EVERSOURCE ENERGY

56 Prospect Street,
P.O. Box 270
Hartford, CT 06103

Kathleen M. Shanley
Manager – Transmission Siting
Tel: (860) 728-4527

October 2, 2020

Melanie A. Bachman
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RE: **Notice of Exempt Modification**
**Eversource Site # ES-055 Willimantic**
**349R Mountain Street, Windham, CT 06280**
**Latitude: 41-42-10.84 N / Longitude: 72-13-17.01 W**

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains multiple antennas at various mounting heights on an existing 196-foot self-support tower located at 349R Mountain Street in Windham. See Attachment A, Parcel Map and Property Card. The tower and property are owned by SBA Properties Inc., doing business as SBA Communications Corporation ("SBA"). Eversource and SBA have entered into an agreement allowing the modification of Eversource's equipment on the existing tower. See Attachment B, Letter of Authorization. Eversource plans to install two 4-foot 3-inch tall omni-directional antennas, to be mounted at approximately 161 feet and 153 feet above ground level ("AGL"), and two 7/8-inch diameter coaxial cables. There will be no changes to the fenced compound, the tower or the existing antennas and equipment on the tower. The tower and existing and proposed equipment are depicted on Attachment C, Construction Drawings, dated June 18, 2020 and Attachment D, Structural Analysis, dated March 3, 2020. The Connecticut Siting Council approved Eversource's use of the tower at this location in Petition No. 910 in August 2009.

The proposed installation is part of Eversource's program to update the current obsolete analog voice radio communications system to a modern digital voice communications system. The new system will enable the highest level of voice communications under all operating conditions, including during critical emergency and storm restoration activities. The new radio system will also provide for remote control of distribution safety equipment.

Please accept this letter as notification, pursuant to Regulations of Connecticut State Agencies ("R.C.S.A.") §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being delivered to Victor Funderburk, Mayor of the Town of Windham, Jim Rivers, Town Manager of the Town of Windham, and Matthew Vertefeuille, Director of Code Enforcement of the Town of Windham, via private carrier. Proof of delivery is attached. See Attachment E, Proof of Delivery of Notice.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2):

1. There will be no change to the height of the existing tower.
2. The proposed modifications will not require extension of the site boundary.
3. The proposed modification will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the new antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard as shown in the attached Radio Frequency Emissions Report, dated June 30, 2020. (Attachment F – Power Density Report[1])
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, Eversource respectfully submits that the proposed modifications to the above referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2). One original copy of this notice has been provided via courier to the Council.

Communications regarding this Notice of Exempt Modification should be directed to Kathleen Shanley at (860) 728-4527.

By: _____
Kathleen M. Shanley
Manager – Transmission Siting

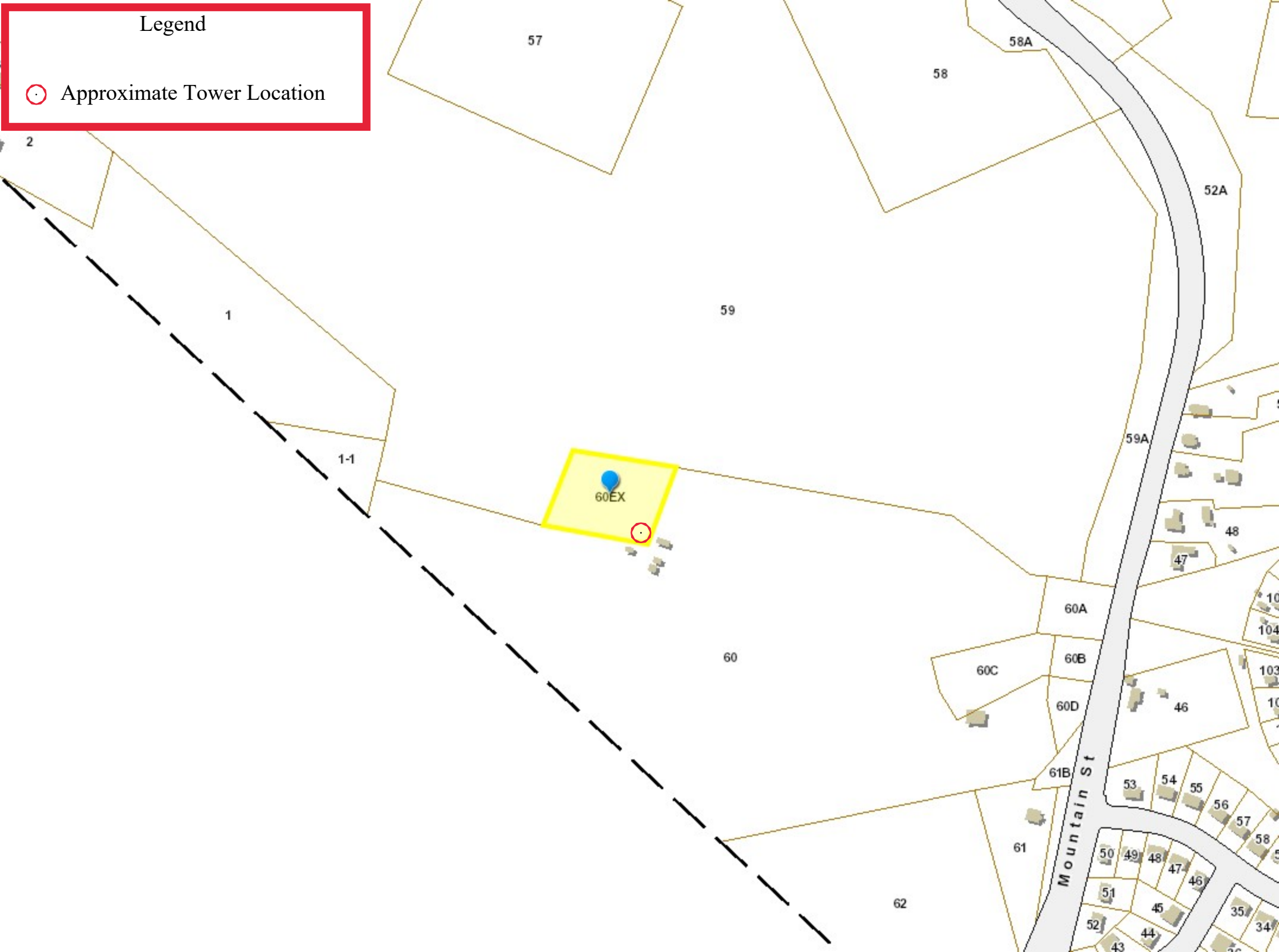
cc: Honorable Victor Funderburk, Mayor, Town of Windham
Jim Rivers, Town Manager, Town of Windham
Matthew Vertefeuille, Director of Code Enforcement
SBA

Attachments

A. Parcel Map and Property Card
B. Letter of Authorization
C. Construction Drawings
D. Structural Analysis
E. Proof of Delivery of Notice
F. Power Density Report

[1] Receive-only antennas are not included in the Power Density Report, as they are irrelevant to the % MPE calculations.

ATTACHMENT A – PARCEL MAP AND PROPERTY CARD


Legend
Approximate Tower Location
57
58
58A
52A
2
1
1-1
59
59A
60EX
60
60A
60B
60C
60D
61
61B
62
48
47
46
Mountain St
53
54
55
56
57
58
50
49
48
47
46
51
45
52
44
43
35
34

**Property Location:** 349R MOUNTAIN ST | **MAP ID:** 3/9 154/ 60/EX / | **Bldg Name:** | **State Use:** 304

**Vision ID:** 5568 | **Account #** 00004100 | **Bldg #:** 1 of 1 | **Sec #:** 1 of 1 | **Card** 1 of 1 | **Print Date:** 12/05/2018 18:06

| CURRENT OWNER | TOPO. | UTILITIES | STRT./ROAD | LOCATION |
|---|---|---|---|---|
| SBA PROPERTIES INC | 2 Above Street | 5 Well | 3 Unpaved | |
| 8051 CONGRESS AVE | 5 Steep | 6 Septic | | |
| BOCA RATON, FL 33487 | | 0 None | | |
| Additional Owners: | | | | |

**SUPPLEMENTAL DATA**

| | | | |
|---|---|---|---|
| Other ID: | 3- 9/154/ 60EX | LCI | C |
| Zoning | R4 | ParcelStatus | |
| Neighborhood | 250 - 0 | Cost Flag | |
| Living Units | 0 | Lot Number | 0 |
| Census | 8004 | A_D | |
| District No | 2 | | |
| GIS ID: | | ASSOC PID# | |

**CURRENT ASSESSMENT**

| Description | Code | Appraised Value | Assessed Value |
|---|---|---|---|
| UTL LAND | 4-1 | 124,400 | 87,080 |
| UTL BLDG | 4-2 | 29,900 | 20,930 |
| UTL OUTBL | 4-3 | 17,020 | 11,920 |
| | Total | 171,320 | 119,930 |

6163
WINDHAM, CT

**VISION**

**RECORD OF OWNERSHIP**

| RECORD OF OWNERSHIP | BK-VOL/PAGE | SALE DATE | q/u | v/i | SALE PRICE | V.C. |
|---|---|---|---|---|---|---|
| SBA PROPERTIES INC | 631/ 299 | 04/10/2001 | U | I | 108,650 | 22 |
| NUTMEG BROADCASTING COMPANY | 343/ 130 | 09/10/1990 | U | I | 0 | 0 |
| NUTMEG BROADCASTING COMPANY | 304/ 277 | 10/09/1987 | Q | I | 75,000 | |
| SYNCOM CAPITAL CORPORATION | 285/ 647 | 09/01/1985 | U | I | 0 | |
| DELTA COMMUNICATIONS CORPORATION | 263/ 635 | 06/01/1980 | U | I | 0 | |
| DAWSON JEROME & HILDA | 241/ 106 | 04/01/1975 | U | I | 0 | |

**PREVIOUS ASSESSMENTS (HISTORY)**

| Yr. | Code | Assessed Value | Yr. | Code | Assessed Value | Yr. | Code | Assessed Value |
|---|---|---|---|---|---|---|---|---|
| 2017 | 4-1 | 87,080 | 2016 | 4-1 | 87,080 | 2015 | 300 | 26,810 |
| 2017 | 4-2 | 26,810 | 2016 | 4-2 | 26,810 | 2015 | 300 | 87,080 |
| 2017 | 4-3 | 0 | 2016 | 4-3 | 0 | | | |
| | Total: | 113,890 | | Total: | 113,890 | | Total: | 113,890 |

**EXEMPTIONS**

| Year | Type | Description | Amount |
|---|---|---|---|
| | | | |
| | | Total: | |

**OTHER ASSESSMENTS**

| Code | Description | Number | Amount | Comm. Int. |
|---|---|---|---|---|
| | | | | |

*This signature acknowledges a visit by a Data Collector or Assessor*

**APPRAISED VALUE SUMMARY**

| | |
|---|---|
| Appraised Bldg. Value (Card) | 29,900 |
| Appraised XF (B) Value (Bldg) | 0 |
| Appraised OB (L) Value (Bldg) | 17,020 |
| Appraised Land Value (Bldg) | 124,400 |
| Special Land Value | 0 |
| Total Appraised Parcel Value | 171,320 |
| Valuation Method: | C |
| Adjustment: | 0 |
| **Net Total Appraised Parcel Value** | **171,320** |

**ASSESSING NEIGHBORHOOD**

| NBHD/ SUB | NBHD Name | Street Index Name | Tracing | Batch |
|---|---|---|---|---|
| 0001/A | | | 433 | I |

**NOTES**

**BUILDING PERMIT RECORD**

| Permit ID | Issue Date | Type | Description | Amount | Insp. Date | % Comp. | Date Comp. | Comments |
|---|---|---|---|---|---|---|---|---|
| 34217 | 03/12/2018 | 53 | Cell Tower/Antennae | 15,000 | | 0 | | |
| 32161 | 09/13/2016 | 53 | Cell Tower/Antennae | 79,651 | | 0 | | |
| 14063 | 07/01/2003 | BP | | 6,000 | 07/10/2003 | 0 | 07/10/2003 | 06-26 |
| 13760 | 05/07/2003 | BP | | 54,000 | 09/10/2003 | 0 | 09/10/2003 | 34-26 |
| 11453 | 03/13/2002 | BP | | 30,000 | 09/09/2002 | 0 | 09/09/2002 | 34-26 |
| 10561 | 04/16/2001 | BP | | 2,000 | 04/17/2001 | 0 | 04/17/2001 | 06-26 |
| 3086 | 03/01/1992 | BP | | 0 | | 0 | | 16 26 #274 |

**VISIT/ CHANGE HISTORY**

| Date | Type | IS | ID | Cd. | Purpose/Result |
|---|---|---|---|---|---|
| 10/02/2002 | | | BM | 1 | ENTRY + SIGN |

**LAND LINE VALUATION SECTION**

| B # | Use Code | Use Description | Zone | D | Front | Depth | Units | Unit Price | I. Factor | S.A. | Acre Disc | C. Factor | ST. Idx | Adj. | Notes- Adj | Special Pricing | S Adj Fact | Adj. Unit Price | Land Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 304 | Public Utility C | R4 | | | | 1.00 AC | 80,000.00 | 1.0000 | 0 | 1.0000 | 1.00 | 250 | 1.00 | Topography; | | 1.00 | | 80,000 |
| 1 | 304 | Public Utility C | | | | | 0.05 AC | 1,400.00 | 1.0000 | 0 | 1.0000 | 1.00 | | 0.00 | Topography; | | 1.00 | | 70 |
| 1 | 304 | Public Utility C | | | | | 1.00 AC | 44,330.00 | 1.0000 | 0 | 1.0000 | 1.00 | | 0.00 | | | 1.00 | | 44,330 |

Total Card Land Units: 2.05 AC | Parcel Total Land Area: 2.05 AC | Total Land Value: 124,400

**Property Location: 349R MOUNTAIN ST** **MAP ID: 3/9 154/ 60/EX /** **Bldg Name:** **State Use: 304**

**Vision ID: 5568** **Account # 00004100** **Bldg #: 1 of 1** **Sec #: 1 of 1** **Card 1 of 1** **Print Date: 12/05/2018 18:06**

## CONSTRUCTION DETAIL

| Element | Cd. | Ch. | Description |
|---|---|---|---|
| Style | 79 | | Telephone Bldg |
| Model | 94 | | Commercial |
| Grade | 03 | | Average |
| Stories | 1.0 | | |
| Occupancy | 0 | | |
| Exterior Wall 1 | 15 | | Concrete/mas |
| Level From | 01 | | 01 |
| Level To | 01 | | 01 |
| Uncov Parking | 0 | | |
| Perimeter | 68 | | |
| Identical Units | 1 | | |
| Efficiency | 0 | | |
| 1 Bedroom | 0 | | |
| 2 Bedroom | 0 | | |
| 3 Bedroom | 0 | | |
| AC Type | 03 | | Central |
| Structure Type | 720 | | 720 |
| Bldg Use | 304 | | Public Utility C |
| Percent Finish | 100 | | |
| Heating | 07 | | Electr Basebrd |
| Frame Type | 02 | | Wood Frame |
| Plumbing | 00 | | None |
| Local Modifier | 2.75 | | |
| Partitions | 00 | | None |
| Wall Height | 10 | | |
| Size | 280 | | |

## CONSTRUCTION DETAIL (CONTINUED)

| Element | Cd. | Ch. | Description |
|---|---|---|---|

## MIXED USE

| Code | Description | Percentage |
|---|---|---|
| 304 | Public Utility C | 100 |

## COST/MARKET VALUATION

| | |
|---|---|
| Adj. Base Rate: | 146.29 |
| AYB | 1975 |
| Dep Code | A |
| Remodel Rating | |
| Year Remodeled | |
| Dep % | 27 |
| Functional Obslnc | |
| External Obslnc | |
| Cost Trend Factor | |
| Condition | |
| % Complete | |
| Overall % Cond | 73 |
| Apprais Val | 29,900 |
| Dep % Ovr | 0 |
| Dep Ovr Comment | |
| Misc Imp Ovr | 0 |
| Misc Imp Ovr Comment | |
| Cost to Cure Ovr | 0 |
| Cost to Cure Ovr Comment | |


## OB-OUTBUILDING & YARD ITEMS(L) / XF-BUILDING EXTRA FEATURES(B)

| Code | Description | Sub | Sub Descript | L/B | Units | Unit Price | Yr | Gde | Dp Rt | Cnd | %Cnd | Apr Value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FN3O | CHAIN LINK 6 | | | L | 120 | 16.90 | 1975 | | | | 50 | 1,010 |
| SH1O | SHED FRAME | | | L | 288 | 15.00 | 1990 | | | | 70 | 3,020 |
| FN3O | CHAIN LINK 6 | | | L | 80 | 16.90 | 1990 | | | | 70 | 950 |
| FN4O | CHAIN LINK 8 | | | L | 320 | 22.25 | 2002 | | | | 70 | 4,980 |
| PC3O | PAVING CONC | | | L | 1,296 | 6.81 | 2002 | | | | 80 | 7,060 |

## BUILDING SUB-AREA SUMMARY SECTION

| Code | Description | Gross Area | Living Area | Eff. Area |
|---|---|---|---|---|
| BAS | First Floor | 280 | 280 | |
| | Ttl. Gross Liv/Lease Area: | 280 | 280 | |

ATTACHMENT B – LETTER OF AUTHORIZATION

SBA Communications Corporation
8051 Congress Avenue
Boca Raton, FL 33487-1307

T + 561.995.7670
F + 561.995.7626

sbasite.com

# LETTER OF AUTHORIZATION

**SBA Site ID:** CT06462-A, Mountain Street

**Property Located at:** 349 Mountain Street, Windham, CT, 06226

---

**THE CITY/COUNTY OF: Windham / Windham**

## APPLICATION FOR ZONING/USE/BUILDING PERMIT

This letter authorizes Connecticut Light & Power and its authorized agents to file for all necessary zoning, planning and building permits (local, state and federal) for the purposes of installing, operating and maintaining a telecommunications facility on the existing tower on the property referenced above on behalf of SBA Properties, LLC.

All approval conditions that may be granted to Connecticut Light & Power in connection with above referenced facility relating to this specific application are the sole responsibility of Connecticut Light & Power.

SBA Properties, LLC

Jason Silberstein

Executive VP, Site Leasing

Date: 4/14/2020

ATTACHMENT C – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

# WILLIMANTIC (CT06462-A)
# 349 MOUNTAIN ST
# WINDHAM, CT 06280

## PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (2) NEW OMNI / WHIP ANTENNAS, (1) AT ELEVATION 165'–1 1/2"± AGL AND (1) AT ELEVATION 157'–1 1/2"± AGL
2. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING SHELTER

## GOVERNING CODES

2018 CONNECTICUT STATE BUILDING CODE (2015 IBC BASIS)
2017 NATIONAL ELECTRIC CODE
TIA–222–H

## GENERAL NOTES

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

## SITE INFORMATION

| | |
|---|---|
| SITE NAME: | WILLIMANTIC (CT06462–A) |
| SITE ID NUMBER: | #5568 |
| SITE ADDRESS: | 349 MOUNTAIN ST<br>WINDHAM, CT 06280 |
| MAP: | 03 |
| BLOCK: | 154 |
| LOT: | 60 |
| ZONE: | R4 |
| LATITUDE: | 41° 42' 10.84" N |
| LONGITUDE: | 72° 13' 17.01" W |
| ELEVATION: | 525'± AMSL |
| FEMA/FIRM DESIGNATION: | X |
| ACREAGE: | 2.05± AC (BOOK: 0631, PAGE: 0299) |

## CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

PROPERTY OWNER:
SBA PROPERTIES INC
8051 CONGRESS AVE
BOCA RATON, FL 33487

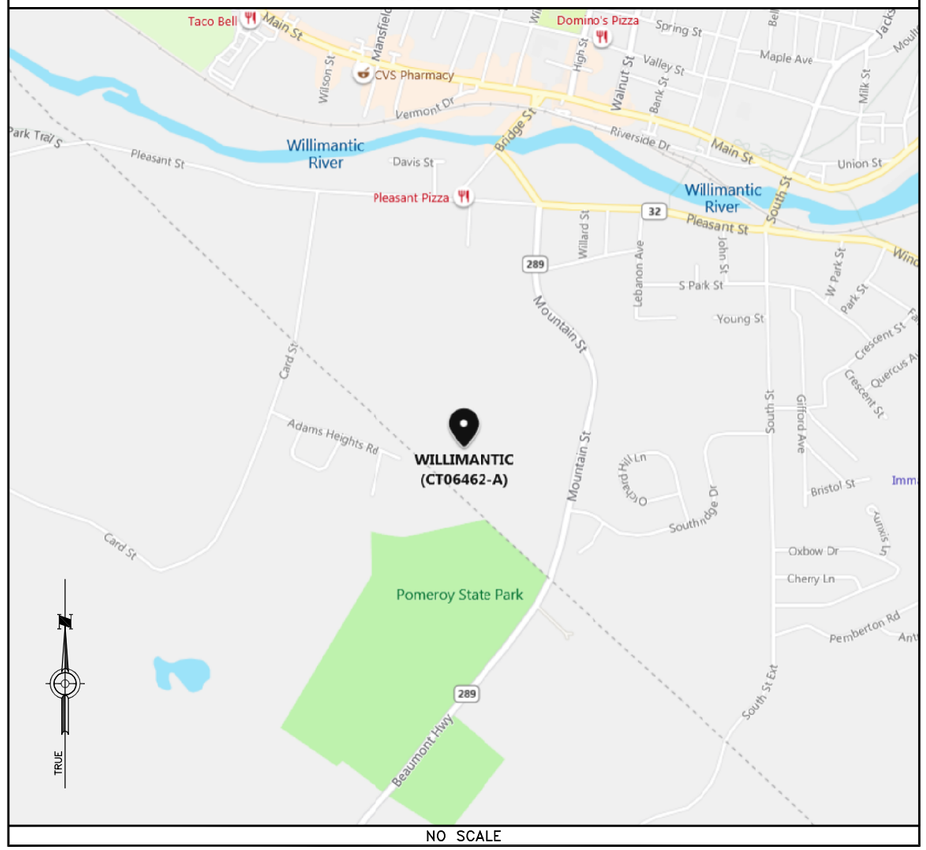
EVERSOURCE ENERGY PROJECT MANAGER:
NIKOLL PRECI
(860) 655–3079

POWER PROVIDER:
EVERSOURCE ENERGY
(800) 286–2000

TELCO PROVIDER:
FRONTIER
(800) 921–8102

CALL BEFORE YOU DIG:
(800) 922–4455

## LOCATION MAP




NO SCALE

## DESIGN TYPE

SITE UPGRADE
SELF–SUPPORT TOWER

## DRAWING INDEX

| SHEET NO: | SHEET TITLE |
|---|---|
| T–1 | TITLE SHEET |
| C–1 | SITE PLAN |
| C–2 | TOWER ELEVATION |
| G–1 | GROUNDING DETAILS |
| N–1 | NOTES & SPECIFICATIONS |
| N–2 | NOTES & SPECIFICATIONS |
| N–3 | NOTES & SPECIFICATIONS |

## DO NOT SCALE DRAWINGS

SUBCONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME

**UNDERGROUND SERVICE ALERT**

**UTILITIES PROTECTION CENTER, INC.**
**811**

48 HOURS BEFORE YOU DIG


EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286–2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–2522


| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| 0 | 06/18/20 | ISSUED FOR FILING |

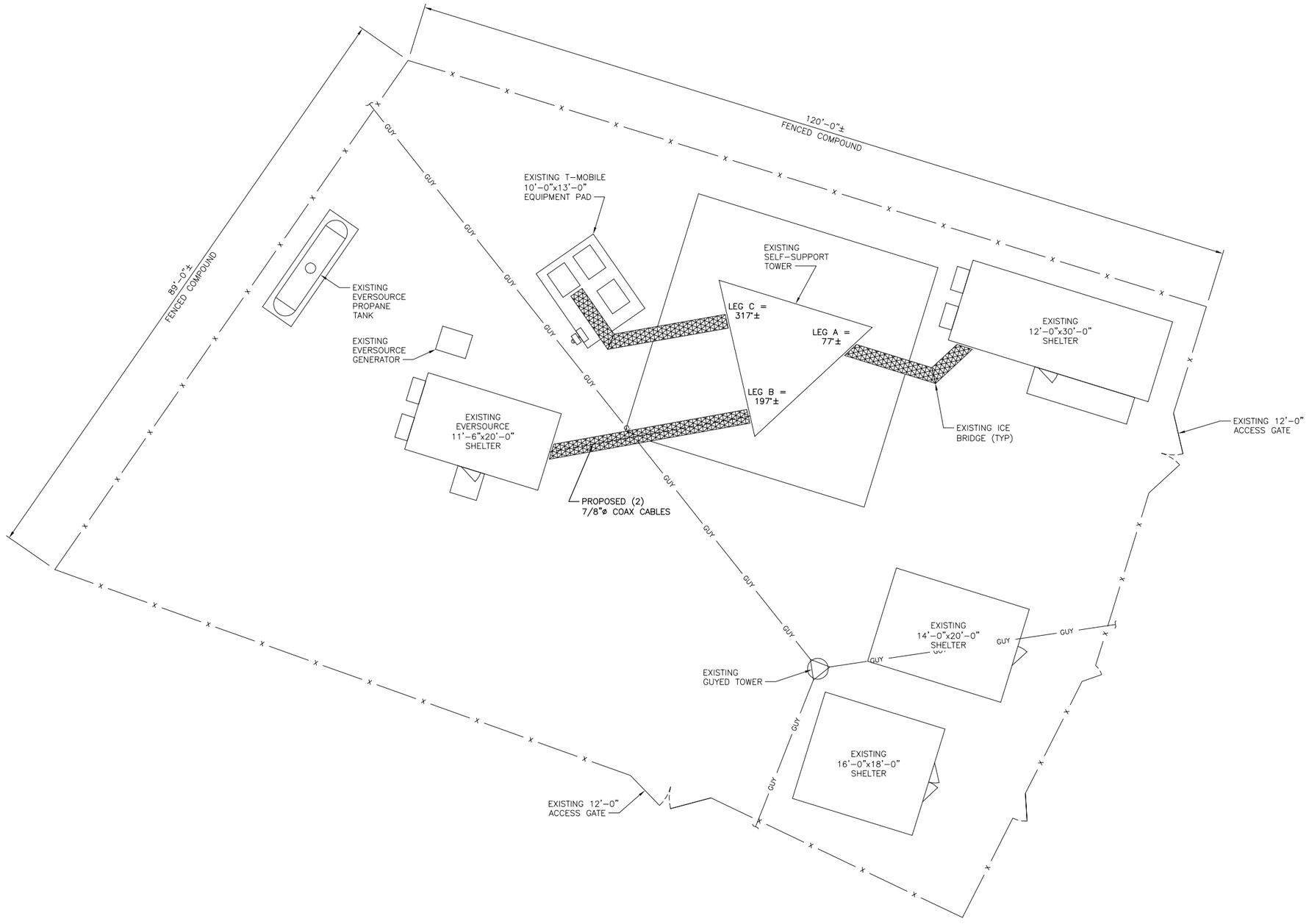
STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
06/18/2020



WILLIMANTIC (CT06462–A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE
TITLE SHEET

SHEET NUMBER
**T-1**




SITE PLAN
NO SCALE


EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286-2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-2522


| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| 0 | 06/18/20 | ISSUED FOR FILING |

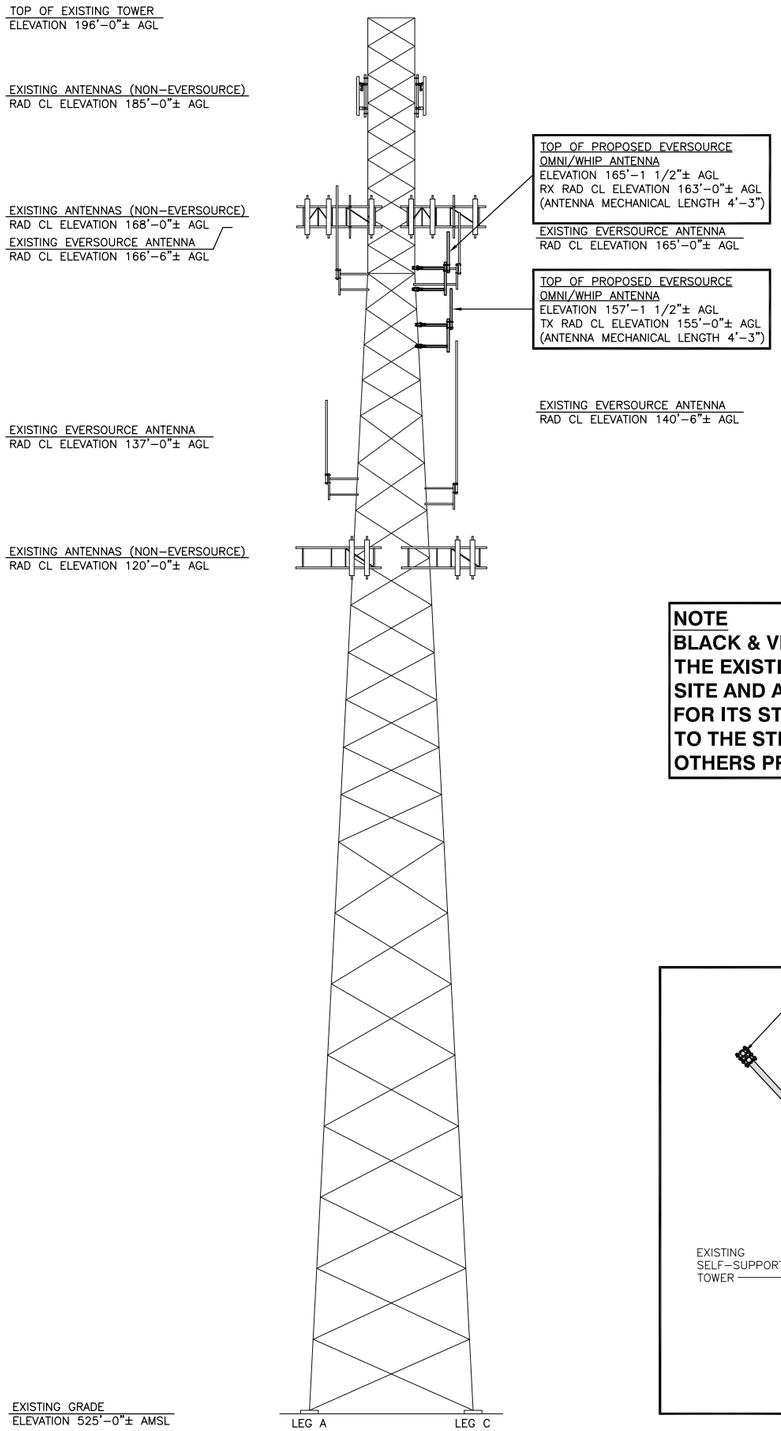
STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED
PROFESSIONAL ENGINEER
06/18/2020



WILLIMANTIC (CT06462-A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

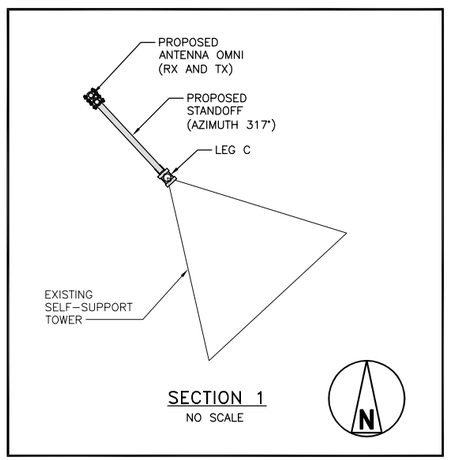



TOWER ELEVATION FACE AC

NO SCALE

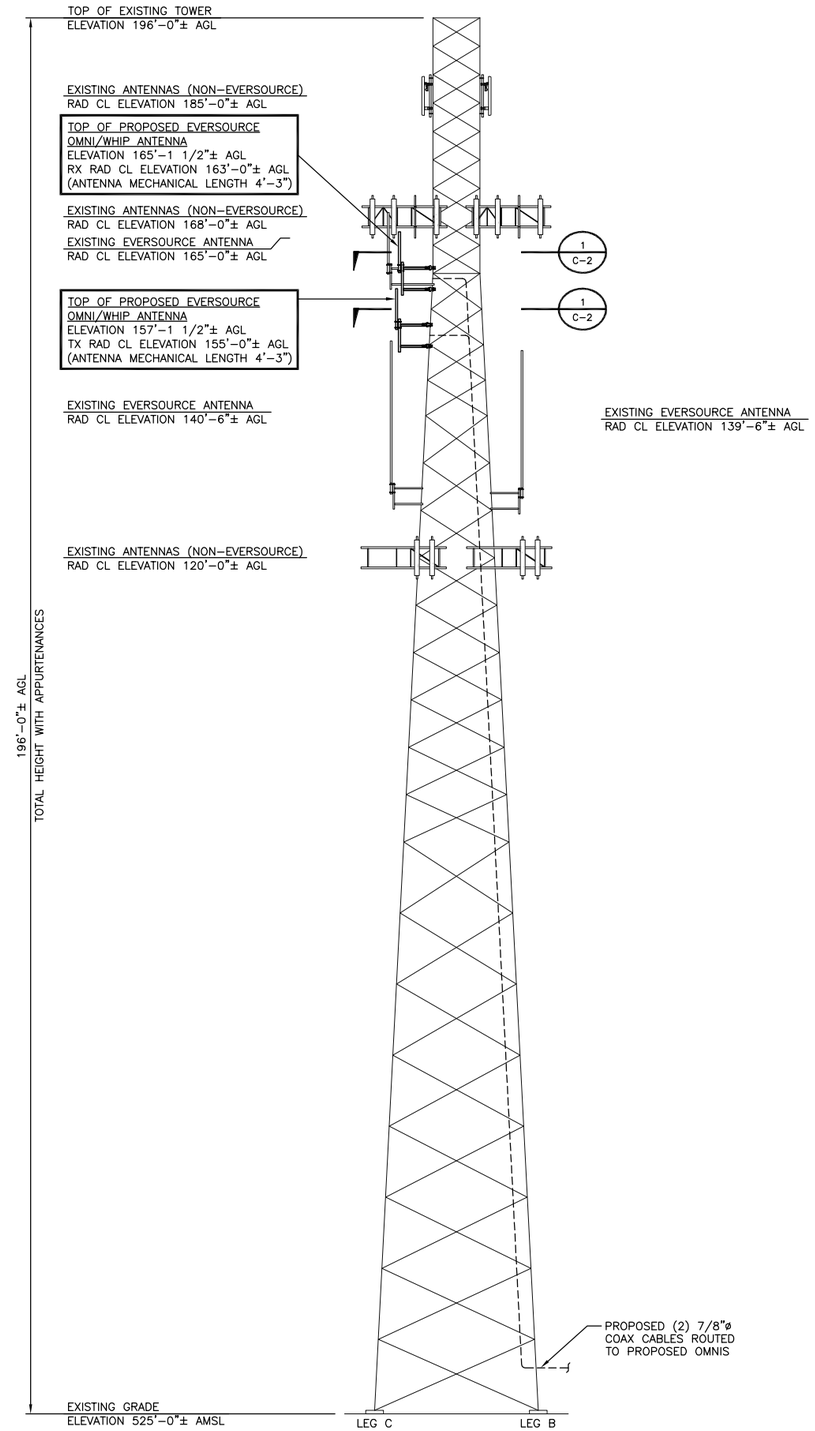
**NOTE**

**BLACK & VEATCH HAS NOT EVALUATED THE EXISTING STRUCTURE FOR THIS SITE AND ASSUMES NO RESPONSIBILITY FOR ITS STRUCTURAL INTEGRITY. REFER TO THE STRUCTURAL ANALYSIS BY OTHERS PRIOR TO ANY CONSTRUCTION.**




SECTION 1

NO SCALE




TOWER ELEVATION FACE CB

NO SCALE


EVERSOURCE ENERGY

107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286-2000

BLACK & VEATCH

6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-2522


| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 0 | 06/18/20 | ISSUED FOR FILING |

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER

06/18/2020



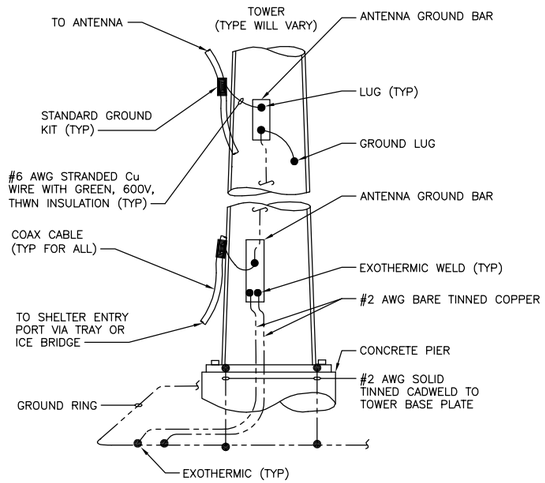
WILLIMANTIC (CT06462-A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE

TOWER ELEVATION & ANTENNA EQUIPMENT

SHEET NUMBER

**C-2**

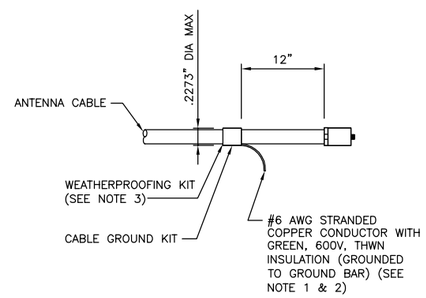



## NOTE

1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, ANTENNA LOCATION AND CONNECTION ORIENTATION. PROVIDE AS REQUIRED.

ANTENNA CABLE GROUNDING

NO SCALE

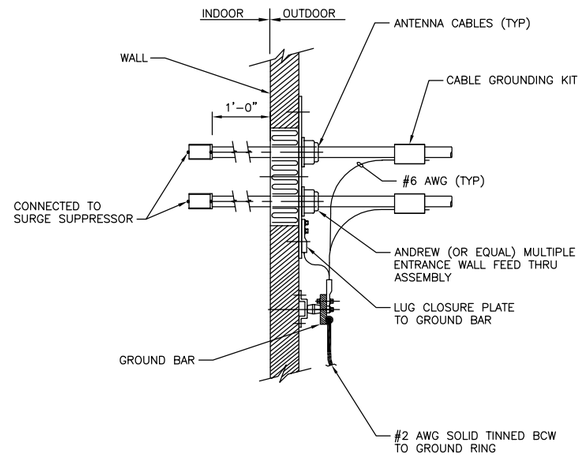



## NOTES

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR.
2. GROUNDING KIT SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.
3. WEATHER PROOFING SHALL BE TYPE AND PART NUMBER AS SUPPLIED OR RECOMMENDED BY CABLE MANUFACTURER.

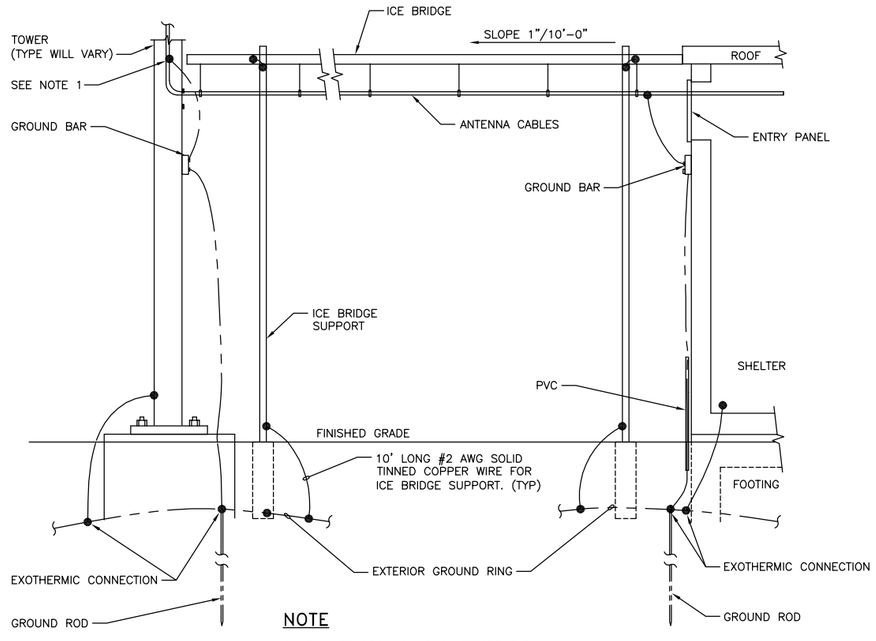
CONNECTION OF CABLE GROUND KIT TO ANTENNA CABLE

NO SCALE




CABLE INSTALLATION WITH WALL FEED THRU ASSEMBLY

NO SCALE




## NOTE

1. PROVIDE GROUND KIT 6" BEFORE TURN

ICE BRIDGE AND ANTENNA CABLE DETAIL

NO SCALE

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286-2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-2522

| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| 0 | 06/18/20 | ISSUED FOR FILING |

STATE OF CONNECTICUT · MARK P. STILES · 34358 · LICENSED PROFESSIONAL ENGINEER

06/18/2020



WILLIMANTIC (CT06462-A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE

GROUNDING DETAILS

SHEET NUMBER

**G-1**

## DESIGN BASIS

1. GOVERNING CODE: 2018 CONNECTICUT STATE BUILDING CODE (2015 IBC BASIS).

## GENERAL CONDITIONS

1. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL BUILDING CODES, PERMIT CONDITIONS AND SAFETY CODES DURING CONSTRUCTION.

2. THE ENGINEER IS NOT: A GUARANTOR OF THE INSTALLING CONTRACTOR'S WORK; RESPONSIBLE FOR SAFETY IN, ON OR ABOUT THE WORK SITE; IN CONTROL OF THE SAFETY OR ADEQUACY OF ANY BUILDING COMPONENT, SCAFFOLDING OR SUPERINTENDING THE WORK.

3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL PERMITS, INSPECTIONS, TESTING AND CERTIFICATES NEEDED FOR LEGAL OCCUPANCY OF THE FINISHED PROJECT.

4. THE CONTRACTOR IS RESPONSIBLE TO REVIEW THIS COMPLETE PLAN SET AND VERIFY THE EXISTING CONDITIONS SHOWN IN THESE PLANS AS THEY RELATE TO THE WORK PRIOR TO SUBMITTING PRICE. SIGNIFICANT DEVIATIONS FROM WHAT IS SHOWN AFFECTING THE WORK SHALL BE REPORTED IMMEDIATELY TO THE CONSTRUCTION MANAGER.

5. DETAILS INCLUDED IN THIS PLAN SET ARE TYPICAL AND APPLY TO SIMILAR CONDITIONS.

6. EXISTING ELECTRICAL AND MECHANICAL FIXTURES, PIPING, WIRING, AND EQUIPMENT OBSTRUCTING THE WORK SHALL BE REMOVED AND/OR RELOCATED AS DIRECTED BY THE CONSTRUCTION MANAGER. TEMPORARY SERVICE INTERRUPTIONS MUST BE COORDINATED WITH OWNER.

7. THE CONTRACTOR SHALL DILIGENTLY PROTECT THE EXISTING BUILDING/SITE CONDITIONS AND THOSE OF ANY ADJOINING BUILDING/SITES AND RESTORE ANY DAMAGE CAUSED BY HIS ACTIVITIES TO THE PRE-CONSTRUCTION CONDITION.

8. THE CONTRACTOR SHALL SAFEGUARD AGAINST: CREATING A FIRE HAZARD, AFFECTING TENANT EGRESS OR COMPROMISING BUILDING SITE SECURITY MEASURES.

9. THE CONTRACTOR SHALL REMOVE ALL DEBRIS AND CONSTRUCTION WASTE FROM THE SITE EACH DAY. WORK AREAS SHALL BE SWEPT AND MADE CLEAN AT THE END OF EACH WORK DAY.

10. THE CONTRACTOR'S HOURS OF WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES AND ORDINANCES AND BE APPROVED BY OWNER.

11. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER IF ASBESTOS IS ENCOUNTERED DURING THE EXECUTION OF HIS WORK. THE CONTRACTOR SHALL CEASE ALL ACTIVITIES WHERE THE ASBESTOS MATERIAL IS FOUND UNTIL NOTIFIED BY THE CONSTRUCTION MANAGER TO RESUME OPERATIONS.

## THERMAL & MOISTURE PROTECTION

1. FIRE-STOP ALL PENETRATIONS FOR ELECTRICAL CONDUITS OR WAVEGUIDE CABLING THROUGH BUILDING WALLS, FLOORS, AND CEILINGS SHALL BE FIRESTOPPED WITH ACCEPTED MATERIALS TO MAINTAIN THE FIRE RATING OF THE EXISTING ASSEMBLY. ALL FILL MATERIAL SHALL BE SHAPED, FITTED, AND PERMANENTLY SECURED IN PLACE. FIRESTOPPING SHALL BE INSTALLED IN ACCORDANCE WITH ASTM E814.

2. HILTI CP620 FIRE FOAM OR 3M FIRE BARRIER FILL, VOID OR CAVITY MATERIAL OR ACCEPTED EQUAL SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ASSOCIATED UNDERWRITERS LABORATORIES (UL) SYSTEM NUMBER.

3. FIRESTOPPING SHALL BE APPLIED AS SOON AS PRACTICABLE AFTER PENETRATIONS ARE MADE AND EQUIPMENT INSTALLED.

4. FIRESTOPPED PENETRATIONS SHALL BE LEFT EXPOSED AND MADE AVAILABLE FOR INSPECTION BEFORE CONCEALING SUCH PENETRATIONS. FIRESTOPPING MATERIAL CERTIFICATES SHALL BE MADE AVAILABLE AT THE TIME OF INSPECTION.

5. ANY BUILDING ROOF PENETRATION AND/OR RESTORATION SHALL BE PERFORMED SO THAT THE ROOF WARRANTY IN PLACE IS NOT COMPROMISED. CONTRACTOR SHALL ARRANGE FOR OWNER'S ROOFING CONTRACTOR TO PERFORM ANY AND ALL ROOFING WORK IF SO REQUIRED BY EXISTING ROOF WARRANTY. OTHERWISE, ROOF SHALL BE MADE WATERTIGHT WITH LIKE CONSTRUCTION AS SOON AS PRACTICABLE AND AT COMPLETION OF CONSTRUCTION.

6. ALL PENETRATIONS INTO AND/OR THROUGH BUILDING EXTERIOR WALLS SHALL BE SEALED WITH SILICONE SEALER.

7. WHERE CONDUIT AND CABLES PENETRATES FIRE RATED WALLS AND FLOORS, FIRE GROUT ALL PENETRATIONS IN ORDER TO MAINTAIN THE FIRE RATING USING A LISTED FIRE SEALING DEVICE OR GROUT.

8. CONTRACTOR TO REMOVE AND RE-INSTALL ALL FIRE PROOFING AS REQUIRED DURING CONSTRUCTION.

## SUBMITTALS

1. CONTRACTOR TO SUBMIT SHOP DRAWINGS TO ENGINEER FOR REVIEW PRIOR TO FABRICATION.

2. CONTRACTOR TO NOTIFY ENGINEER FOR INSPECTION PRIOR TO CLOSING PENETRATIONS.

3. CONTRACTORS SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD PRIOR TO FABRICATION AND ERECTION OF ANY MATERIAL. THE ENGINEER SHALL BE NOTIFIED OF ANY CONDITIONS WHICH PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

4. ALL STEEL MATERIAL EXPOSED TO WEATHER SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 " ZINC (HOT-DIPPED GALVANIZED) COATINGS" ON IRON AND STEEL PRODUCTS.

5. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS FOR REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

## STEEL

1. MATERIAL:

| | |
|---|---|
| WIDE FLANGE: | ASTM A572, GR 50 |
| TUBING: | ASTM A500, GR C |
| PIPE: | ASTM A53, GR B AND ASTM A572, GR 50 |
| ANGLE: | ASTM A570, GR 50 AND ASTM A36 |
| BOLTS: | ASTM A325 |
| GRATING: | TYPE GW-2 (1"x3/16" BARS) |
| MISC. MATERIAL: | ASTM A36 |

ALL STEEL SHAPES SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 WITH A COATING WEIGHT OF 2 OZ/SF.

2. DAMAGED GALVANIZED SURFACES SHALL BE CLEANED WITH A WIRE BRUSH AND PAINTED WITH TWO COATS OF COLD ZINC, "GALVANOX", "DRY GALV", "ZINC IT", OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES. TOUCH UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT IN SHOP OR FIELD.

3. DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC "MANUAL OF STEEL CONSTRUCTION" 13TH EDITION.

4. THE STEEL STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER COMPLETION. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE BUILDING AND ITS COMPONENT PARTS DURING ERECTION.

5. ALL STEEL ELEMENTS SHALL BE INSTALLED PLUMB AND LEVEL.

6. TOWER MANUFACTURER'S DESIGNS SHALL PREVAIL FOR TOWER.

## SITE GENERAL

1. CONTRACTOR SHALL FOLLOW CONDITIONS OF ALL APPLICABLE PERMITS AND WORK IN ACCORDANCE WITH OSHA REGULATIONS.

2. THESE PLANS DEPICT KNOWN UNDERGROUND STRUCTURES, CONDUITS, AND/OR PIPELINES. THE LOCATIONS FOR THESE ELEMENTS ARE BASED UPON THE VARIOUS RECORD DRAWINGS AVAILABLE. THE CONTRACTOR IS HEREBY ADVISED THAT THESE DRAWINGS MAY NOT ACCURATELY DEPICT AS-BUILT LOCATIONS AND OTHER UNKNOWN STRUCTURES. THE CONTRACTOR SHALL THEREFORE DETERMINE THE EXACT LOCATION OF EXISTING UNDERGROUND ELEMENTS AND EXCAVATE WITH CARE AFTER CALLING MARKOUT SERVICE AT 1-800-272-4480 48 HOURS BEFORE DIGGING, DRILLING OR BLASTING.

3. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, AND OTHER UTILITIES WHERE ENCOUNTERED, SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION, SHALL BE RELOCATED AS DIRECTED BY ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR PIER DRILLING AROUND OR NEAR UTILITIES. CONTRACTOR SHALL HAND DIG UTILITIES AS NEEDED. CONTRACTOR SHALL PROVIDE, BUT IS NOT LIMITED TO, APPROPRIATE A) FALL PROTECTION, B) CONFINED SPACE ENTRY, C) ELECTRICAL SAFETY, AND D) TRENCHING AND EXCAVATION.

4. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.

5. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, OR OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED, AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT THE POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, SUBJECT TO THE APPROVAL OF THE CONSTRUCTION MANAGER.

6. CONTRACTOR IS RESPONSIBLE FOR REPAIRING OR REPLACING STRUCTURES OR UTILITIES DAMAGED DURING CONSTRUCTION.

7. CONTRACTOR SHALL PROTECT EXISTING PAVED AND GRAVEL SURFACES, CURBS, LANDSCAPE AND STRUCTURES AND RESTORE SITE OR PRE-CONSTRUCTION CONDITION WITH AS GOOD, OR BETTER, MATERIALS. NEW MATERIALS SHALL MATCH EXISTING THICKNESS AND TYPE.

8. THE CONTRACTOR SHALL SHORE ALL TRENCH EXCAVATIONS GREATER THAN 5 FEET IN DEPTH OR LESS WHERE SOIL CONDITIONS ARE DEEMED UNSTABLE. ALL SHEETING AND/OR SHORING METHODS SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER.

9. THE CONTRACTOR IS RESPONSIBLE FOR MANAGING GROUNDWATER LEVELS IN THE VICINITY OF EXCAVATIONS TO PROTECT ADJACENT PROPERTIES AND NEW WORK. GROUNDWATER SHALL BE DRAINED IN ACCORDANCE WITH LOCAL SEDIMENTATION AND EROSION CONTROL GUIDELINES.


EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286-2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-2522


| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| 0 | 06/18/20 | ISSUED FOR FILING |




WILLIMANTIC (CT06462-A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
**N-1**

## ELECTRICAL

1. CONTRACTOR SHALL VERIFY EXISTING ELECTRIC SERVICE TYPE AND CAPACITY AND ORDER NEW ELECTRIC SERVICE FROM LOCAL ELECTRIC UTILITY, WHERE APPLICABLE.
2. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH ALL APPLICABLE CODES, AND SHALL BE ACCEPTABLE TO ALL AUTHORITIES HAVING JURISDICTION. WHERE A CONFLICT EXISTS BETWEEN CODES, PLAN AND SPECIFICATIONS, OR AUTHORITIES HAVING JURISDICTION, THE MORE STRINGENT AUTHORITIES SHALL APPLY.
3. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC, FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN AND/OR OTHERWISE REQUIRED.
4. ALL ELECTRICAL CONDUCTORS SHALL BE 100% COPPER AND SHALL HAVE TYPE THHN INSULATION UNLESS INDICATED OTHERWISE.
5. CONDUIT SHALL BE THREADED RIGID GALVANIZED STEEL OR EMT WITH ONLY COMPRESSION TYPE COUPLINGS AND CONNECTORS, ALL MADE UP WRENCH TIGHT.
6. ALL BURIED CONDUIT SHALL BE MINIMUM SCH 40 PVC UNLESS NOTED OTHERWISE, OR AS PER LOCAL CODE REQUIREMENTS.
7. PROVIDE FLEXIBLE STEEL CONDUIT OR LIQUID TIGHT FLEXIBLE STEEL CONDUIT TO ALL VIBRATING EQUIPMENT, INCLUDING HVAC UNITS, TRANSFORMERS, MOTORS, ETC, OR WHERE EQUIPMENT IS PLACED UPON A SLAB ON GRADE.
8. ALL BRANCH CIRCUITS AND FEEDERS SHALL HAVE A SEPARATE GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR BONDED TO ALL ENCLOSURES, PULLBOXES, ETC.
9. CONDUIT AND CABLE WITHIN CORRIDORS SHALL BE CONCEALED AND EXPOSED ELSEWHERE, UNLESS NOTED OTHERWISE.
10. ELECTRICAL MATERIALS INSTALLED ON ROOFTOP SHALL BE LISTED FOR NEMA 3R USE. –AND ALL WIRING WITHIN A VENTILATION DUCT SHALL BE LISTED FOR SUCH USE. IN GENERAL WIRING METHODS WITHIN A DUCT SHALL BE AN MC CABLE WITH SMOOTH OR CORRUGATED METAL JACKET AND HAVE NO OUTER COVERING OVER THE METAL JACKET. INTERLOCKED ARMOR TYPE OF MC CABLE IS NOT ACCEPTABLE FOR THIS APPLICATION. CONTRACTOR CAN ALSO USE TYPE MI CABLE IN THE VENTILATION DUCT PROVIDED IT DOES NOT HAVE ANY OUTER COVERINGS OVER THE METAL EXTERIOR.
11. WIRING DEVICES SHALL BE SPECIFICATION GRADE, AND WIRING DEVICE COVER PLATES SHALL BE PLASTIC WITH ENGRAVING AS SPECIFIED.

## GROUNDING

1. #6 THWN SHALL BE STRANDED #6 COPPER WITH GREEN THWN INSULATION SUITABLE FOR WET INSTALLATIONS.
2. #2 THWN SHALL BE STRANDED #2 COPPER WITH THWN INSULATION SUITABLE FOR WET INSTALLATIONS.
3. #2 BARE TINNED SHALL BE SOLID COPPER TINNED. ALL BURIED WIRE SHALL MEET THIS CRITERIA.
4. ALL LUGS SHALL BE 2–HOLE, LONG BARREL, TINNED SOLID COPPER UNLESS OTHERWISE SPECIFIED, LUGS SHALL BE THOMAS AND BETTS SERIES 548##BE OR EQUIVALENT (IE #2 THWN – 54856BE, #2 SOLID – 54856BE, AND #6 THWN – 54852BE).
5. ALL HARDWARE, BOLTS, NUTS, AND WASHERS SHALL BE 18–8 STAINLESS STEEL. EVERY CONNECTION SHALL BE BOLT–FLAT WASHER–BUSS–LUG–FLAT WASHER–BELLEVILLE WASHER–NUT IN THAT EXACT ORDER. BACK–TO–BACK LUGGING, BOLT–FLAT WASHER–LUG–BUSS–LUG–FLAT WASHER–BELLEVILLE WASHER–NUT, IN THAT EXACT ORDER, IS ACCEPTED WHERE NECESSARY TO CONNECT MANY LUGS TO A BUSS BAR. STACKING OF LUGS, BUSS–LUG–LUG, IS NOT ACCEPTABLE.
6. WHERE CONNECTIONS ARE MADE TO STEEL OR DISSIMILAR METALS, A THOMAS AND BETTS DRAGON TOOTH WASHER MODEL DTWXXX SHALL BE USED BETWEEN THE LUG AND THE STEEL, BOLT–FLAT WASHER–STEEL–DRAGON TOOTH WASHER–LUG–FLAT WASHER–BELEVILE WASHER–NUT.
7. ALL CONNECTIONS, INTERIOR AND EXTERIOR, SHALL BE MADE WITH THOMAS AND BETTS KPOR–SHIELD. COAT ALL WIRES BEFORE LUGGING AND COAT ALL SURFACES BEFORE CONNECTING.
8. THE MINIMUM BEND RADIUS SHALL BE 8 INCHES FOR #6 WIRE AND SMALLER AND 12 INCHES FOR WIRE LARGER THAN #6.
9. ALL CONNECTIONS TO THE GROUND RING SHALL BE EXOTHERMIC WELD.
10. BOND THE FENCE TO THE GROUND RING AT EACH CORNER, AND AT EACH GATE POST WITH #2 SOLID TINNED WIRE. EXOTHERMIC WELD BOTH ENDS.
11. GROUND KITS SHALL BE SOLID COPPER STRAP WITH #6 WIRE 2–HOLE COMPRESSION CRIMPED LUGS AND SHALL BE SEALED ACCORDING TO MANUFACTURER INSTRUCTIONS.
12. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL BE USED.
13. GROUND BARS SHALL BE FURNISHED AND INSTALLED WITH PRE–DRILLED HOLE DIAMETERS AND SPACINGS. GROUND BARS SHALL NEITHER BE FIELD FABRICATED NOR NEW HOLES DRILLED. GROUND LUGS SHALL MATCH THE SPACING ON THE BAR. HARDWARE DIAMETER SHALL BE MINIMUM 3.8 INCH.
14. MGB GROUND CONNECTION SHALL BE EXOTHERMIC WELDED TO THE GROUND SYSTEM.
15. ALL CABLE TRAY AND/OR PLATFORM STEEL SHALL BE BONDED TOGETHER WITH JUMPERS (#6 IN EQUIPMENT ROOM, #2 ELSEWHERE AND HOMERUN).

## ANTENNA & CABLE NOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TRANSMISSION CABLES, JUMPERS, CONNECTORS, GROUNDING STRAPS, ANTENNAS, MOUNTS AND HARDWARE. ALL MATERIALS SHALL BE INSPECTED BY THE CONTRACTOR FOR DAMAGE UPON DELIVERY. JUMPERS SHALL BE SUPPLIED AT ANTENNAS AND EQUIPMENT INSIDE SHELTER COORDINATE LENGTH OF JUMP CABLES WITH EVERSOURCE. COORDINATE AND VERIFY ALL OF THE MATERIALS TO BE PROVIDED WITH EVERSOURCE PRIOR TO SUBMITTING BID AND ORDERING MATERIALS.
2. AFTER INSTALLATION, THE TRANSMISSION LINE SYSTEM SHALL BE PIM/SWEEP TESTED FOR PROPER INSTALLATION AND DAMAGE WITH ANTENNAS CONNECTED. CONTRACTOR TO OBTAIN LATEST TESTING PROCEDURES FROM EVERSOURCE PRIOR TO BIDDING.
3. ANTENNA CABLES SHALL BE COLOR CODED AT THE FOLLOWING LOCATIONS:
   – AT THE ANTENNAS.
   – AT THE WAVEGUIDE ENTRY PLATE ON BOTH SIDES OF THE EQUIPMENT SHELTER WALL.
   – JUMPER CABLES AT THE EQUIPMENT ENTER.
4. SYSTEM INSTALLATION:
   THE CONTRACTOR SHALL INSTALL ALL CABLES AND ANTENNAS TO THE MANUFACTURER'S SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR THE PROCUREMENT AND INSTALLATION OF THE FOLLOWING:
   – ALL CONNECTORS, ASSOCIATED CABLE MOUNTING, AND GROUNDING HARDWARE.
   – WALL MOUNTS, STANDOFFS, AND ASSOCIATED HARDWARE.
   – 1/2 INCH HELIAX ANTENNA JUMPERS OF APPROPRIATE LENGTHS.
5. MINIMUM BENDING RADIUS FOR COAXIAL CABLES:
   – 7/8 INCH, RMIN = 15 INCHES
   – 1 5/8 INCH, RMIN = 25 INCHES
6. CABLE SHALL BE INSTALLED WITH A MINIMUM NUMBER OF BENDS WHERE POSSIBLE. CABLE SHALL NOT BE LEFT UNTERMINATED AND SHALL BE SEALED IMMEDIATELY AFTER BEING INSTALLED.
7. ALL CABLE CONNECTIONS OUTSIDE SHALL BE COVERED WITH WATERPROOF SPLICING KIT.
8. CONTRACTOR SHALL VERIFY EXACT LENGTH AND DIRECTION OF TRAVEL IN FIELD PRIOR TO CONSTRUCTION.
9. CABLE SHALL BE FURNISHED WITHOUT SPLICES AND WITH CONNECTORS AT EACH END.


EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286–2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–2522


| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 0 | 06/18/20 | ISSUED FOR FILING |

STATE OF CONNECTICUT · MARK P. STILES · 34358 · LICENSED PROFESSIONAL ENGINEER

06/18/2020



WILLIMANTIC (CT06462–A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE
NOTES
& SPECIFICATIONS

SHEET NUMBER
**N-2**

## SYMBOLS

| | |
|---|---|
| ● | EXOTHERMIC CONNECTION |
| ■ | COMPRESSION CONNECTION |
| ⏚● | 5/8"ø x 10'-0" COPPER CLAD STEEL GROUND ROD. |
| ⏚◉ | TEST GROUND ROD WITH INSPECTION SLEEVE |
| - - - | GROUNDING CONDUCTOR |
| (A) | KEY NOTES |
| CHAINLINK FENCE | X — X — X — X — X |
| WOOD FENCE | |
| LEASE AREA | |
| ICE BRIDGE | |
| CABLE TRAY | |
| GAS LINE | G — G — G — G — G |
| UNDERGROUND ELECTRICAL/TELCO | E/T — E/T — E/T — E/T |
| UNDERGROUND ELECTRICAL/CONTROL | E/C — E/C — E/C — E/C |
| UNDERGROUND ELECTRICAL | E — E — E — E — E |
| UNDERGROUND TELCO | T — T — T — T — T |
| PROPERTY LINE (PL) | |

## ABBREVIATIONS

| | | | |
|---|---|---|---|
| AC | ALTERNATING CURRENT | MGB | MASTER GROUNDING BAR |
| AIC | AMPERAGE INTERRUPTION CAPACITY | MIN | MINIMUM |
| ANI | AUXILIARY NETWORK INTERFACE | MW | MICROWAVE |
| ATM | ASYNCHRONOUS TRANSFER MODE | MTS | MANUAL TRANSFER SWITCH |
| ATS | AUTOMATIC TRANSFER SWITCH | NEC | NATIONAL ELECTRICAL CODE |
| AWG | AMERICAN WIRE GAUGE | OC | ON CENTER |
| AWS | ADVANCED WIRELESS SERVICES | PP | POLARIZING PRESERVING |
| BATT | BATTERY | PCU | PRIMARY CONTROL UNIT |
| BBU | BASEBAND UNIT | PDU | PROTOCOL DATA UNIT |
| BTC | BARE TINNED COPPER CONDUCTOR | PWR | POWER |
| BTS | BASE TRANSCEIVER STATION | RECT | RECTIFIER |
| CCU | CLIMATE CONTROL UNIT | RET | REMOTE ELECTRICAL TILT |
| CDMA | CODE DIVISION MULTIPLE ACCESS | RMC | RIGID METALLIC CONDUIT |
| CHG | CHARGING | RF | RADIO FREQUENCY |
| CLU | CLIMATE UNIT | RUC | RACK USER COMMISSIONING |
| COMM | COMMON | RRH | REMOTE RADIO HEAD |
| DC | DIRECT CURRENT | RRU | REMOTE RADIO UNIT |
| DIA | DIAMETER | RWY | RACEWAY |
| DWG | DRAWING | SFP | SMALL FORM-FACTOR PLUGGABLE |
| EC | ELECTRICAL CONDUCTOR | SIAD | SMART INTEGRATED ACCESS DEVICE |
| EMT | ELECTRICAL METALLIC TUBING | SSC | SITE SOLUTIONS CABINET |
| FIF | FACILITY INTERFACE FRAME | T1 | 1544KBPS DIGITAL LINE |
| GEN | GENERATOR | TDMA | TIME-DIVISION MULTIPLE ACCESS |
| GPS | GLOBAL POSITIONING SYSTEM | TMA | TOWER MOUNT AMPLIFIER |
| GSM | GLOBAL SYSTEM FOR MOBILE | TVSS | TRANSIENT VOLTAGE SUPPRESSION SYSTEM |
| HVAC | HEAT/VENTILATION/AIR CONDITIONING | TYP | TYPICAL |
| ICF | INTERCONNECTION FRAME | UMTS | UNIVERSAL MOBILE TELECOMMUNICATION SYSTEM |
| IGR | INTERIOR GROUNDING RING (HALO) | UPS | UNINTERRUPTIBLE POWER SUPPLY (DC POWER PLANT) |
| LTE | LONG TERM EVOLUTION | | |


EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286-2000

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-2522


| | |
|---|---|
| PROJECT NO: | 405025 |
| DRAWN BY: | TYW |
| CHECKED BY: | TH |

| REV | DATE | DESCRIPTION |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| 0 | 06/18/20 | ISSUED FOR FILING |

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
06/18/2020



WILLIMANTIC (CT06462-A)
349 MOUNTAIN ST
WINDHAM, CT 06280

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
**N-3**

# REFERENCE CUTSHEETS

TELEWAVE, INC.®

195 - 260 MHz

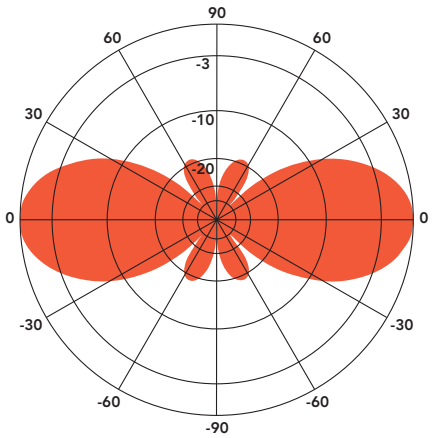
# ANT220F2DIN

## *FIBERGLASS COLLINEAR ANTENNA 2.5 dBd*

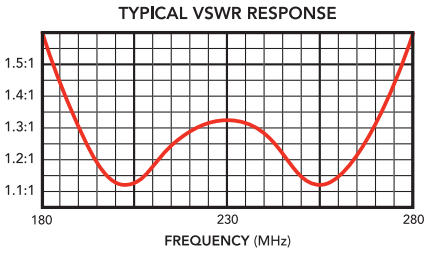
The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection. The ANT220F2 is an excellent choice for wireless PTC systems in urban or rural areas.

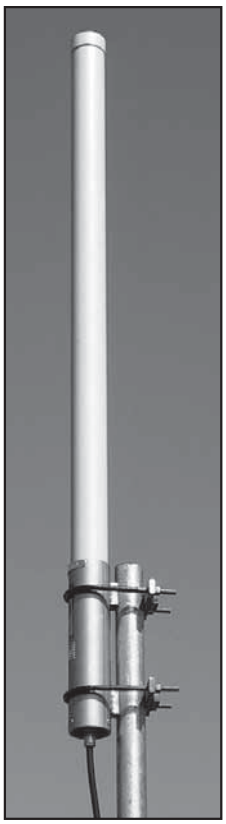
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, acid rain, and wind blown abrasives.

The ANT220F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.




ANT220F2 - 230 MHz
Vertical Plane
Gain = 2.58 dBd



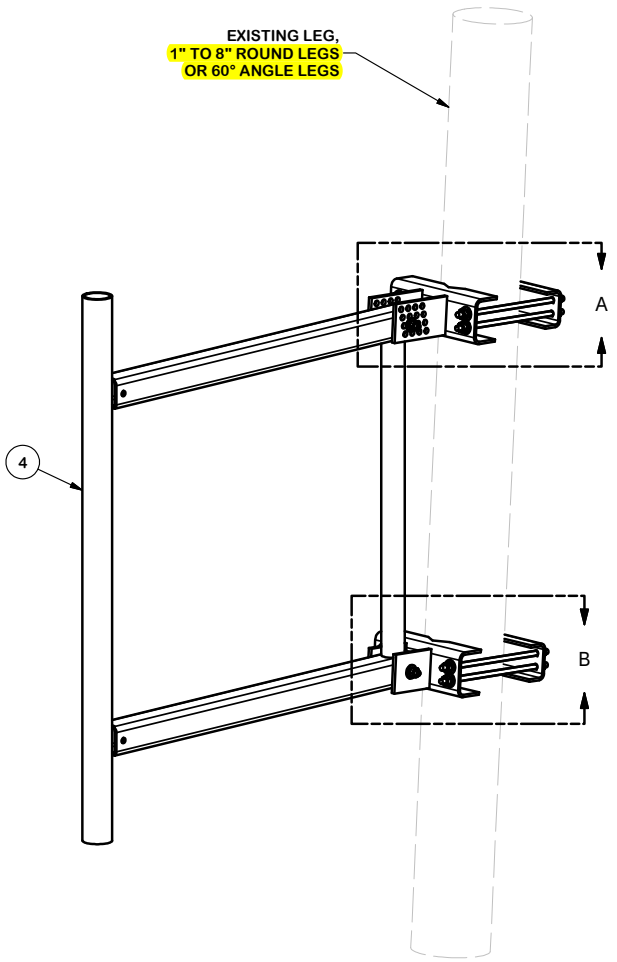



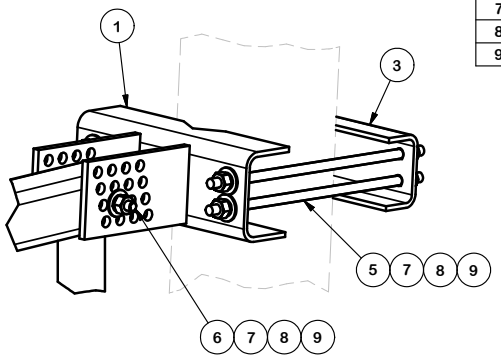
ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.

| SPECIFICATIONS | | | |
|---|---|---|---|
| **Frequency (continuous)** | 195-260 MHz | **Dimensions (L x base diam.) in.** | 51 x 2.75 |
| **Gain** | 2.5 dBd | **Tower weight (antenna + clamps)** | 11 lb. |
| **Power rating (typ.)** | 500 watts | **Shipping weight** | 14 lb. |
| **Impedance** | 50 ohms | **Wind rating / with 0.5" ice** | 200 / 150 MPH |
| **VSWR** | 1.5:1 or less | **Maximum exposed area** | 1.1 ft.² |
| **Pattern** | Omnidirectional | **Lateral thrust at 100 MPH** | 44 lb. |
| **Vertical beamwidth** | 38° | **Bending moment at top clamp** | 47 ft. lb. |
| **Termination** | 7-16 DIN-F | **(100 MPH, 40 PSF flat plate equiv.)** | |

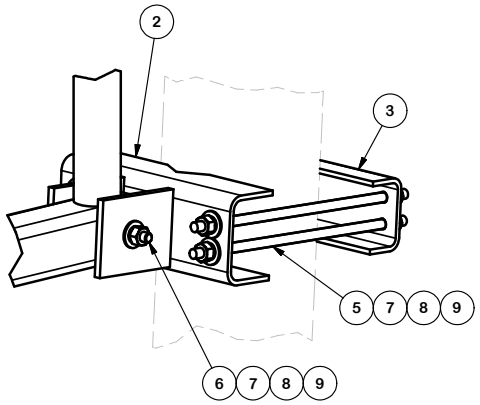
TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = 3.5"± DIAMETER.

| PARTS LIST | | | | | | |
|---|---|---|---|---|---|---|
| ITEM | QTY | PART NO. | PART DESCRIPTION | LENGTH | UNIT WT. | NET WT. |
| 1 | 1 | CFM | UPPER GATE FOOT WELDMENT | | 13.90 | 13.90 |
| 2 | 1 | CFS | LOWER GATE FOOT WELDMENT | | 12.72 | 12.72 |
| 3 | 2 | GBB | GATE BACKING BAR | | 4.53 | 9.06 |
| 4 | 1 | 4PBG | 48" PIPE MOUNT STANDOFF ARM | | 113.96 | 113.96 |
| 5 | 8 | G12R-12 | 1/2" x 12" GALV. THREADED ROD | | 0.67 | 5.35 |
| 5 | 8 | G12R-15 | 1/2" x 15" GALV. THREADED ROD | | 0.84 | 6.69 |
| 6 | 2 | A1205 | 1/2" x 5" A325 HDG BOLT | | 0.34 | 0.69 |
| 7 | 18 | G12FW | 1/2" HDG USS FLATWASHER | | 0.03 | 0.61 |
| 8 | 18 | G12LW | 1/2" HDG LOCKWASHER | | 0.01 | 0.25 |
| 9 | 18 | G12NUT | 1/2" HDG HEAVY 2H HEX NUT | | 0.07 | 1.29 |
| | | | | | TOTAL WT. # | 164.53 |

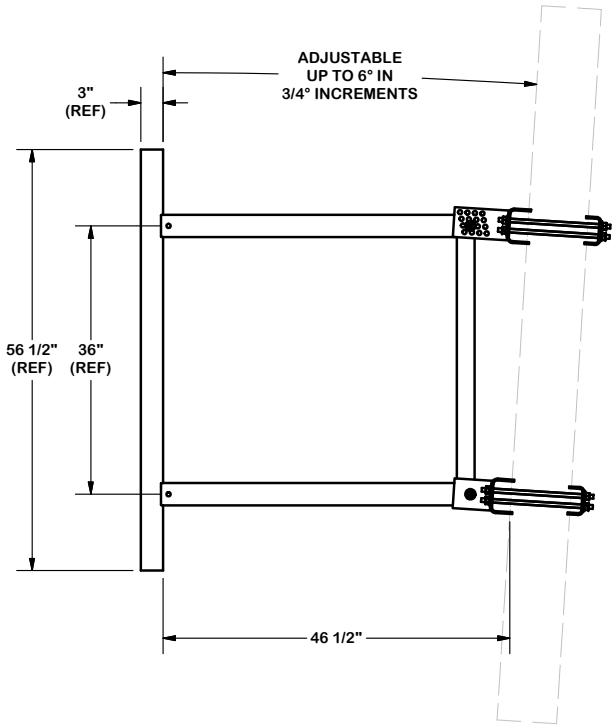



DETAIL A




DETAIL B




## TOLERANCE NOTES

**TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:**
**SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")***
**DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES**
**LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES**
**BENDS ARE ± 1/2 DEGREE**
**ALL OTHER MACHINING *(± 0.030")***
**ALL OTHER ASSEMBLY *(± 0.060")***



DESCRIPTION: 48" ULTIMATE UNIVERSAL STANDOFF FRAME

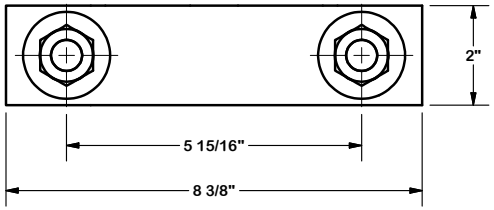
SITE PRO 1 — A valmont COMPANY

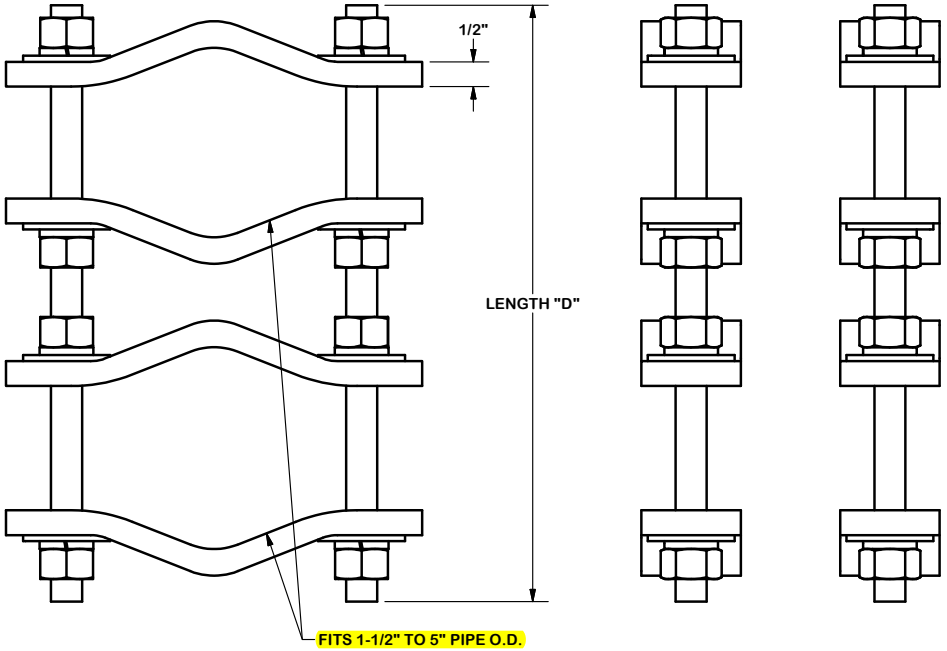
Engineering Support Team: 1-888-753-7446

Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

| CPD NO. | DRAWN BY | ENG. APPROVAL | PART NO. | PAGE |
|---|---|---|---|---|
| | RCH 2/4/2011 | | USF-4U | 1 OF 1 |

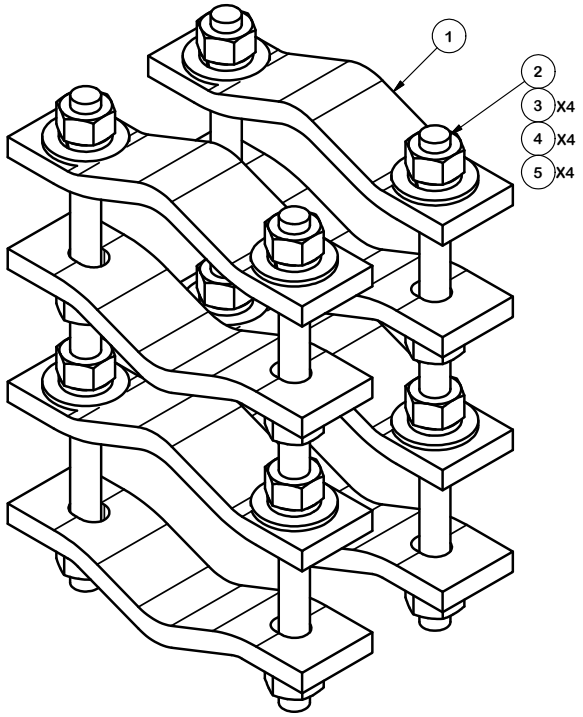
| CLASS | SUB | DRAWING USAGE | CHECKED BY | DWG. NO. |
|---|---|---|---|---|
| 81 | 01 | CUSTOMER | BMC 2/16/2011 | USF-4U |




| PARTS LIST | | | | | | |
|---|---|---|---|---|---|---|
| ITEM | QTY | PART NO. | PART DESCRIPTION | LENGTH | UNIT WT. | NET WT. |
| 1 | 8 | DCP | CLAMP HALF, 1/2" THICK, 8-3/8" | | 2.40 | 19.20 |
| 2 | B | C | 5/8" THREADED ROD | D | E | F |
| 3 | 16 | G58NUT | 5/8" HDG HEAVY 2H HEX NUT | | 0.13 | 2.08 |
| 4 | 16 | G58LW | 5/8" HDG LOCKWASHER | | 0.03 | 0.42 |
| 5 | 16 | G58FW | 5/8" HDG USS FLATWASHER | | 0.07 | 1.13 |

| VARIABLE PARTS TABLE | | | | | | |
|---|---|---|---|---|---|---|
| ASSEMBLY "A" | QTY "B" | PART "C" | LENGTH "D" | UNIT WT. "E" | NET WT. "F" | TOTAL WEIGHT |
| DCP12K | 4 | G58R-12 | 12" | 1.05 | 4.18 | 27.01 |
| DCP18K | 4 | G58R-18 | 18" | 1.57 | 6.27 | 29.10 |




## TOLERANCE NOTES

**TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:**
**SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")***
**DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES**
**LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES**
**BENDS ARE ± 1/2 DEGREE**
**ALL OTHER MACHINING *(± 0.030")***
**ALL OTHER ASSEMBLY *(± 0.060")***



DESCRIPTION
PIPE TO PIPE CLAMP SET
1-1/2" TO 5" PIPE
1/2" THICK CLAMP

SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

| CPD NO. | DRAWN BY | ENG. APPROVAL | PART NO. | PAGE |
|---|---|---|---|---|
| | KC8 8/21/2012 | | SEE ASSEMBLY "A" | 1 OF 1 |

| CLASS | SUB | DRAWING USAGE | CHECKED BY | DWG. NO. |
|---|---|---|---|---|
| 81 | 01 | CUSTOMER | CEK 1/22/2013 | DCPxxK |

ATTACHMENT D – STRUCTURAL ANALYSIS REPORT

TES
Tower Engineering Solutions
Phone (972) 483-0607, Fax (972) 975-9615
1320 Greenway Drive, Suite 600, Irving, Texas 75038

# Structural Analysis Report

**Existing 196 ft ROHN Self Supporting Tower**

**Customer Name: SBA Communications Corp**

**Customer Site Number: CT06462-A-2**

**Customer Site Name: Mountain Street**

**Carrier Name: Connecticut Light & Power (App#: 104047, v6)**

**Carrier Site ID / Name: ES-055 / Willimantic**

**Site Location: 349 Mountain Street**

**Windham, Connecticut**

**Windham County**

**Latitude: 41.703011**

**Longitude: -72.221391**


**Analysis Result:**

**Max Structural Usage: 54.8% [Pass]**

**Max Foundation Usage: 33.2% [Pass]**

**Additional Usage Caused by Mount Modification: N/A**

**Report Prepared By: Walter Velez**

Tower Engineering Solutions
Phone (972) 483-0607, Fax (972) 975-9615
1320 Greenway Drive, Suite 600, Irving, Texas 75038

# Structural Analysis Report

**Existing 196 ft ROHN Self Supporting Tower**

**Customer Name: SBA Communications Corp**

**Customer Site Number: CT06462-A-2**

**Customer Site Name: Mountain Street**

**Carrier Name: Connecticut Light & Power (App#: 104047, v6)**

**Carrier Site ID / Name: ES-055 / Willimantic**

**Site Location: 349 Mountain Street**

**Windham, Connecticut**

**Windham County**

**Latitude: 41.703011**

**Longitude: -72.221391**

## Analysis Result:

**Max Structural Usage: 54.8% [Pass]**

**Max Foundation Usage: 33.2% [Pass]**

**Additional Usage Caused by Mount Modification: N/A**

**Report Prepared By: Walter Velez**

## Introduction

The purpose of this report is to summarize the analysis results on the 196 ft ROHN Self Supporting Tower to support the proposed antennas and transmission lines in addition to those currently installed. Any modification listed under Sources of Information was assumed completed and was included in this analysis.

## Sources of Information

| | |
|---|---|
| **Tower Drawings** | Original fabrications drawings prepared by ROHN Industries, Inc. Dated 09-27-2001. Drawing No C011214. Eng. File No 49204TT.<br>Previous structural report prepared by Tower Engineering Solutions. Dated 12-04-2019. TES Project No 90207. |
| **Foundation Drawing** | Original foundation drawings prepared by ROHN Industries, Inc. Dated 08-31-2001. Drawing No A012046-1. Eng. File No 49204TT. |
| **Geotechnical Report** | Geotechnical report prepared by BL Companies. Dated 12-01-2000. Project No 00C672-C. |
| **Modification Drawings** | N/A |

## Analysis Criteria

The comprehensive analysis was performed in accordance with the requirements and stipulations of the TIA-222-H**.** In accordance with this standard, the structure was analyzed using **TESTowers,** a proprietary analysis software. The program considers the structure as an elastic 3-D model with second-order effects and temperature effects incorporated in the analysis. The analysis was performed using multiple wind directions.

| | |
|---|---|
| **Wind Speed Used in the Analysis:** | 121.0 mph (3-Sec. Gust) (Ultimate wind speed) |
| **Wind Speed with Ice:** | 50 mph (3-Sec. Gust) with 1" radial ice concurrent |
| **Service Load Wind Speed:** | 60 mph + 0" Radial ice |
| **Standard/Codes:** | ANSI/TIA/EIA 222-H, 2018 IBC & 2018 Connecticut State Building Code |
| **Exposure Category:** | B |
| **Risk Category:** | II |
| **Topographic Category:** | 1 |
| **Crest Height:** | 0 ft |
| **Seismic Parameters:** | $S_S$ = 0.192, $S_1$ = 0.055 |

This structural analysis is based upon the tower being classified as a Risk Category II; however, if a different classification is required subsequent to the date hereof, the tower classification will be changed to meet such requirement and a new structural analysis will be run.

## Existing Antennas, Mounts and Transmission Lines

The table below summarizes the antennas, mounts and transmission lines that were considered in the analysis as existing on the tower.

| Items | Elevation (ft.) | Qty. | Antenna Descriptions | Mount Type & Qty. | Transmission Lines | Owner |
|---|---|---|---|---|---|---|
| **1** | 185.0 | 3 | Antel BXA-80080/4FC - Panel | Direct | (3) 1 5/8" | Verizon |
| **2** | | 6 | RFS Celwave FD9R6004/2C-3L | | | |
| **3** | 168.0 | 3 | Ericsson AIR21 B2/B4 - Panel | (3) 10' T Frames | (12) 1 5/8" (Stacked 6/6); (2) 1 5/8" Fiber | T-Mobile |
| **4** | | 3 | Ericsson AIR32 B66aa/B2a - Panel | | | |
| **5** | | 3 | Commscope LNX-6515DS-A1M - Panel | | | |
| **6** | | 3 | EMS RR90-17-02DP - Panel | | | |
| **7** | | 3 | Ericsson KRY 112 144 | | | |
| **8** | | 3 | Ericsson RRUS11 B12 | | | |
| **9** | 162.0 | 1 | RFS PD1142-2B | (1) 1.5' Standoff | (6) 7/8" | Connecticut Light & Power |
| **10** | 157.0 | 1 | RFS 458-2N | (1) 4' Standoff | | |
| **11** | | 1 | Telwave ANT450D6-9 | (1) 4' Standoff | | |
| **12** | 140.0 | 1 | RFS 220-7N | (3) 8' Standoff | | |
| **13** | 134.5 | 1 | RFS PD1142-2B | | | |
| **14** | 132.5 | 1 | Telwave ANT450D6-9 | | | |
| **15** | 120.0 | 3 | Commscope SBNHH-1D45B - Panel | (3) 10' T-Frames | (8) 1 5/8"; (2) 1 5/8" Fiber | Verizon |
| **16** | | 6 | Commscope SBNHH-1D65B - Panel | | | |
| **17** | | 3 | Alcatel Lucent RRH2X60-AWS | | | |
| **18** | | 3 | Alcatel Lucent RRH2x60-700 | | | |
| **19** | | 3 | Alcatel Lucent RRH2X60-PCS | | | |
| **20** | | 2 | RFS Celwave DB-T1-6Z-8AB-0Z | | | |

## Proposed Carrier's Final Configuration of Antennas, Mounts and Transmission Lines

Information pertaining to the proposed carrier's final configuration of antennas and transmission lines was provided by SBA Communications Corp. The proposed antennas and lines are listed below.

| Items | Elevation (ft.) | Qty. | Antenna Descriptions | Mount Type & Qty. | Transmission Lines | Owner |
|---|---|---|---|---|---|---|
| **21** | 167.0 | 1 | Commscope DB586-Y Omni | (1) Sidearm (Commscope S-200) | (8) 7/8" Coax; (1) 1/2" Coax | Connecticut Light & Power |
| **22** | 166.5 | 1 | RFS 458-2 Omni | (1) Sidearm (Commscope S-400) | | |
| **23** | 165.0 | 1 | RFS BA1312-0 Omni | (1) Sidearm (Commscope S-400) | | |
| **24** | 164.0 | 1 | Powerwave LGP104 TMA | | | |
| **25** | 163.0 | 1 | Telewave ANT220F2 Omni | (1) Sidearm (Site Pro USF-4U) | | |
| **26** | 155.0 | 1 | Telewave ANT220F2 Omni | (1) Sidearm (Site Pro USF-4U) | | |
| **27** | 140.4 | 1 | RFS 220-3AN Omni | (1) 6' Sidearm (Commscope S-600) | | |
| **28** | 139.5 | 1 | RFS 220-7N Omni | (1) 4' Sidearm (Wireless Solutions WS-S400) | | |
| **29** | 137.0 | 1 | Kreco CO-36A Omni | (1) 6' Sidearm (Commscope S-600) | | |

Please see the attached coax layout for the line placement considered in the analysis.

## Analysis Results

The results of the structural analysis, performed for the wind and ice loading and antenna equipment as defined above, are summarized as the following:

| Tower Component | Legs | Diagonals | Horizontals | Anchor Bolts |
|---|---|---|---|---|
| Max. Usage: | **51.5%** | **54.8%** | **2.9%** | **37.0%** |
| Pass/Fail | **Pass** | **Pass** | **Pass** | **Pass** |

## Foundations

| | Compression (Kips) | Uplift (Kips) | Shear (Kips) |
|---|---|---|---|
| Original Design Reactions | 345.4 | 301.3 | 57.8 |
| Analysis Reactions | 230.5 | 190.9 | 25.3 |
| Factored Reactions* | 466.3 | 406.8 | 78.0 |

* Per section 15.6.2 of the TIA-222-H standard, factored reactions were obtained by multiplying a 1.35 factor to the original design reactions.

The foundation has been investigated using the supplied documents and soils report and was found adequate. Therefore, no modification to the foundation will be required.

## Operational Condition (Rigidity):

Operational characteristics of the tower are found to be within the limits prescribed by ANSI/TIA/EIA 222-H for the installed antennas. The maximum twist/sway at the elevation of the proposed equipment is 0.1454 degrees under the operational wind speed as specified in the Analysis Criteria.

## Conclusions

Based on the analysis results, the existing structure and its foundation were found to be adequate to safely support the existing and proposed equipment and meet the minimum requirements per the ANSI/TIA-222-H standards, 2018 IBC and the 2018 Connecticut State Building Code under the design basic wind speed specified in the Analysis Criteria.

# Standard Conditions

1. This analysis was performed based on the information supplied to **(TES) Tower Engineering Solutions, LLC.** Verification of the information provided was not included in the Scope of Work for **TES**. The accuracy of the analysis is dependent on the accuracy of the information provided.

2. The structural analysis was performance based upon the evidence available at the time of this report. All information provided by the client is considered to be accurate.

3. The analyses will be performed based on the codes as specified by the client or based on the best knowledge of the engineering staff of **TES**. In the absence of information to the contrary, all work will be performed in accordance with the latest relevant revision of ANSI/TIA-222. If wind speed and/or ice loads are different from the minimum values recommended by the ANSI/TIA-222 standard or other codes, **TES** should be notified in writing and the applicable minimum values provided by the client.

4. The configuration of the existing mounts, antennas, coax and other appurtenances were supplied by the customer for the current structural analysis. **TES** has not visited the tower site to verify the adequacy of the information provided. If there is any discrepancy found in the report regarding the existing conditions, **TES** should be notified immediately to evaluate the effect of the discrepancy on the analysis results.

5. The client will assume responsibility for rework associated with the differences in initially provided information, including tower and foundation information, existing and/or proposed equipment and transmission lines.

6. If a feasibility analysis was performed, final acceptance of changed conditions shall be based upon a rigorous structural analysis.

# Structure: CT06462-A-2-SBA

| | | | | | | |
|---|---|---|---|---|---|---|
| **Site Name:** | Mountain Street | | | **Code:** | EIA/TIA-222-H | 3/3/2020 |
| **Type:** | Self Support | **Base Shape:** | Triangle | **Basic WS:** | 121.00 | |
| **Height:** | 196.00 (ft) | **Base Width:** | 23.00 | **Basic Ice WS:** | 50.00 | |
| **Base Elev:** | 0.00 (ft) | **Top Width:** | 6.60 | **Operational WS:** | 60.00 | Page: 1 |

Tower Engineering Solutions

## Section Properties

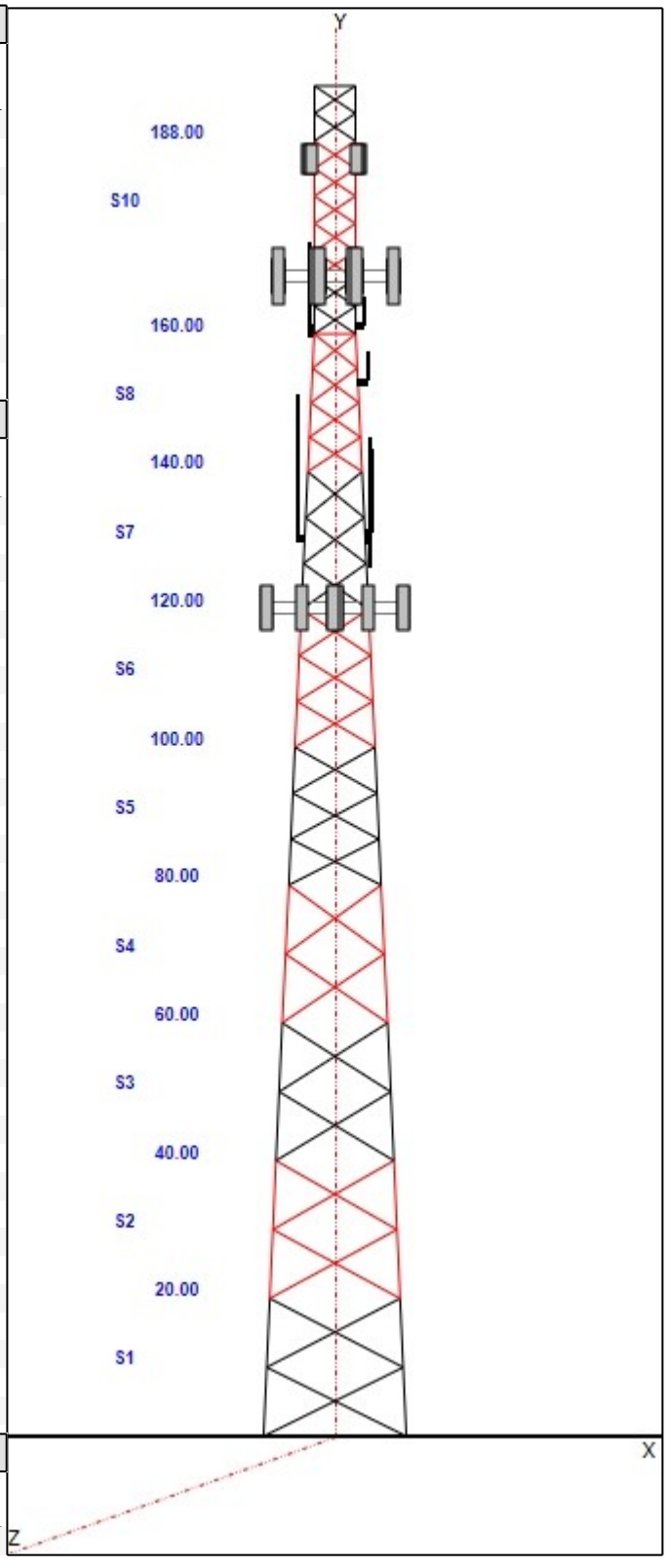
| Sect | Leg Members | Diagonal Members | Horizontal Members |
|---|---|---|---|
| 1 | PX 8" DIA PIPE | SAE 4X4X0.25 | |
| 2 | PSP ROHN 8 EHS | SAE 4X4X0.25 | |
| 3 | PSP ROHN 8 EHS | SAE 3.5X3.5X0.25 | |
| 4 | PX 6" DIA PIPE | SAE 3.5X3.5X0.25 | |
| 5 | PSP ROHN 6 EHS | SAE 3X3X0.25 | |
| 6 | PX 5" DIA PIPE | SAE 2.5X2.5X0.25 | |
| 7 | PX 4" DIA PIPE | SAE 2.5X2.5X0.25 | |
| 8 | PX 3" DIA PIPE | SAE 2X2X0.1875 | SAE 1.75X1.75X0.1875 |
| 9-10 | PST 3" DIA PIPE | SAE 2X2X0.25 | |
| 11 | PST 3" DIA PIPE | SAE 1.75X1.75X0.1875 | SAE 1.75X1.75X0.1875 |

## Discrete Appurtenances

| Attach Elev (ft) | Force Elev (ft) | Qty | Description |
|---|---|---|---|
| 185.00 | 185.00 | 3 | Antel BXA-80080/4FC |
| 185.00 | 185.00 | 6 | RFS Celwave FD9R6004/2C-3L |
| 168.00 | 168.00 | 3 | Ericsson AIR21 B2/B4 |
| 168.00 | 168.00 | 3 | Ericsson AIR32 B66aa/B2a |
| 168.00 | 168.00 | 3 | Commscope LNX-6515DS-A1M |
| 168.00 | 168.00 | 3 | EMS RR90-17-02DP |
| 168.00 | 168.00 | 3 | Ericsson KRY 112 144 |
| 168.00 | 168.00 | 3 | Ericsson RRUS11 B12 |
| 168.00 | 168.00 | 3 | 10' T Frames |
| 164.81 | 167.00 | 1 | Commscope DB586-Y Omni |
| 164.81 | 164.00 | 1 | Powerwave LGP104 TMA |
| 164.81 | 164.81 | 1 | Sidearm (Commscope/Andrew S-200) |
| 160.88 | 162.88 | 1 | Telewave ANT220F2 Omni |
| 160.88 | 160.88 | 1 | Sidearm (Site Pro USF-4U) |
| 160.67 | 165.00 | 1 | RFS BA1312-0 Omni |
| 160.67 | 160.67 | 1 | Sidearm (Commscope S-400) |
| 159.85 | 166.50 | 1 | RFS 458-2 Omni |
| 159.85 | 159.85 | 1 | Sidearm (Commscope S-400) |
| 152.88 | 155.01 | 1 | Telewave ANT220F2 Omni |
| 152.88 | 152.88 | 1 | Sidearm (Site Pro USF-4U) |
| 131.00 | 137.00 | 1 | Kreco CO-36A Omni |
| 131.00 | 131.00 | 1 | 6' Sidearm (Commscope S-600) |
| 130.07 | 140.40 | 1 | RFS 220-3AN Omni |
| 130.07 | 130.07 | 1 | 6' Sidearm (Commscope/Andrew S-600) |
| 130.00 | 135.32 | 1 | RFS 220-7N Omni |
| 130.00 | 130.00 | 1 | 4' Sidearm (Wireless Solutions WS-S400) |
| 120.00 | 120.00 | 3 | Commscope SBNHH-1D45B |
| 120.00 | 120.00 | 6 | Commscope SBNHH-1D65B |
| 120.00 | 120.00 | 3 | Alcatel Lucent RRH2X60-AWS |
| 120.00 | 120.00 | 3 | Alcatel Lucent RRH2x60-700 |
| 120.00 | 120.00 | 3 | Alcatel Lucent RRH2X60-PCS |
| 120.00 | 120.00 | 2 | RFS Celwave DB-T1-6Z-8AB-0Z |
| 120.00 | 120.00 | 3 | 10' T-Frames |

## Linear Appurtenances

| Elev From (ft) | Elev To (ft) | Qty | Description |
|---|---|---|---|
| 1.00 | 196.00 | 1 | Safety Climb |
| 3.00 | 196.00 | 0 | Step bolts (ladder) |
| 3.00 | 196.00 | 0 | Step bolts (ladder) |



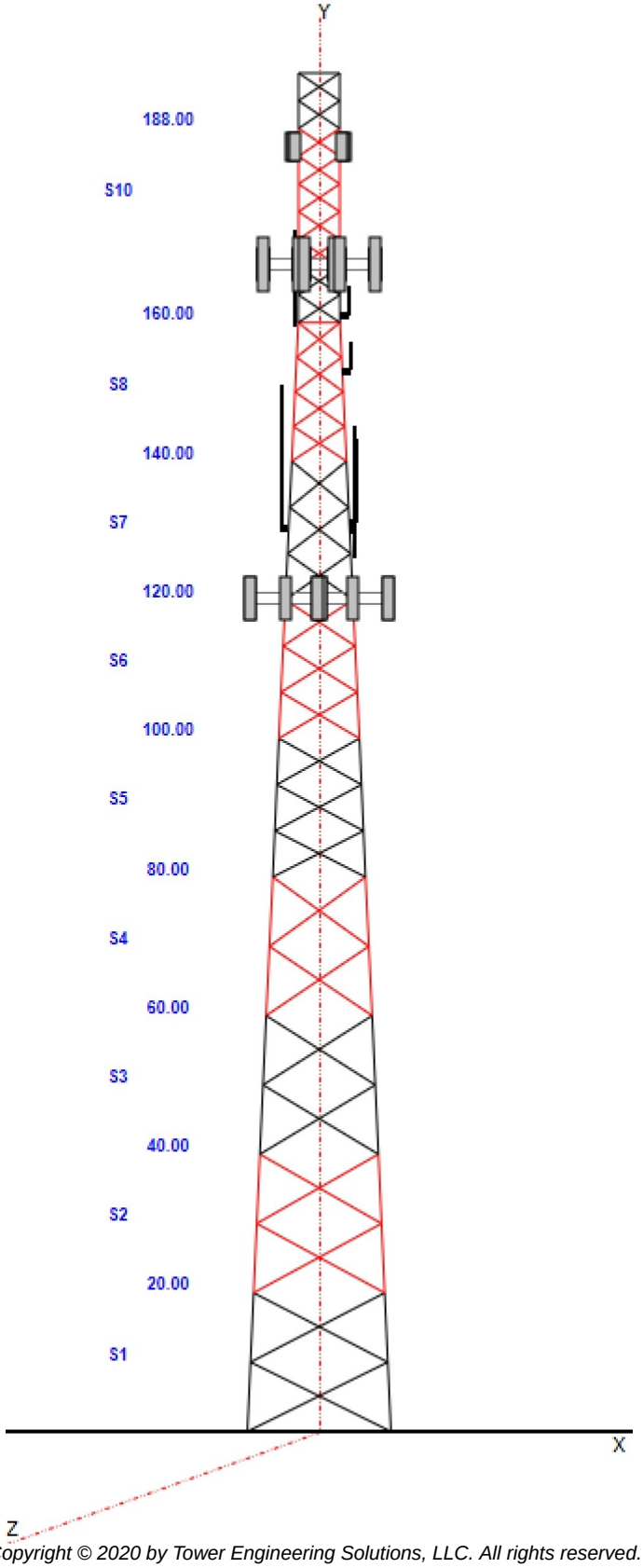
| | | | |
|---|---|---|---|
| 3.00 | 196.00 | 0 | Step bolts (ladder) |
| 0.00 | 185.00 | 1 | W/G Ladder (VZW) |
| 3.00 | 185.00 | 3 | 1 5/8" Coax |
| 0.00 | 168.00 | 1 | W/G Ladder (TMO) |
| 3.00 | 168.00 | 12 | 1 5/8" Coax |
| 3.00 | 168.00 | 2 | 1 5/8" Fiber |
| 0.00 | 160.00 | 1 | W/G Ladder (CLP) |
| 3.00 | 160.00 | 1 | 1/2" Coax |
| 3.00 | 160.00 | 8 | 7/8" Coax |
| 3.00 | 120.00 | 8 | 1 5/8" Coax |
| 3.00 | 120.00 | 2 | 1 5/8" Fiber |

## Base Reactions

| Leg | | | Overturning | | |
|---|---|---|---|---|---|
| Max Uplift: | -190.91 | (kips | Moment: | 4282.66 | (ft-kips) |
| Max Down: | 230.46 | (kips | Total Down: | 46.34 | (kips) |
| Max Shear: | 25.35 | (kips | Total Shear: | 41.70 | (kips) |

## Structure: CT06462-A-2-SBA

| | | | | | | |
|---|---|---|---|---|---|---|
| **Site Name:** | Mountain Street | | | **Code:** | EIA/TIA-222-H | 3/3/2020 |
| **Type:** | Self Support | **Base Shape:** | Triangle | **Basic WS:** | 121.00 | |
| **Height:** | 196.00 (ft) | **Base Width:** | 23.00 | **Basic Ice WS:** | 50.00 | |
| **Base Elev:** | 0.00 (ft) | **Top Width:** | 6.60 | **Operational WS:** | 60.00 | Page: 3 |



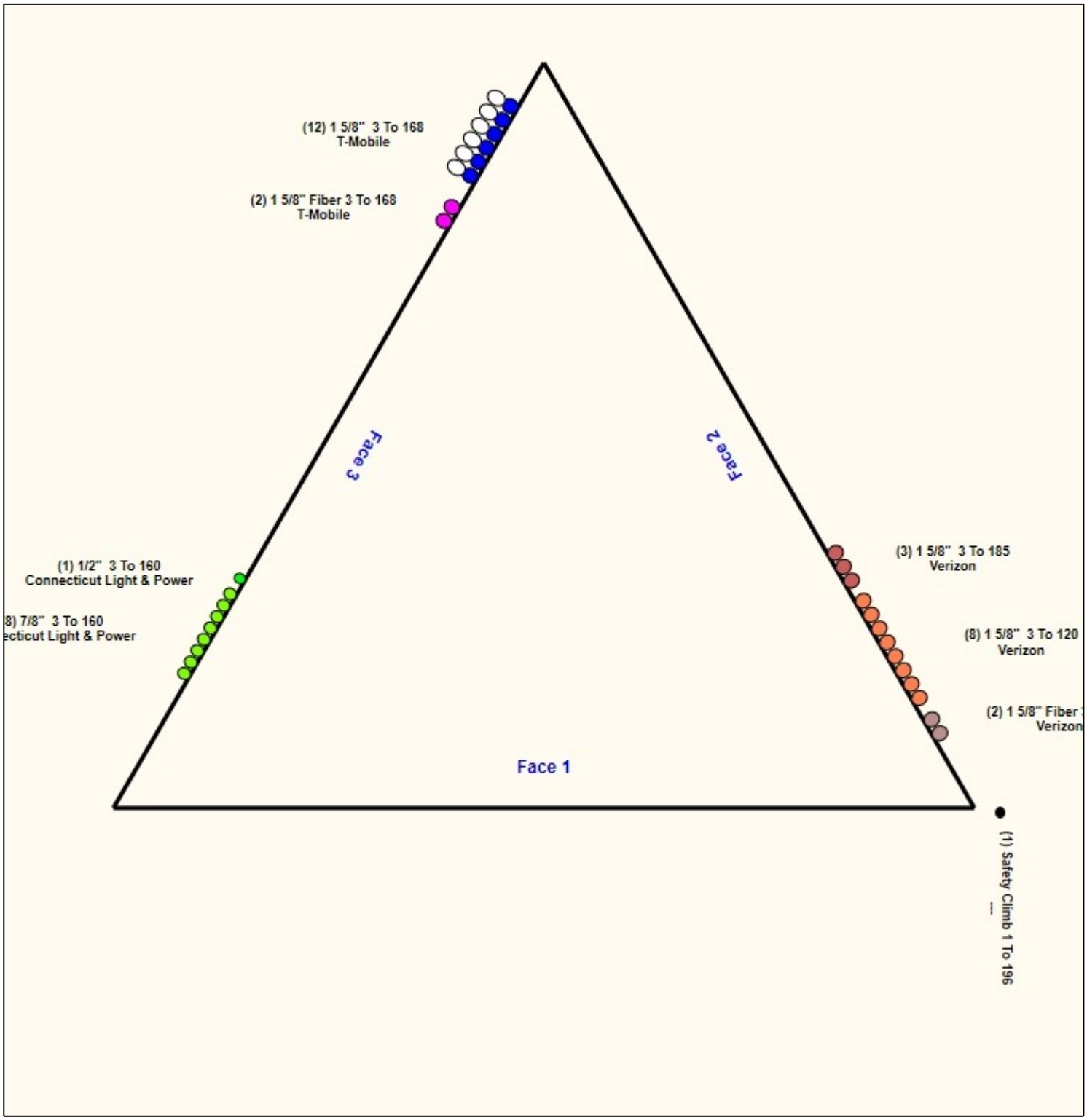
# Structure: CT06462-A-2-SBA - Coax Line Placement

**Type:** Self Support
**Site Name:** Mountain Street
**Height:** 196.00 (ft)

3/3/2020



Tower Engineering Solutions



# Loading Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 5 | |

Tower Engineering Solutions

## Discrete Appurtenances Properties

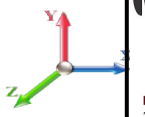
| | | | No Ice | | Ice | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Attach Elev (ft)** | **Description** | **Qty** | **Weight (lb)** | **CaAa (sf)** | **Weight (lb)** | **CaAa (sf)** | **Len (in)** | **Width (in)** | **Depth (in)** | **Ka** | **Orientation Factor** | **Vert Ecc (ft)** |
| 185.00 | Antel BXA-80080/4FC | 3 | 14.30 | 4.800 | 87.68 | 6.070 | 48.200 | 11.200 | 5.900 | 1.00 | 1.00 | 0.000 |
| 185.00 | RFS Celwave FD9R6004/2C-3L | 6 | 3.10 | 0.310 | 8.54 | 0.569 | 5.800 | 6.500 | 1.500 | 1.00 | 0.60 | 0.000 |
| 168.00 | Ericsson AIR21 B2/B4 | 3 | 91.50 | 6.050 | 198.02 | 6.768 | 56.000 | 12.000 | 8.000 | 0.80 | 0.86 | 0.000 |
| 168.00 | Ericsson AIR32 B66aa/B2a | 3 | 132.20 | 6.050 | 238.72 | 6.768 | 56.000 | 12.000 | 8.000 | 0.80 | 0.86 | 0.000 |
| 168.00 | Commscope LNX-6515DS-A1M | 3 | 49.80 | 10.640 | 204.21 | 12.678 | 96.200 | 10.900 | 5.900 | 0.80 | 0.82 | 0.000 |
| 168.00 | EMS RR90-17-02DP | 3 | 18.00 | 4.360 | 78.07 | 5.000 | 56.000 | 8.000 | 2.800 | 0.80 | 0.73 | 0.000 |
| 168.00 | Ericsson KRY 112 144 | 3 | 11.00 | 1.140 | 18.25 | 2.029 | 13.230 | 10.340 | 6.300 | 0.80 | 0.60 | 0.000 |
| 168.00 | Ericsson RRUS11 B12 | 3 | 50.00 | 1.380 | 93.67 | 1.613 | 16.240 | 10.170 | 6.900 | 0.80 | 0.67 | 0.000 |
| 168.00 | 10' T Frames | 3 | 500.00 | 15.000 | 852.17 | 28.148 | 0.000 | 0.000 | 0.000 | 0.75 | 0.75 | 0.000 |
| 164.81 | Commscope DB586-Y Omni | 1 | 8.25 | 1.010 | 39.42 | 1.657 | 52.560 | 2.500 | 2.500 | 1.00 | 1.00 | 2.190 |
| 164.81 | Powerwave LGP104 TMA | 1 | 7.00 | 0.230 | 12.73 | 0.386 | 7.000 | 4.000 | 1.200 | 1.00 | 1.00 | -0.810 |
| 164.81 | Sidearm (Commscope/Andrew | 1 | 40.00 | 2.630 | 94.00 | 6.645 | 10.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 160.88 | Telewave ANT220F2 Omni | 1 | 11.00 | 1.040 | 33.93 | 1.639 | 51.000 | 2.800 | 2.800 | 1.00 | 1.00 | 2.000 |
| 160.88 | Sidearm (Site Pro USF-4U) | 1 | 165.00 | 5.150 | 329.56 | 9.688 | 20.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 160.67 | RFS BA1312-0 Omni | 1 | 4.40 | 1.730 | 55.43 | 3.804 | 104.000 | 2.000 | 2.000 | 1.00 | 1.00 | 4.330 |
| 160.67 | Sidearm (Commscope S-400) | 1 | 53.32 | 3.500 | 124.71 | 8.829 | 10.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 159.85 | RFS 458-2 Omni | 1 | 22.00 | 3.720 | 58.09 | 6.679 | 159.600 | 2.800 | 2.800 | 1.00 | 1.00 | 6.650 |
| 159.85 | Sidearm (Commscope S-400) | 1 | 41.00 | 3.500 | 95.86 | 8.795 | 10.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 152.88 | Telewave ANT220F2 Omni | 1 | 11.00 | 1.040 | 33.93 | 1.639 | 51.000 | 2.800 | 2.800 | 1.00 | 1.00 | 2.130 |
| 152.88 | Sidearm (Site Pro USF-4U) | 1 | 165.00 | 5.150 | 329.55 | 9.688 | 20.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 131.00 | Kreco CO-36A Omni | 1 | 12.00 | 0.750 | 29.94 | 1.339 | 144.000 | 0.620 | 0.620 | 1.00 | 1.00 | 6.000 |
| 131.00 | 6' Sidearm (Commscope S-600) | 1 | 70.00 | 5.150 | 162.33 | 12.831 | 15.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 130.07 | RFS 220-3AN Omni | 1 | 24.00 | 5.680 | 119.09 | 10.490 | 248.400 | 2.750 | 2.750 | 1.00 | 1.00 | 10.33 |
| 130.07 | 6' Sidearm (Commscope/Andrew | 1 | 70.00 | 5.150 | 138.82 | 9.623 | 15.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 130.00 | RFS 220-7N Omni | 1 | 22.00 | 5.320 | 157.72 | 9.776 | 228.000 | 2.800 | 2.800 | 1.00 | 1.00 | 5.320 |
| 130.00 | 4' Sidearm (Wireless Solutions | 1 | 53.32 | 3.500 | 123.70 | 8.753 | 10.000 | 0.000 | 0.000 | 1.00 | 1.00 | 0.000 |
| 120.00 | Commscope SBNHH-1D45B | 3 | 64.40 | 14.770 | 296.72 | 15.789 | 76.800 | 22.300 | 12.200 | 0.80 | 0.80 | 0.000 |
| 120.00 | Commscope SBNHH-1D65B | 6 | 40.60 | 8.050 | 161.87 | 8.865 | 72.000 | 11.850 | 7.100 | 0.80 | 0.83 | 0.000 |
| 120.00 | Alcatel Lucent RRH2X60-AWS | 3 | 55.00 | 3.500 | 106.71 | 4.010 | 37.000 | 11.000 | 5.000 | 0.80 | 0.67 | 0.000 |
| 120.00 | Alcatel Lucent RRH2x60-700 | 3 | 46.00 | 3.500 | 102.41 | 4.009 | 37.000 | 11.000 | 5.000 | 0.80 | 0.67 | 0.000 |
| 120.00 | Alcatel Lucent RRH2X60-PCS | 3 | 55.00 | 2.200 | 105.20 | 2.598 | 22.000 | 12.000 | 9.400 | 0.80 | 0.67 | 0.000 |
| 120.00 | RFS Celwave DB-T1-6Z-8AB-0Z | 2 | 18.90 | 4.800 | 106.04 | 5.351 | 24.000 | 24.000 | 10.000 | 0.80 | 0.67 | 0.000 |
| 120.00 | 10' T-Frames | 3 | 500.00 | 15.000 | 838.38 | 27.633 | 0.000 | 0.000 | 0.000 | 0.75 | 0.75 | 0.000 |
| | **Totals:** | **70** | **5,840.89** | | **12,834.03** | | | | | | **Number of Appurtenances :** | **33** |

## Linear Appurtenances Properties

| Elev. From (ft) | Elev. To (ft) | Description | Qty | Width (in) | Weight (lb/ft) | Pct In Block | Spread On Faces | Bundling Arrangement | Cluster Dia (in) | Out of Zone | Spacing (in) | Orientation Factor | Ka Override |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.00 | 196.00 | Safety Climb | 1 | 0.38 | 0.27 | 100.00 | 1 | Individual NR | | N | 1.00 | 1.00 | |
| 3.00 | 196.00 | Step bolts (ladder) | | 0.63 | 1.04 | 100.00 | 1 | Individual NR | | N | 1.00 | 1.00 | |
| 3.00 | 196.00 | Step bolts (ladder) | | 0.63 | 1.04 | 100.00 | 2 | Individual NR | | N | 1.00 | 1.00 | |
| 3.00 | 196.00 | Step bolts (ladder) | | 0.63 | 1.04 | 100.00 | 3 | Individual NR | | N | 1.00 | 1.00 | |
| 0.00 | 185.00 | W/G Ladder (VZW) | 1 | 2.00 | 6.00 | 100.00 | 2 | Individual NR | | N | 1.00 | 1.00 | |
| 3.00 | 185.00 | 1 5/8" Coax | 3 | 1.98 | 1.04 | 100.00 | 2 | Individual IR | | N | 0.50 | 0.64 | |
| 0.00 | 168.00 | W/G Ladder (TMO) | 1 | 2.50 | 6.00 | 100.00 | 3 | Individual NR | | N | 1.00 | 1.00 | |
| 3.00 | 168.00 | 1 5/8" Coax | 12 | 1.98 | 1.04 | 50.00 | 3 | Block | | N | 0.50 | 1.00 | |
| 3.00 | 168.00 | 1 5/8" Fiber | 2 | 1.98 | 1.04 | 100.00 | 3 | Individual IR | | N | 0.50 | 1.00 | |
| 0.00 | 160.00 | W/G Ladder (CLP) | 1 | 3.00 | 6.00 | 100.00 | 3 | Individual NR | | N | 1.00 | 1.00 | |
| 3.00 | 160.00 | 1/2" Coax | 1 | 0.65 | 0.16 | 100.00 | 3 | Individual IR | | N | 1.00 | 1.00 | |
| 3.00 | 160.00 | 7/8" Coax | 8 | 1.11 | 0.52 | 100.00 | 3 | Individual IR | | N | 0.50 | 1.00 | |
| 3.00 | 120.00 | 1 5/8" Coax | 8 | 1.98 | 1.04 | 100.00 | 2 | Individual IR | | N | 0.50 | 0.42 | |
| 3.00 | 120.00 | 1 5/8" Fiber | 2 | 1.98 | 1.04 | 100.00 | 2 | Individual IR | | N | 0.50 | 0.76 | |

# Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 7 | |




Tower Engineering Solutions

**Load Case:** 1.2D + 1.0W Normal Wind — 1.2D + 1.0W 121 mph Wind at Normal To Face

**Wind Load Factor:** 1.00 — **Wind Importance Factor:** 1.00

**Dead Load Factor:** 1.20

**Ice Dead Load Factor:** 0.00 — **Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 22.30 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 1.00 | 1.00 | 0.00 | 43.67 | 89.04 | 0.00 | 6,528.3 | 0.0 | 2349.60 | 1284.77 | 3,634.37 |
| 2 | 30.0 | 22.32 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 1.00 | 1.00 | 0.00 | 41.35 | 102.48 | 0.00 | 5,727.3 | 0.0 | 2205.88 | 1481.64 | 3,687.52 |
| 3 | 50.0 | 25.83 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 1.00 | 1.00 | 0.00 | 35.08 | 102.48 | 0.00 | 5,321.6 | 0.0 | 2166.27 | 1714.46 | 3,880.73 |
| 4 | 70.0 | 28.43 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 1.00 | 1.00 | 0.00 | 31.63 | 102.48 | 0.00 | 4,847.7 | 0.0 | 2171.13 | 1887.46 | 4,058.59 |
| 5 | 90.0 | 30.55 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 1.00 | 1.00 | 0.00 | 32.63 | 102.48 | 0.00 | 4,493.7 | 0.0 | 2336.98 | 2027.97 | 4,364.96 |
| 6 | 110.0 | 32.35 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 1.00 | 1.00 | 0.00 | 25.69 | 102.48 | 0.00 | 3,921.5 | 0.0 | 1979.23 | 2147.64 | 4,126.88 |
| 7 | 130.0 | 33.93 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 1.00 | 1.00 | 0.00 | 22.39 | 69.48 | 0.00 | 3,096.9 | 0.0 | 1803.83 | 1567.29 | 3,371.12 |
| 8 | 150.0 | 35.35 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 1.00 | 1.00 | 0.00 | 19.44 | 69.48 | 0.00 | 2,404.0 | 0.0 | 1613.38 | 1632.70 | 3,246.08 |
| 9 | 164.0 | 36.26 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 1.00 | 1.00 | 0.00 | 7.64 | 19.44 | 0.00 | 862.1 | 0.0 | 632.37 | 484.56 | 1,116.93 |
| 10 | 178.0 | 37.12 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 1.00 | 1.00 | 0.00 | 19.03 | 11.87 | 0.00 | 1,624.6 | 0.0 | 1611.60 | 269.75 | 1,881.35 |
| 11 | 192.0 | 37.93 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 1.00 | 1.00 | 0.00 | 7.92 | 0.25 | 0.00 | 506.9 | 0.0 | 680.23 | 5.80 | 686.04 |
| | | | | | | | | | | | | | | **39,334.7** | **0.0** | | | **34,054.58** |

**Load Case:** 1.2D + 1.0W 60° Wind — 1.2D + 1.0W 121 mph Wind at 60° From Face

**Wind Load Factor:** 1.00 — **Wind Importance Factor:** 1.00

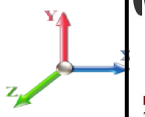
**Dead Load Factor:** 1.20

**Ice Dead Load Factor:** 0.00 — **Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 22.30 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 0.80 | 1.00 | 0.00 | 37.42 | 89.04 | 0.00 | 6,528.3 | 0.0 | 2013.18 | 1284.77 | 3,297.95 |
| 2 | 30.0 | 22.32 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 0.80 | 1.00 | 0.00 | 35.58 | 102.48 | 0.00 | 5,727.3 | 0.0 | 1897.97 | 1481.64 | 3,379.60 |
| 3 | 50.0 | 25.83 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 0.80 | 1.00 | 0.00 | 30.44 | 102.48 | 0.00 | 5,321.6 | 0.0 | 1879.96 | 1714.46 | 3,594.42 |
| 4 | 70.0 | 28.43 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 0.80 | 1.00 | 0.00 | 27.38 | 102.48 | 0.00 | 4,847.7 | 0.0 | 1879.45 | 1887.46 | 3,766.92 |
| 5 | 90.0 | 30.55 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 0.80 | 1.00 | 0.00 | 28.18 | 102.48 | 0.00 | 4,493.7 | 0.0 | 2017.89 | 2027.97 | 4,045.86 |
| 6 | 110.0 | 32.35 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 0.80 | 1.00 | 0.00 | 22.40 | 102.48 | 0.00 | 3,921.5 | 0.0 | 1726.05 | 2147.64 | 3,873.70 |
| 7 | 130.0 | 33.93 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 0.80 | 1.00 | 0.00 | 19.53 | 69.48 | 0.00 | 3,096.9 | 0.0 | 1572.97 | 1567.29 | 3,140.26 |
| 8 | 150.0 | 35.35 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 0.80 | 1.00 | 0.00 | 16.88 | 69.48 | 0.00 | 2,404.0 | 0.0 | 1400.83 | 1632.70 | 3,033.53 |
| 9 | 164.0 | 36.26 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 0.80 | 1.00 | 0.00 | 6.64 | 19.44 | 0.00 | 862.1 | 0.0 | 549.98 | 484.56 | 1,034.53 |
| 10 | 178.0 | 37.12 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 0.80 | 1.00 | 0.00 | 16.56 | 11.87 | 0.00 | 1,624.6 | 0.0 | 1402.00 | 269.75 | 1,671.75 |
| 11 | 192.0 | 37.93 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 0.80 | 1.00 | 0.00 | 6.87 | 0.25 | 0.00 | 506.9 | 0.0 | 589.99 | 5.80 | 595.80 |
| | | | | | | | | | | | | | | **39,334.7** | **0.0** | | | **31,434.31** |

# Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 8 | |




Tower Engineering Solutions

**Load Case:** 1.2D + 1.0W 90° Wind — 1.2D + 1.0W 121 mph Wind at 90° From Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 1.20
**Ice Dead Load Factor:** 0.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 22.30 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 0.85 | 1.00 | 0.00 | 38.98 | 89.04 | 0.00 | 6,528.3 | 0.0 | 2097.28 | 1284.77 | 3,382.06 |
| 2 | 30.0 | 22.32 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 0.85 | 1.00 | 0.00 | 37.02 | 102.48 | 0.00 | 5,727.3 | 0.0 | 1974.94 | 1481.64 | 3,456.58 |
| 3 | 50.0 | 25.83 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 0.85 | 1.00 | 0.00 | 31.60 | 102.48 | 0.00 | 5,321.6 | 0.0 | 1951.54 | 1714.46 | 3,666.00 |
| 4 | 70.0 | 28.43 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 0.85 | 1.00 | 0.00 | 28.44 | 102.48 | 0.00 | 4,847.7 | 0.0 | 1952.37 | 1887.46 | 3,839.84 |
| 5 | 90.0 | 30.55 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 0.85 | 1.00 | 0.00 | 29.29 | 102.48 | 0.00 | 4,493.7 | 0.0 | 2097.66 | 2027.97 | 4,125.63 |
| 6 | 110.0 | 32.35 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 0.85 | 1.00 | 0.00 | 23.22 | 102.48 | 0.00 | 3,921.5 | 0.0 | 1789.35 | 2147.64 | 3,936.99 |
| 7 | 130.0 | 33.93 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 0.85 | 1.00 | 0.00 | 20.25 | 69.48 | 0.00 | 3,096.9 | 0.0 | 1630.69 | 1567.29 | 3,197.98 |
| 8 | 150.0 | 35.35 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 0.85 | 1.00 | 0.00 | 17.52 | 69.48 | 0.00 | 2,404.0 | 0.0 | 1453.97 | 1632.70 | 3,086.67 |
| 9 | 164.0 | 36.26 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 0.85 | 1.00 | 0.00 | 6.89 | 19.44 | 0.00 | 862.1 | 0.0 | 570.57 | 484.56 | 1,055.13 |
| 10 | 178.0 | 37.12 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 0.85 | 1.00 | 0.00 | 17.18 | 11.87 | 0.00 | 1,624.6 | 0.0 | 1454.40 | 269.75 | 1,724.15 |
| 11 | 192.0 | 37.93 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 0.85 | 1.00 | 0.00 | 7.13 | 0.25 | 0.00 | 506.9 | 0.0 | 612.55 | 5.80 | 618.36 |
| | | | | | | | | | | | | | | **39,334.7** | **0.0** | | | **32,089.38** |

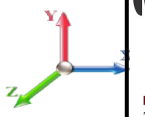
**Load Case:** 0.9D + 1.0W Normal Wind — 0.9D + 1.0W 121 mph Wind at Normal To Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 0.90
**Ice Dead Load Factor:** 0.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 22.30 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 1.00 | 1.00 | 0.00 | 43.67 | 89.04 | 0.00 | 4,896.3 | 0.0 | 2349.60 | 1284.77 | 3,634.37 |
| 2 | 30.0 | 22.32 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 1.00 | 1.00 | 0.00 | 41.35 | 102.48 | 0.00 | 4,295.5 | 0.0 | 2205.88 | 1481.64 | 3,687.52 |
| 3 | 50.0 | 25.83 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 1.00 | 1.00 | 0.00 | 35.08 | 102.48 | 0.00 | 3,991.2 | 0.0 | 2166.27 | 1714.46 | 3,880.73 |
| 4 | 70.0 | 28.43 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 1.00 | 1.00 | 0.00 | 31.63 | 102.48 | 0.00 | 3,635.8 | 0.0 | 2171.13 | 1887.46 | 4,058.59 |
| 5 | 90.0 | 30.55 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 1.00 | 1.00 | 0.00 | 32.63 | 102.48 | 0.00 | 3,370.3 | 0.0 | 2336.98 | 2027.97 | 4,364.96 |
| 6 | 110.0 | 32.35 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 1.00 | 1.00 | 0.00 | 25.69 | 102.48 | 0.00 | 2,941.1 | 0.0 | 1979.23 | 2147.64 | 4,126.88 |
| 7 | 130.0 | 33.93 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 1.00 | 1.00 | 0.00 | 22.39 | 69.48 | 0.00 | 2,322.6 | 0.0 | 1803.83 | 1567.29 | 3,371.12 |
| 8 | 150.0 | 35.35 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 1.00 | 1.00 | 0.00 | 19.44 | 69.48 | 0.00 | 1,803.0 | 0.0 | 1613.38 | 1632.70 | 3,246.08 |
| 9 | 164.0 | 36.26 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 1.00 | 1.00 | 0.00 | 7.64 | 19.44 | 0.00 | 646.6 | 0.0 | 632.37 | 484.56 | 1,116.93 |
| 10 | 178.0 | 37.12 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 1.00 | 1.00 | 0.00 | 19.03 | 11.87 | 0.00 | 1,218.5 | 0.0 | 1611.60 | 269.75 | 1,881.35 |
| 11 | 192.0 | 37.93 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 1.00 | 1.00 | 0.00 | 7.92 | 0.25 | 0.00 | 380.2 | 0.0 | 680.23 | 5.80 | 686.04 |
| | | | | | | | | | | | | | | **29,501.0** | **0.0** | | | **34,054.58** |

# Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 9 | |




Tower Engineering Solutions

**Load Case:** 0.9D + 1.0W 60° Wind — 0.9D + 1.0W 121 mph Wind at 60° From Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 0.90
**Ice Dead Load Factor:** 0.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 22.30 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 0.80 | 1.00 | 0.00 | 37.42 | 89.04 | 0.00 | 4,896.3 | 0.0 | 2013.18 | 1284.77 | 3,297.95 |
| 2 | 30.0 | 22.32 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 0.80 | 1.00 | 0.00 | 35.58 | 102.48 | 0.00 | 4,295.5 | 0.0 | 1897.97 | 1481.64 | 3,379.60 |
| 3 | 50.0 | 25.83 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 0.80 | 1.00 | 0.00 | 30.44 | 102.48 | 0.00 | 3,991.2 | 0.0 | 1879.96 | 1714.46 | 3,594.42 |
| 4 | 70.0 | 28.43 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 0.80 | 1.00 | 0.00 | 27.38 | 102.48 | 0.00 | 3,635.8 | 0.0 | 1879.45 | 1887.46 | 3,766.92 |
| 5 | 90.0 | 30.55 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 0.80 | 1.00 | 0.00 | 28.18 | 102.48 | 0.00 | 3,370.3 | 0.0 | 2017.89 | 2027.97 | 4,045.86 |
| 6 | 110.0 | 32.35 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 0.80 | 1.00 | 0.00 | 22.40 | 102.48 | 0.00 | 2,941.1 | 0.0 | 1726.05 | 2147.64 | 3,873.70 |
| 7 | 130.0 | 33.93 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 0.80 | 1.00 | 0.00 | 19.53 | 69.48 | 0.00 | 2,322.6 | 0.0 | 1572.97 | 1567.29 | 3,140.26 |
| 8 | 150.0 | 35.35 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 0.80 | 1.00 | 0.00 | 16.88 | 69.48 | 0.00 | 1,803.0 | 0.0 | 1400.83 | 1632.70 | 3,033.53 |
| 9 | 164.0 | 36.26 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 0.80 | 1.00 | 0.00 | 6.64 | 19.44 | 0.00 | 646.6 | 0.0 | 549.98 | 484.56 | 1,034.53 |
| 10 | 178.0 | 37.12 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 0.80 | 1.00 | 0.00 | 16.56 | 11.87 | 0.00 | 1,218.5 | 0.0 | 1402.00 | 269.75 | 1,671.75 |
| 11 | 192.0 | 37.93 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 0.80 | 1.00 | 0.00 | 6.87 | 0.25 | 0.00 | 380.2 | 0.0 | 589.99 | 5.80 | 595.80 |
| | | | | | | | | | | | | | | **29,501.0** | **0.0** | | | **31,434.31** |

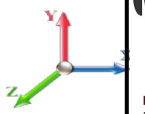
**Load Case:** 0.9D + 1.0W 90° Wind — 0.9D + 1.0W 121 mph Wind at 90° From Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 0.90
**Ice Dead Load Factor:** 0.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 22.30 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 0.85 | 1.00 | 0.00 | 38.98 | 89.04 | 0.00 | 4,896.3 | 0.0 | 2097.28 | 1284.77 | 3,382.06 |
| 2 | 30.0 | 22.32 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 0.85 | 1.00 | 0.00 | 37.02 | 102.48 | 0.00 | 4,295.5 | 0.0 | 1974.94 | 1481.64 | 3,456.58 |
| 3 | 50.0 | 25.83 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 0.85 | 1.00 | 0.00 | 31.60 | 102.48 | 0.00 | 3,991.2 | 0.0 | 1951.54 | 1714.46 | 3,666.00 |
| 4 | 70.0 | 28.43 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 0.85 | 1.00 | 0.00 | 28.44 | 102.48 | 0.00 | 3,635.8 | 0.0 | 1952.37 | 1887.46 | 3,839.84 |
| 5 | 90.0 | 30.55 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 0.85 | 1.00 | 0.00 | 29.29 | 102.48 | 0.00 | 3,370.3 | 0.0 | 2097.66 | 2027.97 | 4,125.63 |
| 6 | 110.0 | 32.35 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 0.85 | 1.00 | 0.00 | 23.22 | 102.48 | 0.00 | 2,941.1 | 0.0 | 1789.35 | 2147.64 | 3,936.99 |
| 7 | 130.0 | 33.93 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 0.85 | 1.00 | 0.00 | 20.25 | 69.48 | 0.00 | 2,322.6 | 0.0 | 1630.69 | 1567.29 | 3,197.98 |
| 8 | 150.0 | 35.35 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 0.85 | 1.00 | 0.00 | 17.52 | 69.48 | 0.00 | 1,803.0 | 0.0 | 1453.97 | 1632.70 | 3,086.67 |
| 9 | 164.0 | 36.26 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 0.85 | 1.00 | 0.00 | 6.89 | 19.44 | 0.00 | 646.6 | 0.0 | 570.57 | 484.56 | 1,055.13 |
| 10 | 178.0 | 37.12 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 0.85 | 1.00 | 0.00 | 17.18 | 11.87 | 0.00 | 1,218.5 | 0.0 | 1454.40 | 269.75 | 1,724.15 |
| 11 | 192.0 | 37.93 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 0.85 | 1.00 | 0.00 | 7.13 | 0.25 | 0.00 | 380.2 | 0.0 | 612.55 | 5.80 | 618.36 |
| | | | | | | | | | | | | | | **29,501.0** | **0.0** | | | **32,089.38** |

# Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 10 | |




Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Di + 1.0Wi Normal Wind — 1.2D + 1.0Di + 1.0Wi 50 mph Wind at Normal From Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 1.20
**Ice Dead Load Factor:** 1.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 3.81 | 31.267 | 49.02 | 20.23 | 0.18 | 2.68 | 1.00 | 1.00 | 0.89 | 59.24 | 119.39 | 11.68 | 10,820. | 4292.5 | 513.83 | 319.34 | 833.17 |
| 2 | 30.0 | 3.81 | 28.860 | 50.18 | 21.38 | 0.19 | 2.63 | 1.00 | 1.00 | 0.99 | 57.60 | 140.59 | 13.21 | 10,646. | 4918.9 | 491.16 | 371.41 | 862.57 |
| 3 | 50.0 | 4.41 | 23.184 | 50.07 | 21.27 | 0.19 | 2.62 | 1.00 | 1.00 | 1.04 | 51.90 | 141.80 | 13.90 | 10,112. | 4791.2 | 508.99 | 435.13 | 944.11 |
| 4 | 70.0 | 4.86 | 21.246 | 42.84 | 20.72 | 0.19 | 2.62 | 1.00 | 1.00 | 1.08 | 45.80 | 142.63 | 14.37 | 9,487.9 | 4640.2 | 495.52 | 483.70 | 979.22 |
| 5 | 90.0 | 5.22 | 22.280 | 46.53 | 24.41 | 0.24 | 2.48 | 1.00 | 1.00 | 1.11 | 49.34 | 143.27 | 14.74 | 9,419.6 | 4925.9 | 543.07 | 517.05 | 1,060.12 |
| 6 | 110.0 | 5.52 | 16.430 | 41.48 | 22.90 | 0.23 | 2.50 | 1.00 | 1.00 | 1.13 | 40.51 | 143.79 | 15.04 | 8,393.6 | 4472.1 | 474.69 | 551.35 | 1,026.04 |
| 7 | 130.0 | 5.79 | 14.331 | 36.28 | 21.26 | 0.24 | 2.45 | 1.00 | 1.00 | 1.15 | 35.51 | 96.92 | 15.29 | 6,650.3 | 3553.4 | 429.30 | 473.84 | 903.14 |
| 8 | 150.0 | 6.04 | 12.808 | 35.04 | 23.35 | 0.29 | 2.32 | 1.00 | 1.00 | 1.16 | 33.70 | 93.32 | 19.39 | 5,863.4 | 3459.4 | 401.03 | 486.24 | 887.28 |
| 9 | 164.0 | 6.19 | 4.976 | 13.87 | 9.20 | 0.33 | 2.22 | 1.00 | 1.00 | 1.17 | 13.42 | 25.13 | 4.70 | 2,035.7 | 1173.6 | 156.71 | 126.71 | 283.42 |
| 10 | 178.0 | 6.34 | 12.376 | 34.78 | 23.11 | 0.33 | 2.21 | 1.00 | 1.00 | 1.18 | 33.58 | 16.64 | 7.30 | 3,703.9 | 2079.2 | 400.41 | 87.34 | 487.75 |
| 11 | 192.0 | 6.48 | 5.252 | 15.29 | 10.63 | 0.36 | 2.14 | 1.00 | 1.00 | 1.19 | 14.75 | 0.25 | 1.59 | 1,289.9 | 783.0 | 174.03 | 7.75 | 181.78 |
| | | | | | | | | | | | | | | **78,424.3** | **39089.6** | | | **8,448.61** |

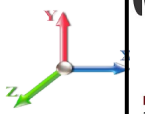
**Load Case:** 1.2D + 1.0Di + 1.0Wi 60° Wind — 1.2D + 1.0Di + 1.0Wi 50 mph Wind at 60° From Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 1.20
**Ice Dead Load Factor:** 1.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 3.81 | 31.267 | 49.02 | 20.23 | 0.18 | 2.68 | 0.80 | 1.00 | 0.89 | 52.99 | 119.39 | 11.68 | 10,820. | 4292.5 | 459.59 | 319.34 | 778.93 |
| 2 | 30.0 | 3.81 | 28.860 | 50.18 | 21.38 | 0.19 | 2.63 | 0.80 | 1.00 | 0.99 | 51.82 | 140.59 | 13.21 | 10,646. | 4918.9 | 441.94 | 371.41 | 813.35 |
| 3 | 50.0 | 4.41 | 23.184 | 50.07 | 21.27 | 0.19 | 2.62 | 0.80 | 1.00 | 1.04 | 47.26 | 141.80 | 13.90 | 10,112. | 4791.2 | 463.51 | 435.13 | 898.63 |
| 4 | 70.0 | 4.86 | 21.246 | 42.84 | 20.72 | 0.19 | 2.62 | 0.80 | 1.00 | 1.08 | 41.55 | 142.63 | 14.37 | 9,487.9 | 4640.2 | 449.55 | 483.70 | 933.25 |
| 5 | 90.0 | 5.22 | 22.280 | 46.53 | 24.41 | 0.24 | 2.48 | 0.80 | 1.00 | 1.11 | 44.88 | 143.27 | 14.74 | 9,419.6 | 4925.9 | 494.02 | 517.05 | 1,011.07 |
| 6 | 110.0 | 5.52 | 16.430 | 41.48 | 22.90 | 0.23 | 2.50 | 0.80 | 1.00 | 1.13 | 37.23 | 143.79 | 15.04 | 8,393.6 | 4472.1 | 436.19 | 551.35 | 987.54 |
| 7 | 130.0 | 5.79 | 14.331 | 36.28 | 21.26 | 0.24 | 2.45 | 0.80 | 1.00 | 1.15 | 32.64 | 96.92 | 15.29 | 6,650.3 | 3553.4 | 394.65 | 473.84 | 868.48 |
| 8 | 150.0 | 6.04 | 12.808 | 35.04 | 23.35 | 0.29 | 2.32 | 0.80 | 1.00 | 1.16 | 31.14 | 93.32 | 19.39 | 5,863.4 | 3459.4 | 370.55 | 486.24 | 856.79 |
| 9 | 164.0 | 6.19 | 4.976 | 13.87 | 9.20 | 0.33 | 2.22 | 0.80 | 1.00 | 1.17 | 12.42 | 25.13 | 4.70 | 2,035.7 | 1173.6 | 145.09 | 126.71 | 271.80 |
| 10 | 178.0 | 6.34 | 12.376 | 34.78 | 23.11 | 0.33 | 2.21 | 0.80 | 1.00 | 1.18 | 31.11 | 16.64 | 7.30 | 3,703.9 | 2079.2 | 370.90 | 87.34 | 458.24 |
| 11 | 192.0 | 6.48 | 5.252 | 15.29 | 10.63 | 0.36 | 2.14 | 0.80 | 1.00 | 1.19 | 13.69 | 0.25 | 1.59 | 1,289.9 | 783.0 | 161.63 | 7.75 | 169.39 |
| | | | | | | | | | | | | | | **78,424.3** | **39089.6** | | | **8,047.48** |

# Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 11 | |




Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Di + 1.0Wi 90° Wind — 1.2D + 1.0Di + 1.0Wi 50 mph Wind at 90° From Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 1.20
**Ice Dead Load Factor:** 1.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 3.81 | 31.267 | 49.02 | 20.23 | 0.18 | 2.68 | 0.85 | 1.00 | 0.89 | 54.55 | 119.39 | 11.68 | 10,820. | 4292.5 | 473.15 | 319.34 | 792.49 |
| 2 | 30.0 | 3.81 | 28.860 | 50.18 | 21.38 | 0.19 | 2.63 | 0.85 | 1.00 | 0.99 | 53.27 | 140.59 | 13.21 | 10,646. | 4918.9 | 454.24 | 371.41 | 825.65 |
| 3 | 50.0 | 4.41 | 23.184 | 50.07 | 21.27 | 0.19 | 2.62 | 0.85 | 1.00 | 1.04 | 48.42 | 141.80 | 13.90 | 10,112. | 4791.2 | 474.88 | 435.13 | 910.00 |
| 4 | 70.0 | 4.86 | 21.246 | 42.84 | 20.72 | 0.19 | 2.62 | 0.85 | 1.00 | 1.08 | 42.62 | 142.63 | 14.37 | 9,487.9 | 4640.2 | 461.04 | 483.70 | 944.74 |
| 5 | 90.0 | 5.22 | 22.280 | 46.53 | 24.41 | 0.24 | 2.48 | 0.85 | 1.00 | 1.11 | 46.00 | 143.27 | 14.74 | 9,419.6 | 4925.9 | 506.28 | 517.05 | 1,023.34 |
| 6 | 110.0 | 5.52 | 16.430 | 41.48 | 22.90 | 0.23 | 2.50 | 0.85 | 1.00 | 1.13 | 38.05 | 143.79 | 15.04 | 8,393.6 | 4472.1 | 445.82 | 551.35 | 997.17 |
| 7 | 130.0 | 5.79 | 14.331 | 36.28 | 21.26 | 0.24 | 2.45 | 0.85 | 1.00 | 1.15 | 33.36 | 96.92 | 15.29 | 6,650.3 | 3553.4 | 403.31 | 473.84 | 877.15 |
| 8 | 150.0 | 6.04 | 12.808 | 35.04 | 23.35 | 0.29 | 2.32 | 0.85 | 1.00 | 1.16 | 31.78 | 93.32 | 19.39 | 5,863.4 | 3459.4 | 378.17 | 486.24 | 864.42 |
| 9 | 164.0 | 6.19 | 4.976 | 13.87 | 9.20 | 0.33 | 2.22 | 0.85 | 1.00 | 1.17 | 12.67 | 25.13 | 4.70 | 2,035.7 | 1173.6 | 148.00 | 126.71 | 274.71 |
| 10 | 178.0 | 6.34 | 12.376 | 34.78 | 23.11 | 0.33 | 2.21 | 0.85 | 1.00 | 1.18 | 31.73 | 16.64 | 7.30 | 3,703.9 | 2079.2 | 378.28 | 87.34 | 465.62 |
| 11 | 192.0 | 6.48 | 5.252 | 15.29 | 10.63 | 0.36 | 2.14 | 0.85 | 1.00 | 1.19 | 13.96 | 0.25 | 1.59 | 1,289.9 | 783.0 | 164.73 | 7.75 | 172.49 |
| | | | | | | | | | | | | | | **78,424.3** | **39089.6** | | | **8,147.76** |

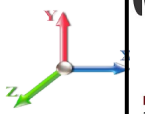
**Load Case:** 1.0D + 1.0W Normal Wind — 1.0D + 1.0W 60 mph Wind at Normal To Face

**Wind Load Factor:** 1.00
**Dead Load Factor:** 1.00
**Ice Dead Load Factor:** 0.00
**Wind Importance Factor:** 1.00
**Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 5.48 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 1.00 | 1.00 | 0.00 | 47.57 | 89.04 | 0.00 | 5,440.3 | 0.0 | 629.21 | 315.91 | 945.12 |
| 2 | 30.0 | 5.49 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 1.00 | 1.00 | 0.00 | 45.17 | 102.48 | 0.00 | 4,772.8 | 0.0 | 592.56 | 364.31 | 956.87 |
| 3 | 50.0 | 6.35 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 1.00 | 1.00 | 0.00 | 39.50 | 102.48 | 0.00 | 4,434.7 | 0.0 | 599.72 | 421.56 | 1,021.28 |
| 4 | 70.0 | 6.99 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 1.00 | 1.00 | 0.00 | 33.77 | 102.48 | 0.00 | 4,039.7 | 0.0 | 569.94 | 464.10 | 1,034.03 |
| 5 | 90.0 | 7.51 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 1.00 | 1.00 | 0.00 | 34.84 | 102.48 | 0.00 | 3,744.7 | 0.0 | 613.49 | 498.65 | 1,112.14 |
| 6 | 110.0 | 7.96 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 1.00 | 1.00 | 0.00 | 26.96 | 102.48 | 0.00 | 3,267.9 | 0.0 | 510.73 | 528.07 | 1,038.80 |
| 7 | 130.0 | 8.34 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 1.00 | 1.00 | 0.00 | 22.85 | 69.48 | 0.00 | 2,580.7 | 0.0 | 452.57 | 385.37 | 837.94 |
| 8 | 150.0 | 8.69 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 1.00 | 1.00 | 0.00 | 19.44 | 69.48 | 0.00 | 2,003.4 | 0.0 | 396.71 | 401.46 | 798.16 |
| 9 | 164.0 | 8.92 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 1.00 | 1.00 | 0.00 | 7.64 | 19.44 | 0.00 | 718.4 | 0.0 | 155.49 | 119.14 | 274.64 |
| 10 | 178.0 | 9.13 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 1.00 | 1.00 | 0.00 | 19.03 | 11.87 | 0.00 | 1,353.9 | 0.0 | 396.27 | 66.33 | 462.60 |
| 11 | 192.0 | 9.33 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 1.00 | 1.00 | 0.00 | 7.92 | 0.25 | 0.00 | 422.4 | 0.0 | 167.26 | 1.43 | 168.69 |
| | | | | | | | | | | | | | | **32,778.9** | **0.0** | | | **8,650.26** |

# Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 12 | |




Tower Engineering Solutions

**Load Case:** 1.0D + 1.0W 60° Wind — 1.0D + 1.0W 60 mph Wind at 60° From Face

**Wind Load Factor:** 1.00 — **Wind Importance Factor:** 1.00

**Dead Load Factor:** 1.00

**Ice Dead Load Factor:** 0.00 — **Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 5.48 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 0.80 | 1.00 | 0.00 | 41.31 | 89.04 | 0.00 | 5,440.3 | 0.0 | 546.49 | 315.91 | 862.40 |
| 2 | 30.0 | 5.49 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 0.80 | 1.00 | 0.00 | 39.40 | 102.48 | 0.00 | 4,772.8 | 0.0 | 516.85 | 364.31 | 881.16 |
| 3 | 50.0 | 6.35 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 0.80 | 1.00 | 0.00 | 34.86 | 102.48 | 0.00 | 4,434.7 | 0.0 | 529.31 | 421.56 | 950.87 |
| 4 | 70.0 | 6.99 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 0.80 | 1.00 | 0.00 | 29.52 | 102.48 | 0.00 | 4,039.7 | 0.0 | 498.22 | 464.10 | 962.31 |
| 5 | 90.0 | 7.51 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 0.80 | 1.00 | 0.00 | 30.39 | 102.48 | 0.00 | 3,744.7 | 0.0 | 535.03 | 498.65 | 1,033.67 |
| 6 | 110.0 | 7.96 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 0.80 | 1.00 | 0.00 | 23.67 | 102.48 | 0.00 | 3,267.9 | 0.0 | 448.48 | 528.07 | 976.55 |
| 7 | 130.0 | 8.34 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 0.80 | 1.00 | 0.00 | 19.98 | 69.48 | 0.00 | 2,580.7 | 0.0 | 395.80 | 385.37 | 781.17 |
| 8 | 150.0 | 8.69 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 0.80 | 1.00 | 0.00 | 16.88 | 69.48 | 0.00 | 2,003.4 | 0.0 | 344.44 | 401.46 | 745.90 |
| 9 | 164.0 | 8.92 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 0.80 | 1.00 | 0.00 | 6.64 | 19.44 | 0.00 | 718.4 | 0.0 | 135.23 | 119.14 | 254.38 |
| 10 | 178.0 | 9.13 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 0.80 | 1.00 | 0.00 | 16.56 | 11.87 | 0.00 | 1,353.9 | 0.0 | 344.73 | 66.33 | 411.06 |
| 11 | 192.0 | 9.33 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 0.80 | 1.00 | 0.00 | 6.87 | 0.25 | 0.00 | 422.4 | 0.0 | 145.07 | 1.43 | 146.50 |
| | | | | | | | | | | | | | | **32,778.9** | **0.0** | | | **8,005.97** |

**Load Case:** 1.0D + 1.0W 90° Wind — 1.0D + 1.0W 60 mph Wind at 90° From Face

**Wind Load Factor:** 1.00 — **Wind Importance Factor:** 1.00

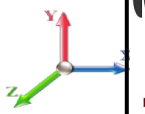
**Dead Load Factor:** 1.00

**Ice Dead Load Factor:** 0.00 — **Ice Importance Factor:** 1.00

| Sect Seq | Wind Height (ft) | qz (psf) | Total Flat Area (sqft) | Total Round Area (sqft) | Ice Round Area (sqft) | Sol Ratio | Cf | Df | Dr | Ice Thick (in) | Eff Area (sqft) | Linear Area (sqft) | Ice Linear Area (sqft) | Total Weight (lb) | Weight Ice (lb) | Struct Force (lb) | Linear Force (lb) | Total Force (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 5.48 | 31.267 | 28.80 | 0.00 | 0.13 | 2.84 | 0.85 | 1.00 | 0.00 | 42.88 | 89.04 | 0.00 | 5,440.3 | 0.0 | 567.17 | 315.91 | 883.08 |
| 2 | 30.0 | 5.49 | 28.860 | 28.80 | 0.00 | 0.14 | 2.81 | 0.85 | 1.00 | 0.00 | 40.85 | 102.48 | 0.00 | 4,772.8 | 0.0 | 535.77 | 364.31 | 900.09 |
| 3 | 50.0 | 6.35 | 23.184 | 28.80 | 0.00 | 0.14 | 2.81 | 0.85 | 1.00 | 0.00 | 36.02 | 102.48 | 0.00 | 4,434.7 | 0.0 | 546.91 | 421.56 | 968.47 |
| 4 | 70.0 | 6.99 | 21.246 | 22.13 | 0.00 | 0.13 | 2.84 | 0.85 | 1.00 | 0.00 | 30.58 | 102.48 | 0.00 | 4,039.7 | 0.0 | 516.15 | 464.10 | 980.24 |
| 5 | 90.0 | 7.51 | 22.280 | 22.12 | 0.00 | 0.15 | 2.76 | 0.85 | 1.00 | 0.00 | 31.50 | 102.48 | 0.00 | 3,744.7 | 0.0 | 554.64 | 498.65 | 1,053.29 |
| 6 | 110.0 | 7.96 | 16.430 | 18.58 | 0.00 | 0.14 | 2.80 | 0.85 | 1.00 | 0.00 | 24.49 | 102.48 | 0.00 | 3,267.9 | 0.0 | 464.04 | 528.07 | 992.11 |
| 7 | 130.0 | 8.34 | 14.331 | 15.03 | 0.00 | 0.14 | 2.79 | 0.85 | 1.00 | 0.00 | 20.70 | 69.48 | 0.00 | 2,580.7 | 0.0 | 409.99 | 385.37 | 795.37 |
| 8 | 150.0 | 8.69 | 12.808 | 11.69 | 0.00 | 0.15 | 2.76 | 0.85 | 1.00 | 0.00 | 17.52 | 69.48 | 0.00 | 2,003.4 | 0.0 | 357.51 | 401.46 | 758.97 |
| 9 | 164.0 | 8.92 | 4.976 | 4.67 | 0.00 | 0.17 | 2.69 | 0.85 | 1.00 | 0.00 | 6.89 | 19.44 | 0.00 | 718.4 | 0.0 | 140.30 | 119.14 | 259.44 |
| 10 | 178.0 | 9.13 | 12.376 | 11.67 | 0.00 | 0.17 | 2.68 | 0.85 | 1.00 | 0.00 | 17.18 | 11.87 | 0.00 | 1,353.9 | 0.0 | 357.61 | 66.33 | 423.94 |
| 11 | 192.0 | 9.33 | 5.252 | 4.67 | 0.00 | 0.18 | 2.66 | 0.85 | 1.00 | 0.00 | 7.13 | 0.25 | 0.00 | 422.4 | 0.0 | 150.62 | 1.43 | 152.04 |
| | | | | | | | | | | | | | | **32,778.9** | **0.0** | | | **8,167.04** |

# Force/Stress Compression Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 13 | |




Tower Engineering Solutions

## LEG MEMBERS

| Sect | Top Elev | Member | Force (kips) | Load Case | Len (ft) | Bracing % X | Y | Z | KL/R | Fy (ksi) | Mem Cap (kips) | Leg Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | PX - 8" DIA PIPE | -224.14 | 1.2D + 1.0W Normal Wind | 10.02 | 100 | 100 | 100 | 41.77 | 50.00 | 505.44 | 44.3 | Member X |
| 2 | 40 | PSP - ROHN 8 EHS | -199.05 | 1.2D + 1.0W Normal Wind | 10.02 | 100 | 100 | 100 | 41.17 | 50.00 | 386.42 | 51.5 | Member X |
| 3 | 60 | PSP - ROHN 8 EHS | -171.96 | 1.2D + 1.0W Normal Wind | 10.02 | 100 | 100 | 100 | 41.17 | 50.00 | 386.42 | 44.5 | Member X |
| 4 | 80 | PX - 6" DIA PIPE | -144.68 | 1.2D + 1.0W Normal Wind | 10.02 | 100 | 100 | 100 | 54.90 | 50.00 | 303.24 | 47.7 | Member X |
| 5 | 100 | PSP - ROHN 6 EHS | -119.05 | 1.2D + 1.0W Normal Wind | 6.68 | 100 | 100 | 100 | 36.01 | 50.00 | 274.76 | 43.3 | Member X |
| 6 | 120 | PX - 5" DIA PIPE | -90.08 | 1.2D + 1.0W Normal Wind | 6.68 | 100 | 100 | 100 | 43.56 | 50.00 | 239.34 | 37.6 | Member X |
| 7 | 140 | PX - 4" DIA PIPE | -60.99 | 1.2D + 1.0W Normal Wind | 6.68 | 100 | 100 | 100 | 54.15 | 50.00 | 160.15 | 38.1 | Member X |
| 8 | 160 | PX - 3" DIA PIPE | -39.31 | 1.2D + 1.0W Normal Wind | 5.01 | 100 | 100 | 100 | 52.73 | 50.00 | 110.90 | 35.4 | Member X |
| 9 | 168 | PST - 3" DIA PIPE | -17.15 | 1.2D + 1.0W Normal Wind | 4.00 | 100 | 100 | 100 | 41.38 | 50.00 | 88.54 | 19.4 | Member X |
| 10 | 188 | PST - 3" DIA PIPE | -7.95 | 1.2D + 1.0W Normal Wind | 4.00 | 100 | 100 | 100 | 41.38 | 50.00 | 88.54 | 9.0 | Member X |
| 11 | 196 | PST - 3" DIA PIPE | -0.65 | 1.2D + 1.0W Normal Wind | 4.00 | 100 | 100 | 100 | 41.38 | 50.00 | 88.54 | 0.7 | Member X |

## Splices

| | | Top Splice | | | | | Bottom Splice | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sect | Top Elev | Load Case | Force (kips) | Cap (kips) | Use % | Bolt Type | Num Bolts | Load Case | Force (kips) | Cap (kips) | Use % | Bolt Type | Num Bolts |
| 1 | 20 | 1.2D + 1.0W Normal Wind | 205.63 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 230.78 | 0.00 | | | |
| 2 | 40 | 1.2D + 1.0W Normal Wind | 178.91 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 205.63 | 0.00 | | 1 A325 | 8 |
| 3 | 60 | 1.2D + 1.0W Normal Wind | 151.38 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 178.91 | 0.00 | | 1 A325 | 8 |
| 4 | 80 | 1.2D + 1.0W Normal Wind | 124.05 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 151.38 | 0.00 | | 1 A325 | 8 |
| 5 | 100 | 1.2D + 1.0W Normal Wind | 94.67 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 124.05 | 0.00 | | 1 A325 | 6 |
| 6 | 120 | 1.2D + 1.0W Normal Wind | 66.04 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 94.67 | 0.00 | | 1 A325 | 6 |
| 7 | 140 | 1.2D + 1.0W Normal Wind | 42.03 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 66.04 | 0.00 | | 1 A325 | 4 |
| 8 | 160 | 1.2D + 1.0W Normal Wind | 19.77 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 42.03 | 0.00 | | 7/8 A325 | 4 |
| 9 | 168 | 1.2D + 1.0W Normal Wind | 10.37 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 19.77 | 0.00 | | 7/8 A325 | 4 |
| 10 | 188 | 1.2D + 1.0W Normal Wind | 0.99 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 10.37 | 0.00 | | 7/8 A325 | 4 |
| 11 | 196 | 1.2D + 1.0Di + 1.0Wi 60° Wind | 0.21 | 0.00 | 0.0 | | | 1.2D + 1.0W Normal Wind | 0.99 | 0.00 | | 3/4 A325 | 4 |

## HORIZONTAL MEMBERS

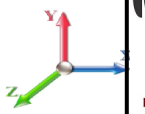
| Sect | Top Elev | Member | Force (kips) | Load Case | Len (ft) | Bracing % X | Y | Z | KL/R | Fy (ksi) | Mem Cap (kips) | Num Bolts | Num Holes | Shear Cap (kips) | Bear Cap (kips) | Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 2 | 40 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 3 | 60 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 4 | 80 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 5 | 100 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 6 | 120 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 7 | 140 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 8 | 160 | SAE - 1.75X1.75X0.187[illegible] | -0.25 | 1.2D + 1.0W 90° Wind | 6.69 | 50 | 50 | 50 | 118.51 | 36.00 | 12.46 | 1 | 1 | 13.81 | 9.79 | 2.5 | Bolt Bear |
| 9 | 168 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 10 | 188 | | | | | | | | | | 0.00 | 0 | 0 | | | | |
| 11 | 196 | SAE - 1.75X1.75X0.187[illegible] | -0.01 | 0.9D + 1.0W 60° Wind | 6.60 | 100 | 100 | 100 | 230.90 | 36.00 | 3.33 | 1 | 1 | 13.81 | 9.79 | 0.4 | Member Z |

## DIAGONAL MEMBERS

| Sect | Top Elev | Member | Force (kips) | Load Case | Len (ft) | Bracing % X | Y | Z | KL/R | Fy (ksi) | Mem Cap (kips) | Num Bolts | Num Holes | Shear Cap (kips) | Bear Cap (kips) | Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | SAE - 4X4X0.25 | -7.77 | 0.9D + 1.0W 90° Wind | 23.71 | 50 | 50 | 50 | 178.97 | 36.00 | 17.34 | 1 | 1 | 19.87 | 14.3 | 54.1 | Bolt Bear |
| 2 | 40 | SAE - 4X4X0.25 | -7.86 | 1.2D + 1.0W 90° Wind | 22.81 | 50 | 50 | 50 | 172.16 | 36.00 | 18.73 | 1 | 1 | 19.87 | 14.3 | 54.8 | Bolt Bear |
| 3 | 60 | SAE - 3.5X3.5X0.25 | -7.45 | 1.2D + 1.0W 90° Wind | 21.03 | 50 | 50 | 50 | 181.81 | 36.00 | 14.63 | 1 | 1 | 19.87 | 14.3 | 51.9 | Bolt Bear |

# Force/Stress Compression Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 14 | |



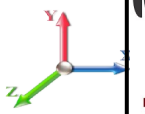

Tower Engineering Solutions

## DIAGONAL MEMBERS

| Sect | Top Elev | Member | Force (kips) | Load Case | Len (ft) | Bracing % X | Y | Z | KL/R | Fy (ksi) | Mem Cap (kips) | Num Bolts | Num Holes | Shear Cap (kips) | Bear Cap (kips) | Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 80 | SAE - 3.5X3.5X0.25 | -6.75 | 1.2D + 1.0W 90° Wind | 19.26 | 50 | 50 | 50 | 166.49 | 36.00 | 17.45 | 1 | 1 | 19.87 | 14.3 | 47.1 | Bolt Bear |
| 5 | 100 | SAE - 3X3X0.25 | -6.06 | 1.2D + 1.0W 90° Wind | 15.99 | 50 | 50 | 50 | 162.02 | 36.00 | 15.70 | 1 | 1 | 19.87 | 14.3 | 42.2 | Bolt Bear |
| 6 | 120 | SAE - 2.5X2.5X0.25 | -5.30 | 1.2D + 1.0W 90° Wind | 14.23 | 50 | 50 | 50 | 173.91 | 36.00 | 11.26 | 1 | 1 | 19.87 | 14.3 | 47.0 | Member Z |
| 7 | 140 | SAE - 2.5X2.5X0.25 | -3.77 | 1.2D + 1.0W Normal Wind | 12.43 | 50 | 50 | 50 | 151.85 | 36.00 | 14.77 | 1 | 1 | 13.81 | 13.0 | 28.9 | Bolt Bear |
| 8 | 160 | SAE - 2X2X0.1875 | -2.76 | 1.2D + 1.0W 90° Wind | 9.86 | 50 | 50 | 50 | 150.21 | 36.00 | 9.01 | 1 | 1 | 13.81 | 9.79 | 30.6 | Member Z |
| 9 | 168 | SAE - 2X2X0.25 | -2.53 | 1.2D + 1.0W 90° Wind | 7.78 | 50 | 50 | 50 | 119.49 | 36.00 | 18.65 | 1 | 1 | 13.81 | 13.0 | 19.4 | Bolt Bear |
| 10 | 188 | SAE - 2X2X0.25 | -1.25 | 1.2D + 1.0W Normal Wind | 7.72 | 50 | 50 | 50 | 118.82 | 36.00 | 18.82 | 1 | 1 | 13.81 | 13.0 | 9.6 | Bolt Bear |
| 11 | 196 | SAE - 1.75X1.75X0.1875 | -0.23 | 1.2D + 1.0W 90° Wind | 7.72 | 50 | 50 | 50 | 135.00 | 36.00 | 9.74 | 1 | 1 | 13.81 | 9.79 | 2.4 | Member Z |

# Force/Stress Tension Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 15 | |




TES Tower Engineering Solutions

## LEG MEMBERS

| Sect | Top Elev | Member | Force (kips) | Load Case | Fy (ksi) | Mem Cap (kips) | Leg Use % | Controls |
|---|---|---|---|---|---|---|---|---|
| 1 | 20 | PX - 8" DIA PIPE | 186.37 | 0.9D + 1.0W 60° Wind | 50 | 574.20 | 32.5 | Member |
| 2 | 40 | PSP - ROHN 8 EHS | 165.30 | 0.9D + 1.0W 60° Wind | 50 | 437.40 | 37.8 | Member |
| 3 | 60 | PSP - ROHN 8 EHS | 143.05 | 0.9D + 1.0W 60° Wind | 50 | 437.40 | 32.7 | Member |
| 4 | 80 | PX - 6" DIA PIPE | 120.27 | 0.9D + 1.0W 60° Wind | 50 | 378.00 | 31.8 | Member |
| 5 | 100 | PSP - ROHN 6 EHS | 98.74 | 0.9D + 1.0W 60° Wind | 50 | 302.09 | 32.7 | Member |
| 6 | 120 | PX - 5" DIA PIPE | 73.66 | 0.9D + 1.0W 60° Wind | 50 | 274.95 | 26.8 | Member |
| 7 | 140 | PX - 4" DIA PIPE | 49.72 | 0.9D + 1.0W 60° Wind | 50 | 198.45 | 25.1 | Member |
| 8 | 160 | PX - 3" DIA PIPE | 31.48 | 0.9D + 1.0W 60° Wind | 50 | 135.90 | 23.2 | Member |
| 9 | 168 | PST - 3" DIA PIPE | 12.33 | 0.9D + 1.0W 60° Wind | 50 | 100.35 | 12.3 | Member |
| 10 | 188 | PST - 3" DIA PIPE | 5.96 | 0.9D + 1.0W 60° Wind | 50 | 100.35 | 5.9 | Member |
| 11 | 196 | PST - 3" DIA PIPE | 0.29 | 0.9D + 1.0W 60° Wind | 50 | 100.35 | 0.3 | Member |

## Splices

| | | Top Splice | | | | | | Bottom Splice | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sect | Top Elev | Load Case | Force (kips) | Cap (kips) | Use % | Bolt Type | Num Bolts | Load Case | Force (kips) | Cap (kips) | Use % | Bolt Type | Num Bolts |
| 1 | 20 | 0.9D + 1.0W 60° Wind | 170.11 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 192.4 | 0.00 | | | |
| 2 | 40 | 0.9D + 1.0W 60° Wind | 147.87 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 170.1 | 424.08 | 40.1 | 1 A325 | 8 |
| 3 | 60 | 0.9D + 1.0W 60° Wind | 125.05 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 147.8 | 424.08 | 34.9 | 1 A325 | 8 |
| 4 | 80 | 0.9D + 1.0W 60° Wind | 102.05 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 125.0 | 424.08 | 29.5 | 1 A325 | 8 |
| 5 | 100 | 0.9D + 1.0W 60° Wind | 77.19 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 102.0 | 318.06 | 32.1 | 1 A325 | 6 |
| 6 | 120 | 0.9D + 1.0W 60° Wind | 52.06 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 77.19 | 318.06 | 24.3 | 1 A325 | 6 |
| 7 | 140 | 0.9D + 1.0W 60° Wind | 33.47 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 52.06 | 212.04 | 24.6 | 1 A325 | 4 |
| 8 | 160 | 0.9D + 1.0W 60° Wind | 14.10 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 33.47 | 166.24 | 20.1 | 7/8 A325 | 4 |
| 9 | 168 | 0.9D + 1.0W 60° Wind | 6.24 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 14.10 | 166.24 | 8.5 | 7/8 A325 | 4 |
| 10 | 188 | 0.9D + 1.0W 60° Wind | 0.42 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 6.24 | 166.24 | 3.8 | 7/8 A325 | 4 |
| 11 | 196 | | 0.00 | 0.00 | 0.0 | | | 0.9D + 1.0W 60° Wind | 0.42 | 120.40 | 0.3 | 3/4 A325 | 4 |

## HORIZONTAL MEMBERS

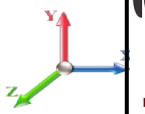
| Sect | Top Elev | Member | Force (kips) | Load Case | Fy (ksi) | Mem Cap (kips) | Num Bolts | Num Holes | Shear Cap (kips) | Bear Cap (kips) | B.S. Cap (kips) | Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 2 | 40 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 3 | 60 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 4 | 80 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 5 | 100 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 6 | 120 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 7 | 140 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 8 | 160 | SAE - 1.75X1.75X0.1875 | 0.23 | 0.9D + 1.0W 90° Wind | 36 | 20.09 | 1 | 1 | 13.81 | 9.79 | 8.09 | 2.9 | Blck Shear |
| 9 | 168 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 10 | 188 | - | | | 36 | 0.00 | 0 | 0 | | | | | |
| 11 | 196 | SAE - 1.75X1.75X0.1875 | 0.02 | 1.2D + 1.0W Normal Wi | 36 | 20.09 | 1 | 1 | 13.81 | 9.79 | 8.09 | 0.3 | Blck Shear |

## DIAGONAL MEMBERS

| Sect | Top Elev | Member | Force (kips) | Load Case | Fy (ksi) | Mem Cap (kips) | Num Bolts | Num Holes | Shear Cap (kips) | Bear Cap (kips) | B.S. Cap (kips) | Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | SAE - 4X4X0.25 | 7.76 | 1.2D + 1.0W 90° Wind | 36 | 62.86 | 1 | 1 | 19.87 | 14.35 | 17.95 | 54.1 | Bolt Bear |
| 2 | 40 | SAE - 4X4X0.25 | 7.71 | 0.9D + 1.0W 90° Wind | 36 | 62.86 | 1 | 1 | 19.87 | 14.35 | 17.95 | 53.7 | Bolt Bear |
| 3 | 60 | SAE - 3.5X3.5X0.25 | 7.33 | 0.9D + 1.0W 90° Wind | 36 | 54.76 | 1 | 1 | 19.87 | 14.35 | 17.95 | 51.1 | Bolt Bear |
| 4 | 80 | SAE - 3.5X3.5X0.25 | 6.71 | 1.2D + 1.0W 90° Wind | 36 | 54.76 | 1 | 1 | 19.87 | 14.35 | 17.95 | 46.7 | Bolt Bear |

# Force/Stress Tension Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 16 | |



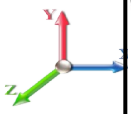

Tower Engineering Solutions

## DIAGONAL MEMBERS

| Sect | Top Elev | Member | Force (kips) | Load Case | Fy (ksi) | Mem Cap (kips) | Num Bolts | Num Holes | Shear Cap (kips) | Bear Cap (kips) | B.S. Cap (kips) | Use % | Controls |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 100 | SAE - 3X3X0.25 | 6.01 | 1.2D + 1.0W 90° Wind | 36 | 46.66 | 1 | 1 | 19.87 | 14.35 | 15.01 | 41.8 | Bolt Bear |
| 6 | 120 | SAE - 2.5X2.5X0.25 | 5.24 | 1.2D + 1.0W 90° Wind | 36 | 38.56 | 1 | 1 | 19.87 | 14.35 | 13.54 | 38.7 | Blck Shear |
| 7 | 140 | SAE - 2.5X2.5X0.25 | 3.84 | 0.9D + 1.0W 90° Wind | 36 | 38.56 | 1 | 1 | 13.81 | 13.05 | 13.73 | 29.4 | Bolt Bear |
| 8 | 160 | SAE - 2X2X0.1875 | 2.85 | 1.2D + 1.0W 90° Wind | 36 | 23.00 | 1 | 1 | 13.81 | 9.79 | 8.09 | 35.2 | Blck Shear |
| 9 | 168 | SAE - 2X2X0.25 | 2.59 | 1.2D + 1.0W 90° Wind | 36 | 30.46 | 1 | 1 | 13.81 | 13.05 | 10.79 | 24.0 | Blck Shear |
| 10 | 188 | SAE - 2X2X0.25 | 1.15 | 0.9D + 1.0W 60° Wind | 36 | 30.46 | 1 | 1 | 13.81 | 13.05 | 10.79 | 10.6 | Blck Shear |
| 11 | 196 | SAE - 1.75X1.75X0.1875 | 0.24 | 1.2D + 1.0W 90° Wind | 36 | 20.09 | 1 | 1 | 13.81 | 9.79 | 8.09 | 3.0 | Blck Shear |

# Seismic Section Forces

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 17 | |



Tower Engineering Solutions

**Load Case:** 1.2D + 1.0Ev + 1.0Eh

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dead Load Factor** | 1.20 | **Sds** | 0.204 | **Ss** | 0.1920 | **Fa** | 1.6000 | **Ke** | 1.0698 | **TL** | 6.0000 |
| **Seismic Load Factor** | 1.00 | **Sd1** | 0.088 | **S1** | 0.0550 | **Fv** | 2.4000 | **Kg** | 0.0000 | **Cs** | 0.0459 |
| **Seismic Importance Factor** | 1.00 | **W1** | 18.85 | **R** | 3.0000 | **Vs** | 1.7719 | **T** | 0.6397 | **f1** | 1.5633 |

| Sect # | Elev (ft) | Wz (lb) | Lateral Fsz (lbs) | Vertical Ev (lbs) |
|---|---|---|---|---|
| 1 | 10.00 | 5440.2 | 25.68 | 222.95 |
| 2 | 30.00 | 4772.7 | 72.31 | 195.59 |
| 3 | 50.00 | 4434.6 | 115.45 | 181.74 |
| 4 | 70.00 | 4039.7 | 149.75 | 165.55 |
| 5 | 90.00 | 3744.7 | 180.68 | 153.46 |
| 6 | 110.00 | 5710.4 | 351.72 | 234.02 |
| 7 | 130.00 | 2832.0 | 198.60 | 116.06 |
| 8 | 150.00 | 2242.3 | 180.29 | 91.89 |
| 9 | 164.00 | 3564.9 | 325.72 | 146.09 |
| 10 | 178.00 | 1415.3 | 132.35 | 58.00 |
| 11 | 192.00 | 422.41 | 39.36 | 17.31 |

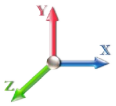
**Load Case:** 0.9D + 1.0Ev + 1.0Eh

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dead Load Factor** | 0.90 | **Sds** | 0.204 | **Ss** | 0.1920 | **Fa** | 1.6000 | **Ke** | 1.0698 | **TL** | 6.0000 |
| **Seismic Load Factor** | 1.00 | **Sd1** | 0.088 | **S1** | 0.0550 | **Fv** | 2.4000 | **Kg** | 0.0000 | **Cs** | 0.0459 |
| **Seismic Importance Factor** | 1.00 | **W1** | 18.85 | **R** | 3.0000 | **Vs** | 1.7719 | **T** | 0.6397 | **f1** | 1.5633 |

| Sect # | Elev (ft) | Wz (lb) | Lateral Fsz (lbs) | Vertical Ev (lbs) |
|---|---|---|---|---|
| 1 | 10.00 | 5440.2 | 25.68 | 222.95 |
| 2 | 30.00 | 4772.7 | 72.31 | 195.59 |
| 3 | 50.00 | 4434.6 | 115.45 | 181.74 |
| 4 | 70.00 | 4039.7 | 149.75 | 165.55 |
| 5 | 90.00 | 3744.7 | 180.68 | 153.46 |
| 6 | 110.00 | 5710.4 | 351.72 | 234.02 |
| 7 | 130.00 | 2832.0 | 198.60 | 116.06 |
| 8 | 150.00 | 2242.3 | 180.29 | 91.89 |
| 9 | 164.00 | 3564.9 | 325.72 | 146.09 |
| 10 | 178.00 | 1415.3 | 132.35 | 58.00 |
| 11 | 192.00 | 422.41 | 39.36 | 17.31 |

# Support Forces Summary

| | | | | | |
|---|---|---|---|---|---|
| **Structure:** | CT06462-A-2-SBA | **Code:** | EIA/TIA-222-H | 3/3/2020 | |
| **Site Name:** | Mountain Street | **Exposure:** | B | | |
| **Height:** | 196.00 (ft) | **Crest Height:** | 0.00 | | |
| **Base Elev:** | 0.000 (ft) | **Site Class:** | D - Stiff Soil | | |
| **Gh:** | 0.85 **Topography:** 1 | **Struct Class:** | II | Page: 18 | |




IES Tower Engineering Solutions

| Load Case | Node | FX (kips) | FY (kips) | FZ (kips) | (-) = Uplift (+) = Down |
|---|---|---|---|---|---|
| 1.2D + 1.0W Normal Wind | 1 | -0.01 | 230.46 | -25.35 | |
| | 1a | 8.24 | -92.11 | -8.17 | |
| | 1b | -8.22 | -92.00 | -8.18 | |
| 1.2D + 1.0W 60° Wind | 1 | -2.74 | 116.93 | -12.45 | |
| | 1a | -12.11 | 116.61 | 3.90 | |
| | 1b | -19.00 | -187.20 | -11.00 | |
| 1.2D + 1.0W 90° Wind | 1 | -3.25 | 15.43 | -1.00 | |
| | 1a | -19.07 | 193.53 | 9.21 | |
| | 1b | -17.43 | -162.61 | -8.21 | |
| 0.9D + 1.0W Normal Wind | 1 | -0.01 | 226.42 | -25.09 | |
| | 1a | 8.45 | -95.87 | -8.30 | |
| | 1b | -8.44 | -95.79 | -8.31 | |
| 0.9D + 1.0W 60° Wind | 1 | -2.74 | 112.99 | -12.19 | |
| | 1a | -11.89 | 112.68 | 3.77 | |
| | 1b | -19.22 | -190.91 | -11.13 | |
| 0.9D + 1.0W 90° Wind | 1 | -3.25 | 11.58 | -0.75 | |
| | 1a | -18.85 | 189.53 | 9.08 | |
| | 1b | -17.65 | -166.34 | -8.33 | |
| 1.2D + 1.0Di + 1.0Wi Normal Wind | 1 | -0.01 | 85.04 | -4.69 | |
| | 1a | 3.52 | 2.88 | -2.84 | |
| | 1b | -3.51 | 3.07 | -2.84 | |
| 1.2D + 1.0Di + 1.0Wi 60° Wind | 1 | -0.68 | 56.75 | -1.52 | |
| | 1a | -1.65 | 56.65 | 0.19 | |
| | 1b | -6.30 | -22.41 | -3.65 | |
| 1.2D + 1.0Di + 1.0Wi 90° Wind | 1 | -0.79 | 30.27 | 1.41 | |
| | 1a | -3.41 | 76.42 | 1.53 | |
| | 1b | -5.86 | -15.69 | -2.94 | |
| 1.2D + 1.0Ev + 1.0Eh | 1 | 0.00 | 26.67 | 5.26 | |
| | 1a | 5.89 | 10.63 | -3.50 | |
| | 1b | -5.89 | 10.63 | -3.50 | |
| 0.9D + 1.0Ev + 1.0Eh | 1 | 0.00 | 22.80 | 5.52 | |
| | 1a | 6.12 | 6.77 | -3.63 | |
| | 1b | -6.12 | 6.77 | -3.63 | |
| 1.0D + 1.0W Normal Wind | 1 | 0.00 | 66.34 | -6.98 | |
| | 1a | 1.54 | -13.90 | -1.76 | |
| | 1b | -1.54 | -13.81 | -1.76 | |
| 1.0D + 1.0W 60° Wind | 1 | -0.71 | 38.11 | -3.73 | |
| | 1a | -3.58 | 38.01 | 1.27 | |
| | 1b | -4.25 | -37.50 | -2.46 | |
| 1.0D + 1.0W 90° Wind | 1 | -0.83 | 12.86 | -0.85 | |
| | 1a | -5.33 | 57.13 | 2.61 | |
| | 1b | -3.86 | -31.37 | -1.76 | |

**Max Reactions**

| Leg | | | Overturning | | |
|---|---|---|---|---|---|
| Max Uplift: | -190.91 | (kips) | Moment: | 4282.66 | (ft-kips) |
| Max Down: | 230.46 | (kips) | Total Down: | 46.34 | (kips) |
| Max Shear: | 25.35 | (kips) | Total Shear: | 41.70 | (kips) |

## Max Reactions

| Leg | | | Overturning | | |
|---|---|---|---|---|---|
| Max Uplift: | -190.91 | (kips) | Moment: | 4282.66 | (ft-kips) |
| Max Down: | 230.46 | (kips) | Total Down: | 46.34 | (kips) |
| Max Shear: | 25.35 | (kips) | Total Shear: | 41.70 | (kips) |

## Anchor Bolts

| | | | |
|---|---|---|---|
| Bolt Size (in.): | 1.00 | Number Bolts: | 10 |
| Yield Strength (Ksi): | 109.00 | Tensile Strength (Ksi): | 125.00 |
| | | Length: | 0.75 |

**Interaction Ratios:**

Tensile: **0.12** Compression: **0.37**

## Max Usages

Max Leg: 51.5% (1.2D + 1.0W Normal Wind - Sect 2)
Max Diag: 54.8% (1.2D + 1.0W 90° Wind - Sect 2)
Max Horiz: 2.9% (0.9D + 1.0W 90° Wind - Sect 8)

## Max Deflection, Twist and Sway

| Load Case | Elevation (ft) | Deflection (ft) | Twist (deg) | Sway (deg) |
|---|---|---|---|---|
| 0.9D + 1.0Ev + 1.0Eh - Normal To Face | 120.00 | 0.0226 | -0.0010 | 0.0209 |
| | 126.67 | 0.0250 | 0.0010 | 0.0224 |
| | 133.33 | 0.0276 | -0.0011 | 0.0240 |
| | 155.00 | 0.0374 | -0.0012 | 0.0296 |
| | 160.00 | 0.0400 | -0.0012 | 0.0301 |
| | 164.00 | 0.0421 | 0.0012 | 0.0307 |
| | 168.00 | 0.0443 | -0.0011 | 0.0310 |
| | 184.00 | 0.0529 | -0.0010 | 0.0314 |
| 0.9D + 1.0W 121 mph Wind at 60° From Face | 120.00 | 0.3848 | -0.1173 | 0.3645 |
| | 126.67 | 0.4271 | 0.0291 | 0.3703 |
| | 133.33 | 0.4746 | -0.1673 | 0.4045 |
| | 155.00 | 0.6453 | 0.0302 | 0.4887 |
| | 160.00 | 0.6891 | -0.2139 | 0.5023 |
| | 164.00 | 0.7231 | 0.0424 | 0.5152 |
| | 168.00 | 0.7608 | -0.2113 | 0.5205 |
| | 184.00 | 0.9074 | -0.2066 | 0.5307 |
| 0.9D + 1.0W 121 mph Wind at 90° From Face | 120.00 | 0.3900 | -0.1584 | 0.3705 |
| | 126.67 | 0.4337 | 0.0437 | 0.3644 |
| | 133.33 | 0.4809 | -0.2272 | 0.4083 |
| | 155.00 | 0.6535 | 0.0367 | 0.4947 |
| | 160.00 | 0.6983 | -0.3018 | 0.5056 |
| | 164.00 | 0.7333 | 0.0515 | 0.5177 |
| | 168.00 | 0.7711 | -0.3006 | 0.5271 |
| | 184.00 | 0.9197 | -0.2972 | 0.5388 |

| | | | | |
|---|---|---|---|---|
| 0.9D + 1.0W 121 mph Wind at Normal To Face | 120.00 | 0.4074 | -0.0191 | 0.3865 |
| | 126.67 | 0.4529 | -0.0264 | 0.4324 |
| | 133.33 | 0.5029 | -0.0084 | 0.4829 |
| | 155.00 | 0.6845 | -0.0086 | 0.5302 |
| | 160.00 | 0.7311 | -0.0092 | 0.5922 |
| | 164.00 | 0.7678 | -0.0108 | 0.5547 |
| | 168.00 | 0.8077 | -0.0103 | 0.5573 |
| | 184.00 | 0.9644 | -0.0097 | 0.5671 |
| 1.0D + 1.0W 60 mph Wind at 60° From Face | 120.00 | 0.0951 | -0.0291 | 0.0896 |
| | 126.67 | 0.1055 | 0.0055 | 0.0910 |
| | 133.33 | 0.1172 | -0.0416 | 0.0994 |
| | 155.00 | 0.1588 | 0.0058 | 0.1198 |
| | 160.00 | 0.1696 | -0.0505 | 0.1225 |
| | 164.00 | 0.1780 | 0.0075 | 0.1258 |
| | 168.00 | 0.1872 | -0.0479 | 0.1272 |
| | 184.00 | 0.2229 | -0.0440 | 0.1294 |
| 1.0D + 1.0W 60 mph Wind at 90° From Face | 120.00 | 0.0964 | -0.0346 | 0.0909 |
| | 126.67 | 0.1072 | 0.0098 | 0.0895 |
| | 133.33 | 0.1187 | -0.0495 | 0.1003 |
| | 155.00 | 0.1609 | 0.0074 | 0.1213 |
| | 160.00 | 0.1719 | -0.0604 | 0.1234 |
| | 164.00 | 0.1805 | 0.0099 | 0.1264 |
| | 168.00 | 0.1896 | -0.0573 | 0.1290 |
| | 184.00 | 0.2259 | -0.0525 | 0.1314 |
| 1.0D + 1.0W 60 mph Wind at Normal To Face | 120.00 | 0.1009 | -0.0046 | 0.0951 |
| | 126.67 | 0.1120 | -0.0064 | 0.1064 |
| | 133.33 | 0.1244 | -0.0020 | 0.1186 |
| | 155.00 | 0.1689 | -0.0019 | 0.1304 |
| | 160.00 | 0.1804 | -0.0020 | 0.1454 |
| | 164.00 | 0.1894 | -0.0023 | 0.1360 |
| | 168.00 | 0.1992 | -0.0022 | 0.1366 |
| | 184.00 | 0.2376 | -0.0020 | 0.1391 |
| 1.2D + 1.0Di + 1.0Wi 50 mph Wind at 60° From Face | 120.00 | 0.1020 | -0.0364 | 0.0963 |
| | 126.67 | 0.1118 | 0.0059 | 0.0978 |
| | 133.33 | 0.1256 | -0.0523 | 0.1075 |
| | 155.00 | 0.1703 | 0.0067 | 0.1294 |
| | 160.00 | 0.1817 | -0.0637 | 0.1312 |
| | 164.00 | 0.1897 | 0.0080 | 0.1347 |
| | 168.00 | 0.2004 | -0.0604 | 0.1370 |
| | 184.00 | 0.2388 | -0.0555 | 0.1387 |
| 1.2D + 1.0Di + 1.0Wi 50 mph Wind at 90° From Face | 120.00 | 0.1026 | -0.0434 | 0.0972 |
| | 126.67 | 0.1125 | 0.0118 | 0.0948 |
| | 133.33 | 0.1263 | -0.0624 | 0.1076 |
| | 155.00 | 0.1713 | 0.0082 | 0.1300 |
| | 160.00 | 0.1828 | -0.0764 | 0.1312 |
| | 164.00 | 0.1911 | 0.0117 | 0.1346 |
| | 168.00 | 0.2017 | -0.0724 | 0.1380 |
| | 184.00 | 0.2404 | -0.0664 | 0.1401 |
| 1.2D + 1.0Di + 1.0Wi 50 mph Wind at Normal From Face | 120.00 | 0.1052 | -0.0070 | 0.1000 |
| | 126.67 | 0.1170 | -0.0094 | 0.1137 |
| | 133.33 | 0.1298 | -0.0015 | 0.1275 |
| | 155.00 | 0.1768 | -0.0014 | 0.1377 |
| | 160.00 | 0.1889 | -0.0015 | 0.1564 |
| | 164.00 | 0.1983 | -0.0048 | 0.1427 |
| | 168.00 | 0.2086 | -0.0046 | 0.1437 |
| | 184.00 | 0.2489 | -0.0042 | 0.1461 |
| 1.2D + 1.0Ev + 1.0Eh - Normal To Face | 120.00 | 0.0226 | 0.0010 | 0.0209 |
| | 126.67 | 0.0250 | 0.0010 | 0.0224 |
| | 133.33 | 0.0276 | -0.0011 | 0.0241 |
| | 155.00 | 0.0374 | -0.0012 | 0.0297 |
| | 160.00 | 0.0400 | -0.0012 | 0.0302 |
| | 164.00 | 0.0421 | 0.0012 | 0.0307 |
| | 168.00 | 0.0443 | 0.0011 | 0.0311 |
| | 184.00 | 0.0530 | 0.0010 | 0.0315 |

| | | | | |
|---|---|---|---|---|
| 1.2D + 1.0W 121 mph Wind at 60° From Face | 120.00 | 0.3851 | -0.1173 | 0.3649 |
| | 126.67 | 0.4275 | 0.0291 | 0.3708 |
| | 133.33 | 0.4750 | -0.1673 | 0.4050 |
| | 155.00 | 0.6459 | 0.0302 | 0.4894 |
| | 160.00 | 0.6897 | -0.2140 | 0.5028 |
| | 164.00 | 0.7238 | 0.0425 | 0.5157 |
| | 168.00 | 0.7616 | -0.2113 | 0.5210 |
| | 184.00 | 0.9083 | -0.2067 | 0.5312 |
| 1.2D + 1.0W 121 mph Wind at 90° From Face | 120.00 | 0.3904 | -0.1584 | 0.3709 |
| | 126.67 | 0.4342 | 0.0437 | 0.3649 |
| | 133.33 | 0.4813 | -0.2272 | 0.4088 |
| | 155.00 | 0.6541 | 0.0367 | 0.4953 |
| | 160.00 | 0.6990 | -0.3018 | 0.5061 |
| | 164.00 | 0.7340 | 0.0515 | 0.5183 |
| | 168.00 | 0.7719 | -0.3007 | 0.5278 |
| | 184.00 | 0.9206 | -0.2973 | 0.5394 |
| 1.2D + 1.0W 121 mph Wind at Normal To Face | 120.00 | 0.4079 | -0.0191 | 0.3869 |
| | 126.67 | 0.4534 | -0.0264 | 0.4329 |
| | 133.33 | 0.5034 | -0.0084 | 0.4834 |
| | 155.00 | 0.6852 | -0.0087 | 0.5310 |
| | 160.00 | 0.7319 | -0.0092 | 0.5930 |
| | 164.00 | 0.7687 | -0.0108 | 0.5555 |
| | 168.00 | 0.8087 | -0.0102 | 0.5579 |
| | 184.00 | 0.9655 | -0.0097 | 0.5679 |

# Mat Foundation Design for Self Supporting Tower

| | | | | Date |
|---|---|---|---|---|
| | | | | 3/3/2020 |
| **Customer Name:** | **SBA Communications Corp** | **EIA/TIA Standard:** | EIA-222-H |
| **Site Name:** | Mountain Street | **Structure Height (Ft.):** | 196 |
| **Site Nmber:** | CT06462-A-2-SBA | **Engineer Name:** | W. Velez |
| **Engr. Number:** | 92326 | **Engineer Login ID:** | |

**Foundation Info Obtained from:** Drawings/Calculations

**Analysis or Design?** Analysis

**Number of Tower Legs:** 3 Legs

**Base Reactions (Factored):**

(1). Individual Leg:

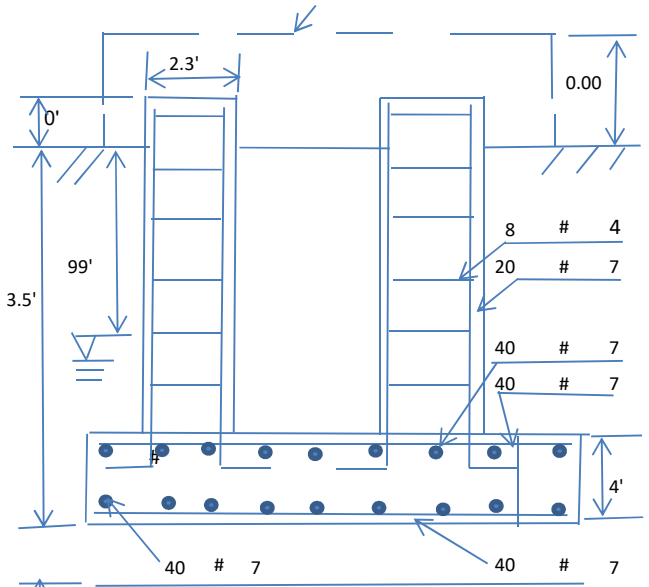
| | | | |
|---|---|---|---|
| Axial Load (Kips): | 230.5 | Uplift Force (Kips): | 190.9 |
| Shear Force (Kips): | 25.4 | | |

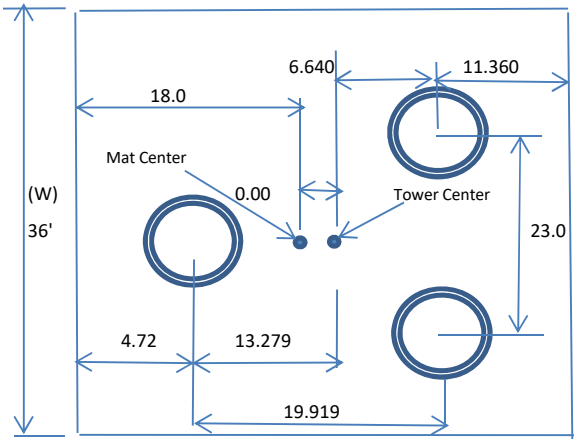
(2). Tower Base:

| | | | |
|---|---|---|---|
| Total Vertical Load (Kips): | 46.3 | Total Shear Force (Kips): | 41.7 |
| Moment (Kips-ft): | 4282.7 | | |

**Foundation Geometries:**

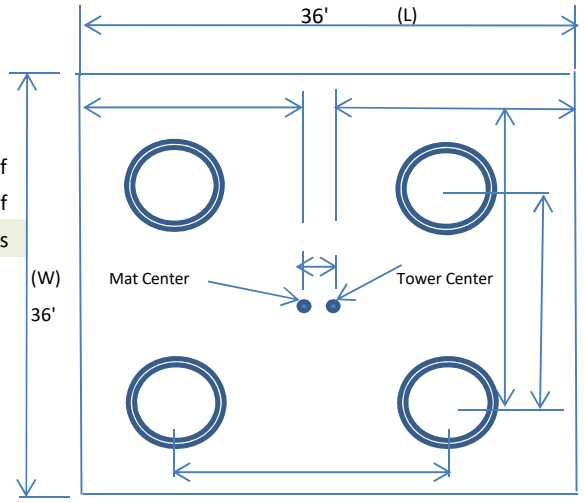
| | | | | |
|---|---|---|---|---|
| Leg distance (Center-to-Center ft.): | | 23.0 | Mods required -Yes/No ?: | No |
| Diameter of Pier (ft.): | Round | 2.2 | Pier Height A. G. (ft.): | 0.00 |
| Tower center to mat center (ft): | | 0.00 | Depth of Base BG (ft.): | 3.5 |
| Length of Pad (ft.): | | 36 | Width of Pad (ft.): | 36 |
| Thickness of Pad (ft): | | 4.00 | | |




**Material Properties and Reabr Info:**

| | | | | |
|---|---|---|---|---|
| Concrete Strength (psi): | 3000 | Steel Elastic Modulus: | 29000 | ksi |
| Vertical bar yield (ksi) | 60 | Tie steel yield (ksi): | 60 | |
| Vertical Rebar Size #: | 7 | Tie / Stirrup Size #: | 4 | |
| Qty. of Vertical Rebars: | 20 | Tie Spacing (in): | 6.0 | |
| Pad Rebar Yield (Ksi): | 60 | Pad Steel Rebar Size (#): | 7 | |
| Concrete Cover (in.): | 3 | Unit Weight of Concrete: | 150.0 | pcf |
| Rebar at the bottom of the concrete pad: | | | | |
| Qty. of Rebar in Pad (L): | 40 | Qty. of Rebar in Pad (W): | 40 | |
| Rebar at the top of the concrete pad: | | | | |
| Qty. of Rebar in Pad (L): | 40 | Qty. of Rebar in Pad (W): | 40 | |




**Soil Design Parameters:**

| | | | | |
|---|---|---|---|---|
| Soil Unit Weight (pcf): | 120.0 | Soil Buoyant Weight: | 57.6 | Pcf |
| Water Table B.G.S. (ft): | 99.0 | Unit Weight of Water: | 62.4 | pcf |
| Ultimate Bearing Pressure (psf): | 4000 | Consider ties in concrete shear strength: | Yes | |

Allowable overstress %: 5.00% **TES Engr. Number:** 92326 Page 2/2 Date: 3/3/2020

Apply 1.35 for e/w per G/H: 1

**Foundation Analysis and Design:** Uplift Strength Reduction Factor: 0.75 Compression Strength Reduction Factor: 0.75

| | | | |
|---|---|---|---|
| Total Dry Soil Volume (cu. Ft.): | 2.57 | Total Dry Soil Weight (Kips): | 0.31 |
| Total Buoyant Soil Volume (cu. Ft.): | 0.00 | Total Buoyant Soil Weight (Kips): | 0.00 |
| Total Effective Soil Weight (Kips): | 0.31 | Weight from the Concrete Block at Top (K): | 0.00 |
| Total Dry Concrete Volume (cu. Ft.): | 5184.08 | Total Dry Concrete Weight (Kips): | 777.61 |
| Total Buoyant Concrete Volume (cu. Ft.): | 0.00 | Total Buoyant Concrete Weight (Kips): | 0.00 |
| Total Effective Concrete Weight (Kips): | 777.61 | Total Vertical Load on Base (Kips): | 824.26 |

**Check Soil Capacities:**

| | | | | | Load/ Capacity Ratio | |
|---|---|---|---|---|---|---|
| Calculated Maxium Net Soil Pressure under the base (psf): | 966.67 | < | Allowable Factored Soil Bearing (psf): | 3000 | 0.32 | OK! |
| Allowable Foundation Overturning Resistance (kips-ft.): | 13436.4 | > | Design Factored Momont (kips-ft): | 4415 | 0.33 | OK! |
| Factor of Safety Against Overturning (O. R. Moment/Design Moment): | 3.04 | OK! | | | | |

**Check the capacities of Reinforceing Concrete:**

| | | | |
|---|---|---|---|
| Strength reduction factor (Flexure and axial tension): | 0.90 | Strength reduction factor (Shear): | 0.75 |
| Strength reduction factor (Axial compresion): | 0.65 | Wind Load Factor on Concrete Design: | 1.00 |

(2).Concrete Pad:

| | | | | | | |
|---|---|---|---|---|---|---|
| One-Way Design Shear Capacity (L or W Direction, Kips): | 1581.6 | > | One-Way Factored Shear (L/W-Dir Kips) | 398.6 | 0.25 | OK! |
| One-Way Design Shear Capacity (Diagonal Dir., Kips): | 1336.9 | > | One-Way Factored Shear (Dia. Dir, Kips | 359.5 | 0.27 | OK! |
| Lower Steel Pad Reinforcement Ratio (L or W-Direct. ): | 0.0012 | | Lower Steel Reinf. Ratio (Dia. Dir.): | 0.0011 | | |
| Lower Steel Pad Moment Capacity (L or W-Dir. Kips-ft): | 4742.2 | > | Moment at Bottom ( L-Direct. K-Ft): | 1573.1 | 0.33 | OK! |
| Lower Steel Pad Moment Capacity (Dia. Direction,K-ft): | 4603.2 | > | Moment at Bottom ( Dia. Dir. K-Ft): | 1315.8 | 0.29 | OK! |
| Upper Steel Pad Reinforcement Ratio (L or W -Direction): | 0.0012 | | Upper Steel Reinf. Ratio (Dia. Dir.): | 0.0011 | | |
| Upper Steel Pad Moment Capacity (L or W-Dir., Kips-ft): | 4742.2 | > | Moment at the top (L-Dir Kips-Ft): | 936.6 | 0.20 | OK! |
| Upper Steel Pad Moment Capacity (Dia. Direction, K-ft): | 4603.2 | > | Moment at the top (Dia. Dir., K-Ft): | 582.0 | 0.13 | OK! |
| Punching Failure Capacity From Down Load (Kips): | 1637.9 | > | Punch. Failure Factored Shear (K): | 230.5 | 0.14 | OK! |
| Punching Failure Capacity From Uplift (Kips): | 1479.8 | > | Punch. Failure Factored Shear (K): | 190.9 | 0.13 | OK! |

(3). Check Max. eccentricity of Loading:

| | | | | | |
|---|---|---|---|---|---|
| The maximum eccentricity of Loading: | 5.40 | ft. | Allowable eccentricity (0.45 W, ft.): | 16.2 | OK! |

ATTACHMENT E – PROOF OF DELIVERY OF NOTICE

Ref: CT587100-ES-055 Date: 01Oct20
Dep: BL GRAPHICS Wgt: 0.65 LBS

DV: 0.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4791

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 0.65 LB MAN
CAD: 0765627/CAFE3311

BILL THIRD PARTY

TO **CT06462-A**
**SBA COMMUNICATIONS CORPORATION**
**8051 CONGRESS AVENUE**

**BOCA RATON FL 33487**

REF: CT587100-ES-055 WILLIMANTIC

DEPT: BL GRAPHICS

565C2/A27E/05A2

FedEx Express

J191219082001uv

**FRI - 02 OCT 10:30A**
**PRIORITY OVERNIGHT**

TRK# 0201 **9151 3346 4791**

**XH BCTA**

**33487**
FL-US **FLL**

Ref: CT587100-ES-055 Date: 01Oct20
Dep: BL GRAPHICS Wgt: 0.65 LBS

DV:

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4780

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 0.65 LB MAN
CAD: 0765627/CAFE3311

BILL THIRD PARTY

565C2/A27E/05A2

TO **MATTHEW VERTEFEUILLE**
**TOWN OF WINDHAM**
**979 MAIN STREET**

**WILLIMANTIC CT 06226**

REF: CT587100-ES-055 WILLIMANTIC

DEPT: BL GRAPHICS

FedEx
Express

J191219082801av

**FRI - 02 OCT 10:30A**
**PRIORITY OVERNIGHT**

TRK# 0201 **9151 3346 4780**

**00 GONA**

**06226**
CT-US **BDL**

Ref: CT587100-ES-055 Date: 01Oct20
Dep: BL GRAPHICS Wgt: 0.65 LBS

DV: 0.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4770

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 0.65 LB MAN
CAD: 0765627/CAFE3311

BILL THIRD PARTY

TO **JIM RIVERS. TOWN MANAGER**
**TOWN OF WINDHAM**
**979 MAIN STREET**

**WILLIMANTIC CT 06226**

REF: CT587100-ES-055 WILLIMANTIC

DEPT: BL GRAPHICS

565C2/A27E/05A2

FedEx
Express

J191219082001uv

TRK# 0201 **9151 3346 4770**

**FRI - 02 OCT 10:30A**
**PRIORITY OVERNIGHT**

**00 GONA**

**06226**
CT-US **BDL**

Part # 156148-448 FMTE EXP 06/20

Ref: CT587100-ES-055 Date: 01Oct20
Dep: BL GRAPHICS Wgt: 0.65 LBS

DV: 0.00

SHIPPING: 0.00
SPECIAL: 0.00
HANDLING: 0.00
TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4769

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 0.65 LB MAN
CAD: 0765627/CAFE3311

BILL THIRD PARTY

TO **HONORABLE VICTOR FUNDERBURK, MAYOR**
**TOWN OF WINDHAM**
**979 MAIN STREET**

**WILLIMANTIC CT 06226**

REF: CT587100-ES-055 WILLIMANTIC

DEPT: BL GRAPHICS

565C2/A27E/0582

FedEx
Express

J191219082001uv

**FRI - 02 OCT 10:30A**
**PRIORITY OVERNIGHT**

TRK# 0201 **9151 3346 4769**

**00 GONA**

**06226**
CT-US **BDL**

Ref: CT587100-ES-055 Date: 01Oct20
Dep: BL GRAPHICS Wgt: 0.65 LBS

DV:

| | |
|---|---|
| SHIPPING: | 0.00 |
| SPECIAL: | 0.00 |
| HANDLING: | 0.00 |
| 0.00 TOTAL: | 0.00 |

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4758

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 0.65 LB
CAD: 0765627/CAFE3311

BILL THIRD PARTY

TO

**CONNECTICUT SITING COUNCIL**
**10 FRANKLIN SQUARE**

**NEW BRITAIN CT 06051**

REF: CT587100-ES-055 WILLIMANTIC

DEPT: BL GRAPHICS

565C2/A27E/05A2

FedEx Express

J191219082001uv

**FRI - 02 OCT 10:30A**
**PRIORITY OVERNIGHT**

TRK# 0201 **9151 3346 4758**

**00 BDLA**

**06051**
CT-US **BDL**

ATTACHMENT F - POWER DENSITY REPORT

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

# Calculated Radio Frequency Emissions Report

## ES-055

349 Mountain Street

Windham, CT 06280

June 30, 2020

# Table of Contents



# List of Tables



# List of Figures

## 1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed Eversource installation on the self-support tower off at 349 Mountain Street in Windham, CT. Eversource is proposing to install two omnidirectional antennas – one transmit and one receive-only antenna – as part of its 220 MHz communications system.

This report considers the proposed antenna configuration as detailed by Eversource along with % MPE (Maximum Permissible Exposure) measurements around the site to determine FCC compliance of the facility. Please note that there is a guyed tower within the same compound (see below), which would contribute to the % MPE measurements recorded during the field survey.

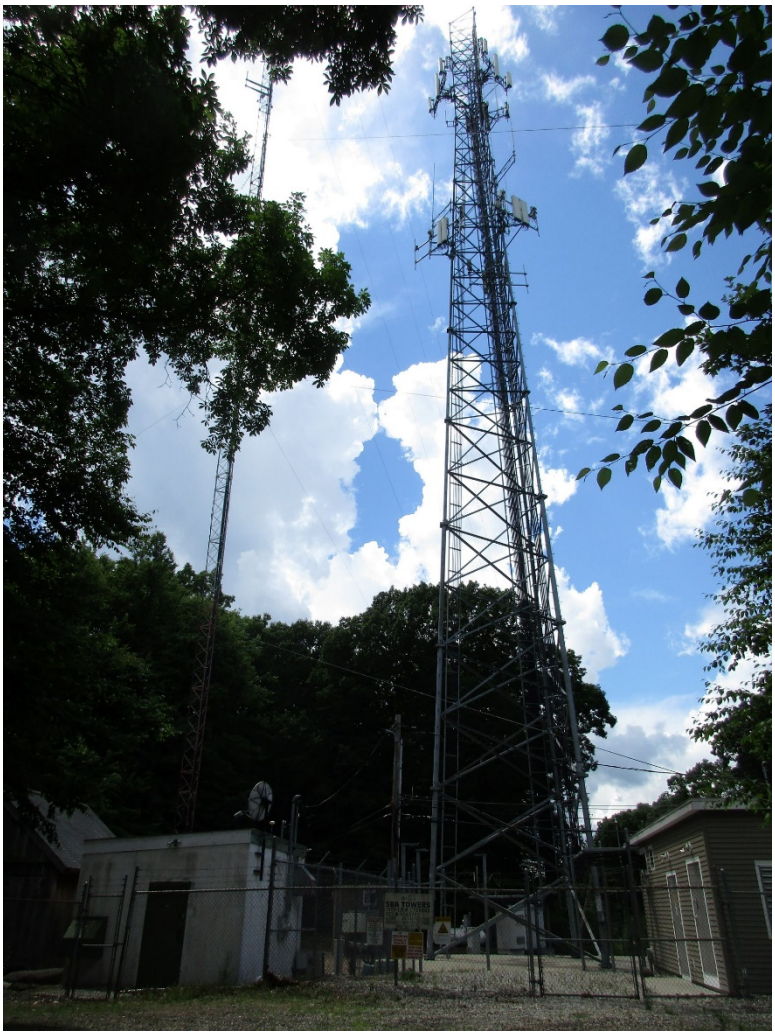


**Figure 1: View of ES-055 Willimantic**

| | |
|---|---|
| Site Address | 349 Mountain Street |
| Latitude | 41° 42' 10.84" N |
| Longitude | 72° 13' 17.01" W |
| Site Elevation AMSL | 525’ |
| Survey Engineer | Marc Salas |
| Survey Date/Time | 6/29/2020; 1:30 PM – 2:15 PM |

**Table 1: Survey Information**

## 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 B 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 B 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.

## 4. Power Density Calculation Methods

The power density calculation results were generated using the following formula as outlined in FCC bulletin OET 65, and Connecticut Siting Council recommendations:

$$\text{Power Density} = \left(\frac{1.6^2 \times 1.64 \times \text{ERP}}{4\pi \times R^2}\right) \text{X Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power = 1.64 x ERP

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna

V = Vertical Distance from radiation center of antenna

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and full power, and that all antenna channels are transmitting simultaneously. 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 consider actual terrain elevations which could attenuate the signal. As a result, the calculated power density and corresponding % MPE levels reported below are much higher than the actual levels will be from the final installation.

## 5. Proposed Antenna Configuration

Table 2 below lists the technical details of the proposed Eversource installation. These parameters are applied to the above calculation methods in order to calculate the % MPE values of the proposed equipment. Any proposed receive-only antennas have not been included in the table as they are irrelevant in terms of the % MPE calculations.

| Operator | Antenna Model | TX Freq. (MHz) | Ant Gain (dBd) | Power per Channel (ERP -Watts) | Number of Channels | Vertical Beamwidth | Length (ft) | Antenna Centerline Height (ft) |
|---|---|---|---|---|---|---|---|---|
| Eversource | Telewave ANT220F2 | 217 | 2.5 | 124 | 4 | 38° | 4.25 | 155 |

**Table 2: Eversource Antenna Configuration (Proposed)[1] [2]**

[1] Transmit power assumes 0 dB of cable loss.

[2] Transmit antenna height is based on the Tower Engineering Solutions Structural Analysis Report dated March 3, 2020.

## 6. Measurement Procedure

Frequencies from 300 KHz to 50 GHz were measured using the Narda Probe EA 5091, E-Field, shaped, FCC probe in conjunction with the NBM550 survey meter. The EA 5091 probe is “shaped” such that in a mixed signal environment (i.e.: more than one frequency band is used in a particular location), it accurately measures the percent of MPE.

From FCC OET Bulletin No. 65 - Edition 97-01 – “A useful characteristic of broadband probes used in multiple-frequency RF environments is a frequency-dependent response that corresponds to the variation in MPE limits with frequency. Broadband probes having such a "shaped" response permit direct assessment of compliance at sites where RF fields result from antennas transmitting over a wide range of frequencies. Such probes can express the composite RF field as a percentage of the applicable MPEs”.

**Probe Description** - As suggested in FCC OET Bulletin No. 65 - Edition 97-01, the response of the measurement instrument should be essentially isotropic, (i.e., independent of orientation or rotation angle of the probe). For this reason, the Narda EA 5091 probe was used for these measurements.

**Sampling Description** - At each measurement location, a spatially averaged measurement is collected over the height of an average human body. The NBM550 survey meter performs a time average measurement while the user slowly moves the probe over a distance range of 20 cm to 200 cm (about 6 feet) above ground level. The results recorded at each measurement location include average values over the spatial distance.

**Instrumentation Information** - A summary of specifications for the equipment used is provided in the table below.

| | | | | |
|---|---|---|---|---|
| **Manufacturer** | Narda Microwave | | | |
| **Probe** | EA 5091, Serial# 0116 | | | |
| **Calibration Date** | May 2020 | | | |
| **Calibration Interval** | 24 Months | | | |
| **Meter** | NBM550, Serial# E-1069 | | | |
| **Calibration Date** | May 2020 | | | |
| **Calibration Interval** | 24 Months | | | |
| **Probe Specifications** | **Frequency Range** | **Field Measured** | **Standard** | **Measurement Range** |
| | 300 KHz-50 GHz | Electric Field | U.S. FCC 1997 Occupational/Controlled | 0.2 – 600 % of Standard |

**Table 3: Instrumentation Information**

**Instrument Measurement Uncertainty** - The total measurement uncertainty of the NARDA measurement probe and meter is no greater than ±3 dB (0.5% to 6%), ±1 dB (6% to 100%), ±2 dB (100% to 600%). The factors which contribute to this include the probe’s frequency response deviation, calibration uncertainty, ellipse ratio, and isotropic response[3]. Every effort is taken to reduce the overall uncertainty during measurement collection including pointing the probe directly at the likely highest source of emissions.

[3] For further details, please refer to Narda Safety Test Solutions NBM550 Probe Specifications, pg. 64
http://www.narda-sts.us/pdf_files/DataSheets/NBM-Probes_DataSheet.pdf

## 7. Surveyed and Calculated % MPE Results

Measured and calculated results and a description of each survey location are detailed in the table below. Measurements were recorded on June 29, 2020 between 1:30 PM and 2:15 PM. The calculated % MPE contribution from the proposed equipment was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the "Off Beam Loss" factor shown in the power density formula from Section 4. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 16 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 5.71% (Average Uncontrolled/General Population MPE) and was recorded at Location 11 by the mailbox for 875 Mountain Street. The highest composite (measured + calculated) % MPE value is calculated to be 5.76% (Average Uncontrolled/General Population) and is also calculated to occur at Location 11.

| Meas. Location | Location Description | Latitude | Longitude | Dist. From Site (feet) | Measured % MPE (Uncontrolled/ General) | Calculated % MPE (Eversource Proposed) | Composite % MPE (Uncontrolled/ General) |
|---|---|---|---|---|---|---|---|
| 1 | Double swing gate on east side of fenced compound | 41.70297 | -72.22119 | 56 | 1.86% | 0.05% | 1.91% |
| 2 | Single swing on east side of fenced compound near wood framed shelter | 41.70285 | -72.22124 | 72 | 2.58% | 0.04% | 2.62% |
| 3 | Double swing gate on south side of fenced compound | 41.70282 | -72.22148 | 74 | 2.31% | 0.04% | 2.35% |
| 4 | Near the NE corner of the fenced compound | 41.70310 | -72.22131 | 40 | < 1.00% | 0.05% | < 1.05% |
| 5 | Near the NW corner of the fenced compound | 41.70318 | -72.22157 | 80 | < 1.00% | 0.04% | < 1.04% |
| 6 | NE of compound, along power line access way | 41.70308 | -72.22095 | 121 | 1.19% | 0.02% | 1.20% |
| 7 | Along gravel access road | 41.70283 | -72.22066 | 208 | < 1.00% | 0.21% | < 1.03% |
| 8 | Along gravel access road | 41.70271 | -72.22025 | 328 | < 1.00% | 0.33% | < 1.10% |
| 9 | Along gravel access road at bend | 41.70261 | -72.21965 | 495 | < 1.00% | 0.25% | < 1.25% |
| 10 | At tower access road gate | 41.70199 | -72.21879 | 801 | < 1.00% | 0.12% | < 1.12% |
| **11** | **By mailbox for 875 Mountain Street** | **41.70191** | **-72.21744** | **1149** | **5.71%** | **0.06%** | **5.76%** |
| 12 | By stop sign on Southridge Drive at Mountain Street intersection | 41.70127 | -72.21729 | 1284 | 5.12% | 0.05% | 5.16% |
| 13 | Spring View Lane, end of cul-de-sac | 41.69999 | -72.21718 | 1593 | 3.45% | 0.03% | 3.49% |
| 14 | SW corner of Orchard Hill Lane split | 41.70165 | -72.21337 | 2244 | 3.82% | 0.02% | 3.84% |
| 15 | By stop sign on Young Street at Lebanon Avenue intersection | 41.70667 | -72.21476 | 2246 | 3.01% | 0.02% | 3.03% |
| 16 | Adam Heights Road, at dead end | 41.70277 | -72.22406 | 735 | 1.52% | 0.14% | 1.66% |

**Table 4: Measured and Calculated % MPE Results [4] [5]**

[4] Due to measurement uncertainty at low levels (See Table 3), any readings outside the measurement range of the probe (< 1.00 % FCC General Population/Uncontrolled MPE) are noted as such.

[5] Measured and calculated % MPE values listed are rounded to two decimal points and the composite % MPE listed is a summation of each unrounded contribution. Therefore, summing each rounded value may not identically match the total composite value reflected in the table.

Figures 2 and 3 below are aerial views[6] of the tower location and the surrounding area, along with the measurement locations listed in Table 4.


**Figure 2: Measurement Points – Zoom In**


**Figure 3: All Measurement Points**

[6] Map showing location of telecommunications facility and the surrounding area. *Google Earth*, https://earth.google.com/web/.

## 8. Conclusion

A number of accessible areas around the tower at 349 Mountain Street in Windham, CT were surveyed and found to be well within the mandated General Population/Uncontrolled limits for Maximum Permissible Exposure, as delineated in the Federal Communications Commission's Radio Frequency exposure rules published in 47 CFR 1.1307(b)(1)-(b)(3).

The highest spatially averaged % MPE measurement of all surveyed points based on the 1997 FCC standard for exposure to the general population is 5.71% MPE. This measurement was recorded at Location 11 by the mailbox for 875 Mountain Street.

The highest composite (measured + calculated) power density is **5.76% of the FCC General Population MPE limit** with the proposed Eversource equipment and is also calculated to occur at Location 11.

The above analysis concludes that RF exposure at ground level around the tower, both currently and with the proposed antenna installation, will be below the maximum power density limits as outlined by the FCC in the OET Bulletin 65 Ed. 97-01.

As noted previously, the calculated % MPE levels are more conservative (higher) than the actual levels will be from the finished installation.

## 9. 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 FCC OET Bulletin 65 Edition 97-01, IEEE Std. C95.1, and IEEE Std. C95.3.

Keith Vellante

June 30, 2020

Report Prepared By: Keith Vellante
Director of RF Services
C Squared Systems, LLC

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[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) |
|---|---|---|---|---|
| 0.3-3.0 | 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[8]

| 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 5: FCC Limits for Maximum Permissible Exposure (MPE)**

[7] 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

[8] 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

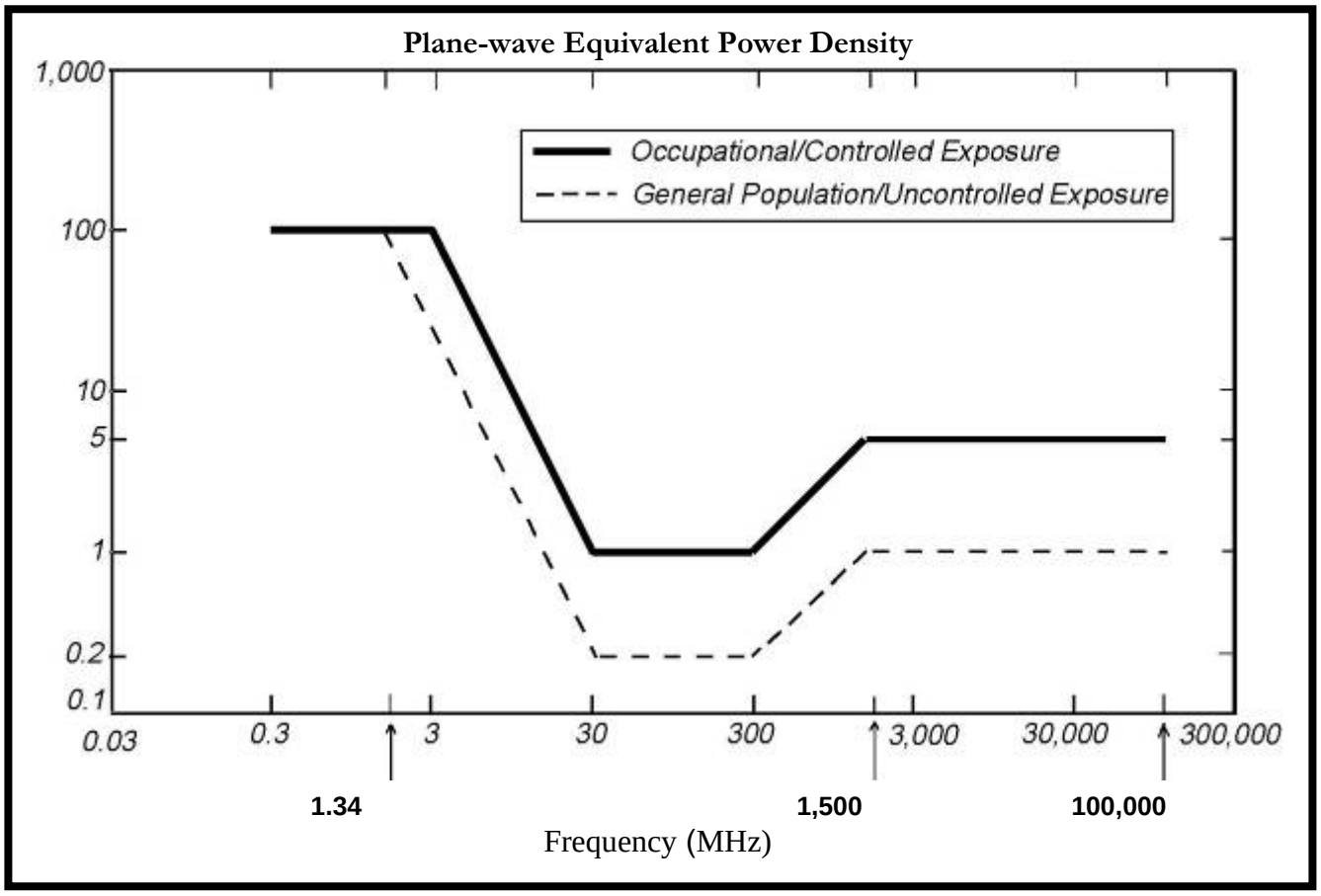
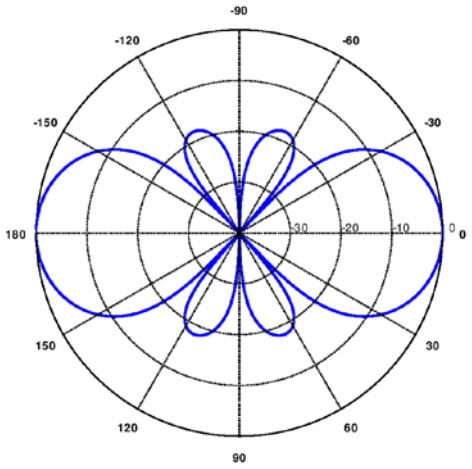



**Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)**

## Attachment C: Eversource Antenna Data Sheet and Electrical Patterns[9]

**217 MHz**

| | |
|---|---|
| Manufacturer: | Telewave |
| Model #: | ANT220F2 |
| Frequency Band: | 195 - 260 MHz |
| Gain: | 2.5 dBd |
| Vertical Beamwidth: | 38° |
| Horizontal Beamwidth: | 360° |
| Polarization: | Vertical-Polarization |
| Length: | 4.25’ |




[9] In the case where pattern data was unavailable from the manufacturer, vertical patterns shown are for antennas with similar specifications.