83I-01T	120
NHH-45B-R2B (Verizon Proposed)	145	10-ft T-Frame	120
NHH-45B-R2B (Verizon Proposed)	145	SC479-HF1LDF	120
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	PA6-65	120
		PA6-65	120
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	ANT150F2	100
		6' Standoff Arm	100
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	SD314	85
		6' Standoff Arm	85
RF4439d-25A (B2/B66A RRH) (Verizon Proposed)	145	ANT450F6	85
		6' Standoff Arm	85
RF4461d-13A (Verizon Proposed)	145	6' Standoff Arm	80
RF4461d-13A (Verizon Proposed)	145	ANT150F2	80
RF4461d-13A (Verizon Proposed)	145	2-ft Stand Off	55
RF4461d-13A (Verizon Proposed)	145	531-70HD	55
RC2DC-3315-PF-48 (Verizon Proposed)	145	531-70HD	55
SitePro VFA12-HD (Verizon Proposed)	145	531-70HD	55
SitePro VFA12-HD (Verizon Proposed)	145	2-ft Stand Off	25
SitePro VFA12-HD (Verizon Proposed)	145	ANT150F2	25
SitePro VFA12-HD (Verizon Proposed)	145	ANT150F2 (Inverted)	20

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500M-58	58 ksi	70 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 90 mph wind.

Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: ***23134.00 - East Haddam***		
	Project: ***160-ft Lattice Tower (CSP #52)***		
	Client: Verizon	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 10/09/23	Scale: NTS
	Path:		Dwg No. E-1

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	6.698	46	0.3266	0.1213
T2	140 - 120	5.318	46	0.3236	0.1127
T3	120 - 100	3.970	46	0.2932	0.0799
T4	100 - 80	2.757	46	0.2513	0.0619
T5	80 - 60	1.749	46	0.1927	0.0445
T6	60 - 40	0.993	46	0.1397	0.0320
T7	40 - 20	0.464	46	0.0931	0.0205
T8	20 - 0	0.118	46	0.0422	0.0100

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	10-ft Lighting Rod	46	6.698	0.3266	0.1213	Inf
145.00	MT6413-77A	46	5.662	0.3266	0.1174	578923
120.00	PA6-65	46	3.970	0.2932	0.0799	32773
100.00	ANT150F2	46	2.757	0.2513	0.0619	23511
85.00	SD314	46	1.979	0.2078	0.0487	19271
80.00	ANT150F2	46	1.749	0.1927	0.0445	18406
55.00	531-70HD	46	0.842	0.1281	0.0291	22205
25.00	ANT150F2	46	0.182	0.0545	0.0125	18019
20.00	ANT150F2	46	0.118	0.0422	0.0100	16526

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	8.301	30	0.4012	0.1476
T2	140 - 120	6.607	30	0.3973	0.1387
T3	120 - 100	4.953	30	0.3611	0.1028
T4	100 - 80	3.458	30	0.3111	0.0820
T5	80 - 60	2.207	30	0.2402	0.0605
T6	60 - 40	1.260	30	0.1751	0.0442
T7	40 - 20	0.593	30	0.1173	0.0286
T8	20 - 0	0.153	30	0.0533	0.0141

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	10-ft Lighting Rod	30	8.301	0.4012	0.1476	Inf
145.00	MT6413-77A	30	7.030	0.4009	0.1437	346582
120.00	PA6-65	30	4.953	0.3611	0.1028	28300
100.00	ANT150F2	30	3.458	0.3111	0.0820	19812
85.00	SD314	30	2.493	0.2585	0.0657	15905
80.00	ANT150F2	30	2.207	0.2402	0.0605	15119

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
55.00	531-70HD	30	1.071	0.1607	0.0404	18084
25.00	ANT150F2	30	0.235	0.0689	0.0177	14381
20.00	ANT150F2	30	0.153	0.0533	0.0141	13196

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	160 - 140	Leg	#12ZG-58-1.5" - 1.00"	1	-8351.40	211311.15	79.2	Pass
T2	140 - 120	Leg	#12ZG-58-1.5" - 1.00"	20	-22542.50	211311.15	18.6	Pass
T3	120 - 100	Leg	#12ZG-58-1.75" - 1.00"	36	-56256.70	296839.09	67.2	Pass
T4	100 - 80	Leg	#12ZG-58-1.75" - 1.00"	52	-120710.00	296839.09	40.7	Pass
T5	80 - 60	Leg	#12ZG-58-2.00" - 0.875"	67	-146222.00	348940.73	41.9	Pass
T6	60 - 40	Leg	#12ZG-58-2.25" - 0.875"	76	-192537.00	441840.16	43.6	Pass
T7	40 - 20	Leg	#12ZG-58-2.25" - 0.875"	85	-228786.00	441840.16	51.8	Pass
T8	20 - 0	Leg	#12ZG-58-2.50" - 0.875"	94	-271572.00	545771.50	49.8	Pass
T1	160 - 140	Diagonal	L3x3x5/16	8	-5241.32	26705.85	19.6 32.9 (b)	Pass
T2	140 - 120	Diagonal	L3x3x5/16	23	-7808.46	21046.07	37.1 56.2 (b)	Pass
T3	120 - 100	Diagonal	L3x3x5/16	41	-9716.22	16822.59	57.8 66.1 (b)	Pass
T4	100 - 80	Diagonal	L3x3x5/16	56	-9966.91	13596.07	73.3	Pass
T5	80 - 60	Diagonal	2L3 1/2x3 1/2x1/4	71	-17527.70	36378.90	48.2 58.6 (b)	Pass
T6	60 - 40	Diagonal	2L3 1/2x3 1/2x1/4	80	-16153.60	32964.16	49.0 71.1 (b)	Pass
T7	40 - 20	Diagonal	2L3 1/2x3 1/2x1/4	89	-18757.30	29813.61	62.9	Pass
T8	20 - 0	Diagonal	2L3 1/2x3 1/2x1/4	98	-17155.80	26949.93	63.7 77.4 (b)	Pass
T1	160 - 140	Top Girt	L3x3x3/16	4	-381.52	12042.60	3.2	Pass
T3	120 - 100	Top Girt	L3x3x3/16	39	-1371.63	7125.80	19.2	Pass
							Summary	
						Leg (T1)	79.2	Pass
						Diagonal (T8)	77.4	Pass
						Top Girt (T3)	19.2	Pass
						Bolt Checks	77.4	Pass
						RATING =	**79.2**	**Pass**

Anchor Bolt Analysis:

Input Data:

Tower Reactions:

Tension Force =	Tension := 214·kips	(Input From tnxTower)
Compression Force =	Compression := 254·kips	(Input From tnxTower)
Shear Force =	Shear := 30·kips	(Input From tnxTower)

Anchor Bolt Data:

ASTM F1554-105	Per Valmont Drawing 266040T dated 7/21/2016	
Number of Anchor Bolts =	N := 12	(User Input)
Bolt Ultimate Strength =	F_u := 125·ksi	(User Input)
Bolt Yield Strength =	F_y := 105·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 1.25·in	(User Input)
Threads per Inch =	n := 7	(User Input)
Length from Top of Pier to Bottom of Leveling Nut =	L_{ar} := 0·in	(User Input)

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 1.227 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.969 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 1.111 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.278 \cdot in$

Elastic Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^{\ 3}}{32} = 0.135 \cdot in^3$

Plastic Section Modulus of Bolt = $Z_x := \frac{D_n^{\ 3}}{6} = 0.228 \cdot in^3$

Anchor Bolt Design Strength:

Resistance Factor for Flexure = $\phi_f := 0.9$

Resistance Factor for Compression = $\phi_c := 0.9$

Resistance Factor for Tension = $\phi_t := 0.75$

Resistance Factor for Shear = $\phi_v := 0.75$

Design Tensile Strength = $\Phi R_{nt} := \phi_t \cdot F_u \cdot A_n = 90.9 \cdot k$

Design Compression Strength = $\Phi R_{nc} := \phi_c \cdot F_y \cdot A_g = 116 \cdot k$

Design Shear Strength (Tension) = $\Phi R_{nv} := \phi_v \cdot 0.5 F_u \cdot A_g = 57.5 \cdot k$

Design Shear Strength (Compression) = $\Phi R_{nvc} := \phi_c \cdot 0.6 F_y \cdot A_g \cdot 0.75 = 52.2 \cdot k$

CENTEK engineering
Centered on Solutions www.centekeng.com
63-2 North Branford Road P: (203) 488-0580
Branford, CT 06405 F: (203) 488-8587

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $P_{ut} := \frac{Tension}{N} = 17.8 \cdot kips$

Maximum Compressive Force = $P_{uc} := \frac{Compression}{N} = 21.2 \cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 2.5 \cdot kips$

Condition1 = $Condition1 := if\left[\left[\left(\frac{P_{ut}}{\Phi R_{nt}}\right)^2 + \left(\frac{V_u}{\Phi R_{nv}}\right)^2\right] \le 1.00, \text{"OK"}, \text{"Overstressed"}\right]$

Condition1 = "OK"

Condition2 = $Condition2 := if\left[\left[\left(\frac{P_{uc}}{\Phi R_{nc}}\right) + \left(\frac{V_u}{\Phi R_{nvc}}\right)^2\right] \le 1.00, \text{"OK"}, \text{"Overstressed"}\right]$

Condition2 = "OK"

Bolt % of Capacity = $\max\left[\left(\frac{P_{ut}}{\Phi R_{nt}}\right)^2 + \left(\frac{V_u}{\Phi R_{nv}}\right)^2, \left(\frac{P_{uc}}{\Phi R_{nc}}\right) + \left(\frac{V_u}{\Phi R_{nvc}}\right)^2\right] = 18.5 \cdot \%$

Pier and Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 4528 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$S_t := 48.9 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$WT_t := 50.3 \cdot kip$	(User Input from tnxTower)	
Max Compression Force =	$C_t := 254 \cdot kip$	(User Input from tnxTower)	
Max Uplift Force =	$U_t := 214 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 160 \cdot ft$	(User Input)	
Tower Width =	$W_t := 22 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 1$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 5 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 3.25 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 4.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 2.25 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 36 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4500 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_s := 8000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 8$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.00 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 23$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 0.5 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 8$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.00 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 76$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.00 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 76$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.785 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.785 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785 \cdot in^2$

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Load Factor = $LF := 1$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := if(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}) = 150 \cdot pcf$

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 120 \cdot pcf$

Passive Pressure = $P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 0.99 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 0.99 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 1.8 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.395 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 2.25 \cdot ft$

$A_p := W_f \cdot T_p = 81 \cdot ft^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 112.995 \cdot kip$

Weight of Concrete = $WT_c := \left[(W_f^2 \cdot T_f) + (4) \cdot \left(\frac{d_p^2 \cdot \pi}{4} L_p\right)\right] \cdot \gamma_c = 461.904 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left[W_f^2 - (4) \cdot \left(\frac{d_p^2 \cdot \pi}{4}\right)\right] \cdot (L_p - L_{pag} - n)\right] \cdot \gamma_s = 411.09 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right] \cdot \gamma_s = 31.177 \cdot kip$

Tower Offset = $X_{t1} := \left[\frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{2}\right]$ $\quad X_{t2} := \frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{3}$

$X_t := if(Pos_t = 1, X_{t1}, X_{t2}) = 8.474$

$X_{off1} := \frac{W_f}{2} - \left[\frac{(W_t \cdot \cos(30 \cdot deg))}{3} + X_t\right] = 3.175$ $\quad X_{off2} := 0$

$X_{off} := if(Pos_t = 1, X_{off1}, X_{off2})$ $\quad X_{off} = 3.175 \cdot ft$

Total Weight = $WT_{tot} := 0.9WT_c + 0.75WT_{s1} + WT_t = 774.3 \cdot kip$

Resisting Moment = $M_r := (WT_{tot}) \cdot \frac{W_f}{2} + 0.9WT_t \cdot \left(\frac{W_f}{2} - X_{off}\right) + 0.75\left(S_u \cdot \frac{T_p}{3}\right) + 0.75WT_{s2} \cdot \left[W_f + \frac{(D_f - n) \cdot \tan(\Phi_s)}{3}\right] = 15537 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + S_t \cdot (L_p + T_f) = 4797 \cdot kip \cdot ft$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 3.24$

Factor of Safety Required = $FS_{req} := 1$ $\quad$ OverTurning_Moment_Check := if(FS ≥ FS_{req}, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 461.445 \cdot kips$

Shear_Check := if($S_p > S_t$, "Okay", "No Good")

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Total Load = $Load_{tot} := WT_c + WT_{s1} + WT_t = 923 \cdot kip$

Area of the Mat = $A_{mat} := W_f^2 = 1.296 \times 10^3$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 7776 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.329 \cdot ksf$

Max_Pressure_Check := if($P_{max} < 0.75q_s$, "Okay", "No Good")

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = 0.096 \cdot ksf$

Min_Pressure_Check := if[($P_{min} \geq 0$)·($P_{min} < 0.75q_s$), "Okay", "No Good"]

Min_Pressure_Check = "Okay"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 12.929$

Distance to Kern = $X_k := \frac{W_f}{6} = 6$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity = $e := \frac{M_{ot}}{Load_{tot}} = 5.195$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot Load_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e\right)} = 1.335 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 1.329 \cdot ksf$

Pressure_Check := if($q_{adj} < 0.75q_s$, "Okay", "No Good")

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 4.499 \times 10^3 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > LF \cdot C_t, "Okay", "No Good")$

$Bearing\_Check = "Okay"$

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 23 \cdot in$

$FL := LF \cdot \frac{C_t}{W_f^2} = 0.196 \cdot ksf$

$V_{req} := FL \cdot (X_t - .5 \cdot d_p - d) \cdot W_f = 32.153 \cdot kips$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d = 1133 \cdot kip$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

$Beam\_Shear\_Check = "Okay"$

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := (d_p + d) \cdot \pi = 18.6$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 27.5$

Required Shear Strength = $V_{req} := FL \cdot (W_f^2 - A_{bo}) = 249 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1170.1 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

$Punching\_Shear\_Check = "Okay"$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

Maximum Moment in Pad = $M_{max} := 575 \cdot kip \cdot ft$ (User Input)

Design Moment = $M_n := \frac{LF \cdot M_{max}}{\phi_m} = 638.889 \cdot kips \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.6$$

(ACI-2008 10.2.7.3)

$$b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p = 276.631 \cdot in$$

$$A_s := \frac{M_n}{(f_y \cdot d)} = 5.556 \cdot in^2$$

$$a := \frac{A_s \cdot f_y}{\beta \cdot f_c \cdot b_{eff}} = 0.446 \cdot in$$

$$A_s := \frac{M_n}{f_y \cdot \left(d - \frac{a}{2} \right)} = 5.61 \cdot in^2$$

$$\rho := \frac{A_s}{b_{eff} \cdot d} = 0.01058 \cdot in$$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases} = 0.0018$$ (ACI -2008 7.12.2.1)

Check Bottom Bars:

$$As := \text{if}\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 5.7 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 59.7 \cdot in^2$$

Pad_Reinforcement_Bot := if(As_prov > As, "Okay", "No Good")

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \text{if}\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 5.7 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 59.7 \cdot in^2$$

Pad_Reinforcement_Top := if(As_prov > As, "Okay", "No Good")

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 4.67 \cdot in$$

Spacing or Cover Dimension =

$$c := \text{if}\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 2.333 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0$$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 28.7 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in$$ (ACI-2008 12.2.1)

$L_{dbtCheck}$:= if($L_{dbt} \geq L_{dbmin}$, "Use L.dbt", "Use L.dbmin") = "Use L.dbt"

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr_{pad} = 81 \cdot in$$

Lpad_Check := if($L_{Pad} > L_{dbt}$, "Okay", "No Good")

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 1809.56 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 9.05 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 18.06 \cdot in^2$

Steel_Area_Check := if($A_{sprov} > A_{smin}$, "Okay", "No Good")

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 5.556 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 42 \cdot in$

Maximum Moment in Pier = $M_p := S_f \cdot (L_p) \cdot LF = 1907.1 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$$\begin{pmatrix} D & N & n & P_u & M_{xu} \end{pmatrix} := \begin{pmatrix} d_p \cdot 12 & NB_{pier} & BS_{pier} & \frac{C_t \cdot 1.333}{kips} & \frac{M_p}{in \cdot kips} \end{pmatrix}$$

$$\begin{pmatrix} D & N & n & P_u & M_{xu} \end{pmatrix} = \begin{pmatrix} 48 & 23 & 8 & 338.582 & 1.907 \times 10^3 \end{pmatrix}$$

$$\begin{pmatrix} \phi P_n & \phi M_{xn} & f_{sp} & \rho \end{pmatrix} := \begin{pmatrix} 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} \phi P_n & \phi M_{xn} & f_{sp} & \rho \end{pmatrix} := \phi P'_n(D, N, n, P_u, M_{xu})^T$$

$$\begin{pmatrix} \phi P_n & \phi M_{xn} & f_{sp} & \rho \end{pmatrix} = \begin{pmatrix} 2.889 \times 10^3 & 1.627 \times 10^4 & -21.001 & 0.01 \end{pmatrix}$$

Axial_Load_Check := if($\phi P_n \geq P_u$, "Okay", "No Good")

Axial_Load_Check = "Okay"

Bending_Check := if($\phi M_{xn} \geq M_{xu}$, "Okay", "No Good")

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 36 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 24 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension = $c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 2.778 \cdot in$

Transverse Reinforcement = $k_{tr} := 0$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 24.15 \cdot in$$

Minimum Development Length = $L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 12.522 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := max(L_{dbt}, L_{dbmin}) = 24.146 \cdot in$

$L_{tension\_Check} := if(L_{pier} + L_{pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$

$L_{tension\_Check} = \text{"Okay"}$

Compression: (ACI-2008 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 17.889 \cdot in$$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot (d_{bpier} \cdot f_y) = 18 \cdot in$

$L_{dbc} := if(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}) = 18 \cdot in$

$L_{compression\_Check} := if(L_{pier} + L_{pad} > L_{dbc}, \text{"Okay"}, \text{"No Good"})$

$L_{compression\_Check} = \text{"Okay"}$

verizon
NPP RFDS

NORTHEAST > North East > New England > Wallingford-1 > EAST HADDAM 3 CT - A

Cheiban, Ziad - ziad.cheiban@verizonwireless.com - 20230801_101321

Project Details		Location Information	
Carrier Aggregation	N	Site Id	2609730
Ecip	N	Search Ring#	
Project Name	EAST HADDAM 3 CT - NEW BUILD	E-NodeB ID#	null
Project Alt Name	EAST HADDAM 3 CT - NEW BUILD	PSLC#	300023
Project Id	17133983	Switch Name	Wallingford-1
Designed Sector Carrier 4G	16	Tower Type	
Designed Sector Carrier 5G	4	Site Type	MACRO
Additional Sector Carrier 4G	0	Street Address	194 Mt Parnassus Road
Additional Sector Carrier 5G	0	City	East Haddam
Suffix	Rev1_2023-08-01	State	CT
FP Solution Type & Tech Type	MCR;4G_700;5G_850;4G_850;4G_AWS;5G_L-Sub6;4G_PCS	Zip Code	06423
		County	Middlesex
		Latitude	41.47003/ 41° 28' 12.108"
		Longitude	-72.41120/ 72° 24' 40.320"

Project Scope

New Build Macro
Extension on Existing Tower

Rev1_2023-08-01: Added 4th sector. Adjusted ACL to 145'

Antenna Summary

Added Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerl ine	Tip Height	Azimuth	Install Type	Quantity
				5G	Samsung	MT6413-77A	145	146.2	345(A),75(B),165(C),255(D)	PHYSICAL	4
LTE	LTE	LTE	LTE		CommScope	NHH-45B-R2B	145	148	345(A),75(B),165(C),255(D)	PHYSICAL	8

Removed Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerl ine	Tip Height	Azimuth	Install Type	Quantity

Retained Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerl ine	Tip Height	Azimuth	Install Type	Quantity

Added: 12	Removed: 0	Retained: 0

Non Antenna Summary

Added Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity
RRU	Tower			LTE	LTE	Samsung	B2/B66A RRH ORAN (RF4439d-25A)	PHYSICAL	4
RRU	Tower	LTE	LTE			Samsung	RF4461d-13A	PHYSICAL	4

Removed Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Retained Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Added: 8	Removed: 0	Retained: 0

Services

1900 LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	1050	1050	1050	1050
Mech Down-tilt	0	0	0	0
Elect Down-tilt	0	0	0	0
Tip Height	148	148	148	148
Regulatory Power	407.15 (W/MHz) EIRP	407.15 (W/MHz) EIRP	407.15 (W/MHz) EIRP	407.15 (W/MHz) EIRP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843902	18843906	18843910	18843914
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

700 LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	5230	5230	5230	5230
Mech Down-tilt	0	0	0	0
Elect Down-tilt	2	2	2	2
Tip Height	148	148	148	148
Regulatory Power	109.59 (W/MHz) ERP	109.59 (W/MHz) ERP	109.59 (W/MHz) ERP	109.59 (W/MHz) ERP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843901	18843905	18843909	18843913
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

850 LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	2450	2450	2450	2450
Mech Down-tilt	0	0	0	0
Elect Down-tilt	2	2	2	2
Tip Height	148	148	148	148
Regulatory Power	395.20 (W/MHz) ERPSD	395.20 (W/MHz) ERPSD	395.20 (W/MHz) ERPSD	395.20 (W/MHz) ERPSD
Cell Max Power	44.5 dBm	44.5 dBm	44.5 dBm	44.5 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843904	18843908	18843912	18843916
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

AWS LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	2050	2050	2050	2050
Mech Down-tilt	0	0	0	0
Elect Down-tilt	0	0	0	0
Tip Height	148	148	148	148
Regulatory Power	228.42 (W/MHz) EIRP	228.42 (W/MHz) EIRP	228.42 (W/MHz) EIRP	228.42 (W/MHz) EIRP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843903	18843907	18843911	18843915
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	20	20	20	20
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

CBAND NR		0002			
Sector		0001	0002	0003	0004
Azimuth		345	75	165	255
Cell/Enodeb-Id		640175	640175	640175	640175
Antenna Model		MT6413-77A	MT6413-77A	MT6413-77A	MT6413-77A
Antenna Make		Samsung	Samsung	Samsung	Samsung
Centerline		145	145	145	145
DLEARFCN		650006	650006	650006	650006
Mech Down-tilt		0	0	0	0
Elect Down-tilt		2	2	2	2
Tip Height		146.2	146.2	146.2	146.2
Regulatory Power		748.75 (W/MHz) EIRP	748.75 (W/MHz) EIRP	748.75 (W/MHz) EIRP	748.75 (W/MHz) EIRP
Cell Max Power		47.0 dBm	47.0 dBm	47.0 dBm	47.0 dBm
TMA Make					
TMA Model					
RRU Make		Samsung	Samsung	Samsung	Samsung
RRU Model		MT6413-77A	MT6413-77A	MT6413-77A	MT6413-77A
Number of Tx,Rx		4 , 4	4 , 4	4 , 4	4 , 4
Position		3	3	3	3
Transmitter Id		18843917	18843918	18843919	18843920
Source		VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth		100	100	100	100
Ant. Dimensions H x W x D(inch)		29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51
Weight(lb)		55.1	55.1	55.1	55.1

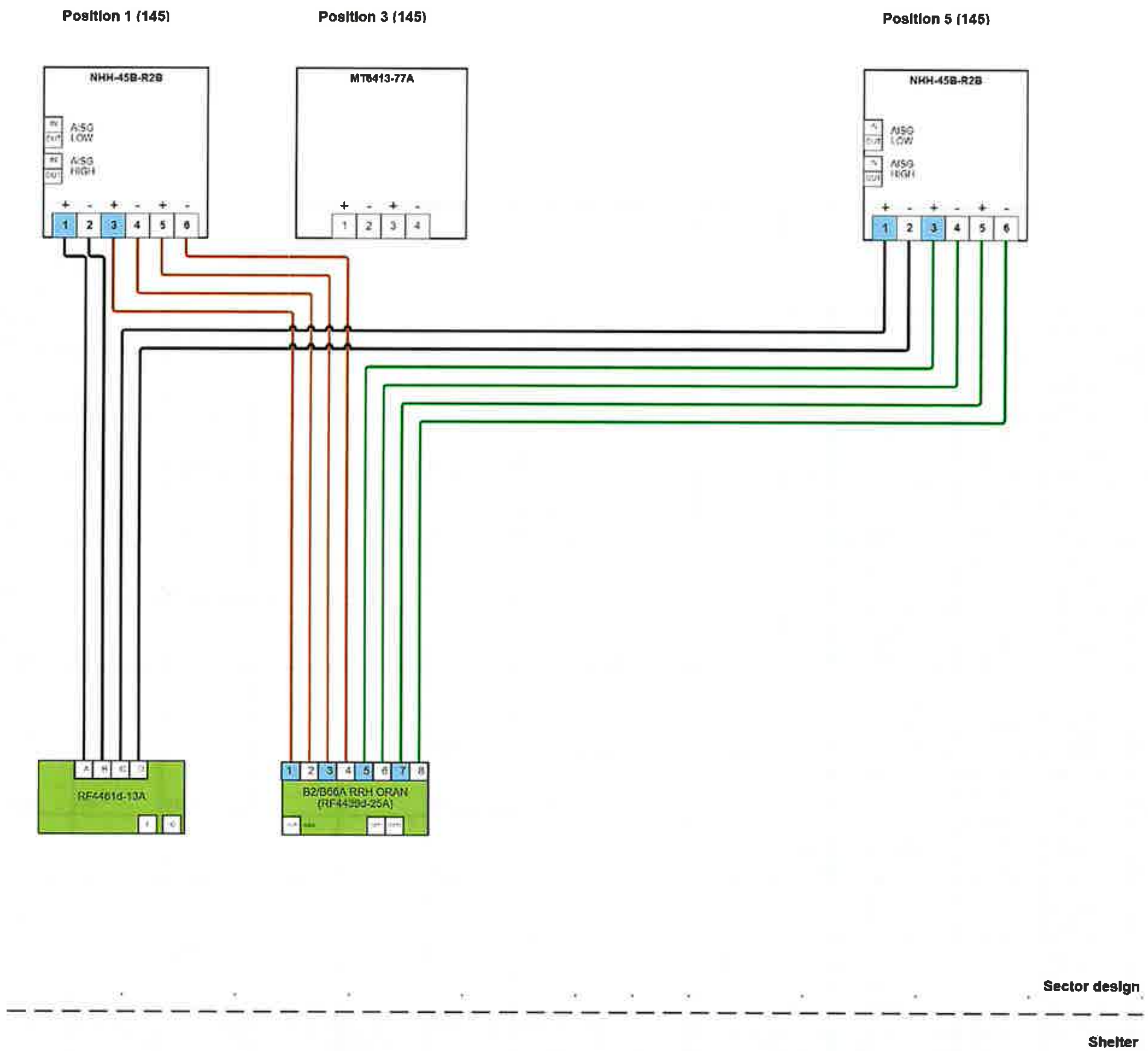
Callsigns Per Antenna

Sector	Make	Model	Ant CL Height AG	Ant Tip Height	Azimuth	Elect Down-tilt	Mech Down-tilt	Gain	Bandwidth	Regulatory Power	700	850	1900	2100	28 GHz	31 GHz	39 GHz	LSub-6	CBRS
02	CommScope	NHH-45B-R2	145	148	75	0	0	17.9	41	228.42				WQGA906,WQGB276					
02	CommScope	NHH-45B-R2	145	148	75	2	0	14.07	49	109.59	WQJQ689								
03	CommScope	NHH-45B-R2	145	148	165	2	0	14.07	49	109.59	WQJQ689								
0003	Samsung	MT6413-77A	145	146.2	165	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
01	CommScope	NHH-45B-R2	145	148	345	0	0	17.6	43	407.15			KNLH251,WPOJ730						
03	CommScope	NHH-45B-R2	145	148	165	2	0	15.08	43	395.2		KNKA404							
01	CommScope	NHH-45B-R2	145	148	345	2	0	15.08	43	395.2		KNKA404							
04	CommScope	NHH-45B-R2	145	148	255	0	0	17.9	41	228.42				WQGA906,WQGB276					
04	CommScope	NHH-45B-R2	145	148	255	0	0	17.6	43	407.15			KNLH251,WPOJ730						
02	CommScope	NHH-45B-R2	145	148	75	2	0	15.08	43	395.2		KNKA404							
01	CommScope	NHH-45B-R2	145	148	345	0	0	17.9	41	228.42				WQGA906,WQGB276					
03	CommScope	NHH-45B-R2	145	148	165	0	0	17.9	41	228.42				WQGA906,WQGB276					
01	CommScope	NHH-45B-R2	145	148	345	2	0	14.07	49	109.59	WQJQ689								
04	CommScope	NHH-45B-R2	145	148	255	2	0	14.07	49	109.59	WQJQ689								
0004	Samsung	MT6413-77A	145	146.2	255	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
03	CommScope	NHH-45B-R2	145	148	165	0	0	17.6	43	407.15			KNLH251,WPOJ730						
0002	Samsung	MT6413-77A	145	146.2	75	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
0001	Samsung	MT6413-77A	145	146.2	345	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
02	CommScope	NHH-45B-R2	145	148	75	0	0	17.6	43	407.15			KNLH251,WPOJ730						
04	CommScope	NHH-45B-R2	145	148	255	2	0	15.08	43	395.2		KNKA404							

Callsigns

Callsign	Market	Radio Code	Market #	Block	State	County	License Name	Wholly Owner	Total MHZ	Freq Range 1	Freq Range 2	Freq Range 3	Freq Range 4	Regulatory Power	Threshold (W)	POPs/Sq. mil	Status	Action	Approve for Insvc
WQJQ689	Northeast	WU	REA001	C	CT	9007	Cellco Partnershi	Yes	22.000	746.000 - 757.000/.0 00 - .000	776.000 - 787.000/.0 00 - .000	746.000 - 757.000/.0 00 - .000	776.000 - 787.000/.0 00 - .000	109.59	1000	444.75	proposed	added	1
KNKA404	Hartford-New Britain-Bristol, CT	CL	CMA032	A	CT	9007	Cellco Partnershi	Yes	25.000	824.000 - 835.000/84 5.000 - 846.500	869.000 - 880.000/89 0.000 - 891.500	824.000 - 835.000/84 5.000 - 846.500	869.000 - 880.000/89 0.000 - 891.500	395.2	400	444.75	proposed	added	1
WPOJ730	Hartford, CT	CW	BTA184	C	CT	9007	Cellco Partnershi	Yes	10.000	1895.000 - 1900.000/. 000 - .000	1975.000 - 1980.000/. 000 - .000	1895.000 - 1900.000/. 000 - .000	1975.000 - 1980.000/. 000 - .000	407.15	1640	444.75	proposed	added	1
KNLH251	Hartford, CT	CW	BTA184	F	CT	9007	Cellco Partnershi	Yes	10.000	1890.000 - 1895.000/. 000 - .000	1970.000 - 1975.000/. 000 - .000	1890.000 - 1895.000/. 000 - .000	1970.000 - 1975.000/. 000 - .000	407.15	1640	444.75	proposed	added	1
WQGB276	Hartford-New Britain-Bristol, CT	AW	CMA032	A	CT	9007	Cellco Partnershi	Yes	20.000	1710.000 - 1720.000/. 000 - .000	2110.000 - 2120.000/. 000 - .000	1710.000 - 1720.000/. 000 - .000	2110.000 - 2120.000/. 000 - .000	228.42	1640	444.75	proposed	added	1
WRNE581	New York, NY	PM	PEA001	A1	CT	9007	Cellco Partnershi	Yes	20.000	3700.000 - 3720.000/. 000 - .000	.000 - .000/.000 - .000	3700.000 - 3720.000/. 000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	1
WRNE582	New York, NY	PM	PEA001	A2	CT	9007	Cellco Partnershi	Yes	20.000	3720.000 - 3740.000/. 000 - .000	.000 - .000/.000 - .000	3720.000 - 3740.000/. 000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	1
WRNE583	New York, NY	PM	PEA001	A3	CT	9007	Cellco Partnershi	Yes	20.000	3740.000 - 3760.000/. 000 - .000	.000 - .000/.000 - .000	3740.000 - 3760.000/. 000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	1
WRNE584	New York, NY	PM	PEA001	A4	CT	9007	Cellco Partnershi	Yes	20.000	3760.000 - 3780.000/. 000 - .000	.000 - .000/.000 - .000	3760.000 - 3780.000/. 000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	0
WRNE585	New York, NY	PM	PEA001	A5	CT	9007	Cellco Partnershi	Yes	20.000	3780.000 - 3800.000/. 000 - .000	.000 - .000/.000 - .000	3780.000 - 3800.000/. 000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	0
WQGA906	New York-No. New Jer.-Long Island, NY-NJ-CT-PA-MA-	AW	BEA010	B	CT	9007	Cellco Partnershi	Yes	20.000	1720.000 - 1730.000/. 000 - .000	2120.000 - 2130.000/. 000 - .000	1720.000 - 1730.000/. 000 - .000	2120.000 - 2130.000/. 000 - .000	228.42	1640	444.75	proposed	added	1

Alpha
(Proposed)



Legends

RET dc signal capable port

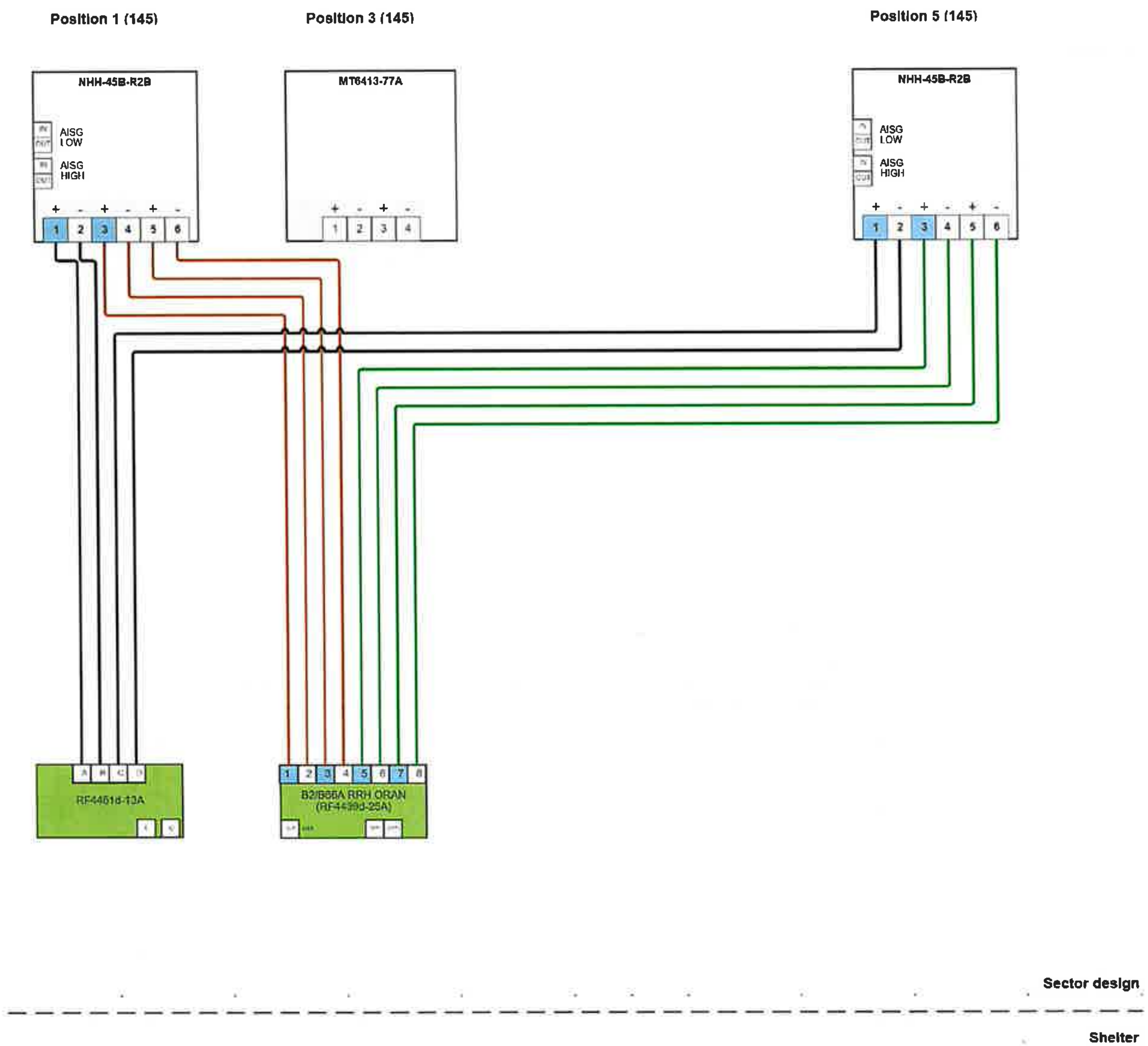
- 700/850(LB)
- 700(LT)
- 850(CB)
- AWS(AW)
- PCS(PC)
- AWS/PCS(HB)
- 28GHz(U28)
- 39GHz(U39)
- L-Sub6(S6)
- CBRS(RS)
- LAA(LA)
- Fiber
- AISG
- DC

Coax
Coax Jumper
Sectors Shared Equipments

Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions

Beta
(Proposed)



Legends

RET dc signal capable port

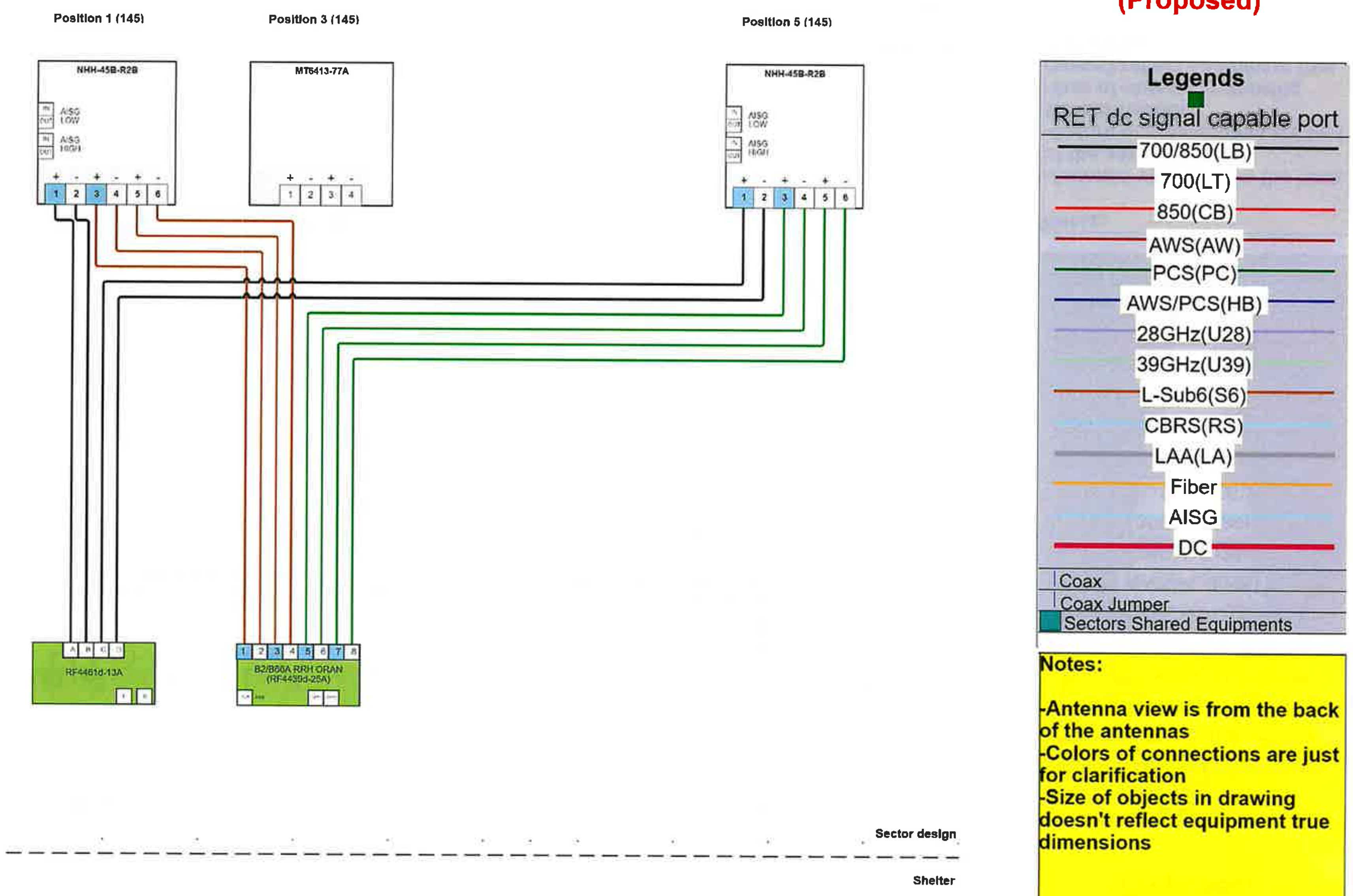
- 700/850(LB)
- 700(LT)
- 850(CB)
- AWS(AW)
- PCS(PC)
- AWS/PCS(HB)
- 28GHz(U28)
- 39GHz(U39)
- L-Sub6(S6)
- CBRS(RS)
- LAA(LA)
- Fiber
- AISG
- DC

Coax
Coax Jumper
Sectors Shared Equipments

Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions

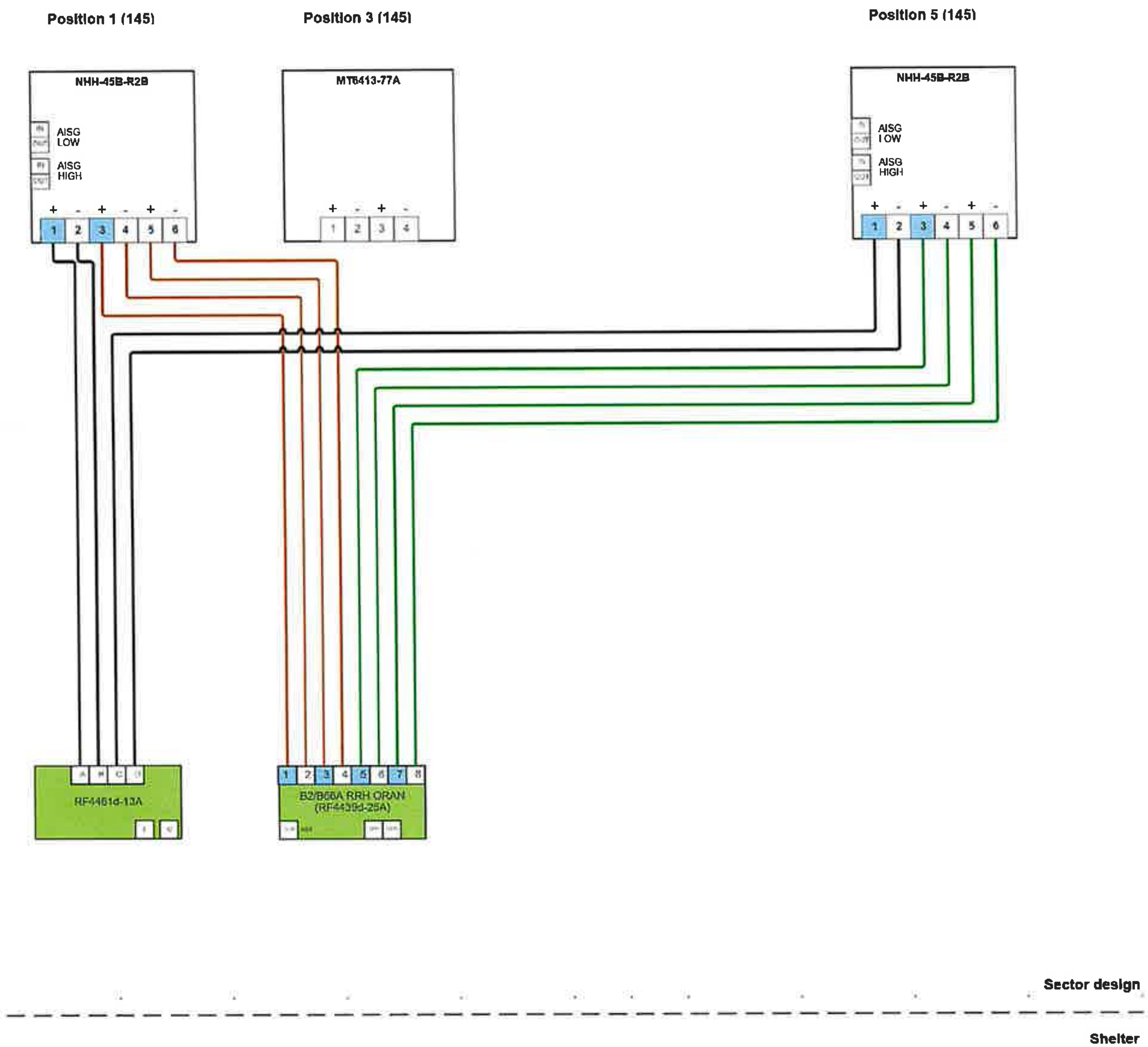
Gamma
(Proposed)



Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions

Delta
(Proposed)



Legends

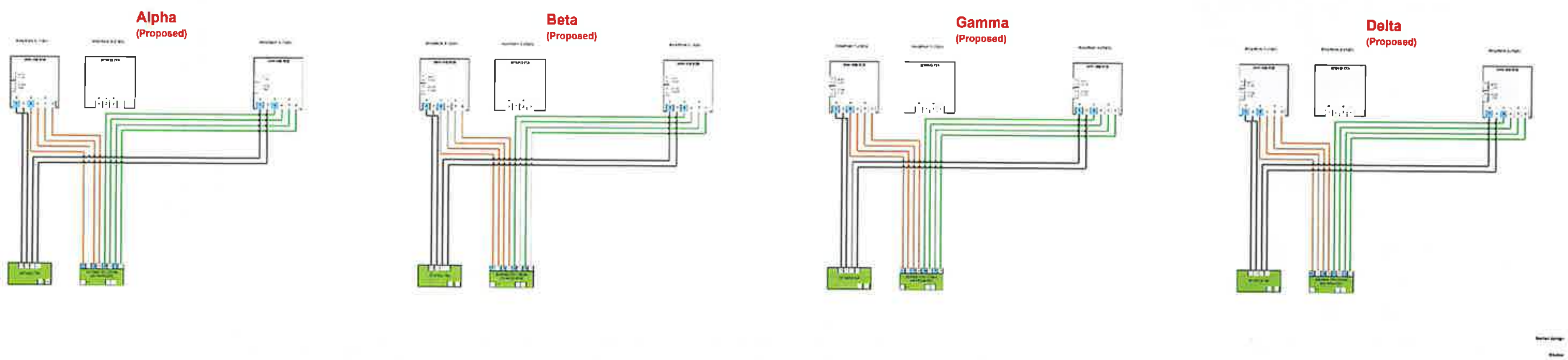
RET dc signal capable port

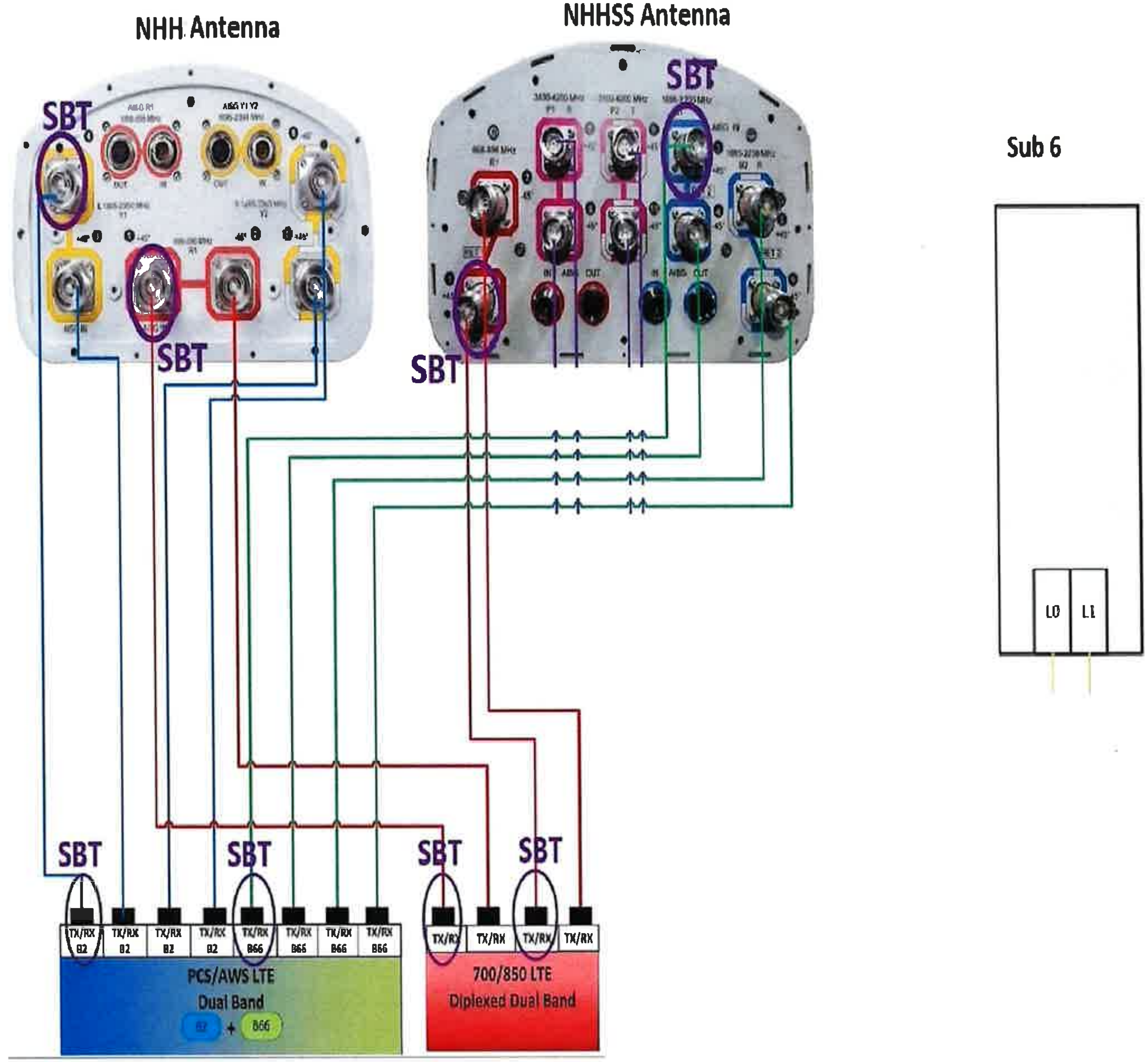
- 700/850(LB)
- 700(LT)
- 850(CB)
- AWS(AW)
- PCS(PC)
- AWS/PCS(HB)
- 28GHz(U28)
- 39GHz(U39)
- L-Sub6(S6)
- CBRS(RS)
- LAA(LA)
- Fiber
- AISG
- DC

Coax
Coax Jumper
Sectors Shared Equipments

Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions


Alpha
(Proposed)
Beta
(Proposed)
Gamma
(Proposed)
Delta
(Proposed)



NHH Antenna
NHHSS Antenna
Sub 6
L0
L1
SBT
SBT
SBT
SBT
SBT
SBT
SBT
SBT
TX/RX B2
TX/RX B2
TX/RX B2
TX/RX B2
TX/RX B66
TX/RX B66
TX/RX B66
TX/RX B66
PCS/AWS LTE
Dual Band
B2 + B66
TX/RX
TX/RX
TX/RX
TX/RX
700/850 LTE
Diplexed Dual Band

CENTEK engineering

Centered on Solutions℠

Antenna Mount Analysis Report

Site Ref: East Haddam 3

194 MT Parnassus Road
East Haddam, CT

Centek Project No. 23134.00

Date: October 9, 2023

Max Stress Ratio = 87%

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Prepared for:

Verizon Wireless
20 Alexander Drive
Wallingford, CT 06492

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

CENTEK Engineering, Inc.
Mount Analysis
Verizon Site Ref. ~ East Haddam 3
East Haddam, CT
October 9, 2023

Table of Contents

CENTEK engineering

Centered on Solutions℠

October 9, 2023

Mr. Peter Nute
ProTerra Design Group, LLC
4 Bay Road
Hadley, MA

Re: *Structural Letter ~ Antenna Mount*
Verizon – Site Ref: East Haddam 3
194 MT Parnassus Road
East Haddam, CT

Centek Project No. 23134.00

Dear Mr. Nute,

Centek Engineering, Inc. has reviewed the Verizon antenna installation at the above referenced site. The purpose of the review is to determine the structural adequacy of the **proposed mount, consisting of four (4) V-frame sector mounts (SitePro P/N: VFA12-HD)** to support the proposed equipment configuration. The review considered the effects of wind load, dead load and ice load in accordance with the 2021 International Building Code as modified by the 2022 Connecticut State Building Code (CTBC) including ASCE 7-16 and ANSI/TIA-222-H *Structural Standard for Antenna Supporting Structures, Antennas and Small Wind Turbine Support Structures"*.

The loads considered in this analysis consist of the following:

- **Verizon:**
  V-Frames: Eight (8) Commscope NHH-45B-R2B panel antennas, four (4) Samsung MT6413-77A panel antennas, four (4) Samsung RF4439d-25A (B2/B66A) RRHs, four (4) Samsung RF4461d-13A RRHs and one (1) OVP Box mounted on four (4) V-Frames with a RAD center elevation of 145 ft +/- AGL.

The antenna mount was analyzed per the requirements of the 2021 International Building Code as modified by the 2022 Connecticut State Building Code considering a Ultimate design wind speed of 135 mph for East Haddam as required in Appendix P of the 2022 Connecticut State Building Code.

Based on our review of the installation, it is our opinion that the **subject antenna mount has sufficient capacity** to support the aforementioned antenna configuration.

If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Section 2 - Calculations

Development of Design Heights, Exposure Coefficients, and Velocity Pressures Per TIA-222-H

Wind Speeds

Basic Wind Speed	$V := 135$	mph	(User Input - CSBC 2022 Appendix P)
Basic Wind Speed with Ice	$V_i := 50$	mph	(User Input - TIA-222-H Annex B)
Basic Wind Speed (Mount)	$V_m := 30$	mph	(User Input - TIA-222-H Section 16.3)

Input

Structure Type =	Structure_Type := Flexible		(User Input)
Structure Category =	$SC := IV$		(User Input)
Exposure Category =	$Exp := C$		(User Input)
Structure Height =	$h := 160$	ft	(User Input)
Height to Center of Antennas =	$z_{ant} := 145$	ft	(User Input)
Radial Ice Thickness =	$t_i := 1.0$	in	(User Input per Annex B of TIA-222-H)
Radial Ice Density =	$Id := 56.00$	pcf	(User Input)
Topograpic Factor =	$K_{zt} := 1$		(User Input)
Shielding Factor for Appurtenances =	$K_a := 1.0$		(User Input)
Rooftop Wind Speed-up Factor =	$K_s := 1.0$		(User Input)
Ground Elevation Factor =	$K_e = 0.996$		(User Input)
Gust Response Factor =	$G_H = 1.35$		(User Input)

Output

Wind Direction Probability Factor = $K_d := 0.95$ (Per Table 2-2 of TIA-222-H)

Importance Factors = (Per Table 2-3 of TIA-222-H)

$$I_{ice} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.15 & \text{if } SC = 3 \\ 1.25 & \text{if } SC = 4 \end{cases} = 1.25$$

$$I_{Seismic} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.25 & \text{if } SC = 3 \\ 1.50 & \text{if } SC = 4 \end{cases} = 1.5$$

$$K_{iz} := \left(\frac{z_{ant}}{33}\right)^{0.1} = 1.16 \qquad t_{iz} := t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 1.449$$

Velocity Pressure Coefficient Antennas = $Kz_{ant} := 2.01\left(\left(\frac{z_{ant}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.369$

Velocity Pressure w/o Ice Antennas = $qz_{ant} := 0.00256 \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot Kz_{ant} \cdot V^2 = 60.393$

Velocity Pressure with Ice Antennas = $qz_{ice.ant} := 0.00256 \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot Kz_{ant} \cdot V_i^2 = 8.284$

Velocity Pressure with Ice Antennas = $qz_m := 0.00256 \cdot K_{zt} \cdot K_s \cdot K_e \cdot K_d \cdot Kz_{ant} \cdot V_m^2 = 2.982$

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Commscope NHH-45B-R2B		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height =	$L_{app} := 72$	in	(User Input)
Appurtenance Width =	$W_{app} := 18$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 7$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 80$	lbs	(User Input)
Number of Appurtenances =	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 4.0$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.27$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) = $SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 9$ sf

Total Appurtenance Wind Force = $F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 929$ lbs

Surface Area for One Appurtenance (Side) = $SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 3.5$ sf

Total Appurtenance Wind Force = $F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 361$ lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)= $SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 10.9$ sf

Total Appurtenance Wind Force w/ Ice= $Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 154$ lbs

Surface Area for One Appurtenance w/ Ice (Side) = $SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 5.1$ sf

Total Appurtenance Wind Force w/ Ice= $Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 73$ lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) = $SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 9$ sf

Total Appurtenance Wind Force = $F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 46$ lbs

Surface Area for One Appurtenance (Side) = $SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 3.5$ sf

Total Appurtenance Wind Force = $F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 18$ lbs

Gravity Loads (ice only)

Volume of Each Appurtenance = $V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 9072$ cu in

Volume of Ice on Each Appurtenance = $V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 6423$ cu in

Weight of Ice on Each Appurtenance = $W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 208$ lbs

Weight of Ice on All Appurtenances = $W_{ICEapp} \cdot N_{app} = 208$ lbs

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Samsung MT6413-77A		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height=	$L_{app} := 28.9$	in	(User Input)
Appurtenance Width =	$W_{app} := 15.75$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 5.51$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 60$	lbs	(User Input)
Number of Appurtenances=	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.8$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.2$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 309$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 108$	lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 4.1$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 55$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 1.9$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 25$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.2$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 15$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 5$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 2508$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 2479$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 80$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 80$	lbs

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model = Samsung RF4439-25A(B2,B66A)RRH

Appurtenance Shape = Flat (User Input)

Appurtenance Height= $L_{app} := 15$ in (User Input)

Appurtenance Width = $W_{app} := 15$ in (User Input)

Appurtenance Thickness = $T_{app} := 10$ in (User Input)

Appurtenance Weight = $WT_{app} := 75$ lbs (User Input)

Number of Appurtenances= $N_{app} := 1$ (User Input)

Appurtenance Aspect Ratio = $Ar_{app} := \frac{L_{app}}{W_{app}} = 1.0$

Appurtenance Force Coefficient = $Ca_{app} = 1.2$

Wind Load (without ice)

Surface Area for One Appurtenance (Front) = $SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$ sf

Total Appurtenance Wind Force = $F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 153$ lbs

Surface Area for One Appurtenance (Side) = $SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1$ sf

Total Appurtenance Wind Force = $F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 102$ lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)= $SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 2.2$ sf

Total Appurtenance Wind Force w/ Ice= $Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 30$ lbs

Surface Area for One Appurtenance w/ Ice (Side) = $SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 1.6$ sf

Total Appurtenance Wind Force w/ Ice= $Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 22$ lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) = $SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$ sf

Total Appurtenance Wind Force = $F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 8$ lbs

Surface Area for One Appurtenance (Side) = $SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1$ sf

Total Appurtenance Wind Force = $F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 5$ lbs

Gravity Loads (ice only)

Volume of Each Appurtenance = $V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 2250$ cu in

Volume of Ice on Each Appurtenance = $V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 1882$ cu in

Weight of Ice on Each Appurtenance = $W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 61$ lbs

Weight of Ice on All Appurtenances = $W_{ICEapp} \cdot N_{app} = 61$ lbs

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	Samsung RF4461d-13ARRH		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height =	$L_{app} := 15$	in	(User Input)
Appurtenance Width =	$W_{app} := 15$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 10.23$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 80$	lbs	(User Input)
Number of Appurtenances =	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.0$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 153$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 104$	lbs

Wind Load (with ice)

Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 2.2$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 30$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 1.6$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 22$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 1.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 8$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 1.1$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 5$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 2302$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 1904$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 62$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 62$	lbs

Development of Wind & Ice Load on Appurtenances

Appurtenance Data:

Appurtenance Model =	OVP Box		
Appurtenance Shape =	Flat		(User Input)
Appurtenance Height =	$L_{app} := 29.5$	in	(User Input)
Appurtenance Width =	$W_{app} := 16.5$	in	(User Input)
Appurtenance Thickness =	$T_{app} := 12.6$	in	(User Input)
Appurtenance Weight =	$WT_{app} := 32$	lbs	(User Input)
Number of Appurtenances =	$N_{app} := 1$		(User Input)
Appurtenance Aspect Ratio =	$Ar_{app} := \frac{L_{app}}{W_{app}} = 1.8$		
Appurtenance Force Coefficient =	$Ca_{app} = 1.2$		

Wind Load (without ice)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.4$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 331$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 2.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_{ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 253$	lbs

Wind Load (with ice)

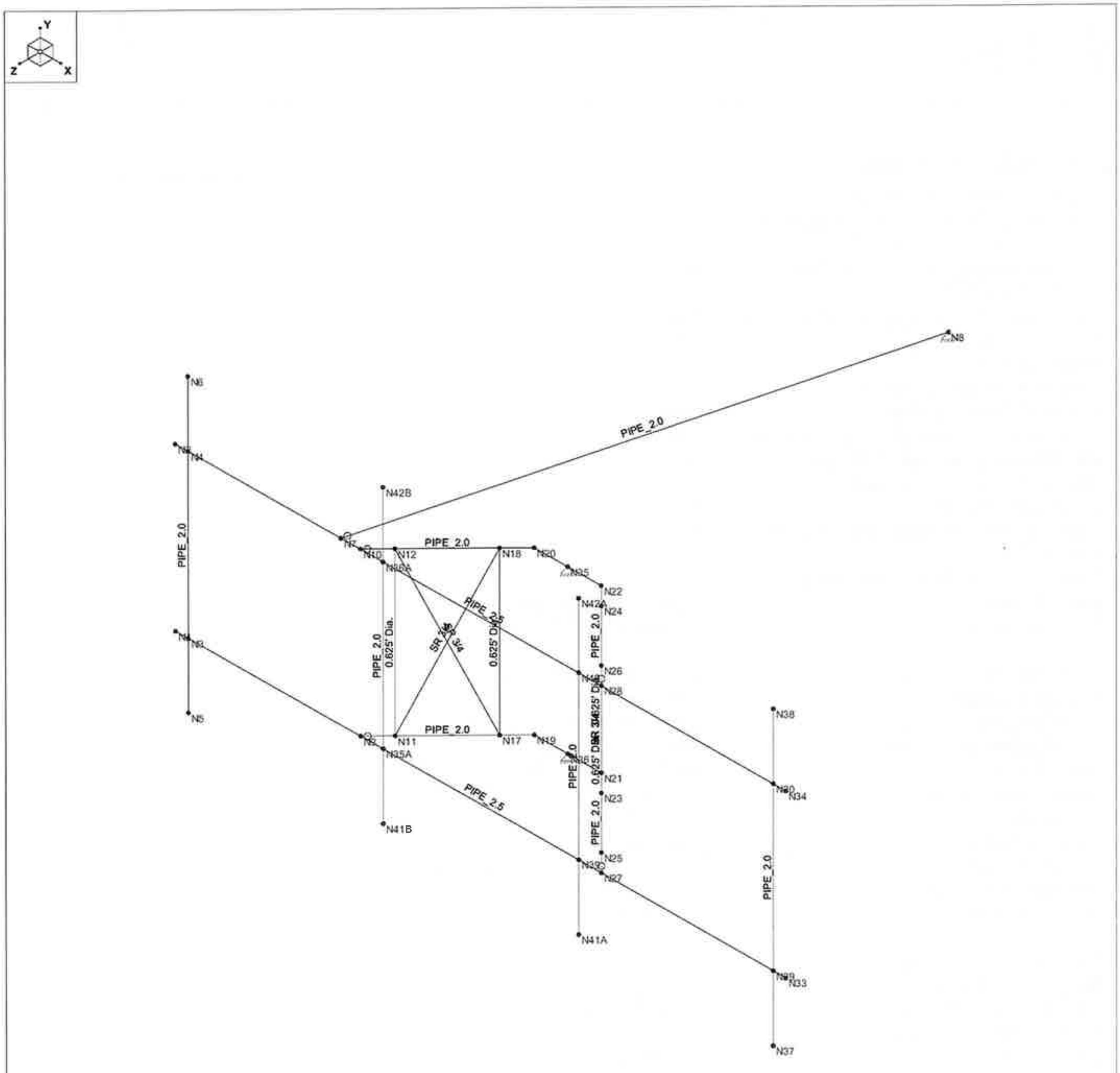
Surface Area for One Appurtenance w/ Ice (Front)=	$SA_{ICEappF} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (W_{app} + 2 \cdot t_{iz})}{144} = 4.4$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappF} = 59$	lbs
Surface Area for One Appurtenance w/ Ice (Side) =	$SA_{ICEappS} := \frac{(L_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz})}{144} = 3.5$	sf
Total Appurtenance Wind Force w/ Ice=	$Fi_{app} := qz_{ice.ant} \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{ICEappS} = 47$	lbs

Wind Load (Mount)

Surface Area for One Appurtenance (Front) =	$SA_{appF} := \frac{L_{app} \cdot W_{app}}{144} = 3.4$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appF} = 16$	lbs
Surface Area for One Appurtenance (Side) =	$SA_{appS} := \frac{L_{app} \cdot T_{app}}{144} = 2.6$	sf
Total Appurtenance Wind Force =	$F_{app} := qz_m \cdot G_H \cdot Ca_{app} \cdot K_a \cdot SA_{appS} = 12$	lbs

Gravity Loads (ice only)

Volume of Each Appurtenance =	$V_{app} := L_{app} \cdot W_{app} \cdot T_{app} = 6133$	cu in
Volume of Ice on Each Appurtenance =	$V_{ice} := (L_{app} + 2 \cdot t_{iz})(W_{app} + 2 \cdot t_{iz}) \cdot (T_{app} + 2 \cdot t_{iz}) - V_{app} = 3608$	cu in
Weight of Ice on Each Appurtenance =	$W_{ICEapp} := \frac{V_{ice}}{1728} \cdot Id = 117$	lbs
Weight of Ice on All Appurtenances =	$W_{ICEapp} \cdot N_{app} = 117$	lbs



Envelope Only Solution

Centek Engineering		
TJL	East Haddam 3	Oct 9, 2023 at 10:47 AM
23134.00	Member Framing	Mount.R3D

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 15th(360-16): LRFD
Cold Formed Steel Code	AISI S100-10: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	150.001
Footing Concrete f'c (ksi)	4
Footing Concrete Ec (ksi)	3644
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	2
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Grade B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Antenna Mast_2.0...	PIPE_2.0	Column	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
2	Horizontal_2.5 ST...	PIPE_2.5	Beam	Pipe	A53 Grade B	Typical	1.61	1.45	1.45	2.89
3	Outrigger_2.0 ST...	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
4	Stabilizer_2.0 ST...	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
5	0.625" Dia. Bar	0.625' Dia.	Column	BAR	A36 Gr.36	Typical	.307	.007	.007	.015
6	0.75"Dia. Bar	SR 3/4	Column	BAR	A36 Gr.36	Typical	.442	.016	.016	.031

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Horizontal_2.5 STD...	12.5	Segment		Lbyy						Lateral
2	M2	Horizontal_2.5 STD...	12.5	Segment		Lbyy						Lateral
3	M3	Stabilizer_2.0 STD ...	10.18			Lbyy						Lateral
4	M4	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
5	M5	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
6	M6	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
7	M7	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
8	M8	0.625" Dia. Bar	3.333									Lateral
9	M9	0.625" Dia. Bar	3.333									Lateral
10	M10	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
11	M11	0.625" Dia. Bar	3.333									Lateral
12	M12	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
13	M13	0.625" Dia. Bar	3.333									Lateral
14	M14	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
15	M15	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
16	PS.2	Antenna Mast_2.0 ...	6			Lbyy						Lateral
17	PS.1	Antenna Mast_2.0 ...	6			Lbyy						Lateral
18	M19	Antenna Mast_2.0 ...	6			Lbyy						Lateral
19	M21A	Antenna Mast_2.0 ...	6			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M1	N2	N34			Horizontal_2.5 STD Pipe	Beam	Pipe	A53 Grade B	Typical
2	M2	N1	N33			Horizontal_2.5 STD Pipe	Beam	Pipe	A53 Grade B	Typical
3	M3	N7	N8			Stabilizer_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
4	M4	N10	N20			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
5	M5	N9	N19			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
6	M6	N28	N22			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
7	M7	N27	N21			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
8	M8	N12	N11			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
9	M9	N18	N17			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
10	M10	N12	N17			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
11	M11	N26	N25			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
12	M12	N18	N11			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
13	M13	N24	N23			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
14	M14	N26	N23			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
15	M15	N24	N25			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
16	PS.2	N5	N6			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
17	PS.1	N37	N38			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
18	M19	N41A	N42A			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
19	M20	N19	N21			RIGID	None	None	RIGID	Typical
20	M21	N20	N22			RIGID	None	None	RIGID	Typical
21	M21A	N41B	N42B			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	N1	0	0.	-0.	0	
2	N2	0	3.333334	-0.	0	
3	N3	.25	0.	-0.	0	
4	N4	.25	3.333334	-0.	0	
5	N5	.25	-1.333333	-0.	0	
6	N6	.25	4.666667	-0.	0	
7	N7	3.390625	3.333334	-0.	0	
8	N8	6.025403	3.333334	-9.833125	0	
9	N9	3.78125	0.	-0.	0	
10	N10	3.78125	3.333334	-0.	0	
11	N11	4.138628	0.	-0.357378	0	
12	N12	4.138628	3.333334	-0.357378	0	
13	N17	5.206335	0.	-1.425085	0	
14	N18	5.206335	3.333334	-1.425085	0	
15	N19	5.563713	0.	-1.782463	0	
16	N20	5.563713	3.333334	-1.782463	0	
17	N21	6.936287	0.	-1.782463	0	
18	N22	6.936287	3.333334	-1.782463	0	
19	N23	7.293665	0.	-1.425085	0	
20	N24	7.293665	3.333334	-1.425085	0	
21	N25	8.361372	0.	-0.357378	0	
22	N26	8.361372	3.333334	-0.357378	0	
23	N27	8.71875	0.	-0.	0	
24	N28	8.71875	3.333334	-0.	0	
25	N29	12.25	0.	-0.	0	
26	N30	12.25	3.333334	-0.	0	
27	N33	12.5	0.	-0.	0	
28	N34	12.5	3.333334	-0.	0	
29	N35	6.25	3.333334	-1.782463	0	
30	N36	6.25	0.	-1.782463	0	
31	N35A	4.25	0.	-0.	0	
32	N36A	4.25	3.333334	-0.	0	
33	N37	12.25	-1.333333	0	0	
34	N38	12.25	4.666667	0	0	
35	N39	8.25	0.	-0.	0	
36	N40	8.25	3.333334	-0.	0	
37	N41A	8.25	-1.333333	-0.	0	
38	N42A	8.25	4.666667	-0.	0	
39	N41B	4.25	-1.333333	-0.	0	
40	N42B	4.25	4.666667	-0.	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N8	Reaction	Reaction	Reaction			
2	N19						
3	N20						
4	N17						
5	N18						
6	N21						
7	N22						
8	N23						
9	N24						
10	N35	Reaction	Reaction	Reaction			
11	N36	Reaction	Reaction	Reaction			

Member Point Loads (BLC 2 : Dead Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Y	-.04	.5
2	PS.1	Y	-.04	.5
3	PS.2	Y	-.04	5.5
4	PS.1	Y	-.04	5.5
5	M21A	Y	-.03	.5
6	M21A	Y	-.03	5.5
7	PS.2	Y	-.075	%50
8	PS.1	Y	-.08	%50
9	M19	Y	-.032	%50

Member Point Loads (BLC 3 : Ice Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Y	-.104	.5
2	PS.1	Y	-.104	.5
3	PS.2	Y	-.104	5.5
4	PS.1	Y	-.104	5.5
5	M21A	Y	-.04	.5
6	M21A	Y	-.04	5.5
7	PS.2	Y	-.061	%50
8	PS.1	Y	-.062	%50
9	M19	Y	-.117	%50

Member Point Loads (BLC 4 : Lm Maintenance Load (500lb))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Y	-.5	%50

Member Point Loads (BLC 5 : Lv Maintenance Load (250lb))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.25	12

Member Point Loads (BLC 6 : Wind with Ice X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	X	.037	.5

Member Point Loads (BLC 6 : Wind with Ice X) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
2	PS.1	X	.037	.5
3	PS.2	X	.037	5.5
4	PS.1	X	.037	5.5
5	M21A	X	.013	.5
6	M21A	X	.013	5.5
7	PS.2	X	.022	%50
8	PS.1	X	.022	%50
9	M19	X	.047	%50

Member Point Loads (BLC 7 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	X	.181	.5
2	PS.1	X	.181	.5
3	PS.2	X	.181	5.5
4	PS.1	X	.181	5.5
5	M21A	X	.054	.5
6	M21A	X	.054	5.5
7	PS.2	X	.102	%50
8	PS.1	X	.104	%50
9	M19	X	.253	%50

Member Point Loads (BLC 8 : Wm Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	X	.009	.5
2	PS.1	X	.009	.5
3	PS.2	X	.009	5.5
4	PS.1	X	.009	5.5
5	M21A	X	.003	.5
6	M21A	X	.003	5.5
7	PS.2	X	.005	%50
8	PS.1	X	.005	%50
9	M19	X	.012	%50

Member Point Loads (BLC 9 : Wind with Ice Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Z	.077	.5
2	PS.1	Z	.077	.5
3	PS.2	Z	.077	5.5
4	PS.1	Z	.077	5.5
5	M21A	Z	.028	.5
6	M21A	Z	.028	5.5
7	M19	Z	.059	%50

Member Point Loads (BLC 10 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Z	.465	.5
2	PS.1	Z	.465	.5
3	PS.2	Z	.465	5.5
4	PS.1	Z	.465	5.5
5	M21A	Z	.155	.5

Member Point Loads (BLC 10 : Wind Z) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
6	M21A	Z	.155	5.5
7	M19	Z	.331	%50

Member Point Loads (BLC 11 : Wm Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Z	.023	.5
2	PS.1	Z	.023	.5
3	PS.2	Z	.023	5.5
4	PS.1	Z	.023	5.5
5	M21A	Z	.008	.5
6	M21A	Z	.008	5.5
7	M19	Z	.016	%50

Member Distributed Loads (BLC 6 : Wind with Ice X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.003	.003	0	0
2	M4	X	.003	.003	0	0
3	M5	X	.003	.003	0	0
4	M6	X	.003	.003	0	0
5	M7	X	.003	.003	0	0
6	M8	X	.003	.003	0	0
7	M9	X	.003	.003	0	0
8	M10	X	.003	.003	0	0
9	M11	X	.003	.003	0	0
10	M12	X	.003	.003	0	0
11	M13	X	.003	.003	0	0
12	M14	X	.003	.003	0	0
13	M15	X	.003	.003	0	0
14	PS.2	X	.003	.003	0	0
15	PS.1	X	.003	.003	0	0
16	M19	X	.003	.003	0	0
17	M20	X	.003	.003	0	0
18	M21	X	.003	.003	0	0
19	M21A	X	.003	.003	0	0

Member Distributed Loads (BLC 7 : Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.018	.018	0	0
2	M4	X	.018	.018	0	0
3	M5	X	.018	.018	0	0
4	M6	X	.018	.018	0	0
5	M7	X	.018	.018	0	0
6	M8	X	.018	.018	0	0
7	M9	X	.018	.018	0	0
8	M10	X	.018	.018	0	0
9	M11	X	.018	.018	0	0
10	M12	X	.018	.018	0	0
11	M13	X	.018	.018	0	0
12	M14	X	.018	.018	0	0

Member Distributed Loads (BLC 7 : Wind X) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
13	M15	X	.018	.018	0	0
14	PS.2	X	.018	.018	0	0
15	PS.1	X	.018	.018	0	0
16	M19	X	.018	.018	0	0
17	M20	X	.018	.018	0	0
18	M21	X	.018	.018	0	0
19	M21A	X	.018	.018	0	0

Member Distributed Loads (BLC 8 : Wm Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.003	.003	0	0
2	M4	X	.003	.003	0	0
3	M5	X	.003	.003	0	0
4	M6	X	.003	.003	0	0
5	M7	X	.003	.003	0	0
6	M8	X	.003	.003	0	0
7	M9	X	.003	.003	0	0
8	M10	X	.003	.003	0	0
9	M11	X	.003	.003	0	0
10	M12	X	.003	.003	0	0
11	M13	X	.003	.003	0	0
12	M14	X	.003	.003	0	0
13	M15	X	.003	.003	0	0
14	PS.2	X	.003	.003	0	0
15	PS.1	X	.003	.003	0	0
16	M19	X	.003	.003	0	0
17	M20	X	.003	.003	0	0
18	M21	X	.003	.003	0	0
19	M21A	X	.003	.003	0	0

Member Distributed Loads (BLC 9 : Wind with Ice Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M2	Z	.003	.003	0	0
3	M3	Z	.003	.003	0	0
4	M4	Z	.003	.003	0	0
5	M5	Z	.003	.003	0	0
6	M6	Z	.003	.003	0	0
7	M7	Z	.003	.003	0	0
8	M8	Z	.003	.003	0	0
9	M9	Z	.003	.003	0	0
10	M10	Z	.003	.003	0	0
11	M11	Z	.003	.003	0	0
12	M12	Z	.003	.003	0	0
13	M13	Z	.003	.003	0	0
14	M14	Z	.003	.003	0	0
15	M15	Z	.003	.003	0	0
16	PS.2	Z	.003	.003	0	0
17	M19	Z	.003	.003	0	0
18	M20	Z	.003	.003	0	0
19	M21	Z	.003	.003	0	0

Member Distributed Loads (BLC 9 : Wind with Ice Z) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
20	M21A	Z	.003	.003	0	0

Member Distributed Loads (BLC 10 : Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.018	.018	0	0
2	M2	Z	.018	.018	0	0
3	M3	Z	.018	.018	0	0
4	M4	Z	.018	.018	0	0
5	M5	Z	.018	.018	0	0
6	M6	Z	.018	.018	0	0
7	M7	Z	.018	.018	0	0
8	M8	Z	.018	.018	0	0
9	M9	Z	.018	.018	0	0
10	M10	Z	.018	.018	0	0
11	M11	Z	.018	.018	0	0
12	M12	Z	.018	.018	0	0
13	M13	Z	.018	.018	0	0
14	M14	Z	.018	.018	0	0
15	M15	Z	.018	.018	0	0
16	PS.2	Z	.018	.018	0	0
17	M19	Z	.018	.018	0	0
18	M20	Z	.018	.018	0	0
19	M21	Z	.018	.018	0	0
20	M21A	Z	.018	.018	0	0

Member Distributed Loads (BLC 11 : Wm Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M2	Z	.003	.003	0	0
3	M3	Z	.003	.003	0	0
4	M4	Z	.003	.003	0	0
5	M5	Z	.003	.003	0	0
6	M6	Z	.003	.003	0	0
7	M7	Z	.003	.003	0	0
8	M8	Z	.003	.003	0	0
9	M9	Z	.003	.003	0	0
10	M10	Z	.003	.003	0	0
11	M11	Z	.003	.003	0	0
12	M12	Z	.003	.003	0	0
13	M13	Z	.003	.003	0	0
14	M14	Z	.003	.003	0	0
15	M15	Z	.003	.003	0	0
16	PS.2	Z	.003	.003	0	0
17	M19	Z	.003	.003	0	0
18	M20	Z	.003	.003	0	0
19	M21	Z	.003	.003	0	0
20	M21A	Z	.003	.003	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight	None		-1						
2	Dead Load	None					9			
3	Ice Load	None					9			
4	Lm Maintenance Load (500lb)	None					1			
5	Lv Maintenance Load (250lb)	None					1			
6	Wind with Ice X	None					9	19		
7	Wind X	None					9	19		
8	Wm Wind X	None					9	19		
9	Wind with Ice Z	None					7	20		
10	Wind Z	None					7	20		
11	Wm Wind Z	None					7	20		

Load Combinations

	Description	So..	P...	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	1.4D	Yes	Y		1	1.4	2	1.4																
2	1.2D +1.5Lv	Yes	Y		1	1.2	2	1.2	5	1.5														
3	1.2D + 1.0W (X-directi...	Yes	Y		1	1.2	2	1.2	7	1														
4	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	6	1												
5	1.2D +1.5Lm+ 1.0Wm ..	Yes	Y		1	1.2	2	1.2	4	1.5	8	1												
6	1.2D + 1.0W (Z-directi...	Yes	Y		1	1.2	2	1.2	10	1														
7	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	9	1												
8	1.2D +1.5Lm+ 1.0Wm ..	Yes	Y		1	1.2	2	1.2	4	1.5	11	1												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	.34	3	.025	1	0	2	0	8	0	8	0	8
2		min	0	2	.021	5	-1.615	3	0	1	0	1	0	1
3	N35	max	.032	1	.828	8	1.178	3	0	8	0	8	0	8
4		min	-1.724	3	.411	3	-2.16	6	0	1	0	1	0	1
5	N36	max	1.322	8	.8	5	.838	5	0	8	0	8	0	8
6		min	-1.257	3	.43	6	-1.569	6	0	1	0	1	0	1
7	Totals:	max	0	8	1.63	8	0	3						
8		min	-2.641	3	.88	3	-4.193	6						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	N1	max	.106	3	.058	8	1.084	6	1.511e-03	8	2.992e-02	6	2.819e-03	3
2		min	-.057	6	-.174	4	-.079	5	-4.861e-03	6	-7.935e-04	5	-6.04e-04	8
3	N2	max	.04	3	.058	8	1.055	6	3.696e-03	6	2.988e-02	6	2.558e-03	4
4		min	-.069	6	-.174	4	-.016	5	-3.713e-03	3	-6.653e-04	5	-6.299e-04	8
5	N3	max	.106	3	.056	8	.995	6	1.511e-03	8	2.992e-02	6	2.819e-03	3
6		min	-.057	6	-.166	4	-.077	5	-4.861e-03	6	-7.935e-04	5	-6.04e-04	8
7	N4	max	.04	3	.056	8	.965	6	3.696e-03	6	2.988e-02	6	2.558e-03	4
8		min	-.069	6	-.166	4	-.014	5	-3.713e-03	3	-6.653e-04	5	-6.3e-04	8
9	N5	max	.16	3	.056	8	1.094	6	1.479e-03	5	2.992e-02	6	3.511e-03	3
10		min	-.063	8	-.166	4	-.101	5	-6.528e-03	6	-7.935e-04	5	-6.039e-04	8

Envelope Joint Displacements (Continued)

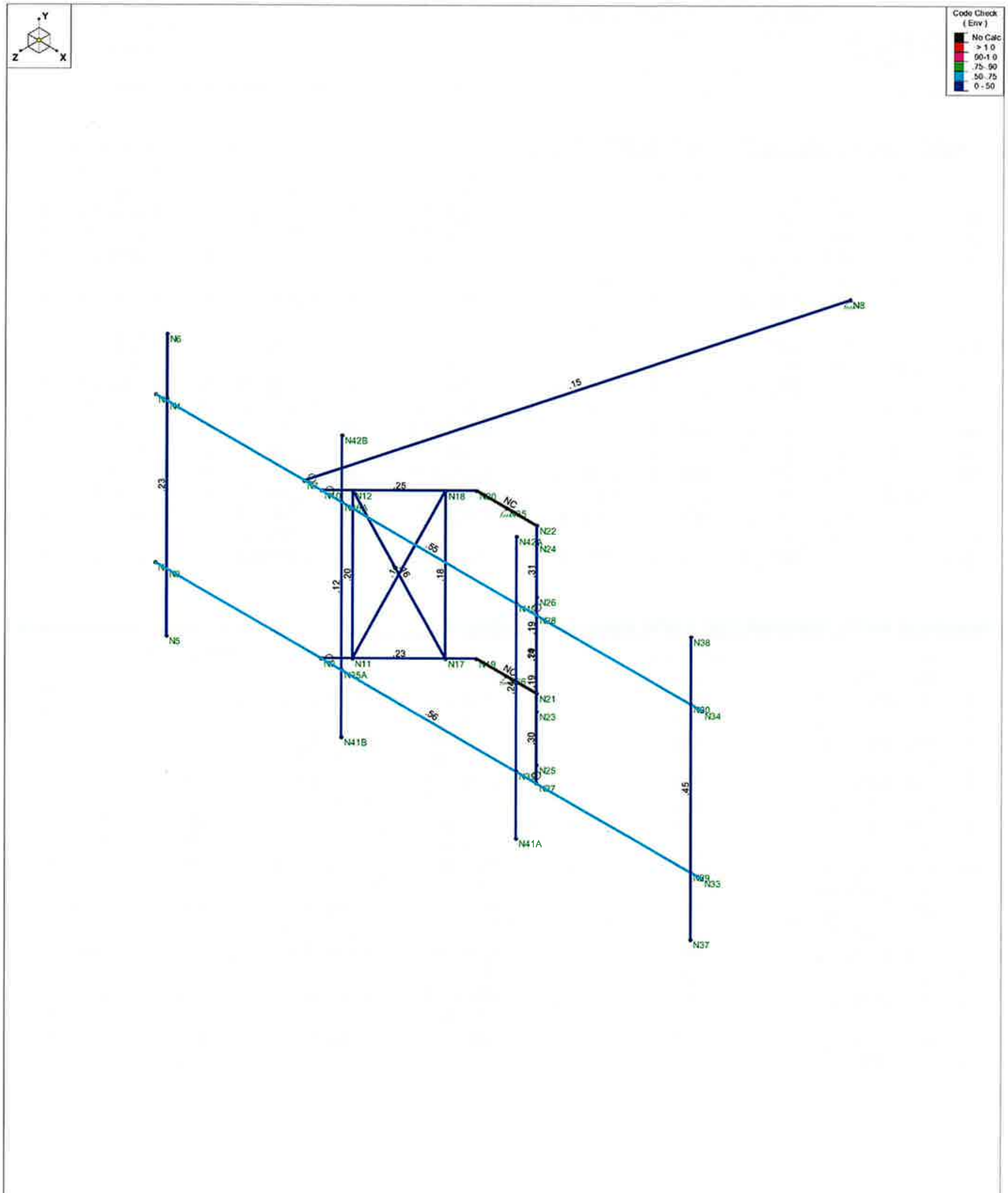
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
11	N6	max	.033	5	.056	8	1.046	6	5.366e-03	6	2.988e-02	6	2.42e-03	4
12		min	-.089	6	-.166	4	-.059	3	-3.713e-03	3	-6.653e-04	5	-6.301e-04	8
13	N7	max	.04	3	.055	8	.02	3	2.29e-03	6	1.812e-02	6	2.938e-03	4
14		min	-.068	6	-.027	4	-.016	6	-1.974e-03	3	-1.636e-03	3	-2.934e-04	8
15	N8	max	0	8	0	8	0	8	1.803e-03	1	7.927e-03	3	3.287e-03	4
16		min	0	1	0	1	0	1	1.228e-03	4	-7.299e-06	1	-2.824e-04	8
17	N9	max	.105	3	.053	5	.129	3	1.201e-03	8	1.576e-02	6	2.16e-03	4
18		min	-.057	6	-.015	4	-.078	6	-2.42e-03	6	-1.146e-03	5	-6.554e-04	8
19	N10	max	.04	3	.053	5	.028	3	2.115e-03	6	1.504e-02	6	2.206e-03	4
20		min	-.068	6	-.015	4	-.094	6	-1.758e-03	3	-1.547e-03	3	-6.125e-04	8
21	N11	max	.081	3	.057	8	.105	3	1.637e-03	8	5.557e-03	3	1.456e-03	6
22		min	-.045	6	-.01	3	-.066	6	-1.478e-03	3	-3.593e-03	8	-8.994e-04	5
23	N12	max	.027	3	.057	8	.016	3	1.67e-03	8	2.826e-03	3	1.387e-03	3
24		min	-.054	6	-.01	3	-.081	6	-1.694e-03	3	-3.177e-03	6	-9.027e-04	8
25	N17	max	.016	3	.052	8	.041	3	1.222e-03	8	4.146e-03	3	9.478e-04	3
26		min	-.011	6	-.018	3	-.034	6	-3.075e-04	3	-2.57e-03	6	-3.383e-03	8
27	N18	max	0	1	.052	8	0	1	1.191e-03	8	6.319e-04	3	1.175e-03	3
28		min	-.014	6	-.018	3	-.041	6	-4.898e-04	3	-3.144e-03	6	-3.369e-03	8
29	N19	max	0	8	.039	8	.025	3	7.979e-04	4	3.039e-03	3	1.442e-03	3
30		min	0	1	-.012	3	-.023	6	3.864e-04	6	-2.764e-03	6	-4.707e-03	8
31	N20	max	0	8	.039	8	0	1	8.179e-04	7	2.96e-05	1	1.429e-03	3
32		min	0	1	-.012	3	-.028	6	4.389e-04	3	-3.384e-03	6	-4.707e-03	8
33	N21	max	0	8	.012	3	.023	6	7.979e-04	4	3.039e-03	3	1.442e-03	3
34		min	0	1	-.039	8	-.025	3	3.864e-04	6	-2.764e-03	6	-4.707e-03	8
35	N22	max	0	8	.012	3	.028	6	8.179e-04	7	2.96e-05	1	1.429e-03	3
36		min	0	1	-.039	8	0	1	4.389e-04	3	-3.384e-03	6	-4.707e-03	8
37	N23	max	.016	3	.014	3	.035	6	7.449e-04	3	4.145e-03	3	7.879e-04	3
38		min	-.012	6	-.059	8	-.041	3	-5.568e-04	8	-2.891e-03	6	-3.773e-03	8
39	N24	max	0	1	.014	3	.043	6	9.893e-04	3	7.118e-04	3	1.039e-03	3
40		min	-.014	6	-.059	8	0	1	-5.951e-04	8	-3.45e-03	6	-3.798e-03	8
41	N25	max	.081	3	.003	3	.072	6	1.405e-03	3	5.567e-03	3	-3.696e-04	3
42		min	-.048	6	-.07	8	-.105	3	-2.084e-03	8	-3.564e-03	8	-3.713e-03	5
43	N26	max	.028	3	.003	3	.086	6	1.567e-03	3	3.01e-03	3	3.438e-04	3
44		min	-.056	6	-.07	8	-.02	3	-2.095e-03	8	-3.139e-03	6	-3.712e-03	8
45	N27	max	.105	3	-.005	6	.083	6	1.672e-03	3	4.624e-03	3	-6.72e-04	3
46		min	-.059	6	-.081	5	-.129	3	-7.395e-04	6	-2.077e-02	6	-5.886e-03	8
47	N28	max	.041	3	-.002	3	.1	6	1.791e-03	3	2.922e-03	3	-1.358e-04	3
48		min	-.069	6	-.081	8	-.033	3	-4.867e-04	8	-2.101e-02	6	-5.903e-03	8
49	N29	max	.105	3	-.032	3	1.342	6	2.606e-03	3	3.717e-03	3	6.894e-04	3
50		min	-.059	6	-.439	8	-.299	3	-3.256e-03	6	-3.401e-02	6	-6.479e-03	8
51	N30	max	.041	3	-.032	3	1.361	6	4.179e-03	6	3.774e-03	3	-2.814e-04	3
52		min	-.069	6	-.439	8	-.181	3	-1.116e-03	8	-3.399e-02	6	-6.472e-03	8
53	N33	max	.105	3	-.03	3	1.444	6	2.606e-03	3	3.717e-03	3	6.894e-04	3
54		min	-.059	6	-.459	8	-.311	3	-3.256e-03	6	-3.401e-02	6	-6.479e-03	8
55	N34	max	.041	3	-.032	3	1.463	6	4.179e-03	6	3.774e-03	3	-2.815e-04	3
56		min	-.069	6	-.459	8	-.192	3	-1.116e-03	8	-3.399e-02	6	-6.472e-03	8
57	N35	max	0	8	0	8	0	8	8.179e-04	7	2.96e-05	1	1.429e-03	3
58		min	0	1	0	1	0	1	4.389e-04	3	-3.384e-03	6	-4.707e-03	8
59	N36	max	0	8	0	8	0	8	7.979e-04	4	3.039e-03	3	1.442e-03	3
60		min	0	1	0	1	0	1	3.864e-04	6	-2.764e-03	6	-4.707e-03	8
61	N35A	max	.105	3	.049	5	.113	3	1.026e-03	8	1.204e-02	6	1.37e-03	4
62		min	-.057	6	-.006	1	-.156	6	-2.276e-03	6	-1.214e-03	5	-9.843e-04	8

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
63	N36A	max	.04	3	.048	5	.035	3	1.972e-03	6	1.136e-02	6	1.366e-03	4
64		min	-.069	6	-.006	1	-.168	6	-1.555e-03	3	-8.244e-04	3	-9.544e-04	8
65	N37	max	.125	3	-.032	3	1.415	6	2.605e-03	3	3.717e-03	3	1.382e-03	3
66		min	-.159	8	-.439	8	-.341	3	-4.853e-03	6	-3.401e-02	6	-6.478e-03	8
67	N38	max	.128	5	-.032	3	1.449	6	5.779e-03	6	3.774e-03	3	-8.53e-04	6
68		min	-.056	6	-.439	8	-.138	3	-1.104e-03	5	-3.399e-02	6	-6.473e-03	8
69	N39	max	.105	3	-.002	6	.039	8	1.541e-03	3	4.791e-03	3	-3.497e-04	3
70		min	-.058	6	-.053	5	-.103	3	-5.75e-04	8	-1.729e-02	6	-4.218e-03	8
71	N40	max	.041	3	-.002	6	0	1	1.623e-03	3	2.71e-03	3	2.554e-04	3
72		min	-.069	6	-.053	5	-.017	3	-5.2e-04	8	-1.759e-02	6	-4.231e-03	8
73	N41A	max	.1	3	-.002	6	.048	8	1.541e-03	3	4.791e-03	3	-2.793e-04	3
74		min	-.122	8	-.053	5	-.127	3	-6.067e-04	6	-1.729e-02	6	-4.218e-03	8
75	N42A	max	.092	5	-.002	6	.012	6	1.623e-03	3	2.71e-03	3	1.851e-04	3
76		min	-.061	6	-.053	5	-.015	5	-5.083e-04	8	-1.759e-02	6	-4.232e-03	8
77	N41B	max	.127	3	.048	5	.136	3	1.023e-03	5	1.204e-02	6	1.426e-03	4
78		min	-.07	8	-.006	1	-.111	6	-2.878e-03	6	-1.214e-03	5	-9.841e-04	8
79	N42B	max	.039	5	.048	5	.026	5	2.575e-03	6	1.136e-02	6	1.31e-03	4
80		min	-.081	6	-.006	1	-.129	6	-1.556e-03	3	-8.244e-04	3	-9.546e-04	8

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Mem...	Shape	Code Check	L...	LC	Sh...	Loc[ft]	Dir	...	phi*P...	phi*P...	phi*Mn y-y [k-ft]	phi*...	Cb	Eqn
1	M2	PIPE_2.5	.560	3....	6	.088	3.776		6	14.559	50.715	3.596	3.5...	1....	H1...
2	M1	PIPE_2.5	.545	3....	6	.141	3.776		3	14.559	50.715	3.596	3.5...	1....	H1...
3	PS.1	PIPE_2.0	.446	4....	5	.056	4.625		5	20.867	32.13	1.872	1.8...	1....	H1...
4	M6	PIPE_2.0	.309	2....	8	.119	.499		5	32.032	32.13	1.872	1.8...	1....	H1...
5	M7	PIPE_2.0	.304	2....	8	.121	.499		8	32.032	32.13	1.872	1.8...	1....	H1...
6	M4	PIPE_2.0	.250	2....	5	.093	2.521		5	32.032	32.13	1.872	1.8...	1....	H1...
7	M19	PIPE_2.0	.243	4....	5	.071	4.625		3	20.867	32.13	1.872	1.8...	1....	H1...
8	M5	PIPE_2.0	.233	2....	8	.092	.499		6	32.032	32.13	1.872	1.8...	1....	H1...
9	PS.2	PIPE_2.0	.225	1....	4	.051	4.688		6	20.867	32.13	1.872	1.8...	1....	H1...
10	M14	SR 3/4	.197	0	5	.014	0		5	6.954	14.314	.179	.179	2....	H1...
11	M8	0.625' Dia.	.197	0	6	.026	0		8	1.058	9.94	.104	.104	2....	H1...
12	M13	0.625' Dia.	.193	3....	3	.022	3.333		3	1.058	9.94	.104	.104	2....	H1...
13	M11	0.625' Dia.	.190	0	3	.026	3.333		8	1.058	9.94	.104	.104	2....	H1...
14	M9	0.625' Dia.	.180	0	6	.023	3.333		3	1.058	9.94	.104	.104	2....	H1...
15	M10	SR 3/4	.159	3....	3	.019	0		8	6.954	14.314	.179	.179	1	H1...
16	M3	PIPE_2.0	.150	5....	3	.009	10.18		3	9.492	32.13	1.872	1.8...	1....	H1...
17	M15	SR 3/4	.144	3....	8	.028	0		3	6.954	14.314	.179	.179	2....	H1...
18	M12	SR 3/4	.137	0	3	.026	3.659		3	6.954	14.314	.179	.179	2....	H1...
19	M21A	PIPE_2.0	.121	4....	7	.077	4.625		3	20.867	32.13	1.872	1.8...	1....	H1...



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek Engineering		SK - 1
TJL	East Haddam 3	Oct 9, 2023 at 10:46 AM
23134.00	Unity Check	Mount.R3D

Antenna Mount Connection:

Anchor Data:

A307 Threaded Rod =

Number of Anchor Bolts = $N := 4$ (User Input)

Diameter of Bolts = $D := 0.625in$ (User Input)

Design Tension = $T_{design} := 10.4 \cdot kips$ (User Input)

Design Shear = $V_{design} := 6.23 \cdot kips$ (User Input)

Design Reactions:

Fx = $F_x := 1.8 \cdot kips$ (User Input)

Fy = $F_y := 0.8 \cdot kips$ (User Input)

Fz = $F_z := 2.2 \cdot kips$ (User Input)

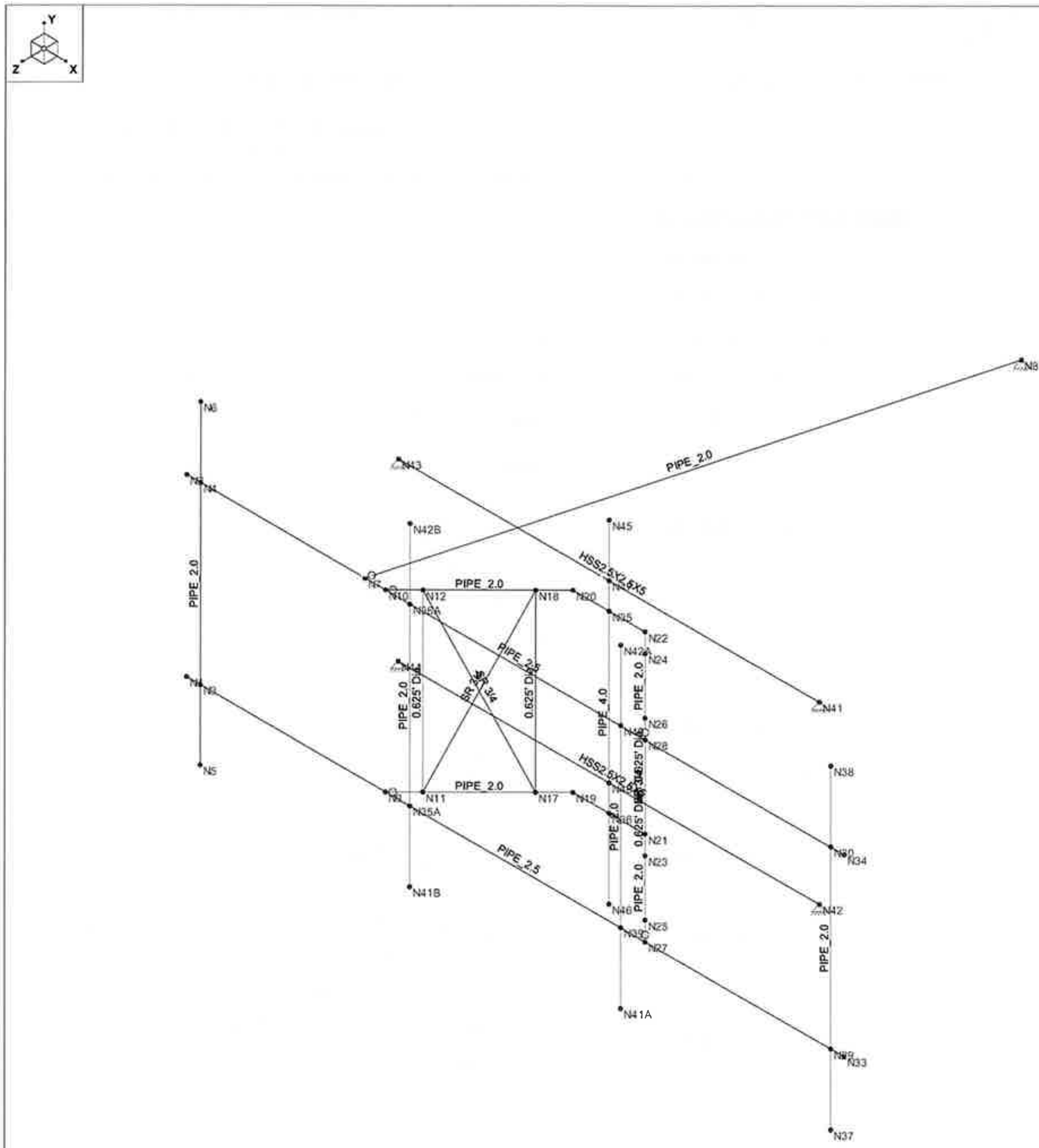
Anchor Check:

Max Tension Force = $T_{Max} := \frac{F_z}{N} = 550 lb$

Max Shear Force = $V_{Max} := \frac{F_y}{N} + \frac{F_x}{N} = 650 lb$

Condition 1 = $Condition1 := if\left(\frac{T_{Max}}{T_{design}} + \frac{V_{Max}}{V_{design}} \le 1.0, "OK", "NG"\right) = "OK"$

% of Capacity = $\max\left[\frac{T_{Max}}{T_{design}}, \frac{V_{Max}}{V_{design}}, \left(\frac{\frac{T_{Max}}{T_{design}} + \frac{V_{Max}}{V_{design}}}{1.0}\right)\right] = 15.7 \cdot \%$



Envelope Only Solution

Centek Engineering		
TJL	East Haddam 3	Oct 9, 2023 at 10:57 AM
23134.00	Member Framing	Mount - Face.R3D

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 15th(360-16): LRFD
Cold Formed Steel Code	AISI S100-10: ASD
Wood Code	AWC NDS-12: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	150.001
Footing Concrete f'c (ksi)	4
Footing Concrete Ec (ksi)	3644
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	2
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Grade B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Antenna Mast_2.0...	PIPE_2.0	Column	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
2	Horizontal_2.5 ST...	PIPE_2.5	Beam	Pipe	A53 Grade B	Typical	1.61	1.45	1.45	2.89
3	Outrigger_2.0 ST...	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
4	Stabilizer_2.0 ST...	PIPE_2.0	Beam	Pipe	A53 Grade B	Typical	1.02	.627	.627	1.25
5	0.625" Dia. Bar	0.625' Dia.	Column	BAR	A36 Gr.36	Typical	.307	.007	.007	.015
6	0.75"Dia. Bar	SR 3/4	Column	BAR	A36 Gr.36	Typical	.442	.016	.016	.031
7	Vert	PIPE_4.0	Column	Pipe	A53 Grade B	Typical	2.96	6.82	6.82	13.6
8	Face Tube	HSS2.5X2.5X5	Beam	Tube	A500 Gr.46	Typical	2.35	1.82	1.82	3.2

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[...	Lcomp bot[...	L-torq...	Kyy	Kzz	Cb	Functi...
1	M1	Horizontal_2.5 STD...	12.5	Segment		Lbyy						Lateral
2	M2	Horizontal_2.5 STD...	12.5	Segment		Lbyy						Lateral
3	M3	Stabilizer_2.0 STD ...	10.18			Lbyy						Lateral
4	M4	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
5	M5	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
6	M6	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
7	M7	Outrigger_2.0 STD ...	2.521	Segment	Segment	Lbyy						Lateral
8	M8	0.625" Dia. Bar	3.333									Lateral
9	M9	0.625" Dia. Bar	3.333									Lateral
10	M10	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
11	M11	0.625" Dia. Bar	3.333									Lateral
12	M12	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
13	M13	0.625" Dia. Bar	3.333									Lateral
14	M14	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
15	M15	0.75"Dia. Bar	3.659	1.83	1.83	Lbyy						Lateral
16	PS.2	Antenna Mast_2.0 ...	6			Lbyy						Lateral
17	PS.1	Antenna Mast_2.0 ...	6			Lbyy						Lateral
18	M19	Antenna Mast_2.0 ...	6			Lbyy						Lateral
19	M21A	Antenna Mast_2.0 ...	6			Lbyy						Lateral
20	M22	Vert	6.333									Lateral
21	M23	Face Tube	8			Lbyy						Lateral
22	M24	Face Tube	8			Lbyy						Lateral

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
1	M1	N2	N34			Horizontal_2.5 STD Pipe	Beam	Pipe	A53 Grade B	Typical
2	M2	N1	N33			Horizontal_2.5 STD Pipe	Beam	Pipe	A53 Grade B	Typical
3	M3	N7	N8			Stabilizer_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
4	M4	N10	N20			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
5	M5	N9	N19			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
6	M6	N28	N22			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
7	M7	N27	N21			Outrigger_2.0 STD Pipe	Beam	Pipe	A53 Grade B	Typical
8	M8	N12	N11			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
9	M9	N18	N17			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
10	M10	N12	N17			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
11	M11	N26	N25			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
12	M12	N18	N11			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design ...
13	M13	N24	N23			0.625" Dia. Bar	Column	BAR	A36 Gr.36	Typical
14	M14	N26	N23			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
15	M15	N24	N25			0.75"Dia. Bar	Column	BAR	A36 Gr.36	Typical
16	PS.2	N5	N6			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
17	PS.1	N37	N38			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
18	M19	N41A	N42A			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
19	M20	N19	N21			RIGID	None	None	RIGID	Typical
20	M21	N20	N22			RIGID	None	None	RIGID	Typical
21	M21A	N41B	N42B			Antenna Mast_2.0 STD Pi...	Column	Pipe	A53 Grade B	Typical
22	M22	N45	N46			Vert	Column	Pipe	A53 Grade B	Typical
23	M23	N43	N41			Face Tube	Beam	Tube	A500 Gr.46	Typical
24	M24	N44	N42			Face Tube	Beam	Tube	A500 Gr.46	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	N1	0	0.	-0.	0	
2	N2	0	3.333334	-0.	0	
3	N3	.25	0.	-0.	0	
4	N4	.25	3.333334	-0.	0	
5	N5	.25	-1.333333	-0.	0	
6	N6	.25	4.666667	-0.	0	
7	N7	3.390625	3.333334	-0.	0	
8	N8	6.025403	3.333334	-9.833125	0	
9	N9	3.78125	0.	-0.	0	
10	N10	3.78125	3.333334	-0.	0	
11	N11	4.138628	0.	-0.357378	0	
12	N12	4.138628	3.333334	-0.357378	0	
13	N17	5.206335	0.	-1.425085	0	
14	N18	5.206335	3.333334	-1.425085	0	
15	N19	5.563713	0.	-1.782463	0	
16	N20	5.563713	3.333334	-1.782463	0	
17	N21	6.936287	0.	-1.782463	0	
18	N22	6.936287	3.333334	-1.782463	0	
19	N23	7.293665	0.	-1.425085	0	
20	N24	7.293665	3.333334	-1.425085	0	
21	N25	8.361372	0.	-0.357378	0	
22	N26	8.361372	3.333334	-0.357378	0	
23	N27	8.71875	0.	-0.	0	
24	N28	8.71875	3.333334	-0.	0	
25	N29	12.25	0.	-0.	0	
26	N30	12.25	3.333334	-0.	0	
27	N33	12.5	0.	-0.	0	
28	N34	12.5	3.333334	-0.	0	
29	N35	6.25	3.333334	-1.782463	0	
30	N36	6.25	0.	-1.782463	0	
31	N35A	4.25	0.	-0.	0	
32	N36A	4.25	3.333334	-0.	0	
33	N37	12.25	-1.333333	0	0	
34	N38	12.25	4.666667	0	0	
35	N39	8.25	0.	-0.	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
36	N40	8.25	3.333334	-0.	0	
37	N41A	8.25	-1.333333	-0.	0	
38	N42A	8.25	4.666667	-0.	0	
39	N41B	4.25	-1.333333	-0.	0	
40	N42B	4.25	4.666667	-0.	0	
41	N41	10.25	3.833334	-1.782463	0	
42	N42	10.25	0.5	-1.782463	0	
43	N43	2.25	3.833334	-1.782463	0	
44	N44	2.25	0.5	-1.782463	0	
45	N45	6.25	4.833334	-1.782463	0	
46	N46	6.25	-1.5	-1.782463	0	
47	N47	6.25	3.833334	-1.782463	0	
48	N48	6.25	0.5	-1.782463	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N8	Reaction	Reaction	Reaction			
2	N19						
3	N20						
4	N17						
5	N18						
6	N21						
7	N22						
8	N23						
9	N24						
10	N35						
11	N36						
12	N41	Reaction	Reaction	Reaction			
13	N42	Reaction	Reaction	Reaction			
14	N43	Reaction	Reaction	Reaction			
15	N44	Reaction	Reaction	Reaction			
16	N45						
17	N46						
18	N47						
19	N48						

Member Point Loads (BLC 2 : Dead Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Y	-.04	.5
2	PS.1	Y	-.04	.5
3	PS.2	Y	-.04	5.5
4	PS.1	Y	-.04	5.5
5	M21A	Y	-.03	.5
6	M21A	Y	-.03	5.5
7	PS.2	Y	-.075	%50
8	PS.1	Y	-.08	%50
9	M19	Y	-.032	%50

Member Point Loads (BLC 3 : Ice Load)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Y	-.104	.5
2	PS.1	Y	-.104	.5
3	PS.2	Y	-.104	5.5
4	PS.1	Y	-.104	5.5
5	M21A	Y	-.04	.5
6	M21A	Y	-.04	5.5
7	PS.2	Y	-.061	%50
8	PS.1	Y	-.062	%50
9	M19	Y	-.117	%50

Member Point Loads (BLC 4 : Lm Maintenance Load (500lb))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.1	Y	-.5	%50

Member Point Loads (BLC 5 : Lv Maintenance Load (250lb))

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-.25	12

Member Point Loads (BLC 6 : Wind with Ice X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	X	.037	.5
2	PS.1	X	.037	.5
3	PS.2	X	.037	5.5
4	PS.1	X	.037	5.5
5	M21A	X	.013	.5
6	M21A	X	.013	5.5
7	PS.2	X	.022	%50
8	PS.1	X	.022	%50
9	M19	X	.047	%50

Member Point Loads (BLC 7 : Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	X	.181	.5
2	PS.1	X	.181	.5
3	PS.2	X	.181	5.5
4	PS.1	X	.181	5.5
5	M21A	X	.054	.5
6	M21A	X	.054	5.5
7	PS.2	X	.102	%50
8	PS.1	X	.104	%50
9	M19	X	.253	%50

Member Point Loads (BLC 8 : Wm Wind X)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	X	.009	.5
2	PS.1	X	.009	.5
3	PS.2	X	.009	5.5
4	PS.1	X	.009	5.5
5	M21A	X	.003	.5

Member Point Loads (BLC 8 : Wm Wind X) (Continued)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
6	M21A	X	.003	5.5
7	PS.2	X	.005	%50
8	PS.1	X	.005	%50
9	M19	X	.012	%50

Member Point Loads (BLC 9 : Wind with Ice Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Z	.077	.5
2	PS.1	Z	.077	.5
3	PS.2	Z	.077	5.5
4	PS.1	Z	.077	5.5
5	M21A	Z	.028	.5
6	M21A	Z	.028	5.5
7	M19	Z	.059	%50

Member Point Loads (BLC 10 : Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Z	.465	.5
2	PS.1	Z	.465	.5
3	PS.2	Z	.465	5.5
4	PS.1	Z	.465	5.5
5	M21A	Z	.155	.5
6	M21A	Z	.155	5.5
7	M19	Z	.331	%50

Member Point Loads (BLC 11 : Wm Wind Z)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	PS.2	Z	.023	.5
2	PS.1	Z	.023	.5
3	PS.2	Z	.023	5.5
4	PS.1	Z	.023	5.5
5	M21A	Z	.008	.5
6	M21A	Z	.008	5.5
7	M19	Z	.016	%50

Member Distributed Loads (BLC 6 : Wind with Ice X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.003	.003	0	0
2	M4	X	.003	.003	0	0
3	M5	X	.003	.003	0	0
4	M6	X	.003	.003	0	0
5	M7	X	.003	.003	0	0
6	M8	X	.003	.003	0	0
7	M9	X	.003	.003	0	0
8	M10	X	.003	.003	0	0
9	M11	X	.003	.003	0	0
10	M12	X	.003	.003	0	0
11	M13	X	.003	.003	0	0
12	M14	X	.003	.003	0	0

Member Distributed Loads (BLC 6 : Wind with Ice X) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
13	M15	X	.003	.003	0	0
14	PS.2	X	.003	.003	0	0
15	PS.1	X	.003	.003	0	0
16	M19	X	.003	.003	0	0
17	M20	X	.003	.003	0	0
18	M21	X	.003	.003	0	0
19	M21A	X	.003	.003	0	0

Member Distributed Loads (BLC 7 : Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.018	.018	0	0
2	M4	X	.018	.018	0	0
3	M5	X	.018	.018	0	0
4	M6	X	.018	.018	0	0
5	M7	X	.018	.018	0	0
6	M8	X	.018	.018	0	0
7	M9	X	.018	.018	0	0
8	M10	X	.018	.018	0	0
9	M11	X	.018	.018	0	0
10	M12	X	.018	.018	0	0
11	M13	X	.018	.018	0	0
12	M14	X	.018	.018	0	0
13	M15	X	.018	.018	0	0
14	PS.2	X	.018	.018	0	0
15	PS.1	X	.018	.018	0	0
16	M19	X	.018	.018	0	0
17	M20	X	.018	.018	0	0
18	M21	X	.018	.018	0	0
19	M21A	X	.018	.018	0	0

Member Distributed Loads (BLC 8 : Wm Wind X)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M3	X	.003	.003	0	0
2	M4	X	.003	.003	0	0
3	M5	X	.003	.003	0	0
4	M6	X	.003	.003	0	0
5	M7	X	.003	.003	0	0
6	M8	X	.003	.003	0	0
7	M9	X	.003	.003	0	0
8	M10	X	.003	.003	0	0
9	M11	X	.003	.003	0	0
10	M12	X	.003	.003	0	0
11	M13	X	.003	.003	0	0
12	M14	X	.003	.003	0	0
13	M15	X	.003	.003	0	0
14	PS.2	X	.003	.003	0	0
15	PS.1	X	.003	.003	0	0
16	M19	X	.003	.003	0	0
17	M20	X	.003	.003	0	0
18	M21	X	.003	.003	0	0
19	M21A	X	.003	.003	0	0

Member Distributed Loads (BLC 9 : Wind with Ice Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M2	Z	.003	.003	0	0
3	M3	Z	.003	.003	0	0
4	M4	Z	.003	.003	0	0
5	M5	Z	.003	.003	0	0
6	M6	Z	.003	.003	0	0
7	M7	Z	.003	.003	0	0
8	M8	Z	.003	.003	0	0
9	M9	Z	.003	.003	0	0
10	M10	Z	.003	.003	0	0
11	M11	Z	.003	.003	0	0
12	M12	Z	.003	.003	0	0
13	M13	Z	.003	.003	0	0
14	M14	Z	.003	.003	0	0
15	M15	Z	.003	.003	0	0
16	PS.2	Z	.003	.003	0	0
17	M19	Z	.003	.003	0	0
18	M20	Z	.003	.003	0	0
19	M21	Z	.003	.003	0	0
20	M21A	Z	.003	.003	0	0

Member Distributed Loads (BLC 10 : Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.018	.018	0	0
2	M2	Z	.018	.018	0	0
3	M3	Z	.018	.018	0	0
4	M4	Z	.018	.018	0	0
5	M5	Z	.018	.018	0	0
6	M6	Z	.018	.018	0	0
7	M7	Z	.018	.018	0	0
8	M8	Z	.018	.018	0	0
9	M9	Z	.018	.018	0	0
10	M10	Z	.018	.018	0	0
11	M11	Z	.018	.018	0	0
12	M12	Z	.018	.018	0	0
13	M13	Z	.018	.018	0	0
14	M14	Z	.018	.018	0	0
15	M15	Z	.018	.018	0	0
16	PS.2	Z	.018	.018	0	0
17	M19	Z	.018	.018	0	0
18	M20	Z	.018	.018	0	0
19	M21	Z	.018	.018	0	0
20	M21A	Z	.018	.018	0	0

Member Distributed Loads (BLC 11 : Wm Wind Z)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M2	Z	.003	.003	0	0
3	M3	Z	.003	.003	0	0
4	M4	Z	.003	.003	0	0
5	M5	Z	.003	.003	0	0

Member Distributed Loads (BLC 11 : Wm Wind Z) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
6	M6	Z	.003	.003	0	0
7	M7	Z	.003	.003	0	0
8	M8	Z	.003	.003	0	0
9	M9	Z	.003	.003	0	0
10	M10	Z	.003	.003	0	0
11	M11	Z	.003	.003	0	0
12	M12	Z	.003	.003	0	0
13	M13	Z	.003	.003	0	0
14	M14	Z	.003	.003	0	0
15	M15	Z	.003	.003	0	0
16	PS.2	Z	.003	.003	0	0
17	M19	Z	.003	.003	0	0
18	M20	Z	.003	.003	0	0
19	M21	Z	.003	.003	0	0
20	M21A	Z	.003	.003	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight	None		-1						
2	Dead Load	None					9			
3	Ice Load	None					9			
4	Lm Maintenance Load (500lb)	None					1			
5	Lv Maintenance Load (250lb)	None					1			
6	Wind with Ice X	None					9	19		
7	Wind X	None					9	19		
8	Wm Wind X	None					9	19		
9	Wind with Ice Z	None					7	20		
10	Wind Z	None					7	20		
11	Wm Wind Z	None					7	20		

Load Combinations

	Description	So..	P...	S...	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac..	BLC	Fac...
1	1.4D	Yes	Y		1	1.4	2	1.4																
2	1.2D +1.5Lv	Yes	Y		1	1.2	2	1.2	5	1.5														
3	1.2D + 1.0W (X-directi...	Yes	Y		1	1.2	2	1.2	7	1														
4	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	6	1												
5	1.2D +1.5Lm+ 1.0Wm ...	Yes	Y		1	1.2	2	1.2	4	1.5	8	1												
6	1.2D + 1.0W (Z-directi...	Yes	Y		1	1.2	2	1.2	10	1														
7	1.2D + 1.0Di + 1.0Wi (...	Yes	Y		1	1.2	2	1.2	3	1	9	1												
8	1.2D +1.5Lm+ 1.0Wm ...	Yes	Y		1	1.2	2	1.2	4	1.5	11	1												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	.536	6	.026	1	-.305	1	0	8	0	8	0	8
2		min	.082	1	.019	6	-2.076	6	0	1	0	1	0	1
3	N41	max	-.021	1	.453	8	.235	3	0	8	0	8	0	8
4		min	-.761	5	.252	3	-.377	6	0	1	.0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
5	N42	max	.627	8	.48	8	.42	4	0	8	0	8	0	8
6		min	-.805	3	.259	3	-1.161	6	0	1	0	1	0	1
7	N43	max	-.021	1	.466	5	.128	6	0	8	0	8	0	8
8		min	-.761	5	.283	6	-.108	4	0	1	0	1	0	1
9	N44	max	.627	8	.458	4	.509	5	0	8	0	8	0	8
10		min	-.805	3	.274	6	-.707	6	0	1	0	1	0	1
11	Totals:	max	0	7	1.86	8	0	1						
12		min	-2.641	3	1.11	3	-4.193	6						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
1	N1	max	.178	3	.036	6	1.514	6	1.422e-02	5	2.163e-02	6	2.944e-03	7
2		min	-.188	6	-.856	4	-.707	5	-2.531e-02	6	-3.152e-03	5	6.542e-04	5
3	N2	max	.151	3	.036	6	.645	6	1.415e-02	5	2.123e-02	6	2.897e-03	7
4		min	-.254	6	-.856	4	-.142	5	-1.673e-02	6	-3.225e-03	5	5.785e-04	5
5	N3	max	.178	3	.043	6	1.449	6	1.422e-02	5	2.163e-02	6	2.944e-03	7
6		min	-.188	6	-.848	4	-.697	5	-2.531e-02	6	-3.152e-03	5	6.541e-04	5
7	N4	max	.151	3	.043	6	.581	6	1.415e-02	5	2.123e-02	6	2.897e-03	7
8		min	-.254	6	-.848	4	-.133	5	-1.673e-02	6	-3.225e-03	5	5.784e-04	5
9	N5	max	.22	3	.043	6	1.876	6	1.421e-02	5	2.163e-02	6	3.035e-03	4
10		min	-.148	6	-.848	4	-.925	5	-2.697e-02	6	-3.152e-03	5	6.966e-04	5
11	N6	max	.14	3	.043	6	.335	6	1.416e-02	5	2.123e-02	6	2.899e-03	7
12		min	-.292	6	-.848	4	.039	1	-1.507e-02	6	-3.225e-03	5	5.358e-04	5
13	N7	max	.151	3	.14	6	.045	3	1.428e-02	5	8.124e-03	6	3.082e-03	7
14		min	-.253	6	-.704	4	-.057	6	-1.681e-02	6	-3.558e-03	8	1.281e-03	5
15	N8	max	0	8	0	8	0	8	7.844e-03	5	8.858e-03	3	6.207e-03	6
16		min	0	1	0	1	0	1	-9.75e-04	6	-6.093e-04	7	-4.436e-04	5
17	N9	max	.178	3	.149	6	.704	6	1.444e-02	5	9.139e-03	6	2.266e-03	7
18		min	-.188	6	-.691	4	-.567	5	-2.143e-02	6	-3.066e-03	8	9.328e-04	5
19	N10	max	.151	3	.149	6	.026	3	1.43e-02	5	5.238e-03	6	2.353e-03	7
20		min	-.253	6	-.691	4	-.087	6	-1.682e-02	6	-3.613e-03	8	1.007e-03	5
21	N11	max	.133	3	.077	6	.75	6	1.388e-02	5	1.027e-02	3	2.309e-03	6
22		min	-.141	6	-.624	4	-.549	5	-1.941e-02	6	-1.06e-02	6	8.493e-05	5
23	N12	max	.112	3	.077	6	.019	8	1.375e-02	5	8.737e-03	3	1.711e-03	4
24		min	-.189	6	-.624	4	-.022	6	-1.779e-02	6	-1.478e-02	6	3.384e-04	8
25	N17	max	.022	3	-.152	6	.865	6	1.426e-02	5	5.892e-03	3	6.857e-04	6
26		min	-.025	6	-.448	4	-.507	5	-1.847e-02	6	-6.817e-03	6	-2.639e-04	5
27	N18	max	.019	3	-.152	6	.137	6	1.372e-02	5	4.848e-03	3	4.912e-04	3
28		min	-.03	6	-.447	4	-.104	3	-1.799e-02	6	-8.895e-03	6	-9.992e-05	8
29	N19	max	.003	3	-.228	6	.89	6	1.433e-02	5	2.97e-03	3	2.963e-04	3
30		min	-.003	8	-.387	4	-.5	5	-1.834e-02	6	-4.771e-03	6	-4.297e-04	8
31	N20	max	.003	3	-.228	3	.169	6	1.38e-02	5	2.229e-03	3	2.414e-04	3
32		min	0	1	-.389	5	-.12	3	-1.765e-02	6	-5.583e-03	6	-1.554e-04	8
33	N21	max	.003	3	-.223	3	.969	6	1.433e-02	5	2.97e-03	3	2.963e-04	3
34		min	-.003	8	-.393	8	-.484	5	-1.834e-02	6	-4.771e-03	6	-4.297e-04	8
35	N22	max	.003	3	-.224	3	.261	6	1.38e-02	5	2.229e-03	3	2.414e-04	3
36		min	0	1	-.391	5	-.157	3	-1.765e-02	6	-5.583e-03	6	-1.554e-04	8
37	N23	max	.022	3	-.148	6	.995	6	1.377e-02	5	5.889e-03	3	-3.367e-06	3
38		min	-.025	6	-.456	5	-.477	4	-1.793e-02	6	-7.147e-03	6	-6.473e-04	5
39	N24	max	.019	3	-.149	6	.293	6	1.385e-02	5	4.895e-03	3	2.355e-04	6

Envelope Joint Displacements (Continued)

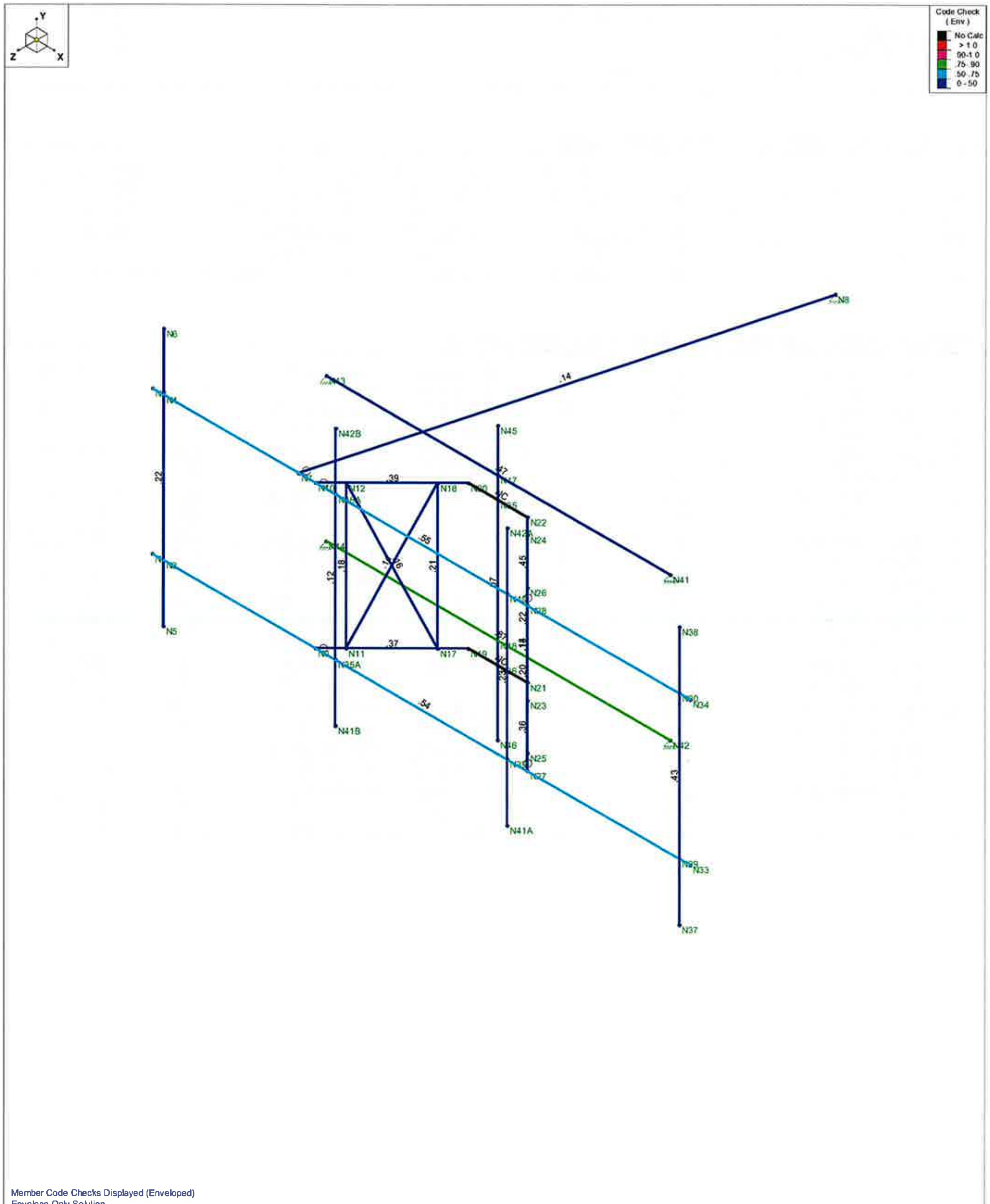
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
40		min	-.031	6	-.455	5	-.172	3	-1.762e-02	6	-9.124e-03	6	-9.139e-04	8
41	N25	max	.133	3	.077	6	1.115	6	1.379e-02	4	1.028e-02	3	-4.753e-04	6
42		min	-.144	6	-.644	5	-.464	4	-1.767e-02	6	-1.058e-02	6	-2.959e-03	5
43	N26	max	.113	3	.077	6	.454	6	1.374e-02	4	8.825e-03	3	3.766e-04	6
44		min	-.19	6	-.644	5	-.266	3	-1.692e-02	6	-1.455e-02	6	-2.938e-03	5
45	N27	max	.178	3	.151	6	1.161	6	1.426e-02	4	6.911e-03	3	-4.841e-04	6
46		min	-.19	6	-.719	5	-.466	3	-1.793e-02	6	-2.525e-02	6	-4.362e-03	5
47	N28	max	.152	3	.15	6	.517	6	1.421e-02	4	6.407e-03	3	-5.042e-04	3
48		min	-.254	6	-.719	5	-.305	3	-1.552e-02	6	-2.622e-02	6	-4.363e-03	8
49	N29	max	.178	3	.119	6	2.623	6	1.435e-02	4	6.611e-03	3	1.413e-04	6
50		min	-.19	6	-1.019	5	-.75	3	-1.989e-02	6	-3.896e-02	6	-5.25e-03	5
51	N30	max	.152	3	.119	6	1.985	6	1.435e-02	4	6.605e-03	3	1.865e-04	6
52		min	-.253	6	-1.019	5	-.582	3	-1.242e-02	6	-3.872e-02	6	-5.283e-03	5
53	N33	max	.178	3	.12	6	2.74	6	1.435e-02	4	6.611e-03	3	1.412e-04	6
54		min	-.19	6	-1.035	5	-.77	3	-1.989e-02	6	-3.896e-02	6	-5.25e-03	5
55	N34	max	.152	3	.12	6	2.101	6	1.435e-02	4	6.605e-03	3	1.865e-04	6
56		min	-.253	6	-1.035	5	-.602	3	-1.242e-02	6	-3.872e-02	6	-5.283e-03	5
57	N35	max	.003	3	-.226	3	.215	6	1.38e-02	5	2.229e-03	3	2.414e-04	3
58		min	0	1	-.39	5	-.138	3	-1.765e-02	6	-5.583e-03	6	-1.554e-04	8
59	N36	max	.003	3	-.226	3	.929	6	1.433e-02	5	2.97e-03	3	2.963e-04	3
60		min	-.003	8	-.39	5	-.492	5	-1.834e-02	6	-4.771e-03	6	-4.297e-04	8
61	N35A	max	.178	3	.156	6	.662	6	1.441e-02	5	6.117e-03	3	1.45e-03	7
62		min	-.188	6	-.681	4	-.551	5	-2.113e-02	6	-3.237e-03	8	5.681e-04	5
63	N36A	max	.151	3	.156	6	.025	5	1.429e-02	5	4.607e-03	3	1.512e-03	7
64		min	-.253	6	-.681	4	-.108	6	-1.682e-02	6	-3.445e-03	8	6.149e-04	5
65	N37	max	.186	3	.119	6	2.962	6	1.434e-02	4	6.611e-03	3	5.935e-04	3
66		min	-.188	6	-1.019	5	-.815	3	-2.149e-02	6	-3.896e-02	6	-5.207e-03	8
67	N38	max	.178	3	.119	6	1.807	6	1.436e-02	4	6.605e-03	3	1.866e-04	6
68		min	-.256	6	-1.019	5	-.516	3	-1.083e-02	6	-3.872e-02	6	-5.327e-03	5
69	N39	max	.178	3	.152	6	1.029	6	1.417e-02	4	6.963e-03	3	-1.177e-04	6
70		min	-.19	6	-.699	5	-.464	4	-1.772e-02	6	-2.169e-02	6	-2.71e-03	5
71	N40	max	.152	3	.152	6	.379	6	1.413e-02	4	6.349e-03	3	-7.876e-05	3
72		min	-.253	6	-.699	5	-.269	3	-1.585e-02	6	-2.295e-02	6	-2.711e-03	5
73	N41A	max	.168	3	.152	6	1.314	6	1.417e-02	4	6.963e-03	3	-1.177e-04	6
74		min	-.191	6	-.699	5	-.69	4	-1.779e-02	6	-2.169e-02	6	-2.698e-03	5
75	N42A	max	.154	3	.152	6	.391	7	1.413e-02	4	6.349e-03	3	-1.492e-04	3
76		min	-.251	6	-.699	5	-.208	3	-1.578e-02	6	-2.295e-02	6	-2.723e-03	5
77	N41B	max	.195	3	.156	6	1.008	6	1.44e-02	5	6.117e-03	3	1.49e-03	4
78		min	-.172	6	-.681	4	-.781	5	-2.173e-02	6	-3.237e-03	8	5.901e-04	5
79	N42B	max	.142	3	.156	6	.253	5	1.43e-02	5	4.607e-03	3	1.513e-03	7
80		min	-.271	6	-.681	4	-.37	6	-1.622e-02	6	-3.445e-03	8	5.245e-04	3
81	N41	max	0	8	0	8	0	8	1.376e-02	5	6.61e-03	7	1.217e-02	8
82		min	0	1	0	1	0	1	-1.767e-02	6	-4.598e-03	3	6.91e-03	3
83	N42	max	0	8	0	8	0	8	1.426e-02	5	2.754e-02	6	1.231e-02	8
84		min	0	1	0	1	0	1	-1.824e-02	6	-1.22e-02	4	6.984e-03	3
85	N43	max	0	8	0	8	0	8	1.376e-02	5	2.775e-03	3	-7.176e-03	6
86		min	0	1	0	1	0	1	-1.767e-02	6	-4.594e-03	7	-1.218e-02	5
87	N44	max	0	8	0	8	0	8	1.426e-02	5	1.308e-02	5	-7.107e-03	6
88		min	0	1	0	1	0	1	-1.824e-02	6	-2.343e-02	6	-1.209e-02	4
89	N45	max	0	8	-.226	3	.316	5	1.376e-02	5	1.845e-03	3	3.114e-04	3
90		min	-.003	3	-.39	5	-.103	6	-1.767e-02	6	-4.622e-03	6	7.126e-06	8
91	N46	max	.008	3	-.226	3	1.26	6	1.433e-02	5	2.97e-03	3	2.963e-04	3

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC
92		min	-.011	8	-.39	5	-.75	5	-1.834e-02	6	-4.771e-03	6	-4.297e-04	8
93	N47	max	0	5	-.226	3	.18	7	1.376e-02	5	1.845e-03	3	3.114e-04	3
94		min	0	1	-.39	5	-.118	3	-1.767e-02	6	-4.622e-03	6	7.126e-06	8
95	N48	max	0	3	-.226	3	.819	6	1.426e-02	5	2.43e-03	3	1.634e-04	3
96		min	0	8	-.39	5	-.406	5	-1.824e-02	6	-4.158e-03	6	-2.869e-04	8

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Mem...	Shape	Code Check	L...	LC	Sh...	Loc[ft]	Dir	...	phi*P...	phi*P...	phi*Mn y-y [k-ft]	phi*...	Cb	Eqn
1	M1	PIPE_2.5	.550	3....	6	.096	8.724		6	14.559	50.715	3.596	3.5...	1....	H1...
2	M2	PIPE_2.5	.536	8....	6	.113	3.776		6	14.559	50.715	3.596	3.5...	1....	H1...
3	M3	PIPE_2.0	.137	5....	3	.009	0		3	9.492	32.13	1.872	1.8...	1....	H1...
4	M4	PIPE_2.0	.392	2....	6	.095	2.521		4	32.032	32.13	1.872	1.8...	1....	H1...
5	M5	PIPE_2.0	.368	2....	3	.123	0		6	32.032	32.13	1.872	1.8...	1....	H1...
6	M6	PIPE_2.0	.446	2....	6	.168	2.521		8	32.032	32.13	1.872	1.8...	1....	H1...
7	M7	PIPE_2.0	.361	2....	3	.144	.499		8	32.032	32.13	1.872	1.8...	1....	H1...
8	M8	0.625' Dia.	.181	0	6	.026	0		6	1.058	9.94	.104	.104	1....	H1...
9	M9	0.625' Dia.	.214	3....	6	.016	3.333		6	1.058	9.94	.104	.104	2....	H1...
10	M10	SR 3/4	.158	0	6	.042	0		6	6.954	14.314	.179	.179	2....	H1...
11	M11	0.625' Dia.	.197	3....	6	.025	3.333		6	1.058	9.94	.104	.104	2....	H1...
12	M12	SR 3/4	.136	3....	3	.029	3.659		3	6.954	14.314	.179	.179	2....	H1...
13	M13	0.625' Dia.	.218	3....	6	.016	3.333		6	1.058	9.94	.104	.104	1....	H1...
14	M14	SR 3/4	.144	3....	6	.036	3.659		6	6.954	14.314	.179	.179	2....	H1...
15	M15	SR 3/4	.132	0	3	.030	0		3	6.954	14.314	.179	.179	1	H1...
16	PS.2	PIPE_2.0	.223	1....	4	.051	4.688		6	20.867	32.13	1.872	1.8...	1....	H1...
17	PS.1	PIPE_2.0	.435	1....	8	.055	4.625		5	20.867	32.13	1.872	1.8...	1....	H1...
18	M19	PIPE_2.0	.226	1....	6	.054	1.375		6	20.867	32.13	1.872	1.8...	1....	H1...
19	M21A	PIPE_2.0	.118	1....	5	.068	4.625		6	20.867	32.13	1.872	1.8...	1....	H1...
20	M22	PIPE_4.0	.070	1....	5	.231	1.056		6	82.012	93.24	10.631	10....	2....	H1...
21	M23	HSS2.5X2....	.467	4	7	.020	0	y	4	43.695	97.29	6.486	6.4...	1....	H1...
22	M24	HSS2.5X2....	.874	4	6	.049	4	z	6	43.695	97.29	6.486	6.4...	1....	H1...



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Centek Engineering		
TJL	East Haddam 3	Oct 9, 2023 at 10:57 AM
23134.00	Unity Check	Mount - Face.R3D

verizon NPP RFDS

NORTHEAST > North East > New England > Wallingford-1 > EAST HADDAM 3 CT - A

Cheiban, Ziad - ziad.cheiban@verizonwireless.com - 20230801_101321

Project Details		Location Information	
Carrier Aggregation	N	Site Id	2609730
Ecip	N	Search Ring#	
Project Name	EAST HADDAM 3 CT - NEW BUILD	E-NodeB ID#	null
Project Alt Name	EAST HADDAM 3 CT - NEW BUILD	PSLC#	300023
Project Id	17133983	Switch Name	Wallingford-1
Designed Sector Carrier 4G	16	Tower Type	
Designed Sector Carrier 5G	4	Site Type	MACRO
Additional Sector Carrier 4G	0	Street Address	194 Mt Parnassus Road
Additional Sector Carrier 5G	0	City	East Haddam
Suffix	Rev1_2023-08-01	State	CT
FP Solution Type & Tech Type	MCR;4G_700;5G_850;4G_850;4G_AWS;5G_L-Sub6;4G_PCS	Zip Code	06423
		County	Middlesex
		Latitude	41.47003/ 41° 28' 12.108"
		Longitude	-72.41120/ 72° 24' 40.320"

Project Scope

New Build Macro
Extension on Existing Tower

Rev1_2023-08-01: Added 4th sector. Adjusted ACL to 145'

Antenna Summary

Added Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity
				5G	Samsung	MT6413-77A	145	146.2	345(A),75(B),165(C),255(D)	PHYSICAL	4
LTE	LTE	LTE	LTE		CommScope	NHH-45B-R2B	145	148	345(A),75(B),165(C),255(D)	PHYSICAL	8

Removed Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity

Retained Antenna

700	850	1900	AWS	L-Sub6	Make	Model	Centerline	Tip Height	Azimuth	Install Type	Quantity

Added: 12	Removed: 0	Retained: 0

Non Antenna Summary

Added Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity
RRU	Tower			LTE	LTE	Samsung	B2/B66A RRH ORAN (RF4439d-25A)	PHYSICAL	4
RRU	Tower	LTE	LTE			Samsung	RF4461d-13A	PHYSICAL	4

Removed Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Retained Non Antenna

Equipment Type	Location	700	850	1900	AWS	Make	Model	Install Type	Quantity

Added: 8	Removed: 0	Retained: 0

Services

1900 LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	1050	1050	1050	1050
Mech Down-tilt	0	0	0	0
Elect Down-tilt	0	0	0	0
Tip Height	148	148	148	148
Regulatory Power	407.15 (W/MHz) EIRP	407.15 (W/MHz) EIRP	407.15 (W/MHz) EIRP	407.15 (W/MHz) EIRP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843902	18843906	18843910	18843914
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

700 LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	5230	5230	5230	5230
Mech Down-tilt	0	0	0	0
Elect Down-tilt	2	2	2	2
Tip Height	148	148	148	148
Regulatory Power	109.59 (W/MHz) ERP	109.59 (W/MHz) ERP	109.59 (W/MHz) ERP	109.59 (W/MHz) ERP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	RF4461d-13A	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843901	18843905	18843909	18843913
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	10	10	10	10
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

850 LTE		0002			
Sector		01	02	03	04
Azimuth		345	75	165	255
Cell/Enodeb-Id		064182	064182	064182	064182
Antenna Model		NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make		CommScope	CommScope	CommScope	CommScope
Centerline		145	145	145	145
DLEARFCN		2450	2450	2450	2450
Mech Down-tilt		0	0	0	0
Elect Down-tilt		2	2	2	2
Tip Height		148	148	148	148
Regulatory Power		395.20 (W/MHz) ERPSD	395.20 (W/MHz) ERPSD	395.20 (W/MHz) ERPSD	395.20 (W/MHz) ERPSD
Cell Max Power		44.5 dBm	44.5 dBm	44.5 dBm	44.5 dBm
TMA Make					
TMA Model					
RRU Make		Samsung	Samsung	Samsung	Samsung
RRU Model		RF4461d-13A	RF4461d-13A	RF4461d-13A	RF4461d-13A
Number of Tx,Rx		4 , 4	4 , 4	4 , 4	4 , 4
Position		1,5	1,5	1,5	1,5
Transmitter Id		18843904	18843908	18843912	18843916
Source		VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth		10	10	10	10
Ant. Dimensions H x W x D(inch)		72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)		73.6	73.6	73.6	73.6

Services

AWS LTE	0002			
Sector	01	02	03	04
Azimuth	345	75	165	255
Cell/Enodeb-Id	064182	064182	064182	064182
Antenna Model	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B	NHH-45B-R2B
Antenna Make	CommScope	CommScope	CommScope	CommScope
Centerline	145	145	145	145
DLEARFCN	2050	2050	2050	2050
Mech Down-tilt	0	0	0	0
Elect Down-tilt	0	0	0	0
Tip Height	148	148	148	148
Regulatory Power	228.42 (W/MHz) EIRP	228.42 (W/MHz) EIRP	228.42 (W/MHz) EIRP	228.42 (W/MHz) EIRP
Cell Max Power	46.0 dBm	46.0 dBm	46.0 dBm	46.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)	B2/B66A RRH ORAN (RF4439d-25A)
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	1,5	1,5	1,5	1,5
Transmitter Id	18843903	18843907	18843911	18843915
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	20	20	20	20
Ant. Dimensions H x W x D(inch)	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0	72.0 x 18.0 x 7.0
Weight(lb)	73.6	73.6	73.6	73.6

Services

CBAND NR	0002			
Sector	0001	0002	0003	0004
Azimuth	345	75	165	255
Cell/Enodeb-Id	640175	640175	640175	640175
Antenna Model	MT6413-77A	MT6413-77A	MT6413-77A	MT6413-77A
Antenna Make	Samsung	Samsung	Samsung	Samsung
Centerline	145	145	145	145
DLEARFCN	650006	650006	650006	650006
Mech Down-tilt	0	0	0	0
Elect Down-tilt	2	2	2	2
Tip Height	146.2	146.2	146.2	146.2
Regulatory Power	748.75 (W/MHz) EIRP	748.75 (W/MHz) EIRP	748.75 (W/MHz) EIRP	748.75 (W/MHz) EIRP
Cell Max Power	47.0 dBm	47.0 dBm	47.0 dBm	47.0 dBm
TMA Make				
TMA Model				
RRU Make	Samsung	Samsung	Samsung	Samsung
RRU Model	MT6413-77A	MT6413-77A	MT6413-77A	MT6413-77A
Number of Tx,Rx	4 , 4	4 , 4	4 , 4	4 , 4
Position	3	3	3	3
Transmitter Id	18843917	18843918	18843919	18843920
Source	VZNPP	VZNPP	VZNPP	VZNPP
Bandwidth	100	100	100	100
Ant. Dimensions H x W x D(inch)	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51	29.53 x 15.75 x 5.51
Weight(lb)	55.1	55.1	55.1	55.1

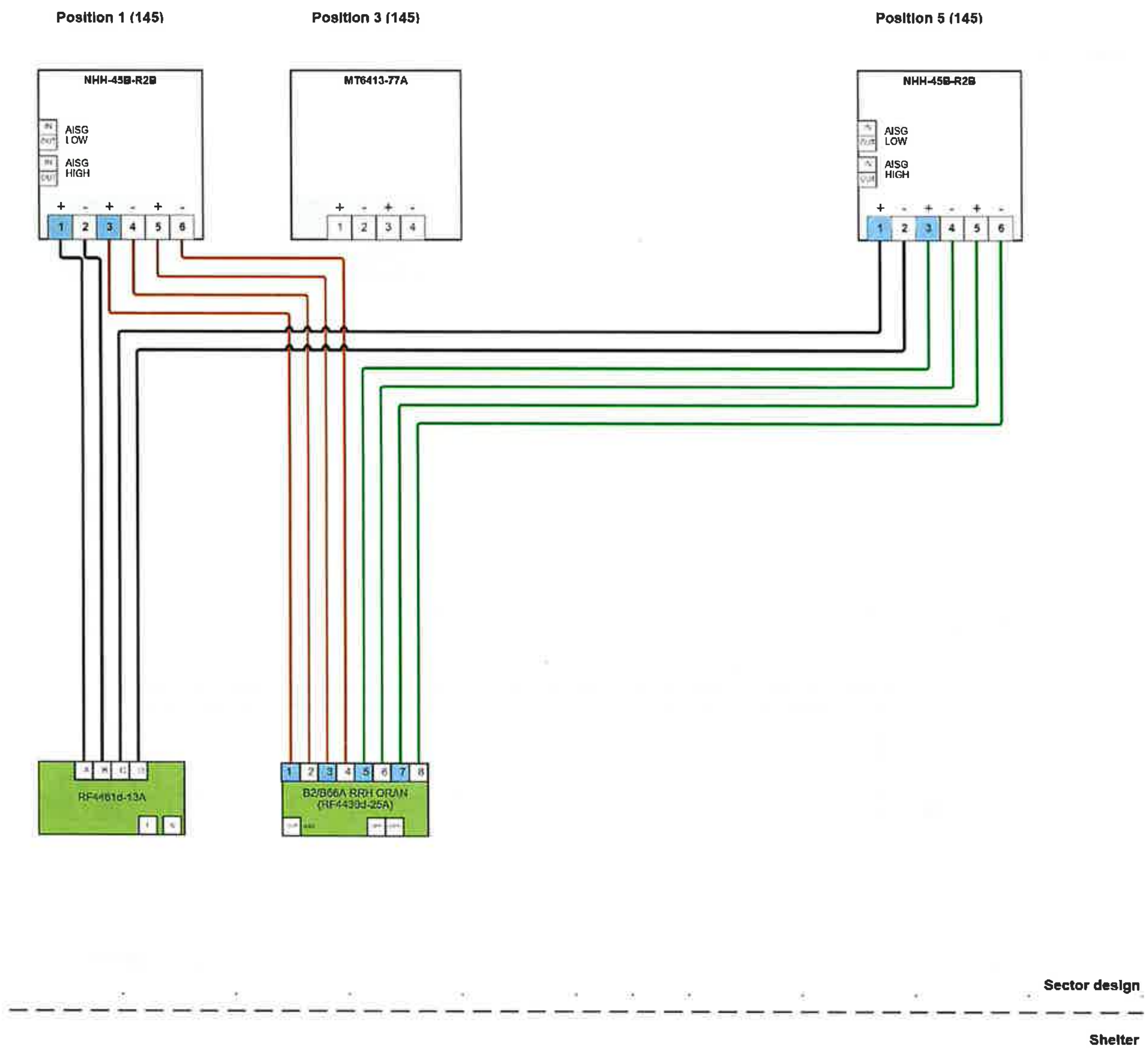
Callsigns Per Antenna

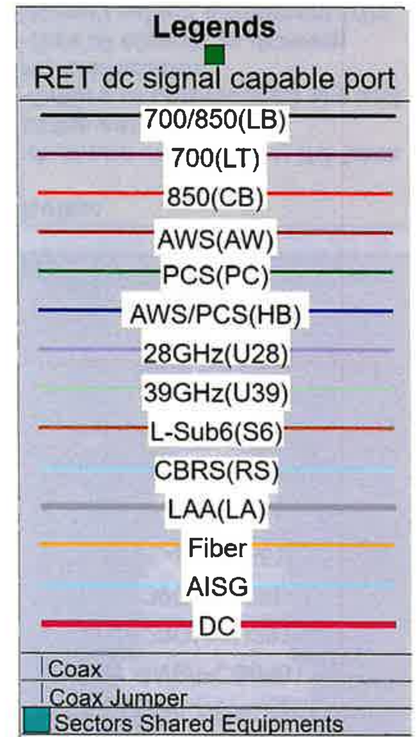
Sector	Make	Model	Ant CL Height AG	Ant Tip Height	Azimuth	Elect Down-tilt	Mech Down-tilt	Gain	Bandwidth	Regulatory Power	700	850	1900	2100	28 GHz	31 GHz	39 GHz	LSub-6	CBRS
02	CommScope	NHH-45B-R2	145	148	75	0	0	17.9	41	228.42				WQGA906,WQGB276					
02	CommScope	NHH-45B-R2	145	148	75	2	0	14.07	49	109.59	WQJQ689								
03	CommScope	NHH-45B-R2	145	148	165	2	0	14.07	49	109.59	WQJQ689								
0003	Samsung	MT6413-77A	145	146.2	165	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
01	CommScope	NHH-45B-R2	145	148	345	0	0	17.6	43	407.15			KNLH251,WPOJ730						
03	CommScope	NHH-45B-R2	145	148	165	2	0	15.08	43	395.2		KNKA404							
01	CommScope	NHH-45B-R2	145	148	345	2	0	15.08	43	395.2		KNKA404							
04	CommScope	NHH-45B-R2	145	148	255	0	0	17.9	41	228.42				WQGA906,WQGB276					
04	CommScope	NHH-45B-R2	145	148	255	0	0	17.6	43	407.15			KNLH251,WPOJ730						
02	CommScope	NHH-45B-R2	145	148	75	2	0	15.08	43	395.2		KNKA404							
01	CommScope	NHH-45B-R2	145	148	345	0	0	17.9	41	228.42				WQGA906,WQGB276					
03	CommScope	NHH-45B-R2	145	148	165	0	0	17.9	41	228.42				WQGA906,WQGB276					
01	CommScope	NHH-45B-R2	145	148	345	2	0	14.07	49	109.59	WQJQ689								
04	CommScope	NHH-45B-R2	145	148	255	2	0	14.07	49	109.59	WQJQ689								
0004	Samsung	MT6413-77A	145	146.2	255	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
03	CommScope	NHH-45B-R2	145	148	165	0	0	17.6	43	407.15			KNLH251,WPOJ730						
0002	Samsung	MT6413-77A	145	146.2	75	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
0001	Samsung	MT6413-77A	145	146.2	345	2	0	23.35	105	748.75								WRNE581,WRNE582,WRNE583,WRNE584,WRNE585	
02	CommScope	NHH-45B-R2	145	148	75	0	0	17.6	43	407.15			KNLH251,WPOJ730						
04	CommScope	NHH-45B-R2	145	148	255	2	0	15.08	43	395.2		KNKA404							

Callsigns

Callsign	Market	Radio Code	Market #	Block	State	County	License Name	Wholly Owner	Total MHZ	Freq Range 1	Freq Range 2	Freq Range 3	Freq Range 4	Regulatory Power	Threshold (W)	POPs/Sq. mil	Status	Action	Approve for Inavc
WQJQ689	Northeast	WU	REA001	C	CT	9007	Cellco Partnershi	Yes	22.000	746.000 - 757.000/.000 - .000	776.000 - 787.000/.000 - .000	746.000 - 757.000/.000 - .000	776.000 - 787.000/.000 - .000	109.59	1000	444.75	proposed	added	1
KNKA404	Hartford-New Britain-Bristol, CT	CL	CMA032	A	CT	9007	Cellco Partnershi	Yes	25.000	824.000 - 835.000/845.000 - 846.500	869.000 - 880.000/890.000 - 891.500	824.000 - 835.000/845.000 - 846.500	869.000 - 880.000/890.000 - 891.500	395.2	400	444.75	proposed	added	1
WPOJ730	Hartford, CT	CW	BTA184	C	CT	9007	Cellco Partnershi	Yes	10.000	1895.000 - 1900.000/.000 - .000	1975.000 - 1980.000/.000 - .000	1895.000 - 1900.000/.000 - .000	1975.000 - 1980.000/.000 - .000	407.15	1640	444.75	proposed	added	1
KNLH251	Hartford, CT	CW	BTA184	F	CT	9007	Cellco Partnershi	Yes	10.000	1890.000 - 1895.000/.000 - .000	1970.000 - 1975.000/.000 - .000	1890.000 - 1895.000/.000 - .000	1970.000 - 1975.000/.000 - .000	407.15	1640	444.75	proposed	added	1
WQGB276	Hartford-New Britain-Bristol, CT	AW	CMA032	A	CT	9007	Cellco Partnershi	Yes	20.000	1710.000 - 1720.000/.000 - .000	2110.000 - 2120.000/.000 - .000	1710.000 - 1720.000/.000 - .000	2110.000 - 2120.000/.000 - .000	228.42	1640	444.75	proposed	added	1
WRNE581	New York, NY	PM	PEA001	A1	CT	9007	Cellco Partnershi	Yes	20.000	3700.000 - 3720.000/.000 - .000	.000 - .000/.000 - .000	3700.000 - 3720.000/.000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	1
WRNE582	New York, NY	PM	PEA001	A2	CT	9007	Cellco Partnershi	Yes	20.000	3720.000 - 3740.000/.000 - .000	.000 - .000/.000 - .000	3720.000 - 3740.000/.000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	1
WRNE583	New York, NY	PM	PEA001	A3	CT	9007	Cellco Partnershi	Yes	20.000	3740.000 - 3760.000/.000 - .000	.000 - .000/.000 - .000	3740.000 - 3760.000/.000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	1
WRNE584	New York, NY	PM	PEA001	A4	CT	9007	Cellco Partnershi	Yes	20.000	3760.000 - 3780.000/.000 - .000	.000 - .000/.000 - .000	3760.000 - 3780.000/.000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	0
WRNE585	New York, NY	PM	PEA001	A5	CT	9007	Cellco Partnershi	Yes	20.000	3780.000 - 3800.000/.000 - .000	.000 - .000/.000 - .000	3780.000 - 3800.000/.000 - .000	.000 - .000/.000 - .000	748.75	1640	444.75	proposed	added	0
WQGA906	New York-No. New Jer.-Long Island, NY-NJ-CT-PA-MA-	AW	BEA010	B	CT	9007	Cellco Partnershi	Yes	20.000	1720.000 - 1730.000/.000 - .000	2120.000 - 2130.000/.000 - .000	1720.000 - 1730.000/.000 - .000	2120.000 - 2130.000/.000 - .000	228.42	1640	444.75	proposed	added	1

Alpha
(Proposed)

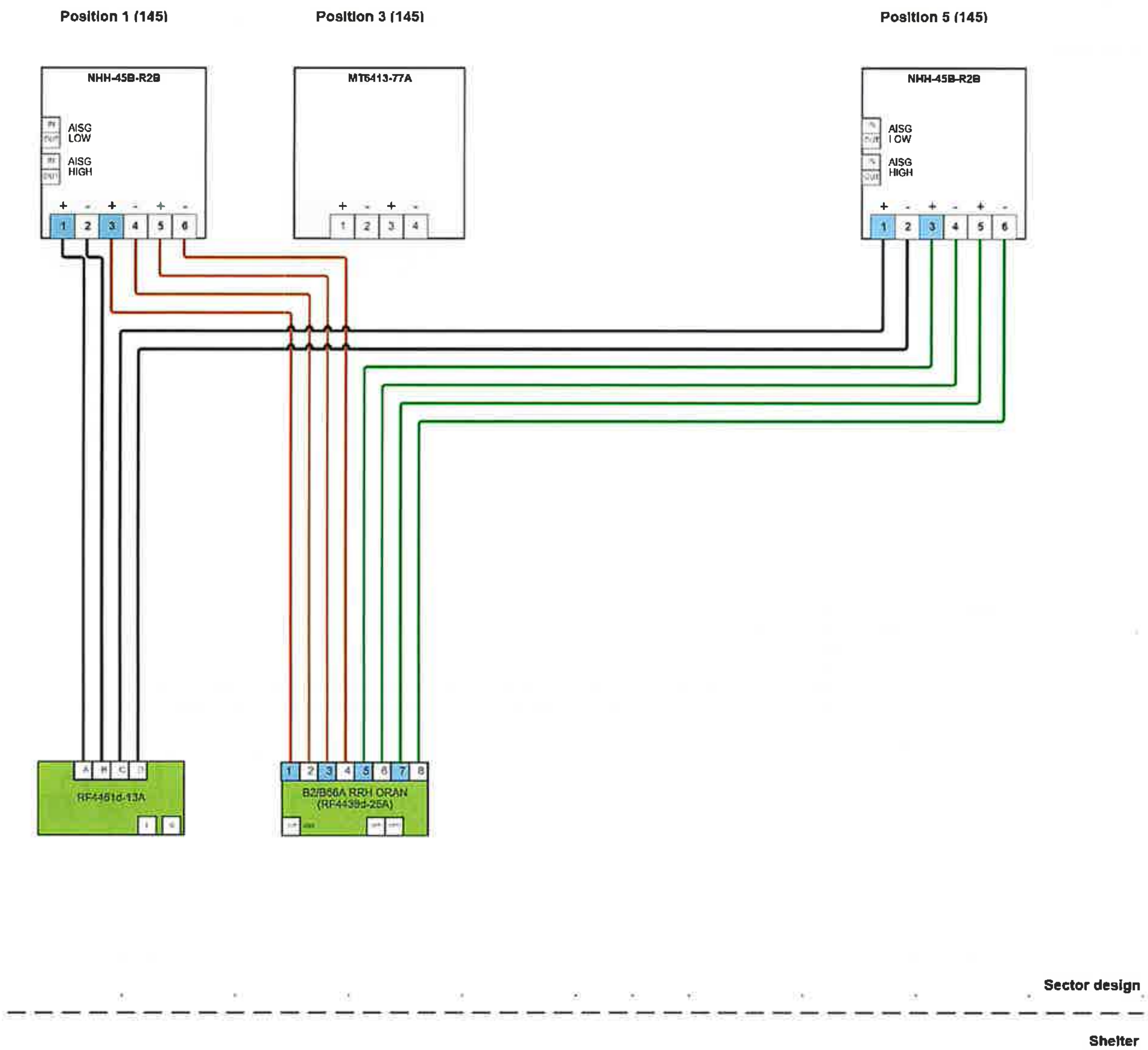




Notes:

- Antenna view is from the back of the antennas
- Colors of connections are just for clarification
- Size of objects in drawing doesn't reflect equipment true dimensions

Beta
(Proposed)



Legends

RET dc signal capable port

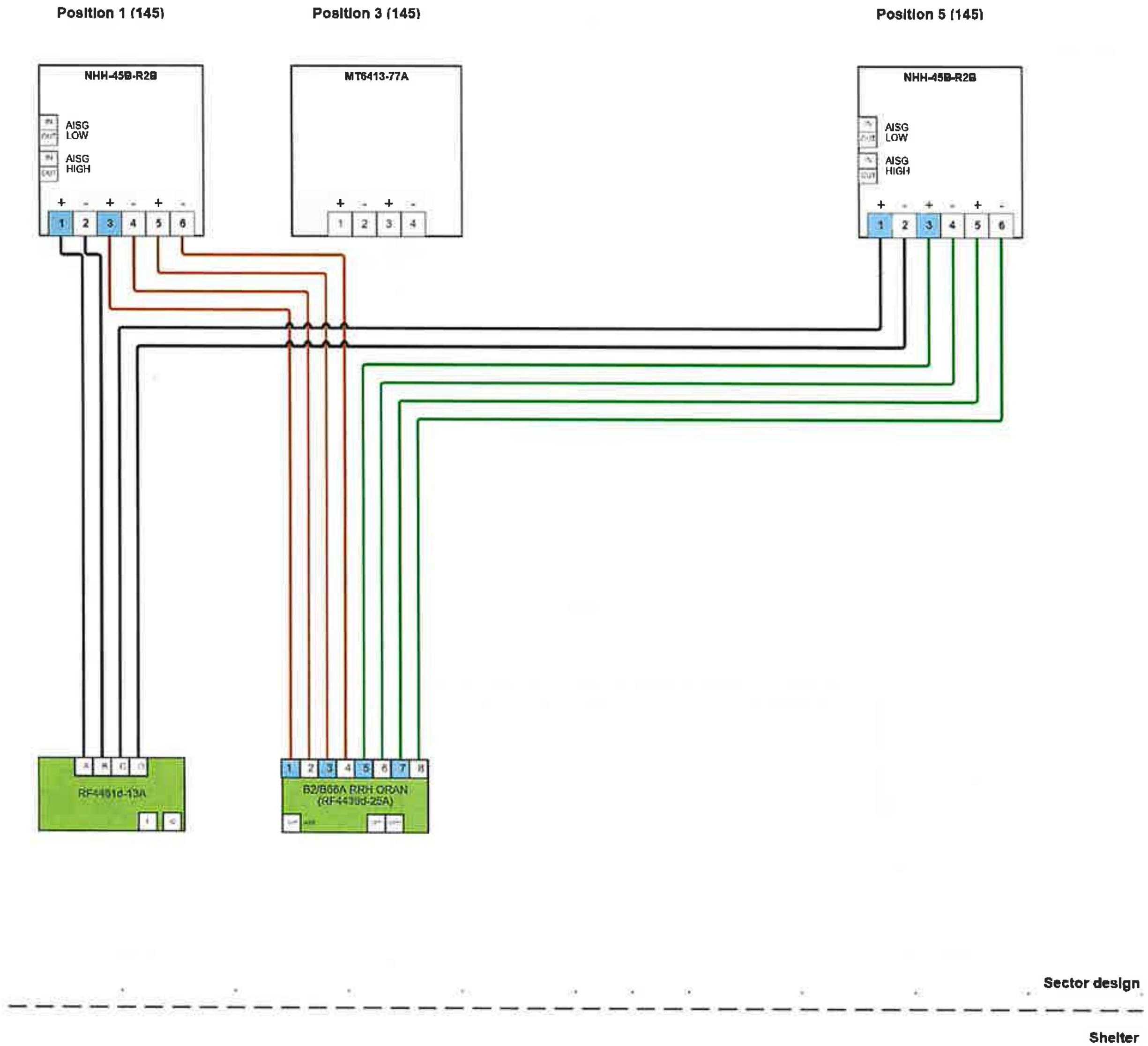
- 700/850(LB)
- 700(LT)
- 850(CB)
- AWS(AW)
- PCS(PC)
- AWS/PCS(HB)
- 28GHz(U28)
- 39GHz(U39)
- L-Sub6(S6)
- CBRS(RS)
- LAA(LA)
- Fiber
- AISG
- DC

- Coax
- Coax Jumper
- Sectors Shared Equipments

Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions

Gamma
(Proposed)



Legends

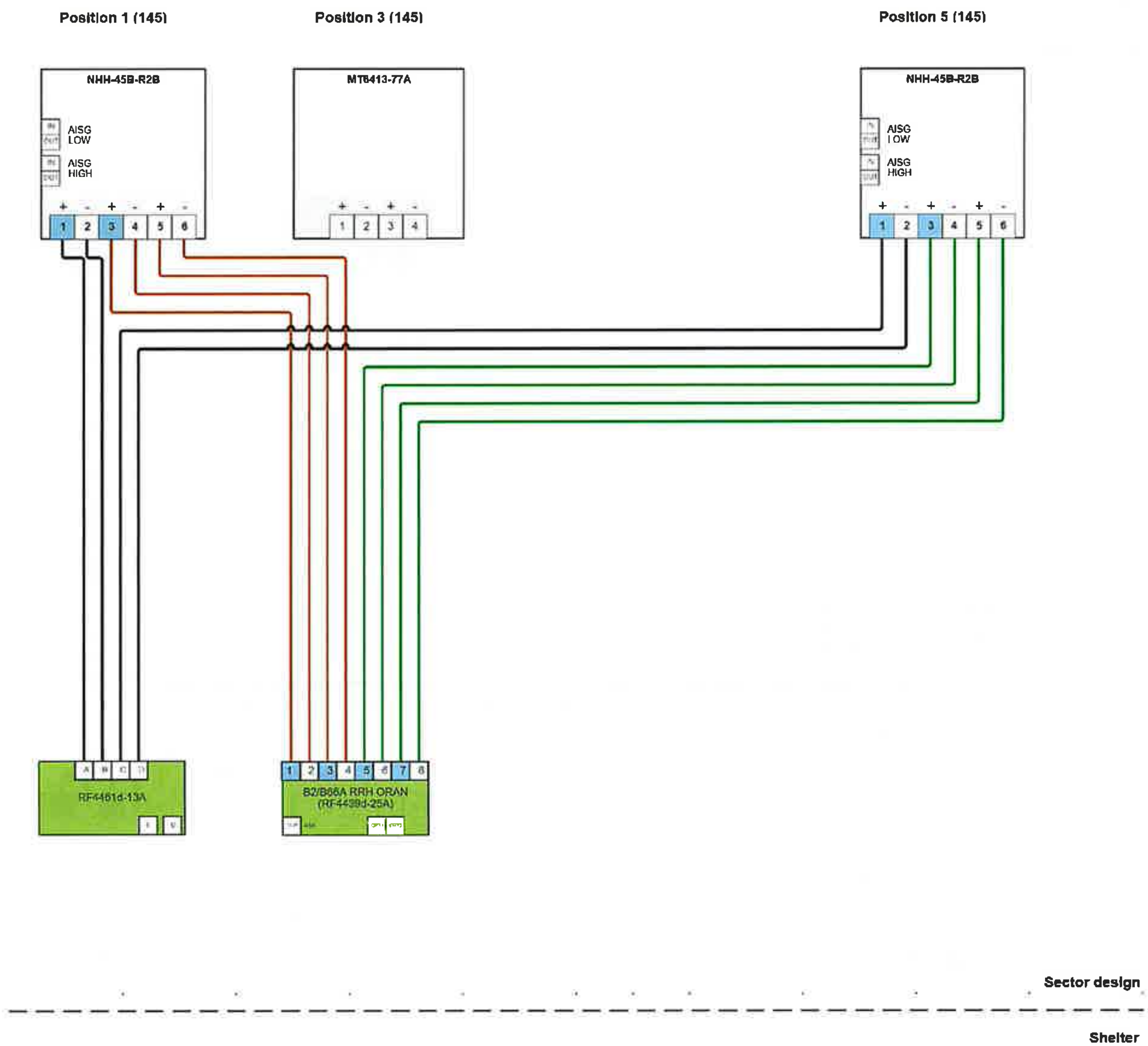
RET dc signal capable port

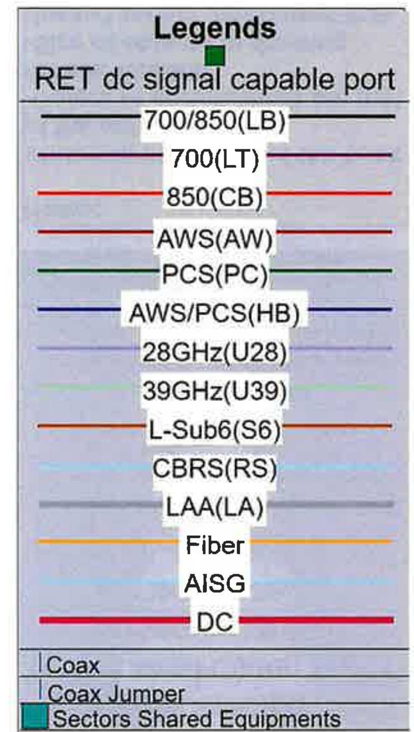
- 700/850(LB)
- 700(LT)
- 850(CB)
- AWS(AW)
- PCS(PC)
- AWS/PCS(HB)
- 28GHz(U28)
- 39GHz(U39)
- L-Sub6(S6)
- CBRS(RS)
- LAA(LA)
- Fiber
- AISG
- DC
- Coax
- Coax Jumper
- Sectors Shared Equipments

Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions

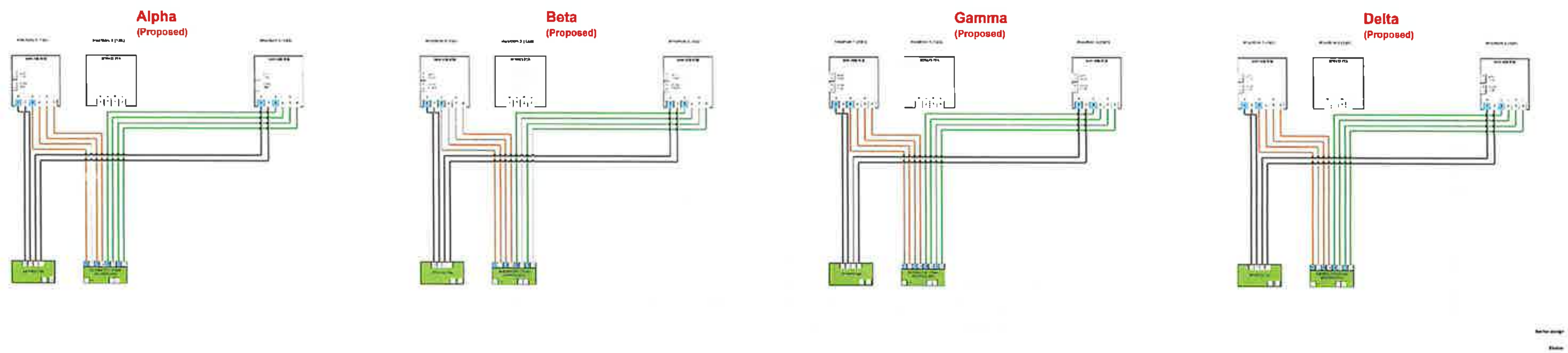
Delta
(Proposed)



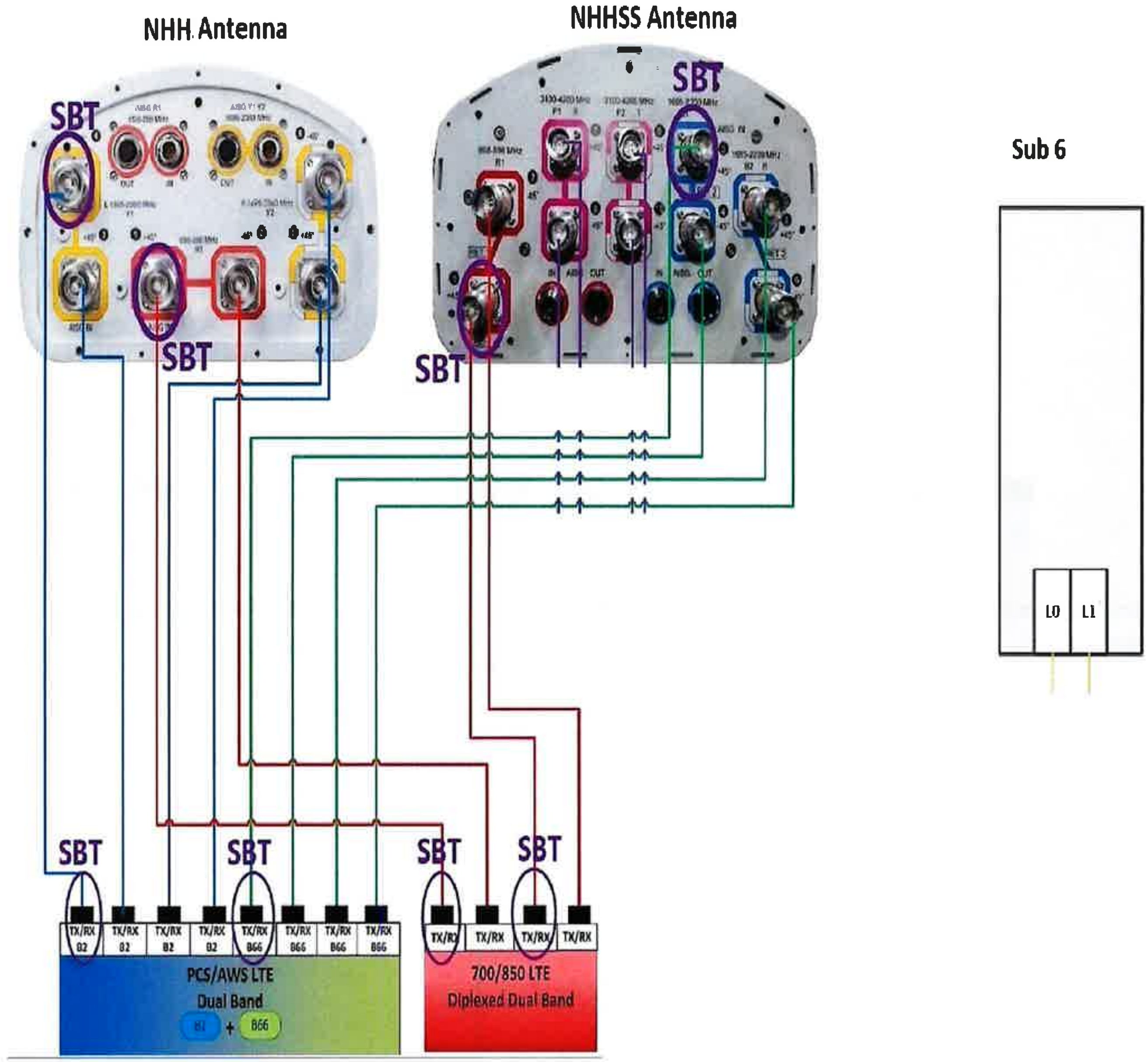


Notes:

-Antenna view is from the back of the antennas
-Colors of connections are just for clarification
-Size of objects in drawing doesn't reflect equipment true dimensions



Alpha
(Proposed)
Beta
(Proposed)
Gamma
(Proposed)
Delta
(Proposed)


NHH Antenna
NHHSS Antenna
Sub 6
SBT
SBT
SBT
SBT
SBT
SBT
SBT
SBT
TX/RX B2
TX/RX B2
TX/RX B2
TX/RX B2
TX/RX B66
TX/RX B66
TX/RX B66
TX/RX B66
PCS/AWS LTE
Dual Band
B2 + B66
TX/RX
TX/RX
TX/RX
TX/RX
700/850 LTE
Diplexed Dual Band
L0
L1

ATTACHMENT 6

ALL-POINTS TECHNOLOGY CORPORATION

VISIBILITY ANALYSIS

EAST HADDAM 3 CT
194 MOUNT PARNASSUS ROAD
EAST HADDAM, CT

PREPARED FOR:

verizon

PREPARED BY:
All-Points Technology Corporation, P.C.
567 Vauxhall Street Extension – Suite 311
Waterford, CT 06385

VISUAL ASSESSMENT & PHOTO-SIMULATIONS

Cellco Partnership, d/b/a Verizon Wireless ("Verizon") is seeking approval for the extension of an existing wireless communications facility (the "Facility") at 194 Mount Parnassus Road in East Haddam, Connecticut (the "Host Property"). At the request of Verizon, All-Points Technology Corporation, P.C. ("APT") completed this assessment to evaluate the potential visual effects of the proposed Facility extension from within a 2-mile radius (the "Study Area").

Project Setting

The existing Facility is located on a ±0.20-acre property owned by the State of Connecticut on the south side of Mount Parnassus Road (the "Site"). The immediate vicinity surrounding the Host Property, and the Study Area in general, consists primarily of low-density residential development, agricultural fields, and forest. The topography within the Study Area is relatively hilly. Ground elevations range from 207 feet above mean seal level ("AMSL") at the southwestern extent of the Study Area to approximately 621 feet AMSL ±300 feet southeast of the Site. Tree cover within the Study Area (consisting primarily of mixed deciduous hardwoods with interspersed stands of conifers) occupies approximately 6,187 acres (or ±76.9%) of the 8,042-acre Study Area.

Project Undertaking

The existing Facility consists of a ±121' tall self-support tower, occupied by multiple state and municipal antennas and microwave dishes, within a fenced compound located at a ground elevation of approximately 595 feet AMSL. Verizon intends to collocate antennas on the proposed 40-foot tower extension, which would increase the height of the structure to ±161' above ground level ("AGL"). Verizon would install 12 panel antennas, eight (8) remote radio heads, and one (1) OVP junction box on four (4) sector frame mounts at an approximate centerline height of 146' AGL. Related ground equipment, including a 50-kW diesel-fueled generator with tertiary containment would be placed within the existing compound on a new 11'0" by 20'0" concrete pad.

Please refer to the Site Drawings prepared by Proterra Design Group, LLC, Rev. 0, dated February 6, 2024, and provided under separate cover, for details regarding the proposed installation.

Methodology

APT used the combination of predictive computer modeling, in-field reconnaissance, and a review of various data sources to evaluate the proposed Facility's visibility on both a quantitative and qualitative basis. The predictive model provides a measurable assessment of visibility throughout the Study Area, including private properties and other areas inaccessible for direct observations. The in-field analysis consisted of a field reconnaissance throughout the Study Area to observe existing conditions, verify results of the model, inventory seasonal and year-round view locations, and provide photographic documentation from publicly accessible areas. A description of the procedures used in the analysis is provided below.

Preliminary Computer Modeling

To conduct this assessment, a predictive computer model was developed specifically for this project using ESRI's ArcMap GIS[1] software and available GIS data. The predictive model incorporates Project and Study Area-specific data, including the Site location, its ground elevation and both the existing Facility height and the proposed extension height, as well as the surrounding topography, existing vegetation, and structures (the primary features that can block direct lines of sight).

A digital surface model ("DSM"), capturing both the natural and built features on the Earth's surface, was generated for the extent of the Study Area utilizing State of Connecticut 2016 LiDAR[2] LAS[3] data points. LiDAR is a remote-sensing technology that develops elevation data by measuring the time it takes for laser light to return from the surface to the instrument's sensors. The varying reflectivity of objects also means that the "returns" can be classified based on the characteristics of the reflected light, normally into categories such as "bare earth," "vegetation," "road," "surface water" or "building". Derived from the 2016 LiDAR data, the LAS datasets contain the corresponding elevation point data and return classification values. The Study Area DSM incorporates the first return LAS dataset values that are associated with the highest feature in the landscape, typically a treetop, top of a building, and/or the highest point of other tall structures.

Once the DSM was generated, ESRI's Viewshed Tool was utilized to identify locations within the Study Area where the proposed Facility extension may be visible. ESRI's Viewshed Tool predicts visibility by identifying those cells[4] within the DSM that can be seen from an observer location. Cells where visibility was indicated were extracted and converted from a raster dataset to a polygon feature which was then overlaid onto aerial photograph and topographic base maps. Since the DSM includes the highest relative feature in the landscape, isolated "visible" cells are often indicated within heavily forested areas (e.g., from the top of the highest tree) or on building rooftops during the initial processing. It is recognized that these areas do not represent

---

[1] ArcMap is a Geographic Information System desktop application developed by the Environmental Systems Research Institute for creating maps, performing spatial analysis, and managing geographic data.

[2] Light Detection and Ranging

[3] An LAS file is an industry-standard binary format for storing airborne LiDAR data.

[4] Each DSM cell size is 1 square meter.

typical viewer locations and overstate visibility. As such, the resulting polygon feature is further refined by extracting those areas. The viewshed results are also cross-checked against the most current aerial photographs to assess whether significant changes (a new housing development, for example) have occurred since the time the LiDAR-based LAS datasets were captured.

The results of the preliminary analysis are intended to provide a comparative representation of those areas where portions of the existing and extended Facility may potentially be visible to the human eye without the aid of magnification, based on a viewer eye-height of five (5) feet above the ground and the combination of intervening topography, trees and other vegetation, and structures. However, the Facility may not necessarily be visible from all locations within those areas identified by the predictive model, which has limitations. For instance, the computer model cannot account for mass density, tree diameters and branching variability of trees, or the degradation of views that occur with distance. As a result, some areas depicted on the Viewshed Analysis maps as theoretically offering potential visibility of the extended Facility may be over-predictive because the quality of those views is not sufficient for the human eye to recognize the Facility or discriminate it from other surrounding or intervening objects.

Seasonal Visibility

Visibility also varies seasonally with increased, albeit obstructed, views occurring during "leaf-off" conditions. Beyond the variabilities associated with density of woodland stands found within any given Study Area, each individual tree also has its own unique trunk, pole timber and branching patterns that provide varying degrees of screening in leafless conditions which, as introduced above, cannot be precisely modeled. Seasonal visibility is therefore estimated based on a combination of factors including the type, size, and density of trees within a given area; topographic constraints; and other visual obstructions that may be present. Considering these variables, areas depicting seasonal visibility on the Viewshed Analysis maps are intended to represent locations from where there is a potential for views through intervening trees, as opposed to indicating that leaf-off views will exist from within an entire seasonally-shaded area.

Crane Test and Field Reconnaissance

To supplement and fine tune the results of the computer modeling efforts, APT completed in-field verification activities on January 30, 2024 consisting of a crane test, vehicular and pedestrian reconnaissance, and photo-documentation. A crane was positioned at the Facility location with its boom arm extended with a brightly-colored (red) flag over the approximate centerline of the proposed extension at a height of 161' AGL[5]. APT conducted a Study Area reconnaissance by driving publicly accessible roads to inventory where the crane/flag could, and could not, be seen. Visual observations from the reconnaissance were used to evaluate the

[5] The top of the flag represented the top of the proposed extended Facility.

results of the viewshed mapping and obtain photo-documentation from representative locations within the Study Area.

Photographic Documentation and Simulations

Photographs were taken with a Canon EOS 6D digital camera body[6] and Canon EF 24 to 105 millimeter ("mm") zoom lens. The coordinates of the existing tower location were entered as a "waypoint" into a handheld global positioning system ("GPS") device, with the "find" tool on the GPS unit then used to provide the distance and orientation to the flag position. The geographic coordinates of each photo location were recorded as meta data using GPS technology internal to the camera.

APT typically uses a standard focal length of 50 mm to present a consistent field of view. On occasion, photos are taken at lower focal lengths to provide a greater depth of field and to provide context to the scene by including surrounding features within the photograph. Four (4) photographs presented in the attached photo-documentation were taken at a 35 mm focal length, as noted in the attached Table 1 – Photo Locations.

Photographic simulations were generated to portray scaled renderings of the proposed Facility from 15 locations presented herein where the Facility may be recognizable above or, seasonally, through the trees. Using field data, Site plan information and 3-dimensional (3D) modeling software, spatially referenced models of the Site and Facility were generated and merged. The geographic coordinates obtained in the field for the photograph locations were incorporated into the model to produce virtual camera positions within the spatial 3D model. Photo-simulations were then created using a combination of renderings generated in the 3D model and photo-rendering software programs, which were ultimately composited and merged with the existing conditions photographs (using Adobe Photoshop image editing software). The scale of the subjects in the photograph (the boom/flag) and the corresponding simulation (the extended Facility) is proportional to their surroundings.

Photo-documentation of the field reconnaissance and photo-simulations of the proposed extended Facility are presented in the attachment at the end of this report. The field reconnaissance photos that include the boom/flag in the view provide visual reference points for the approximate height and location of the proposed extended Facility relative to the scene. The corresponding photo-simulations depict the proposed tower extension and Verizon appurtenances and provide the reader with representation of the Facility when viewed from various locations. Photographs were taken from publicly accessible areas and unobstructed view lines were chosen wherever possible. For presentation purposes in this report, the photographs were produced in an approximate 7-inch by 10.5-inch format. When reproducing the images in

[6] The Canon EOS 6D is a full-framed camera which includes a lens receptor of the same size as the film used in 35 mm cameras. As such, the images produced are comparable to those taken with a conventional 35 mm camera.

this format size, we believe it is important to present the largest view while providing key contextual landscape elements (existing developments, street signs, utility poles, etc.) so that the viewer can determine the proportionate scale of each object within the scene.

Table 1 – Photo Locations summarizes the photographs and simulations presented in the attachment to this report, and includes a description of each location, view orientation, distance from where the photo was taken relative to the Site, and the general characteristics of the view. The photo locations are depicted on the photolog and Viewshed Analysis maps provided as attachments to this report.

Final Visibility Mapping

Information obtained during the field reconnaissance was incorporated into the mapping data layers, including observations of the field reconnaissance, the photograph locations, areas that experienced recent land use changes and those places where the initial model was found to over or under-predict visibility. Once the additional data was integrated into the model, APT recalculated the visibility of the proposed extended Facility within the Study Area.

Conclusions

The existing Facility is not highly visible today beyond the immediate vicinity of the Site (0.25 mile or less). The tower's open steel weave design combined with rolling terrain and substantial tree cover throughout the Study Area serve to minimize its visibility. Extending the tower by 40 feet will make the Facility more prominent in some locations where it is currently visible, as it will rise farther above the tree line. However, no new areas of visibility are created by the proposed extension, with the exception of elevated agricultural fields near the western edge of the Study Area at distances approaching two miles away.

As presented on the attached comparative Viewshed Analysis maps, predicted year-round visibility is estimated to increase from ±12 acres to ±23 acres and would account for ±0.28% of the Study Area. Seasonal visibility of the proposed extended Facility is estimated to be approximately 94 acres, or ±1.16% of the Study Area.

Overall, the proposed Facility extension would not result in a substantial increase of visibility nor significantly alter the current characteristics of the area.

Proximity to Schools And Commercial Child Day Care Centers

No schools or commercial child day care centers are located within 250 feet of the proposed Facility. Franklin Academy is located approximately 2.28 miles to the southwest of the Site at 140 River Road in East Haddam. The nearest commercial child care center, A First Start

Preschool, is located at 499 Town Street in East Haddam, approximately 1.98 miles to the northwest of the Site. There is no predicted visibility of the proposed extended Facility from either location.

Limitations

The photo-simulations provide a representation of the Facility under similar settings as those encountered during the field review and reconnaissance. Views can change throughout the seasons and the time of day, and are dependent on weather and other atmospheric conditions (e.g., haze, fog, clouds); the location, angle and intensity of the sun; and the specific viewer location. Weather conditions on the day of the field review included overcast skies.

ATTACHMENTS

Table 1 - Photo Locations

Photo	Location	Orientation	Distance	Visibility
1	MOUNT PARNASSUS ROAD	W	+/- 0.37 MILE	NOT VISIBLE
2	MOUNT PARNASSUS ROAD	W	+/- 0.24 MILE	VISIBLE
3	CAPTAIN GEORGE COMER MEMORIAL STATE PARK	W	+/- 0.23 MILE	VISIBLE
4	MOUNT PARNASSUS ROAD*	WSW	+/- 415 FEET	VISIBLE
5	SMITH ROAD*	SSE	+/- 0.31 MILE	NOT VISIBLE
6	SMITH ROAD*	SSE	+/- 0.18 MILE	NOT VISIBLE
7	SMITH ROAD	SSE	+/- 0.16 MILE	SEASONAL
8	MOUNT PARNASSUS ROAD*	SE	+/- 0.21 MILE	NOT VISIBLE
9	SHANAGHAN ROAD	SE	+/- 0.13 MILE	SEASONAL
10	SHANAGHAN ROAD	ESE	+/- 0.12 MILE	VISIBLE
11	SHANAGHAN ROAD	ENE	+/- 0.12 MILE	SEASONAL
12	SHANAGHAN ROAD	NE	+/- 0.15 MILE	VISIBLE
13	SHANAGHAN ROAD	NNE	+/- 0.19 MILE	SEASONAL
14	SHANAGHAN ROAD	NNE	+/- 0.25 MILE	SEASONAL
15	SHANAGHAN ROAD	N	+/- 0.50 MILE	NOT VISIBLE
16	MOUNT PARNASSUS ROAD	ENE	+/- 0.62 MILE	NOT VISIBLE
17	BOGEL ROAD	ESE	+/- 0.88 MILE	VISIBLE
18	BOARDMAN ROAD	E	+/- 1.95 MILES	VISIBLE
19	TOWN STREET	E	+/- 1.76 MILES	NOT VISIBLE
20	TOWN STREET	E	+/- 1.74 MILES	VISIBLE
21	TOWN STREET	E	+/- 1.77 MILES	NOT VISIBLE
22	SHANAGHAN ROAD	N	+/- 1.70 MILES	NOT VISIBLE
23	MOUNT PARNASSUS ROAD	W	+/- 1.24 MILES	NOT VISIBLE

**Photograph was taken at 35 mm focal length.*

Table 1 - Photo Locations Continued

Photo	Location	Orientation	Distance	Visibility
24	BALLAHACK ROAD NUMBER 2	SW	+/- 1.18 MILES	SEASONAL
25	BASHAN ROAD	S	+/- 1.79 MILES	VISIBLE

**Photograph was taken at 35 mm focal length.*

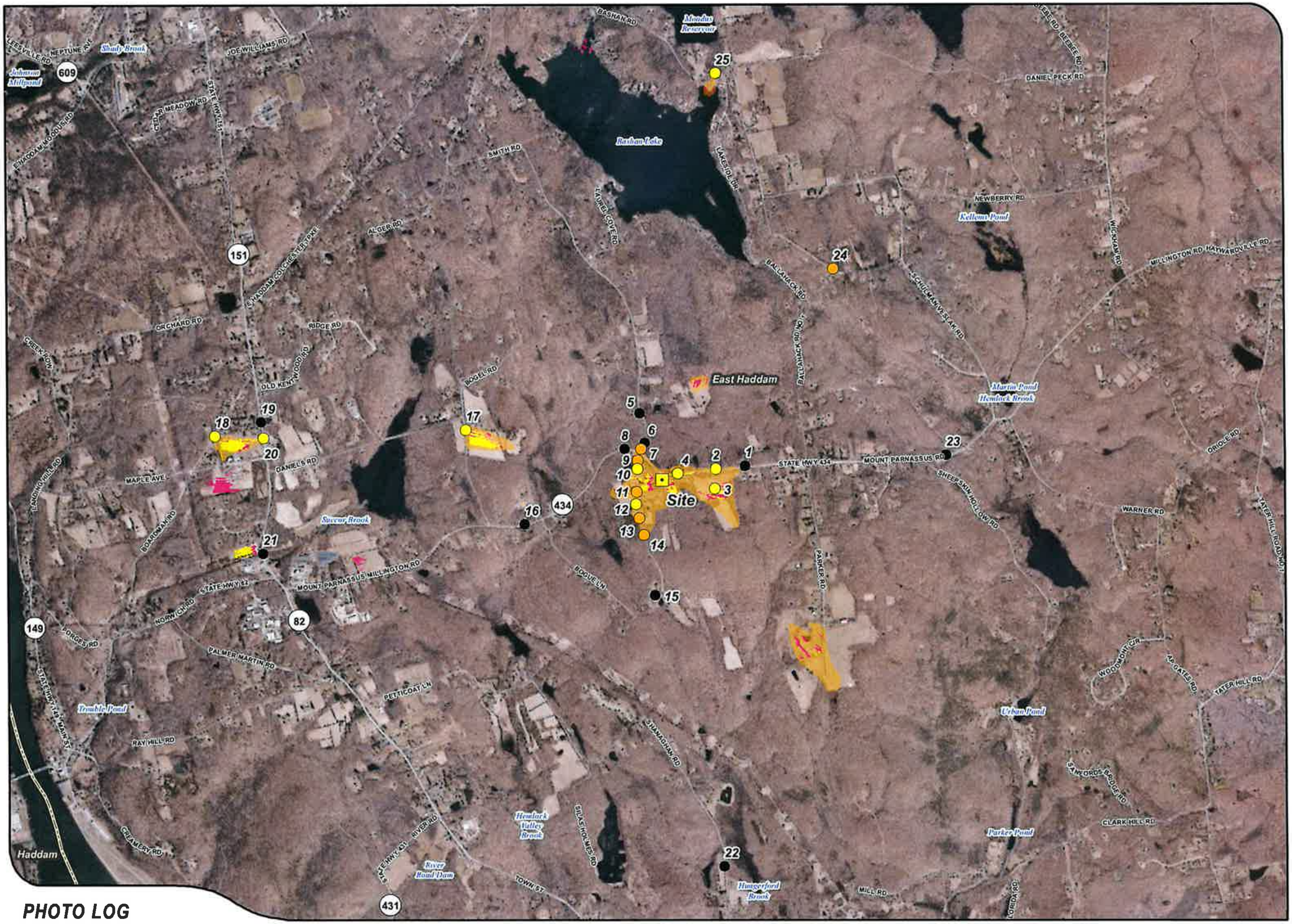


PHOTO LOG

Legend

- Site
- Not Visible
- Seasonal
- Year-Round Visibility
- Municipal Boundary

*Areas of Potential Seasonal Visibility - Existing and Proposed

***Predicted Year-Round Visibility**

Year-Round Visibility of Existing Tower at 121' AGL

**Visibility layers obtained from viewshed analysis mapping contained in this document*

N
W E

1,000 500 0 1,000

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	MOUNT PARNASSUS ROAD	W	+/- 0.37 MILE	NOT VISIBLE

EXISTING

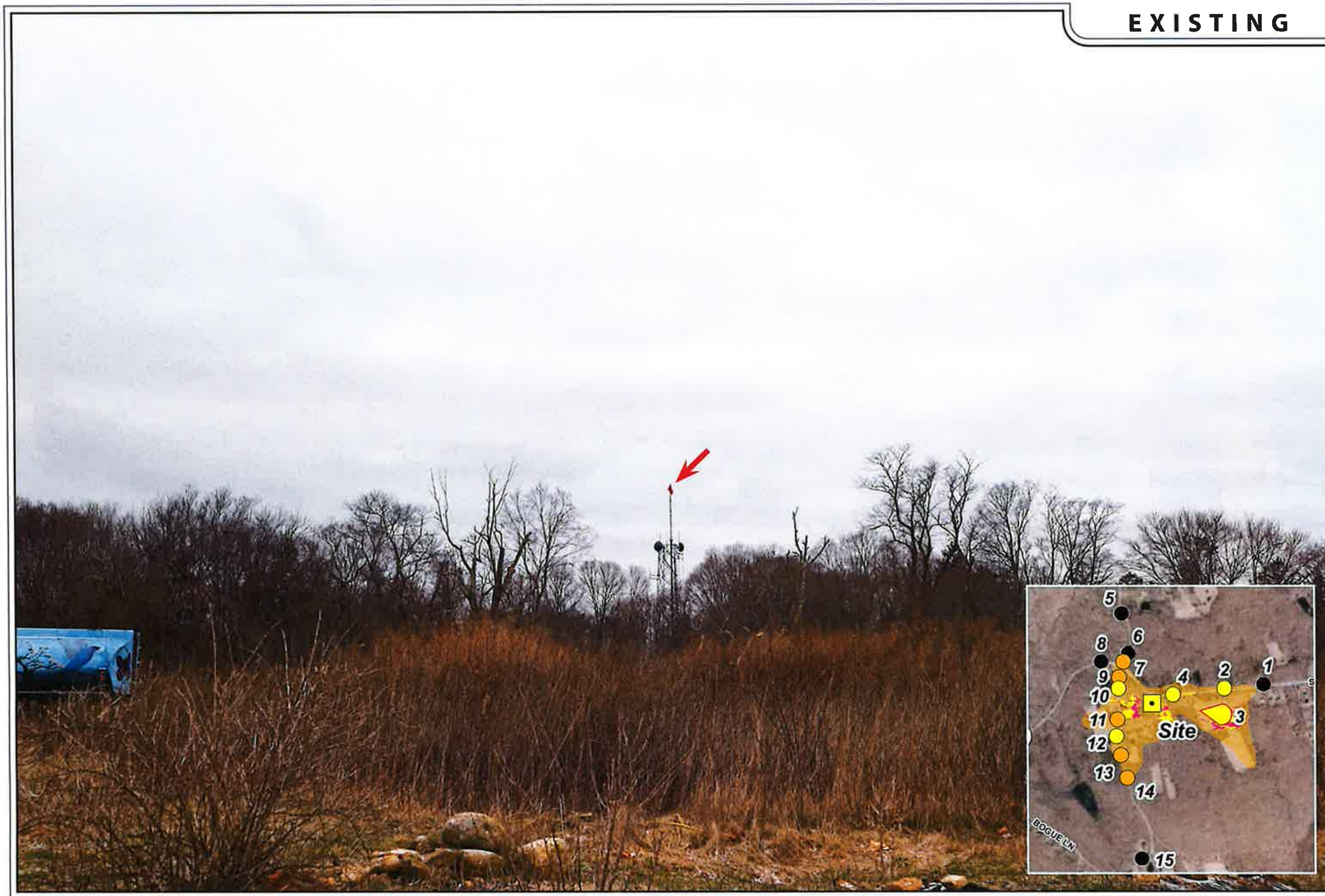
PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	MOUNT PARNASSUS ROAD	W	+/- 0.24 MILE	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	MOUNT PARNASSUS ROAD	W	+/- 0.24 MILE	VISIBLE

EXISTING



PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	CAPTAIN GEORGE COMER MEMORIAL STATE PARK	W	+/- 0.23 MILE	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	CAPTAIN GEORGE COMER MEMORIAL STATE PARK	W	+/- 0.23 MILE	VISIBLE

EXISTING

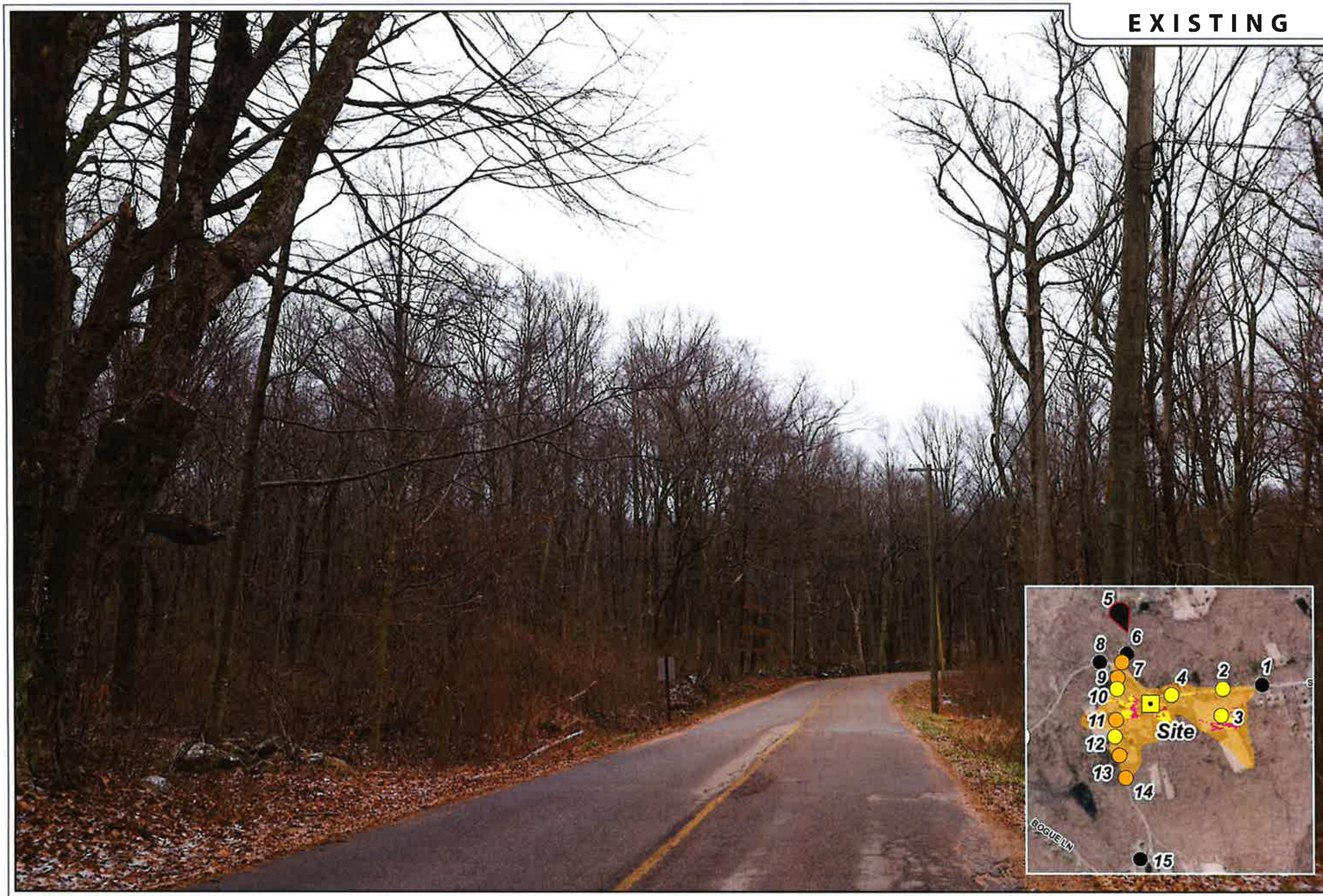
PHOTOGRAPHED ON 1/30/2024
35mm Focal Length

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	MOUNT PARNASSUS ROAD	WSW	+/- 415 FEET	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	MOUNT PARNASSUS ROAD	WSW	+/- 415 FEET	VISIBLE

EXISTING



PHOTOGRAPHED ON 1/30/2024
35mm Focal Length

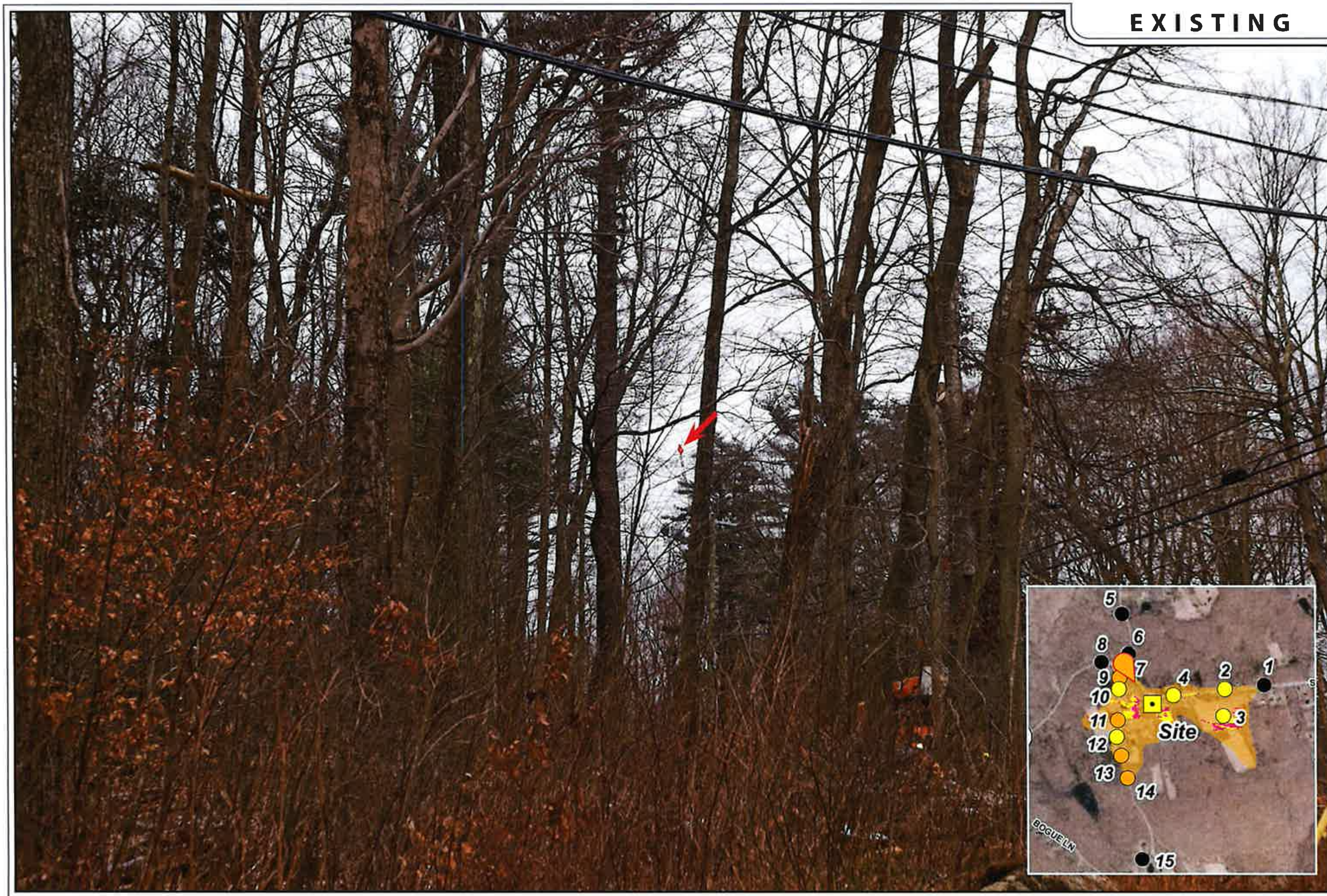
PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
5	SMITH ROAD	SSE	+/- 0.31 MILE	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024
35mm Focal Length

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	SMITH ROAD	SSE	+/- 0.18 MILE	NOT VISIBLE

EXISTING



PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
7	SMITH ROAD	SSE	+/- 0.16 MILE	SEASONAL

PROPOSED

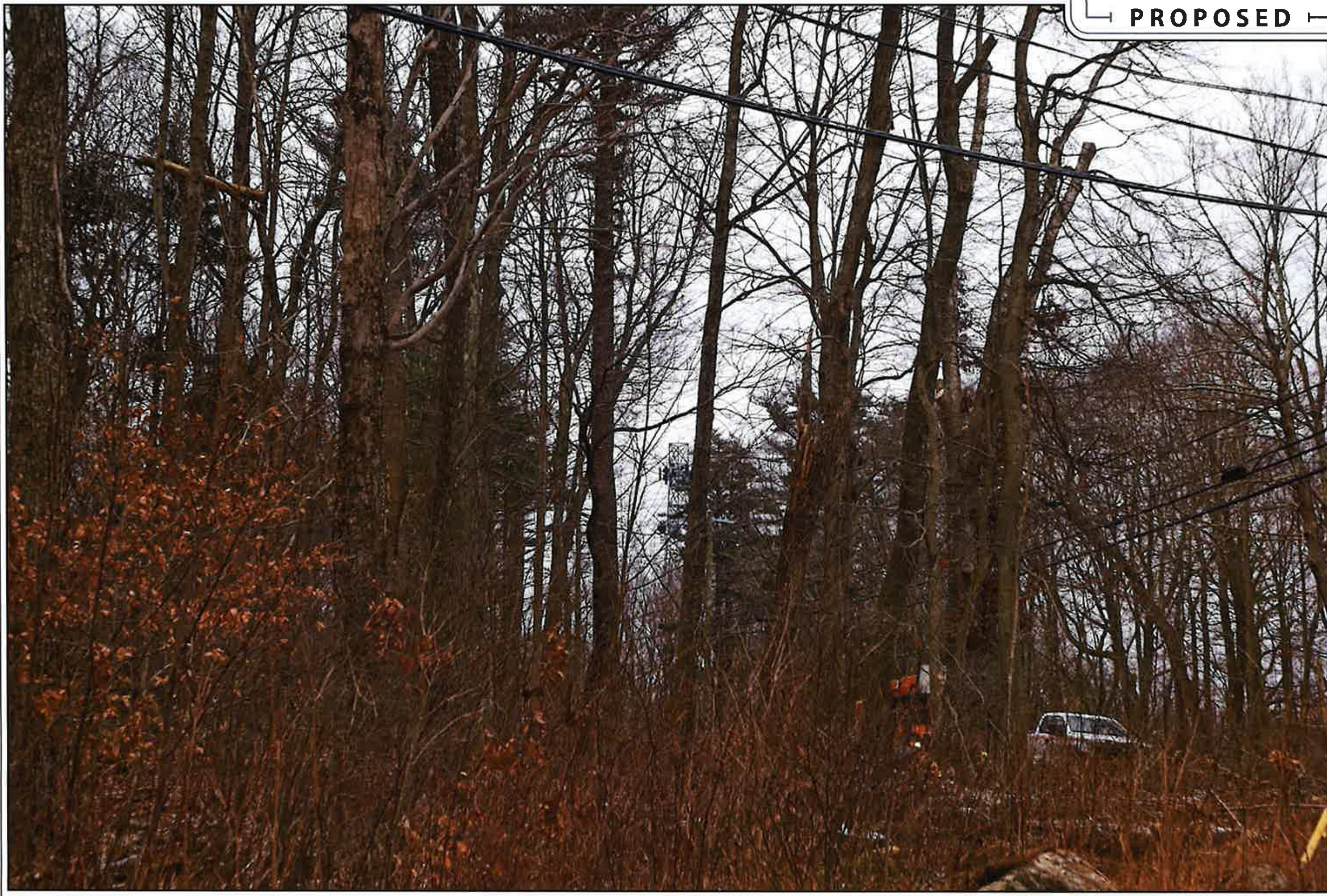
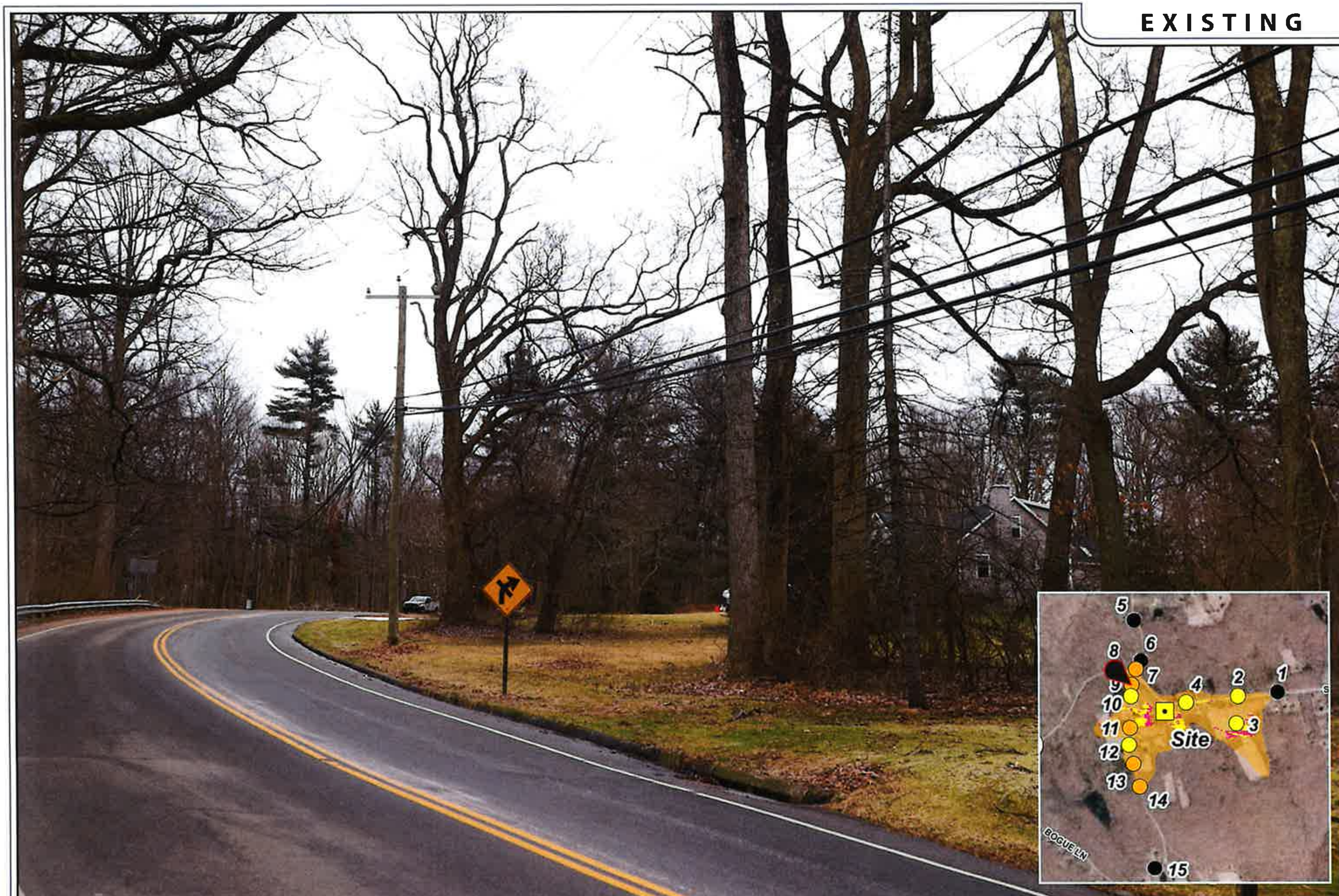


PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
7	SMITH ROAD	SSE	+/- 0.16 MILE	SEASONAL

EXISTING

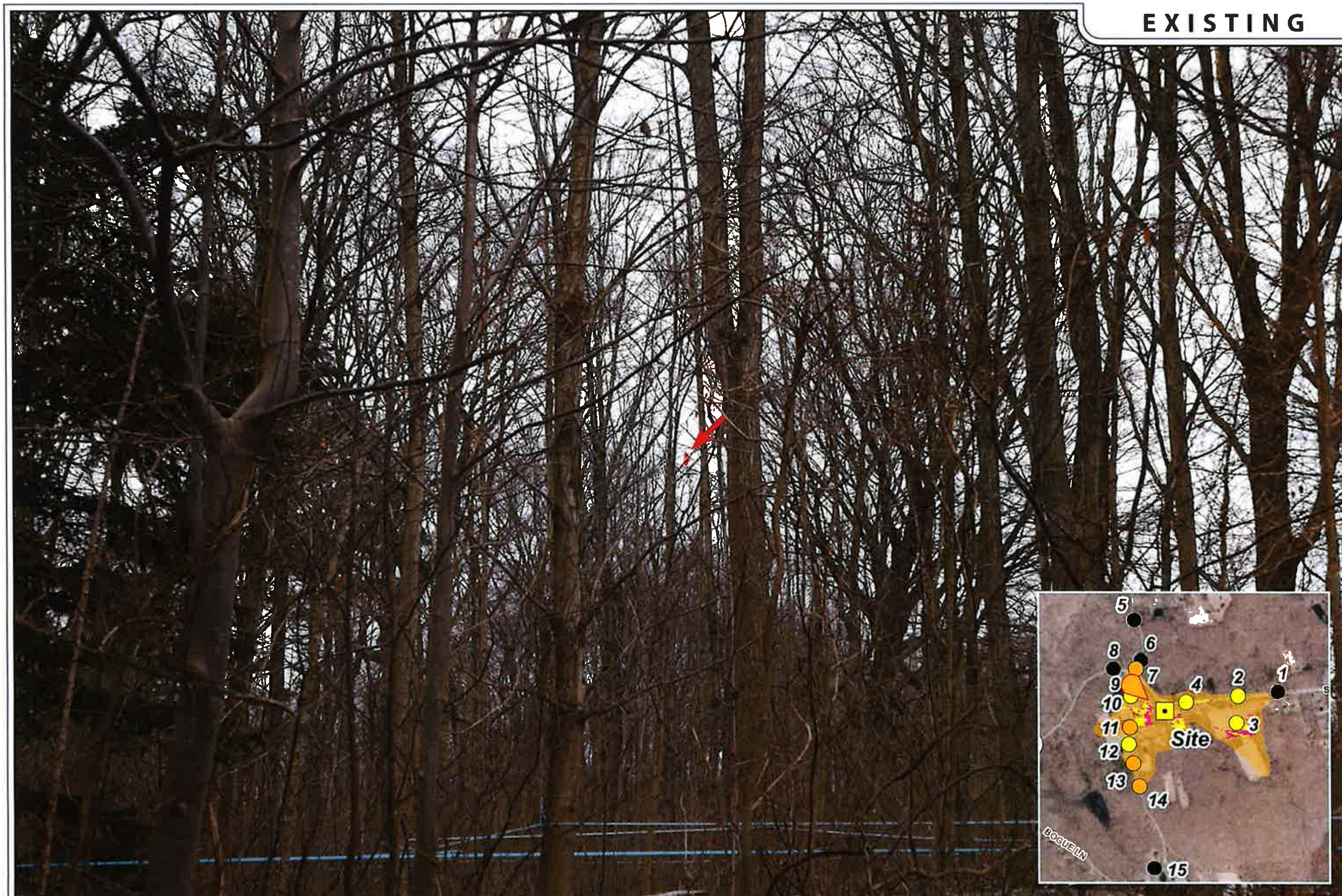


PHOTOGRAPHED ON 1/30/2024

35mm Focal Length

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
8	MOUNT PARNASSUS ROAD	SE	+/- 0.21 MILE	NOT VISIBLE

EXISTING



PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
9	SHANAGHAN ROAD	SE	+/- 0.13 MILE	SEASONAL

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
9	SHANAGHAN ROAD	SE	+/- 0.13 MILE	SEASONAL

EXISTING

PHOTOGRAPHED ON 11/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
10	SHANAGHAN ROAD	ESE	+/- 0.12 MILE	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
10	SHANAGHAN ROAD	ESE	+/- 0.12 MILE	VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
11	SHANAGHAN ROAD	ENE	+/- 0.12 MILE	SEASONAL

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
11	SHANAGHAN ROAD	ENE	+/- 0.12 MILE	SEASONAL

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
12	SHANAGHAN ROAD	NE	+/- 0.15 MILE	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
12	SHANAGHAN ROAD	NE	+/- 0.15 MILE	VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
13	SHANAGHAN ROAD	NNE	+/- 0.19 MILE	SEASONAL

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
13	SHANAGHAN ROAD	NNE	+/- 0.19 MILE	SEASONAL

EXISTING

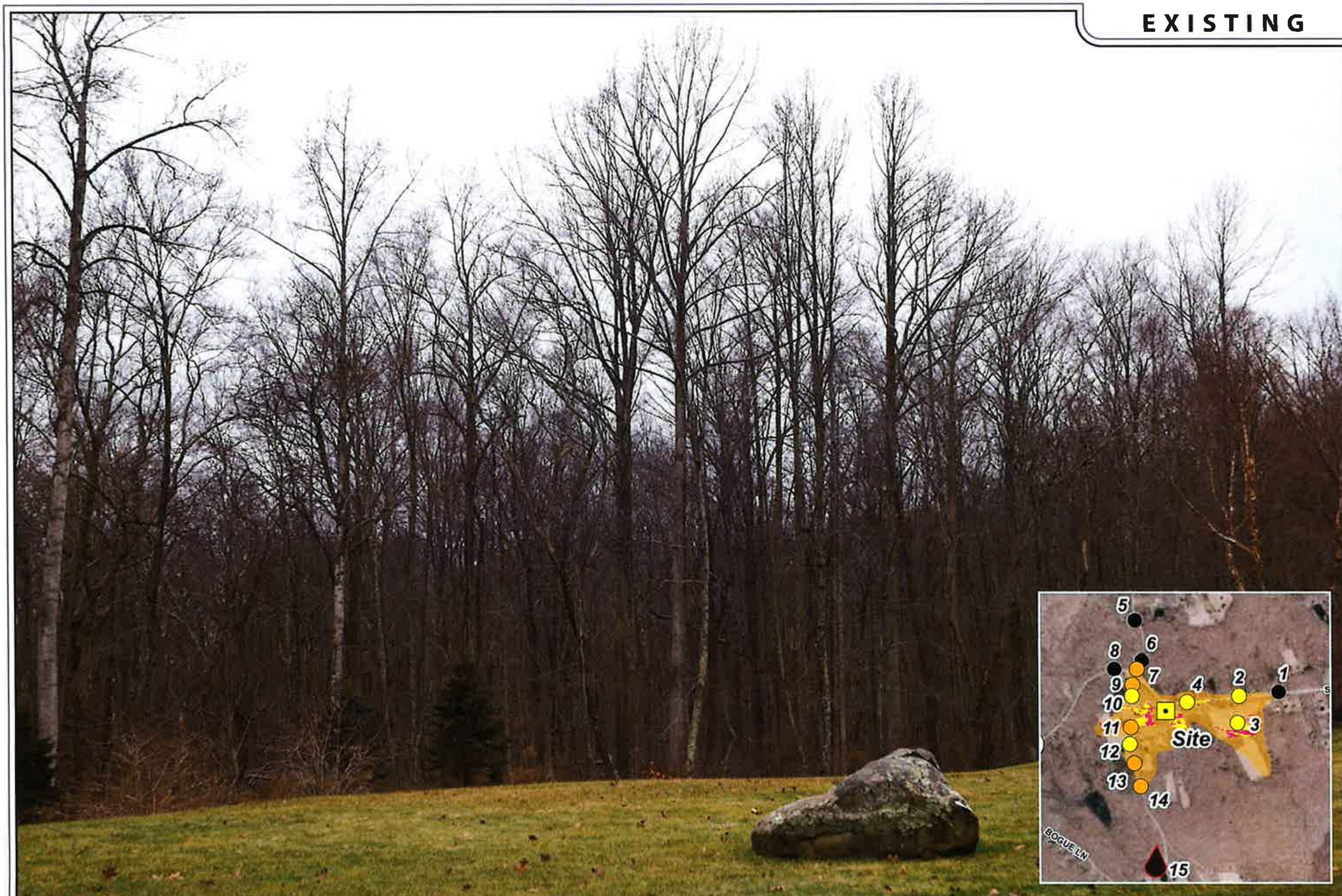
PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
14	SHANAGHAN ROAD	NNE	+/- 0.25 MILE	SEASONAL

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
14	SHANAGHAN ROAD	NNE	+/- 0.25 MILE	SEASONAL

EXISTING



PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
15	SHANAGHAN ROAD	N	+/- 0.50 MILE	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
16	MOUNT PARNASSUS ROAD	ENE	+/- 0.62 MILE	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
17	BOGEL ROAD	ESE	+/- 0.88 MILE	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
17	**BOGEL ROAD**	**ESE**	**+/- 0.88 MILE**	**VISIBLE**

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
18	BOARDMAN ROAD	E	+/- 1.95 MILES	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
18	BOARDMAN ROAD	E	+/- 1.95 MILES	VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
19	TOWN STREET	E	+/- 1.76 MILES	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
20	TOWN STREET	E	+/- 1.74 MILES	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
20	TOWN STREET	E	+/- 1.74 MILES	VISIBLE

EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
21	TOWN STREET	E	+/- 1.77 MILES	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
22	SHANAGHAN ROAD	N	+/- 1.70 MILES	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
23	MOUNT PARNASSUS ROAD	W	+/- 1.24 MILES	NOT VISIBLE

EXISTING

PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
24	BALLAHACK ROAD NUMBER 2	SW	+/- 1.18 MILES	SEASONAL

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
24	BALLAHACK ROAD NUMBER 2	SW	+/- 1.18 MILES	SEASONAL

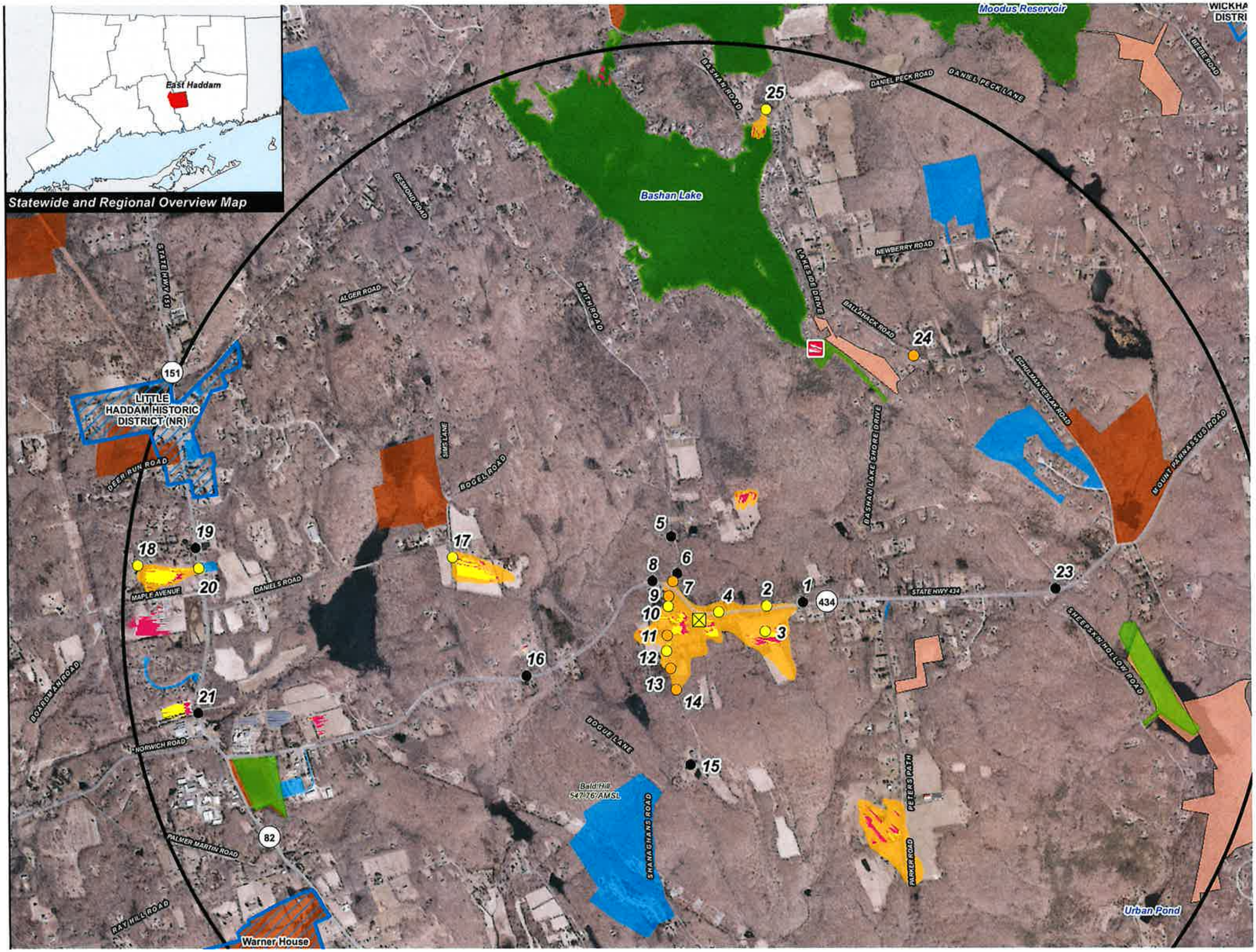
EXISTING

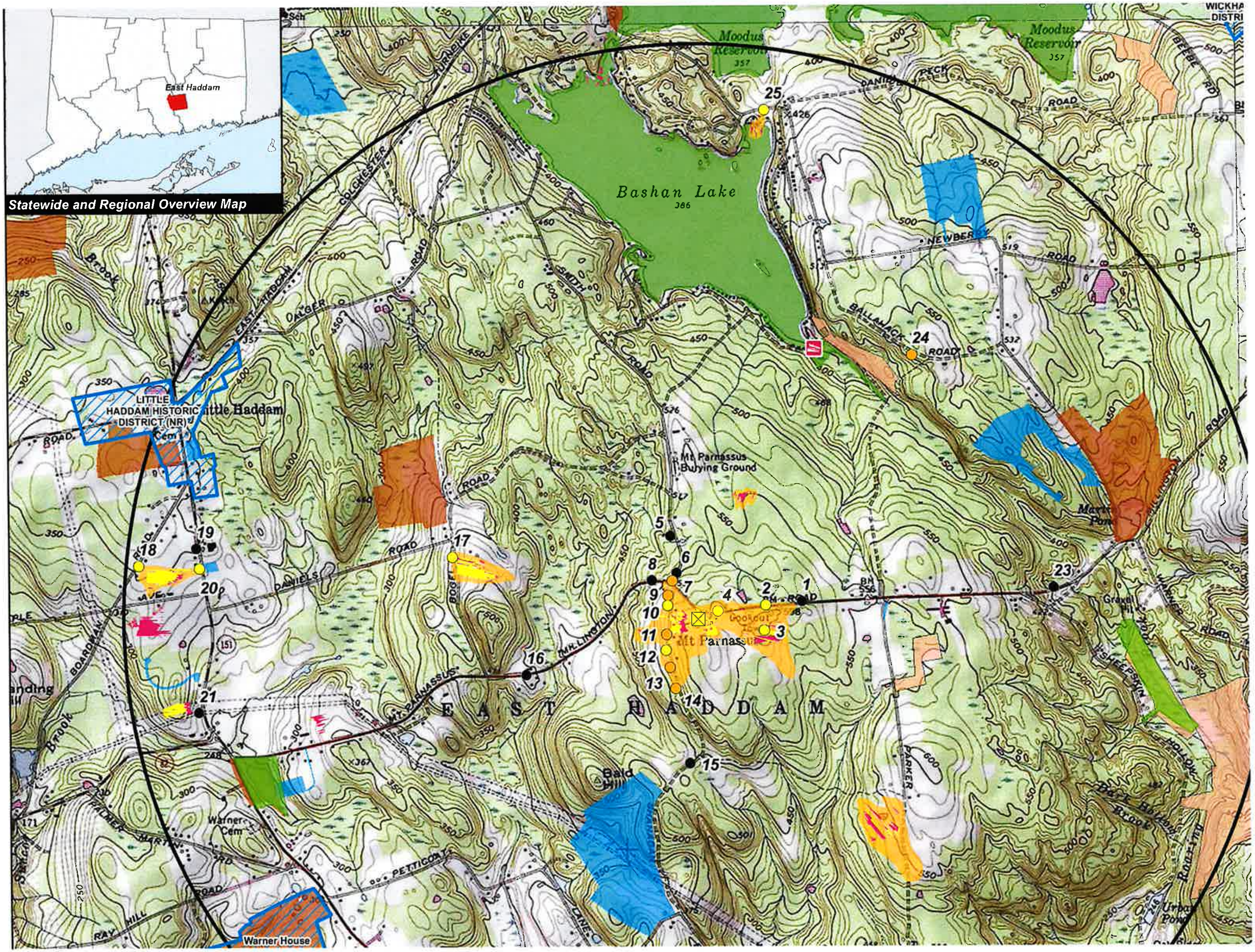
PHOTOGRAPHED ON 1/30/2024

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
25	BASHAN ROAD	S	+/- 1.79 MILES	VISIBLE

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
25	BASHAN ROAD	S	+/- 1.79 MILES	VISIBLE


Statewide and Regional Overview Map
East Haddam
Moodus Reservoir
Bashan Lake
Urban Pond
Bald Hill
547.76' AMSL
LITTLE HADDAM HISTORIC DISTRICT (NR)
Warner House
WICKHA
DISTRI
BEBE ROAD
DANIEL PECK ROAD
DANIEL PECK LANE
BASHAN ROAD
NEWBERRY ROAD
LAKESIDE DRIVE
BALLAHACK ROAD
SCHULMAN VESLAK ROAD
MOUNT PARNASSUS ROAD
BASHAN LAKE SHORE DRIVE
SMITH ROAD
DESMOND ROAD
ALGER ROAD
STATE HWY 151
SIMS LANE
BOGEL ROAD
DEER RUN ROAD
DANIELS ROAD
MAPLE AVENUE
BOARDMAN ROAD
NORWICH ROAD
PALMER MARTIN ROAD
RAY HILL ROAD
BOGUE LANE
SHANAGHANS ROAD
PETERS PATH
PARKER ROAD
STATE HWY 434
SHEEPSKIN HOLLOW ROAD
151
434
82
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23
24
25



Statewide and Regional Overview Map
East Haddam
Bashan Lake
Moodus Reservoir
LITTLE HADDAM HISTORIC DISTRICT (NR)
Little Haddam
Mt Parnassus Burying Ground
Mt Parnassus
EAST HADDAM
Warner House
Bald Hill
Warner Cem
NEWBERY ROAD
BALLAMACK ROAD
DANIELS ROAD
PARKER
SHEEPSKIN HOLLOW
COLCHESTER
PETTICOAT
BOARDMAN
RAY HILL ROAD
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23
24
25

ATTACHMENT 7

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

Calculated Radio Frequency Emissions Report

East Haddam 3 CT

194 Mt Parnassus Road, East Haddam, CT 06423

December 21, 2023

Table of Contents

List of Figures

List of Tables

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed installation of Verizon's antenna arrays to be mounted at 145' AGL on an existing self-support tower located at 194 Mt Parnassus Road in East Haddam, CT. The coordinates of the self-support tower are 41° 28' 12.108" N, 72° 24' 40.320" W.

Verizon is proposing the following:

1) Install 12 twelve (12) multi-band antennas, four (4) per sector to support its commercial LTE network.

This report considers the proposed antenna configuration for Verizon[1] as well as existing antenna configuration[2] for CSP, DOT, TOE Haddam, and VS/QV antennas to derive the resulting % MPE of its proposed modification.

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

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

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

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

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

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

[1] As referenced to Verizon's Radio Frequency Design Sheet updated 08/01/2023.

[2] As referenced to equipment list provided by Smartlink – 52 Mt. Parnassus Working Copy 7-19-2022 Equipment List

3. RF Exposure Prediction Methods

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

$$\text{Power Density} = \left(\frac{\text{GRF}^2 \times 1.64 \times \text{ERP}}{4\pi \times R^2}\right) \text{X Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

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

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Off Beam Loss is determined by the selected antenna patterns

Ground reflection factor (GRF) of 1.6

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

4. Antenna Inventory

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

Operator	Sector / Call Sign	TX Freq (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width (degree)	Mech. Tilt	Length (ft)	Antenna Centerline Height (ft)
Verizon	Alpha / 345°	700	160	16.8	7658	NHH-45B-R2B	48	0	6	145
		850	160	17.5	8997		43			
		1900	160	19.9	15636		43			
		2100	240	20.3	25716		41			
		3700	320	26.5	142939	MT6413-77A	-	0	-	145
	Beta / 75°	700	160	16.8	7658	NHH-45B-R2B	48	0	6	145
		850	160	17.5	8997		43			
		1900	160	19.9	15636		43			
		2100	240	20.3	25716		41			
		3700	320	26.5	142939	MT6413-77A	-	0	6	145
	Gamma / 165°	700	160	16.8	7658	NHH-45B-R2B	48	0	6	145
		850	160	17.5	8997		43			
		1900	160	19.9	15636		43			
		2100	240	20.3	25716		41			
		3700	320	26.5	142939	MT6413-77A	-	0	6	145
	Delta / 255°	700	160	16.8	7658	NHH-45B-R2B	48	0	6	145
		850	160	17.5	8997		43			
		1900	160	19.9	15636		43			
		2100	240	20.3	25716		41			
		3700	320	26.5	142939	MT6413-77A	-	0	6	145

Table 1: Proposed Antenna Inventory[3,4]

[3] Antenna heights are in reference to Verizon's Radio Frequency Design Sheet updated 08/01/2023.

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

5. Calculation Results

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

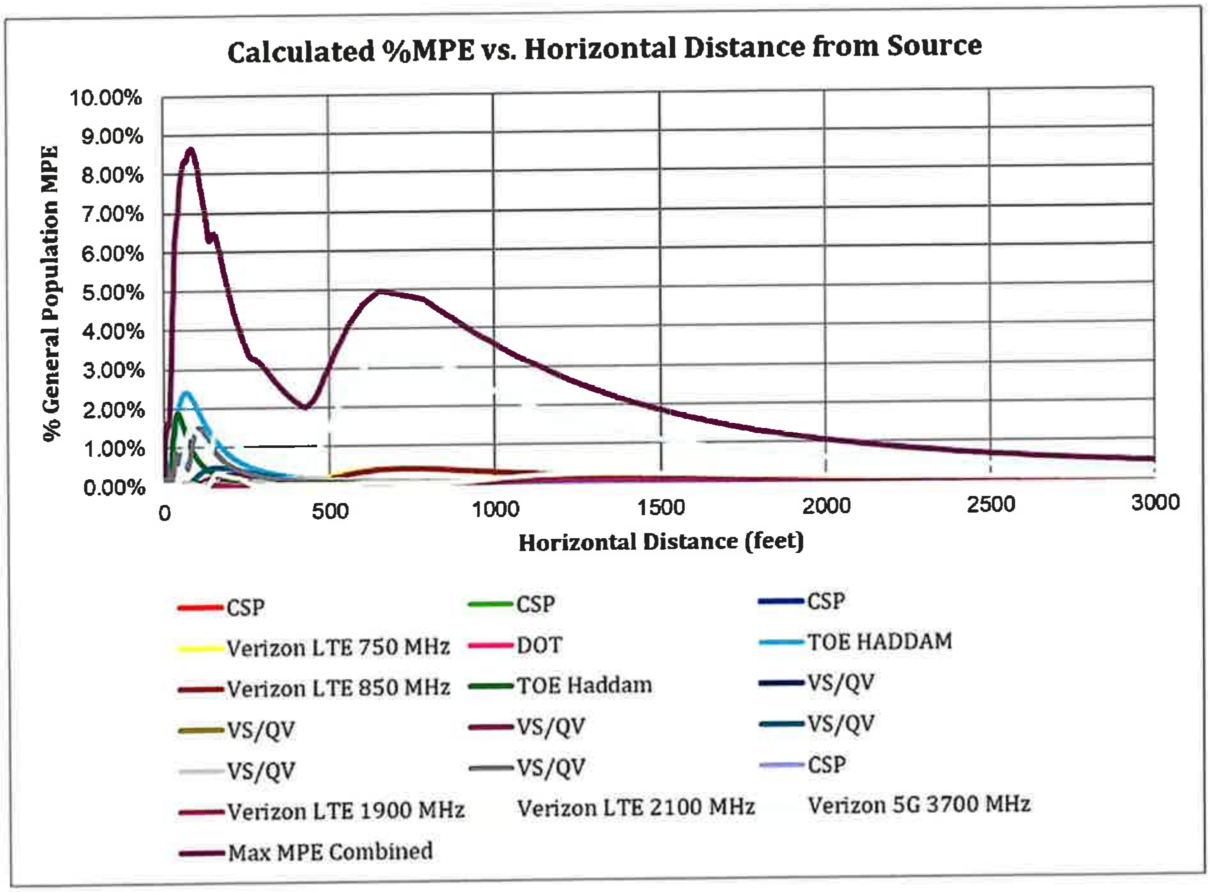


Figure 1: Graph of General Population % MPE vs. Distance

The highest percent of MPE (8.66% of the General Population limit) is calculated to occur at a horizontal distance of 88 feet from antennas. Please note that the percent of MPE calculations close to the site take into account off beam loss, which is determined from the vertical pattern of the antennas used. Therefore, RF power density levels may increase as the distance from the site increases. At distances of approximately 1500 feet and beyond, one would now be in the main beam of the antenna pattern and off beam loss is no longer considered. Beyond this point, RF levels become calculated solely on distance from the site and the percent of MPE decreases significantly as distance from the site increases.

Table 2 below lists percent of MPE values as well as the associated parameters that were included in the calculations. The highest percent of MPE value was calculated to occur at a horizontal distance of 88 feet from the site (reference Figure 1).

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

Carrier	Number of Transmitters	Power out of Base Station Per Transmitter (Watts)	Antenna Height (Feet)	Distance to the Base of Antennas (Feet)	Power Density (mW/cm^2)	Limit (mW/cm^2)	% MPE
CSP	1	25.0	120.0	88	0.000021	0.516	0.00%
CSP	4	25.0	120.0	88	0.000086	0.536	0.02%
CSP	1	25.0	120.0	88	0.000051	0.516	0.01%
CSP	2	1.0	120.0	88	0.000000	1.000	0.00%
DOT	1	100.0	55.0	88	0.004445	0.200	2.22%
TOE HADDAM	2	50.0	55.0	88	0.004445	0.200	2.22%
TOE Haddam	1	25.0	25.0	88	0.001799	0.200	0.90%
Verizon 5G 3700 MHz	1	320.0	145.0	88	0.014919	1.000	1.49%
Verizon LTE 1900 MHz	1	160.0	145.0	88	0.000028	1.000	0.00%
Verizon LTE 2100 MHz	1	240.0	145.0	88	0.000209	1.000	0.02%
Verizon LTE 750 MHz	1	160.0	145.0	88	0.000402	0.500	0.08%
Verizon LTE 850 MHz	1	160.0	145.0	88	0.000532	0.567	0.09%
VS/QV	1	100.0	120.0	88	0.000162	0.307	0.05%
VS/QV	1	100.0	85.0	88	0.000277	0.307	0.09%
VS/QV	1	100.0	100.0	88	0.000044	0.200	0.02%
VS/QV	1	100.0	80.0	88	0.000346	0.200	0.17%
VS/QV	1	100.0	85.0	88	0.000277	0.300	0.09%
VS/QV	1	35.0	20.0	88	0.005417	0.467	1.16%
						Total	**8.66%**

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

[5] In the case where pattern data was unavailable from the manufacturer, vertical patterns with similar specifications were used

6. Conclusion

The above analysis verifies that RF exposure levels from the site with Verizon's proposed antenna configuration will be well below the maximum permissible levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Using the conservative calculation methods and parameters detailed above, the maximum cumulative percent of MPE in consideration of all transmitters is calculated to be **8.66% of the FCC limit (General Population/Uncontrolled).** This maximum cumulative percent of MPE value is calculated to occur 88 feet away from the site.

7. Statement of Certification

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

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

December 19, 2023
Date

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

December 21, 2023
Date

Attachment A: References

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

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

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

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

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

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

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

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

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

Table 3: FCC Limits for Maximum Permissible Exposure

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

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

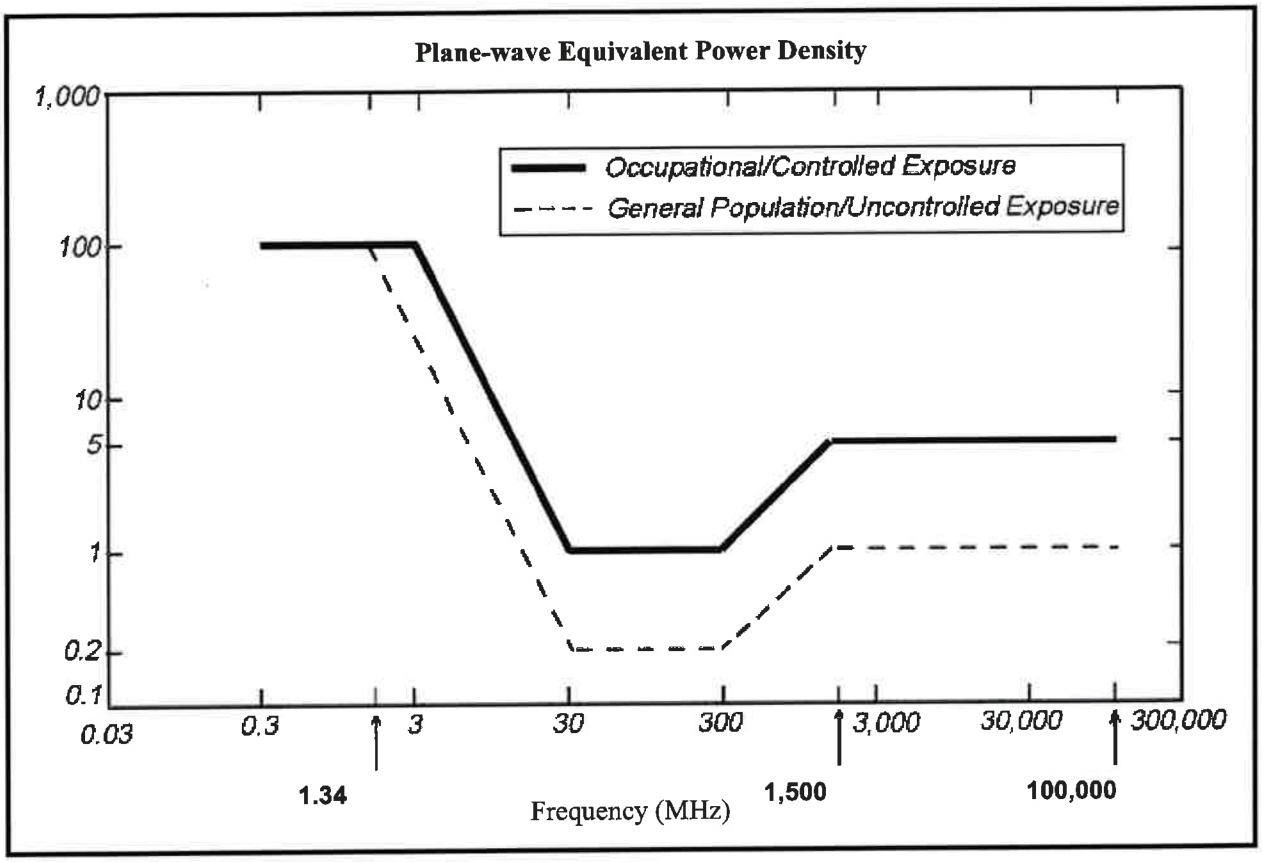


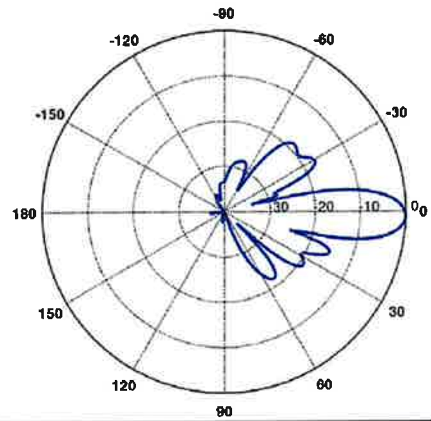
Figure 2: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

C2 Systems

Attachment C: Verizon Antenna Model Data Sheets and Electrical Patterns

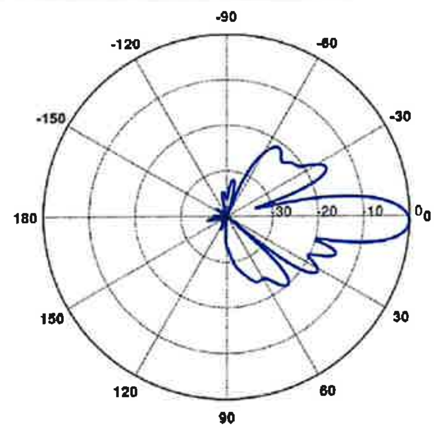
739 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-45B-2RB
Frequency Band:	698-806 MHz
Gain:	16.8 dBi
Vertical Beamwidth:	12.5°
Horizontal Beamwidth:	48°
Polarization:	±45°
Size L x W x D:	72.0" x 17.9" x 7.0"



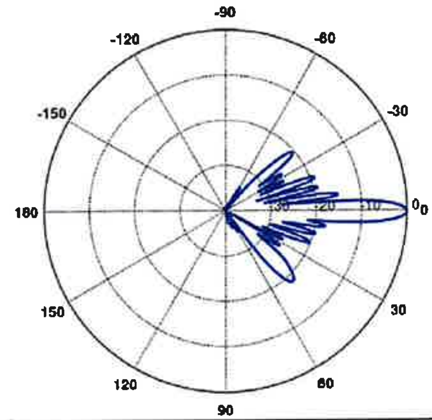
885 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-45B-2RB
Frequency Band:	806 - 896 MHz
Gain:	17.5 dBi
Vertical Beamwidth:	11.4°
Horizontal Beamwidth:	43°
Polarization:	±45°
Size L x W x D:	72.0" x 17.9" x 7.0"



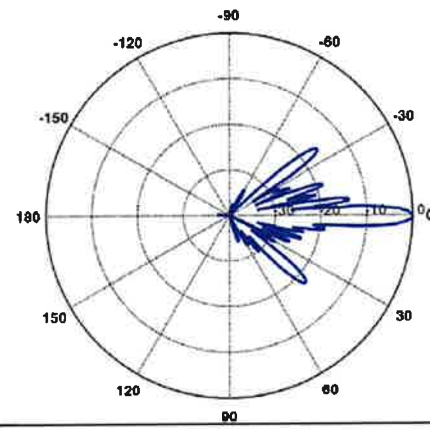
1900 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-45B-2RB
Frequency Band:	1850-1990 MHz
Gain:	19.9 dBi
Vertical Beamwidth:	5.4°
Horizontal Beamwidth:	43°
Polarization:	±45°
Size L x W x D:	72.0" x 17.9" x 7.0"



2100 MHz

Manufacturer:	COMMSCOPE
Model #:	NHH-45B-2RB
Frequency Band:	1920-2200 MHz
Gain:	20.3 dBi
Vertical Beamwidth:	5°
Horizontal Beamwidth:	41°
Polarization:	±45°
Size L x W x D:	72.0" x 17.9" x 7.0"



ATTACHMENT 8

```
****************************************************
*              Federal Airways & Airspace          *
* Summary Report: Alteration Of Existing Structure *
*                  Antenna Structure               *
****************************************************
```

Airspace User: Not Identified

File: EHADDAM3

Location: East Haddam, CT

Latitude: 41°-28'-12.04"   Longitude: 72°-24'-39.83"

SITE ELEVATION AMSL......595 ft.
STRUCTURE HEIGHT.........165 ft.
OVERALL HEIGHT AMSL......760 ft.

NOTICE CRITERIA

FAR 77.9(a): NNR (DNE 200 ft AGL)
FAR 77.9(b): NR (Exceeds Notice Slope, Maximum: 158 ft.)
FAR 77.9(c): NNR (Not a Traverse Way)
FAR 77.9: NNR FAR 77.9 IFR Straight-In Notice Criteria for 42B
FAR 77.9: NNR FAR 77.9 IFR Notice for SNC
FAR 77.9(d): NNR (Off Airport Construction)

NR = Notice Required
NNR = Notice Not Required
PNR = Possible Notice Required (depends upon actual IFR procedure)
For new construction review Air Navigation Facilities at bottom of this report.

If the proposed construction is an alteration to an existing structure, notice requirements may be superceded by the item exemptions listed below.

The location and analysis were based upon an existing structure. However, no existing aeronautical study number was identified. If the 'existing' structure penetrates an obstruction surface defined by CFR 77.17, 77.19, 77.21 or 77.23 (see below) it is strongly recommended the FAA be notified of the 'existing' structure to determine obstruction marking or lighting requirements. It is not uncommon for the FAA to issue a Determination of No Hazard (DNH) for an existing structure and modify the airspace to accommodate the structure, should that be required. If the FAA issues a DNH enter the aeronautical study number (ASN) in the space provided on the Airspace Analysis Window Form and re-run Airspace.

No frequencies were identified in this alteration are included in the FAA's Co-Location Policy published in the Federal Register November 15, 2007. Therefore, application of the Co-Location Policy notice exemption rule can not be applied.

Notice Criteria found in Title 14 CFR 77.9 applies to the alteration of existing structures.

OBSTRUCTION STANDARDS

FAR 77.17(a)(1): DNE 499 ft AGL
FAR 77.17(a)(2): DNE - Airport Surface
FAR 77.19(a): DNE - Horizontal Surface
FAR 77.19(b): DNE - Conical Surface
FAR 77.19(c): DNE - Primary Surface
FAR 77.19(d): DNE - Approach Surface
FAR 77.19(e): DNE - Approach Transitional Surface
FAR 77.19(e): DNE - Abeam Transitional Surface

VFR TRAFFIC PATTERN AIRSPACE FOR: 42B: GOODSPEED
Type: A RD: 15078.84 RE: 8.3

FAR 77.17(a)(1): DNE
FAR 77.17(a)(2): DNE - Height No Greater Than 200 feet AGL.
VFR Horizontal Surface: DNE
VFR Conical Surface: DNE
VFR Primary Surface: DNE
VFR Approach Surface: DNE
VFR Transitional Surface: DNE

The structure is within VFR - Traffic Pattern Airspace Runway Side Area. Structures that exceed horizontal, conical, and/or 500' AGL will receive a hazard determination from the FAA.

VFR TRAFFIC PATTERN AIRSPACE FOR: SNC: CHESTER
Type: A RD: 40098.11 RE: 395

FAR 77.17(a)(1): DNE
FAR 77.17(a)(2): Does Not Apply.
VFR Horizontal Surface: DNE
VFR Conical Surface: DNE
VFR Primary Surface: DNE
VFR Approach Surface: DNE
VFR Transitional Surface: DNE

TERPS DEPARTURE PROCEDURE (FAA Order 8260.3, Volume 4)

FAR 77.17(a)(3) Departure Surface Criteria (40:1)
The Maximum Height Permitted is 385 ft AMSL

MINIMUM OBSTACLE CLEARANCE ALTITUDE (MOCA)

FAR 77.17(a)(4) MOCA Altitude Enroute Criteria
The Maximum Height Permitted is 1600 ft AMSL

PRIVATE LANDING FACILITIES

FACIL IDENT	TYP	NAME	BEARING To FACIL	RANGE IN NM	DELTA ARP ELEVATION	FAA IFR

```
----- --- ---------------------------- --------   -----  --------- ---
CT86  HEL SANFORD                         160.32    2.3     +460
No Impact to Private Landing Facility
Structure is beyond notice limit by  8975 feet.

CT11  AIR DEVILS HOPYARD FLD              115.72    3.61    +635
Possible Impact to Private Landing Facility
Exceeds 261 ft VFR Transitional Surface (N/A Private Airport).
```

AIR NAVIGATION ELECTRONIC FACILITIES

FAC IDNT	TYPE	ST AT	FREQ	VECTOR	DIST (ft)	DELTA ELEVA	ST	LOCATION	GRND ANGLE	APCH BEAR
HFD	VOR/DME	R	114.9	329.14	72653	-89	CT	HARTFORD	-.07	
MAD	VOR/DME	I	110.4	233.5	95854	+544	CT	MADISON	.33	
GON	VOR/DME	R	110.8	117.43	110881	+751	CT	GROTON	.39	
ORW	VOR/DME	I	110.0	74.27	117078	+450	CT	NORWICH	.22	
BDL	RADAR ASR	I		336.62	186125	+524	CT	BRADLEY INTL	.16	
HTO	VORTAC	R	113.6	172.66	202447	+738	NY	HAMPTON	.21	
QVH	RADAR ARSR	Y	1326.9	199.35	228472	+409	NY	RIVERHEAD	.10	
PVD	RADAR ASR	I	2735.	67.38	240350	+194	RI	THEODORE FRANCIS	.05	

5G AIRPORT SAFETY AREA
No Identified 5G conflict.

CFR Title 47, §1.30000-§1.30004
AM STUDY NOT REQUIRED: Structure is not near a FCC licensed AM station.
Movement Method Proof as specified in §73.151(c) is not required.
Please review 'AM Station Report' for details.

Nearest AM Station: WLIS @ 15969 meters.

Airspace® Summary Version 23.11.692

12-12-2023

10:35:29

ATTACHMENT 9

Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts
and New York

February 22, 2024

Via Certificate of Mailing

Irene M. Haines, First Selectman
Town of East Haddam
1 Plains Road
Moodus, CT 06469

Re: **Cellco Partnership d/b/a Verizon Wireless – Petition for Declaratory Ruling Filed with the Connecticut Siting Council for the Modification of an Existing Telecommunications Facility at 194 Mount Parnassus Road, East Haddam, Connecticut**

Dear First Selectman Haines:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") seeking approval to modify the existing wireless telecommunications facility at 194 Mount Parnassus Road in East Haddam, Connecticut (the "Property"). The modifications involve the extension of the existing 121-foot lattice tower by 40 feet, to an overall height of 161 feet. The extended tower would continue to support the State and municipal emergency service antennas and new antennas installed by Cellco. Equipment associated with Cellco's antennas would be located on the ground near the base of the tower within the existing facility compound.

A copy of the full Petition is attached for your review. If you have any questions regarding this Petition, please contact me or the Siting Council directly at (860) 827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

28513044-v1

Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts
and New York

February 22, 2024

Via Certificate of Mailing

James Ventres, Land Use Administrator
Town of East Haddam
1 Plains Road
Moodus, CT 06469

Re: **Cellco Partnership d/b/a Verizon Wireless – Petition for Declaratory Ruling Filed with the Connecticut Siting Council for the Modification of an Existing Telecommunications Facility at 194 Mount Parnassus Road, East Haddam, Connecticut**

Dear Mr. Ventres:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") seeking approval to modify the existing wireless telecommunications facility at 194 Mount Parnassus Road in East Haddam, Connecticut (the "Property"). The modifications involve the extension of the existing 121-foot lattice tower by 40 feet, to an overall height of 161 feet. The extended tower would continue to support the State and municipal emergency service antennas and new antennas installed by Cellco. Equipment associated with Cellco's antennas would be located on the ground near the base of the tower within the existing facility compound.

A copy of the full Petition is attached for your review. If you have any questions regarding this Petition, please contact me or the Siting Council directly at (860) 827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

28513192-v1

Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts
and New York

February 22, 2024

Via Certificate of Mailing

State of Connecticut
Department of Transportation
2800 Berlin Turnpike
Newington, CT 06131

Re: **Cellco Partnership d/b/a Verizon Wireless – Petition for Declaratory Ruling Filed with the Connecticut Siting Council for the Modification of an Existing Telecommunications Facility at 194 Mount Parnassus Road, East Haddam, Connecticut**

Dear Sir or Madam:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") seeking approval to modify the existing wireless telecommunications facility at 194 Mount Parnassus Road in East Haddam, Connecticut (the "Property"). The modifications involve the extension of the existing 121-foot lattice tower by 40 feet, to an overall height of 161 feet. The extended tower would continue to support the State and municipal emergency service antennas and new antennas installed by Cellco. Equipment associated with Cellco's antennas would be located on the ground near the base of the tower within the existing facility compound.

A copy of the full Petition is attached for your review. If you have any questions regarding this Petition, please contact me or the Siting Council directly at (860) 827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

28513233-v1

ATTACHMENT 10

Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts
and New York

February 22, 2024

Via Certificate of Mailing

«Name_and_Address»

Re: **Petition for Declaratory Ruling Filed with the Connecticut Siting Council for the Modification of an Existing Telecommunications Facility at 194 Mount Parnassus Road, East Haddam, Connecticut**

Dear «Salutation»:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") seeking approval to modify the existing wireless telecommunications facility at 194 Mount Parnassus Road in East Haddam, Connecticut (the "Property"). The modifications involve the extension of the existing 121-foot lattice tower by 40 feet, to an overall height of 161 feet. The extended tower would continue to support the State and municipal emergency service antennas and new antennas installed by Cellco. Equipment associated with Cellco's antennas would be located on the ground near the base of the tower within the existing facility compound.

This notice is being sent to you because you are identified on the Town Assessor's records as an owner of land that abuts the Property. If you have any questions regarding the Petition, the Council's process for reviewing the Petition or the details of the filing itself, please feel free to contact me at the number listed above. You may also contact the Council directly at 860-827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

28513246-v1

verizon

SITE NAME: EAST HADDAM 3 CT
LOCATION CODE (PSLC): 300023
PROJECT ID: 17133983
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

PERMITTING

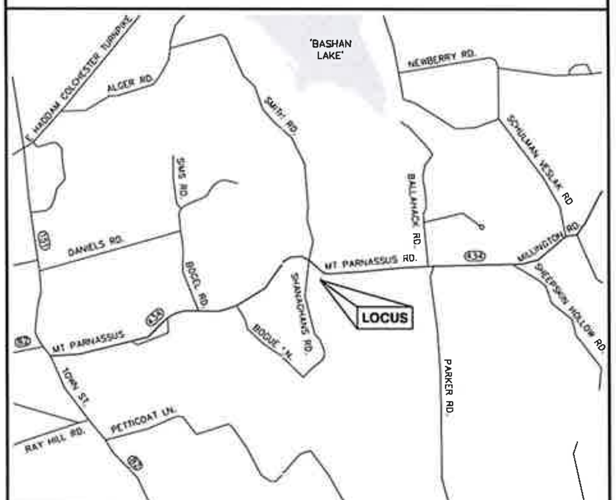
DRAWING INDEX

SHEET	DESCRIPTION	REVISION
T-1	TITLE SHEET	1
Z-1	OVERALL SITE PLAN	1
Z-2	COMPOUND PLAN AND ELEVATION	1
D-1 TO D-3	DETAILS	1

GENERAL NOTES

1. CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE ENGINEER & OWNER REPRESENTATIVE IN WRITING OF DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.
2. ALL UNDERGROUND UTILITY INFORMATION WAS DETERMINED FROM SURFACE INVESTIGATIONS AND EXISTING PLANS OF RECORD. THE CONTRACTOR SHALL LOCATE ALL UNDERGROUND UTILITIES IN THE FIELD PRIOR TO ANY SITE WORK. CALL DIG-SAFE (888) 344-7233 (OR 811) 72-HOURS PRIOR TO ANY EXCAVATION.
3. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH THE LATEST VERIZON WIRELESS CONSTRUCTION GUIDELINES.
4. NEW CONSTRUCTION WILL CONFORM TO ALL APPLICABLE CODES AND ORDINANCES:
   BUILDING CODE: 2022 CONNECTICUT STATE BUILDING CODE (IBC 2021) AND AMENDMENTS
   ELECTRICAL CODE: 2020 NEC (NFPA-70) WITH CONNECTICUT AMENDMENTS
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE PASSING ANTENNA MOUNT ANALYSIS REPORT BY CENTEK ENGINEERING DATED OCTOBER 9, 2023.
6. REFER TO PASSING STRUCTURAL ANALYSIS BY CENTEK ENGINEERING DATED OCTOBER 6, 2023.
7. THE CONSTRUCTION SHOWN HEREIN MAY REQUIRE SPECIAL INSPECTIONS UNDER THE STATE BUILDING CODE. APPLICANT/CONTRACTOR SHALL VERIFY WITH THE AUTHORITIES HAVING JURISDICTION (AHJ) PRIOR TO CONSTRUCTION AND ENGAGE THE INSPECTOR AND/OR APPROPRIATE 3RD PARTIES AS MAY BE REQUIRED.

VICINITY MAP



SCALE: 1" = 2000'± (22x34)
1" = 4000'± (11x17)

PROJECT INFORMATION

SITE TYPE:	CO-LOCATION ON EXISTING SELF-SUPPORT TOWER TO BE EXTENDED
SITE NAME:	EAST HADDAM 3 CT
LOCATION CODE (PSLC):	300023
FUZE ID:	17133983
RFDS DATE:	08/01/23 REV1
SITE ADDRESS:	194 MT PARNASSUS ROAD EAST HADDAM, CT 06423
COUNTY:	MIDDLESEX
PARCEL #:	039-064
TOWER LATITUDE:	41° 28' 12.04"± N (41.470012°± N) (RECORD SURVEY 1-A)
TOWER LONGITUDE:	72° 24' 39.63"± W (72.411064°± W) (RECORD SURVEY 1-A)
TOWER GROUND ELEV.:	595.0'± (AMSL) (RECORD SURVEY 1-A)
DATUM:	NAD83/NAVD88
STRUCTURE HEIGHT: HIGHEST APPURTENANCE:	161'± (TOP OF SELF-SUPPORT TOWER) 165'± (TOP OF LIGHTNING ROD)
PROPERTY OWNER:	N/F STATE OF CONNECTICUT 2800 BERLIN TURNPIKE NEWINGTON, CT 06131
TOWER OWNER:	STATE OF CONNECTICUT
TOWER OWNER ADDRESS:	STATE OF CONNECTICUT PUBLIC SAFETY DEPT. 1111 COUNTRY CLUB ROAD MIDDLETOWN, CT 06457
APPLICANT:	CELLCO PARTNERSHIP, A DELAWARE GENERAL PARTNERSHIP, dba VERIZON WIRELESS 20 ALEXANDER DRIVE, SECOND FLOOR WALLINGFORD, CT 06492
SITE ENGINEER:	PROTERRA DESIGN GROUP, LLC 4 BAY ROAD BUILDING A, SUITE 200 HADLEY, MA 01035 (413) 320-4918

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A, Suite 200
Hadley, MA 01035
Ph (413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

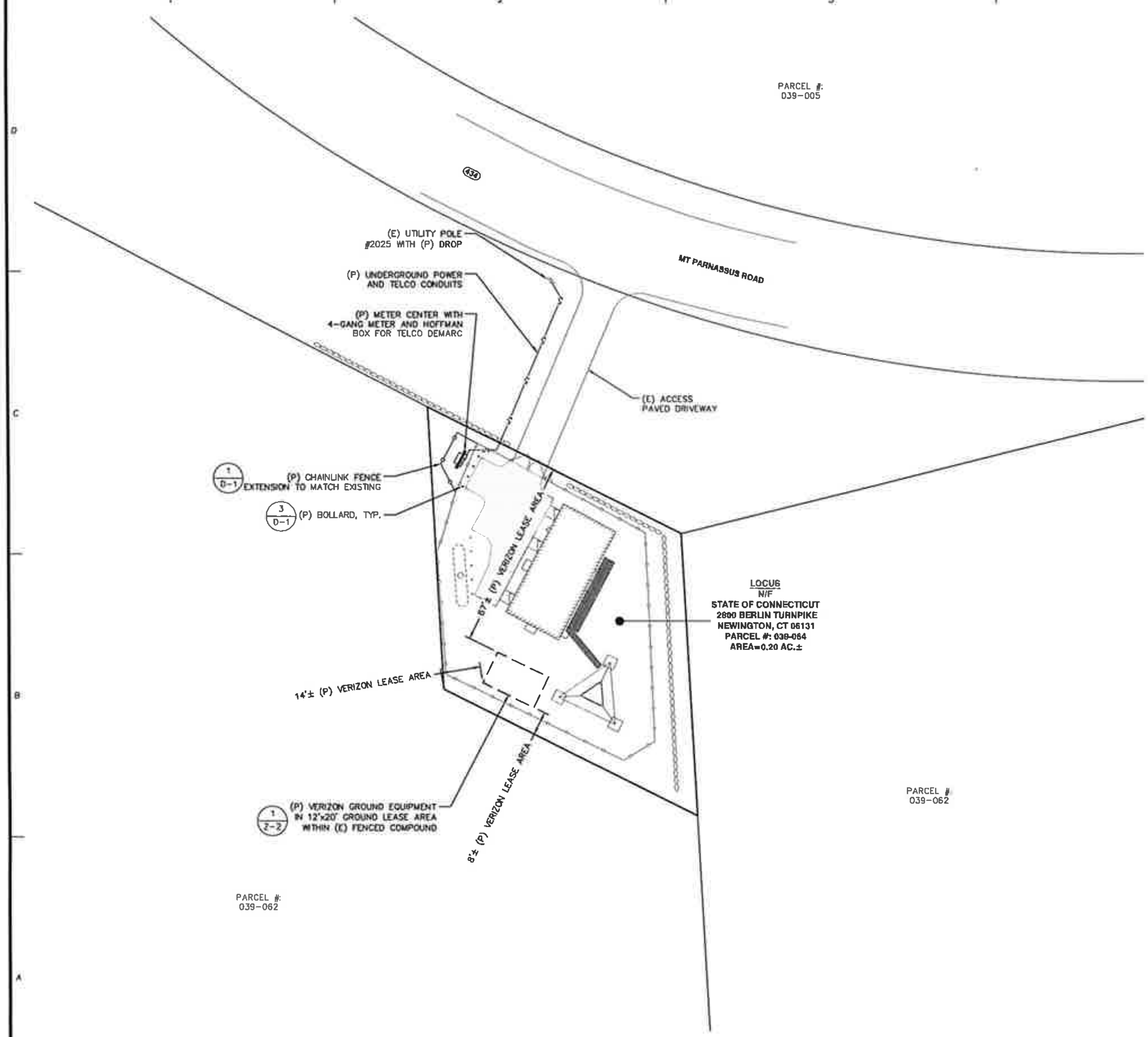
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
2/6/24

DATE:	02/06/24
DRAWN:	TBD/PN
CHECK:	JMM/TEJ
SCALE:	SEE PLAN
JOB NO.:	13-030

SHEET TITLE:
TITLE SHEET

T-1



OVERALL SITE PLAN

SCALE: 1"=20' (22x34) 1"=40' (11x17)

(E) EXISTING
(P) PROPOSED
(F) FUTURE

GENERAL NOTES

1. THE TYPE, DIMENSIONS, MOUNTING HARDWARE, AND POSITIONS OF ALL PROJECT OWNER'S EQUIPMENT ARE SHOWN IN ILLUSTRATIVE FASHION. ACTUAL HARDWARE DETAILS AND FINAL LOCATIONS MAY DIFFER SLIGHTLY FROM WHAT IS SHOWN.
2. THE PROJECT OWNER'S PCS FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.
3. THE DESIGN OF THE TOWER, FOUNDATION AND ANTENNA MOUNTING HARDWARE WILL MEET THE ANSI/EIA/TIA-222-H STANDARDS FOR STRUCTURAL STEEL ANTENNA SUPPORTING STRUCTURES AND STATE BUILDING CODE REQUIREMENTS. DETAILED CONSTRUCTION DRAWINGS AND STRUCTURAL CALCULATIONS WILL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED WITH A BUILDING PERMIT APPLICATION FOR REVIEW AND APPROVAL BY THE LOCAL BUILDING CODE ENFORCEMENT OFFICIAL.
4. ONCE THE FACILITY BECOMES FULLY OPERATIONAL, NORMAL AND ROUTINE MAINTENANCE BY TOWER OWNER'S AND CARRIER'S TECHNICIANS WILL BE PERFORMED. THE ESTIMATED VEHICULAR TRAFFIC GENERATED BY THESE VISITS IS PREDICTED TO BE LESS THAN THE TYPICAL TRAFFIC GENERATED BY A SINGLE-FAMILY DWELLING.
5. THE PROPOSED INSTALLATION WILL BE CO-LOCATED ON A EXISTING MONOPOLE TOWER AND WITHIN AN EXISTING FENCED COMPOUND. IT HAS BEEN ASSUMED THAT THE EXISTING TOWER AND COMPOUND WAS LAWFULLY APPROVED BY THE AUTHORITIES HAVING JURISDICTION.
6. THE PROPOSED INSTALLATION TO BE IN COMPLIANCE WITH BUILDING CODE 2022 CONNECTICUT STATE BUILDING CODE (IBC 2021) AND AMENDMENTS.

REFERENCES

STATE OF CONNECTICUT CTS EAST HADDAM REMOTE SITE ENHANCEMENT (SITE #52) DEPARTMENT OF EMERGENCY SERVICES AND PUBLIC PROTECTION (DESPP) 90% CONSTRUCTION DOCUMENTS SUBMISSION NOVEMBER 25, 2014.

PROPERTY/TOPOGRAPHY SURVEY - PLAN PREPARED BY MILONE & MACBROOM DATED JULY 1, 2014.

ZONING INFORMATION - 'ZONING REGULATIONS EAST HADDAM CONNECTICUT' REVISED TO: APRIL 1, 2023 AND EAST HADDAM ZONING MAP - 2021 CONTAINED THEREIN.

RECORD 1-A TOWER BY NORTHEAST SURVEY CONSULTANTS PC CERTIFICATION BY CHARLES G. GIDMAN, PLS-CT DATED SEPTEMBER 25, 2023.

WETLAND: TOWN OF EAST HADDAM CT ONLINE GIS WETLANDS MAP (HTTPS://WWW.AXISGIS.COM/EAST_HADDAMCT/)

TELECOMMUNICATION FACILITY SURVEY: LIMITED COMPASS & TAPE SURVEY PERFORMED BY PROTERRA DESIGN GROUP, LLC ON JULY 6, 2023.

PROTERRA DESIGN GROUP, LLC DID NOT PERFORM AN ON-THE-GROUND SURVEY IN CONJUNCTION WITH THIS PROJECT. THE PLAN IS INTENDED FOR CO-LOCATION OF WIRELESS INFRASTRUCTURE WITHIN AN EXISTING FENCED COMPOUND & LAWFULLY CONSTRUCTED SELF-SUPPORT TOWER. THE PLAN SHALL BE USED FOR NO OTHER PURPOSE.

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A; Suite 200
Hadley, MA 01035
Ph: (413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

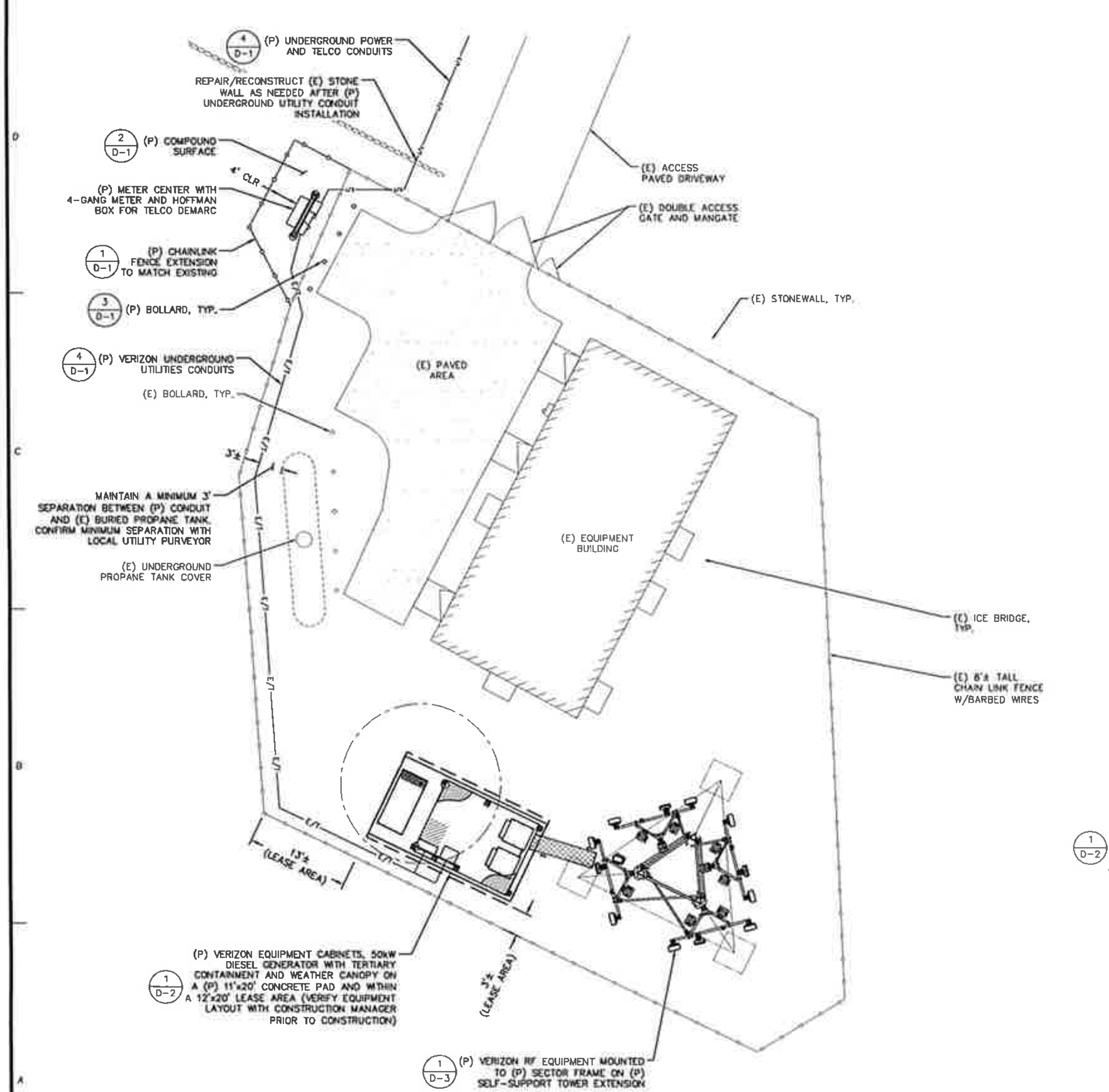
TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
2/6/24

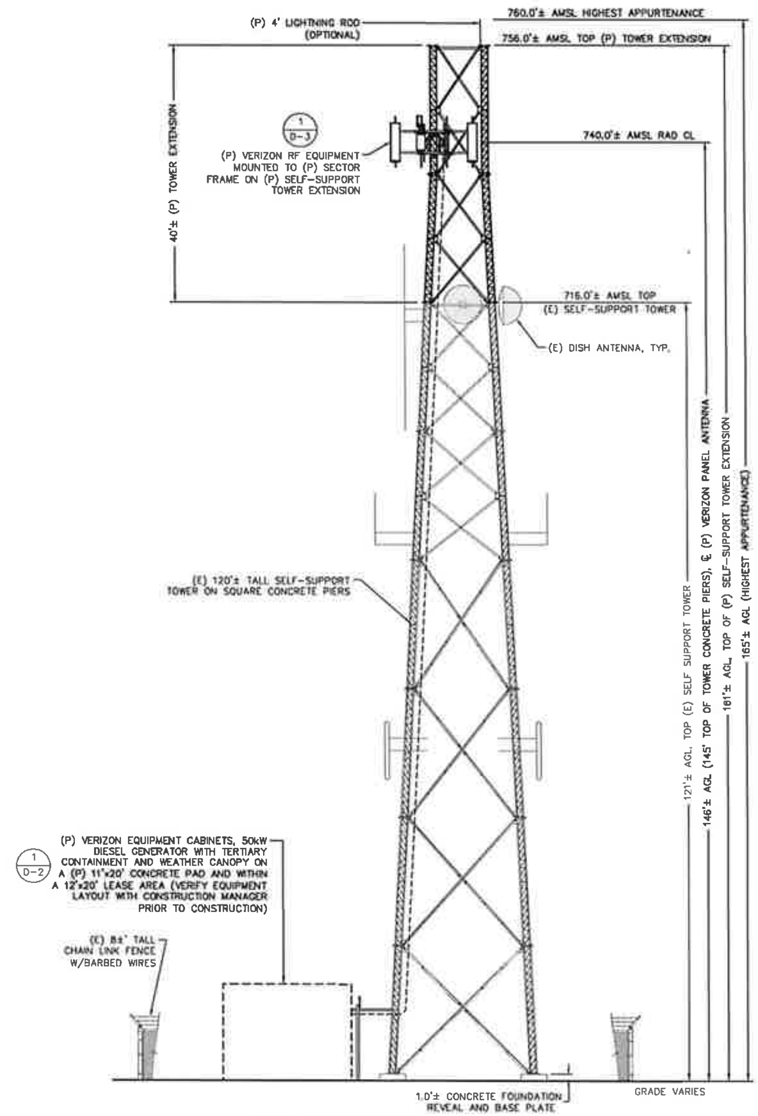
DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:
OVERALL SITE PLAN

Z-1



COMPOUND PLAN (1 / Z-2)
SCALE: 1"=8' (22x34) 1"=16' (11x17)

(E) EXISTING
(P) PROPOSED
(F) FUTURE



TOWER GROUND ELEVATION: 595.0'± (AMSL)
(RECORD SURVEY 1A BY NORTHEAST SURVEY CONSULTANTS PC)

SOUTHWEST ELEVATION (2 / Z-2)
SCALE: 1"=10' (22x34) 1"=20' (11x17)

(E) = EXISTING
(P) = PROPOSED

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A, Suite 200
Hadley, MA 01035
Ph (413) 320-4918

CONSULTANTS:

NO	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

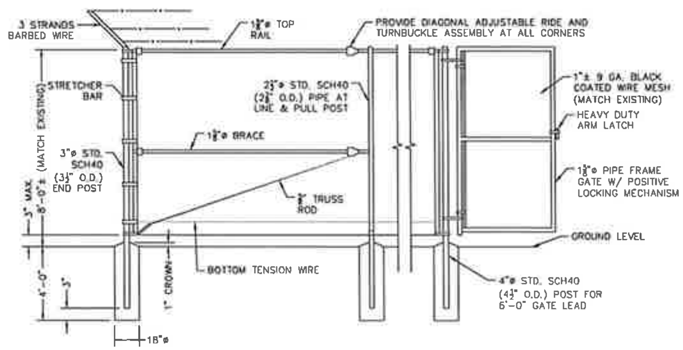
TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

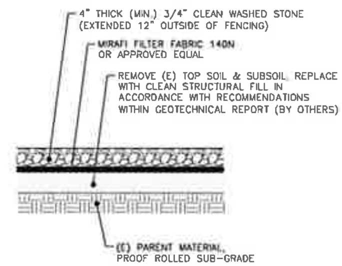
STAMP:

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:
COMPOUND PLAN & ELEVATION

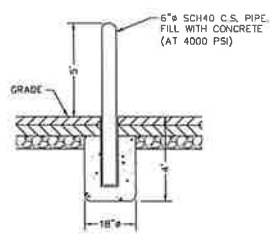
Z-2



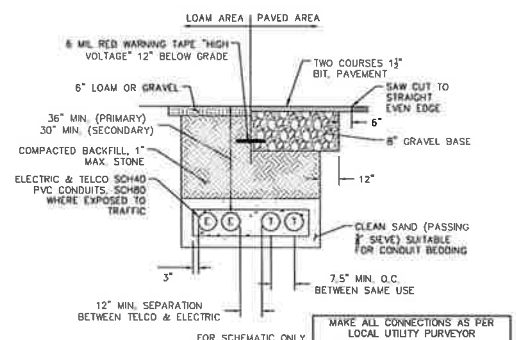
CHAIN LINK FENCE (1 / D-1)
SCALE: NONE



COMPOUND SURFACE (2 / D-1)
SCALE: NONE



BOLLARD (3 / D-1)
SCALE: NONE



MAKE ALL CONNECTIONS AS PER LOCAL UTILITY PURVEYOR SPECIFICATIONS/REQUIREMENTS

NOTES
1. MAKE ALL CONNECTIONS AS PER UTILITY COMPANY AND NEC REQUIREMENTS.
2. CONCRETE ENCASE PER THE REQUIREMENTS OF THE UTILITY COMPANY OR WHERE MIN. COVER OVER CONDUIT IS REDUCED BY SITE CONDITIONS.
3. VERIFY CONDUIT SIZE WITH NEC.

BURIED CONDUIT SECTION (4 / D-1)
SCALE: NONE

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A, Suite 200
Hadley, MA 01035
Ph (413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

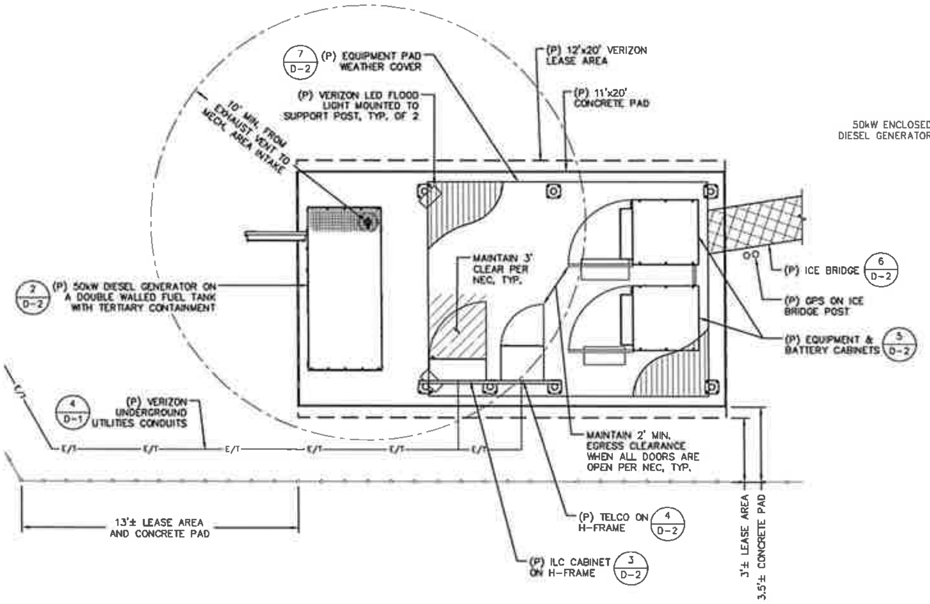
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE, SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
2/6/24

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:

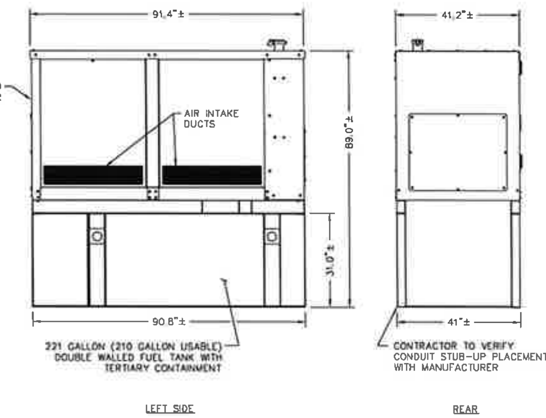
DETAILS

D-1



EQUIPMENT LAYOUT PLAN (1/D-2)

SCALE: 1"=3' (22x34) 1"=6' (11x17)

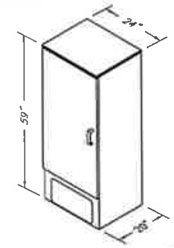


50kW AC GENERATOR WITH TERTIARY CONTAIMENT (2/D-2)

SCALE: NONE

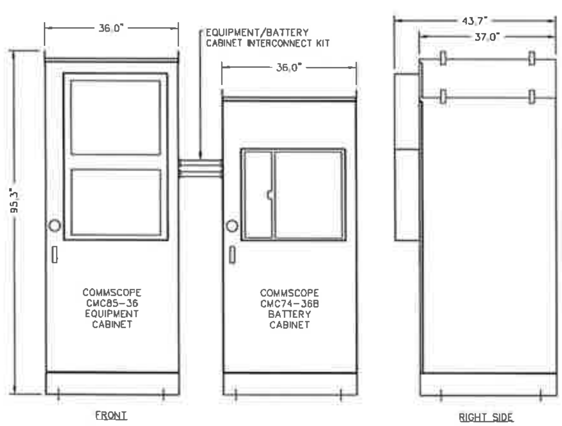
INTEGRATED LOAD CENTER (ILC) CABINET (3/D-2)

SCALE: NONE



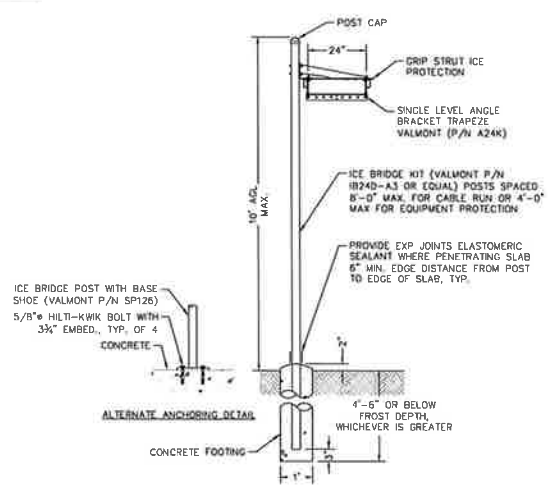
TELCO CABINET (4/D-2)

SCALE: NONE



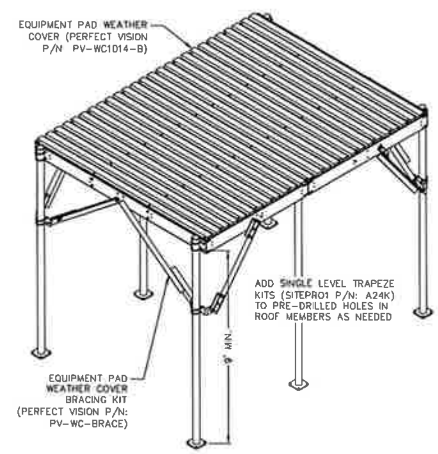
EQUIPMENT & BATTERY CABINET DETAIL (5/D-2)

SCALE: NONE



ICE BRIDGE DETAIL (6/D-2)

SCALE: NONE



EQUIPMENT PAD WEATHER COVER DETAIL (7/D-2)

SCALE: NONE

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A, Suite 200
Hadley, MA 01035
Ph: (413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

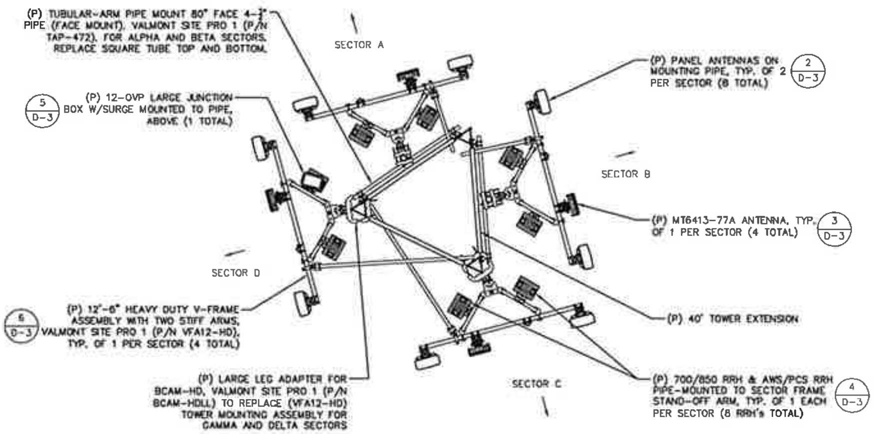
APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:

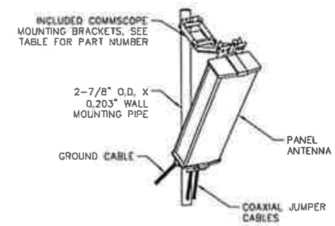
DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:

DETAILS

D-2

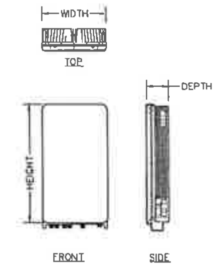


ANTENNA PLAN (1 / D-3)
SCALE: 1"=4' (22x34) 1"=8' (11x17)



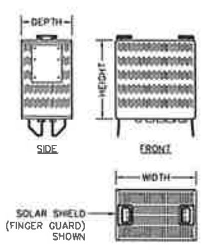
MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT	MOUNT BRACKET
COMMSCOPE NHH-45B-R2B	72.0"	18.0"	7.0"	74±lbs.	BSAMNT-3 (3 MOUNTING BRACKETS PER KIT)

PANEL ANTENNA DETAIL (2 / D-3)
SCALE: NONE



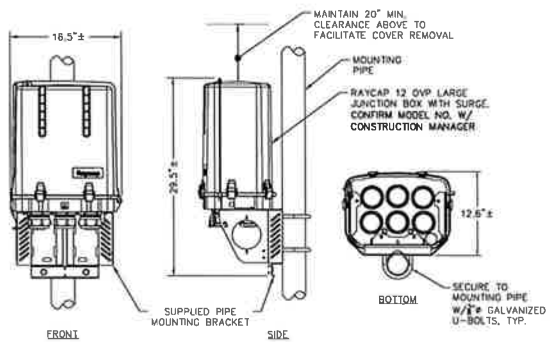
MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
MT6413-77A - ANTENNA	28.9"±	15.8"±	5.5"±	57±lbs.

L-SUB6 ANTENNA DETAIL (3 / D-3)
SCALE: NONE

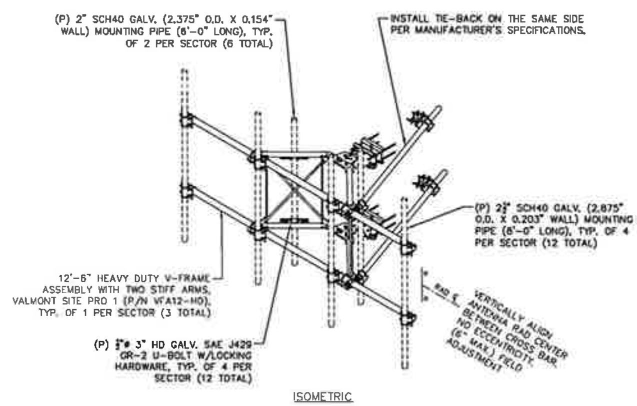


MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
SAMSUNG CRAN RRH (RF4461d-13A)	14.96"	14.96"	10.24"	79±lbs.
SAMSUNG B2/B66a CRAN RRH (RF4439d-25A)	14.96"	14.96"	10.04"	75±lbs.

RRH DETAIL (4 / D-3)
SCALE: NONE



LARGE JUNCTION BOX WITH SURGE PIPE MOUNTING DETAIL (5 / D-3)
SCALE: NONE



SECTOR FRAME DETAIL (6 / D-3)
SCALE: NONE

ProTerra DESIGN GROUP, LLC
4 Bay Road
Building A, Suite 200
Hadley, MA 01035
Ph:(413) 320-4918

CONSULTANTS:

NO.	DATE	REVISIONS
A	11/27/23	PERMITTING REVIEW
0	12/12/23	ISSUED FOR PERMITTING
1	02/06/24	ISSUED FOR PERMITTING

TITLE:
EAST HADDAM 3 CT
LOCATION CODE: 300023
ADDRESS: 194 MT PARNASSUS ROAD
EAST HADDAM, CT 06423

APPLICANT:
verizon
BELL ATLANTIC MOBILE SYSTEMS, LLC
dba VERIZON WIRELESS
20 ALEXANDER DRIVE,
SECOND FLOOR
WALLINGFORD, CT 06492

STAMP:
2/6/24

DATE: 02/06/24
DRAWN: TBD/PN
CHECK: JMM/TEJ
SCALE: SEE PLAN
JOB NO.: 13-030
SHEET TITLE:
DETAILS
D-3

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS

ABUTTING PROPERTY OWNERS

194 MOUNT PARNASSUS ROAD
EAST HADDAM, CONNECTICUT

	Property Address	**Owner's and Mailing Address**
1.	122 Shanaghan Road	John Shanaghan and Karen Clifford 176 Mt. Parnassus Road East Haddam, CT 06423
2.	200 Mt. Parnassus Road	Chester and Carol Slabinski 200 Mt. Parnassus Road East Haddam, CT 06423
3.	Mt. Parnassus Road	Richard Clifford and Gale Cummings 29 Laurel Cove Beach Road East Haddam, CT 06423
4.	203 Mt. Parnassus Road	Thomas Comer 203 Mt. Parnassus Road East Haddam, CT 06423