EVERSOURCE ENERGY

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

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

October 22, 2020

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

RE: **Notice of Exempt Modification**
Eversource Site # 945
71 Tower Lane (aka 55 Shelton Road, 59 Shelton Road and 5 Shelton Road), Oxford, CT 06478
Latitude: 41-24-43.8 N / Longitude: 73-07-46.5 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains multiple antennas at various mounting heights on an existing approximately 92-foot self-support tower located at 71 Tower Lane in Oxford. See Attachment A, Parcel Map and Property Card. The tower and property are owned by the Department of Emergency Services and Public Protection ("DESPP")[1]. Eversource and DESPP have entered into an agreement allowing the modification of Eversource's equipment on the Connecticut State Police tower. See Attachment B, Letter of Authorization. Eversource plans to install one 13-foot 7-inch tall omni-directional antenna to be mounted at approximately 96 feet above ground level ("AGL"); one existing omni-directional antenna will be relocated to a mounting height of 72-feet 6-inches AGL. Two new 7/8-inch diameter coaxial cables will be installed, and one existing 7/8-inch diameter coaxial cable will be relocated. There will be no changes to the area of the fenced compound, the tower or other existing antennas and equipment on the tower. The tower and existing and proposed equipment are depicted on Attachment C, Construction Drawings, dated July 27, 2020 and Attachment D, Structural Analysis, dated July 21, 2020. The Connecticut Siting Council assumed jurisdiction of this State-owned tower in Petition No. 141 in October 1985; pursuant to the Decision in Petition No. 308a, that tower was replaced with the current taller tower.

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

[1] The DESPP is the statewide agency for law enforcement, fire services, and scientific services.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies ("R.C.S.A.") §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being delivered to George R. Temple, First Selectman for the Town of Oxford and Steven S. Macary, Zoning Enforcement Official for the Town of Oxford via private carrier. Proof of delivery is attached. See Attachment E, Proof of Delivery of Notice.

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

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

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

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

By: _____
Kathleen M. Shanley
Manager – Transmission Siting

cc: George R Temple, First Selectman, Town of Oxford
Steven S. Macary, Zoning Enforcement Official, Town of Oxford
DESPP

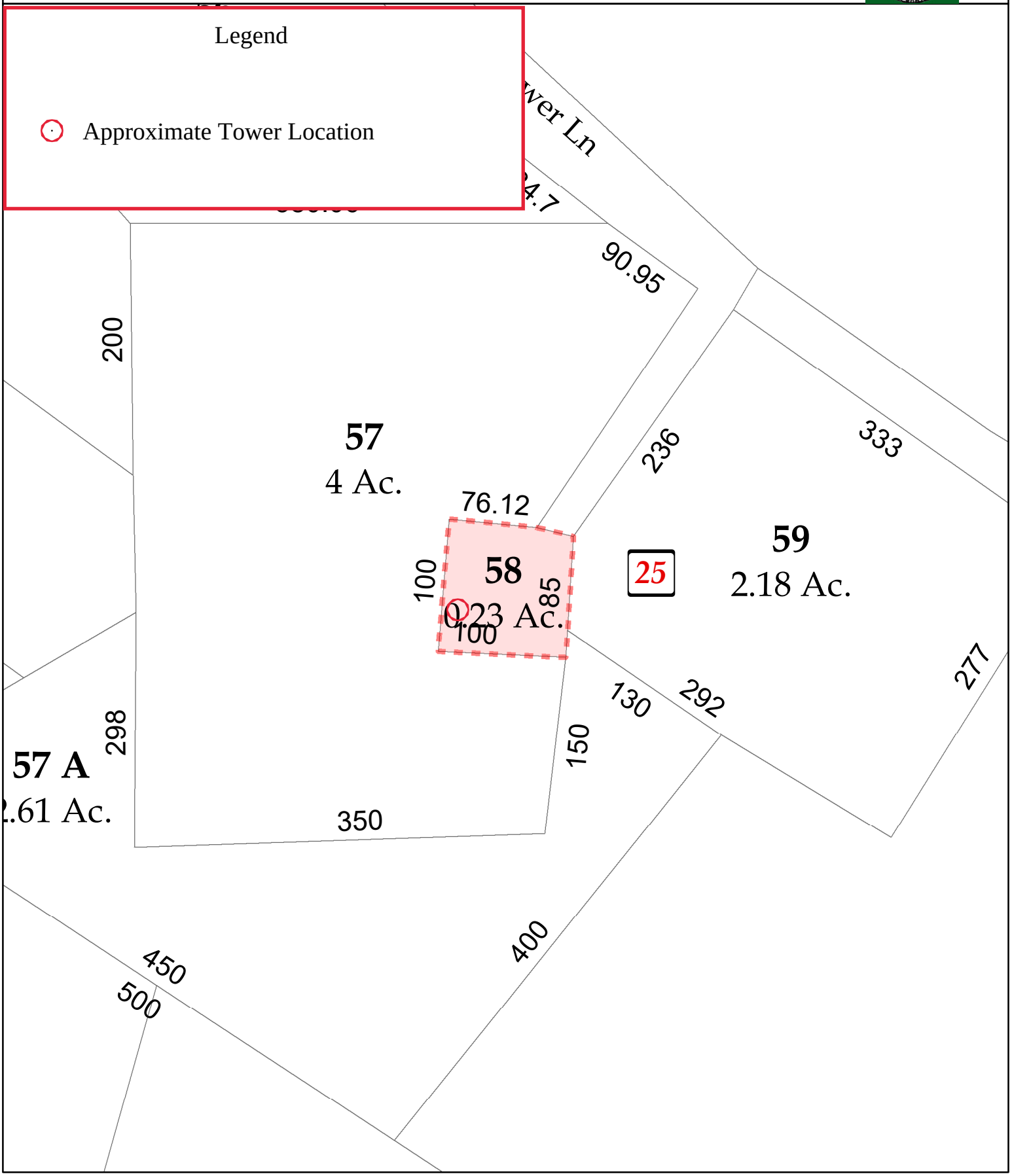
Attachments

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

ATTACHMENT A – PARCEL MAP AND PROPERTY CARD

Town of Oxford, Connecticut - Assessment Parcel Map

Parcel: 29-65-58 **Location:** TOWER LA



Approximate Scale: 1 inch = 100 feet

0 50 100 150 200 Feet

Map Produced: February 2020

Town of Oxford
Property Listing Report

Parcel ID 29/65/58

Account C0410900

Property Information

Owner	CONN STATE FOREST FIRE
Address	TOWER LA
Mailing Address	SHELTON RD OXFORD , CT 06478
Land Use	- Exempt Vac
Land Class	E

Census Tract	R 3
Neighborhood	080
Zoning	RESA
Acreage	0.23
Utilities	
Lot Setting/ Desc	/

Photo

PARCEL VALUATIONS (Assessed value = 70% of Appraised Value)

	Appraised	Assessed
Buildings	0	0
Outbuildings	5800	4100
Improvements	5800	4100
Extras	0	0
Land	60300	42200
Total	66100	46300
Previous		

Construction Details

Year Built	
Stories	
Building Style	
Building Use	
Building Condition	
Total Rooms	
Bedrooms	
Full Bathrooms	0
Half Bathrooms	
Bath Style	
Kitchen Style	
Roof Style	
Roof Cover	

EXTERIOR WALLS:	
Primary	
Secondary	
INTERIOR WALLS:	
Primary	
Secondary	
FLOORS:	
Primary	
Secondary	
HEATING/AC:	
Heating Type	
Heating Fuel	
AC Type	

BUILDING AREA:	
Effective Building Area	
Gross Building Area	
Total Living Area	

SALES HISTORY:	
Sale Date	10/1/2010
Sale Price	0
Book/ Page	999/ 999

Report Created On 9/3/2020

ATTACHMENT B – LETTER OF AUTHORIZATION

STATE OF CONNECTICUT

DEPARTMENT OF EMERGENCY SERVICES AND PUBLIC PROTECTION

January 7, 2020

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Letter of Authorization** – Co-location on Connecticut State Police tower
Property address: 55 Shelton Road, Oxford, CT
Latitude: 41-24-43.54" Longitude: 73-07-46.64"

To Whom It May Concern:

Eversource Energy(Eversource) has an Agreement with the Connecticut Department of Emergency Services and Public Protection (DESPP) to co-locate its communications equipment on the DESPP tower located at 55 Shelton Road, Oxford, Connecticut.

Eversource shall be required by the terms of the agreement to seek and obtain all necessary permits and approvals. As a duly authorized representative of the DESPP, permission is hereby granted to Eversource and agents thereof, for the purpose of consummating any applications necessary to gain the required approvals from the State of Connecticut.

Any fees or charges associated with all applications or permits and any conditions placed on the applicant shall be the sole responsibility of Eversource.

Yours truly,

Brian Benito
Planning Specialist
State Of Connecticut
Department of Emergency Services and Public Protection
CTS Unit
860-685-8297
brian.benito@ct.gov

ATTACHMENT C – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

OXFORD CSP
71 TOWER LANE
OXFORD, CT 06478

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (1) NEW OMNI/WHIP ANTENNA AT ELEVATION 111'–0"± AGL
2. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING EQUIPMENT ROOM
3. RELOCATE (1) EXISTING EVERSOURCE ANTENNA AT ELEVATION 105'–0"± AGL TO ELEVATION 85'–6"± AGL

GOVERNING CODES

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

GENERAL NOTES

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

SITE INFORMATION

SITE NAME:	OXFORD CSP
SITE ID NUMBER:	#945
SITE ADDRESS:	71 TOWER LANE OXFORD, CT 06478
MAP:	29
BLOCK:	65
LOT:	58
ZONE:	RESA
LATITUDE:	41° 24' 43.8" N
LONGITUDE:	73° 07' 46.5" W
ELEVATION:	770'± AMSL
FEMA/FIRM DESIGNATION:	X

CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

PROPERTY OWNER:
SHELTON ROAD
OXFORD, CT 06478

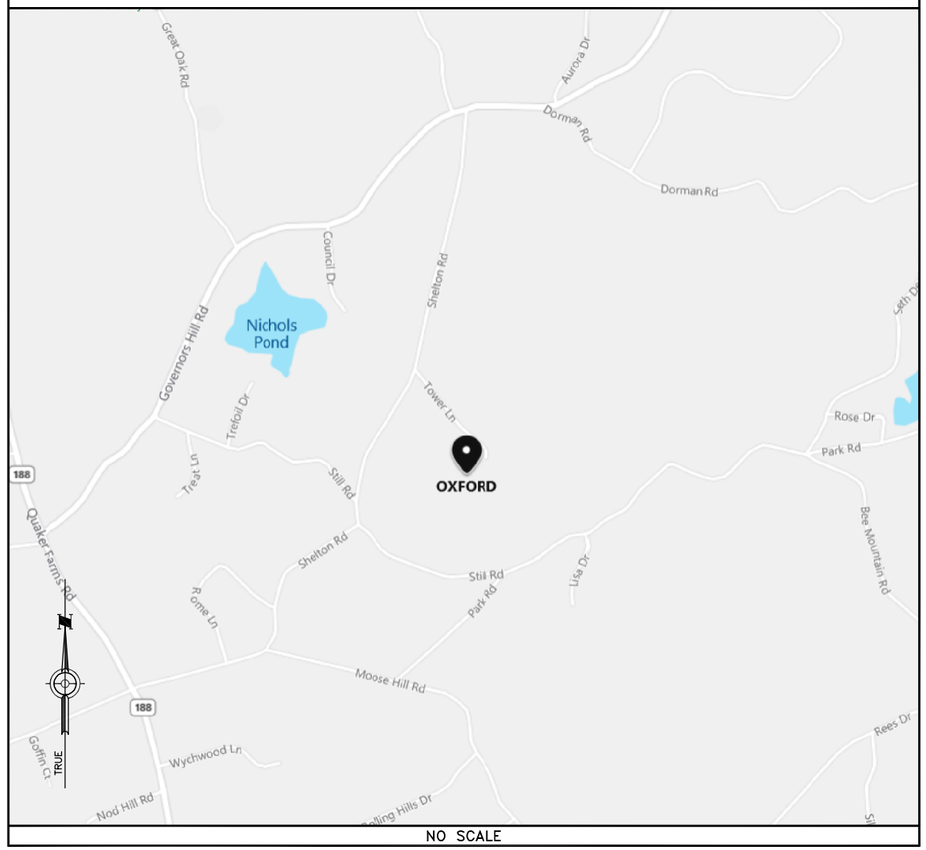
EVERSOURCE ENERGY
PROJECT MANAGER:
NIKOLL PRECI
(860) 655–3079

POWER PROVIDER:
EVERSOURCE ENERGY
(800) 286–2000

TELCO PROVIDER:
FRONTIER
(800) 921–8102

CALL BEFORE YOU DIG:
(800) 922–4455

LOCATION MAP



NO SCALE

DESIGN TYPE

SITE UPGRADE
SELF–SUPPORT TOWER

DRAWING INDEX

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

DO NOT SCALE DRAWINGS

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

UNDERGROUND SERVICE ALERT

UTILITIES PROTECTION CENTER, INC.
811

48 HOURS BEFORE YOU DIG

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

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–3595

PROJECT NO:	403093
DRAWN BY:	TYW
CHECKED BY:	CAG

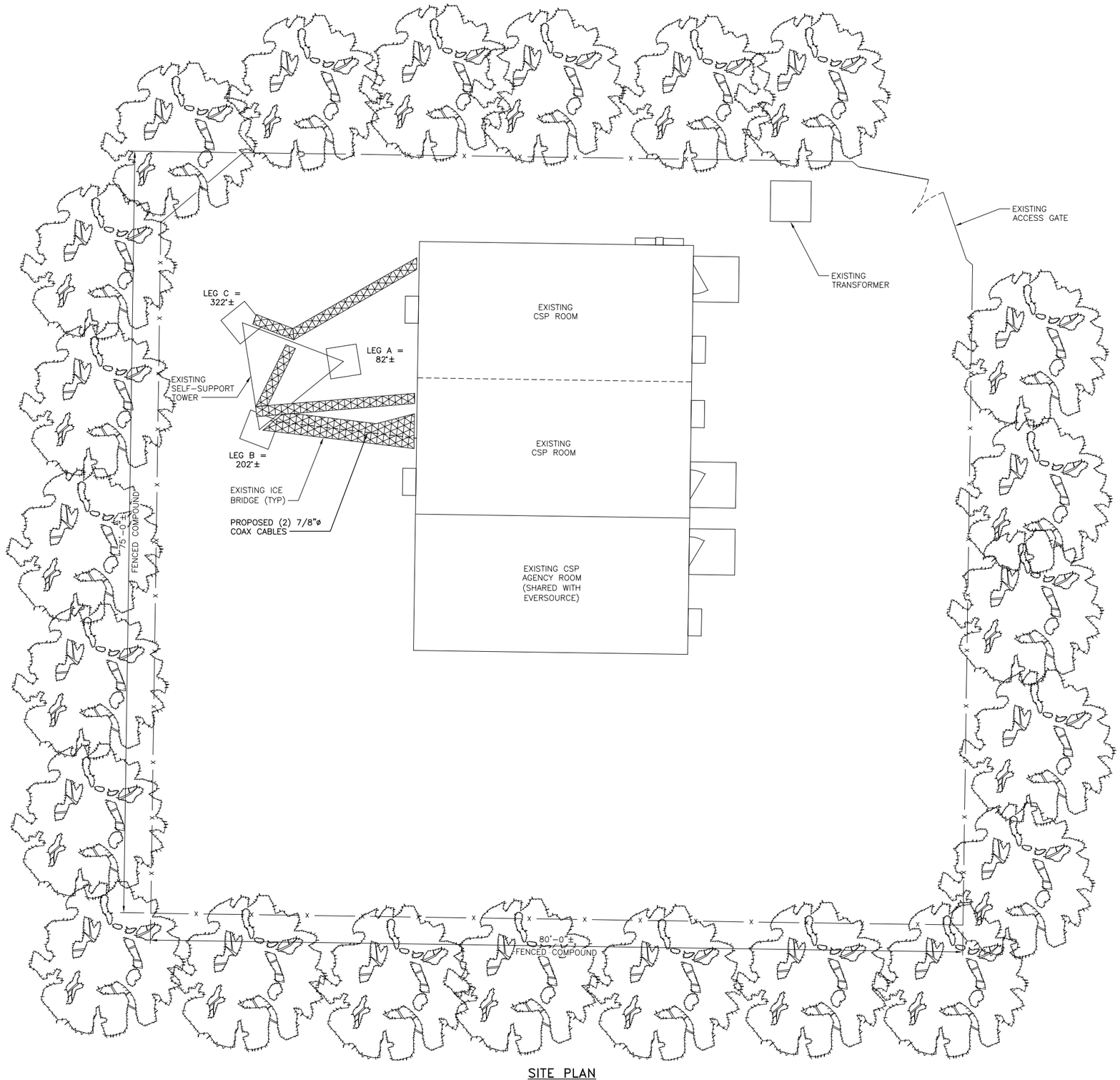
REV	DATE	DESCRIPTION
0	07/27/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
07/27/2020

OXFORD CSP
71 TOWER LANE
OXFORD, CT 06478

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T–1



SITE PLAN
NO SCALE

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

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-3595

PROJECT NO:	403093
DRAWN BY:	TYW
CHECKED BY:	CAG

REV	DATE	DESCRIPTION
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JOSHUA J. RILEY 33208 LICENSED PROFESSIONAL ENGINEER
STATE OF CONNECTICUT
07/27/2020

OXFORD CSP
71 TOWER LANE
OXFORD, CT 06478

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

TOP OF PROPOSED EVERSOURCE OMNI/WHIP ANTENNA
ELEVATION 111'–0"± AGL
RX RAD CL ELEVATION 107'–2 3/8"± AGL
TX RAD CL ELEVATION 100'–5"± AGL
(ANTENNA MECHANICAL LENGTH 13'–7")

TOP OF EXISTING EVERSOURCE ANTENNA
ELEVATION 105'–0"± AGL
(TO BE RELOCATED TO RAD CL ELEVATION 79'–6"± AGL)

1 C-2

TOP OF EXISTING EVERSOURCE ANTENNA
ELEVATION 102'–0"± AGL

TOP OF EXISTING ANTENNA (NON–EVERSOURCE)
ELEVATION 99'–0"± AGL

TOP OF EXISTING TOWER
ELEVATION 92'–0"± AGL

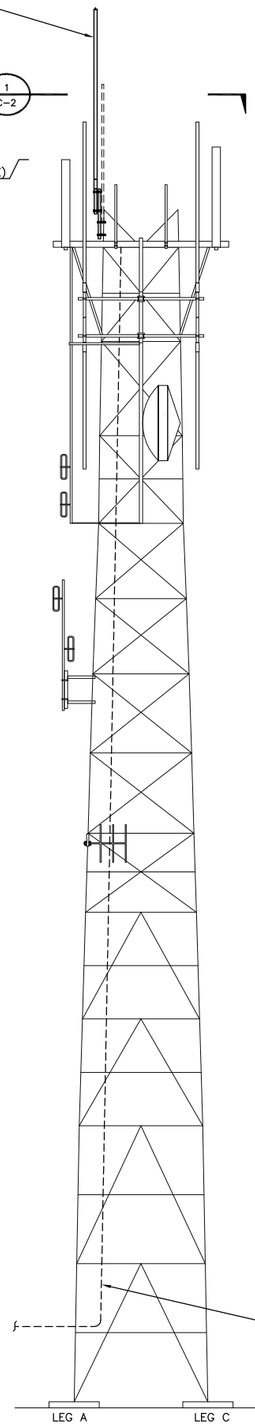
EXISTING ANTENNAS (NON–EVERSOURCE)
RAD CL ELEVATION 79'–0"± AGL

EXISTING ANTENNA (NON–EVERSOURCE)
RAD CL ELEVATION 73'–0"± AGL

EXISTING ANTENNA (NON–EVERSOURCE)
RAD CL ELEVATION 62'–0"± AGL

EXISTING ANTENNA (NON–EVERSOURCE)
RAD CL ELEVATION 44'–6"± AGL

EXISTING GRADE
ELEVATION 770'–0"± AMSL



PROPOSED (2) 7/8"ø COAX CABLES ROUTED TO PROPOSED OMNI

TOWER ELEVATION FACE AC
NO SCALE

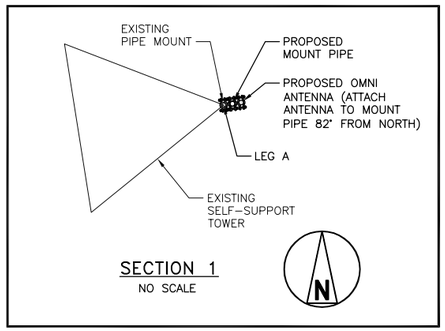
TOP OF EXISTING ANTENNA (NON–EVERSOURCE)
ELEVATION 102'–0"± AGL

TOP OF EXISTING ANTENNA (NON–EVERSOURCE)
ELEVATION 100'–0"± AGL

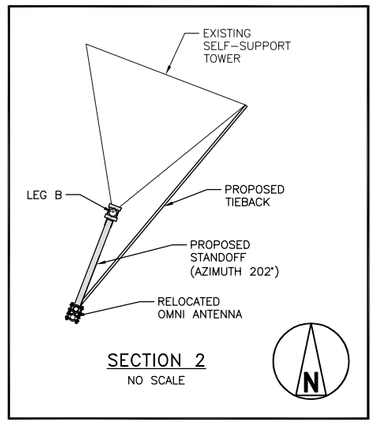
TOP OF EXISTING MOUNT PIPE (NON–EVERSOURCE)
ELEVATION 97'–0"± AGL

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

EXISTING ANTENNAS (NON–EVERSOURCE)
RAD CL ELEVATION 78'–0"± AGL



SECTION 1
NO SCALE



SECTION 2
NO SCALE

TOP OF EXISTING ANTENNA (NON–EVERSOURCE)
ELEVATION 114'–0"± AGL

TOP OF EXISTING ANTENNA (NON–EVERSOURCE)
ELEVATION 102'–0"± AGL

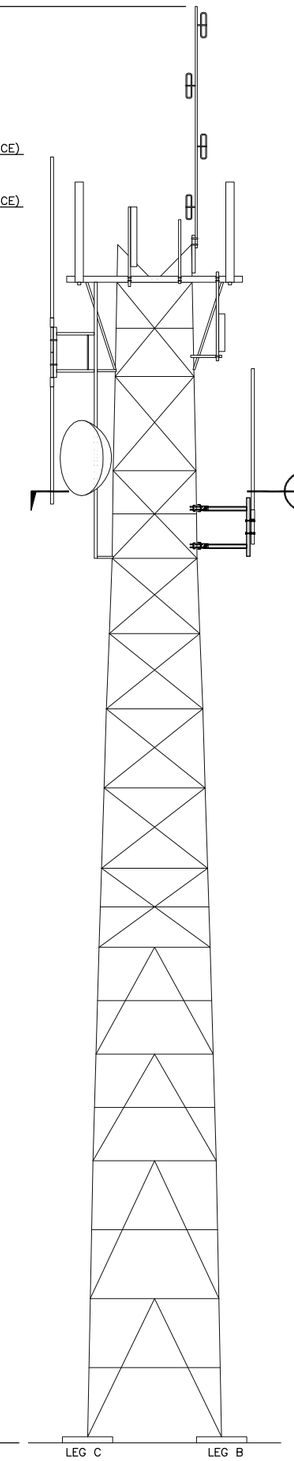
TOP OF EXISTING ANTENNA (NON–EVERSOURCE)
ELEVATION 98'–0"± AGL

EXISTING ANTENNA (NON–EVERSOURCE)
RAD CL ELEVATION 79'–0"± AGL

EXISTING ANTENNA (NON–EVERSOURCE)
RAD CL ELEVATION 78'–0"± AGL

114'–0"± AGL
TOTAL HEIGHT WITH APPURTENANCES

EXISTING GRADE
ELEVATION 770'–0"± AMSL



TOWER ELEVATION FACE CB
NO SCALE

TOP OF EXISTING ANTENNAS (NON–EVERSOURCE)
ELEVATION 100'–0"± AGL

TOP OF EXISTING MOUNT PIPE (NON–EVERSOURCE)
ELEVATION 97'–0"± AGL

TOP OF EXISTING TOWER
ELEVATION 92'–0"± AGL

EXISTING ANTENNA (NON–EVERSOURCE)
RAD CL ELEVATION 88'–0"± AGL

EXISTING RELOCATED EVERSOURCE ANTENNA
RAD CL ELEVATION 79'–6"± AGL
MOUNT CL ELEVATION 72'–6"± AGL

2 C-2

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

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–3595

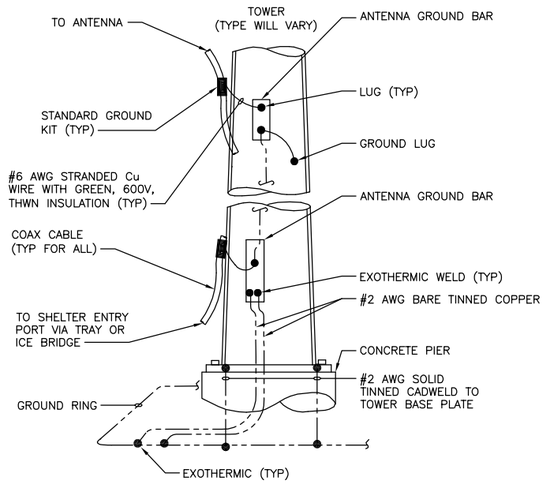
PROJECT NO:	403093
DRAWN BY:	TYW
CHECKED BY:	CAG

REV	DATE	DESCRIPTION
0	07/27/20	ISSUED FOR FILING

OXFORD CSP
71 TOWER LANE
OXFORD, CT 06478

SHEET TITLE
TOWER ELEVATION & ANTENNA EQUIPMENT

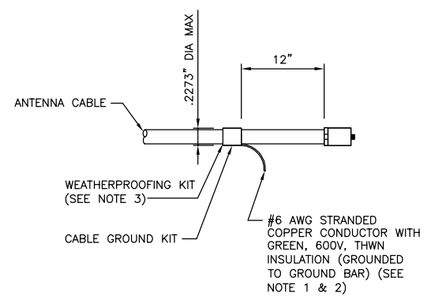
SHEET NUMBER
C-2



NOTE

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

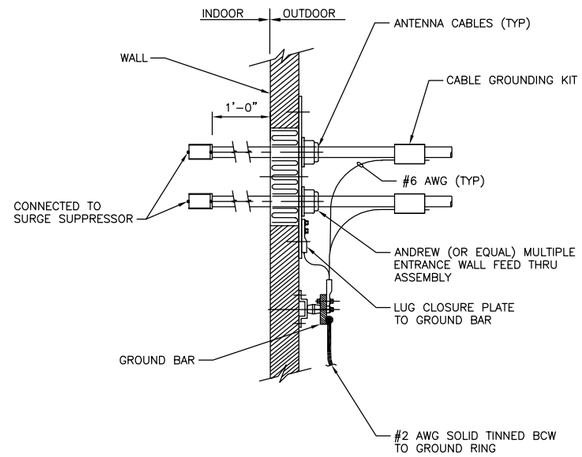
ANTENNA CABLE GROUNDING
NO SCALE



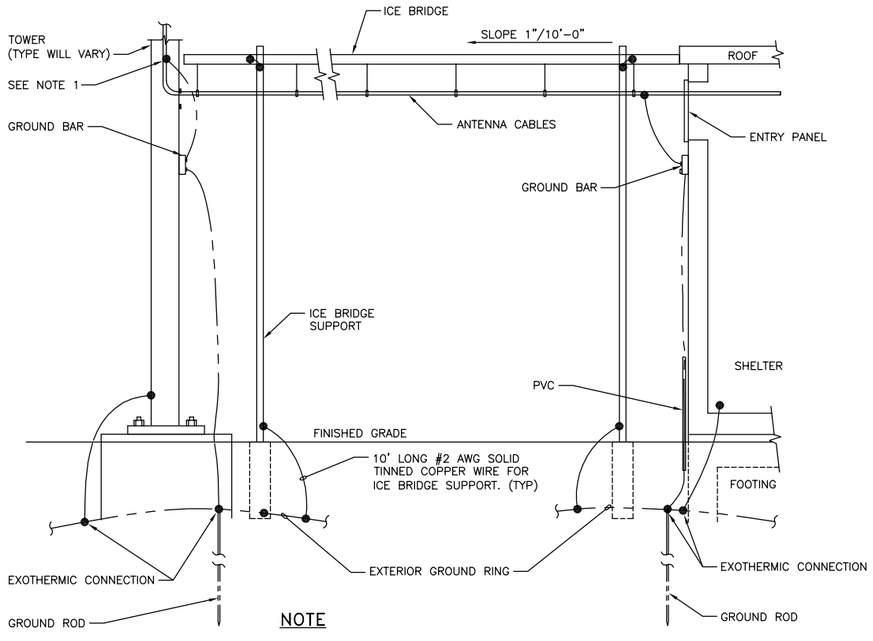
NOTES

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

CONNECTION OF CABLE GROUND
KIT TO ANTENNA CABLE
NO SCALE



CABLE INSTALLATION WITH WALL
FEED THRU ASSEMBLY
NO SCALE



NOTE

1. PROVIDE GROUND KIT 6" BEFORE TURN

ICE BRIDGE AND ANTENNA
CABLE DETAIL
NO SCALE

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

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458-3595

PROJECT NO:	403093
DRAWN BY:	TYW
CHECKED BY:	CAG

REV	DATE	DESCRIPTION
0	07/27/20	ISSUED FOR FILING

STATE OF CONNECTICUT
MARK P. STILES
24358
LICENSED
PROFESSIONAL ENGINEER
07/27/2020

OXFORD CSP
71 TOWER LANE
OXFORD, CT 06478

SHEET TITLE
GROUNDING
DETAILS

SHEET NUMBER
G-1

DESIGN BASIS

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

GENERAL CONDITIONS

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

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

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

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

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

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

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

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

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

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

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

THERMAL & MOISTURE PROTECTION

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

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

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

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

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

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

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

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

SUBMITTALS

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

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

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

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

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

STEEL

1. MATERIAL:

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

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

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

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

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

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

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

SITE GENERAL

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

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

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

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

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

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

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

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

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

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PROJECT NO:	403093
DRAWN BY:	TYW
CHECKED BY:	CAG

REV	DATE	DESCRIPTION
0	07/27/20	ISSUED FOR FILING

OXFORD CSP
71 TOWER LANE
OXFORD, CT 06478

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
N-1

ELECTRICAL

1. CONTRACTOR SHALL VERIFY EXISTING ELECTRIC SERVICE TYPE AND CAPACITY AND ORDER NEW ELECTRIC SERVICE FROM LOCAL ELECTRIC UTILITY, WHERE APPLICABLE.
2. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH ALL APPLICABLE CODES, AND SHALL BE ACCEPTABLE TO ALL AUTHORITIES HAVING JURISDICTION. WHERE A CONFLICT EXISTS BETWEEN CODES, PLAN AND SPECIFICATIONS, OR AUTHORITIES HAVING JURISDICTION, THE MORE STRINGENT AUTHORITIES SHALL APPLY.
3. CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC, FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN AND/OR OTHERWISE REQUIRED.
4. ALL ELECTRICAL CONDUCTORS SHALL BE 100% COPPER AND SHALL HAVE TYPE THHN INSULATION UNLESS INDICATED OTHERWISE.
5. CONDUIT SHALL BE THREADED RIGID GALVANIZED STEEL OR EMT WITH ONLY COMPRESSION TYPE COUPLINGS AND CONNECTORS, ALL MADE UP WRENCH TIGHT.
6. ALL BURIED CONDUIT SHALL BE MINIMUM SCH 40 PVC UNLESS NOTED OTHERWISE, OR AS PER LOCAL CODE REQUIREMENTS.
7. PROVIDE FLEXIBLE STEEL CONDUIT OR LIQUID TIGHT FLEXIBLE STEEL CONDUIT TO ALL VIBRATING EQUIPMENT, INCLUDING HVAC UNITS, TRANSFORMERS, MOTORS, ETC, OR WHERE EQUIPMENT IS PLACED UPON A SLAB ON GRADE.
8. ALL BRANCH CIRCUITS AND FEEDERS SHALL HAVE A SEPARATE GREEN INSULATED EQUIPMENT GROUNDING CONDUCTOR BONDED TO ALL ENCLOSURES, PULLBOXES, ETC.
9. CONDUIT AND CABLE WITHIN CORRIDORS SHALL BE CONCEALED AND EXPOSED ELSEWHERE, UNLESS NOTED OTHERWISE.
10. ELECTRICAL MATERIALS INSTALLED ON ROOFTOP SHALL BE LISTED FOR NEMA 3R USE. –AND ALL WIRING WITHIN A VENTILATION DUCT SHALL BE LISTED FOR SUCH USE. IN GENERAL WIRING METHODS WITHIN A DUCT SHALL BE AN MC CABLE WITH SMOOTH OR CORRUGATED METAL JACKET AND HAVE NO OUTER COVERING OVER THE METAL JACKET. INTERLOCKED ARMOR TYPE OF MC CABLE IS NOT ACCEPTABLE FOR THIS APPLICATION. CONTRACTOR CAN ALSO USE TYPE MI CABLE IN THE VENTILATION DUCT PROVIDED IT DOES NOT HAVE ANY OUTER COVERINGS OVER THE METAL EXTERIOR.
11. WIRING DEVICES SHALL BE SPECIFICATION GRADE, AND WIRING DEVICE COVER PLATES SHALL BE PLASTIC WITH ENGRAVING AS SPECIFIED.
12. GROUNDING SYSTEM RESISTANCE SHALL BE MEASURED, RECORDED, AND DATED USING MEGGER DET14 OR SIMILAR INSTRUMENT. GROUND RESISTANCE SHALL NOT EXCEED 5 OHMS. IF THE RESISTANCE VALUE IS EXCEEDED, NOTIFY CONSTRUCTION MANAGER FOR FURTHER INSTRUCTION.
13. COORDINATE WITH BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK INVOLVING EXISTING SYSTEMS OR EQUIPMENT IN ORDER TO DETERMINE THE EFFECT, IF ANY, ON OTHER TENANTS WITHIN THE BUILDING, AND TO DETERMINE THE APPROPRIATE TIME FOR PERFORMING THIS WORK.
14. THE CONTRACTOR SHALL BE REQUIRED TO VISIT THE SITE PRIOR TO SUBMITTING BID IN ORDER TO DETERMINE THE EXTENT OF THE EXISTING CONDITIONS.
15. ALL CONDUCTOR ENDS SHALL BE TAGGED AND ELECTRICAL EQUIPMENT LABELED WITH ENGRAVED IDENTIFICATION PLATES.
16. CONTRACTOR IS RESPONSIBLE FOR ALL CONTROL WIRING AND ALARM TIE–INS.

GROUNDING

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

ANTENNA & CABLE NOTES

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

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MARK P. STILES
24358
LICENSED PROFESSIONAL ENGINEER
07/27/2020

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SHEET TITLE
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SYMBOLS

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

ABBREVIATIONS

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

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SHEET TITLE

NOTES
& SPECIFICATIONS

SHEET NUMBER

N-3

REFERENCE CUTSHEETS

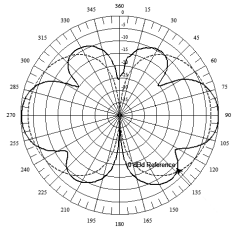
VHF Omni Antennas (160-222 MHz)

		160-174 MHz						217-222 MHz									
	Model Number	DS1G03F36U-N	DS1G03F36U-D	DS1G06F36U-N	DS1G06F36U-D	DS1G03F36D-N	DS1G03F36D-D	DS2C00F36U-N	DS2C00F36U-D	DS2C03F36U-N	DS2C03F36U-D	DS2C06F36U-N	DS2C06F36U-D	DS2C00F36D-N	DS2C00F36D-D	DS2C03F36D-N	DS2C03F36D-D
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN
	Type	Single		Single		Dual		Single		Single		Single		Dual		Dual	
ELECTRICAL	**Bandwidth**, MHz	14		14		14		5		5		5		5		5	
ELECTRICAL	**Power**, Watts	500		500		350		500		500		500		350		350	
ELECTRICAL	**Gain**, dBd	3		6		3		0		3		6		0		3	
ELECTRICAL	**Horizontal Beamwidth**, degrees	360		360		360		360		360		360		360		360	
ELECTRICAL	**Vertical Beamwidth**, degrees	30		16		30		60		30		16		60		30	
ELECTRICAL	**Beam Tilt**, degrees	0		0		0		0		0		0		0		0	
ELECTRICAL	**Isolation (minimum)**, dB	N/A		N/A		30		N/A		N/A		N/A		30		30	
MECHANICAL	**Number of Connectors**	1		1		2		1		1		1		2		2	
MECHANICAL	**Flat Plate Area**, ft²(m²)	2.53 (0.24)		4.38 (0.41)		4.5 (0.42)		1.9 (0.18)		1.9 (0.18)		2.58 (0.24)		2.4 (0.22)		4.1 (0.38)	
MECHANICAL	**Lateral Windload Thrust**, lbf(N)	95 (423)		164 (730)		169 (752)		53 (236)		69 (307)		108 (480)		90 (400)		169 (752)	
MECHANICAL	**Survival Wind Speed**																
MECHANICAL	**without ice**, mph(kph)	110 (177)		75 (121)		75 (121)		222 (357)		172 (277)		110 (177)		130 (209)		75 (121)	
MECHANICAL	**with 0.5" radial ice**, mph(kph)	93 (150)		60 (97)		65 (105)		193 (311)		150 (241)		96 (154)		115 (185)		65 (105)	
MECHANICAL	**Mounting Hardware** included	DSH3V3R		DSH3V3N		DSH3V3N		DSH2V3R		DSH2V3R		DSH3V3N		DSH3V3R		DSH3V3N	
DIMENSIONS	**Length**, ft(m)	12.7 (3.9)		21.9 (6.7)		22.3 (6.8)		7.7 (2.3)		9.9 (3)		18.1 (5.5)		13.6 (4.1)		24.3 (7.4)	
DIMENSIONS	**Radome O.D.**, in(cm)	3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)	
DIMENSIONS	**Mast O.D.**, in(cm)	2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)	
DIMENSIONS	**Net Weight** w/o bracket, lb(kg)	37 (16.8)		60 (27.2)		63 (28.6)		19 (8.6)		26 (11.8)		47 (21.3)		40 (18.1)		70 (31.8)	
DIMENSIONS	**Shipping Weight**, lb(kg)	67 (30.4)		90 (40.8)		93 (42.2)		39 (17.7)		56 (25.4)		77 (34.9)		70 (31.8)		100 (45.4)	

DS2C00F36D-D

VERTICAL PATTERNS

DS1G03F36U-N
DS1G03F36U-D



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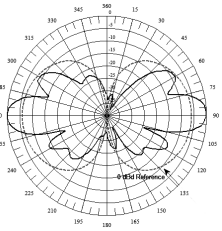

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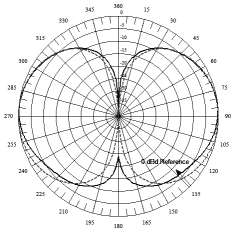

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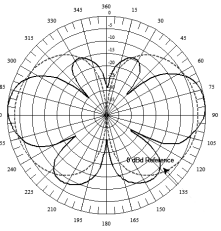

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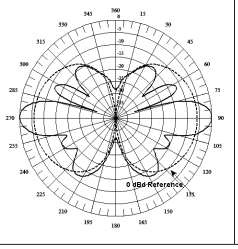

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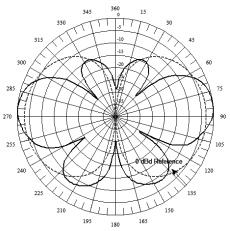

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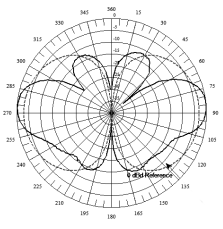

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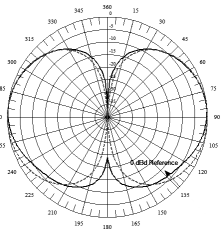

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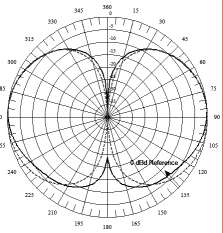

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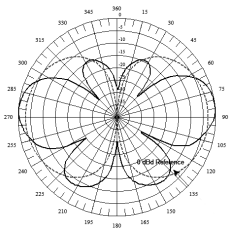
DS2C03F36D-D



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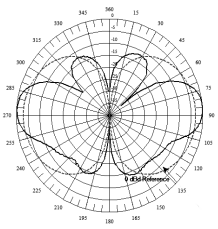

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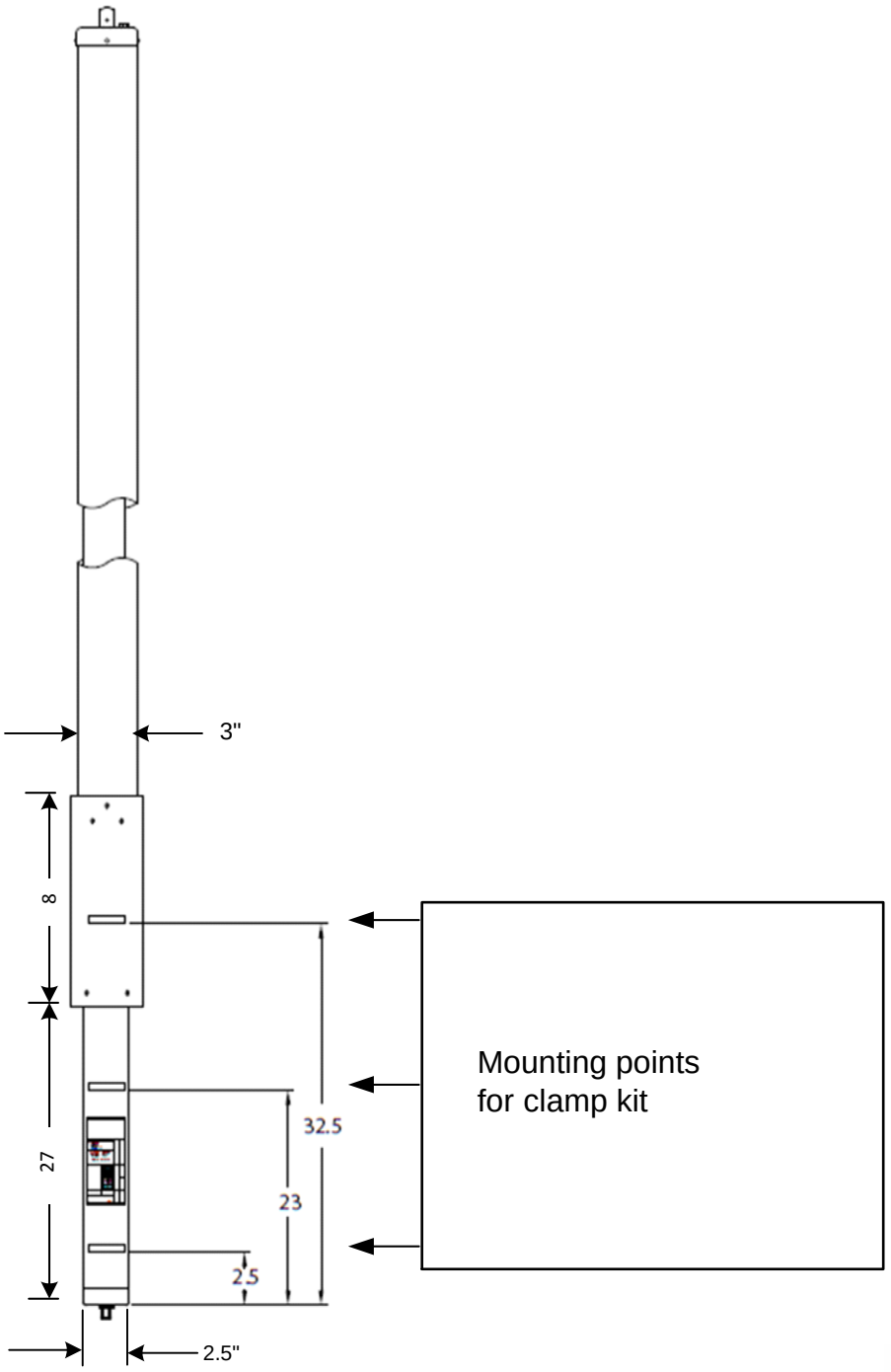
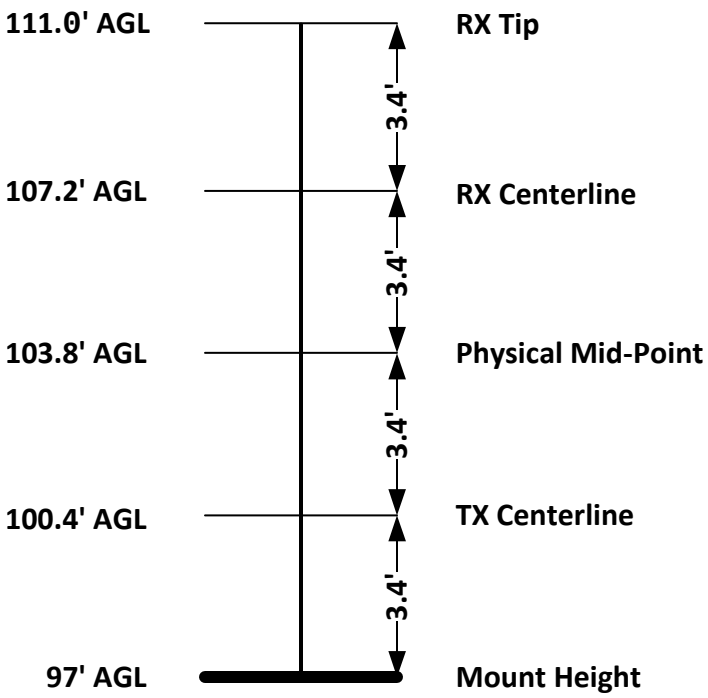
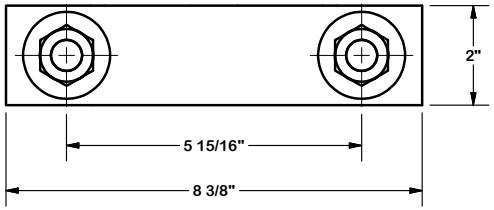


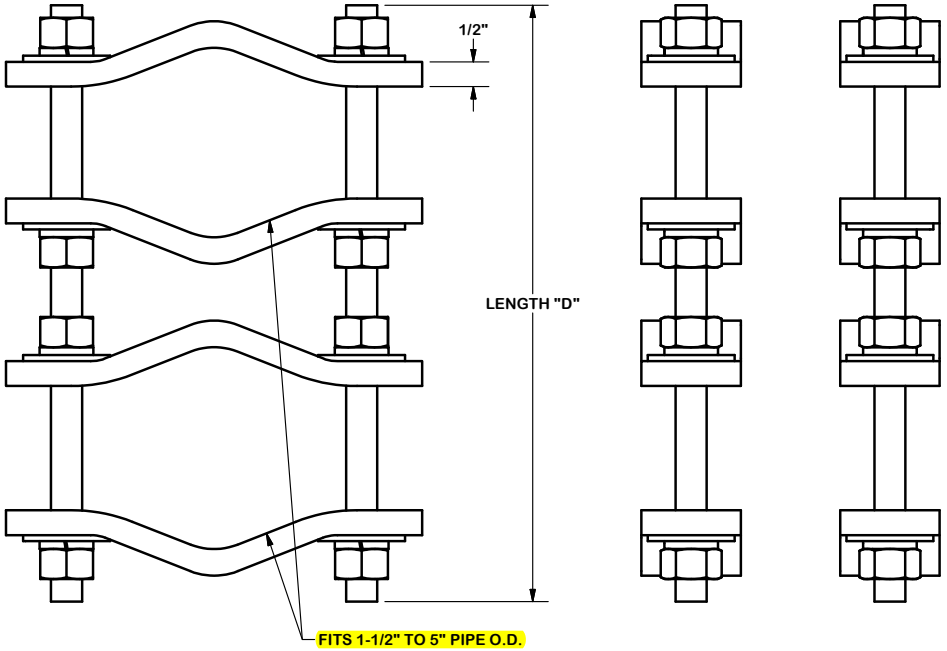
dBSpectra DS2C00F36 (13.6' Total)



ONE (1) CLAMP SET REQUIRED.

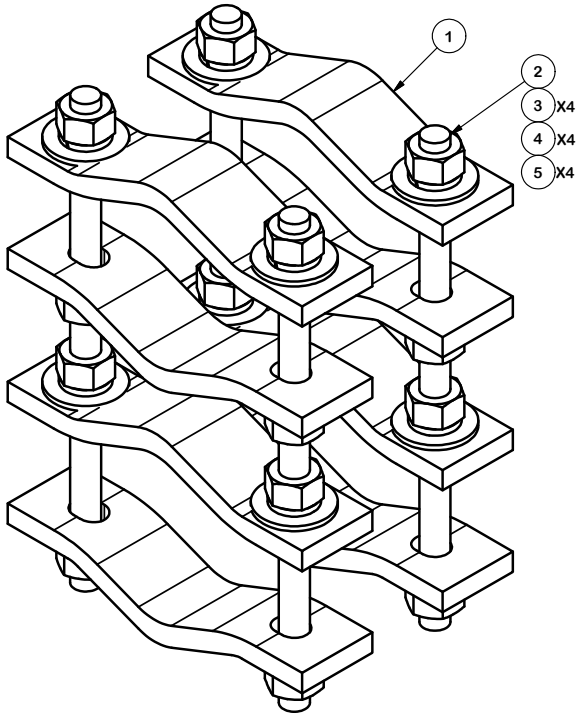
ONE (1) 2-1/2" STD. (2.875" OD) X 7' LG MOUNT PIPE REQUIRED.





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

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



TOLERANCE NOTES

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

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

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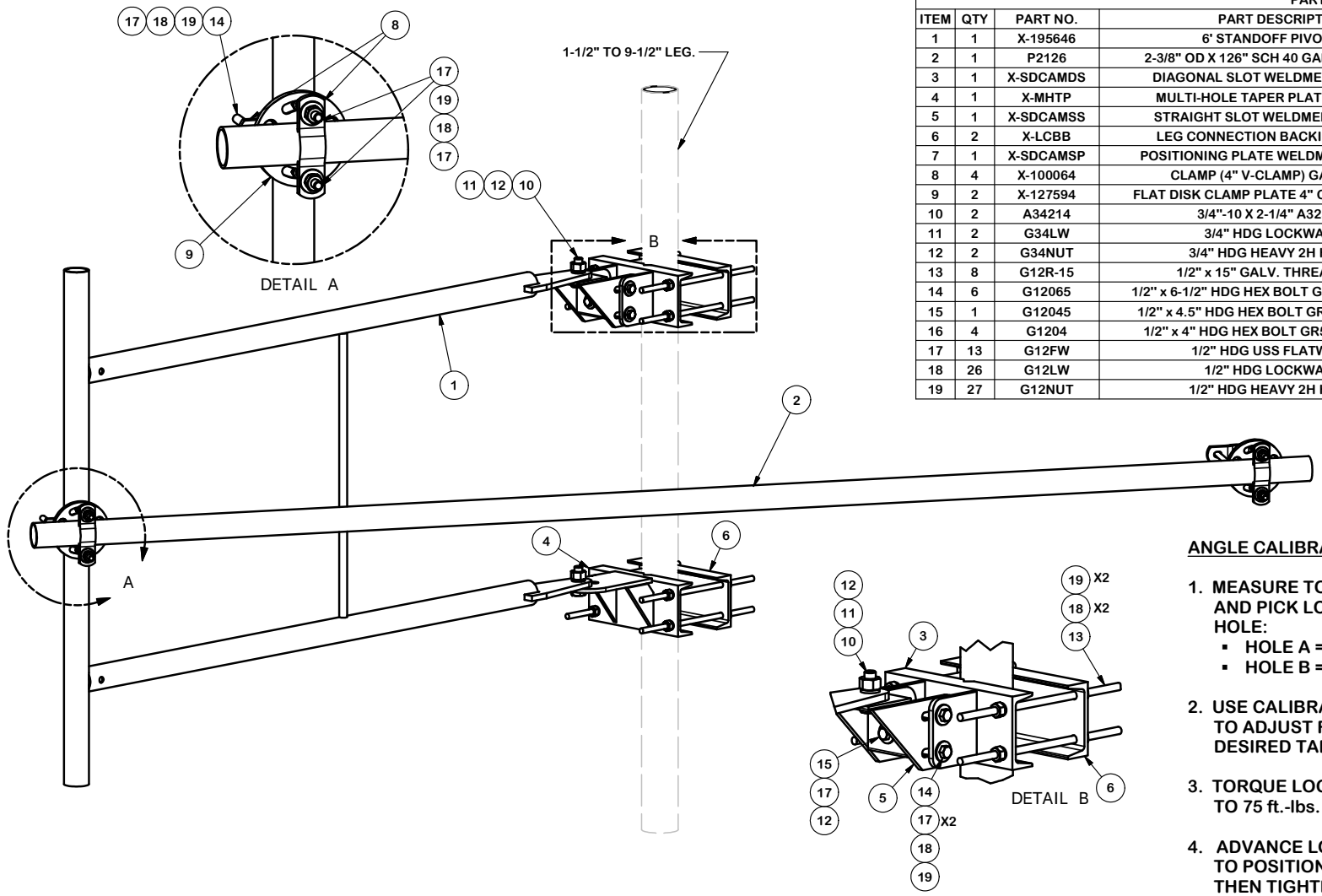
Engineering Support Team: 1-888-753-7446

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

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.
	KC8 8/21/2012		SEE ASSEMBLY "A"

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

TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = L3X3 ANGLE
STANDOFF FRAME FITS ANGLE LEGS FROM 3" UP TO 6".
REPLACE THE FLAT DISH CLAMP PLATE (ITEM #9) THAT COMES WITH THE PSA6 SIDE ARM WITH THE SAM-U (SPEC SHEET BELOW) FOR THE CONNECTION FROM THE TIEBACK TO THE TOWER LEG.

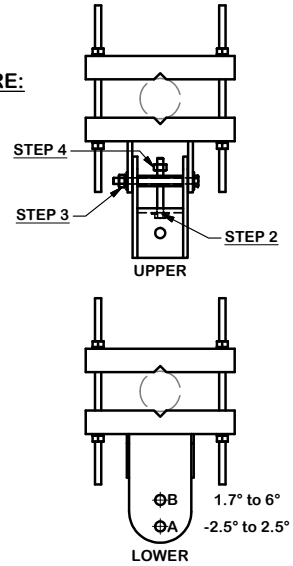


PARTS LIST

ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	X-195646	6' STANDOFF PIVOT ARM		66.73	66.73
2	1	P2126	2-3/8" OD X 126" SCH 40 GALVANIZED PIPE	126 in	40.75	40.75
3	1	X-SDCAMDS	DIAGONAL SLOT WELDMENT FOR BCAM		13.57	13.57
4	1	X-MHTP	MULTI-HOLE TAPER PLATE WELDMENT		13.17	13.17
5	1	X-SDCAMSS	STRAIGHT SLOT WELDMENT FOR BCAM		8.48	8.48
6	2	X-LCBB	LEG CONNECTION BACKING BRACKET	12 in	7.56	15.11
7	1	X-SDCAMSP	POSITIONING PLATE WELDMENT FOR BCAM		1.43	1.43
8	4	X-100064	CLAMP (4" V-CLAMP) GALVANIZED		0.91	3.65
9	2	X-127594	FLAT DISK CLAMP PLATE 4" CENTERS (GALV.)		2.51	5.01
10	2	A34214	3/4"-10 X 2-1/4" A325 BOLT	2 1/4 in	0.47	0.95
11	2	G34LW	3/4" HDG LOCKWASHER		0.04	0.09
12	2	G34NUT	3/4" HDG HEAVY 2H HEX NUT		0.21	0.42
13	8	G12R-15	1/2" x 15" GALV. THREADED ROD		0.84	6.69
14	6	G12065	1/2" x 6-1/2" HDG HEX BOLT GR5 FULL THREAD	6 1/2 in	0.41	2.46
15	1	G12045	1/2" x 4.5" HDG HEX BOLT GR5 FULL THREAD	4 1/2 in	0.30	0.30
16	4	G1204	1/2" x 4" HDG HEX BOLT GR5 FULL THREAD	4 in	0.27	1.08
17	13	G12FW	1/2" HDG USS FLATWASHER	3/32 in	0.03	0.44
18	26	G12LW	1/2" HDG LOCKWASHER	1/8 in	0.01	0.36
19	27	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	1.93
					TOTAL WT. #	182.62

ANGLE CALIBRATING PROCEDURE:

1. MEASURE TOWER TAPER AND PICK LOWER BRACKET HOLE:
   - HOLE A = -2.5° TO 2.5°
   - HOLE B = 1.7° TO 6°
2. USE CALIBRATING BOLT TO ADJUST FRAME TO DESIRED TAPER
3. TORQUE LOCKING BOLTS TO 75 ft.-lbs.
4. ADVANCE LOCKING NUT TO POSITIONING PLATE, THEN TIGHTEN.



REV	DESCRIPTION OF REVISIONS	CPD	BY	DATE
B	CHNAGED SIDEARM LEG CONNECTION		CEK	6/8/2017
A	P1126 CHANGED TO P2126	4749	CEK	11/13/2015

REVISION HISTORY

TOLERANCE NOTES

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

DESCRIPTION: 6' SIDE ARM (PSA6)

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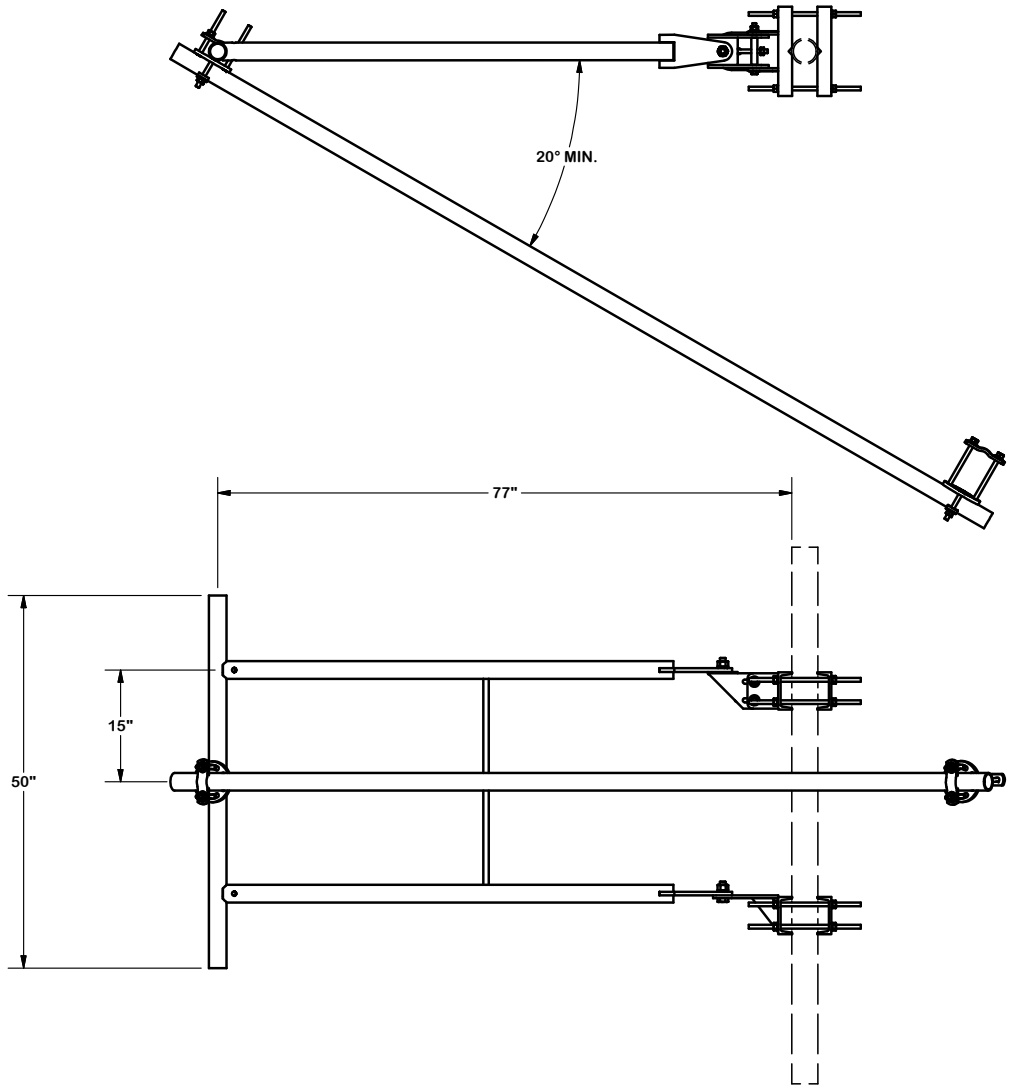
Engineering Support Team: 1-888-753-7446
Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.
4749	CEK 9/1/2010		PSA6

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
		CUSTOMER	BMC 7/6/2017	PSA6



TOLERANCE NOTES

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LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
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ALL OTHER MACHINING *(± 0.030")*
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REV	DESCRIPTION OF REVISIONS	CPD	BY	DATE
B	CHNAGED SIDEARM LEG CONNECTION		CEK	6/8/2017
A	P1126 CHANGED TO P2126	4749	CEK	11/13/2015

REVISION HISTORY

DESCRIPTION: 6' SIDE ARM (PSA6)

SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

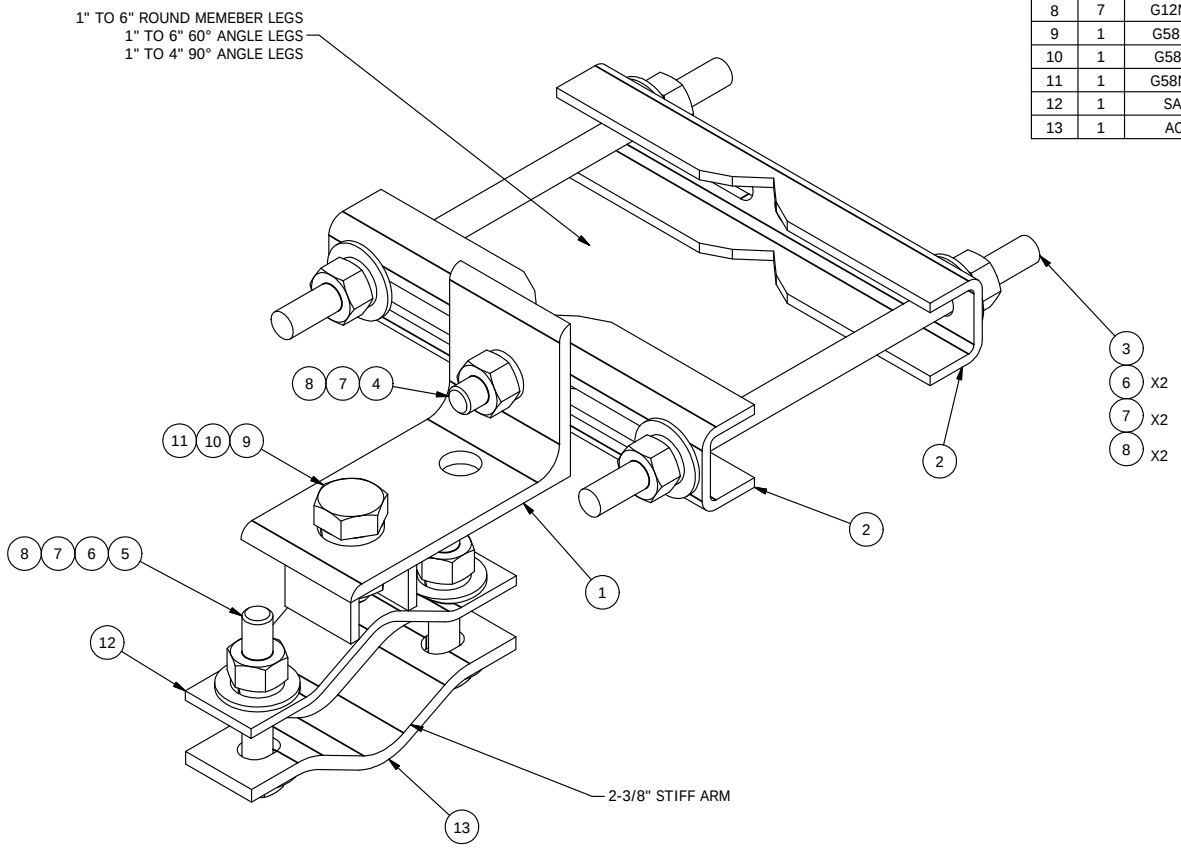
Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.
4749	CEK 9/1/2010		PSA6

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
		CUSTOMER	BMC 7/6/2017	PSA6

ONE (1) STIFF ARM ATTACHMENT REQUIRED.

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	X-STA3	STIFF ARM ANGLE BRACKET	2 1/2 in	1.39	1.39
2	2	X-STU	STIFF ARM CHANNEL BRACKET		1.37	2.74
3	2	G12R-10	1/2" x 10" THREADED ROD (HDG.)		0.56	1.12
4	1	G12112	1/2" x 1-1/2" HDG HEX BOLT GR5	1/2 in	0.15	0.15
5	2	G1203	1/2" x 3" HDG HEX BOLT GR5 FULL THREAD	3 in	0.22	0.43
6	8	G12FW	1/2" HDG USS FLATWASHER		0.03	0.27
7	7	G12LW	1/2" HDG LOCKWASHER		0.01	0.10
8	7	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	0.50
9	1	G58112	5/8" x 1-1/2" HDG BOLT	1 1/2 in	0.25	0.25
10	1	G58LW	5/8" HDG LOCKWASHER		0.03	0.03
11	1	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	0.13
12	1	SAM	STIFF ARM MOUNT CLAMP		0.77	0.77
13	1	ACP	CLAMP HALF 1/4" THICK, 5-3/4" LONG		0.65	0.65
					TOTAL WT. #	8.53



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DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION: UNIVERSAL STIFF ARM ATTACHMENT

SITE PRO 1 — A valmont COMPANY
Engineering Support Team: 1-888-753-7446
Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	CEK 2/22/2012		SAM-U	1 OF 1

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
87	02	CUSTOMER	BMC 2/22/2012	SAM-U

ATTACHMENT D – STRUCTURAL ANALYSIS

AECOM

Submitted to
Eversource Energy
107 Selden Street
Berlin, CT 06037

Submitted by
AECOM
500 Enterprise Drive,
Suite 3B
Rocky Hill, CT 06067
July 21, 2020

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF AN EXISTING 92' SELF SUPPORTING LATTICE TOWER AND FOUNDATION FOR PROPOSED ANTENNA ARRANGEMENT

EVERSOURCE ENERGY

Site Name: Connecticut State Police Tower #24
Site Address: 59 Shelton Road
Oxford, Connecticut

60624421
EVS-015 Revision 3

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis and modification of the existing 92' self-supporting lattice tower structure, located at 59 Shelton Road in Oxford, Connecticut.

The structural analysis was conducted in accordance with the 2018 Connecticut State Building Code which include the TIA-222-H[1] Standard, 2018 International Building Code, the 2018 Connecticut State Building Code Amendments to the 2015 International Building Code, the AISC[2] Load Resistance Factor Design (LRFD), the ASCE 7[3] design Code, and the Department of Emergency Services and Public Protection (DESPP) / Connecticut State Police (CSP) design Requirements which include the TIA-222-F[4] Standard.

The antenna loading considered in the analysis consists of all the existing antennas, transmission lines and ancillary items as outlined in the Introduction Section of this report.

The proposed Eversource antenna upgrades are listed below:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
<u>Re-location of existing antenna:</u> **(1) Kreco CO-36A 14' Omni Antenna**	**Eversource (existing)**	**@ 79.5'**
<u>Install:</u> **(1) dbSpectra DS2C00F36D-D Omni Antenna** **(2) HCA78-50J (7/8" Diameter) Coaxial Cable**	**Eversource (Proposed)**	**@ 103.8'**
(1) SitePro1 PSA6 6' Side-arm Mount w/ Support Arm (for re-located antenna) **(1) 7/8" Coaxial Cable (Length re-adjusted for re-location)**	**Eversource (Proposed)**	**@ 72.5'**

The results of the analysis herein indicates:

1. The existing steel tower structure IS considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
2. The existing tower anchor bolts ARE considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
3. The existing foundation IS considered structurally adequate for the proposed antenna loading with the load classification specified herein.
4. The existing tower's sway (deflection) is 0.61250 degrees, and the existing tower's twist (rotation) is 0.0919 degrees. These figures combined ARE within the Connecticut State Police requirement of 0.75 for combined twist (rotation) and sway (deflection) with the load classification specified herein.
5. The maximum structural capacity rating calculated herein (after the above equipment has been installed as indicated) is ***<u>97.5%</u>***.

1. TIA = Telecommunications Industry Association Structural Standard for Antenna Supporting Structures and Antennas (Version H)

2. AISC = American Institute of Steel Construction (15th Edition)

3. ASCE 7 = American Society of Civil Engineers Standard 7 (2016 Edition)

4. TIA = Telecommunications Industry Association Structural Standard for Antenna Supporting Structures and Antennas (Version F)

1. EXECUTIVE SUMMARY - *continued*

This analysis is based on:

1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.

2) Foundation drawings by Bayar Engineering, P.C., job number 0810, issued May 19, 1994.

3) Existing tower structure members obtained from Tower Mapping and inventory of Existing Communications Tower, performed by JGI Eastern, Inc. (a.k.a. Terracon), dated September 2, 2008.

4) Geotechnical report by Dr. Clarence Welti, P.E., P.C. dated January 9, 2009.

5) Previous structural analysis and reinforcement performed by URS Corporation on behalf of AT&T, project number 36924438 / SAI-065, signed and sealed June, 16 2011.

6) Structural Tower Mapping Report conducted by Eastern Communications Incorporated, dated January 10, 2013.

7) Antenna/appurtenance inventory as documented by the Connecticut State Police dated January 27, 2014.

8) Tower Mapping and Inventory performed by D&K Nationwide Communications, Inc. dated March 16, 2016.

9) Proposed Connecticut State Police antenna inventory, provided by Motorola, obtained via e-mail dated June 21, 2016.

10) Previous structural analysis and evaluation performed by AECOM on behalf of the Connecticut State Police, project number 60509756.04 / PNS-604, signed and sealed August 19, 2016.

11) Previous structural analysis and modification performed by AECOM on behalf of the Connecticut State Police, project number 606028135 / VZ6-002, signed and sealed on December 20, 2016.

12) Previous structural analysis and evaluation, performed by AECOM, on behalf of Eversource, project 60624421 / EVS-015, signed and sealed on January 31, 2020.

13) Updates to Eversource antenna inventory, obtained via e-mail dated April 8, 2020.

14) Tower climb performed by Roadrunner, Inc on July 13, 2020 to verify previous installations of members from prior tower modifications.

15) Antenna and mount configuration as specified in Section 2 and 6.

16) Coaxial cable orientation as specified in Section 6 of this report.

1. EXECUTIVE SUMMARY - *continued*

This report is only valid as per the assumptions and data utilized in this report for antenna inventory, mounts, associated coaxial cables and tower members from field assessed measurements. The user of this report shall field verify the antenna, cabling and mount configuration used, as well as the physical condition of the tower members, connections and foundations. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please contact Michael Egan (860) 263-5817.

Sincerely,

AECOM,

Richard A. Sambor, P.E.
Senior Structural Engineer

RAS/mcd

Cc: DJR – AECOM
CF/Book

2. INTRODUCTION

The subject tower is located at 59 Shelton Road in Oxford, CT. The structure is an existing 92' self-supporting steel tapered lattice tower. The original tower manufacturer is unknown.

The structural analysis was conducted in accordance with the following:

- 2018 International Building Code (compliant with the TIA-222-H design loads)
- 2015 International Building Code with 2018 Connecticut State Building Code Amendments for a wind speed of 130 mph (3-second gust – Ultimate Wind Speed)
- 2016 AISC Load Resistance Factor Design (LRFD)
- 2016 ASCE 7 Minimum Design Loads for Buildings and Other Structures for the ice thickness referenced in the TIA-222-H Standard
- Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) and 90 mph (fastest mile) concurrent with 0.5" ice. Twist (rotation) and sway (deflection) were determined in accordance with Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) concurrent with 0.5" ice, analyzed under the TIA-222-F design Standard.

The inventory together with the proposed Eversource antenna arrangement is summarized in the table below:

Antenna Type	***Carrier***	***Mount***	***Antenna Centerline Elevation***	***Cable***
(1) dbSpectra DS2C00F36D-D Omni Antenna	**Eversource (Proposed)**	**Pipe Mounted to Climb Ladder**	**103.8'**	**(2) 7/8"**
(1) Scala OGT-9-806 Omni Antenna*	D&K-13 CSP-2 (existing)	Pipe Mounted to AT&T Platform	96'	(1) 1-5/8"
(1) Decibel DB262 Dipole Antenna w/ lightning rod attached @ 114'	D&K-12 DHS-5 (existing)	Pipe Mounted to Leg	94'	(1) 7/8"
(1) Sinclair SC479-HF1LDF Omni Antenna	D&K-10 CSP-19 (existing)	*Shared with CSP-22 Mount*	92.5'	(1) 1-5/8"
(1) Sinclair SC479-HF1LDF Omni Antenna	D&K-9 CSP-18 (existing)	*Shared with CSP-22 Mount*	92.5'	(1) 1/2" from TTA Unit
(2) KMW AM-X-CD-16-65-00T (2) Diplexers (2) RRU (4) Andrew SBNH-1D6565C (2 per Sector) (4) Diplexers (2 per Sector) (4) RRU (2 per Sector) (6) Powerwave TT19-08BP11-001 TMA's	AT&T (existing)	Existing Platform	92'	(1) 3" Flex Conduit with 3 Optic Fiber & 6 DC Cables (6) LDF6-50A (1-1/4")
(2) Sinclair SE414-SWBP4LDF(D00) Enclosed Dipole Antennas	CSP (existing)	*Shared with CSP-2 Pipe Mount*	92'	*(1) 1/2" from New TTA Unit (below)*

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) Bird 430-94C TTA Unit	D&K-8 NEU-16 (existing)	6' Pipe attached to AT&T Platform	92'	(1) 1-5/8" (1) 1/2"
(1) Bird 432-83H-01T TTA Unit	D&K-7 CSP-22 (existing)	*Shared with Below Mount*	91'	(1) 1-5/8" (1) 1/2"
(2) Sinclair SE414-SWBP4LDF(D00) Enclosed Dipole Antennas (1) Bird 432E-83I-01T TTA Unit	CSP (Proposed)	*Shared with New Mount @ 80' (SitePro1 LTF10-384)*	80'	(2) AVA7-50 (1) 1/2" from TTA to Dipole Antenna
(1) Kreco 14' Omni Antenna	**D&K-15 Eversource (re-located)**	**Proposed 6' Side Arm Mount with support bar (part # PSA6) Mounted @ 72.6'**	**79.5'**	**(1) 7/8"**
(1) (inverted) Sinclair SC479-HF1LDF Omni Antenna	D&K-6 CSP-21 (existing)	12' T-Frame/Boom Gate Mount @ 85' (+/-)	77'	(1) 1-5/8"
(1) (inverted) Sinclair SC479-HF1LDF Omni Antenna	D&K-5 CSP-20 (existing)	*Shared with above Mount*	77'	(1) 1-5/8"
(1) RFS PA6-65 6' Dish w/ Radome	D&K-4 CSP-1 (existing)	Pipe Mounted to Leg	74.5'	(1) WEP65
(1) Telewave VHF150 Dipole Antenna	D&K-3 CSP-9 (existing)	3' Sidearm	72'	(1) 1/2"
(1) Decibel DB-222 Dipole Antenna	D&K-2 DEP-6 (existing)	1' Sidearm	54.5'	(1) 1/2"
(1) SY-203 Yagi Antenna	D&K-1 DEP-7 (existing)	Mounted to climb ladder	39'	(1) 1/2"

NOTES: Antenna ID numbering and elevations obtained from Tower Mapping and Existing inventory via tower climb, performed by D&K Nationwide Communications, Inc. on March 16, 2016.

"*****" indicates future decommissioning of CSP antennas

This structural analysis of the communications tower was performed by AECOM on behalf of Eversource. The purpose of this analysis was to investigate the structural integrity of the previously modified tower and previously modified foundation for existing and proposed antenna loads in compliance with the 2018 Connecticut State Building Code. This analysis was conducted to evaluate stress on the tower and the effect forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

The structural analysis was done in accordance with, the TIA-222-H–Structural Standard for Antenna Towers and Antenna Supporting Structures and Antennas, the 2015 International Building Code with 2018 Connecticut State Building Code Amendments, the 2018 International Building Code (in compliance with the TIA-222-H Standard) and the American Institute of Steel Construction (AISC) Manual of Steel Construction – Load Resistance Factor Design (LRFD).

The structural analysis was conducted using TNX Tower version 8.0.5.0 and used the following conditions for this tower review (following the TIA-222-H Standard):

- Structure Class 3 – (Essential Communications)
  - NOTE: ASCE 7 and CT State Building Code Applied Risk Category 4 for design wind loads (see below)
- Topographic Category 1 – (No abrupt elevation changes to location of structure – see below note):
  - *A previous analysis (and modification) had considered the location of the tower and the topographic differences for design. When considering TIA-222-H Section 2.6.6.1 #2 where the protrusion ratio is below 2.0, therefore the previously considered wind speed-up per the topographic consideration is removed from this analysis.*
- Exposure Class C – (Open Terrain with scattered obstructions)
- Load Conditions:
  - Two load conditions were evaluated as shown which were compared to design stresses according to AISC and TIA-222-H Standard.

Basic Wind Speed:

- IBC 2018 w/ 2018 CT State Building Code Amendment:
  - (2018) IBC Section 1609.1.1 – Determination of Wind Loads – Exception 5 “Designs using TIA-222” applies for determination of Design Wind Load obtained as “V.ult” are to be converted to “V.asd” when applying the TIA-222-H design Standard (under Section 1609.3) for Basic Wind Speed.
  - (2018) CT State Building Code Amendment to the IBC Section 1609.3 wind loads are obtained from Appendix N of the State Building Code.
    - **V.des = 130 mph** (3-Second Gust) Wind Design Parameter for the Town of Oxford, Connecticut for Risk Category four (IV) for essential communications (Connecticut State Police). NOTE: Because the State of Connecticut has not officially published the design wind-speeds, use of the State of Connecticut wind-speeds are per municipality (indicated above).

Load Condition 1 = 130 mph (3-second gust) Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 50 mph (3-second gust) Wind Load (with ice) + Ice Load + Tower Dead Load

Ice thickness used for this analysis is **1.00 inch** (assumed to start at the base of the tower and is considered to increase in thickness with height. The initial ice thickness for design is referenced in the Annex of TIA-222-H and follows the same design criteria as the ASCE 7 (2016) Standard.

The load condition below implements the design requirements of the Connecticut State Police for the tower structures deflection limits with the allowable deflection limit of the combination of the tower’s sway (deflection) and twist (rotation) under the TIA-222-F design Standard. This design limit required the design combined value of sway (deflection) and twist (rotation) to be under 0.75 degrees following the TIA-222-F design Standard.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS (cont.)

Load Condition 3 = 90 mph (fastest mile) Wind Load (with Ice) + Ice Load + Dead Load

Seismic event consideration factors/values for design:

- S.s = 0.196 (2018 CT State Building Code – Location Specific Value)
- S.1 = 0.064 (2018 CT State Building Code – Location Specific Value)
- Site Classification = “D”
- Seismic Design Category = “A” – (2012 International Building Code)
- F.a = 1.6 (Obtained from TIA-222-H Table 2-11 Considering above conditions)
- F.v = 2.4 (Obtained from TIA-222-H Table 2-12 Considering above conditions)

NOTE: TIA-222-H Section 9.8 require S.s values to be greater than 1.0 to be applied for analysis. Due to the S.s value below this threshold, the seismic base shear calculation is omitted from this structural analysis report.

Strength Limit State Load Combinations (TIA-222-H Section 2.3.2):

The structural analysis herein has considered the following load combinations within the analysis:

1. ***1.2 Dead Load Tower structure + 1.0 Dead Load Guy Assemblies + 1.6 Wind load without ice***
2. 1.2 Dead Load Tower structure + 1.0 Dead Load Guy Assemblies + 1.0 Dead weight of ice due to factored ice thickness + 1.0 Concurrent wind load with factored ice thickness + 1.0 Load effects due to temperature
3. 1.2 Dead Load Tower structure + 1.0 Dead Load Guy Assemblies + 1.0 Earthquake Load

NOTE 1: The above **bolded** load combination is considered to create the governing design loads per the results of the analysis.

NOTE 2: The above “Dead Load Guy Assemblies” are not considered as part of the analysis and are considered as a value of zero.

NOTE 3: The “Load effects due to temperature” do not apply for structures that are self-supporting (from the TIA-222-H Standard)

4. FINDINGS AND EVALUATION

The combined axial and bending stresses on the existing tower structure were evaluated to compare with strength design in accordance with AISC (LRFD). The results of the analysis indicated the existing tower, previously modified anchor bolts and foundation have enough capacity to support the proposed loading conditions indicated herein.

The previously modified tower's deflection (sway) is 0.6125 degrees and the previously modified tower's rotation (twist) is 0.1102 degrees with a wind velocity of 90 mph concurrent with 0.5" ice. These figures combined are within the Connecticut State Police required maximum 0.75 degrees for combined twist and sway when applying the TIA-222-F design conditions.

Tower Base Reactions:

Description	Current (TIA-222-H)
Axial Load (kips)	47
Pier Compression (kips)	201
Pier Uplift (kips)	174
Overall Overturning (kip-ft)	1785
Overall Shear (kips)	30.5
Shear per Leg (kips)	16.3

For detailed proposed tower reactions, see drawing no. E-1 in section 6 of this report.

TABLE 3: Tower Component Stress vs. Capacity Summary:

Component/ (Section No.)	Existing Component Size	Controlling Component/Elevation	Stress (% capacity)	Pass/Fail
Tower Leg (T6)	(2) 2-1/2x2-1/2x1/4" reinforcing angles bolted existing V3-1/2x3-1/2x5/16 (60° Angle)	Compression / 45.3' – 51.7''	67.7 %	**Pass**
Diagonal (T5)	L3x3x3/8	Bolted Connection (see below) / 51.7' – 58'	94.9 %	**Pass**
Horizontal (T4)	L2-1/2x2-1/2x3/16	Compression / 58' – 70'	43.1 %	**Pass**
Top Girt (T7)	L2-1/2x2-1/2x3/16	Compression / 39' – 45.3333'	61.7 %	**Pass**
Secondary Horizontal Bracing (T9)	L2x2x1/4	Compression / 0' – 22'	80.3 %	**Pass**
Bolt Checks	(1) A325N 1/2" Dia. Bolt	Bolt Shear Capacity / Diagonal Connections from 51.7' – 58'	94.9 %	**Pass**

4. FINDINGS AND EVALUATION (cont.)

Foundation Summary:

Component	Required	Computed	% Capacity	Pass/Fail
Existing Anchor Uplift & shear Capacity (TIA-222-H – 4.9.9)	Ratio < 1.0	0.86	86.0 %	Pass
Overturning Moment Factor of Safety TIA-222-H Conditions	Resist OT * (0.75) Reduction Factor (TIA-222-H – Section 9) 3231 Kip*ft	1891 kip*ft	78.05 %	Pass
Bearing Pressure (TIA-222-G Conditions)	9 ksf max (0.75 TIA Reduction Factor of 12 ksf – Ultimate Bearing (LRFD)	3.5575 ksf	39.5 %	Pass
Foundation Flexure/Bending (Area of Steel Reinf.)	9.680 in2 (Existing)	9.440 in2 (calculated)	97.5 %	Pass

Structure Rating (Maximum from all Components) =	**97.5 %**	**Pass**

Maximum Deformations – Proposed Condition

TIA-222-H Section 2.8.2 - Limit State Deformations

1. A rotation of 4 degrees about the vertical axis (twist) or any horizontal axis (sway) of the structure
2. A horizontal displacement (in feet) of 3% of the height of the structure.

Load Case Description	Current		Allowable	
	Sway (degree)	Displacement (Feet)	Sway (degree)	Displacement (Feet)
Service Wind Load	0.1564	0.1200	4.0	2.76

Tower Twist & Sway at Top (Connecticut State Police Requirements – TIA/EIA-222-F):

Description	Current	Total	Allowable
Tower Twist (degrees)	0.1102	0.7227	0.750
Tower Sway (degrees)	0.6125		

NOTE: Values of combined twist and sway are required to be below 0.75 degrees combined under the DESPP / CSP required loading and shall not be considered "passing" until below this limit.

5. CONCLUSIONS AND RECOMMENDATIONS

1. The existing steel tower structure IS considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
2. The existing tower anchor bolts ARE considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
3. The existing foundation IS considered structurally adequate for the proposed antenna loading with the load classification specified herein.
4. The existing tower's sway (deflection) is 0.61250 degrees, and the existing tower's twist (rotation) is 0.0919 degrees. These figures combined ARE within the Connecticut State Police requirement of 0.75 for combined twist (rotation) and sway (deflection) with the load classification specified herein.
5. The maximum structural capacity rating calculated herein (after the above equipment has been installed as indicated) is ***97.5%***.

Limitations/Assumptions:

This report is based on the following:

1) Tower inventory as listed in this report.
2) Tower is properly installed and maintained.
3) All members are as specified in the original design documents and are in good condition.
4) All required members are in place.
5) All bolts are in place and are properly tightened.
6) Tower is in plumb condition.
7) All member protective coatings are in good condition.
8) All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9) Foundations are in good condition without defects and were properly constructed to support original design loads as specified in the original design documents.
10) Previous modification analyses as stated within the Executive Summary of this report are assumed constructed unless noted otherwise.
11) Accuracy of field measurements of existing tower members as assessed from tower climbs by Others.
12) All coaxial cable is installed as specified in Section 6 of this report

AECOM is not responsible for any modifications completed prior to or hereafter in which AECOM is not or was not directly involved. Modifications include but are not limited to:

A. Adding antennas
B. Removing/replacing antennas
C. Adding coaxial cables

AECOM hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact AECOM. AECOM disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

Ongoing and Periodic Inspection and Maintenance:

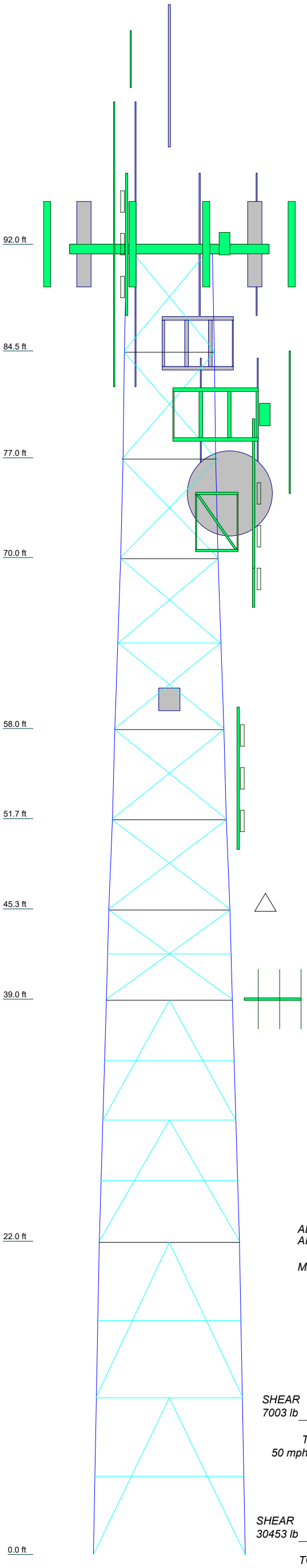
After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

The owner shall refer to TIA-222-H Section 14.2 for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire tower structural system be performed at least yearly and more frequently as conditions warrant. It is also recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading conditions.

6. DRAWINGS AND DATA

TNX TOWER INPUT/OUTPUT SUMMARY

	T1	T2	T3	T4	T5	T6	T7	T8	T9
Section	V3x3x1/4	Section 5	Section 4	L3x3x3/8	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50	L2 1/2x2 1/2x3/16	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4
Legs	L2x2x3/16	L2 1/2x2 1/2x3/16	L2x2x3/16	L2 1/2x2 1/2x3/16	N.A.	A36	2L2 1/2x2 1/2x1/4	2L2 1/2x2 1/2x1/4	2L3x3x3/8
Leg Grade	N.A.			N.A.	L2x2x1/4				
Diagonals	6	6.29165	6.5833	6.75	7.66667	8.05556	8.44444	8.83333	9.83333
Diagonal Grade	2 @ 7.41667		1 @ 6.91667	2 @ 5.95833	3 @ 6.25			2 @ 8.45833	2 @ 10.9583
Top Girts	568.9	591.2	628.4	1366.6	787.5	804.3	904.1	2345.4	4115.6
Horizontals									12142.0
Sec. Horizontals									
Face Width (ft)									
# Panels @ (ft)									
Weight (lb)									



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8x4' (L.R.)	105	2 Bay DiPole (DK-12 / CSP (leg Mt))	92
dbSpectra DS2C00F36D-D Omni Antenna (Eversource - Proposed)	103.8	Raycap DC6-48-60-18-8C Distribution Unit (ATI)	92
(2) TT19-08BP111-001 TMA (ATI)	92	(2) TT19-08BP111-001 TMA (ATI)	92
(2) LPG 21903 Diplexer (ATI)	92	(2) TT19-08BP111-001 TMA (ATI)	92
(2) LPG 21903 Diplexer (ATI)	92	T-Boom/Gate Mount (DNK-5,6,7,9,10)	85
(2) LPG 21903 Diplexer (ATI)	92	T-Boom/Gate Mount (Troop A P25)	80
Pirod Rotable Top Platform 122379 (ATI)	92	SE414-SWBP4LDF (D00) Panel (Troop A TX)	80
AM-X-CD-16-65-00T-RET (6') (ATI)	92	432E-83I-01T TTA Unit (Troop A P25 TTA)	80
AM-X-CD-16-65-00T-RET (6') (ATI)	92	SE414-SWBP4LDF (D00) Panel (Troop RX)	80
SBNH-1D6565C (ATI)	92	Kreco CO-36A Omni Antenna (DNK-15 (Relocated))	79.5
SBNH-1D6565C (ATI)	92	SC479-HF1LDF ((Inverted) DNK-5 / CSP-20)	79
SBNH-1D6565C (ATI)	92	SC479-HF1LDF ((Inverted) DNK-6 / CSP-21)	79
SBNH-1D6565C (ATI)	92	10'6"x4" Pipe Mount (DNK-4 / CSP-1)	74.5
(2) RRU (ATI)	92	PA6-65AC (DNK-4 / CSP - 1)	74.5
(2) RRU (ATI)	92	SitePro1 PSA6 w/ Support Arm (DNK-15 (Relocated))	72.5
(2) RRU (ATI)	92	6'x6" Dipole Antenna (DNK-3 / CSP-9)	71.5
SC479-HF1LDF (DNK-9 / CSP-18)	92	432E-83I-01T TTA Unit (DNK-7 / CSP-22)	60
SC479-HF1LDF (DNK-10 / CSP-19)	92	DB222-A (DNK-2 / DEP-6)	54.5
432E-83I-01T TTA Unit (DNK-8 / NEU-26)	92	1' Side Mount Standoff (1) (DNK-2 / DEP-6)	54.5
OGT9-840 (DNK-13 / CSP-2)	92	1' Side Mount Standoff (1) (DNK-1 / DEP-7)	39
OGT9-840 (DNK-14 / CSP-3)	92	SY203(C) - YAGI Antenna (DNK-1 / DEP-7)	39
SE414-SWBP4LDF (D00) Panel (Troops RX Diversity)	92		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36M-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. See reinforcement drawings for reinforced leg sizes
8. Section 1 (T9) is composed of (1) V6x6x3/8 w/ (2) L3x2 1/2x1/4
9. Section 2 (T8) is composed of (1) L5x5x5/16 w/ (2) L3x2 1/2x1/4
10. Section 3 (T7,6,5) is composed of (1) L3 1/2x 3 1/2x5/16 w/ (2) L2 1/2x2 1/2x1/4
11. Section 4 is composed of (1) L3x3x1/4 w/ (2) L2 1/2x 2 1/2x1/4
12. Section 5 Is composed of (1) L3x3x1/4 w/ (1) L2x2x1/4 (internally welded inside of the 3x3 member).
13. Previous Analysis Considered Topographic Cat 3 w/ H = 163ft. This has been recinded due to the ratio being slightly below 2.0. (1/31/2020)
14. TOWER RATING: 94.9%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 200893 lb
SHEAR: 16339 lb

UPLIFT: -174078 lb
SHEAR: 14485 lb

AXIAL 47246 lb
SHEAR 7003 lb *MOMENT 420 kip-ft*

TORQUE 5 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 22991 lb
SHEAR 30453 lb *MOMENT 1785 kip-ft*

TORQUE 19 kip-ft
REACTIONS - 130 mph WIND

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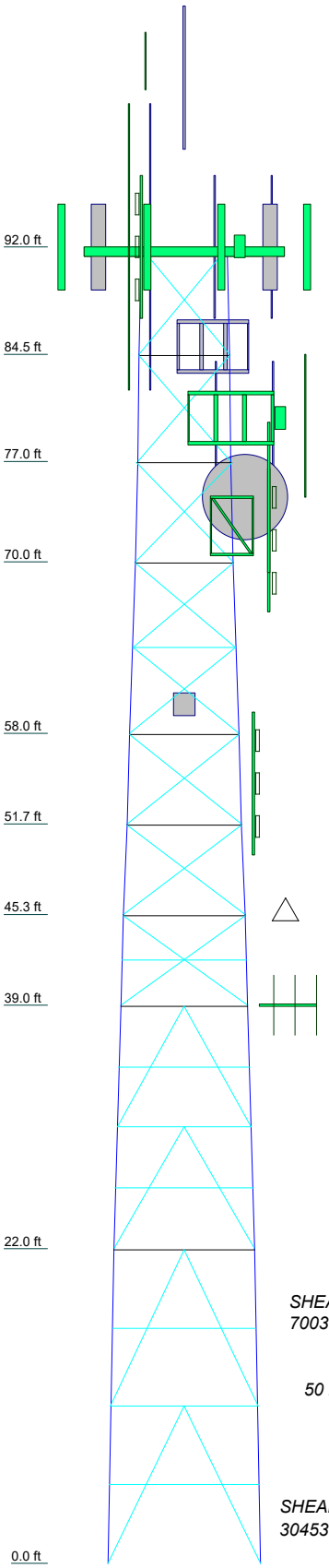
Job:	**92' Self-Supporting Lattice Tower (60 deg angle Legs)**		
Project:	**CSP Tower - Oxford, CT (Rev.3 - EL & SA Update)**		
Client: EVS-015 / Eversource / Evaluation / TIA-"H"		Drawn by: MCD	App'd:
Code: TIA-222-H		Date: 07/21/20	Scale: NTS
Path:			Dwg No. E-1

Section		T1	T2	T3	T4	T5	T6	T7	T8	T9
Legs		V3x3x1/4		Section 5	Section 4		A		Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4
Leg Grade						A36M-50				
Diagonals					L3x3x3/8				2L2 1/2x2 1/2x1/4	2L3x3x3/8
Diagonal Grade						A36				
Top Girts		L2x2x3/16	B	L2x2x3/16					L2 1/2x2 1/2x3/16	
Horizontals		N.A.			L2 1/2x2 1/2x3/16		N.A.			2L2 1/2x2 1/2x3/16
Sec. Horizontals					N.A.				L2x2x1/4	
Face Width (ft)	10.6667	6	6.29165	6.5833	6.75	7.66667	8.05556	8.44444	8.83333	9.83333
# Panels @ (ft)		2 @ 7.41667		1 @ 6.91667	2 @ 5.95833		3 @ 6.25		2 @ 8.45833	2 @ 10.9583
Weight (lb)	12142.0	568.9	591.2	628.4	1396.6	787.5	804.3	904.1	2345.4	4115.6



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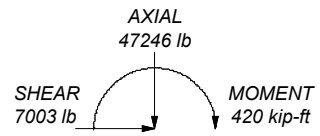
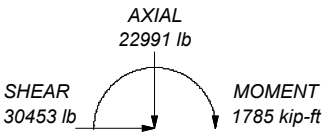
MAX. CORNER REACTIONS AT BASE:
DOWN: 200893 lb
SHEAR: 16339 lb

UPLIFT: -174078 lb
SHEAR: 14485 lb



TORQUE 5 kip-ft
50 mph WIND - 1.0000 in ICE



TORQUE 19 kip-ft
REACTIONS - 130 mph WIND

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	B	L2 1/2x2 1/2x3/16

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36M-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. See reinforcement drawings for reinforced leg sizes
8. Section 1 (T9) is composed of (1) V6x6x3/8 w/ (2) L3x2 1/2x1/4
9. Section 2 (T8) is composed of (1) L5x5x5/16 w/ (2) L3x2 1/2x1/4
10. Section 3 (T7,6,5) is composed of (1) L3 1/2x 3 1/2x5/16 w/ (2) L2 1/2x2 1/2x1/4
11. Section 4 is composed of (1) L3x3x1/4 w/ (2) L2 1/2x 2 1/2x1/4
12. Section 5 Is composed of (1) L3x3x1/4 w/ (1) L2x2x1/4 (internally welded inside of the 3x3 member).
13. Previous Analysis Considered Topographic Cat 3 w/ H = 163ft. This has been recinded due to the ratio being slightly below 2.0. (1/31/2020)
14. TOWER RATING: 94.9%

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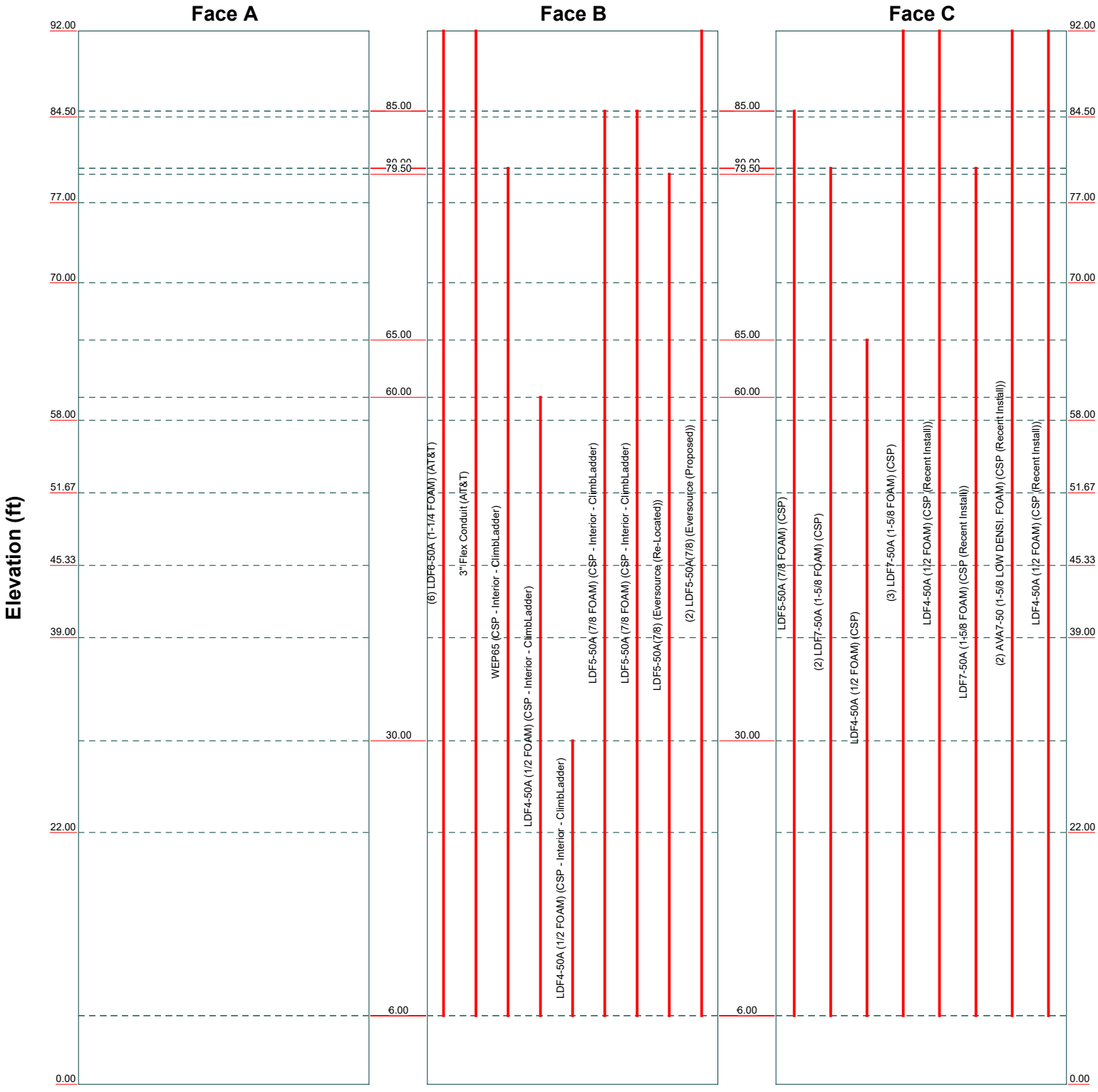
Client: EVS-015 / Eversource / Evaluation / TIA-"H"		Drawn by: MCD	App'd:
Code: TIA-222-H		Date: 07/21/20	Scale: NTS
Path:			Dwg No. E-1

TNX TOWER FEEDLINE DISTRIBUTION CHART

Feed Line Distribution Chart
0' - 92'

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



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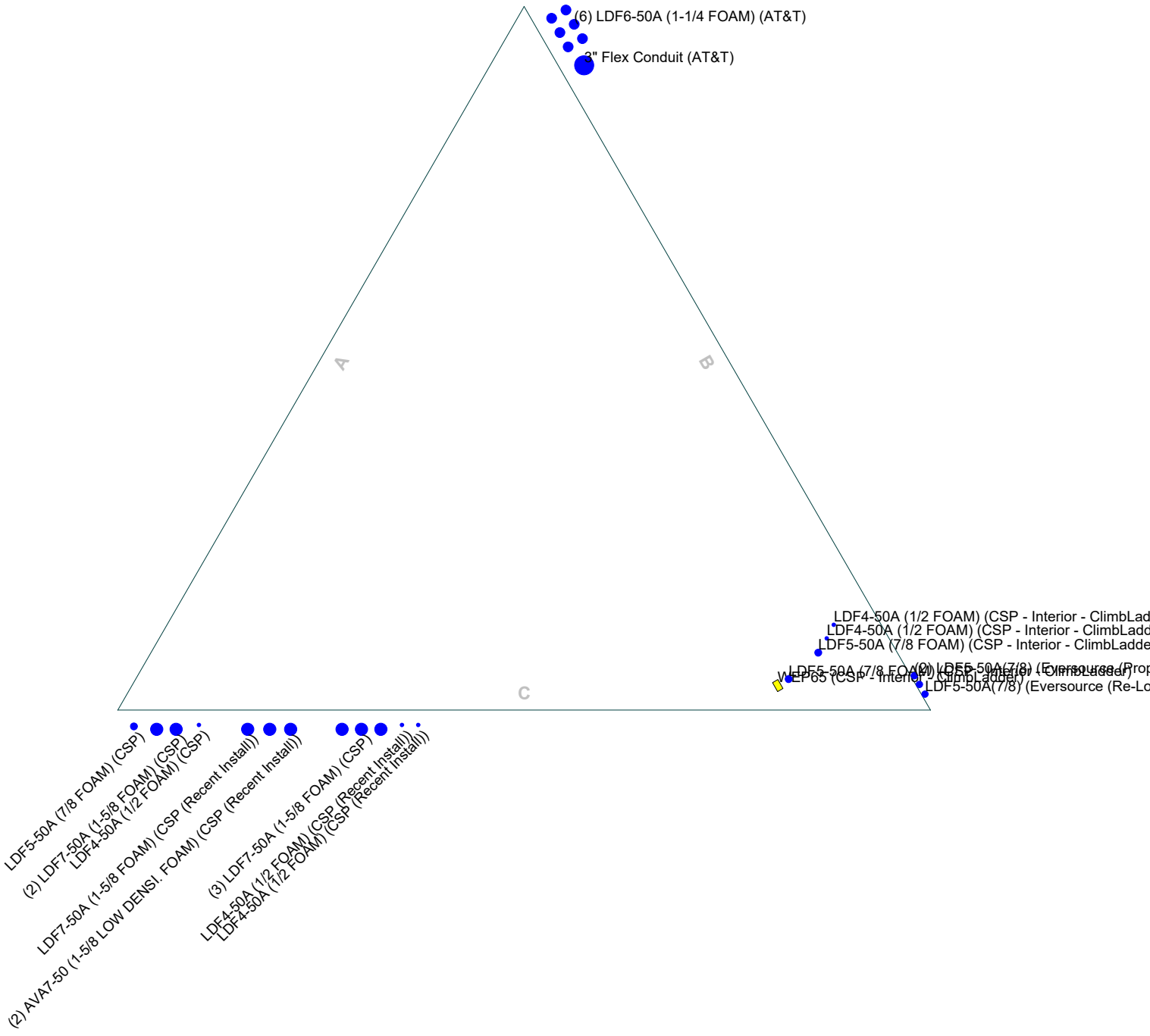
Code:	TIA-222-H	Date: 07/21/20	Scale: NTS
Path:			Dwg No. E-7

TNX TOWER FEEDLINE PLAN

Feed Line Plan

Round Flat App In Face App Out Face



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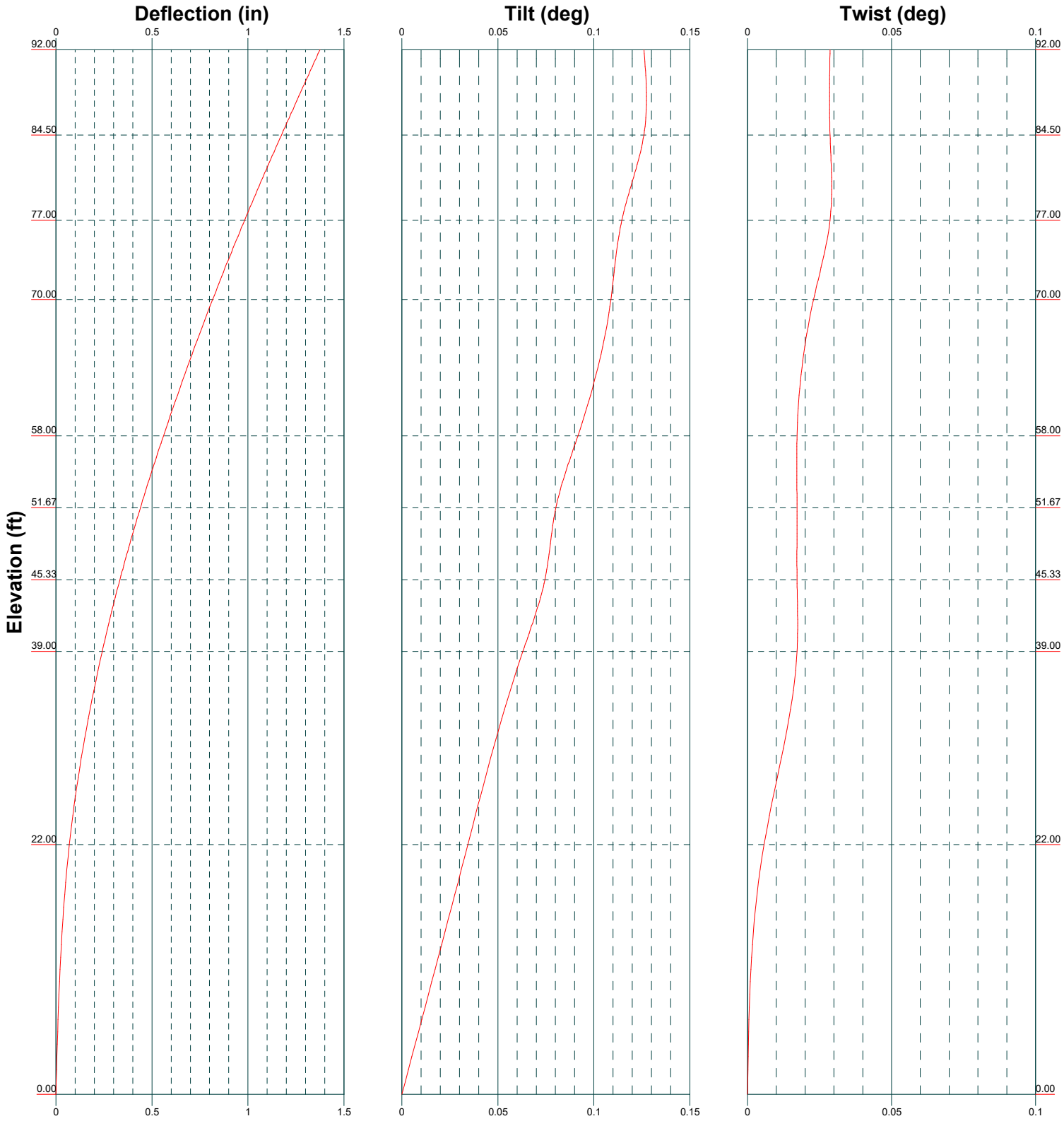
Path:			Dwg No. E-7

TNX TOWER DEFLECTION, TILT AND TWIST

TIA-222-H - Service - 60 mph

Maximum Values



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Job: ***92' Self-Supporting Lattice Tower (60 deg angle Legs)***			
Project: ***CSP Tower - Oxford, CT (Rev.3 - EL & SA Update)***			
Client: EVS-015 / Eversource / Evaluation / TIA-"H"	Drawn by: MCD	App'd:	
Code: TIA-222-H	Date: 07/21/20	Scale: NTS	
Path:		Dwg No. E-5	

TNX TOWER DETAILED OUTPUT

Tower Input Data

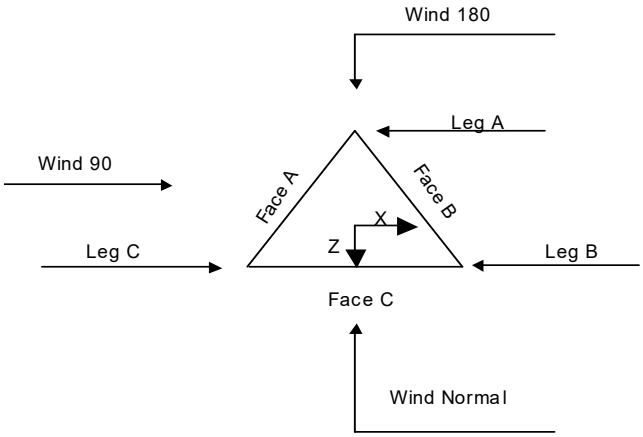
The main tower is a 3x free standing tower with an overall height of 92.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 6.00 ft at the top and 10.67 ft at the base.
This tower is designed using the TIA-222-H standard.
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 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
See reinforcement drawings for reinforced leg sizes.
Section 1 (T9) is composed of (1) V6x6x3/8 w/ (2) L3x2 1/2x1/4.
Section 2 (T8) is composed of (1) L5x5x5/16 w/ (2) L3x2 1/2x1/4.
Section 3 (T7,6,5) is composed of (1) L3 1/2x 3 1/2x5/16 w/ (2) L2 1/2x2 1/2x1/4.
Section 4 is composed of (1) L3x3x1/4 w/ (2) L2 1/2x 2 1/2x1/4.
Section 5 Is composed of (1) L3x3x1/4 w/ (1) L2x2x1/4 (internally welded inside of the 3x3 member)..
Previous Analysis Considered Topographic Cat 3 w/ H = 163ft. This has been recinded due to the ratio being slightly below 2.0. (1/31/2020).
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	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	92.00-84.50			6.00	1	7.50
T2	84.50-77.00			6.29	1	7.50
T3	77.00-70.00			6.58	1	7.00
T4	70.00-58.00			6.75	1	12.00
T5	58.00-51.67			7.67	1	6.33
T6	51.67-45.33			8.06	1	6.33
T7	45.33-39.00			8.44	1	6.33
T8	39.00-22.00			8.83	1	17.00
T9	22.00-0.00			9.83	1	22.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	92.00-84.50	7.42	X Brace	No	Yes	1.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T2	84.50-77.00	7.42	X Brace	No	Yes	1.0000	0.0000
T3	77.00-70.00	6.92	X Brace	No	Yes	1.0000	0.0000
T4	70.00-58.00	5.96	X Brace	No	Yes	1.0000	0.0000
T5	58.00-51.67	6.25	X Brace	No	Yes	1.0000	0.0000
T6	51.67-45.33	6.25	X Brace	No	Yes	1.0000	0.0000
T7	45.33-39.00	6.25	X Brace	No	Yes	1.0000	0.0000
T8	39.00-22.00	8.46	K Brace Down	No	Yes	1.0000	0.0000
T9	22.00-0.00	10.96	K Brace Down	No	Yes	1.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 92.00-84.50	60 Angle	V3x3x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T2 84.50-77.00	60 Angle	V3x3x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T3 77.00-70.00	Arbitrary Shape	Section 5	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T4 70.00-58.00	Arbitrary Shape	Section 4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T5 58.00-51.67	Arbitrary Shape	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T6 51.67-45.33	Arbitrary Shape	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T7 45.33-39.00	Arbitrary Shape	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T8 39.00-22.00	Arbitrary Shape	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	A36M-50 (50 ksi)	Double Equal Angle	2L2 1/2x2 1/2x1/4	A36 (36 ksi)
T9 22.00-0.00	Arbitrary Shape	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4	A36M-50 (50 ksi)	Double Angle	2L3x3x3/8	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 92.00-84.50	Equal Angle	L2x2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T2 84.50-77.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T3 77.00-70.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T4 70.00-58.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T5 58.00-51.67	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T6 51.67-45.33	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T7 45.33-39.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T8 39.00-22.00	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T9 22.00-0.00	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		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 92.00-84.50	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T2 84.50-77.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 77.00-70.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 70.00-58.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 58.00-51.67	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 51.67-45.33	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 45.33-39.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 39.00-22.00	None	Flat Bar		A36 (36 ksi)	Double Angle	2L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 22.00-0.00	None	Flat Bar		A36 (36 ksi)	Double Angle	2L2 1/2x2 1/2x3/16	A36 (36 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
T7 45.33-39.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Equal Angle		A572-50 (50 ksi)
T8 39.00-22.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T9 22.00-0.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Equal Angle		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 92.00-84.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 84.50-77.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 77.00-70.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 70.00-58.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 58.00-51.67	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 51.67-45.33	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 45.33-39.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 39.00-22.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 22.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	No	1	1	1	1	1	1	1	1
92.00-84.50				1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1
84.50-77.00				1	1	1	1	1	1	1
T3	Yes	No	1	1	1	1	1	1	1	1
77.00-70.00				1	1	1	1	1	1	1
T4	Yes	No	1	1	1	1	1	1	1	1
70.00-58.00				1	1	1	1	1	1	1
T5	Yes	No	1	1	1	1	1	1	1	1
58.00-51.67				1	1	1	1	1	1	1
T6	Yes	No	1	1	1	1	1	1	1	1
51.67-45.33				1	1	1	1	1	1	1
T7	Yes	No	1	1	1	1	1	1	1	1
45.33-39.00				1	1	1	1	1	1	1
T8	Yes	No	1	1	1	1	1	1	1	1
39.00-22.00				1	1	1	1	1	1	1
T9 22.00-0.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 92.00-84.50	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 84.50-77.00	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 77.00-70.00	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 70.00-58.00	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 58.00-51.67	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 51.67-45.33	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 45.33-39.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 39.00-22.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 22.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 92.00-84.50	Sleeve DS	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1	0.0000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T2 84.50-77.00	Sleeve DS	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T3 77.00-70.00	Sleeve DS	0.6250 A325N	6	0.5000 A490N	1	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T4 70.00-58.00	Sleeve DS	0.6250 A325N	6	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T5 58.00-51.67	Sleeve DS	0.6250 A325N	12	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T6 51.67-45.33	Sleeve DS	0.6250 A325N	0	0.5000 A490N	1	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T7 45.33-39.00	Sleeve DS	0.6250 A325N	0	0.5000 A490N	1	0.5000 A325N	1	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T8 39.00-22.00	Sleeve DS	0.6250 A325N	12	0.5000 A325N	2	0.5000 A325N	2	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	2	0.5000 A325N	1
T9 22.00-0.00	Sleeve DS	0.6250 A325N	16	0.5000 A325N	2	0.5000 A325N	2	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	2	0.5000 A325N	1

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
LDF6-50A (1-1/4 FOAM) (AT&T)	B	No	No	Ar (CaAa)	92.00 - 6.00	2.0000	-0.45	6	3	1.0000	1.5500		0.66
LDF5-50A (7/8 FOAM) (CSP)	C	No	No	Ar (CaAa)	85.00 - 6.00	2.0000	0.48	1	1	1.0900	1.0900		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM) (CSP)	C	No	No	Ar (CaAa)	80.00 - 6.00	2.0000	0.44	2	2	1.0000	1.9800		0.82
LDF4-50A (1/2 FOAM) (CSP)	C	No	No	Ar (CaAa)	65.00 - 6.00	2.0000	0.4	1	1	0.6300	0.6300		0.15
LDF7-50A (1-5/8 FOAM) (CSP)	C	No	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.2	3	3	1.0000	1.9800		0.82
3" Flex Conduit (AT&T)	B	No	No	Ar (CaAa)	92.00 - 6.00	2.0000	-0.4	1	1	0.0000	3.0000		3.00
LDF4-50A (1/2 FOAM) (CSP (Recent Install))	C	No	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.15	1	1	0.6300	0.6300		0.15
LDF7-50A (1-5/8 FOAM) (CSP (Recent Install))	C	No	No	Ar (CaAa)	80.00 - 6.00	2.0000	0.34	1	1	1.9800	1.9800		0.82
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP (Recent Install))	C	No	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.3	2	2	1.2500	1.9800		0.72
LDF4-50A (1/2 FOAM) (CSP (Recent Install)) * Cables running on Interior Climb Ladder	C	No	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.13	1	1	0.6300	0.6300		0.15
WEP65 (CSP - Interior - ClimbLadder)	B	No	No	Af (CaAa)	80.00 - 6.00	-18.0000	0.38	1	1	1.5836	1.5836		0.53
LDF4-50A (1/2 FOAM) (CSP - Interior - ClimbLadder)	B	No	No	Ar (CaAa)	60.00 - 6.00	-6.0000	0.35	1	1	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM) (CSP - Interior - ClimbLadder)	B	No	No	Ar (CaAa)	30.00 - 6.00	-8.0000	0.36	1	1	0.6300	0.6300		0.15
LDF5-50A (7/8 FOAM) (CSP - Interior - ClimbLadder)	B	No	No	Ar (CaAa)	85.00 - 6.00	-16.0000	0.38	1	1	1.0900	1.0900		0.33
LDF5-50A (7/8 FOAM) (CSP - Interior - ClimbLadder)	B	No	No	Ar (CaAa)	85.00 - 6.00	-10.0000	0.37	1	1	1.0900	1.0900		0.33
Proposed LDF5-50A(7/	B	No	No	Ar (CaAa)	79.50 - 6.00	0.0000	0.48	1	1	0.5000	1.0300		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
8) (Eversource (Re-Located)) LDF5-50A(7/8) (Eversource (Proposed))	B	No	No	Ar (CaAa)	92.00 - 6.00	0.0000	0.46	2	2	0.5000	1.0300		0.33

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 lb
T1	92.00-84.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	10.879	0.000	57.48
		C	0.000	0.000	8.425	0.000	31.66
T2	84.50-77.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	13.454	0.000	64.52
		C	0.000	0.000	10.970	0.000	41.35
T3	77.00-70.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	14.147	0.000	63.98
		C	0.000	0.000	12.733	0.000	48.93
T4	70.00-58.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	24.377	0.000	109.98
		C	0.000	0.000	22.269	0.000	84.93
T5	58.00-51.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	13.198	0.000	58.84
		C	0.000	0.000	11.919	0.000	45.22
T6	51.67-45.33	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	13.198	0.000	58.84
		C	0.000	0.000	11.919	0.000	45.22
T7	45.33-39.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	13.198	0.000	58.84
		C	0.000	0.000	11.919	0.000	45.22
T8	39.00-22.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	35.931	0.000	159.13
		C	0.000	0.000	31.994	0.000	121.38
T9	22.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	34.351	0.000	151.04
		C	0.000	0.000	30.112	0.000	114.24

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 lb
T1	92.00-84.50	A	1.269	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	20.976	0.000	285.38
		C		0.000	0.000	24.038	0.000	247.35
T2	84.50-77.00	A	1.258	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	28.378	0.000	364.21
		C		0.000	0.000	31.090	0.000	321.97
T3	77.00-70.00	A	1.246	0.000	0.000	0.000	0.000	0.00

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 lb
		B		0.000	0.000	30.166	0.000	376.96
		C		0.000	0.000	35.336	0.000	365.90
T4	70.00-58.00	A	1.229	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	51.981	0.000	643.54
		C		0.000	0.000	62.364	0.000	638.96
T5	58.00-51.67	A	1.210	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	28.838	0.000	349.78
		C		0.000	0.000	33.489	0.000	339.42
T6	51.67-45.33	A	1.195	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	28.660	0.000	345.60
		C		0.000	0.000	33.301	0.000	335.10
T7	45.33-39.00	A	1.179	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	28.461	0.000	340.93
		C		0.000	0.000	33.089	0.000	330.26
T8	39.00-22.00	A	1.141	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	77.514	0.000	908.04
		C		0.000	0.000	87.535	0.000	857.47
T9	22.00-0.00	A	1.030	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	71.711	0.000	795.68
		C		0.000	0.000	78.831	0.000	729.14

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	92.00-84.50	-0.3728	-3.5456	-1.0077	1.0643
T2	84.50-77.00	-0.7673	-1.3812	-1.5223	4.0718
T3	77.00-70.00	-1.2874	0.2706	-2.2408	5.9001
T4	70.00-58.00	-1.2928	0.3254	-2.4323	6.0920
T5	58.00-51.67	-1.2415	0.4337	-2.2583	6.5998
T6	51.67-45.33	-1.2712	0.4181	-2.3146	6.7534
T7	45.33-39.00	-1.2381	0.3848	-2.2742	6.6153
T8	39.00-22.00	-1.3502	0.4677	-2.2770	7.5641
T9	22.00-0.00	-1.1429	1.2902	-1.7537	6.6248

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	LDF6-50A (1-1/4 FOAM)	84.50 - 92.00	0.6000	0.6000
T1	2	LDF5-50A (7/8 FOAM)	84.50 - 85.00	0.6000	0.6000
T1	5	LDF7-50A (1-5/8 FOAM)	84.50 - 92.00	0.6000	0.6000
T1	6	3" Flex Conduit	84.50 - 92.00	1.0000	0.6000
T1	7	LDF4-50A (1/2 FOAM)	84.50 - 92.00	0.6000	0.6000
T1	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	84.50 - 92.00	0.6000	0.6000
T1	10	LDF4-50A (1/2 FOAM)	84.50 - 92.00	0.6000	0.6000
T1	15	LDF5-50A (7/8 FOAM)	84.50 - 85.00	0.6000	0.6000
T1	16	LDF5-50A (7/8 FOAM)	84.50 - 85.00	0.6000	0.6000
T1	19	LDF5-50A(7/8)	84.50 - 92.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T2	1	LDF6-50A (1-1/4 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	2	LDF5-50A (7/8 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	3	LDF7-50A (1-5/8 FOAM)	77.00 - 80.00	0.6000	0.6000
T2	5	LDF7-50A (1-5/8 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	6	3" Flex Conduit	77.00 - 84.50	1.0000	0.6000
T2	7	LDF4-50A (1/2 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	8	LDF7-50A (1-5/8 FOAM)	77.00 - 80.00	0.6000	0.6000
T2	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	77.00 - 84.50	0.6000	0.6000
T2	10	LDF4-50A (1/2 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	12	WEP65	77.00 - 80.00	0.6000	0.6000
T2	15	LDF5-50A (7/8 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	16	LDF5-50A (7/8 FOAM)	77.00 - 84.50	0.6000	0.6000
T2	18	LDF5-50A(7/8)	77.00 - 79.50	0.6000	0.6000
T2	19	LDF5-50A(7/8)	77.00 - 84.50	0.6000	0.6000
T3	1	LDF6-50A (1-1/4 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	2	LDF5-50A (7/8 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	3	LDF7-50A (1-5/8 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	5	LDF7-50A (1-5/8 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	6	3" Flex Conduit	70.00 - 77.00	1.0000	0.6000
T3	7	LDF4-50A (1/2 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	8	LDF7-50A (1-5/8 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	70.00 - 77.00	0.6000	0.6000
T3	10	LDF4-50A (1/2 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	12	WEP65	70.00 - 77.00	0.6000	0.6000
T3	15	LDF5-50A (7/8 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	16	LDF5-50A (7/8 FOAM)	70.00 - 77.00	0.6000	0.6000
T3	18	LDF5-50A(7/8)	70.00 - 77.00	0.6000	0.6000
T3	19	LDF5-50A(7/8)	70.00 - 77.00	0.6000	0.6000
T4	1	LDF6-50A (1-1/4 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	2	LDF5-50A (7/8 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	3	LDF7-50A (1-5/8 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	4	LDF4-50A (1/2 FOAM)	58.00 - 65.00	0.6000	0.6000
T4	5	LDF7-50A (1-5/8 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	6	3" Flex Conduit	58.00 - 70.00	1.0000	0.6000
T4	7	LDF4-50A (1/2 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	8	LDF7-50A (1-5/8 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	58.00 - 70.00	0.6000	0.6000
T4	10	LDF4-50A (1/2 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	12	WEP65	58.00 - 70.00	0.6000	0.6000
T4	13	LDF4-50A (1/2 FOAM)	58.00 - 60.00	0.6000	0.6000
T4	15	LDF5-50A (7/8 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	16	LDF5-50A (7/8 FOAM)	58.00 - 70.00	0.6000	0.6000
T4	18	LDF5-50A(7/8)	58.00 - 70.00	0.6000	0.6000
T4	19	LDF5-50A(7/8)	58.00 - 70.00	0.6000	0.6000
T5	1	LDF6-50A (1-1/4 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	2	LDF5-50A (7/8 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	3	LDF7-50A (1-5/8 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	4	LDF4-50A (1/2 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	5	LDF7-50A (1-5/8 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	6	3" Flex Conduit	51.67 - 58.00	1.0000	0.6000
T5	7	LDF4-50A (1/2 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	8	LDF7-50A (1-5/8 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	51.67 - 58.00	0.6000	0.6000
T5	10	LDF4-50A (1/2 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	12	WEP65	51.67 - 58.00	0.6000	0.6000
T5	13	LDF4-50A (1/2 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	15	LDF5-50A (7/8 FOAM)	51.67 - 58.00	0.6000	0.6000
T5	16	LDF5-50A (7/8 FOAM)	51.67 - 58.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	18	LDF5-50A(7/8)	51.67 - 58.00	0.6000	0.6000
T5	19	LDF5-50A(7/8)	51.67 - 58.00	0.6000	0.6000
T6	1	LDF6-50A (1-1/4 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	2	LDF5-50A (7/8 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	3	LDF7-50A (1-5/8 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	4	LDF4-50A (1/2 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	5	LDF7-50A (1-5/8 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	6	3" Flex Conduit	45.33 - 51.67	1.0000	0.6000
T6	7	LDF4-50A (1/2 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	8	LDF7-50A (1-5/8 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	45.33 - 51.67	0.6000	0.6000
T6	10	LDF4-50A (1/2 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	12	WEP65	45.33 - 51.67	0.6000	0.6000
T6	13	LDF4-50A (1/2 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	15	LDF5-50A (7/8 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	16	LDF5-50A (7/8 FOAM)	45.33 - 51.67	0.6000	0.6000
T6	18	LDF5-50A(7/8)	45.33 - 51.67	0.6000	0.6000
T6	19	LDF5-50A(7/8)	45.33 - 51.67	0.6000	0.6000
T7	1	LDF6-50A (1-1/4 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	2	LDF5-50A (7/8 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	3	LDF7-50A (1-5/8 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	4	LDF4-50A (1/2 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	5	LDF7-50A (1-5/8 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	6	3" Flex Conduit	39.00 - 45.33	1.0000	0.6000
T7	7	LDF4-50A (1/2 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	8	LDF7-50A (1-5/8 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	39.00 - 45.33	0.6000	0.6000
T7	10	LDF4-50A (1/2 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	12	WEP65	39.00 - 45.33	0.6000	0.6000
T7	13	LDF4-50A (1/2 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	15	LDF5-50A (7/8 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	16	LDF5-50A (7/8 FOAM)	39.00 - 45.33	0.6000	0.6000
T7	18	LDF5-50A(7/8)	39.00 - 45.33	0.6000	0.6000
T7	19	LDF5-50A(7/8)	39.00 - 45.33	0.6000	0.6000
T8	1	LDF6-50A (1-1/4 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	2	LDF5-50A (7/8 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	3	LDF7-50A (1-5/8 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	4	LDF4-50A (1/2 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	5	LDF7-50A (1-5/8 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	6	3" Flex Conduit	22.00 - 39.00	1.0000	0.6000
T8	7	LDF4-50A (1/2 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	8	LDF7-50A (1-5/8 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	22.00 - 39.00	0.6000	0.6000
T8	10	LDF4-50A (1/2 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	12	WEP65	22.00 - 39.00	0.6000	0.6000
T8	13	LDF4-50A (1/2 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	14	LDF4-50A (1/2 FOAM)	22.00 - 30.00	0.6000	0.6000
T8	15	LDF5-50A (7/8 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	16	LDF5-50A (7/8 FOAM)	22.00 - 39.00	0.6000	0.6000
T8	18	LDF5-50A(7/8)	22.00 - 39.00	0.6000	0.6000
T8	19	LDF5-50A(7/8)	22.00 - 39.00	0.6000	0.6000
T9	1	LDF6-50A (1-1/4 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	2	LDF5-50A (7/8 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	3	LDF7-50A (1-5/8 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	4	LDF4-50A (1/2 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	5	LDF7-50A (1-5/8 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	6	3" Flex Conduit	6.00 - 22.00	0.6000	0.6000
T9	7	LDF4-50A (1/2 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	8	LDF7-50A (1-5/8 FOAM)	6.00 - 22.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T9	9	AVA7-50 (1-5/8 LOW DENSI. FOAM)	6.00 - 22.00	0.6000	0.6000
T9	10	LDF4-50A (1/2 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	12	WEP65	6.00 - 22.00	0.6000	0.6000
T9	13	LDF4-50A (1/2 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	14	LDF4-50A (1/2 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	15	LDF5-50A (7/8 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	16	LDF5-50A (7/8 FOAM)	6.00 - 22.00	0.6000	0.6000
T9	18	LDF5-50A(7/8)	6.00 - 22.00	0.6000	0.6000
T9	19	LDF5-50A(7/8)	6.00 - 22.00	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 lb
(2) TT19-08BP111-001 TMA (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.64 0.76 0.88	0.52 0.62 0.74	20.00 21.80 29.22
(2) TT19-08BP111-001 TMA (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.64 0.76 0.88	0.52 0.62 0.74	20.00 21.80 29.22
(2) TT19-08BP111-001 TMA (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.64 0.76 0.88	0.52 0.62 0.74	20.00 21.80 29.22
(2) LPG 21903 Diplexer (AT&T)	A	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.27 0.34 0.43	0.18 0.25 0.32	5.50 7.92 11.41
(2) LPG 21903 Diplexer (AT&T)	B	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.27 0.34 0.43	0.18 0.25 0.32	5.50 7.92 11.41
(2) LPG 21903 Diplexer (AT&T)	C	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	0.27 0.34 0.43	0.18 0.25 0.32	5.50 7.92 11.41
Pirod Rotable Top Platform 122379 (AT&T)	C	None		0.0000	92.00	No Ice 1/2" Ice 1" Ice	37.40 42.20 47.00	37.40 42.20 47.00	3400.00 3940.00 4480.00
AM-X-CD-16-65-00T-RET (6') (AT&T)	A	From Leg	3.00 6.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	8.26 8.81 9.36	4.64 5.09 5.54	50.00 95.50 148.00
AM-X-CD-16-65-00T-RET (6') (AT&T)	A	From Leg	3.00 -6.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	8.26 8.81 9.36	4.64 5.09 5.54	50.00 95.50 148.00
SBNH-1D6565C (AT&T)	B	From Leg	3.00 6.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	11.41 12.02 12.65	7.70 8.29 8.89	60.00 126.70 200.07
SBNH-1D6565C (AT&T)	B	From Leg	3.00 -6.00 0.00	0.0000	92.00	No Ice 1/2" Ice 1" Ice	11.41 12.02 12.65	7.70 8.29 8.89	60.00 126.70 200.07
SBNH-1D6565C (AT&T)	C	From Leg	3.00 6.00	0.0000	92.00	No Ice 1/2" Ice	11.41 12.02	7.70 8.29	60.00 126.70

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 lb
			0.00			1" Ice	12.65	8.89	200.07
SBNH-1D6565C	C	From Leg	3.00	0.0000	92.00	No Ice	11.41	7.70	60.00
(AT&T)			-6.00			1/2" Ice	12.02	8.29	126.70
			0.00			1" Ice	12.65	8.89	200.07
(2) RRU	A	From Leg	3.00	0.0000	92.00	No Ice	1.40	0.70	10.00
(AT&T)			0.00			1/2" Ice	1.56	0.82	20.34
			0.00			1" Ice	1.73	0.95	32.81
(2) RRU	B	From Leg	3.00	0.0000	92.00	No Ice	1.40	0.70	10.00
(AT&T)			0.00			1/2" Ice	1.56	0.82	20.34
			0.00			1" Ice	1.73	0.95	32.81
(2) RRU	C	From Leg	3.00	0.0000	92.00	No Ice	1.40	0.70	10.00
(AT&T)			0.00			1/2" Ice	1.56	0.82	20.34
			0.00			1" Ice	1.73	0.95	32.81
SY203(C) - YAGI Antenna	B	From Leg	1.00	0.0000	39.00	No Ice	14.04	2.47	3.20
(DNK-1 / DEP-7)			0.00			1/2" Ice	14.49	2.72	77.98
			0.00			1" Ice	14.96	2.98	158.69
1' Side Mount Standoff (1)	B	None		0.0000	39.00	No Ice	2.72	2.72	50.00
(DNK-1 / DEP-7)						1/2" Ice	4.91	4.91	89.00
						1" Ice	7.10	7.10	128.00
DB222-A	B	From Leg	1.00	0.0000	54.50	No Ice	1.60	1.60	16.00
(DNK-2 / DEP-6)			0.00			1/2" Ice	2.88	2.88	20.80
			0.00			1" Ice	4.16	4.16	25.60
1' Side Mount Standoff (1)	B	None		0.0000	54.50	No Ice	2.72	2.72	50.00
(DNK-2 / DEP-6)						1/2" Ice	4.91	4.91	89.00
						1" Ice	7.10	7.10	128.00
6'x6" Dipole Antenna	B	From Leg	3.00	0.0000	71.50	No Ice	9.17	1.67	50.00
(DNK-3 / CSP-9)			0.00			1/2" Ice	9.89	2.79	77.56
			0.00			1" Ice	10.62	3.93	117.56
10'6"x4" Pipe Mount	B	From Leg	3.00	0.0000	74.50	No Ice	3.47	3.47	114.00
(DNK-4 / CSP-1)			0.00			1/2" Ice	5.62	5.62	146.84
			0.00			1" Ice	6.25	6.25	186.71
SC479-HF1LDF	B	From Face	3.00	0.0000	79.00	No Ice	4.74	4.74	34.00
((Inverted) DNK-5 / CSP-20)			-4.00			1/2" Ice	6.54	6.54	69.82
			0.00			1" Ice	8.04	8.04	114.98
T-Boom/Gate Mount	B	From Face	0.50	0.0000	85.00	No Ice	11.89	2.92	320.00
(DNK-5,6,7,9,10)			0.00			1/2" Ice	16.61	4.12	330.00
			0.00			1" Ice	21.31	5.34	355.00
SC479-HF1LDF	B	From Face	3.00	0.0000	79.00	No Ice	4.74	4.74	34.00
((Inverted) DNK-6 / CSP-21)			4.00			1/2" Ice	6.54	6.54	69.82
			0.00			1" Ice	8.04	8.04	114.98
432E-83I-01T TTA Unit	A	From Leg	1.00	0.0000	60.00	No Ice	2.85	0.97	25.00
(DNK-7 / CSP-22)			0.00			1/2" Ice	3.06	1.11	44.70
			0.00			1" Ice	3.28	1.26	67.39
SC479-HF1LDF	B	From Face	3.00	0.0000	92.00	No Ice	4.66	4.66	34.00
(DNK-9 / CSP-18)			-4.00			1/2" Ice	6.54	6.54	69.82
			0.00			1" Ice	8.04	8.04	114.98
SC479-HF1LDF	B	From Face	3.00	0.0000	92.00	No Ice	4.66	4.66	34.00
(DNK-10 / CSP-19)			4.00			1/2" Ice	6.54	6.54	69.82
			0.00			1" Ice	8.04	8.04	114.98
432E-83I-01T TTA Unit	B	From Leg	1.00	0.0000	92.00	No Ice	2.85	0.97	25.00
(DNK-8 / NEU-26)			0.00			1/2" Ice	3.06	1.11	44.70
			0.00			1" Ice	3.28	1.26	67.39
***DNK-12 is Leg Mounted									
OGT9-840	A	From Face	1.00	0.0000	92.00	No Ice	2.27	2.27	18.50
(DNK-13 / CSP-2)			0.00			1/2" Ice	3.44	3.44	36.09
			0.00			1" Ice	4.61	4.61	60.98
*** DNK-13,14 Mounted to									

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
ATT Frame									
OGT9-840	C	From Leg	1.00	0.0000	92.00	No Ice	2.27	2.27	18.50
(DNK-14 / CSP-3)			0.00			1/2" Ice	3.44	3.44	36.09
			0.00			1" Ice	4.61	4.61	60.98
*** DNK-15 Mounted to tower leg									
*** PNS/CSP Installed Additions									
T-Boom/Gate Mount	B	From Leg	0.00	0.0000	80.00	No Ice	11.89	2.92	320.00
(Troop A P25)			0.00			1/2" Ice	16.61	4.12	330.00
			0.00			1" Ice	21.31	5.34	355.00
SE414-SWBP4LDF (D00)	B	From Leg	4.00	0.0000	80.00	No Ice	1.90	5.27	29.62
Panel			0.00			1/2" Ice	2.22	5.87	63.88
(Troop A TX)			3.00			1" Ice	2.55	6.49	103.87
432E-83I-01T TTA Unit	B	From Leg	4.00	0.0000	80.00	No Ice	2.85	0.97	25.00
(Troop A P25 TTA)			0.00			1/2" Ice	3.06	1.11	44.70
			0.00			1" Ice	3.28	1.26	67.39
SE414-SWBP4LDF (D00)	B	From Leg	4.00	0.0000	80.00	No Ice	1.90	5.27	29.62
Panel			0.00			1/2" Ice	2.22	5.87	63.88
(Troop RX)			-3.00			1" Ice	2.55	6.49	103.87
SE414-SWBP4LDF (D00)	B	From Leg	4.00	0.0000	92.00	No Ice	1.90	5.27	29.62
Panel			0.00			1/2" Ice	2.22	5.87	63.88
(Troops RX Diversity)			0.00			1" Ice	2.55	6.49	103.87
*** DNK-11 / CSP-23 REMOVED									
2 Bay DiPole	C	From Leg	0.00	0.0000	92.00	No Ice	2.00	2.00	55.00
(D&K-12 / CSP (leg Mt))			0.00			1/2" Ice	3.00	3.00	100.00
			0.00			1" Ice	4.00	4.00	145.00
Raycap DC6-48-60-18-8C	C	None		0.0000	92.00	No Ice	0.79	0.79	20.00
Distribution Unit						1/2" Ice	1.27	1.27	35.12
(AT&T)						1" Ice	1.75	1.75	52.57
Kreco CO-36A Omni	B	From Leg	6.00	0.0000	79.50	No Ice	3.73	3.73	25.95
Antenna			0.00			1/2" Ice	5.35	5.35	57.81
(DNK-15 (Relocated))			0.00			1" Ice	6.99	6.99	99.67
SitePro1 PSA6 w/ Support	B	From Leg	0.00	0.0000	72.50	No Ice	3.63	6.59	136.32
Arm			0.00			1/2" Ice	4.95	9.53	141.21
(DNK-15 (Relocated))			0.00			1" Ice	6.29	12.44	155.82
Proposed									
dbSpectra DS2C00F36D-D	A	From Leg	0.50	0.0000	103.80	No Ice	4.95	4.95	84.60
Omni Antenna			0.00			1/2" Ice	6.58	6.58	124.76
(Eversource - Proposed)			0.00			1" Ice	8.25	8.25	174.96
Lightning Rod 5/8x4'	C	From Leg	0.00	0.0000	105.00	No Ice	0.25	0.25	31.00
(L.R.)			0.00			1/2" Ice	0.66	0.66	33.82
			0.00			1" Ice	0.97	0.97	39.29

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral / Vert (ft)	Azimuth Adjustment (°)	3 dB Beam Width (°)	Elevation (ft)	Outside Diameter (ft)		Aperture Area (ft^2)	Weight (lb)
PA6-65AC (DNK-4 / CSP - 1)	B	Paraboloid w/Radome	From Face	3.00 0.00 0.00	Worst		74.50	6.00	No Ice 1/2" Ice 1" Ice	28.27 29.05 29.83	90.00 240.00 390.00

222-H Verification Constants

Constant	Value
K_d	0.85
Ice Thickness Importance Factor	1.15
Z_g	900
α	9.5
K_{zmin}	0.85
K_c	n/a
K_t	1
f	1
K_e	1

222-H Section Verification ArRr By Element

Section Elevation (ft)	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice		A_r (ft^2)	A_r w/Ice (ft^2)	A_rR_r (ft^2)	A_rR_r w/Ice (ft^2)
T1 92.00-84.50					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T2 84.50-77.00					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T3 77.00-70.00					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T4 70.00-58.00					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T5 58.00-51.67					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T6 51.67-45.33					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T7 45.33-39.00					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T8 39.00-22.00					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000
T9 22.00-0.00					A		Sum:		0.000	0.000	0.000	0.000
					B				0.000	0.000	0.000	0.000
					C				0.000	0.000	0.000	0.000

222-H Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 92.00-84.50	88.25		1.233	1	1		45	A	0.194	0.000
								B	0.194	0.000
								C	0.194	0.000
T2 84.50-77.00	80.75		1.21	1	1		44	A	0.193	0.000
								B	0.193	0.000
								C	0.193	0.000
T3 77.00-70.00	73.50		1.186	1	1		44	A	0.204	0.000
								B	0.204	0.000
								C	0.204	0.000
T4 70.00-58.00	64.00		1.152	1	1		42	A	0.239	0.000
								B	0.239	0.000
								C	0.239	0.000
T5 58.00-51.67	54.83		1.115	1	1		41	A	0.238	0.000
								B	0.238	0.000
								C	0.238	0.000
T6 51.67-45.33	48.50		1.087	1	1		40	A	0.231	0.000
								B	0.231	0.000
								C	0.231	0.000
T7 45.33-39.00	42.17		1.055	1	1		39	A	0.25	0.000
								B	0.25	0.000
								C	0.25	0.000
T8 39.00-22.00	30.50		0.986	1	1		36	A	0.185	0.000
								B	0.185	0.000
								C	0.185	0.000
T9 22.00-0.00	11.00		0.85	1	1		31	A	0.178	0.000
								B	0.178	0.000
								C	0.178	0.000

222-H Section Verification Tables - Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 92.00-84.50	88.25	88.25	1.233	1	1	1.2689	7	A	0.354	5.125
								B	0.354	5.125
								C	0.354	5.125
T2 84.50-77.00	80.75	80.75	1.21	1	1	1.2577	7	A	0.348	5.151
								B	0.348	5.151
								C	0.348	5.151
T3 77.00-70.00	73.50	73.50	1.186	1	1	1.2459	6	A	0.339	3.126
								B	0.339	3.126
								C	0.339	3.126
T4 70.00-58.00	64.00	64.00	1.152	1	1	1.2288	6	A	0.374	6.194
								B	0.374	6.194
								C	0.374	6.194
T5 58.00-51.67	54.83	54.83	1.115	1	1	1.2099	6	A	0.364	3.346
								B	0.364	3.346
								C	0.364	3.346
T6 51.67-45.33	48.50	48.50	1.087	1	1	1.1951	6	A	0.354	3.411

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
								B	0.354	3.411
								C	0.354	3.411
T7 45.33-39.00	42.17	42.17	1.055	1	1	1.1785	6	A	0.397	4.625
								B	0.397	4.625
								C	0.397	4.625
T8 39.00-22.00	30.50	30.50	0.986	1	1	1.1410	5	A	0.288	8.237
								B	0.288	8.237
								C	0.288	8.237
T9 22.00-0.00	11.00	11.00	0.85	1	1	1.0304	5	A	0.257	8.603
								B	0.257	8.603
								C	0.257	8.603

222-H Section Verification Tables - Service

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 92.00-84.50	88.25		1.233	1	1		10	A	0.194	0.000
								B	0.194	0.000
								C	0.194	0.000
T2 84.50-77.00	80.75		1.21	1	1		9	A	0.193	0.000
								B	0.193	0.000
								C	0.193	0.000
T3 77.00-70.00	73.50		1.186	1	1		9	A	0.204	0.000
								B	0.204	0.000
								C	0.204	0.000
T4 70.00-58.00	64.00		1.152	1	1		9	A	0.239	0.000
								B	0.239	0.000
								C	0.239	0.000
T5 58.00-51.67	54.83		1.115	1	1		9	A	0.238	0.000
								B	0.238	0.000
								C	0.238	0.000
T6 51.67-45.33	48.50		1.087	1	1		9	A	0.231	0.000
								B	0.231	0.000
								C	0.231	0.000
T7 45.33-39.00	42.17		1.055	1	1		8	A	0.25	0.000
								B	0.25	0.000
								C	0.25	0.000
T8 39.00-22.00	30.50		0.986	1	1		8	A	0.185	0.000
								B	0.185	0.000
								C	0.185	0.000
T9 22.00-0.00	11.00		0.85	1	1		7	A	0.178	0.000
								B	0.178	0.000
								C	0.178	0.000

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 92.00-84.50	88.25	1.233	45	48.212	A	9.331	0.000	3.751	40.20	0.000	0.000
					B	9.331	0.000		40.20	10.879	0.000
					C	9.331	0.000		40.20	8.425	0.000
T2 84.50-77.00	80.75	1.21	44	50.399	A	9.731	0.000	3.751	38.55	0.000	0.000
					B	9.731	0.000		38.55	13.454	0.000
					C	9.731	0.000		38.55	10.970	0.000
T3 77.00-70.00	73.50	1.186	44	48.708	A	9.941	0.000	4.313	43.39	0.000	0.000
					B	9.941	0.000		43.39	14.147	0.000
					C	9.941	0.000		43.39	12.733	0.000
T4 70.00-58.00	64.00	1.152	42	91.051	A	21.753	0.000	10.206	46.92	0.000	0.000
					B	21.753	0.000		46.92	24.377	0.000
					C	21.753	0.000		46.92	22.269	0.000
T5 58.00-51.67	54.83	1.115	41	52.575	A	12.490	0.000	6.120	49.00	0.000	0.000
					B	12.490	0.000		49.00	13.198	0.000
					C	12.490	0.000		49.00	11.919	0.000
T6 51.67-45.33	48.50	1.087	40	55.038	A	12.728	0.000	6.120	48.08	0.000	0.000
					B	12.728	0.000		48.08	13.198	0.000
					C	12.728	0.000		48.08	11.919	0.000
T7 45.33-39.00	42.17	1.055	39	57.501	A	14.358	0.000	6.120	42.62	0.000	0.000
					B	14.358	0.000		42.62	13.198	0.000
					C	14.358	0.000		42.62	11.919	0.000
T8 39.00-22.00	30.50	0.986	36	166.862	A	30.805	0.000	16.392	53.21	0.000	0.000
					B	30.805	0.000		53.21	35.931	0.000
					C	30.805	0.000		53.21	31.994	0.000
T9 22.00-0.00	11.00	0.85	31	237.160	A	42.232	0.000	23.322	55.22	0.000	0.000
					B	42.232	0.000		55.22	34.351	0.000
					C	42.232	0.000		55.22	30.112	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 92.00-84.50	88.25	1.233	7	1.2689	49.798	A	9.331	8.299	6.924	39.28	0.000	0.000
						B	9.331	8.299		39.28	20.976	0.000
						C	9.331	8.299		39.28	24.038	0.000
T2 84.50-77.00	80.75	1.21	7	1.2577	51.971	A	9.731	8.370	6.896	38.10	0.000	0.000
						B	9.731	8.370		38.10	28.378	0.000
						C	9.731	8.370		38.10	31.090	0.000
T3 77.00-70.00	73.50	1.186	6	1.2459	50.161	A	11.879	5.109	6.252	36.80	0.000	0.000
						B	11.879	5.109		36.80	30.166	0.000
						C	11.879	5.109		36.80	35.336	0.000
T4 70.00-58.00	64.00	1.152	6	1.2288	93.511	A	25.032	9.907	13.486	38.60	0.000	0.000
						B	25.032	9.907		38.60	51.981	0.000
						C	25.032	9.907		38.60	62.364	0.000
T5 58.00-51.67	54.83	1.115	6	1.2099	53.852	A	14.194	5.386	7.824	39.96	0.000	0.000
						B	14.194	5.386		39.96	28.838	0.000
						C	14.194	5.386		39.96	33.489	0.000
T6 51.67-45.33	48.50	1.087	6	1.1951	56.300	A	14.411	5.523	7.803	39.14	0.000	0.000
						B	14.411	5.523		39.14	28.660	0.000
						C	14.411	5.523		39.14	33.301	0.000
T7 45.33-39.00	42.17	1.055	6	1.1785	58.745	A	16.018	7.286	7.779	33.38	0.000	0.000
						B	16.018	7.286		33.38	28.461	0.000

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
						C	16.018	7.286		33.38	33.089	0.000
T8 39.00-22.00	30.50	0.986	5	1.1410	170.096	A	35.118	13.838	20.705	42.29	0.000	0.000
						B	35.118	13.838		42.29	77.514	0.000
						C	35.118	13.838		42.29	87.535	0.000
T9 22.00-0.00	11.00	0.85	5	1.0304	240.939	A	47.271	14.663	28.361	45.79	0.000	0.000
						B	47.271	14.663		45.79	71.711	0.000
						C	47.271	14.663		45.79	78.831	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 92.00-84.50	88.25	1.233	10	48.212	A	9.331	0.000	3.751	40.20	0.000	0.000
					B	9.331	0.000		40.20	10.879	0.000
					C	9.331	0.000		40.20	8.425	0.000
T2 84.50-77.00	80.75	1.21	9	50.399	A	9.731	0.000	3.751	38.55	0.000	0.000
					B	9.731	0.000		38.55	13.454	0.000
					C	9.731	0.000		38.55	10.970	0.000
T3 77.00-70.00	73.50	1.186	9	48.708	A	9.941	0.000	4.313	43.39	0.000	0.000
					B	9.941	0.000		43.39	14.147	0.000
					C	9.941	0.000		43.39	12.733	0.000
T4 70.00-58.00	64.00	1.152	9	91.051	A	21.753	0.000	10.206	46.92	0.000	0.000
					B	21.753	0.000		46.92	24.377	0.000
					C	21.753	0.000		46.92	22.269	0.000
T5 58.00-51.67	54.83	1.115	9	52.575	A	12.490	0.000	6.120	49.00	0.000	0.000
					B	12.490	0.000		49.00	13.198	0.000
					C	12.490	0.000		49.00	11.919	0.000
T6 51.67-45.33	48.50	1.087	9	55.038	A	12.728	0.000	6.120	48.08	0.000	0.000
					B	12.728	0.000		48.08	13.198	0.000
					C	12.728	0.000		48.08	11.919	0.000
T7 45.33-39.00	42.17	1.055	8	57.501	A	14.358	0.000	6.120	42.62	0.000	0.000
					B	14.358	0.000		42.62	13.198	0.000
					C	14.358	0.000		42.62	11.919	0.000
T8 39.00-22.00	30.50	0.986	8	166.862	A	30.805	0.000	16.392	53.21	0.000	0.000
					B	30.805	0.000		53.21	35.931	0.000
					C	30.805	0.000		53.21	31.994	0.000
T9 22.00-0.00	11.00	0.85	7	237.160	A	42.232	0.000	23.322	55.22	0.000	0.000
					B	42.232	0.000		55.22	34.351	0.000
					C	42.232	0.000		55.22	30.112	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	45	1	1	9.331	1422.17	189.62	C
92.00-84.50			B	0.194	2.618		1	1	9.331			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.194	2.618		1	1	9.331			
T2	105.87	591.18	A	0.193	2.619	44	1	1	9.731	1552.20	206.96	C
84.50-77.00			B	0.193	2.619		1	1	9.731			
			C	0.193	2.619		1	1	9.731			
T3	112.91	628.42	A	0.204	2.582	44	1	1	9.941	1581.00	225.86	C
77.00-70.00			B	0.204	2.582		1	1	9.941			
			C	0.204	2.582		1	1	9.941			
T4	194.91	1396.63	A	0.239	2.471	42	1	1	21.753	2995.69	249.64	C
70.00-58.00			B	0.239	2.471		1	1	21.753			
			C	0.239	2.471		1	1	21.753			
T5	104.06	787.49	A	0.238	2.475	41	1	1	12.490	1629.60	257.31	C
58.00-51.67			B	0.238	2.475		1	1	12.490			
			C	0.238	2.475		1	1	12.490			
T6	104.06	804.31	A	0.231	2.495	40	1	1	12.728	1616.52	255.24	C
51.67-45.33			B	0.231	2.495		1	1	12.728			
			C	0.231	2.495		1	1	12.728			
T7	104.06	904.06	A	0.25	2.438	39	1	1	14.358	1676.99	264.79	C
45.33-39.00			B	0.25	2.438		1	1	14.358			
			C	0.25	2.438		1	1	14.358			
T8	280.51	2345.40	A	0.185	2.648	36	1	1	30.805	3831.98	225.41	C
39.00-22.00			B	0.185	2.648		1	1	30.805			
			C	0.185	2.648		1	1	30.805			
T9 22.00-0.00	265.28	4115.63	A	0.178	2.671	31	1	1	42.232	4024.59	182.94	C
			B	0.178	2.671		1	1	42.232			
			C	0.178	2.671		1	1	42.232			
Sum Weight:	1360.80	12142.04						OTM	958.39 kip-ft	20330.75		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	45	0.8	1	7.465	1233.93	164.52	C
92.00-84.50			B	0.194	2.618		0.8	1	7.465			
			C	0.194	2.618		0.8	1	7.465			
T2	105.87	591.18	A	0.193	2.619	44	0.8	1	7.785	1359.41	181.25	C
84.50-77.00			B	0.193	2.619		0.8	1	7.785			
			C	0.193	2.619		0.8	1	7.785			
T3	112.91	628.42	A	0.204	2.582	44	0.8	1	7.953	1390.62	198.66	C
77.00-70.00			B	0.204	2.582		0.8	1	7.953			
			C	0.204	2.582		0.8	1	7.953			
T4	194.91	1396.63	A	0.239	2.471	42	0.8	1	17.402	2608.51	217.38	C
70.00-58.00			B	0.239	2.471		0.8	1	17.402			
			C	0.239	2.471		0.8	1	17.402			
T5	104.06	787.49	A	0.238	2.475	41	0.8	1	9.992	1414.05	223.27	C
58.00-51.67			B	0.238	2.475		0.8	1	9.992			
			C	0.238	2.475		0.8	1	9.992			
T6	104.06	804.31	A	0.231	2.495	40	0.8	1	10.182	1400.77	221.17	C
51.67-45.33			B	0.231	2.495		0.8	1	10.182			
			C	0.231	2.495		0.8	1	10.182			
T7	104.06	904.06	A	0.25	2.438	39	0.8	1	11.487	1446.03	228.32	C
45.33-39.00			B	0.25	2.438		0.8	1	11.487			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.25	2.438		0.8	1	11.487			
T8	280.51	2345.40	A	0.185	2.648	36	0.8	1	24.644	3329.29	195.84	C
39.00-22.00			B	0.185	2.648		0.8	1	24.644			
			C	0.185	2.648		0.8	1	24.644			
T9 22.00-0.00	265.28	4115.63	A	0.178	2.671	31	0.8	1	33.786	3425.20	155.69	C
			B	0.178	2.671		0.8	1	33.786			
			C	0.178	2.671		0.8	1	33.786			
Sum Weight:	1360.80	12142.04						OTM	833.49 kip-ft	17607.83		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	45	0.85	1	7.931	1280.99	170.80	C
92.00-84.50			B	0.194	2.618		0.85	1	7.931			
			C	0.194	2.618		0.85	1	7.931			
T2	105.87	591.18	A	0.193	2.619	44	0.85	1	8.271	1407.61	187.68	C
84.50-77.00			B	0.193	2.619		0.85	1	8.271			
			C	0.193	2.619		0.85	1	8.271			
T3	112.91	628.42	A	0.204	2.582	44	0.85	1	8.450	1438.22	205.46	C
77.00-70.00			B	0.204	2.582		0.85	1	8.450			
			C	0.204	2.582		0.85	1	8.450			
T4	194.91	1396.63	A	0.239	2.471	42	0.85	1	18.490	2705.30	225.44	C
70.00-58.00			B	0.239	2.471		0.85	1	18.490			
			C	0.239	2.471		0.85	1	18.490			
T5	104.06	787.49	A	0.238	2.475	41	0.85	1	10.616	1467.94	231.78	C
58.00-51.67			B	0.238	2.475		0.85	1	10.616			
			C	0.238	2.475		0.85	1	10.616			
T6	104.06	804.31	A	0.231	2.495	40	0.85	1	10.819	1454.71	229.69	C
51.67-45.33			B	0.231	2.495		0.85	1	10.819			
			C	0.231	2.495		0.85	1	10.819			
T7	104.06	904.06	A	0.25	2.438	39	0.85	1	12.204	1503.77	237.44	C
45.33-39.00			B	0.25	2.438		0.85	1	12.204			
			C	0.25	2.438		0.85	1	12.204			
T8	280.51	2345.40	A	0.185	2.648	36	0.85	1	26.184	3454.96	203.23	C
39.00-22.00			B	0.185	2.648		0.85	1	26.184			
			C	0.185	2.648		0.85	1	26.184			
T9 22.00-0.00	265.28	4115.63	A	0.178	2.671	31	0.85	1	35.897	3575.05	162.50	C
			B	0.178	2.671		0.85	1	35.897			
			C	0.178	2.671		0.85	1	35.897			
Sum Weight:	1360.80	12142.04						OTM	864.72 kip-ft	18288.56		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	532.73	1369.45	A	0.354	2.162	7	1	1	14.456	332.12	44.28	C
92.00-84.50			B	0.354	2.162		1	1	14.456			
			C	0.354	2.162		1	1	14.456			
T2	686.18	1418.53	A	0.348	2.176	7	1	1	14.882	380.75	50.77	C
84.50-77.00			B	0.348	2.176		1	1	14.882			
			C	0.348	2.176		1	1	14.882			
T3	742.86	1343.13	A	0.339	2.198	6	1	1	15.006	396.49	56.64	C
77.00-70.00			B	0.339	2.198		1	1	15.006			
			C	0.339	2.198		1	1	15.006			
T4	1282.50	2991.08	A	0.374	2.119	6	1	1	31.226	717.94	59.83	C
70.00-58.00			B	0.374	2.119		1	1	31.226			
			C	0.374	2.119		1	1	31.226			
T5	689.21	1633.34	A	0.364	2.141	6	1	1	17.540	386.46	61.02	C
58.00-51.67			B	0.364	2.141		1	1	17.540			
			C	0.364	2.141		1	1	17.540			
T6	680.70	1660.74	A	0.354	2.162	6	1	1	17.822	380.46	60.07	C
51.67-45.33			B	0.354	2.162		1	1	17.822			
			C	0.354	2.162		1	1	17.822			
T7	671.19	1918.58	A	0.397	2.071	6	1	1	20.643	388.76	61.38	C
45.33-39.00			B	0.397	2.071		1	1	20.643			
			C	0.397	2.071		1	1	20.643			
T8	1765.50	4705.32	A	0.288	2.329	5	1	1	43.355	911.55	53.62	C
39.00-22.00			B	0.288	2.329		1	1	43.355			
			C	0.288	2.329		1	1	43.355			
T9 22.00-0.00	1524.82	6952.78	A	0.257	2.417	5	1	1	55.874	885.70	40.26	C
			B	0.257	2.417		1	1	55.874			
			C	0.257	2.417		1	1	55.874			
Sum Weight:	8575.70	23992.94						OTM	228.73 kip-ft	4780.23		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	532.73	1369.45	A	0.354	2.162	7	0.8	1	12.590	309.12	41.22	C
92.00-84.50			B	0.354	2.162		0.8	1	12.590			
			C	0.354	2.162		0.8	1	12.590			
T2	686.18	1418.53	A	0.348	2.176	7	0.8	1	12.936	357.06	47.61	C
84.50-77.00			B	0.348	2.176		0.8	1	12.936			
			C	0.348	2.176		0.8	1	12.936			
T3	742.86	1343.13	A	0.339	2.198	6	0.8	1	12.630	367.84	52.55	C
77.00-70.00			B	0.339	2.198		0.8	1	12.630			
			C	0.339	2.198		0.8	1	12.630			
T4	1282.50	2991.08	A	0.374	2.119	6	0.8	1	26.220	661.43	55.12	C
70.00-58.00			B	0.374	2.119		0.8	1	26.220			
			C	0.374	2.119		0.8	1	26.220			
T5	689.21	1633.34	A	0.364	2.141	6	0.8	1	14.701	355.13	56.07	C
58.00-51.67			B	0.364	2.141		0.8	1	14.701			
			C	0.364	2.141		0.8	1	14.701			
T6	680.70	1660.74	A	0.354	2.162	6	0.8	1	14.940	349.15	55.13	C
51.67-45.33			B	0.354	2.162		0.8	1	14.940			
			C	0.354	2.162		0.8	1	14.940			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T7	671.19	1918.58	A	0.397	2.071	6	0.8	1	17.440	356.39	56.27	C
45.33-39.00			B	0.397	2.071		0.8	1	17.440			
			C	0.397	2.071		0.8	1	17.440			
T8	1765.50	4705.32	A	0.288	2.329	5	0.8	1	36.331	836.99	49.23	C
39.00-22.00			B	0.288	2.329		0.8	1	36.331			
			C	0.288	2.329		0.8	1	36.331			
T9 22.00-0.00	1524.82	6952.78	A	0.257	2.417	5	0.8	1	46.420	795.91	36.18	C
			B	0.257	2.417		0.8	1	46.420			
			C	0.257	2.417		0.8	1	46.420			
Sum Weight:	8575.70	23992.94						OTM	211.20 kip-ft	4389.02		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	532.73	1369.45	A	0.354	2.162	7	0.85	1	13.056	314.87	41.98	C
92.00-84.50			B	0.354	2.162		0.85	1	13.056			
			C	0.354	2.162		0.85	1	13.056			
T2	686.18	1418.53	A	0.348	2.176	7	0.85	1	13.422	362.98	48.40	C
84.50-77.00			B	0.348	2.176		0.85	1	13.422			
			C	0.348	2.176		0.85	1	13.422			
T3	742.86	1343.13	A	0.339	2.198	6	0.85	1	13.224	375.00	53.57	C
77.00-70.00			B	0.339	2.198		0.85	1	13.224			
			C	0.339	2.198		0.85	1	13.224			
T4	1282.50	2991.08	A	0.374	2.119	6	0.85	1	27.472	675.56	56.30	C
70.00-58.00			B	0.374	2.119		0.85	1	27.472			
			C	0.374	2.119		0.85	1	27.472			
T5	689.21	1633.34	A	0.364	2.141	6	0.85	1	15.411	362.96	57.31	C
58.00-51.67			B	0.364	2.141		0.85	1	15.411			
			C	0.364	2.141		0.85	1	15.411			
T6	680.70	1660.74	A	0.354	2.162	6	0.85	1	15.660	356.98	56.36	C
51.67-45.33			B	0.354	2.162		0.85	1	15.660			
			C	0.354	2.162		0.85	1	15.660			
T7	671.19	1918.58	A	0.397	2.071	6	0.85	1	18.240	364.49	57.55	C
45.33-39.00			B	0.397	2.071		0.85	1	18.240			
			C	0.397	2.071		0.85	1	18.240			
T8	1765.50	4705.32	A	0.288	2.329	5	0.85	1	38.087	855.63	50.33	C
39.00-22.00			B	0.288	2.329		0.85	1	38.087			
			C	0.288	2.329		0.85	1	38.087			
T9 22.00-0.00	1524.82	6952.78	A	0.257	2.417	5	0.85	1	48.784	818.36	37.20	C
			B	0.257	2.417		0.85	1	48.784			
			C	0.257	2.417		0.85	1	48.784			
Sum Weight:	8575.70	23992.94						OTM	215.58 kip-ft	4486.82		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	10	1	1	9.331	302.95	40.39	C
92.00-84.50			B	0.194	2.618		1	1	9.331			
			C	0.194	2.618		1	1	9.331			
T2	105.87	591.18	A	0.193	2.619	9	1	1	9.731	330.65	44.09	C
84.50-77.00			B	0.193	2.619		1	1	9.731			
			C	0.193	2.619		1	1	9.731			
T3	112.91	628.42	A	0.204	2.582	9	1	1	9.941	336.78	48.11	C
77.00-70.00			B	0.204	2.582		1	1	9.941			
			C	0.204	2.582		1	1	9.941			
T4	194.91	1396.63	A	0.239	2.471	9	1	1	21.753	638.14	53.18	C
70.00-58.00			B	0.239	2.471		1	1	21.753			
			C	0.239	2.471		1	1	21.753			
T5	104.06	787.49	A	0.238	2.475	9	1	1	12.490	347.13	54.81	C
58.00-51.67			B	0.238	2.475		1	1	12.490			
			C	0.238	2.475		1	1	12.490			
T6	104.06	804.31	A	0.231	2.495	9	1	1	12.728	344.35	54.37	C
51.67-45.33			B	0.231	2.495		1	1	12.728			
			C	0.231	2.495		1	1	12.728			
T7	104.06	904.06	A	0.25	2.438	8	1	1	14.358	357.23	56.40	C
45.33-39.00			B	0.25	2.438		1	1	14.358			
			C	0.25	2.438		1	1	14.358			
T8	280.51	2345.40	A	0.185	2.648	8	1	1	30.805	816.28	48.02	C
39.00-22.00			B	0.185	2.648		1	1	30.805			
			C	0.185	2.648		1	1	30.805			
T9 22.00-0.00	265.28	4115.63	A	0.178	2.671	7	1	1	42.232	857.31	38.97	C
			B	0.178	2.671		1	1	42.232			
			C	0.178	2.671		1	1	42.232			
Sum Weight:	1360.80	12142.04						OTM	204.15 kip-ft	4330.81		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	10	0.8	1	7.465	262.85	35.05	C
92.00-84.50			B	0.194	2.618		0.8	1	7.465			
			C	0.194	2.618		0.8	1	7.465			
T2	105.87	591.18	A	0.193	2.619	9	0.8	1	7.785	289.58	38.61	C
84.50-77.00			B	0.193	2.619		0.8	1	7.785			
			C	0.193	2.619		0.8	1	7.785			
T3	112.91	628.42	A	0.204	2.582	9	0.8	1	7.953	296.23	42.32	C
77.00-70.00			B	0.204	2.582		0.8	1	7.953			
			C	0.204	2.582		0.8	1	7.953			
T4	194.91	1396.63	A	0.239	2.471	9	0.8	1	17.402	555.66	46.30	C
70.00-58.00			B	0.239	2.471		0.8	1	17.402			
			C	0.239	2.471		0.8	1	17.402			
T5	104.06	787.49	A	0.238	2.475	9	0.8	1	9.992	301.22	47.56	C
58.00-51.67			B	0.238	2.475		0.8	1	9.992			
			C	0.238	2.475		0.8	1	9.992			
T6	104.06	804.31	A	0.231	2.495	9	0.8	1	10.182	298.39	47.11	C
51.67-45.33			B	0.231	2.495		0.8	1	10.182			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.231	2.495		0.8	1	10.182			
T7	104.06	904.06	A	0.25	2.438	8	0.8	1	11.487	308.03	48.64	C
45.33-39.00			B	0.25	2.438		0.8	1	11.487			
			C	0.25	2.438		0.8	1	11.487			
T8	280.51	2345.40	A	0.185	2.648	8	0.8	1	24.644	709.20	41.72	C
39.00-22.00			B	0.185	2.648		0.8	1	24.644			
			C	0.185	2.648		0.8	1	24.644			
T9 22.00-0.00	265.28	4115.63	A	0.178	2.671	7	0.8	1	33.786	729.63	33.16	C
			B	0.178	2.671		0.8	1	33.786			
			C	0.178	2.671		0.8	1	33.786			
Sum Weight:	1360.80	12142.04						OTM	177.55 kip-ft	3750.78		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	10	0.85	1	7.931	272.87	36.38	C
92.00-84.50			B	0.194	2.618		0.85	1	7.931			
			C	0.194	2.618		0.85	1	7.931			
T2	105.87	591.18	A	0.193	2.619	9	0.85	1	8.271	299.84	39.98	C
84.50-77.00			B	0.193	2.619		0.85	1	8.271			
			C	0.193	2.619		0.85	1	8.271			
T3	112.91	628.42	A	0.204	2.582	9	0.85	1	8.450	306.37	43.77	C
77.00-70.00			B	0.204	2.582		0.85	1	8.450			
			C	0.204	2.582		0.85	1	8.450			
T4	194.91	1396.63	A	0.239	2.471	9	0.85	1	18.490	576.28	48.02	C
70.00-58.00			B	0.239	2.471		0.85	1	18.490			
			C	0.239	2.471		0.85	1	18.490			
T5	104.06	787.49	A	0.238	2.475	9	0.85	1	10.616	312.70	49.37	C
58.00-51.67			B	0.238	2.475		0.85	1	10.616			
			C	0.238	2.475		0.85	1	10.616			
T6	104.06	804.31	A	0.231	2.495	9	0.85	1	10.819	309.88	48.93	C
51.67-45.33			B	0.231	2.495		0.85	1	10.819			
			C	0.231	2.495		0.85	1	10.819			
T7	104.06	904.06	A	0.25	2.438	8	0.85	1	12.204	320.33	50.58	C
45.33-39.00			B	0.25	2.438		0.85	1	12.204			
			C	0.25	2.438		0.85	1	12.204			
T8	280.51	2345.40	A	0.185	2.648	8	0.85	1	26.184	735.97	43.29	C
39.00-22.00			B	0.185	2.648		0.85	1	26.184			
			C	0.185	2.648		0.85	1	26.184			
T9 22.00-0.00	265.28	4115.63	A	0.178	2.671	7	0.85	1	35.897	761.55	34.62	C
			B	0.178	2.671		0.85	1	35.897			
			C	0.178	2.671		0.85	1	35.897			
Sum Weight:	1360.80	12142.04						OTM	184.20 kip-ft	3895.79		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	4217.45					
Bracing Weight	7924.59					
Total Member Self-Weight	12142.04			0.30	-4.34	
Total Weight	19158.77			0.30	-4.34	
Wind 0 deg - No Ice		0.00	-30452.93	-1804.09	-4.34	18.92
Wind 30 deg - No Ice		14205.37	-24604.42	-1481.22	-859.70	18.38
Wind 60 deg - No Ice		24014.89	-13865.00	-839.44	-1458.82	12.92
Wind 90 deg - No Ice		28410.74	0.00	0.30	-1715.05	3.99
Wind 120 deg - No Ice		26373.01	15226.46	902.50	-1566.99	-6.01
Wind 150 deg - No Ice		14205.37	24604.42	1481.82	-859.70	-14.40
Wind 180 deg - No Ice		0.00	27730.01	1679.79	-4.34	-18.92
Wind 210 deg - No Ice		-14205.37	24604.42	1481.82	851.02	-18.38
Wind 240 deg - No Ice		-26373.01	15226.46	902.50	1558.31	-12.92
Wind 270 deg - No Ice		-28410.74	0.00	0.30	1706.37	-3.99
Wind 300 deg - No Ice		-24014.89	-13865.00	-839.44	1450.14	6.01
Wind 330 deg - No Ice		-14205.37	-24604.42	-1481.22	851.02	14.40
Member Ice	11850.90					
Total Weight Ice	43413.76			6.12	-10.42	
Wind 0 deg - Ice		0.00	-7002.96	-407.39	-10.42	3.76
Wind 30 deg - Ice		3354.78	-5810.65	-340.61	-210.60	4.78
Wind 60 deg - Ice		5725.95	-3305.88	-191.87	-353.35	4.51
Wind 90 deg - Ice		6709.56	0.00	6.12	-410.78	3.04
Wind 120 deg - Ice		6064.74	3501.48	212.88	-368.53	0.75
Wind 150 deg - Ice		3354.78	5810.65	352.85	-210.60	-1.74
Wind 180 deg - Ice		0.00	6611.76	402.10	-10.42	-3.76
Wind 210 deg - Ice		-3354.78	5810.65	352.85	189.77	-4.78
Wind 240 deg - Ice		-6064.74	3501.48	212.88	347.70	-4.51
Wind 270 deg - Ice		-6709.56	0.00	6.12	389.95	-3.04
Wind 300 deg - Ice		-5725.95	-3305.88	-191.87	332.52	-0.75
Wind 330 deg - Ice		-3354.78	-5810.65	-340.61	189.77	1.74
Total Weight	19158.77			0.30	-4.34	
Wind 0 deg - Service		0.00	-6487.01	-383.36	-4.84	4.03
Wind 30 deg - Service		3026.00	-5241.18	-314.59	-187.05	3.92
Wind 60 deg - Service		5115.60	-2953.49	-177.88	-314.67	2.75
Wind 90 deg - Service		6051.99	0.00	1.00	-369.26	0.85
Wind 120 deg - Service		5617.92	3243.51	193.19	-337.72	-1.28
Wind 150 deg - Service		3026.00	5241.18	316.59	-187.05	-3.07
Wind 180 deg - Service		0.00	5906.98	358.76	-4.84	-4.03
Wind 210 deg - Service		-3026.00	5241.18	316.59	177.36	-3.92
Wind 240 deg - Service		-5617.92	3243.51	193.19	328.03	-2.75
Wind 270 deg - Service		-6051.99	0.00	1.00	359.57	-0.85
Wind 300 deg - Service		-5115.60	-2953.49	-177.88	304.99	1.28
Wind 330 deg - Service		-3026.00	-5241.18	-314.59	177.36	3.07

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

Comb. No.	Description
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	92 - 84.5	Leg	Max Tension	7	3057.45	-0.17	0.15
			Max. Compression	2	-5326.32	-0.22	-0.14
			Max. Mx	4	-1404.84	-0.46	0.02
			Max. My	22	2466.87	-0.05	0.16
			Max. Vy	4	2098.36	-0.17	0.00
			Max. Vx	22	-1882.66	-0.00	0.16
		Diagonal	Max Tension	15	3252.41	0.00	0.00
			Max. Compression	2	-4131.23	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	30	-128.18	0.04	0.00
			Max. My	12	-3827.05	-0.00	0.01
			Max. Vy	30	-34.74	0.04	0.00
			Max. Vx	12	-2.43	0.00	0.00
		Top Girt	Max Tension	10	766.36	0.00	0.00
			Max. Compression	15	-310.35	0.00	0.00
			Max. Mx	26	428.21	-0.04	0.00
			Max. My	26	443.13	0.00	0.00
			Max. Vy	26	27.83	0.00	0.00
			Max. Vx	26	-0.31	0.00	0.00
T2	84.5 - 77	Leg	Max Tension	7	11623.62	-0.53	0.49
			Max. Compression	10	-15012.47	0.18	-0.44
			Max. Mx	4	-2218.33	-1.39	0.04
			Max. My	18	-14049.22	0.19	-0.52
			Max. Vy	16	-1147.01	0.55	-0.02
			Max. Vx	18	4548.11	0.19	-0.52
		Diagonal	Max Tension	15	5141.58	0.00	0.00
			Max. Compression	2	-6355.23	0.00	0.00
			Max. Mx	10	1701.93	0.09	-0.00
			Max. My	14	-3796.54	-0.03	0.01
			Max. Vy	31	-39.64	0.06	0.00
			Max. Vx	14	-3.13	0.00	0.00
		Top Girt	Max Tension	6	2462.57	0.00	0.00
			Max. Compression	11	-1342.11	0.00	0.00
			Max. Mx	26	1209.42	-0.05	0.00
			Max. My	26	1148.75	0.00	0.00
			Max. Vy	26	34.77	0.00	0.00
			Max. Vx	26	0.39	0.00	0.00
T3	77 - 70	Leg	Max Tension	7	23659.64	-0.08	0.00
			Max. Compression	10	-28859.74	0.05	0.14
			Max. Mx	18	-22470.19	1.03	0.59
			Max. My	16	-2649.40	0.02	1.53
			Max. Vy	10	-6896.93	1.01	0.21
			Max. Vx	16	-1629.13	0.02	1.53
		Diagonal	Max Tension	15	7776.76	0.00	0.00
			Max. Compression	2	-8853.35	0.00	0.00
			Max. Mx	10	2584.38	0.11	0.01
			Max. My	2	1437.29	0.11	-0.02
			Max. Vy	31	-43.01	0.07	0.00
			Max. Vx	2	4.48	0.00	0.00
		Top Girt	Max Tension	6	3370.94	0.00	0.00
			Max. Compression	11	-2332.57	0.00	0.00
			Max. Mx	26	1314.39	-0.05	0.00
			Max. My	26	1197.84	0.00	0.00
			Max. Vy	26	30.03	0.00	0.00
			Max. Vx	26	0.21	0.00	0.00
T4	70 - 58	Leg	Max Tension	7	47744.63	-0.07	0.03
			Max. Compression	10	-55676.00	-0.07	0.01
			Max. Mx	10	-43573.06	0.66	0.19
			Max. My	2	13588.35	-0.31	-0.58
			Max. Vy	10	-7285.25	0.66	0.19
			Max. Vx	3	2309.75	-0.31	-0.58
		Diagonal	Max Tension	15	7021.47	0.00	0.00
			Max. Compression	2	-7761.40	0.00	0.00
			Max. Mx	10	2857.83	0.10	0.00
			Max. My	2	-7671.01	-0.01	-0.02
			Max. Vy	31	-44.36	0.06	0.00
			Max. Vx	2	5.10	0.00	0.00
		Horizontal	Max Tension	6	2668.73	0.00	0.00
			Max. Compression	11	-2166.31	0.00	0.00
			Max. Mx	26	731.52	-0.07	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	26	679.26	0.00	0.00
			Max. Vy	26	39.06	0.00	0.00
			Max. Vx	26	-0.86	0.00	0.00
		Top Girt	Max Tension	6	2647.47	0.00	0.00
			Max. Compression	11	-2048.80	0.00	0.00
			Max. Mx	26	850.71	-0.06	0.00
			Max. My	26	767.17	0.00	0.00
			Max. Vy	26	-36.59	0.00	0.00
			Max. Vx	26	0.81	0.00	0.00
T5	58 - 51.6667	Leg	Max Tension	7	59245.46	-0.57	-0.03
			Max. Compression	10	-68593.06	-0.15	-0.04
			Max. Mx	10	-63432.46	0.64	0.06
			Max. My	4	-4489.12	0.02	-0.38
			Max. Vy	18	-8510.89	0.64	0.03
			Max. Vx	3	2319.94	-0.30	-0.38
		Diagonal	Max Tension	15	7551.19	0.00	0.00
			Max. Compression	2	-8387.01	0.00	0.00
			Max. Mx	10	3524.40	0.11	0.01
			Max. My	2	-8286.07	-0.02	-0.02
			Max. Vy	31	-45.98	0.07	0.00
			Max. Vx	2	3.63	0.00	0.00
		Top Girt	Max Tension	6	3053.94	0.00	0.00
			Max. Compression	11	-2552.19	0.00	0.00
			Max. Mx	26	767.46	-0.08	0.00
			Max. My	26	721.37	0.00	0.00
			Max. Vy	26	41.03	0.00	0.00
			Max. Vx	26	-0.73	0.00	0.00
T6	51.6667 - 45.3333	Leg	Max Tension	7	71645.81	-0.53	-0.04
			Max. Compression	10	-82548.64	-0.37	-0.02
			Max. Mx	10	-77258.50	0.60	0.00
			Max. My	4	-4692.12	0.01	-0.32
			Max. Vy	18	-8937.75	0.60	0.04
			Max. Vx	16	-2470.35	0.01	0.32
		Diagonal	Max Tension	15	7623.93	0.00	0.00
			Max. Compression	2	-8506.07	0.00	0.00
			Max. Mx	10	3877.60	0.12	0.00
			Max. My	2	-8400.50	-0.02	-0.02
			Max. Vy	31	-47.73	0.07	0.00
			Max. Vx	2	3.84	0.00	0.00
		Top Girt	Max Tension	6	2984.40	0.00	0.00
			Max. Compression	11	-2547.27	0.00	0.00
			Max. Mx	26	694.52	-0.09	0.00
			Max. My	26	661.66	0.00	0.00
			Max. Vy	26	42.68	0.00	0.00
			Max. Vx	26	0.76	0.00	0.00
T7	45.3333 - 39	Leg	Max Tension	7	83457.70	-0.37	-0.03
			Max. Compression	10	-95867.94	-0.39	-0.06
			Max. Mx	10	-95812.74	0.42	0.00
			Max. My	12	-3833.61	-0.03	-0.55
			Max. Vy	18	-9380.53	0.41	0.03
			Max. Vx	16	-2542.64	0.00	0.42
		Diagonal	Max Tension	15	8215.79	0.10	0.01
			Max. Compression	2	-9363.07	0.00	0.00
			Max. Mx	10	4612.06	0.13	-0.01
			Max. My	2	2607.29	0.13	-0.02
			Max. Vy	31	-50.14	0.08	-0.01
			Max. Vx	2	4.30	0.00	0.00
		Secondary Horizontal	Max Tension	10	1661.26	0.01	-0.01
			Max. Compression	10	-1661.26	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	27	101.64	0.02	0.00
			Max. My	4	-191.17	0.01	0.01
			Max. Vy	27	26.20	0.02	0.00
			Max. Vx	4	2.31	0.00	0.00
		Top Girt	Max Tension	6	3827.65	0.00	0.00
			Max. Compression	11	-3384.10	0.00	0.00
			Max. Mx	26	775.97	-0.09	0.00
			Max. My	26	748.07	0.00	0.00
			Max. Vy	26	44.23	0.00	0.00
			Max. Vx	26	-0.78	0.00	0.00
T8	39 - 22	Leg	Max Tension	7	107982.45	-0.32	-0.02
			Max. Compression	10	-124530.27	-0.05	-0.02
			Max. Mx	10	-105129.89	0.52	-0.02
			Max. My	4	-6011.97	-0.00	-0.57
			Max. Vy	18	-10996.09	0.52	-0.04
			Max. Vx	16	-2248.93	0.00	0.45
		Diagonal	Max Tension	25	13644.06	0.00	0.00
			Max. Compression	24	-13774.24	0.00	0.00
			Max. Mx	26	-90.11	0.11	0.00
			Max. My	26	-134.79	0.00	-0.00
			Max. Vy	26	-44.93	0.00	0.00
			Max. Vx	26	1.52	0.00	0.00
		Horizontal	Max Tension	24	6866.55	0.00	0.00
			Max. Compression	3	-6874.93	0.00	0.00
			Max. Mx	6	-1161.26	-0.12	-0.01
			Max. My	33	221.01	-0.08	-0.01
			Max. Vy	29	-54.64	-0.08	-0.01
			Max. Vx	35	2.78	0.00	0.00
		Secondary Horizontal	Max Tension	2	2798.68	0.00	0.00
			Max. Compression	2	-2798.68	0.00	0.00
			Max. Mx	26	303.67	-0.11	0.00
			Max. My	26	303.67	0.00	0.00
			Max. Vy	26	-44.87	0.00	0.00
			Max. Vx	26	-0.76	0.00	0.00
		Top Girt	Max Tension	2	7714.07	0.00	0.00
			Max. Compression	15	-6798.43	-0.01	0.00
			Max. Mx	6	3031.19	0.06	0.00
			Max. My	27	-186.95	0.02	0.01
			Max. Vy	29	-32.49	0.04	0.01
			Max. Vx	35	2.26	0.00	0.00
T9	22 - 0	Leg	Max Tension	7	149234.00	-0.62	-0.01
			Max. Compression	10	-172293.01	0.00	-0.00
			Max. Mx	11	-142178.15	0.88	0.01
			Max. My	12	-5762.95	-0.01	-1.02
			Max. Vy	18	-11205.17	0.88	0.03
			Max. Vx	16	-4404.37	-0.00	0.79
		Diagonal	Max Tension	25	18641.24	0.00	0.00
			Max. Compression	24	-18920.66	0.00	0.00
			Max. Mx	26	-57.23	0.21	0.00
			Max. My	26	-55.89	0.00	0.01
			Max. Vy	26	-69.55	0.00	0.00
			Max. Vx	26	-1.74	0.00	0.00
		Horizontal	Max Tension	24	8219.47	0.00	0.00
			Max. Compression	25	-8140.38	0.00	0.00
			Max. Mx	6	377.35	-0.14	-0.01
			Max. My	33	168.31	-0.07	-0.01
			Max. Vy	29	-52.61	-0.07	-0.01
			Max. Vx	35	2.58	0.00	0.00
		Secondary Horizontal	Max Tension	2	4284.19	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	2	-4284.19	0.00	0.00
			Max. Mx	26	463.62	-0.12	0.00
			Max. My	26	463.62	0.00	0.00
			Max. Vy	26	45.43	0.00	0.00
			Max. Vx	26	-0.50	0.00	0.00
		Top Girt	Max Tension	24	7912.86	0.00	0.00
			Max. Compression	25	-7783.44	0.00	0.00
			Max. Mx	6	948.81	0.06	0.01
			Max. My	27	-88.11	0.03	0.01
			Max. Vy	29	-33.26	0.05	0.01
			Max. Vx	35	2.23	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	18	199916.31	14493.27	-7557.64
	Max. H_x	18	199916.31	14493.27	-7557.64
	Max. H_z	5	-152901.04	-10607.17	7241.87
	Min. Vert	7	-174077.81	-12879.20	6629.45
	Min. H_x	7	-174077.81	-12879.20	6629.45
	Min. H_z	18	199916.31	14493.27	-7557.64
Leg B	Max. Vert	10	200892.86	-13984.27	-8450.56
	Max. H_x	23	-173345.40	12364.49	7512.47
	Max. H_z	25	-152168.63	9717.46	8774.41
	Min. Vert	23	-173345.40	12364.49	7512.47
	Min. H_x	10	200892.86	-13984.27	-8450.56
	Min. H_z	12	166468.54	-10123.56	-9011.79
Leg A	Max. Vert	2	200345.79	1027.79	16332.85
	Max. H_x	20	7624.31	3711.18	265.63
	Max. H_z	2	200345.79	1027.79	16332.85
	Min. Vert	15	-173755.71	-1022.07	-14466.57
	Min. H_x	11	-90642.51	-3989.75	-7834.39
	Min. H_z	15	-173755.71	-1022.07	-14466.57

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	19158.77	-0.00	-0.00	0.30	-4.34	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	22990.52	-0.00	-30452.93	-1779.92	-5.21	18.92
0.9 Dead+1.0 Wind 0 deg - No Ice	17242.89	-0.00	-30452.93	-1780.01	-3.91	18.92
1.2 Dead+1.0 Wind 30 deg - No Ice	22990.52	14205.37	-24604.42	-1461.92	-849.46	18.38
0.9 Dead+1.0 Wind 30 deg - No Ice	17242.89	14205.37	-24604.42	-1462.01	-848.16	18.38
1.2 Dead+1.0 Wind 60 deg - No Ice	22990.52	24014.89	-13865.00	-828.59	-1441.00	12.92
0.9 Dead+1.0 Wind 60 deg - No	17242.89	24014.89	-13865.00	-828.68	-1439.70	12.92

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	kip-ft	kip-ft	kip-ft
Ice						
1.2 Dead+1.0 Wind 90 deg - No Ice	22990.52	28410.74	-0.00	0.36	-1693.71	3.99
0.9 Dead+1.0 Wind 90 deg - No Ice	17242.89	28410.74	-0.00	0.27	-1692.41	3.99
1.2 Dead+1.0 Wind 120 deg - No Ice	22990.52	26373.01	15226.46	890.50	-1546.98	-6.01
0.9 Dead+1.0 Wind 120 deg - No Ice	17242.89	26373.01	15226.46	890.41	-1545.68	-6.01
1.2 Dead+1.0 Wind 150 deg - No Ice	22990.52	14205.37	24604.42	1462.65	-849.46	-14.40
0.9 Dead+1.0 Wind 150 deg - No Ice	17242.89	14205.37	24604.42	1462.56	-848.16	-14.40
1.2 Dead+1.0 Wind 180 deg - No Ice	22990.52	-0.00	27730.01	1658.27	-5.21	-18.92
0.9 Dead+1.0 Wind 180 deg - No Ice	17242.89	-0.00	27730.01	1658.18	-3.91	-18.92
1.2 Dead+1.0 Wind 210 deg - No Ice	22990.52	-14205.37	24604.42	1462.65	839.04	-18.38
0.9 Dead+1.0 Wind 210 deg - No Ice	17242.89	-14205.37	24604.42	1462.56	840.34	-18.38
1.2 Dead+1.0 Wind 240 deg - No Ice	22990.52	-26373.01	15226.46	890.50	1536.56	-12.92
0.9 Dead+1.0 Wind 240 deg - No Ice	17242.89	-26373.01	15226.46	890.41	1537.86	-12.92
1.2 Dead+1.0 Wind 270 deg - No Ice	22990.52	-28410.74	0.00	0.36	1683.29	-3.99
0.9 Dead+1.0 Wind 270 deg - No Ice	17242.89	-28410.74	0.00	0.27	1684.60	-3.99
1.2 Dead+1.0 Wind 300 deg - No Ice	22990.52	-24014.89	-13865.00	-828.59	1430.58	6.01
0.9 Dead+1.0 Wind 300 deg - No Ice	17242.89	-24014.89	-13865.00	-828.68	1431.88	6.01
1.2 Dead+1.0 Wind 330 deg - No Ice	22990.52	-14205.37	-24604.42	-1461.92	839.04	14.40
0.9 Dead+1.0 Wind 330 deg - No Ice	17242.89	-14205.37	-24604.42	-1462.01	840.34	14.40
1.2 Dead+1.0 Ice+1.0 Temp	47245.51	-0.00	-0.00	6.18	-11.28	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	47245.51	-0.00	-7002.96	-400.62	-11.28	3.76
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	47245.51	3354.78	-5810.65	-335.03	-208.28	4.78
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	47245.51	5725.95	-3305.88	-188.69	-348.80	4.51
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	47245.51	6709.56	-0.00	6.18	-405.28	3.04
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	47245.51	6064.74	3501.48	209.58	-363.58	0.75
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	47245.51	3354.78	5810.65	347.39	-208.28	-1.74
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	47245.51	-0.00	6611.76	395.91	-11.28	-3.76
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	47245.51	-3354.78	5810.65	347.39	185.72	-4.78
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	47245.51	-6064.74	3501.48	209.58	341.02	-4.51
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	47245.51	-6709.56	-0.00	6.18	382.72	-3.04
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	47245.51	-5725.95	-3305.88	-188.69	326.24	-0.75
1.2 Dead+1.0 Wind 330	47245.51	-3354.78	-5810.65	-335.03	185.72	1.74

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	kip-ft	kip-ft	kip-ft
deg+1.0 Ice+1.0 Temp						
Dead+Wind 0 deg - Service	19158.77	-0.00	-6487.01	-378.93	-4.34	4.03
Dead+Wind 30 deg - Service	19158.77	3026.00	-5241.18	-311.19	-184.18	3.92
Dead+Wind 60 deg - Service	19158.77	5115.60	-2953.49	-176.28	-310.19	2.75
Dead+Wind 90 deg - Service	19158.77	6051.99	-0.00	0.30	-364.02	0.85
Dead+Wind 120 deg - Service	19158.77	5617.92	3243.51	189.92	-332.76	-1.28
Dead+Wind 150 deg - Service	19158.77	3026.00	5241.18	311.79	-184.18	-3.07
Dead+Wind 180 deg - Service	19158.77	-0.00	5906.98	353.47	-4.34	-4.03
Dead+Wind 210 deg - Service	19158.77	-3026.00	5241.18	311.79	175.50	-3.92
Dead+Wind 240 deg - Service	19158.77	-5617.92	3243.51	189.92	324.08	-2.75
Dead+Wind 270 deg - Service	19158.77	-6051.99	0.00	0.30	355.34	-0.85
Dead+Wind 300 deg - Service	19158.77	-5115.60	-2953.49	-176.28	301.51	1.28
Dead+Wind 330 deg - Service	19158.77	-3026.00	-5241.18	-311.19	175.50	3.07

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-19158.77	0.00	0.00	19158.77	0.00	0.000%
2	0.00	-22990.52	-30452.93	0.00	22990.52	30452.93	0.000%
3	0.00	-17242.89	-30452.93	0.00	17242.89	30452.93	0.000%
4	14205.37	-22990.52	-24604.42	-14205.37	22990.52	24604.42	0.000%
5	14205.37	-17242.89	-24604.42	-14205.37	17242.89	24604.42	0.000%
6	24014.89	-22990.52	-13865.00	-24014.89	22990.52	13865.00	0.000%
7	24014.89	-17242.89	-13865.00	-24014.89	17242.89	13865.00	0.000%
8	28410.74	-22990.52	0.00	-28410.74	22990.52	0.00	0.000%
9	28410.74	-17242.89	0.00	-28410.74	17242.89	0.00	0.000%
10	26373.01	-22990.52	15226.46	-26373.01	22990.52	-15226.46	0.000%
11	26373.01	-17242.89	15226.46	-26373.01	17242.89	-15226.46	0.000%
12	14205.37	-22990.52	24604.42	-14205.37	22990.52	-24604.42	0.000%
13	14205.37	-17242.89	24604.42	-14205.37	17242.89	-24604.42	0.000%
14	-0.00	-22990.52	27730.01	0.00	22990.52	-27730.01	0.000%
15	-0.00	-17242.89	27730.01	0.00	17242.89	-27730.01	0.000%
16	-14205.37	-22990.52	24604.42	14205.37	22990.52	-24604.42	0.000%
17	-14205.37	-17242.89	24604.42	14205.37	17242.89	-24604.42	0.000%
18	-26373.01	-22990.52	15226.46	26373.01	22990.52	-15226.46	0.000%
19	-26373.01	-17242.89	15226.46	26373.01	17242.89	-15226.46	0.000%
20	-28410.74	-22990.52	0.00	28410.74	22990.52	-0.00	0.000%
21	-28410.74	-17242.89	0.00	28410.74	17242.89	-0.00	0.000%
22	-24014.89	-22990.52	-13865.00	24014.89	22990.52	13865.00	0.000%
23	-24014.89	-17242.89	-13865.00	24014.89	17242.89	13865.00	0.000%
24	-14205.37	-22990.52	-24604.42	14205.37	22990.52	24604.42	0.000%
25	-14205.37	-17242.89	-24604.42	14205.37	17242.89	24604.42	0.000%
26	0.00	-47245.51	0.00	0.00	47245.51	0.00	0.000%
27	0.00	-47245.51	-7002.96	0.00	47245.51	7002.96	0.000%
28	3354.78	-47245.51	-5810.65	-3354.78	47245.51	5810.65	0.000%
29	5725.95	-47245.51	-3305.88	-5725.95	47245.51	3305.88	0.000%
30	6709.56	-47245.51	0.00	-6709.56	47245.51	0.00	0.000%
31	6064.74	-47245.51	3501.48	-6064.74	47245.51	-3501.48	0.000%
32	3354.78	-47245.51	5810.65	-3354.78	47245.51	-5810.65	0.000%
33	-0.00	-47245.51	6611.76	0.00	47245.51	-6611.76	0.000%
34	-3354.78	-47245.51	5810.65	3354.78	47245.51	-5810.65	0.000%
35	-6064.74	-47245.51	3501.48	6064.74	47245.51	-3501.48	0.000%
36	-6709.56	-47245.51	0.00	6709.56	47245.51	0.00	0.000%
37	-5725.95	-47245.51	-3305.88	5725.95	47245.51	3305.88	0.000%
38	-3354.78	-47245.51	-5810.65	3354.78	47245.51	5810.65	0.000%
39	-0.00	-19158.77	-6487.01	0.00	19158.77	6487.01	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
40	3026.00	-19158.77	-5241.18	-3026.00	19158.77	5241.18	0.000%
41	5115.60	-19158.77	-2953.49	-5115.60	19158.77	2953.49	0.000%
42	6051.99	-19158.77	0.00	-6051.99	19158.77	0.00	0.000%
43	5617.92	-19158.77	3243.51	-5617.92	19158.77	-3243.51	0.000%
44	3026.00	-19158.77	5241.18	-3026.00	19158.77	-5241.18	0.000%
45	0.00	-19158.77	5906.98	0.00	19158.77	-5906.98	0.000%
46	-3026.00	-19158.77	5241.18	3026.00	19158.77	-5241.18	0.000%
47	-5617.92	-19158.77	3243.51	5617.92	19158.77	-3243.51	0.000%
48	-6051.99	-19158.77	0.00	6051.99	19158.77	-0.00	0.000%
49	-5115.60	-19158.77	-2953.49	5115.60	19158.77	2953.49	0.000%
50	-3026.00	-19158.77	-5241.18	3026.00	19158.77	5241.18	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	92 - 84.5	1.375	43	0.1269	0.0292
T2	84.5 - 77	1.175	43	0.1244	0.0284
T3	77 - 70	0.983	43	0.1164	0.0276
T4	70 - 58	0.816	43	0.1072	0.0246
T5	58 - 51.6667	0.560	43	0.0917	0.0200
T6	51.6667 - 45.3333	0.440	43	0.0828	0.0180
T7	45.3333 - 39	0.333	43	0.0727	0.0163
T8	39 - 22	0.241	43	0.0615	0.0147
T9	22 - 0	0.070	43	0.0349	0.0064

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
105.00	Lightning Rod 5/8x4'	43	1.375	0.1269	0.0292	118339
103.80	dbSpectra DS2C00F36D-D Omni Antenna	43	1.375	0.1269	0.0292	118339
92.00	(2) TT19-08BP111-001 TMA	43	1.375	0.1269	0.0292	118339
85.00	T-Boom/Gate Mount	43	1.188	0.1247	0.0285	86856
80.00	T-Boom/Gate Mount	43	1.059	0.1201	0.0282	56840
79.50	Kreco CO-36A Omni Antenna	43	1.046	0.1195	0.0281	55264
79.00	SC479-HF1LDF	43	1.033	0.1189	0.0281	53803
74.50	PA6-65AC	43	0.922	0.1131	0.0267	46840
72.50	SitePro1 PSA6 w/ Support Arm	43	0.874	0.1105	0.0258	46008
71.50	6'x6" Dipole Antenna	43	0.851	0.1091	0.0253	45720
60.00	432E-83I-01T TTA Unit	43	0.599	0.0943	0.0206	43108
54.50	DB222-A	43	0.492	0.0869	0.0189	41884
39.00	SY203(C) - YAGI Antenna	43	0.241	0.0615	0.0147	32435

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	92 - 84.5	6.332	10	0.5787	0.1372
T2	84.5 - 77	5.419	10	0.5675	0.1335
T3	77 - 70	4.542	10	0.5317	0.1298
T4	70 - 58	3.775	10	0.4916	0.1155
T5	58 - 51.6667	2.595	10	0.4227	0.0938
T6	51.6667 - 45.3333	2.045	10	0.3825	0.0846
T7	45.3333 - 39	1.551	10	0.3361	0.0763
T8	39 - 22	1.123	10	0.2845	0.0688
T9	22 - 0	0.326	10	0.1622	0.0299

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
105.00	Lightning Rod 5/8x4'	10	6.332	0.5787	0.1372	26483
103.80	dbSpectra DS2C00F36D-D Omni Antenna	10	6.332	0.5787	0.1372	26483
92.00	(2) TT19-08BP111-001 TMA	10	6.332	0.5787	0.1372	26483
85.00	T-Boom/Gate Mount	10	5.479	0.5689	0.1337	19511
80.00	T-Boom/Gate Mount	10	4.887	0.5482	0.1323	13006
79.50	Kreco CO-36A Omni Antenna	10	4.828	0.5455	0.1321	12658
79.00	SC479-HF1LDF	10	4.771	0.5429	0.1317	12342
74.50	PA6-65AC	10	4.262	0.5174	0.1256	10793
72.50	SitePro1 PSA6 w/ Support Arm	10	4.043	0.5059	0.1212	10558
71.50	6'x6" Dipole Antenna	10	3.935	0.5002	0.1189	10466
60.00	432E-83I-01T TTA Unit	10	2.780	0.4345	0.0969	9589
54.50	DB222-A	10	2.285	0.4011	0.0886	9235
39.00	SY203(C) - YAGI Antenna	10	1.123	0.2845	0.0688	7097

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load per Bolt lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	92	Diagonal	A325N	0.5000	1	4131.23	8835.73	0.468 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	766.35	6198.75	0.124 ✔	1	Member Bearing
T2	84.5	Diagonal	A325N	0.5000	1	6355.23	8835.73	0.719 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	2462.57	6198.75	0.397 ✔	1	Member Bearing
T3	77	Leg	A325N	0.6250	6	7846.00	27611.70	0.284 ✔	1	Bolt DS
		Diagonal	A490N	0.5000	1	8853.34	11044.70	0.802 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	3370.94	6198.75	0.544 ✔	1	Member Bearing
T4	70	Leg	A325N	0.6250	6	13047.40	27611.70	0.473 ✔	1	Bolt DS
		Diagonal	A325N	0.5000	1	7761.40	8835.73	0.878 ✔	1	Bolt Shear
		Horizontal	A325N	0.5000	1	2668.73	6198.75	0.431 ✔	1	Member Bearing

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load per Bolt lb	Ratio Load / Allowable	Allowable Ratio	Criteria
		Top Girt	A325N	0.5000	1	2647.47	6198.75	0.427 ✔	1	Member Bearing
T5	58	Leg	A325N	0.6250	12	10572.10	27611.70	0.383 ✔	1	Bolt DS
		Diagonal	A325N	0.5000	1	8387.01	8835.73	0.949 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	3053.94	6198.75	0.493 ✔	1	Member Bearing
T6	51.6667	Diagonal	A490N	0.5000	1	8506.07	11044.70	0.770 ✔	1	Bolt Shear
		Top Girt	A325N	0.5000	1	2984.40	6198.75	0.481 ✔	1	Member Bearing
T7	45.3333	Diagonal	A490N	0.5000	1	9363.07	11044.70	0.848 ✔	1	Bolt Shear
		Secondary Horizontal	A325N	0.5000	1	1661.26	8265.00	0.201 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	1	3827.65	6198.75	0.617 ✔	1	Member Bearing
T8	39	Leg	A325N	0.6250	12	17584.50	27611.70	0.637 ✔	1	Bolt DS
		Diagonal	A325N	0.5000	2	6822.03	17400.00	0.392 ✔	1	Member Block Shear
		Horizontal	A325N	0.5000	2	3433.27	13050.00	0.263 ✔	1	Member Block Shear
		Secondary Horizontal	A325N	0.5000	1	2798.68	8265.00	0.339 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	2	3857.03	6525.00	0.591 ✔	1	Member Block Shear
T9	22	Leg	A325N	0.6250	16	17975.20	27611.70	0.651 ✔	1	Bolt DS
		Diagonal	A325N	0.5000	2	9460.33	17671.50	0.535 ✔	1	Bolt Shear
		Horizontal	A325N	0.5000	2	4109.74	13050.00	0.315 ✔	1	Member Block Shear
		Secondary Horizontal	A325N	0.5000	1	4284.19	8265.00	0.518 ✔	1	Member Bearing
		Top Girt	A325N	0.5000	2	3956.43	6525.00	0.606 ✔	1	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	92 - 84.5	V3x3x1/4	7.50	7.42	128.1 K=1.00	1.4375	-5326.32	25057.10	0.213 [1] ✔
T2	84.5 - 77	V3x3x1/4	7.50	7.42	128.1 K=1.00	1.4375	-15012.50	25057.10	0.599 [1] ✔
T3	77 - 70	Section 5	7.00	6.92	105.0 K=1.00	2.3295	-28859.70	46823.30	0.616 [1] ✔
T4	70 - 58	Section 4	12.01	5.96	72.7 K=1.00	3.7667	-55676.00	115119.00	0.484 [1] ✔
T5	58 - 51.6667	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	6.34	6.25	81.3 K=1.00	4.3915	-68593.10	121852.00	0.563 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T6	51.6667 - 45.3333	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	6.34	6.25	81.3 K=1.00	4.3915	-82548.60	121852.00	0.677 [1] ✔
T7	45.3333 - 39	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	6.34	3.20	41.6 K=1.00	4.3915	-95867.90	174169.00	0.550 [1] ✔
T8	39 - 22	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	17.01	4.23	43.4 K=1.00	5.5790	-124530.00	218805.00	0.569 [1] ✔
T9	22 - 0	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4	22.01	5.48	49.6 K=1.00	6.8906	-172293.00	259045.00	0.665 [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 lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	92 - 84.5	L3x3x3/8	9.63	4.63	101.0 K=1.07	2.1100	-4131.23	51602.50	0.080 [1] ✔
T2	84.5 - 77	L3x3x3/8	9.82	4.73	102.5 K=1.06	2.1100	-6355.23	50883.20	0.125 [1] ✔
T3	77 - 70	L3x3x3/8	9.61	4.54	99.6 K=1.07	2.1100	-8853.34	52284.40	0.169 [1] ✔
T4	70 - 58	L3x3x3/8	9.53	4.54	99.6 K=1.07	2.1100	-7734.70	52271.80	0.148 [1] ✔
T5	58 - 51.6667	L3x3x3/8	10.05	4.85	104.4 K=1.05	2.1100	-8387.01	49931.70	0.168 [1] ✔
T6	51.6667 - 45.3333	L3x3x3/8	10.35	5.01	106.8 K=1.04	2.1100	-8506.07	48734.50	0.175 [1] ✔
T7	45.3333 - 39	L3x3x3/8	10.67	5.16	109.2 K=1.03	2.1100	-9363.07	47490.20	0.197 [1] ✔
T8	39 - 22	2L2 1/2x2 1/2x1/4	9.78	9.08	133.4 K=0.94	2.3800	-13745.00	38287.90	0.359 [1] ✔
T9	22 - 0	2L3x3x3/8	12.19	11.36	138.0 K=0.92	4.2200	-18920.70	63436.60	0.298 [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 lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T4	70 - 58	L2 1/2x2 1/2x3/16	7.21	6.58	159.6 K=1.00	0.9020	-2166.31	10136.30	0.214 [1] ✔
T8	39 - 22	2L2 1/2x2 1/2x3/16	9.34	6.56	75.7 K=1.00	1.8000	-6874.93	53130.20	0.129 [1] ✔
T9	22 - 0	2L2 1/2x2 1/2x3/16	10.25	7.19	83.0	1.8000	-8140.38	50759.90	0.160 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
					K=1.00				✔

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T7	45.3333 - 39	L2x2x1/4	8.64	8.13	160.2 K=1.00	0.9380	-1661.26	10455.10	0.159 [1] ✔
T8	39 - 22	L2x2x1/4	9.58	6.70	205.7 K=1.00	0.9380	-2798.68	6342.52	0.441 [1] ✔
T9	22 - 0	KL/R > 200 (C) - 112 L2x2x1/4 KL/R > 200 (C) - 139	10.46	7.31	224.3 K=1.00	0.9380	-4284.19	5336.81	0.803 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	92 - 84.5	L2x2x3/16	6.00	5.54	168.9 K=1.00	0.7150	-310.36	7175.38	0.043 [1] ✔
T2	84.5 - 77	L2 1/2x2 1/2x3/16	6.29	5.84	141.5 K=1.00	0.9020	-1342.11	12895.50	0.104 [1] ✔
T3	77 - 70	L2x2x3/16	6.59	6.07	184.8 K=1.00	0.7150	-2332.57	5989.85	0.389 [1] ✔
T4	70 - 58	L2 1/2x2 1/2x3/16	6.76	6.13	148.6 K=1.00	0.9020	-2048.80	11698.00	0.175 [1] ✔
T5	58 - 51.6667	L2 1/2x2 1/2x3/16	7.67	7.17	173.7 K=1.00	0.9020	-2552.19	8552.01	0.298 [1] ✔
T6	51.6667 - 45.3333	L2 1/2x2 1/2x3/16	8.06	7.56	183.2 K=1.00	0.9020	-2547.27	7694.36	0.331 [1] ✔
T7	45.3333 - 39	L2 1/2x2 1/2x3/16	8.45	7.94	192.6 K=1.00	0.9020	-3384.10	6959.54	0.486 [1] ✔
T8	39 - 22	L2 1/2x2 1/2x3/16	8.84	4.07	109.3 K=1.11	0.9020	-6798.43	20271.30	0.335 [1] ✔
T9	22 - 0	L2 1/2x2 1/2x3/16	9.84	4.53	114.9 K=1.05	0.9020	-7783.44	18981.30	0.410 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	92 - 84.5	V3x3x1/4	7.50	7.42	97.5	1.4375	3057.45	64687.50	0.047 [1] ✔
T2	84.5 - 77	V3x3x1/4	7.50	7.42	97.5	1.4375	11623.60	64687.50	0.180 [1] ✔
T3	77 - 70	Section 5	7.00	6.92	105.0	2.3295	23659.60	104828.00	0.226 [1] ✔
T4	70 - 58	Section 4	12.01	5.96	72.7	3.7667	47744.60	169502.00	0.282 [1] ✔
T5	58 - 51.6667	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	6.34	6.25	81.3	4.3915	59245.50	197618.00	0.300 [1] ✔
T6	51.6667 - 45.3333	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	6.34	6.25	81.3	4.3915	71645.80	197618.00	0.363 [1] ✔
T7	45.3333 - 39	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	6.34	3.20	41.6	4.3915	83457.70	197618.00	0.422 [1] ✔
T8	39 - 22	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	17.01	4.23	43.4	5.5790	107982.00	251055.00	0.430 [1] ✔
T9	22 - 0	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4	22.01	5.48	49.6	6.8906	149234.00	310077.00	0.481 [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 lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	92 - 84.5	L3x3x3/8	9.63	4.63	62.2	1.4067	3252.41	61192.30	0.053 [1] ✔
T2	84.5 - 77	L3x3x3/8	9.82	4.73	63.5	1.4067	5141.58	61192.30	0.084 [1] ✔
T3	77 - 70	L3x3x3/8	9.61	4.54	61.0	1.4067	7776.76	61192.30	0.127 [1] ✔
T4	70 - 58	L3x3x3/8	9.18	4.37	58.8	1.4067	7021.47	61192.30	0.115 [1] ✔
T5	58 - 51.6667	L3x3x3/8	10.05	4.85	65.1	1.4067	7551.19	61192.30	0.123 [1] ✔
T6	51.6667 - 45.3333	L3x3x3/8	10.35	5.01	67.2	1.4067	7623.93	61192.30	0.125 [1] ✔
T7	45.3333 - 39	L3x3x3/8	10.67	5.16	69.2	1.4067	8215.79	61192.30	0.134 [1] ✔
T8	39 - 22	2L2 1/2x2 1/2x1/4	9.66	8.96	145.1	1.5506	13644.10	67452.20	0.202 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T9	22 - 0	2L3x3x3/8	12.19	11.36	153.6	2.8134	18641.20	122385.00	0.152 [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 lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T4	70 - 58	L2 1/2x2 1/2x3/16	7.21	6.58	104.8	0.5886	2668.73	25604.50	0.104 [1]
T8	39 - 22	2L2 1/2x2 1/2x3/16	9.34	6.56	77.6	1.1742	6866.55	51078.50	0.134 [1]
T9	22 - 0	2L2 1/2x2 1/2x3/16	10.25	7.19	84.9	1.1742	8219.47	51078.50	0.161 [1]

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T7	45.3333 - 39	L2x2x1/4	8.64	8.13	164.4	0.5863	1661.26	25504.60	0.065 [1]
T8	39 - 22	L2x2x1/4	9.58	6.70	181.6	0.5863	2798.68	25504.60	0.110 [1]
T9	22 - 0	L2x2x1/4	10.46	7.31	197.5	0.5863	4284.19	25504.60	0.168 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	92 - 84.5	L2x2x3/16	6.00	5.54	111.9	0.4484	766.35	19503.60	0.039 [1]
T2	84.5 - 77	L2 1/2x2 1/2x3/16	6.29	5.84	93.2	0.5886	2462.57	25604.50	0.096 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T3	77 - 70	L2x2x3/16	6.59	6.07	122.1	0.4484	3370.94	19503.60	0.173 [1] ✔
T4	70 - 58	L2 1/2x2 1/2x3/16	6.76	6.13	97.7	0.5886	2647.47	25604.50	0.103 [1] ✔
T5	58 - 51.6667	L2 1/2x2 1/2x3/16	7.67	7.17	113.8	0.5886	3053.94	25604.50	0.119 [1] ✔
T6	51.6667 - 45.3333	L2 1/2x2 1/2x3/16	8.06	7.56	119.8	0.5886	2984.40	25604.50	0.117 [1] ✔
T7	45.3333 - 39	L2 1/2x2 1/2x3/16	8.45	7.94	125.8	0.5886	3827.65	25604.50	0.149 [1] ✔
T8	39 - 22	L2 1/2x2 1/2x3/16	8.84	4.07	98.0	0.5886	7714.07	25604.50	0.301 [1] ✔
T9	22 - 0	L2 1/2x2 1/2x3/16	9.84	4.53	108.7	0.5886	7912.86	25604.50	0.309 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T1	92 - 84.5	Leg	V3x3x1/4	1	-5006.57	25057.10	20.0	Pass
		Leg	V3x3x1/4	2	-5325.73	25057.10	21.3	Pass
		Leg	V3x3x1/4	3	-5326.32	25057.10	21.3	Pass
T2	84.5 - 77	Leg	V3x3x1/4	13	-14049.20	25057.10	56.1	Pass
		Leg	V3x3x1/4	14	-15012.50	25057.10	59.9	Pass
		Leg	V3x3x1/4	15	-14405.80	25057.10	57.5	Pass
T3	77 - 70	Leg	Section 5	25	-27298.10	46823.30	58.3	Pass
		Leg	Section 5	26	-28859.70	46823.30	61.6	Pass
		Leg	Section 5	27	-27809.40	46823.30	59.4	Pass
T4	70 - 58	Leg	Section 4	37	-54216.20	115119.00	47.1	Pass
		Leg	Section 4	38	-55676.00	115119.00	48.4	Pass
		Leg	Section 4	39	-54766.20	115119.00	47.6	Pass
T5	58 - 51.6667	Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	58	-67195.20	121852.00	55.1	Pass
		Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	59	-68593.10	121852.00	56.3	Pass
		Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	60	-67722.80	121852.00	55.6	Pass
T6	51.6667 - 45.3333	Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	70	-81225.60	121852.00	66.7	Pass
		Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	71	-82548.60	121852.00	67.7	Pass
		Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	72	-81734.70	121852.00	67.1	Pass
T7	45.3333 - 39	Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	82	-94621.50	174169.00	54.3	Pass
		Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	83	-95867.90	174169.00	55.0	Pass
		Leg	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	84	-95110.80	174169.00	54.6	Pass
T8	39 - 22	Leg	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	97	-123383.00	218805.00	56.4 62.9 (b)	Pass
		Leg	Oxford V5x5x5/16 w/ (2)	98	-124530.00	218805.00	56.9	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
			3x2-1/2x1/4				63.7 (b)	
		Leg	Oxford V5x5x5/16 w/ (2)	99	-123858.00	218805.00	56.6	Pass
			3x2-1/2x1/4				63.2 (b)	
T9	22 - 0	Leg	Oxford V6x6x3/8 w/ (2)	124	-171278.00	259045.00	66.1	Pass
			3x2-1/2x1/4					
		Leg	Oxford V6x6x3/8 w/ (2)	125	-172293.00	259045.00	66.5	Pass
			3x2-1/2x1/4					
		Leg	Oxford V6x6x3/8 w/ (2)	126	-171724.00	259045.00	66.3	Pass
			3x2-1/2x1/4					
T1	92 - 84.5	Diagonal	L3x3x3/8	7	-4068.05	51602.50	7.9	Pass
							46.0 (b)	
		Diagonal	L3x3x3/8	8	-3793.22	51602.50	7.4	Pass
							42.9 (b)	
		Diagonal	L3x3x3/8	9	-3897.09	51602.50	7.6	Pass
							44.1 (b)	
		Diagonal	L3x3x3/8	10	-4131.23	51602.50	8.0	Pass
							46.8 (b)	
		Diagonal	L3x3x3/8	11	-3522.13	51602.50	6.8	Pass
							39.9 (b)	
		Diagonal	L3x3x3/8	12	-3577.20	51602.50	6.9	Pass
							40.5 (b)	
T2	84.5 - 77	Diagonal	L3x3x3/8	19	-6015.33	50883.20	11.8	Pass
							68.1 (b)	
		Diagonal	L3x3x3/8	20	-5236.20	50883.20	10.3	Pass
							59.3 (b)	
		Diagonal	L3x3x3/8	21	-5865.65	50883.20	11.5	Pass
							66.4 (b)	
		Diagonal	L3x3x3/8	22	-6355.23	50883.20	12.5	Pass
							71.9 (b)	
		Diagonal	L3x3x3/8	23	-4714.71	50883.20	9.3	Pass
							53.4 (b)	
		Diagonal	L3x3x3/8	24	-5004.26	50883.20	9.8	Pass
							56.6 (b)	
T3	77 - 70	Diagonal	L3x3x3/8	31	-8083.07	52284.40	15.5	Pass
							73.2 (b)	
		Diagonal	L3x3x3/8	32	-6415.83	52284.40	12.3	Pass
							58.1 (b)	
		Diagonal	L3x3x3/8	33	-7726.01	52284.40	14.8	Pass
							70.0 (b)	
		Diagonal	L3x3x3/8	34	-8853.34	52284.40	16.9	Pass
							80.2 (b)	
		Diagonal	L3x3x3/8	35	-4781.79	52284.40	9.1	Pass
							43.3 (b)	
		Diagonal	L3x3x3/8	36	-5517.13	52284.40	10.6	Pass
							50.0 (b)	
T4	70 - 58	Diagonal	L3x3x3/8	43	-7040.81	52271.80	13.5	Pass
							79.7 (b)	
		Diagonal	L3x3x3/8	44	-5702.80	52271.80	10.9	Pass
							64.5 (b)	
		Diagonal	L3x3x3/8	45	-6914.71	52271.80	13.2	Pass
							78.3 (b)	
		Diagonal	L3x3x3/8	46	-7734.70	52271.80	14.8	Pass
							87.5 (b)	
		Diagonal	L3x3x3/8	47	-4124.49	52271.80	7.9	Pass
							46.7 (b)	
		Diagonal	L3x3x3/8	48	-4825.80	52271.80	9.2	Pass
							54.6 (b)	
		Diagonal	L3x3x3/8	52	-6942.42	53507.10	13.0	Pass
							78.6 (b)	
		Diagonal	L3x3x3/8	53	-5651.02	53507.10	10.6	Pass
							64.0 (b)	

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
		Diagonal	L3x3x3/8	54	-7081.28	53507.10	13.2 80.1 (b)	Pass
		Diagonal	L3x3x3/8	55	-7761.40	53507.10	14.5 87.8 (b)	Pass
		Diagonal	L3x3x3/8	56	-3610.95	53507.10	6.7 40.9 (b)	Pass
		Diagonal	L3x3x3/8	57	-4439.20	53507.10	8.3 50.2 (b)	Pass
T5	58 - 51.6667	Diagonal	L3x3x3/8	64	-7687.95	49931.70	15.4 87.0 (b)	Pass
		Diagonal	L3x3x3/8	65	-6383.43	49931.70	12.8 72.2 (b)	Pass
		Diagonal	L3x3x3/8	66	-7602.95	49931.70	15.2 86.0 (b)	Pass
		Diagonal	L3x3x3/8	67	-8387.01	49931.70	16.8 94.9 (b)	Pass
		Diagonal	L3x3x3/8	68	-4923.54	49931.70	9.9 55.7 (b)	Pass
		Diagonal	L3x3x3/8	69	-5629.29	49931.70	11.3 63.7 (b)	Pass
T6	51.6667 - 45.3333	Diagonal	L3x3x3/8	76	-7878.06	48734.50	16.2 71.3 (b)	Pass
		Diagonal	L3x3x3/8	77	-6646.75	48734.50	13.6 60.2 (b)	Pass
		Diagonal	L3x3x3/8	78	-7743.50	48734.50	15.9 70.1 (b)	Pass
		Diagonal	L3x3x3/8	79	-8506.07	48734.50	17.5 77.0 (b)	Pass
		Diagonal	L3x3x3/8	80	-5292.64	48734.50	10.9 47.9 (b)	Pass
		Diagonal	L3x3x3/8	81	-5928.13	48734.50	12.2 53.7 (b)	Pass
T7	45.3333 - 39	Diagonal	L3x3x3/8	88	-8764.48	47490.20	18.5 79.4 (b)	Pass
		Diagonal	L3x3x3/8	89	-7214.00	47490.20	15.2 65.3 (b)	Pass
		Diagonal	L3x3x3/8	90	-8415.33	47490.20	17.7 76.2 (b)	Pass
		Diagonal	L3x3x3/8	91	-9363.07	47490.20	19.7 84.8 (b)	Pass
		Diagonal	L3x3x3/8	92	-6273.01	47490.20	13.2 56.8 (b)	Pass
		Diagonal	L3x3x3/8	93	-6875.74	47490.20	14.5 62.3 (b)	Pass
T8	39 - 22	Diagonal	2L2 1/2x2 1/2x1/4	104	-12609.00	38287.90	32.9 35.7 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	105	-12287.80	38287.90	32.1 35.7 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	107	-13718.20	38287.90	35.8 39.0 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	108	-13745.00	38287.90	35.9 39.0 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	110	-9548.21	38287.90	24.9 27.0 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	111	-9566.77	38287.90	25.0 27.1 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	115	-12549.20	38972.50	32.2 35.5 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	116	-12156.80	38972.50	31.2 35.6 (b)	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	117	-13744.40	38972.50	35.3	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
		Diagonal	2L2 1/2x2 1/2x1/4	118	-13774.20	38972.50	39.2 (b) 35.3	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	119	-9183.67	38972.50	39.1 (b) 23.6	Pass
		Diagonal	2L2 1/2x2 1/2x1/4	120	-9203.27	38972.50	26.1 (b) 23.6	Pass
T9	22 - 0	Diagonal	2L3x3x3/8	131	-17564.80	63436.60	26.0 (b) 27.7	Pass
		Diagonal	2L3x3x3/8	132	-17536.30	63436.60	49.7 (b) 27.6	Pass
		Diagonal	2L3x3x3/8	134	-18904.50	63436.60	49.6 (b) 29.8	Pass
		Diagonal	2L3x3x3/8	135	-18920.70	63436.60	53.5 (b) 29.8	Pass
		Diagonal	2L3x3x3/8	137	-14668.20	63436.60	53.5 (b) 23.1	Pass
		Diagonal	2L3x3x3/8	138	-14680.60	63436.60	41.5 (b) 23.1	Pass
		Diagonal	2L3x3x3/8	142	-17247.10	64106.20	41.5 (b) 26.9	Pass
		Diagonal	2L3x3x3/8	143	-17155.60	64106.20	48.8 (b) 26.8	Pass
		Diagonal	2L3x3x3/8	144	-18707.80	64106.20	48.5 (b) 29.2	Pass
		Diagonal	2L3x3x3/8	145	-18726.60	64106.20	52.9 (b) 29.2	Pass
		Diagonal	2L3x3x3/8	146	-14078.30	64106.20	53.0 (b) 22.0	Pass
		Diagonal	2L3x3x3/8	147	-14092.00	64106.20	39.8 (b) 22.0	Pass
T4	70 - 58	Horizontal	L2 1/2x2 1/2x3/16	49	-2127.01	10136.30	39.9 (b) 21.0	Pass
		Horizontal	L2 1/2x2 1/2x3/16	50	-2105.88	10136.30	42.6 (b) 20.8	Pass
		Horizontal	L2 1/2x2 1/2x3/16	51	-2166.31	10136.30	43.1 (b) 21.4	Pass
T8	39 - 22	Horizontal	2L2 1/2x2 1/2x3/16	103	-6466.13	53130.20	41.8 (b) 12.2	Pass
		Horizontal	2L2 1/2x2 1/2x3/16	106	6866.55	51078.50	23.6 (b) 13.4	Pass
		Horizontal	2L2 1/2x2 1/2x3/16	109	4767.32	51078.50	26.3 (b) 9.3	Pass
T9	22 - 0	Horizontal	2L2 1/2x2 1/2x3/16	130	-7774.07	50759.90	18.3 (b) 15.3	Pass
		Horizontal	2L2 1/2x2 1/2x3/16	133	8219.47	51078.50	29.2 (b) 16.1	Pass
		Horizontal	2L2 1/2x2 1/2x3/16	136	6364.62	51078.50	31.5 (b) 12.5	Pass
T7	45.3333 - 39	Secondary Horizontal	L2x2x1/4	94	-1661.26	10455.10	24.4 (b) 15.9	Pass
		Secondary Horizontal	L2x2x1/4	95	-1661.26	10455.10	20.1 (b) 15.9	Pass
		Secondary Horizontal	L2x2x1/4	96	-1648.14	10455.10	20.1 (b) 15.8	Pass
T8	39 - 22	Secondary Horizontal	L2x2x1/4	112	-2798.68	6342.52	19.9 (b) 44.1	Pass
		Secondary Horizontal	L2x2x1/4	113	-2798.68	6342.52	44.1	Pass
		Secondary Horizontal	L2x2x1/4	114	-2783.57	6342.52	43.9	Pass
		Secondary Horizontal	L2x2x1/4	121	-2798.68	7112.29	39.3	Pass
		Secondary Horizontal	L2x2x1/4	122	-2798.68	7112.29	39.3	Pass
		Secondary Horizontal	L2x2x1/4	123	-2783.57	7112.29	39.1	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T9	22 - 0	Secondary Horizontal	L2x2x1/4	139	-4284.19	5336.81	80.3	Pass
		Secondary Horizontal	L2x2x1/4	140	-4284.19	5336.81	80.3	Pass
		Secondary Horizontal	L2x2x1/4	141	-4270.05	5336.81	80.0	Pass
		Secondary Horizontal	L2x2x1/4	148	-4284.19	5822.29	73.6	Pass
		Secondary Horizontal	L2x2x1/4	149	-4284.19	5822.29	73.6	Pass
		Secondary Horizontal	L2x2x1/4	150	-4270.05	5822.29	73.3	Pass
T1	92 - 84.5	Top Girt	L2x2x3/16	4	-310.36	7175.38	4.3 12.3 (b)	Pass
		Top Girt	L2x2x3/16	5	-305.68	7175.38	4.3 12.4 (b)	Pass
		Top Girt	L2x2x3/16	6	-305.54	7175.38	4.3 12.4 (b)	Pass
T2	84.5 - 77	Top Girt	L2 1/2x2 1/2x3/16	16	-1329.09	12895.50	10.3 39.0 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	17	-1295.21	12895.50	10.0 39.7 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	18	-1342.11	12895.50	10.4 38.7 (b)	Pass
T3	77 - 70	Top Girt	L2x2x3/16	28	-2272.27	5989.85	37.9 53.3 (b)	Pass
		Top Girt	L2x2x3/16	29	-2220.05	5989.85	37.1 54.4 (b)	Pass
		Top Girt	L2x2x3/16	30	-2332.57	5989.85	38.9 52.0 (b)	Pass
T4	70 - 58	Top Girt	L2 1/2x2 1/2x3/16	40	-1992.30	11698.00	17.0 42.1 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	41	-1963.16	11698.00	16.8 42.7 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	42	-2048.80	11698.00	17.5 40.9 (b)	Pass
T5	58 - 51.6667	Top Girt	L2 1/2x2 1/2x3/16	61	-2517.72	8552.01	29.4 48.8 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	62	-2497.76	8552.01	29.2 49.3 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	63	-2552.19	8552.01	29.8 48.1 (b)	Pass
T6	51.6667 - 45.3333	Top Girt	L2 1/2x2 1/2x3/16	73	-2521.50	7694.36	32.8 47.8 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	74	-2505.60	7694.36	32.6 48.1 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	75	-2547.27	7694.36	33.1 47.2 (b)	Pass
T7	45.3333 - 39	Top Girt	L2 1/2x2 1/2x3/16	85	-3358.20	6959.54	48.3 61.4 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	86	-3342.06	6959.54	48.0 61.7 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	87	-3384.10	6959.54	48.6 60.8 (b)	Pass
T8	39 - 22	Top Girt	L2 1/2x2 1/2x3/16	100	-6362.80	20271.30	31.4 55.7 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	101	-6798.43	20271.30	33.5 59.1 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	102	-4713.77	20271.30	23.3 42.7 (b)	Pass
T9	22 - 0	Top Girt	L2 1/2x2 1/2x3/16	127	-7132.06	18981.30	37.6 56.2 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	128	-7783.44	18981.30	41.0 60.6 (b)	Pass
		Top Girt	L2 1/2x2 1/2x3/16	129	-5822.89	18981.30	30.7 45.6 (b)	Pass
							Summary	

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
						Leg (T6)	67.7	Pass
						Diagonal (T5)	94.9	Pass
						Horizontal (T4)	43.1	Pass
						Secondary Horizontal (T9)	80.3	Pass
						Top Girt (T7)	61.7	Pass
						Bolt Checks	94.9	Pass
						RATING =	**94.9**	**Pass**

ANCHOR BOLT ANALYSIS

ANCHOR BOLT ANALYSIS

Input Data

Tower Reactions:

Uplift:	Uplift := 174.166kips	*user input*
Shear:	Shear := 16.340kips	*user input*
Compression:	Compression := 200.893kips	*user input*

Anchor Bolt Data:

Use ASTM A36 (actual material strength unknown therefore assume min design values)

Number of Anchor Bolts = N	N := 5	*user input*	NOTE: The existing (4) bolts have a previous site modification of (8) additional anchor bolts (project 60628135 (VZ6-002)). For this analysis one (1) additional bolt is considered (conservative consideration).
Bolt Ultimate Strength:	$F_u := 58 \cdot ksi$	*user input*	
Bolt Yield Strength:	Fy := 36·ksi	*user input*	
Bolt Modulus:	E := 29000ksi	*user input*	
Thickness of Anchor Bolts	D := 1.375in	*user input*	
Threads per Inch:	n := 6	*user input*	
Coefficient of Friction:	μ := 0.55	*user input*	(for baseplate with grout ASCE 10-15)
Length from top of pier to bottom of leveling nut:	$L_{ar} := 0in$	*user input*	
Bolt Modulus:	E := 29000ksi	*user input*	

Anchor Bolt Section Properties:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 1.48\cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 1.15\cdot in^2$$

Net Diameter:

$$D_n := D - \frac{0.9743 in}{n} \qquad D_n = 1.21\cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.3\cdot in$$

Plastic Section Modulus of Bolt:

$$Z_x := \frac{D_n^3}{6} \qquad Z_x = 0.3\cdot in^3$$

Forces:

Tension Force:

$$T_u := \frac{Uplift}{N}$$

$$T_u = 34.83\cdot kip$$

$$T_{ub} := T_u$$

Compression Force:

$$P_{uc} := \frac{Compression}{N}$$

$$P_{uc} = 40.18\cdot kip \qquad P_{ucb} := P_{uc}$$

Shear Force:

$$V_u := \frac{Shear}{N} \qquad V_u = 3.27\cdot kip \qquad V_{ub} := V_u$$

Resistance Factor for Flexure (ANSI/TIA-222-G 4.7):

$$\phi_f := 0.9$$

Resistance Factor for Anchor Bolt (Compression) (TIA-222-H 4.9.9 Addendum 1):

$$\phi_c := 0.9$$

Resistance Factor for Tension (ANSI/TIA-222-G 4.9.6.1):

$$\phi_t := 0.75$$

Resistance Factor for Shear (ANSI/TIA-222-G 4.9.6.3):

$$\phi_v := 0.75$$

TIA-222-H 4.9.9 Calculate Equation Variables Strength Design:

Design Tensile Strength, Rnt:

$R_{nt} := F_u \cdot A_n$

$R_{nt} = 66.98 \cdot ft \cdot kip$

$\phi_t \cdot R_{nt} = 50.24 \cdot ft \cdot kip$

Design Compression Strength, Rnc:

$R_{nc} := Fy \cdot A_g$

$R_{nc} = 53.46 \cdot ft \cdot kip$

$\phi_c \cdot R_{nc} = 48.11 \cdot ft \cdot kip$

Design Shear Strength (Tension), Rnv:

$R_{nv} := 0.5 \cdot F_u \cdot A_g$

$R_{nv} = 43.06 \cdot ft \cdot kip$

$\phi_v \cdot R_{nv} = 32.3 \cdot ft \cdot kip$

Design Shear Strength (Compression), Rnvc:

$R_{nvc} := 0.6 \cdot Fy \cdot 0.75 A_g$

$R_{nvc} = 24.06 \cdot ft \cdot kip$

$\phi_c \cdot R_{nvc} = 21.65 \cdot ft \cdot kip$

NOTE: Per TIA-222-H The determination of capacity formulas are based on the exising constructed condition of exposed anchor rod from the top of the foundation to the bottom of the (base) leveling nut., Therefore the following equations next page), reflects for this tower site, the first formula shall be applied:

lar = 3" - 1.75" (nut height) = 1.25" < 1.75" Bolt Diameter

TIA-222-H 4.9.9 Combined Shear and Tension:

$$\left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 + \left[\frac{V_{ub}}{(\phi_v \cdot R_{nv})}\right]^2 \le 1$$

$$\left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 + \left(\frac{V_{ub}}{\phi_v \cdot R_{nv}}\right)^2 = 0.49$$

TIA-222-H 4.9.9 Combined Shear and Compression:

$$\left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2 \le 1$$

$$\left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2 = 0.86$$

NOTE: Larger ratio number shown above Governs design Capacity.

Combined Shear and Tension/Compression Check:

$$\text{ShearAndTensionCheck} := \text{if}\left[\max\left[\left[\frac{V_{ub}}{(\phi_v \cdot R_{nv})}\right]^2 + \left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2, \left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2\right] \le 1, \text{"OK"}, \text{"NO GOOD"}\right]$$

ShearAndTensionCheck = "OK"

FOUNDATION ANALYSIS

PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower	$M_t := 1785\,kip\cdot ft$
Shear at Base of Tower	$S_t := 16.339\,kip$
Max Compressive Force	$C_t := 200.893\,kip$
Max Uplift	$U_t := 174.078\,kip$
Height of Tower	$H_t := 92\cdot ft$
Width of Tower at Base	$W_t := 10.7\cdot ft$
Weight of Tower	$WT_t := 1.0\cdot kip$

NOTE: Weight of Tower is incorporated into the other loads listed above and is therefore set equal to one for programming.

FOOTING DIMENSIONS:

Width of Footing	$W_f := 19\cdot ft$
Overall Depth of Footing	$D_f := 6.5ft$
Length of Pier	$L_p := 4.5\cdot ft$
Extension of Pier Above Grade	$L_{pag} := 0.75\cdot ft$
Diameter of Pier	$d_p := 3.0\cdot ft$
Thickness of Footing	$T_f := 2.0\cdot ft$
Reinforement Cover:	$Cvr := 3in$

MATERIAL PROPERTIES:

Compressive Strength of Concrete	$f'c := 3000\,psi$	Unit Weight of Soil	$\gamma_s := 125\,pcf$
Yield Strength of Steel Reinforcement	$fy := 60000\,psi$	Unit Weight of Concrete	$\gamma_c := 150\,pcf$
Internal Friction Angle of Soil	$\phi_s := 34.0\,deg$	Depth to Neglect	$n := 0.5\,ft$
Allowable Bearing Capacity	$q_s := 6000\,psf$	Cohesion of Clay Type Soil	$c := 0\,ksf$
Ultimate Bearing Capacity	$R_s := 2\cdot q_s$	Note: Use 0 for Sandy Soil	

Coefficient of Lateral Soil Pressure $K_p := \frac{1+\sin(\phi_s)}{1-\sin(\phi_s)}$ $K_p = 3.5371$

What is Position of Center of Tower with respect to Center of Pad? 1=Offset, 2=Not Offset $Pos_{tower} := 2$

STEEL REINFORCING:

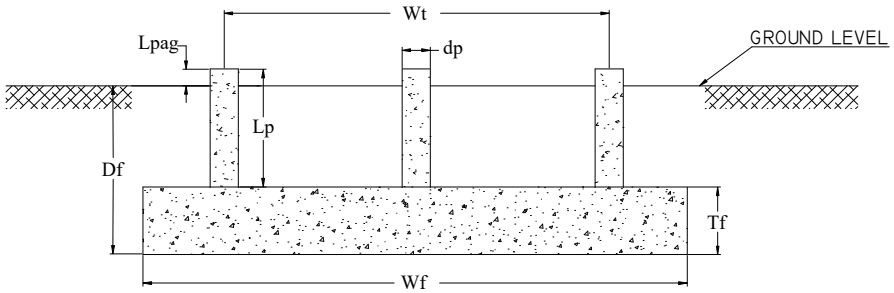
PIER REINFORCEMENT:

Bar Size	$BSpier := 8$	Bar Diameter	$d_{bpier} := 1.000\,in$
Number of Bars	$NBpier := 8$	Bar Area	$A_{bpier} := 0.790\,in^2$

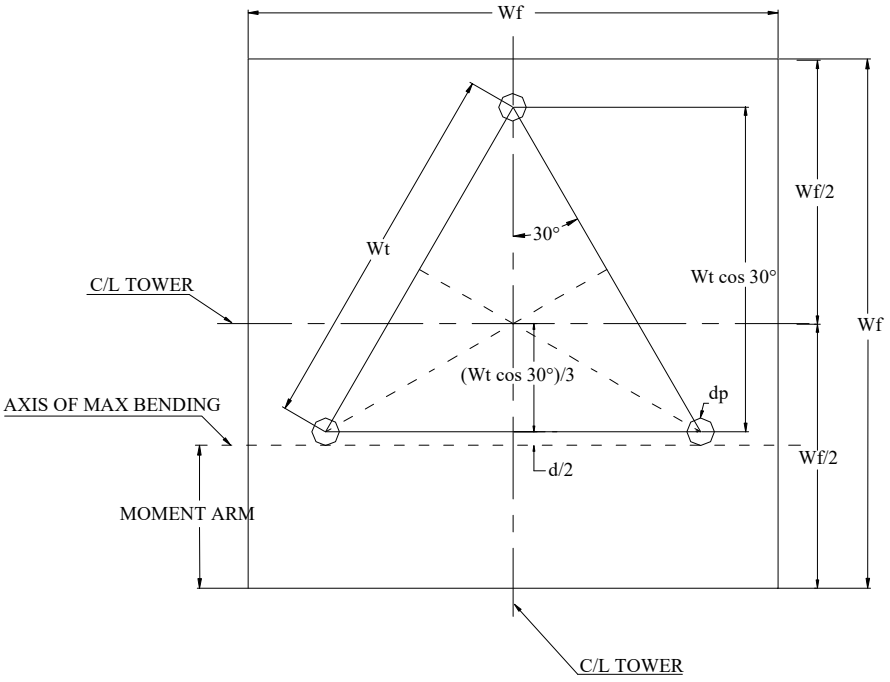
PAD REINFORCEMENT:

Bar Size	$BS_{pad} := 6$	Bar Diameter	$d_{bpad} := 0.75\cdot in$
Number of Bars	$NB_{pad} := 22$	Bar Area	$A_{bpad} := 0.44\cdot in^2$

FOUNDATION OVERVIEW



ELEVATION



PLAN

STABILITY OF FOOTING

NOTE: Recduction factor is implemented as 0.75 for pull-out/uplift of foundation.
Reduction factor shall be applied to Overturning Moment in this case

Passive Pressure:

$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pn} = 0.2211 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pt} = 1.9896 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}]$ $\quad P_{top} = 1.9896 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{bot} = 2.8739 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $\quad P_{ave} = 2.4318 \cdot ksf$

Shear:

$T_{pp} := if[n < (D_f - T_f), T_f, (D_f - n)]$ $\quad T_{pp} = 2 \cdot ft$

$A_{pp} := W_f \cdot T_{pp}$ $\quad A_{pp} = 38 \cdot ft^2$

Ultimate Shear:

$S_u := P_{ave} \cdot A_{pp}$ $\quad S_u = 92.4076 \cdot kip$

Weight of Concrete Pad:

$WT_c := (W_f^2 \cdot T_f) \cdot \gamma_c$ $\quad WT_c = 108.3 \cdot kip$

Weight of Soil: above Footing:

$WT_{s1} := W_f^2 (|D_f - T_f|) \cdot \gamma_s$ $\quad WT_{s1} = 203.0625 \cdot kip$

Weight of Soil Wedge at back face:

$WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f \right] \cdot \gamma_s$ $\quad WT_{s2} = 28.8352 \cdot kip$

Distance to center of Tower Leg from Edge of Footing:

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

$X_t := if(Pos_{tower} = 1, X_{t1}, X_{t2})$ $\quad X_t = 6.4112 \cdot ft$

Additional Offset of Footing:

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

$X_{off} := if(Pos_{tower} = 1, X_{off1}, X_{off2})$ $\quad X_{off} = 0 \cdot ft$

Resisting Moment:

$M_r := 0.9(WT_c + WT_{s1}) \cdot \frac{W_f}{2} + 0.9 WT_t \cdot \left(\frac{W_f}{2} - X_{off} \right) + 0.9 S_u \cdot \frac{T_{pp}}{3} + 0.9 WT_{s2} \cdot \left(W_f + \frac{T_{pp} \cdot \tan(\phi_s)}{3} \right)$

$\phi_{OT} := 0.75$ ***ANSI/TIA-222-H REDUCTION FACTOR*** $\quad M_r = 3230.8963 \cdot kip \cdot ft$

Overturning Moment:

$M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off}$ $\quad M_{ot} = 1891.2035 \cdot kip \cdot ft$

Overturn Ratio (%):

$Ratio_{Stability} := \frac{M_{ot}}{M_r \cdot \phi_{OT}}$ $\quad Ratio_{Stability} = 78.05 \cdot \%$

$StabilityCheck := if(M_r \cdot \phi_{OT} > M_{ot}, "Okay", "No Good")$ $\quad StabilityCheck = "Okay"$

BEARING PRESSURE CHECK:

Pressure Applied:

$LOAD_{tot} := 0.9WT_c + 0.9WT_{s1} + 0.9WT_t$ $\quad LOAD_{tot} = 281.1263 \cdot kip$

$A_{mat} := W_f^{\,2}$ $\quad A_{mat} = 361 \cdot ft^2$

$S := \frac{W_f^{\,3}}{6}$ $\quad S = 1143.1667 \cdot ft^3$

$P_{max} := \frac{LOAD_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$ $\quad P_{max} = 2.4331 \cdot ksf$

$P_{min} := \frac{LOAD_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$ $\quad P_{min} = -0.8756 \cdot ksf$

$MaxPressure := if\left(P_{max} < 0.75R_s, "Okay", "No\ Good"\right)$ $\quad MaxPressure = "Okay"$

$MinPressure := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < 0.75 \cdot R_s\right), "Okay", "No\ Good"\right]$ $\quad MinPressure = "No\ Good"$

Distance to Resultant of Pressure Distribution:

$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3}$ $\quad X_p = 4.6573 \cdot ft$

Distance to Kern:

$X_k := \frac{W_f}{3}$ $\quad X_k = 6.3333 \cdot ft$

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

Eccentricity:

$e := \frac{M_{ot}}{LOAD_{tot}}$ $\quad e = 6.7272$

Adjusted Soil Pressure:

$q_a := \frac{2 \cdot LOAD_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$ $\quad q_a = 3.5575 \cdot ksf$

Revised Maximum:

$q_{max} := if\left(X_p < X_k, q_a, P_{max}\right)$ $\quad q_{max} = 3.5575 \cdot ksf$

$PressureCheck := if\left(q_{max} < 0.75 \cdot R_s, "Okay", "No\ Good"\right)$ $\quad PressureCheck = "Okay"$

CHECK PUNCHING AND BEAM SHEAR:

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

$\phi_c := 0.85$ (ACI 9.3.2.3)

$d := T_f - Cvr - .5\cdot in$ $\quad d = 20.5\cdot in$

Factored load: $FL := \frac{C_t}{W_f^2}$ $\quad FL = 0.5565\cdot ksf$

$V_{req} := \frac{FL\cdot\left(X_t - 0.5\cdot d_p - d\right)\cdot W_f}{\phi_c}$ $\quad V_{req} = 39.8408\cdot kip$

ACI 11.3.1.1 $V_{Avail} := 2\cdot\sqrt{f'c\cdot psi}\cdot W_f\cdot d$ $\quad V_{Avail} = 512.011\cdot kip$

$BeamShearCheck := if\left(V_{req} < V_{Avail}, "Okay", "No\ Good"\right)$ $\quad BeamShearCheck = "Okay"$

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.12.2.1)

$b_o := \left(d_p + d\right)\cdot\pi$ $\quad b_o = 14.7917\cdot ft$

$V_{req} := FL\cdot\frac{W_f^2 - \left(d_p + d\right)^2\cdot\frac{\pi}{4}}{\phi_c}$ $\quad V_{req} = 224.9458\cdot kip$

$V_{Avail} := 4\cdot\sqrt{f'c\cdot psi}\cdot b_o\cdot d$ $\quad V_{Avail} = 797.2101\cdot kip$

$PunchingShearCheck := if\left(V_{req} < V_{Avail}, "Okay", "No\ Good"\right)$ $\quad PunchingShearCheck = "Okay"$

TENSILE REINFORCEMENT IN PAD:

$\phi_m := 0.90$ per ACI 9.3.2.2

Applied Moments:

$$M_{nT} := \left[U_t \cdot \left(W_t \cdot \sin(60 \cdot deg) - \frac{d_p}{2}\right) + S_t \cdot \left(D_f + L_{pag}\right)\right] - WT_t \cdot X_{off}$$

$$M_{nS} := -1 \cdot \left[\frac{1}{2} \cdot \left(\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot deg) - \frac{d_p}{2}\right)^2 \cdot W_t \cdot \left[\gamma_s \cdot \left(T_{pp} - T_f\right)\right] + WT_{s2} \cdot \left[\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot deg) - \frac{d_p}{2} + \left(D_f - n\right) \cdot \tan\left(\phi_s\right)\right]\right]$$

$$M_{nC} := -1 \cdot \left[\frac{1}{2} \cdot \left(\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot deg) - \frac{d_p}{2}\right)^2 \cdot W_t \cdot \left(\gamma_c \cdot T_f\right)\right]$$

Design Moment: $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m}$ $M_n = 929.5878 \cdot kips \cdot ft$

Required Reinforcement:

ACI 10.2.7.3 $\beta := if\left[f'c \le 4000 \cdot psi, .85, if\left[f'c \ge 8000 \cdot psi, .65, .85 - \left(\dfrac{\frac{f'c}{psi} - 4000}{1000}\right) \cdot .05\right]\right]$ $\beta = 0.85$

Effective Width: $b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p$ $b_{eff} = 147.1977 \cdot in$

$A_s := \dfrac{M_n}{\phi_m \cdot fy \cdot d}$ $A_s = 10.0768 \cdot in^2$

$a := \dfrac{A_s \cdot fy}{\beta \cdot f'c \cdot b_{eff}}$ $a = 1.6108 \cdot in$

$A_s := \dfrac{M_n}{fy \cdot \left(d - \dfrac{a}{2}\right)}$ $A_s = 9.44 \cdot in^2$

$\rho := \dfrac{A_s}{b_{eff} \cdot d}$ $d = 20.5 \cdot in$ $\rho = 0.0031$

Temperature and Shrinkage: (ACI 7.12.2.1b)

$\rho_{sh} := if(fy \geq 60000 \cdot psi, 0.0018, 0.0020)$ $\rho_{sh} = 0.0018$

Area Required: $As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$ $As = 9.44 \cdot in^2$

Area Provided: $As_{prov} := A_{bpad} \cdot NB_{pad}$ $As_{prov} = 9.68 \cdot in^2$

$PadReinforcement := if\left(As_{prov} > As, "Okay", "No Good"\right)$ PadReinforcement = "Okay"

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 12.2.3)

Bar Spacing: $B_{sPad} := \frac{W_f - 2 \cdot Cvr - NB_{pad} \cdot d_{bpad}}{NB_{pad} - 1}$ $B_{sPad} = 9.7857 \cdot in$

Development Length Factors:

Reinforcement Location Factor	$\alpha := 1.0$
Coating Factor	$\beta := 1.0$
Concrete strength Factor	$\lambda := 1.0$
Reinforcement Size Factor	$\gamma := 1.0$

Spacing or Cover Dimension: $c := if\left(Cvr < \frac{B_{sPad}}{2}, Cvr, \frac{B_{sPad}}{2}\right)$ $c = 3 \cdot in$

Transverse Reinforcement Index: As allowed by ACI 12.2.4 $k_{tr} := 0$

Development Length: $L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpad}}} \cdot d_{bpad}$ $L_{dbt} = 15.4047 \cdot in$

$L_{dbmin} := 12 \cdot in$

Minimum Development Length: (ACI 12.2.1) $L_{dbtCheck} := if\left(L_{dbt} \geq L_{dbmin}, "Use\ L.dbt", "Use\ L.dbmin"\right)$ $L_{dbtCheck} = "Use\ L.dbt"$

Available Length in Pad: $L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr$ $L_{Pad} = 46.8 \cdot in$

$LpadTension := if\left(L_{Pad} > L_{dbt}, "Okay", "No Good"\right)$ LpadTension = "Okay"

REINFORCEMENT IN PIER:

(ACI 10.8.4 and 10.9.1)

$A_p := \frac{\pi \cdot d_p^{\,2}}{4}$ $\quad A_p = 1017.876 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p$ $\quad A_{smin} = 5.0894 \cdot in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $\quad A_{sprov} = 6.32 \cdot in^2$

$SteelAreaCheck := if\left(A_{sprov} > A_{smin}, "Okay", "No Good"\right)$ $\quad SteelAreaCheck = "Okay"$

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $\quad B_{sPier} = 13.1372 \cdot in$

Diamter of Reinforcement Cage: $Diam_{cage} := d_p - 2 \cdot Cvr$ $\quad Diam_{cage} = 30 \cdot in$

Maximum Moment in Pier: $M_p := \left(S_t \cdot L_p\right)$ $\quad M_p = 882.306 \cdot kips \cdot in$

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

(defined variables)

$\left(f'_c \;\; f_y \;\; cl \;\; Spiral\right) = (3 \;\; 60 \;\; 4 \;\; 0)$

The required input is column diameter in inches, number of reinforcing bars, bar size number, factored axial load in kips and moment in kip inches:

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := (48 \;\; 11 \;\; 9 \;\; 241 \;\; 1060)$

Clears any previous output:

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := \phi P'_n\left(D, N, n, P_u, M_{xu}\right)^T$

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio:

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = (2877.6017 \;\; 12656.6712 \;\; -15.0626 \;\; 0.0061)$

Column size and reinforcement may be changed to match capacity to the applied load.

$AxialLoadCheck := if\left(\phi P_n \geq P_u, "Okay", "No Good"\right)$ $\quad AxialLoadCheck = "Okay"$

$BendingCheck := if\left(\phi M_{xn} \geq M_{xu}, "Okay", "No Good"\right)$ $\quad BendingCheck = "Okay"$

DEVELOPMENT LENGTH OF PIER REINFORCEMENT:

TENSION (ACI 12.2.3)

Spacing and Cover: $Cvr = 3 \cdot in$ $B_{sPier} = 13.1372 \cdot in$

Factors for development:

Reinforcement Location Factor	$\alpha := 1.0$
Coating Factor	$\beta := 1.0$
Concrete strength Factor	$\lambda := 1.0$
Reinforcement Size Factor	$\gamma := 1.0$

Spacing or Cover Dimension: $c := if\left(Cvr < \frac{B_{sPier}}{2}, Cvr, \frac{B_{sPier}}{2}\right)$ $c = 3 \cdot in$

Transverse Reinforcement: As allowed by ACI 12.2.4 $k_{tr} := 0$

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpier}}} \cdot d_{bpier} \qquad L_{dbt} = 27.3861 \cdot in$$

Minimum Development Length: (ACI 12.2.1) $L_{dbmin} := 12 \cdot in$

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

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot fy}{\sqrt{f'c \cdot psi}} \qquad L_{dbc1} = 21.9089 \cdot in$$

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

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right)$ $L_{dbc} = 21.9089 \cdot in$

Available Length in Pier:

$L_{pier} := L_p - 3 \cdot in$ $\quad L_{pier} = 51 \cdot in$

$L_{piertension} := if\left(L_{pier} > L_{dbt}, "Okay", "No Good"\right)$ $\quad L_{piertension} = "Okay"$

$L_{piercompression} := if\left(L_{pier} > L_{dbc}, "Okay", "No Good"\right)$ $\quad L_{piercompression} = "Okay"$

Available Length in Pad:

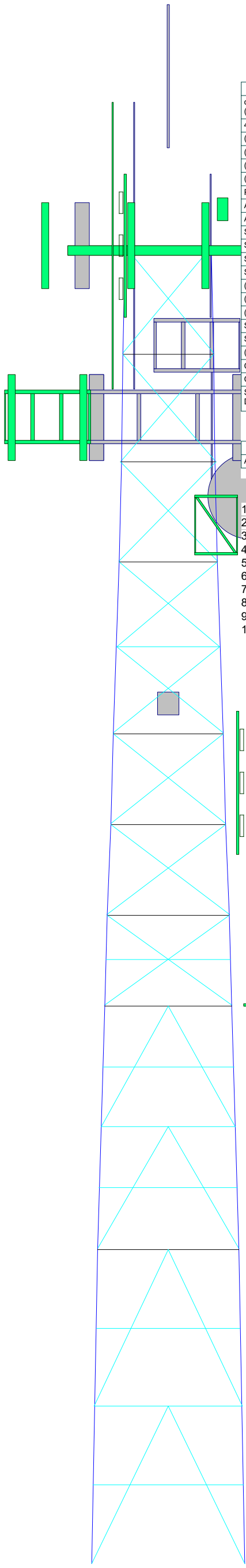
$L_{pad} := T_f - 3 \cdot in$ $\quad L_{pad} = 21 \cdot in$

$L_{padtension} := if\left[L_{pad} > \left(L_{dbt} - L_{pier}\right), "Okay", "No Good"\right]$ $\quad L_{padtension} = "Okay"$

$L_{padcompression} := if\left[L_{pad} > \left(L_{dbc} - L_{pier}\right), "Okay", "No Good"\right]$ $\quad L_{padcompression} = "Okay"$

Section	T1	T2	T3	T4	T5	T6	T7	T8	T9
Legs	V3x3x1/4		Section 5	Section 4	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4		Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4
Leg Grade	A36M-50								
Diagonals	L2x2x3/16	L2 1/2x2 1/2x3/16	L2x2x3/16	L3x3x3/8				2L2 1/2x2 1/2x1/4	2L3x3x3/8
Diagonal Grade	A36								
Top Girts	L2 1/2x2 1/2x3/16								
Horizontals	N.A.	N.A.	N.A.	L2 1/2x2 1/2x3/16	N.A.	N.A.	N.A.	2L2 1/2x2 1/2x3/16	
Sec. Horizontals	N.A.							L3x3x1/4	
Face Width (ft) 10.6667	6	6.29165	6.5833	6.75	7.66667	8.05556	8.44444	8.83333	9.83333
# Panels @ (ft)	2 @ 7.41667		1 @ 6.91667			3 @ 6.25		2 @ 8.45833	2 @ 10.9583
Weight (lb) 12387.1	568.9	591.2	628.4		787.5	804.3	948.3	2441.1	4220.7

92.0 ft
84.5 ft
77.0 ft
70.0 ft
58.0 ft
51.7 ft
45.3 ft
39.0 ft
22.0 ft
0.0 ft



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
dbSpectra DS2C00F36D-D Omni Antenna (Eversource - Proposed)	103.8	2 Bay DiPole (DK-12 / CSP (leg Mt))	92
432E-83I-01T TTA Unit (DNK-8 / NEU-26)	94.5	Raycap DC6-48-60-18-8C Distribution Unit (ATI)	92
(2) TT19-08BP111-001 TMA (ATI)	92	(2) TT19-08BP111-001 TMA (ATI)	92
(2) LPG 21903 Diplexer (ATI)	92	T-Boom/Gate Mount (DNK-5,6,7,9,10)	85
(2) LPG 21903 Diplexer (ATI)	92	T-Boom/Gate Mount (Troop A P25)	80
(2) LPG 21903 Diplexer (ATI)	92	SE414-SWBP4LDF (D00) Panel (Troop A TX)	80
Pirod Rotable Top Platform 122379 (ATI)	92	432E-83I-01T TTA Unit (Troop A P25 TTA)	80
AM-X-CD-16-65-00T-RET (6') (ATI)	92	SE414-SWBP4LDF (D00) Panel (Troop RX)	80
AM-X-CD-16-65-00T-RET (6') (ATI)	92	SC479-HF1LDF ((Inverted) DNK-5 / CSP-20)	80
SBNH-1D6565C (ATI)	92	SC479-HF1LDF ((Inverted) DNK-6 / CSP-21)	80
SBNH-1D6565C (ATI)	92	Kreco CO-36A Omni Antenna (DNK-15 (Re-located))	79.5
SBNH-1D6565C (ATI)	92	10'6"x4" Pipe Mount (DNK-4 / CSP-1)	74.5
SBNH-1D6565C (ATI)	92	PA6-65AC (DNK-4 / CSP - 1)	74.5
(2) RRU (ATI)	92	SitePro1 PSA6 w/ Support Arm (DNK-15 (Re-located))	72.5
(2) RRU (ATI)	92		
(2) RRU (ATI)	92	6'x6" Dipole Antenna (DNK-3 / CSP-9)	71.5
SC479-HF1LDF (DNK-9 / CSP-18)	92	432E-83I-01T TTA Unit (DNK-7 / CSP-22)	60
SC479-HF1LDF (DNK-10 / CSP-19)	92	DB222-A (DNK-2 / DEP-6)	54.5
(2) TT19-08BP111-001 TMA (ATI)	92	1' Side Mount Standoff (1) (DNK-2 / DEP-6)	54.5
OGT9-840 (DNK-13 / CSP-2)	92	SY203(C) - YAGI Antenna (DNK-1 / DEP-7)	39
OGT9-840 (DNK-14 / CSP-3)	92	1' Side Mount Standoff (1) (DNK-1 / DEP-7)	39
SE414-SWBP4LDF (D00) Panel (Troops RX Diversity)	92		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36M-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 90 mph wind.
5. See reinforcement drawings for reinforced leg sizes
6. Section 1 (T9) is composed of (1) V6x6x3/8 w/ (2) L3x2 1/2x1/4
7. Section 2 (T8) is composed of (1) L5x5x5/16 w/ (2) L3x2 1/2x1/4
8. Section 3 (T7,6,5) is composed of (1) L3 1/2x 3 1/2x5/16 w/ (2) L2 1/2x2 1/2x1/4
9. Section 4 is composed of (1) L3x3x1/4 w/ (2) L2 1/2x 2 1/2x1/4
10. Section 5 Is composed of (1) L3x3x1/4 w/ (1) L2x2x1/4 (internally welded inside of the 3x3 member).

MAX. CORNER REACTIONS AT BASE:
DOWN: 226785 lb
SHEAR: 19191 lb

UPLIFT: -199073 lb
SHEAR: 17687 lb

AXIAL
27161 lb

SHEAR
36159 lb

MOMENT
2011 kip-ft

TORQUE 16 kip-ft
90 mph WIND - 0.5000 in ICE

AXIAL
17533 lb

SHEAR
26646 lb

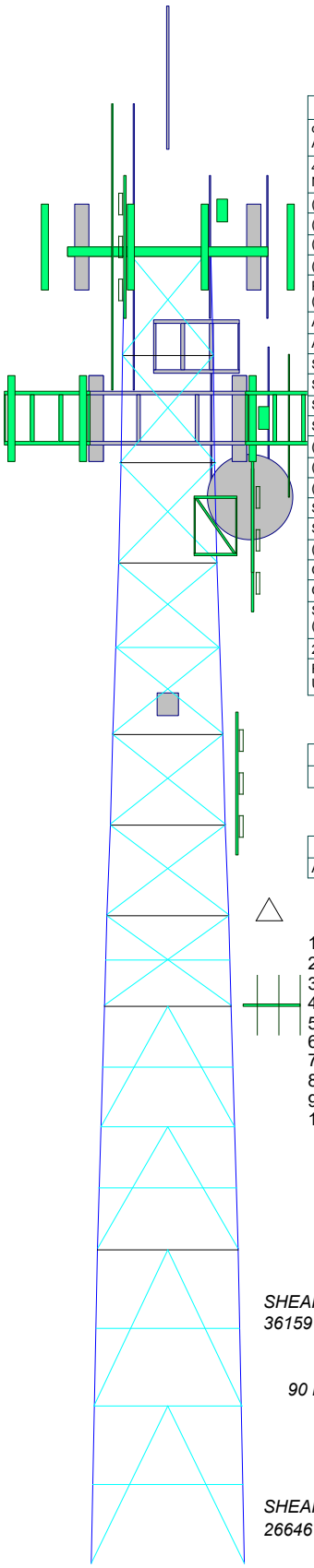
MOMENT
1503 kip-ft

TORQUE 12 kip-ft
REACTIONS - 90 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job: ***92' Self-Supporting Lattice Tower (60 deg angle Legs)***			
Project: ***CSP Tower - Oxford, CT (Rev. 3 - EL & SA Update)***			
Client: EVS-015 / Eversource / Evaluation / DESPP/CSP Loads	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/21/20	Scale: NTS	
Path:		Dwg No. E-1	

Section	T9	T8	T7	T6	T5	T4	T3	T2	T1
Legs	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	A			Section 4	Section 5	V3x3x1/4	
Leg Grade	A36M-50								
Diagonals	2L3x3x3/8	2L2 1/2x2 1/2x1/4	L3x3x3/8						
Diagonal Grade	A36								
Top Girts	2L2 1/2x2 1/2x3/16					L2 1/2x2 1/2x3/16	L2x2x3/16	B	L2x2x3/16
Horizontals	2L2 1/2x2 1/2x3/16			N.A.				N.A.	
Sec. Horizontals	L3x3x1/4		N.A.			N.A.			
Face Width (ft)	10.6667	9.83333	8.44444	8.05556	7.66667	6.75	6.5833	6.29165	6
# Panels @ (ft)	2 @ 10.9583	2 @ 8.45833	3 @ 6.25			2 @ 5.95833	1 @ 6.91667	2 @ 7.41667	
Weight (lb)	12387.1	4220.7	2441.1	948.3	804.3	787.5	1396.6	628.4	591.2	568.9



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
dbSpectra DS2C00F36D-D Omni Antenna (Eversource - Proposed)	103.8	(2) TT19-08BP111-001 TMA (ATI)	92
432E-83I-01T TTA Unit (DNK-8 / NEU-26)	94.5	T-Boom/Gate Mount (DNK-5,6,7,9,10)	85
(2) TT19-08BP111-001 TMA (ATI)	92	T-Boom/Gate Mount (Troop A P25)	80
(2) LPG 21903 Diplexer (ATI)	92	SE414-SWBP4LDF (D00) Panel (Troop A TX)	80
(2) LPG 21903 Diplexer (ATI)	92	432E-83I-01T TTA Unit (Troop A P25 TTA)	80
(2) LPG 21903 Diplexer (ATI)	92	SE414-SWBP4LDF (D00) Panel (Troop RX)	80
Pirod Rotable Top Platform 122379 (ATI)	92	SC479-HF1LDF ((Inverted) DNK-5 / CSP-20)	80
AM-X-CD-16-65-00T-RET (6') (ATI)	92	SC479-HF1LDF ((Inverted) DNK-6 / CSP-21)	80
AM-X-CD-16-65-00T-RET (6') (ATI)	92	Kreco CO-36A Omni Antenna (DNK-15 (Re-located))	79.5
SBNH-1D6565C (ATI)	92	10'6"x4" Pipe Mount (DNK-4 / CSP-1)	74.5
SBNH-1D6565C (ATI)	92	PA6-65AC (DNK-4 / CSP - 1)	74.5
SBNH-1D6565C (ATI)	92	SitePro1 PSA6 w/ Support Arm (DNK-15 (Re-located))	72.5
SBNH-1D6565C (ATI)	92	6'x6" Dipole Antenna (DNK-3 / CSP-9)	71.5
(2) RRU (ATI)	92	432E-83I-01T TTA Unit (DNK-7 / CSP-22)	60
(2) RRU (ATI)	92	DB222-A (DNK-2 / DEP-6)	54.5
(2) RRU (ATI)	92	1' Side Mount Standoff (1) (DNK-2 / DEP-6)	54.5
SC479-HF1LDF (DNK-9 / CSP-18)	92	SY203(C) - YAGI Antenna (DNK-1 / DEP-7)	39
SC479-HF1LDF (DNK-10 / CSP-19)	92	1' Side Mount Standoff (1) (DNK-1 / DEP-7)	39
(2) TT19-08BP111-001 TMA (ATI)	92		
OGT9-840 (DNK-13 / CSP-2)	92		
OGT9-840 (DNK-14 / CSP-3)	92		
SE414-SWBP4LDF (D00) Panel (Troops RX Diversity)	92		
2 Bay DiPole (DK-12 / CSP (leg Mt))	92		
Raycap DC6-48-60-18-8C Distribution Unit (ATI)	92		

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	B	L2 1/2x2 1/2x3/16

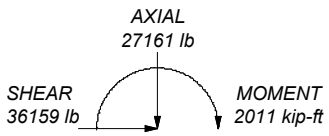
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36M-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

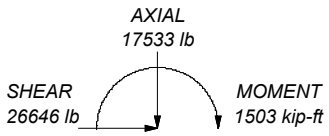
TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 90 mph wind.
5. See reinforcement drawings for reinforced leg sizes
6. Section 1 (T9) is composed of (1) V6x6x3/8 w/ (2) L3x2 1/2x1/4
7. Section 2 (T8) is composed of (1) L5x5x5/16 w/ (2) L3x2 1/2x1/4
8. Section 3 (T7,6,5) is composed of (1) L3 1/2x 3 1/2x5/16 w/ (2) L2 1/2x2 1/2x1/4
9. Section 4 is composed of (1) L3x3x1/4 w/ (2) L2 1/2x 2 1/2x1/4
10. Section 5 Is composed of (1) L3x3x1/4 w/ (1) L2x2x1/4 (internally welded inside of the 3x3 member).

UPLIFT: -199073 lb
SHEAR: 17687 lb



TORQUE 16 kip-ft
90 mph WIND - 0.5000 in ICE



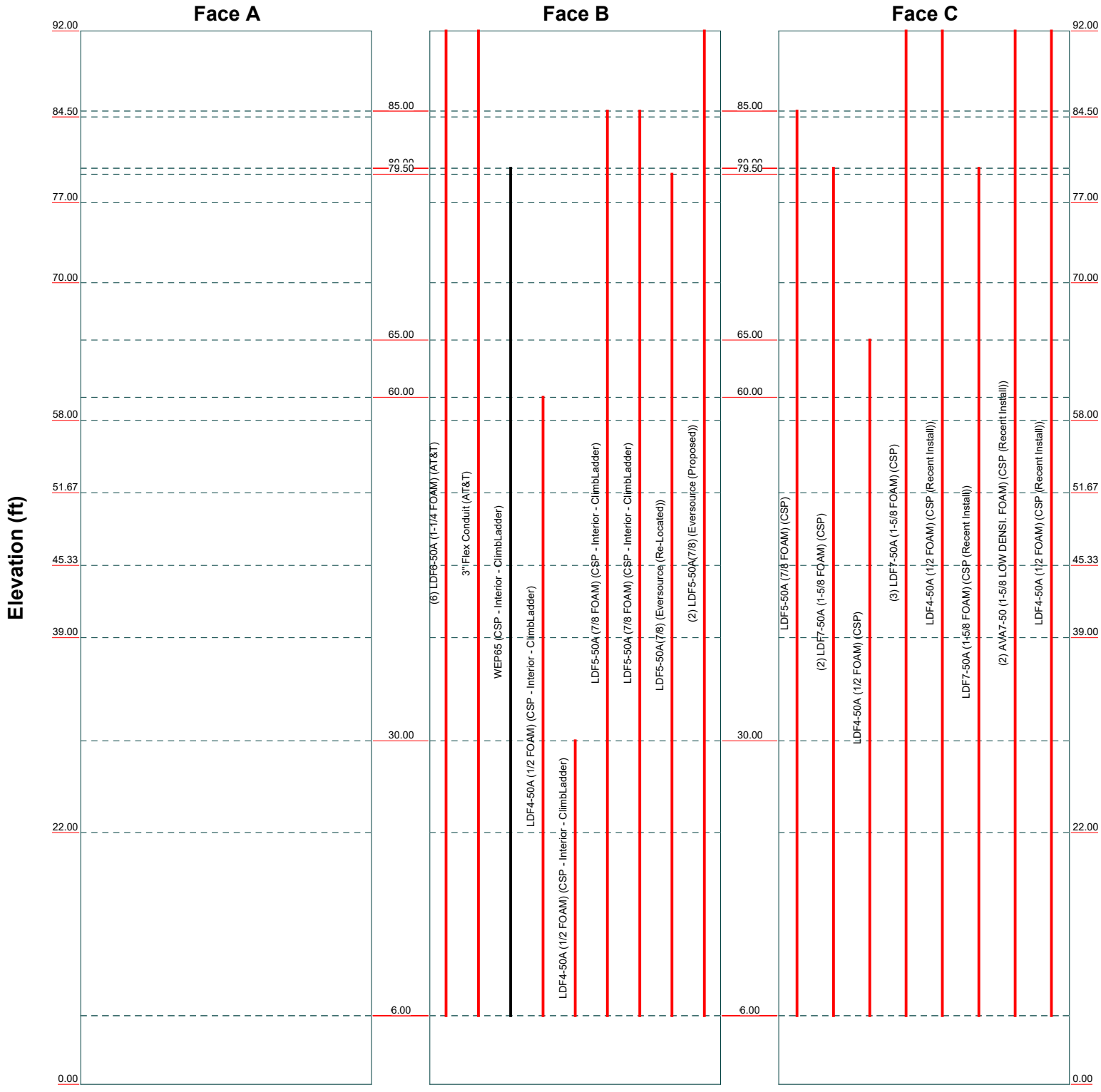
TORQUE 12 kip-ft
REACTIONS - 90 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job:	***92' Self-Supporting Lattice Tower (60 deg angle Legs)***		
Project:	***CSP Tower - Oxford, CT (Rev. 3 - EL & SA Update)***		
Client:	EVS-015 / Eversource / Evaluation / DESPP/CSP Loads	Drawn by: MCD	App'd:
Code:	TIA/EIA-222-F	Date: 07/21/20	Scale: NTS
Path:			Dwg No. E-1

Feed Line Distribution Chart
0' - 92'

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



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Rocky Hill, CT
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FAX: 860-812-2094

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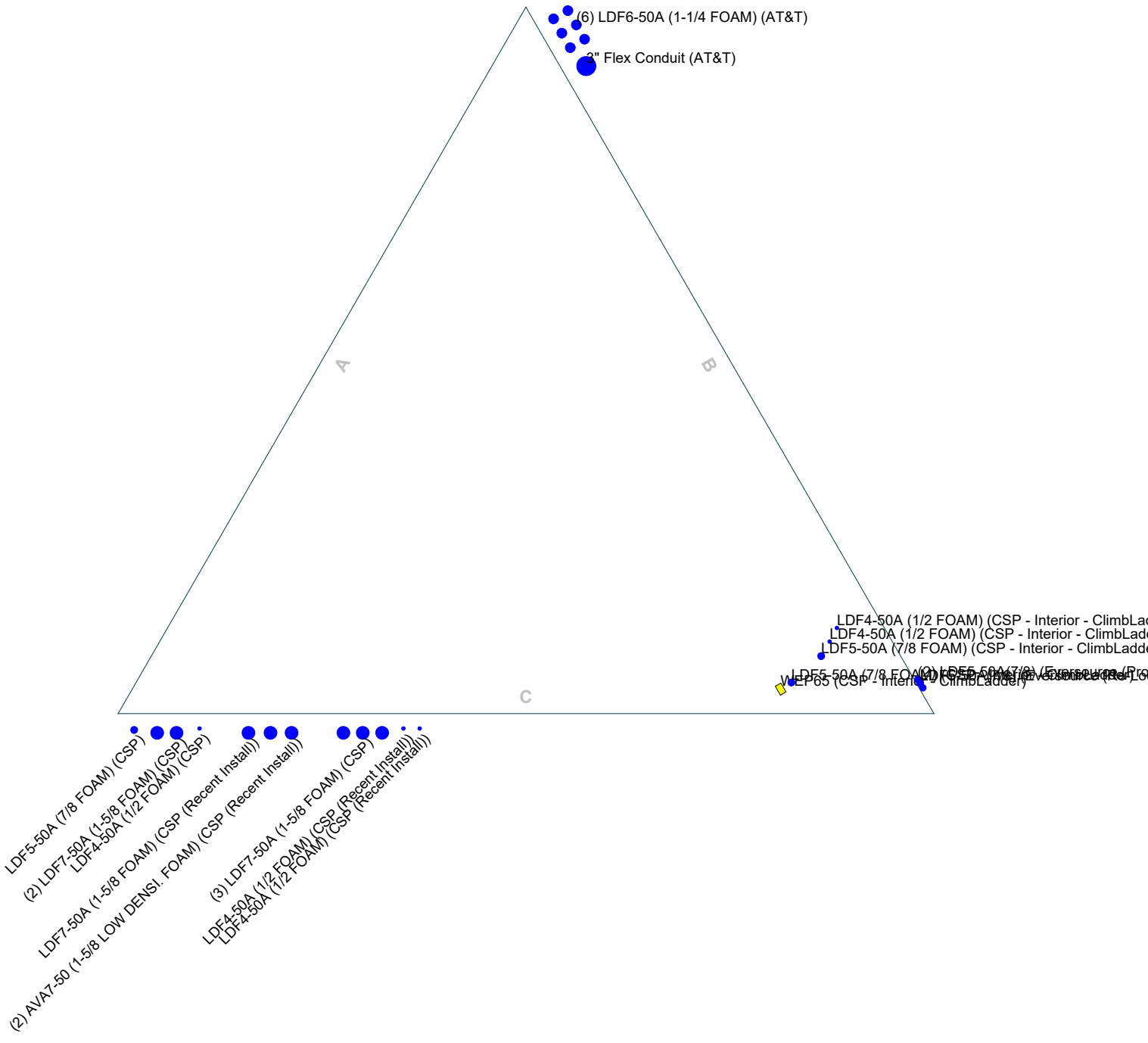
Client: EVS-015 / Eversource / Evaluation / DESPP/CSP Loads	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/21/20	Scale: NTS	
Path:		Dwg No. E-7	

Feed Line Plan

Round Flat App In Face App Out Face

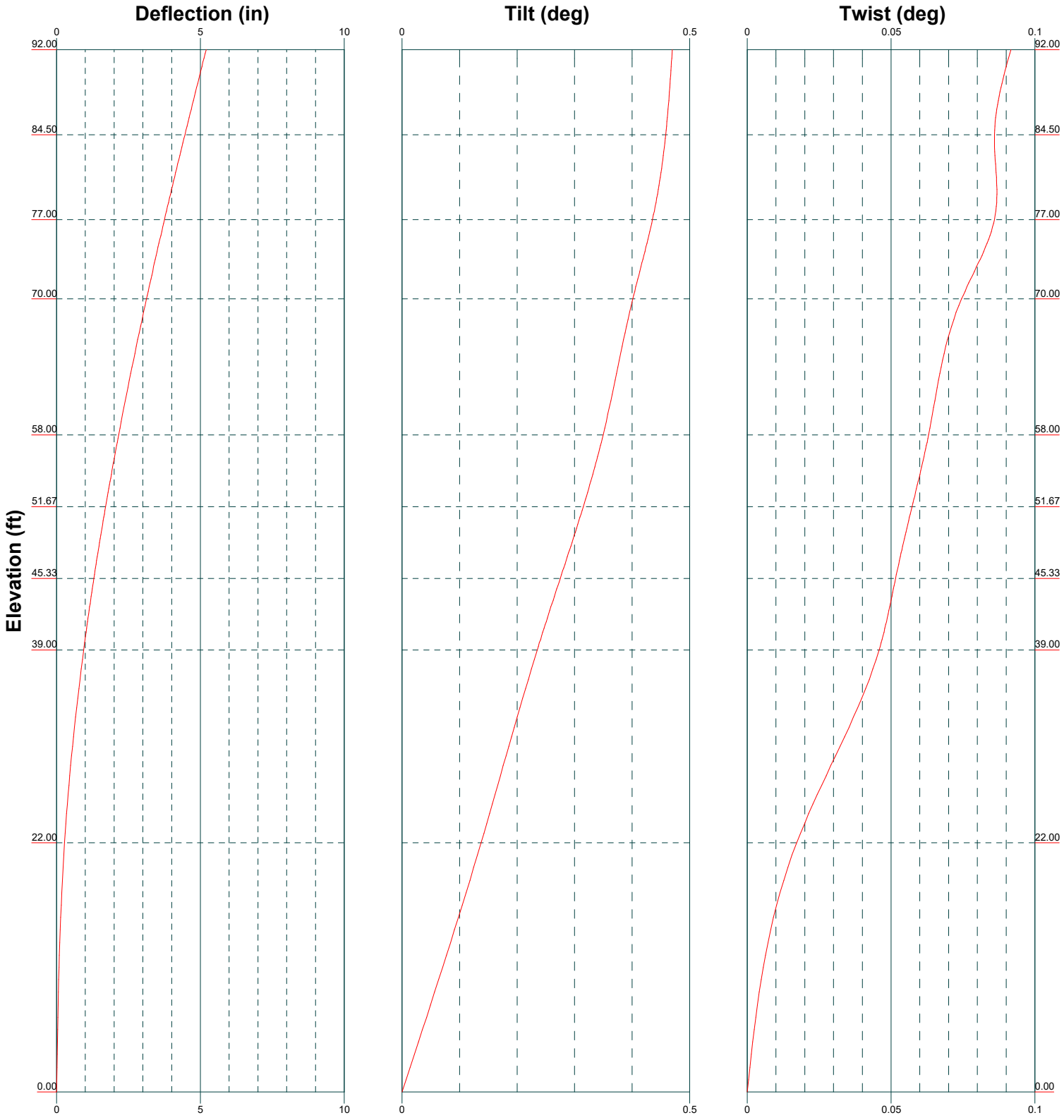


AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job: ***92' Self-Supporting Lattice Tower (60 deg angle Legs)***			
Project: ***CSP Tower - Oxford, CT (Rev. 3 - EL & SA Update)***			
Client: EVS-015 / Eversource / Evaluation / DESPP/CSP Loads	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/21/20	Scale: NTS	
Path:		Dwg No. E-7	

TIA/EIA-222-F - Service - 90 mph

Maximum Values



AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-263-5800
FAX: 860-812-2094

Job: ***92' Self-Supporting Lattice Tower (60 deg angle Legs)***			
Project: ***CSP Tower - Oxford, CT (Rev. 3 - EL & SA Update)***			
Client: EVS-015 / Eversource / Evaluation / DESPP/CSP Loads	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/21/20	Scale: NTS	
Path:		Dwg No. E-5	

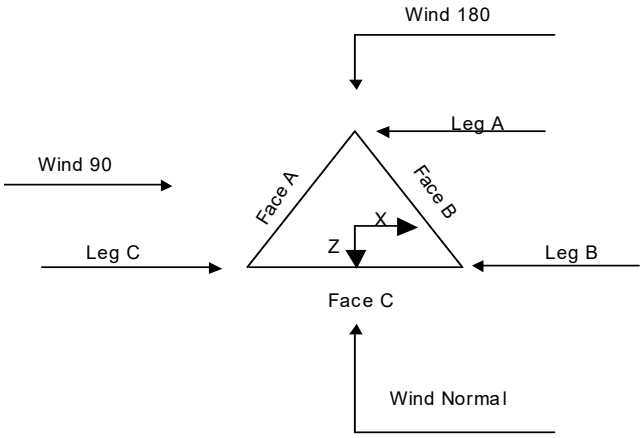
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 92.00 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 6.00 ft at the top and 10.67 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New Haven County, Connecticut.
Basic wind speed of 90 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 90 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 90 mph.
See reinforcement drawings for reinforced leg sizes.
Section 1 (T9) is composed of (1) V6x6x3/8 w/ (2) L3x2 1/2x1/4.
Section 2 (T8) is composed of (1) L5x5x5/16 w/ (2) L3x2 1/2x1/4.
Section 3 (T7,6,5) is composed of (1) L3 1/2x 3 1/2x5/16 w/ (2) L2 1/2x2 1/2x1/4.
Section 4 is composed of (1) L3x3x1/4 w/ (2) L2 1/2x 2 1/2x1/4.
Section 5 Is composed of (1) L3x3x1/4 w/ (1) L2x2x1/4 (internally welded inside of the 3x3 member)..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
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-G Bracing Resist. Exemption
√	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Use TIA-222-G 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	92.00-84.50			6.00	1	7.50
T2	84.50-77.00			6.29	1	7.50
T3	77.00-70.00			6.58	1	7.00
T4	70.00-58.00			6.75	1	12.00
T5	58.00-51.67			7.67	1	6.33
T6	51.67-45.33			8.06	1	6.33
T7	45.33-39.00			8.44	1	6.33
T8	39.00-22.00			8.83	1	17.00
T9	22.00-0.00			9.83	1	22.00

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	92.00-84.50	7.42	X Brace	No	Yes	1.0000	0.0000
T2	84.50-77.00	7.42	X Brace	No	Yes	1.0000	0.0000
T3	77.00-70.00	6.92	X Brace	No	Yes	1.0000	0.0000
T4	70.00-58.00	5.96	X Brace	No	Yes	1.0000	0.0000
T5	58.00-51.67	6.25	X Brace	No	Yes	1.0000	0.0000
T6	51.67-45.33	6.25	X Brace	No	Yes	1.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T7	45.33-39.00	6.25	X Brace	No	Yes	1.0000	0.0000
T8	39.00-22.00	8.46	K Brace Down	No	Yes	1.0000	0.0000
T9	22.00-0.00	10.96	K Brace Down	No	Yes	1.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 92.00-84.50	60 Angle	V3x3x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T2 84.50-77.00	60 Angle	V3x3x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T3 77.00-70.00	Arbitrary Shape	Section 5	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T4 70.00-58.00	Arbitrary Shape	Section 4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T5 58.00-51.67	Arbitrary Shape	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T6 51.67-45.33	Arbitrary Shape	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T7 45.33-39.00	Arbitrary Shape	Oxford V3-1/2x3-1/2x5/16 w/ (2) 2-1/2x2-1/2x1/4	A36M-50 (50 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T8 39.00-22.00	Arbitrary Shape	Oxford V5x5x5/16 w/ (2) 3x2-1/2x1/4	A36M-50 (50 ksi)	Double Equal Angle	2L2 1/2x2 1/2x1/4	A36 (36 ksi)
T9 22.00-0.00	Arbitrary Shape	Oxford V6x6x3/8 w/ (2) 3x2-1/2x1/4	A36M-50 (50 ksi)	Double Angle	2L3x3x3/8	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 92.00-84.50	Equal Angle	L2x2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T2 84.50-77.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T3 77.00-70.00	Equal Angle	L2x2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T4 70.00-58.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T5 58.00-51.67	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T6 51.67-45.33	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T7 45.33-39.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T8 39.00-22.00	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		A36 (36 ksi)
T9 22.00-0.00	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Flat Bar		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 92.00-84.50	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T2 84.50-77.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 77.00-70.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 70.00-58.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 58.00-51.67	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 51.67-45.33	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 45.33-39.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 39.00-22.00	None	Flat Bar		A36 (36 ksi)	Double Angle	2L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 22.00-0.00	None	Flat Bar		A36 (36 ksi)	Double Angle	2L2 1/2x2 1/2x3/16	A36 (36 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
T7 45.33-39.00	Equal Angle	L3x3x1/4	A36 (36 ksi)	Equal Angle		A572-50 (50 ksi)
T8 39.00-22.00	Equal Angle	L3x3x1/4	A36 (36 ksi)	Equal Angle		A572-50 (50 ksi)
T9 22.00-0.00	Equal Angle	L3x3x1/4	A36 (36 ksi)	Equal Angle		A572-50 (50 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 92.00-84.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 84.50-77.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T3 77.00-70.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 70.00-58.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 58.00-51.67	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 51.67-45.33	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 45.33-39.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 39.00-22.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 22.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1]: Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	No	1	1	1	1	1	1	1	1
92.00-84.50				1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1
84.50-77.00				1	1	1	1	1	1	1
T3	Yes	No	1	1	1	1	1	1	1	1
77.00-70.00				1	1	1	1	1	1	1
T4	Yes	No	1	1	1	1	1	1	1	1
70.00-58.00				1	1	1	1	1	1	1
T5	Yes	No	1	1	1	1	1	1	1	1
58.00-51.67				1	1	1	1	1	1	1
T6	Yes	No	1	1	1	1	1	1	1	1
51.67-45.33				1	1	1	1	1	1	1
T7	Yes	No	1	1	1	1	1	1	1	1
45.33-39.00				1	1	1	1	1	1	1
T8	Yes	No	1	1	1	1	1	1	1	1
39.00-22.00				1	1	1	1	1	1	1
T9 22.00-0.00	Yes	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 92.00-84.50	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 84.50-77.00	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 77.00-70.00	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 70.00-58.00	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 58.00-51.67	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 51.67-45.33	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 45.33-39.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 39.00-22.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 22.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 92.00-84.50	Sleeve DS	0.6250 A325N	12	0.5000 A325N	1	0.5000 A325N	1	0.0000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T2 84.50-77.00	Sleeve DS	0.6250 A325N	12	0.5000 A325X	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T3 77.00-70.00	Sleeve DS	0.6250 A325N	12	0.5000 A490N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T4 70.00-58.00	Sleeve DS	0.6250 A325N	12	0.5000 A325X	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T5 58.00-51.67	Sleeve DS	0.6250 A325N	12	0.5000 A325X	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T6 51.67-45.33	Sleeve DS	0.6250 A325N	12	0.5000 A490N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T7 45.33-39.00	Sleeve DS	0.6250 A325N	12	0.5000 A490N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	1	0.5000 A325N	1
T8 39.00-22.00	Sleeve DS	0.6250 A325N	12	0.5000 A325N	2	0.5000 A325N	2	0.5000 A325N	2	0.6250 A325N	0	0.5000 A325N	2	0.5000 A325N	1
T9 22.00-0.00	Sleeve DS	0.6250 A325X	12	0.5000 A325N	2	0.5000 A325N	2	0.5000 A325N	2	0.6250 A325N	0	0.5000 A325N	2	0.5000 A325N	1

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
LDF6-50A (1-1/4 FOAM) (AT&T)	B	Yes	No	Ar (CaAa)	92.00 - 6.00	2.0000	-0.45	6	3	1.0000	1.5500		0.66
LDF5-50A (7/8 FOAM) (CSP)	C	Yes	No	Ar (CaAa)	85.00 - 6.00	2.0000	0.48	1	1	1.0900	1.0900		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM) (CSP)	C	Yes	No	Ar (CaAa)	80.00 - 6.00	2.0000	0.44	2	2	1.0000	1.9800		0.82
LDF4-50A (1/2 FOAM) (CSP)	C	Yes	No	Ar (CaAa)	65.00 - 6.00	2.0000	0.4	1	1	0.6300	0.6300		0.15
LDF7-50A (1-5/8 FOAM) (CSP)	C	Yes	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.2	3	3	1.0000	1.9800		0.82
3" Flex Conduit (AT&T)	B	Yes	No	Ar (CaAa)	92.00 - 6.00	2.0000	-0.4	1	1	0.0000	3.0000		3.00
LDF4-50A (1/2 FOAM) (CSP (Recent Install))	C	Yes	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.15	1	1	0.6300	0.6300		0.15
LDF7-50A (1-5/8 FOAM) (CSP (Recent Install))	C	Yes	No	Ar (CaAa)	80.00 - 6.00	2.0000	0.34	1	1	1.9800	1.9800		0.82
AVA7-50 (1-5/8 LOW DENSI. FOAM) (CSP (Recent Install))	C	Yes	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.3	2	2	1.2500	1.9800		0.72
LDF4-50A (1/2 FOAM) (CSP (Recent Install)) * Cables running on Interior Climb Ladder	C	Yes	No	Ar (CaAa)	92.00 - 6.00	2.0000	0.13	1	1	0.6300	0.6300		0.15
WEP65 (CSP - Interior - ClimbLadder)	B	Yes	No	Af (CfAe)	80.00 - 6.00	-18.0000	0.38	1	1	1.5836	1.5836	5.1284	0.53
LDF4-50A (1/2 FOAM) (CSP - Interior - ClimbLadder)	B	Yes	No	Ar (CaAa)	60.00 - 6.00	-6.0000	0.35	1	1	0.6300	0.6300		0.15
LDF4-50A (1/2 FOAM) (CSP - Interior - ClimbLadder)	B	Yes	No	Ar (CaAa)	30.00 - 6.00	-8.0000	0.36	1	1	0.6300	0.6300		0.15
LDF5-50A (7/8 FOAM) (CSP - Interior - ClimbLadder)	B	Yes	No	Ar (CaAa)	85.00 - 6.00	-16.0000	0.38	1	1	1.0900	1.0900		0.33
LDF5-50A (7/8 FOAM) (CSP - Interior - ClimbLadder) **Proposed**	B	Yes	No	Ar (CaAa)	85.00 - 6.00	-10.0000	0.37	1	1	1.0900	1.0900		0.33
LDF5-50A(7/	B	Yes	No	Ar (CaAa)	79.50 - 6.00	0.0000	0.46	1	1	0.5000	1.0300		0.33

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
8) (Eversource (Re-Located)) LDF5-50A(7/8) (Eversource (Proposed))	B	Yes	No	Ar (CaAa)	92.00 - 6.00	0.0000	0.46	2	2	0.5000	1.0300		0.33

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 lb
T1	92.00-84.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	9.343	0.000	57.48
		C	0.000	0.000	8.425	0.000	31.66
T2	84.50-77.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.396	11.126	0.000	64.52
		C	0.000	0.000	10.970	0.000	41.35
T3	77.00-70.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.924	10.865	0.000	63.98
		C	0.000	0.000	12.733	0.000	48.93
T4	70.00-58.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	1.584	18.752	0.000	109.98
		C	0.000	0.000	22.269	0.000	84.93
T5	58.00-51.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.836	10.230	0.000	58.84
		C	0.000	0.000	11.919	0.000	45.22
T6	51.67-45.33	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.836	10.230	0.000	58.84
		C	0.000	0.000	11.919	0.000	45.22
T7	45.33-39.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.836	10.230	0.000	58.84
		C	0.000	0.000	11.919	0.000	45.22
T8	39.00-22.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	2.243	27.962	0.000	159.13
		C	0.000	0.000	31.994	0.000	121.38
T9	22.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	2.111	26.851	0.000	151.04
		C	0.000	0.000	30.112	0.000	114.24

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 lb
T1	92.00-84.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	15.684	0.000	160.76
		C		0.000	0.000	16.704	0.000	110.43
T2	84.50-77.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.563	19.117	0.000	187.82
		C		0.000	0.000	21.445	0.000	142.78
T3	77.00-70.00	A	0.500	0.000	0.000	0.000	0.000	0.00

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 lb
		B		0.000	1.313	18.790	0.000	189.16
		C		0.000	0.000	24.605	0.000	165.79
T4	70.00-58.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	2.250	32.538	0.000	325.96
		C		0.000	0.000	43.321	0.000	290.10
T5	58.00-51.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	1.188	18.033	0.000	176.47
		C		0.000	0.000	23.294	0.000	155.33
T6	51.67-45.33	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	1.188	18.033	0.000	176.47
		C		0.000	0.000	23.294	0.000	155.33
T7	45.33-39.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	1.188	18.033	0.000	176.47
		C		0.000	0.000	23.294	0.000	155.33
T8	39.00-22.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	3.188	49.709	0.000	480.40
		C		0.000	0.000	62.526	0.000	416.93
T9	22.00-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	3.000	48.165	0.000	459.26
		C		0.000	0.000	58.848	0.000	392.40

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	92.00-84.50	A	0.000	0.000	0.000	0.000
		B	0.000	0.445	0.780	1.226
		C	0.000	0.525	0.889	1.449
T2	84.50-77.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.594	1.041	1.707
		C	0.000	0.670	1.183	1.928
T3	77.00-70.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.647	1.072	1.774
		C	0.000	0.787	1.345	2.158
T4	70.00-58.00	A	0.000	0.000	0.000	0.000
		B	0.000	1.212	2.087	3.468
		C	0.000	1.505	2.651	4.306
T5	58.00-51.67	A	0.000	0.000	0.000	0.000
		B	0.000	0.633	1.068	1.809
		C	0.000	0.761	1.328	2.175
T6	51.67-45.33	A	0.000	0.000	0.000	0.000
		B	0.000	0.625	1.054	1.785
		C	0.000	0.751	1.310	2.146
T7	45.33-39.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.795	1.356	2.297
		C	0.000	0.956	1.687	2.762
T8	39.00-22.00	A	0.000	0.000	0.000	0.000
		B	0.000	1.477	2.266	3.877
		C	0.000	1.725	2.764	4.526
T9	22.00-0.00	A	0.000	0.000	0.000	0.000
		B	0.000	1.190	1.985	3.433
		C	0.000	1.346	2.370	3.881

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	92.00-84.50	-0.8855	-2.0657	-1.6913	-0.4590
T2	84.50-77.00	-1.5317	0.4301	-2.0160	2.0456
T3	77.00-70.00	-2.4326	2.1910	-2.5441	3.4909
T4	70.00-58.00	-2.4018	2.1543	-2.6545	3.5832
T5	58.00-51.67	-2.3742	2.3849	-2.5709	4.0287
T6	51.67-45.33	-2.4488	2.4362	-2.6542	4.1460
T7	45.33-39.00	-2.2884	2.1960	-2.5092	3.8236
T8	39.00-22.00	-2.6731	2.8597	-2.7612	4.8598
T9	22.00-0.00	-2.1367	2.5132	-2.2152	4.5330

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 lb
(2) TT19-08BP111-001 TMA (AT&T)	A	From Leg	3.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.64 0.76	0.52 0.62	20.00 21.80
(2) TT19-08BP111-001 TMA (AT&T)	B	From Leg	3.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.64 0.76	0.52 0.62	20.00 21.80
(2) TT19-08BP111-001 TMA (AT&T)	C	From Leg	3.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.64 0.76	0.52 0.62	20.00 21.80
(2) LPG 21903 Diplexer (AT&T)	A	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	5.50 7.92
(2) LPG 21903 Diplexer (AT&T)	B	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	5.50 7.92
(2) LPG 21903 Diplexer (AT&T)	C	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	5.50 7.92
Pirod Rotable Top Platform 122379 (AT&T)	C	None		0.0000	92.00	No Ice 1/2" Ice	41.90 53.50	41.90 53.50	1560.00 2310.00
AM-X-CD-16-65-00T-RET (6') (AT&T)	A	From Leg	3.00 6.00 0.00	0.0000	92.00	No Ice 1/2" Ice	8.26 8.81	4.64 5.09	50.00 95.50
AM-X-CD-16-65-00T-RET (6') (AT&T)	A	From Leg	3.00 -6.00 0.00	0.0000	92.00	No Ice 1/2" Ice	8.26 8.81	4.64 5.09	50.00 95.50
SBNH-1D6565C (AT&T)	B	From Leg	3.00 6.00 0.00	0.0000	92.00	No Ice 1/2" Ice	11.41 12.02	7.70 8.29	60.00 126.70
SBNH-1D6565C (AT&T)	B	From Leg	3.00 -6.00 0.00	0.0000	92.00	No Ice 1/2" Ice	11.41 12.02	7.70 8.29	60.00 126.70
SBNH-1D6565C	C	From Leg	3.00	0.0000	92.00	No Ice	11.41	7.70	60.00

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 lb
(AT&T)			6.00 0.00			1/2" Ice	12.02	8.29	126.70
SBNH-1D6565C	C	From Leg	3.00	0.0000	92.00	No Ice	11.41	7.70	60.00
(AT&T)			-6.00 0.00			1/2" Ice	12.02	8.29	126.70
(2) RRU	A	From Leg	3.00	0.0000	92.00	No Ice	1.40	0.70	10.00
(AT&T)			0.00 0.00			1/2" Ice	1.56	0.82	20.34
(2) RRU	B	From Leg	3.00	0.0000	92.00	No Ice	1.40	0.70	10.00
(AT&T)			0.00 0.00			1/2" Ice	1.56	0.82	20.34
(2) RRU	C	From Leg	3.00	0.0000	92.00	No Ice	1.40	0.70	10.00
(AT&T)			0.00 0.00			1/2" Ice	1.56	0.82	20.34
SY203(C) - YAGI Antenna	B	From Leg	1.00	0.0000	39.00	No Ice	14.04	2.47	3.20
(DNK-1 / DEP-7)			0.00 0.00			1/2" Ice	14.49	2.72	77.98
1' Side Mount Standoff (1)	B	None		0.0000	39.00	No Ice	2.72	2.72	50.00
(DNK-1 / DEP-7)						1/2" Ice	4.91	4.91	89.00
DB222-A	B	From Leg	1.00	0.0000	54.50	No Ice	1.60	1.60	16.00
(DNK-2 / DEP-6)			0.00 0.00			1/2" Ice	2.88	2.88	20.80
1' Side Mount Standoff (1)	B	None		0.0000	54.50	No Ice	2.72	2.72	50.00
(DNK-2 / DEP-6)						1/2" Ice	4.91	4.91	89.00
6'x6" Dipole Antenna	B	From Leg	3.00	0.0000	71.50	No Ice	9.17	1.67	50.00
(DNK-3 / CSP-9)			0.00 0.00			1/2" Ice	9.89	2.79	77.56
10'6"x4" Pipe Mount	B	From Leg	3.00	0.0000	74.50	No Ice	4.72	4.72	114.00
(DNK-4 / CSP-1)			0.00 0.00			1/2" Ice	5.62	5.62	146.84
SC479-HF1LDF	B	From Face	4.00	0.0000	80.00	No Ice	5.06	5.06	34.00
((Inverted) DNK-5 / CSP-20)			-4.00 0.00			1/2" Ice	6.54	6.54	69.82
T-Boom/Gate Mount	B	From Face	0.50	0.0000	85.00	No Ice	11.89	2.92	320.00
(DNK-5,6,7,9,10)			0.00 0.00			1/2" Ice	16.61	4.12	330.00
SC479-HF1LDF	B	From Face	4.00	0.0000	80.00	No Ice	5.06	5.06	34.00
((Inverted) DNK-6 / CSP-21)			4.00 0.00			1/2" Ice	6.54	6.54	69.82
432E-83I-01T TTA Unit	A	From Leg	1.00	0.0000	60.00	No Ice	3.33	1.11	25.00
(DNK-7 / CSP-22)			0.00 0.00			1/2" Ice	3.57	1.27	44.70
SC479-HF1LDF	B	From Face	4.00	0.0000	92.00	No Ice	5.06	5.06	34.00
(DNK-9 / CSP-18)			-4.00 0.00			1/2" Ice	6.54	6.54	69.82
SC479-HF1LDF	B	From Face	4.00	0.0000	92.00	No Ice	5.06	5.06	34.00
(DNK-10 / CSP-19)			4.00 0.00			1/2" Ice	6.54	6.54	69.82
432E-83I-01T TTA Unit	B	From Leg	1.00	0.0000	94.50	No Ice	3.33	1.11	25.00
(DNK-8 / NEU-26)			0.00 0.00			1/2" Ice	3.57	1.27	44.70
***DNK-12 is Leg Mounted									
OGT9-840	A	From Face	1.00	0.0000	92.00	No Ice	2.27	2.27	18.50
(DNK-13 / CSP-2)			0.00 0.00			1/2" Ice	3.44	3.44	36.09
*** DNK-13,14 Mounted to ATT Frame									

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 lb
OGT9-840 (DNK-14 / CSP-3) *** DNK-15 Mounted to tower leg *** PNS/CSP Installed Additions	C	From Leg	1.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	2.27 3.44	2.27 3.44	18.50 36.09
T-Boom/Gate Mount (Troop A P25)	B	None		0.0000	80.00	No Ice 1/2" Ice	11.85 16.61	2.92 4.12	320.00 330.00
SE414-SWBP4LDF (D00) Panel (Troop A TX)	B	From Leg	4.00 0.00 3.00	0.0000	80.00	No Ice 1/2" Ice	1.90 2.22	5.27 5.87	29.62 63.88
432E-83I-01T TTA Unit (Troop A P25 TTA)	B	From Leg	4.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	3.33 3.57	1.11 1.27	25.00 44.70
SE414-SWBP4LDF (D00) Panel (Troop RX)	B	From Leg	4.00 0.00 -3.00	0.0000	80.00	No Ice 1/2" Ice	1.90 2.22	5.27 5.87	29.62 63.88
SE414-SWBP4LDF (D00) Panel (Troops RX Diversity) *** DNK-11 / CSP-23 REMOVED **Proposed** ******	B	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	1.90 2.22	5.27 5.87	29.62 63.88
2 Bay DiPole (D&K-12 / CSP (leg Mt))	C	From Leg	0.00 0.00 0.00	0.0000	92.00	No Ice 1/2" Ice	2.00 3.00	2.00 3.00	55.00 100.00
Raycap DC6-48-60-18-8C Distribution Unit (AT&T)	C	None		0.0000	92.00	No Ice 1/2" Ice	0.79 1.27	0.79 1.27	20.00 35.12
Kreco CO-36A Omni Antenna (DNK-15 (Re-located))	B	From Leg	6.00 0.00 0.00	0.0000	79.50	No Ice 1/2" Ice	3.73 5.35	3.73 5.35	25.95 57.81
SitePro1 PSA6 w/ Support Arm (DNK-15 (Re-located)) **Proposed**	B	From Leg	0.00 0.00 0.00	0.0000	72.50	No Ice 1/2" Ice	3.63 4.95	6.59 9.53	136.32 141.21
dbSpectra DS2C00F36D-D Omni Antenna (Eversource - Proposed)	A	From Leg	0.50 0.00 0.00	0.0000	103.80	No Ice 1/2" Ice	4.95 6.58	4.95 6.58	84.60 124.76

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 lb
PA6-65AC (DNK-4 / CSP - 1)	B	Paraboloid w/Radome	From Face	3.00 3.00	Worst		74.50	6.00	No Ice 1/2" Ice	28.27 29.05	90.00 240.00

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 lb
				0.00						

Tower Pressures - No Ice

$G_H = 1.168$

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 92.00-84.50	88.25	1.325	27	48.212	A	9.331	0.000	3.751	40.20	0.000	0.000
					B	8.550	0.000		43.87	9.343	0.000
					C	8.441	0.000		44.44	8.425	0.000
T2 84.50-77.00	80.75	1.291	27	50.399	A	9.731	0.000	3.751	38.55	0.000	0.000
					B	9.086	0.000		41.28	11.126	0.000
					C	8.547	0.000		43.88	10.970	0.000
T3 77.00-70.00	73.50	1.257	26	48.708	A	9.941	0.000	4.313	43.39	0.000	0.000
					B	9.793	0.000		44.05	10.865	0.000
					C	8.597	0.000		50.18	12.733	0.000
T4 70.00-58.00	64.00	1.208	25	91.051	A	21.753	0.000	10.206	46.92	0.000	0.000
					B	21.249	0.000		48.03	18.752	0.000
					C	19.101	0.000		53.43	22.269	0.000
T5 58.00-51.67	54.83	1.156	24	52.575	A	12.490	0.000	6.120	49.00	0.000	0.000
					B	12.257	0.000		49.93	10.230	0.000
					C	11.161	0.000		54.83	11.919	0.000
T6 51.67-45.33	48.50	1.116	23	55.038	A	12.728	0.000	6.120	48.08	0.000	0.000
					B	12.510	0.000		48.92	10.230	0.000
					C	11.417	0.000		53.60	11.919	0.000
T7 45.33-39.00	42.17	1.073	22	57.501	A	15.053	0.000	6.120	40.65	0.000	0.000
					B	14.533	0.000		42.11	10.230	0.000
					C	13.367	0.000		45.78	11.919	0.000
T8 39.00-22.00	30.50	1	21	166.862	A	32.300	0.000	16.392	50.75	0.000	0.000
					B	32.277	0.000		50.79	27.962	0.000
					C	29.536	0.000		55.50	31.994	0.000
T9 22.00-0.00	11.00	1	21	237.160	A	43.868	0.000	23.322	53.16	0.000	0.000
					B	43.994	0.000		53.01	26.851	0.000
					C	41.498	0.000		56.20	30.112	0.000

Tower Pressure - With Ice

$G_H = 1.168$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	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 92.00-84.50	88.25	1.325	27	0.5000	48.837	A	9.331	3.270	5.001	39.69	0.000	0.000
						B	8.104	2.825		45.76	15.684	0.000
						C	7.882	2.745		47.06	16.704	0.000
T2 84.50-77.00	80.75	1.291	27	0.5000	51.024	A	9.731	3.328	5.001	38.30	0.000	0.000
						B	8.586	2.734		44.18	19.117	0.000
						C	7.803	2.657		47.81	21.445	0.000

Section Elevation	z	K_Z	q_z	t_Z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	in	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
T3 77.00-70.00	73.50	1.257	26	0.5000	49.291	A	10.719	2.050	5.091	39.87	0.000	0.000
						B	10.257	1.403		43.66	18.790	0.000
						C	8.561	1.263		51.82	24.605	0.000
T4 70.00-58.00	64.00	1.208	25	0.5000	92.052	A	23.087	4.031	11.541	42.56	0.000	0.000
						B	21.869	2.819		46.75	32.538	0.000
						C	18.781	2.526		54.16	43.321	0.000
T5 58.00-51.67	54.83	1.156	24	0.5000	53.103	A	13.194	2.226	6.824	44.25	0.000	0.000
						B	12.572	1.593		48.17	18.033	0.000
						C	11.019	1.465		54.66	23.294	0.000
T6 51.67-45.33	48.50	1.116	23	0.5000	55.566	A	13.432	2.311	6.824	43.35	0.000	0.000
						B	12.835	1.686		46.99	18.033	0.000
						C	11.286	1.560		53.12	23.294	0.000
T7 45.33-39.00	42.17	1.073	22	0.5000	58.029	A	15.757	3.091	6.824	36.20	0.000	0.000
						B	14.648	2.296		40.27	18.033	0.000
						C	12.995	2.135		45.10	23.294	0.000
T8 39.00-22.00	30.50	1	21	0.5000	168.279	A	34.190	6.064	18.282	45.42	0.000	0.000
						B	33.501	4.587		48.00	49.709	0.000
						C	29.664	4.339		53.77	62.526	0.000
T9 22.00-0.00	11.00	1	21	0.5000	238.994	A	46.313	7.115	25.767	48.23	0.000	0.000
						B	45.880	5.925		49.74	48.165	0.000
						C	42.432	5.770		53.46	58.848	0.000

Tower Pressure - Service

$G_H = 1.168$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
T1 92.00-84.50	88.25	1.325	27	48.212	A	9.331	0.000	3.751	40.20	0.000	0.000
					B	8.550	0.000		43.87	9.343	0.000
					C	8.441	0.000		44.44	8.425	0.000
T2 84.50-77.00	80.75	1.291	27	50.399	A	9.731	0.000	3.751	38.55	0.000	0.000
					B	9.086	0.000		41.28	11.126	0.000
					C	8.547	0.000		43.88	10.970	0.000
T3 77.00-70.00	73.50	1.257	26	48.708	A	9.941	0.000	4.313	43.39	0.000	0.000
					B	9.793	0.000		44.05	10.865	0.000
					C	8.597	0.000		50.18	12.733	0.000
T4 70.00-58.00	64.00	1.208	25	91.051	A	21.753	0.000	10.206	46.92	0.000	0.000
					B	21.249	0.000		48.03	18.752	0.000
					C	19.101	0.000		53.43	22.269	0.000
T5 58.00-51.67	54.83	1.156	24	52.575	A	12.490	0.000	6.120	49.00	0.000	0.000
					B	12.257	0.000		49.93	10.230	0.000
					C	11.161	0.000		54.83	11.919	0.000
T6 51.67-45.33	48.50	1.116	23	55.038	A	12.728	0.000	6.120	48.08	0.000	0.000
					B	12.510	0.000		48.92	10.230	0.000
					C	11.417	0.000		53.60	11.919	0.000
T7 45.33-39.00	42.17	1.073	22	57.501	A	15.053	0.000	6.120	40.65	0.000	0.000
					B	14.533	0.000		42.11	10.230	0.000
					C	13.367	0.000		45.78	11.919	0.000
T8 39.00-22.00	30.50	1	21	166.862	A	32.300	0.000	16.392	50.75	0.000	0.000
					B	32.277	0.000		50.79	27.962	0.000
					C	29.536	0.000		55.50	31.994	0.000
T9 22.00-0.00	11.00	1	21	237.160	A	43.868	0.000	23.322	53.16	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					B	43.994	0.000		53.01	26.851	0.000
					C	41.498	0.000		56.20	30.112	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	1	1	9.331	1353.81	180.51	A
92.00-84.50			B	0.177	2.673	0.586	1	1	8.550			
			C	0.175	2.681	0.586	1	1	8.441			
T2	105.87	591.18	A	0.193	2.619	0.589	1	1	9.731	1488.52	198.47	A
84.50-77.00			B	0.18	2.663	0.587	1	1	9.086			
			C	0.17	2.701	0.585	1	1	8.547			
T3	112.91	628.42	A	0.204	2.582	0.591	1	1	9.941	1500.41	214.34	A
77.00-70.00			B	0.201	2.592	0.591	1	1	9.793			
			C	0.176	2.676	0.586	1	1	8.597			
T4	194.91	1396.63	A	0.239	2.471	0.599	1	1	21.753	2774.29	231.19	A
70.00-58.00			B	0.233	2.488	0.598	1	1	21.249			
			C	0.21	2.564	0.592	1	1	19.101			
T5	104.06	787.49	A	0.238	2.475	0.599	1	1	12.490	1486.21	234.66	A
58.00-51.67			B	0.233	2.489	0.598	1	1	12.257			
			C	0.212	2.555	0.593	1	1	11.161			
T6	104.06	804.31	A	0.231	2.495	0.597	1	1	12.728	1457.67	230.16	A
51.67-45.33			B	0.227	2.507	0.596	1	1	12.510			
			C	0.207	2.571	0.592	1	1	11.417			
T7	104.06	948.32	A	0.262	2.403	0.605	1	1	15.053	1515.18	239.24	A
45.33-39.00			B	0.253	2.429	0.603	1	1	14.533			
			C	0.232	2.491	0.598	1	1	13.367			
T8	280.51	2441.09	A	0.194	2.618	0.589	1	1	32.300	3500.59	205.92	A
39.00-22.00			B	0.193	2.618	0.589	1	1	32.277			
			C	0.177	2.675	0.586	1	1	29.536			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	1	1	43.868	4198.99	190.86	B
			B	0.186	2.645	0.588	1	1	43.994			
			C	0.175	2.682	0.586	1	1	41.498			
Sum Weight:	1360.80	12387.06						OTM	896.55 kip-ft	19275.68		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	0.825	1	7.698	1216.66	162.22	A
92.00-84.50			B	0.177	2.673	0.586	0.825	1	7.054			
			C	0.175	2.681	0.586	0.825	1	6.964			
T2	105.87	591.18	A	0.193	2.619	0.589	0.825	1	8.028	1349.00	179.87	A
84.50-77.00			B	0.18	2.663	0.587	0.825	1	7.496			
			C	0.17	2.701	0.585	0.825	1	7.052			
T3	112.91	628.42	A	0.204	2.582	0.591	0.825	1	8.202	1363.60	194.80	A
77.00-70.00			B	0.201	2.592	0.591	0.825	1	8.079			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.176	2.676	0.586	0.825	1	7.092			
T4	194.91	1396.63	A	0.239	2.471	0.599	0.825	1	17.946	2498.93	208.24	A
70.00-58.00			B	0.233	2.488	0.598	0.825	1	17.530			
			C	0.21	2.564	0.592	0.825	1	15.759			
T5	104.06	787.49	A	0.238	2.475	0.599	0.825	1	10.304	1334.68	210.74	A
58.00-51.67			B	0.233	2.489	0.598	0.825	1	10.112			
			C	0.212	2.555	0.593	0.825	1	9.208			
T6	104.06	804.31	A	0.231	2.495	0.597	0.825	1	10.500	1307.40	206.43	A
51.67-45.33			B	0.227	2.507	0.596	0.825	1	10.321			
			C	0.207	2.571	0.592	0.825	1	9.419			
T7	104.06	948.32	A	0.262	2.403	0.605	0.825	1	12.419	1350.73	213.27	A
45.33-39.00			B	0.253	2.429	0.603	0.825	1	11.990			
			C	0.232	2.491	0.598	0.825	1	11.028			
T8	280.51	2441.09	A	0.194	2.618	0.589	0.825	1	26.647	3142.17	184.83	A
39.00-22.00			B	0.193	2.618	0.589	0.825	1	26.629			
			C	0.177	2.675	0.586	0.825	1	24.367			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	0.825	1	36.191	3705.65	168.44	B
			B	0.186	2.645	0.588	0.825	1	36.295			
			C	0.175	2.682	0.586	0.825	1	34.236			
Sum Weight:	1360.80	12387.06						OTM	806.61 kip-ft	17268.81		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	0.8	1	7.465	1197.06	159.61	A
92.00-84.50			B	0.177	2.673	0.586	0.8	1	6.840			
			C	0.175	2.681	0.586	0.8	1	6.753			
T2	105.87	591.18	A	0.193	2.619	0.589	0.8	1	7.785	1329.06	177.21	A
84.50-77.00			B	0.18	2.663	0.587	0.8	1	7.268			
			C	0.17	2.701	0.585	0.8	1	6.838			
T3	112.91	628.42	A	0.204	2.582	0.591	0.8	1	7.953	1344.06	192.01	A
77.00-70.00			B	0.201	2.592	0.591	0.8	1	7.834			
			C	0.176	2.676	0.586	0.8	1	6.877			
T4	194.91	1396.63	A	0.239	2.471	0.599	0.8	1	17.402	2459.59	204.97	A
70.00-58.00			B	0.233	2.488	0.598	0.8	1	16.999			
			C	0.21	2.564	0.592	0.8	1	15.281			
T5	104.06	787.49	A	0.238	2.475	0.599	0.8	1	9.992	1313.04	207.32	A
58.00-51.67			B	0.233	2.489	0.598	0.8	1	9.806			
			C	0.212	2.555	0.593	0.8	1	8.929			
T6	104.06	804.31	A	0.231	2.495	0.597	0.8	1	10.182	1285.93	203.04	A
51.67-45.33			B	0.227	2.507	0.596	0.8	1	10.008			
			C	0.207	2.571	0.592	0.8	1	9.134			
T7	104.06	948.32	A	0.262	2.403	0.605	0.8	1	12.043	1327.24	209.56	A
45.33-39.00			B	0.253	2.429	0.603	0.8	1	11.626			
			C	0.232	2.491	0.598	0.8	1	10.693			
T8	280.51	2441.09	A	0.194	2.618	0.589	0.8	1	25.840	3090.96	181.82	A
39.00-22.00			B	0.193	2.618	0.589	0.8	1	25.822			
			C	0.177	2.675	0.586	0.8	1	23.629			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	0.8	1	35.094	3635.17	165.24	B
			B	0.186	2.645	0.588	0.8	1	35.195			
			C	0.175	2.682	0.586	0.8	1	33.198			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
Sum Weight:	1360.80	12387.06						OTM	793.76 kip-ft	16982.11		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	0.85	1	7.931	1236.25	164.83	A
92.00-84.50			B	0.177	2.673	0.586	0.85	1	7.268			
			C	0.175	2.681	0.586	0.85	1	7.175			
T2	105.87	591.18	A	0.193	2.619	0.589	0.85	1	8.271	1368.93	182.52	A
84.50-77.00			B	0.18	2.663	0.587	0.85	1	7.723			
			C	0.17	2.701	0.585	0.85	1	7.265			
T3	112.91	628.42	A	0.204	2.582	0.591	0.85	1	8.450	1383.15	197.59	A
77.00-70.00			B	0.201	2.592	0.591	0.85	1	8.324			
			C	0.176	2.676	0.586	0.85	1	7.307			
T4	194.91	1396.63	A	0.239	2.471	0.599	0.85	1	18.490	2538.27	211.52	A
70.00-58.00			B	0.233	2.488	0.598	0.85	1	18.062			
			C	0.21	2.564	0.592	0.85	1	16.236			
T5	104.06	787.49	A	0.238	2.475	0.599	0.85	1	10.616	1356.33	214.16	A
58.00-51.67			B	0.233	2.489	0.598	0.85	1	10.419			
			C	0.212	2.555	0.593	0.85	1	9.487			
T6	104.06	804.31	A	0.231	2.495	0.597	0.85	1	10.819	1328.87	209.82	A
51.67-45.33			B	0.227	2.507	0.596	0.85	1	10.633			
			C	0.207	2.571	0.592	0.85	1	9.705			
T7	104.06	948.32	A	0.262	2.403	0.605	0.85	1	12.795	1374.22	216.98	A
45.33-39.00			B	0.253	2.429	0.603	0.85	1	12.353			
			C	0.232	2.491	0.598	0.85	1	11.362			
T8	280.51	2441.09	A	0.194	2.618	0.589	0.85	1	27.455	3193.37	187.85	A
39.00-22.00			B	0.193	2.618	0.589	0.85	1	27.436			
			C	0.177	2.675	0.586	0.85	1	25.106			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	0.85	1	37.288	3776.13	171.64	B
			B	0.186	2.645	0.588	0.85	1	37.395			
			C	0.175	2.682	0.586	0.85	1	35.273			
Sum Weight:	1360.80	12387.06						OTM	819.45 kip-ft	17555.50		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	271.19	821.84	A	0.258	2.414	0.604	1	1	11.306	1914.80	255.31	A
92.00-84.50			B	0.224	2.518	0.596	1	1	9.787			
			C	0.218	2.538	0.594	1	1	9.513			
T2	330.60	856.23	A	0.256	2.42	0.603	1	1	11.739	2157.49	287.67	A
84.50-77.00			B	0.222	2.525	0.595	1	1	10.213			
			C	0.205	2.579	0.591	1	1	9.375			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T3	354.96	867.60	A	0.259	2.411	0.604	1	1	11.958	2199.33	314.19	A
77.00-70.00			B	0.237	2.478	0.599	1	1	11.097			
			C	0.199	2.598	0.59	1	1	9.307			
T4	616.06	1950.55	A	0.295	2.31	0.614	1	1	25.563	3949.44	329.12	A
70.00-58.00			B	0.268	2.384	0.607	1	1	23.579			
			C	0.231	2.494	0.597	1	1	20.290			
T5	331.79	1086.76	A	0.29	2.322	0.613	1	1	14.558	2104.19	332.24	A
58.00-51.67			B	0.267	2.388	0.606	1	1	13.538			
			C	0.235	2.483	0.598	1	1	11.895			
T6	331.79	1111.30	A	0.283	2.341	0.611	1	1	14.844	2057.38	324.85	A
51.67-45.33			B	0.261	2.404	0.605	1	1	13.854			
			C	0.231	2.495	0.597	1	1	12.217			
T7	331.79	1333.47	A	0.325	2.232	0.624	1	1	17.686	2099.45	331.49	A
45.33-39.00			B	0.292	2.318	0.613	1	1	16.056			
			C	0.261	2.406	0.605	1	1	14.286			
T8	897.33	3422.98	A	0.239	2.47	0.599	1	1	37.823	4982.28	293.08	A
39.00-22.00			B	0.226	2.51	0.596	1	1	36.235			
			C	0.202	2.589	0.591	1	1	32.228			
T9 22.00-0.00	851.66	5547.32	A	0.224	2.519	0.595	1	1	50.550	5677.33	258.06	A
			B	0.217	2.541	0.594	1	1	49.399			
			C	0.202	2.59	0.591	1	1	45.840			
Sum Weight:	4317.18	16998.03						OTM	1275.71 kip-ft	27141.68		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	271.19	821.84	A	0.258	2.414	0.604	0.825	1	9.673	1788.34	238.45	A
92.00-84.50			B	0.224	2.518	0.596	0.825	1	8.369			
			C	0.218	2.538	0.594	0.825	1	8.133			
T2	330.60	856.23	A	0.256	2.42	0.603	0.825	1	10.036	2028.59	270.48	A
84.50-77.00			B	0.222	2.525	0.595	0.825	1	8.710			
			C	0.205	2.579	0.591	0.825	1	8.009			
T3	354.96	867.60	A	0.259	2.411	0.604	0.825	1	10.082	2061.62	294.52	A
77.00-70.00			B	0.237	2.478	0.599	0.825	1	9.302			
			C	0.199	2.598	0.59	0.825	1	7.809			
T4	616.06	1950.55	A	0.295	2.31	0.614	0.825	1	21.523	3676.19	306.35	A
70.00-58.00			B	0.268	2.384	0.607	0.825	1	19.752			
			C	0.231	2.494	0.597	0.825	1	17.003			
T5	331.79	1086.76	A	0.29	2.322	0.613	0.825	1	12.249	1954.04	308.53	A
58.00-51.67			B	0.267	2.388	0.606	0.825	1	11.338			
			C	0.235	2.483	0.598	0.825	1	9.967			
T6	331.79	1111.30	A	0.283	2.341	0.611	0.825	1	12.493	1908.56	301.35	A
51.67-45.33			B	0.261	2.404	0.605	0.825	1	11.608			
			C	0.231	2.495	0.597	0.825	1	10.242			
T7	331.79	1333.47	A	0.325	2.232	0.624	0.825	1	14.928	1939.52	306.24	A
45.33-39.00			B	0.292	2.318	0.613	0.825	1	13.493			
			C	0.261	2.406	0.605	0.825	1	12.012			
T8	897.33	3422.98	A	0.239	2.47	0.599	0.825	1	31.840	4624.23	272.01	A
39.00-22.00			B	0.226	2.51	0.596	0.825	1	30.372			
			C	0.202	2.589	0.591	0.825	1	27.037			
T9 22.00-0.00	851.66	5547.32	A	0.224	2.519	0.595	0.825	1	42.445	5182.71	235.58	A
			B	0.217	2.541	0.594	0.825	1	41.370			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
Sum Weight:	4317.18	16998.03	C	0.202	2.59	0.591	0.825	1 OTM	38.415 1187.98 kip-ft	25163.81		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	271.19	821.84	A	0.258	2.414	0.604	0.8	1	9.440	1770.27	236.04	A
92.00-84.50			B	0.224	2.518	0.596	0.8	1	8.166			
			C	0.218	2.538	0.594	0.8	1	7.936			
T2	330.60	856.23	A	0.256	2.42	0.603	0.8	1	9.792	2010.17	268.02	A
84.50-77.00			B	0.222	2.525	0.595	0.8	1	8.496			
			C	0.205	2.579	0.591	0.8	1	7.814			
T3	354.96	867.60	A	0.259	2.411	0.604	0.8	1	9.814	2041.95	291.71	A
77.00-70.00			B	0.237	2.478	0.599	0.8	1	9.046			
			C	0.199	2.598	0.59	0.8	1	7.595			
T4	616.06	1950.55	A	0.295	2.31	0.614	0.8	1	20.946	3637.16	303.10	A
70.00-58.00			B	0.268	2.384	0.607	0.8	1	19.206			
			C	0.231	2.494	0.597	0.8	1	16.534			
T5	331.79	1086.76	A	0.29	2.322	0.613	0.8	1	11.920	1932.59	305.15	A
58.00-51.67			B	0.267	2.388	0.606	0.8	1	11.024			
			C	0.235	2.483	0.598	0.8	1	9.691			
T6	331.79	1111.30	A	0.283	2.341	0.611	0.8	1	12.157	1887.30	297.99	A
51.67-45.33			B	0.261	2.404	0.605	0.8	1	11.288			
			C	0.231	2.495	0.597	0.8	1	9.960			
T7	331.79	1333.47	A	0.325	2.232	0.624	0.8	1	14.534	1916.68	302.63	A
45.33-39.00			B	0.292	2.318	0.613	0.8	1	13.127			
			C	0.261	2.406	0.605	0.8	1	11.687			
T8	897.33	3422.98	A	0.239	2.47	0.599	0.8	1	30.985	4573.08	269.00	A
39.00-22.00			B	0.226	2.51	0.596	0.8	1	29.535			
			C	0.202	2.589	0.591	0.8	1	26.295			
T9 22.00-0.00	851.66	5547.32	A	0.224	2.519	0.595	0.8	1	41.287	5112.06	232.37	A
			B	0.217	2.541	0.594	0.8	1	40.223			
			C	0.202	2.59	0.591	0.8	1	37.354			
Sum Weight:	4317.18	16998.03						OTM	1175.44 kip-ft	24881.25		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	271.19	821.84	A	0.258	2.414	0.604	0.85	1	9.906	1806.40	240.85	A
92.00-84.50			B	0.224	2.518	0.596	0.85	1	8.571			
			C	0.218	2.538	0.594	0.85	1	8.330			
T2	330.60	856.23	A	0.256	2.42	0.603	0.85	1	10.279	2047.00	272.93	A
84.50-77.00			B	0.222	2.525	0.595	0.85	1	8.925			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			C	0.205	2.579	0.591	0.85	1	8.204			
T3	354.96	867.60	A	0.259	2.411	0.604	0.85	1	10.350	2081.29	297.33	A
77.00-70.00			B	0.237	2.478	0.599	0.85	1	9.559			
			C	0.199	2.598	0.59	0.85	1	8.023			
T4	616.06	1950.55	A	0.295	2.31	0.614	0.85	1	22.100	3715.23	309.60	A
70.00-58.00			B	0.268	2.384	0.607	0.85	1	20.299			
			C	0.231	2.494	0.597	0.85	1	17.473			
T5	331.79	1086.76	A	0.29	2.322	0.613	0.85	1	12.579	1975.49	311.92	A
58.00-51.67			B	0.267	2.388	0.606	0.85	1	11.652			
			C	0.235	2.483	0.598	0.85	1	10.242			
T6	331.79	1111.30	A	0.283	2.341	0.611	0.85	1	12.829	1929.82	304.71	A
51.67-45.33			B	0.261	2.404	0.605	0.85	1	11.929			
			C	0.231	2.495	0.597	0.85	1	10.525			
T7	331.79	1333.47	A	0.325	2.232	0.624	0.85	1	15.322	1962.37	309.85	A
45.33-39.00			B	0.292	2.318	0.613	0.85	1	13.859			
			C	0.261	2.406	0.605	0.85	1	12.337			
T8	897.33	3422.98	A	0.239	2.47	0.599	0.85	1	32.695	4675.38	275.02	A
39.00-22.00			B	0.226	2.51	0.596	0.85	1	31.210			
			C	0.202	2.589	0.591	0.85	1	27.778			
T9 22.00-0.00	851.66	5547.32	A	0.224	2.519	0.595	0.85	1	43.603	5253.37	238.79	A
			B	0.217	2.541	0.594	0.85	1	42.517			
			C	0.202	2.59	0.591	0.85	1	39.476			
Sum Weight:	4317.18	16998.03						OTM	1200.51 kip-ft	25446.36		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	1	1	9.331	1353.81	180.51	A
92.00-84.50			B	0.177	2.673	0.586	1	1	8.550			
			C	0.175	2.681	0.586	1	1	8.441			
T2	105.87	591.18	A	0.193	2.619	0.589	1	1	9.731	1488.52	198.47	A
84.50-77.00			B	0.18	2.663	0.587	1	1	9.086			
			C	0.17	2.701	0.585	1	1	8.547			
T3	112.91	628.42	A	0.204	2.582	0.591	1	1	9.941	1500.41	214.34	A
77.00-70.00			B	0.201	2.592	0.591	1	1	9.793			
			C	0.176	2.676	0.586	1	1	8.597			
T4	194.91	1396.63	A	0.239	2.471	0.599	1	1	21.753	2774.29	231.19	A
70.00-58.00			B	0.233	2.488	0.598	1	1	21.249			
			C	0.21	2.564	0.592	1	1	19.101			
T5	104.06	787.49	A	0.238	2.475	0.599	1	1	12.490	1486.21	234.66	A
58.00-51.67			B	0.233	2.489	0.598	1	1	12.257			
			C	0.212	2.555	0.593	1	1	11.161			
T6	104.06	804.31	A	0.231	2.495	0.597	1	1	12.728	1457.67	230.16	A
51.67-45.33			B	0.227	2.507	0.596	1	1	12.510			
			C	0.207	2.571	0.592	1	1	11.417			
T7	104.06	948.32	A	0.262	2.403	0.605	1	1	15.053	1515.18	239.24	A
45.33-39.00			B	0.253	2.429	0.603	1	1	14.533			
			C	0.232	2.491	0.598	1	1	13.367			
T8	280.51	2441.09	A	0.194	2.618	0.589	1	1	32.300	3500.59	205.92	A
39.00-22.00			B	0.193	2.618	0.589	1	1	32.277			
			C	0.177	2.675	0.586	1	1	29.536			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	1	1	43.868	4198.99	190.86	B

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
			B	0.186	2.645	0.588	1	1	43.994			
			C	0.175	2.682	0.586	1	1	41.498			
Sum Weight:	1360.80	12387.06						OTM	896.55 kip-ft	19275.68		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	0.825	1	7.698	1216.66	162.22	A
92.00-84.50			B	0.177	2.673	0.586	0.825	1	7.054			
			C	0.175	2.681	0.586	0.825	1	6.964			
T2	105.87	591.18	A	0.193	2.619	0.589	0.825	1	8.028	1349.00	179.87	A
84.50-77.00			B	0.18	2.663	0.587	0.825	1	7.496			
			C	0.17	2.701	0.585	0.825	1	7.052			
T3	112.91	628.42	A	0.204	2.582	0.591	0.825	1	8.202	1363.60	194.80	A
77.00-70.00			B	0.201	2.592	0.591	0.825	1	8.079			
			C	0.176	2.676	0.586	0.825	1	7.092			
T4	194.91	1396.63	A	0.239	2.471	0.599	0.825	1	17.946	2498.93	208.24	A
70.00-58.00			B	0.233	2.488	0.598	0.825	1	17.530			
			C	0.21	2.564	0.592	0.825	1	15.759			
T5	104.06	787.49	A	0.238	2.475	0.599	0.825	1	10.304	1334.68	210.74	A
58.00-51.67			B	0.233	2.489	0.598	0.825	1	10.112			
			C	0.212	2.555	0.593	0.825	1	9.208			
T6	104.06	804.31	A	0.231	2.495	0.597	0.825	1	10.500	1307.40	206.43	A
51.67-45.33			B	0.227	2.507	0.596	0.825	1	10.321			
			C	0.207	2.571	0.592	0.825	1	9.419			
T7	104.06	948.32	A	0.262	2.403	0.605	0.825	1	12.419	1350.73	213.27	A
45.33-39.00			B	0.253	2.429	0.603	0.825	1	11.990			
			C	0.232	2.491	0.598	0.825	1	11.028			
T8	280.51	2441.09	A	0.194	2.618	0.589	0.825	1	26.647	3142.17	184.83	A
39.00-22.00			B	0.193	2.618	0.589	0.825	1	26.629			
			C	0.177	2.675	0.586	0.825	1	24.367			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	0.825	1	36.191	3705.65	168.44	B
			B	0.186	2.645	0.588	0.825	1	36.295			
			C	0.175	2.682	0.586	0.825	1	34.236			
Sum Weight:	1360.80	12387.06						OTM	806.61 kip-ft	17268.81		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	0.8	1	7.465	1197.06	159.61	A
92.00-84.50			B	0.177	2.673	0.586	0.8	1	6.840			
			C	0.175	2.681	0.586	0.8	1	6.753			
T2	105.87	591.18	A	0.193	2.619	0.589	0.8	1	7.785	1329.06	177.21	A

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
84.50-77.00			B	0.18	2.663	0.587	0.8	1	7.268			
			C	0.17	2.701	0.585	0.8	1	6.838			
T3	112.91	628.42	A	0.204	2.582	0.591	0.8	1	7.953	1344.06	192.01	A
77.00-70.00			B	0.201	2.592	0.591	0.8	1	7.834			
			C	0.176	2.676	0.586	0.8	1	6.877			
T4	194.91	1396.63	A	0.239	2.471	0.599	0.8	1	17.402	2459.59	204.97	A
70.00-58.00			B	0.233	2.488	0.598	0.8	1	16.999			
			C	0.21	2.564	0.592	0.8	1	15.281			
T5	104.06	787.49	A	0.238	2.475	0.599	0.8	1	9.992	1313.04	207.32	A
58.00-51.67			B	0.233	2.489	0.598	0.8	1	9.806			
			C	0.212	2.555	0.593	0.8	1	8.929			
T6	104.06	804.31	A	0.231	2.495	0.597	0.8	1	10.182	1285.93	203.04	A
51.67-45.33			B	0.227	2.507	0.596	0.8	1	10.008			
			C	0.207	2.571	0.592	0.8	1	9.134			
T7	104.06	948.32	A	0.262	2.403	0.605	0.8	1	12.043	1327.24	209.56	A
45.33-39.00			B	0.253	2.429	0.603	0.8	1	11.626			
			C	0.232	2.491	0.598	0.8	1	10.693			
T8	280.51	2441.09	A	0.194	2.618	0.589	0.8	1	25.840	3090.96	181.82	A
39.00-22.00			B	0.193	2.618	0.589	0.8	1	25.822			
			C	0.177	2.675	0.586	0.8	1	23.629			
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	0.8	1	35.094	3635.17	165.24	B
			B	0.186	2.645	0.588	0.8	1	35.195			
			C	0.175	2.682	0.586	0.8	1	33.198			
Sum Weight:	1360.80	12387.06						OTM	793.76 kip-ft	16982.11		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	89.14	568.91	A	0.194	2.618	0.589	0.85	1	7.931	1236.25	164.83	A
92.00-84.50			B	0.177	2.673	0.586	0.85	1	7.268			
			C	0.175	2.681	0.586	0.85	1	7.175			
T2	105.87	591.18	A	0.193	2.619	0.589	0.85	1	8.271	1368.93	182.52	A
84.50-77.00			B	0.18	2.663	0.587	0.85	1	7.723			
			C	0.17	2.701	0.585	0.85	1	7.265			
T3	112.91	628.42	A	0.204	2.582	0.591	0.85	1	8.450	1383.15	197.59	A
77.00-70.00			B	0.201	2.592	0.591	0.85	1	8.324			
			C	0.176	2.676	0.586	0.85	1	7.307			
T4	194.91	1396.63	A	0.239	2.471	0.599	0.85	1	18.490	2538.27	211.52	A
70.00-58.00			B	0.233	2.488	0.598	0.85	1	18.062			
			C	0.21	2.564	0.592	0.85	1	16.236			
T5	104.06	787.49	A	0.238	2.475	0.599	0.85	1	10.616	1356.33	214.16	A
58.00-51.67			B	0.233	2.489	0.598	0.85	1	10.419			
			C	0.212	2.555	0.593	0.85	1	9.487			
T6	104.06	804.31	A	0.231	2.495	0.597	0.85	1	10.819	1328.87	209.82	A
51.67-45.33			B	0.227	2.507	0.596	0.85	1	10.633			
			C	0.207	2.571	0.592	0.85	1	9.705			
T7	104.06	948.32	A	0.262	2.403	0.605	0.85	1	12.795	1374.22	216.98	A
45.33-39.00			B	0.253	2.429	0.603	0.85	1	12.353			
			C	0.232	2.491	0.598	0.85	1	11.362			
T8	280.51	2441.09	A	0.194	2.618	0.589	0.85	1	27.455	3193.37	187.85	A
39.00-22.00			B	0.193	2.618	0.589	0.85	1	27.436			
			C	0.177	2.675	0.586	0.85	1	25.106			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T9 22.00-0.00	265.28	4220.70	A	0.185	2.647	0.587	0.85	1	37.288	3776.13	171.64	B
			B	0.186	2.645	0.588	0.85	1	37.395			
			C	0.175	2.682	0.586	0.85	1	35.273			
Sum Weight:	1360.80	12387.06						OTM	819.45 kip-ft	17555.50		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	4217.45					
Bracing Weight	8169.60					
Total Member Self-Weight	12387.06			-0.19	-3.65	
Total Weight	17532.78			-0.19	-3.65	
Wind 0 deg - No Ice		14.08	-26475.93	-1506.79	-11.27	10.53
Wind 30 deg - No Ice		12495.41	-21446.15	-1241.99	-731.07	12.25
Wind 45 deg - No Ice		17461.17	-17312.19	-1007.31	-1019.35	11.71
Wind 60 deg - No Ice		21132.04	-12103.37	-708.70	-1233.70	10.34
Wind 90 deg - No Ice		24966.45	-14.08	-7.81	-1445.29	5.71
Wind 120 deg - No Ice		23104.26	13225.77	746.52	-1315.10	-0.08
Wind 135 deg - No Ice		17441.27	17292.28	996.16	-1008.57	-3.71
Wind 150 deg - No Ice		12471.03	21432.07	1234.00	-717.87	-6.55
Wind 180 deg - No Ice		-14.08	24182.36	1403.63	3.97	-10.96
Wind 210 deg - No Ice		-12495.41	21446.15	1241.62	723.77	-12.25
Wind 225 deg - No Ice		-17461.17	17312.19	1006.94	1012.05	-11.71
Wind 240 deg - No Ice		-23118.33	13250.16	759.72	1315.42	-10.46
Wind 270 deg - No Ice		-24966.45	14.08	7.43	1437.99	-5.71
Wind 300 deg - No Ice		-21117.97	-12078.99	-695.50	1218.79	0.62
Wind 315 deg - No Ice		-17441.27	-17292.28	-996.53	1001.27	3.71
Wind 330 deg - No Ice		-12471.03	-21432.07	-1234.37	710.57	6.55
Member Ice	4610.98					
Total Weight Ice	27160.62			0.92	-5.79	
Wind 0 deg - Ice		96.14	-35911.19	-2015.25	-20.14	11.12
Wind 30 deg - Ice		17301.46	-29679.87	-1687.18	-995.34	15.41
Wind 45 deg - Ice		24218.40	-24062.45	-1372.83	-1388.93	15.83
Wind 60 deg - Ice		29381.47	-16908.63	-969.45	-1683.68	15.13
Wind 90 deg - Ice		34436.41	-96.14	-13.43	-1960.03	10.96
Wind 120 deg - Ice		31242.93	17872.34	996.58	-1756.17	4.40
Wind 135 deg - Ice		24082.44	23926.49	1354.39	-1368.64	-0.46
Wind 150 deg - Ice		17134.95	29583.74	1674.68	-970.49	-4.45
Wind 180 deg - Ice		-96.14	33650.75	1916.82	8.56	-11.58
Wind 210 deg - Ice		-17301.46	29679.87	1689.02	983.75	-15.41
Wind 225 deg - Ice		-24218.40	24062.45	1374.67	1377.35	-15.83
Wind 240 deg - Ice		-31339.07	18038.85	1021.43	1758.93	-15.52
Wind 270 deg - Ice		-34436.41	96.14	15.27	1948.45	-10.96
Wind 300 deg - Ice		-29285.34	-16742.12	-944.61	1657.75	-3.55
Wind 315 deg - Ice		-24082.44	-23926.49	-1352.54	1357.06	0.46
Wind 330 deg - Ice		-17134.95	-29583.74	-1672.83	958.90	4.45
Total Weight	17532.78			-0.19	-3.65	
Wind 0 deg - Service		14.08	-26475.93	-1506.09	-11.77	10.53
Wind 30 deg - Service		12495.41	-21446.15	-1241.29	-731.58	12.25
Wind 45 deg - Service		17461.17	-17312.19	-1006.61	-1019.85	11.71
Wind 60 deg - Service		21132.04	-12103.37	-707.99	-1234.21	10.34
Wind 90 deg - Service		24966.45	-14.08	-7.10	-1445.80	5.71

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 120 deg - Service		23104.26	13225.77	747.22	-1315.61	-0.08
Wind 135 deg - Service		17441.27	17292.28	996.86	-1009.08	-3.71
Wind 150 deg - Service		12471.03	21432.07	1234.70	-718.38	-6.55
Wind 180 deg - Service		-14.08	24182.36	1404.34	3.46	-10.96
Wind 210 deg - Service		-12495.41	21446.15	1242.32	723.26	-12.25
Wind 225 deg - Service		-17461.17	17312.19	1007.64	1011.54	-11.71
Wind 240 deg - Service		-23118.33	13250.16	760.42	1314.92	-10.46
Wind 270 deg - Service		-24966.45	14.08	8.14	1437.49	-5.71
Wind 300 deg - Service		-21117.97	-12078.99	-694.79	1218.28	0.62
Wind 315 deg - Service		-17441.27	-17292.28	-995.83	1000.77	3.71
Wind 330 deg - Service		-12471.03	-21432.07	-1233.67	710.07	6.55

Load Combinations

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

Comb. No.	Description
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	92 - 84.5	5.202	46	0.4686	0.0920
T2	84.5 - 77	4.463	46	0.4600	0.0885
T3	77 - 70	3.751	46	0.4326	0.0866
T4	70 - 58	3.126	46	0.4018	0.0772
T5	58 - 51.6667	2.158	46	0.3476	0.0619
T6	51.6667 - 45.3333	1.705	46	0.3154	0.0555
T7	45.3333 - 39	1.296	46	0.2778	0.0497
T8	39 - 22	0.942	46	0.2357	0.0445
T9	22 - 0	0.277	46	0.1351	0.0194

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
103.80	dbSpectra DS2C00F36D-D Omni Antenna	46	5.202	0.4686	0.0920	33622
94.50	432E-83I-01T TTA Unit	46	5.202	0.4686	0.0920	33622
92.00	(2) TT19-08BP111-001 TMA	46	5.202	0.4686	0.0920	33622
85.00	T-Boom/Gate Mount	46	4.512	0.4611	0.0887	24788
80.00	SC479-HF1LDF	46	4.031	0.4452	0.0880	16513
79.50	Kreco CO-36A Omni Antenna	46	3.984	0.4432	0.0879	16067
74.50	PA6-65AC	46	3.523	0.4217	0.0839	13833
72.50	SitePro1 PSA6 w/ Support Arm	46	3.344	0.4128	0.0811	13582
71.50	6'x6" Dipole Antenna	46	3.256	0.4084	0.0795	13467
60.00	432E-83I-01T TTA Unit	46	2.310	0.3570	0.0641	12100
54.50	DB222-A	46	1.903	0.3304	0.0583	11567
39.00	SY203(C) - YAGI Antenna	46	0.942	0.2357	0.0445	8768

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	92 - 84.5	6.862	30	0.6125	0.1102

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T2	84.5 - 77	5.897	30	0.6016	0.1064
T3	77 - 70	4.965	30	0.5674	0.1045
T4	70 - 58	4.144	30	0.5285	0.0934
T5	58 - 51.6667	2.870	30	0.4590	0.0755
T6	51.6667 - 45.3333	2.271	30	0.4172	0.0679
T7	45.3333 - 39	1.729	30	0.3681	0.0610
T8	39 - 22	1.259	30	0.3127	0.0547
T9	22 - 0	0.372	30	0.1800	0.0243

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
103.80	dbSpectra DS2C00F36D-D Omni Antenna	30	6.862	0.6125	0.1102	27711
94.50	432E-83I-01T TTA Unit	30	6.862	0.6125	0.1102	27711
92.00	(2) TT19-08BP111-001 TMA	30	6.862	0.6125	0.1102	27711
85.00	T-Boom/Gate Mount	30	5.961	0.6030	0.1065	20374
80.00	SC479-HF1LDF	30	5.332	0.5832	0.1060	13248
79.50	Kreco CO-36A Omni Antenna	30	5.271	0.5807	0.1059	12860
74.50	PA6-65AC	30	4.666	0.5537	0.1014	10818
72.50	SitePro1 PSA6 w/ Support Arm	30	4.431	0.5425	0.0980	10538
71.50	6'x6" Dipole Antenna	30	4.316	0.5369	0.0961	10427
60.00	432E-83I-01T TTA Unit	30	3.070	0.4712	0.0781	9399
54.50	DB222-A	30	2.532	0.4367	0.0712	8971
39.00	SY203(C) - YAGI Antenna	30	1.259	0.3127	0.0547	6725

DESIGN STRENGTH OF SCHIFFLERIZED ANGLE STRUTS
(AISC ENGINEERING JOURNAL – SECOND QUARTER 1991)

Design Strength of Schifflerized Angle Struts

SESHU MADHAVA RAO ADLURI and MURTY K. S. MADUGULA

ABSTRACT

Latticed triangular-base steel towers have been used as communication structures for a long time. The legs of these towers generally consist of "schifflerized" angles (90° equal leg angles bent to 60°). For ready use of designers, the geometric properties and design axial compressive strengths of schifflerized angles are presented using recommendations based on a recent experimental study.

NOTATION

A = A_g = gross area of cross-section
a = length of unbent portion of schifflerized angle leg
b = length of bent portion of schifflerized angle leg
C_w = warping constant
F_{cr} = critical stress
I_{pc} = polar moment of inertia about centroid
I_{ps} = polar moment of inertia about shear center
I_u = maximum moment of inertia (about u-u axis)
I_v = minimum moment of inertia (about v-v axis)
J = Saint-Venant's torsion constant
r_u = maximum radius of gyration (about u-u axis)
r_v = minimum radius of gyration (about v-v axis)
t = thickness of the leg of schifflerized angle member
$\bar{u}_c$ = distance of the centroid from heel
$\bar{u}_s$ = distance between the centroid and shear center
ϕ_c = resistance factor for axial compression

INTRODUCTION

General

Steel angles find widespread use in steel construction. Of special interest is their application in latticed towers. These towers are generally designed to have a rectangular or triangular base. The triangular-base tower, with one leg member at each of the three corners of an equilateral triangle, is frequently employed in guyed and self-supporting communication towers. Triangular-base towers result in a significant reduction in the weight of the structure when compared to rectangular-base towers. In case of triangular-base towers, in order to have smooth bracing connections, the included angle between the two leg plates of the main leg members should be 60°. This is achieved by "schifflerizing" the hot-rolled equal leg 90° angles. Each leg plate is bent inwards by 15° so that the angle between the leg plate and the axis of symmetry of the section is 30° as shown in Fig. 1 instead of 45°. The process involves either re-rolling or brake-pressing a 90° angle. The finished member is called a schifflerized angle. Such angles are used in U.S.A., Canada, Australia and other countries in preference to solid round bars whenever possible. The schifflerization process increases the moment of inertia of the schifflerized angle about the minor principal axis by approximately 20% to 50% and reduces the maximum moment of inertia by an equivalent amount when compared to regular 90° angle. Properties like area and Saint-Venant's torsion constant remain the same for both the schifflerized angle and the corresponding 90° angle. While the shear center of a 90° angle lies at the intersection of the center lines of the legs, for a schifflerized angle, it does not lie at this intersection point but is shifted to a new location along the axis of symmetry further away from the centroid as shown in Fig. 1. The warping constant of the schifflerized angle is increased to one-and-a-half to two times the value for 90° angle. Consequently, the member is stronger in flexural buckling and is weaker in flexural-

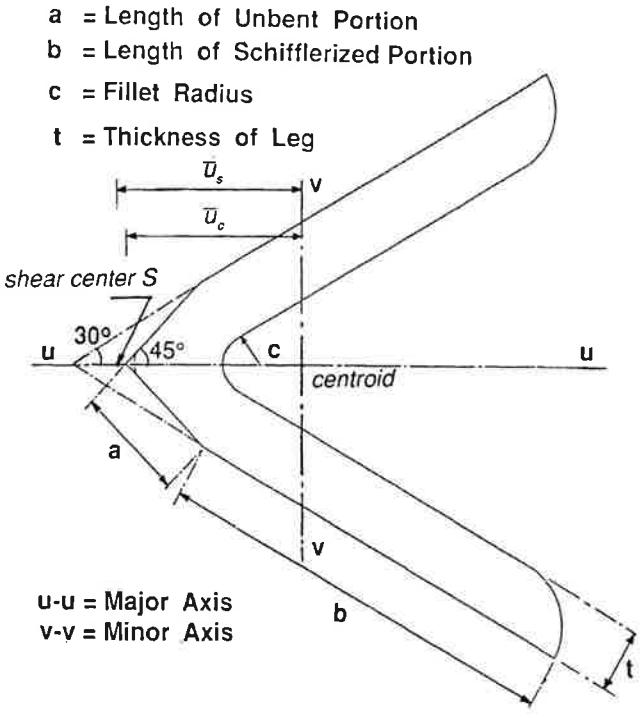


Fig. 1. Typical cross-section of a schifflerized angle.

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torsional buckling when compared to the regular 90° angle. The schifflerization process, while bending the legs inward by 15° each, cannot deform the heel (or root) portion of the original regular angle because of its high rigidity. As a result, every 60° angle will have a 90° unchanged root portion of length ranging from 1 in. to 2 in. (25 to 50 mm) depending upon the leg thickness (dimension "a" in Fig. 1). The process also introduces additional residual stresses into the section which add to the existing residual stresses due to the differential cooling of hot-rolled angles. However, studies[1] have shown that the effect of these additional residual stresses is minimal.

Geometric Properties of Schifflerized Angles

Although schifflerized angles are extensively used in triangular-base towers, no published literature is available concerning their properties and behavior. Design engineers dealing with schifflerized angles have thus far depended on knowledge extrapolated from the published literature about the regular 90° angles. For the ready use of designers, the properties of these angles are presented in Table 1. These are based on equations developed in Ref. 2. As is the accepted practice, all the properties (including Saint-Venant's torsion constant) of schifflerized angles have been consistently derived by idealizing the section into segments of rectangles. The derivations are made by assuming that the angle leg plates are thin (i.e., the section is represented by center lines of plates). This does not result in any error for computing the area of cross-section. However, the radii of gyration will be conservative on an average by approximately 0.5% when compared to the values derived using thick plate assumption. The warping constant has been estimated using Goodier's theory.[2] It may be noted that the AISC LRFD manual[3] lists the properties of regular 90° angle sections (except Saint-Venant's torsion constant) computed by idealizing the section into rectangular segments (Saint-Venant's torsion constant was estimated by including the effect of fillet radius).

Design Axial Compressive Strength

Although AISC LRFD manual[3] states that it is virtually impossible to load single angle struts concentrically, it is to be noted that single schifflerized angles are traditionally designed as concentrically loaded struts. A recent study[1] at the University of Windsor showed that AISC LRFD specifications satisfactorily predict the strength of schifflerized angles when the flat width to be used in strength computations is taken as the width of the bent portion ("b" in Fig. 1) of the angle leg. A total of 18 specimens were tested under concentric loading with slenderness ratios ranging between 50 and 100. The test specimens were selected to cover both flexural and flexural-torsional modes of failure. The average value of the ratio of nominal axial compressive strength ($A_g F_{cr}$) computed using the above recommendation and the test failure load was 0.88. The standard deviation of the ratios was 0.056. Using this recommendation, for ready use of designers, the design compressive strengths ($\phi_c A_g F_{cr}$) of these angles as per AISC LRFD specifications,[3] for different lengths are presented in Tables 2 and 3 for nominal yield stresses of 36 ksi and 50 ksi respectively. In calculating the strengths, the local buckling effects are considered as per Appendix B of the AISC LRFD specification. Although the maximum allowable slenderness ratio for compression members is 200, slenderness ratios for schifflerized angles rarely exceed 120 (since they are only used as main legs and not as web members). To include special cases when the slenderness ratio may exceed 120, the design axial compressive strengths have been tabulated for a maximum slenderness ratio of 150. The stepped lines in Tables 2 and 3 show the demarcation between flexural-torsional buckling mode and flexural buckling mode. Member strengths to the left of the stepped lines are governed by flexural-torsional buckling and those to the right are governed by flexural buckling.

ACKNOWLEDGMENTS

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Table 1.
Geometric Properties of Schifflerized Angles

Size in.	Thickness in.	a in.*	Area sq. in.	$\bar{u}_c$ in.	I_u in.^{4}	r_u in.	I_v in.^{4}	r_v in.	J In.^{4}	$\bar{u}_s$ in.	I_{ps} in.^{4}	I_{pc} in.^{4}	C_w in.^{6}
8 × 8	1⅛	2	16.7	3.81	98.0	2.42	56.4	1.84	7.06	3.48	357	154	38.5
	1	1¾	15.0	3.77	86.5	2.40	51.7	1.86	5.00	3.50	322	138	27.3
	⅞	1⅝	13.2	3.72	76.6	2.41	46.4	1.87	3.38	3.53	288	123	18.7
	¾	1⅜	11.4	3.68	65.2	2.39	41.0	1.89	2.14	3.54	249	106	11.9
	⅝	1¼	9.61	3.63	55.0	2.39	35.1	1.91	1.25	3.56	212	90.1	7.03
	9/16	13/16	8.68	3.60	49.8	2.40	32.0	1.92	0.916	3.57	192	81.8	5.18
	½	1⅛	7.75	3.58	44.6	2.40	28.8	1.93	0.646	3.58	172	73.3	3.68
6 × 6	1	1¾	11.0	2.91	36.7	1.83	20.1	1.35	3.67	2.58	130	56.8	11.1
	⅞	1⅝	9.73	2.86	32.6	1.83	18.2	1.37	2.48	2.61	117	50.8	7.67
	¾	1⅜	8.44	2.82	27.7	1.81	16.3	1.39	1.58	2.63	102	44.0	4.91
	⅝	1¼	7.11	2.77	23.5	1.82	14.1	1.41	0.926	2.66	87.7	37.5	2.94
	9/16	13/16	6.43	2.74	21.3	1.82	12.9	1.42	0.679	2.67	80.0	34.2	2.18
	½	1⅛	5.75	2.72	19.1	1.82	11.6	1.42	0.479	2.68	72.0	30.7	1.56
	7/16	13/32	5.06	2.68	16.9	1.83	10.4	1.43	0.323	2.69	64.0	27.3	1.07
	⅜	11/16	4.36	2.65	14.7	1.84	9.02	1.44	0.204	2.71	55.7	23.7	0.698
	5/16	1	3.65	2.63	12.4	1.84	7.65	1.45	0.119	2.72	47.0	20.0	0.416
5 × 5	⅞	1⅝	7.98	2.43	19.0	1.54	9.93	1.12	2.04	2.14	65.3	28.9	4.29
	¾	1⅜	6.94	2.39	16.1	1.52	8.98	1.14	1.30	2.17	57.7	25.1	2.78
	⅝	1¼	5.86	2.34	13.7	1.53	7.80	1.15	0.763	2.20	49.8	21.5	1.68
	½	1⅛	4.75	2.28	11.2	1.53	6.51	1.17	0.396	2.22	41.2	17.7	0.897
	7/16	13/32	4.18	2.25	9.93	1.54	5.81	1.18	0.267	2.24	36.7	15.7	0.622
	⅜	11/16	3.61	2.22	8.66	1.55	5.07	1.19	0.169	2.25	32.0	13.7	0.408
	5/16	1	3.03	2.20	7.29	1.55	4.32	1.19	0.0986	2.27	27.1	11.6	0.245
4 × 4	¾	1⅜	5.44	1.96	8.31	1.24	4.25	0.884	1.02	1.69	28.1	12.6	1.36
	⅝	1¼	4.61	1.91	7.09	1.24	3.74	0.901	0.600	1.73	24.6	10.8	0.832
	½	1⅛	3.75	1.86	5.80	1.24	3.16	0.918	0.313	1.76	20.5	8.96	0.453
	7/16	13/32	3.31	1.82	5.18	1.25	2.83	0.925	0.211	1.77	18.4	8.01	0.316
	⅜	11/16	2.86	1.79	4.54	1.26	2.48	0.932	0.134	1.79	16.2	7.02	0.210
	5/16	1	2.40	1.77	3.83	1.26	2.13	0.941	0.0782	1.80	13.8	5.95	0.128
	¼	15/16	1.94	1.74	3.10	1.27	1.75	0.950	0.0404	1.82	11.2	4.85	0.0701
3½ × 3½	½	1¼	3.25	1.64	3.93	1.10	2.03	0.791	0.271	1.52	13.5	5.96	0.298
	7/16	13/32	2.87	1.61	3.52	1.11	1.83	0.798	0.183	1.53	12.1	5.34	0.209
	⅜	11/16	2.48	1.58	3.09	1.12	1.61	0.805	0.116	1.55	10.7	4.70	0.140
	5/16	1	2.09	1.55	2.61	1.12	1.38	0.814	0.0680	1.57	9.1	3.99	0.0858
	¼	15/16	1.69	1.53	2.12	1.12	1.14	0.822	0.0352	1.58	7.48	3.26	0.0476
3 × 3	½	1¼	2.75	1.43	2.51	0.954	1.21	0.663	0.229	1.28	8.18	3.71	0.182
	7/16	13/32	2.43	1.40	2.25	0.962	1.09	0.670	0.155	1.29	7.39	3.34	0.129
	⅜	11/16	2.11	1.37	1.98	0.969	0.966	0.677	0.0989	1.31	6.54	2.95	0.0865
	5/16	1	1.78	1.34	1.68	0.972	0.836	0.686	0.0579	1.32	5.63	2.52	0.0537
	¼	15/16	1.44	1.31	1.37	0.975	0.694	0.695	0.0300	1.34	4.65	2.06	0.0302
	3/16	15/16	1.09	1.28	1.07	0.989	0.535	0.700	0.0128	1.35	3.60	1.60	0.0157
2½ × 2½	½	1¼	2.25	1.22	1.47	0.808	0.644	0.535	0.188	1.02	4.47	2.12	0.0987
	⅜	11/16	1.73	1.15	1.18	0.823	0.521	0.548	0.0813	1.05	3.63	1.70	0.0480
	5/16	1	1.46	1.13	0.999	0.826	0.455	0.557	0.0477	1.08	3.15	1.45	0.0303
	¼	15/16	1.19	1.10	0.816	0.829	0.381	0.566	0.0247	1.09	2.62	1.20	0.0173
	3/16	15/16	0.90	1.06	0.640	0.842	0.295	0.572	0.0106	1.11	2.04	0.935	0.00912

* Note: See Fig. 1 for definition of "*a*."

LRFD values.

Table 2.
Design Strength of Schifflerized Angle Struts (Yield Stress = 36 ksi)

Size in.	Thickness in.	Compressive Strength in Kips for an Effective Length (in ft.) of																					
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
8 × 8	1⅛	483	478	474	469	463	457	443	427	409	390	370	350	329	309	288	267	247	227	208	189	173	158	145
	1	427	421	417	413	408	402	395	384	368	352	334	316	298	280	261	243	225	207	190	174	158	145	133
	⅞	368	363	359	355	351	346	340	334	326	312	297	281	265	249	233	217	201	186	171	156	142	130	119
	¾	308	302	298	295	291	287	283	277	272	265	258	245	231	217	204	190	176	163	150	138	126	115	105
	⅝	244	238	234	231	229	225	222	218	214	209	204	198	192	184	173	161	150	139	128	118	107	98	90
	9/16	211	204	201	198	196	193	190	187	184	180	175	170	165	160	154	147	136	126	117	107	98	89	82
	½	174	167	164	161	159	157	155	152	150	147	143	140	136	131	127	122	118	113	104	96	88	81	74
6 × 6	1	321	317	313	303	290	275	258	241	222	204	185	167	149	132	116	103	92	83					
	⅞	280	277	273	268	257	244	230	215	199	182	166	150	135	120	105	93	83	75					
	¾	238	235	231	228	223	213	201	188	174	161	147	133	120	107	94	84	75	67					
	⅝	193	190	188	185	181	176	170	160	148	137	125	114	103	92	81	72	64	58					
	9/16	170	167	165	162	159	155	151	145	135	125	114	104	94	84	75	66	59	53					
	½	147	144	141	139	136	133	130	125	121	112	103	93	85	76	67	60	53	48					
	7/16	122	119	117	115	113	110	107	104	100	96	91	83	75	67	60	53	47	43					
	⅜	96	93	91	89	88	86	84	81	79	76	72	69	65	58	52	46	41	37					
	5/16	67	64	63	61	60	59	58	56	55	53	51	49	47	44	42	39	35	31					
5 × 5	⅞	233	230	222	210	196	181	165	149	133	117	102	87	75	65	57								
	¾	199	196	193	183	172	159	146	132	118	104	91	79	68	59	52								
	⅝	164	162	159	155	146	136	125	113	101	90	79	68	59	51	45								
	½	127	125	123	120	116	111	102	93	84	74	66	57	49	43	38								
	7/16	107	105	103	101	98	95	90	82	74	66	58	51	44	38	34								
	⅜	87	85	83	82	79	77	74	71	64	58	51	44	38	33	29								
	5/16	66	64	62	61	60	58	56	53	51	48	43	38	33	28	25								
4 × 4	¾	158	152	142	131	117	103	89	76	63	52	44	37											
	⅝	132	129	121	112	101	89	78	66	55	46	38	33											
	½	104	102	99	92	83	74	64	55	47	39	32	28											
	7/16	90	88	85	81	74	66	57	49	42	35	29	25											
	⅜	74	73	71	68	64	57	50	43	37	30	26	22											
	5/16	58	57	55	54	51	48	42	37	31	26	22	19											
	¼	41	40	39	38	36	35	33	30	26	21	18	15											
3½ × 3½	½	92	89	82	73	64	55	46	37	30	25	21												
	7/16	79	77	73	65	57	49	41	33	27	22	19												
	⅜	67	65	63	57	50	43	36	29	24	20	17												
	5/16	53	52	50	48	42	36	31	25	20	17	14												
	¼	39	38	37	35	33	30	25	21	17	14	12												
3 × 3	½	78	72	64	55	45	36	28	22	18														
	7/16	68	64	57	49	41	33	25	20	16														
	⅜	58	56	50	43	36	29	22	18	14														
	5/16	47	46	42	36	30	25	19	15	12														
	¼	35	34	33	30	25	20	16	13	10														
	3/16	23	22	21	20	19	16	12	10	8														
2½ × 2½	½	62	54	45	36	27	19	15																
	⅜	48	42	35	28	21	16	12																
	5/16	40	36	30	24	19	14	11																
	¼	31	29	25	20	16	12	9																
	3/16	21	20	19	15	12	9	7																

Table 3.
Design Strength of Schifflerized Angle Struts (Yield Stress = 50 ksi)

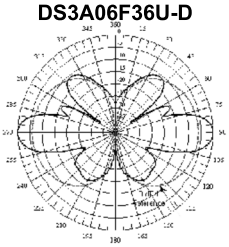
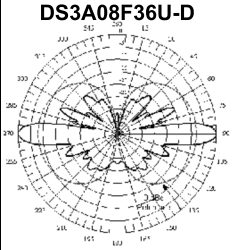
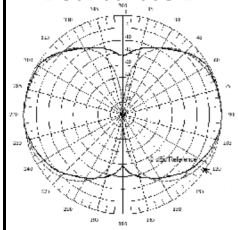
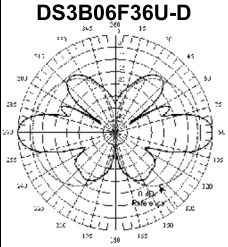
Size in.	Thickness in.	Compressive Strength in Kips for an Effective Length (in ft.) of																						
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
8 × 8	1⅛	656	646	638	630	619	607	582	552	520	487	453	419	385	352	319	288	258	231	209	189	173	158	145
	1	576	566	558	551	542	531	518	498	470	440	411	380	350	321	292	264	236	212	191	174	158	145	133
	⅞	493	482	475	468	461	452	442	430	417	391	365	339	312	286	261	236	212	191	172	156	142	130	119
	¾	406	395	389	383	377	370	361	352	342	330	318	296	273	251	229	208	188	168	152	138	126	115	105
	⅝	315	304	297	292	288	282	276	270	262	254	245	235	225	213	195	177	160	144	130	118	107	98	90
	9/16	260	249	244	239	235	231	227	222	216	210	203	196	188	179	171	160	145	131	118	107	98	89	82
	½	207	197	192	188	185	182	179	175	171	166	161	156	150	144	138	132	125	118	107	97	88	81	74
6 × 6	1	437	431	423	405	380	353	323	293	263	233	204	176	152	132	116	103	92	83					
	⅞	380	374	367	358	338	314	289	262	236	209	184	160	138	120	105	93	83	75					
	¾	320	314	308	301	292	275	253	231	208	185	164	143	123	107	94	84	75	67					
	⅝	257	251	246	241	234	226	215	196	177	159	140	123	106	93	81	72	64	58					
	9/16	224	218	214	209	203	196	189	179	162	145	128	112	97	85	75	66	59	53					
	½	190	184	180	176	172	166	160	152	144	130	116	102	88	77	67	53	48						
	7/16	153	148	144	141	137	133	128	123	117	111	102	90	78	68	60	53	47	43					
	⅜	113	108	106	103	101	98	95	91	87	83	79	74	68	59	52	46	41	37					
	5/16	75	72	70	68	67	65	63	61	59	56	54	51	48	45	42	39	35	31					
5 × 5	⅞	318	311	296	275	250	224	197	171	146	122	102	87	75	65	57								
	¾	270	265	258	241	220	198	175	153	131	110	92	79	68	59	52								
	⅝	220	216	210	203	187	169	150	131	113	96	80	68	59	51	45								
	½	167	163	159	154	148	139	123	108	94	80	67	57	49	43	38								
	7/16	139	136	132	128	123	117	109	96	83	71	60	51	44	38	34								
	⅜	110	107	104	101	97	93	88	82	73	62	52	44	38	33	29								
	5/16	77	74	72	70	68	65	62	59	55	51	44	38	33	28	25								
4 × 4	¾	216	205	186	165	142	119	98	78	63	52	44	37											
	⅝	179	174	159	142	123	104	85	68	55	46	38	33											
	½	140	136	130	117	102	86	72	58	47	39	32	28											
	7/16	119	115	111	103	90	77	64	52	42	35	29	25											
	⅜	97	94	91	86	79	67	56	45	37	30	26	22											
	5/16	74	72	69	66	62	57	48	39	32	26	22	19											
	¼	49	47	45	43	41	39	36	32	26	21	18	15											
3½ × 3½	½	124	119	105	91	75	60	47	37	30	25	21												
	7/16	106	102	94	81	67	54	42	33	27	22	19												
	⅜	88	85	81	70	59	48	37	29	24	20	17												
	5/16	69	66	63	59	50	41	32	25	20	17	14												
	¼	48	46	44	42	39	33	26	21	17	14	12												
3 × 3	½	106	94	80	64	49	37	28	22	18														
	7/16	92	84	71	58	44	33	25	20	16														
	⅜	77	73	62	50	39	29	22	18	14														
	5/16	62	59	53	43	34	25	19	15	12														
	¼	45	43	41	35	28	21	16	13	10														
	3/16	27	26	25	23	21	16	12	10	8														
2½ × 2½	½	83	69	53	38	27	19	15																
	⅜	64	54	42	31	21	16	12																
	5/16	53	46	36	27	19	14	11																
	¼	40	38	30	22	16	12	9																
	3/16	26	25	23	17	12	9	7																

UHF Omni Antennas (300 MHz)

dbSpectra

		380-410 MHz/370-390 MHz								
	Model Number	**DS3A06F36U-N**	**DS3A06F36U-D**	**DS3A08F36U-N**	**DS3A08F36U-D**	**DS3B00F36U-N**	**DS3B00F36U-D**	**DS3B06F36U-N**	**DS3B06F36U-D**	**DS3A08F36U3N**
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)
	Type	Single		Single		Single		Single		Single
ELECTRICAL	**Bandwidth**, MHz	30		30		20		20		30
	Power, Watts	500		500		500		500		500
	Gain, dBd	6		8		0		6		8
	Horizontal Beamwidth, degrees	360		360		360		360		360
	Vertical Beamwidth, degrees	16		10		60		16		10
	Beam Tilt, degrees	0		0		0		0		3 Down
	Isolation (minimum), dB	N/A		N/A		N/A		N/A		N/A
MECHANICAL	**Number of Connectors**	1		1		1		1		1
	Flat Plate Area, ft^2	1.95		3.03		0.60		1.95		3.03
	Lateral Windload Thrust, lbf	82		127		25		82		127
	Wind Speed Rating without ice, mph	190		160		325		190		160
DIMENSIONS	**Mounting Hardware** included	DSH3V3R		DSH3V3N		DSH2V3R		DSH3V3R		DSH3V3N
	Length, ft(m)	11.8 (3.6)		18.3 (5.6)		3.6 (1.1)		11.8 (3.6)		18.3 (5.6)
	Radome O.D., in(cm)	3 (7.6)		3 (7.6)		3 (5.1)		3 (7.6)		3 (7.6)
	Mast O.D., in(cm)	2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)
	Net Weight w/o bracket, lb(kg)	35 (15.9)		47 (21.3)		6.7 (3.0)		35 (15.9)		47 (21.3)
	Shipping Weight, lb(kg)	65 (29.5)		77 (34.9)		16.7 (7.6)		65 (29.5)		77 (34.9)

VERTICAL PATTERNS

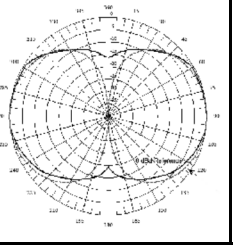
DS3A06F36U-N DS3A06F36U-D	DS3A08F36U-N DS3A08F36U-D	DS3B00F36U-N DS3B00F36U-D	DS3B06F36U-N DS3B06F36U-D
			

UHF Omni Antennas (406-436 MHz)

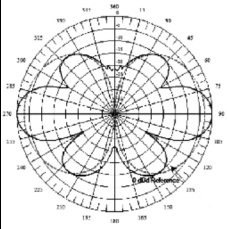
		406-436 MHz														
	Model Number	DS4A00F36U-N	DS4A00F36U-D	DS4A03F36U-N	DS4A03F36U-D	DS4A06F36U-N	DS4A06F36U-D	DS4A08F36U-N	DS4A08F36U-D	DS4A10F36U-N	DS4A10F36U-D	DS4A03F36D-N	DS4A03F36D-D	DS4A06F36D-D	DS4A06F36D-N	DS4A08F36U3D	DS4A08F36U3N
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	7/16 DIN	N(F)	7/16 DIN	N(F)
	Type	Single		Single		Single		Single		Single		Dual		Dual		Single	
ELECTRICAL	**Bandwidth**, MHz	30		30		30		30		30		30		30		30	
	Power, Watts	500		500		500		500		500		350		500		500	
	Gain, dBd	0		3		6		8		10		3		6		8	
	Horizontal Beamwidth, degrees	360		360		360		360		360		360		360		360	
	Vertical Beamwidth, degrees	60		30		16		10		6		30		16		10	
	Beam Tilt, degrees	0		0		0		0		0		0		0		3	
MECHANICAL	**Isolation (minimum)**, dB	N/A		N/A		N/A		N/A		N/A		30		N/A		N/A	
	Number of Connectors	1		1		1		1		1		2		2		1	
	Flat Plate Area, ft^2	0.46		0.83		1.95		3.03		3.97		1.72		3.03		3.03	
	Lateral Windload Thrust, lbf	19		35		82		127		167		72		127		127	
	Wind Speed Rating without ice, mph	325		250		190		160		150		190		160		160	
DIMENSIONS	**Mounting Hardware** included	DSH2V3R		DSH2V3R		DSH3V3R		DSH3V3N		DSH3V3N		DSH3V3R		DSH3V3N		DSH3V3N	
	Length, ft(m)	2.8 (0.9)		5 (1.5)		11.8 (3.6)		18.3 (5.6)		24 (7.2)		10.4 (3.2)		18.3(5.6)		18.3(5.6)	
	Radome O.D., in(cm)	3 (5.1)		3 (5.1)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3(7.6)		3(7.6)	
	Mast O.D., in(cm)	2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5(6.4)		2.5(6.4)	
	Net Weight w/o bracket, lb(kg)	5.5 (2.5)		8 (3.6)		35 (15.9)		47 (21.3)		70 (31.8)		29 (13.2)		70(31.8)		47(21.3)	
	Shipping Weight, lb(kg)	9.6 (4.4)		18 (8.2)		65 (29.5)		77 (34.9)		100 (45.4)		59 (26.8)		80(36.3)		77(34.9)	

VERTICAL PATTERNS

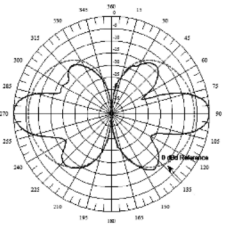
DS4A00F36U-N
DS4A00F36U-D



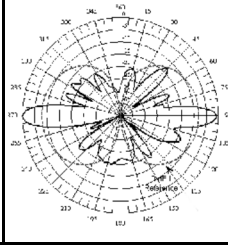
DS4A03F36U-N
DS4A03F36U-D



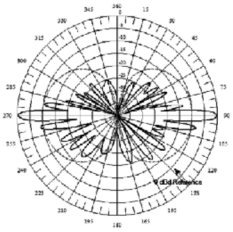
DS4A06F36U-N
DS4A06F36U-D



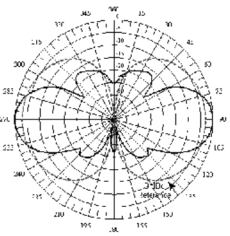
DS4A08F36U-N
DS4A08F36U-D



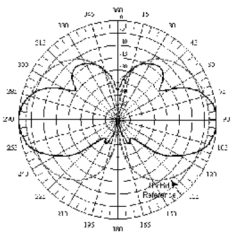
DS4A10F36U-N
DS4A10F36U-D



DS4A03F36D-N
DS4A03F36D-D



Top



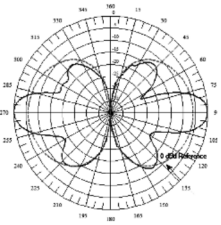
Bottom

UHF Omni Antennas (425-455 MHz)

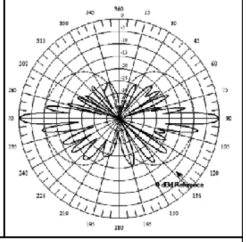
	Model Number	DS4B06F36U-N	DS4B06F36U-D	DS4B10F36U-N	DS4B10F36U-D	DS4B03F36D-N	DS4B03F36D-D
		425-455 MHz					
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN
	Type	Single		Single		Dual	
ELECTRICAL	**Bandwidth**, MHz	30		30		30	
ELECTRICAL	**Power**, Watts	500		500		350	
ELECTRICAL	**Gain**, dBd	6		10		3	
ELECTRICAL	**Horizontal Beamwidth**, degrees	360		360		360	
ELECTRICAL	**Vertical Beamwidth**, degrees	16		6		30	
ELECTRICAL	**Beam Tilt**, degrees	0		0		0	
MECHANICAL	**Isolation (minimum)**, dB	N/A		N/A		36	
MECHANICAL	**Number of Connectors**	1		1		2	
MECHANICAL	**Flat Plate Area**, ft^2	1.95		3.94		2.32	
MECHANICAL	**Lateral Windload Thrust**, lbf	82		166		97	
MECHANICAL	**Wind Speed Rating without ice**, mph	190		150		175	
DIMENSIONS	**Mounting Hardware** included	DSH3V3R		DSH3V3N		DSH3V3N	
DIMENSIONS	**Length**, ft(m)	11.8 (3.6)		23.8 (7.3)		14 (4.3)	
DIMENSIONS	**Radome O.D.**, in(cm)	3 (7.6)		3 (7.6)		3 (7.6)	
DIMENSIONS	**Mast O.D.**, in(cm)	2.5 (6.4)		2.5 (6.4)		2.5 (6.4)	
DIMENSIONS	**Net Weight** w/o bracket, lb(kg)	35 (15.9)		65 (29.5)		40 (18.1)	
DIMENSIONS	**Shipping Weight**, lb(kg)	65 (29.5)		95 (43.1)		70 (31.8)	

VERTICAL PATTERNS

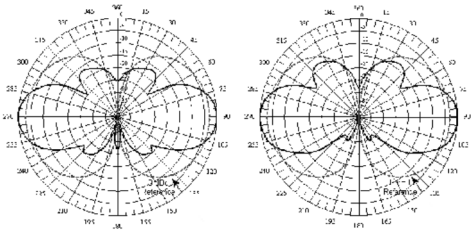
DS4B06F36U-N
DS4B06F36U-D



DS4B10F36U-N
DS4B10F36U-D



DS4B03F36D-N
DS4B03F36D-D



Top Bottom

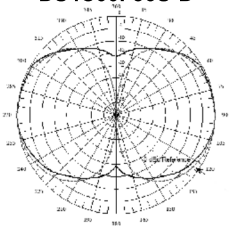
UHF Omni Antennas (450-482 MHz)

dbSpectra

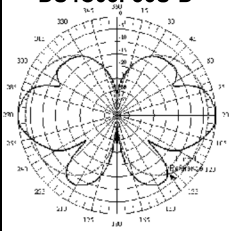
	Model Number	DS4C00F36U-N	DS4C00F36U-D	DS4C03F36U-N	DS4C03F36U-D	DS4C06F36U-N	DS4C06F36U-D	DS4C08F36U-N	DS4C08F36U-D	DS4C10F36U-N	DS4C10F36U-D	DS4C00F36D-N	DS4C00F36D-D	DS4C03F36D-N	DS4C03F36D-D	DS4C06F36U3N	DS4C06F36U3D	DS4C08F36U3N	DS4C08F36U3D
		450-482 MHz																	
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN
	Type	Single		Single		Single		Single		Single		Dual		Dual		Beamtilt		Beamtilt	
ELECTRICAL	**Bandwidth**, MHz	32		32		32		32		32		32		32		32		32	
	Power, Watts	500		500		500		500		500		350		350		500		500	
	Gain, dBd	0		3		6		8		10		0		3		6		8	
	Horizontal Beamwidth, degrees	360		360		360		360		360		360		360		360		360	
	Vertical Beamwidth, degrees	60		30		16		10		6		60		30		16		10	
	Beam Tilt, degrees	0		0		0		0		0		0		0		3 Down		3 Down	
MECHANICAL	**Isolation (minimum)**, dB	N/A		N/A		N/A		N/A		N/A		> 25		36		N/A		N/A	
	Number of Connectors	1		1		1		1		1		2		2		1		1	
	Flat Plate Area, ft^2	0.46		1.32		1.71		3.03		3.94		1.03		2.32		1.61		3.03	
	Lateral Windload Thrust, lbf	19		56		72		127		166		43		97		67		127	
	Wind Speed Rating without ice, mph	325		225		190		160		150		250		175		225		160	
DIMENSIONS	**Mounting Hardware** included	DSH2V3R		DSH2V3R		DSH3V3R		DSH3V3N		DSH3V3N		DSH2V3R		DSH3V3N		DSH3V3R		DSH3V3N	
	Length, ft(m)	2.8	(0.9)	8	(2.4)	10.3	(3.1)	18.3	(5.6)	23.8	(7.3)	6.2	(1.9)	14	(4.3)	9.7	(3)	18.3	(5.6)
	Radome O.D., in(cm)	3	(5.1)	3	(7.6)	3	(7.6)	3	(7.6)	3	(7.6)	3	(5.1)	3	(7.6)	3	(7.6)	3	(7.6)
	Mast O.D., in(cm)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)	2.5	(6.4)
	Net Weight w/o bracket, lb(kg)	5.5	(2.5)	20	(9.1)	29	(13.2)	47	(21.3)	65	(29.5)	13	(5.9)	40	(18.1)	25	(11.3)	47	(21.3)
	Shipping Weight, lb(kg)	9.6	(4.4)	40	(18.1)	59	(26.8)	77	(34.9)	95	(43.1)	20.6	(9.3)	70	(31.8)	55	(24.9)	77	(34.9)

VERTICAL PATTERNS

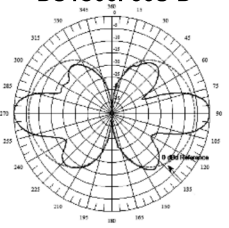
DS4C00F36U-N
DS4C00F36U-D



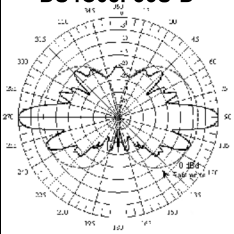
DS4C03F36U-N
DS4C03F36U-D



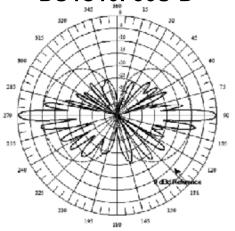
DS4C06F36U-N
DS4C06F36U-D



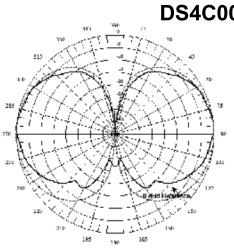
DS4C08F36U-N
DS4C08F36U-D



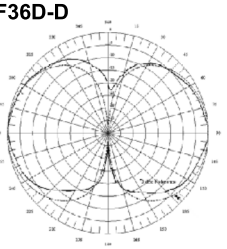
DS4C10F36U-N
DS4C10F36U-D



DS4C00F36D-N
DS4C00F36D-D

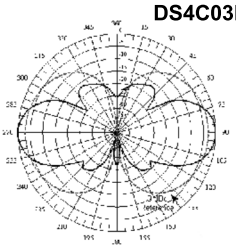


Top

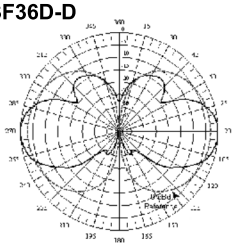


Bottom

DS4C03F36D-N
DS4C03F36D-D

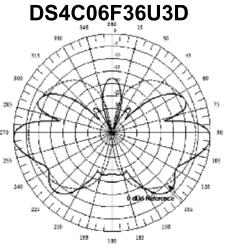


Top

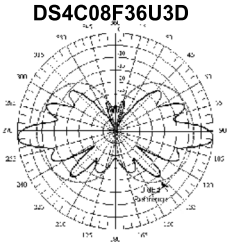


Bottom

DS4C06F36U3N
DS4C06F36U3D



DS4C08F36U3N
DS4C08F36U3D

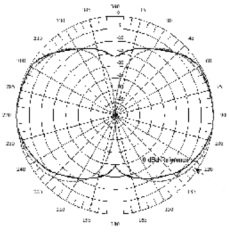


UHF Omni Antennas (480-512 MHz)

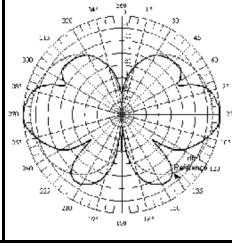
					480-512 MHz							
	Model Number	DS4D00F36U-N	DS4D00F36U-D	DS4D03F36U-N	DS4D03F36U-D	DS4D06F36U-N	DS4D06F36U-D	DS4D08F36U-N	DS4D08F36U-D	DS4D10F36U-N	DS4D10F36U-D	DS4D06F36D-N	DS4D06F36D-D
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN
	Type	Single		Single		Single		Single		Single		Dual	
ELECTRICAL	**Bandwidth**, MHz	32		32		32		32		32		32	
ELECTRICAL	**Power**, Watts	500		500		500		500		500		350	
ELECTRICAL	**Gain**, dBd	0		3		6		8		10		6	
ELECTRICAL	**Horizontal Beamwidth**, degrees	360		360		360		360		360		360	
ELECTRICAL	**Vertical Beamwidth**, degrees	60		30		16		10		6		16	
ELECTRICAL	**Beam Tilt**, degrees	0		0		0		0		0		0	
ELECTRICAL	**Isolation (minimum)**, dB	N/A		N/A		N/A		N/A		N/A		35	
MECHANICAL	**Number of Connectors**	1		1		1		1		1		2	
MECHANICAL	**Flat Plate Area**, ft^2	0.46		1.06		1.71		3.03		3.96		3.21	
MECHANICAL	**Lateral Windload Thrust**, lbf	19		45		72		127		166		135	
MECHANICAL	**Wind Speed Rating without ice**, mph	325		250		190		160		150		160	
DIMENSIONS	**Mounting Hardware** included	DSH2V3R		DSH2V3R		DSH3V3R		DSH3V3N		DSH3V3N		DSH3V3N	
DIMENSIONS	**Length**, ft(m)	2.8 (0.9)		6.4 (2)		10.3 (3.1)		18.3 (5.6)		23.9 (7.3)		19.4 (5.9)	
DIMENSIONS	**Radome O.D.**, in(cm)	3 (5.1)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)	
DIMENSIONS	**Mast O.D.**, in(cm)	2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)	
DIMENSIONS	**Net Weight** w/o bracket, lb(kg)	5.5 (2.5)		16 (7.3)		29 (13.2)		47 (21.3)		65 (29.5)		50 (22.7)	
DIMENSIONS	**Shipping Weight**, lb(kg)	9.6 (4.4)		26 (11.8)		59 (26.8)		77 (34.9)		95 (43.1)		80 (36.3)	

VERTICAL PATTERNS

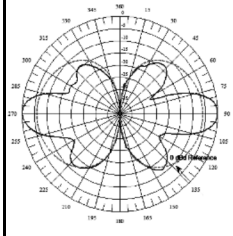
DS4D00F36U-N
DS4D00F36U-D



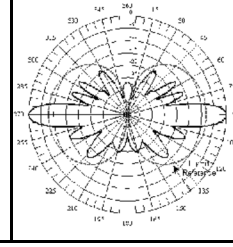
DS4D03F36U-N
DS4D03F36U-D



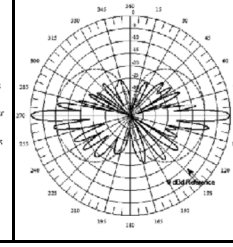
DS4D06F36U-N
DS4D06F36U-D



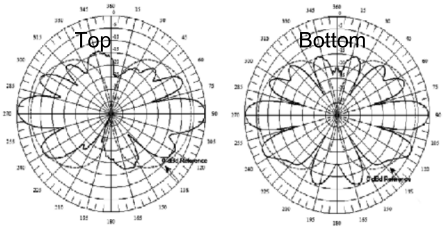
DS4D08F36U-N
DS4D08F36U-D



DS4D10F36U-N
DS4D10F36U-D



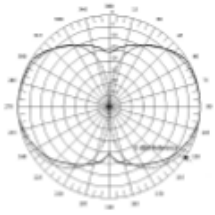
DS4D06F36D-N
DS4D06F36D-D



UHF Omni Antennas (425-455 MHz/450-482 MHz/480-512 MHz)

dbSpectra

	Model Number	DS4B00F36U-N	DS4B00F36U-D	DS4B03F36U-N	DS4B03F36U-D	DS4B08F36U-N	DS4B08F36U-D	DS4B08F36U3N	DS4B08F36U3D	DS4C06F36D-N	DS4C06F36D-D	DS4D03F36D-N	DS4D03F36D-D	DS4D08F36U3N	DS4D08F36U3D	DS4C03F36D-N	DS4C03F36D-D	DS4B06F36D-N
		425-455 MHz/450-482 MHz/480-512 MHz																
	Input Connector	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)	7/16 DIN	N(F)
	Type	Single		Single		Single		Single		Dual		Dual		Single		Dual		Dual
ELECTRICAL	**Bandwidth**, MHz	30		30		30		30		32		32		32		32		30
	Power, Watts	500		500		500		500		500		500		500		500		500
	Gain, dBd	0		3		8		8		6		3		8		3		6
	Horizontal Beamwidth, degrees	360		360		360		360		360		360		360		360		360
	Vertical Beamwidth, degrees	60		30		9		9		16		30		10		30		16
	Beam Tilt, degrees	0		0		0		3		0		0		3 Down		0		0
MECHANICAL	**Isolation (minimum)**, dB	N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A
	Number of Connectors	1		1		1		1		2		2		1		2		2
	Flat Plate Area, ft^2	0.48		0.91		3.02		3.02		3.21		1.32		3.03		2.32		3.21
	Lateral Windload Thrust, lbf	20		38		127		127		135		56		127		97		135
	Wind Speed Rating without ice, mph	325		250		160		160		160		225		160		175		160
DIMENSIONS	**Mounting Hardware** included	DSH2V3R		DSH2V3R		DSH3V3N		DSH3V3N		DSH3V3N		DSH2V3R		DSH3V3N		DSH3V3N		DSH3V3N
	Length, ft(m)	2.9(0.9)		5.5 (1.65)		18.25 (5.6)		18.25 (5.6)		19.4 (5.9)		8 (2.4)		18.3 (5.6)		14 (4.3)		19.4 (5.9)
	Radome O.D., in(cm)	3(7.61)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.6)		3 (7.62)		3 (7.6)		3 (7.6)		3 (7.6)
	Mast O.D., in(cm)	2.5(6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)		2.5 (6.4)
	Net Weight w/o bracket, lb(kg)	5.5 (2.5)		14 (6.3)		45 (20.4)		45 (20.4)		50 (22.7)		10 (4.5)		45 (20.4)		36.5 (16.6)		50 (22.7)
	Shipping Weight, lb(kg)	11(5)		25(11.25)		55 (24.9)		55 (24.9)		60 (27.2)		20 (9)		55 (24.9)		47 (21.3)		60 (27.2)



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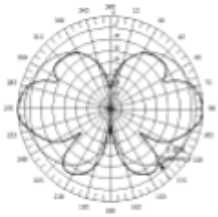

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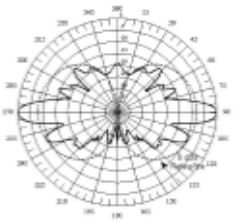

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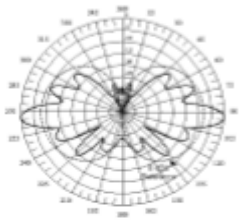

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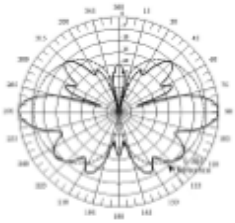

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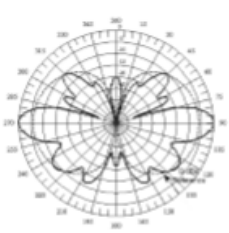

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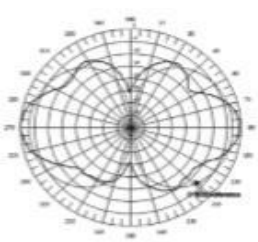

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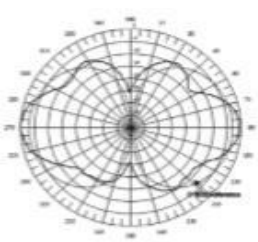

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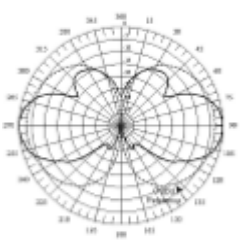
DS4D08F36D3D



DS4C03F36D-N
DS4C03F36D-D

RADIO FREQUENCY SYSTEMS
The Clear Choice®

7/8" HELIFLEX® Air-Dielectric Coaxial Cable

HELIFLEX® 7/8" low loss air dielectric cable

7/8" HELIFLEX® Air Dielectric Coaxial Cable

FEATURES / BENEFITS

- **Low Attenuation**
  The low attenuation of HELIFLEX® coaxial cable results in highly efficient signal transfer in your RF system.
- **Complete Shielding**
  The solid outer conductor of HELIFLEX® coaxial cable creates a continuous RFI/EMI shield that minimizes system interference.
- **Low VSWR**
  Special low VSWR versions of HELIFLEX® coaxial cables contribute to low system noise.
- **Outstanding Intermodulation Performance**
  HELIFLEX® coaxial cable's solid inner and outer conductors virtually eliminate intermods. Intermodulation performance is also confirmed with state-of-the-art equipment at the RFS factory.
- **High Power Rating**
  Due to their low attenuation, outstanding heat transfer properties and temperature stabilized dielectric materials, HELIFLEX® cable provides safe long term operating life at high transmit power levels.
- **Wide Range of Application**
  Typical areas of application are: feedlines for broadcast and terrestrial microwave antennas, wireless cellular, PCS and ESMR base stations, cabling of antenna arrays, and radio equipment interconnects.

Technical Features

APPLICATIONS		
Applications		UHF, VHF
STRUCTURE		
Cable Type		Air-Dielectric, Corrugated
Size		7/8"
Jacket Option		Black
Inner Conductor	mm (in)	9 (0.35) Copper Tube
Dielectric	mm (in)	20.2 (0.79) Helical Polyethylene Spacer
Outer Conductor	mm (in)	25.5 (1) Corrugated Copper
Jacket	mm (in)	28 (1.103) Polyethylene, PE
ELECTRICAL SPECIFICATIONS		
Impedance	Ω	50 +/- 0.5
Maximum Frequency	GHz	3.0
Velocity	%	93.0
Capacitance	pF/m (pF/ft)	71 (21.6)
Inductance	µH/m (µH/ft)	0.178 (0.054)
Peak Power Rating	kW	73.0
RF Peak Voltage	Volts	2700.0
Jacket Spark	Volt RMS	8000.0
Inner Conductor dc Resistance	Ω/1000 m (Ω/1000 ft)	1.1 (0.34)
Outer Conductor dc Resistance	Ω/1000 m (Ω/1000 ft)	0.88 (0.27)
Return Loss (VSWR) Performance		Standard
Maximum Return Loss	dB (VSWR)	Typical 20.8dB (1.2 VSWR) or better within the operation bands of most global frequency ranges. Premium also available. Contact factory for options in your specific frequency band.
Phase Stabilized		Phase stabilized and phase matched cables and assemblies are available upon request.
Temperature & Power		Standard
MECHANICAL SPECIFICATIONS		
Cable Weight, Nominal	kg/m (lb/ft)	0.68 (0.46)
Minimum Bending Radius, Single Bend	mm (in)	100 (4)
Minimum Bending Radius, Repeated Bends	mm (in)	250 (10)
Bending Moment	Nm (lb*ft)	27
Tensile Strength	N (lb)	1600 (360)
Recommended / Maximum Clamp Spacing	m (ft)	0.5 / 0.9 (1.8 / 3)

RADIO FREQUENCY SYSTEMS
The Clear Choice®

7/8" HELIFLEX® Air-Dielectric Coaxial Cable

ATTENUATION AND POWER RATING

Frequency MHz	Attenuation dB/100m	Attenuation dB/100ft	Power kW
0.5	0.08	0.025	73.00
1	0.12	0.035	73.00
1.5	0.14	0.043	70.90
2	0.16	0.05	61.40
10	0.37	0.112	27.30
20	0.52	0.158	19.20
30	0.64	0.194	15.70
50	0.83	0.252	12.10
88	1.10	0.337	9.11
100	1.18	0.359	8.49
108	1.23	0.374	8.15
150	1.45	0.443	6.92
174	1.57	0.478	6.39
200	1.69	0.514	5.94
300	2.08	0.634	4.84
400	2.42	0.738	4.17
450	2.57	0.785	3.93
500	2.72	0.83	3.71
512	2.76	0.84	3.66
600	3.00	0.914	3.37
700	3.25	0.992	3.12
800	3.49	1.07	2.91
824	3.55	1.08	2.86
894	3.71	1.13	2.74
900	3.72	1.13	2.74
925	3.78	1.15	2.69
960	3.85	1.17	2.65
1000	3.94	1.20	2.59
1250	4.45	1.36	2.30
1500	4.91	1.50	2.10
1700	5.26	1.60	1.97
1800	5.43	1.65	1.91
2000	5.75	1.75	1.81
2200	6.07	1.85	1.72
2300	6.22	1.90	1.68
3000	7.22	2.20	1.47

Attenuation at 20°C (68°F) cable temperature; tolerance +/- 5% max.; Mean power rating at 40°C (104°F) ambient temperature

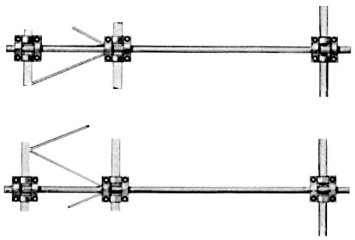
TESTING AND ENVIRONMENTAL

Fire Performance	Halogene Free
Flame Retardant Jacket Specifications	Meets the requirements according to: IEC60754-1, IEC60754-2
Installation Temperature	-40 to 60 (-40 to 140) °C(°F)
Storage Temperature	-70 to 85 (-94 to 185) °C(°F)
Operation Temperature	-50 to 85 (-58 to 185) °C(°F)

External Document Links

Notes

DB5004



Adjustable Side Mounting Kit for 3 in (76.2 mm) OD round members. Use to mount all metal mast antennas away from side of tower measuring 2 to 8 feet (0.61 to 2.44 m) across the face. Two 10 foot sections of pipe and six clamp assemblies are included.

General Specifications

Application	Outdoor
Includes	Brackets | Clamps | Hardware | Pipe
Package Quantity	2

Mechanical Specifications

Color	Silver
Material Type	Galvanized steel

Dimensions

Compatible Diameter, maximum	76.2 mm | 3.0 in
Compatible Diameter, minimum	33.0 mm | 1.3 in
Net Weight	50.6 kg | 111.6 lb

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2011/65/EU	Compliant by Exemption
ISO 9001:2015	Designed, manufactured and/or distributed under this quality management system
China RoHS SJ/T 11364-2014	Above Maximum Concentration Value (MCV)

COMMSCOPE®

Instruction Sheet

095211-000 Revision M, May 2016

Fiberglass Outriggers and Side Mount

DB5030 and DB5004S-MTD™ (Outriggers)
DB5004 (Side Mount)

GENERAL INFORMATION

- DB5030 (Figure 1) and DB5004S-MTD (Figure 2) outriggers are designed to limit tip deflection on fiberglass antennas in high wind conditions.
- B5030 can be used for smaller side-mounted fiberglass antennas, measuring less than 2 inches O.D.
- DB5004S-MTD can be used for larger side-mounted fiberglass antennas with 2-inch O.D. radomes. Two optional 14-inch tie wraps can be used with this outrigger to provide additional support for the antenna.
- Both DB5030 and DB5004S-MTD outriggers are 123 inches (3.1 m) in length and attach to the tower legs using two DB375 mounting clamps.
- Plastic ends on both outriggers are fitted with neoprene tape lining that slips over the top of the antenna and sits about midpoint on the radome.
- DB5004 (Figure 4) is an adjustable side mount kit that mounts across the face of the tower. This kit includes two 10-foot sections of pipe and six clamp assemblies.
- Carefully read all instructions before installation begins.
- Verify that all required hardware is present.
- Follow the instructions that are included with the antenna along with the instructions described in this bulletin.

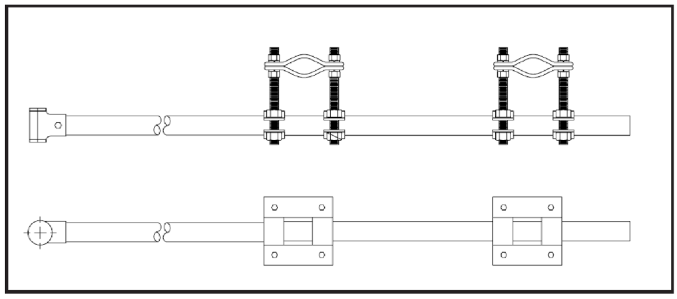


Figure 1. DB5030 Fiberglass Outrigger Assembly.

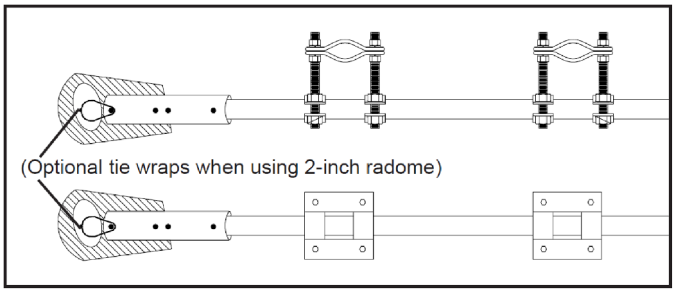


Figure 2. DB5004S-MTD™ Fiberglass Outrigger Assembly.

(continued on page 2)

SAFETY NOTICE

The installation, maintenance, or removal of an antenna requires qualified, experienced personnel. CommScope installation instructions are written for such installation personnel. Antenna systems should be inspected once a year by qualified personnel to verify proper installation, maintenance, and condition of equipment.

CommScope disclaims any liability or responsibility for the results of improper or unsafe installation practices.

It is recommended that transmit power be turned off when the field installation is performed. Follow all applicable safety precautions as shown on this page.

Do not install near power lines. Power lines, telephone lines, and guy wires look the same. Assume any wire or line can electrocute you.

Do not install on a wet or windy day or when lightning or thunder is in the area. Do not use metal ladder.

Wear shoes with rubber soles and heels. Wear protective clothing including a long-sleeved shirt and rubber gloves.

CE

(Continued from page 1)

DB5030/DB5004S-MTD MOUNTING INSTRUCTIONS

1. Drop the outrigger antenna-end piece over the top of the antenna radome. Exercise care so that the weight of the outrigger does not bear on the antenna radome.
2. Lower the outrigger until it engages the radome at a point where little or no clearance exists between the end-piece and the radome. The distance the outrigger will travel down the radome will vary depending on the antenna model.
3. If necessary, move the outrigger upward from this point to a suitable anchoring position on the tower.
4. Anchor the outrigger to the face of the tower using two DB375 mounting clamps.
5. Tighten all hardware.
6. Use optional 14-inch tie wrap to secure antennas with 2-inch O.D. radomes, for additional support (Figure 3).

See Figure 4 for example of completed assembly.

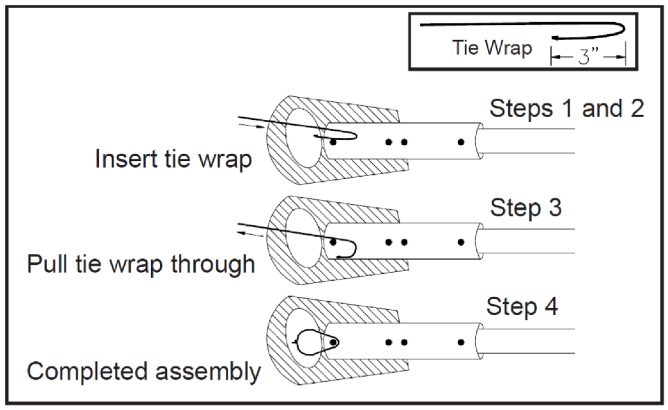


Figure 3. Example of Securing Antenna with Tie Wraps when Installing 2-inch Radome Antenna.

DB5004 MOUNTING INSTRUCTIONS

1. Attach the side mount across the face of the tower and to the antenna using hardware supplied with kit.
2. Tighten all hardware.

See Figure 4 for example of completed assembly.

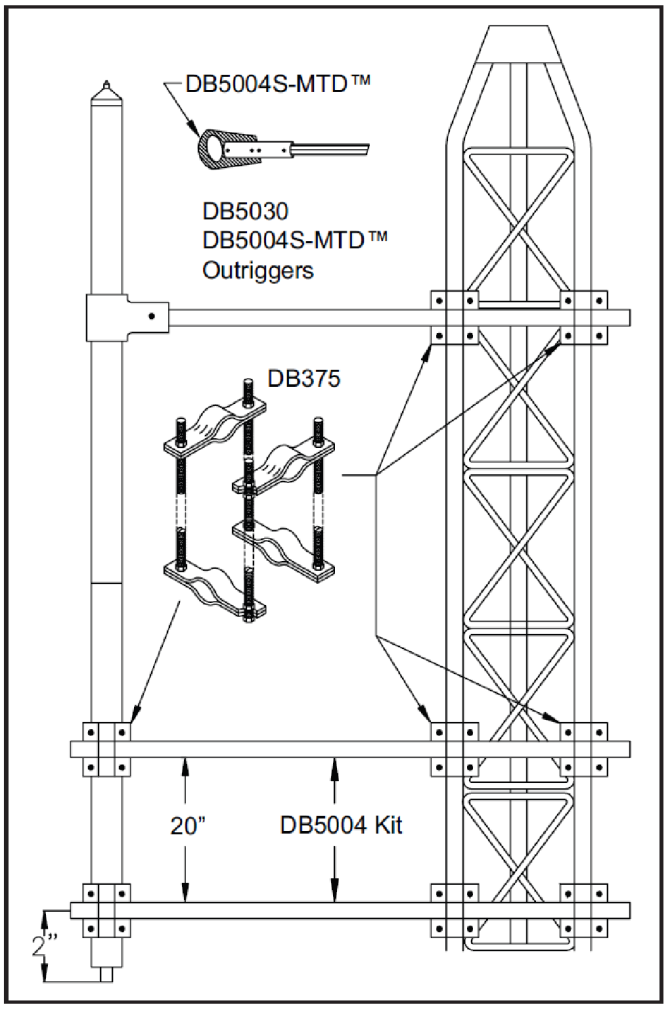


Figure 4. Example of Antenna Showing DB5030 Series Fiberglass Outrigger Assembly and DB5004 Adjustable Side Mount Kit.

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $6 billion.

More information on AECOM and its services can be found at www.aecom.com.

500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
860-529-8882
Fax: 860-529-3991

ATTACHMENT E – PROOF OF DELIVERY OF NOTICE

Ref: OXFORD
Dep: BL GRAPHICS

Date: 21Oct20
Wgt: 1.80 LBS

DV:

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 5916

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 21OCT20
ACTWGT: 1.80 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO

CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051
REF: OXFORD

DEPT: BL GRAPHICS

56DC2/A27E/0582

FedEx
Express

J2010191106011av

TRK# 0201 9151 3346 5916

THU – 22 OCT 10:30A
PRIORITY OVERNIGHT

00 BDLA

06051
CT–US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: OXFORD
Dep: BL GRAPHICS

Date: 21Oct20
Wgt: 1.80 LBS

DV:

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

SVCS: PRIORITY OVERNIGHT
TRCK: 9151 3346 5905

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 21OCT20
ACTWGT: 1.80 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO **BRIAN BENITO**
DEPT OF EMERGENCY SERVICES
1111 COUNTRY CLUB ROAD

MIDDLETOWN CT 06457
REF: OXFORD

DEPT: BL GRAPHICS

56DC2/A27E/05A2

FedEx Express

J2010191106011uv

THU - 22 OCT 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 5905**

00 BDLA

06457
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: OXFORD
Dep: BL GRAPHICS

Date: 21Oct20
Wgt: 1.80 LBS

DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 5890

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 21OCT20
ACTWGT: 1.80 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC2/A27E/05A2

TO **STEVEN S. MACARY**
TOWN OF OXFORD
486 OXFORD ROAD

OXFORD CT 06478

REF: OXFORD

DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

THU - 22 OCT 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 5890**

00 HFDA

06478
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: OXFORD
Dep: BL GRAPHICS

Date: 21Oct20
Wgt: 1.80 LBS

DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 5880

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 21OCT20
ACTWGT: 1.80 LB
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO **HONORABLE GEORGE R. TEMPLE**
TOWN OF OXFORD
486 OXFORD ROAD

OXFORD CT 06478

REF: OXFORD

DEPT: BL GRAPHICS

56DC2/A27E/05A2

FedEx Express

J2010191106011uv

TRK# 0201 **9151 3346 5880**

THU – 22 OCT 10:30A
PRIORITY OVERNIGHT

00 HFDA

06478
CT – US **BDL**

Part # 156148-434 RIT EXP 09/21 **

ATTACHMENT F – POWER DENSITY REPORT

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

Calculated Radio Frequency Emissions Report

ES-067

71 Tower Lane (aka 55 Shelton Road)

Oxford, CT 06478

September 1, 2020

Table of Contents

List of Tables

List of Figures

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed Eversource installation on the tower at 71 Tower Lane (aka 55 Shelton Road) in Oxford, CT. Eversource is proposing to install one omnidirectional antenna as part of its 220 MHz communications system. As part of that installation, Eversource is also proposing to relocate an existing antenna to a lower elevation on the tower.

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

Figure 1: View of ES-067 Oxford

Site Address	71 Tower Lane
Latitude	41° 24' 43.8" N
Longitude	73° 07' 46.5" W
Site Elevation AMSL	770’
Survey Engineer	Marc Salas
Survey Date/Time	8/24/2020; 1:30 PM – 2:30 PM

Table 1: Survey Information

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached “FCC Limits for Maximum Permissible Exposure (MPE)” in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

3. Power Density Calculation Methods

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

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

Where:

EIRP = Effective Isotropic Radiated Power = 1.64 x ERP

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

H = Horizontal Distance from antenna

V = Vertical Distance from radiation center of antenna

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and full power, and that all antenna channels are transmitting simultaneously. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not consider actual terrain elevations which could attenuate the signal. As a result, the calculated power density and corresponding % MPE levels reported below are much higher than the actual levels will be from the final installation.

4. Proposed Antenna Configuration

Table 2 below lists the technical details of the proposed Eversource installation. These parameters are applied to the above calculation methods in order to calculate the % MPE values of the proposed equipment.

Operator	Antenna Model	TX Freq. (MHz)	Ant Gain (dBd)	Power ERP (Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	dBSpectra DS2C00F36D	217	0	124	4	60°	13.6	100.4

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

As indicated earlier, Eversource is proposing to relocate an existing antenna from approximately 100' centerline to 79.5' centerline. % MPE contributions from this antenna would be accounted for in the field measurements and because this height change would result in only a slight impact to the overall % MPE, no additional calculations were performed. For instance, the height change would potentially increase the % MPE from that antenna only, by a factor of 1.6.

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

[2] Transmit antenna height listed for the proposed antenna is based on the Aecom Structural Analysis Report dated July 21, 2020 and the overall mechanical length of the antenna. The proposed antenna consists of two internally stacked antennas – upper is for receive, lower is for transmit. Due unavailability of this specific digital antenna pattern, a similar antenna pattern for a like antenna was substituted in the calculations.

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# 01265			
Calibration Date	January 2019			
Calibration Interval	24 Months			
Meter	NBM550, Serial# F-0147			
Calibration Date	March 2020			
Calibration Interval	24 Months			
Probe Specifications	**Frequency Range**	**Field Measured**	**Standard**	**Measurement Range**
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.2 – 600 % of Standard

Table 3: Instrumentation Information

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

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

6. Surveyed and Calculated % MPE Results

Measured and calculated results and a description of each survey location are detailed in the table below. Measurements were recorded on August 24, 2020 between 1:30 PM and 2:30 PM. The calculated % MPE contribution from the proposed equipment modifications was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the "Off Beam Loss" factor shown in the power density formula from Section 4. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 15 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 4.65% (Average Uncontrolled / General Population MPE) and was recorded near the 214 Park Street mailbox (Location 15). The highest composite (measured + calculated) % MPE value is calculated to be 6.32% (Average Uncontrolled / General Population) and is calculated to occur by the compound access gate (Location 1).

Meas. Location	Location Description	Latitude	Longitude	Dist. From Site (feet)	Measured % MPE (Uncontrolled / General)	Calculated % MPE (Eversource Proposed)	Composite % MPE (Uncontrolled / General)
1	**Compound access gate**	**41.41222**	**-73.12935**	**66**	**1.41%**	**4.91%**	**6.32%**
2	East of fenced compound	41.41208	-73.12934	74	< 1.00%	4.71%	< 5.71%
3	NW corner of fenced compound	41.41224	-73.12962	30	2.06%	2.12%	4.18%
4	North of Compound Along Access Road	41.41239	-73.12921	130	2.88%	3.20%	6.09%
5	End of Access Road	41.41272	-73.12889	277	1.29%	0.94%	2.23%
6	Along Tower Road	41.41333	-73.12958	423	1.53%	0.39%	1.92%
7	Along Tower Road	41.41420	-73.13064	797	1.65%	0.10%	1.75%
8	Intersection of Shelton Road and Tower Road	41.41506	-73.13155	1188	2.18%	0.05%	2.22%
9	Along Shelton Rd	41.41679	-73.13101	1735	2.60%	0.02%	2.63%
10	Northern Intersection of Still Road and Shelton Road	41.41147	-73.13390	1209	3.19%	0.04%	3.24%
11	Southern Intersection of Still Road and Shelton Road	41.41070	-73.13378	1269	3.57%	0.04%	3.61%
12	Along Still Road	41.40932	-73.13023	1056	3.80%	0.06%	3.86%
13	Intersection of Still Road and Park Road	41.40932	-73.12830	1097	3.68%	0.06%	3.74%
14	Intersection of Park Road and Lisa Drive	41.41043	-73.12499	1410	4.28%	0.03%	4.31%
15	**Near 214 Park Street Mailbox**	**41.41244**	**-73.12235**	**1985**	**4.65%**	**0.02%**	**4.67%**

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

[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.

Figures 2 and 3 below are aerial views[5] of the tower location and the surrounding area, along with the measurement locations listed in Table 4.

Figure 2: Measurement Points – Zoom In

Figure 3: All Measurement Points

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

7. Conclusion

A number of accessible areas around the tower at 71 Tower Lane (aka 55 Shelton Road) in Oxford, 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 4.65% MPE. This measurement was recorded at Location 15 by the 214 Park Street mailbox.

The highest composite (measured + calculated) power density is **6.32% of the FCC General Population MPE limit** with the proposed Eversource equipment is calculated to occur at Location 1 at the tower compound access gate.

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

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

8. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in FCC OET Bulletin 65 Edition 97-01, IEEE Std. C95.1, and IEEE Std. C95.3.

Marc Salas — August 31, 2020

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

Keith Vellante — September 01, 2020

Reviewed/Approved By: Keith Vellante
Director of RF Services
C Squared Systems, LLC
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

IEEE C95.1-2005, IEEE Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz IEEE-SA Standards Board

IEEE C95.3-2002 (R2008), IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz-300 GHz IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[6]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure[7]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 5: FCC Limits for Maximum Permissible Exposure (MPE)

[6] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure

[7] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure

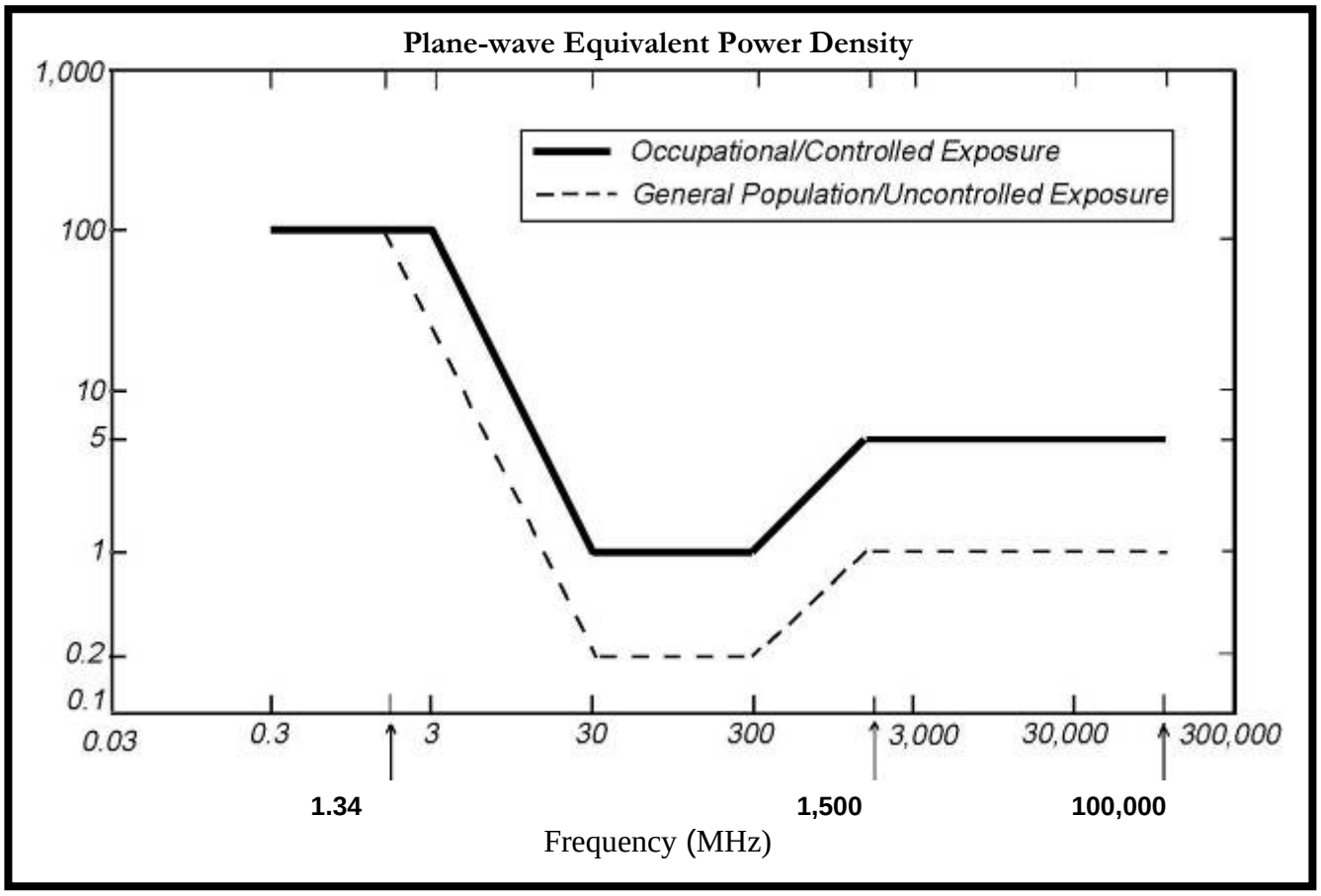


Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Eversource Antenna Data Sheet and Electrical Patterns

217 MHz

Manufacturer:	dbSpectra
Model #:	DS2C00F36D
Frequency Band:	217 - 222 MHz
Gain:	0 dBd
Vertical Beamwidth:	60°
Horizontal Beamwidth:	360°
Polarization:	Vertical-Polarization
Length:	13.6’