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

Deborah Denfeld
Team Lead – Transmission Siting
Tel: (860) 728-4654

October 17, 2023

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

RE: **Notice of Exempt Modification – Microwave Dish Replacement**
Eversource Site # 6581
790 Willis Street, Bristol, CT 06010
Latitude: 41-38-56 N / Longitude: 72-56-50 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 130-foot self-supporting lattice tower located at 790 Willis Street in Bristol ("Site"). See Attachment A, Parcel Map and Property Card. The tower and property are owned by Eversource. Eversource plans to remove and replace one 8-foot diameter, single-polarity Standard Microwave dish with one 8-foot diameter, dual-polarity High Performance Microwave dish.

The proposed installation modification is part of Eversource's continued investment in upgrading its communications infrastructure. The current microwave dish is nearing the end of its useful life. The replacement microwave dish proposed at this Site will provide improved communications to the existing radio network and cellular systems utilized by Eversource for their day-to-day operations. The Connecticut Siting Council approved the self-supporting tower at this location in Petition No. 800 in January 2007.

The proposed replacement dish would be mounted on the existing dish mount at an elevation of 86 feet above ground level ("AGL"). The existing elliptical waveguide cabling will be reused for the new microwave dish. One additional elliptical waveguide cable is proposed for potential future deployment but will not be installed as part of this initial upgrade.

Radio equipment will be modified within the existing Eversource shelter to accommodate the replacement dish. There will be no changes to the area of the fenced compound, the tower or other existing antennas and equipment currently mounted on the tower. The tower and existing and proposed equipment are depicted in Attachment B, Exempt Modification Drawings, dated October 10, 2023 and Attachment C, Structural Analysis, dated July 3, 2023.

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 has been delivered to the Honorable Jeffrey Caggiano, Mayor for the City of Bristol and Robert M. Flanagain, AICP, City Planner for the City of Bristol. See Attachment D, Proof of Delivery of Notice.

The planned modifications to the facility meet the regulatory criteria provided for in R.C.S.A. § 16-50j-72(b)(2), as follows:

1. There will be no change to the height of the existing tower.
2. The proposed modifications will not require any extension of the Site boundary.
3. The proposed modifications 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 dish 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 29, 2023 (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 (Attachment C, Structural Analysis).

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 and two copies of this notice and a check in the amount of $625 for the filing fee are enclosed. Please direct communications regarding this Notice of Exempt Modification to me at (860) 728-4654.

By: Deborah Denfeld
_____
Deborah Denfeld
Team Lead – Transmission Siting

cc: Hon. Jeffrey Caggiano, Mayor, City of Bristol
Robert M. Flanagan, AICP, City Planner, City of Bristol

Attachments:

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

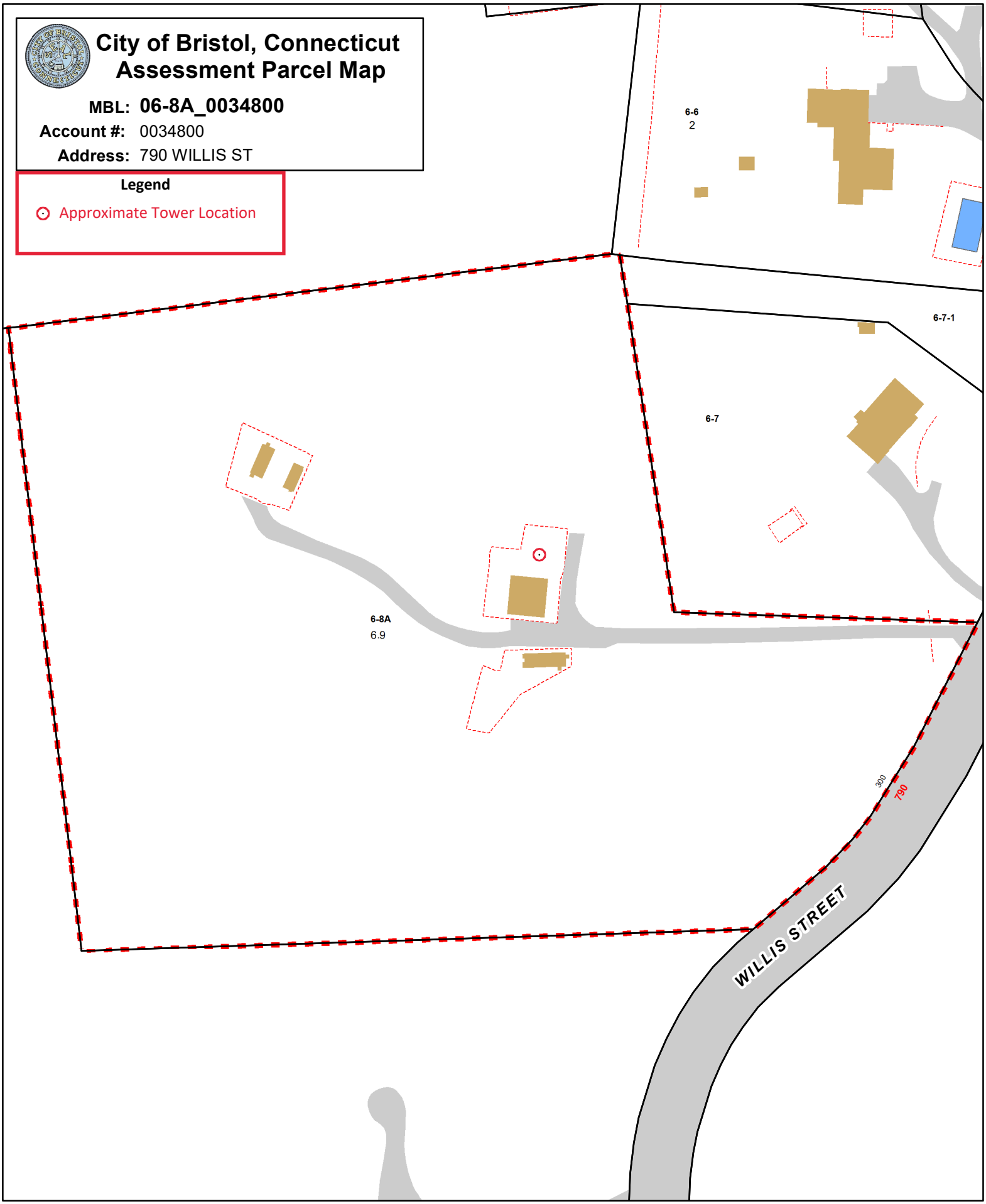
ATTACHMENT A – PARCEL MAP AND PROPERTY CARD

City of Bristol, Connecticut
Assessment Parcel Map

MBL: 06-8A_0034800
Account #: 0034800
Address: 790 WILLIS ST

Legend

⊙ Approximate Tower Location



Approximate Scale: 1 inch = 100 feet

Map Produced May 2022

City of Bristol, CT

Property Listing Report

Map Block Lot	06-8A	Building #	1	PID	5681	Account	0034800

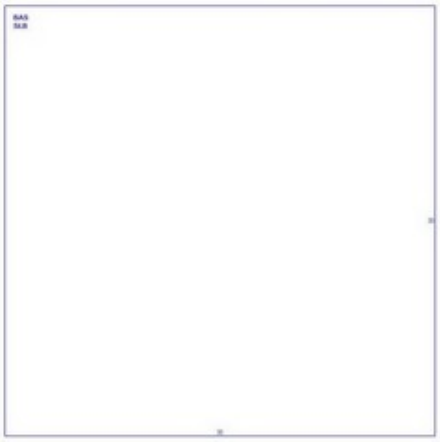
Property Information

Property Location	790 WILLIS ST
Owner	CONN LIGHT + POWER CO
Co-Owner	
Mailing Address	107 SELDEN ST BERLIN CT 06037
Land Use	436 Public Utility
Land Class	I
Zoning Code	R-25
Census Tract	04055

Neighborhood	50
Acreage	6.9
Utilities	
Lot Setting/Desc	Above
Book / Page	0277/0293
Additional Info	

Photo

Sketch



Primary Construction Details

Year Built	1950
Building Desc.	Public Utility
Building Style	Warehouse
Building Grade	NA
Stories	1
Occupancy	1.00
Exterior Walls	Concr/Cinder
Exterior Walls 2	NA
Roof Style	Gable
Roof Cover	Asphalt Shingl
Interior Walls	Minim/Masonry
Interior Walls 2	NA
Interior Floors 1	Concr-Finished
Interior Floors 2	

Heating Fuel	Electric
Heating Type	Hot Air-no Duc
AC Type	04
Bedrooms	0
Full Bathrooms	0
Half Bathrooms	0
Extra Fixtures	0
Total Rooms	0
Bath Style	NA
Kitchen Style	NA
Fin Bsmt Area	0
Fin Bsmt Quality	0
Bsmt Gar	0
Fireplaces	0

(*Industrial / Commercial Details)

Building Use	Ind/Comm
Building Condition	A
Sprinkler %	NA
Heat / AC	Heat/AC Pkgs
Frame Type	Masonry
Baths / Plumbing	Light
Ceiling / Wall	None
Rooms / Prtns	Light
Wall Height	8.00
First Floor Use	NA
Foundation	NA

Report Created On 9/29/2023

City of Bristol, CT

Property Listing Report

Map Block Lot	06-8A	Building #	1	PID	5681	Account	0034800

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	24900	17430
Extras	0	0
Improvements		
Outbuildings	391300	273910
Land	297200	208040
Total	713400	499380

Outbuilding and Extra Features

Type	Description
Cell Tower/Site	2 UNITS
PreCastConcCel	300 S.F.
PreCastConcCel	300 S.F.
Carport	900 S.F.
Garage	420 S.F.
PreCastConcCel	200 S.F.

Sub Areas

Subarea Type	Gross Area (sq ft)	Living Area (sq ft)
First Floor	900	900
Slab	900	0
Total Area	1800	900

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
CONN LIGHT + POWER CO	0277/0293	1952-01-25	0

Report Created On 9/29/2023

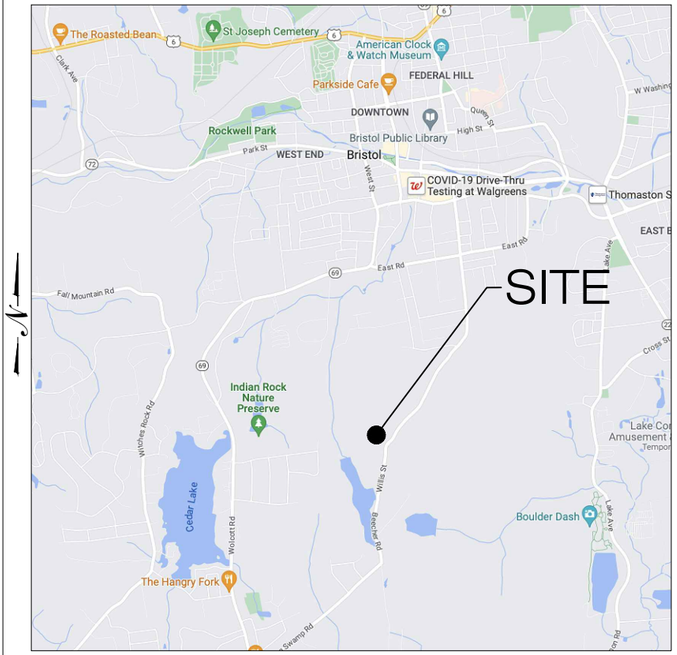
ATTACHMENT B – EXEMPT MODIFICATION DRAWINGS

EVERSOURCE ENERGY

SOUTH MTN RADIO
790 WILLIS STREET
BRISTOL, CT 06010

DESIGN: SITE UPGRADE
(SELF-SUPPORT TOWER)

LOCATION MAP



SCALE : NTS SOURCE: GOOGLE MAPS

CALL BEFORE YOU DIG
811 OR
800-922-4455
2040 WHITNEY AVE.
HAMDEN, CT 06517

DRAWING INDEX

PROJECT DESCRIPTION

1. REPLACE EXIST. EVERSOURCE MICROWAVE DISH WITH NEW MICROWAVE DISH (COMMSCOPE HX8-6W-6GF) AT 86'-0" RAD CENTER.
2. INSTALL NEW EW63 ELLIPTICAL COAX CABLE ROUTED WITHIN EXISTING CABLE LADDER ON THE FACE OF EXISTING TOWER.

GOVERNING CODES

2022 CONNECTICUT STATE BUILDING CODE (2021 IBC BASIS)
2018 NATIONAL ELECTRIC CODE
EIA/TIA 222H

GENERAL NOTES

THE FACILITY IS AN UNMANNED FACILITY AND IS NOT FOR HUMAN HABITATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR ROUTINE MAINTENANCE AND DOES NOT REQUIRE ANY SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL. THIS PROJECT WILL NOT INCUR ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE. NO COMMERCIAL SIGNAGE IS PROPOSED.

SITE INFORMATION

SITE NAME:	SOUTH MTN RADIO
SITE ID NUMBER:	5681
SITE ADDRESS:	790 WILLIS STREET BRISTOL, CT 06010
MAP:	6
BLOCK:	8
LOT:	A
ZONE:	R-25
LATITUDE:	41° 38' 56.0" N
LONGITUDE:	72° 56' 50.0" W
ELEVATION:	1047'± AMSL
FIRM FLOOD DESIGNNATION:	'X'

CONTACT INFORMATION

APPLICANT:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

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

EVERSOURCE ENERGY:
PROJECT MANAGER
STEVE FLORIO
(860) 655-7943

POWER PROVIDER:
EVERSOURCE ENERGY
(800) 286-2000

TELCO PROVIDER:
FRONTIER
(800) 921-8102

CALL BEFORE YOU DIG:
(800) 922-4455

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
OFFICE: (860) 665-6748

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHAUL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

PERMIT DOCUMENTS

NO	DATE	REVISION
0	09/29/23	FOR CLIENT REVIEW
1	10/10/23	FOR FILING
2		
3		
4		
5		
6		

DESIGN PROFESSIONAL OF RECORD

PROF: SCOTT M. CHASSE PE
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHAUL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

SOUTH MOUNTAIN SITE UPGRADE

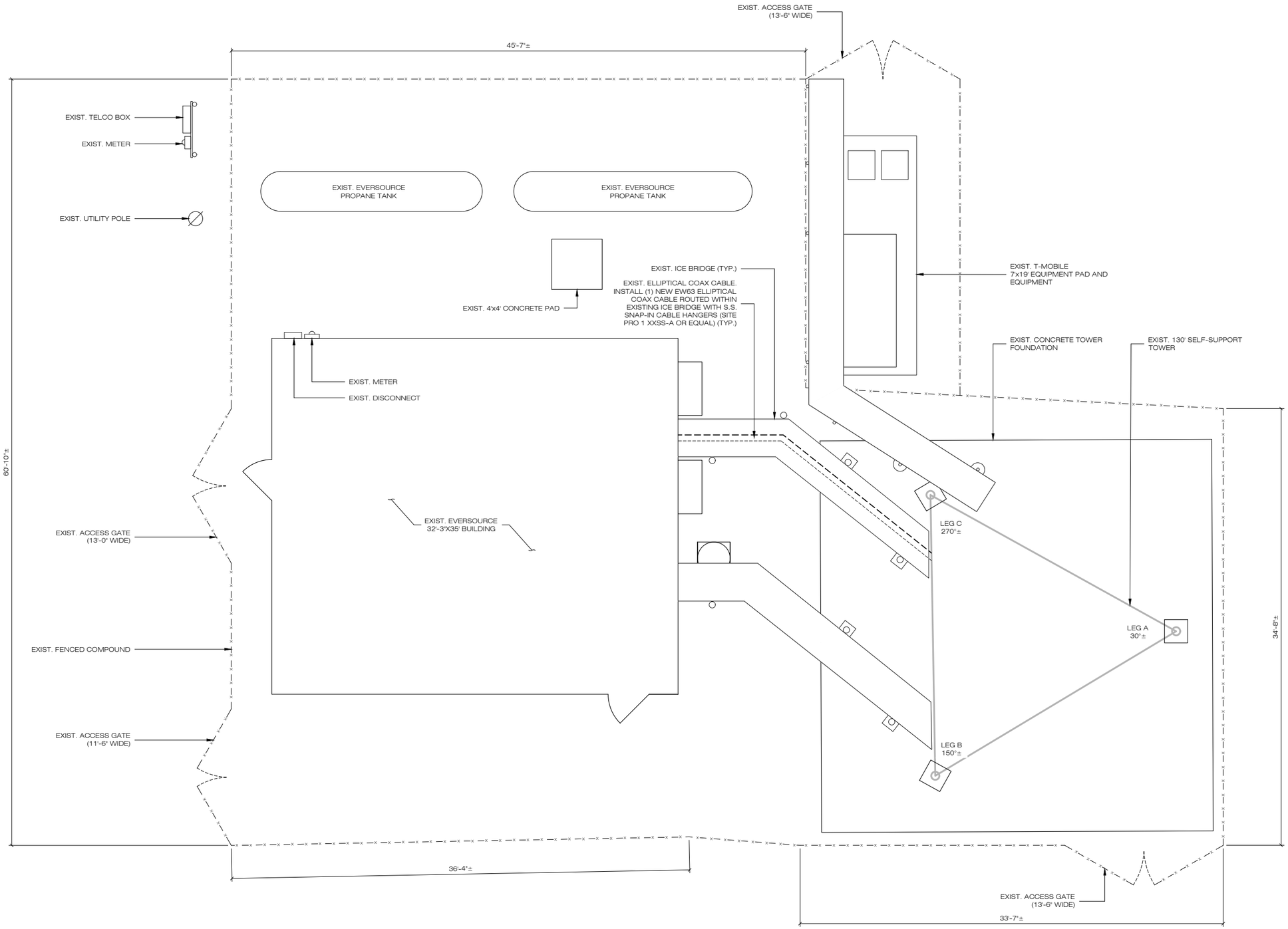
SITE ADDRESS: 790 WILLIS STREET BRISTOL, CT 06010

APT FILING NUMBER: CT2592931

DRAWN BY: CDC
DATE: 09/29/23 CHECKED BY: KB

SHEET TITLE:
TITLE SHEET & INDEX

SHEET NUMBER:
T-1



1 C-1 **SITE PLAN**
SCALE : 1/4" - 1'-0"

4'-0" 0 2'-0" 4'-0" 8'-0"
1/4" SCALE: 1 INCH= 4'-0"

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
OFFICE: (860) 665-6748

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHAUL STREET EXTENSION - SUITE 311
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2		
3		
4		
5		
6		

STATE OF NEW YORK
SCOTT M. CHASSE
078603
LICENSED PROFESSIONAL ENGINEER

DESIGN PROFESSIONAL OF RECORD

PROF: SCOTT M. CHASSE PE
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHAUL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

SOUTH MOUNTAIN SITE UPGRADE

SITE ADDRESS: 790 WILLIS STREET BRISTOL, CT 06010

APT FILING NUMBER: CT2592931

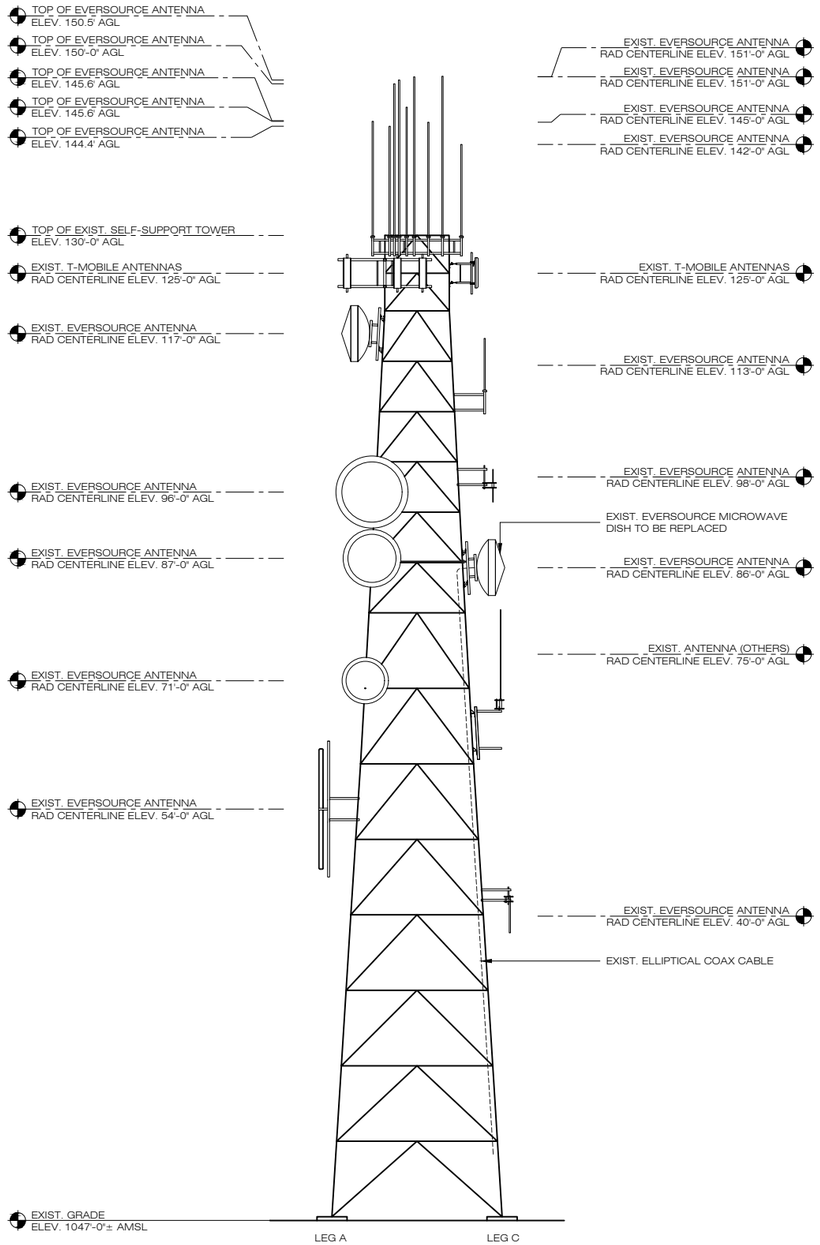
DRAWN BY: CDC
DATE: 09/29/23
CHECKED BY: KB

SHEET TITLE:
SITE PLAN

SHEET NUMBER:
C-1

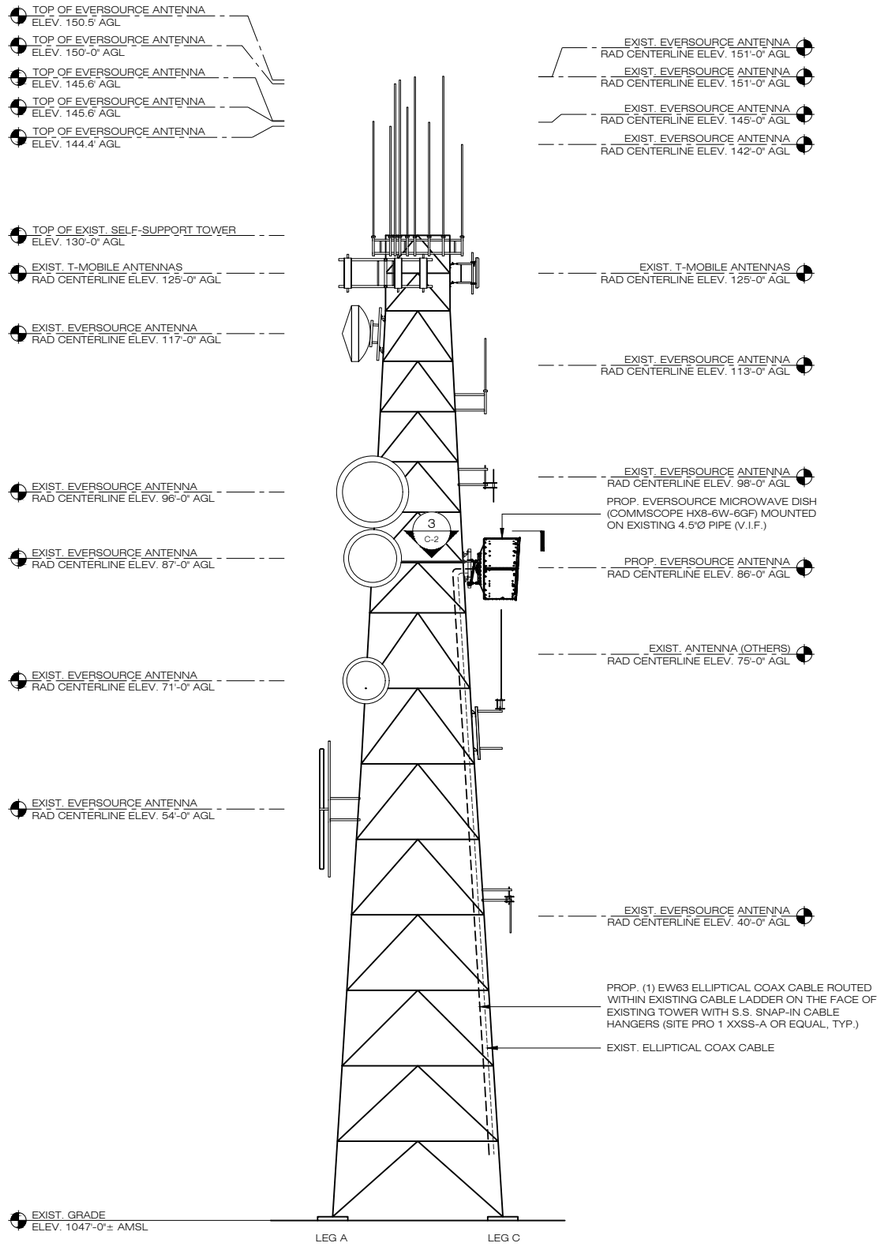
NOTE:
EXISTING ANTENNAS ARE NOT SHOWN FOR CLARITY:

1. OMNI ANTENNA AT 115' CL
2. 6 FT DISH AT 107' CL
3. APP11-850/105N ANTENNA AT 105' CL
4. APP11-850/105N ANTENNA AT 104' CL
5. YAGI ANTENNA AT 84' CL
6. (3) 20' OMNI ANTENNAS AT 70' CL
7. DIAMOND X-500A ANTENNA AT 65' CL
8. DB212-1 ANTENNA AT 58' CL



1 C-2 **EXISTING TOWER ELEVATION**
SCALE : 1" = 10'-0"

10 0 5 10 20
(IN FEET) 1 inch = 10 ft.



2 C-2 **PROPOSED TOWER ELEVATION**
SCALE : 1" = 10'-0"

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
OFFICE: (860) 665-6748

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHAUL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
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PERMIT DOCUMENTS

NO	DATE	REVISION
0	09/29/23	FOR CLIENT REVIEW
1	10/10/23	FOR FILING
2		
3		
4		
5		
6		

STATE OF NEW YORK
SCOTT M. CHASSE
078603
LICENSED PROFESSIONAL ENGINEER

DESIGN PROFESSIONAL OF RECORD

PROF: SCOTT M. CHASSE PE
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHAUL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

SOUTH MOUNTAIN SITE UPGRADE

SITE ADDRESS: 790 WILLIS STREET, BRISTOL, CT 06010

APT FILING NUMBER: CT2592931

DRAWN BY: CDC
DATE: 09/29/23
CHECKED BY: KB

SHEET TITLE:
TOWER ELEVATIONS

SHEET NUMBER:
C-2

DESIGN BASIS:

GOVERNING CODES/DESIGN STANDARDS:

2021 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED BY THE 2022 CONNECTICUT STATE BUILDING CODE
ASCE 7-16
TIA-222-H (TOWER)

01 GENERAL:

ABBREVIATIONS USED IN THESE SPECIFICATIONS INCLUDE THE FOLLOWING:

ACI	AMERICAN CONCRETE INSTITUTE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AWS	AMERICAN WELDING SOCIETY
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASTM	AMERICAN STANDARDS AND TESTING METHODS
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
ICC-ES	INTERNATIONAL CODE COUNCIL EVALUATION SERVICE
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
UL	UNDERWIRTERS LABORATORIES
NEC	NATIONAL ELECTRICAL CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

EVERY INDIVIDUAL TRADE, DISCIPLINE, AND CONTRACTOR SHALL INCLUDE THESE GENERAL SPECIFICATIONS.

THE ENGINEER IS NOT RESPONSIBLE FOR NOR A GUARANTOR OF THE INSTALLING CONTRACTORS WORK, ADEQUACY OF ANY SITE COMPONENT, SUPERVISION OF ANY WORK, AND SAFETY IN, ON, OR ABOUT THE WORK SITE.

ANY REFERENCE HEREIN TO AN OR EQUAL ITEM, THAT EQUAL ITEM SHALL BE PRE-APPROVED BY THE CONSTRUCTION MANAGER BEFORE INSTALLATION

ALL TRADES SHALL COORDINATE THEIR WORK WITH ALL OTHER TRADES AND OTHER WORK AND CONDITIONS AS APNEWRIATE OR REQUIRED TO AVOID CONFLICTS. RESOLVE AND COORDINATE ALL CONFLICTS WITH ALL AFFECTED WORK AND SITE OPERATIONS. COORDINATION WITH THE SITE SHALL BE WITH THE OWNER, OR OWNER'S SPECIFIED REPRESENTATIVE, FOR EVERYTHING RELATED TO THE INSTALLATION OF THIS PROJECT.

ALL WORK SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE EDITIONS OF ALL APPLICABLE CODES AND SHALL BE ACCEPTABLE TO ALL AUTHORITIES HAVING JURISDICTION (AHJ). WHERE A CONFLICT EXISTS BETWEEN CODES, PLANS, SPECIFICATIONS, AND/OR AHJ, THE MORE STRINGENT AUTHORITY SHALL APPLY. WHERE CONFLICT EXISTS BETWEEN PLANS AND SPECIFICATIONS, PLAN SHALL APPLY. WHERE CONFLICT EXISTS BETWEEN PLAN SHEETS, CONSTRUCTION MANAGER SHALL BE CONSULTED PRIOR TO COMMENCING ANY WORK.

CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC., FOR A COMPLETE AND NEWERLY OPERATIVE AND USABLE SYSTEM THROUGHOUT AND AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN AND/OR OTHERWISE REQUIRED.

CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS, INSTALLATIONS, AND EQUIPMENT IN THE FIELD PRIOR TO BID, FABRICATION, AND INSTALLATION OF ANY WORK.

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

CONTRACTOR SHALL VISIT THE SITE TO MANAGE AND GAIN APPROVAL FOR ALL TENANT DISRUPTIONS, POWER OUTAGES, WORK SCHEDULES, DEFINITION OF WORK AREA AND WORK STORAGE, NEWER BUILDING/SITE ACCESS, NOISE AND CLEANLINESS REQUIREMENTS WITH THE BUILDING/SITE MANAGEMENT PRIOR TO ALL WORK. ANY DISRUPTIONS SHALL BE KEPT TO A MINIMUM AND SHALL BE IMPLEMENTED ONLY UPON WRITTEN APPROVAL OF THE OWNER.

THE CONTRACTOR SHALL SAFEGUARD AGAINST CREATING ANY HAZARD AFFECTING TENANT EGRESS OR COMPROMISING SITE SECURITY MEASURES.

PRIOR TO ALL BELOW-GRADE WORK AND ANY SURFACE WORK IN A NEW AREA FOR STRUCTURES OR VEHICLES, CONTRACTOR SHALL ENGAGE A MARKOUT SERVICE TO IDENTIFY ANY UNDERGROUND STRUCTURES, CONDUITS, AND PIPELINES IN THE AREA. ALL EXISTING SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, AND OTHER UNDERGROUND UTILITIES IDENTIFIED OR ENCOUNTERED, SHALL BE PROTECTED AT ALL TIMES. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN DIGGING OR EXCAVATING IN ANY MANNER AROUND OR NEAR SUCH UTILITIES. CONTRACTOR IS RESPONSIBLE FOR REPAIRS, REPLACEMENT, AND ALL DAMAGES DUE TO DAMAGE OF UTILITIES BY HIS OPERATIONS.

ALL EXISTING AND NEW EQUIPMENT AND MATERIAL LOCATIONS, ROUTING, ORIENTATION, MOUNTING, SPECIFICATIONS AND GENERAL INSTALLED CHARACTERISTICS SHALL BE CONSIDERED DIAGRAMMATIC ON THE PLANS. EXACT CONDITIONS SHALL BE DETERMINED IN THE FIELD PRIOR TO ANY INSTALLATION. ANY DIFFERENCES THAT MAY CAUSE SCHEDULE, COST, OR QUALITY SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER OR ENGINEER PRIOR TO ANY WORK.

ALL REFERENCES HEREIN TO VERIFICATION OF ANY CONDITION OF SITE, FIELD, PLANS, OR SPECIFICATIONS PRIOR TO ANY WORK SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR. ANY AND ALL ADDITIONS, MODIFICATIONS, CHANGES, REPAIR, OR DEMOLITION AS A RESULT OF FAILURE TO BRING ANY EXISTING CONDITION NEWERLY TO THE ATTENTION OF THE OWNER OR ENGINEER SHALL BE THE FULL RESPONSIBILITY OF THE CONTRACTOR WITHOUT DELAY, COST, OR CHANGES IN QUALITY.

ALL NOTES THIS SHEET SHALL APPLY UNLESS SPECIFICALLY NOTED OTHERWISE ON THE INCLUDED DRAWINGS OR IN SEPARATE PROJECT SPECIFICATIONS AS APPLICABLE. ALL SPECIFICATIONS SHALL BE CONSIDERED REQUIRED UNLESS APPROVED EQUAL BY THE OWNER, CONSTRUCTION MANAGER, OR ENGINEER AS APPLICABLE.

THE WORDS “PROVIDE” OR “INSTALL” SHALL MEAN FURNISH AND INSTALL.

CONTRACTOR SHALL PROVIDE ALL CUTTING AND PATCHING AS REQUIRED FOR THE INSTALLATION OF HIS WORK. ANY PATCHING SHALL MATCH EXISTING SURROUNDING AREA IN ALL RESPECTS. ALL REMOVED MATERIAL SHALL BE REMOVED FROM THE PREMISES DAILY IN AN APPROVED SAFE MANNER.

ALL SURPLUS MATERIAL SHALL BE REMOVED FROM THE SITE PROMPTLY WHEN DEEMED TO BE SURPLUS.

EVERY CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF HIS WORK AND NEWLY INSTALLED OR EXISTING WORK, INCLUDING PROTECTION OF THE SITE, ALL STRUCTURES, AND ALL OCCUPANTS. FURNISH, INSTALL, MAINTAIN, AND REMOVE AS APNEWRIATE, ALL APNEWRIATE BARRIERS, SAFETY GUARDS, SIGNAGE, AND SECURITY AS REQUIRED.

EVERY CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR RESPECTIVE FEES, PERMITS, INSPECTIONS, TESTING, CERTIFICATES, AND ALL MANAGEMENT OF SAME REQUIRED FOR COMPLETION OF AND LEGAL OCCUPANCY OF THE FINISHED PROJECT.

ALL CONTRACTORS SHALL PROVIDE ALL NECESSARY TOOLS, FIXTURES, SERVICES, MATERIALS, JOB AIDS, AND PERSONNEL REQUIRED FOR THE EXECUTION OF THEIR WORK.

EACH CONTRACTOR SHALL GUARANTEE ALL MATERIALS AND WORKMANSHIP BY THEM TO BE FREE OF DEFECTS AND MAINTAINED FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE OF THE INSTALLATION BY THE OWNER AND ENGINEER.

ALL WORK SHALL BE PERFORMED BY LICENSED CONTRACTORS IN THE TRADE HAVING JURISDICTION.

ANY DEVIATION, MODIFICATION, ADDITION, OR CHANGE IN DESIGN SHALL NOT BE MADE WITHOUT WRITTEN APPROVAL OF THE OWNER OR ENGINEER.

ALL CONTRACTORS SHALL SUBMIT SHOP DRAWINGS OF ALL EQUIPMENT AND MATERIALS TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION AND INSTALLATION, AND SHALL NOT PROCEED UNTIL ENGINEER APPROVAL IN WRITING IS RETURNED. EACH CONTRACTOR SHALL MAINTAIN ON JOB SITE A COMPLETE SET OF SHOP DRAWINGS WITH ANY DEVIATIONS FROM THE ORIGINAL DESIGN SHALL BE NOTED.

ALL MATERIALS AND EQUIPMENT SHALL BE NEW, WITHOUT BLEMISH OR DEFECT, AND SUITABLE AND LISTED FOR THE INSTALLATION AND SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS OR SPECIFICATIONS. ALL ITEMS OF EQUIPMENT OR MATERIAL THAT ARE OF ONE GENERIC TYPE SHALL BE ONE MANUFACTURER THROUGHOUT.

ALL MATERIALS, EQUIPMENT, TOOLS, AND ITEMS UNDER THE CONTRACTOR'S RESPONSIBILITY ON THE JOBSITE SHALL BE ADEQUATELY SECURED, MAINTAINED, AND PROTECTED, SO AS NOT TO BECOME DAMAGED OR CREATE ANY HAZARD TO PERSONNEL OR NEWERTY.

THE CONTRACTORS HOURS OF WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES AND ORDINANCES AND BE APPROVED BY THE OWNER.

CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR ALL OF HIS CREW AND INSURE THAT EVERY CREW MEMBER FOLLOWS SAVE WORK PRACTICES. SAFETY TRAINING SHALL INCLUDE, BUT NOT BE LIMITED TO, FALL PROTECTION, CONFINED SPACE ENTRY, ELECTRICAL SAFETY, AND TRENCHING/EXCAVATION SAFETY WHERE SUCH WORK IS EXECUTED OR ENCOUNTERED.

ALL TEMPORARY WORK REQUIRED OR SPECIFIED AS A PART OF THIS WORK, SHALL MEET ALL OF THE SAME REQUIREMENTS AS PERMANENT INSTALLATIONS, SHALL MEET ALL APPLICABLE CODE REQUIREMENTS, AND SHALL BE COMPLETELY REMOVED AFTER ITS PURPOSES HAVE BEEN SERVED.

ANY EXISTING UTILITY, SERVICE, STRUCTURE, EQUIPMENT, OR FIXTURE OBSTRUCTING THE WORK SHALL BE REMOVED AND/OR RELOCATED AS DIRECTED BY THE CONSTRUCTION MANAGER.

IF ASBESTOS IS ENCOUNTERED DURING WORK EXECUTION, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND CEASE ALL ACTIVITIES IN AFFECTED AREAS UNTIL NOTIFIED BY THE CONSTRUCTION TO RESUME OPERATIONS.

EXIST. 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.

05 STEEL:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

MATERIALS:

WIDE FLANGE	ASTM A992, GR 50
TUBING	ASTM A500, GR B
PIPE	ASTM A53, GR B
BOLTS	ASTM A325
GRATING	TYPE GW-2 (1-1/4"x3/16" BARS)
EXISTING METALS	ASTM A36

PROVIDE CERTIFICATION THAT WELDERS TO BE USED IN WORK ARE LICENSED AND HAVE SATISFACTORILY PASSED AWS QUALIFICATION TEST UNDER THE PROVISIONS OF APPENDIX D, PARTS II AND III OF THE AWS CODE FOR WELDING IN BUILDING CONSTRUCTION.

ALL BUILDING CONNECTION POINTS TO BE CENTERED ON EXISTING STRUCTURAL BEARING POINTS AND THE LOCATIONS ARE TO BE VERIFIED IN FIELD PRIOR TO THE FABRICATION OF STEEL.

DESIGN AND CONSTRUCTION OF STRUCTURAL STEEL SHALL CONFORM TO THE LATEST EDITION OF AISC SPECIFICATION FOR *"THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS"*.

NON-STRUCTURAL CONNECTIONS FOR STEEL GRATING MAY USE 5/8" DIAMETER GALVANIZED ASTM A 307 BOLTS UNLESS OTHERWISE NOTED.

ALL STEEL MATERIAL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT-DIPPED GALVANIZED) COATINGS" ON IRON AND STEEL PRODUCTS WITH A COATING WEIGHT OF 2 OZ/SF.

ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE EXPOSED TO WEATHER SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE."

DAMAGED GALVANIZED SURFACES SHALL BE REPAIRED BY TOUCHING UP ALL DAMAGED GALVANIZED STEEL WITH COLD ZINC, "GALVANOX", "DRY GALV", OR "ZINC IT", IN ACCORDANCE WITH MANUFACTURERS GUIDELINES. TOUCH UP DAMAGED NON-GALVANIZED STEEL WITH SAME PAINT APPLIED IN SHOP OR FIELD.

THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW. FIELD CUTTING OF STRUCTURAL STEEL IS NOT PERMITTED EXCEPT WITH THE PRIOR APPROVAL OF THE ENGINEER.

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

THE STEEL STRUCTURE SHALL BE 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.

ALL STEEL ELEMENTS SHALL BE INSTALLED PLUMB AND LEVEL.

TOWER MANUFACTURER'S DESIGNS SHALL PREVAIL FOR TOWER.

CONNECTIONS SHALL BE DESIGNED BY THE FABRICATOR AND CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF THE AISC *"MANUAL OF STEEL CONSTRUCTION"*. CONNECTIONS SHALL BE PROVIDED TO CONFORM TO THE REQUIREMENTS OF TYPE 2 CONSTRUCTION.

STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE MINIMUM 3/4" DIAMETER AND EACH CONNECTION SHALL HAVE MINIMUM TWO BOLTS. LOCK WASHERS ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES. IF TENSION CONTROL BOLTS ARE USED, CONNECTIONS SHALL BE DESIGNED FOR SLIP CRITICAL BOLT ALLOWABLE LOAD VALUES.

DESIGN CONNECTIONS AT BEAM ENDS FOR 10 KIPS (MIN).

ALL U-BOLTED CONNECTIONS SHALL BE COMPLETED WITH DOUBLE NUTS OR A LOCK WASHER.

CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES, APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS *"STANDARD QUALIFICATION PROCEDURES"*. ALL WELDING SHALL BE PERFORMED USING E70XX ELECTRODES AND SHALL CONFORM TO AISC AND D1.1. WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE LARGER OF 1/4" FILLET OR MINIMUM SIZE PER TABLE J2.4 IN THE AISC *"MANUAL OF STEEL CONSTRUCTION"*. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED. SEE NOTE REGARDING DAMAGED GALVANIZED SURFACES.

ALL ARC AND GAS WELDING SHALL BE DONE BY A LICENSED AND CERTIFIED WELDER IN ACCORDANCE WITH AWS.

SEAL ALL PENETRATIONS AND SEAMS BETWEEN MASONRY AND STEEL WITH DOW CORNING 790 SILICONE BUILDING SEALANT OR EQUAL.

26 GROUNDING:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

GROUND ALL SYSTEMS AND EQUIPMENT IN ACCORDANCE WITH BEST INDUSTRY PRACTICE, THE REQUIREMENTS OF THE NFPA 70 NATIONAL ELECTRICAL CODE (NEC), AND ALL OTHER APPLICABLE CODES AND REGULATIONS.

ALL GROUNDING ELECTRODES PRESENT AT EACH SERVICE LOCATION SHALL BE BONDED TOGETHER TO FORM THE GROUNDING ELECTRODE SYSTEM.

ALL EQUIPMENT ENCLOSURES, DEVICES, AND CONDUITS SHALL BE GROUNDED BY THE INSTALLATION OF A SEPARATE GROUNDING CONDUCTOR FOR ALL FEEDER AND BRANCH CIRCUITS THAT IS SIZED PER CODE OR IS OF THE SIZE INDICATED ON THE DRAWINGS, SHALL BE CONTINUOUS IN LENGTH, AND SHALL BE BONDED TO EACH ENCLOSURE PASSED THROUGH. CONDUIT SHALL NOT BE USED AS A GROUNDING OR BONDING WIRE OR CIRCUIT.

BOND ALL METALLIC CONDUITS TOGETHER THAT ARE CONNECTED TO NON-METALLIC ENCLOSURES, IN-GROUND BOXES, AND TO AN ENCLOSURE WHERE A GROUND BUS IS SPECIFIED OR SUPPLIED. ACCOMPLISH THIS BOND WITH GROUNDING CONDUCTORS MINIMUM SIZED TO THE LARGEST GROUNDING CONDUCTOR PRESENT IN THE ENCLOSURE CONNECTED TO A GROUNDING TYPE BUSHING EQUALLY SIZED OR MAXIMUM GROUND WIRE ACCOMMODATION AVAILABLE IN STANDARD MANUFACTURE FOR THE CONDUIT SIZE, WHICHEVER IS LESS.

EQUIPMENT GROUNDING AND LOAD SIDE BONDING CONDUCTORS SHALL BE SIZED PER THE CIRCUIT'S OVER-CURRENT PROTECTIVE DEVICE (OCPD) SIZE. WHERE THE UNGROUNDED CONDUCTORS ARE INCREASED IN SIZE ABOVE THE STANDARD FOR THE CIRCUIT'S OCPD, INCREASE THE GROUNDING CONDUCTOR NEWORTIONATELY TO THE CROSS-SECTIONAL AREA OF THE UNGROUNDED CONDUCTORS.

SERVICE MAIN BONDING JUMPERS AND GROUNDING ELECTRODE CONDUCTORS SHALL BE SIZED AND INSTALLED PER THE MINIMUM OF ALL APPLICABLE CODES AND REGULATIONS.

26 LIGHTNING PROTECTION:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS AND THE GROUNDING SPECIFICATIONS HEREIN.

THE LIGHTNING PROTECTION GROUNDING SYSTEM (LPGS) SHALL CONSIST OF BONDING ALL EQUIPMENT AND CONDUCTIVE STRUCTURES TO LOCALIZED SINGLE-POINT GROUNDING CONNECTIONS (TYPICALLY GROUND BARS) WHICH ARE BONDED TOGETHER AND TO AN IN-GROUND SYSTEM. IF THE LPGS IS ON A BUILDING, IT SHALL BE EFFECTIVELY BONDED TO THE ELECTRICAL SERVICE MAIN BONDING JUMPER AND TO ADDITIONAL IN-GROUND ELECTRODES AS MAY BE REQUIRED OR INDICATED. IF THE LPGS IS ON A DEDICATED COMMUNICATION SITE, ALL EQUIPMENT AREAS AND TOWERS SHALL EACH HAVE THEIR OWN IN-GROUND RING WITH EVERY RING BONDED TOGETHER, AND ALL CONDUCTIVE STRUCTURES IN CLOSE PROXIMITY (FENCES, ICE BRIDGES, ISOLATED EQUIPMENT, ETC.) ALSO BONDED TO PROVIDE A COMMON ELECTRICAL EQUIPOTENTIAL SYSTEM FOR ALL CONDUCTIVE ELEMENTS AND STRUCTURES.

CONDUCTORS:

- MIN #2 AWG SOLID BARE TINNED COPPER (SBTC) FOR ALL IN-GROUND CONDUCTORS.
- MIN #2 AWG COPPER GREEN STRANDED FOR BONDING STRUCTURES, AND FOR INTER-SYSTEM BONDING OF INDIVIDUAL ELEMENTS SUCH AS GROUND BAR TO GROUND BAR.
- MIN #6 AWG COPPER GREEN STRANDED OR ALL EQUIPMENT BONDING.
- INSTALL ALL IN-GROUND CONDUCTORS IN THE SAME HORIZONTAL PLANE OR IN A DOWNWARD DIRECTION AWAY FROM THE TOWER AND EQUIPMENT AREAS.
- AVOID LONG RUNS. MAKE DIRECT RUNS AS MUCH AS POSSIBLE.
- PLACE THROUGH NON-METALLIC SLEEVES WHEN PASSING THROUGH FLOORS, WALLS, CEILINGS, AND SIMILAR STRUCTURES.
- MAKE ALL CONNECTIONS IN CONTACT WITH EARTH WITH EXOTHERMIC WELDING. MAKE ALL OTHER CONNECTIONS WITH EXOTHERMIC WELDING, IRREVERSIBLE COMPRESSION CONNECTORS, OR LISTED COMPRESSION TWO-HOLE LUGS.
- INSTALL ALL CONDUCTORS WITH A MINIMUM 18 INCH BEND RADIUS AND NO BEND LONGER THAN A 90 DEGREE ARC. ALL BENDS SHALL BE HORIZONTAL, OR DOWNWARD TOWARDS EARTH.
- ALL CONDUCTORS PASSING FROM ABOVE-GROUND TO IN-GROUND CONNECTIONS, WHERE EXPOSED, SHALL BE COVERED AND PROTECTED WITH A NON-METALLIC CONDUIT SEALED AT BOTH ENDS.
- IF 2 OR MORE IN-GROUND CONDUCTOS ARE IN THE SAME PATH (2 RINGS OVERLAPPING, BONDING FOLLOWING ANOTHER RING OR RADIAL, OR SIMILAR), COMBINE WITH A SHARED SINGLE CONDUCTOR.

EQUIPMENT AND TOWER GROUND RINGS SHALL BE:

- BONDED TO ANY CONDUCTIVE OBJECT OR STRUCTURE WITHIN 5 FEET OF EQUIPMENT GROUND RINGS AND WITHIN 20 FEET OF TOWER GROUND RINGS.
- INSTALLED MINIMUM 18 INCHES FROM FOUNDATIONS, FOOTINGS, AND SIMILAR.

INSTALL ALL IN-GROUND RINGS, RADIALS, BONDS CONNECTING THEM, AND ALL SIMILAR GROUNDING:

- MIN 30 INCHES BELOW GRADE, OR 6 INCHES BELOW THE FROST LINE, WHICHEVER IS GREATER DEPTH.
- MIN 2 FEET FROM FOUNDATIONS, FOOTINGS, OTHER GROUNDING SYSTEMS, AND SIMILAR STRUCTURES, EXCEPT WHEN MAKING A BOND TO ANY OF THESE STRUCTURES. DO NOT BOND TO FOUNDATION INTERNAL REINFORCEMENT.

ALL EQUIPMENT GROUPED IN A COMMON AREA, COMPOUND, STRUCTURE, OR SIMILAR SHALL BE BONDED TO A SINGLE-POINT GROUND, PREFERABLY AN ISOLATED GROUND BAR. BOND THE GROUND BAR TO THE SYSTEM WITH MINIMUM SINGLE BONDING CONDUCTOR. IF BONDING TO AN IN-GROUND RING, INSTALL 2 BONDING CONDUCTORS MINIMUM WITH EACH CONDUCTOR INSTALLED DIRECTIONALLY AWAY FROM EACH OTHER AND PARALLEL TO THE IN-GROUND CONDUCTOR, WITH NO TEE CONNECTIONS.

TOWER GROUNDING:

- EACH TOWER LEG SHALL BE BONDED TO ITS RING. SINGLE-LEGGED TOWERS, OR MONOPOLES, SHALL HAVE 2 BONDS ON OPPOSITE SIDES.
- BOND TO TOWER BASE, NOT TO VERTICAL TOWER STRUCTURE, AWAY FROM TOWER MOUNTING HARDWARE.
- EACH BOND SHALL HAVE A CORRESPONDING GROUND ROD ON THE RING.
- EACH BOND SHALL CONSIST OF 2 CONDUCTORS FROM THE TOWER TO ITS RING WITH EACH CONDUCTOR DIRECTED IN OPPOSITE DIRECTIONS WITH A PARALLEL CONNECTION ON THE RING ON OPPOSITE SIDES OF THE GROUND ROD.

EQUIPMENT AREA GROUNDING:

- COMMUNICATION AREAS ON EARTH SHALL HAVE A GROUND RING.
- BOND ALL EQUIPMENT TO A SINGLE-POINT GROUND (GROUND BAR).
- BOND THE EQIPMENT SINGLE-POINT GROUND TO THE EQUIPMENT GROUND RING WITH MINIMUM 2 CONDUCTORS DIRECTED IN OPPOSITE DIRECTIONS WITH PARALLEL CONNECTIONS ON THE RING.
- IF EQUIPMENT IS ENCLOSED IN A SHELTER:
- IF THE SHELTER IS CONSIDERED TO BE EXPOSED TO A DIRECT LIGHTNING STRIKE, INSTALL A BUILDING LIGHTNING PROTECTION SYSTEM PER APPLICABLE VERSION OF NFPA 780.
- BOND ALL FIXED CONDUCTIVE BUILDING COMPONENTS TOGETHER AND TO THE BUILDING RING GROUND AT THE CORNERS. THIS IS TYPICALLY CALLED THE HALO GROUND. DO NOT BOND EQUIPMENT TO THE HALO GROUND.
- BOND ALL EQUIPMENT TOGETHER TO A SINGLE-POINT OR INTERIOR EQUIPMENT RING GROUND (IEGR). BOND THE SINGLE-POINT OR IEGR TO THE EXTERNAL EQUIPMENT RING GROUND.
- PLACE GROUND RODS AT THE EQUIPMENT GROUND RING CORNERS.

GROUND RODS:

- SEPARATION SPACE BETWEEN ANY 2 GROUND RODS SHALL BE NO CLOSER THAN THEIR DEPTH. THIS APPLIES TO ALL RODS IN THE COMPLETE SYSTEM.
- DRIVE VERTICALLY IN UNDISTURBED SOIL WITH THE TOP AT SAME DEPTH AS THE IN-GROUND CONDUCTOR. IF NOT POSSIBLE TO INSTALL VERTICALLY, PLACE AS CLOSE TO VERTICAL AS POSSIBLE AND IN A DIRECTION AWAY FROM THE NEAREST ABOVE-GROUND CONDUCTIVE ELEMENT (TOWER, EQUIPMENT, ETC.).

RADIALS (TYP. NEW DEDICATED COMMUNICATION SITES):

- WHERE FEASIBLE WITH ENOUGH SPACE AVAILABLE, INSTALL A MINIMUM OF 4, MAXIMUM 10 RING RADIALS.
- EACH RADIAL'S LENGTH SHALL BE MIN 20 FT, MAX 80 FT.
- EXTEND RADIALS PERPENDICULAR FROM RINGS IN AS STRAIGHT LINE AS POSSIBLE, AWAY FROM OTHER RING GROUNDS, RADIALS, BONDS, AND SIMILAR.
- A COMMON PRACTICE IS TO PLACE 4 RADIALS FROM THE TOWER RING TO THE 4 CORNERS OF THE AVAILABLE AREA.

AT A MINIMUM, BOND ALL COMPOUND CONDUCTIVE FENCE CORNER POSTS AND GATE POSTS TO THE LPGS. PREFERABLY, INSTALL A GROUND RING THAT FOLLOWS THE FENCE LINE, BONDING ALL POSTS TO THE RING.

27 ANTENNAS & CABLES:

THESE SPECIFICATIONS SHALL INCLUDE THE GENERAL SPECIFICATIONS HEREIN.

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TRANSMISSION CABLES, JUMPERS, CONNECTORS, GROUNDING STRAPS, ANTENNAS, MOUNT 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 JUMPER CABLES WITH OWNER. COORDINATE AND VERIFY ALL OF THE MATERIALS TO BE PROVIDED WITH OWNER PRIOR TO SUBMITTING BID AND ORDERING MATERIALS.

AFTER INSTALLATION, THE TRANSMISSION LINE SYSTEM SHALL BE PIM / SWEEP TESTED FOR NEWER INSTALLATION AND DAMAGE WITH ANTENNAS CONNECTED. CONTRACTOR SHALL OBTAIN AND USE LATEST TESTING PROCEDURES FROM OWNER OR MANUFACTURER PRIOR TO BIDDING.

ANTENNA CABLES SHALL BE UNIQUELY COLOR-CODED AT THE ANTENNAS, BOTH SIDES OF EQUIPMENT SHELTER WALL, AND JUMPER CABLES AT THE EQUIPMENT.

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL CONNECTORS, ASSOCIATED CABLE MOUNTING AND GROUNDING HARDWARE, WALL MOUNTS, STANDOFFS, AND ALL ASSOCIATED HARDWARE TO INSTALL ALL CABLES AND ANTENNAS TO THE MANUFACTURER'S AND OWNER'S SPECIFICATIONS.

ANTENNA CABLES SHALL BE AS FOLLOWS:
EW63, HELIAX® STANDARD ELLIPTICAL WAVEGUIDE, 5.925-7.125 GHz, BLACK PE JACKET:

MATERIAL SPECIFICATIONS

CONDUCTOR MATERIAL:	CORRUGATED COPPER
JACKET MATERIAL:	PE

MECHANICAL SPECIFICATIONS:

MINIMUM BEND RADIUS, MULTIPLE BENDS (E PLANE): 260mm I 10.236"
MINIMUM BEND RADIUS, MULTIPLE BENDS (H PLANE): 740MM I 29.134"
MINIMUM BEND RADIUS, SINGLE BENDS (E PLANE): 180MM I 7.087"
MINIMUM BEND RADIUS, SINGLE BENDS (H PLANE): 510MM I 20.079"
MAXIMUM TWIST: 3.281°/m I 1°/FT

ENVIRONMENTAL SPECIFICATIONS:

INSTALLATION TEMPERATURE:	-40°C TO+60°C(-40°F TO+140°F)
OPERATING TEMPERATURE:	-55°C TO+85°C(-67°F TO+185°F)
STORAGE TEMPERATURE:	-70°C TO+85°C(-94°F TO+185°F)
ATTENUATION, AMBIENT TEMPERATURE:	70°F I 23.889°C
AVERAGE POWER, AMBIENT TEMPERATURE:	104°F I 40°C
AVERAGE POWER, TEMPERATURE RISE:	42°C I 107.6°F

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.

ALL EXTERIOR CABLE CONNECTIONS SHALL BE COVERED WITH A WATERPROOF SPLICING KIT.

CONTRACTOR SHALL VERIFY EXACT LENGTH AND DIRECTION OF TRAVEL IN FIELD PRIOR TO CONSTRUCTION.

CABLE SHALL BE FURNISHED AND INSTALLED WITHOUT SPLICES AND WITH CONNECTORS AT EACH END.

HX8-6W-6GF

2.4m | 8ft ValuLine® High Performance, High XPD Antenna, dual-polarized, 5.925 – 7.125 GHz, grey, CPR137G flange

Product Classification

Product Type	Microwave antenna
Product Brand	ValuLine®

General Specifications

Antenna Type	HX - ValuLine® High Performance, High XPD Antenna, dual-polarized
Polarization	Dual
Antenna Input	CPR137G
Antenna Color	Gray
Reflector Construction	One-piece reflector
Radome Color	Gray
Radome Material	Fabric
Flash Included	Yes
Side Struts, Included	1
Side Struts, Optional	4

Dimensions

Diameter, nominal	2.4 m | 8 ft

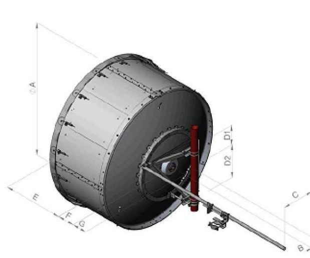
Electrical Specifications

Operating Frequency Band	5.925 – 7.125 GHz
Gain, Low Band	40.8 dBi
Gain, Mid Band	41.6 dBi
Gain, Top Band	42.4 dBi
Boresite Cross Polarization Discrimination (XPD)	33 dB

HX8-6W-6GF

Antenna Dimensions and Mounting Information

HX8

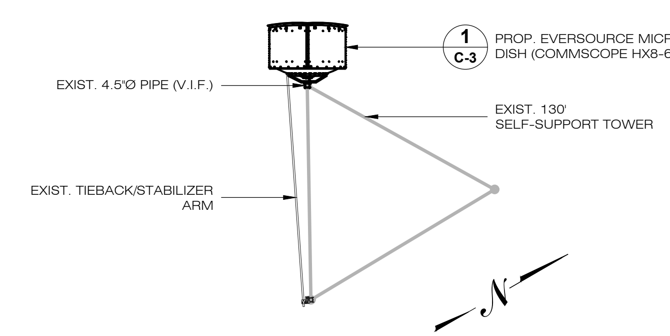


Dimensions in inches (mm)								
Antenna size, ft (m)	A	B	C	D1	D2	E	F	G
8 (2.4)	95.1 (2416)	8.0 (203)	22.5 (572)	14.1 (357)	23.6 (600)	42.4 (1078)	12.1 (306)	10.3 (262)

Wind Forces at Wind Velocity Survival Rating

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

1 C-3 **ANTENNA SPECIFICATIONS**
SCALE : NOT TO SCALE



2 C-3 **ANTENNA SECTION DETAIL**
SCALE : NOT TO SCALE

EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037
OFFICE: (860) 665-6748

ALL-POINTS TECHNOLOGY CORPORATION
567 VAUXHAUL STREET EXTENSION - SUITE 311
WATERFORD, CT 06385 PHONE: (860)-663-1697
WWW.ALLPOINTSTECH.COM FAX: (860)-663-0935

PERMIT DOCUMENTS

NO	DATE	REVISION
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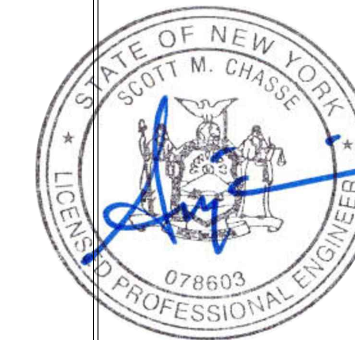
1	10/10/23	FOR FILING
2		
3		
4		
5		
6		



DESIGN PROFESSIONAL OF RECORD

PROF: SCOTT M. CHASSE PE
COMP: ALL-POINTS TECHNOLOGY CORPORATION, P.C.
ADD: 567 VAUXHAUL STREET EXTENSION - SUITE 311 WATERFORD, CT 06385

SOUTH MOUNTAIN SITE UPGRADE

SITE ADDRESS: 790 WILLIS STREET BRISTOL, CT 06010

APT FILING NUMBER: CT2592931

	DRAWN BY: CDC
DATE: 09/29/23	CHECKED BY: KB

SHEET TITLE:

ANTENNA CUT SHEET & NOTES & SPECIFICATIONS

SHEET NUMBER:

C-3

ATTACHMENT C – STRUCTURAL ANALYSIS

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

130-ft Existing ROHN Lattice Tower

Proposed Eversource
Antenna Upgrade

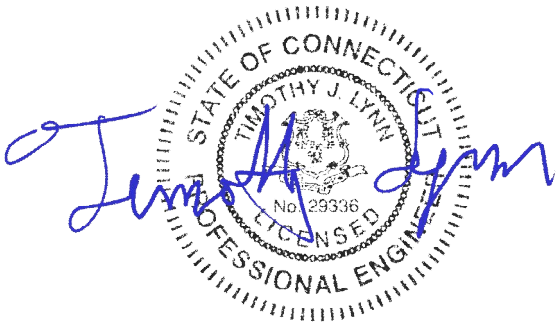
Site Ref: South Mountain

2 Willis Street
Bristol, CT

CENTEK Project No. 23080.03

Date: July 3, 2023

Max Stress Ratio = 81%



Prepared for:
Eversource Energy
107 Selden Street
Berlin, CT 06037

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

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Eversource on the existing lattice tower located in Bristol, Connecticut.

The host tower is a 130-ft three legged, tapered steel lattice tower originally designed and manufactured by ROHN file no: 060-3415 dated January 11, 2007. The tower geometry, structure member sizes and foundation system information were taken from the aforementioned ROHN design documents.

Antenna and appurtenance inventory were obtained from a previous structural analysis report prepared by Centek Engineering job no. 19066.15 dated July 29, 2021 and a previous structural analysis report prepared by Black & Veatch job no. 405025 dated January 13, 2022.

The existing tower consists of seven (7) tapered steel pipe leg sections conforming to ASTM A572-50. Diagonal lateral support bracing consists of steel pipe sections conforming to ASTM A572-50. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by bolted and welded gusset connections. The tower face width is 8.50-ft at the top and 22.54-ft at the bottom.

Antenna and Appurtenance Summary

- EXISTING:
  Antennas: One (1) Lightning rod leg mounted to the top of the existing tower with a base elevation of 130-ft above the existing tower base plate
- Eversource (Existing):
  Antennas: One (1) Comprod 876-70 dipole antenna, one (1) dbspectra DS2C03F36D-D antenna, two (2) RFS PD458-1 Omni antennas, two (2) RFS PD220, one (1) DS5C06F36D-D, one (1) 12-ft x 3in. ∅ Omni antenna, one (1) 21-ft x3in. ∅ Omni antenna and one (1) Sinclair SC229-SFXSN Omni antenna pipe mounted with a base elevation of 130-ft above the existing tower base.
  Coax Cables: Fourteen (14) 7/8” ∅ coax cables
- Eversource (Existing):
  Antennas: One (1) Dish mount assembly, one (1) 6ft-8in. x 4in. pipe mount and one (1) 6-ft ∅ Microwave Dish with a RAD center elevation of 117-ft above the existing tower base.
  Coax Cables: One (1) E60 Elliptical coax cable.
- Eversource (Existing):
  Antennas: Two (2) Celwave 1142-2B Omni antennas on two (2) 4-ft side arms with base elevations of 115-ft and 113-ft above the existing tower base plate
  Coax Cables: One (1) 1/2” ∅ and one (1) 7/8” ∅ coax cables.
- Eversource (Existing):
  Antennas: One (1) 6-ft ∅ Microwave Dish with RAD center elevation of 107-ft above the existing tower base plate
  Coax Cables: One (1) E65 elliptical ∅ coax cable.

- CSP TROOP H (Existing):
  Antennas: Two (2) Kathrein AP11-850/105N panel antennas on one (1) 4-ft side arm with RAD center elevations of 105-ft and 104-ft above the existing tower base plate
  Coax Cables: Two (2) 7/8" ∅ coax cables.
- Eversource (Existing):
  Antennas: One (1) Andrew/Decibel DB205-A Dipole antenna on (1) 4-ft side arm with a RAD center elevation of 98-ft above the existing tower base.
  Coax Cables: One (1) 7/8" ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) Dish mount assembly, one (1) 6ft-8in. x 4in. pipe mount and one (1) 8-ft ∅ Microwave Dish with a RAD center elevation of 96-ft above the existing tower base plate
  Coax Cables: One (1) E60 elliptical ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) 6-ft ∅ Microwave Dish with RAD center elevation of 87-ft above the existing tower base plate
  Coax Cables: One (1) E65 elliptical ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) Celwave 1142-2B Omni antenna mounted on (1) 4-ft side arm with a base elevation of 84-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) 2-ft YAGI antenna pipe mounted with a RAD center elevation of 84-ft above the existing tower base plate.
  Coax Cables: One (1) 7/8" ∅ coax cable.
- CT Transit Authority (Existing):
  Antennas: Three (3) 20-ft x 3in. ∅ Omni antennas [(1)] (one TX upright, two RX inverted) and one (1) Tower Top Amplifier (TTA) mounted to Leg A on (1) 10-ft T-Arm (Valmont P/N EUSF-10-24) with an elevation of 75-ft above the existing tower base.
  Antennas: Three (3) 20-ft x 3in. ∅ Omni antennas [(1)] (one TX upright, two RX inverted) and one (1) Tower Top Amplifier (TTA) mounted to Leg B on (1) 10-ft T-Arm (Valmont P/N EUSF-10-24) with an elevation of 70-ft above the existing tower base.
  Coax Cables: Six (6) 1-5/8" ∅ and two (2) 1/2" ∅ coax cables routed within a waveguide ladder to be located on Tower Face B, adjacent to Leg B. Refer to feed-line plan within Section 3 of this report for location.
- Eversource (Existing):
  Antennas: One (1) Dish mount assembly, one (1) 5ft-8in. x 4in. pipe mount and one (1) 4-ft ∅ Microwave Dish with a RAD center elevation of 71-ft above the existing tower base plate
  Coax Cables: One (1) E65 elliptical ∅ coax cable.

- Eversource (Existing):
  Antennas: (1) Diamond X-500A Omni antenna mounted on one (1) 4-ft side arm with a base elevation of 65-ft above the existing tower base.
  Coax Cables: None/Disconnected.
- Eversource (Existing):
  Antennas: One (1) Andrew/Decibel DB212-1 Dipole antenna mounted on one (1) 3-ft side arm with a RAD center elevation of 58-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) Andrew/Decibel DB212-1 Dipole antenna mounted on one (1) 4-ft side arm with a RAD center elevation of 54-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) DB230-2B Yagi antenna mounted on one (1) 4-ft side arm with a RAD center elevation of 46-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) DB222-C 2-Bay Dipole antenna mounted on one (1) 4-ft side arm with a base elevation of 43-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Eversource (Existing):
  Antennas: One (1) set of Wind Speed cups mounted to the tower leg with a RAD center elevation of 42-ft above the existing tower base.
  Coax Cables: N/A
- T-MOBILE (Existing):
  Antennas: Three (3) Ericsson AIR32 panel antennas, three (3) RFS APXVAALL24_43 panel antennas, three (3) Ericsson AIR6449 panel antennas, three (3) Ericsson 4449 remote radio heads and three (3) Ericsson 4415 remote radio heads mounted on (3) existing 10-ft ROHN boom gates with a RAD center elevation of 125-ft above the existing tower base.
  Coax Cables: Three (3) 6x24 fiber cables running on a face of the tower on a cable ladder as specified in Section 3 of this report.
- **EVERSOURCE (Existing to Remove):**
  Antennas: One (1) Dish mount assembly, one (1) 6ft-8in. x 4in. pipe mount and one (1) 8-ft ∅ Microwave Dish with a RAD center elevation of 86-ft above the existing tower base plate
  Coax Cables: One (1) E60 elliptical ∅ coax cable.
- **EVERSOURCE (Proposed):**
  Antenna: One (1) Commscope HX8-6W-6GF 8-ft ∅ Microwave dish antenna mounted to the leg of the existing tower with a RAD center elevation of ±86-ft above grade level.
  Coax Cable: One (1) EW63 elliptical coax cable running on the face of the existing tower as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

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

Analysis

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

The existing tower was analyzed for the controlling basic wind speed (3-second gust) with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-H entitled "Structural Standard for Antenna Support Structures and Antennas", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

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

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-H, gravity loads of the tower structure and its components, and the application of 1.50" radial ice on the tower structure and its components.

Load Cases:	Load Case 1; 130 mph (Ultimate) wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix P of the 2022 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.50" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-H]*
	Load Case 3; 101 mph (Nominal) wind speed used for deflection calculation.	

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

Tower Capacity

- Calculated stresses were found to be within allowable limits. This tower was found to be at **80.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T6)	20'-0"-40'-0"	70.6%	**PASS**
Diagonal (T4)	60'-0"-80'-0"	80.8%	**PASS**
Horizontal (T5)	40'-0"-60'-0"	59.2%	**PASS**

- The tower combined deflection is **0.2919 degrees**.

Deflection Criteria	Proposed (degrees)	Allowable (degrees)	Result
Sway (Tilt)	0.2834	0.5	**n/a**
Twist	0.0698	0.5	**n/a**
Combined	0.2919	0.5	**PASS**

Note 1: Tower deflection calculated utilizing the service wind load combination and nominal wind speed of 101 mph.

Foundation and Anchors

The existing foundation system consists of one (1) 31-ft square x 4-ft thick reinforced concrete pad bearing on the existing sub grade. The existing foundation geometry and sub-grade properties were obtained from the aforementioned ROHN design documents. The tower legs are connected to the foundation with (8) 1.00"∅, ASTM F1554-105 (Fu = 125ksi) anchor bolts per leg.

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

Load Effect	Proposed Tower Reactions
Leg Shear	30 kips
Leg Compression	221 kips
Leg Tension	199 kips
Base Moment	4077 ft-kips
Base Shear	51 kips

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

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	38.5%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	FS Required [1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad	Overturning	1.00	2.0	**PASS**

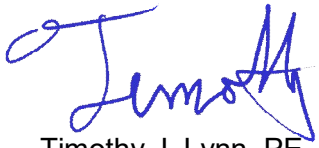
Note 1: FS denotes Factor of Safety

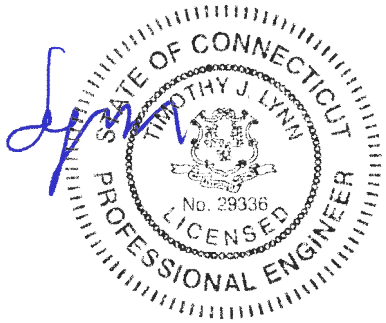
Conclusion

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

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

Please feel free to call with any questions or comments.
Respectfully Submitted by:





Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

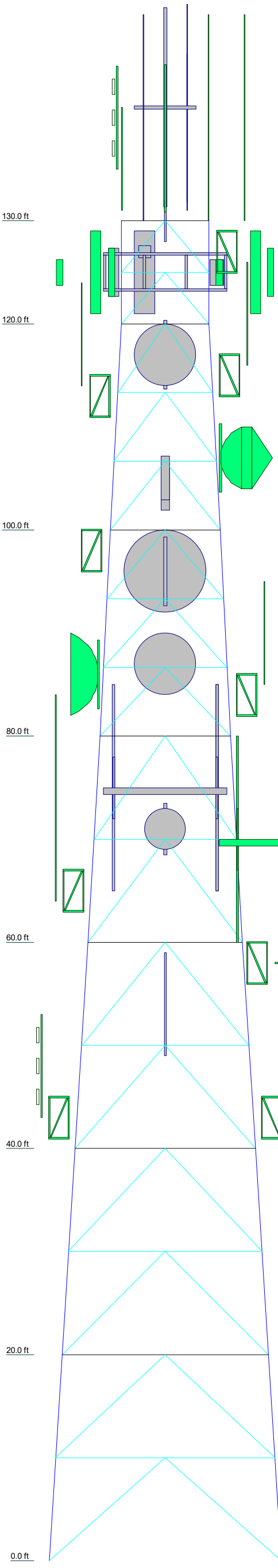
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-H standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	T1	T2	T3	T4	T5	T6	T7						
Legs	ROHN 2.5 STD	ROHN 3 STD	ROHN 4 STD	ROHN 5 STD	ROHN 5 EH	ROHN 6 EHS	ROHN 6 EH						
Leg Grade								A572-50					
Diagonals	ROHN 2 STD	ROHN 2.5 STD		ROHN 2.5 X-STR		ROHN 3 STD							
Diagonal Grade								A572-50					
Top Girts	ROHN 1.5 STD		ROHN 2 STD		ROHN 2.5 STD								
Horizontals	ROHN 1.5 STD		ROHN 2 STD		ROHN 2.5 STD								
Inner Bracing	L2x2x1/8				L2 1/2x2 1/2x3/16		L3x3x3/16	L3 1/2x3 1/2x1/4					
Face Width (ft)	8.5	8.54167	10.625	12.7083	14.9583	17.5417	20.0417	22.5417					
# Panels @ (ft)	2 @ 5	6 @ 6.66667			8 @ 10								
Weight (K)	0.6	1.7	2.0	2.4	2.9	3.5	4.1	17.3					



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
PD458-1 (Eversource)	131	ROHN 4-ft Side Arm (Eversource)	98
PD220 (Eversource)	131	DB205-A (Eversource)	98
6' Standoff Arm (Eversource)	131	6'8"x4" Pipe Mount (Eversource)	96
DS4C06F36D-D (Eversource)	131	Dish Mount Assy (Eversource)	96
12' x 3" Dia Omni (Eversource)	130	8 FT DISH	96
PD458-1 (Eversource)	130	R5 Universal Pipe Mount w/ Angle (Eversource)	87
21' x 3" Dia Omni (Eversource)	130	PAD6-59BC (Eversource)	87
Lightning Rod	130	6'8"x4" Pipe Mount (Eversource)	86
PD220 (Eversource)	130	HX8-6W-6GF (Eversource - Proposed)	86
876-70 (Eversource)	130	Dish Mount Assy (Eversource)	86
DS2C03F36D-D (Eversource)	127	1142-2B (Eversource)	84
SitePro USF-4U (Eversource)	127	ROHN 4-ft Side Arm (Eversource)	84
AIR32 (T-Mobile)	125	2' Yagi (Eversource)	84
AIR32 (T-Mobile)	125	Valmont T-Arm (1) (CT - Transit)	75
AIR32 (T-Mobile)	125	TTA 12"x6"x4" (CT - Transit)	75
AIR6449 (T-Mobile)	125	20' x 3" Dia Omni (CT - Transit)	75
AIR6449 (T-Mobile)	125	20' x 3" Dia Omni (CT - Transit)	75
AIR6449 (T-Mobile)	125	20' x 3" Dia Omni (CT - Transit)	75
Radio 4449 B71 B12 (T-Mobile)	125	6'x2" Pipe Mount (CT - Transit)	75
Radio 4449 B71 B12 (T-Mobile)	125	6'x2" Pipe Mount (CT - Transit)	75
Radio 4449 B71 B12 (T-Mobile)	125	Dish Mount Assy (Eversource)	71
4415 B25 (T-Mobile)	125	4 FT DISH	71
4415 B25 (T-Mobile)	125	5'0"x4.5" Pipe Mount (Eversource)	71
4415 B25 (T-Mobile)	125	20' x 3" Dia Omni (CT - Transit)	70
Rohn 6'x10' Boom Gate (3) (T-Mobile)	125	20' x 3" Dia Omni (CT - Transit)	70
APXVAALL24-43 (T-Mobile)	125	20' x 3" Dia Omni (CT - Transit)	70
APXVAALL24-43 (T-Mobile)	125	TTA 12"x6"x4" (CT - Transit)	70
APXVAALL24-43 (T-Mobile)	125	6'x2" Pipe Mount (CT - Transit)	70
6'8"x4" Pipe Mount (Eversource)	117	6'x2" Pipe Mount (CT - Transit)	70
Dish Mount Assy (Eversource)	117	Valmont T-Arm (1) (CT - Transit)	70
PA6-59	117	ROHN 4-ft Side Arm (Eversource)	65
1142-2B (Eversource)	115	Diamond X-500A (Eversource)	65
ROHN 4-ft Side Arm (Eversource)	115	DB212-1 (Eversource)	58
ROHN 4-ft Side Arm (Eversource)	113	3' Side arm (Eversource)	58
1142-2B (Eversource)	113	ROHN 4-ft Side Arm (Eversource)	54
Dish Mount Assy (Eversource)	107	DB212-1 (Eversource)	54
6'8"x4" Pipe Mount (Eversource)	107	DB230-2B (Eversource)	46
6 FT DISH	107	DB222-C (Eversource)	43
AP11-850/105N (CSP - Troop H)	105	ROHN 4-ft Side Arm (Eversource)	43
ROHN 4-ft Side Arm (Eversource)	104	ROHN 4-ft Side Arm (Eversource)	43
AP11-850/105N (CSP - Troop H)	104	Wind speed cups	42

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi			

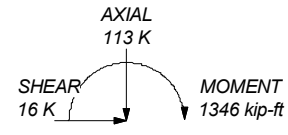
TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 101 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 80.8%

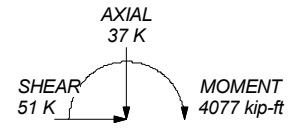
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 221 K
SHEAR: 30 K

UPLIFT: -199 K
SHEAR: 28 K



TORQUE 29 kip-ft
50 mph WIND - 1.5000 in ICE



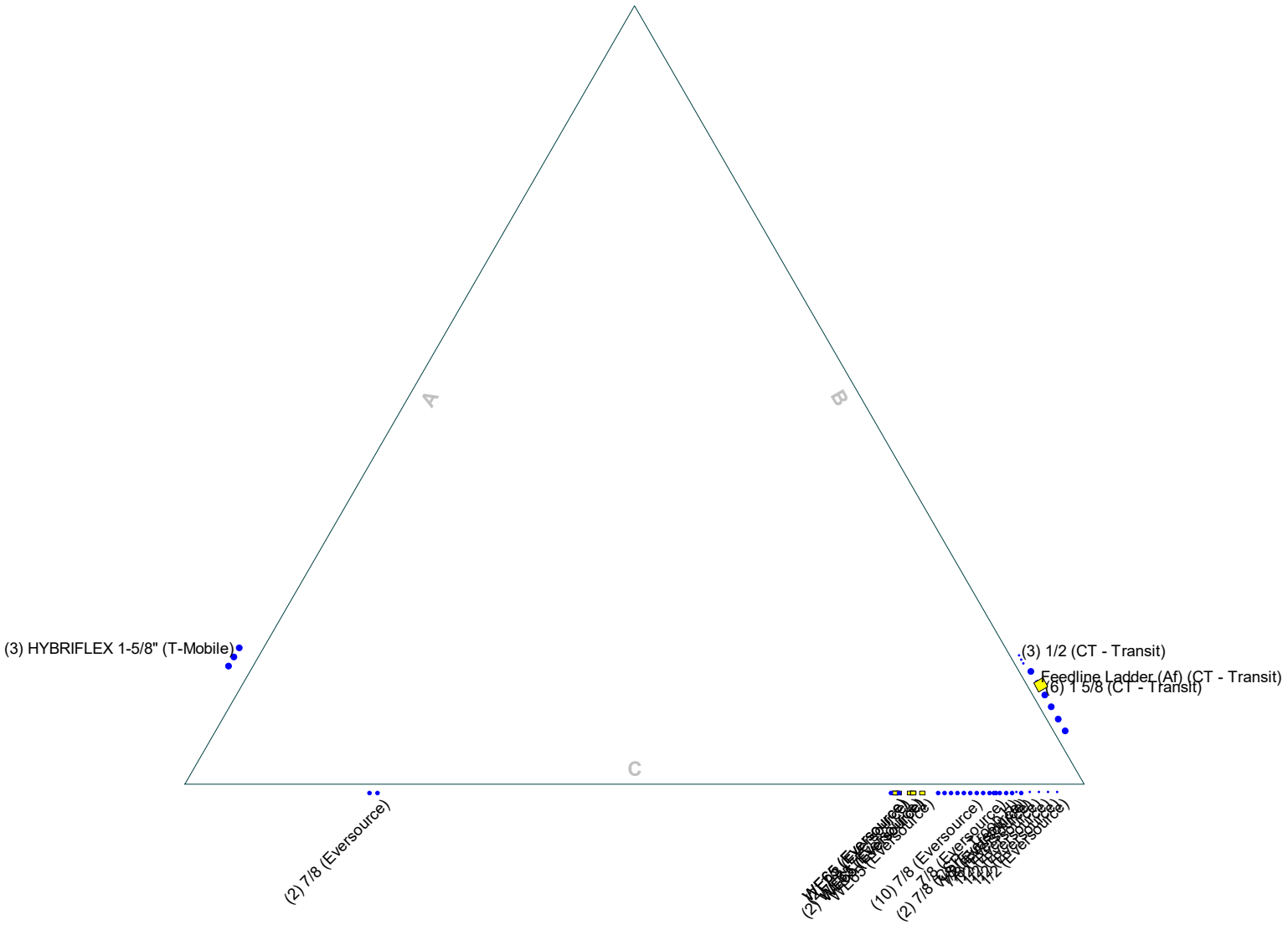
TORQUE 49 kip-ft
REACTIONS - 130 mph WIND

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

Job: ***23080.03 - South Mountain***			
Project: ***130-ft ROHN SSMW Tower, Willis Street, Bristol, CT***			
Client: Eversource	Drawn by: TJL	App'd:	
Code: TIA-222-H	Date: 07/03/23	Scale: NTS	
Path:		Dwg No. E-1	

Feed Line Plan

Round Flat App In Face App Out Face



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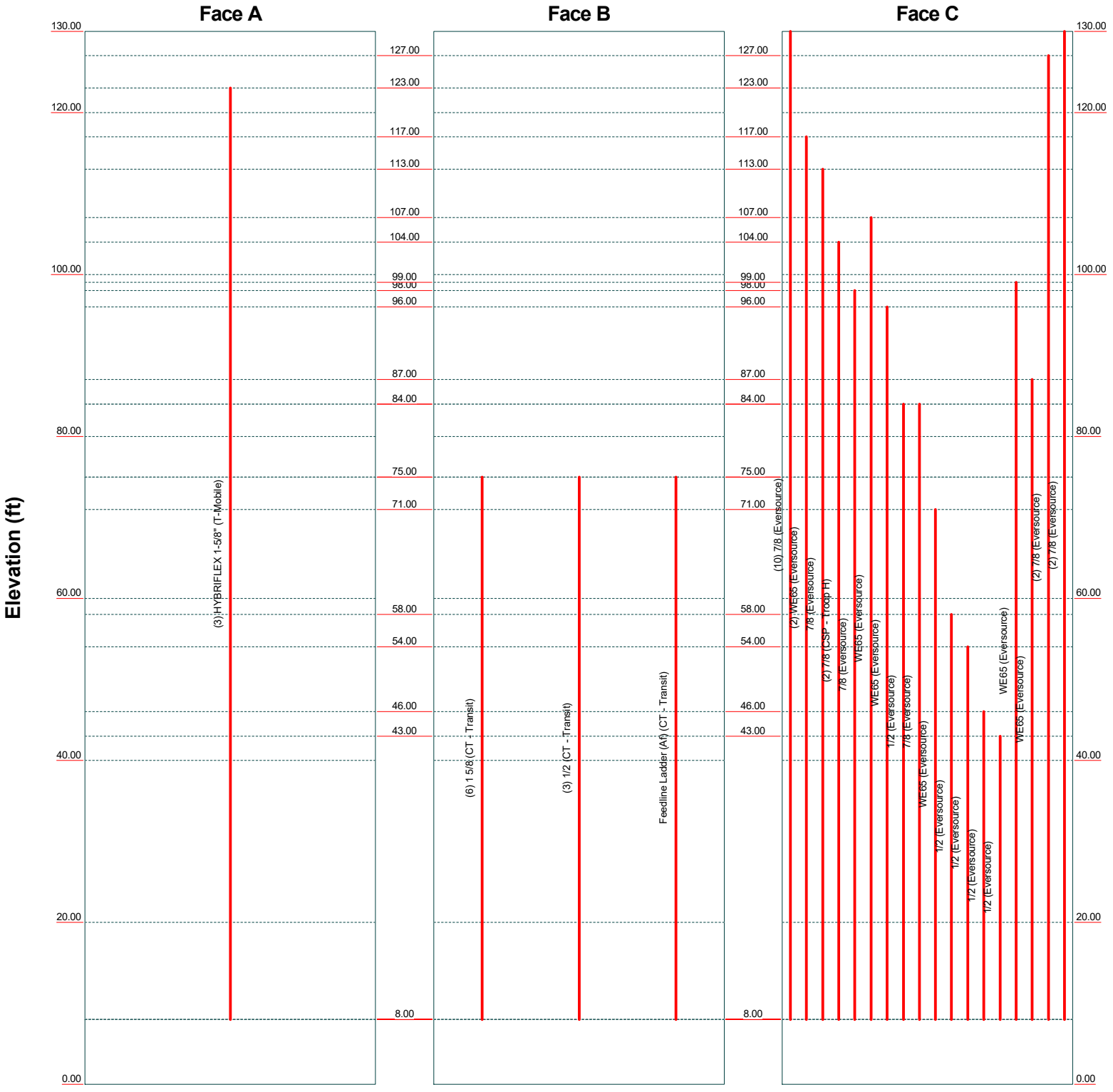
Code: TIA-222-H	Date: 07/03/23	Scale: NTS	
Path:		Dwg No. E-7	

Feed Line Distribution Chart
0' - 130'

Round | Flat | App In Face | App Out Face | Truss Leg



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Code: TIA-222-H	Date: 07/03/23	Scale: NTS	
Path:		Dwg No. E-7	

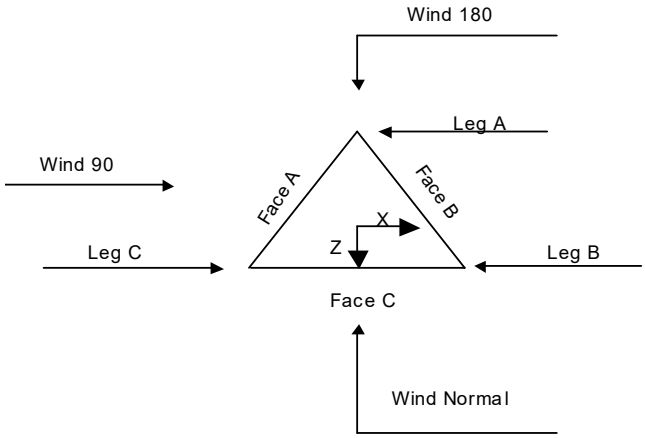
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 130.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 8.50 ft at the top and 22.54 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

Tower base elevation above sea level: 0.00 ft.
Basic wind speed of 130 mph.
Risk Category III.
Exposure Category C.
Simplified Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Category: 1.
Crest Height: 0.00 ft.
Nominal ice thickness of 1.5000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 101 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		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 ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	130.00-120.00			8.50	1	10.00
T2	120.00-100.00			8.54	1	20.00
T3	100.00-80.00			10.63	1	20.00
T4	80.00-60.00			12.71	1	20.00
T5	60.00-40.00			14.96	1	20.00
T6	40.00-20.00			17.54	1	20.00
T7	20.00-0.00			20.04	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	130.00-120.00	5.00	K Brace Down	No	Yes	0.0000	0.0000
T2	120.00-100.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T3	100.00-80.00	6.67	K Brace Down	No	Yes	0.0000	0.0000
T4	80.00-60.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T5	60.00-40.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T6	40.00-20.00	10.00	K Brace Down	No	Yes	0.0000	0.0000
T7	20.00-0.00	10.00	K Brace Down	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 130.00-120.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T2 120.00-100.00	Pipe	ROHN 3 STD	A572-50 (50 ksi)	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)
T3 100.00-80.00	Pipe	ROHN 4 STD	A572-50 (50 ksi)	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)
T4 80.00-60.00	Pipe	ROHN 5 STD	A572-50 (50 ksi)	Pipe	ROHN 2.5 X-STR	A572-50 (50 ksi)
T5 60.00-40.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T6 40.00-20.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 ksi)
T7 20.00-0.00	Pipe	ROHN 6 EH	A572-50 (50 ksi)	Pipe	ROHN 3 STD	A572-50 (50 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 130.00-120.00	Pipe	ROHN 1.5 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T2 120.00-100.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T3 100.00-80.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T4 80.00-60.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T5 60.00-40.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T6 40.00-20.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)
T7 20.00-0.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 130.00-120.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 1.5 STD	A572-50 (50 ksi)
T2 120.00-100.00	None	Flat Bar		A36 (36 ksi)	Pipe	ROHN 2 STD	A572-50 (50 ksi)
T3 100.00-80.00	None	Flat Bar		A36	Pipe	ROHN 2 STD	A572-50

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T4 80.00-60.00	None	Flat Bar		(36 ksi) A36 (36 ksi)	Pipe	ROHN 2 STD	(50 ksi) A572-50 (50 ksi)
T5 60.00-40.00	None	Flat Bar		(36 ksi) A36 (36 ksi)	Pipe	ROHN 2 STD	(50 ksi) A572-50 (50 ksi)
T6 40.00-20.00	None	Flat Bar		(36 ksi) A36 (36 ksi)	Pipe	ROHN 2.5 STD	(50 ksi) A572-50 (50 ksi)
T7 20.00-0.00	None	Flat Bar		(36 ksi) A36 (36 ksi)	Pipe	ROHN 2.5 STD	(50 ksi) A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T1 130.00-120.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T2 120.00-100.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T3 100.00-80.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T4 80.00-60.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T5 60.00-40.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 40.00-20.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T7 20.00-0.00	Solid Round		A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	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 130.00-120.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1	36.0000	36.0000	36.0000
T2 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1	36.0000	36.0000	36.0000
T3 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1	36.0000	36.0000	36.0000
T4 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1	36.0000	36.0000	36.0000
T5 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1	36.0000	36.0000	36.0000
T6 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1.02	1	1	36.0000	36.0000	36.0000
T7 20.00-0.00	0.00	0.0000	A36	1.02	1	1	36.0000	36.0000	36.0000

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft^2	in					in	in	in
			(36 ksi)						

Tower Section Geometry *(cont'd)*

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Single Diags X	K Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
ft															
T1	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
130.00-120.00				1	1	1	1	1	1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1	1	1	1	1	1
T7 20.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1 130.00-120.00	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
T2 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
T3 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
T4 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
T5 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
T6 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
T7 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Elevation ft	Redundant Horizontal		Redundant Diagonal		Redundant Sub-Diagonal		Redundant Sub-Horizontal		Redundant Vertical		Redundant Hip		Redundant Hip Diagonal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 130.00-120.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 120.00-100.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 100.00-80.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 80.00-60.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 60.00-40.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 40.00-20.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 20.00-0.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

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 130.00-120.00	Flange	0.7500 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T2 120.00-100.00	Flange	0.8750 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T3 100.00-80.00	Flange	1.0000 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T4 80.00-60.00	Flange	1.0000 A325N	4	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T5 60.00-40.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T6 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	0.6250 A325N	0
T7 20.00-0.00	Flange	1.0000 F1554-105	8	0.6250 A325N	3	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	2	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
7/8 (Eversource)	C	No	No	Ar (CaAa)	130.00 - 8.00	2.0000	-0.37	10	10	0.7500 1.0000	1.1100		0.54
WE65 (Eversource)	C	No	No	Af (CaAa)	117.00 - 8.00	2.0000	-0.3	2	2	1.5836	1.5836		0.53
7/8 (Eversource)	C	No	No	Ar (CaAa)	113.00 - 8.00	2.0000	-0.4	1	1	0.7500 1.0000	1.1100		0.54
7/8 (CSP - Troop H)	C	No	No	Ar (CaAa)	104.00 - 8.00	2.0000	-0.41	2	2	0.7500 1.0000	1.1100		0.54

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
7/8 (Eversource)	C	No	No	Ar (CaAa)	98.00 - 8.00	2.0000	-0.42	1	1	0.7500 1.0000	1.1100		0.54
WE65 (Eversource)	C	No	No	Af (CaAa)	107.00 - 8.00	2.0000	-0.32	1	1	0.7500 1.0000	1.5836		0.53
WE65 (Eversource)	C	No	No	Af (CaAa)	96.00 - 8.00	2.0000	-0.31	1	1	0.7500 1.0000	1.5836		0.53
1/2 (Eversource)	C	No	No	Ar (CaAa)	84.00 - 8.00	2.0000	-0.425	1	1	0.7500 1.0000	0.5800		0.25
7/8 (Eversource)	C	No	No	Ar (CaAa)	84.00 - 8.00	2.0000	-0.43	1	1	1.1100	1.1100		0.54
WE65 (Eversource)	C	No	No	Af (CaAa)	71.00 - 8.00	2.0000	-0.31	1	1	0.7500 1.0000	1.5836		0.53
1/2 (Eversource)	C	No	No	Ar (CaAa)	58.00 - 8.00	2.0000	-0.44	1	1	0.7500 1.0000	0.5800		0.25
1/2 (Eversource)	C	No	No	Ar (CaAa)	54.00 - 8.00	2.0000	-0.47	1	1	0.5800	0.5800		0.25
1/2 (Eversource)	C	No	No	Ar (CaAa)	46.00 - 8.00	2.0000	-0.46	1	1	0.5800	0.5800		0.25
1/2 (Eversource)	C	No	No	Ar (CaAa)	43.00 - 8.00	2.0000	-0.45	1	1	0.5800	0.5800		0.25
1 5/8 (CT - Transit)	B	No	No	Ar (CaAa)	75.00 - 8.00	2.0000	0.4	6	6	1.9800	1.9800		1.04
1/2 (CT - Transit)	B	No	No	Ar (CaAa)	75.00 - 8.00	2.0000	0.345	3	3	0.7500 1.0000	0.5800		0.25
Feedline Ladder (Af) (CT - Transit)	B	No	No	Af (CaAa)	75.00 - 8.00	2.0000	0.38	1	1	3.0000	3.0000		8.40
WE65 (Eversource)	C	No	No	Af (CaAa)	99.00 - 8.00	2.0000	-0.29	1	1	0.7500 1.0000	1.5836		0.53
HYBRIFLEX 1-5/8" (T-Mobile)	A	No	No	Ar (CaAa)	123.00 - 8.00	5.0000	-0.35	3	3	1.0000	1.9800		1.90
WE65 (Eversource)	C	No	No	Af (CaAa)	87.00 - 8.00	2.0000	-0.29	1	1	0.7500 1.0000	1.5836		0.53
7/8 (Eversource)	C	No	No	Ar (CaAa)	127.00 - 8.00	2.0000	0.29	2	2	1.1100	1.1100		0.54
7/8 (Eversource)	C	No	No	Ar (CaAa)	130.00 - 8.00	2.0000	-0.29	2	2	1.1100	1.1100		0.54

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	130.00-120.00	A	0.000	0.000	1.782	0.000	0.02
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	14.874	0.000	0.07
T2	120.00-100.00	A	0.000	0.000	11.880	0.000	0.11
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	44.232	0.000	0.18
T3	100.00-80.00	A	0.000	0.000	11.880	0.000	0.11
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	67.335	0.000	0.25
T4	80.00-60.00	A	0.000	0.000	11.880	0.000	0.11
		B	0.000	0.000	27.930	0.000	0.23
		C	0.000	0.000	77.915	0.000	0.28

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
T5	60.00-40.00	A	0.000	0.000	11.880	0.000	0.11
		B	0.000	0.000	37.240	0.000	0.31
		C	0.000	0.000	82.668	0.000	0.29
T6	40.00-20.00	A	0.000	0.000	11.880	0.000	0.11
		B	0.000	0.000	37.240	0.000	0.31
		C	0.000	0.000	84.930	0.000	0.30
T7	20.00-0.00	A	0.000	0.000	7.128	0.000	0.07
		B	0.000	0.000	22.344	0.000	0.18
		C	0.000	0.000	50.958	0.000	0.18

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	130.00-120.00	A	1.971	0.000	0.000	4.978	0.000	0.08
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	46.776	0.000	0.64
T2	120.00-100.00	A	1.946	0.000	0.000	33.020	0.000	0.52
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	136.095	0.000	1.82
T3	100.00-80.00	A	1.907	0.000	0.000	32.761	0.000	0.52
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	206.871	0.000	2.78
T4	80.00-60.00	A	1.860	0.000	0.000	32.445	0.000	0.50
		B		0.000	0.000	77.409	0.000	1.28
		C		0.000	0.000	238.267	0.000	3.19
T5	60.00-40.00	A	1.798	0.000	0.000	32.034	0.000	0.49
		B		0.000	0.000	102.175	0.000	1.66
		C		0.000	0.000	256.829	0.000	3.36
T6	40.00-20.00	A	1.709	0.000	0.000	31.436	0.000	0.47
		B		0.000	0.000	100.670	0.000	1.59
		C		0.000	0.000	265.453	0.000	3.35
T7	20.00-0.00	A	1.531	0.000	0.000	18.153	0.000	0.26
		B		0.000	0.000	58.614	0.000	0.87
		C		0.000	0.000	150.154	0.000	1.75

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	130.00-120.00	7.1089	10.0882	7.3293	12.5663
T2	120.00-100.00	6.1534	13.5865	6.3947	16.9996
T3	100.00-80.00	12.5516	18.9584	14.7617	23.3519
T4	80.00-60.00	25.7318	25.0213	29.2192	29.3635
T5	60.00-40.00	31.6095	28.4250	37.3044	34.1502
T6	40.00-20.00	35.0938	31.2820	42.8519	38.4270
T7	20.00-0.00	28.3937	25.2819	37.2035	33.2507

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	2	7/8	120.00 - 130.00	0.6000	0.6000
T1	23	HYBRIFLEX 1-5/8"	120.00 - 123.00	0.6000	0.6000
T1	26	7/8	120.00 - 127.00	0.6000	0.6000
T1	27	7/8	120.00 - 130.00	0.6000	0.6000
T2	2	7/8	100.00 - 120.00	0.6000	0.6000
T2	3	WE65	100.00 - 117.00	0.6000	0.6000
T2	4	7/8	100.00 - 113.00	0.6000	0.6000
T2	5	7/8	100.00 - 104.00	0.6000	0.6000
T2	7	WE65	100.00 - 107.00	0.6000	0.6000
T2	23	HYBRIFLEX 1-5/8"	100.00 - 120.00	0.6000	0.6000
T2	26	7/8	100.00 - 120.00	0.6000	0.6000
T2	27	7/8	100.00 - 120.00	0.6000	0.6000
T3	2	7/8	80.00 - 100.00	0.6000	0.6000
T3	3	WE65	80.00 - 100.00	0.6000	0.6000
T3	4	7/8	80.00 - 100.00	0.6000	0.6000
T3	5	7/8	80.00 - 100.00	0.6000	0.6000
T3	6	7/8	80.00 - 98.00	0.6000	0.6000
T3	7	WE65	80.00 - 100.00	0.6000	0.6000
T3	8	WE65	80.00 - 96.00	0.6000	0.6000
T3	9	1/2	80.00 - 84.00	0.6000	0.6000
T3	10	7/8	80.00 - 84.00	0.6000	0.6000
T3	22	WE65	80.00 - 99.00	0.6000	0.6000
T3	23	HYBRIFLEX 1-5/8"	80.00 - 100.00	0.6000	0.6000
T3	25	WE65	80.00 - 87.00	0.6000	0.6000
T3	26	7/8	80.00 - 100.00	0.6000	0.6000
T3	27	7/8	80.00 - 100.00	0.6000	0.6000
T4	2	7/8	60.00 - 80.00	0.6000	0.6000
T4	3	WE65	60.00 - 80.00	0.6000	0.6000
T4	4	7/8	60.00 - 80.00	0.6000	0.6000
T4	5	7/8	60.00 - 80.00	0.6000	0.6000
T4	6	7/8	60.00 - 80.00	0.6000	0.6000
T4	7	WE65	60.00 - 80.00	0.6000	0.6000
T4	8	WE65	60.00 - 80.00	0.6000	0.6000
T4	9	1/2	60.00 - 80.00	0.6000	0.6000
T4	10	7/8	60.00 - 80.00	0.6000	0.6000
T4	11	WE65	60.00 - 71.00	0.6000	0.6000
T4	17	1 5/8	60.00 - 75.00	0.6000	0.6000
T4	18	1/2	60.00 - 75.00	0.6000	0.6000
T4	19	Feedline Ladder (Af)	60.00 - 75.00	0.6000	0.6000
T4	22	WE65	60.00 - 80.00	0.6000	0.6000
T4	23	HYBRIFLEX 1-5/8"	60.00 - 80.00	0.6000	0.6000
T4	25	WE65	60.00 - 80.00	0.6000	0.6000
T4	26	7/8	60.00 - 80.00	0.6000	0.6000
T4	27	7/8	60.00 - 80.00	0.6000	0.6000
T5	2	7/8	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
T5	3	WE65	40.00 - 60.00	0.6000	0.6000
T5	4	7/8	40.00 - 60.00	0.6000	0.6000
T5	5	7/8	40.00 - 60.00	0.6000	0.6000
T5	6	7/8	40.00 - 60.00	0.6000	0.6000
T5	7	WE65	40.00 - 60.00	0.6000	0.6000
T5	8	WE65	40.00 - 60.00	0.6000	0.6000
T5	9	1/2	40.00 - 60.00	0.6000	0.6000
T5	10	7/8	40.00 - 60.00	0.6000	0.6000
T5	11	WE65	40.00 - 60.00	0.6000	0.6000
T5	13	1/2	40.00 - 58.00	0.6000	0.6000
T5	14	1/2	40.00 - 54.00	0.6000	0.6000
T5	15	1/2	40.00 - 46.00	0.6000	0.6000
T5	16	1/2	40.00 - 43.00	0.6000	0.6000
T5	17	1 5/8	40.00 - 60.00	0.6000	0.6000
T5	18	1/2	40.00 - 60.00	0.6000	0.6000
T5	19	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T5	22	WE65	40.00 - 60.00	0.6000	0.6000
T5	23	HYBRIFLEX 1-5/8"	40.00 - 60.00	0.6000	0.6000
T5	25	WE65	40.00 - 60.00	0.6000	0.6000
T5	26	7/8	40.00 - 60.00	0.6000	0.6000
T5	27	7/8	40.00 - 60.00	0.6000	0.6000
T6	2	7/8	20.00 - 40.00	0.6000	0.6000
T6	3	WE65	20.00 - 40.00	0.6000	0.6000
T6	4	7/8	20.00 - 40.00	0.6000	0.6000
T6	5	7/8	20.00 - 40.00	0.6000	0.6000
T6	6	7/8	20.00 - 40.00	0.6000	0.6000
T6	7	WE65	20.00 - 40.00	0.6000	0.6000
T6	8	WE65	20.00 - 40.00	0.6000	0.6000
T6	9	1/2	20.00 - 40.00	0.6000	0.6000
T6	10	7/8	20.00 - 40.00	0.6000	0.6000
T6	11	WE65	20.00 - 40.00	0.6000	0.6000
T6	13	1/2	20.00 - 40.00	0.6000	0.6000
T6	14	1/2	20.00 - 40.00	0.6000	0.6000
T6	15	1/2	20.00 - 40.00	0.6000	0.6000
T6	16	1/2	20.00 - 40.00	0.6000	0.6000
T6	17	1 5/8	20.00 - 40.00	0.6000	0.6000
T6	18	1/2	20.00 - 40.00	0.6000	0.6000
T6	19	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T6	22	WE65	20.00 - 40.00	0.6000	0.6000
T6	23	HYBRIFLEX 1-5/8"	20.00 - 40.00	0.6000	0.6000
T6	25	WE65	20.00 - 40.00	0.6000	0.6000
T6	26	7/8	20.00 - 40.00	0.6000	0.6000
T6	27	7/8	20.00 - 40.00	0.6000	0.6000
T7	2	7/8	8.00 - 20.00	0.6000	0.6000
T7	3	WE65	8.00 - 20.00	0.6000	0.6000
T7	4	7/8	8.00 - 20.00	0.6000	0.6000
T7	5	7/8	8.00 - 20.00	0.6000	0.6000
T7	6	7/8	8.00 - 20.00	0.6000	0.6000
T7	7	WE65	8.00 - 20.00	0.6000	0.6000
T7	8	WE65	8.00 - 20.00	0.6000	0.6000
T7	9	1/2	8.00 - 20.00	0.6000	0.6000
T7	10	7/8	8.00 - 20.00	0.6000	0.6000
T7	11	WE65	8.00 - 20.00	0.6000	0.6000
T7	13	1/2	8.00 - 20.00	0.6000	0.6000
T7	14	1/2	8.00 - 20.00	0.6000	0.6000
T7	15	1/2	8.00 - 20.00	0.6000	0.6000
T7	16	1/2	8.00 - 20.00	0.6000	0.6000
T7	17	1 5/8	8.00 - 20.00	0.6000	0.6000
T7	18	1/2	8.00 - 20.00	0.6000	0.6000
T7	19	Feedline Ladder (Af)	8.00 - 20.00	0.6000	0.6000
T7	22	WE65	8.00 - 20.00	0.6000	0.6000
T7	23	HYBRIFLEX 1-5/8"	8.00 - 20.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T7	25	WE65	8.00 - 20.00	0.6000	0.6000
T7	26	7/8	8.00 - 20.00	0.6000	0.6000
T7	27	7/8	8.00 - 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
Lightning Rod	A	From Leg	0.00 0.00 0.00	2.0000	130.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.00 2.02 3.05 5.15	1.00 2.02 3.05 5.15	0.04 0.05 0.06 0.12
PD458-1 (Eversource)	B	From Face	0.00 0.00 8.00	0.0000	131.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.88 4.34 5.83 8.84	2.88 4.34 5.83 8.84	0.02 0.05 0.08 0.17
PD220 (Eversource)	B	From Face	0.00 0.00 10.00	0.0000	131.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.08 5.30 7.54 12.06	3.08 5.30 7.54 12.06	0.02 0.05 0.09 0.21
PD220 (Eversource)	B	From Leg	0.00 0.00 10.00	0.0000	130.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.08 5.30 7.54 12.06	3.08 5.30 7.54 12.06	0.02 0.05 0.09 0.21
12' x 3" Dia Omni (Eversource)	C	From Leg	0.00 0.00 6.00	0.0000	130.00	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	0.04 0.06 0.09 0.19
PD458-1 (Eversource)	C	From Face	0.00 0.00 8.00	0.0000	130.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.88 4.34 5.83 8.84	2.88 4.34 5.83 8.84	0.02 0.05 0.08 0.17
21' x 3" Dia Omni (Eversource)	A	From Face	0.00 0.00 10.00	0.0000	130.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.30 8.43 10.58 14.93	6.30 8.43 10.58 14.93	0.05 0.10 0.15 0.31
6' Standoff Arm (Eversource)	A	From Leg	0.00 0.00 10.00	0.0000	131.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.40 2.83 3.26 4.15	0.13 0.18 0.24 0.37	0.05 0.07 0.10 0.17
DS4C06F36D-D (Eversource)	A	From Leg	0.00 0.00 10.00	0.0000	131.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.82 7.79 9.78 13.81	5.82 7.79 9.78 13.81	0.05 0.09 0.15 0.29
APXVAALL24-43 (T-Mobile)	A	From Leg	4.00 -2.00 0.00	0.0000	125.00	No Ice 1/2" Ice 1" Ice 2" Ice	20.24 20.89 21.54 22.87	8.89 9.49 10.09 11.33	0.15 0.27 0.39 0.66
APXVAALL24-43 (T-Mobile)	B	From Leg	4.00 -2.00	0.0000	125.00	No Ice 1/2" Ice	20.24 20.89	8.89 9.49	0.15 0.27

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	21.54	10.09	0.39
						2" Ice	22.87	11.33	0.66
APXVAALL24-43	C	From Leg	4.00	0.0000	125.00	No Ice	20.24	8.89	0.15
(T-Mobile)			-2.00			1/2" Ice	20.89	9.49	0.27
			0.00			1" Ice	21.54	10.09	0.39
						2" Ice	22.87	11.33	0.66
AIR32	A	From Leg	4.00	0.0000	125.00	No Ice	6.51	4.71	0.13
(T-Mobile)			-5.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
						2" Ice	8.06	6.18	0.35
AIR32	B	From Leg	4.00	0.0000	125.00	No Ice	6.51	4.71	0.13
(T-Mobile)			-5.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
						2" Ice	8.06	6.18	0.35
AIR32	C	From Leg	4.00	0.0000	125.00	No Ice	6.51	4.71	0.13
(T-Mobile)			-5.00			1/2" Ice	6.89	5.07	0.18
			0.00			1" Ice	7.27	5.43	0.23
						2" Ice	8.06	6.18	0.35
AIR6449	A	From Leg	4.00	0.0000	125.00	No Ice	4.05	2.74	0.10
(T-Mobile)			5.00			1/2" Ice	4.32	2.97	0.13
			0.00			1" Ice	4.59	3.20	0.17
						2" Ice	5.15	3.68	0.25
AIR6449	B	From Leg	4.00	0.0000	125.00	No Ice	4.05	2.74	0.10
(T-Mobile)			5.00			1/2" Ice	4.32	2.97	0.13
			0.00			1" Ice	4.59	3.20	0.17
						2" Ice	5.15	3.68	0.25
AIR6449	C	From Leg	4.00	0.0000	125.00	No Ice	4.05	2.74	0.10
(T-Mobile)			5.00			1/2" Ice	4.32	2.97	0.13
			0.00			1" Ice	4.59	3.20	0.17
						2" Ice	5.15	3.68	0.25
Radio 4449 B71 B12	A	From Leg	4.00	0.0000	125.00	No Ice	1.64	1.29	0.07
(T-Mobile)			-2.00			1/2" Ice	1.80	1.44	0.09
			2.00			1" Ice	1.97	1.59	0.11
						2" Ice	2.32	1.91	0.16
Radio 4449 B71 B12	B	From Leg	4.00	0.0000	125.00	No Ice	1.64	1.29	0.07
(T-Mobile)			-2.00			1/2" Ice	1.80	1.44	0.09
			2.00			1" Ice	1.97	1.59	0.11
						2" Ice	2.32	1.91	0.16
Radio 4449 B71 B12	C	From Leg	4.00	0.0000	125.00	No Ice	1.64	1.29	0.07
(T-Mobile)			-2.00			1/2" Ice	1.80	1.44	0.09
			2.00			1" Ice	1.97	1.59	0.11
						2" Ice	2.32	1.91	0.16
4415 B25	A	From Leg	4.00	0.0000	125.00	No Ice	1.84	0.82	0.05
(T-Mobile)			-2.00			1/2" Ice	2.01	0.94	0.06
			-2.00			1" Ice	2.19	1.07	0.08
						2" Ice	2.57	1.37	0.12
4415 B25	B	From Leg	4.00	0.0000	125.00	No Ice	1.84	0.82	0.05
(T-Mobile)			-2.00			1/2" Ice	2.01	0.94	0.06
			-2.00			1" Ice	2.19	1.07	0.08
						2" Ice	2.57	1.37	0.12
4415 B25	C	From Leg	4.00	0.0000	125.00	No Ice	1.84	0.82	0.05
(T-Mobile)			-2.00			1/2" Ice	2.01	0.94	0.06
			-2.00			1" Ice	2.19	1.07	0.08
						2" Ice	2.57	1.37	0.12
Rohn 6'x10' Boom Gate (3)	A	From Leg	4.00	0.0000	125.00	No Ice	47.40	47.40	1.62
(T-Mobile)			0.00			1/2" Ice	56.40	56.40	2.01
			0.00			1" Ice	65.40	65.40	2.40

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	83.40	83.40	3.18
6'8"x4" Pipe Mount (Eversource)	A	From Leg	0.50 0.00 0.00	0.0000	117.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.95 3.01 3.42 4.28	1.95 3.01 3.42 4.28	0.07 0.09 0.12 0.19
Dish Mount Assy (Eversource)	A	None		0.0000	117.00	No Ice 1/2" Ice 1" Ice 2" Ice	24.00 30.00 36.00 48.00	24.00 30.00 36.00 48.00	0.42 0.97 1.53 2.64
1142-2B (Eversource)	C	From Leg	4.00 0.00 6.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.12 2.54 3.97 6.88	1.12 2.54 3.97 6.88	0.01 0.02 0.04 0.11
ROHN 4-ft Side Arm (Eversource)	C	From Leg	2.00 0.00 0.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
1142-2B (Eversource)	B	From Leg	4.00 0.00 6.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.12 2.54 3.97 6.88	1.12 2.54 3.97 6.88	0.01 0.02 0.04 0.11
ROHN 4-ft Side Arm (Eversource)	B	From Leg	2.00 0.00 0.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
AP11-850/105N (CSP - Troop H)	A	From Leg	4.00 0.00 0.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.66 4.99 5.33 6.03	2.25 2.57 2.90 3.57	0.01 0.04 0.07 0.15
AP11-850/105N (CSP - Troop H)	A	From Leg	4.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.66 4.99 5.33 6.03	2.25 2.57 2.90 3.57	0.01 0.04 0.07 0.15
ROHN 4-ft Side Arm (Eversource)	A	From Leg	2.00 0.00 0.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
6'8"x4" Pipe Mount (Eversource)	B	From Leg	0.50 0.00 0.00	0.0000	107.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.96 3.01 3.42 4.28	1.96 3.01 3.42 4.28	0.07 0.09 0.12 0.19
Dish Mount Assy (Eversource)	B	None		0.0000	107.00	No Ice 1/2" Ice 1" Ice 2" Ice	24.00 30.00 36.00 48.00	24.00 30.00 36.00 48.00	0.42 0.97 1.53 2.64
ROHN 4-ft Side Arm (Eversource)	C	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
DB205-A (Eversource)	C	From Leg	4.00 0.00 9.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.20 2.16 3.12 5.04	1.20 2.16 3.12 5.04	0.04 0.05 0.06 0.08
2' Yagi (Eversource)	A	From Leg	3.50 0.00 0.00	0.0000	84.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.08 3.79 5.52 9.08	2.08 3.79 5.52 9.08	0.03 0.05 0.08 0.18

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
6'8"x4" Pipe Mount (Eversource)	A	From Leg	0.50 0.00 0.00	0.0000	96.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.98 3.01 3.42 4.28	1.98 3.01 3.42 4.28	0.07 0.09 0.12 0.19
Dish Mount Assy (Eversource)	A	None		0.0000	96.00	No Ice 1/2" Ice 1" Ice 2" Ice	24.00 30.00 36.00 48.00	24.00 30.00 36.00 48.00	0.42 0.97 1.53 2.64
6'8"x4" Pipe Mount (Eversource)	C	From Leg	0.50 0.00 0.00	0.0000	86.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.00 3.01 3.42 4.28	2.00 3.01 3.42 4.28	0.07 0.09 0.12 0.19
Dish Mount Assy (Eversource)	C	None		0.0000	86.00	No Ice 1/2" Ice 1" Ice 2" Ice	24.00 30.00 36.00 48.00	24.00 30.00 36.00 48.00	0.42 0.97 1.53 2.64
1142-2B (Eversource)	B	From Leg	4.00 0.00 6.00	0.0000	84.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.12 2.54 3.97 6.88	1.12 2.54 3.97 6.88	0.01 0.02 0.04 0.11
ROHN 4-ft Side Arm (Eversource)	B	From Leg	2.00 0.00 0.00	0.0000	84.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
5'0"x4.5" Pipe Mount (Eversource)	A	From Leg	0.50 0.00 0.00	0.0000	71.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.44 2.08 2.40 3.07	1.44 2.08 2.40 3.07	0.05 0.07 0.09 0.14
Dish Mount Assy (Eversource)	A	None		0.0000	71.00	No Ice 1/2" Ice 1" Ice 2" Ice	24.00 30.00 36.00 48.00	24.00 30.00 36.00 48.00	0.42 0.97 1.53 2.64
Diamond X-500A (Eversource)	C	From Leg	4.00 0.00 9.00	0.0000	65.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.40 7.23 9.08 12.83	5.40 7.23 9.08 12.83	0.05 0.09 0.14 0.27
ROHN 4-ft Side Arm (Eversource)	C	From Leg	2.00 0.00 0.00	0.0000	65.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
DB212-1 (Eversource)	B	From Leg	3.50 0.00 0.00	0.0000	58.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.40 8.42 12.45 20.57	4.40 8.42 12.45 20.57	0.03 0.07 0.13 0.34
3' Side arm (Eversource)	B	From Leg	1.50 0.00 0.00	0.0000	58.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.90 6.60 7.30 8.70	5.90 6.60 7.30 8.70	0.13 0.15 0.16 0.19
DB212-1 (Eversource)	A	From Leg	4.00 0.00 0.00	0.0000	54.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.40 8.42 12.45 20.57	4.40 8.42 12.45 20.57	0.03 0.07 0.13 0.34
ROHN 4-ft Side Arm (Eversource)	A	From Leg	2.00 0.00 0.00	0.0000	54.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.28 7.88 10.48 15.68	5.28 7.88 10.48 15.68	0.07 0.08 0.10 0.14
DB230-2B	B	From Leg	4.00	0.0000	46.00	No Ice	2.10	2.10	0.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Eversource)			0.00			1/2" Ice	3.78	3.78	0.14
			0.00			1" Ice	5.46	5.46	0.17
						2" Ice	8.82	8.82	0.23
ROHN 4-ft Side Arm	B	From Leg	2.00	0.0000	43.00	No Ice	5.28	5.28	0.07
(Eversource)			0.00			1/2" Ice	7.88	7.88	0.08
			0.00			1" Ice	10.48	10.48	0.10
						2" Ice	15.68	15.68	0.14
DB222-C	C	From Leg	4.00	0.0000	43.00	No Ice	1.60	1.60	0.02
(Eversource)			0.00			1/2" Ice	2.88	2.88	0.02
			5.00			1" Ice	4.16	4.16	0.03
						2" Ice	6.72	6.72	0.04
ROHN 4-ft Side Arm	C	From Leg	2.00	0.0000	43.00	No Ice	5.28	5.28	0.07
(Eversource)			0.00			1/2" Ice	7.88	7.88	0.08
			0.00			1" Ice	10.48	10.48	0.10
						2" Ice	15.68	15.68	0.14
Wind speed cups	B	From Leg	4.00	0.0000	42.00	No Ice	1.80	1.80	0.04
			0.00			1/2" Ice	2.25	2.25	0.05
			0.00			1" Ice	2.70	2.70	0.06
						2" Ice	3.60	3.60	0.08
Valmont T-Arm (1)	A	From Leg	1.50	0.0000	75.00	No Ice	10.54	10.54	0.34
(CT - Transit)			0.00			1/2" Ice	14.45	14.45	0.41
			0.00			1" Ice	18.36	18.36	0.49
						2" Ice	26.18	26.18	0.64
TTA 12"x6"x4"	A	From Leg	3.00	0.0000	75.00	No Ice	0.70	0.47	0.02
(CT - Transit)			0.00			1/2" Ice	0.82	0.57	0.02
			0.00			1" Ice	0.95	0.69	0.03
						2" Ice	1.24	0.95	0.05
TTA 12"x6"x4"	B	From Leg	3.00	0.0000	70.00	No Ice	0.70	0.47	0.02
(CT - Transit)			0.00			1/2" Ice	0.82	0.57	0.02
			0.00			1" Ice	0.95	0.69	0.03
						2" Ice	1.24	0.95	0.05
Valmont T-Arm (1)	B	From Leg	1.50	0.0000	70.00	No Ice	10.54	10.54	0.34
(CT - Transit)			0.00			1/2" Ice	14.45	14.45	0.41
			0.00			1" Ice	18.36	18.36	0.49
						2" Ice	26.18	26.18	0.64
20' x 3" Dia Omni	A	From Leg	3.00	10.0000	75.00	No Ice	6.00	6.00	0.05
(CT - Transit)			5.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
						2" Ice	14.23	14.23	0.30
20' x 3" Dia Omni	A	From Leg	3.00	-10.0000	75.00	No Ice	6.00	6.00	0.05
(CT - Transit)			5.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
						2" Ice	14.23	14.23	0.30
20' x 3" Dia Omni	A	From Leg	3.00	-10.0000	75.00	No Ice	6.00	6.00	0.05
(CT - Transit)			-5.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
						2" Ice	14.23	14.23	0.30
20' x 3" Dia Omni	B	From Leg	3.00	10.0000	70.00	No Ice	6.00	6.00	0.05
(CT - Transit)			5.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
						2" Ice	14.23	14.23	0.30
20' x 3" Dia Omni	B	From Leg	3.00	-10.0000	70.00	No Ice	6.00	6.00	0.05
(CT - Transit)			5.00			1/2" Ice	8.03	8.03	0.09
			0.00			1" Ice	10.08	10.08	0.15
						2" Ice	14.23	14.23	0.30
20' x 3" Dia Omni	B	From Leg	3.00	-10.0000	70.00	No Ice	6.00	6.00	0.05
(CT - Transit)			-5.00			1/2" Ice	8.03	8.03	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	10.08	10.08	0.15
						2" Ice	14.23	14.23	0.30
6'x2" Pipe Mount (CT - Transit)	A	From Leg	3.00 5.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.20 1.80 2.17 2.93	1.20 1.80 2.17 2.93	0.02 0.03 0.04 0.08
6'x2" Pipe Mount (CT - Transit)	A	From Leg	3.00 -5.00 0.00	0.0000	75.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.20 1.80 2.17 2.93	1.20 1.80 2.17 2.93	0.02 0.03 0.04 0.08
6'x2" Pipe Mount (CT - Transit)	B	From Leg	3.00 5.00 0.00	0.0000	70.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.20 1.80 2.17 2.93	1.20 1.80 2.17 2.93	0.02 0.03 0.04 0.08
6'x2" Pipe Mount (CT - Transit)	B	From Leg	3.00 -5.00 0.00	0.0000	70.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.20 1.80 2.17 2.93	1.20 1.80 2.17 2.93	0.02 0.03 0.04 0.08
DS2C03F36D-D (Eversource)	B	From Leg	4.00 0.00 13.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.30 9.77 12.25 17.27	7.30 9.77 12.25 17.27	0.08 0.13 0.20 0.38
SitePro USF-4U (Eversource)	B	From Leg	2.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice 2" Ice	5.75 8.00 10.25 14.75	5.75 8.00 10.25 14.75	0.16 0.21 0.26 0.35
R5 Universal Pipe Mount w/ Angle (Eversource)	A	From Leg	0.50 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.50 2.00 2.50 3.50	1.50 2.00 2.50 3.50	0.20 0.23 0.26 0.33
876-70 (Eversource)	C	From Leg	0.50 0.00 10.00	0.0000	130.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.00 10.00 13.00 19.00	7.00 10.00 13.00 19.00	0.07 0.10 0.13 0.20

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
4 FT DISH	A	Paraboloid w/Radome	From Leg	0.50 0.00 0.00	Worst		71.00	4.00	No Ice 1/2" Ice 1" Ice 2" Ice	12.57 13.10 13.62 14.68	0.14 0.28 0.42 0.71
HX8-6W-6GF (Eversource - Proposed)	C	Paraboloid w/o Radome	From Leg	0.50 0.00 0.00	Worst		86.00	8.00	No Ice 1/2" Ice 1" Ice 2" Ice	50.27 51.32 52.37 54.48	0.70 0.96 1.23 1.75
8 FT DISH	A	Paraboloid	From	0.50	Worst		96.00	8.00	No Ice	50.27	0.47

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
		w/Radome	Leg	0.00					1/2" Ice	51.32	1.01
				0.00					1" Ice	52.37	1.55
									2" Ice	54.48	2.63
6 FT DISH	B	Paraboloid	From	0.50	Worst		107.00	6.00	No Ice	28.27	0.14
		w/Radome	Leg	0.00					1/2" Ice	29.05	0.29
				0.00					1" Ice	29.83	0.44
									2" Ice	31.39	0.74
PA6-59	A	Paraboloid	From	0.50	Worst		117.00	6.00	No Ice	28.27	0.09
		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
									2" Ice	31.39	0.69
PAD6-59BC	A	Paraboloid w/o	From	1.00	Worst		87.00	6.00	No Ice	28.27	0.15
(Eversource)		Radome	Leg	0.00					1/2" Ice	29.07	0.29
				0.00					1" Ice	29.86	0.44
									2" Ice	31.44	0.74

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	125.00	1.326	49	87.604	A	0.000	12.468	4.792	38.43	1.782	0.000
130.00-120.00					B	0.000	12.468		38.43	0.000	0.000
					C	0.000	12.468		38.43	14.874	0.000
T2	110.00	1.291	47	197.508	A	0.000	28.604	11.688	40.86	11.880	0.000
120.00-100.00					B	0.000	28.604		40.86	0.000	0.000
					C	0.000	28.604		40.86	44.232	0.000
T3	90.00	1.238	46	240.843	A	0.000	34.029	15.027	44.16	11.880	0.000
100.00-80.00					B	0.000	34.029		44.16	0.000	0.000
					C	0.000	34.029		44.16	67.335	0.000
T4 80.00-60.00	70.00	1.174	43	285.953	A	0.000	35.085	18.582	52.96	11.880	0.000
					B	0.000	35.085		52.96	27.930	0.000
					C	0.000	35.085		52.96	77.915	0.000
T5 60.00-40.00	50.00	1.094	40	334.291	A	0.000	39.450	18.595	47.13	11.880	0.000
					B	0.000	39.450		47.13	37.240	0.000
					C	0.000	39.450		47.13	82.668	0.000
T6 40.00-20.00	30.00	0.982	36	386.897	A	0.000	46.386	22.141	47.73	11.880	0.000
					B	0.000	46.386		47.73	37.240	0.000
					C	0.000	46.386		47.73	84.930	0.000
T7 20.00-0.00	10.00	0.85	31	436.897	A	0.000	48.658	22.141	45.50	7.128	0.000
					B	0.000	48.658		45.50	22.344	0.000
					C	0.000	48.658		45.50	50.958	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	125.00	1.326	7	1.9707	90.889	A	0.000	32.863	11.361	34.57	4.978	0.000
130.00-120.00						B	0.000	32.863		34.57	0.000	0.000
						C	0.000	32.863		34.57	46.776	0.000
T2	110.00	1.291	7	1.9457	204.002	A	0.000	66.009	24.683	37.39	33.020	0.000
120.00-100.00						B	0.000	66.009		37.39	0.000	0.000
						C	0.000	66.009		37.39	136.095	0.000
T3 100.00-80.00	90.00	1.238	7	1.9070	247.209	A	0.000	73.789	27.764	37.63	32.761	0.000
						B	0.000	73.789		37.63	0.000	0.000
						C	0.000	73.789		37.63	206.871	0.000
T4 80.00-60.00	70.00	1.174	6	1.8597	292.162	A	0.000	70.241	31.007	44.14	32.445	0.000
						B	0.000	70.241		44.14	77.409	0.000
						C	0.000	70.241		44.14	238.267	0.000
T5 60.00-40.00	50.00	1.094	6	1.7982	340.297	A	0.000	75.818	30.616	40.38	32.034	0.000
						B	0.000	75.818		40.38	102.175	0.000
						C	0.000	75.818		40.38	256.829	0.000
T6 40.00-20.00	30.00	0.982	5	1.7086	392.603	A	0.000	83.271	33.561	40.30	31.436	0.000
						B	0.000	83.271		40.30	100.670	0.000
						C	0.000	83.271		40.30	265.453	0.000
T7 20.00-0.00	10.00	0.85	5	1.5309	442.009	A	0.000	83.919	32.373	38.58	18.153	0.000
						B	0.000	83.919		38.58	58.614	0.000
						C	0.000	83.919		38.58	150.154	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	125.00	1.326	29	87.604	A	0.000	12.468	4.792	38.43	1.782	0.000
130.00-120.00					B	0.000	12.468		38.43	0.000	0.000
					C	0.000	12.468		38.43	14.874	0.000
T2	110.00	1.291	29	197.508	A	0.000	28.604	11.688	40.86	11.880	0.000
120.00-100.00					B	0.000	28.604		40.86	0.000	0.000
					C	0.000	28.604		40.86	44.232	0.000
T3	90.00	1.238	27	240.843	A	0.000	34.029	15.027	44.16	11.880	0.000
100.00-80.00					B	0.000	34.029		44.16	0.000	0.000
					C	0.000	34.029		44.16	67.335	0.000
T4 80.00-60.00	70.00	1.174	26	285.953	A	0.000	35.085	18.582	52.96	11.880	0.000
					B	0.000	35.085		52.96	27.930	0.000
					C	0.000	35.085		52.96	77.915	0.000
T5 60.00-40.00	50.00	1.094	24	334.291	A	0.000	39.450	18.595	47.13	11.880	0.000
					B	0.000	39.450		47.13	37.240	0.000
					C	0.000	39.450		47.13	82.668	0.000
T6 40.00-20.00	30.00	0.982	22	386.897	A	0.000	46.386	22.141	47.73	11.880	0.000
					B	0.000	46.386		47.73	37.240	0.000
					C	0.000	46.386		47.73	84.930	0.000
T7 20.00-0.00	10.00	0.85	19	436.897	A	0.000	48.658	22.141	45.50	7.128	0.000
					B	0.000	48.658		45.50	22.344	0.000
					C	0.000	48.658		45.50	50.958	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	49	1	1	7.067	1.23	123.48	C
130.00-120.00			B	0.142	2.8		1	1	7.067			
			C	0.142	2.8		1	1	7.067			
T2	0.30	1.70	A	0.145	2.791	47	1	1	16.035	3.17	158.25	C
120.00-100.00			B	0.145	2.791		1	1	16.035			
			C	0.145	2.791		1	1	16.035			
T3	0.36	2.04	A	0.141	2.804	46	1	1	18.390	3.83	191.71	C
100.00-80.00			B	0.141	2.804		1	1	18.390			
			C	0.141	2.804		1	1	18.390			
T4	0.62	2.37	A	0.123	2.875	43	1	1	17.830	4.47	223.66	C
80.00-60.00			B	0.123	2.875		1	1	17.830			
			C	0.123	2.875		1	1	17.830			
T5	0.72	2.93	A	0.118	2.893	40	1	1	20.397	4.72	236.03	C
60.00-40.00			B	0.118	2.893		1	1	20.397			
			C	0.118	2.893		1	1	20.397			
T6	0.73	3.48	A	0.12	2.885	36	1	1	23.277	4.53	226.58	C
40.00-20.00			B	0.12	2.885		1	1	23.277			
			C	0.12	2.885		1	1	23.277			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	31	1	1	24.940	3.22	160.81	C
			B	0.111	2.919		1	1	24.940			
			C	0.111	2.919		1	1	24.940			
Sum Weight:	3.26	17.31						OTM	1564.84 kip-ft	25.18		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	49	0.825	1	7.067	1.23	123.48	C
130.00-120.00			B	0.142	2.8		0.825	1	7.067			
			C	0.142	2.8		0.825	1	7.067			
T2	0.30	1.70	A	0.145	2.791	47	0.825	1	16.035	3.17	158.25	C
120.00-100.00			B	0.145	2.791		0.825	1	16.035			
			C	0.145	2.791		0.825	1	16.035			
T3	0.36	2.04	A	0.141	2.804	46	0.825	1	18.390	3.83	191.71	C
100.00-80.00			B	0.141	2.804		0.825	1	18.390			
			C	0.141	2.804		0.825	1	18.390			
T4	0.62	2.37	A	0.123	2.875	43	0.825	1	17.830	4.47	223.66	C
80.00-60.00			B	0.123	2.875		0.825	1	17.830			
			C	0.123	2.875		0.825	1	17.830			
T5	0.72	2.93	A	0.118	2.893	40	0.825	1	20.397	4.72	236.03	C
60.00-40.00			B	0.118	2.893		0.825	1	20.397			
			C	0.118	2.893		0.825	1	20.397			
T6	0.73	3.48	A	0.12	2.885	36	0.825	1	23.277	4.53	226.58	C
40.00-20.00			B	0.12	2.885		0.825	1	23.277			
			C	0.12	2.885		0.825	1	23.277			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	31	0.825	1	24.940	3.22	160.81	C
			B	0.111	2.919		0.825	1	24.940			
			C	0.111	2.919		0.825	1	24.940			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
Sum Weight:	3.26	17.31						OTM	1564.84 kip-ft	25.18		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	49	0.8	1	7.067	1.23	123.48	C
130.00-120.00			B	0.142	2.8		0.8	1	7.067			
			C	0.142	2.8		0.8	1	7.067			
T2	0.30	1.70	A	0.145	2.791	47	0.8	1	16.035	3.17	158.25	C
120.00-100.00			B	0.145	2.791		0.8	1	16.035			
			C	0.145	2.791		0.8	1	16.035			
T3	0.36	2.04	A	0.141	2.804	46	0.8	1	18.390	3.83	191.71	C
100.00-80.00			B	0.141	2.804		0.8	1	18.390			
			C	0.141	2.804		0.8	1	18.390			
T4	0.62	2.37	A	0.123	2.875	43	0.8	1	17.830	4.47	223.66	C
80.00-60.00			B	0.123	2.875		0.8	1	17.830			
			C	0.123	2.875		0.8	1	17.830			
T5	0.72	2.93	A	0.118	2.893	40	0.8	1	20.397	4.72	236.03	C
60.00-40.00			B	0.118	2.893		0.8	1	20.397			
			C	0.118	2.893		0.8	1	20.397			
T6	0.73	3.48	A	0.12	2.885	36	0.8	1	23.277	4.53	226.58	C
40.00-20.00			B	0.12	2.885		0.8	1	23.277			
			C	0.12	2.885		0.8	1	23.277			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	31	0.8	1	24.940	3.22	160.81	C
			B	0.111	2.919		0.8	1	24.940			
			C	0.111	2.919		0.8	1	24.940			
Sum Weight:	3.26	17.31						OTM	1564.84 kip-ft	25.18		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	49	0.85	1	7.067	1.23	123.48	C
130.00-120.00			B	0.142	2.8		0.85	1	7.067			
			C	0.142	2.8		0.85	1	7.067			
T2	0.30	1.70	A	0.145	2.791	47	0.85	1	16.035	3.17	158.25	C
120.00-100.00			B	0.145	2.791		0.85	1	16.035			
			C	0.145	2.791		0.85	1	16.035			
T3	0.36	2.04	A	0.141	2.804	46	0.85	1	18.390	3.83	191.71	C
100.00-80.00			B	0.141	2.804		0.85	1	18.390			
			C	0.141	2.804		0.85	1	18.390			
T4	0.62	2.37	A	0.123	2.875	43	0.85	1	17.830	4.47	223.66	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
80.00-60.00			B	0.123	2.875		0.85	1	17.830			
			C	0.123	2.875		0.85	1	17.830			
T5	0.72	2.93	A	0.118	2.893	40	0.85	1	20.397	4.72	236.03	C
60.00-40.00			B	0.118	2.893		0.85	1	20.397			
			C	0.118	2.893		0.85	1	20.397			
T6	0.73	3.48	A	0.12	2.885	36	0.85	1	23.277	4.53	226.58	C
40.00-20.00			B	0.12	2.885		0.85	1	23.277			
			C	0.12	2.885		0.85	1	23.277			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	31	0.85	1	24.940	3.22	160.81	C
			B	0.111	2.919		0.85	1	24.940			
			C	0.111	2.919		0.85	1	24.940			
Sum Weight:	3.26	17.31						OTM	1564.84 kip-ft	25.18		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.71	2.59	A	0.362	2.145	7	1	1	20.390	0.46	45.88	C
130.00-120.00			B	0.362	2.145		1	1	20.390			
			C	0.362	2.145		1	1	20.390			
T2	2.34	5.52	A	0.324	2.235	7	1	1	40.042	1.14	57.01	C
120.00-100.00			B	0.324	2.235		1	1	40.042			
			C	0.324	2.235		1	1	40.042			
T3	3.30	6.32	A	0.298	2.3	7	1	1	44.159	1.40	70.22	C
100.00-80.00			B	0.298	2.3		1	1	44.159			
			C	0.298	2.3		1	1	44.159			
T4	4.98	6.17	A	0.24	2.467	6	1	1	40.930	1.68	84.10	C
80.00-60.00			B	0.24	2.467		1	1	40.930			
			C	0.24	2.467		1	1	40.930			
T5	5.52	7.14	A	0.223	2.522	6	1	1	43.887	1.75	87.32	C
60.00-40.00			B	0.223	2.522		1	1	43.887			
			C	0.223	2.522		1	1	43.887			
T6	5.41	8.06	A	0.212	2.556	5	1	1	48.023	1.64	82.05	C
40.00-20.00			B	0.212	2.556		1	1	48.023			
			C	0.212	2.556		1	1	48.023			
T7 20.00-0.00	2.88	8.51	A	0.19	2.63	5	1	1	48.067	1.03	51.60	C
			B	0.19	2.63		1	1	48.067			
			C	0.19	2.63		1	1	48.067			
Sum Weight:	25.14	44.31						OTM	573.77 kip-ft	9.10		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.71	2.59	A	0.362	2.145	7	0.825	1	20.390	0.46	45.88	C
130.00-120.00			B	0.362	2.145		0.825	1	20.390			
			C	0.362	2.145		0.825	1	20.390			
T2	2.34	5.52	A	0.324	2.235	7	0.825	1	40.042	1.14	57.01	C
120.00-100.00			B	0.324	2.235		0.825	1	40.042			
			C	0.324	2.235		0.825	1	40.042			
T3	3.30	6.32	A	0.298	2.3	7	0.825	1	44.159	1.40	70.22	C
100.00-80.00			B	0.298	2.3		0.825	1	44.159			
			C	0.298	2.3		0.825	1	44.159			
T4	4.98	6.17	A	0.24	2.467	6	0.825	1	40.930	1.68	84.10	C
80.00-60.00			B	0.24	2.467		0.825	1	40.930			
			C	0.24	2.467		0.825	1	40.930			
T5	5.52	7.14	A	0.223	2.522	6	0.825	1	43.887	1.75	87.32	C
60.00-40.00			B	0.223	2.522		0.825	1	43.887			
			C	0.223	2.522		0.825	1	43.887			
T6	5.41	8.06	A	0.212	2.556	5	0.825	1	48.023	1.64	82.05	C
40.00-20.00			B	0.212	2.556		0.825	1	48.023			
			C	0.212	2.556		0.825	1	48.023			
T7 20.00-0.00	2.88	8.51	A	0.19	2.63	5	0.825	1	48.067	1.03	51.60	C
			B	0.19	2.63		0.825	1	48.067			
			C	0.19	2.63		0.825	1	48.067			
Sum Weight:	25.14	44.31						OTM	573.77 kip-ft	9.10		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.71	2.59	A	0.362	2.145	7	0.8	1	20.390	0.46	45.88	C
130.00-120.00			B	0.362	2.145		0.8	1	20.390			
			C	0.362	2.145		0.8	1	20.390			
T2	2.34	5.52	A	0.324	2.235	7	0.8	1	40.042	1.14	57.01	C
120.00-100.00			B	0.324	2.235		0.8	1	40.042			
			C	0.324	2.235		0.8	1	40.042			
T3	3.30	6.32	A	0.298	2.3	7	0.8	1	44.159	1.40	70.22	C
100.00-80.00			B	0.298	2.3		0.8	1	44.159			
			C	0.298	2.3		0.8	1	44.159			
T4	4.98	6.17	A	0.24	2.467	6	0.8	1	40.930	1.68	84.10	C
80.00-60.00			B	0.24	2.467		0.8	1	40.930			
			C	0.24	2.467		0.8	1	40.930			
T5	5.52	7.14	A	0.223	2.522	6	0.8	1	43.887	1.75	87.32	C
60.00-40.00			B	0.223	2.522		0.8	1	43.887			
			C	0.223	2.522		0.8	1	43.887			
T6	5.41	8.06	A	0.212	2.556	5	0.8	1	48.023	1.64	82.05	C
40.00-20.00			B	0.212	2.556		0.8	1	48.023			
			C	0.212	2.556		0.8	1	48.023			
T7 20.00-0.00	2.88	8.51	A	0.19	2.63	5	0.8	1	48.067	1.03	51.60	C
			B	0.19	2.63		0.8	1	48.067			
			C	0.19	2.63		0.8	1	48.067			
Sum Weight:	25.14	44.31						OTM	573.77 kip-ft	9.10		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.71	2.59	A	0.362	2.145	7	0.85	1	20.390	0.46	45.88	C
130.00-120.00			B	0.362	2.145		0.85	1	20.390			
			C	0.362	2.145		0.85	1	20.390			
T2	2.34	5.52	A	0.324	2.235	7	0.85	1	40.042	1.14	57.01	C
120.00-100.00			B	0.324	2.235		0.85	1	40.042			
			C	0.324	2.235		0.85	1	40.042			
T3	3.30	6.32	A	0.298	2.3	7	0.85	1	44.159	1.40	70.22	C
100.00-80.00			B	0.298	2.3		0.85	1	44.159			
			C	0.298	2.3		0.85	1	44.159			
T4	4.98	6.17	A	0.24	2.467	6	0.85	1	40.930	1.68	84.10	C
80.00-60.00			B	0.24	2.467		0.85	1	40.930			
			C	0.24	2.467		0.85	1	40.930			
T5	5.52	7.14	A	0.223	2.522	6	0.85	1	43.887	1.75	87.32	C
60.00-40.00			B	0.223	2.522		0.85	1	43.887			
			C	0.223	2.522		0.85	1	43.887			
T6	5.41	8.06	A	0.212	2.556	5	0.85	1	48.023	1.64	82.05	C
40.00-20.00			B	0.212	2.556		0.85	1	48.023			
			C	0.212	2.556		0.85	1	48.023			
T7 20.00-0.00	2.88	8.51	A	0.19	2.63	5	0.85	1	48.067	1.03	51.60	C
			B	0.19	2.63		0.85	1	48.067			
			C	0.19	2.63		0.85	1	48.067			
Sum Weight:	25.14	44.31						OTM	573.77 kip-ft	9.10		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	29	1	1	7.067	0.75	74.53	C
130.00-120.00			B	0.142	2.8		1	1	7.067			
			C	0.142	2.8		1	1	7.067			
T2	0.30	1.70	A	0.145	2.791	29	1	1	16.219	1.92	96.15	C
120.00-100.00			B	0.145	2.791		1	1	16.219			
			C	0.145	2.791		1	1	16.219			
T3	0.36	2.04	A	0.141	2.804	27	1	1	19.100	2.36	118.04	C
100.00-80.00			B	0.141	2.804		1	1	19.100			
			C	0.141	2.804		1	1	19.100			
T4	0.62	2.37	A	0.123	2.875	26	1	1	18.940	2.77	138.54	C
80.00-60.00			B	0.123	2.875		1	1	18.940			
			C	0.123	2.875		1	1	18.940			
T5	0.72	2.93	A	0.118	2.893	24	1	1	21.522	2.92	145.83	C
60.00-40.00			B	0.118	2.893		1	1	21.522			
			C	0.118	2.893		1	1	21.522			
T6	0.73	3.48	A	0.12	2.885	22	1	1	24.728	2.81	140.65	C
40.00-20.00			B	0.12	2.885		1	1	24.728			
			C	0.12	2.885		1	1	24.728			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	19	1	1	26.319	2.01	100.30	C
			B	0.111	2.919		1	1	26.319			
			C	0.111	2.919		1	1	26.319			
Sum Weight:	3.26	17.31						OTM	961.40 kip-ft	15.54		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	29	0.825	1	7.067	0.75	74.53	C
130.00-120.00			B	0.142	2.8		0.825	1	7.067			
			C	0.142	2.8		0.825	1	7.067			
T2	0.30	1.70	A	0.145	2.791	29	0.825	1	16.219	1.92	96.15	C
120.00-100.00			B	0.145	2.791		0.825	1	16.219			
			C	0.145	2.791		0.825	1	16.219			
T3	0.36	2.04	A	0.141	2.804	27	0.825	1	19.100	2.36	118.04	C
100.00-80.00			B	0.141	2.804		0.825	1	19.100			
			C	0.141	2.804		0.825	1	19.100			
T4	0.62	2.37	A	0.123	2.875	26	0.825	1	18.940	2.77	138.54	C
80.00-60.00			B	0.123	2.875		0.825	1	18.940			
			C	0.123	2.875		0.825	1	18.940			
T5	0.72	2.93	A	0.118	2.893	24	0.825	1	21.522	2.92	145.83	C
60.00-40.00			B	0.118	2.893		0.825	1	21.522			
			C	0.118	2.893		0.825	1	21.522			
T6	0.73	3.48	A	0.12	2.885	22	0.825	1	24.728	2.81	140.65	C
40.00-20.00			B	0.12	2.885		0.825	1	24.728			
			C	0.12	2.885		0.825	1	24.728			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	19	0.825	1	26.319	2.01	100.30	C
			B	0.111	2.919		0.825	1	26.319			
			C	0.111	2.919		0.825	1	26.319			
Sum Weight:	3.26	17.31						OTM	961.40 kip-ft	15.54		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	29	0.8	1	7.067	0.75	74.53	C
130.00-120.00			B	0.142	2.8		0.8	1	7.067			
			C	0.142	2.8		0.8	1	7.067			
T2	0.30	1.70	A	0.145	2.791	29	0.8	1	16.219	1.92	96.15	C
120.00-100.00			B	0.145	2.791		0.8	1	16.219			
			C	0.145	2.791		0.8	1	16.219			
T3	0.36	2.04	A	0.141	2.804	27	0.8	1	19.100	2.36	118.04	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
100.00-80.00			B	0.141	2.804		0.8	1	19.100			
			C	0.141	2.804		0.8	1	19.100			
T4	0.62	2.37	A	0.123	2.875	26	0.8	1	18.940	2.77	138.54	C
80.00-60.00			B	0.123	2.875		0.8	1	18.940			
			C	0.123	2.875		0.8	1	18.940			
T5	0.72	2.93	A	0.118	2.893	24	0.8	1	21.522	2.92	145.83	C
60.00-40.00			B	0.118	2.893		0.8	1	21.522			
			C	0.118	2.893		0.8	1	21.522			
T6	0.73	3.48	A	0.12	2.885	22	0.8	1	24.728	2.81	140.65	C
40.00-20.00			B	0.12	2.885		0.8	1	24.728			
			C	0.12	2.885		0.8	1	24.728			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	19	0.8	1	26.319	2.01	100.30	C
			B	0.111	2.919		0.8	1	26.319			
			C	0.111	2.919		0.8	1	26.319			
Sum Weight:	3.26	17.31						OTM	961.40 kip-ft	15.54		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.09	0.64	A	0.142	2.8	29	0.85	1	7.067	0.75	74.53	C
130.00-120.00			B	0.142	2.8		0.85	1	7.067			
			C	0.142	2.8		0.85	1	7.067			
T2	0.30	1.70	A	0.145	2.791	29	0.85	1	16.219	1.92	96.15	C
120.00-100.00			B	0.145	2.791		0.85	1	16.219			
			C	0.145	2.791		0.85	1	16.219			
T3	0.36	2.04	A	0.141	2.804	27	0.85	1	19.100	2.36	118.04	C
100.00-80.00			B	0.141	2.804		0.85	1	19.100			
			C	0.141	2.804		0.85	1	19.100			
T4	0.62	2.37	A	0.123	2.875	26	0.85	1	18.940	2.77	138.54	C
80.00-60.00			B	0.123	2.875		0.85	1	18.940			
			C	0.123	2.875		0.85	1	18.940			
T5	0.72	2.93	A	0.118	2.893	24	0.85	1	21.522	2.92	145.83	C
60.00-40.00			B	0.118	2.893		0.85	1	21.522			
			C	0.118	2.893		0.85	1	21.522			
T6	0.73	3.48	A	0.12	2.885	22	0.85	1	24.728	2.81	140.65	C
40.00-20.00			B	0.12	2.885		0.85	1	24.728			
			C	0.12	2.885		0.85	1	24.728			
T7 20.00-0.00	0.44	4.15	A	0.111	2.919	19	0.85	1	26.319	2.01	100.30	C
			B	0.111	2.919		0.85	1	26.319			
			C	0.111	2.919		0.85	1	26.319			
Sum Weight:	3.26	17.31						OTM	961.40 kip-ft	15.54		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	6.50					
Bracing Weight	10.80					
Total Member Self-Weight	17.31			-7.33	-14.86	
Total Weight	30.81			-7.33	-14.86	
Wind 0 deg - No Ice		-0.00	-51.28	-4153.07	-14.61	47.67
Wind 30 deg - No Ice		25.49	-44.41	-3597.52	-2070.51	49.25
Wind 45 deg - No Ice		36.05	-36.26	-2938.63	-2922.12	44.97
Wind 60 deg - No Ice		44.16	-25.64	-2079.98	-3575.60	37.63
Wind 90 deg - No Ice		50.99	0.00	-7.07	-4126.60	15.93
Wind 120 deg - No Ice		44.16	25.65	2065.77	-3575.86	-10.04
Wind 135 deg - No Ice		36.06	36.27	2924.34	-2922.48	-22.44
Wind 150 deg - No Ice		25.50	44.41	3583.12	-2070.96	-33.32
Wind 180 deg - No Ice		0.00	51.28	4138.41	-15.12	-47.67
Wind 210 deg - No Ice		-25.49	44.41	3582.86	2040.78	-49.25
Wind 225 deg - No Ice		-36.05	36.26	2923.97	2892.39	-44.97
Wind 240 deg - No Ice		-44.16	25.64	2065.32	3545.87	-37.63
Wind 270 deg - No Ice		-50.99	-0.00	-7.59	4096.87	-15.93
Wind 300 deg - No Ice		-44.16	-25.65	-2080.43	3546.13	10.04
Wind 315 deg - No Ice		-36.06	-36.27	-2939.00	2892.75	22.44
Wind 330 deg - No Ice		-25.50	-44.41	-3597.78	2041.23	33.32
Member Ice	27.00					
Total Weight Ice	106.92			42.00	-119.29	
Wind 0 deg - Ice		-0.00	-15.99	-1208.46	-119.24	23.98
Wind 30 deg - Ice		7.97	-13.85	-1040.91	-741.26	28.51
Wind 45 deg - Ice		11.27	-11.31	-842.18	-998.91	27.91
Wind 60 deg - Ice		13.80	-8.00	-583.19	-1196.61	25.40
Wind 90 deg - Ice		15.94	0.00	42.05	-1363.30	15.49
Wind 120 deg - Ice		13.80	8.00	667.27	-1196.66	1.42
Wind 135 deg - Ice		11.27	11.31	926.24	-998.97	-6.00
Wind 150 deg - Ice		7.97	13.85	1124.95	-741.34	-13.02
Wind 180 deg - Ice		0.00	15.99	1292.46	-119.34	-23.98
Wind 210 deg - Ice		-7.97	13.85	1124.91	502.67	-28.51
Wind 225 deg - Ice		-11.27	11.31	926.17	760.32	-27.91
Wind 240 deg - Ice		-13.80	8.00	667.19	958.03	-25.40
Wind 270 deg - Ice		-15.94	-0.00	41.95	1124.72	-15.49
Wind 300 deg - Ice		-13.80	-8.00	-583.27	958.08	-1.42
Wind 315 deg - Ice		-11.27	-11.31	-842.24	760.39	6.00
Wind 330 deg - Ice		-7.97	-13.85	-1040.95	502.75	13.02
Total Weight	30.81			-7.33	-14.86	
Wind 0 deg - Service		-0.00	-31.34	-2543.05	-3.66	28.76
Wind 30 deg - Service		15.58	-27.14	-2204.83	-1255.42	29.66
Wind 45 deg - Service		22.04	-22.16	-1803.68	-1773.92	27.06
Wind 60 deg - Service		26.99	-15.67	-1280.92	-2171.80	22.61
Wind 90 deg - Service		31.17	0.00	-18.91	-2507.28	9.51
Wind 120 deg - Service		26.99	15.67	1243.07	-2171.96	-6.15
Wind 135 deg - Service		22.04	22.16	1765.78	-1774.15	-13.62
Wind 150 deg - Service		15.58	27.14	2166.85	-1255.69	-20.16
Wind 180 deg - Service		0.00	31.34	2504.92	-3.98	-28.76
Wind 210 deg - Service		-15.58	27.14	2166.70	1247.77	-29.66
Wind 225 deg - Service		-22.04	22.16	1765.55	1766.28	-27.06
Wind 240 deg - Service		-26.99	15.67	1242.79	2164.16	-22.61
Wind 270 deg - Service		-31.17	-0.00	-19.22	2499.64	-9.51
Wind 300 deg - Service		-26.99	-15.67	-1281.20	2164.32	6.15
Wind 315 deg - Service		-22.04	-22.16	-1803.91	1766.50	13.62
Wind 330 deg - Service		-15.58	-27.14	-2204.98	1248.05	20.16

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

Comb. No.	Description
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	130 - 120	Leg	Max Tension	19	3.67	-0.02	0.13
			Max. Compression	35	-9.78	0.05	-0.01
			Max. Mx	28	3.02	-0.35	-0.16
			Max. My	10	-3.90	-0.00	0.52
			Max. Vy	18	-1.36	-0.02	0.13
			Max. Vx	10	2.16	0.00	-0.14
		Diagonal	Max Tension	14	4.27	0.00	0.00
			Max. Compression	14	-4.35	0.00	0.00
			Max. Mx	36	0.89	0.05	0.00
			Max. My	35	-0.10	0.00	-0.00
			Max. Vy	36	0.03	0.00	0.00
			Max. Vx	35	0.00	0.00	0.00
		Horizontal	Max Tension	28	3.12	-0.01	0.00
			Max. Compression	12	-3.08	-0.01	-0.00
			Max. Mx	38	-0.06	-0.04	-0.00
			Max. My	8	-1.36	-0.01	-0.01
			Max. Vy	38	-0.04	-0.04	-0.00
			Max. Vx	18	0.00	-0.01	-0.01
		Top Girt	Max Tension	18	0.75	-0.01	0.00
			Max. Compression	2	-0.73	-0.01	-0.00
			Max. Mx	38	-0.17	-0.03	-0.00
			Max. My	18	-0.36	-0.01	-0.00
			Max. Vy	38	-0.03	-0.03	-0.00
			Max. Vx	18	0.00	-0.01	-0.00
		Inner Bracing	Max Tension	2	0.00	0.00	0.00
			Max. Compression	30	-0.00	0.00	0.00
			Max. Mx	34	-0.00	-0.03	0.00
			Max. My	38	-0.00	0.00	0.00
			Max. Vy	34	0.03	0.00	0.00
			Max. Vx	38	-0.00	0.00	0.00
T2	120 - 100	Leg	Max Tension	9	21.66	-0.08	-0.05
			Max. Compression	2	-28.02	0.45	0.02
			Max. Mx	18	4.17	0.88	0.08
			Max. My	26	-4.40	-0.01	1.26
			Max. Vy	28	0.65	-0.08	0.00
			Max. Vx	20	-1.02	0.01	0.15
		Diagonal	Max Tension	16	7.97	0.00	0.00
			Max. Compression	16	-8.10	0.00	0.00
			Max. Mx	36	1.48	0.10	0.00
			Max. My	28	-1.66	0.00	-0.00
			Max. Vy	36	-0.05	0.00	0.00
			Max. Vx	28	0.00	0.00	0.00
		Horizontal	Max Tension	16	5.02	-0.02	0.00
			Max. Compression	14	-4.98	-0.02	-0.00
			Max. Mx	38	-0.10	-0.07	-0.00
			Max. My	18	-1.16	-0.04	-0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	38	-0.05	-0.07	-0.00
			Max. Vx	18	0.00	-0.04	-0.01
		Top Girt	Max Tension	31	3.40	-0.01	0.00
			Max. Compression	14	-3.61	-0.02	-0.00
			Max. Mx	38	-0.11	-0.05	-0.00
			Max. My	18	-0.77	-0.02	-0.01
			Max. Vy	38	-0.04	-0.05	-0.00
			Max. Vx	18	0.00	-0.02	-0.01
		Inner Bracing	Max Tension	25	0.00	0.00	0.00
			Max. Compression	30	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.04	0.00
			Max. My	38	-0.01	0.00	0.00
			Max. Vy	34	0.03	0.00	0.00
			Max. Vx	38	-0.00	0.00	0.00
T3	100 - 80	Leg	Max Tension	9	49.78	-0.41	-0.16
			Max. Compression	2	-59.61	0.80	-0.06
			Max. Mx	18	26.60	1.08	0.05
			Max. My	26	-5.80	-0.03	1.63
			Max. Vy	8	-1.38	-0.41	-0.16
			Max. Vx	16	-2.37	-0.02	-0.61
		Diagonal	Max Tension	20	11.92	0.00	0.00
			Max. Compression	20	-12.08	0.00	0.00
			Max. Mx	39	2.66	0.13	0.00
			Max. My	28	-1.46	0.00	-0.00
			Max. Vy	39	-0.06	0.00	0.00
			Max. Vx	28	0.00	0.00	0.00
		Horizontal	Max Tension	6	8.39	-0.02	0.00
			Max. Compression	22	-8.45	-0.03	-0.00
			Max. Mx	38	-0.11	-0.08	-0.00
			Max. My	18	-0.90	-0.04	-0.02
			Max. Vy	38	-0.06	-0.08	-0.00
			Max. Vx	18	0.00	-0.04	-0.02
		Top Girt	Max Tension	16	5.64	-0.02	0.00
			Max. Compression	14	-5.61	-0.02	-0.00
			Max. Mx	38	-0.03	-0.07	-0.00
			Max. My	18	-0.99	-0.04	-0.01
			Max. Vy	38	-0.05	-0.07	-0.00
			Max. Vx	18	0.00	-0.04	-0.01
		Inner Bracing	Max Tension	11	0.01	0.00	0.00
			Max. Compression	6	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.06	0.00
			Max. My	38	-0.01	0.00	0.00
			Max. Vy	34	0.04	0.00	0.00
			Max. Vx	38	-0.00	0.00	0.00
T4	80 - 60	Leg	Max Tension	29	81.56	-0.91	-0.28
			Max. Compression	2	-94.83	0.46	-0.08
			Max. Mx	18	58.47	-0.95	0.08
			Max. My	26	-8.14	-0.05	1.45
			Max. Vy	18	0.74	-0.95	0.08
			Max. Vx	4	-1.14	-0.02	-0.82
		Diagonal	Max Tension	16	16.42	0.00	0.00
			Max. Compression	16	-16.65	0.00	0.00
			Max. Mx	39	4.03	0.23	0.00
			Max. My	2	-0.35	0.00	-0.00
			Max. Vy	39	-0.07	0.00	0.00
			Max. Vx	2	0.00	0.00	0.00
		Horizontal	Max Tension	16	9.83	-0.03	0.00
			Max. Compression	14	-9.97	-0.04	-0.00
			Max. Mx	38	-0.51	-0.11	-0.01
			Max. My	18	-1.42	-0.06	-0.02
			Max. Vy	38	-0.06	-0.11	-0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	18	0.00	-0.06	-0.02
		Top Girt	Max Tension	20	8.55	-0.03	0.00
			Max. Compression	22	-8.65	-0.03	-0.00
			Max. Mx	38	-0.09	-0.09	-0.00
			Max. My	18	-0.41	-0.05	-0.02
			Max. Vy	38	-0.06	-0.09	-0.00
			Max. Vx	18	0.00	-0.05	-0.02
		Inner Bracing	Max Tension	11	0.01	0.00	0.00
			Max. Compression	43	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.08	0.00
			Max. My	40	-0.01	0.00	-0.00
			Max. Vy	34	0.04	0.00	0.00
			Max. Vx	38	0.00	0.00	0.00
T5	60 - 40	Leg	Max Tension	9	120.04	-0.66	-0.19
			Max. Compression	2	-135.74	0.64	-0.17
			Max. Mx	28	99.41	-0.70	-0.09
			Max. My	6	-40.36	0.12	-0.97
			Max. Vy	28	-0.23	-0.47	0.23
			Max. Vx	20	0.44	-0.02	0.70
		Diagonal	Max Tension	16	15.03	0.00	0.00
			Max. Compression	16	-15.28	0.00	0.00
			Max. Mx	39	3.94	0.30	0.00
			Max. My	2	0.83	0.00	-0.00
			Max. Vy	39	-0.09	0.00	0.00
			Max. Vx	2	0.00	0.00	0.00
		Horizontal	Max Tension	16	9.88	-0.04	0.00
			Max. Compression	16	-9.93	-0.04	-0.00
			Max. Mx	38	-0.57	-0.13	-0.00
			Max. My	18	-1.33	-0.06	-0.02
			Max. Vy	38	-0.07	-0.13	-0.00
			Max. Vx	18	0.00	-0.06	-0.02
		Top Girt	Max Tension	16	9.47	-0.03	0.00
			Max. Compression	16	-9.57	-0.03	0.00
			Max. Mx	38	-0.67	-0.11	-0.00
			Max. My	18	-1.39	-0.06	-0.02
			Max. Vy	38	-0.07	-0.11	-0.00
			Max. Vx	18	0.00	-0.06	-0.02
		Inner Bracing	Max Tension	27	0.00	0.00	0.00
			Max. Compression	43	-0.01	0.00	0.00
			Max. Mx	34	-0.01	-0.13	0.00
			Max. My	40	-0.01	0.00	-0.00
			Max. Vy	34	0.06	0.00	0.00
			Max. Vx	38	0.00	0.00	0.00
T6	40 - 20	Leg	Max Tension	9	153.85	-0.66	-0.17
			Max. Compression	2	-172.24	0.46	-0.11
			Max. Mx	28	134.07	-0.68	0.16
			Max. My	6	-45.43	0.12	-0.97
			Max. Vy	28	-0.12	-0.67	0.01
			Max. Vx	4	-0.23	-0.02	-0.83
		Diagonal	Max Tension	17	14.91	0.00	0.00
			Max. Compression	16	-15.24	0.00	0.00
			Max. Mx	39	4.11	0.35	0.00
			Max. My	2	1.28	0.00	-0.00
			Max. Vy	39	-0.10	0.00	0.00
			Max. Vx	2	0.00	0.00	0.00
		Horizontal	Max Tension	16	10.44	-0.08	-0.00
			Max. Compression	17	-10.48	-0.06	-0.00
			Max. Mx	38	-0.70	-0.21	-0.01
			Max. My	18	-1.49	-0.12	-0.02
			Max. Vy	38	-0.10	-0.21	-0.01
			Max. Vx	18	0.00	-0.12	-0.02

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Top Girt	Max Tension	16	10.26	-0.07	-0.00
			Max. Compression	17	-10.31	-0.05	-0.00
			Max. Mx	38	-0.63	-0.19	-0.01
			Max. My	18	-1.36	-0.12	-0.02
			Max. Vy	38	-0.09	-0.19	-0.01
			Max. Vx	18	0.00	-0.12	-0.02
		Inner Bracing	Max Tension	21	0.00	0.00	0.00
			Max. Compression	48	-0.02	0.00	0.00
			Max. Mx	34	-0.01	-0.19	0.00
			Max. My	38	-0.01	0.00	0.00
			Max. Vy	34	0.08	0.00	0.00
			Max. Vx	38	-0.00	0.00	0.00
T7	20 - 0	Leg	Max Tension	19	184.79	-0.83	0.09
			Max. Compression	2	-206.22	0.00	-0.00
			Max. Mx	28	165.53	-0.84	0.01
			Max. My	4	-10.76	-0.04	-0.89
			Max. Vy	28	-0.17	-0.84	0.02
			Max. Vx	4	-0.23	-0.04	-0.89
		Diagonal	Max Tension	17	14.35	0.00	0.00
			Max. Compression	16	-14.75	0.00	0.00
			Max. Mx	47	4.57	0.39	0.00
			Max. My	2	1.44	0.00	-0.00
			Max. Vy	47	-0.10	0.00	0.00
			Max. Vx	2	0.00	0.00	0.00
		Horizontal	Max Tension	32	10.64	-0.10	-0.00
			Max. Compression	33	-10.62	-0.08	-0.00
			Max. Mx	38	-0.65	-0.20	-0.01
			Max. My	18	-1.51	-0.13	-0.02
			Max. Vy	38	-0.10	-0.20	-0.01
			Max. Vx	18	0.00	-0.13	-0.02
		Top Girt	Max Tension	16	10.56	-0.09	-0.00
			Max. Compression	17	-10.56	-0.07	-0.00
			Max. Mx	38	-0.79	-0.21	-0.01
			Max. My	18	-1.53	-0.12	-0.02
			Max. Vy	38	-0.10	-0.21	-0.01
			Max. Vx	18	0.00	-0.12	-0.02
		Inner Bracing	Max Tension	21	0.00	0.00	0.00
			Max. Compression	48	-0.02	0.00	0.00
			Max. Mx	34	-0.01	-0.27	0.00
			Max. My	8	-0.01	0.00	0.00
			Max. Vy	34	0.10	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	24	218.37	26.53	-14.23
	Max. H_x	24	218.37	26.53	-14.23
	Max. H_z	7	-191.63	-23.62	13.81
	Min. Vert	9	-198.48	-25.03	13.33
	Min. H_x	9	-198.48	-25.03	13.33
	Min. H_z	22	211.51	25.17	-14.68
Leg B	Max. Vert	12	219.98	-25.95	-15.30
	Max. H_x	29	-197.32	24.40	14.39
	Max. H_z	31	-190.46	22.74	15.32

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg A	Min. Vert	29	-197.32	24.40	14.39
	Min. H_x	12	219.98	-25.95	-15.30
	Min. H_z	14	213.12	-24.33	-16.18
	Max. Vert	2	221.17	1.22	30.26
	Max. H_x	26	12.79	4.57	1.17
	Max. H_z	2	221.17	1.22	30.26
	Min. Vert	19	-198.70	-1.23	-28.46
	Min. H_x	13	-94.57	-4.60	-13.77
	Min. H_z	19	-198.70	-1.23	-28.46

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	30.81	0.00	0.00	-7.35	-14.87	-0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	36.97	-0.00	-51.28	-4076.96	-17.64	47.71
0.9 Dead+1.0 Wind 0 deg - No Ice	27.73	-0.00	-51.28	-4072.66	-13.17	47.70
1.2 Dead+1.0 Wind 30 deg - No Ice	36.97	25.49	-44.41	-3531.78	-2034.67	49.24
0.9 Dead+1.0 Wind 30 deg - No Ice	27.73	25.49	-44.41	-3527.76	-2029.18	49.24
1.2 Dead+1.0 Wind 45 deg - No Ice	36.97	36.05	-36.26	-2885.23	-2870.18	44.93
0.9 Dead+1.0 Wind 45 deg - No Ice	27.73	36.05	-36.26	-2881.54	-2864.25	44.94
1.2 Dead+1.0 Wind 60 deg - No Ice	36.97	44.16	-25.64	-2042.67	-3511.30	37.56
0.9 Dead+1.0 Wind 60 deg - No Ice	27.73	44.16	-25.64	-2039.40	-3505.05	37.58
1.2 Dead+1.0 Wind 90 deg - No Ice	36.97	50.99	0.00	-8.61	-4051.88	15.82
0.9 Dead+1.0 Wind 90 deg - No Ice	27.73	50.99	0.00	-6.38	-4045.36	15.85
1.2 Dead+1.0 Wind 120 deg - No Ice	36.97	44.16	25.65	2025.38	-3511.58	-10.16
0.9 Dead+1.0 Wind 120 deg - No Ice	27.73	44.16	25.65	2026.58	-3505.32	-10.13
1.2 Dead+1.0 Wind 135 deg - No Ice	36.97	36.06	36.27	2867.87	-2870.56	-22.56
0.9 Dead+1.0 Wind 135 deg - No Ice	27.73	36.06	36.27	2868.64	-2864.64	-22.53
1.2 Dead+1.0 Wind 150 deg - No Ice	36.97	25.50	44.41	3514.31	-2035.15	-33.41
0.9 Dead+1.0 Wind 150 deg - No Ice	27.73	25.50	44.41	3514.75	-2029.65	-33.39
1.2 Dead+1.0 Wind 180 deg - No Ice	36.97	0.00	51.28	4059.23	-18.19	-47.71
0.9 Dead+1.0 Wind 180 deg - No Ice	27.73	0.00	51.28	4059.39	-13.71	-47.70
1.2 Dead+1.0 Wind 210 deg - No Ice	36.97	-25.49	44.41	3514.09	1998.86	-49.24
0.9 Dead+1.0 Wind 210 deg - No Ice	27.73	-25.49	44.41	3514.53	2002.31	-49.24
1.2 Dead+1.0 Wind 225 deg -	36.97	-36.05	36.26	2867.55	2834.39	-44.94

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
No Ice						
0.9 Dead+1.0 Wind 225 deg - No Ice	27.73	-36.05	36.26	2868.31	2837.42	-44.95
1.2 Dead+1.0 Wind 240 deg - No Ice	36.97	-44.16	25.64	2024.97	3475.54	-37.57
0.9 Dead+1.0 Wind 240 deg - No Ice	27.73	-44.16	25.64	2026.17	3478.24	-37.59
1.2 Dead+1.0 Wind 270 deg - No Ice	36.97	-50.99	-0.00	-9.13	4016.15	-15.82
0.9 Dead+1.0 Wind 270 deg - No Ice	27.73	-50.99	-0.00	-6.90	4018.57	-15.85
1.2 Dead+1.0 Wind 300 deg - No Ice	36.97	-44.16	-25.65	-2043.16	3475.82	10.17
0.9 Dead+1.0 Wind 300 deg - No Ice	27.73	-44.16	-25.65	-2039.89	3478.51	10.13
1.2 Dead+1.0 Wind 315 deg - No Ice	36.97	-36.06	-36.27	-2885.65	2834.79	22.56
0.9 Dead+1.0 Wind 315 deg - No Ice	27.73	-36.06	-36.27	-2881.95	2837.80	22.53
1.2 Dead+1.0 Wind 330 deg - No Ice	36.97	-25.50	-44.41	-3532.09	1999.35	33.41
0.9 Dead+1.0 Wind 330 deg - No Ice	27.73	-25.50	-44.41	-3528.06	2002.79	33.39
1.2 Dead+1.0 Ice+1.0 Temp	113.08	0.00	0.00	40.34	-122.85	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	113.08	-0.00	-15.99	-1183.55	-122.95	24.09
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	113.08	7.97	-13.85	-1019.55	-731.66	28.59
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	113.08	11.27	-11.31	-825.04	-983.79	27.96
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	113.08	13.80	-8.00	-571.55	-1177.27	25.43
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	113.08	15.94	0.00	40.41	-1340.39	15.46
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	113.08	13.80	8.00	652.37	-1177.32	1.35
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	113.08	11.27	11.31	905.85	-983.86	-6.10
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	113.08	7.97	13.85	1100.35	-731.74	-13.13
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	113.08	0.00	15.99	1264.31	-123.05	-24.08
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	113.08	-7.97	13.85	1100.32	485.65	-28.59
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	113.08	-11.27	11.31	905.81	737.79	-27.97
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	113.08	-13.80	8.00	652.33	931.27	-25.44
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	113.08	-15.94	-0.00	40.36	1094.40	-15.46
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	113.08	-13.80	-8.00	-571.61	931.33	-1.35
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	113.08	-11.27	-11.31	-825.09	737.87	6.10
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	113.08	-7.97	-13.85	-1019.59	485.74	13.13
Dead+Wind 0 deg - Service	30.81	-0.00	-31.34	-2482.87	-14.74	28.79
Dead+Wind 30 deg - Service	30.81	15.58	-27.14	-2151.13	-1242.22	29.66
Dead+Wind 45 deg - Service	30.81	22.04	-22.16	-1757.69	-1750.67	27.04
Dead+Wind 60 deg - Service	30.81	26.99	-15.67	-1244.98	-2140.84	22.58
Dead+Wind 90 deg - Service	30.81	31.17	0.00	-7.22	-2469.82	9.45

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
Dead+Wind 120 deg - Service	30.81	26.99	15.67	1230.50	-2141.00	-6.21
Dead+Wind 135 deg - Service	30.81	22.04	22.16	1743.16	-1750.90	-13.68
Dead+Wind 150 deg - Service	30.81	15.58	27.14	2136.53	-1242.51	-20.21
Dead+Wind 180 deg - Service	30.81	0.00	31.34	2468.11	-15.07	-28.79
Dead+Wind 210 deg - Service	30.81	-15.58	27.14	2136.39	1212.42	-29.66
Dead+Wind 225 deg - Service	30.81	-22.04	22.16	1742.95	1720.88	-27.05
Dead+Wind 240 deg - Service	30.81	-26.99	15.67	1230.24	2111.06	-22.58
Dead+Wind 270 deg - Service	30.81	-31.17	-0.00	-7.53	2440.05	-9.45
Dead+Wind 300 deg - Service	30.81	-26.99	-15.67	-1245.27	2111.23	6.21
Dead+Wind 315 deg - Service	30.81	-22.04	-22.16	-1757.93	1721.12	13.68
Dead+Wind 330 deg - Service	30.81	-15.58	-27.14	-2151.30	1212.71	20.21

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	-30.81	0.00	0.00	30.81	0.00	0.000%
2	-0.00	-36.97	-51.28	0.00	36.97	51.28	0.000%
3	-0.00	-27.73	-51.28	0.00	27.73	51.28	0.000%
4	25.49	-36.97	-44.41	-25.49	36.97	44.41	0.000%
5	25.49	-27.73	-44.41	-25.49	27.73	44.41	0.000%
6	36.05	-36.97	-36.26	-36.05	36.97	36.26	0.000%
7	36.05	-27.73	-36.26	-36.05	27.73	36.26	0.000%
8	44.16	-36.97	-25.64	-44.16	36.97	25.64	0.000%
9	44.16	-27.73	-25.64	-44.16	27.73	25.64	0.000%
10	50.99	-36.97	0.00	-50.99	36.97	-0.00	0.000%
11	50.99	-27.73	0.00	-50.99	27.73	-0.00	0.000%
12	44.16	-36.97	25.65	-44.16	36.97	-25.65	0.000%
13	44.16	-27.73	25.65	-44.16	27.73	-25.65	0.000%
14	36.06	-36.97	36.27	-36.06	36.97	-36.27	0.000%
15	36.06	-27.73	36.27	-36.06	27.73	-36.27	0.000%
16	25.50	-36.97	44.41	-25.50	36.97	-44.41	0.000%
17	25.50	-27.73	44.41	-25.50	27.73	-44.41	0.000%
18	0.00	-36.97	51.28	-0.00	36.97	-51.28	0.000%
19	0.00	-27.73	51.28	-0.00	27.73	-51.28	0.000%
20	-25.49	-36.97	44.41	25.49	36.97	-44.41	0.000%
21	-25.49	-27.73	44.41	25.49	27.73	-44.41	0.000%
22	-36.05	-36.97	36.26	36.05	36.97	-36.26	0.000%
23	-36.05	-27.73	36.26	36.05	27.73	-36.26	0.000%
24	-44.16	-36.97	25.64	44.16	36.97	-25.64	0.000%
25	-44.16	-27.73	25.64	44.16	27.73	-25.64	0.000%
26	-50.99	-36.97	-0.00	50.99	36.97	0.00	0.000%
27	-50.99	-27.73	-0.00	50.99	27.73	0.00	0.000%
28	-44.16	-36.97	-25.65	44.16	36.97	25.65	0.000%
29	-44.16	-27.73	-25.65	44.16	27.73	25.65	0.000%
30	-36.06	-36.97	-36.27	36.06	36.97	36.27	0.000%
31	-36.06	-27.73	-36.27	36.06	27.73	36.27	0.000%
32	-25.50	-36.97	-44.41	25.50	36.97	44.41	0.000%
33	-25.50	-27.73	-44.41	25.50	27.73	44.41	0.000%
34	0.00	-113.08	0.00	0.00	113.08	0.00	0.000%
35	-0.00	-113.08	-15.99	0.00	113.08	15.99	0.000%
36	7.97	-113.08	-13.85	-7.97	113.08	13.85	0.000%
37	11.27	-113.08	-11.31	-11.27	113.08	11.31	0.000%
38	13.80	-113.08	-8.00	-13.80	113.08	8.00	0.000%
39	15.94	-113.08	0.00	-15.94	113.08	-0.00	0.000%
40	13.80	-113.08	8.00	-13.80	113.08	-8.00	0.000%
41	11.27	-113.08	11.31	-11.27	113.08	-11.31	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
42	7.97	-113.08	13.85	-7.97	113.08	-13.85	0.000%
43	0.00	-113.08	15.99	-0.00	113.08	-15.99	0.000%
44	-7.97	-113.08	13.85	7.97	113.08	-13.85	0.000%
45	-11.27	-113.08	11.31	11.27	113.08	-11.31	0.000%
46	-13.80	-113.08	8.00	13.80	113.08	-8.00	0.000%
47	-15.94	-113.08	-0.00	15.94	113.08	0.00	0.000%
48	-13.80	-113.08	-8.00	13.80	113.08	8.00	0.000%
49	-11.27	-113.08	-11.31	11.27	113.08	11.31	0.000%
50	-7.97	-113.08	-13.85	7.97	113.08	13.85	0.000%
51	-0.00	-30.81	-31.34	0.00	30.81	31.34	0.000%
52	15.58	-30.81	-27.14	-15.58	30.81	27.14	0.000%
53	22.04	-30.81	-22.16	-22.04	30.81	22.16	0.000%
54	26.99	-30.81	-15.67	-26.99	30.81	15.67	0.000%
55	31.17	-30.81	0.00	-31.17	30.81	-0.00	0.000%
56	26.99	-30.81	15.67	-26.99	30.81	-15.67	0.000%
57	22.04	-30.81	22.16	-22.04	30.81	-22.16	0.000%
58	15.58	-30.81	27.14	-15.58	30.81	-27.14	0.000%
59	0.00	-30.81	31.34	-0.00	30.81	-31.34	0.000%
60	-15.58	-30.81	27.14	15.58	30.81	-27.14	0.000%
61	-22.04	-30.81	22.16	22.04	30.81	-22.16	0.000%
62	-26.99	-30.81	15.67	26.99	30.81	-15.67	0.000%
63	-31.17	-30.81	-0.00	31.17	30.81	0.00	0.000%
64	-26.99	-30.81	-15.67	26.99	30.81	15.67	0.000%
65	-22.04	-30.81	-22.16	22.04	30.81	22.16	0.000%
66	-15.58	-30.81	-27.14	15.58	30.81	27.14	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00000001
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000001
23	Yes	4	0.00000001	0.00000001
24	Yes	4	0.00000001	0.00000001
25	Yes	4	0.00000001	0.00000001
26	Yes	4	0.00000001	0.00000001

27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001
51	Yes	4	0.00000001	0.00000001
52	Yes	4	0.00000001	0.00000001
53	Yes	4	0.00000001	0.00000001
54	Yes	4	0.00000001	0.00000001
55	Yes	4	0.00000001	0.00000001
56	Yes	4	0.00000001	0.00000001
57	Yes	4	0.00000001	0.00000001
58	Yes	4	0.00000001	0.00000001
59	Yes	4	0.00000001	0.00000001
60	Yes	4	0.00000001	0.00000001
61	Yes	4	0.00000001	0.00000001
62	Yes	4	0.00000001	0.00000001
63	Yes	4	0.00000001	0.00000001
64	Yes	4	0.00000001	0.00000001
65	Yes	4	0.00000001	0.00000001
66	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	130 - 120	4.412	51	0.2834	0.0698
T2	120 - 100	3.813	51	0.2768	0.0641
T3	100 - 80	2.694	51	0.2425	0.0449
T4	80 - 60	1.731	51	0.1941	0.0304
T5	60 - 40	0.988	51	0.1404	0.0257
T6	40 - 20	0.453	51	0.0923	0.0178
T7	20 - 0	0.135	59	0.0424	0.0091

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
131.00	PD458-1	51	4.412	0.2834	0.0698	86443
130.00	Lightning Rod	51	4.412	0.2834	0.0698	86443
127.00	DS2C03F36D-D	51	4.231	0.2819	0.0683	86443
125.00	APXVAALL24-43	51	4.110	0.2807	0.0672	86443
117.00	PA6-59	51	3.637	0.2735	0.0618	41536
115.00	1142-2B	51	3.521	0.2708	0.0600	40199
113.00	1142-2B	51	3.407	0.2678	0.0582	39105
107.00	6 FT DISH	51	3.071	0.2571	0.0521	36153
105.00	AP11-850/105N	51	2.961	0.2531	0.0500	35266
104.00	AP11-850/105N	51	2.907	0.2511	0.0490	34833
98.00	ROHN 4-ft Side Arm	51	2.589	0.2381	0.0430	30930
96.00	8 FT DISH	51	2.486	0.2335	0.0411	29141
87.00	PAD6-59BC	51	2.045	0.2120	0.0341	22832
86.00	HX8-6W-6GF	51	1.998	0.2095	0.0335	22295
84.00	2' Yagi	51	1.907	0.2045	0.0324	21299
75.00	Valmont T-Arm (1)	51	1.524	0.1806	0.0283	20590
71.00	4 FT DISH	51	1.369	0.1697	0.0269	21514
70.00	TTA 12"x6"x4"	51	1.332	0.1670	0.0267	21758
65.00	Diamond X-500A	51	1.153	0.1535	0.0264	23067
58.00	DB212-1	51	0.925	0.1354	0.0253	24131
54.00	DB212-1	51	0.806	0.1257	0.0240	23616
46.00	DB230-2B	51	0.592	0.1067	0.0206	22511
43.00	ROHN 4-ft Side Arm	51	0.520	0.0996	0.0192	22127
42.00	Wind speed cups	51	0.497	0.0972	0.0187	22016

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	130 - 120	7.231	2	0.4612	0.1151
T2	120 - 100	6.254	2	0.4513	0.1057
T3	100 - 80	4.423	2	0.3971	0.0740
T4	80 - 60	2.842	2	0.3184	0.0503
T5	60 - 40	1.622	2	0.2307	0.0427
T6	40 - 20	0.744	2	0.1516	0.0295
T7	20 - 0	0.221	18	0.0697	0.0150

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
131.00	PD458-1	2	7.231	0.4612	0.1151	58217
130.00	Lightning Rod	2	7.231	0.4612	0.1151	58217
127.00	DS2C03F36D-D	2	6.936	0.4590	0.1126	58217
125.00	APXVAALL24-43	2	6.740	0.4573	0.1109	58217
117.00	PA6-59	2	5.967	0.4461	0.1019	27474
115.00	1142-2B	2	5.778	0.4419	0.0990	26315
113.00	1142-2B	2	5.591	0.4372	0.0959	25343
107.00	6 FT DISH	2	5.041	0.4204	0.0859	22813
105.00	AP11-850/105N	2	4.861	0.4141	0.0824	22079

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
104.00	AP11-850/105N	2	4.773	0.4108	0.0807	21726
98.00	ROHN 4-ft Side Arm	2	4.251	0.3900	0.0708	19020
96.00	8 FT DISH	2	4.083	0.3827	0.0678	17902
87.00	PAD6-59BC	2	3.358	0.3477	0.0563	14004
86.00	HX8-6W-6GF	2	3.282	0.3437	0.0554	13673
84.00	2' Yagi	2	3.132	0.3354	0.0535	13059
75.00	Valmont T-Arm (1)	2	2.503	0.2965	0.0468	12597
71.00	4 FT DISH	2	2.248	0.2786	0.0444	13143
70.00	TTA 12"x6"x4"	2	2.187	0.2742	0.0442	13286
65.00	Diamond X-500A	2	1.894	0.2521	0.0439	14056
58.00	DB212-1	2	1.519	0.2225	0.0419	14682
54.00	DB212-1	2	1.323	0.2064	0.0398	14365
46.00	DB230-2B	2	0.971	0.1753	0.0342	13685
43.00	ROHN 4-ft Side Arm	2	0.853	0.1636	0.0318	13450
42.00	Wind speed cups	2	0.816	0.1596	0.0310	13383

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	130	Leg	A325N	0.7500	4	0.87	30.10	0.029 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	1.45	13.81	0.105 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	1.56	13.81	0.113 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	0.38	13.81	0.027 ✓	1	Bolt Shear
T2	120	Leg	A325N	0.8750	4	5.42	41.56	0.130 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	2.70	13.81	0.196 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	2.51	13.81	0.182 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	1.80	13.81	0.131 ✓	1	Bolt Shear
T3	100	Leg	A325N	1.0000	4	12.45	54.52	0.228 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	4.03	13.81	0.292 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	4.23	13.81	0.306 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	2.82	13.81	0.204 ✓	1	Bolt Shear
T4	80	Leg	A325N	1.0000	4	20.36	54.52	0.373 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	5.55	13.81	0.402 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	4.99	13.81	0.361 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	4.33	13.81	0.313 ✓	1	Bolt Shear
T5	60	Leg	A325N	1.0000	6	20.01	54.52	0.367 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	5.09	13.81	0.369 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	4.96	13.81	0.360 ✓	1	Bolt Shear
		Top Girt	A325N	0.6250	2	4.79	13.81	0.347 ✓	1	Bolt Shear
T6	40	Leg	A325N	1.0000	6	25.64	54.52	0.470 ✓	1	Bolt Tension
		Diagonal	A325N	0.6250	3	5.08	13.81	0.368 ✓	1	Bolt Shear
		Horizontal	A325N	0.6250	2	5.24	13.81	0.379 ✓	1	Bolt Shear

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	20	Top Girt	A325N	0.6250	2	5.15	13.81	0.373 ✔	1	Bolt Shear
		Leg	F1554-105	1.0000	8	23.10	56.79	0.407 ✔	1	Bolt Tension
		Diagonal	A325N	0.6250	3	4.92	13.81	0.356 ✔	1	Bolt Shear
		Horizontal	A325N	0.6250	2	5.32	13.81	0.385 ✔	1	Bolt Shear
		Top Girt	A325N	0.6250	2	5.28	13.81	0.383 ✔	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	130 - 120	ROHN 2.5 STD	10.00	5.00	63.3 K=1.00	1.7040	-9.81	57.19	0.172 [1] ✔
T2	120 - 100	ROHN 3 STD	20.04	6.68	68.9 K=1.00	2.2285	-28.02	70.89	0.395 [1] ✔
T3	100 - 80	ROHN 4 STD	20.04	6.68	53.1 K=1.00	3.1741	-59.61	116.23	0.513 [1] ✔
T4	80 - 60	ROHN 5 STD	20.04	10.02	64.0 K=1.00	4.2999	-94.83	143.37	0.661 [1] ✔
T5	60 - 40	ROHN 5 EH	20.06	10.03	65.4 K=1.00	6.1120	-135.74	201.11	0.675 [1] ✔
T6	40 - 20	ROHN 6 EHS	20.05	10.03	54.1 K=1.00	6.7133	-172.24	243.97	0.706 [1] ✔
T7	20 - 0	ROHN 6 EH	20.05	10.03	54.8 K=1.00	8.4049	-206.22	303.62	0.679 [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	130 - 120	ROHN 2 STD	6.58	6.39	97.4 K=1.00	1.0745	-4.35	24.15	0.180 [1] ✔
T2	120 - 100	ROHN 2.5 STD	8.53	8.29	105.0 K=1.00	1.7040	-8.10	34.23	0.237 [1] ✔
T3	100 - 80	ROHN 2.5 STD	9.21	8.94	113.2 K=1.00	1.7040	-12.08	30.03	0.402 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	80 - 60	ROHN 2.5 X-STR	12.49	12.10	157.2 K=1.00	2.2535	-16.65	20.60	0.808 [1] ✔
T5	60 - 40	ROHN 3 STD	13.31	12.96	133.6 K=1.00	2.2285	-15.21	28.20	0.539 [1] ✔
T6	40 - 20	ROHN 3 STD	14.16	13.77	142.0 K=1.00	2.2285	-15.01	24.96	0.601 [1] ✔
T7	20 - 0	ROHN 3 STD	15.07	14.70	151.6 K=1.00	2.2285	-14.48	21.90	0.661 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	130 - 120	ROHN 1.5 STD	8.52	4.14	79.8 K=1.00	0.7995	-3.08	22.58	0.136 [1] ✔
T2	120 - 100	ROHN 2 STD	9.93	4.82	73.5 K=1.00	1.0745	-4.98	32.58	0.153 [1] ✔
T3	100 - 80	ROHN 2 STD	12.01	5.82	88.7 K=1.00	1.0745	-8.45	27.20	0.311 [1] ✔
T4	80 - 60	ROHN 2 STD	13.83	6.68	101.9 K=1.00	1.0745	-9.97	22.63	0.441 [1] ✔
T5	60 - 40	ROHN 2 STD	16.25	7.89	120.3 K=1.00	1.0745	-9.93	16.76	0.592 [1] ✔
T6	40 - 20	ROHN 2.5 STD	18.79	9.12	115.5 K=1.00	1.7040	-10.48	28.85	0.363 [1] ✔
T7	20 - 0	ROHN 2.5 STD	21.29	10.37	131.3 K=1.00	1.7040	-10.62	22.32	0.476 [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	130 - 120	ROHN 1.5 STD	8.50	4.13	79.6 K=1.00	0.7995	-0.73	22.63	0.032 [1] ✔
T2	120 - 100	ROHN 2 STD	8.54	4.13	62.9 K=1.00	1.0745	-3.61	36.21	0.100 [1] ✔
T3	100 - 80	ROHN 2 STD	10.63	5.13	78.1 K=1.00	1.0745	-5.61	30.94	0.181 [1] ✔
T4	80 - 60	ROHN 2 STD	12.71	6.12	93.3 K=1.00	1.0745	-8.65	25.57	0.338 [1] ✔
T5	60 - 40	ROHN 2 STD	14.96	7.25	110.5	1.0745	-9.57	19.81	0.483 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T6	40 - 20	ROHN 2.5 STD	17.54	8.49	107.6 K=1.00	1.7040	-10.31	32.89	0.313 [1] ✔
T7	20 - 0	ROHN 2.5 STD	20.04	9.74	123.4 K=1.00	1.7040	-10.56	25.27	0.418 [1] ✔

[1] P_u / ϕP_n controls

Inner Bracing 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	130 - 120	L2x2x1/8	4.26	4.26	128.6 K=1.00	0.4844	-0.00	8.38	0.001 [1] ✔
T2	120 - 100	L2x2x1/8	4.97	4.97	149.9 K=1.00	0.4844	-0.01	6.17	0.001 [1] ✔
T3	100 - 80	L2x2x1/8	6.01	6.01	181.3 K=1.00	0.4844	-0.01	4.22	0.002 [1] ✔
T4	80 - 60	L2x2x1/8	6.92	6.92	208.8 K=1.00	0.4844	-0.01	3.18	0.004 [1] ✔
T5	60 - 40	L2 1/2x2 1/2x3/16	8.13	8.13	197.0 K=1.00	0.9020	-0.01	6.65	0.002 [1] ✔
T6	40 - 20	L3x3x3/16	9.40	9.40	189.2 K=1.00	1.0900	-0.02	8.72	0.002 [1] ✔
T7	20 - 0	L3 1/2x3 1/2x1/4	10.65	10.65	184.1 K=1.00	1.6900	-0.02	14.28	0.001 [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	130 - 120	ROHN 2.5 STD	10.00	5.00	63.3	1.7040	3.50	76.68	0.046 [1] ✔
T2	120 - 100	ROHN 3 STD	20.04	6.68	68.9	2.2285	21.66	100.28	0.216 [1] ✔
T3	100 - 80	ROHN 4 STD	20.04	6.68	53.1	3.1741	49.78	142.83	0.349 [1] ✔
T4	80 - 60	ROHN 5 STD	20.04	10.02	64.0	4.2999	81.44	193.49	0.421 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T5	60 - 40	ROHN 5 EH	20.06	10.03	65.4	6.1120	120.04	275.04	0.436 [1] ✔
T6	40 - 20	ROHN 6 EHS	20.05	10.03	54.1	6.7133	153.85	302.10	0.509 [1] ✔
T7	20 - 0	ROHN 6 EH	20.05	10.03	54.8	8.4049	184.79	378.22	0.489 [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	130 - 120	ROHN 2 STD	6.58	6.39	97.4	1.0745	4.27	48.35	0.088 [1] ✔
T2	120 - 100	ROHN 2.5 STD	8.53	8.29	105.0	1.7040	7.97	76.68	0.104 [1] ✔
T3	100 - 80	ROHN 2.5 STD	9.21	8.94	113.2	1.7040	11.92	76.68	0.155 [1] ✔
T4	80 - 60	ROHN 2.5 X-STR	12.49	12.10	157.2	2.2535	16.42	101.41	0.162 [1] ✔
T5	60 - 40	ROHN 3 STD	12.89	12.54	129.3	2.2285	15.03	100.28	0.150 [1] ✔
T6	40 - 20	ROHN 3 STD	13.73	13.34	137.5	2.2285	14.91	100.28	0.149 [1] ✔
T7	20 - 0	ROHN 3 STD	14.61	14.24	146.9	2.2285	14.35	100.28	0.143 [1] ✔

[1] P_u / ϕP_n controls

Horizontal 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	130 - 120	ROHN 1.5 STD	8.52	4.14	79.8	0.7995	3.12	35.98	0.087 [1] ✔
T2	120 - 100	ROHN 2 STD	9.93	4.82	73.5	1.0745	5.02	48.35	0.104 [1] ✔
T3	100 - 80	ROHN 2 STD	12.01	5.82	88.7	1.0745	8.39	48.35	0.173 [1] ✔
T4	80 - 60	ROHN 2 STD	13.83	6.68	101.9	1.0745	9.83	48.35	0.203 [1] ✔
T5	60 - 40	ROHN 2 STD	16.25	7.89	120.3	1.0745	9.88	48.35	0.204 [1] ✔
T6	40 - 20	ROHN 2.5 STD	18.79	9.12	115.5	1.7040	10.44	76.68	0.136 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	20 - 0	ROHN 2.5 STD	21.29	10.37	131.3	1.7040	10.64	76.68	0.139 [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	130 - 120	ROHN 1.5 STD	8.50	4.13	79.6	0.7995	0.75	35.98	0.021 [1]
T2	120 - 100	ROHN 2 STD	8.54	4.13	62.9	1.0745	3.40	48.35	0.070 [1]
T3	100 - 80	ROHN 2 STD	10.63	5.13	78.1	1.0745	5.64	48.35	0.117 [1]
T4	80 - 60	ROHN 2 STD	12.71	6.12	93.3	1.0745	8.55	48.35	0.177 [1]
T5	60 - 40	ROHN 2 STD	14.96	7.25	110.5	1.0745	9.47	48.35	0.196 [1]
T6	40 - 20	ROHN 2.5 STD	17.54	8.49	107.6	1.7040	10.26	76.68	0.134 [1]
T7	20 - 0	ROHN 2.5 STD	20.04	9.74	123.4	1.7040	10.56	76.68	0.138 [1]

[1] P_u / ϕP_n controls

Inner Bracing 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	130 - 120	L2x2x1/8	4.26	4.26	81.6	0.4844	0.00	15.69	0.000 [1]
T2	120 - 100	L2x2x1/8	4.97	4.97	95.1	0.4844	0.00	15.69	0.000 [1]
T3	100 - 80	L2x2x1/8	6.01	6.01	115.1	0.4844	0.01	15.69	0.000 [1]
T4	80 - 60	L2x2x1/8	6.35	6.35	121.8	0.4844	0.01	15.69	0.000 [1]
T5	60 - 40	L2 1/2x2 1/2x3/16	7.48	7.48	115.4	0.9020	0.00	29.22	0.000 [1]
T6	40 - 20	L3x3x3/16	8.77	8.77	112.1	1.0900	0.00	35.32	0.000 [1]
T7	20 - 0	L3 1/2x3 1/2x1/4	10.02	10.02	110.3	1.6900	0.00	54.76	0.000 [1]

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

[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	130 - 120	Leg	ROHN 2.5 STD	3	-9.81	57.19	17.2	Pass
T2	120 - 100	Leg	ROHN 3 STD	30	-28.02	70.89	39.5	Pass
T3	100 - 80	Leg	ROHN 4 STD	69	-59.61	116.23	51.3	Pass
T4	80 - 60	Leg	ROHN 5 STD	108	-94.83	143.37	66.1	Pass
T5	60 - 40	Leg	ROHN 5 EH	135	-135.74	201.11	67.5	Pass
T6	40 - 20	Leg	ROHN 6 EHS	162	-172.24	243.97	70.6	Pass
T7	20 - 0	Leg	ROHN 6 EH	189	-206.22	303.62	67.9	Pass
T1	130 - 120	Diagonal	ROHN 2 STD	11	-4.35	24.15	18.0	Pass
T2	120 - 100	Diagonal	ROHN 2.5 STD	38	-8.10	34.23	23.7	Pass
T3	100 - 80	Diagonal	ROHN 2.5 STD	81	-12.08	30.03	40.2	Pass
T4	80 - 60	Diagonal	ROHN 2.5 X-STR	116	-16.65	20.60	80.8	Pass
T5	60 - 40	Diagonal	ROHN 3 STD	143	-15.21	28.20	53.9	Pass
T6	40 - 20	Diagonal	ROHN 3 STD	170	-15.01	24.96	60.1	Pass
T7	20 - 0	Diagonal	ROHN 3 STD	198	-14.48	21.90	66.1	Pass
T1	130 - 120	Horizontal	ROHN 1.5 STD	10	-3.08	22.58	13.6	Pass
T2	120 - 100	Horizontal	ROHN 2 STD	37	-4.98	32.58	15.3 18.2 (b)	Pass
T3	100 - 80	Horizontal	ROHN 2 STD	79	-8.45	27.20	31.1	Pass
T4	80 - 60	Horizontal	ROHN 2 STD	115	-9.97	22.63	44.1	Pass
T5	60 - 40	Horizontal	ROHN 2 STD	142	-9.93	16.76	59.2	Pass
T6	40 - 20	Horizontal	ROHN 2.5 STD	169	-10.48	28.85	36.3 37.9 (b)	Pass
T7	20 - 0	Horizontal	ROHN 2.5 STD	196	-10.62	22.32	47.6	Pass
T1	130 - 120	Top Girt	ROHN 1.5 STD	6	-0.73	22.63	3.2	Pass
T2	120 - 100	Top Girt	ROHN 2 STD	32	-3.61	36.21	10.0 13.1 (b)	Pass
T3	100 - 80	Top Girt	ROHN 2 STD	71	-5.61	30.94	18.1 20.4 (b)	Pass
T4	80 - 60	Top Girt	ROHN 2 STD	111	-8.65	25.57	33.8	Pass
T5	60 - 40	Top Girt	ROHN 2 STD	137	-9.57	19.81	48.3	Pass
T6	40 - 20	Top Girt	ROHN 2.5 STD	164	-10.31	32.89	31.3 37.3 (b)	Pass
T7	20 - 0	Top Girt	ROHN 2.5 STD	191	-10.56	25.27	41.8	Pass
T1	130 - 120	Inner Bracing	L2x2x1/8	16	-0.00	8.38	0.6	Pass
T2	120 - 100	Inner Bracing	L2x2x1/8	43	-0.01	6.17	0.7	Pass
T3	100 - 80	Inner Bracing	L2x2x1/8	82	-0.01	4.22	0.8	Pass
T4	80 - 60	Inner Bracing	L2x2x1/8	122	-0.01	3.18	0.9	Pass
T5	60 - 40	Inner Bracing	L2 1/2x2 1/2x3/16	149	-0.01	6.65	0.7	Pass
T6	40 - 20	Inner Bracing	L3x3x3/16	176	-0.02	8.72	0.7	Pass
T7	20 - 0	Inner Bracing	L3 1/2x3 1/2x1/4	203	-0.02	14.28	0.6	Pass
							Summary	
						Leg (T6)	70.6	Pass
						Diagonal (T4)	80.8	Pass
						Horizontal (T5)	59.2	Pass
						Top Girt	48.3	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
						(T5) Inner Bracing (T4)	0.9	Pass
						Bolt Checks	47.0	Pass
						RATING =	**80.8**	**Pass**

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Subject:	Anchor Bolt Analysis
Location:	130-ft Lattice Tower Bristol, CT
Rev. 0: 7/3/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 23080.03

Anchor Bolt Analysis:

Input Data:

Tower Reactions:

Tension Force =	Tension := 199·kips	(Input From tnxTower)
Compression Force =	Compression := 221·kips	(Input From tnxTower)
Shear Force =	Shear := 30·kips	(Input From tnxTower)

Anchor Bolt Data:

ASTM F1554-105

Number of Anchor Bolts =	N := 8	(User Input)
Bolt Ultimate Strength =	F_u := 125·ksi	(User Input)
Bolt Yield Strength =	F_y := 105·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 1.00·in	(User Input)
Threads per Inch =	n := 8	(User Input)
Length from Top of Pier to Bottom of Leveling Nut =	L_{ar} := 0·in	(User Input)

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Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n} \right)^2 = 0.606 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.22 \cdot in$

Elastic Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot in^3$

Plastic Section Modulus of Bolt = $Z_x := \frac{D_n^3}{6} = 0.113 \cdot in^3$

Anchor Bolt Design Strength:

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

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

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

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

Design Tensile Strength = $\Phi R_{nt} := \phi_t \cdot F_u \cdot A_n = 56.8 \cdot k$

Design Compression Strength = $\Phi R_{nc} := \phi_c \cdot F_y \cdot A_g = 74.2 \cdot k$

Design Shear Strength (Tension) = $\Phi R_{nv} := \phi_v \cdot 0.5 F_u \cdot A_g = 36.8 \cdot k$

Design Shear Strength (Compression) = $\Phi R_{nvc} := \phi_c \cdot 0.6 F_y \cdot A_g \cdot 0.75 = 33.4 \cdot k$

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Subject:	Anchor Bolt Analysis
Location:	130-ft Lattice Tower Bristol, CT
Rev. 0: 7/3/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 23080.03

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $P_{ut} := \frac{Tension}{N} = 24.9 \cdot kips$

Maximum Compressive Force = $P_{uc} := \frac{Compression}{N} = 27.6 \cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 3.8 \cdot kips$

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

Condition1 = "OK"

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

Condition2 = "OK"

Bolt % of Capacity = $\max\left[\left(\frac{P_{ut}}{\Phi R_{nt}}\right)^2 + \left(\frac{V_u}{\Phi R_{nv}}\right)^2, \left(\frac{P_{uc}}{\Phi R_{nc}}\right) + \left(\frac{V_u}{\Phi R_{nvc}}\right)^2\right] = 38.5 \cdot \%$

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Subject:	FOUNDATION ANALYSIS
Location:	130-ft Lattice Tower Bristol, CT
Rev. 0: 7/3/23	Prepared by: T.J.L. Checked by: C.F.C. Job No. 23080.03

Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 4077 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$S_t := 51 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$WT_t := 37 \cdot kip$	(User Input from tnxTower)	
Max Compression Force =	$C_t := 221 \cdot kip$	(User Input from tnxTower)	
Max Uplift Force =	$U_t := 199 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 130 \cdot ft$	(User Input)	
Tower Width =	$W_t := 22.5 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 2$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 3.5 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 4.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 31.0 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 34 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_u := 12000 \cdot psf$		
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3.537$

Load Factor = $LF := 1 = 1$

Stability of Footing:

Adjusted Concrete Unit Weight =

$\gamma_c := if\left(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}\right) = 150 \cdot pcf$

Adjusted Soil Unit Weight =

$\gamma_s := if\left(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}\right) = 100 \cdot pcf$

Passive Pressure =

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

$P_{pt} := K_p \cdot \gamma_s \cdot \left(D_f - T_f\right) + c \cdot 2 \cdot \sqrt{K_p} = -0.177 \cdot ksf$

$P_{top} := if\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 1.238 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0.619 \cdot ksf$

$T_p := if\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 3.5$

$A_p := W_f \cdot T_p = 108.5$

Ultimate Shear =

$S_u := P_{ave} \cdot A_p = 67.161 \cdot kip$

Weight of Concrete Pad =

$WT_{pad} := \left(W_f^2 \cdot T_f\right) \cdot \gamma_c = 576.6 \cdot kip$

Total Weight of Concrete =

$WT_c := WT_{pad} = 577 \cdot kip$

Tower Offset =

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

$X_t := if\left(Pos_t, X_{t1}, X_{t2}\right) = 5.757$

$X_{off} := \frac{W_f}{2} - \left[\frac{\left(W_t \cdot \cos(30 \cdot deg)\right)}{3} + X_t\right] = 3.248$

Resisting Moment =

$M_r := \left(0.9 \cdot WT_c + 0.75 \cdot WT_t\right) \cdot \frac{W_f}{2} + 0.75 \cdot S_u \cdot \frac{T_f}{3} = 8541 \cdot kip \cdot ft$

Overturning Moment =

$M_{ot} := OM + S_t \cdot T_f = 4281 \cdot kip \cdot ft$

Factor of Safety Actual =

$FS := \frac{M_r}{M_{ot}} = 2$

Factor of Safety Required =

$FS_{req} := 1$

$OverTurning\_Moment\_Check := if\left(FS \geq FS_{req}, "Okay", "No\ Good"\right)$

$OverTurning\_Moment\_Check = "Okay"$

Bearing Pressure Caused by Footing:

Total Load = $Load_{tot} := WT_c + WT_t = 614 \cdot kip$

Area of the Mat = $A_{mat} := W_f^{\,2} = 961$

Section Modulus of Mat = $S := \frac{W_f^{\,3}}{6} = 4965.17 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.501 \cdot ksf$

$Max\_Pressure\_Check := if\left(P_{max} < 0.75 \cdot q_u, "Okay", "No\ Good"\right)$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.224 \cdot ksf$

$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < 0.75 \cdot q_u\right), "Okay", "No\ Good"\right]$

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 8.993$

Distance to Kern = $X_k := \frac{W_f}{6} = 5.167$

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

Eccentricity = $e := \frac{M_{ot}}{Load_{tot}} = 6.977$

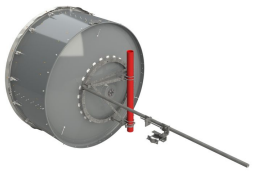
Adjusted Soil Pressure = $P_a := \frac{2 \cdot Load_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 1.548 \cdot ksf$

$q_{adj} := if\left(P_{min} < 0, P_a, P_{max}\right) = 1.548 \cdot ksf$

$Pressure\_Check := if\left(q_{adj} < 0.75 \cdot q_u, "Okay", "No\ Good"\right)$

Pressure_Check = "Okay"

HX8-6W-6GF



2.4m | 8ft ValuLine® High Performance, High XPD Antenna, dual-polarized, 5.925 – 7.125 GHz, grey, CPR137G flange

Product Classification

Product Type	Microwave antenna
Product Brand	ValuLine®

General Specifications

Antenna Type	HX - ValuLine® High Performance, High XPD Antenna, dual-polarized
Polarization	Dual
Antenna Input	CPR137G
Antenna Color	Gray
Reflector Construction	One-piece reflector
Radome Color	Gray
Radome Material	Fabric
Flash Included	Yes
Side Struts, Included	1
Side Struts, Optional	4

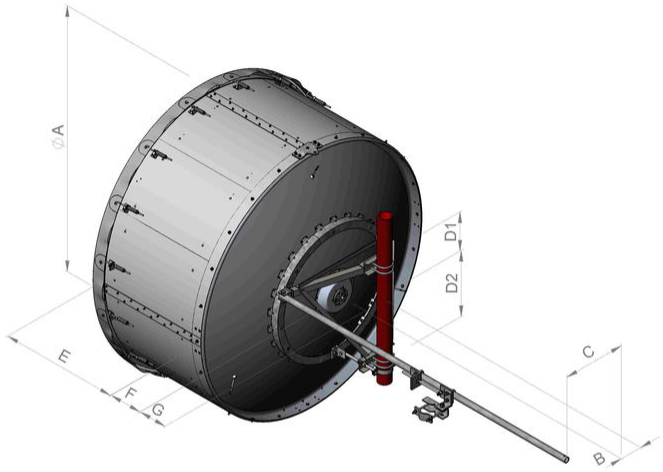
Dimensions

Diameter, nominal	2.4 m | 8 ft

HX8-6W-6GF

Antenna Dimensions and Mounting Information

HX8



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

Electrical Specifications

Operating Frequency Band	5.925 – 7.125 GHz
Gain, Low Band	40.8 dBi
Gain, Mid Band	41.6 dBi
Gain, Top Band	42.4 dBi
Boresite Cross Polarization Discrimination (XPD)	33 dB
Front-to-Back Ratio	70 dB
Beamwidth, Horizontal	1.3 °
Beamwidth, Vertical	1.3 °
Return Loss	26 dB

HX8-6W-6GF

VSWR	1.1
Radiation Pattern Envelope Reference (RPE)	7389
Electrical Compliance	ACMA FX03_6b, 6p7b | ETSI 302 217 Class 3 | IC 3059A | IC 3064A | US FCC Part 101A | US FCC Part 74A
Cross Polarization Discrimination (XPD) Electrical Compliance	ETSI EN 302217 XPD Category 2

Electrical Specifications, Band 2

Beamwidth, Horizontal	1.3 °
Beamwidth, Vertical	1.3 °
Gain, Mid Band	40.7 dBi
Operating Frequency Band	5.725 – 5.850 GHz

Mechanical Specifications

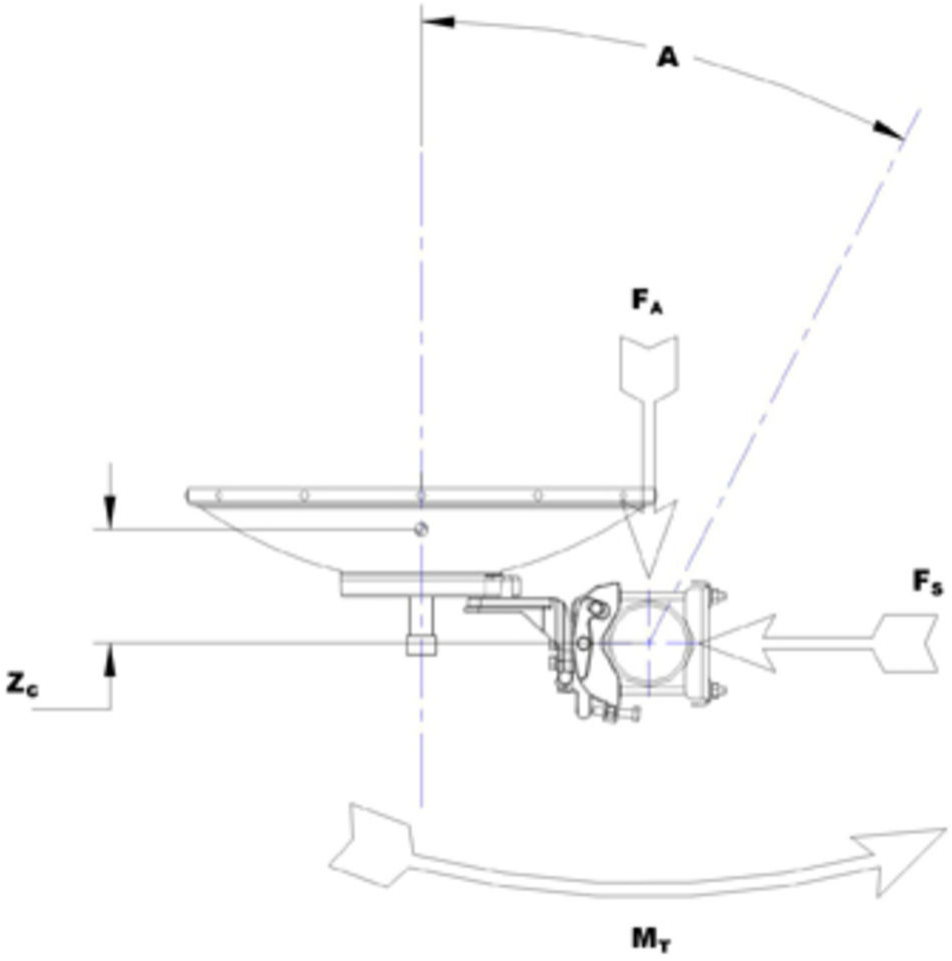
Compatible Mounting Pipe Diameter	115 mm | 4.5 in
Fine Azimuth Adjustment Range	±5°
Fine Elevation Adjustment Range	±5°
Wind Speed, operational	180 km/h | 111.847 mph
Wind Speed, survival	200 km/h | 124.274 mph

Wind Forces at Wind Velocity Survival Rating

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

HX8-6W-6GF

Wind Forces at Wind Velocity Survival Rating Image



Packaging and Weights

Height, packed	2250 mm | 88.583 in
Width, packed	1130 mm | 44.488 in
Length, packed	2380 mm | 93.701 in
Packaging Type	Standard pack
Volume	6.1 m^3 | 215.42 ft^3
Weight, gross	318 kg | 701.069 lb
Weight, net	187 kg | 412.264 lb

Regulatory Compliance/Certifications

Agency	Classification

HX8-6W-6GF

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

* Footnotes

Axial Force (FA)	Maximum forces exerted on a supporting structure as a result of wind from the most critical direction for this parameter. The individual maximums specified may not occur simultaneously. All forces are referenced to the mounting pipe.
Boresite Cross Polarization Discrimination (XPD)	The difference between the peak of the co-polarized main beam and the maximum cross-polarized signal over an angle twice the 3 dB beamwidth of the co-polarized main beam.
Cross Polarization Discrimination (XPD) Electrical Compliance	The difference between the peak of the co-polarized main beam and the maximum cross-polarized signal over an angle twice the 3 dB beamwidth of the co-polarized main beam.
Front-to-Back Ratio	Denotes highest radiation relative to the main beam, at 180° ±40°, across the band. Production antennas do not exceed rated values by more than 2 dB unless stated otherwise.
Gain, Mid Band	For a given frequency band, gain is primarily a function of antenna size. The gain of Andrew antennas is determined by either gain by comparison or by computer integration of the measured antenna patterns.
Operating Frequency Band	Bands correspond with CCIR recommendations or common allocations used throughout the world. Other ranges can be accommodated on special order.
Packaging Type	Andrew standard packing is suitable for export. Antennas are shipped as standard in totally recyclable cardboard or wire-bound crates (dependent on product). For your convenience, Andrew offers heavy duty export packing options.
Radiation Pattern Envelope Reference (RPE)	Radiation patterns define an antenna's ability to discriminate against unwanted signals. Under still dry conditions, production antennas will not have any peak exceeding the current RPE by more than 3dB, maintaining an angular accuracy of +/-1° throughout
Return Loss	The figure that indicates the proportion of radio waves incident upon the antenna that are rejected as a ratio of those that are accepted.
Side Force (FS)	Maximum side force exerted on the mounting pipe as a result of wind from the most critical direction for this parameter. The individual maximums specified may not occur simultaneously. All forces are referenced to the mounting pipe.

Twisting Moment (MT)	Maximum forces exerted on a supporting structure as a result of wind from the most critical direction for this parameter. The individual maximums specified may not occur simultaneously. All forces are referenced to the mounting pipe.
VSWR	Maximum; is the guaranteed Peak Voltage-Standing-Wave-Ratio within the operating band.
Wind Speed, operational	For VHLP(X), SHP(X), HX and USX antennas, the wind speed where the maximum antenna deflection is 0.3 x the 3 dB beam width of the antenna. For other antennas, it is defined as a deflection is equal to or less than 0.1 degrees.
Wind Speed, survival	The maximum wind speed the antenna, including mounts and radomes, where applicable, will withstand without permanent deformation. Realignment may be required. This wind speed is applicable to antenna with the specified amount of radial ice.

ATTACHMENT D – PROOF OF DELIVERY OF NOTICE

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Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com.FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery,misdelivery,or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim.Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental,consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss.Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

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

EVERSOURCE ENERGY

ES-004

790 Willis Street

Bristol, CT 06010

September 29, 2023

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed Eversource swap out installation on the self-support tower at 790 Willis Street in Bristol, CT. Eversource is proposing to swap out one of the microwave antennas. This report provides and updated analysis with % MPE (Maximum Permissible Exposure) measurements around the site to determine FCC compliance of the facility.

Figure 1: View of ES-004 South Mountain

Site Address	790 Willis Street
Latitude	41°38'56"N
Longitude	72°56'50"W
Site Elevation AMSL	1047’
Survey Engineer	Ram Acharya
Survey Date/Time	9/22/2023; 8:30 AM – 10 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:

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

Where:

EIRP = Effective Isotropic Radiated Power = 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 (GRF) 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 swap out of Eversource installation. These parameters are applied to the above calculation methods in order to calculate the % MPE values of the proposed swap out equipment. Any receive-only antennas have not been included in the table as they are irrelevant in terms of the % MPE calculations.

Operator	Antenna Model	TX Freq. (MHz)	Ant Gain (dBd)	Power per Channel (ERP - Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	HX8-6W-6GF	5945.2	39.45	9772	1	1.3°	8	86

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

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

[2] Transmit antenna centerline height is based on the CENTEK ENGINEERING Structural Analysis Report dated July 3, 2023.

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# 0116			
Calibration Date	January 2023			
Calibration Interval	24 Months			
Meter	NBM550, Serial# E-1069			
Calibration Date	January 2023			
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.
https://www.narda-sts.com/en/servicesupport/product-literature/nbmnim/pd/pdfs/22772/eID/

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 September 22, 2023 between 8:30 AM and 10 AM. The calculated % MPE contribution from the proposed swap out equipment was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the "Off Beam Loss" factor shown in the power density formula from Section 3. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 23 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 5.44% (Average Uncontrolled/General Population MPE) and was recorded at Location 17. The highest composite (measured + calculated) % MPE value is calculated to be 5.44% (Average Uncontrolled/General Population) and is also calculated to occur at Location 17.

Meas. Location	Latitude	Longitude	Dist. From Site (feet)	Ave % Controlled/ Occupational	Measured % MPE (Uncontrolled / General)	Calculated % MPE (Eversource Proposed)	Composite % MPE (Uncontrolled / General)
1	41.64876	-72.94714	54	0.0031	< 1.00%	0.00%	< 1.00%
2	41.64898	-72.94705	57	0.0038	< 1.00%	0.00%	< 1.00%
3	41.64897	-72.94729	34	0.0165	< 1.00%	0.00%	< 1.00%
4	41.64874	-72.94744	81	0.0102	< 1.00%	0.00%	< 1.00%
5	41.64865	-72.94743	103	0.02	< 1.00%	0.00%	< 1.00%
6	41.64850	-72.94744	153	0.0081	< 1.00%	0.00%	< 1.00%
7	41.64834	-72.94726	201	0.0088	< 1.00%	0.00%	< 1.00%
8	41.64866	-72.94704	97	0.0056	< 1.00%	0.00%	< 1.00%
9	41.64888	-72.94776	147	0.0251	< 1.00%	0.00%	< 1.00%
10	41.64898	-72.94804	226	0.9546	4.77%	0.00%	4.77%
11	41.64916	-72.94788	205	0.4303	2.15%	0.00%	2.15%
12	41.64923	-72.94807	262	0.0138	< 1.00%	0.00%	< 1.00%
13	41.64903	-72.94821	276	0.0208	< 1.00%	0.00%	< 1.00%
14	41.64888	-72.94816	257	0.0482	< 1.00%	0.00%	< 1.00%
15	41.64872	-72.94669	157	0.0768	< 1.00%	0.00%	< 1.00%
16	41.64873	-72.94607	320	0.0566	< 1.00%	0.00%	< 1.00%
17	**41.64452**	**-72.94748**	**1598**	**1.087**	**5.44%**	**0.00%**	**5.44%**
18	41.64611	-72.94694	1018	0.666	3.33%	0.00%	3.33%
19	41.64738	-72.94697	557	0.3801	1.90%	0.00%	< 1.00%
20	41.647405	-72.947644	554	0.2987	1.49%	0.00%	1.49%
21	41.648225	-72.946133	384	0.0534	< 1.00%	0.00%	< 1.00%
22	41.649260	-72.945284	546	0.0472	< 1.00%	0.00%	< 1.00%
23	41.650354	-72.944077	1012	0.2443	1.22%	0.00%	1.22%

Table 4: Measured and Calculated % MPE Results [4][5][6]

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

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

[6] The calculated %MPE is very low for Eversource's swap out antenna due to the parameters of the antenna. The swap out antenna has a very narrow beamwidth which is good for long range communication but covers a very narrow area.

Figures 2 and 3 below are aerial views[7] of the tower location and the surrounding area, along with the measurement locations listed in Table 4.

Figure 2: Measurement Points – Zoom In

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

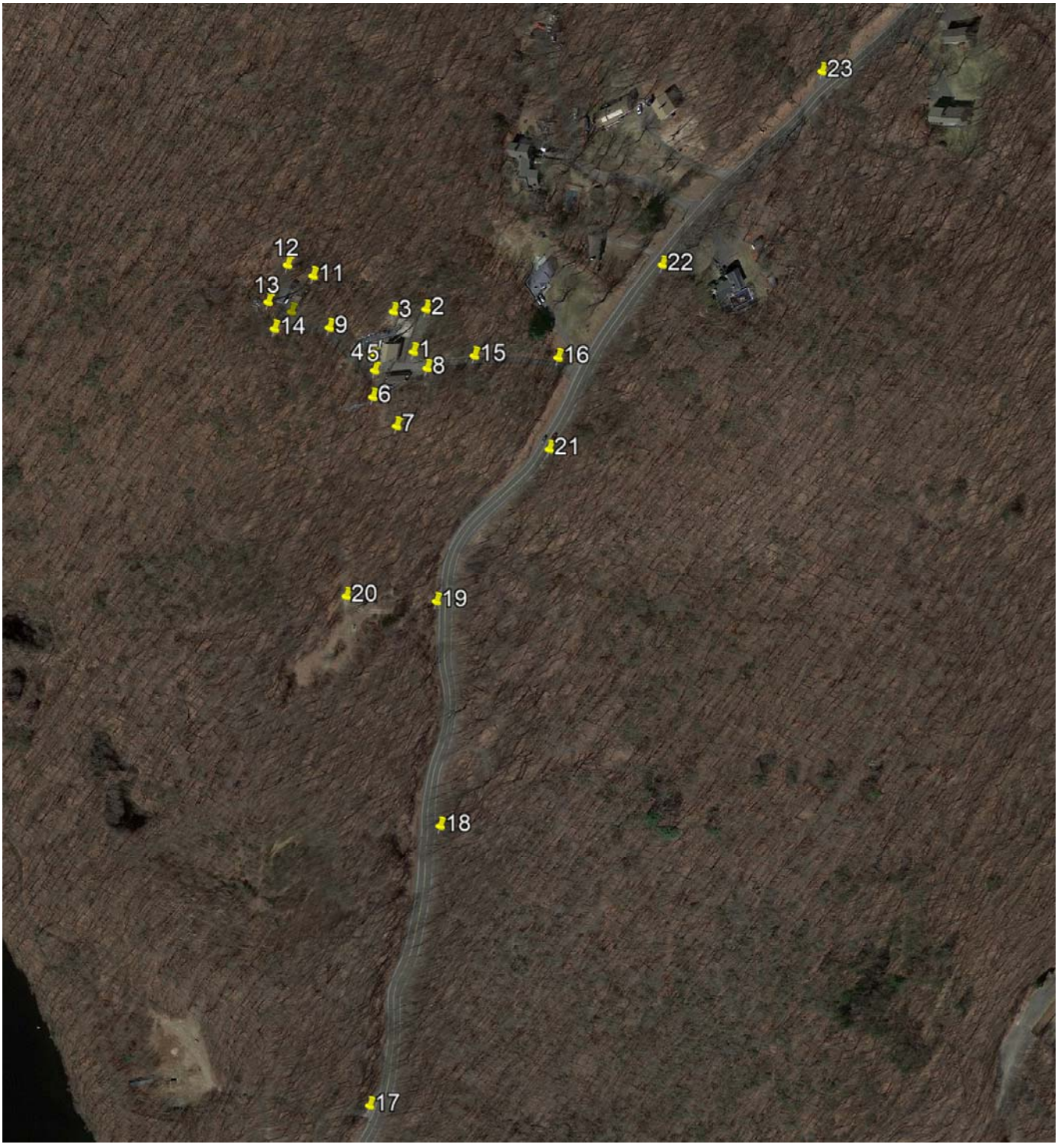

Figure 3: All Measurement Points

7. Conclusion

A number of accessible areas around the tower at 790 Willis Street in Bristol, CT were surveyed and found to be well within the mandated General Population/Uncontrolled limits for Maximum Permissible Exposure, as delineated in the Federal Communications Commission's Radio Frequency exposure rules published in 47 CFR 1.1307(b)(1)-(b)(3).

The highest spatially averaged % MPE measurement of all surveyed points based on the 1997 FCC standard for exposure to the general population is 5.44% MPE. This measurement was recorded at Location 17.

The highest composite (measured + calculated) power density is **5.44% of the FCC General Population MPE limit** with the proposed swap out Eversource equipment and is also calculated to occur at Location 17.

The above analysis concludes that RF exposure at ground level around the tower, both currently and with the proposed swap out 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.

September 26, 2023

Report Prepared By: Ram Acharya
RF Engineer
C Squared Systems, LLC

Date

September 29, 2023

Report Prepared By: Martin Lavin
Senior RF Engineer
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[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)
0.3-3.0	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[9]

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)

[8] 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

[9] 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

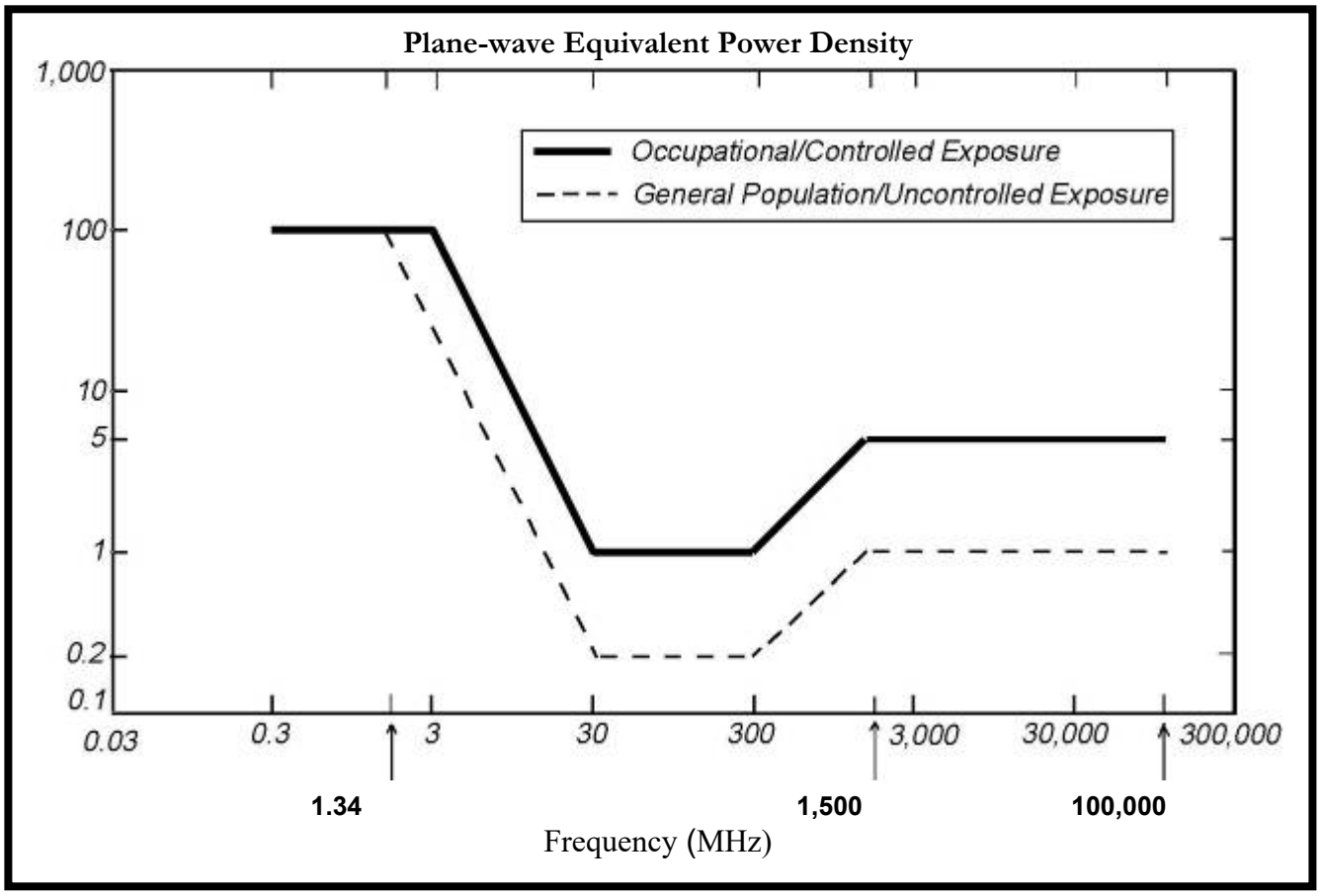

Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Eversource Antenna Data Sheet and Electrical Patterns

217 MHz

Manufacturer:	COMMSCOPE
Model #:	HX8-6W-6GF
Frequency Band:	5.725-5.850 GHz
Gain:	39.45 dBd
Vertical Beamwidth:	1.3°
Horizontal Beamwidth:	1.3°
Polarization:	Dual-Polarization
Length:	8’