EVERSOURCE ENERGY

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

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

November 4, 2020

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

RE: **Notice of Exempt Modification**
Eversource Site # 22
Bald Hill Road, Union, CT 06076
Latitude: 41-58-27.1 N / Longitude: 72-11-56.12 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains multiple antennas and microwave dishes at various mounting heights on an existing 180-foot self-support tower located at Bald Hill Road in Union. See Attachment A, Parcel Map and Property Card. The tower and property are owned by Eversource. Eversource plans to install one 20-foot tall dipole antenna, to be mounted at approximately 180 feet above ground level ("AGL) and two 7/8-inch diameter coaxial cables. There will be no changes to the fenced compound or the tower structure. The tower and existing and proposed equipment on the tower are depicted on Attachment B, Construction Drawings, dated September 24, 2020 and Attachment C, Structural Analysis, dated September 3, 2020. The Connecticut Siting Council approved the self-support tower at this location in Docket No. 159 in June 1993.

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.

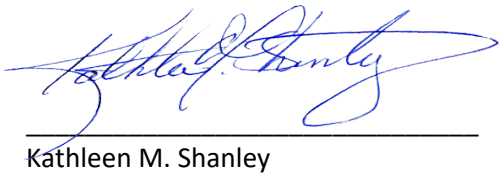
Please accept this letter as notification, pursuant to Regulations of Connecticut State Agencies ("R.C.S.A.") §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being delivered to David D. Eaton, First Selectman for the Town of Union and Mathieu J. Silbermann, Chair of the Planning and Zoning Commission for the Town of Union via private carrier. Proof of delivery is attached. See Attachment D, 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 September 30, 2020 (Attachment E – Power Density Report).
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

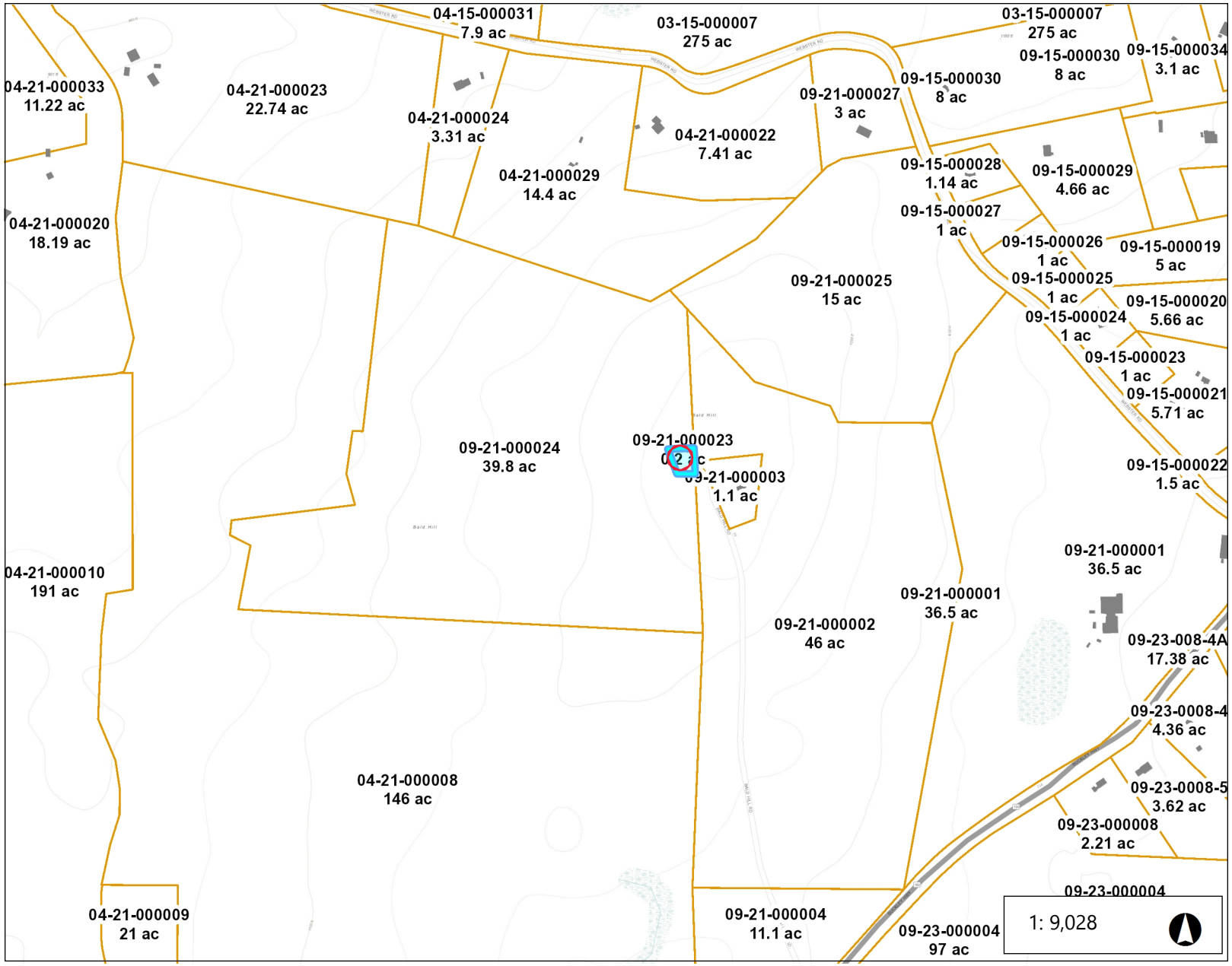
cc: David D. Eaton, First Selectman, Town of Union
Mathieu J. Silbermann, Chair of Planning & Zoning Commission, Town of Union

Attachments

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

ATTACHMENT A – PARCEL MAP AND PROPERTY CARD

ES-045 Union Parcel Map



Legend

- Town
- Buildings 2012
- Parcels
- Approximate Tower Location

Notes

0.3 0 0.14 0.3 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere

BALD HILL RD

Location	BALD HILL RD	**Mblu**	09/ 21/ 23L/ /
Acct#	00039410	**Owner**	CL&P PROPERTY TAX DEPT
Assessment	$431,080	**Appraisal**	$615,820
PID	22	**Building Count**	1

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$615,820	$0	$615,820
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$431,080	$0	$431,080

Owner of Record

Owner	CL&P PROPERTY TAX DEPT	**Sale Price**	$0
Co-Owner	BAUER(UNION-LEASE)	**Certificate**	
Address	PO BOX 270 HARTFORD, CT 06141-0270	**Book & Page**	35/370
		Sale Date	02/13/1992

Ownership History

Ownership History				
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Sale Date**
CL&P PROPERTY TAX DEPT	$0		35/370	02/13/1992

Building Information

Building 1 : Section 1

Year Built:	
Living Area:	0
Replacement Cost:	$0
Building Percent Good:	
Replacement Cost Less Depreciation:	$0

Building Attributes

Building Photo


Building Photo (http://images.vgsi.com/photos/UnionCTPhotos//57)

Building Layout


Building Layout (ParcelSketch.ashx?pid=22&bid=22)

Building Sub-Areas (sq ft)	Legend

Field	Description
Style	Outbuildings
Model	
Grade:	
Stories:	
Occupancy	
Exterior Wall 1	
Exterior Wall 2	
Roof Structure:	
Roof Cover	
Interior Wall 1	
Interior Wall 2	
Interior Flr 1	
Interior Flr 2	
Heat Fuel	
Heat Type:	
AC Type:	
Total Bedrooms:	
Total Bthrms:	
Total Half Baths:	
Total Xtra Fixtrs:	
Total Rooms:	
Bath Style:	
Kitchen Style:	

No Data for Building Sub-Areas

Extra Features

Extra Features	Legend
No Data for Extra Features	

Land

Land Use

Use Code	4340
Description	Cell Tower
Zone	RR
Neighborhood	12
Alt Land Appr	No
Category	

Land Line Valuation

Size (Acres)	0
Frontage	0
Depth	0
Assessed Value	$0
Appraised Value	$0

Outbuildings

Outbuildings	Legend

Code	Description	Sub Code	Sub Description	Size	Value	Bldg #
SHD6	PRE FAB SHED			80.00 S.F.	$21,000	1
CELL	CELL TENANT			3.00 UNITS	$535,500	1
FN3	FENCE-6' CHAIN			348.00 L.F.	$1,570	1
SHD6	PRE FAB SHED			220.00 S.F.	$57,750	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$615,820	$0	$615,820
2017	$418,900	$0	$418,900
2013	$418,900	$0	$418,900

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2018	$431,080	$0	$431,080
2017	$293,240	$0	$293,240
2013	$293,240	$0	$293,240

ATTACHMENT B – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. REMOVE EXISTING OMNI/WHIP ANTENNA AT ELEVATION 201'–0"± AGL
2. INSTALL (1) NEW DIPOLE ANTENNA AT ELEVATION 200'–0"± AGL
3. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING SHELTER
4. UPGRADE SHELTER ELECTRIC SERVICE FROM 100A TO 200A
5. ADD NEW CABLE ENTRY PANEL AND TOWER GROUND BAR TO EXISTING SHELTER AND TOWER LEG C

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:	UNION RADIO
SITE ID NUMBER:	#22
SITE ADDRESS:	BALD HILL ROAD UNION, CT 06076
MAP:	09
BLOCK:	21
LOT:	23L
ZONE:	RR
LATITUDE:	41° 58' 27.1" N
LONGITUDE:	72° 11' 56.12" W
ELEVATION:	1278'± AMSL
FEMA/FIRM DESIGNATION:	C
ACREAGE:	0.2± AC (BOOK: 035, PAGE: 370)

CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

PROPERTY OWNER:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

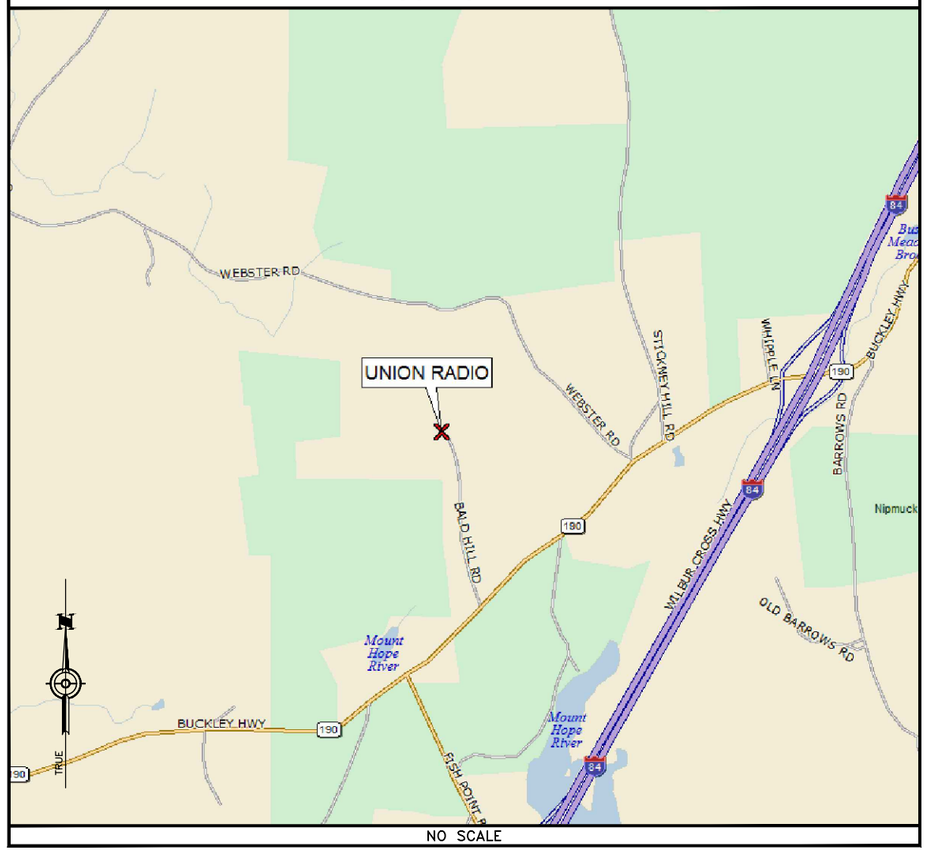
EVERSOURCE ENERGY
PROJECT MANAGER:
NIKOLL PRECI
(860) 655–3079

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
C–3	ANTENNA EQUIPMENT
G–1	GROUNDING PLAN
G–2	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) 458–3595

PROJECT NO:	405025
DRAWN BY:	TCG
CHECKED BY:	CAG

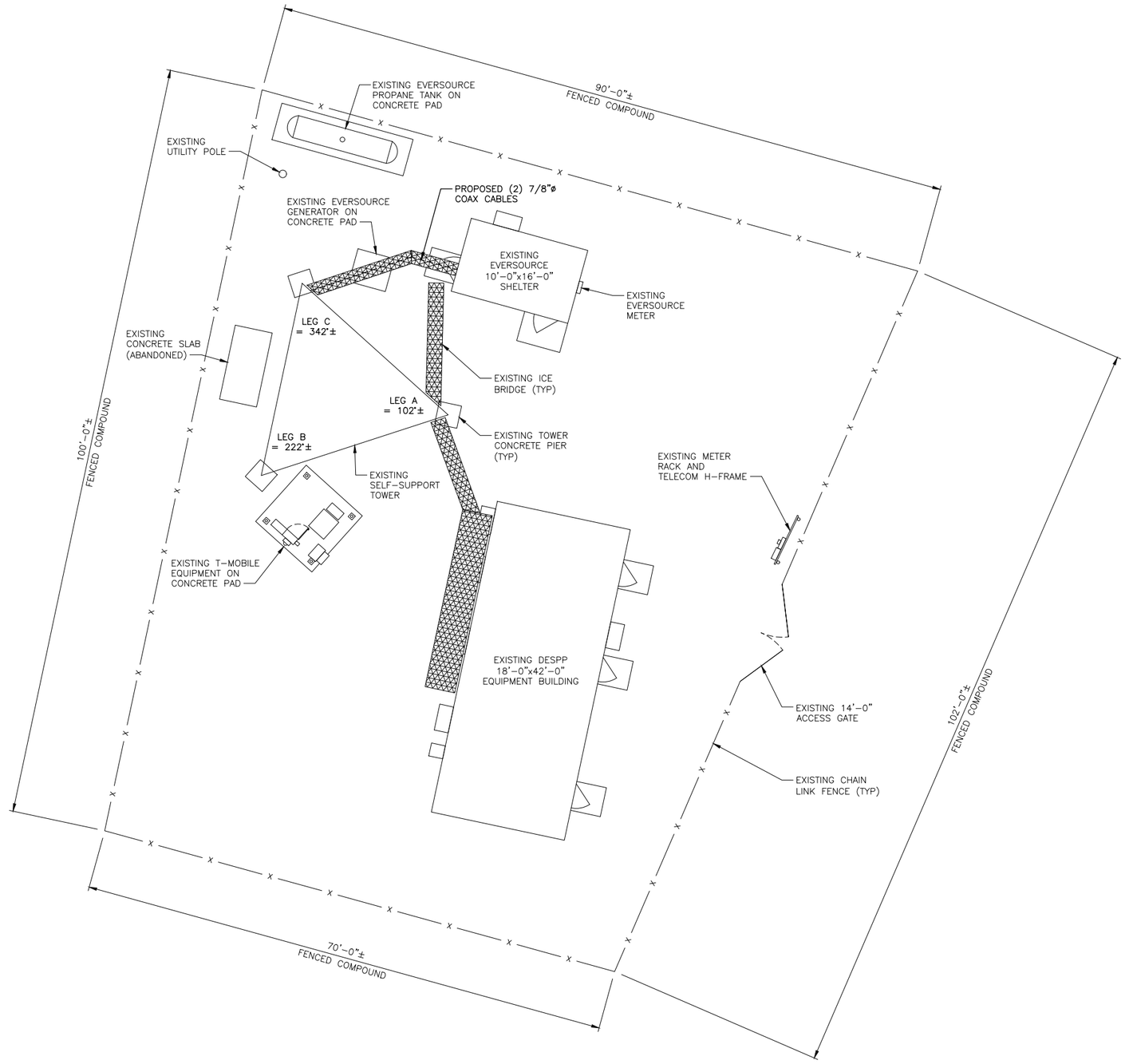
REV	DATE	DESCRIPTION
0	09/20/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
3208
LICENSED PROFESSIONAL ENGINEER
09/24/2020

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

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
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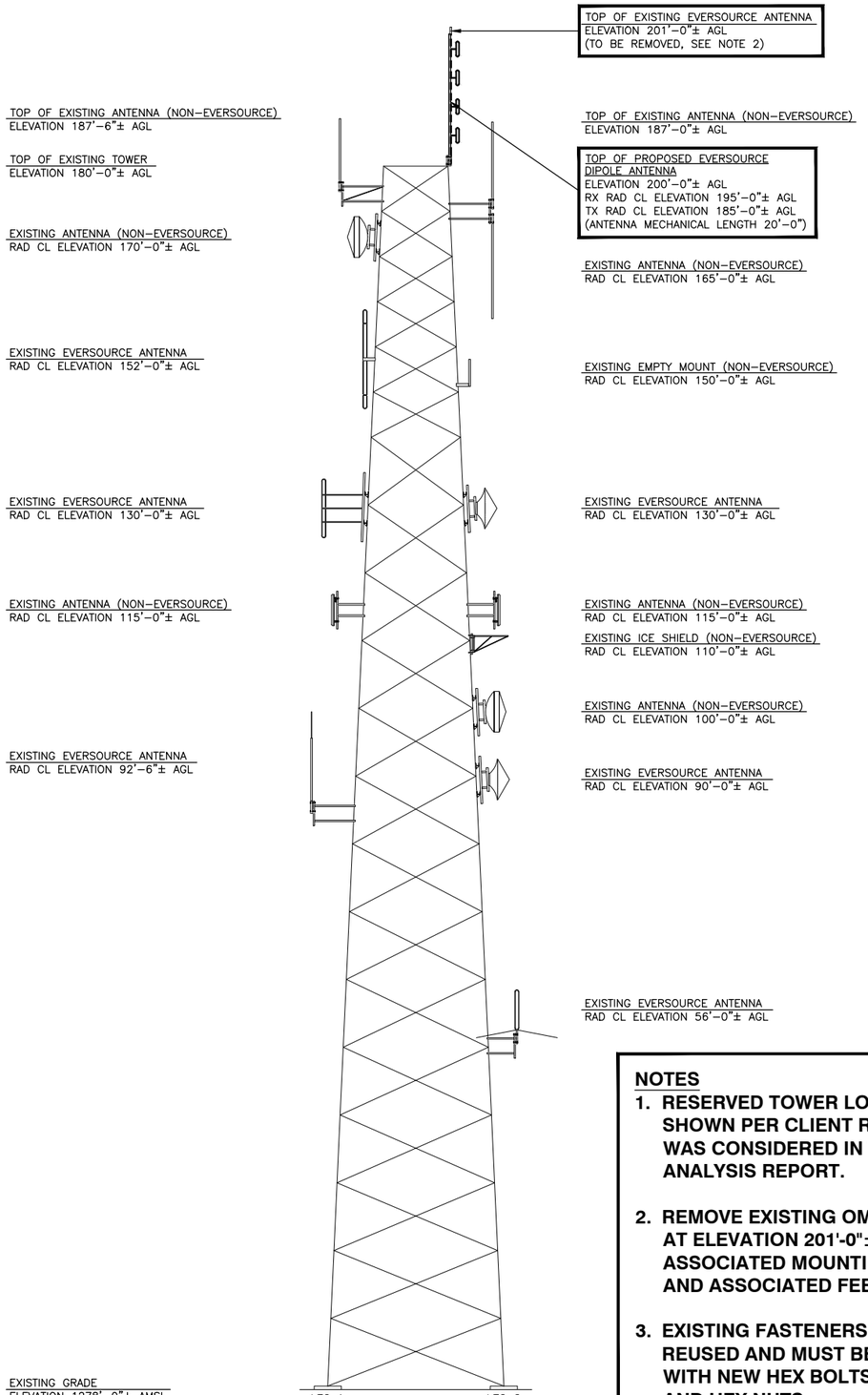
UNION RADIO
BALD HILL ROAD
UNION, CT 06076

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

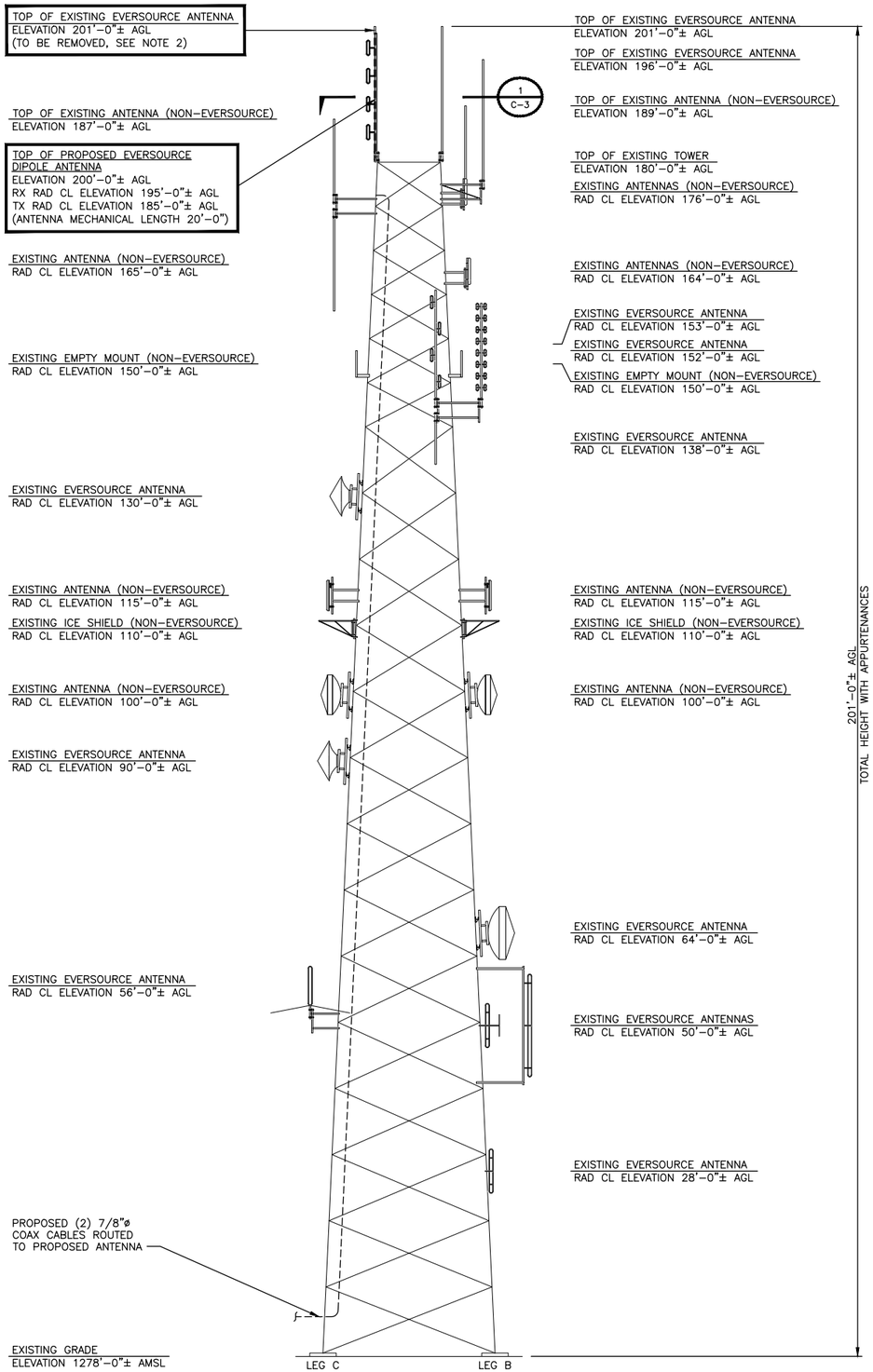


TOWER ELEVATION FACE AC

NO SCALE

NOTES

1. **RESERVED TOWER LOADING NOT SHOWN PER CLIENT REQUEST BUT WAS CONSIDERED IN TOWER ANALYSIS REPORT.**
2. **REMOVE EXISTING OMNI ANTENNA AT ELEVATION 201'-0"± AGL, ASSOCIATED MOUNTING CLAMPS, AND ASSOCIATED FEEDLINES.**
3. **EXISTING FASTENERS CANNOT BE REUSED AND MUST BE REPLACED WITH NEW HEX BOLTS, WASHERS, AND HEX NUTS.**



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) 458–3595

PROJECT NO:	405025
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REV	DATE	DESCRIPTION
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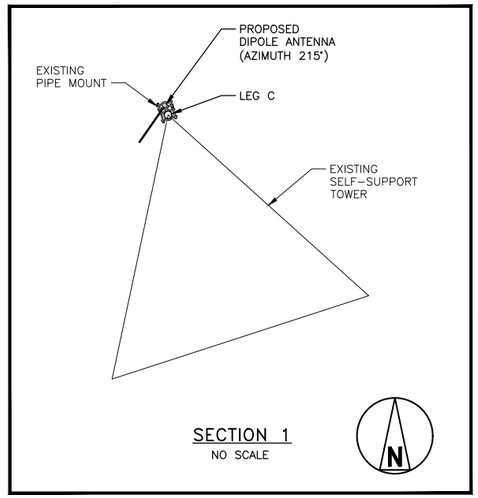
UNION RADIO
BALD HILL ROAD
UNION, CT 06076

SHEET TITLE

TOWER ELEVATION

SHEET NUMBER

C-2



SECTION 1
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) 458-3595

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STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
09/24/2020

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

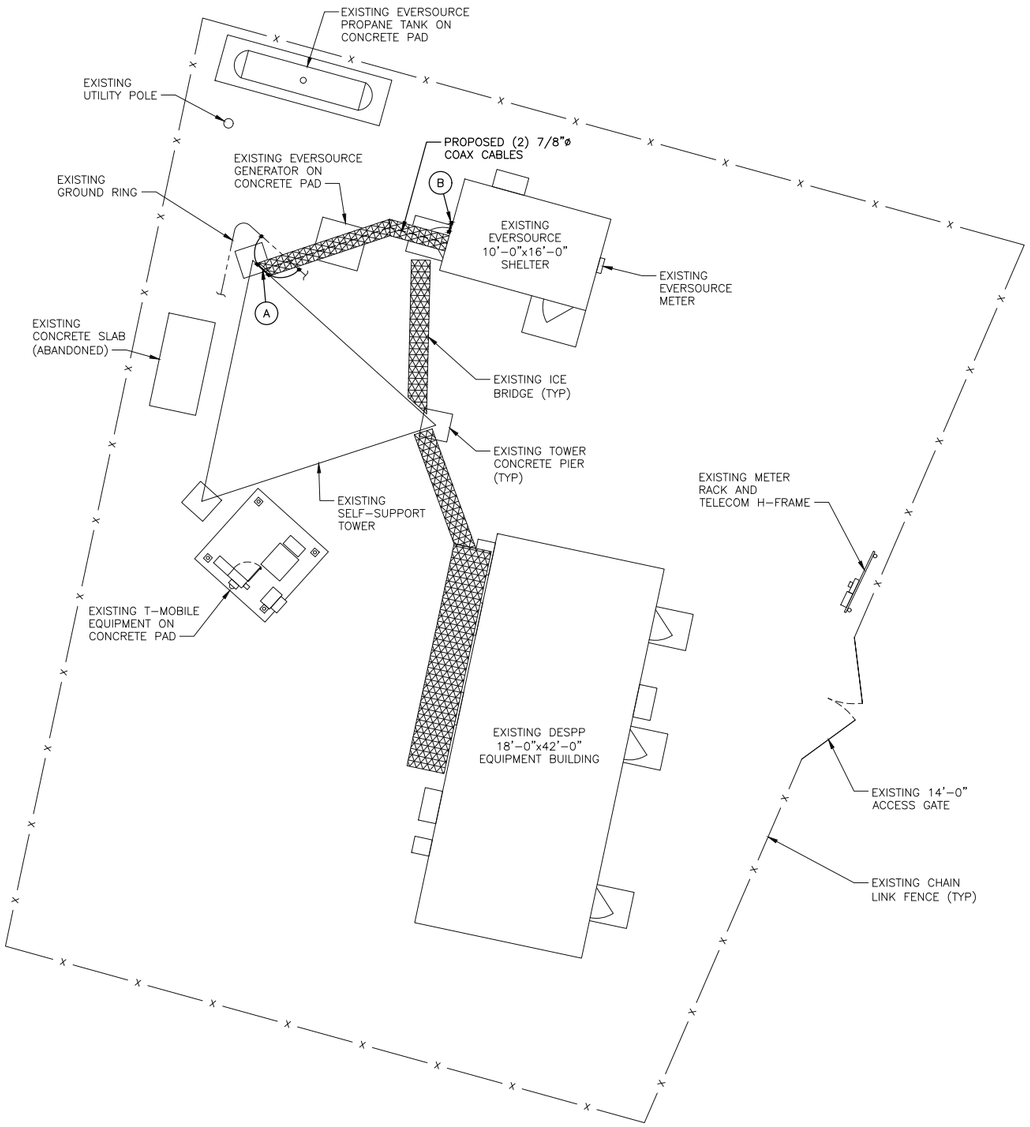
SHEET TITLE
ANTENNA
EQUIPMENT

SHEET NUMBER
C-3

LEGEND

● EXOTHERMIC (UNLESS NOTED OTHERWISE).

———— GROUND WIRE.



GROUNDING PLAN
NO SCALE

N

KEY NOTES

(A) TOWER GROUND BAR: EXTEND TWO #2 AWG COPPER TINNED WIRE FROM BURIED GROUND RING UP TO THE NEW TOWER GROUND BAR AND EXOTHERMICALLY WELD.

(B) EXTERIOR GROUND BAR: EXTEND #2 TINNED CU WIRE FROM EXISTING GROUND BAR AND EXOTHERMICALLY WELD. SEE DETAIL G-2.

NOTES

1. ALL GROUNDING SYSTEM CONDUCTORS AND CONNECTIONS BELOW GRADE SHALL BE THERMAL WELDS AT GROUND RODS AND AT A MINIMUM OF 36" BELOW GRADE, OR 6" BELOW FROST LINE, WHICH EVER IS GREATER OF THE TWO DIMENSIONS.
2. ALL INSTALLATIONS SHALL BE FIELD VERIFIED.
3. ALL GROUND WIRE SHALL BE #2 AWG BARE COPPER TINNED UNLESS NOTED OTHERWISE.
4. ALL GROUND WIRES SHALL PROVIDE A STRAIGHT DOWNWARD PATH TO GROUND WITH GRADUAL BEND AS REQUIRED. GROUND WIRES SHALL NOT BE LOOPED OR SHARPLY BENT.
5. ALL EXOTHERMIC CONNECTIONS SHALL BE INSTALLED UTILIZING THE PROPER CONNECTION/MOLD AND MATERIALS FOR THE PARTICULAR APPLICATION.
6. ALL BOLTED GROUNDING CONNECTIONS SHALL BE INSTALLED WITH AN EXTERNAL TOOTHED LOCK WASHER. GROUNDING BUS BARS MAY HAVE PRE PUNCHED HOLES OR TAPPED HOLES. ALL HARDWARE SHALL BE 3/8" STAINLESS STEEL.
7. EXTERNAL GROUNDING CONDUCTOR SHALL NOT BE INSTALLED OR ROUTED THROUGH HOLES IN ANY METAL OBJECTS, CONDUITS, OR SUPPORTS TO PRECLUDE ESTABLISHING A MAGNETIC CHOKE POINT.
8. PLASTIC CLIPS SHALL BE USED TO FASTEN AND SUPPORT GROUNDING CONDUCTORS. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL NOT BE USED.
9. STANDARD BUS BARS MGB, GWB, IGB, TELCO GB, FIBER GB, AND POWER GB SHALL BE FURNISHED AND INSTALLED BY THE SUBCONTRACTOR. THEY SHALL NOT BE FABRICATED OR MODIFIED IN THE FIELD. ALL GROUNDING BUSES SHALL BE IDENTIFIED WITH MINIMUM 3/4" LETTERS BY WAY OF STENCILING OR DESIGNATION PLATE.
10. CONTRACTOR SHALL REPAIR/PLACE EXISTING GROUNDING SYSTEM COMPONENTS DAMAGED DURING CONSTRUCTION AT THE CONTRACTORS EXPENSE.

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) 458-3595

PROJECT NO:	405025
DRAWN BY:	TCG
CHECKED BY:	CAG

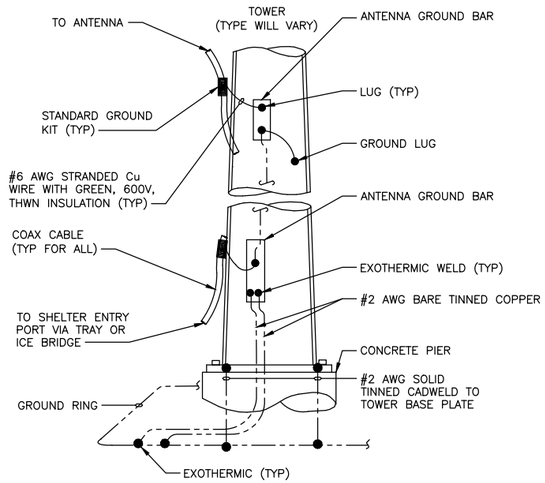
REV	DATE	DESCRIPTION
0	09/20/20	ISSUED FOR FILING

STATE OF CONNECTICUT · MARK P. STILES · 24358 · LICENSED PROFESSIONAL ENGINEER
09/24/2020

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

SHEET TITLE
GROUNDING PLAN

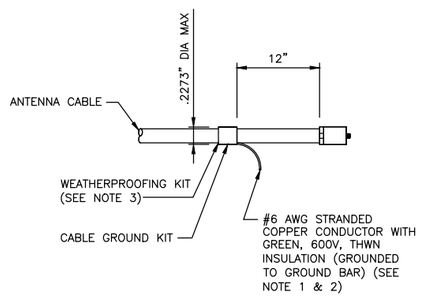
SHEET NUMBER
G-1



NOTE

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

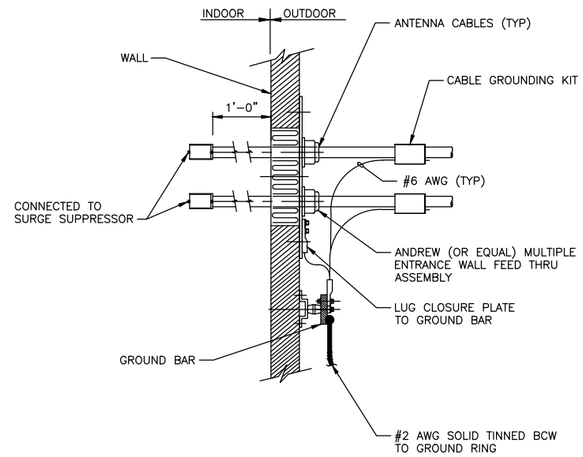
ANTENNA CABLE GROUNDING
NO SCALE



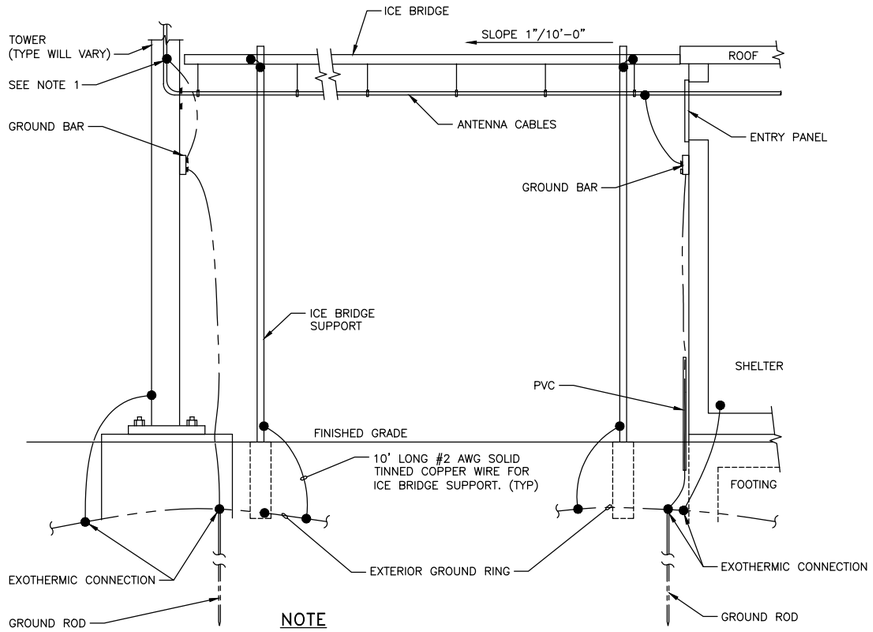
NOTES

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



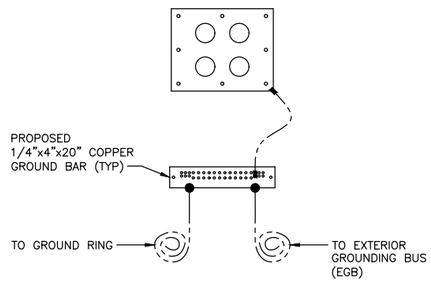
CABLE INSTALLATION WITH WALL
FEED THRU ASSEMBLY
NO SCALE



NOTE

1. PROVIDE GROUND KIT 6" BEFORE TURN

ICE BRIDGE AND ANTENNA
CABLE DETAIL
NO SCALE



HATCH PLATE GROUNDING
AT SHELTER
NO SCALE

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
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STATE OF CONNECTICUT
MARK P. STILES
29458
LICENSED
PROFESSIONAL ENGINEER
09/24/2020

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

SHEET TITLE
GROUNDING
DETAILS

SHEET NUMBER
G-2

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
ANGLE:	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.

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PROJECT NO:	405025
DRAWN BY:	TCG
CHECKED BY:	CAG

REV	DATE	DESCRIPTION
0	09/20/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
09/24/2020

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

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.
12. GROUNDING SYSTEM RESISTANCE SHALL BE MEASURED, RECORDED, AND DATED USING MEGGER DET14 OR SIMILAR INSTRUMENT. GROUND RESISTANCE SHALL NOT EXCEED 5 OHMS. IF THE RESISTANCE VALUE IS EXCEEDED, NOTIFY CONSTRUCTION MANAGER FOR FURTHER INSTRUCTION.
13. COORDINATE WITH BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK INVOLVING EXISTING SYSTEMS OR EQUIPMENT IN ORDER TO DETERMINE THE EFFECT, IF ANY, ON OTHER TENANTS WITHIN THE BUILDING, AND TO DETERMINE THE APPROPRIATE TIME FOR PERFORMING THIS WORK.
14. THE CONTRACTOR SHALL BE REQUIRED TO VISIT THE SITE PRIOR TO SUBMITTING BID IN ORDER TO DETERMINE THE EXTENT OF THE EXISTING CONDITIONS.
15. ALL CONDUCTOR ENDS SHALL BE TAGGED AND ELECTRICAL EQUIPMENT LABELED WITH ENGRAVED IDENTIFICATION PLATES.
16. CONTRACTOR IS RESPONSIBLE FOR ALL CONTROL WIRING AND ALARM TIE–INS.

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. 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).
4. 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.
5. 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.
6. 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.
7. THE MINIMUM BEND RADIUS SHALL BE 8 INCHES FOR #6 WIRE AND SMALLER AND 12 INCHES FOR WIRE LARGER THAN #6.
8. BOND THE FENCE TO THE GROUND RING AT EACH CORNER, AND AT EACH GATE POST WITH #2 SOLID TINNED WIRE. EXOTHERMIC WELD BOTH ENDS.
9. GROUND KITS SHALL BE SOLID COPPER STRAP WITH #6 WIRE 2–HOLE COMPRESSION CRIMPED LUGS AND SHALL BE SEALED ACCORDING TO MANUFACTURER INSTRUCTIONS.
10. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL BE USED.
11. 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.

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.

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PROJECT NO:	405025
DRAWN BY:	TCG
CHECKED BY:	CAG

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STATE OF CONNECTICUT · MARK P. STILES · 24358 · LICENSED PROFESSIONAL ENGINEER

09/24/2020

UNION RADIO
BALD HILL ROAD
UNION, CT 06076

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		

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SHEET TITLE

NOTES & SPECIFICATIONS

SHEET NUMBER

N-3

REFERENCE CUTSHEETS

SD212D-SF3P4SNM(I40) Exposed dipole directive, 5.5 dBd, two feed cables, 190-225 MHz

- 5.5 dB gain with offset pattern
- 190-225 MHz at a VSWR of 1.5:1 or better
- Dual port with 40 dB port-to-port isolation

Recommend SMK-125-A3 or SMK-125-A7 for Offset Side Mount.
Available from Sinclair separately.

The SD212D series is a 2-bay exposed dipole antenna with two separate feed cables, designed for applications where moderate gain is required and there isn't room for two separate antennas on a tower. These premium-quality antennas are well suited to public safety/public security applications.

The design of these antennas provides for coverage between 190-225 MHz.

The standard connector is N male which is terminated on a 1 foot cable.

Electrical Specifications

Frequency Range	MHz	190 to 225
Bandwidth	MHz	35
Connector		DIN-Male ORDER WITH DIN CONNECTOR
Gain (nominal)	dBd (dBi)	5.5 (7.6)
Input VSWR (max)		1.5:1
Polarization		vertical
Impedance	Ω	50
Pattern		Offset
Isolation (typ)	dB	40
Horizontal beamwidth (typ)	degrees	210
Vertical beamwidth (typ)	degrees	34
Average Power Input (max)	W	300
Isolation between sections (nom)	dB	30
Lightning protection		DC ground
Front-to-back ratio (typ)	dB	6

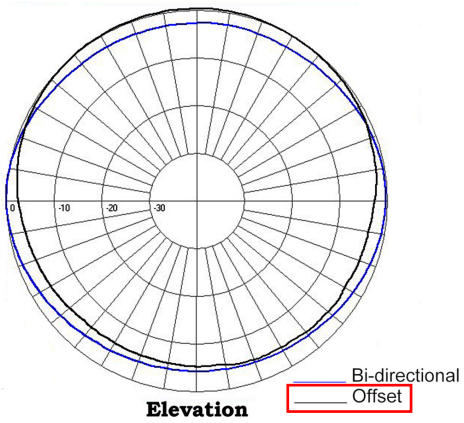
Notes
*1 : Qty 2

Ordering Information
Clamps must be ordered separately.

Mechanical Specifications

Width	in (mm)	18.5 (470)	
Depth	in (mm)	3 (76)	
Length/ Height	in (mm)	240 (6096)	
Base pipe diameter	in (mm)	2.38 (60)	
Base pipe mounting length	in (mm)	60 (1524)	
Radiating element material		aluminum	
Base pipe material		aluminum	
Weight	lbs (kg)	50 (22.7)	
Weight iced (1/2" ice)	lbs (kg)	106 (48.12)	
Mounting Hardware (Optional)		Clamp006A	*1
Actual shipping weight	lbs (kg)	78 (35.41)	
Mounting configurations		Universal Mount	
Recommended For Offset Side Mount:		SMK-125-A3 or SMK-125-A7	

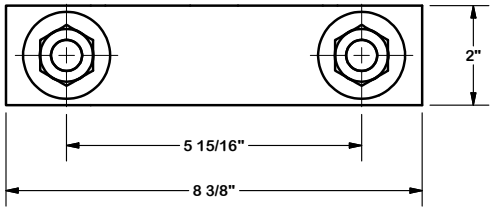
Use Offset Pattern

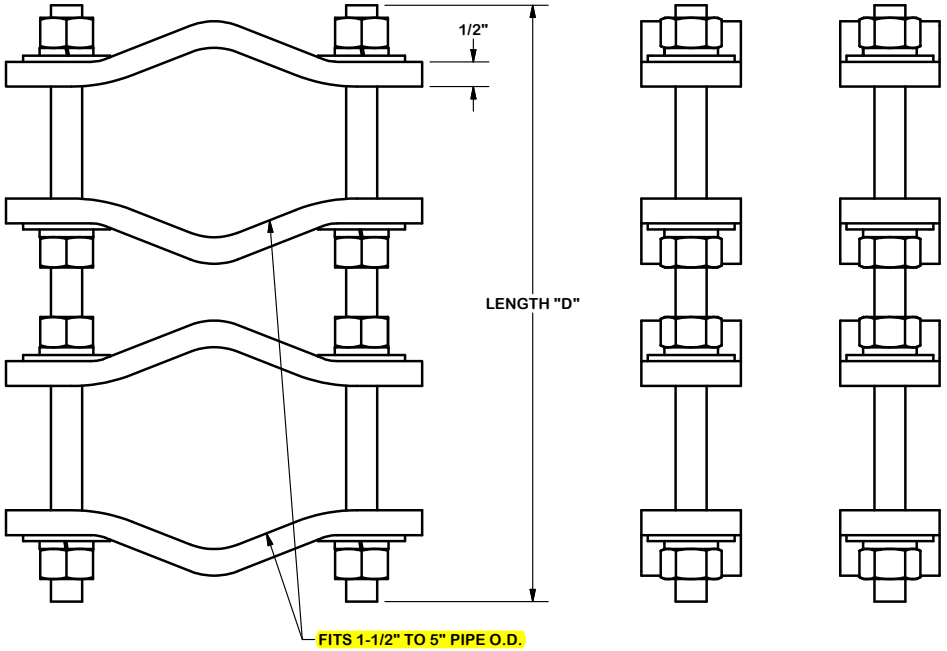


Environmental Specifications

Temperature range	°F (°C)	-40 to +140 (-40 to +60)
Wind Loading Area (Flat Plate Equivalent)	ft² (m²)	3.73 (0.35)
Wind Loading Area (1/2" ice)	ft² (m²)	6.03 (0.56)
Rated wind velocity (no ice)	mph (km/h)	125 (201)
Rated wind velocity (1/2" radial ice)	mph (km/h)	100 (161)
Lateral thrust (100 mph No Ice)	lbs (N)	136 (604.9)
Torsional moment (100 mph No Ice)	ft-lbs (Nm)	34 (45.9)
Bending moment (100 mph No Ice)	ft-lbs (Nm)	891 (1202.9)
Tip deflection (100 mph No Ice)	degrees	3.1

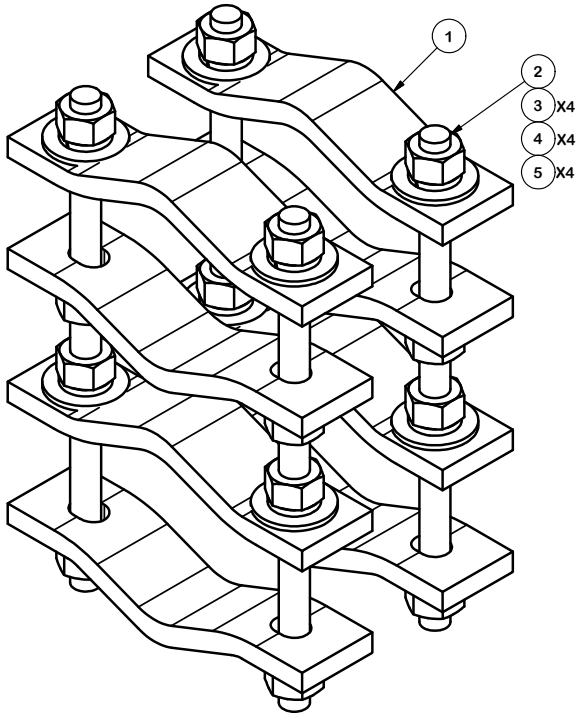
ATTACH PROPOSED ANTENNA TO EXISTING PIPE MOUNT USING CLAMP SET
SITE PRO 1 DCP18K (3 PIPE-TO-ANTENNA CONNECTIONS REQUIRED – TOTAL OF 2 SETS)





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 C – STRUCTURAL ANALYSIS REPORT

Date: **September 3, 2020**

Black & Veatch Corp.
6800 W. 115th St., Suite 2292
Overland Park, KS 66211
(913) 458-2522

Subject:	**Structural Analysis Report**	
Crown Castle Designation:	**Site Number:**	ES-045
	Site Name:	UnionRS
Engineering Firm Designation:	**Black & Veatch Corp. Project Number:**	405025
Site Data:	**Bald Hill Road, Union, Tolland, CT** **Latitude *41° 58' 27.10"*, Longitude *-72° 11' 56.12*** **180 Foot - Self Support Tower**	

Black & Veatch Corp. is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC1: Proposed Equipment Configuration **Sufficient Capacity – 53.3%**

This analysis utilizes an ultimate 3-second gust wind speed of 135 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Preechaya Sirisuwan / Cesar Garcia Godos

Respectfully submitted by:

Joshua J. Riley, P.E.
Professional Engineer

09/03/2020

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1) INTRODUCTION

This tower is a 180 ft Self Support tower designed by Andrew Corp.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	III
Wind Speed:	135 mph
Exposure Category:	B
Topographic Factor:	1
Ice Thickness:	2 in
Seismic Ss:	0.173
Seismic S1:	0.064
Wind Speed with Ice:	50 mph
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
180.0	190.0	1	telewave	SD212D-SF3P4SNM	2	7/8	-

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
180.0	191.0	1	unknown	20' x 3" Dia Omni	1	7/8	1
180.0	191.0	1	unknown	20' x 3" Dia Omni	1	7/8	3
176.0	186.0	1	dbspectra	DS9A09F36D-N	2	1-1/4	1
	182.0	1	unknown	10' x 3" Dia Omni	1	1/2	
	176.0	2	tower mounts	Side Arm Mount [SO 602-1]	1	7/8	
175.0	183.0	1	scala	OGT9-806	4	1-5/8	1
	176.0	3	sinclair	SE414-SF3P2LD (D00-E5749)_TIA	2	1/2	
	175.0	1	tower mounts	Sector Mount [SM 201-1]			
		1	tower mounts	Side Arm Mount [SO 201-1]			
		1	tx rx systems	432E-83I-01T			
173.0	181.0	1	antennae	3" Dia 12' Omni	2	1-5/8	1
	173.0	1	tower mounts	Side Arm Mount [SO 308-1]			
	165.0	1	antennae	3" Dia 12' Omni			
169.0	169.0	1	unknown	6 FT DISH	1	EW65	1
		2	tower mounts	Pipe Mount [PM 601-1]			
163.0	164.0	3	amphenol	WPA-700120-8CF-EDIN	4	1-5/8	1
		1	scala	AP14-850/105	1	1/2	
	163.0	1	tower mounts	Sector Mount [SM 201-1]			
		1	tower mounts	Side Arm Mount			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
				[SO 201-1]			
		1	tx rx systems	432E-83I-01T			
152.0	152.0	1	unknown	Folded Di-Pole	1	7/8	1
143.0	153.0	1	unknown	20' Di-Pole	1 2 1	1-5/8 7/8 1/2	1
	152.0	1	unknown	18' Di-Pole			
	143.0	2	tower mounts	Side Arm Mount [SO 305-1]			
	138.0	1	unknown	10' x 3" Dia Omni			
130.0	130.0	1	unknown	8 FT DISH	1 1	EW65 7/8	1
		1	unknown	Folded Di-Pole			
		1	tower mounts	Pipe Mount [PM 601-1]			
		1	tower mounts	Side Arm Mount [SO 305-1]			
120.0	120.0	1	tower mounts	T-Arm Mount [TA 702-3]	15	1-5/8	2
		3	ericsson	RADIO 4449 B12/B71			
		3	rfs celwave	APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe			
		3	rfs celwave	APXVAARR24_43-U-NA20_TIA w/ Mount Pipe			
		6	unknown	TMA 10"x8"x3"	-	-	1
110.0	110.0	2	andrew miscl	MD-S8 (for 8' MW) : Ice Shield	-	-	1
		3	tower mounts	Pipe Mount [PM 601-1]			
100.0	100.0	2	unknown	6 FT DISH	2	EW65	1
		3	tower mounts	Pipe Mount [PM 601-1]			
90.0	90.0	1	unknown	6 FT DISH	1	EW65	1
		1	tower mounts	Pipe Mount [PM 601-1]			
85.0	92.5	1	unknown	15' x 3" Dia Omni	1	7/8	1
	85.0	1	tower mounts	Side Arm Mount [SO 308-1]			
64.0	64.0	1	unknown	8 FT DISH	1	EW65	1
		1	tower mounts	Pipe Mount [PM 601-1]			
52.0	56.0	1	decibel	Dipole and Ground Plain	2	1/2	1
		1	tower mounts	Sector Mount [6' SM 401-1]			
50.0	50.0	1	unknown	DB225-F	1 2	7/8 1/2	1
		1	unknown	Folded Di-Pole			
27.0	27.0	1	decibel	DB212-2-C	1	1/2	1

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Existing Equipment to be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
TOWER MANUFACTURER DRAWINGS	Andrew Corp.	Tower geometry	Eversource
TOWER STRUCTURAL ANALYSIS REPORT	Centek Engineering, Inc., dated 10/24/2018	Tower loading	Eversource

3.1) Analysis Method

tnxTower (version 8.0.5.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built and maintained in accordance with the manufacturer's specifications.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
3) This analysis was performed under the assumption that all information provide to Black & Veatch is current and correct. This is to include site data, appurtenance loading, tower/foundation detail, and geotechnical data.
4) Tower Loading is based on drone mapping and previous tower analysis.
5) The existing base plate grout was considered in this analysis. Grout must be maintained and inspected periodically and must be replaced if damaged or crack.

This analysis may be affected if any assumptions are not valid or have been made in error. Black & Veatch Corp. should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	180 - 160	Leg	P5x.258	2	-16.32	165.38	9.9	Pass
T2	160 - 140	Leg	P6x.28	26	-31.63	222.71	14.2	Pass
T3	140 - 120	Leg	P8x.322	47	-52.45	326.25	16.1	Pass
T4	120 - 100	Leg	P8x.322	62	-82.77	326.25	25.4	Pass
T5	100 - 80	Leg	P8x.322	77	-114.54	326.25	35.1	Pass
T6	80 - 60	Leg	P8x.322	92	-147.62	326.25	45.2	Pass
T7	60 - 40	Leg	P10x.365	106	-183.98	481.71	38.2	Pass
T8	40 - 20	Leg	P10x.365	121	-220.61	481.71	45.8	Pass
T9	20 - 0	Leg	P10x.365	136	-256.72	481.71	53.3	Pass
T1	180 - 160	Diagonal	L2 1/2x2 1/2x3/16	9	-3.28	11.94	27.5 31.9 (b)	Pass
T2	160 - 140	Diagonal	2L2x2x3/16	30	-4.62	23.46	19.7 29.9 (b)	Pass
T3	140 - 120	Diagonal	2L2 1/2x2 1/2x3/16	51	-6.03	31.31	19.3 30.1 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T4	120 - 100	Diagonal	2L2 1/2x2 1/2x3/16	68	-7.74	26.31	29.4 38.9 (b)	Pass
T5	100 - 80	Diagonal	2L2 1/2x2 1/2x3/16	83	-9.37	22.32	42.0 47.1 (b)	Pass
T6	80 - 60	Diagonal	2L3x3x3/16	98	-10.17	33.84	30.0 44.7 (b)	Pass
T7	60 - 40	Diagonal	2L3x3x1/4	109	-11.27	38.50	29.3 37.4 (b)	Pass
T8	40 - 20	Diagonal	2L3x3x1/4	124	-11.82	33.47	35.3 39.0 (b)	Pass
T9	20 - 0	Diagonal	L5x5x5/16	139	-13.06	35.36	36.9 46.4 (b)	Pass
T1	180 - 160	Top Girt	L2 1/2x2 1/2x3/16	6	-0.12	6.03	1.9	Pass
							Summary	
						Leg (T9)	53.3	Pass
						Diagonal (T5)	47.1	Pass
						Top Girt (T1)	1.9	Pass
						Bolt Checks	47.1	Pass
						Rating =	53.3	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	37.3	Pass
1, 2	Base Foundation (Compared w/ Design Loads)	0	50.3	Pass

Structure Rating (max from all components) =	53.3%

Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity. Rating per TIA-222-H Section 15.5.
2) Foundation capacity determined by comparing analysis reactions to original design reactions.

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load*	*Tilt*	*Twist*	*Check**
	ft	*in*	*Comb.*	°	°	
T1	180 - 160	1.5795	43	0.06	0.01	OK
T2	160 - 140	1.3081	43	0.06	0.01	OK
T3	140 - 120	1.0462	43	0.06	0.01	OK
T4	120 - 100	0.804	43	0.05	0	OK
T5	100 - 80	0.5806	43	0.05	0	OK
T6	80 - 60	0.387	47	0.04	0	OK

*Limit State Deformation (TIA-222-H Section 2.8.2)

1) Maximum Rotation = 4 Degrees

2) Maximum Deflection = 0.03 * Tower Height = 65 in.

Critical Deflections of Tower at the MW Dish Elevations - Service Wind

Elevation (ft)	*MW Dish*	*Tilt (°)*	*Twist (°)*	*Diameter, D (ft)*	*Frequency, α (GHz)*	*Decibel Points*	*Deformation Limit (θ)**	*Deformation Limit Exceeded?*
170	6 FT DISH	0.06	0.01	6	10	10 dB	0.885	Not Exceeded
130	8 FT DISH	0.06	0	8	10	10 dB	0.664	Not Exceeded
100	6 FT DISH	0.05	0	6	10	10 dB	0.885	Not Exceeded
100	6 FT DISH	0.05	0	6	10	10 dB	0.885	Not Exceeded
90	6 FT DISH	0.04	0	6	10	10 dB	0.885	Not Exceeded
64	8 FT DISH	0.03	0	8	10	10 dB	0.664	Not Exceeded

*Limit per TIA-222-H Annex D

Maximum Tower Deflections - Design Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*	*Combined Max*	*Check**
	ft	*in*		°	°		
T1	180 - 160	4.7229	43	0.19	0.03	0.192	OK
T2	160 - 140	3.9308	47	0.18	0.03	0.182	OK
T3	140 - 120	3.1642	47	0.17	0.02	0.171	OK
T4	120 - 100	2.4459	47	0.16	0.01	0.160	OK
T5	100 - 80	1.7778	47	0.14	0.01	0.140	OK
T6	80 - 60	1.1884	47	0.11	0.01	0.110	OK

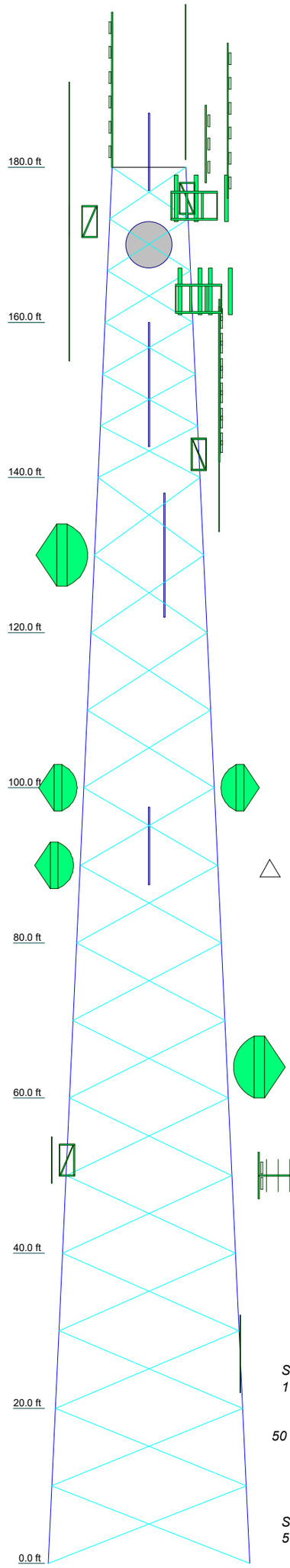
*Up to 0.5 degree is considered acceptable per SUB090 Section 7

Critical Deflections of Tower at the MW Dish Elevations - Design Wind

Elevation	*Appurtenance*	*Gov. Load Comb.*	*Deflection*	*Tilt*	*Twist*	*Radius of Curvature*
ft			*in*	°	°	*ft*
170	6 FT DISH	47	4.3219	0.19	0.03	537466.000
130	8 FT DISH	47	2.7988	0.17	0.02	84113.000
100	6 FT DISH	47	1.7778	0.14	0.01	57453.000
100	6 FT DISH	47	1.7778	0.14	0.01	57453.000
90	6 FT DISH	47	1.4705	0.13	0.01	45414.000
64	8 FT DISH	47	0.8015	0.09	0.01	36938.000

APPENDIX A

TNXTOWER OUTPUT



Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	
Legs	P5x.258	P6x.28	P8x.322					P10x.365		
Leg Grade	A500-46									
Diagonals	L2 1/2x2 1/2x3/16	2L2x2x3/16	2L2 1/2x2 1/2x3/16			2L3x3x3/16		2L3x3x1/4	L5x5x5/16	
Diagonal Grade	A36									
Top Girts	N.A.									
Face Width (ft)	L2 1/2x2 1/2x3/16	11.3333	13.1667	15	16.8333	18.6667	20.5	22.3333	24.1667	26
# Panels @ (ft)	6 @ 6.66667					14 @ 10				
Weight (K)	1.7	2.5	3.1	3.3	3.4	3.9	5.5	5.7	6.1	35.1

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Flash Beacon Lighting	180	Site Pro 1 SFS-H 48" Horizontal Angle Stabilizer Kit	120
20' x 3" Dia Omni	180	Site Pro 1 SFS-H 48" Horizontal Angle Stabilizer Kit	120
5'x2" Mount Pipe	180	APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	120
5'x2" Mount Pipe	180	APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	120
SD212D-SF3P4SNM	180	APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	120
(2) 12'x2" Horizontal Pipe	176	APXVAARR24_43-U-NA20_TIA w/ Mount Pipe	120
DS9A09F36D-N	176	APXVAARR24_43-U-NA20_TIA w/ Mount Pipe	120
Side Arm Mount [SO 602-1]	176	APXVAARR24_43-U-NA20_TIA w/ Mount Pipe	120
(2) 12'x2" Horizontal Pipe	176	RADIO 4449 B12/B71	120
10' x 3" Dia Omni	176	RADIO 4449 B12/B71	120
Side Arm Mount [SO 602-1]	176	RADIO 4449 B12/B71	120
Side Arm Mount [SO 201-1]	175	(2) TMA 10"x8"x3"	120
SE414-SF3P2LDF(D00-E5749)_TIA	175	(2) TMA 10"x8"x3"	120
SE414-SF3P2LDF(D00-E5749)_TIA	175	(2) TMA 10"x8"x3"	120
SE414-SF3P2LDF(D00-E5749)_TIA	175	T-Arm Mount [TA 702-3]	120
OGT9-806	175	8' x 2" Horizontal Pipe	120
432E-83I-01T	175	8' x 2" Horizontal Pipe	120
Sector Mount [SM 201-1]	175	MD-S8 (for 8' MW) : Ice Shield	110
3" Dia 12' Omni	173	Pipe Mount [PM 601-1]	110
3" Dia 12' Omni	173	(2) Pipe Mount [PM 601-1]	110
Side Arm Mount [SO 308-1]	173	MD-S8 (for 8' MW) : Ice Shield	110
6 FT DISH	170	Pipe Mount [PM 601-1]	100
(2) Pipe Mount [PM 601-1]	169	(2) Pipe Mount [PM 601-1]	100
WPA-700120-8CF-EDIN	163	6 FT DISH	100
WPA-700120-8CF-EDIN	163	6 FT DISH	100
WPA-700120-8CF-EDIN	163	Pipe Mount [PM 601-1]	90
AP14-850/105	163	6 FT DISH	90
432E-83I-01T	163	Side Arm Mount [SO 308-1]	85
Side Arm Mount [SO 201-1]	163	15' x 3" Dia Omni	85
Sector Mount [SM 201-1]	163	Pipe Mount [PM 601-1]	64
16'x2" Antenna Mount Pipe	152	8 FT DISH	64
Folded Di-Pole	152	Dipole and Ground Plain	52
Side Arm Mount [SO 301-1]	150	Sector Mount [6' SM 401-1]	52
Side Arm Mount [SO 301-1]	150	4'x3" Horizontal Pipe	50
10' x 3" Dia Omni	143	DB225-F	50
Side Arm Mount [SO 305-1]	143	Folded Di-Pole	50
18' Di-Pole	143	4'x3" Horizontal Pipe	50
Side Arm Mount [SO 305-1]	143	DB212-2-C	27
20' Di-Pole	143		
Folded Di-Pole	130		
Pipe Mount [PM 601-1]	130		
16'x2" Antenna Mount Pipe	130		
Side Arm Mount [SO 305-1]	130		
8 FT DISH	130		
8' x 2" Horizontal Pipe	120		
Site Pro 1 SFS-H 48" Horizontal Angle Stabilizer Kit	120		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-46	46 ksi	62 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in Tolland County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 135 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 2.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category III.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 53.3%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 266 K
SHEAR: 35 K

UPLIFT: -220 K
SHEAR: 30 K

AXIAL 218 K
SHEAR 17 K *MOMENT 1814 kip-ft*
TORQUE 14 kip-ft
50 mph WIND - 2.0000 in ICE

AXIAL 62 K
SHEAR 57 K *MOMENT 5528 kip-ft*
TORQUE 31 kip-ft
REACTIONS - 135 mph WIND

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Job: ***ES-045 UnionRS***			
Project: ***405025***			
Client: Eversource	Drawn by: Cesar Garcia Godos	App'd:	
Code: TIA-222-H	Date: 07/28/20	Scale: NTS	
Path: C:\Users\GOD84633\OneDrive - Black & Veatch\Documents\07 Eversource\UnionRS\Structural\Rev. H\UnionRS Structural Analysis.eri		Dwg No. E-1	

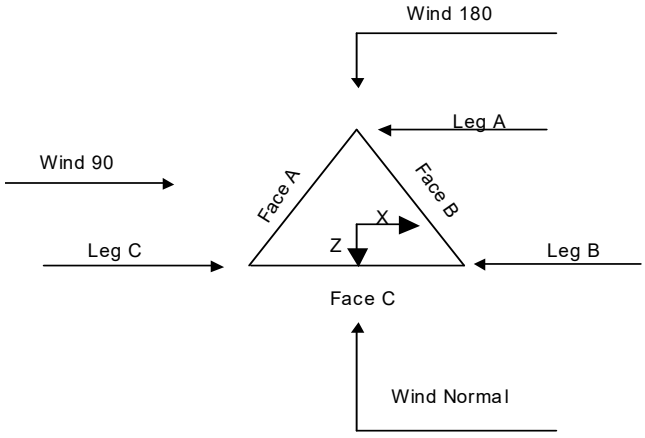
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 9.50 ft at the top and 26.00 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

1) Tower is located in Tolland County, Connecticut.
2) Tower base elevation above sea level: 1278.00 ft.
3) Basic wind speed of 135 mph.
4) Risk Category III.
5) Exposure Category B.
6) Simplified Topographic Factor Procedure for wind speed-up calculations is used.
7) Topographic Category: 1.
8) Crest Height: 0.00 ft.
9) Nominal ice thickness of 2.0000 in.
10) Ice thickness is considered to increase with height.
11) Ice density of 56 pcf.
12) A wind speed of 50 mph is used in combination with ice.
13) Temperature drop of 50 °F.
14) Deflections calculated using a wind speed of 60 mph.
15) Pressures are calculated at each section.
16) Stress ratio used in tower member design is 1.05.
17) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Distribute Leg Loads As Uniform		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Horizontals		Assume Legs Pinned	√	Calculate Redundant Bracing Forces
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Ignore Redundant Members in FEA
	Use Moment Magnification	√	Use Clear Spans For Wind Area	√	SR Leg Bolts Resist Compression
	Use Code Stress Ratios	√	Use Clear Spans For KL/r		All Leg Panels Have Same Allowable
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		Offset Girt At Foundation
	Escalate Ice	√	Bypass Mast Stability Checks	√	Consider Feed Line Torque
	Always Use Max Kz	√	Use Azimuth Dish Coefficients	√	Include Angle Block Shear Check
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Use TIA-222-H Bracing Resist. Exemption
√	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-H Tension Splice Exemption
	Leg Bolts Are At Top Of Section		Add IBC .6D+W Combination		Poles
√	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component		Include Shear-Torsion Interaction
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Always Use Sub-Critical Flow
	SR Members Have Cut Ends		Treat Feed Line Bundles As Cylinder		Use Top Mounted Sockets
	SR Members Are Concentric		Ignore KL/ry For 60 Deg. Angle Legs		Pole Without Linear Attachments
					Pole With Shroud Or No Appurtenances
					Outside and Inside Corner Radii Are Known



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	180.00-160.00			9.50	1	20.00
T2	160.00-140.00			11.33	1	20.00
T3	140.00-120.00			13.17	1	20.00
T4	120.00-100.00			15.00	1	20.00
T5	100.00-80.00			16.83	1	20.00
T6	80.00-60.00			18.67	1	20.00
T7	60.00-40.00			20.50	1	20.00
T8	40.00-20.00			22.33	1	20.00
T9	20.00-0.00			24.17	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	180.00-160.00	6.67	X Brace	No	No	0.0000	0.0000
T2	160.00-140.00	6.67	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	10.00	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	10.00	X Brace	No	No	0.0000	0.0000
T5	100.00-80.00	10.00	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	10.00	X Brace	No	No	0.0000	0.0000
T7	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	P5x.258	A500-46 (46 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T2 160.00-140.00	Pipe	P6x.28	A500-46 (46 ksi)	Double Equal Angle	2L2x2x3/16	A36 (36 ksi)
T3 140.00-120.00	Pipe	P8x.322	A500-46 (46 ksi)	Double Equal Angle	2L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 120.00-100.00	Pipe	P8x.322	A500-46 (46 ksi)	Double Equal Angle	2L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 100.00-80.00	Pipe	P8x.322	A500-46 (46 ksi)	Double Equal Angle	2L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 80.00-60.00	Pipe	P8x.322	A500-46 (46 ksi)	Double Equal Angle	2L3x3x3/16	A36 (36 ksi)
T7 60.00-40.00	Pipe	P10x.365	A500-46 (46 ksi)	Double Equal Angle	2L3x3x1/4	A36 (36 ksi)
T8 40.00-20.00	Pipe	P10x.365	A500-46 (46 ksi)	Double Equal Angle	2L3x3x1/4	A36 (36 ksi)
T9 20.00-0.00	Pipe	P10x.365	A500-46 (46 ksi)	Equal Angle	L5x5x5/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.00-160.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T4 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T5 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T6 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T7 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T8 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T9 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

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

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.00-160.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-160.00	Flange	0.8750 A325N	5	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T2 160.00-140.00	Flange	1.1250 A325N	5	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	1.1250 A325N	5	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	1.1250 A325N	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-80.00	Flange	1.2500 A325N	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 80.00-60.00	Flange	1.2500 A325N	6	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 60.00-40.00	Flange	1.2500 A325N	6	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 40.00-20.00	Flange	1.3750 A325N	6	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 20.00-0.00	Flange	1.3750 A193 Gr B7	0	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Climbing Ladder (Af)	A	No	No	Af (CaAa)	180.00 - 8.00	-24.0000	0.35	1	1	3.0000	3.0000		8.40
Safety Line 3/8 ***	A	No	No	Ar (CaAa)	180.00 - 8.00	-24.0000	0.35	1	1	0.3750	0.3750		0.22
Feedline Ladder (Af)	B	No	No	Af (CaAa)	180.00 - 8.00	1.0000	-0.4	1	1	3.0000	3.0000		8.40
Feedline Ladder (Af)	C	No	No	Af (CaAa)	180.00 - 8.00	1.0000	0.43	1	1	3.0000	3.0000		8.40
T-Bracket (Af) ***	B	No	No	Af (CaAa)	120.00 - 8.00	-2.5000	0.45	1	1	1.5000	1.5000		8.40
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	143.00 - 8.00	0.0000	-0.42	7	4	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	163.00 - 143.00	0.0000	-0.42	6	6	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	173.00 - 163.00	0.0000	-0.42	4	4	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	175.00 - 173.00	0.0000	-0.42	2	2	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	163.00 - 8.00	0.0000	-0.35	4	2	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	175.00 - 163.00	0.0000	-0.35	2	2	0.5000	1.9800		0.82
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	143.00 - 8.00	-0.5000	-0.37	5	5	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	152.00 - 143.00	-0.5000	-0.37	3	3	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	176.00 - 152.00	-0.5000	-0.37	2	2	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	180.00 - 176.00	-0.5000	-0.37	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	50.00 - 8.00	-1.5000	-0.4	3	3	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	85.00 - 50.00	-1.5000	-0.4	2	2	0.5000	1.0300		0.33
LDF5-	B	No	No	Ar (CaAa)	130.00 -	-	-0.4	1	1	0.5000	1.0300		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
50A(7/8)					85.00	1.5000							
LDF4-50A(1/2)	B	No	No	Ar (CaAa)	180.00 - 8.00	0.0000	-0.36	2	2	0.5000	0.6250		0.15
LDF4-50A(1/2)	B	No	No	Ar (CaAa)	50.00 - 8.00	0.0000	-0.375	7	4	0.5000	0.6250		0.15
LDF4-50A(1/2)	B	No	No	Ar (CaAa)	143.00 - 50.00	0.0000	-0.375	2	2	0.5000	0.6250		0.15
LDF4-50A(1/2)	B	No	No	Ar (CaAa)	163.00 - 143.00	0.0000	-0.375	1	1	0.5000	0.6250		0.15
WE65	B	No	No	Ar (CaAa)	100.00 - 8.00	0.0000	-0.39	3	2	0.5000	1.5836		0.53
WE65	B	No	No	Ar (CaAa)	169.00 - 100.00	0.0000	-0.39	1	1	0.5000	1.5836		0.53
***													
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	120.00 - 8.00	0.0000	0.45	12	6	0.5000	1.9800		0.82
HYBRIFLEX (1-5/8)	B	No	No	Ar (CaAa)	120.00 - 8.00	0.0000	0.41	3	2	0.5000	1.9800		0.82
***													
WE65	C	No	No	Ar (CaAa)	90.00 - 8.00	0.0000	0.46	2	2	0.5000	1.5836		0.53
WE65	C	No	No	Ar (CaAa)	130.00 - 90.00	0.0000	0.46	1	1	0.5000	1.5836		0.53
LDF6-50A(1-1/4)	C	No	No	Ar (CaAa)	176.00 - 8.00	0.0000	0.44	2	2	0.5000	1.5500		0.60
LDF4-50A(1/2)	C	No	No	Ar (CaAa)	176.00 - 8.00	0.0000	0.43	1	1	0.5000	0.6250		0.15
WE65	C	No	No	Ar (CaAa)	64.00 - 8.00	- 1.5000	0.42	1	1	0.5000	1.5836		0.53
***													
*** Proposed LDF5-50A(7/8)	C	No	No	Ar (CaAa)	180.00 - 0.00	0.0000	0.48	2	2	1.0300	1.0300		0.33

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight plf
***								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	37.225	0.000	0.27
		C	0.000	0.000	20.080	0.000	0.20
T2	160.00-140.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	63.273	0.000	0.37
		C	0.000	0.000	21.570	0.000	0.21
T3	140.00-120.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	73.057	0.000	0.41
		C	0.000	0.000	23.154	0.000	0.21
T4	120.00-100.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	138.487	0.000	0.82

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C	0.000	0.000	24.737	0.000	0.22
T5	100.00-80.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	145.336	0.000	0.85
		C	0.000	0.000	26.321	0.000	0.22
T6	80.00-60.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	146.881	0.000	0.85
		C	0.000	0.000	28.538	0.000	0.23
T7	60.00-40.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	151.036	0.000	0.86
		C	0.000	0.000	31.071	0.000	0.24
T8	40.00-20.00	A	0.000	0.000	10.750	0.000	0.17
		B	0.000	0.000	155.191	0.000	0.87
		C	0.000	0.000	31.071	0.000	0.24
T9	20.00-0.00	A	0.000	0.000	6.450	0.000	0.10
		B	0.000	0.000	93.115	0.000	0.52
		C	0.000	0.000	20.291	0.000	0.15

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-160.00	A	2.710	0.000	0.000	32.428	0.000	0.85
		B		0.000	0.000	130.193	0.000	2.33
		C		0.000	0.000	80.000	0.000	1.50
T2	160.00-140.00	A	2.676	0.000	0.000	32.158	0.000	0.83
		B		0.000	0.000	185.745	0.000	3.42
		C		0.000	0.000	87.375	0.000	1.59
T3	140.00-120.00	A	2.638	0.000	0.000	31.854	0.000	0.82
		B		0.000	0.000	199.782	0.000	3.62
		C		0.000	0.000	93.397	0.000	1.71
T4	120.00-100.00	A	2.594	0.000	0.000	31.504	0.000	0.80
		B		0.000	0.000	308.077	0.000	5.99
		C		0.000	0.000	99.120	0.000	1.81
T5	100.00-80.00	A	2.543	0.000	0.000	31.092	0.000	0.78
		B		0.000	0.000	325.418	0.000	6.07
		C		0.000	0.000	104.865	0.000	1.81
T6	80.00-60.00	A	2.480	0.000	0.000	30.587	0.000	0.76
		B		0.000	0.000	330.144	0.000	5.96
		C		0.000	0.000	112.737	0.000	1.85
T7	60.00-40.00	A	2.398	0.000	0.000	29.931	0.000	0.73
		B		0.000	0.000	328.985	0.000	5.87
		C		0.000	0.000	120.498	0.000	1.97
T8	40.00-20.00	A	2.278	0.000	0.000	28.975	0.000	0.69
		B		0.000	0.000	325.210	0.000	5.67
		C		0.000	0.000	116.559	0.000	1.84
T9	20.00-0.00	A	2.041	0.000	0.000	16.248	0.000	0.36
		B		0.000	0.000	185.123	0.000	3.05
		C		0.000	0.000	74.055	0.000	1.06

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	180.00-160.00	-3.7993	-11.8280	-6.6608	-13.6151
T2	160.00-140.00	-4.1687	-20.9656	-7.3871	-20.5952
T3	140.00-120.00	-4.8157	-22.8623	-9.0970	-23.4747
T4	120.00-100.00	6.9688	-12.4256	1.2612	-15.8102
T5	100.00-80.00	6.8867	-15.6516	0.7127	-18.4681
T6	80.00-60.00	5.9789	-16.2481	-0.4505	-19.6481
T7	60.00-40.00	5.1724	-17.3826	-2.1135	-19.7922

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T8	40.00-20.00	5.4484	-19.8054	-2.1618	-21.6129
T9	20.00-0.00	2.4109	-11.8341	-3.1545	-14.5135

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	Climbing Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T1	2	Safety Line 3/8	160.00 - 180.00	0.6000	0.6000
T1	4	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T1	5	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T1	9	LDF7-50A(1-5/8)	160.00 - 163.00	0.6000	0.6000
T1	10	LDF7-50A(1-5/8)	163.00 - 173.00	0.6000	0.6000
T1	11	LDF7-50A(1-5/8)	173.00 - 175.00	0.6000	0.6000
T1	12	LDF7-50A(1-5/8)	160.00 - 163.00	0.6000	0.6000
T1	13	LDF7-50A(1-5/8)	163.00 - 175.00	0.6000	0.6000
T1	17	LDF5-50A(7/8)	160.00 - 176.00	0.6000	0.6000
T1	18	LDF5-50A(7/8)	176.00 - 180.00	0.6000	0.6000
T1	22	LDF4-50A(1/2)	160.00 - 180.00	0.6000	0.6000
T1	25	LDF4-50A(1/2)	160.00 - 163.00	0.6000	0.6000
T1	27	WE65	160.00 - 169.00	0.6000	0.6000
T1	35	LDF6-50A(1-1/4)	160.00 - 176.00	0.6000	0.6000
T1	36	LDF4-50A(1/2)	160.00 - 176.00	0.6000	0.6000
T1	40	LDF5-50A(7/8)	160.00 - 180.00	0.6000	0.6000
T2	1	Climbing Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T2	2	Safety Line 3/8	140.00 - 160.00	0.6000	0.6000
T2	4	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T2	5	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T2	8	LDF7-50A(1-5/8)	140.00 - 143.00	0.6000	0.6000
T2	9	LDF7-50A(1-5/8)	143.00 - 160.00	0.6000	0.6000
T2	12	LDF7-50A(1-5/8)	140.00 - 160.00	0.6000	0.6000
T2	15	LDF5-50A(7/8)	140.00 - 143.00	0.6000	0.6000
T2	16	LDF5-50A(7/8)	143.00 - 152.00	0.6000	0.6000
T2	17	LDF5-50A(7/8)	152.00 - 160.00	0.6000	0.6000
T2	22	LDF4-50A(1/2)	140.00 - 160.00	0.6000	0.6000
T2	24	LDF4-50A(1/2)	140.00 - 143.00	0.6000	0.6000
T2	25	LDF4-50A(1/2)	143.00 - 160.00	0.6000	0.6000
T2	27	WE65	140.00 - 160.00	0.6000	0.6000
T2	35	LDF6-50A(1-1/4)	140.00 - 160.00	0.6000	0.6000
T2	36	LDF4-50A(1/2)	140.00 - 160.00	0.6000	0.6000
T2	40	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T3	1	Climbing Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T3	2	Safety Line 3/8	120.00 - 140.00	0.6000	0.6000
T3	4	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T3	5	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T3	8	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T3	12	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T3	15	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T3	21	LDF5-50A(7/8)	120.00 - 130.00	0.6000	0.6000
T3	22	LDF4-50A(1/2)	120.00 - 140.00	0.6000	0.6000
T3	24	LDF4-50A(1/2)	120.00 - 140.00	0.6000	0.6000
T3	27	WE65	120.00 - 140.00	0.6000	0.6000
T3	34	WE65	120.00 - 130.00	0.6000	0.6000
T3	35	LDF6-50A(1-1/4)	120.00 - 140.00	0.6000	0.6000
T3	36	LDF4-50A(1/2)	120.00 - 140.00	0.6000	0.6000
T3	40	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T4	1	Climbing Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T4	2	Safety Line 3/8	100.00 - 120.00	0.6000	0.6000
T4	4	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T4	5	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T4	6	T-Bracket (Af)	100.00 - 120.00	0.6000	0.6000
T4	8	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T4	12	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T4	15	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T4	21	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T4	22	LDF4-50A(1/2)	100.00 - 120.00	0.6000	0.6000
T4	24	LDF4-50A(1/2)	100.00 - 120.00	0.6000	0.6000
T4	27	WE65	100.00 - 120.00	0.6000	0.6000
T4	30	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T4	31	HYBRIFLEX (1-5/8)	100.00 - 120.00	0.6000	0.6000
T4	34	WE65	100.00 - 120.00	0.6000	0.6000
T4	35	LDF6-50A(1-1/4)	100.00 - 120.00	0.6000	0.6000
T4	36	LDF4-50A(1/2)	100.00 - 120.00	0.6000	0.6000
T4	40	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T5	1	Climbing Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T5	2	Safety Line 3/8	80.00 - 100.00	0.6000	0.6000
T5	4	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T5	5	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T5	6	T-Bracket (Af)	80.00 - 100.00	0.6000	0.6000
T5	8	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T5	12	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T5	15	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T5	20	LDF5-50A(7/8)	80.00 - 85.00	0.6000	0.6000
T5	21	LDF5-50A(7/8)	85.00 - 100.00	0.6000	0.6000
T5	22	LDF4-50A(1/2)	80.00 - 100.00	0.6000	0.6000
T5	24	LDF4-50A(1/2)	80.00 - 100.00	0.6000	0.6000
T5	26	WE65	80.00 - 100.00	0.6000	0.6000
T5	30	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T5	31	HYBRIFLEX (1-5/8)	80.00 - 100.00	0.6000	0.6000
T5	33	WE65	80.00 - 90.00	0.6000	0.6000
T5	34	WE65	90.00 - 100.00	0.6000	0.6000
T5	35	LDF6-50A(1-1/4)	80.00 - 100.00	0.6000	0.6000
T5	36	LDF4-50A(1/2)	80.00 - 100.00	0.6000	0.6000
T5	40	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T6	1	Climbing Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T6	2	Safety Line 3/8	60.00 - 80.00	0.6000	0.6000
T6	4	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T6	5	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T6	6	T-Bracket (Af)	60.00 - 80.00	0.6000	0.6000
T6	8	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T6	12	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T6	15	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T6	20	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T6	22	LDF4-50A(1/2)	60.00 - 80.00	0.6000	0.6000
T6	24	LDF4-50A(1/2)	60.00 - 80.00	0.6000	0.6000
T6	26	WE65	60.00 - 80.00	0.6000	0.6000
T6	30	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T6	31	HYBRIFLEX (1-5/8)	60.00 - 80.00	0.6000	0.6000
T6	33	WE65	60.00 - 80.00	0.6000	0.6000
T6	35	LDF6-50A(1-1/4)	60.00 - 80.00	0.6000	0.6000
T6	36	LDF4-50A(1/2)	60.00 - 80.00	0.6000	0.6000
T6	37	WE65	60.00 - 64.00	0.6000	0.6000
T6	40	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T7	1	Climbing Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T7	2	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T7	4	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T7	5	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T7	6	T-Bracket (Af)	40.00 - 60.00	0.6000	0.6000
T7	8	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T7	12	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T7	15	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T7	19	LDF5-50A(7/8)	40.00 - 50.00	0.6000	0.6000
T7	20	LDF5-50A(7/8)	50.00 - 60.00	0.6000	0.6000
T7	22	LDF4-50A(1/2)	40.00 - 60.00	0.6000	0.6000
T7	23	LDF4-50A(1/2)	40.00 - 50.00	0.6000	0.6000
T7	24	LDF4-50A(1/2)	50.00 - 60.00	0.6000	0.6000
T7	26	WE65	40.00 - 60.00	0.6000	0.6000
T7	30	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T7	31	HYBRIFLEX (1-5/8)	40.00 - 60.00	0.6000	0.6000
T7	33	WE65	40.00 - 60.00	0.6000	0.6000
T7	35	LDF6-50A(1-1/4)	40.00 - 60.00	0.6000	0.6000
T7	36	LDF4-50A(1/2)	40.00 - 60.00	0.6000	0.6000
T7	37	WE65	40.00 - 60.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T7	40	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T8	1	Climbing Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T8	2	Safety Line 3/8	20.00 - 40.00	0.6000	0.6000
T8	4	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T8	5	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T8	6	T-Bracket (Af)	20.00 - 40.00	0.6000	0.6000
T8	8	LDF7-50A(1-5/8)	20.00 - 40.00	0.6000	0.6000
T8	12	LDF7-50A(1-5/8)	20.00 - 40.00	0.6000	0.6000
T8	15	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T8	19	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T8	22	LDF4-50A(1/2)	20.00 - 40.00	0.6000	0.6000
T8	23	LDF4-50A(1/2)	20.00 - 40.00	0.6000	0.6000
T8	26	WE65	20.00 - 40.00	0.6000	0.6000
T8	30	LDF7-50A(1-5/8)	20.00 - 40.00	0.6000	0.6000
T8	31	HYBRIFLEX (1-5/8)	20.00 - 40.00	0.6000	0.6000
T8	33	WE65	20.00 - 40.00	0.6000	0.6000
T8	35	LDF6-50A(1-1/4)	20.00 - 40.00	0.6000	0.6000
T8	36	LDF4-50A(1/2)	20.00 - 40.00	0.6000	0.6000
T8	37	WE65	20.00 - 40.00	0.6000	0.6000
T8	40	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T9	1	Climbing Ladder (Af)	8.00 - 20.00	0.6000	0.6000
T9	2	Safety Line 3/8	8.00 - 20.00	0.6000	0.6000
T9	4	Feedline Ladder (Af)	8.00 - 20.00	0.6000	0.6000
T9	5	Feedline Ladder (Af)	8.00 - 20.00	0.6000	0.6000
T9	6	T-Bracket (Af)	8.00 - 20.00	0.6000	0.6000
T9	8	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T9	12	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T9	15	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T9	19	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T9	22	LDF4-50A(1/2)	8.00 - 20.00	0.6000	0.6000
T9	23	LDF4-50A(1/2)	8.00 - 20.00	0.6000	0.6000
T9	26	WE65	8.00 - 20.00	0.6000	0.6000
T9	30	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T9	31	HYBRIFLEX (1-5/8)	8.00 - 20.00	0.6000	0.6000
T9	33	WE65	8.00 - 20.00	0.6000	0.6000
T9	35	LDF6-50A(1-1/4)	8.00 - 20.00	0.6000	0.6000
T9	36	LDF4-50A(1/2)	8.00 - 20.00	0.6000	0.6000
T9	37	WE65	8.00 - 20.00	0.6000	0.6000
T9	40	LDF5-50A(7/8)	0.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Flash Beacon Lighting	A	From Leg	0.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.70 3.10 3.50 4.30	2.70 3.10 3.50 4.30	0.05 0.07 0.09 0.13
***									
20' x 3" Dia Omni	B	From Leg	0.00 0.00 11.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.00 8.03 10.06 14.12	6.00 8.03 10.06 14.12	0.05 0.09 0.13 0.21
5'x2" Mount Pipe	C	From Leg	0.00 0.00 2.50	0.00	180.00	No Ice 1/2" Ice	1.19 1.50 1.81	1.19 1.50 1.81	0.02 0.03 0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	2.46	2.46	0.08
						2" Ice			
5'x2" Mount Pipe	B	From Leg	0.00 0.00 2.50	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.19 1.50 1.81 2.46	1.19 1.50 1.81 2.46	0.02 0.03 0.04 0.08
***									
Side Arm Mount [SO 602-1]	B	From Leg	0.00 0.00 0.00	0.00	176.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.58 3.39 4.18 5.70	10.83 13.16 15.84 22.98	0.15 0.22 0.31 0.55
(2) 12'x2" Horizontal Pipe	B	From Leg	0.00 0.00 0.00	0.00	176.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.85 4.08 5.32 7.60	0.01 0.05 0.08 0.16	0.04 0.07 0.09 0.18
DS9A09F36D-N	B	From Leg	6.00 0.00 10.00	0.00	176.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.33 8.47 10.63 14.99	6.33 8.47 10.63 14.99	0.08 0.12 0.18 0.34
***									
Side Arm Mount [SO 602-1]	A	From Leg	0.00 0.00 0.00	0.00	176.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.58 3.39 4.18 5.70	10.83 13.16 15.84 22.98	0.15 0.22 0.31 0.55
(2) 12'x2" Horizontal Pipe	A	From Leg	0.00 0.00 0.00	0.00	176.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.85 4.08 5.32 7.60	0.01 0.05 0.08 0.16	0.04 0.07 0.09 0.18
10' x 3" Dia Omni	A	From Leg	6.00 0.00 6.00	0.00	176.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.00 4.03 5.06 7.12	3.00 4.03 5.06 7.12	0.03 0.05 0.07 0.11
***									
Sector Mount [SM 201-1]	B	From Leg	1.00 0.00 0.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	17.06 22.64 28.13 39.06	4.95 7.48 10.09 15.55	0.36 0.51 0.70 1.21
Side Arm Mount [SO 201-1]	B	From Leg	1.00 0.00 0.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.78 2.24 2.75 3.89	2.61 3.15 3.73 4.99	0.10 0.12 0.14 0.22
SE414-SF3P2LDF(D00-E5749)_TIA	B	From Leg	2.00 -6.50 1.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.89 2.21 2.54 3.22	4.27 4.61 4.95 5.66	0.01 0.04 0.06 0.13
SE414-SF3P2LDF(D00-E5749)_TIA	B	From Leg	2.00 1.30 1.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.89 2.21 2.54 3.22	4.27 4.61 4.95 5.66	0.01 0.04 0.06 0.13
SE414-SF3P2LDF(D00-E5749)_TIA	B	From Leg	2.00 6.50 1.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.89 2.21 2.54 3.22	4.27 4.61 4.95 5.66	0.01 0.04 0.06 0.13

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
OGT9-806	B	From Leg	2.00 -1.30 8.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.27 3.44 4.61 6.81	2.27 3.44 4.61 6.81	0.02 0.04 0.06 0.13
432E-83I-01T	B	From Leg	2.00 0.00 0.00	0.00	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.20 3.43 3.66 4.15	1.27 1.43 1.60 1.97	0.05 0.07 0.10 0.16
***									
Side Arm Mount [SO 308-1]	C	From Leg	3.00 0.00 0.00	0.00	173.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
3" Dia 12' Omni	C	From Leg	6.00 0.00 8.00	0.00	173.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.60 4.83 6.08 8.02	3.60 4.83 6.08 8.02	0.02 0.05 0.08 0.17
3" Dia 12' Omni	C	From Leg	6.00 0.00 -8.00	0.00	173.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.60 4.83 6.08 8.02	3.60 4.83 6.08 8.02	0.02 0.05 0.08 0.17
***									
(2) Pipe Mount [PM 601-1]	A	From Leg	0.00 0.00 0.00	0.00	169.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.32 1.58 1.84 2.40	1.32 1.58 1.84 2.40	0.07 0.08 0.09 0.13
***									
Sector Mount [SM 201-1]	B	From Leg	1.00 0.00 0.00	0.00	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	17.06 22.64 28.13 39.06	4.95 7.48 10.09 15.55	0.36 0.51 0.70 1.21
Side Arm Mount [SO 201-1]	B	From Leg	1.00 0.00 0.00	0.00	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.78 2.24 2.75 3.89	2.61 3.15 3.73 4.99	0.10 0.12 0.14 0.22
WPA-700120-8CF-EDIN	B	From Leg	2.00 -6.50 1.00	0.00	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.45 7.02 7.61 8.79	6.45 7.02 7.61 8.79	0.02 0.06 0.10 0.22
WPA-700120-8CF-EDIN	B	From Leg	2.00 1.30 1.00	0.00	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.45 7.02 7.61 8.79	6.45 7.02 7.61 8.79	0.02 0.06 0.10 0.22
WPA-700120-8CF-EDIN	B	From Leg	2.00 6.50 1.00	0.00	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.45 7.02 7.61 8.79	6.45 7.02 7.61 8.79	0.02 0.06 0.10 0.22
AP14-850/105	B	From Leg	2.00 -1.30 1.00	0.00	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	10.61 11.25 11.89 13.20	5.64 6.28 6.89 8.14	0.03 0.08 0.14 0.28
432E-83I-01T	B	From Leg	2.00 0.00	0.00	163.00	No Ice 1/2"	3.20 3.43	1.27 1.43	0.05 0.07

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
			0.00			Ice	3.66	1.60	0.10
						1" Ice	4.15	1.97	0.16
						2" Ice			
***									
16'x2" Antenna Mount Pipe	A	From Leg	0.00	0.00	152.00	No Ice	3.80	3.80	0.06
			0.00			1/2"	5.43	5.43	0.09
			0.00			Ice	7.07	7.07	0.13
						1" Ice	10.41	10.41	0.24
						2" Ice			
Folded Di-Pole	A	From Leg	1.00	0.00	152.00	No Ice	3.10	3.10	0.03
			0.00			1/2"	6.22	6.22	0.06
			0.00			Ice	9.34	9.34	0.09
						1" Ice	15.58	15.58	0.15
						2" Ice			
***									
Side Arm Mount [SO 301-1]	B	From Leg	0.50	0.00	150.00	No Ice	0.46	0.91	0.02
			0.00			1/2"	0.65	1.30	0.03
			0.00			Ice	0.87	1.71	0.05
						1" Ice	1.41	2.62	0.09
						2" Ice			
Side Arm Mount [SO 301-1]	C	From Leg	0.50	0.00	150.00	No Ice	0.46	0.91	0.02
			0.00			1/2"	0.65	1.30	0.03
			0.00			Ice	0.87	1.71	0.05
						1" Ice	1.41	2.62	0.09
						2" Ice			
***									
Side Arm Mount [SO 305-1]	B	From Leg	0.00	0.00	143.00	No Ice	0.53	1.52	0.03
			0.00			1/2"	0.78	2.07	0.04
			0.00			Ice	1.06	2.66	0.06
						1" Ice	1.73	3.91	0.13
						2" Ice			
20' Di-Pole	B	From Leg	3.00	0.00	143.00	No Ice	3.33	3.33	0.03
			0.00			1/2"	5.99	5.99	0.04
			10.00			Ice	8.65	8.65	0.05
						1" Ice	13.97	13.97	0.07
						2" Ice			
10' x 3" Dia Omni	B	From Leg	3.00	0.00	143.00	No Ice	3.00	3.00	0.03
			0.00			1/2"	4.03	4.03	0.05
			-5.00			Ice	5.06	5.06	0.07
						1" Ice	7.12	7.12	0.11
						2" Ice			
***									
Side Arm Mount [SO 305-1]	B	From Leg	0.00	0.00	143.00	No Ice	0.53	1.52	0.03
			0.00			1/2"	0.78	2.07	0.04
			0.00			Ice	1.06	2.66	0.06
						1" Ice	1.73	3.91	0.13
						2" Ice			
18' Di-Pole	B	From Leg	3.00	0.00	143.00	No Ice	3.00	3.00	0.03
			0.00			1/2"	5.39	5.39	0.04
			9.00			Ice	7.79	7.79	0.04
						1" Ice	12.57	12.57	0.06
						2" Ice			
***									
16'x2" Antenna Mount Pipe	A	From Leg	0.00	0.00	130.00	No Ice	3.80	3.80	0.06
			2.00			1/2"	5.43	5.43	0.09
			0.00			Ice	7.07	7.07	0.13
						1" Ice	10.41	10.41	0.24
						2" Ice			
Side Arm Mount [SO 305-1]	A	From Leg	0.00	0.00	130.00	No Ice	0.53	1.52	0.03
			0.00			1/2"	0.78	2.07	0.04
			0.00			Ice	1.06	2.66	0.06
						1" Ice	1.73	3.91	0.13
						2" Ice			
Folded Di-Pole	A	From Leg	0.00	0.00	130.00	No Ice	3.10	3.10	0.03
			0.00			1/2"	6.22	6.22	0.06

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
			0.00			Ice	9.34	9.34	0.09
						1" Ice	15.58	15.58	0.15
						2" Ice			
***									
Pipe Mount [PM 601-1]	C	From Leg	0.00	0.00	130.00	No Ice	1.32	1.32	0.07
			0.00			1/2"	1.58	1.58	0.08
			0.00			Ice	1.84	1.84	0.09
						1" Ice	2.40	2.40	0.13
						2" Ice			
***									
T-Arm Mount [TA 702-3]	C	None		0.00	120.00	No Ice	4.75	4.75	0.34
						1/2"	5.82	5.82	0.43
						Ice	6.98	6.98	0.55
						1" Ice	9.72	9.72	0.87
						2" Ice			
8' x 2" Horizontal Pipe	A	From Leg	3.00	0.00	120.00	No Ice	1.90	0.01	0.03
			0.00			1/2"	2.73	0.04	0.04
			2.50			Ice	3.40	0.09	0.06
						1" Ice	4.40	0.21	0.12
						2" Ice			
8' x 2" Horizontal Pipe	B	From Leg	3.00	0.00	120.00	No Ice	1.90	0.01	0.03
			0.00			1/2"	2.73	0.04	0.04
			2.50			Ice	3.40	0.09	0.06
						1" Ice	4.40	0.21	0.12
						2" Ice			
8' x 2" Horizontal Pipe	C	From Leg	3.00	0.00	120.00	No Ice	1.90	0.01	0.03
			0.00			1/2"	2.73	0.04	0.04
			2.50			Ice	3.40	0.09	0.06
						1" Ice	4.40	0.21	0.12
						2" Ice			
Site Pro 1 SFS-H 48" Horizontal Angle Stabilizer Kit	A	From Leg	1.50	0.00	120.00	No Ice	2.68	1.97	0.07
			0.00			1/2"	3.13	2.33	0.08
			2.50			Ice	3.65	2.74	0.11
						1" Ice	4.48	3.41	0.14
						2" Ice			
Site Pro 1 SFS-H 48" Horizontal Angle Stabilizer Kit	B	From Leg	1.50	0.00	120.00	No Ice	2.68	1.97	0.07
			0.00			1/2"	3.13	2.33	0.08
			2.50			Ice	3.65	2.74	0.11
						1" Ice	4.48	3.41	0.14
						2" Ice			
Site Pro 1 SFS-H 48" Horizontal Angle Stabilizer Kit	C	From Leg	1.50	0.00	120.00	No Ice	2.68	1.97	0.07
			0.00			1/2"	3.13	2.33	0.08
			2.50			Ice	3.65	2.74	0.11
						1" Ice	4.48	3.41	0.14
						2" Ice			
APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	A	From Leg	3.00	0.00	120.00	No Ice	6.82	3.49	0.06
			-2.00			1/2"	7.28	4.26	0.11
			0.00			Ice	7.72	4.96	0.16
						1" Ice	8.63	6.40	0.30
						2" Ice			
APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	B	From Leg	3.00	0.00	120.00	No Ice	6.82	3.49	0.06
			-2.00			1/2"	7.28	4.26	0.11
			0.00			Ice	7.72	4.96	0.16
						1" Ice	8.63	6.40	0.30
						2" Ice			
APX16DWV-16DWVS-E-A20_TIA w/ Mount Pipe	C	From Leg	3.00	0.00	120.00	No Ice	6.82	3.49	0.06
			-2.00			1/2"	7.28	4.26	0.11
			0.00			Ice	7.72	4.96	0.16
						1" Ice	8.63	6.40	0.30
						2" Ice			
APXVAARR24_43-U-NA20_TIA w/ Mount Pipe	A	From Leg	3.00	0.00	120.00	No Ice	20.48	11.02	0.19
			2.00			1/2"	21.23	12.55	0.32
			0.00			Ice	21.99	14.10	0.47
						1" Ice	23.44	16.45	0.80
						2" Ice			

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft^2	C_AA_A *Side* ft^2	*Weight* K
APXVAARR24_43-U-NA20_TIA w/ Mount Pipe	B	From Leg	3.00 2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	20.48 21.23 21.99 23.44	11.02 12.55 14.10 16.45	0.19 0.32 0.47 0.80
APXVAARR24_43-U-NA20_TIA w/ Mount Pipe	C	From Leg	3.00 2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	20.48 21.23 21.99 23.44	11.02 12.55 14.10 16.45	0.19 0.32 0.47 0.80
RADIO 4449 B12/B71	A	From Leg	3.00 2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.65 1.81 1.98 2.34	1.30 1.44 1.60 1.92	0.08 0.09 0.11 0.16
RADIO 4449 B12/B71	B	From Leg	3.00 2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.65 1.81 1.98 2.34	1.30 1.44 1.60 1.92	0.08 0.09 0.11 0.16
RADIO 4449 B12/B71	C	From Leg	3.00 2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.65 1.81 1.98 2.34	1.30 1.44 1.60 1.92	0.08 0.09 0.11 0.16
(2) TMA 10"x8"x3"	A	From Leg	1.00 -2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.67 0.77 0.87 1.07	0.26 0.33 0.40 0.54	0.02 0.02 0.02 0.02
(2) TMA 10"x8"x3"	B	From Leg	1.00 -2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.67 0.77 0.87 1.07	0.26 0.33 0.40 0.54	0.02 0.02 0.02 0.02
(2) TMA 10"x8"x3"	C	From Leg	1.00 -2.00 0.00	0.00	120.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.67 0.77 0.87 1.07	0.26 0.33 0.40 0.54	0.02 0.02 0.02 0.02
***									
Pipe Mount [PM 601-1]	C	From Leg	0.00 0.00 0.00	0.00	110.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.32 1.58 1.84 2.40	1.32 1.58 1.84 2.40	0.07 0.08 0.09 0.13
(2) Pipe Mount [PM 601-1]	B	From Leg	0.00 0.00 0.00	0.00	110.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.32 1.58 1.84 2.40	1.32 1.58 1.84 2.40	0.07 0.08 0.09 0.13
MD-S8 (for 8' MW) : Ice Shield	B	From Leg	0.00 0.00 0.00	0.00	110.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.80 4.46 5.13 6.48	2.40 2.83 3.26 4.15	0.57 0.74 0.91 1.26
MD-S8 (for 8' MW) : Ice Shield	C	From Leg	0.00 0.00 0.00	0.00	110.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.80 4.46 5.13 6.48	2.40 2.83 3.26 4.15	0.57 0.74 0.91 1.26
***									
Pipe Mount [PM 601-1]	C	From Leg	0.00 0.00 0.00	0.00	100.00	No Ice 1/2" Ice	1.32 1.58 1.84	1.32 1.58 1.84	0.07 0.08 0.09

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		*C_AA_A Front* ft^2	*C_AA_A Side* ft^2	*Weight* K
						1" Ice	2.40	2.40	0.13
						2" Ice			
(2) Pipe Mount [PM 601-1]	B	From Leg	0.00	0.00	100.00	No Ice	1.32	1.32	0.07
			0.00			1/2"	1.58	1.58	0.08
			0.00			Ice	1.84	1.84	0.09
						1" Ice	2.40	2.40	0.13
						2" Ice			
***									
Pipe Mount [PM 601-1]	C	From Leg	0.00	0.00	90.00	No Ice	1.32	1.32	0.07
			0.00			1/2"	1.58	1.58	0.08
			0.00			Ice	1.84	1.84	0.09
						1" Ice	2.40	2.40	0.13
						2" Ice			
***									
Side Arm Mount [SO 308-1]	A	From Leg	0.00	0.00	85.00	No Ice	0.41	3.06	0.05
			0.00			1/2"	0.81	5.10	0.08
			0.00			Ice	1.23	7.20	0.12
						1" Ice	2.09	11.96	0.25
						2" Ice			
15' x 3" Dia Omni	A	From Leg	6.00	0.00	85.00	No Ice	3.00	3.00	0.03
			0.00			1/2"	4.03	4.03	0.05
			7.50			Ice	5.06	5.06	0.07
						1" Ice	7.12	7.12	0.11
						2" Ice			
***									
Pipe Mount [PM 601-1]	B	From Leg	0.00	0.00	64.00	No Ice	1.32	1.32	0.07
			0.00			1/2"	1.58	1.58	0.08
			0.00			Ice	1.84	1.84	0.09
						1" Ice	2.40	2.40	0.13
						2" Ice			
***									
Sector Mount [6' SM 401-1]	C	From Leg	0.00	0.00	52.00	No Ice	5.02	4.03	0.15
			0.00			1/2"	7.06	5.64	0.22
			0.00			Ice	9.07	7.23	0.30
						1" Ice	13.09	10.36	0.55
						2" Ice			
Dipole and Ground Plain	C	From Leg	4.00	0.00	52.00	No Ice	1.05	1.05	0.03
			-3.00			1/2"	1.91	1.91	0.03
			0.00			Ice	2.77	2.77	0.03
						1" Ice	4.49	4.49	0.03
						2" Ice			
***									
4'x3" Horizontal Pipe	B	From Leg	0.00	0.00	50.00	No Ice	1.40	0.10	0.03
			0.00			1/2"	1.69	0.14	0.04
			8.00			Ice	1.99	0.19	0.06
						1" Ice	2.60	0.32	0.11
						2" Ice			
4'x3" Horizontal Pipe	B	From Leg	0.00	0.00	50.00	No Ice	1.40	0.10	0.03
			0.00			1/2"	1.69	0.14	0.04
			-8.00			Ice	1.99	0.19	0.06
						1" Ice	2.60	0.32	0.11
						2" Ice			
Folded Di-Pole	B	From Leg	4.00	0.00	50.00	No Ice	3.10	3.10	0.03
			0.00			1/2"	6.22	6.22	0.06
			0.00			Ice	9.34	9.34	0.09
						1" Ice	15.58	15.58	0.15
						2" Ice			
DB225-F	B	From Leg	4.00	0.00	50.00	No Ice	8.16	8.16	0.03
			0.00			1/2"	11.92	11.92	0.17
			0.00			Ice	12.44	12.44	0.33
						1" Ice	13.55	13.55	0.65
						2" Ice			
***									
DB212-2-C	B	From Leg	0.00	0.00	27.00	No Ice	3.10	3.10	0.03
			0.00			1/2"	6.22	6.22	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				Ice	9.35	9.35	0.10
							1" Ice	15.67	15.67	0.26
							2" Ice			
Proposed Loading										
SD212D-SF3P4SNM	C	From Leg	0.00	0.00	0.00	180.00	No Ice	7.46	7.46	0.05
			0.00				1/2" Ice	12.06	12.06	0.11
			10.00				1" Ice	16.66	16.66	0.16
							2" Ice	25.86	25.86	0.27

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
6 FT DISH	A	Paraboloid w/Radome	From Leg	1.00	0.00	-12.00		170.00	6.00	No Ice	28.27	0.14
				0.00						1/2" Ice	29.05	0.29
				0.00						1" Ice	29.83	0.44
										2" Ice	31.39	0.74
***												
8 FT DISH	C	Paraboloid w/Radome	From Leg	1.00	0.00	0.00		130.00	8.00	No Ice	50.30	0.25
				0.00						1/2" Ice	51.29	0.51
				0.00						1" Ice	52.28	0.78
										2" Ice	54.27	1.30
***												
6 FT DISH	C	Paraboloid w/Radome	From Leg	1.00	0.00	-80.00		100.00	6.00	No Ice	28.27	0.14
				0.00						1/2" Ice	29.05	0.29
				0.00						1" Ice	29.83	0.44
										2" Ice	31.39	0.74
6 FT DISH	B	Paraboloid w/Radome	From Leg	1.00	0.00	-45.00		100.00	6.00	No Ice	28.27	0.14
				0.00						1/2" Ice	29.05	0.29
				0.00						1" Ice	29.83	0.44
										2" Ice	31.39	0.74
***												
6 FT DISH	C	Paraboloid w/Radome	From Leg	1.00	0.00	0.00		90.00	6.00	No Ice	28.27	0.14
				0.00						1/2" Ice	29.05	0.29
				0.00						1" Ice	29.83	0.44
										2" Ice	31.39	0.74
***												
8 FT DISH	B	Paraboloid w/Radome	From Leg	1.00	0.00	0.00		64.00	8.00	No Ice	50.30	0.25
				0.00						1/2" Ice	51.29	0.51
				0.00						1" Ice	52.28	0.78
										2" Ice	54.27	1.30

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice

Comb. No.	Description
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	7	7.59	-0.54	-0.38
			Max. Compression	31	-16.32	0.08	-0.00
			Max. Mx	22	0.17	0.73	-0.21
			Max. My	5	-1.08	-0.02	1.31
			Max. Vy	22	0.67	-0.58	-0.21
			Max. Vx	17	-0.98	-0.02	0.62
		Diagonal	Max Tension	12	3.20	0.00	0.00
			Max. Compression	12	-3.28	0.00	0.00
			Max. Mx	30	0.64	0.11	0.01
			Max. My	34	0.60	0.11	0.01
			Max. Vy	30	0.09	0.11	0.01
			Max. Vx	34	-0.00	0.00	0.00
		Top Girt	Max Tension	19	0.02	0.00	0.00
			Max. Compression	37	-0.12	0.00	0.00
			Max. Mx	26	-0.09	-0.28	0.00
			Max. My	26	-0.09	0.00	0.01
			Max. Vy	26	0.12	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	26	-0.00	0.00	0.00
T2	160 - 140	Leg	Max Tension	15	23.33	-0.24	0.05
			Max. Compression	10	-31.63	0.44	0.03
			Max. Mx	22	10.86	-0.68	-0.02
			Max. My	4	-2.82	-0.01	-0.73
			Max. Vy	14	0.18	-0.46	0.13
			Max. Vx	8	0.30	-0.01	0.35
		Diagonal	Max Tension	12	4.62	0.00	0.00
			Max. Compression	12	-4.62	0.00	0.00
			Max. Mx	29	0.87	-0.17	0.02
			Max. My	33	-1.09	-0.15	-0.02
			Max. Vy	29	-0.11	-0.17	0.02
			Max. Vx	33	0.01	0.00	0.00
T3	140 - 120	Leg	Max Tension	7	40.57	-0.39	0.13
			Max. Compression	10	-52.45	0.54	0.02
			Max. Mx	10	-52.45	0.54	0.02
			Max. My	21	-3.74	-0.01	-0.67
			Max. Vy	6	-0.75	-0.39	0.13
			Max. Vx	3	0.86	-0.21	0.46
		Diagonal	Max Tension	12	5.94	0.00	0.00
			Max. Compression	12	-6.03	0.00	0.00
			Max. Mx	29	1.36	-0.27	-0.03
			Max. My	31	1.13	-0.27	-0.03
			Max. Vy	29	-0.15	-0.27	-0.03
			Max. Vx	31	0.01	0.00	0.00
T4	120 - 100	Leg	Max Tension	7	64.95	-0.52	0.01
			Max. Compression	10	-82.77	0.70	0.07
			Max. Mx	10	-82.77	0.70	0.07
			Max. My	21	-6.46	-0.03	-0.85
			Max. Vy	22	-0.92	-0.51	-0.05
			Max. Vx	9	0.88	-0.01	0.38
		Diagonal	Max Tension	4	7.68	0.00	0.00
			Max. Compression	4	-7.74	0.00	0.00
			Max. Mx	29	1.91	-0.33	0.04
			Max. My	31	-2.78	-0.32	-0.04
			Max. Vy	29	-0.17	-0.33	0.04
			Max. Vx	31	0.01	0.00	0.00
T5	100 - 80	Leg	Max Tension	7	92.60	-0.63	0.05
			Max. Compression	10	-114.54	1.08	0.10
			Max. Mx	18	-113.16	1.09	-0.10
			Max. My	8	-7.22	0.01	0.99
			Max. Vy	22	-0.67	-0.63	-0.11
			Max. Vx	23	0.74	0.32	0.16
		Diagonal	Max Tension	4	9.30	0.00	0.00
			Max. Compression	4	-9.37	0.00	0.00
			Max. Mx	29	1.91	-0.39	-0.05
			Max. My	30	-1.92	-0.38	-0.05
			Max. Vy	29	-0.18	-0.39	-0.05
			Max. Vx	30	0.01	0.00	0.00
T6	80 - 60	Leg	Max Tension	7	122.38	-0.71	-0.12
			Max. Compression	10	-147.61	1.78	0.08
			Max. Mx	18	-147.48	1.80	0.31
			Max. My	4	-12.93	-0.05	-1.70
			Max. Vy	22	0.47	-1.73	-0.08
			Max. Vx	3	0.49	-0.89	-1.60
		Diagonal	Max Tension	4	10.03	0.00	0.00
			Max. Compression	4	-10.17	0.00	0.00
			Max. Mx	29	2.00	-0.51	-0.06
			Max. My	30	2.24	-0.51	-0.06
			Max. Vy	29	-0.22	-0.51	-0.06
			Max. Vx	30	0.01	0.00	0.00
T7	60 - 40	Leg	Max Tension	7	152.53	-1.31	0.10
			Max. Compression	18	-183.98	1.49	-0.00
			Max. Mx	29	2.14	-2.36	0.00
			Max. My	4	-13.61	-0.05	-1.70
			Max. Vy	33	0.35	-2.34	0.04
			Max. Vx	4	-0.33	-0.04	-1.03
		Diagonal	Max Tension	20	11.19	0.00	0.00
			Max. Compression	20	-11.27	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	29	2.84	-0.63	0.07
			Max. My	31	-3.51	-0.61	-0.07
			Max. Vy	29	-0.26	-0.63	0.07
			Max. Vx	31	0.01	0.00	0.00
T8	40 - 20	Leg	Max Tension	7	182.82	-1.38	-0.00
			Max. Compression	18	-220.61	2.01	-0.00
			Max. Mx	29	3.41	-6.23	0.00
			Max. My	8	-13.07	-0.15	1.74
			Max. Vy	33	0.98	-6.17	0.03
			Max. Vx	8	0.26	-0.15	1.74
		Diagonal	Max Tension	20	11.65	0.00	0.00
			Max. Compression	20	-11.82	0.00	0.00
			Max. Mx	29	3.91	-0.68	-0.08
			Max. My	30	-0.83	-0.67	-0.08
			Max. Vy	29	-0.27	-0.68	-0.08
			Max. Vx	30	0.01	0.00	0.00
T9	20 - 0	Leg	Max Tension	7	212.38	-1.59	-0.02
			Max. Compression	18	-256.72	0.00	0.00
			Max. Mx	31	-147.69	7.25	-0.07
			Max. My	8	-16.45	-0.25	3.14
			Max. Vy	33	-1.31	-6.17	0.03
			Max. Vx	8	0.46	-0.25	3.14
		Diagonal	Max Tension	4	12.45	0.00	0.00
			Max. Compression	18	-13.06	0.00	0.00
			Max. Mx	29	-1.00	0.88	0.08
			Max. My	30	6.67	0.60	0.09
			Max. Vy	29	0.29	0.88	0.08
			Max. Vx	30	-0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	265.96	30.13	-17.21
	Max. H_x	18	265.96	30.13	-17.21
	Max. H_z	7	-219.83	-25.73	14.86
	Min. Vert	7	-219.83	-25.73	14.86
	Min. H_x	7	-219.83	-25.73	14.86
	Min. H_z	18	265.96	30.13	-17.21
Leg B	Max. Vert	10	259.23	-28.22	-17.07
	Max. H_x	23	-207.25	23.84	14.47
	Max. H_z	23	-207.25	23.84	14.47
	Min. Vert	23	-207.25	23.84	14.47
	Min. H_x	10	259.23	-28.22	-17.07
	Min. H_z	10	259.23	-28.22	-17.07
Leg A	Max. Vert	2	254.42	0.56	32.66
	Max. H_x	20	23.19	5.48	2.04
	Max. H_z	2	254.42	0.56	32.66
	Min. Vert	15	-203.22	-0.62	-27.23
	Min. H_x	9	12.26	-5.52	1.07
	Min. H_z	15	-203.22	-0.62	-27.23

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	51.78	0.00	0.00	-3.42	-21.43	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	62.14	-0.29	-53.59	-5262.37	13.92	23.43

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
0.9 Dead+1.0 Wind 0 deg - No Ice	46.60	-0.29	-53.59	-5261.35	20.35	23.43
1.2 Dead+1.0 Wind 30 deg - No Ice	62.14	26.91	-46.85	-4590.07	-2664.77	17.79
0.9 Dead+1.0 Wind 30 deg - No Ice	46.60	26.91	-46.85	-4589.04	-2658.34	17.79
1.2 Dead+1.0 Wind 60 deg - No Ice	62.14	46.90	-26.70	-2590.98	-4630.54	-0.45
0.9 Dead+1.0 Wind 60 deg - No Ice	46.60	46.90	-26.70	-2589.95	-4624.11	-0.45
1.2 Dead+1.0 Wind 90 deg - No Ice	62.14	54.11	0.45	72.74	-5361.60	-28.26
0.9 Dead+1.0 Wind 90 deg - No Ice	46.60	54.11	0.45	73.77	-5355.16	-28.26
1.2 Dead+1.0 Wind 120 deg - No Ice	62.14	46.94	26.77	2647.65	-4672.71	-30.89
0.9 Dead+1.0 Wind 120 deg - No Ice	46.60	46.94	26.77	2648.68	-4666.28	-30.89
1.2 Dead+1.0 Wind 150 deg - No Ice	62.14	25.23	42.14	4196.29	-2571.70	-23.59
0.9 Dead+1.0 Wind 150 deg - No Ice	46.60	25.23	42.14	4197.32	-2565.27	-23.59
1.2 Dead+1.0 Wind 180 deg - No Ice	62.14	0.28	49.57	4924.65	-80.01	-28.61
0.9 Dead+1.0 Wind 180 deg - No Ice	46.60	0.28	49.57	4925.67	-73.58	-28.61
1.2 Dead+1.0 Wind 210 deg - No Ice	62.14	-27.08	46.30	4543.67	2622.22	-23.53
0.9 Dead+1.0 Wind 210 deg - No Ice	46.60	-27.08	46.30	4544.69	2628.65	-23.53
1.2 Dead+1.0 Wind 240 deg - No Ice	62.14	-49.87	28.16	2715.86	4808.31	-4.72
0.9 Dead+1.0 Wind 240 deg - No Ice	46.60	-49.87	28.16	2716.89	4814.74	-4.72
1.2 Dead+1.0 Wind 270 deg - No Ice	62.14	-54.01	-0.38	-55.79	5266.24	24.09
0.9 Dead+1.0 Wind 270 deg - No Ice	46.60	-54.01	-0.38	-54.76	5272.67	24.09
1.2 Dead+1.0 Wind 300 deg - No Ice	62.14	-43.92	-25.38	-2524.86	4328.73	27.90
0.9 Dead+1.0 Wind 300 deg - No Ice	46.60	-43.92	-25.38	-2523.84	4335.16	27.90
1.2 Dead+1.0 Wind 330 deg - No Ice	62.14	-25.02	-42.79	-4248.09	2475.32	21.10
0.9 Dead+1.0 Wind 330 deg - No Ice	46.60	-25.02	-42.79	-4247.07	2481.75	21.10
1.2 Dead+1.0 Ice+1.0 Temp	217.90	0.00	-0.00	-86.95	-99.43	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	217.90	-0.11	-16.13	-1748.83	-81.63	3.38
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	217.90	8.13	-14.10	-1535.50	-934.19	-1.50
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	217.90	14.26	-8.08	-910.74	-1568.28	-8.64
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	217.90	16.35	0.14	-63.44	-1790.05	-13.72
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	217.90	14.04	8.04	750.33	-1557.25	-12.60
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	217.90	7.96	13.40	1308.19	-936.54	-8.06
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	217.90	0.11	15.64	1535.30	-119.42	-4.18
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	217.90	-8.16	14.02	1356.06	736.75	0.62
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	217.90	-14.61	8.25	752.10	1395.45	7.85
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	217.90	-16.33	-0.13	-106.55	1584.55	13.08
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	217.90	-13.68	-7.89	-909.35	1322.80	12.14

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	217.90	-7.93	-13.49	-1488.53	730.90	7.67
Dead+Wind 0 deg - Service	51.78	-0.06	-10.59	-1042.09	-13.60	4.63
Dead+Wind 30 deg - Service	51.78	5.32	-9.26	-909.29	-542.73	3.51
Dead+Wind 60 deg - Service	51.78	9.26	-5.27	-514.41	-931.03	-0.09
Dead+Wind 90 deg - Service	51.78	10.69	0.09	11.76	-1075.43	-5.58
Dead+Wind 120 deg - Service	51.78	9.27	5.29	520.38	-939.36	-6.10
Dead+Wind 150 deg - Service	51.78	4.98	8.32	826.29	-524.34	-4.66
Dead+Wind 180 deg - Service	51.78	0.06	9.79	970.16	-32.16	-5.65
Dead+Wind 210 deg - Service	51.78	-5.35	9.15	894.90	501.62	-4.65
Dead+Wind 240 deg - Service	51.78	-9.85	5.56	533.86	933.44	-0.93
Dead+Wind 270 deg - Service	51.78	-10.67	-0.07	-13.63	1023.89	4.76
Dead+Wind 300 deg - Service	51.78	-8.68	-5.01	-501.35	838.70	5.51
Dead+Wind 330 deg - Service	51.78	-4.94	-8.45	-841.74	472.60	4.17

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-51.78	0.00	0.00	51.78	0.00	0.000%
2	-0.29	-62.14	-53.59	0.29	62.14	53.59	0.000%
3	-0.29	-46.60	-53.59	0.29	46.60	53.59	0.000%
4	26.91	-62.14	-46.85	-26.91	62.14	46.85	0.000%
5	26.91	-46.60	-46.85	-26.91	46.60	46.85	0.000%
6	46.90	-62.14	-26.70	-46.90	62.14	26.70	0.000%
7	46.90	-46.60	-26.70	-46.90	46.60	26.70	0.000%
8	54.11	-62.14	0.45	-54.11	62.14	-0.45	0.000%
9	54.11	-46.60	0.45	-54.11	46.60	-0.45	0.000%
10	46.94	-62.14	26.77	-46.94	62.14	-26.77	0.000%
11	46.94	-46.60	26.77	-46.94	46.60	-26.77	0.000%
12	25.23	-62.14	42.14	-25.23	62.14	-42.14	0.000%
13	25.23	-46.60	42.14	-25.23	46.60	-42.14	0.000%
14	0.28	-62.14	49.57	-0.28	62.14	-49.57	0.000%
15	0.28	-46.60	49.57	-0.28	46.60	-49.57	0.000%
16	-27.08	-62.14	46.30	27.08	62.14	-46.30	0.000%
17	-27.08	-46.60	46.30	27.08	46.60	-46.30	0.000%
18	-49.87	-62.14	28.16	49.87	62.14	-28.16	0.000%
19	-49.87	-46.60	28.16	49.87	46.60	-28.16	0.000%
20	-54.01	-62.14	-0.38	54.01	62.14	0.38	0.000%
21	-54.01	-46.60	-0.38	54.01	46.60	0.38	0.000%
22	-43.92	-62.14	-25.38	43.92	62.14	25.38	0.000%
23	-43.92	-46.60	-25.38	43.92	46.60	25.38	0.000%
24	-25.02	-62.14	-42.79	25.02	62.14	42.79	0.000%
25	-25.02	-46.60	-42.79	25.02	46.60	42.79	0.000%
26	0.00	-217.90	0.00	-0.00	217.90	0.00	0.000%
27	-0.11	-217.90	-16.13	0.11	217.90	16.13	0.000%
28	8.13	-217.90	-14.10	-8.13	217.90	14.10	0.000%
29	14.26	-217.90	-8.08	-14.26	217.90	8.08	0.000%
30	16.35	-217.90	0.14	-16.35	217.90	-0.14	0.000%
31	14.04	-217.90	8.04	-14.04	217.90	-8.04	0.000%
32	7.96	-217.90	13.40	-7.96	217.90	-13.40	0.000%
33	0.11	-217.90	15.64	-0.11	217.90	-15.64	0.000%
34	-8.16	-217.90	14.02	8.16	217.90	-14.02	0.000%
35	-14.61	-217.90	8.25	14.61	217.90	-8.25	0.000%
36	-16.33	-217.90	-0.13	16.33	217.90	0.13	0.000%
37	-13.68	-217.90	-7.89	13.68	217.90	7.89	0.000%
38	-7.93	-217.90	-13.49	7.93	217.90	13.49	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
39	-0.06	-51.78	-10.59	0.06	51.78	10.59	0.000%
40	5.32	-51.78	-9.26	-5.32	51.78	9.26	0.000%
41	9.26	-51.78	-5.27	-9.26	51.78	5.27	0.000%
42	10.69	-51.78	0.09	-10.69	51.78	-0.09	0.000%
43	9.27	-51.78	5.29	-9.27	51.78	-5.29	0.000%
44	4.98	-51.78	8.32	-4.98	51.78	-8.32	0.000%
45	0.06	-51.78	9.79	-0.06	51.78	-9.79	0.000%
46	-5.35	-51.78	9.15	5.35	51.78	-9.15	0.000%
47	-9.85	-51.78	5.56	9.85	51.78	-5.56	0.000%
48	-10.67	-51.78	-0.07	10.67	51.78	0.07	0.000%
49	-8.68	-51.78	-5.01	8.68	51.78	5.01	0.000%
50	-4.94	-51.78	-8.45	4.94	51.78	8.45	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	1.5795	43	0.06	0.01
T2	160 - 140	1.3081	43	0.06	0.01
T3	140 - 120	1.0462	43	0.06	0.01
T4	120 - 100	0.8040	43	0.05	0.00
T5	100 - 80	0.5806	43	0.05	0.00
T6	80 - 60	0.3870	47	0.04	0.00
T7	60 - 40	0.2339	47	0.03	0.00
T8	40 - 20	0.1205	47	0.02	0.00
T9	20 - 0	0.0408	47	0.01	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	Flash Beacon Lighting	43	1.5795	0.06	0.01	Inf
176.00	Side Arm Mount [SO 602-1]	43	1.5250	0.06	0.01	Inf
175.00	Sector Mount [SM 201-1]	43	1.5113	0.06	0.01	Inf
173.00	Side Arm Mount [SO 308-1]	43	1.4841	0.06	0.01	Inf
170.00	6 FT DISH	43	1.4433	0.06	0.01	Inf
169.00	(2) Pipe Mount [PM 601-1]	43	1.4297	0.06	0.01	993396
163.00	Sector Mount [SM 201-1]	43	1.3485	0.06	0.01	641686
152.00	16'x2" Antenna Mount Pipe	43	1.2015	0.06	0.01	331578
150.00	Side Arm Mount [SO 301-1]	43	1.1752	0.06	0.01	299817
143.00	Side Arm Mount [SO 305-1]	43	1.0844	0.06	0.01	225210
130.00	8 FT DISH	43	0.9227	0.06	0.00	247457
120.00	T-Arm Mount [TA 702-3]	43	0.8040	0.05	0.00	299511
110.00	Pipe Mount [PM 601-1]	43	0.6896	0.05	0.00	220754
100.00	6 FT DISH	43	0.5806	0.05	0.00	168914
90.00	6 FT DISH	43	0.4787	0.04	0.00	134997
85.00	Side Arm Mount [SO 308-1]	47	0.4316	0.04	0.00	122607
64.00	8 FT DISH	47	0.2612	0.03	0.00	110520
52.00	Sector Mount [6' SM 401-1]	47	0.1843	0.02	0.00	128044
50.00	4'x3" Horizontal Pipe	47	0.1729	0.02	0.00	133495
27.00	DB212-2-C	47	0.0641	0.01	0.00	109524

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	7.8818	19	0.31	0.06
T2	160 - 140	6.5687	19	0.31	0.04
T3	140 - 120	5.2859	19	0.29	0.03
T4	120 - 100	4.0851	19	0.26	0.02
T5	100 - 80	2.9688	19	0.23	0.02
T6	80 - 60	1.9842	19	0.19	0.01
T7	60 - 40	1.1978	19	0.14	0.01
T8	40 - 20	0.6156	19	0.10	0.01
T9	20 - 0	0.2075	19	0.05	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	Flash Beacon Lighting	19	7.8818	0.31	0.06	559861
176.00	Side Arm Mount [SO 602-1]	19	7.6185	0.31	0.05	559861
175.00	Sector Mount [SM 201-1]	19	7.5527	0.31	0.05	559861
173.00	Side Arm Mount [SO 308-1]	19	7.4212	0.31	0.05	399900
170.00	6 FT DISH	19	7.2240	0.31	0.05	279931
169.00	(2) Pipe Mount [PM 601-1]	19	7.1583	0.31	0.05	254483
163.00	Sector Mount [SM 201-1]	19	6.7648	0.31	0.05	165020
152.00	16'x2" Antenna Mount Pipe	19	6.0486	0.30	0.04	77881
150.00	Side Arm Mount [SO 301-1]	19	5.9197	0.30	0.04	68232
143.00	Side Arm Mount [SO 305-1]	19	5.4738	0.29	0.03	47752
130.00	8 FT DISH	19	4.6748	0.27	0.03	50725
120.00	T-Arm Mount [TA 702-3]	19	4.0851	0.26	0.02	60342
110.00	Pipe Mount [PM 601-1]	19	3.5146	0.25	0.02	45000
100.00	6 FT DISH	19	2.9688	0.23	0.02	34652
90.00	6 FT DISH	19	2.4554	0.21	0.02	27348
85.00	Side Arm Mount [SO 308-1]	19	2.2138	0.20	0.02	24708
64.00	8 FT DISH	19	1.3379	0.15	0.01	22132
52.00	Sector Mount [6' SM 401-1]	19	0.9431	0.12	0.01	25657
50.00	4'x3" Horizontal Pipe	19	0.8843	0.12	0.01	26777
27.00	DB212-2-C	19	0.3265	0.07	0.01	21635

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Leg	A325N	0.8750	5	1.52	41.56	0.037	1.05	Bolt Tension
		Diagonal	A325N	0.6250	1	3.20	9.53	0.335	1.05	Member Block Shear
		Top Girt	A325N	0.6250	1	0.12	13.05	0.009	1.05	Member Bearing
T2	160	Leg	A325N	1.1250	5	4.67	68.69	0.068	1.05	Bolt Tension
		Diagonal	A325N	0.7500	1	4.62	14.73	0.314	1.05	Member Block Shear
T3	140	Leg	A325N	1.1250	5	8.10	68.69	0.118	1.05	Bolt Tension
		Diagonal	A325N	0.7500	1	5.94	18.81	0.316	1.05	Member Block Shear
T4	120	Leg	A325N	1.1250	6	10.73	68.69	0.156	1.05	Bolt Tension
		Diagonal	A325N	0.7500	1	7.68	18.81	0.408	1.05	Member Block Shear
T5	100	Leg	A325N	1.2500	6	15.40	87.22	0.177	1.05	Bolt Tension
		Diagonal	A325N	0.7500	1	9.30	18.81	0.495	1.05	Member Block Shear
T6	80	Leg	A325N	1.2500	6	20.40	87.22	0.234	1.05	Bolt Tension
		Diagonal	A325N	0.8750	1	10.03	21.35	0.470	1.05	Member Block

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T7	60	Leg	A325N	1.2500	6	25.42	87.22	0.291	1.05	Shear Bolt Tension
		Diagonal	A325N	0.8750	1	11.19	28.46	0.393	1.05	Member Block Shear
T8	40	Leg	A325N	1.3750	6	30.47	103.94	0.293	1.05	Bolt Tension
		Diagonal	A325N	0.8750	1	11.65	28.46	0.409	1.05	Member Block Shear
T9	20	Diagonal	A325N	1.0000	1	12.45	25.56	0.487	1.05	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	P5x.258	20.03	6.68	42.7 K=1.00	4.2999	-16.32	157.50	0.104 [1]
T2	160 - 140	P6x.28	20.03	6.68	35.7 K=1.00	5.5813	-31.63	212.11	0.149 [1]
T3	140 - 120	P8x.322	20.03	10.01	40.9 K=1.00	8.3993	-52.45	310.71	0.169 [1]
T4	120 - 100	P8x.322	20.03	10.01	40.9 K=1.00	8.3993	-82.77	310.71	0.266 [1]
T5	100 - 80	P8x.322	20.03	10.01	40.9 K=1.00	8.3993	-114.54	310.71	0.369 [1]
T6	80 - 60	P8x.322	20.03	10.01	40.9 K=1.00	8.3993	-147.62	310.71	0.475 [1]
T7	60 - 40	P10x.365	20.03	10.01	32.7 K=1.00	11.908 3	-183.98	458.77	0.401 [1]
T8	40 - 20	P10x.365	20.03	10.01	32.7 K=1.00	11.908 3	-220.61	458.77	0.481 [1]
T9	20 - 0	P10x.365	20.03	10.01	32.7 K=1.00	11.908 3	-256.72	458.77	0.560 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2 1/2x2 1/2x3/16	12.89	6.22	150.7 K=1.00	0.9020	-3.28	11.37	0.289 [1]
T2	160 - 140	2L2x2x3/16	14.49	6.96	135.3 K=1.00	1.4300	-4.62	22.34	0.207 [1]
T3	140 - 120	2L2 1/2x2 1/2x3/16	17.65	8.52	131.4 K=1.00	1.8000	-6.03	29.82	0.202 [1]
T4	120 - 100	2L2 1/2x2 1/2x3/16	19.19	9.30	143.4 K=1.00	1.8000	-7.74	25.06	0.309 [1]
T5	100 - 80	2L2 1/2x2 1/2x3/16	20.78	10.09	155.7 K=1.00	1.8000	-9.37	21.26	0.441 [1]
T6	80 - 60	2L3x3x3/16	22.40	10.89	139.1 K=1.00	2.1800	-10.17	32.23	0.316 [1]
T7	60 - 40	2L3x3x1/4	24.05	11.62	149.9	2.8800	-11.27	36.67	0.307 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T8	40 - 20	2L3x3x1/4	25.73	12.46	K=1.00 160.8	2.8800	-11.82	31.88	0.371 [1]
T9	20 - 0	L5x5x5/16	27.43	13.29	K=1.00 160.5 K=1.00	3.0300	-13.06	33.67	0.388 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2 1/2x2 1/2x3/16 KL/R > 200 (C) - 6	9.50	8.74	212.0 K=1.00	0.9020	-0.12	5.74	0.020 [1]

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	P5x.258	20.03	6.68	42.7	4.2999	7.59	178.01	0.043 [1]
T2	160 - 140	P6x.28	20.03	6.68	35.7	5.5813	23.33	231.07	0.101 [1]
T3	140 - 120	P8x.322	20.03	10.01	40.9	8.3993	40.51	347.73	0.117 [1]
T4	120 - 100	P8x.322	20.03	10.01	40.9	8.3993	64.38	347.73	0.185 [1]
T5	100 - 80	P8x.322	20.03	10.01	40.9	8.3993	92.43	347.73	0.266 [1]
T6	80 - 60	P8x.322	20.03	10.01	40.9	8.3993	122.38	347.73	0.352 [1]
T7	60 - 40	P10x.365	20.03	10.01	32.7	11.9083	152.55	493.00	0.309 [1]
T8	40 - 20	P10x.365	20.03	10.01	32.7	11.9083	182.82	493.00	0.371 [1]
T9	20 - 0	P10x.365	20.03	10.01	32.7	11.9083	212.38	493.00	0.431 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2 1/2x2 1/2x3/16	12.89	6.22	98.0	0.5710	3.20	24.84	0.129 [1]
T2	160 - 140	2L2x2x3/16	14.49	6.96	138.2	0.8264	4.62	35.95	0.129 [1]
T3	140 - 120	2L2 1/2x2 1/2x3/16	17.65	8.52	133.7	1.1039	5.94	48.02	0.124 [1]
T4	120 - 100	2L2 1/2x2 1/2x3/16	19.19	9.30	145.6	1.1039	7.68	48.02	0.160 [1]
T5	100 - 80	2L2 1/2x2 1/2x3/16	20.78	10.09	157.9	1.1039	9.30	48.02	0.194 [1]
T6	80 - 60	2L3x3x3/16	22.40	10.89	141.3	1.3537	10.03	58.89	0.170 [1]
T7	60 - 40	2L3x3x1/4	24.05	11.62	152.1	1.7850	11.19	77.65	0.144 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T8	40 - 20	2L3x3x1/4	25.73	12.46	163.0	1.7850	11.65	77.65	0.150 [1]
T9	20 - 0	L5x5x5/16	27.43	13.29	103.0	2.0088	12.45	87.38	0.142 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2 1/2x2 1/2x3/16	9.50	8.74	139.4	0.5710	0.02	24.84	0.001 [1]

[1] P_u / ϕP_n controls

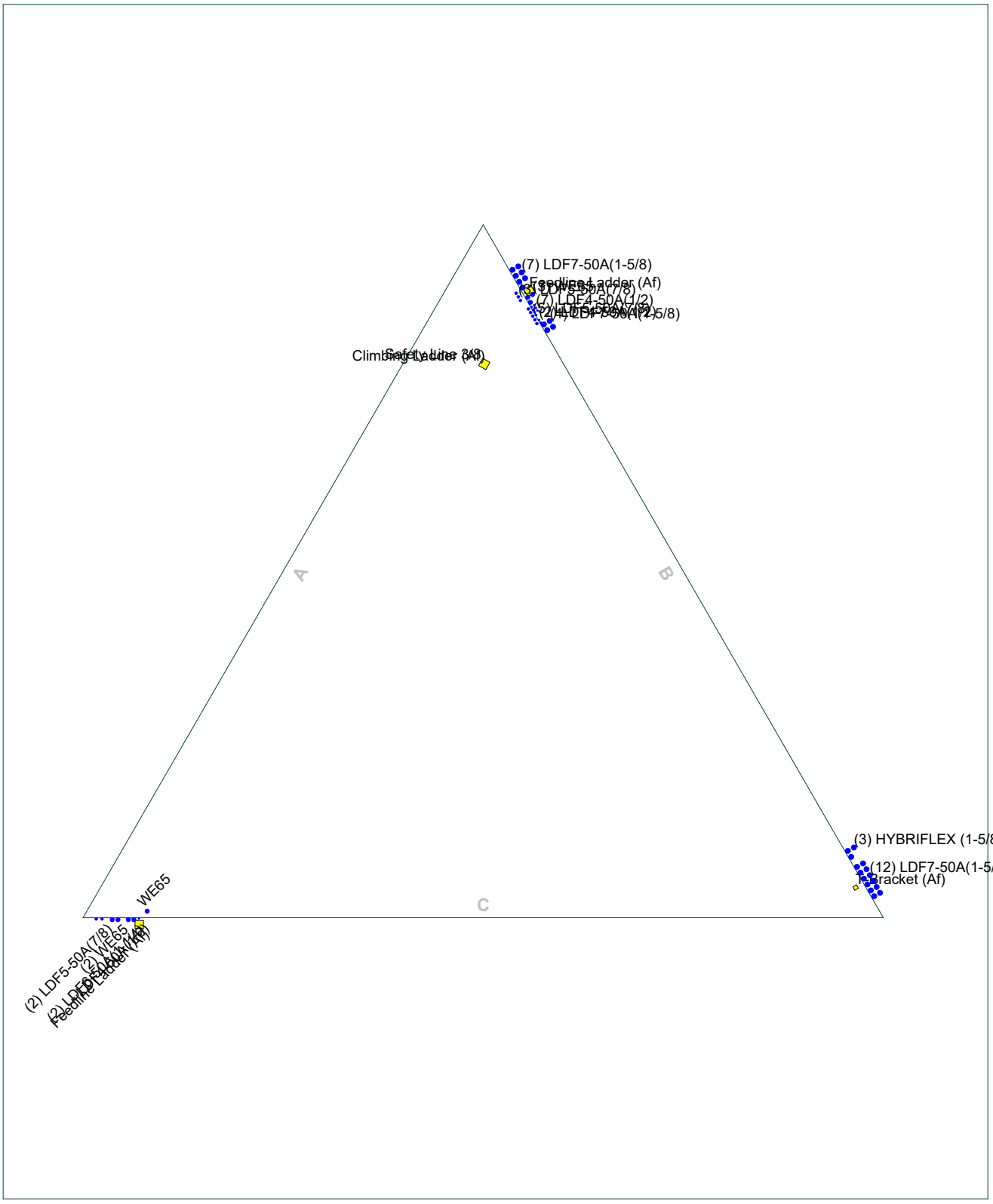
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	180 - 160	Leg	P5x.258	2	-16.32	165.38	9.9	Pass
T2	160 - 140	Leg	P6x.28	26	-31.63	222.71	14.2	Pass
T3	140 - 120	Leg	P8x.322	47	-52.45	326.25	16.1	Pass
T4	120 - 100	Leg	P8x.322	62	-82.77	326.25	25.4	Pass
T5	100 - 80	Leg	P8x.322	77	-114.54	326.25	35.1	Pass
T6	80 - 60	Leg	P8x.322	92	-147.62	326.25	45.2	Pass
T7	60 - 40	Leg	P10x.365	106	-183.98	481.71	38.2	Pass
T8	40 - 20	Leg	P10x.365	121	-220.61	481.71	45.8	Pass
T9	20 - 0	Leg	P10x.365	136	-256.72	481.71	53.3	Pass
T1	180 - 160	Diagonal	L2 1/2x2 1/2x3/16	9	-3.28	11.94	27.5 31.9 (b)	Pass
T2	160 - 140	Diagonal	2L2x2x3/16	30	-4.62	23.46	19.7 29.9 (b)	Pass
T3	140 - 120	Diagonal	2L2 1/2x2 1/2x3/16	51	-6.03	31.31	19.3 30.1 (b)	Pass
T4	120 - 100	Diagonal	2L2 1/2x2 1/2x3/16	68	-7.74	26.31	29.4 38.9 (b)	Pass
T5	100 - 80	Diagonal	2L2 1/2x2 1/2x3/16	83	-9.37	22.32	42.0 47.1 (b)	Pass
T6	80 - 60	Diagonal	2L3x3x3/16	98	-10.17	33.84	30.0 44.7 (b)	Pass
T7	60 - 40	Diagonal	2L3x3x1/4	109	-11.27	38.50	29.3 37.4 (b)	Pass
T8	40 - 20	Diagonal	2L3x3x1/4	124	-11.82	33.47	35.3 39.0 (b)	Pass
T9	20 - 0	Diagonal	L5x5x5/16	139	-13.06	35.36	36.9 46.4 (b)	Pass
T1	180 - 160	Top Girt	L2 1/2x2 1/2x3/16	6	-0.12	6.03	1.9	Pass
							Summary	
						Leg (T9)	53.3	Pass
						Diagonal (T5)	47.1	Pass
						Top Girt (T1)	1.9	Pass
						Bolt Checks	47.1	Pass
						RATING =	**53.3**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan



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Job: ***ES-045 UnionRS***			
Project: ***405025***			
Client: Eversource	Drawn by: Cesar Garcia Godos	App'd:	
Code: TIA-222-H	Date: 07/28/20	Scale: NTS	
Path: C:\Users\GOD84633\OneDrive - Black & Veatch\Documents\07 Eversource\UnionRS\Structural\Rev. H\UnionRS Structural Analysis.erl		Dwg No. E-7	

APPENDIX C

ADDITIONAL CALCULATIONS

Eversource #: ES-045
Site Name: UnionRS

Designed By: PSN
Checked By: CAG
Date: 7/28/2020

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References

ANCHOR ROD ANALYSIS

Project Information

Site Name:UnionRS

TIA Revision: Rev-G / Rev-H

TIA-222-G 105% Allowable? No / Yes

Apply TIA-222-H Section 15.5? No / Yes

Max Leg Reactions

Compression	*Uplift*
Axial_C := 266·kip	Axial_U := 220·kip
Shear_C := 35·kip	Shear_U := 30·kip

Anchor Rod Data

Diameter of Anchor Rod: D := 1.375·in

Number of Anchor Rods: N := 6

Length from top of concrete to bottom of anchor rod leveling nut: lar := 2.875·in

Threads in Shear Plane?: Yes / No

Thread Series: Coarse / Fine / 8-Thread

Consider Base Plate Grout? Yes / No

Grout Factor η: 0.90 / 0.70 / 0.55 / 0.50

Threads per Inch: n = 6 (Thread selection invalid if n = 0)

Rod Ultimate Strength: Fu = 125·ksi

Rod Yield Strength: Fy = 105·ksi

Anchor Rod Plastic Section Modulus: (based on tension root diameter)

$$Z := \frac{1}{6}\cdot\left(D - \frac{0.9743\,in}{n}\right)^3 = 0.297\cdot in^3$$

Radius of Gyration:

$$r := \left(\frac{1}{4}\right)\cdot\left(D - \frac{0.9743\,in}{n}\right) = 0.303\cdot in$$

Net Area of Anchor Rod:

$$An := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\,in}{n}\right)^2 = 1.155\cdot in^2$$

TIA-222-G/H Section 4.9.6.1

Nominal Unthreaded Area of Anchor Rod:

$$Ab := \frac{\pi}{4}\cdot(D)^2 = 1.485\cdot in^2$$

Anchor Rod Grade:

A193 Gr. B7
F1554-36
F1554-55
F1554-105
A687
A354-BC
A354-BD
A449
A572-42
A572-50
A572-55
A572-60
A572-65
A588-42
A588-46
A588-50
A36M-42
A36M-45
A36M-50
A36M-55
A500-50
A514-GR100
A53-B-35
A53-B-42
A607-60

Eversource #: ES-045
Site Name: UnionRS

Designed By: PSN
Checked By: CAG
Date: 7/28/2020

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Anchor Rod Design Capacities

Design Tension Strength: TIA-222-G/H Section 4.9.6.1

$Rnt := Fu \cdot An = 144.36 \cdot kip$

$\phi t = 0.75$

$\phi Rnt := \phi t \cdot Rnt = 108.27 \cdot kip$

Design Compression Strength:

$Rnc := Fy \cdot An = 121.262 \cdot kip$

$\phi c = 1$

$\phi Rnc := \phi c \cdot Rnc = 121.262 \cdot kip$

Design Buckling Strength: TIA-222-H Section 4.5.4.2

$K_0 := 1.2$

$Fcr = 102.933 \cdot ksi$

$Fe = 2.21 \times 10^3 \cdot ksi$

$Rnb := Fcr \cdot An = 118.875 \cdot kip$

$\phi c = 1$

$\phi Rnb := \phi c \cdot Rnb = 118.875 \cdot kip$

Design Shear Strength: TIA-222-G/H Section 4.9.6.3

$$Rnv := \begin{cases} 0.55 \cdot Fu \cdot Ab & \text{if Thread\_Type} = \text{"No"} \wedge \text{TIA} = \text{"Rev-G"} \\ 0.45 \cdot Fu \cdot Ab & \text{if Thread\_Type} = \text{"Yes"} \wedge \text{TIA} = \text{"Rev-G"} \\ 0.625 \cdot Fu \cdot Ab & \text{if Thread\_Type} = \text{"No"} \wedge \text{TIA} = \text{"Rev-H"} \\ 0.5 \cdot Fu \cdot Ab & \text{if Thread\_Type} = \text{"Yes"} \wedge \text{TIA} = \text{"Rev-H"} \end{cases}$$

$Rnv = 92.806 \cdot kip$

$Rnvc := 0.6 \cdot Fy \cdot 0.5 \cdot An = 36.379 \cdot kip$ TIA-222-H Section 4.9.9

$\phi v = 0.75 \qquad \phi c = 1$

$\phi Rnv := \phi v \cdot Rnv = 69.604 \cdot kip \qquad \phi Rnvc := \phi c \cdot Rnvc = 36.379 \cdot kip$

Design Flexural Strength: TIA-222-G/H Section 4.7.1

$Rmn := Fy \cdot Z = 31.204 \cdot kip \cdot in$

$\phi f = 0.9$

$\phi Rmn := \phi f \cdot Rmn = 28.083 \cdot kip \cdot in$

Anchor Rod Loading Demands

Tension Demand:

$$Put := \frac{Axial\_U}{N} = 36.667 \cdot kip$$

Compression Demand:

$$Puc := \frac{Axial\_C}{N} = 44.333 \cdot kip$$

Shear Demand:

$$Vut := \frac{Shear\_U}{N} = 5 \cdot kip$$

$$Vuc := \frac{Shear\_C}{N} = 5.833 \cdot kip$$

Moment Demand:

$$Mut := 0.65 \cdot lar \cdot Vut = 9.344 \cdot kip \cdot in$$

$$Muc := 0.65 \cdot lar \cdot Vuc = 10.901 \cdot kip \cdot in$$

Anchor Rod Interaction Check

TIA-222-G Section 4.9.9

$$SR\_g := \begin{cases} \dfrac{Put + \dfrac{Vut}{\eta}}{\phi Rnt} & \text{if } \eta > 0.50 \\ \dfrac{Put + \dfrac{Vut}{\eta}}{\phi Rnt} & \text{if } \eta = 0.50 \wedge lar \le D \wedge Put > Puc \\ \dfrac{Puc + \dfrac{Vuc}{\eta}}{\phi Rnt} & \text{if } \eta = 0.50 \wedge lar \le D \wedge Put < Puc \\ \left(\dfrac{Vut}{\phi Rnv}\right)^2 + \left(\dfrac{Put}{\phi Rnt} + \dfrac{Mut}{\phi Rmn}\right)^2 & \text{if } \eta = 0.5 \wedge lar > D \wedge Put > Puc \\ \left(\dfrac{Vuc}{\phi Rnv}\right)^2 + \left(\dfrac{Puc}{\phi Rnt} + \dfrac{Muc}{\phi Rmn}\right)^2 & \text{if } \eta = 0.5 \wedge lar > D \wedge Put < Puc \end{cases}$$

$$SR\_g = 0.423$$

Anchor Rod Interaction Check

TIA-222-H Section 4.9.9

$$SR\_Pt := \begin{cases} \left(\frac{Put}{\phi Rnt}\right)^2 + \left(\frac{Vut}{\phi Rnv}\right)^2 & \text{if } lar \le D \\ \left(\frac{Put}{\phi Rnt}\right)^2 + \left(\frac{Vut}{\phi Rnv}\right)^2 & \text{if } D < lar \le 3\cdot in \wedge Grout = \text{"Yes"} \\ \left(\frac{Put}{\phi Rnt} + \frac{Mut}{\phi Rmn}\right)^2 + \left(\frac{Vut}{\phi Rnv}\right)^2 & \text{if } 3\cdot in < lar \wedge Grout = \text{"Yes"} \\ \left(\frac{Put}{\phi Rnt} + \frac{Mut}{\phi Rmn}\right)^2 + \left(\frac{Vut}{\phi Rnv}\right)^2 & \text{if } D < lar \wedge Grout = \text{"No"} \end{cases}$$

$SR\_Pt = 0.12$

$$SR\_Pc := \begin{cases} \left(\frac{Puc}{\phi Rnc}\right) + \left(\frac{Vuc}{\phi Rnvc}\right)^2 & \text{if } lar \le D \\ \left(\frac{Puc}{\phi Rnc}\right) + \left(\frac{Vuc}{\phi Rnvc}\right)^2 & \text{if } D < lar \le 3\cdot in \wedge Grout = \text{"Yes"} \\ \left(\frac{Puc}{\phi Rnc} + \frac{Muc}{\phi Rmn}\right) + \left(\frac{Vuc}{\phi Rnvc}\right)^2 & \text{if } 3\cdot in < lar \wedge Grout = \text{"Yes"} \\ \left(\frac{Puc}{\phi Rnc} + \frac{Muc}{\phi Rmn}\right) + \left(\frac{Vuc}{\phi Rnvc}\right)^2 & \text{if } D < lar \le 4\cdot D \wedge Grout = \text{"No"} \\ \left(\frac{Puc}{\phi Rnb} + \frac{Muc}{\phi Rmn}\right) + \left(\frac{Vuc}{\phi Rnvc}\right)^2 & \text{if } lar > 4\cdot D \wedge Grout = \text{"No"} \end{cases}$$

$SR\_Pc = 0.391$

$$SR := \begin{cases} SR\_g & \text{if } TIA = \text{"Rev-G"} \\ \max(SR\_Pt, SR\_Pc) & \text{if } TIA = \text{"Rev-H"} \wedge S15 = \text{"No"} \\ \frac{\max(SR\_Pt, SR\_Pc)}{1.05} & \text{if } TIA = \text{"Rev-H"} \wedge S15 = \text{"Yes"} \end{cases} = 0.373$$

$$Check_{SR} := \begin{cases} \text{"Passing"} & \text{if } SR \le 1.00 \wedge TIA = \text{"Rev-G"} \wedge S105 = \text{"Yes"} \\ \text{"Acceptable"} & \text{if } 1.00 < SR \le 1.05 \wedge TIA = \text{"Rev-G"} \wedge S105 = \text{"Yes"} \\ \text{"Failing"} & \text{if } SR > 1.05 \wedge TIA = \text{"Rev-G"} \wedge S105 = \text{"Yes"} \\ \text{"Passing"} & \text{if } SR \le 1.00 \wedge TIA = \text{"Rev-G"} \wedge S105 = \text{"No"} \\ \text{"Failing"} & \text{if } SR > 1.00 \wedge TIA = \text{"Rev-G"} \wedge S105 = \text{"No"} \\ \text{"Passing"} & \text{if } SR \le 1.0 \wedge TIA = \text{"Rev-H"} \\ \text{"Failing"} & \text{if } SR > 1.0 \wedge TIA = \text{"Rev-H"} \end{cases} = \text{"Passing"}$$

Eversource #: ES-045
Site Name: UnionRS

Designed By: PSN
Checked By: CAG
Date: 7/28/2020

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Anchor Rod Results

Axial Tension Demand:	$Put = 36.667 \cdot kip$
Axial Tension Capacity:	$\phi Rnt = 108.27 \cdot kip$
Axial Compression Demand:	$Puc = 44.333 \cdot kip$
Axial Compression Capacity:	$\phi Rnc = 121.262 \cdot kip$
Shear Tension Demand:	$Vut = 5 \cdot kip$
Tension Shear Capacity:	$\phi Rnv = 69.604 \cdot kip$
Shear Compression Demand:	$Vuc = 5.833 \cdot kip$
Compresison Shear Capacity:	$\phi R_{nvc} = 36.379 \cdot kip$
Moment Tension Demand:	$M_{ut} = 9.344 \cdot kip \cdot in$
Moment Compression Demand:	$M_{uc} = 10.901 \cdot kip \cdot in$
Moment Capacity:	$\phi R_{mn} = 28.083 \cdot kip \cdot in$

Governing Stress Ratio

$SR = 37.3 \cdot \%$

$Check_{SR} = \text{"Passing"}$

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Building a world of difference.
6800 W. 115th St., Suite 2292
Overland Park, KS 66211
Phone: (913) 458-6909

Client:	Eversource	***Design:***	PSN
Project:	405025	***Date:***	7/28/2020
Site:	UnionRS	***Verify:***	CAG
Title:	Foundation Design Reaction Comparison	***Date:***	7/28/2020
		Code:	TIA-222-H

Template Version 1.8

FOUNDATION ANALYSIS:

Original Tower Design Reactions:

Drilled Caisson:

Uplift:	470.3	Kip
Shear:	66.2	Kip
Compression:	564.0	Kip
Shear:	66.2	Kip

TnxTower Reactions:

Drilled Caisson:

Uplift:	220.0	Kip
Shear:	30.0	Kip
Compression:	266.0	Kip
Shear:	35.0	Kip

Stress Ratio:

Drilled Caisson:

Uplift:	**44.5%**
Shear:	**43.1%**
Compression:	**44.9%**
Shear:	**50.3%**

Note: Ratings per TIA-222-H Section 15.5.

Conclusion:

When the calculated reactions are compared to the original design reactions, the existing foundation is considered to have been designed and constructed with adequate capacity to support the existing and proposed loads.

Controlling Foundation Stress Ratio: **50.3%**

ATTACHMENT D – PROOF OF DELIVERY OF NOTICE

Ref: CT587100-ES-045 Date: 03Nov20
Dep: BL GRAPHICS Wgt: 0.90 LBS

DV:

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6772

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 0.90 LB
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO **HONORABLE DAVID D. EATON**
TOWN OF UNION
1043 BUCKLEY HIGHWAY

UNION CT 06076

REF: CT587100-ES-045

DEPT: BL GRAPHICS

56BC3/51DB/05A2

FedEx Express

J2010191106011w

TRK# 0201 **9151 3346 6772**

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

00 QCWA

06076
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: CT587100-ES-045 Date: 03Nov20
Dep: BL GRAPHICS Wgt: 0.90 LBS
DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6783

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 0.90 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO **MATHIEU J. SILBERMANN**
TOWN OF UNION
1043 BUCKLEY HIGHWAY

UNION CT 06076

REF: CT587100-ES-045

DEPT: BL GRAPHICS

56DC3/51DB/05A2

FedEx Express

J2010191106D1uw

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 6783**

00 QCWA

06076
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: CT587100-ES-045 Date: 03Nov20
Dep: BL GRAPHICS Wgt: 0.90 LBS

DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6794

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 0.90 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO

CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051

REF: CT587100-ES-045

DEPT: BL GRAPHICS

56DC3/51DB/05A2

FedEx Express

J2010191106091uv

TRK# 0201 **9151 3346 6794**

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

00 BDLA

06051
CT-US **BDL**

Part # 156140-434 RIT EXP 09/21 **

ATTACHMENT E - 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-045 – Union Radio

Bald Hill Road

Union, CT

September 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 at Bald Hill Road in Union, CT. Eversource is proposing to install one omnidirectional antenna as part of its 220 MHz communications system . This antenna has two internal elements, the lower element of the antenna is used for transmit and the upper element is used for receive only.

This report considers the proposed antenna configuration as detailed by Eversource along with % MPE (Maximum Permissible Exposure) measurements of the existing tower to determine FCC compliance of the facility.

Figure 1: View of ES-045 Union

Site Address	Bald Hill Road
Latitude	41° 58' 27.0" N
Longitude	72° 11' 56.3" W
Site Elevation AMSL	1278’
Survey Engineer	Marc Salas
Survey Date/Time	6/16/2020; 8:00 AM – 8:45 AM

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.

3. 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.

4. 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.

Operator	Antenna Model	TX Freq. (MHz)	Ant Gain (dBd)	Power ERP (Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	Sinclair SD212D-SF3P4SNM	217	5.5	124	4	34°	20	185

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

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

[2] Transmit antenna height listed is based on the Black & Veatch Structural Analysis Report dated September 3, 2020 and the overall mechanical length of the antenna. The proposed antenna consists of two stacked antennas – upper for receive, lower for transmit.

5. 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# 01116			
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

6. 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 16, 2020 between 8:00 AM and 8:45 AM. The calculated % MPE contribution from the proposed equipment modifications 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 19 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 3.06% (Average Uncontrolled/General Population MPE) and was recorded at Location 16 along Bald Hill Road. The highest composite (measured + calculated) % MPE value is calculated to be 3.35% (Average Uncontrolled/General Population) and is also calculated to occur at Location 16.

Meas. Location	Location Description	Latitude	Longitude	Dist. From Site (feet)	Measured % MPE (Uncontrolled / General)	Calculated % MPE (Eversource Proposed)	Composite % MPE (Uncontrolled / General)
1	SE corner of fenced compound	41.97400	-72.19877	83	< 1.00%	0.01%	< 1.01%
2	E side of fenced compound, S of access gate	41.97408	-72.19872	75	< 1.00%	0.01%	< 1.01%
3	Compound access gate	41.97417	-72.19867	82	< 1.00%	0.01%	< 1.01%
4	NE corner of fenced compound	41.97427	-72.19862	103	< 1.00%	0.01%	< 1.01%
5	N side of fenced compound	41.97429	-72.19870	87	< 1.00%	0.01%	< 1.01%
6	N side of fenced compound	41.97431	-72.19880	69	< 1.00%	0.01%	< 1.01%
7	NW corner of fenced compound	41.97432	-72.19895	55	< 1.00%	0.01%	< 1.01%
8	W side of fenced compound	41.97425	-72.19897	32	< 1.00%	0.01%	< 1.01%
9	W side of fenced compound	41.97415	-72.19901	12	< 1.00%	0.01%	< 1.01%
10	SW corner of fenced compound	41.97405	-72.19905	48	< 1.00%	0.01%	< 1.01%
11	S side of fenced compound	41.97402	-72.19899	55	< 1.00%	0.01%	< 1.01%
12	S side of fenced compound	41.97400	-72.19887	68	< 1.00%	0.01%	< 1.01%
13	Dirt parking area by compound of Bald Hill Road	41.97398	-72.19854	135	< 1.00%	0.03%	< 1.03%
14	W side of building at end of Bald Hill Road	41.97396	-72.19814	239	2.61%	0.29%	2.90%
15	Bald Hill Road, near dirt turnoff to compound	41.97387	-72.19851	166	2.47%	0.06%	2.53%
16	**Along Bald Hill Road**	**41.97326**	**-72.19824**	**386**	**3.06%**	**0.29%**	**3.35%**
17	Along Bald Hill Road	41.97270	-72.19808	588	< 1.00%	0.18%	< 1.18%
18	Along Bald Hill Road	41.97110	-72.19809	1146	< 1.00%	0.06%	< 1.06%
19	Access gate, bottom of Bald Hill Road	41.96953	-72.19764	1732	< 1.00%	0.03%	< 1.03%

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

[4] Antenna heights listed for all existing and proposed antennas are based on the Black & Veatch Structural Analysis Report dated September 3, 2020.

[5] 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.

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

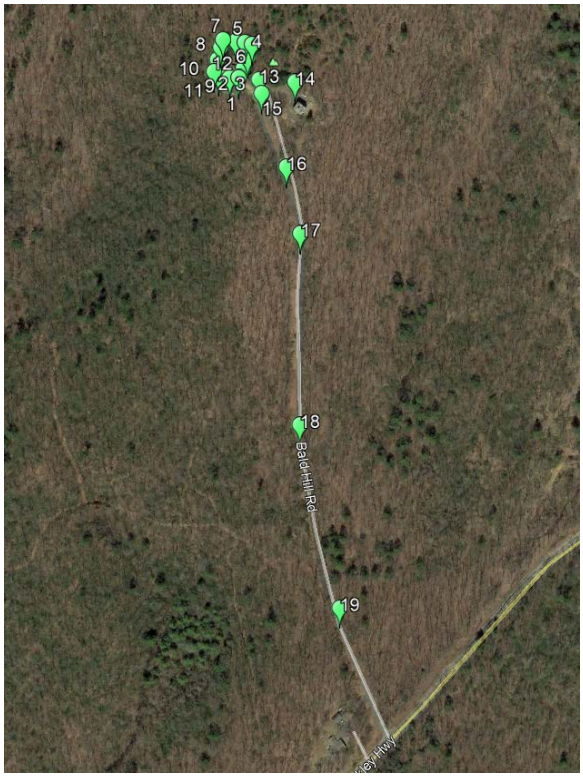


Figure 3: All Measurement Points

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

7. Conclusion

A number of accessible areas around the tower at Bald Hill Road in Union, 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 3.06% MPE. This measurement was recorded at Location 16, along Bald Hill Road.

The highest composite (measured + calculated) power density is **3.35% of the FCC General Population MPE limit** with the proposed Eversource equipment and is also calculated to occur at Location 16.

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.

8. 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.

Marc Salas — September 30, 2020

Report Prepared By: Marc Salas
RF Engineer
C Squared Systems, LLC — Date

Keith Vellante — September 30, 2020

Reviewed/Approved 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

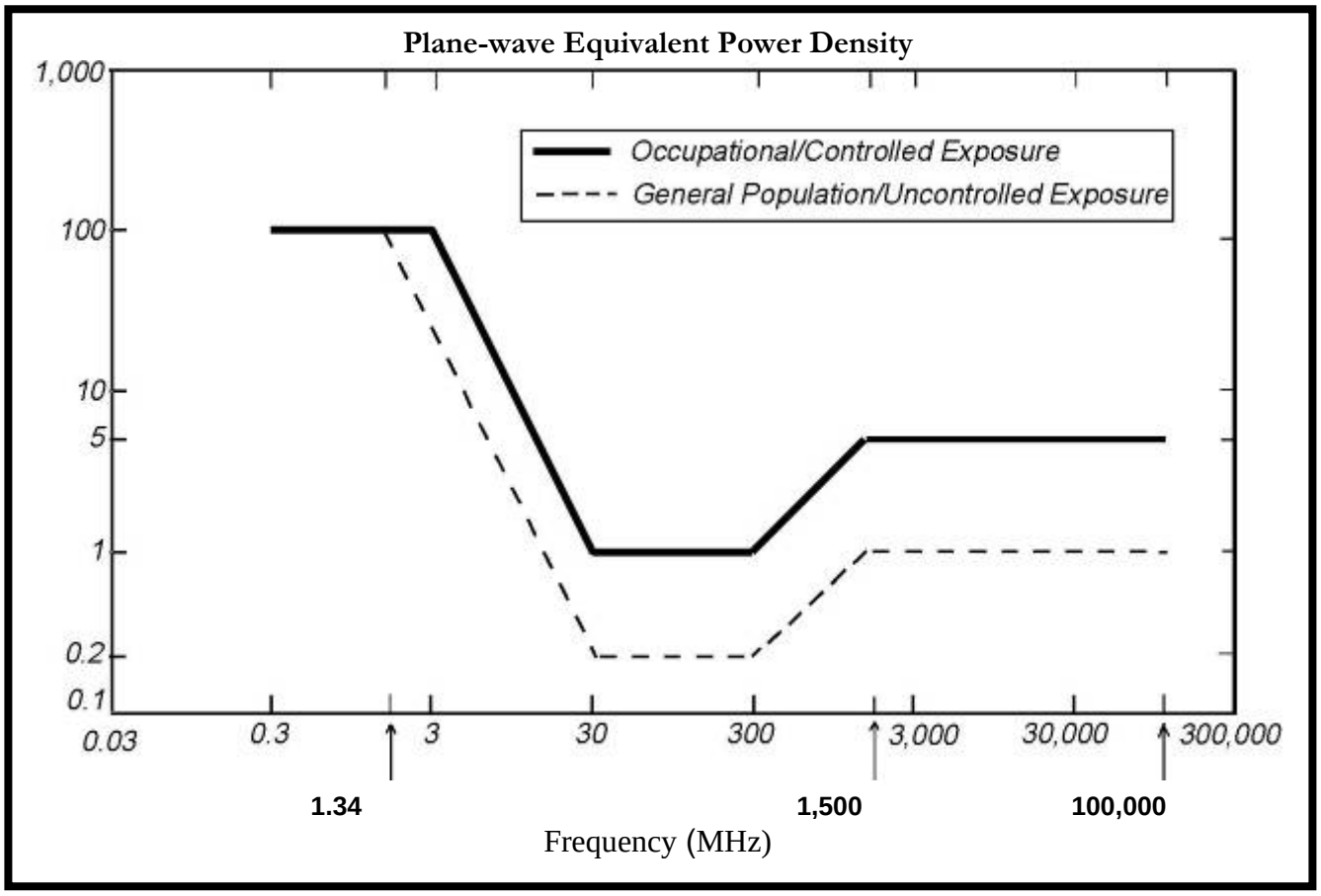
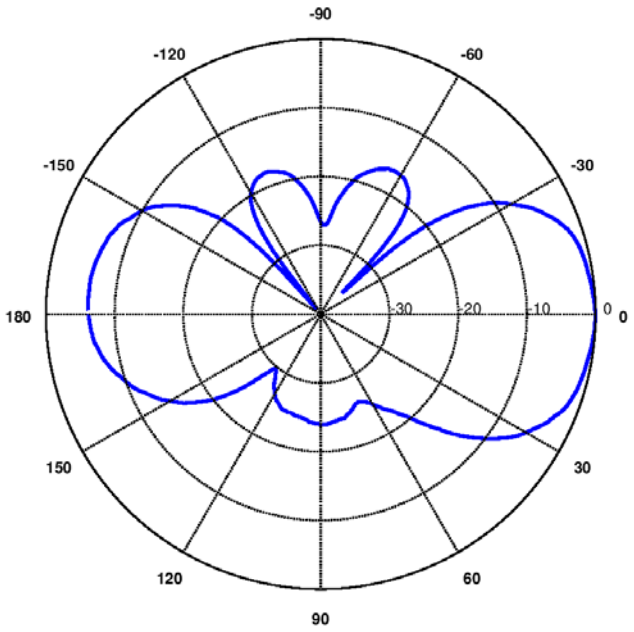


Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

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

217 MHz

Manufacturer:	Sinclair
Model #:	SD212D-SF3P4SNM
Frequency Band:	190-225 MHz
Gain:	5.5 dBd
Vertical Beamwidth:	34°
Horizontal Beamwidth:	210°
Polarization:	Vertical-Polarization
Length:	20’



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