EVERSOURCE ENERGY

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

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

November 4, 2020

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

RE: **Notice of Exempt Modification**
Eversource Site # 8110
7 Hoskins Road (AKA 5 St. Andrews Road), Bloomfield, CT 06002
Latitude: 41-53-33.6 N / Longitude: 72-45-56.50 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains multiple antennas and microwave dishes at various mounting heights on an existing 185-foot self-support tower located at 7 Hoskins Road in Bloomfield. See Attachment A, Parcel Map and Property Card. The tower and property are owned by Eversource. Eversource plans to install one 18-foot 7-inch tall omni-directional antenna, to be mounted at approximately 183 feet above ground level ("AGL) and two 7/8-inch diameter coaxial cables. There will be no changes to the fenced compound, the tower or the existing antennas and equipment currently mounted on the tower. The tower and existing and proposed equipment on the tower are depicted on Attachment B, Construction Drawings, dated September 28, 2020 and Attachment C, Structural Analysis, dated August 10, 2020. The Connecticut Siting Council approved the self-support tower at this location in Docket No. 158 in May 1993 and approved the replacement of the original structure in Petition No. 1112 in September 2014.

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

Please accept this letter as notification, pursuant to Regulations of Connecticut State Agencies ("R.C.S.A.") §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being delivered to Suzette DeBeatham-Brown, Mayor for the Town of Bloomfield, Robert E. Smith, Town Manager for the Town of Bloomfield, and Jose Giner, Land Use Director for the Town of Bloomfield via private carrier. Proof of delivery is attached. See Attachment D, Proof of Delivery of Notice.

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

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

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

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

By: ______________________________
Kathleen M. Shanley
Manager – Transmission Siting

cc: Honorable Suzette DeBeatham-Brown, Mayor, Town of Bloomfield
Robert E. Smith, Town Manager, Town of Bloomfield
Jose Giner, Land Use Director, Town of Bloomfield

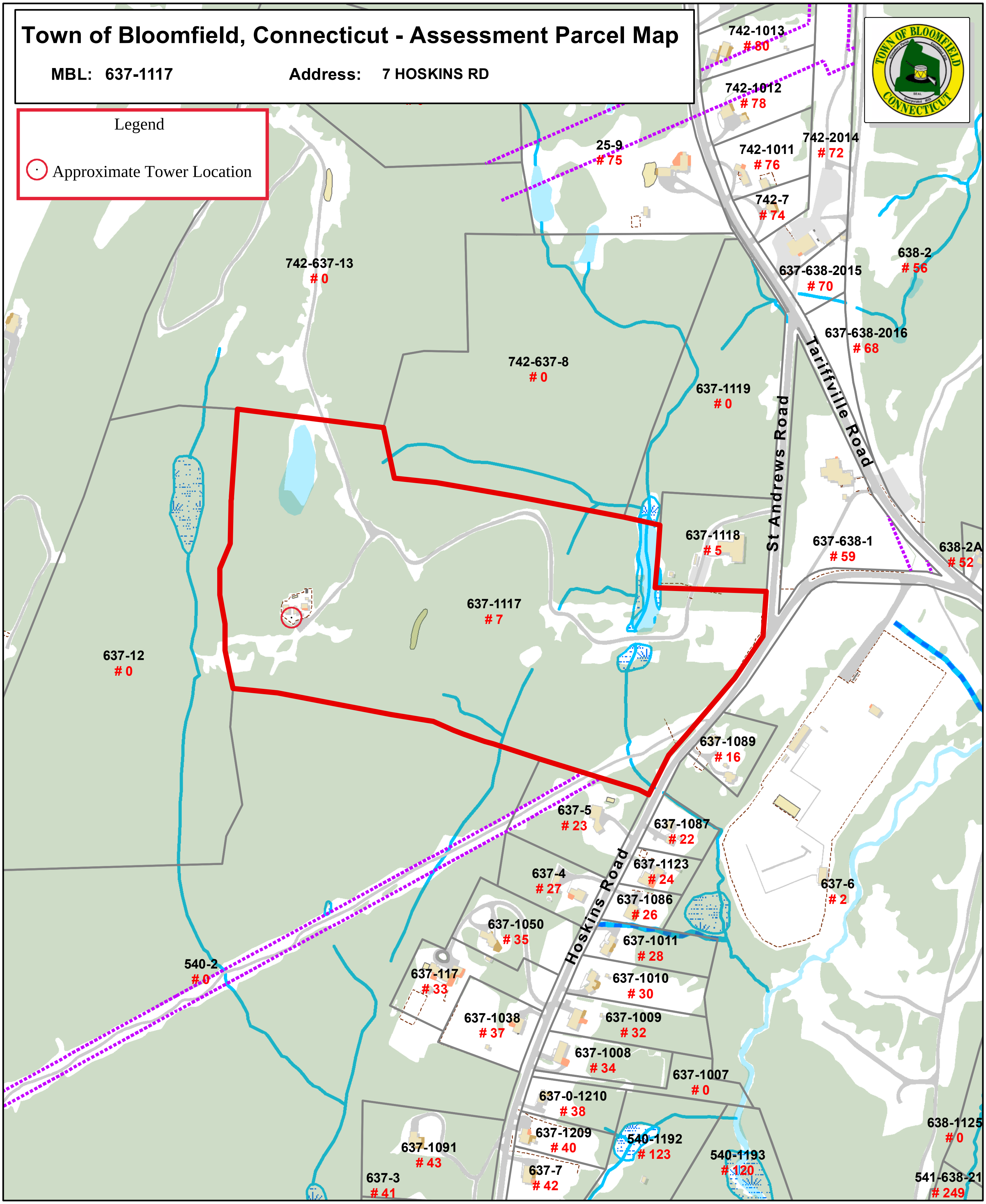
Attachments

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

ATTACHMENT A – PARCEL MAP AND PROPERTY CARD

Town of Bloomfield, Connecticut - Assessment Parcel Map

MBL: 637-1117 **Address:** 7 HOSKINS RD



Approximate Scale:

1 inch = 450 feet

Disclaimer:
This map is for informational purposes only.
All information is subject to verification by any user.
The Town of Bloomfield and its mapping contractors
assume no legal responsibility for the information contained herein.

Map Produced October 2019

Parcels labeled by Unique ID

Town of Bloomfield, CT

Property Listing Report

Map Block Lot	637-1117	Building #	1	PID	8110	Account	R93240

Property Information

Property Location	7 HOSKINS RD
Owner	CONN LIGHT & POWER CO
Co-Owner	ATTN: PROPERTY TAX DEPT
Mailing Address	P O BOX 270 HARTFORD CT 06141
Land Use	201 Comm Land
Land Class	C
Zoning Code	R-80
Census Tract	0000

Site Index	4
Acreage	38.33
Utilities	
Lot Setting/Desc	
Fire District	C
Book / Page	

Photo

Sketch

Primary Construction Details

Year Built	1962
Building Desc.	Vacant with OutBldg
Building Style	UNKNOWN
Building Grade	
Stories	
Occupancy	
Exterior Walls	
Exterior Walls 2	NA
Roof Style	
Roof Cover	
Interior Walls	
Interior Walls 2	NA
Interior Floors 1	
Interior Floors 2	

Heating Fuel	
Heating Type	
AC Type	
Bedrooms	0
Full Bathrooms	0
Half Bathrooms	0
Extra Fixtures	0
Total Rooms	0
Bath Style	NA
Kitchen Style	NA
Bsmt Fin Area	0
Rec Rm Area	0
Bsmt Gar	0
Fireplaces	0

(*Industrial / Commercial Details)

Building Use	Vacant
Building Condition	A
Sprinkler %	NA
Heat / AC	NA
Frame Type	NA
Baths / Plumbing	NA
Ceiling / Wall	NA
Rooms / Prtns	NA
Wall Height	NA
First Floor Use	NA
Foundation	POURED CONC.

Report Created On 5/7/2020

Town of Bloomfield, CT

Property Listing Report | Map Block Lot 637-1117 | Building # 1 | PID 8110 | Account R93240

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	0	0
Extras	0	0
Improvements		
Outbuildings	883200	618240
Land	540800	275180
Total	1424000	893420

Sub Areas

Subarea Type	Gross Area (sq ft)	Living Area (sq ft)
Total Area		0

Outbuilding and Extra Features

Type	Description
Cell Shed	480 S.F.
Cell Shed	120 S.F.
Cell Tower	4 UNITS

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
CONN LIGHT & POWER CO	0292/0097		0

Report Created On 5/7/2020

ATTACHMENT B – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (1) NEW OMNI/WHIP ANTENNA AT ELEVATION 200'-1 11/16"± AGL
2. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING BUILDING
3. INSTALL NEW ICE BRIDGE AT ELEVATION 0'-0"± AGL WITH ASSOCIATED GROUNDING

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:	TALCOTT RADIO
SITE ID NUMBER:	8110
SITE ADDRESS:	5 ST ANDREWS ROAD BLOOMFIELD, CT 06002
MAP:	637
LOT:	1117
ZONE:	R-80
LATITUDE:	41° 53' 33.60" N
LONGITUDE:	72° 45' 56.50" W
ELEVATION:	410'± AMSL
FEMA/FIRM DESIGNATION:	X
ACREAGE:	38.33± AC (BOOK: 0292, PAGE: 0097)

CONTACT INFORMATION

<u>APPLICANTS</u>:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

<u>PROPERTY OWNER</u>:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

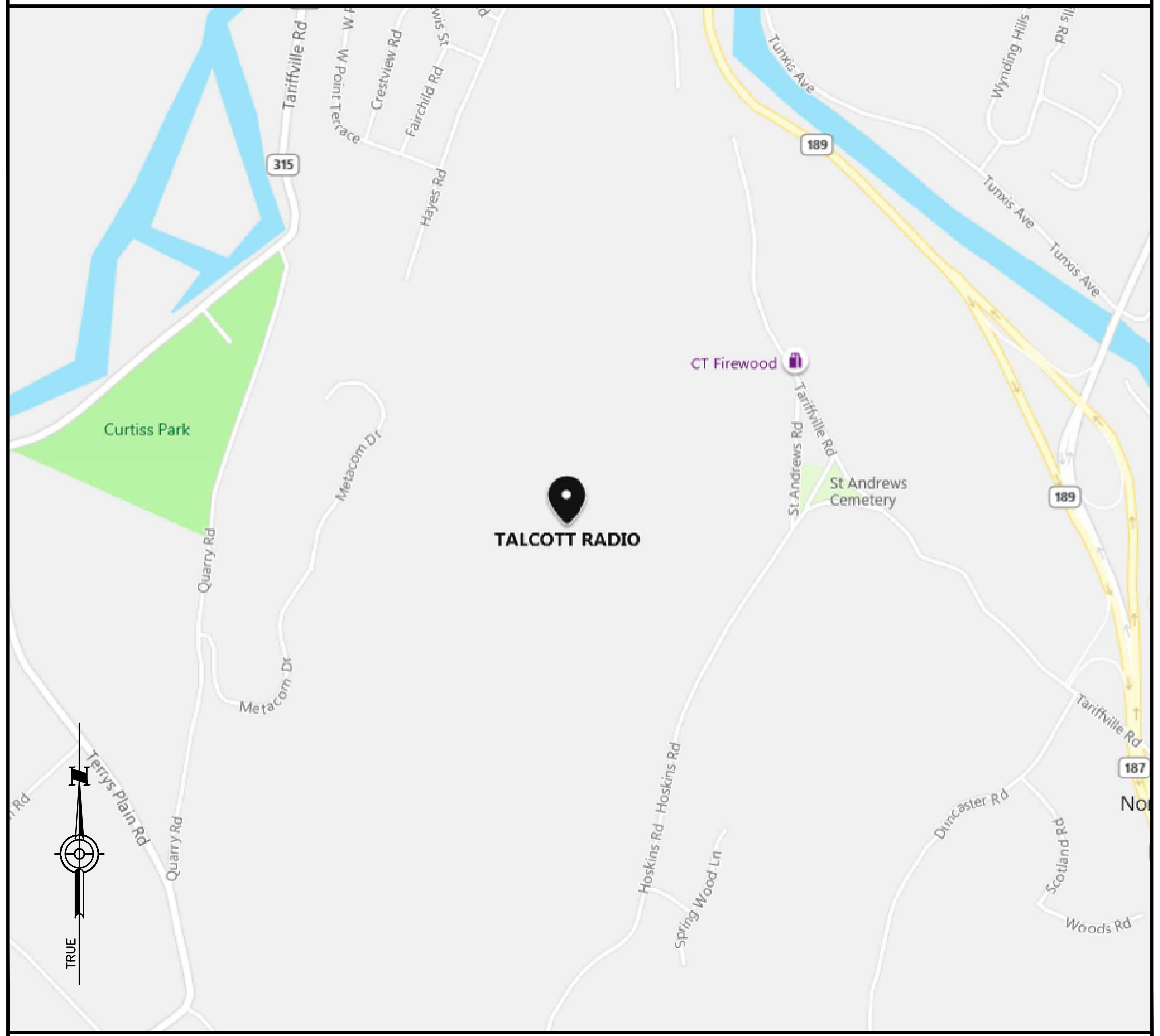
<u>EVERSOURCE ENERGY PROJECT MANAGER</u>:
NIKOLL PRECI
(860) 655-3079

<u>POWER PROVIDER</u>:
EVERSOURCE ENERGY
(800) 286-2000

<u>TELCO PROVIDER</u>:
FRONTIER
(800) 921-8102

<u>CALL BEFORE YOU DIG</u>:
(800) 922-4455

LOCATION MAP



NO SCALE

DESIGN TYPE

SITE UPGRADE
SELF-SUPPORT

DRAWING INDEX

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

DO NOT SCALE DRAWINGS

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

UNDERGROUND SERVICE ALERT
UTILITIES PROTECTION CENTER, INC.
811
48 HOURS BEFORE YOU DIG

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

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

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

REV	DATE	DESCRIPTION
0	09/25/20	ISSUED FOR REVIEW

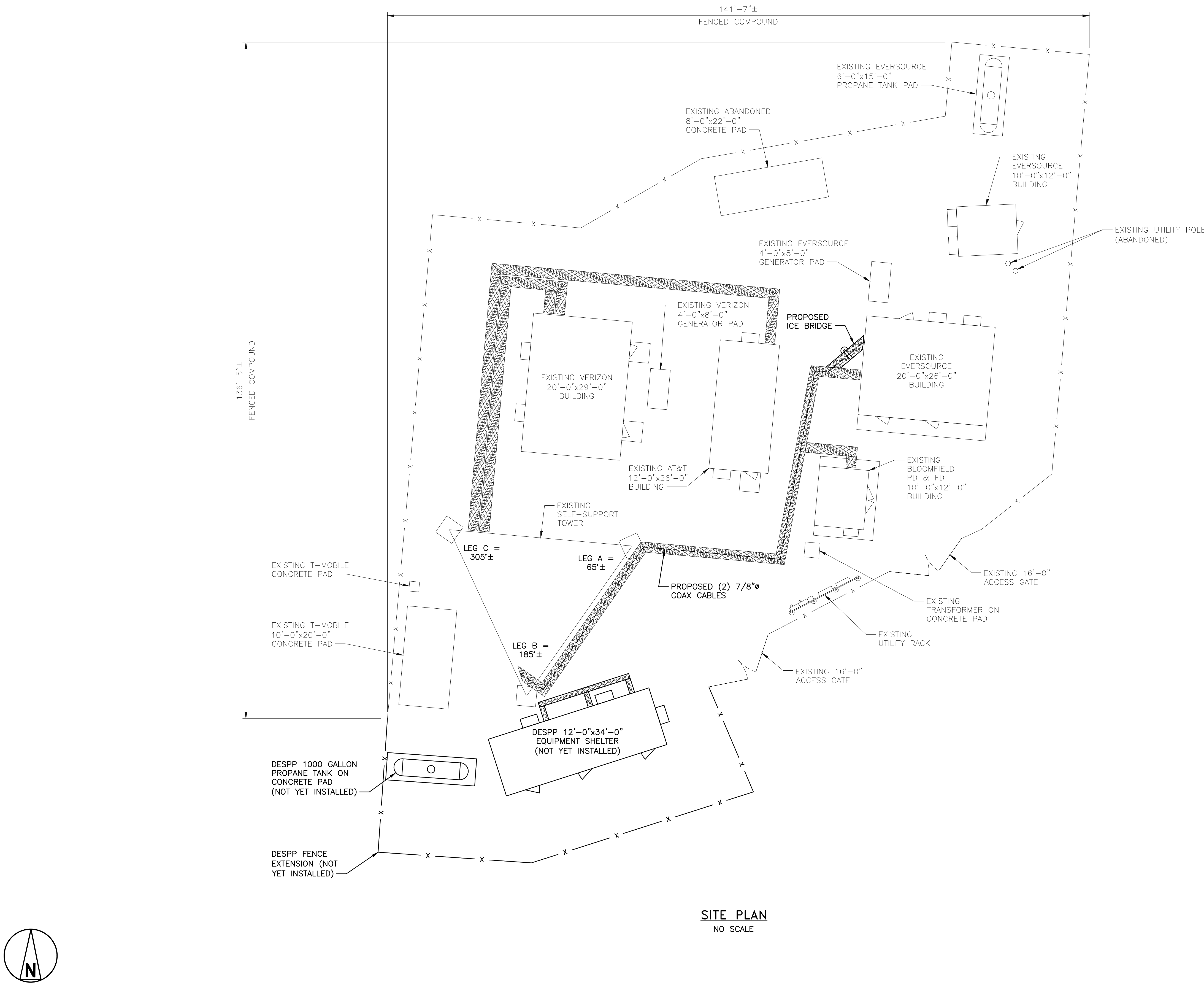
STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
09/28/2020

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1



SITE PLAN
NO SCALE

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

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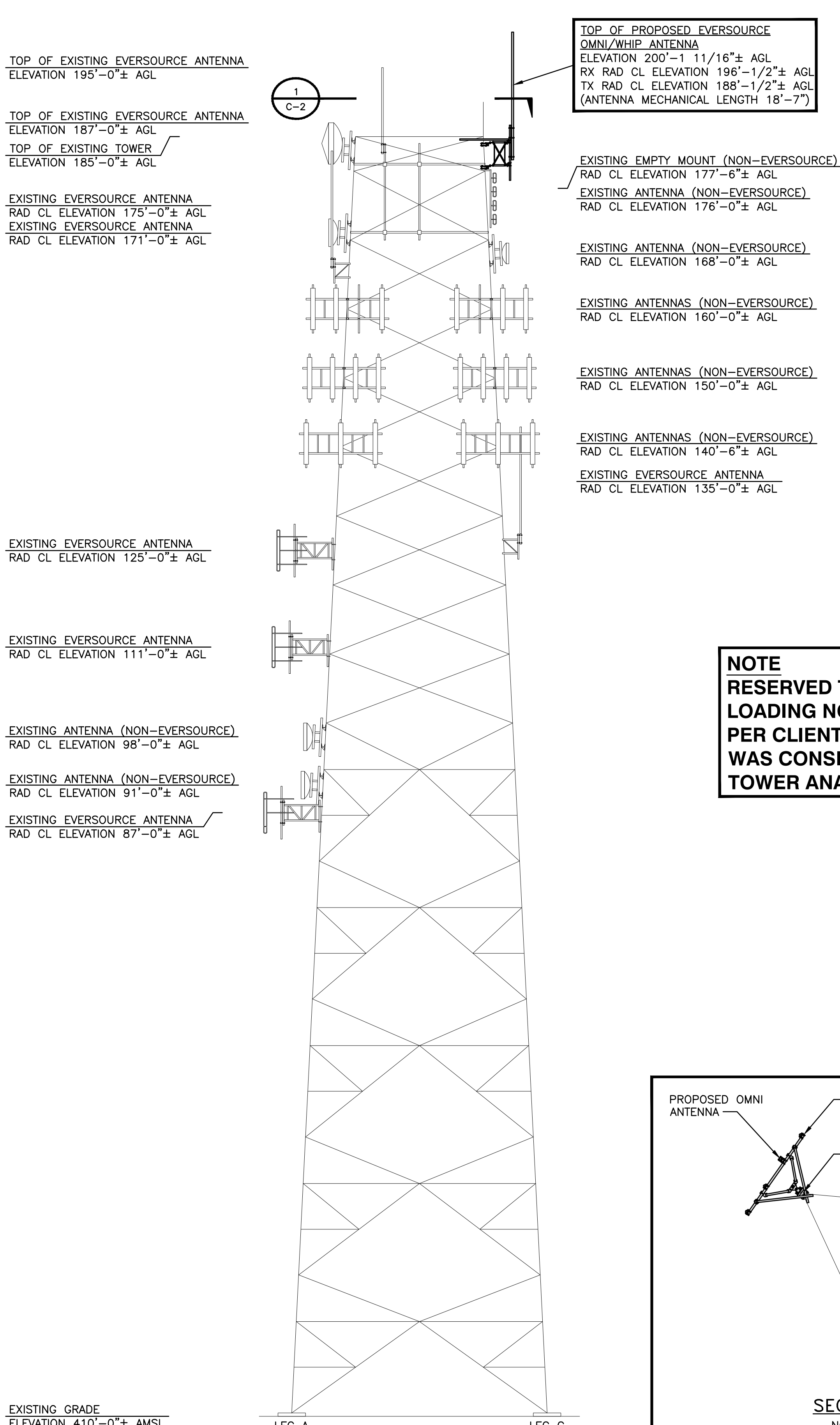
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

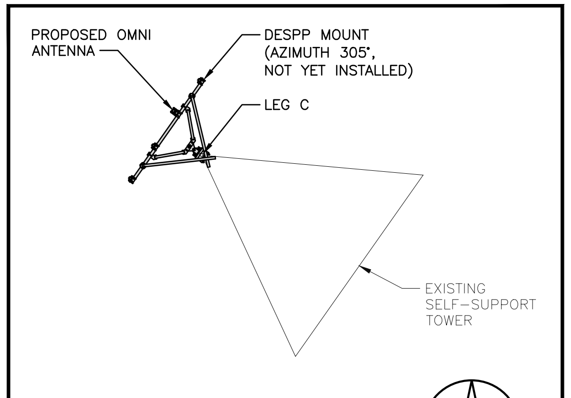


TOWER ELEVATION FACE AC

NO SCALE

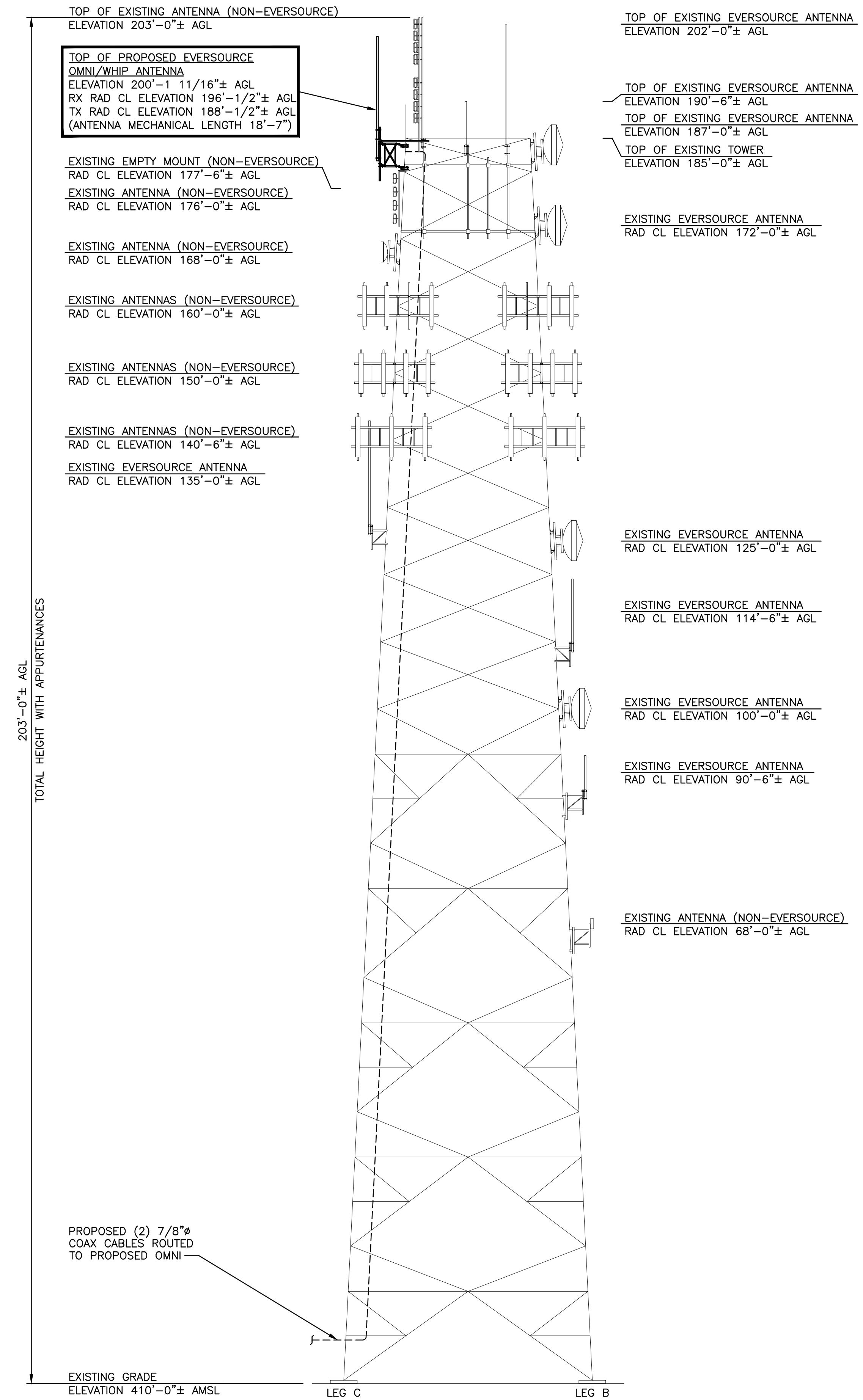
NOTE

RESERVED TOWER LOADING NOT ALL SHOWN PER CLIENT REQUEST BUT WAS CONSIDERED IN THE TOWER ANALYSIS REPORT.



SECTION 1

NO SCALE



TOWER ELEVATION FACE CB

NO SCALE

EVERSOURCE ENERGY

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

BLACK & VEATCH

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STATE OF CONNECTICUT · JOSHUA J. RILEY · 33208 · LICENSED · PROFESSIONAL ENGINEER

09/28/2020

TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE

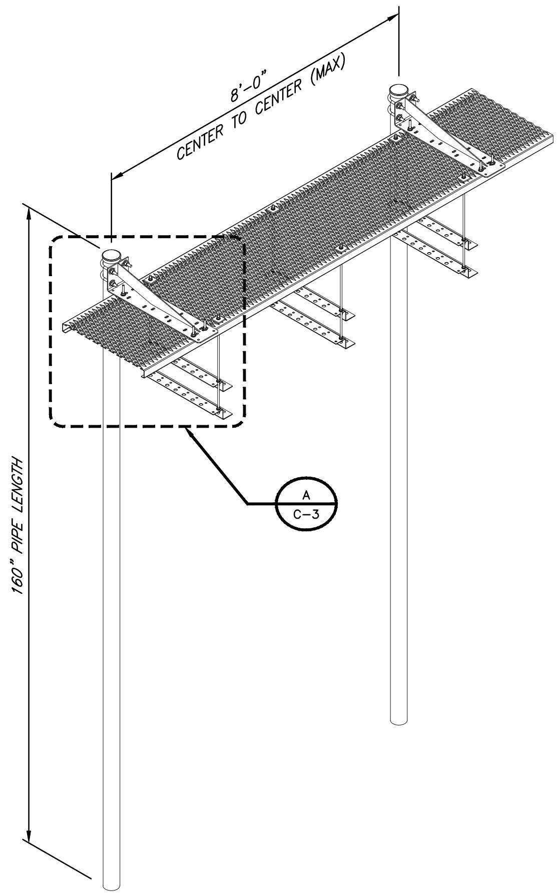
TOWER ELEVATION & ANTENNA EQUIPMENT

SHEET NUMBER

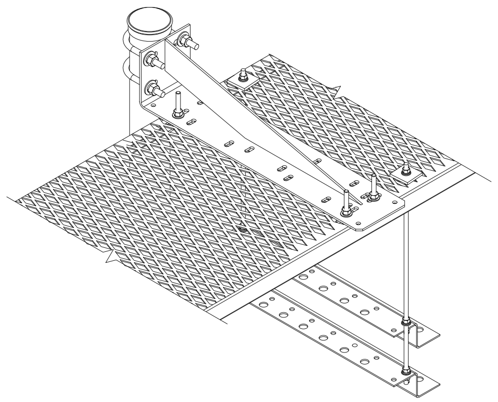
C-2

NOTES

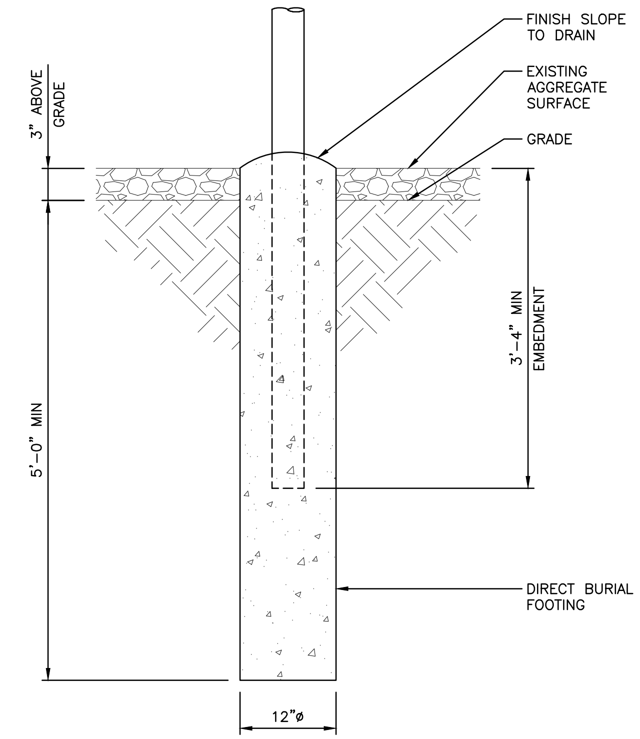
1. THE CLEARANCE BETWEEN THE BOTTOM OF THE FOUNDATION TO THE BOTTOM OF EMBEDDED PIPE SHALL BE A MINIMUM OF 4".
2. ATTACH THE END OF THE ICE BRIDGE TO THE EXISTING SHELTER WALL.



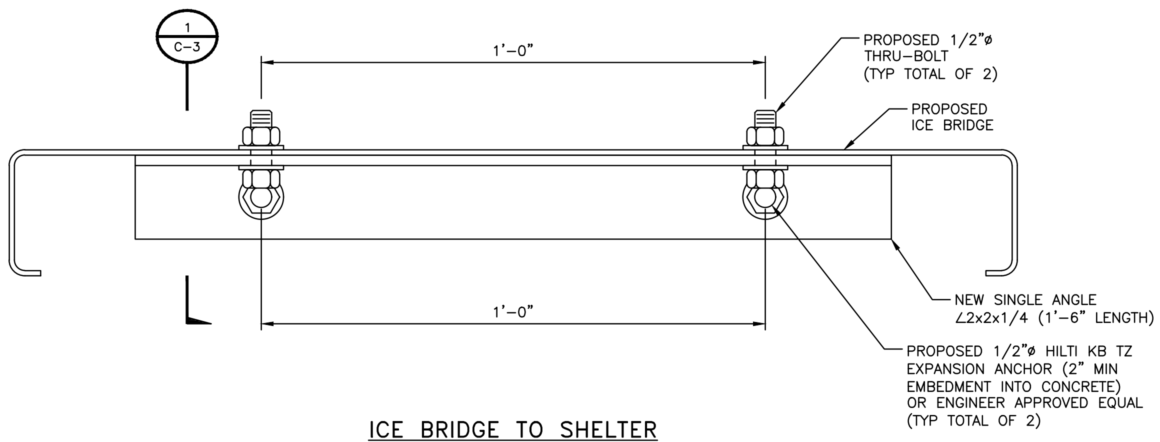
ICE BRIDGE DETAIL
SITE PRO 1 P/N IB24D-V
NO SCALE



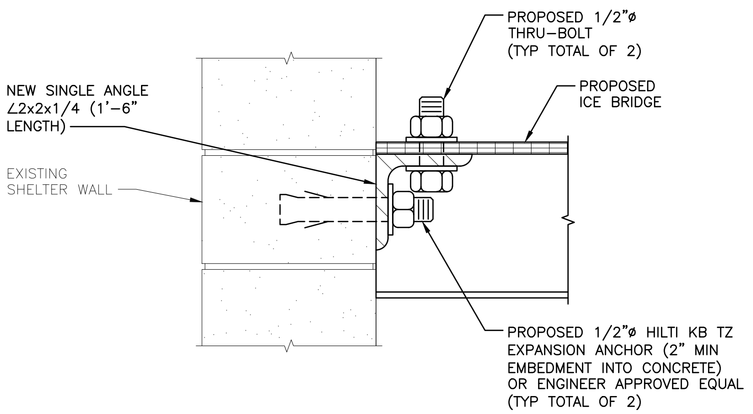
DETAIL A
NO SCALE



ICE BRIDGE
FOUNDATION DETAIL
NO SCALE



ICE BRIDGE TO SHELTER
WALL CONNECTION DETAIL
NO SCALE



SECTION 1
NO SCALE

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

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
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PROFESSIONAL ENGINEER
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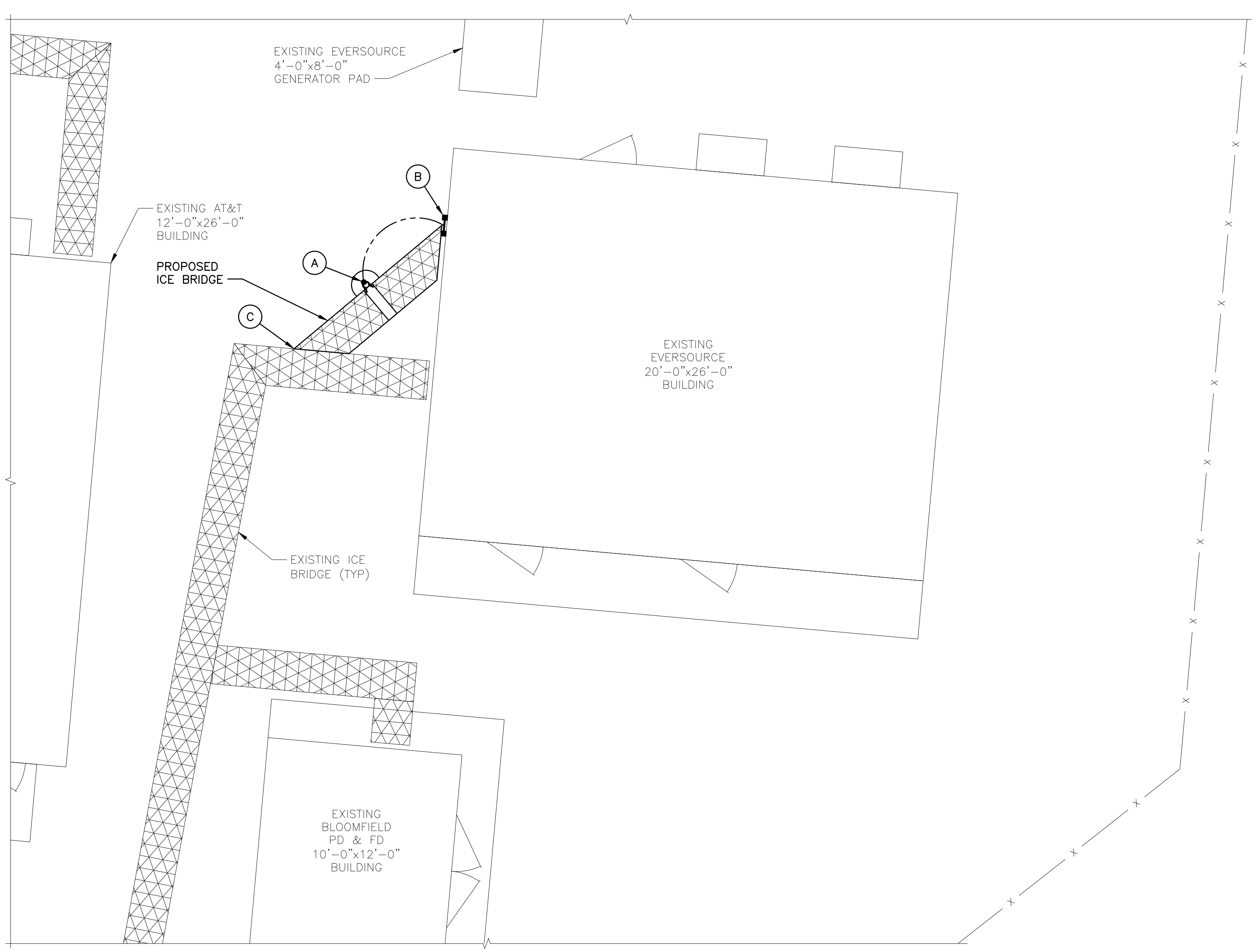
TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE
ICE BRIDE DETAILS

SHEET NUMBER
C-3

LEGEND

- ● EXOTHERMIC (UNLESS NOTED OTHERWISE).
- — – – — GROUND WIRE.



GROUNDING PLAN

NO SCALE

N

KEY NOTES

(A) ICE BRIDGE SUPPORT POST GROUNDING: EXTEND #2 TINNED CU WIRE FROM BURIED GROUND RING TO ALL ICE BRIDGE SUPPORT POSTS AND EXOTHERMICALLY WELD.

(B) EXTERIOR GROUND BAR: EXTEND #2 TINNED CU WIRE FROM BURIED GROUND RING UP TO THE EXTERIOR GROUND BAR AND MAKE AN EXOTHERMIC CONNECTION.

(C) MECHANICALLY BOND NEW ICE BRIDGE TO EXISTING.

NOTES

1. ALL INSTALLATIONS SHALL BE FIELD VERIFIED.
2. ALL GROUND WIRE SHALL BE #2 AWG BARE COPPER TINNED UNLESS NOTED OTHERWISE.
3. ALL GROUND WIRES SHALL PROVIDE A STRAIGHT DOWNWARD PATH TO GROUND WITH GRADUAL BEND AS REQUIRED. GROUND WIRES SHALL NOT BE LOOPED OR SHARPLY BENT.
4. EACH EQUIPMENT CABINET SHALL BE CONNECTED WITH #2 AWG INSULATED SOLID TINNED COPPER WIRE TO GROUND BAR. EQUIPMENT CABINETS SHALL EACH HAVE (2) LUG CONNECTIONS.
5. KOPR-SHIELD ANTI-OXIDATION COMPOUND SHALL BE USED ON ALL COMPRESSION GROUNDING CONNECTIONS.
6. ALL EXOTHERMIC CONNECTIONS SHALL BE INSTALLED UTILIZING THE PROPER CONNECTION/MOLD AND MATERIALS FOR THE PARTICULAR APPLICATION.
7. ALL BOLTED GROUNDING CONNECTIONS SHALL BE INSTALLED WITH AN EXTERNAL TOOTHED LOCK WASHER. GROUNDING BUS BARS MAY HAVE PRE PUNCHED HOLES OR TAPPED HOLES. ALL HARDWARE SHALL BE 3/8" STAINLESS STEEL.
8. EXTERNAL GROUNDING CONDUCTOR SHALL NOT BE INSTALLED OR ROUTED THROUGH HOLES IN ANY METAL OBJECTS, CONDUITS, OR SUPPORTS TO PRECLUDE ESTABLISHING A MAGNETIC CHOKE POINT.
9. PLASTIC CLIPS SHALL BE USED TO FASTEN AND SUPPORT GROUNDING CONDUCTORS. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL NOT BE USED.
10. STANDARD BUS BARS MGB, GWB, IGB, TELCO GB, FIBER GB, AND POWER GB SHALL BE FURNISHED AND INSTALLED BY THE SUBCONTRACTOR. THEY SHALL NOT BE FABRICATED OR MODIFIED IN THE FIELD. ALL GROUNDING BUSES SHALL BE IDENTIFIED WITH MINIMUM 3/4" LETTERS BY WAY OF STENCILING OR DESIGNATION PLATE.
11. IF COAX ON ICE BRIDGE IS MORE THAT 6' FROM THE GROUND BAR AT THE BASE OF THE TOWER, A SECOND GROUND BAR WILL BE NEEDED AT THE END OF THE ICE BRIDGE RUN TO GROUND THE COAX GROUND KIT AND THE IN-LINE SURGE ARRESTORS.
12. CONTRACTOR SHALL REPAIR/PLACE EXISTING GROUNDING SYSTEM COMPONENTS DAMAGED DURING CONSTRUCTION AT THE CONTRACTORS EXPENSE.

EVERSOURCE ENERGY

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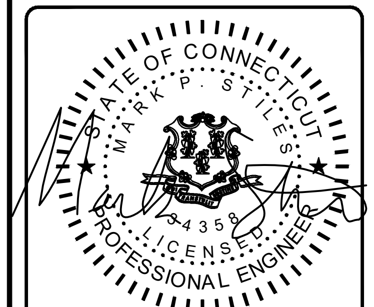

09/28/2020

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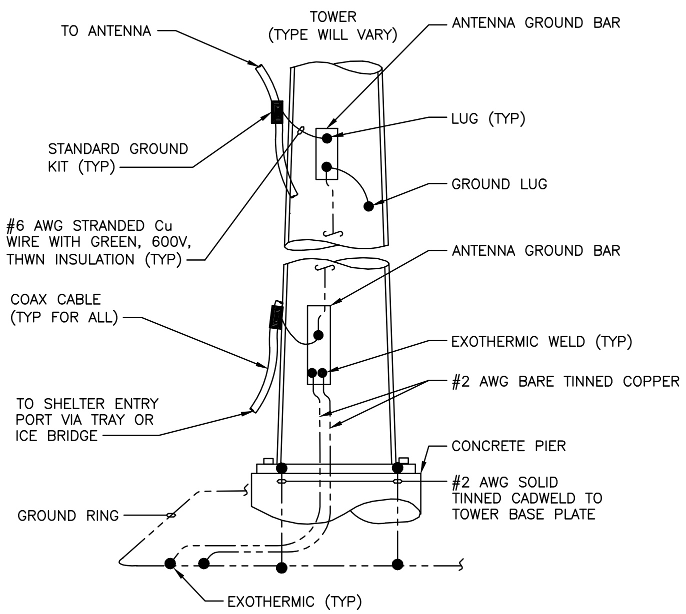
TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE

GROUNDING PLAN

SHEET NUMBER

G-1

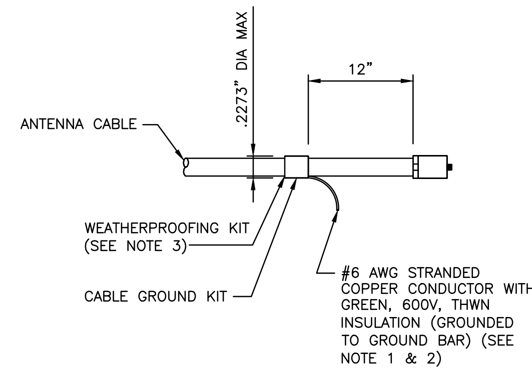


NOTE

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

ANTENNA CABLE GROUNDING

NO SCALE

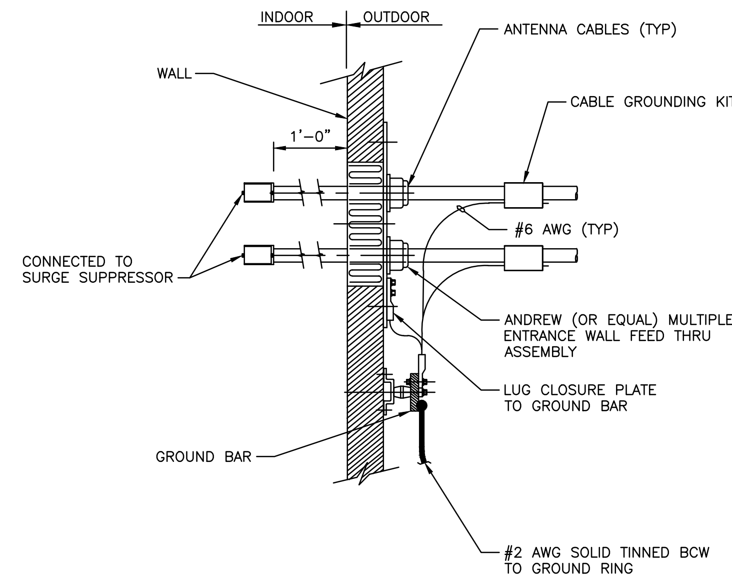


NOTES

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

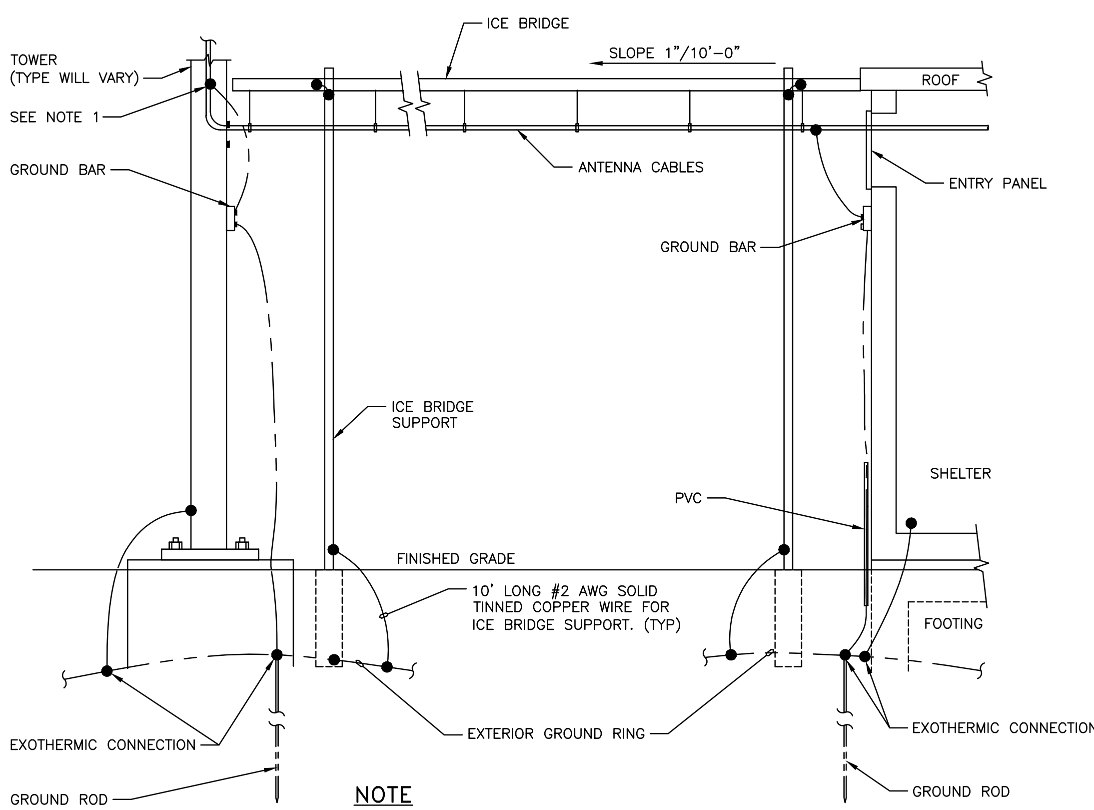
CONNECTION OF CABLE GROUND KIT TO ANTENNA CABLE

NO SCALE



CABLE INSTALLATION WITH WALL FEED THRU ASSEMBLY

NO SCALE



NOTE

1. PROVIDE GROUND KIT 6" BEFORE TURN

ICE BRIDGE AND ANTENNA CABLE DETAIL

NO SCALE

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

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

09/28/2020

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TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE
GROUNDING DETAILS

SHEET NUMBER
G-2

DESIGN BASIS

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

GENERAL CONDITIONS

1. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL BUILDING CODES, PERMIT CONDITIONS AND SAFETY CODES DURING CONSTRUCTION.
2. THE ENGINEER IS NOT: A GUARANTOR OF THE INSTALLING CONTRACTOR'S WORK; RESPONSIBLE FOR SAFETY IN, ON OR ABOUT THE WORK SITE; IN CONTROL OF THE SAFETY OR ADEQUACY OF ANY BUILDING COMPONENT, SCAFFOLDING OR SUPERINTENDING THE WORK.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL PERMITS, INSPECTIONS, TESTING AND CERTIFICATES NEEDED FOR LEGAL OCCUPANCY OF THE FINISHED PROJECT.
4. THE CONTRACTOR IS RESPONSIBLE TO REVIEW THIS COMPLETE PLAN SET AND VERIFY THE EXISTING CONDITIONS SHOWN IN THESE PLANS AS THEY RELATE TO THE WORK PRIOR TO SUBMITTING PRICE. SIGNIFICANT DEVIATIONS FROM WHAT IS SHOWN AFFECTING THE WORK SHALL BE REPORTED IMMEDIATELY TO THE CONSTRUCTION MANAGER.
5. DETAILS INCLUDED IN THIS PLAN SET ARE TYPICAL AND APPLY TO SIMILAR CONDITIONS.
6. EXISTING ELECTRICAL AND MECHANICAL FIXTURES, PIPING, WIRING, AND EQUIPMENT OBSTRUCTING THE WORK SHALL BE REMOVED AND/OR RELOCATED AS DIRECTED BY THE CONSTRUCTION MANAGER. TEMPORARY SERVICE INTERRUPTIONS MUST BE COORDINATED WITH OWNER.
7. THE CONTRACTOR SHALL DILIGENTLY PROTECT THE EXISTING BUILDING/SITE CONDITIONS AND THOSE OF ANY ADJOINING BUILDING/SITES AND RESTORE ANY DAMAGE CAUSED BY HIS ACTIVITIES TO THE PRE-CONSTRUCTION CONDITION.
8. THE CONTRACTOR SHALL SAFEGUARD AGAINST: CREATING A FIRE HAZARD, AFFECTING TENANT EGRESS OR COMPROMISING BUILDING SITE SECURITY MEASURES.
9. THE CONTRACTOR SHALL REMOVE ALL DEBRIS AND CONSTRUCTION WASTE FROM THE SITE EACH DAY. WORK AREAS SHALL BE SWEPT AND MADE CLEAN AT THE END OF EACH WORK DAY.
10. THE CONTRACTOR'S HOURS OF WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES AND ORDINANCES AND BE APPROVED BY OWNER.
11. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER IF ASBESTOS IS ENCOUNTERED DURING THE EXECUTION OF HIS WORK. THE CONTRACTOR SHALL CEASE ALL ACTIVITIES WHERE THE ASBESTOS MATERIAL IS FOUND UNTIL NOTIFIED BY THE CONSTRUCTION MANAGER TO RESUME OPERATIONS.

THERMAL & MOISTURE PROTECTION

1. FIRE-STOP ALL PENETRATIONS FOR ELECTRICAL CONDUITS OR WAVEGUIDE CABLING THROUGH BUILDING WALLS, FLOORS, AND CEILINGS SHALL BE FIRESTOPPED WITH ACCEPTED MATERIALS TO MAINTAIN THE FIRE RATING OF THE EXISTING ASSEMBLY. ALL FILL MATERIAL SHALL BE SHAPED, FITTED, AND PERMANENTLY SECURED IN PLACE. FIRESTOPPING SHALL BE INSTALLED IN ACCORDANCE WITH ASTM E814.
2. HILTI CP620 FIRE FOAM OR 3M FIRE BARRIER FILL, VOID OR CAVITY MATERIAL OR ACCEPTED EQUAL SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ASSOCIATED UNDERWRITERS LABORATORIES (UL) SYSTEM NUMBER.
3. FIRESTOPPING SHALL BE APPLIED AS SOON AS PRACTICABLE AFTER PENETRATIONS ARE MADE AND EQUIPMENT INSTALLED.
4. FIRESTOPPED PENETRATIONS SHALL BE LEFT EXPOSED AND MADE AVAILABLE FOR INSPECTION BEFORE CONCEALING SUCH PENETRATIONS. FIRESTOPPING MATERIAL CERTIFICATES SHALL BE MADE AVAILABLE AT THE TIME OF INSPECTION.
5. ANY BUILDING ROOF PENETRATION AND/OR RESTORATION SHALL BE PERFORMED SO THAT THE ROOF WARRANTY IN PLACE IS NOT COMPROMISED. CONTRACTOR SHALL ARRANGE FOR OWNER'S ROOFING CONTRACTOR TO PERFORM ANY AND ALL ROOFING WORK IF SO REQUIRED BY EXISTING ROOF WARRANTY. OTHERWISE, ROOF SHALL BE MADE WATERTIGHT WITH LIKE CONSTRUCTION AS SOON AS PRACTICABLE AND AT COMPLETION OF CONSTRUCTION.
6. ALL PENETRATIONS INTO AND/OR THROUGH BUILDING EXTERIOR WALLS SHALL BE SEALED WITH SILICONE SEALER.
7. WHERE CONDUIT AND CABLES PENETRATES FIRE RATED WALLS AND FLOORS, FIRE GROUT ALL PENETRATIONS IN ORDER TO MAINTAIN THE FIRE RATING USING A LISTED FIRE SEALING DEVICE OR GROUT.
8. CONTRACTOR TO REMOVE AND RE-INSTALL ALL FIRE PROOFING AS REQUIRED DURING CONSTRUCTION.

SUBMITTALS

1. CONTRACTOR TO SUBMIT SHOP DRAWINGS TO ENGINEER FOR REVIEW PRIOR TO FABRICATION.
2. CONTRACTOR TO NOTIFY ENGINEER FOR INSPECTION PRIOR TO CLOSING PENETRATIONS.
3. CONTRACTORS SHALL VERIFY ALL DIMENSIONS AND CONDITIONS IN THE FIELD PRIOR TO FABRICATION AND ERECTION OF ANY MATERIAL. THE ENGINEER SHALL BE NOTIFIED OF ANY CONDITIONS WHICH PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
4. ALL STEEL MATERIAL EXPOSED TO WEATHER SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 " ZINC (HOT-DIPPED GALVANIZED) COATINGS" ON IRON AND STEEL PRODUCTS.
5. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NONCONFORMING MATERIALS OR CONDITIONS FOR REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

STEEL

1. MATERIAL:

WIDE FLANGE:	ASTM A572, GR 50
TUBING:	ASTM A500, GR C
PIPE:	ASTM A53, GR B AND ASTM 572, GR 50
ANGLE:	ASTM A570, GR 50 AND ASTM A36
BOLTS:	ASTM A325
GRATING:	TYPE GW-2 (1"x3/16" BARS)
MISC. MATERIAL:	ASTM A36

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

2. DAMAGED GALVANIZED SURFACES SHALL BE CLEANED WITH A WIRE BRUSH AND PAINTED WITH TWO COATS OF COLD ZINC, "GALVANOX", "DRY GALV", "ZINC IT", OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES. TOUCH UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT IN SHOP OR FIELD.
3. DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC "MANUAL OF STEEL CONSTRUCTION" 13TH EDITION.
4. THE STEEL STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER COMPLETION. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE BUILDING AND ITS COMPONENT PARTS DURING ERECTION.
5. ALL STEEL ELEMENTS SHALL BE INSTALLED PLUMB AND LEVEL.
6. TOWER MANUFACTURER'S DESIGNS SHALL PREVAIL FOR TOWER.

SITE GENERAL

1. CONTRACTOR SHALL FOLLOW CONDITIONS OF ALL APPLICABLE PERMITS AND WORK IN ACCORDANCE WITH OSHA REGULATIONS.
2. THESE PLANS DEPICT KNOWN UNDERGROUND STRUCTURES, CONDUITS, AND/OR PIPELINES. THE LOCATIONS FOR THESE ELEMENTS ARE BASED UPON THE VARIOUS RECORD DRAWINGS AVAILABLE. THE CONTRACTOR IS HEREBY ADVISED THAT THESE DRAWINGS MAY NOT ACCURATELY DEPICT AS-BUILT LOCATIONS AND OTHER UNKNOWN STRUCTURES. THE CONTRACTOR SHALL THEREFORE DETERMINE THE EXACT LOCATION OF EXISTING UNDERGROUND ELEMENTS AND EXCAVATE WITH CARE AFTER CALLING MARKOUT SERVICE AT 1-800-272-4480 48 HOURS BEFORE DIGGING, DRILLING OR BLASTING.
3. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, AND OTHER UTILITIES WHERE ENCOUNTERED, SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION, SHALL BE RELOCATED AS DIRECTED BY ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR PIER DRILLING AROUND OR NEAR UTILITIES. CONTRACTOR SHALL HAND DIG UTILITIES AS NEEDED. CONTRACTOR SHALL PROVIDE, BUT IS NOT LIMITED TO, APPROPRIATE A) FALL PROTECTION, B) CONFINED SPACE ENTRY, C) ELECTRICAL SAFETY, AND D) TRENCHING AND EXCAVATION.
4. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES, AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
5. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC, FIBER OPTIC, OR OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED, AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT THE POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, SUBJECT TO THE APPROVAL OF THE CONSTRUCTION MANAGER.
6. CONTRACTOR IS RESPONSIBLE FOR REPAIRING OR REPLACING STRUCTURES OR UTILITIES DAMAGED DURING CONSTRUCTION.
7. CONTRACTOR SHALL PROTECT EXISTING PAVED AND GRAVEL SURFACES, CURBS, LANDSCAPE AND STRUCTURES AND RESTORE SITE OR PRE-CONSTRUCTION CONDITION WITH AS GOOD, OR BETTER, MATERIALS. NEW MATERIALS SHALL MATCH EXISTING THICKNESS AND TYPE.
8. THE CONTRACTOR SHALL SHORE ALL TRENCH EXCAVATIONS GREATER THAN 5 FEET IN DEPTH OR LESS WHERE SOIL CONDITIONS ARE DEEMED UNSTABLE. ALL SHEETING AND/OR SHORING METHODS SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER.
9. THE CONTRACTOR IS RESPONSIBLE FOR MANAGING GROUNDWATER LEVELS IN THE VICINITY OF EXCAVATIONS TO PROTECT ADJACENT PROPERTIES AND NEW WORK. GROUNDWATER SHALL BE DRAINED IN ACCORDANCE WITH LOCAL SEDIMENTATION AND EROSION CONTROL GUIDELINES.

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

REV	DATE	DESCRIPTION
0	09/25/20	ISSUED FOR REVIEW

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED
PROFESSIONAL ENGINEER
09/28/2020

TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE

NOTES & SPECIFICATIONS

SHEET NUMBER

N-1

ELECTRICAL

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

GROUNDING

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

ANTENNA & CABLE NOTES

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

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

REV	DATE	DESCRIPTION
0	09/25/20	ISSUED FOR REVIEW

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

09/28/2020

TALCOTT RADIO
5 ST ANDREWS ROAD
BLOOMFIELD, CT 06002

SHEET TITLE

NOTES & SPECIFICATIONS

SHEET NUMBER

N-2

SYMBOLS

●	EXOTHERMIC CONNECTION
■	COMPRESSION CONNECTION
	5/8"øx10-'0" COPPER CLAD STEEL GROUND ROD.
	TEST GROUND ROD WITH INSPECTION SLEEVE
— — — —	GROUNDING CONDUCTOR
(A)	KEY NOTES
CHAINLINK FENCE	——— X ——— X ——— X ——— X ——— X ———
WOOD FENCE	
LEASE AREA	— — — — — — — —
ICE BRIDGE	
CABLE TRAY	
GAS LINE	——— G ——— G ——— G ——— G ——— G ———
UNDERGROUND ELECTRICAL/TELCO	——— E/T ——— E/T ——— E/T ——— E/T ———
UNDERGROUND ELECTRICAL/CONTROL	——— E/C ——— E/C ——— E/C ——— E/C ———
UNDERGROUND ELECTRICAL	——— E ——— E ——— E ——— E ——— E ———
UNDERGROUND TELCO	——— T ——— T ——— T ——— T ——— T ———
PROPERTY LINE (PL)	——— — — ——— — — ——— — — ——— — — ———

ABBREVIATIONS

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

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IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

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NOTES & SPECIFICATIONS

SHEET NUMBER

N-3

REFERENCE CUTSHEETS

VHF Omni Antennas (160-222 MHz)

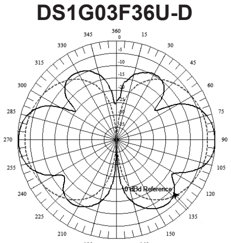
dbSpectra

	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	
Power, Watts	500		500		350		500		500		500		350		350	
Gain, dBd	3		6		3		0		3		6		0		3	
Horizontal Beamwidth, degrees	360		360		360		360		360		360		360		360	
Vertical Beamwidth, degrees	30		16		30		60		30		16		60		30	
Beam Tilt, degrees	0		0		0		0		0		0		0		0	
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	
Flat Plate Area, ft²	2.10		3.63		3.69		1.28		1.64		2.58		2.09		3.08	
Lateral Windload Thrust, lbf	88		152		155		54		69		109		88		129	
Wind Speed Rating without ice, mph	190		150		150		250		225		175		190		160	
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)		15.6 (4.8)		12.6 (3.8)		18.6 (5.7)	
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)	
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)	37 (16.8)		60 (27.2)		63 (28.6)		19 (8.6)		26 (11.8)		47 (21.3)		40 (18.1)		70 (31.8)	
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)	

DS2C03F36D-D

VERTICAL PATTERNS

DS1G03F36U-N
DS1G03F36U-D



DS1G06F36U-N
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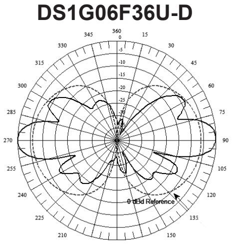

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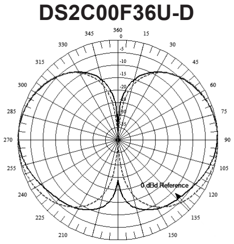

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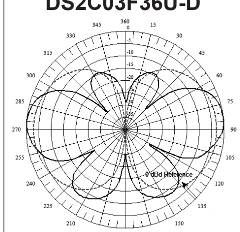

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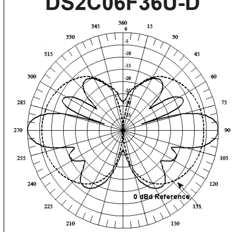
DS2C06F36U-D



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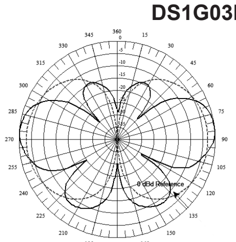

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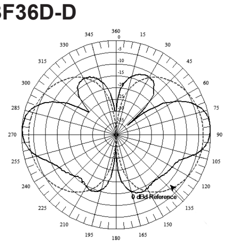

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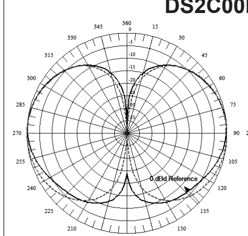

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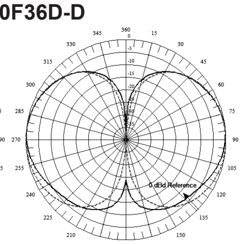

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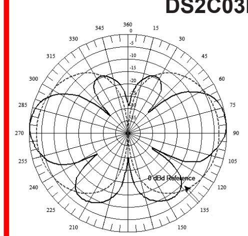

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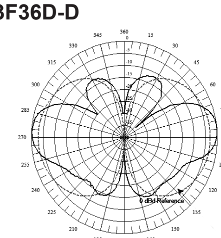

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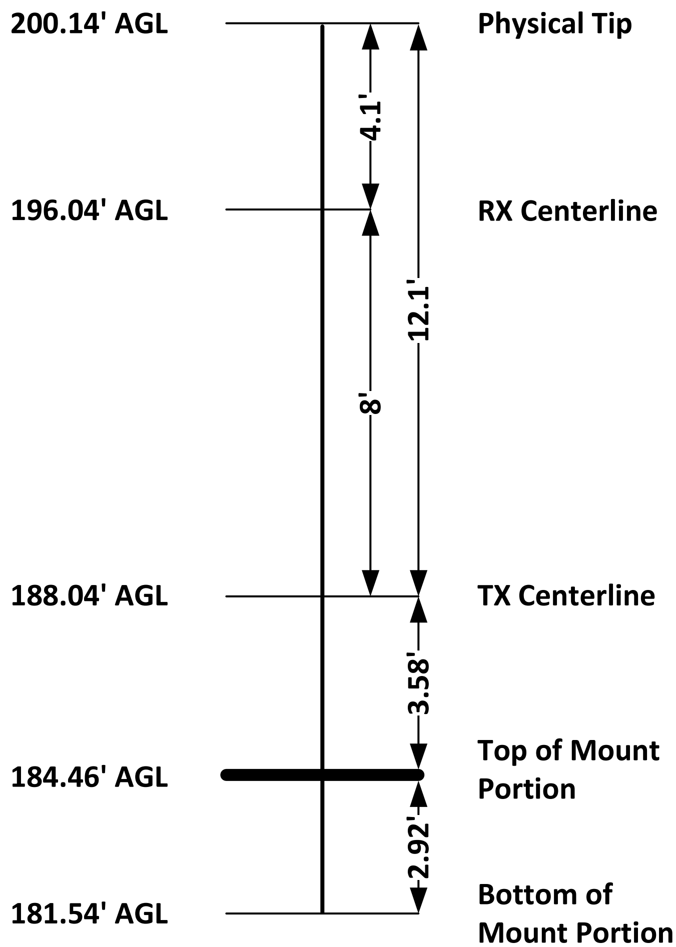
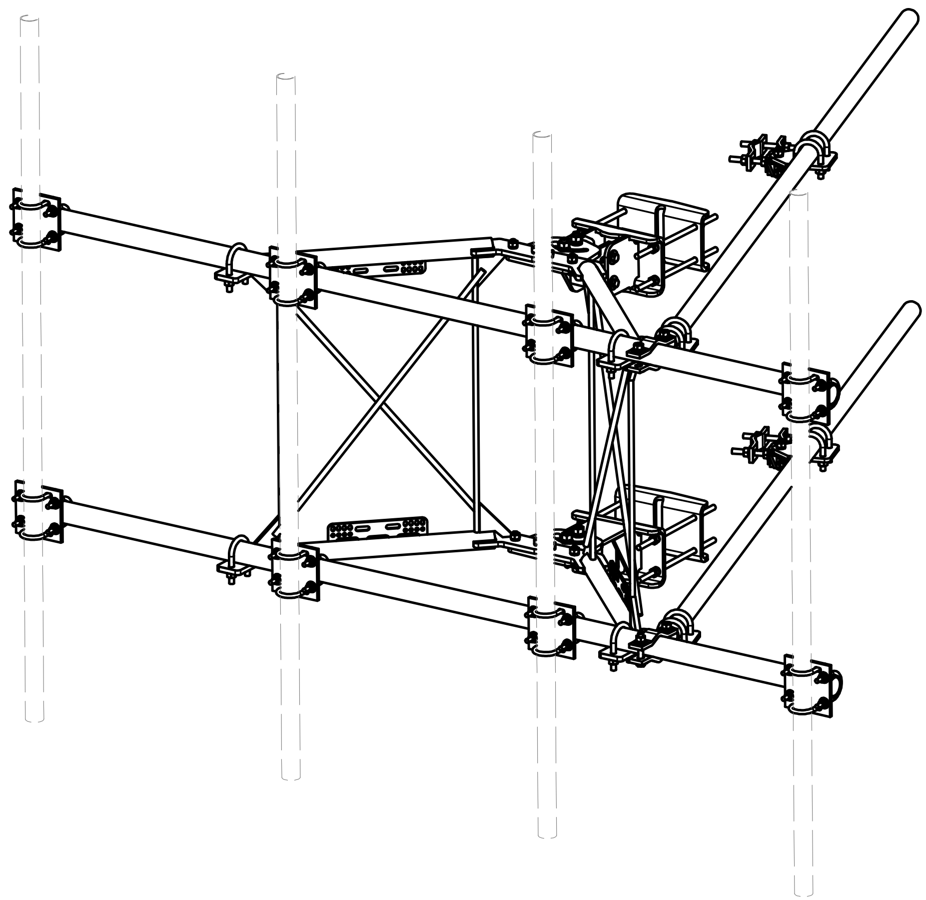
Specifications are subject to change • www.dbspectra.com • 1590 E Hwy 121 Bus, Ste A100, Lewisville, TX 75056 • P(469)322-0080 • F(469)322-0079 • ISO 9001:2015 • 096000-030.E • © 07/2019

dBSpectra DS2C03F36 (18.6' Total)



DESPP MOUNT (NOT YET INSTALLED)



PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	2	X-VFAW	SUPPORT ARM		71.41	142.81
2	1	X-HDCAMTBW	CLAMP WELDMENT FOR BCAM-HD		33.86	33.86
3	1	X-MHTPHD	MULTI-HOLE TAPER PLATE WELDMENT		36.24	36.24
4	2	X-VFAPL4	VFA-HD PIVOT PLATE	12 in	15.88	31.77
5	2	X-LCBP4	BENT BACKING PLATE	13 in	19.00	38.01
6	1	X-HDCAMSS	ANGLE ADJUSTMENT WELDMENT FOR BCAM-HD		16.39	16.39
7	4	X-SPTB	SLIDING PIPE TIE BACK PLATE	5 1/2 in	5.87	23.49
8	1	X-HDCAMSP	POSITIONING PLATE WELDMENT FOR BCAM-HD		2.58	2.58
9	4	X-TBCA	TIE BACK CLIP ANGLE		2.01	8.02
10	8	SCX2	CROSSOVER PLATE	7 in	4.80	38.37
11	4	MCP	CLAMP HALF 1/2" THICK, 11-5/8" LONG	12 1/16 in	3.59	14.37
12	8	DCP	1/2" THICK, 5-3/4" CNTER TO CENTER CLAMP HALF	8 1/8 in	2.36	18.90
13	2	P2126	2-3/8" X 126" (2" SCH. 40) GALVANIZED PIPE	126 in	40.75	81.50
14	2	P30126	2-7/8" O.D. X 126" SCH. 40 PIPE	126 in	64.63	129.25
15	4	A34212	3/4" x 2-1/2" UNC HEX BOLT (A325)	2 1/2 in	0.48	1.92
16	4	G34FW	3/4" HDG USS FLATWASHER		0.06	0.24
17	4	G34LW	3/4" HDG LOCKWASHER		0.04	0.17
18	4	G34NUT	3/4" HDG HEAVY 2H HEX NUT		0.21	0.85
19	8	G58R-18	5/8" x 18" THREADED ROD (HDG.)	18 in	0.40	3.19
20	4	G58R-12	5/8" x 12" THREADED ROD (HDG.)		1.05	4.18
21	4	G58R-8	5/8" x 8" THREADED ROD (HDG.)		0.70	2.79
22	4	X-UB5300	5/8" X 3" X 5-1/4" X 2-1/2" U-BOLT (HDG.)		1.15	4.60
23	8	X-UB5258	5/8" X 2-5/8" X 4-1/2" X 2" U-BOLT (HDG.)		1.00	8.00
24	2	G5807	5/8" x 7" HDG HEX BOLT GR5 FULL THREAD	7 in	0.70	1.41
25	1	G5806	5/8" x 6" HDG HEX BOLT GR5 FULL THREAD	6 in	0.62	0.62
26	8	G5804	5/8" x 4" HDG HEX BOLT GR5		0.44	3.55
27	4	G5802	5/8" x 2" HDG HEX BOLT GR5		0.27	1.08
28	8	A582114	5/8" x 2-1/4" HDG A325 HEX BOLT	2 1/4 in	0.31	2.50
29	25	G58FW	5/8" HDG USS FLATWASHER	1/8 in	0.07	1.76
30	66	G58LW	5/8" HDG LOCKWASHER		0.03	1.72
31	71	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	9.22
32	32	X-UB1300	1/2" X 3" X 5" X 2" GALV U-BOLT		0.74	23.64
33	16	X-UB1212	1/2" X 2" X 3" X 1-1/4" U-BOLT (HDG.)		0.60	9.56
34	64	G12FW	1/2" HDG USS FLATWASHER	3/32 in	0.03	2.18
35	64	G12LW	1/2" HDG LOCKWASHER	1/8 in	0.01	0.89
36	64	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	4.58
					TOTAL WT. #	713.44

REV	DESCRIPTION OF REVISIONS	CPD	BY	DATE
D	UPDATED BCAM VERSION 1 TO BCAM VERSION 2		CEK	6/29/2018
C	UPDATED PIN LEG CONNECTION T0 BCAM CONNECTION		CEK	12/14/2017
B	CHANGED TIE-BACK BACK CONNECTION		CEK	7/28/2017
A	CHANGED TIE-BACK FRONT CONNECTION		CEK	2/2/2017

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")*

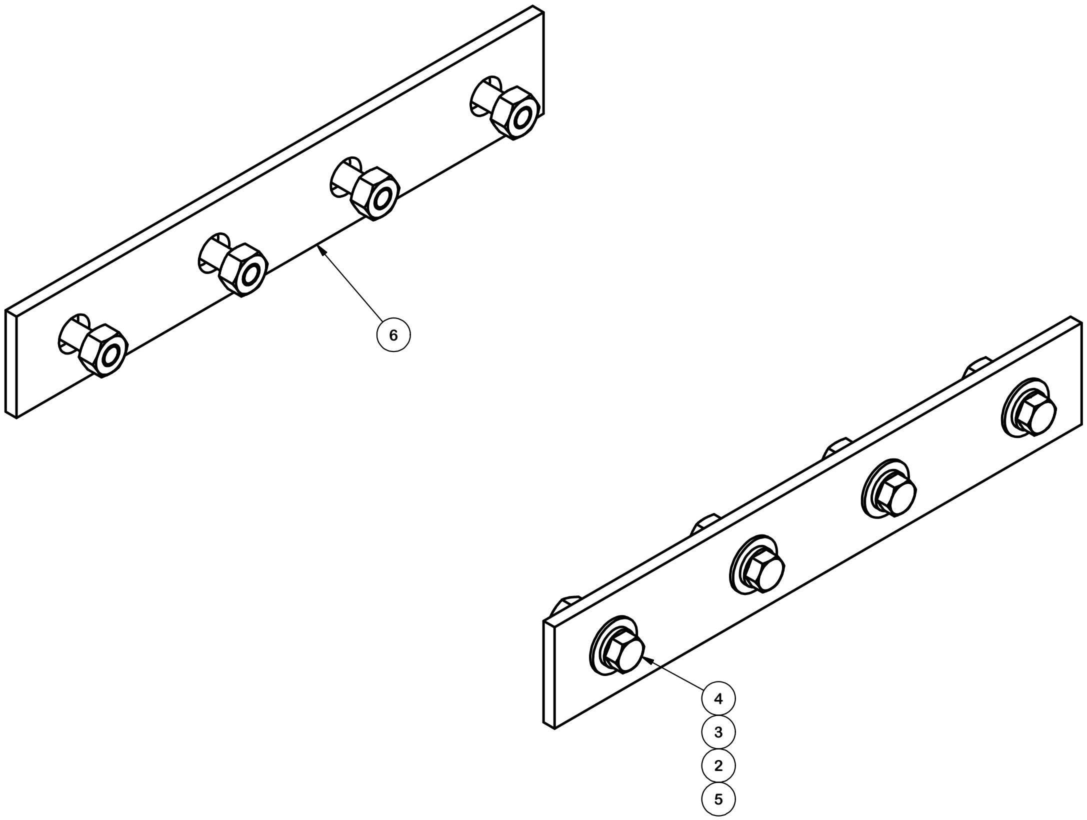
DESCRIPTION
10' 6" HEAVY DUTY
V-FRAME ASSEMBLY
WITH TWO STIFF ARMS

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.
		CEK 1/25/2017		VFA10-HD
CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	02	CUSTOMER	BMC 12/14/2017	VFA10-HD

USED TO CONNECT PROPOSED ICE BRIDGE TO EXISTING ICE BRIDGE. (1) KIT REQUIRED

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
2	8	G38FW	3/8" HDG USS FLATWASHER		0.01	0.09
3	8	G38LW	3/8" HDG LOCKWASHER		0.01	0.05
4	8	G38114	3/8" x 1-1/4" HDG HEX BOLT GR5		0.06	0.50
5	8	G38NUT	3/8" HDG HEAVY 2H HEX NUT		0.03	0.27
6	2	X-WGB-SP	STRAIGHT ICE BRIDGE SPLICE	12 in	1.68	3.36
					TOTAL WT. #	4.11



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
STRAIGHT SPLICE
FOR BRIDGES

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.
	CEK 10/12/2011		WGB-SP
CLASS / SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
	CUSTOMER	KAC 4/23/2012	WGB-SP

ATTACHMENT C – STRUCTURAL ANALYSIS REPORT

Date: **August 10, 2020**

BLACK & VEATCH
Building a world of difference.

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

Subject:	**Structural Analysis Report**	
Eversource Designation:	**Eversource Site Number:** **Eversource Site Name:**	ES-038 TalcottRS
Engineering Firm Designation:	**Black & Veatch Corp. Project Number:**	405025
Site Data:	**5 St Andrews Road (Tariffville Relocation) Bloomfield, Hartford County, CT** **Latitude *41° 53' 33.60"*, Longitude *-72° 45' 56.5"*** **185 Foot - Self Support Tower**	

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

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

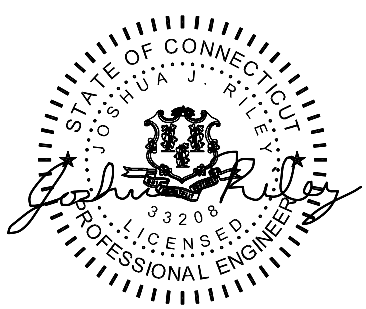
LC1: Proposed Equipment Configuration **Sufficient Capacity – 86.0%**

This analysis utilizes an ultimate 3-second gust wind speed of 130 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Changzhi Zang / Robert Hudson II

Respectfully submitted by:

Joshua J. Riley, P.E.
Professional Engineer



08/10/2020

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 185 ft Self Support tower designed by Sabre in August of 2015.

2) ANALYSIS CRITERIA

TIA-222 Revision:	TIA-222-H
Risk Category:	III
Wind Speed:	130 mph
Exposure Category:	B
Topographic Category:	5
Topographic Factor:	1.755
Ice Thickness:	2.0 in
Wind Speed with Ice:	50 mph
Seismic Ss:	0.178
Seismic S_1:	0.064
Service Wind Speed:	60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
183.0	190.8	1	dBSpectra	DS2C03F36D-D	2	7/8	1

Notes:
1) Mounts to Reserved Sector Mount at 183.0’, See Table 2.

Table 2 - Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
185.0	195.0	1	dBSpectra	DS9A09F36D-N (20’ x3” omni)	2 3 1	1 5/8 7/8 1/2	1
	193.0	1	rfs	BA8080-67 (16’ 8 Bay Di-Pole)			
	189.0	1	kreco	CO-41A			
	187.0	1	telewave	ANT450F-6			
	185.0	1	bird	TTA TX/RX 432F-83W-01-T			2
183.0	190.0	1	dBSpectra	DS7C09P36D-D	3 1	1 5/8 1/2	2
	183.0	1	site pro1	VFA10-HD-S Heavy Duty V-Frame			
	176.0	2	dBSpectra	DS7C09P36D-D			
183.0	183.0	2	tower mount	6'x4" Mount Pipe	4	EW63	1
		2	rfs	PADX8-59A			
181.0	176.0	1	decibel	DB411-B	1	7/8	1
177.0	177.0	1	tower mount	6'x4" Mount Pipe	1	EW90	1
		1	rfs	PA4-57A			
172.0	172.0	1	mount pipes	6'x4" Mount Pipe	2	EW63	1
		1	rfs	PADX8-59A			
171.0	171.0	1	mount pipes	6'x4" Mount Pipe	2	EW63	2

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		1	rfs	PADX8-59A			
168.0	168.0	1	kathrein	PR-900	1	7/8	1
		1	mount pipes	6'x2" Mount Pipe			
165.0	175.0	1	telewave	ANT150F6	1	7/8	1
	165.0	1	tower mounts	Side Arm Mount [SO 602-1]			
160.0	160.0	3	powerwave	TT08-19DB111-001	6 3 12	2 1/4 5/16 5/8	1
		3	powerwave	7770.00 w/ Mount Pipe			
		2	cci antennae	OPA-65R-LCUU-H8 w/ Mount Pipe			
		1	cci antennae	OPA-65R-LCUU-H6 w/ Mount Pipe			
		4	kathrein	800-10966 w/ Mount Pipe			
		2	kathrein	800-10965 w/ Mount Pipe			
		1	tower mounts	Sector Mount [SM 502-3]			
		3	ericsson	RRUS 4478 B14			
		3	ericsson	RRUS 8843 B2/B66A			
		3	ericsson	RRUS 4449 B5/B12			
		3	raycap	DC6-48-60-18-8C-EV			
		3	ericsson	RRUS 32			
		3	ericsson	RRUS E2			
		3	raycap	DC6-48-60-18-8F			
150.0	150.0	3	alcatel lucent	RRH2X40-700	6 2	1 5/8 1 1/4	1
		3	alcatel lucent	RRH2X40-AWS			
		3	amphenol	BXA-70063-6CF w/ Mount Pipe			
		6	amphenol	BXA-171063-12CF w/ Mount Pipe			
		6	antel	LPA-80080/4CF w/ Mount Pipe			
		1	tower mounts	Sector Mount [SM 502-3]			
		1	rfs miscl	DB-T1-6Z-8AB-0Z Distribution Box			
140.5	140.5	1	raycap	Mini-Squid' D-Box	3 1	1 5/8 1 1/4	2
		1	fastback network	IBR 1300			
		6	ericsson	RRUS 11			
		3	rfs celwave	APXV18-206516 w/ Mount Pipe			
		3	rfs celwave	APXV18-206517 w/ Mount Pipe			
		3	andrew	LNX-6515DS-T4M w/ Mount Pipe			
		1	tower mounts	Sector Mount [SM 502-3]			
135.0	135.0	2	rfs celwave	PADX6-59A	4	EW63	2

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		2	tower mounts	Pipe Mount [PM 601-1]			
125.0	135.0	1	telewave	ANT150F-6	1	7/8	1
	125.0	1	tower mounts	Side Arm Mount [SO 602-1]			
		1	comprod	531-70HD 12’ Dipole	1	7/8	1
		1	tower mounts	Side Arm Mount [SO 602-1]			
		1	tower mounts	6'x4" Mount Pipe	2	EW63	1
		1	rfs	PADX8-59A			
109.0	111.0	1	comprod	531-70HD 12’ Dipole	1	7/8	1
	109.0	1	tower mounts	Side Arm Mount [SO 602-1]			
108.0	114.5	1	kreco	CO-41A	1	7/8	1
	108.0	1	tower mounts	Side Arm Mount [SO 602-1]			
100.0	100.0	1	tower mounts	6'x4" Mount Pipe	2	EW63	1
		1	rfs	PADX8-59A			
98.0	98.0	1	tower mounts	Pipe Mount [PM 601-1]	1	3/8	1
		1	rfs	SC3-W100XGT1C			
91.0	91.0	1	tower mounts	Pipe Mount [PM 601-1]	1	3/8	2
		1	rfs	SC3-W100XGT1C			
87.0	90.5	1	telewave	ANT150F-2	1	7/8	1
	87.0	1	tower mounts	Side Arm Mount [SO 601-1]			
85.0	87.0	1	comprod	531-70HD 12’ Dipole	1	7/8	1
	85.0	1	tower mounts	Side Arm Mount [SO 602-1]			
66.0	66.0	1	tower mounts	Side Arm Mount [SO 601-1]	1	1/4	1
		1	Motorola	WB2619			

Notes:
1) Existing Equipment
2) Reserved Equipment

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
GEOTECHNICAL REPORTS	Design Earth Technology dated 10/2014	-	Eversource
TOWER STRUCTURAL ANALYSIS REPORTS	All-Point Technology dated 02/21/2020	-	Eversource

3.1) Analysis Method

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

3.2) Assumptions

1) Tower and structures were built and maintained in accordance with the manufacturer's specifications.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
3) All tower members and foundation dimensions are based on the 2020 Structural Analysis Report prepared by All-Points.
4) Existing tower loading is based on 2019 drone photos, an All-Point Structural Analysis Report from 02/21/2020 and the 2020 tower inventory document provided by Eversource
5) Soil parameters are based on Design Earth Technology Geotech Report, dated 10/2010, which were provided by Eversource. Black & Veatch does not assume any responsibility for its accuracy. The following soil parameters were used in the foundation design:
   No ground water specified
   Soil unit weight 100 lbs/ft^3 (Assume)
   Soil cohesion 500 pdf (Assume)
   Soil bearing capacity 20,000 lb/ft^2 (Bears on rock)

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	185 - 180	Leg	P6x.28	1	-7.65	250.26	3.1	Pass
T2	180 - 160	Leg	P6x.28	15	-22.57	213.87	10.6	Pass
T3	160 - 140	Leg	P6x.28	30	-60.72	213.87	28.4	Pass
T4	140 - 120	Leg	P6x.28	43	-101.97	213.87	47.7	Pass
T5	120 - 100	Leg	P8x0.322	58	-156.14	351.14	44.5	Pass
T6	100 - 93.33	Leg	P8x0.322	73	-186.87	375.83	49.7	Pass
T7	93.33 - 80	Leg	P8x0.322	85	-186.49	375.86	49.6	Pass
T8	80 - 73.33	Leg	P8x.5	109	-247.19	569.77	43.4	Pass
T9	73.33 - 60	Leg	P8x.5	121	-247.28	569.82	43.4	Pass
T10	60 - 53.33	Leg	P10x.365	145	-306.60	543.41	56.4	Pass
T11	53.33 - 40	Leg	P10x.365	157	-306.05	543.44	56.3	Pass
T12	40 - 33.33	Leg	P10x.5	181	-368.90	734.07	50.3	Pass
T13	33.33 - 20	Leg	P10x.5	193	-368.57	734.11	50.2	Pass
T14	20 - 13.33	Leg	P12x.5	217	-431.48	886.74	48.7	Pass
T15	13.33 - 0	Leg	P12x.5	229	-432.33	886.77	48.8	Pass
T1	185 - 180	Diagonal	L3 1/2x3 1/2x1/4	12	-2.06	19.18	10.7 15.2 (b)	Pass
T2	180 - 160	Diagonal	L4x4x1/4	21	-7.24	20.25	35.7 52.5 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T3	160 - 140	Diagonal	L5x5x5/16	36	-14.16	42.34	33.5 86.0 (b)	Pass
T4	140 - 120	Diagonal	L5x5x5/16	51	-18.59	41.44	44.9 51.6 (b)	Pass
T5	120 - 100	Diagonal	L5x5x3/8	66	-21.29	44.46	47.9	Pass
T6	100 - 93.33	Diagonal	L6x6x3/8	83	-24.06	73.53	32.7 38.4 (b)	Pass
T7	93.33 - 80	Diagonal	L4x6x1/2	103	-31.67	85.70	37.0 50.3 (b)	Pass
T8	80 - 73.33	Diagonal	L6x6x3/8	119	-25.69	67.33	38.2 44.4 (b)	Pass
T9	73.33 - 60	Diagonal	L6x6x3/8	139	-33.24	86.57	38.4 54.3 (b)	Pass
T10	60 - 53.33	Diagonal	L6x6x3/8	155	-27.96	62.15	45.0 47.5 (b)	Pass
T11	53.33 - 40	Diagonal	L6x6x3/8	175	-36.27	83.43	43.5 58.1 (b)	Pass
T12	40 - 33.33	Diagonal	L6x6x3/8	191	-29.31	58.26	50.3	Pass
T13	33.33 - 20	Diagonal	L6x6x1/2	211	-38.15	103.92	36.7 44.1 (b)	Pass
T14	20 - 13.33	Diagonal	L6x6x1/2	227	-31.09	70.38	44.2	Pass
T15	13.33 - 0	Diagonal	L6x6x1/2	247	-39.70	99.52	39.9 46.0 (b)	Pass
T7	93.33 - 80	Horizontal	L4x4x5/16	76	-3.24	22.01	14.7	Pass
T9	73.33 - 60	Horizontal	L4x4x5/16	112	-4.29	19.38	22.1	Pass
T11	53.33 - 40	Horizontal	L5x5x5/16	148	-5.32	32.36	16.4	Pass
T13	33.33 - 20	Horizontal	L5x5x5/16	184	-6.40	29.18	21.9	Pass
T15	13.33 - 0	Horizontal	L5x5x5/16	220	-7.48	26.58	28.2	Pass
T1	185 - 180	Top Girt	L5x5x5/16	6	-1.18	19.99	5.9	Pass
T7	93.33 - 80	Redund Horz 1 Bracing	L3x3x1/4	89	-3.24	24.49	13.2	Pass
T9	73.33 - 60	Redund Horz 1 Bracing	L3x3x1/4	125	-4.29	21.14	20.3	Pass
T11	53.33 - 40	Redund Horz 1 Bracing	L3x3x5/16	176	-5.31	23.10	23.0	Pass
T13	33.33 - 20	Redund Horz 1 Bracing	L3x3x5/16	197	-6.39	20.29	31.5	Pass
T15	13.33 - 0	Redund Horz 1 Bracing	L3 1/2x4x5/16	248	-7.50	35.58	21.1	Pass
T7	93.33 - 80	Redund Diag 1 Bracing	L3x3x1/4	90	-2.21	13.42	16.4	Pass
T9	73.33 - 60	Redund Diag 1 Bracing	L3x3x1/4	126	-2.82	12.35	22.9	Pass
T11	53.33 - 40	Redund Diag 1 Bracing	L3x3x5/16	162	-3.40	14.27	23.8	Pass
T13	33.33 - 20	Redund Diag 1 Bracing	L3x3x5/16	198	-4.00	13.15	30.4	Pass
T15	13.33 - 0	Redund Diag 1 Bracing	L3 1/2x4x5/16	234	-4.58	24.06	19.0	Pass
T7	93.33 - 80	Inner Bracing	L3x3x1/4	107	-0.05	5.24	1.4	Pass
T9	73.33 - 60	Inner Bracing	L3x3x1/4	143	-0.06	4.56	1.5	Pass
T11	53.33 - 40	Inner Bracing	L3 1/2x3 1/2x1/4	179	-0.06	6.45	1.5	Pass
T13	33.33 - 20	Inner Bracing	L3 1/2x3 1/2x1/4	215	-0.07	5.71	1.5	Pass
T15	13.33 - 0	Inner Bracing	L3 1/2x3 1/2x1/4	251	-0.07	5.09	1.4	Pass
							Summary	
						Leg (T10)	56.4	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
						Diagonal (T3)	86.0	Pass
						Horizontal (T15)	28.2	Pass
						Top Girt (T1)	5.9	Pass
						Redund Horz 1 Bracing (T13)	31.5	Pass
						Redund Diag 1 Bracing (T13)	30.4	Pass
						Inner Bracing (T13)	1.5	Pass
						Bolt Checks	86.0	Pass
						RATING =	86.0	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	42.1	Pass
1	Base Foundation	0	85.7	Pass
	Base Foundation Soil Interaction		47.0	Pass

Structure Rating (max from all components) =	**86.0%**

Notes:
1) See additional documentation in “Appendix C – Additional Calculations” for calculations supporting the % capacity. Rating per TIA-222-H Section 15.5.

4.1) Recommendations

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

Maximum Tower Deflections - Service Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*	*Check**
T1	185 - 180	1.73	47	0.0666	0.0087	OK
T2	180 - 160	1.659	47	0.0666	0.0085	OK
T3	160 - 140	1.368	47	0.0657	0.0074	OK
T4	140 - 120	1.08	47	0.0619	0.0062	OK
T5	120 - 100	0.807	47	0.054	0.0053	OK
T6	100 - 93.33	0.566	47	0.046	0.0043	OK

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

1) Maximum Rotation = 4 Degrees

2) Maximum Deflection = 0.03 * Tower Height = 67 in.

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

Elevation (ft)	*MW Dish*	*Tilt (°)*	*Twist (°)*	*Diameter, D (ft)*	*Frequency, α (GHz)*	*Decibel Points*	*Deformation Limit (θ)**	*Deformation Limit Exceeded?*
183	PADX8-59A	0.0666	0.0086	8	10	10 dB	0.664	Not Exceeded
183	PADX8-59A	0.0666	0.0086	8	10	10 dB	0.664	Not Exceeded
177	PA4-57A	0.0666	0.0083	8	10	10 dB	0.664	Not Exceeded
172	PADX8-59A	0.0665	0.0081	8	10	10 dB	0.664	Not Exceeded
171	PADX8-59A	0.0664	0.008	8	10	10 dB	0.664	Not Exceeded
168	PR-900	0.0663	0.0078	3.176	10	10 dB	1.672	Not Exceeded
135	PADX6-59A	0.0602	0.006	6	10	10 dB	0.885	Not Exceeded
135	PADX6-59A	0.0602	0.006	6	10	10 dB	0.885	Not Exceeded
125	PADX8-59A	0.0561	0.0055	8	10	10 dB	0.664	Not Exceeded
100	PADX8-59A	0.046	0.0043	8	10	10 dB	0.664	Not Exceeded
98	SCX-W100AB	0.045	0.0043	3.29167	10	10 dB	1.613	Not Exceeded
91	SCX-W100AB	0.0413	0.0041	3.29167	10	10 dB	1.613	Not Exceeded

*Limit per TIA-222-H Annex D

Maximum Tower Deflections - Design Wind

Section No.	*Elevation* *ft*	*Horz. Deflection* *in*	*Gov. Load Comb.*	*Tilt* °	*Twist* °	*Combined Max*	*Check**
T1	185 - 180	4.882	47	0.1879	0.0246	0.190	OK
T2	180 - 160	4.682	47	0.188	0.0239	0.190	OK
T3	160 - 140	3.862	47	0.1854	0.0209	0.187	OK
T4	140 - 120	3.05	47	0.1746	0.0176	0.175	OK
T5	120 - 100	2.28	47	0.1522	0.0149	0.153	OK
T6	100 - 93.33	1.598	47	0.1297	0.0123	0.130	OK

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

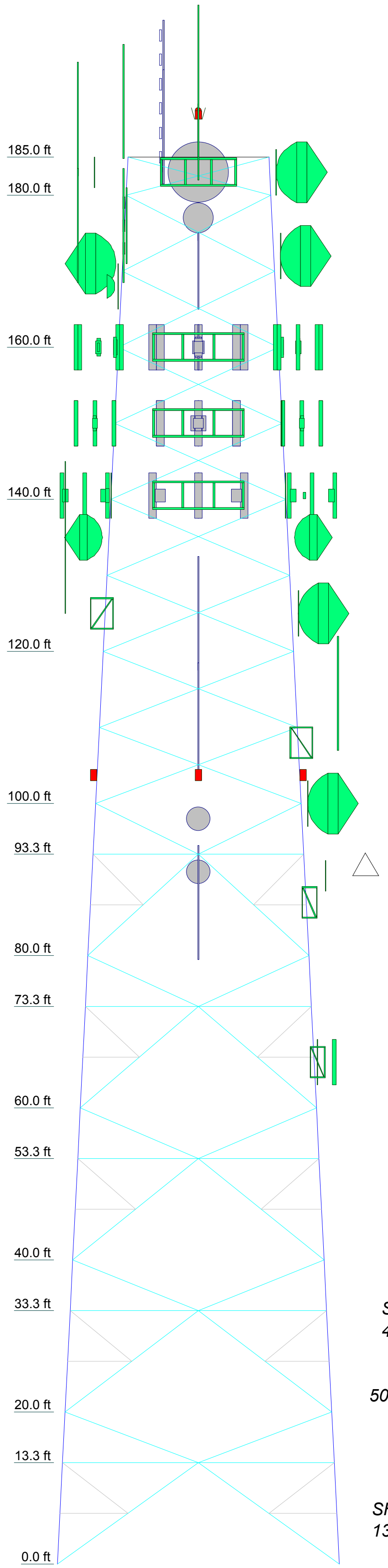
Critical Deflections of Tower at the MW Dish Elevations - Design Wind

Elevation *ft*	*Appurtenance*	*Gov. Load Comb.*	*Deflection* *in*	*Tilt* °	*Twist* °	*Radius of Curvature* *ft*
183	PADX8-59A	47	4.802	0.1879	0.0243	125724.000
183	PADX8-59A	47	4.802	0.1879	0.0243	125724.000
177	PA4-57A	47	4.56	0.1879	0.0236	124199.000
172	PADX8-59A	47	4.356	0.1876	0.0228	207206.000
171	PADX8-59A	47	4.315	0.1875	0.0227	240846.000
168	PR-900	47	4.191	0.1871	0.0222	469531.000
135	PADX6-59A	47	2.852	0.1696	0.017	98113
135	PADX6-59A	47	2.852	0.1696	0.017	98113
125	PADX8-59A	47	2.466	0.158	0.0157	63738
100	PADX8-59A	47	1.598	0.1297	0.0123	30866
98	SCX-W100AB	47	1.536	0.1269	0.0122	25984
91	SCX-W100AB	47	1.339	0.1166	0.0117	22977

APPENDIX A

TNXTOWER OUTPUT

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Red. Horizontals	Red. Diagonals	Inner Bracing	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	P6x.28	A572-50	A	A36	C	N.A.	N.A.	N.A.	N.A.	18.5 / 19	1 @ 5	1.6
T2			L4x4x1/4		N.A.					21	8 @ 10	3.1
T3			L5x5x5/16							23		4.3
T4										25		4.6
T5	P8x0.322		L5x5x3/8							27		6.1
T6			B							27.67	1 @ 6.67	2.0
T7			L4x6x1/2			L4x4x5/16	L3x3x1/4	L3x3x1/4	L3x3x1/4	29	1 @ 13.33	4.6
T8	P8x.5		L6x6x3/8			N.A.	N.A.	N.A.	N.A.	29.67	1 @ 6.67	2.4
T9						L4x4x5/16	L3x3x1/4	L3x3x1/4	L3x3x1/4	31	1 @ 13.33	5.3
T10	P10x.365					N.A.	N.A.	N.A.	N.A.	31.67	1 @ 6.67	2.4
T11						L5x5x5/16	L3x3x5/16	L3x3x5/16	L3 1/2x3 1/2x1/4	33	1 @ 13.33	5.7
T12	P10x.5		L6x6x1/2			N.A.	N.A.	N.A.	N.A.	33.67	1 @ 6.67	2.8
T13						L5x5x5/16	L3x3x5/16	L3x3x5/16	L3 1/2x3 1/2x1/4	35	1 @ 13.33	7.1
T14	P12x.5					N.A.	N.A.	N.A.	N.A.	35.67	1 @ 6.67	3.7
T15						L5x5x5/16	L3 1/2x4x5/16	L3 1/2x4x5/16	L3 1/2x3 1/2x1/4	37	1 @ 13.33	8.0
												63.8



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	L3 1/2x3 1/2x1/4	C	L5x5x5/16
B	L6x6x3/8		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-H Standard.
3. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 2.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category III.
7. Topographic Category 5 with Crest Height of 200.00 ft
8. TOWER RATING: 86%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 474 K
SHEAR: 77 K

UPLIFT: -384 K
SHEAR: 66 K

AXIAL 434 K
SHEAR 40 K
MOMENT 4406 kip-ft
TORQUE 68 kip-ft
50 mph WIND - 2.0000 in ICE

AXIAL 112 K
SHEAR 132 K
MOMENT 14011 kip-ft
TORQUE 129 kip-ft
REACTIONS - 130 mph WIND

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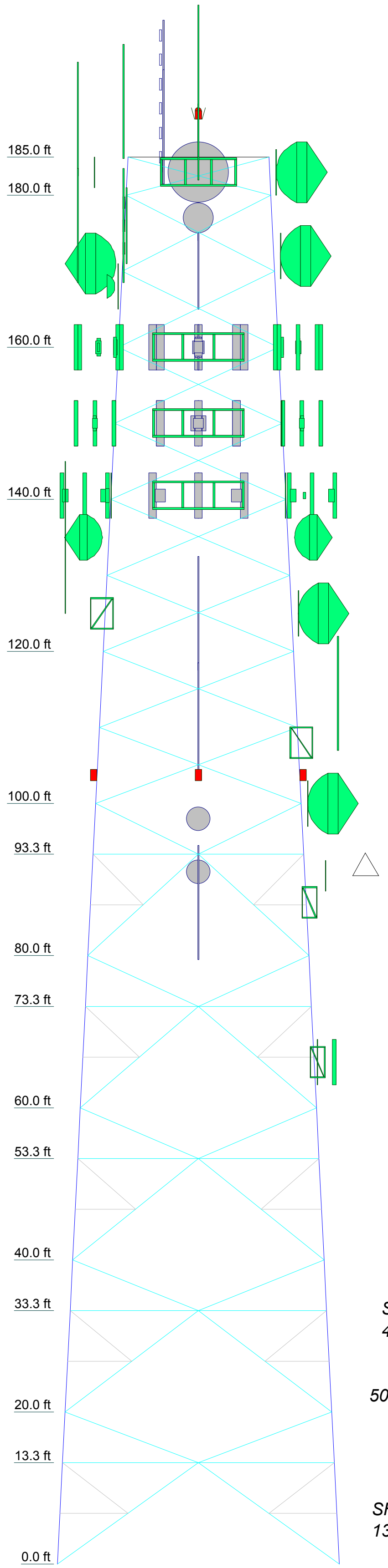
FAX:

Job: ***ES-038 TalcottRS***		
Project: ***405025***		
Client: Eversource	Drawn by: TH	App'd:
Code: TIA-222-H	Date: 07/07/20	Scale: NTS
Path: C:\Users\hai92311\OneDrive - Black & Veatch\My Desktop\TalcottRS\Structural\ES-038 TalcottRS Structural Analysis.eri		Dwg No. E-1

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Red. Horizontals	Red. Diagonals	Inner Bracing	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	P6x.28	A572-50	A	A36	C					18.5	1 @ 5	1.6
T2	P6x.28	A572-50	L4x4x1/4	A36	N.A.					19	8 @ 10	3.1
T3	P6x.28	A572-50	L5x5x5/16	A36	N.A.					21	8 @ 10	4.3
T4	P6x.28	A572-50	L5x5x5/16	A36	N.A.	N.A.	N.A.	N.A.	N.A.	23	8 @ 10	4.6
T5	P8x0.322	A572-50	L5x5x3/8	A36	N.A.					25	8 @ 10	6.1
T6	P8x0.322	A572-50	B	A36	N.A.					27	1 @ 6.67	2.0
T7	P8x.5	A572-50	L4x6x1/2	A36	N.A.	L4x4x5/16	L3x3x1/4	L3x3x1/4	L3x3x1/4	27.67	1 @ 13.33	4.6
T8	P8x.5	A572-50	L6x6x3/8	A36	N.A.	N.A.	N.A.	N.A.	N.A.	29	1 @ 6.67	2.4
T9	P8x.5	A572-50	L6x6x3/8	A36	N.A.	L4x4x5/16	L3x3x1/4	L3x3x1/4	L3x3x1/4	29.67	1 @ 13.33	5.3
T10	P10x.365	A572-50	L6x6x3/8	A36	N.A.	N.A.	N.A.	N.A.	N.A.	31	1 @ 6.67	2.4
T11	P10x.365	A572-50	L6x6x3/8	A36	N.A.	L5x5x5/16	L3x3x5/16	L3x3x5/16	L3 1/2x3 1/2x1/4	31.67	1 @ 13.33	5.7
T12	P10x.5	A572-50	L6x6x3/8	A36	N.A.	N.A.	N.A.	N.A.	N.A.	33	1 @ 6.67	2.8
T13	P10x.5	A572-50	L6x6x1/2	A36	N.A.	L5x5x5/16	L3x3x5/16	L3x3x5/16	L3 1/2x3 1/2x1/4	33.67	1 @ 13.33	7.1
T14	P12x.5	A572-50	L6x6x1/2	A36	N.A.	N.A.	N.A.	N.A.	N.A.	35	1 @ 6.67	3.7
T15	P12x.5	A572-50	L6x6x1/2	A36	N.A.	L5x5x5/16	L3 1/2x2x4x5/16	L3 1/2x2x4x5/16	L3 1/2x3 1/2x1/4	35.67	1 @ 13.33	8.0
										37		63.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
6'x4" Mount Pipe	185	6'x3" Mount Pipe	160
Flash Beacon Lighting	185	6'x3" Mount Pipe	160
CO-41A	185	7770.00 w/ Mount Pipe	160
DS9A09F36D-N	185	OPA-65R-LCUU-H8_TIA w/ Mount Pipe	160
TTA TX/RX 432F-83W-01-T	185	(2) 80010966_TIA w/ Mount Pipe	160
ANT450F6	185	8'x2" Mount Pipe	160
20' 8 Bay Di-Pole	185	7770.00 w/ Mount Pipe	160
6'x4" Mount Pipe	183	(2) LPA-80080/4CF w/ Mount Pipe	150
8' Horizontal x 2" Mount Pipe	183	RRH2X40-AWS	150
6'x4" Mount Pipe	183	RRH2X40-AWS	150
8' Horizontal x 2" Mount Pipe	183	RRH2X40-AWS	150
DS2C03F36D-D	183	RRH2x40 700	150
DS7C09P36U-D	183	RRH2x40 700	150
DS7C09P36U-D	183	RRH2x40 700	150
DS7C09P36U-D	183	DB-T1-6Z-8AB-0Z : Distribution Box	150
Site Pro 1 VFA10-HD-S 10' Heavy Duty V-Frame	183	Sector Mount [SM 502-3]	150
(4) 7'x2.5" Mount Pipe	183	6'x3" Mount Pipe	150
PADX8-59A	183	6'x3" Mount Pipe	150
PADX8-59A	183	6'x3" Mount Pipe	150
20' Horiz. 4"X4"x1/4"	182	(2) BXA-171063-12CF-EDIN-X w/ Mount Pipe	150
20' Horiz. 4"X4"x1/4"	182	BXA-70063-6CF-EDIN-X_TIA w/ Mount Pipe	150
20' Horiz. 4"X4"x1/4"	182	(2) LPA-80080/4CF w/ Mount Pipe	150
DB411-B	181	(2) BXA-171063-12CF-EDIN-X w/ Mount Pipe	150
6'x4" Mount Pipe	177	BXA-70063-6CF-EDIN-X_TIA w/ Mount Pipe	150
8' Horizontal x 2" Mount Pipe	177	(2) LPA-80080/4CF w/ Mount Pipe	150
PA4-57A	177	(2) BXA-171063-12CF-EDIN-X w/ Mount Pipe	150
6'x4" Mount Pipe	172	BXA-70063-6CF-EDIN-X_TIA w/ Mount Pipe	150
PADX8-59A	172	LNX-6515DS-T4M_TIA w/ Mount Pipe	140.5
8' Horizontal x 2" Mount Pipe	172	(2) RRUS 11	140.5
13' x 2" Mount Pipe	171	(2) RRUS 11	140.5
13' x 2" Mount Pipe	171	(2) RRUS 11	140.5
13' x 2" Mount Pipe	171	IBR 1300 w/ Mount Pipe	140.5
22' Horiz. 4"X4"x1/4"	171	DC6-48-60-0-8F : SA Squid	140.5
13' x 2" Mount Pipe	171	Sector Mount [SM 502-3]	140.5
13' x 2" Mount Pipe	171	6'x3" Mount Pipe	140.5
22' Horiz. 4"X4"x1/4"	171	6'x3" Mount Pipe	140.5
22' Horiz. 4"X4"x1/4"	171	6'x3" Mount Pipe	140.5
13' x 2" Mount Pipe	171	APXV18-206516H-C-A20_TIA w/ Mount Pipe	140.5
PADX8-59A	171	APXV18-206516H-C-A20_TIA w/ Mount Pipe	140.5
6'x2" Mount Pipe	168	APXV18-206516H-C-A20_TIA w/ Mount Pipe	140.5
PR-900	168	APXV18-206517-C_TIA w/ Mount Pipe	140.5
Side Arm Mount [SO 602-1]	165	APXV18-206517-C_TIA w/ Mount Pipe	140.5
ANT150F6	165	APXV18-206517-C_TIA w/ Mount Pipe	140.5
8' x 3" Mount Pipe	165	LNX-6515DS-T4M_TIA w/ Mount Pipe	140.5
7770.00 w/ Mount Pipe	160	LNX-6515DS-T4M_TIA w/ Mount Pipe	140.5
(2) 80010966_TIA w/ Mount Pipe	160	Pipe Mount [PM 601-1]	135
OPA-65R-LCUU-H8_TIA w/ Mount Pipe	160	Pipe Mount [PM 601-1]	135
8'x2" Mount Pipe	160	PADX6-59A	135
RRUS 4478 B14	160	PADX6-59A	135
RRUS 4478 B14	160	6' x 3" Mount Pipe	125
RRUS 4478 B14	160	4'x2" Mount Pipe	125
RRUS 8843 B2/B66A	160	12'6"x2" Mount Pipe	125
RRUS 8843 B2/B66A	160	Side Arm Mount [SO 602-1]	125
RRUS 8843 B2/B66A	160	531-70 Dipole Antenna	125
RRUS 32	160	6'x4" Mount Pipe	125
RRUS 32	160	8' Horizontal x 2" Mount Pipe	125
RRUS 32	160	6' x 3" Mount Pipe	125
RRUS 4449 B5/B12	160	Side Arm Mount [SO 602-1]	125
RRUS 4449 B5/B12	160	ANT150F6	125
RRUS 4449 B5/B12	160	PADX8-59A	125
RRUS E2 B29	160	6' x 3" Mount Pipe	109
RRUS E2 B29	160	4'x2" Mount Pipe	109
RRUS E2 B29	160	531-70 Dipole Antenna	109
TT08-19DB111-001 : TMA	160	12'6"x2" Mount Pipe	109
TT08-19DB111-001 : TMA	160	Side Arm Mount [SO 602-1]	109
TT08-19DB111-001 : TMA	160	6' x 3" Mount Pipe	108
DC6-48-60-18-8F	160	4'x2" Mount Pipe	108
DC6-48-60-18-8F	160	Side Arm Mount [SO 602-1]	108
DC6-48-60-18-8F	160	CO-41A	108
DC6-48-60-18-8C-EV	160	Beacon side markers	103
DC6-48-60-18-8C-EV	160	Beacon side markers	103
DC6-48-60-18-8C-EV	160		
OPA-65R-LCUU-H6_TIA w/ Mount Pipe	160		
(2) 80010965_TIA w/ Mount Pipe	160		
8'x2" Mount Pipe	160		
Sector Mount [SM 502-3]	160		
6'x3" Mount Pipe	160		

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Job: **ES-038 TalcottRS**		
Project: **405025**		
Client: Eversource	Drawn by: TH	App'd:
Code: TIA-222-H	Date: 07/07/20	Scale: NTS
Path: C:\Users\hai92311\OneDrive - Black & Veatch\My Desktop\TalcottRS\Structural\ES-038 TalcottRS Structural Analysis.eri		Dwg No. E-1

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 185.00 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 18.50 ft at the top and 37.00 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

1) Tower is located in Hartford County, Connecticut.
2) Tower base elevation above sea level: 418.00 ft.
3) Basic wind speed of 130 mph.
4) Risk Category III.
5) Exposure Category B.
6) Crest Height: 200.00 ft.
7) Rigorous Topographic Factor Procedure for wind speed-up calculations is used.
8) Topographic Feature: Continuous Ridge.
9) Slope Distance L: 1698.00 ft.
10) Distance from Crest x: 397.00 ft.
11) Horizontal Distance Downwind: No.
12) Nominal ice thickness of 2.0000 in.
13) Ice thickness is considered to increase with height.
14) Ice density of 56 pcf.
15) A wind speed of 50 mph is used in combination with ice.
16) Temperature drop of 50 °F.
17) Deflections calculated using a wind speed of 60 mph.
18) Pressures are calculated at each section.
19) Tower analysis based on target reliabilities in accordance with Annex S.
20) Load Modification Factors used: $K_{es}(F_w) = 1.0$, $K_{es}(t_i) = 1.0$.
21) Stress ratio used in tower member design is 1.05.
22) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

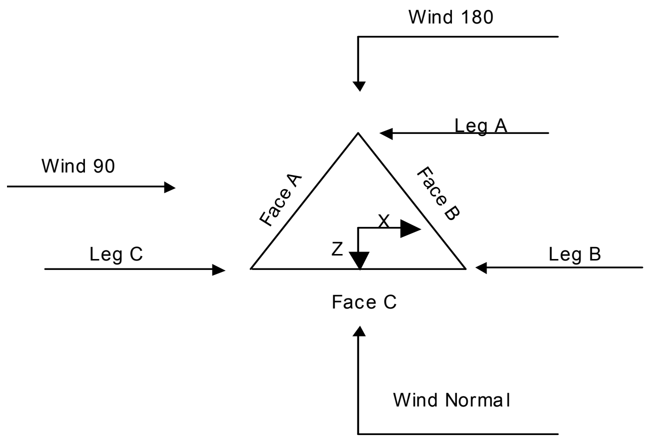
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
√ Secondary Horizontal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

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

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

Poles

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



Triangular Tower

Tower Section Geometry

Tower Section	*Tower Elevation*	*Assembly Database*	*Description*	*Section Width*	*Number of Sections*	*Section Length*
	ft			*ft*		*ft*
T1	185.00-180.00			18.50	1	5.00
T2	180.00-160.00			19.00	1	20.00
T3	160.00-140.00			21.00	1	20.00
T4	140.00-120.00			23.00	1	20.00
T5	120.00-100.00			25.00	1	20.00
T6	100.00-93.33			27.00	1	6.67
T7	93.33-80.00			27.67	1	13.33
T8	80.00-73.33			29.00	1	6.67
T9	73.33-60.00			29.67	1	13.33
T10	60.00-53.33			31.00	1	6.67
T11	53.33-40.00			31.67	1	13.33
T12	40.00-33.33			33.00	1	6.67
T13	33.33-20.00			33.67	1	13.33
T14	20.00-13.33			35.00	1	6.67
T15	13.33-0.00			35.67	1	13.33

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	185.00-180.00	5.00	X Brace	No	No	0.0000	0.0000
T2	180.00-160.00	10.00	X Brace	No	No	0.0000	0.0000
T3	160.00-140.00	10.00	X Brace	No	No	0.0000	0.0000
T4	140.00-120.00	10.00	X Brace	No	No	0.0000	0.0000
T5	120.00-100.00	10.00	X Brace	No	No	0.0000	0.0000
T6	100.00-93.33	6.67	Diamond	No	Yes	0.0000	0.0000
T7	93.33-80.00	13.33	K1 Down	No	Yes	0.0000	0.0000
T8	80.00-73.33	6.67	Diamond	No	Yes	0.0000	0.0000

Tower Section	*Tower Elevation* *ft*	*Diagonal Spacing* *ft*	*Bracing Type*	*Has K Brace End Panels*	*Has Horizontals*	*Top Girt Offset* *in*	*Bottom Girt Offset* *in*
T9	73.33-60.00	13.33	K1 Down	No	Yes	0.0000	0.0000
T10	60.00-53.33	6.67	Diamond	No	Yes	0.0000	0.0000
T11	53.33-40.00	13.33	K1 Down	No	Yes	0.0000	0.0000
T12	40.00-33.33	6.67	Diamond	No	Yes	0.0000	0.0000
T13	33.33-20.00	13.33	K1 Down	No	Yes	0.0000	0.0000
T14	20.00-13.33	6.67	Diamond	No	Yes	0.0000	0.0000
T15	13.33-0.00	13.33	K1 Down	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Leg Type*	*Leg Size*	*Leg Grade*	*Diagonal Type*	*Diagonal Size*	*Diagonal Grade*
T1 185.00-180.00	Pipe	P6x.28	A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T2 180.00-160.00	Pipe	P6x.28	A572-50 (50 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T3 160.00-140.00	Pipe	P6x.28	A572-50 (50 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T4 140.00-120.00	Pipe	P6x.28	A572-50 (50 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T5 120.00-100.00	Pipe	P8x0.322	A572-50 (50 ksi)	Single Angle	L5x5x3/8	A36 (36 ksi)
T6 100.00-93.33	Pipe	P8x0.322	A572-50 (50 ksi)	Single Angle	L6x6x3/8	A36 (36 ksi)
T7 93.33-80.00	Pipe	P8x0.322	A572-50 (50 ksi)	Single Angle	L4x6x1/2	A36 (36 ksi)
T8 80.00-73.33	Pipe	P8x.5	A572-50 (50 ksi)	Single Angle	L6x6x3/8	A36 (36 ksi)
T9 73.33-60.00	Pipe	P8x.5	A572-50 (50 ksi)	Single Angle	L6x6x3/8	A36 (36 ksi)
T10 60.00-53.33	Pipe	P10x.365	A572-50 (50 ksi)	Single Angle	L6x6x3/8	A36 (36 ksi)
T11 53.33-40.00	Pipe	P10x.365	A572-50 (50 ksi)	Single Angle	L6x6x3/8	A36 (36 ksi)
T12 40.00-33.33	Pipe	P10x.5	A572-50 (50 ksi)	Single Angle	L6x6x3/8	A36 (36 ksi)
T13 33.33-20.00	Pipe	P10x.5	A572-50 (50 ksi)	Single Angle	L6x6x1/2	A36 (36 ksi)
T14 20.00-13.33	Pipe	P12x.5	A572-50 (50 ksi)	Single Angle	L6x6x1/2	A36 (36 ksi)
T15 13.33-0.00	Pipe	P12x.5	A572-50 (50 ksi)	Single Angle	L6x6x1/2	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 185.00-180.00	Single Angle	L5x5x5/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T6 100.00-93.33	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x5/16	A36 (36 ksi)
T7 93.33-80.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x5/16	A36 (36 ksi)
T8 80.00-73.33	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x5/16	A36 (36 ksi)
T9 73.33-60.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x5/16	A36 (36 ksi)
T10 60.00-53.33	None	Flat Bar		A36 (36 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T11 53.33-40.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T12 40.00-33.33	None	Flat Bar		A36 (36 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T13 33.33-20.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T14 20.00-13.33	None	Flat Bar		A36 (36 ksi)	Single Angle	L5x5x5/16	A36 (36 ksi)
T15 13.33-0.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L5x5x5/16	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 93.33-80.00	Solid Round		A572-50 (50 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T9 73.33-60.00	Solid Round		A572-50 (50 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T11 53.33-40.00	Solid Round		A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T13 33.33-20.00	Solid Round		A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T15 13.33-0.00	Solid Round		A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T7 93.33-	A36	Horizontal (1)	Single Angle	L3x3x1/4	1
80.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x1/4	1
T9 73.33-	A36	Horizontal (1)	Single Angle	L3x3x1/4	1
60.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x1/4	1
T11 53.33-	A36	Horizontal (1)	Single Angle	L3x3x5/16	1
40.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x5/16	1
T13 33.33-	A36	Horizontal (1)	Single Angle	L3x3x5/16	1
20.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x5/16	1
T15 13.33-	A36	Horizontal (1)	Single Angle	L3 1/2x4x5/16	1
0.00	(36 ksi)	Diagonal (1)	Single Angle	L3 1/2x4x5/16	1

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 185.00-180.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T2 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T3 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T4 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T5 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T6 100.00-93.33	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T7 93.33-80.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T8 80.00-73.33	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T9 73.33-60.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T10 60.00-53.33	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T11 53.33-40.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T12 40.00-33.33	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T13 33.33-20.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T14 20.00-13.33	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T15 13.33-0.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

			K Factors[1]							
Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	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 185.00-180.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 180.00-160.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 100.00-93.33	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 93.33-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 80.00-73.33	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T9 73.33-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T10 60.00-53.33	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T11 53.33-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T12 40.00-	Yes	Yes	1	1	1	1	1	1	1	1

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
33.33				1	1	1	1	1	1	1
T13 33.33-	Yes	Yes	1	1	1	1	1	1	1	1
20.00				1	1	1	1	1	1	1
T14 20.00-	Yes	Yes	1	1	1	1	1	1	1	1
13.33				1	1	1	1	1	1	1
T15 13.33-	Yes	Yes	1	1	1	1	1	1	1	1
0.00				1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1 185.00-180.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 180.00-160.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 100.00-93.33	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 93.33-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 80.00-73.33	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
T9 73.33-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 60.00-53.33	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
T11 53.33-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T12 40.00-33.33	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
T13 33.33-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T14 20.00-13.33	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
T15 13.33-0.00	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 185.00-180.00	Flange	1.2500 A325N	6	0.7500 A325X	1	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 180.00-160.00	Flange	1.2500 A325N	6	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 160.00-140.00	Flange	1.2500 A325N	6	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 140.00-120.00	Flange	1.2500 A325N	8	0.6250 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 120.00-100.00	Flange	1.5000 A325N	8	0.7500 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 100.00-93.33	Flange	1.5000 A325N	0	1.0000 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0
T7 93.33-80.00	Flange	1.5000 A325N	8	1.0000 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	1.0000 A325N	2	0.6250 A325N	0
T8 80.00-73.33	Flange	1.5000 A325N	0	0.8750 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0
T9 73.33-60.00	Flange	1.5000 A325N	8	0.8750 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.8750 A325N	2	0.6250 A325N	0
T10 60.00-53.33	Flange	1.5000 A325N	0	0.8750 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0
T11 53.33-40.00	Flange	1.5000 A325N	8	0.8750 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.8750 A325N	2	0.6250 A325N	0
T12 40.00-33.33	Flange	1.5000 A325N	0	1.0000 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0
T13 33.33-20.00	Flange	1.5000 A325N	8	1.0000 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	1.0000 A325N	2	0.6250 A325N	0
T14 20.00-13.33	Flange	1.5000 A325N	0	1.0000 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0
T15 13.33-0.00	Flange	1.5000 A325N	0	1.0000 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	1.0000 A325N	2	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Safety Line 3/8	A	No	No	Ar (CaAa)	185.00 - 0.00	0.0000	-0.49	1	1	0.3750	0.3750		0.22
Feedline Ladder (Af)	B	No	No	Af (CaAa)	185.00 - 6.00	0.0000	-0.44	1	1	3.0000	3.0000		8.40
Feedline Ladder (Af)	C	No	No	Af (CaAa)	185.00 - 6.00	0.0000	-0.44	1	1	3.0000	3.0000		8.40
Feedline Ladder (Af)	C	No	No	Af (CaAa)	160.00 - 6.00	0.0000	0.44	1	1	3.0000	3.0000		8.40
Feedline Ladder (Af)	A	No	No	Af (CaAa)	160.00 - 6.00	0.0000	-0.44	1	1	3.0000	3.0000		8.40
LDF12-50(2-1/4)	C	No	No	Ar (CaAa)	160.00 - 6.00	0.0000	0.44	6	6	0.5000	2.3500		1.22
(12)LDF4.5-50(5/8'')+(3)ATCB-B01-005(5/16)	C	No	No	Ar (CaAa)	160.00 - 6.00	0.0000	0.44	15	12	0.5000	0.8650		0.15
(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	A	No	No	Ar (CaAa)	150.00 - 6.00	0.0000	-0.45	8	8	0.5000	1.9800		0.82
(3)LDF7-50A(1-5/8'')+(2)LDF6-50A(1-1/4) Hybrid Cable	A	No	No	Ar (CaAa)	140.50 - 6.00	0.0000	-0.4	4	4	0.5000	1.9800		0.82

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)	B	No	No	Ar (CaAa)	185.00 - 6.00	0.0000	-0.38	3	3	0.5000	1.9800		0.82
LDF5-50A(7/8'')	C	No	No	Ar (CaAa)	185.00 - 6.00	0.0000	-0.4	3	3	0.5000	1.0900		0.33
LDF5-50A(7/8'')	C	No	No	Ar (CaAa)	181.00 - 6.00	0.0000	-0.38	1	1	0.5000	1.0900		0.33
LDF4-50A(1/2)	B	No	No	Ar (CaAa)	185.00 - 6.00	0.0000	-0.37	1	1	0.5000	0.6250		0.15
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	183.00 - 6.00	0.0000	-0.45	4	4	0.5000	2.0100		0.51
EW90(ELLIPTICAL)	B	No	No	Ar (CaAa)	177.00 - 6.00	0.0000	-0.43	1	1	0.5000	1.2800		0.32
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	172.00 - 171.00	0.0000	-0.43	2	2	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	171.00 - 6.00	0.0000	-0.43	4	2	0.5000	2.0100		0.51
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	168.00 - 165.00	0.0000	-0.43	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	165.00 - 6.00	0.0000	-0.43	2	1	0.5000	1.0300		0.33
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	135.00 - 125.00	0.0000	-0.4	4	2	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	125.00 - 6.00	0.0000	-0.4	6	2	0.5000	2.0100		0.51
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	125.00 - 6.00	0.0000	-0.465	2	2	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	109.00 - 108.00	0.0000	-0.41	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	108.00 - 6.00	0.0000	-0.41	2	1	0.5000	1.0300		0.33
LDF2-50A(3/8)	C	No	No	Ar (CaAa)	185.00 - 103.00	0.0000	-0.4	1	1	0.4400	0.4400		0.08
LDF2-50A(3/8)	C	No	No	Ar (CaAa)	103.00 - 6.00	0.0000	-0.4	2	1	0.4400	0.4400		0.08
EW63(ELLIPTICAL)	C	No	No	Ar (CaAa)	100.00 - 6.00	0.0000	-0.45	2	1	0.5000	2.0100		0.51
LMR-400(3/8'')	B	No	No	Ar (CaAa)	98.00 - 91.00	0.0000	-0.36	1	1	0.4050	0.4050		0.07
LMR-400(3/8'')	B	No	No	Ar (CaAa)	91.00 - 6.00	0.0000	-0.36	2	2	0.4050	0.4050		0.07
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	87.00 - 85.00	0.0000	-0.39	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	85.00 - 6.00	0.0000	-0.39	2	1	0.5000	1.0300		0.33
CAT5e(1/4)	A	No	No	Ar (CaAa)	66.00 - 6.00	0.0000	-0.31	1	1	0.2638	0.2638		0.05
Proposed													
LCF78-50J(7/8)	B	No	No	Ar (CaAa)	183.00 - 6.00	0.0000	-0.47	2	2	0.5000	1.1000		0.53
LDF7-50A(1-5/8'')	B	No	No	Ar (CaAa)	183.00 - 6.00	0.0000	-0.48	3	3	0.5000	1.9800		0.82
LDF4-50A(1/2'')	B	No	No	Ar (CaAa)	183.00 - 6.00	0.0000	-0.48	1	1	0.5000	0.6300		0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	185.00-180.00	A	0.000	0.000	0.188	0.000	0.00
		B	0.000	0.000	10.826	0.000	0.07
		C	0.000	0.000	4.464	0.000	0.05
T2	180.00-160.00	A	0.000	0.000	0.750	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
		B	0.000	0.000	68.172	0.000	0.36
		C	0.000	0.000	20.939	0.000	0.20
T3	160.00-140.00	A	0.000	0.000	26.986	0.000	0.24
		B	0.000	0.000	75.390	0.000	0.38
		C	0.000	0.000	87.870	0.000	0.57
T4	140.00-120.00	A	0.000	0.000	58.270	0.000	0.37
		B	0.000	0.000	90.490	0.000	0.42
		C	0.000	0.000	87.870	0.000	0.57
T5	120.00-100.00	A	0.000	0.000	58.270	0.000	0.37
		B	0.000	0.000	105.356	0.000	0.46
		C	0.000	0.000	88.002	0.000	0.57
T6	100.00-93.33	A	0.000	0.000	19.433	0.000	0.12
		B	0.000	0.000	36.124	0.000	0.16
		C	0.000	0.000	32.279	0.000	0.20
T7	93.33-80.00	A	0.000	0.000	38.837	0.000	0.25
		B	0.000	0.000	74.030	0.000	0.32
		C	0.000	0.000	64.511	0.000	0.39
T8	80.00-73.33	A	0.000	0.000	19.433	0.000	0.12
		B	0.000	0.000	37.849	0.000	0.16
		C	0.000	0.000	32.279	0.000	0.20
T9	73.33-60.00	A	0.000	0.000	38.995	0.000	0.25
		B	0.000	0.000	75.641	0.000	0.32
		C	0.000	0.000	64.511	0.000	0.39
T10	60.00-53.33	A	0.000	0.000	19.609	0.000	0.12
		B	0.000	0.000	37.849	0.000	0.16
		C	0.000	0.000	32.279	0.000	0.20
T11	53.33-40.00	A	0.000	0.000	39.189	0.000	0.25
		B	0.000	0.000	75.641	0.000	0.32
		C	0.000	0.000	64.511	0.000	0.39
T12	40.00-33.33	A	0.000	0.000	19.609	0.000	0.12
		B	0.000	0.000	37.849	0.000	0.16
		C	0.000	0.000	32.279	0.000	0.20
T13	33.33-20.00	A	0.000	0.000	39.189	0.000	0.25
		B	0.000	0.000	75.641	0.000	0.32
		C	0.000	0.000	64.511	0.000	0.39
T14	20.00-13.33	A	0.000	0.000	19.609	0.000	0.12
		B	0.000	0.000	37.849	0.000	0.16
		C	0.000	0.000	32.279	0.000	0.20
T15	13.33-0.00	A	0.000	0.000	21.774	0.000	0.14
		B	0.000	0.000	41.594	0.000	0.18
		C	0.000	0.000	35.474	0.000	0.22

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
T1	185.00-180.00	A	2.937	0.000	0.000	3.124	0.000	0.06
		B		0.000	0.000	36.304	0.000	0.72
		C		0.000	0.000	16.980	0.000	0.37
T2	180.00-160.00	A	2.925	0.000	0.000	12.451	0.000	0.24
		B		0.000	0.000	227.269	0.000	4.34
		C		0.000	0.000	86.977	0.000	1.88
T3	160.00-140.00	A	2.904	0.000	0.000	67.962	0.000	1.63
		B		0.000	0.000	243.216	0.000	4.62
		C		0.000	0.000	244.525	0.000	5.30
T4	140.00-120.00	A	2.879	0.000	0.000	142.037	0.000	3.05
		B		0.000	0.000	277.082	0.000	5.20
		C		0.000	0.000	243.451	0.000	5.25
T5	120.00-100.00	A	2.849	0.000	0.000	141.394	0.000	3.01
		B		0.000	0.000	318.869	0.000	5.92
		C		0.000	0.000	243.793	0.000	5.21
T6	100.00-93.33	A	2.824	0.000	0.000	46.982	0.000	0.99
		B		0.000	0.000	113.242	0.000	2.11
		C		0.000	0.000	94.667	0.000	2.01
T7	93.33-80.00	A	2.802	0.000	0.000	93.593	0.000	1.97

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
		B		0.000	0.000	241.738	0.000	4.40
		C		0.000	0.000	188.434	0.000	3.99
T8	80.00-73.33	A	2.778	0.000	0.000	46.659	0.000	0.98
		B		0.000	0.000	126.076	0.000	2.28
		C		0.000	0.000	93.851	0.000	1.97
T9	73.33-60.00	A	2.748	0.000	0.000	96.299	0.000	1.99
		B		0.000	0.000	250.305	0.000	4.49
		C		0.000	0.000	186.540	0.000	3.89
T10	60.00-53.33	A	2.714	0.000	0.000	50.011	0.000	1.02
		B		0.000	0.000	124.258	0.000	2.21
		C		0.000	0.000	92.730	0.000	1.92
T11	53.33-40.00	A	2.672	0.000	0.000	99.243	0.000	2.00
		B		0.000	0.000	245.911	0.000	4.32
		C		0.000	0.000	183.832	0.000	3.75
T12	40.00-33.33	A	2.618	0.000	0.000	49.213	0.000	0.98
		B		0.000	0.000	121.513	0.000	2.11
		C		0.000	0.000	91.040	0.000	1.83
T13	33.33-20.00	A	2.546	0.000	0.000	97.156	0.000	1.89
		B		0.000	0.000	238.729	0.000	4.06
		C		0.000	0.000	179.409	0.000	3.54
T14	20.00-13.33	A	2.439	0.000	0.000	47.727	0.000	0.90
		B		0.000	0.000	116.398	0.000	1.92
		C		0.000	0.000	87.891	0.000	1.68
T15	13.33-0.00	A	2.234	0.000	0.000	53.498	0.000	0.95
		B		0.000	0.000	121.512	0.000	1.89
		C		0.000	0.000	92.648	0.000	1.66

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	185.00-180.00	4.0437	-11.0439	5.3956	-10.4455
T2	180.00-160.00	8.3242	-28.2536	13.4219	-31.1497
T3	160.00-140.00	-17.0220	-15.0823	-12.6403	-16.2216
T4	140.00-120.00	-21.5739	-12.7749	-17.7527	-15.5002
T5	120.00-100.00	-21.2284	-15.9957	-17.4767	-20.8492
T6	100.00-93.33	-20.3735	-15.4728	-14.3823	-20.9343
T7	93.33-80.00	-20.7658	-16.8008	-13.6938	-22.8769
T8	80.00-73.33	-20.7719	-17.6809	-14.2088	-25.9738
T9	73.33-60.00	-19.7430	-16.8158	-14.2978	-24.4620
T10	60.00-53.33	-21.2515	-17.8700	-16.3345	-25.9064
T11	53.33-40.00	-19.6708	-16.6548	-15.5547	-24.5048
T12	40.00-33.33	-22.0317	-18.5459	-17.2682	-26.8880
T13	33.33-20.00	-20.3043	-17.2100	-16.4210	-25.2452
T14	20.00-13.33	-22.3183	-18.7605	-18.1357	-27.2469
T15	13.33-0.00	-13.1081	-11.0148	-13.0844	-16.8562

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	Safety Line 3/8	180.00 - 185.00	0.6000	0.4236
T1	2	Feedline Ladder (Af)	180.00 - 185.00	0.6000	0.4236
T1	3	Feedline Ladder (Af)	180.00 - 185.00	0.6000	0.4236

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	12	LDF7-50A(1-5/8)	180.00 - 185.00	0.6000	0.4236
T1	13	LDF5-50A(7/8")	180.00 - 185.00	0.6000	0.4236
T1	14	LDF5-50A(7/8")	180.00 - 181.00	0.6000	0.4236
T1	15	LDF4-50A(1/2)	180.00 - 185.00	0.6000	0.4236
T1	16	EW63(ELLIPTICAL)	180.00 - 183.00	0.6000	0.4236
T1	27	LDF2-50A(3/8)	180.00 - 185.00	0.6000	0.4236
T1	38	LCF78-50J(7/8)	180.00 - 183.00	0.6000	0.4236
T1	39	LDF7-50A(1-5/8")	180.00 - 183.00	0.6000	0.4236
T1	40	LDF4-50A(1/2")	180.00 - 183.00	0.6000	0.4236
T2	1	Safety Line 3/8	160.00 - 180.00	0.6000	0.6000
T2	2	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T2	3	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T2	12	LDF7-50A(1-5/8)	160.00 - 180.00	0.6000	0.6000
T2	13	LDF5-50A(7/8")	160.00 - 180.00	0.6000	0.6000
T2	14	LDF5-50A(7/8")	160.00 - 180.00	0.6000	0.6000
T2	15	LDF4-50A(1/2)	160.00 - 180.00	0.6000	0.6000
T2	16	EW63(ELLIPTICAL)	160.00 - 180.00	0.6000	0.6000
T2	17	EW90(ELLIPTICAL)	160.00 - 177.00	0.6000	0.6000
T2	18	EW63(ELLIPTICAL)	171.00 - 172.00	0.6000	0.6000
T2	19	EW63(ELLIPTICAL)	160.00 - 171.00	0.6000	0.6000
T2	20	LDF5-50A(7/8)	165.00 - 168.00	0.6000	0.6000
T2	21	LDF5-50A(7/8)	160.00 - 165.00	0.6000	0.6000
T2	27	LDF2-50A(3/8)	160.00 - 180.00	0.6000	0.6000
T2	38	LCF78-50J(7/8)	160.00 - 180.00	0.6000	0.6000
T2	39	LDF7-50A(1-5/8")	160.00 - 180.00	0.6000	0.6000
T2	40	LDF4-50A(1/2")	160.00 - 180.00	0.6000	0.6000
T3	1	Safety Line 3/8	140.00 - 160.00	0.6000	0.6000
T3	2	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T3	3	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T3	4	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T3	5	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T3	6	LDF12-50(2-1/4)	140.00 - 160.00	0.6000	0.6000
T3	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	140.00 - 160.00	0.6000	0.6000
T3	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4)	140.00 - 150.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T3	11	Hybrid Cable (3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4)	140.00 - 140.50	0.6000	0.6000
T3	12	Hybrid Cable LDF7-50A(1-5/8)	140.00 - 160.00	0.6000	0.6000
T3	13	LDF5-50A(7/8")	140.00 - 160.00	0.6000	0.6000
T3	14	LDF5-50A(7/8")	140.00 - 160.00	0.6000	0.6000
T3	15	LDF4-50A(1/2)	140.00 - 160.00	0.6000	0.6000
T3	16	EW63(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000
T3	17	EW90(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000
T3	19	EW63(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000
T3	21	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T3	27	LDF2-50A(3/8)	140.00 - 160.00	0.6000	0.6000
T3	38	LCF78-50J(7/8)	140.00 - 160.00	0.6000	0.6000
T3	39	LDF7-50A(1-5/8")	140.00 - 160.00	0.6000	0.6000
T3	40	LDF4-50A(1/2")	140.00 - 160.00	0.6000	0.6000
T4	1	Safety Line 3/8	120.00 - 140.00	0.6000	0.6000
T4	2	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T4	3	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T4	4	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T4	5	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T4	6	LDF12-50(2-1/4)	120.00 - 140.00	0.6000	0.6000
T4	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	120.00 - 140.00	0.6000	0.6000
T4	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	120.00 - 140.00	0.6000	0.6000
T4	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	120.00 - 140.00	0.6000	0.6000
T4	12	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T4	13	LDF5-50A(7/8")	120.00 - 140.00	0.6000	0.6000
T4	14	LDF5-50A(7/8")	120.00 - 140.00	0.6000	0.6000
T4	15	LDF4-50A(1/2)	120.00 - 140.00	0.6000	0.6000
T4	16	EW63(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T4	17	EW90(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T4	19	EW63(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T4	21	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T4	22	EW63(ELLIPTICAL)	125.00 - 135.00	0.6000	0.6000
T4	23	EW63(ELLIPTICAL)	120.00 - 125.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T4	24	LDF5-50A(7/8)	120.00 - 125.00	0.6000	0.6000
T4	27	LDF2-50A(3/8)	120.00 - 140.00	0.6000	0.6000
T4	38	LCF78-50J(7/8)	120.00 - 140.00	0.6000	0.6000
T4	39	LDF7-50A(1-5/8")	120.00 - 140.00	0.6000	0.6000
T4	40	LDF4-50A(1/2")	120.00 - 140.00	0.6000	0.6000
T5	1	Safety Line 3/8	100.00 - 120.00	0.6000	0.6000
T5	2	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T5	3	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T5	4	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T5	5	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T5	6	LDF12-50(2-1/4)	100.00 - 120.00	0.6000	0.6000
T5	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	100.00 - 120.00	0.6000	0.6000
T5	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	100.00 - 120.00	0.6000	0.6000
T5	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	100.00 - 120.00	0.6000	0.6000
T5	12	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T5	13	LDF5-50A(7/8")	100.00 - 120.00	0.6000	0.6000
T5	14	LDF5-50A(7/8")	100.00 - 120.00	0.6000	0.6000
T5	15	LDF4-50A(1/2)	100.00 - 120.00	0.6000	0.6000
T5	16	EW63(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T5	17	EW90(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T5	19	EW63(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T5	21	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T5	23	EW63(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T5	24	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T5	25	LDF5-50A(7/8)	108.00 - 109.00	0.6000	0.6000
T5	26	LDF5-50A(7/8)	100.00 - 108.00	0.6000	0.6000
T5	27	LDF2-50A(3/8)	103.00 - 120.00	0.6000	0.6000
T5	28	LDF2-50A(3/8)	100.00 - 103.00	0.6000	0.6000
T5	38	LCF78-50J(7/8)	100.00 - 120.00	0.6000	0.6000
T5	39	LDF7-50A(1-5/8")	100.00 - 120.00	0.6000	0.6000
T5	40	LDF4-50A(1/2")	100.00 - 120.00	0.6000	0.6000
T6	1	Safety Line 3/8	93.33 - 100.00	0.6000	0.6000
T6	2	Feedline Ladder (Af)	93.33 - 100.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T6	3	Feedline Ladder (Af)	93.33 - 100.00	0.6000	0.6000
T6	4	Feedline Ladder (Af)	93.33 - 100.00	0.6000	0.6000
T6	5	Feedline Ladder (Af)	93.33 - 100.00	0.6000	0.6000
T6	6	LDF12-50(2-1/4)	93.33 - 100.00	0.6000	0.6000
T6	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	93.33 - 100.00	0.6000	0.6000
T6	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	93.33 - 100.00	0.6000	0.6000
T6	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	93.33 - 100.00	0.6000	0.6000
T6	12	LDF7-50A(1-5/8)	93.33 - 100.00	0.6000	0.6000
T6	13	LDF5-50A(7/8")	93.33 - 100.00	0.6000	0.6000
T6	14	LDF5-50A(7/8")	93.33 - 100.00	0.6000	0.6000
T6	15	LDF4-50A(1/2)	93.33 - 100.00	0.6000	0.6000
T6	16	EW63(ELLIPTICAL)	93.33 - 100.00	0.6000	0.6000
T6	17	EW90(ELLIPTICAL)	93.33 - 100.00	0.6000	0.6000
T6	19	EW63(ELLIPTICAL)	93.33 - 100.00	0.6000	0.6000
T6	21	LDF5-50A(7/8)	93.33 - 100.00	0.6000	0.6000
T6	23	EW63(ELLIPTICAL)	93.33 - 100.00	0.6000	0.6000
T6	24	LDF5-50A(7/8)	93.33 - 100.00	0.6000	0.6000
T6	26	LDF5-50A(7/8)	93.33 - 100.00	0.6000	0.6000
T6	28	LDF2-50A(3/8)	93.33 - 100.00	0.6000	0.6000
T6	29	EW63(ELLIPTICAL)	93.33 - 100.00	0.6000	0.6000
T6	30	LMR-400(3/8")	93.33 - 98.00	0.6000	0.6000
T6	38	LCF78-50J(7/8)	93.33 - 100.00	0.6000	0.6000
T6	39	LDF7-50A(1-5/8")	93.33 - 100.00	0.6000	0.6000
T6	40	LDF4-50A(1/2")	93.33 - 100.00	0.6000	0.6000
T7	1	Safety Line 3/8	80.00 - 93.33	0.6000	0.6000
T7	2	Feedline Ladder (Af)	80.00 - 93.33	0.6000	0.6000
T7	3	Feedline Ladder (Af)	80.00 - 93.33	0.6000	0.6000
T7	4	Feedline Ladder (Af)	80.00 - 93.33	0.6000	0.6000
T7	5	Feedline Ladder (Af)	80.00 - 93.33	0.6000	0.6000
T7	6	LDF12-50(2-1/4)	80.00 - 93.33	0.6000	0.6000
T7	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	80.00 - 93.33	0.6000	0.6000
T7	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	80.00 - 93.33	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T7	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	80.00 - 93.33	0.6000	0.6000
T7	12	LDF7-50A(1-5/8)	80.00 - 93.33	0.6000	0.6000
T7	13	LDF5-50A(7/8")	80.00 - 93.33	0.6000	0.6000
T7	14	LDF5-50A(7/8")	80.00 - 93.33	0.6000	0.6000
T7	15	LDF4-50A(1/2)	80.00 - 93.33	0.6000	0.6000
T7	16	EW63(ELLIPTICAL)	80.00 - 93.33	0.6000	0.6000
T7	17	EW90(ELLIPTICAL)	80.00 - 93.33	0.6000	0.6000
T7	19	EW63(ELLIPTICAL)	80.00 - 93.33	0.6000	0.6000
T7	21	LDF5-50A(7/8)	80.00 - 93.33	0.6000	0.6000
T7	23	EW63(ELLIPTICAL)	80.00 - 93.33	0.6000	0.6000
T7	24	LDF5-50A(7/8)	80.00 - 93.33	0.6000	0.6000
T7	26	LDF5-50A(7/8)	80.00 - 93.33	0.6000	0.6000
T7	28	LDF2-50A(3/8)	80.00 - 93.33	0.6000	0.6000
T7	29	EW63(ELLIPTICAL)	80.00 - 93.33	0.6000	0.6000
T7	30	LMR-400(3/8")	91.00 - 93.33	0.6000	0.6000
T7	31	LMR-400(3/8")	80.00 - 91.00	0.6000	0.6000
T7	32	LDF5-50A(7/8)	85.00 - 87.00	0.6000	0.6000
T7	33	LDF5-50A(7/8)	80.00 - 85.00	0.6000	0.6000
T7	38	LCF78-50J(7/8)	80.00 - 93.33	0.6000	0.6000
T7	39	LDF7-50A(1-5/8")	80.00 - 93.33	0.6000	0.6000
T7	40	LDF4-50A(1/2")	80.00 - 93.33	0.6000	0.6000
T8	1	Safety Line 3/8	73.33 - 80.00	0.6000	0.6000
T8	2	Feedline Ladder (Af)	73.33 - 80.00	0.6000	0.6000
T8	3	Feedline Ladder (Af)	73.33 - 80.00	0.6000	0.6000
T8	4	Feedline Ladder (Af)	73.33 - 80.00	0.6000	0.6000
T8	5	Feedline Ladder (Af)	73.33 - 80.00	0.6000	0.6000
T8	6	LDF12-50(2-1/4)	73.33 - 80.00	0.6000	0.6000
T8	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	73.33 - 80.00	0.6000	0.6000
T8	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	73.33 - 80.00	0.6000	0.6000
T8	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	73.33 - 80.00	0.6000	0.6000
T8	12	LDF7-50A(1-5/8)	73.33 - 80.00	0.6000	0.6000
T8	13	LDF5-50A(7/8")	73.33 - 80.00	0.6000	0.6000
T8	14	LDF5-50A(7/8")	73.33 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			80.00		
T8	15	LDF4-50A(1/2)	73.33 - 80.00	0.6000	0.6000
T8	16	EW63(ELLIPTICAL)	73.33 - 80.00	0.6000	0.6000
T8	17	EW90(ELLIPTICAL)	73.33 - 80.00	0.6000	0.6000
T8	19	EW63(ELLIPTICAL)	73.33 - 80.00	0.6000	0.6000
T8	21	LDF5-50A(7/8)	73.33 - 80.00	0.6000	0.6000
T8	23	EW63(ELLIPTICAL)	73.33 - 80.00	0.6000	0.6000
T8	24	LDF5-50A(7/8)	73.33 - 80.00	0.6000	0.6000
T8	26	LDF5-50A(7/8)	73.33 - 80.00	0.6000	0.6000
T8	28	LDF2-50A(3/8)	73.33 - 80.00	0.6000	0.6000
T8	29	EW63(ELLIPTICAL)	73.33 - 80.00	0.6000	0.6000
T8	31	LMR-400(3/8")	73.33 - 80.00	0.6000	0.6000
T8	33	LDF5-50A(7/8)	73.33 - 80.00	0.6000	0.6000
T8	38	LCF78-50J(7/8)	73.33 - 80.00	0.6000	0.6000
T8	39	LDF7-50A(1-5/8")	73.33 - 80.00	0.6000	0.6000
T8	40	LDF4-50A(1/2")	73.33 - 80.00	0.6000	0.6000
T9	1	Safety Line 3/8	60.00 - 73.33	0.6000	0.6000
T9	2	Feedline Ladder (Af)	60.00 - 73.33	0.6000	0.6000
T9	3	Feedline Ladder (Af)	60.00 - 73.33	0.6000	0.6000
T9	4	Feedline Ladder (Af)	60.00 - 73.33	0.6000	0.6000
T9	5	Feedline Ladder (Af)	60.00 - 73.33	0.6000	0.6000
T9	6	LDF12-50(2-1/4)	60.00 - 73.33	0.6000	0.6000
T9	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	60.00 - 73.33	0.6000	0.6000
T9	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	60.00 - 73.33	0.6000	0.6000
T9	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	60.00 - 73.33	0.6000	0.6000
T9	12	LDF7-50A(1-5/8)	60.00 - 73.33	0.6000	0.6000
T9	13	LDF5-50A(7/8")	60.00 - 73.33	0.6000	0.6000
T9	14	LDF5-50A(7/8")	60.00 - 73.33	0.6000	0.6000
T9	15	LDF4-50A(1/2)	60.00 - 73.33	0.6000	0.6000
T9	16	EW63(ELLIPTICAL)	60.00 - 73.33	0.6000	0.6000
T9	17	EW90(ELLIPTICAL)	60.00 - 73.33	0.6000	0.6000
T9	19	EW63(ELLIPTICAL)	60.00 - 73.33	0.6000	0.6000
T9	21	LDF5-50A(7/8)	60.00 - 73.33	0.6000	0.6000
T9	23	EW63(ELLIPTICAL)	60.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			73.33		
T9	24	LDF5-50A(7/8)	60.00 - 73.33	0.6000	0.6000
T9	26	LDF5-50A(7/8)	60.00 - 73.33	0.6000	0.6000
T9	28	LDF2-50A(3/8)	60.00 - 73.33	0.6000	0.6000
T9	29	EW63(ELLIPTICAL)	60.00 - 73.33	0.6000	0.6000
T9	31	LMR-400(3/8")	60.00 - 73.33	0.6000	0.6000
T9	33	LDF5-50A(7/8)	60.00 - 73.33	0.6000	0.6000
T9	34	CAT5e(1/4)	60.00 - 66.00	0.6000	0.6000
T9	38	LCF78-50J(7/8)	60.00 - 73.33	0.6000	0.6000
T9	39	LDF7-50A(1-5/8")	60.00 - 73.33	0.6000	0.6000
T9	40	LDF4-50A(1/2")	60.00 - 73.33	0.6000	0.6000
T10	1	Safety Line 3/8	53.33 - 60.00	0.6000	0.6000
T10	2	Feedline Ladder (Af)	53.33 - 60.00	0.6000	0.6000
T10	3	Feedline Ladder (Af)	53.33 - 60.00	0.6000	0.6000
T10	4	Feedline Ladder (Af)	53.33 - 60.00	0.6000	0.6000
T10	5	Feedline Ladder (Af)	53.33 - 60.00	0.6000	0.6000
T10	6	LDF12-50(2-1/4)	53.33 - 60.00	0.6000	0.6000
T10	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	53.33 - 60.00	0.6000	0.6000
T10	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	53.33 - 60.00	0.6000	0.6000
T10	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	53.33 - 60.00	0.6000	0.6000
T10	12	LDF7-50A(1-5/8)	53.33 - 60.00	0.6000	0.6000
T10	13	LDF5-50A(7/8")	53.33 - 60.00	0.6000	0.6000
T10	14	LDF5-50A(7/8")	53.33 - 60.00	0.6000	0.6000
T10	15	LDF4-50A(1/2)	53.33 - 60.00	0.6000	0.6000
T10	16	EW63(ELLIPTICAL)	53.33 - 60.00	0.6000	0.6000
T10	17	EW90(ELLIPTICAL)	53.33 - 60.00	0.6000	0.6000
T10	19	EW63(ELLIPTICAL)	53.33 - 60.00	0.6000	0.6000
T10	21	LDF5-50A(7/8)	53.33 - 60.00	0.6000	0.6000
T10	23	EW63(ELLIPTICAL)	53.33 - 60.00	0.6000	0.6000
T10	24	LDF5-50A(7/8)	53.33 - 60.00	0.6000	0.6000
T10	26	LDF5-50A(7/8)	53.33 - 60.00	0.6000	0.6000
T10	28	LDF2-50A(3/8)	53.33 - 60.00	0.6000	0.6000
T10	29	EW63(ELLIPTICAL)	53.33 - 60.00	0.6000	0.6000
T10	31	LMR-400(3/8")	53.33 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			60.00		
T10	33	LDF5-50A(7/8)	53.33 - 60.00	0.6000	0.6000
T10	34	CAT5e(1/4)	53.33 - 60.00	0.6000	0.6000
T10	38	LCF78-50J(7/8)	53.33 - 60.00	0.6000	0.6000
T10	39	LDF7-50A(1-5/8")	53.33 - 60.00	0.6000	0.6000
T10	40	LDF4-50A(1/2")	53.33 - 60.00	0.6000	0.6000
T11	1	Safety Line 3/8	40.00 - 53.33	0.6000	0.6000
T11	2	Feedline Ladder (Af)	40.00 - 53.33	0.6000	0.6000
T11	3	Feedline Ladder (Af)	40.00 - 53.33	0.6000	0.6000
T11	4	Feedline Ladder (Af)	40.00 - 53.33	0.6000	0.6000
T11	5	Feedline Ladder (Af)	40.00 - 53.33	0.6000	0.6000
T11	6	LDF12-50(2-1/4)	40.00 - 53.33	0.6000	0.6000
T11	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	40.00 - 53.33	0.6000	0.6000
T11	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	40.00 - 53.33	0.6000	0.6000
T11	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	40.00 - 53.33	0.6000	0.6000
T11	12	LDF7-50A(1-5/8)	40.00 - 53.33	0.6000	0.6000
T11	13	LDF5-50A(7/8")	40.00 - 53.33	0.6000	0.6000
T11	14	LDF5-50A(7/8")	40.00 - 53.33	0.6000	0.6000
T11	15	LDF4-50A(1/2)	40.00 - 53.33	0.6000	0.6000
T11	16	EW63(ELLIPTICAL)	40.00 - 53.33	0.6000	0.6000
T11	17	EW90(ELLIPTICAL)	40.00 - 53.33	0.6000	0.6000
T11	19	EW63(ELLIPTICAL)	40.00 - 53.33	0.6000	0.6000
T11	21	LDF5-50A(7/8)	40.00 - 53.33	0.6000	0.6000
T11	23	EW63(ELLIPTICAL)	40.00 - 53.33	0.6000	0.6000
T11	24	LDF5-50A(7/8)	40.00 - 53.33	0.6000	0.6000
T11	26	LDF5-50A(7/8)	40.00 - 53.33	0.6000	0.6000
T11	28	LDF2-50A(3/8)	40.00 - 53.33	0.6000	0.6000
T11	29	EW63(ELLIPTICAL)	40.00 - 53.33	0.6000	0.6000
T11	31	LMR-400(3/8")	40.00 - 53.33	0.6000	0.6000
T11	33	LDF5-50A(7/8)	40.00 - 53.33	0.6000	0.6000
T11	34	CAT5e(1/4)	40.00 - 53.33	0.6000	0.6000
T11	38	LCF78-50J(7/8)	40.00 - 53.33	0.6000	0.6000
T11	39	LDF7-50A(1-5/8")	40.00 - 53.33	0.6000	0.6000
T11	40	LDF4-50A(1/2")	40.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			53.33		
T12	1	Safety Line 3/8	33.33 - 40.00	0.6000	0.6000
T12	2	Feedline Ladder (Af)	33.33 - 40.00	0.6000	0.6000
T12	3	Feedline Ladder (Af)	33.33 - 40.00	0.6000	0.6000
T12	4	Feedline Ladder (Af)	33.33 - 40.00	0.6000	0.6000
T12	5	Feedline Ladder (Af)	33.33 - 40.00	0.6000	0.6000
T12	6	LDF12-50(2-1/4)	33.33 - 40.00	0.6000	0.6000
T12	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	33.33 - 40.00	0.6000	0.6000
T12	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	33.33 - 40.00	0.6000	0.6000
T12	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	33.33 - 40.00	0.6000	0.6000
T12	12	LDF7-50A(1-5/8)	33.33 - 40.00	0.6000	0.6000
T12	13	LDF5-50A(7/8")	33.33 - 40.00	0.6000	0.6000
T12	14	LDF5-50A(7/8")	33.33 - 40.00	0.6000	0.6000
T12	15	LDF4-50A(1/2)	33.33 - 40.00	0.6000	0.6000
T12	16	EW63(ELLIPTICAL)	33.33 - 40.00	0.6000	0.6000
T12	17	EW90(ELLIPTICAL)	33.33 - 40.00	0.6000	0.6000
T12	19	EW63(ELLIPTICAL)	33.33 - 40.00	0.6000	0.6000
T12	21	LDF5-50A(7/8)	33.33 - 40.00	0.6000	0.6000
T12	23	EW63(ELLIPTICAL)	33.33 - 40.00	0.6000	0.6000
T12	24	LDF5-50A(7/8)	33.33 - 40.00	0.6000	0.6000
T12	26	LDF5-50A(7/8)	33.33 - 40.00	0.6000	0.6000
T12	28	LDF2-50A(3/8)	33.33 - 40.00	0.6000	0.6000
T12	29	EW63(ELLIPTICAL)	33.33 - 40.00	0.6000	0.6000
T12	31	LMR-400(3/8")	33.33 - 40.00	0.6000	0.6000
T12	33	LDF5-50A(7/8)	33.33 - 40.00	0.6000	0.6000
T12	34	CAT5e(1/4)	33.33 - 40.00	0.6000	0.6000
T12	38	LCF78-50J(7/8)	33.33 - 40.00	0.6000	0.6000
T12	39	LDF7-50A(1-5/8")	33.33 - 40.00	0.6000	0.6000
T12	40	LDF4-50A(1/2")	33.33 - 40.00	0.6000	0.6000
T13	1	Safety Line 3/8	20.00 - 33.33	0.6000	0.6000
T13	2	Feedline Ladder (Af)	20.00 - 33.33	0.6000	0.6000
T13	3	Feedline Ladder (Af)	20.00 - 33.33	0.6000	0.6000
T13	4	Feedline Ladder (Af)	20.00 - 33.33	0.6000	0.6000
T13	5	Feedline Ladder (Af)	20.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			33.33		
T13	6	LDF12-50(2-1/4)	20.00 - 33.33	0.6000	0.6000
T13	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	20.00 - 33.33	0.6000	0.6000
T13	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	20.00 - 33.33	0.6000	0.6000
T13	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	20.00 - 33.33	0.6000	0.6000
T13	12	LDF7-50A(1-5/8)	20.00 - 33.33	0.6000	0.6000
T13	13	LDF5-50A(7/8")	20.00 - 33.33	0.6000	0.6000
T13	14	LDF5-50A(7/8")	20.00 - 33.33	0.6000	0.6000
T13	15	LDF4-50A(1/2)	20.00 - 33.33	0.6000	0.6000
T13	16	EW63(ELLIPTICAL)	20.00 - 33.33	0.6000	0.6000
T13	17	EW90(ELLIPTICAL)	20.00 - 33.33	0.6000	0.6000
T13	19	EW63(ELLIPTICAL)	20.00 - 33.33	0.6000	0.6000
T13	21	LDF5-50A(7/8)	20.00 - 33.33	0.6000	0.6000
T13	23	EW63(ELLIPTICAL)	20.00 - 33.33	0.6000	0.6000
T13	24	LDF5-50A(7/8)	20.00 - 33.33	0.6000	0.6000
T13	26	LDF5-50A(7/8)	20.00 - 33.33	0.6000	0.6000
T13	28	LDF2-50A(3/8)	20.00 - 33.33	0.6000	0.6000
T13	29	EW63(ELLIPTICAL)	20.00 - 33.33	0.6000	0.6000
T13	31	LMR-400(3/8")	20.00 - 33.33	0.6000	0.6000
T13	33	LDF5-50A(7/8)	20.00 - 33.33	0.6000	0.6000
T13	34	CAT5e(1/4)	20.00 - 33.33	0.6000	0.6000
T13	38	LCF78-50J(7/8)	20.00 - 33.33	0.6000	0.6000
T13	39	LDF7-50A(1-5/8")	20.00 - 33.33	0.6000	0.6000
T13	40	LDF4-50A(1/2")	20.00 - 33.33	0.6000	0.6000
T14	1	Safety Line 3/8	13.33 - 20.00	0.6000	0.6000
T14	2	Feedline Ladder (Af)	13.33 - 20.00	0.6000	0.6000
T14	3	Feedline Ladder (Af)	13.33 - 20.00	0.6000	0.6000
T14	4	Feedline Ladder (Af)	13.33 - 20.00	0.6000	0.6000
T14	5	Feedline Ladder (Af)	13.33 - 20.00	0.6000	0.6000
T14	6	LDF12-50(2-1/4)	13.33 - 20.00	0.6000	0.6000
T14	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	13.33 - 20.00	0.6000	0.6000
T14	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	13.33 - 20.00	0.6000	0.6000
T14	11	(3)LDF7-50A(1-	13.33 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
		5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	20.00		
T14	12	LDF7-50A(1-5/8)	13.33 - 20.00	0.6000	0.6000
T14	13	LDF5-50A(7/8")	13.33 - 20.00	0.6000	0.6000
T14	14	LDF5-50A(7/8")	13.33 - 20.00	0.6000	0.6000
T14	15	LDF4-50A(1/2)	13.33 - 20.00	0.6000	0.6000
T14	16	EW63(ELLIPTICAL)	13.33 - 20.00	0.6000	0.6000
T14	17	EW90(ELLIPTICAL)	13.33 - 20.00	0.6000	0.6000
T14	19	EW63(ELLIPTICAL)	13.33 - 20.00	0.6000	0.6000
T14	21	LDF5-50A(7/8)	13.33 - 20.00	0.6000	0.6000
T14	23	EW63(ELLIPTICAL)	13.33 - 20.00	0.6000	0.6000
T14	24	LDF5-50A(7/8)	13.33 - 20.00	0.6000	0.6000
T14	26	LDF5-50A(7/8)	13.33 - 20.00	0.6000	0.6000
T14	28	LDF2-50A(3/8)	13.33 - 20.00	0.6000	0.6000
T14	29	EW63(ELLIPTICAL)	13.33 - 20.00	0.6000	0.6000
T14	31	LMR-400(3/8")	13.33 - 20.00	0.6000	0.6000
T14	33	LDF5-50A(7/8)	13.33 - 20.00	0.6000	0.6000
T14	34	CAT5e(1/4)	13.33 - 20.00	0.6000	0.6000
T14	38	LCF78-50J(7/8)	13.33 - 20.00	0.6000	0.6000
T14	39	LDF7-50A(1-5/8")	13.33 - 20.00	0.6000	0.6000
T14	40	LDF4-50A(1/2")	13.33 - 20.00	0.6000	0.6000
T15	1	Safety Line 3/8	0.00 - 13.33	0.6000	0.6000
T15	2	Feedline Ladder (Af)	6.00 - 13.33	0.6000	0.6000
T15	3	Feedline Ladder (Af)	6.00 - 13.33	0.6000	0.6000
T15	4	Feedline Ladder (Af)	6.00 - 13.33	0.6000	0.6000
T15	5	Feedline Ladder (Af)	6.00 - 13.33	0.6000	0.6000
T15	6	LDF12-50(2-1/4)	6.00 - 13.33	0.6000	0.6000
T15	8	(12)LDF4.5-50(5/8")+(3)ATCB-B01-005(5/16)	6.00 - 13.33	0.6000	0.6000
T15	9	(6)LDF7-50A(1-5/8)+(2)LDF6-50A(1-1/4) Hybrid Cable	6.00 - 13.33	0.6000	0.6000
T15	11	(3)LDF7-50A(1-5/8")+(2)LDF6-50A(1-1/4) Hybrid Cable	6.00 - 13.33	0.6000	0.6000
T15	12	LDF7-50A(1-5/8)	6.00 - 13.33	0.6000	0.6000
T15	13	LDF5-50A(7/8")	6.00 - 13.33	0.6000	0.6000
T15	14	LDF5-50A(7/8")	6.00 - 13.33	0.6000	0.6000
T15	15	LDF4-50A(1/2)	6.00 - 13.33	0.6000	0.6000
T15	16	EW63(ELLIPTICAL)	6.00 - 13.33	0.6000	0.6000
T15	17	EW90(ELLIPTICAL)	6.00 - 13.33	0.6000	0.6000
T15	19	EW63(ELLIPTICAL)	6.00 - 13.33	0.6000	0.6000
T15	21	LDF5-50A(7/8)	6.00 - 13.33	0.6000	0.6000
T15	23	EW63(ELLIPTICAL)	6.00 - 13.33	0.6000	0.6000
T15	24	LDF5-50A(7/8)	6.00 - 13.33	0.6000	0.6000
T15	26	LDF5-50A(7/8)	6.00 - 13.33	0.6000	0.6000
T15	28	LDF2-50A(3/8)	6.00 - 13.33	0.6000	0.6000
T15	29	EW63(ELLIPTICAL)	6.00 - 13.33	0.6000	0.6000
T15	31	LMR-400(3/8")	6.00 - 13.33	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T15	33	LDF5-50A(7/8)	6.00 - 13.33	0.6000	0.6000
T15	34	CAT5e(1/4)	6.00 - 13.33	0.6000	0.6000
T15	38	LCF78-50J(7/8)	6.00 - 13.33	0.6000	0.6000
T15	39	LDF7-50A(1-5/8")	6.00 - 13.33	0.6000	0.6000
T15	40	LDF4-50A(1/2")	6.00 - 13.33	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
6'x4" Mount Pipe	A	From Leg	1.00 0.00 2.00	0.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.67 2.62 3.00 3.78	1.67 2.62 3.00 3.78	0.06 0.08 0.11 0.17
Flash Beacon Lighting	A	From Leg	0.00 0.00 5.00	0.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.70 3.10 3.50 4.30	2.70 3.10 3.50 4.30	0.05 0.07 0.09 0.13
13' x 2" Mount Pipe	A	From Face	0.00 4.00 6.50	0.0000	171.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.09 4.42 5.76 8.50	3.09 4.42 5.76 8.50	0.05 0.07 0.10 0.19
13' x 2" Mount Pipe	A	From Face	0.00 -4.00 6.50	0.0000	171.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.09 4.42 5.76 8.50	3.09 4.42 5.76 8.50	0.05 0.07 0.10 0.19
CO-41A	A	From Face	0.00 0.00 4.00	0.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.15 4.38 5.63 7.77	3.15 4.38 5.63 7.77	0.01 0.04 0.07 0.15
13' x 2" Mount Pipe	B	From Face	0.00 -4.00 6.50	0.0000	171.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.09 4.42 5.76 8.50	3.09 4.42 5.76 8.50	0.05 0.07 0.10 0.19
13' x 2" Mount Pipe	B	From Face	0.00 4.00 6.50	0.0000	171.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.09 4.42 5.76 8.50	3.09 4.42 5.76 8.50	0.05 0.07 0.10 0.19
DS9A09F36D-N	C	From Face	0.00 0.00 10.00	0.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice	6.33 8.47 10.63 14.99	6.33 8.47 10.63 14.99	0.08 0.12 0.18 0.34
TTA TX/RX 432F-83W-01-T	C	From Face	0.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.40 1.55 1.70 2.04	0.82 0.94 1.06 1.34	0.01 0.02 0.04 0.07
13' x 2" Mount Pipe	C	From Face	0.00 -4.00	0.0000	171.00	No Ice 1/2"	3.09 4.42	3.09 4.42	0.05 0.07

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft²	C_AA_A *Side* ft²	*Weight* K
			6.50			Ice	5.76	5.76	0.10
						1" Ice	8.50	8.50	0.19
						2" Ice			
13' x 2" Mount Pipe	C	From Face	0.00	0.0000	171.00	No Ice	3.09	3.09	0.05
			4.00			1/2"	4.42	4.42	0.07
			6.50			Ice	5.76	5.76	0.10
						1" Ice	8.50	8.50	0.19
						2" Ice			
ANT450F6	C	From Face	0.00	0.0000	185.00	No Ice	1.90	1.90	0.01
			0.00			1/2"	2.73	2.73	0.02
			2.00			Ice	3.40	3.40	0.04
						1" Ice	4.40	4.40	0.10
						2" Ice			
20' 8 Bay Di-Pole	A	From Face	0.00	0.0000	185.00	No Ice	4.00	4.00	0.06
			0.00			1/2"	6.00	6.00	0.10
			8.00			Ice	8.00	8.00	0.14
						1" Ice	12.00	12.00	0.23
						2" Ice			
DB411-B	C	From Leg	0.00	0.0000	181.00	No Ice	1.50	1.50	0.03
			0.00			1/2"	2.70	2.70	0.03
			-5.00			Ice	3.90	3.90	0.04
						1" Ice	6.30	6.30	0.06
						2" Ice			
20' Horiz. 4"X4"x1/4"	A	From Face	0.00	0.0000	182.00	No Ice	8.00	0.13	0.24
			0.00			1/2"	9.36	0.18	0.31
			0.00			Ice	10.73	0.24	0.40
						1" Ice	13.48	0.37	0.62
						2" Ice			
20' Horiz. 4"X4"x1/4"	B	From Face	0.00	0.0000	182.00	No Ice	8.00	0.13	0.24
			0.00			1/2"	9.36	0.18	0.31
			0.00			Ice	10.73	0.24	0.40
						1" Ice	13.48	0.37	0.62
						2" Ice			
20' Horiz. 4"X4"x1/4"	C	From Face	0.00	0.0000	182.00	No Ice	8.00	0.13	0.24
			0.00			1/2"	9.36	0.18	0.31
			0.00			Ice	10.73	0.24	0.40
						1" Ice	13.48	0.37	0.62
						2" Ice			
22' Horiz. 4"X4"x1/4"	A	From Face	0.00	0.0000	171.00	No Ice	8.80	0.13	0.27
			0.00			1/2"	10.30	0.18	0.35
			0.00			Ice	11.80	0.24	0.43
						1" Ice	14.78	0.37	0.60
						2" Ice			
22' Horiz. 4"X4"x1/4"	B	From Face	0.00	0.0000	171.00	No Ice	8.80	0.13	0.27
			0.00			1/2"	10.30	0.18	0.35
			0.00			Ice	11.80	0.24	0.43
						1" Ice	14.78	0.37	0.60
						2" Ice			
22' Horiz. 4"X4"x1/4"	C	From Face	0.00	0.0000	171.00	No Ice	8.80	0.13	0.27
			0.00			1/2"	10.30	0.18	0.35
			0.00			Ice	11.80	0.24	0.43
						1" Ice	14.78	0.37	0.60
						2" Ice			
6'x4" Mount Pipe	A	From Leg	1.00	0.0000	183.00	No Ice	1.67	1.67	0.06
			0.00			1/2"	2.62	2.62	0.08
			0.00			Ice	3.00	3.00	0.11
						1" Ice	3.78	3.78	0.17
						2" Ice			
8' Horizontal x 2" Mount Pipe	A	From Leg	0.50	0.0000	183.00	No Ice	1.90	0.05	0.03
			4.00			1/2"	2.45	0.08	0.05
			0.00			Ice	3.01	0.11	0.07
						1" Ice	4.15	0.21	0.14
						2" Ice			
6'x4" Mount Pipe	B	From Leg	1.00	0.0000	183.00	No Ice	1.67	1.67	0.06
			0.00			1/2"	2.62	2.62	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
			0.00			1" Ice	3.00	3.00	0.11
						2" Ice	3.78	3.78	0.17
8' Horizontal x 2" Mount Pipe	B	From Leg	0.50 4.00 0.00	0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.90 2.45 3.01 4.15	0.05 0.08 0.11 0.21	0.03 0.05 0.07 0.14
6'x4" Mount Pipe	B	From Leg	1.00 0.00 0.00	0.0000	172.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.67 2.62 3.00 3.78	1.67 2.62 3.00 3.78	0.06 0.08 0.11 0.17
8' Horizontal x 2" Mount Pipe	B	From Leg	0.50 4.00 0.00	0.0000	172.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.90 2.45 3.01 4.15	0.05 0.08 0.11 0.21	0.03 0.05 0.07 0.14
6'x4" Mount Pipe	A	From Leg	1.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.67 2.62 3.00 3.78	1.67 2.62 3.00 3.78	0.06 0.08 0.11 0.17
8' Horizontal x 2" Mount Pipe	A	From Leg	0.50 4.00 0.00	0.0000	177.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.90 2.45 3.01 4.15	0.05 0.08 0.11 0.21	0.03 0.05 0.07 0.14
***									
8' x 3" Mount Pipe	A	From Leg	0.50 0.00 0.00	0.0000	165.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.40 3.19 3.67 4.68	2.40 3.19 3.67 4.68	0.04 0.06 0.08 0.14
Side Arm Mount [SO 602-1]	A	From Leg	0.50 0.00 0.00	0.0000	165.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.58 3.39 4.18 5.70	10.83 13.16 15.84 22.98	0.15 0.22 0.31 0.55
ANT150F6	A	From Leg	6.00 0.00 10.00	0.0000	165.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.80 6.83 8.87 13.01	4.80 6.83 8.87 13.01	0.03 0.07 0.11 0.25
***									
6'x2" Mount Pipe	C	From Leg	0.50 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.43 1.92 2.29 3.06	1.43 1.92 2.29 3.06	0.02 0.03 0.05 0.09
***									
Sector Mount [SM 502-3]	C	None		0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	29.82 42.21 54.43 78.49	29.82 42.21 54.43 78.49	1.67 2.27 3.05 5.18
6'x3" Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.70 2.29 2.67 3.44	1.70 2.29 2.67 3.44	0.05 0.06 0.08 0.13
6'x3" Mount Pipe	B	From Leg	0.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice	1.70 2.29 2.67 3.44	1.70 2.29 2.67 3.44	0.05 0.06 0.08 0.13

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
						2" Ice			
6'x3" Mount Pipe	C	From Leg	0.00	0.0000	160.00	No Ice	1.70	1.70	0.05
			0.00			1/2"	2.29	2.29	0.06
			0.00			Ice	2.67	2.67	0.08
						1" Ice	3.44	3.44	0.13
						2" Ice			
7770.00 w/ Mount Pipe	A	From Leg	3.00	0.0000	160.00	No Ice	5.75	4.25	0.06
			-6.00			1/2"	6.18	5.01	0.11
			0.00			Ice	6.61	5.71	0.16
						1" Ice	7.49	7.16	0.29
						2" Ice			
OPA-65R-LCUU-H8_TIA w/ Mount Pipe	A	From Leg	3.00	0.0000	160.00	No Ice	13.00	9.56	0.10
			6.00			1/2"	13.69	11.03	0.20
			0.00			Ice	14.38	12.49	0.30
						1" Ice	15.70	14.75	0.55
						2" Ice			
(2) 80010966_TIA w/ Mount Pipe	A	From Leg	3.00	0.0000	160.00	No Ice	17.60	9.64	0.16
			0.00			1/2"	18.33	11.15	0.27
			0.00			Ice	19.07	12.70	0.40
						1" Ice	20.49	15.03	0.69
						2" Ice			
8'x2" Mount Pipe	A	From Leg	3.00	0.0000	160.00	No Ice	1.90	1.90	0.03
			0.00			1/2"	2.73	2.73	0.04
			0.00			Ice	3.40	3.40	0.06
						1" Ice	4.40	4.40	0.12
						2" Ice			
7770.00 w/ Mount Pipe	B	From Leg	3.00	0.0000	160.00	No Ice	5.75	4.25	0.06
			-6.00			1/2"	6.18	5.01	0.11
			0.00			Ice	6.61	5.71	0.16
						1" Ice	7.49	7.16	0.29
						2" Ice			
OPA-65R-LCUU-H6_TIA w/ Mount Pipe	B	From Leg	3.00	0.0000	160.00	No Ice	9.68	7.12	0.11
			6.00			1/2"	10.25	8.30	0.18
			0.00			Ice	10.79	9.20	0.26
						1" Ice	11.89	11.03	0.46
						2" Ice			
(2) 80010965_TIA w/ Mount Pipe	B	From Leg	3.00	0.0000	160.00	No Ice	14.05	7.63	0.14
			0.00			1/2"	14.69	8.90	0.23
			0.00			Ice	15.30	9.96	0.34
						1" Ice	16.53	11.92	0.58
						2" Ice			
8'x2" Mount Pipe	B	From Leg	3.00	0.0000	160.00	No Ice	1.90	1.90	0.03
			0.00			1/2"	2.73	2.73	0.04
			0.00			Ice	3.40	3.40	0.06
						1" Ice	4.40	4.40	0.12
						2" Ice			
7770.00 w/ Mount Pipe	C	From Leg	3.00	0.0000	160.00	No Ice	5.75	4.25	0.06
			-6.00			1/2"	6.18	5.01	0.11
			0.00			Ice	6.61	5.71	0.16
						1" Ice	7.49	7.16	0.29
						2" Ice			
(2) 80010966_TIA w/ Mount Pipe	C	From Leg	3.00	0.0000	160.00	No Ice	17.60	9.64	0.16
			0.00			1/2"	18.33	11.15	0.27
			0.00			Ice	19.07	12.70	0.40
						1" Ice	20.49	15.03	0.69
						2" Ice			
OPA-65R-LCUU-H8_TIA w/ Mount Pipe	C	From Leg	3.00	0.0000	160.00	No Ice	13.00	9.56	0.10
			6.00			1/2"	13.69	11.03	0.20
			0.00			Ice	14.38	12.49	0.30
						1" Ice	15.70	14.75	0.55
						2" Ice			
8'x2" Mount Pipe	C	From Leg	3.00	0.0000	160.00	No Ice	1.90	1.90	0.03
			0.00			1/2"	2.73	2.73	0.04
			0.00			Ice	3.40	3.40	0.06
						1" Ice	4.40	4.40	0.12

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
						2" Ice			
RRUS 4478 B14	A	From Leg	3.00	0.0000	160.00	No Ice	1.84	1.06	0.06
			0.00			1/2"	2.01	1.20	0.08
			0.00			Ice	2.19	1.34	0.09
						1" Ice	2.57	1.66	0.14
						2" Ice			
RRUS 4478 B14	B	From Leg	3.00	0.0000	160.00	No Ice	1.84	1.06	0.06
			0.00			1/2"	2.01	1.20	0.08
			0.00			Ice	2.19	1.34	0.09
						1" Ice	2.57	1.66	0.14
						2" Ice			
RRUS 4478 B14	C	From Leg	3.00	0.0000	160.00	No Ice	1.84	1.06	0.06
			0.00			1/2"	2.01	1.20	0.08
			0.00			Ice	2.19	1.34	0.09
						1" Ice	2.57	1.66	0.14
						2" Ice			
RRUS 8843 B2/B66A	A	From Leg	3.00	0.0000	160.00	No Ice	1.64	1.35	0.07
			0.00			1/2"	1.80	1.50	0.09
			0.00			Ice	1.97	1.65	0.11
						1" Ice	2.32	1.99	0.16
						2" Ice			
RRUS 8843 B2/B66A	B	From Leg	3.00	0.0000	160.00	No Ice	1.64	1.35	0.07
			0.00			1/2"	1.80	1.50	0.09
			0.00			Ice	1.97	1.65	0.11
						1" Ice	2.32	1.99	0.16
						2" Ice			
RRUS 8843 B2/B66A	C	From Leg	3.00	0.0000	160.00	No Ice	1.64	1.35	0.07
			0.00			1/2"	1.80	1.50	0.09
			0.00			Ice	1.97	1.65	0.11
						1" Ice	2.32	1.99	0.16
						2" Ice			
RRUS 32	A	From Leg	3.00	0.0000	160.00	No Ice	2.86	1.78	0.06
			0.00			1/2"	3.08	1.97	0.08
			0.00			Ice	3.32	2.17	0.10
						1" Ice	3.81	2.58	0.16
						2" Ice			
RRUS 32	B	From Leg	3.00	0.0000	160.00	No Ice	2.86	1.78	0.06
			0.00			1/2"	3.08	1.97	0.08
			0.00			Ice	3.32	2.17	0.10
						1" Ice	3.81	2.58	0.16
						2" Ice			
RRUS 32	C	From Leg	3.00	0.0000	160.00	No Ice	2.86	1.78	0.06
			0.00			1/2"	3.08	1.97	0.08
			0.00			Ice	3.32	2.17	0.10
						1" Ice	3.81	2.58	0.16
						2" Ice			
RRUS 4449 B5/B12	A	From Leg	3.00	0.0000	160.00	No Ice	1.97	1.41	0.07
			0.00			1/2"	2.14	1.56	0.09
			0.00			Ice	2.33	1.73	0.11
						1" Ice	2.72	2.07	0.16
						2" Ice			
RRUS 4449 B5/B12	B	From Leg	3.00	0.0000	160.00	No Ice	1.97	1.41	0.07
			0.00			1/2"	2.14	1.56	0.09
			0.00			Ice	2.33	1.73	0.11
						1" Ice	2.72	2.07	0.16
						2" Ice			
RRUS 4449 B5/B12	C	From Leg	3.00	0.0000	160.00	No Ice	1.97	1.41	0.07
			0.00			1/2"	2.14	1.56	0.09
			0.00			Ice	2.33	1.73	0.11
						1" Ice	2.72	2.07	0.16
						2" Ice			
RRUS E2 B29	A	From Leg	3.00	0.0000	160.00	No Ice	3.15	1.29	0.05
			0.00			1/2"	3.36	1.44	0.08
			0.00			Ice	3.59	1.60	0.10
						1" Ice	4.07	1.95	0.17

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft²*	*C_AA_A Side* *ft²*	*Weight* *K*
						2" Ice			
RRUS E2 B29	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.15 3.36 3.59 4.07	1.29 1.44 1.60 1.95	0.05 0.08 0.10 0.17
RRUS E2 B29	C	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.15 3.36 3.59 4.07	1.29 1.44 1.60 1.95	0.05 0.08 0.10 0.17
TT08-19DB111-001 : TMA	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.79 0.91 1.04 1.32	0.64 0.75 0.87 1.13	0.02 0.03 0.04 0.06
TT08-19DB111-001 : TMA	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.79 0.91 1.04 1.32	0.64 0.75 0.87 1.13	0.02 0.03 0.04 0.06
TT08-19DB111-001 : TMA	C	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.79 0.91 1.04 1.32	0.64 0.75 0.87 1.13	0.02 0.03 0.04 0.06
DC6-48-60-18-8F	A	From Leg	0.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.92 1.46 1.64 2.04	0.92 1.46 1.64 2.04	0.02 0.04 0.06 0.11
DC6-48-60-18-8F	B	From Leg	0.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.92 1.46 1.64 2.04	0.92 1.46 1.64 2.04	0.02 0.04 0.06 0.11
DC6-48-60-18-8F	C	From Leg	0.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.92 1.46 1.64 2.04	0.92 1.46 1.64 2.04	0.02 0.04 0.06 0.11
DC6-48-60-18-8C-EV	A	From Leg	0.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.74 2.96 3.20 3.68	2.74 2.96 3.20 3.68	0.03 0.05 0.08 0.15
DC6-48-60-18-8C-EV	B	From Leg	0.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.74 2.96 3.20 3.68	2.74 2.96 3.20 3.68	0.03 0.05 0.08 0.15
DC6-48-60-18-8C-EV	C	From Leg	0.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.74 2.96 3.20 3.68	2.74 2.96 3.20 3.68	0.03 0.05 0.08 0.15
***									
Sector Mount [SM 502-3]	C	None		0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice	29.82 42.21 54.43 78.49	29.82 42.21 54.43 78.49	1.67 2.27 3.05 5.18
6'x3" Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	1.71 2.29 2.67	1.71 2.29 2.67	0.05 0.06 0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
						1" Ice	3.44	3.44	0.13
						2" Ice			
6'x3" Mount Pipe	B	From Leg	0.00	0.0000	150.00	No Ice	1.71	1.71	0.05
			0.00			1/2"	2.29	2.29	0.06
			0.00			Ice	2.67	2.67	0.08
						1" Ice	3.44	3.44	0.13
						2" Ice			
6'x3" Mount Pipe	C	From Leg	0.00	0.0000	150.00	No Ice	1.71	1.71	0.05
			0.00			1/2"	2.29	2.29	0.06
			0.00			Ice	2.67	2.67	0.08
						1" Ice	3.44	3.44	0.13
						2" Ice			
(2) BXA-171063-12CF-EDIN-X w/ Mount Pipe	A	From Leg	3.00	0.0000	150.00	No Ice	5.04	5.30	0.04
			0.00			1/2"	5.59	6.47	0.08
			0.00			Ice	6.11	7.36	0.14
						1" Ice	7.18	9.16	0.27
						2" Ice			
BXA-70063-6CF-EDIN-X_TIA w/ Mount Pipe	A	From Leg	3.00	0.0000	150.00	No Ice	7.81	5.80	0.06
			0.00			1/2"	8.36	6.95	0.12
			0.00			Ice	8.87	7.82	0.19
						1" Ice	9.93	9.60	0.35
						2" Ice			
(2) LPA-80080/4CF w/ Mount Pipe	A	From Leg	3.00	0.0000	150.00	No Ice	2.86	6.57	0.03
			0.00			1/2"	3.22	7.19	0.08
			0.00			Ice	3.59	7.84	0.13
						1" Ice	4.34	9.17	0.25
						2" Ice			
(2) BXA-171063-12CF-EDIN-X w/ Mount Pipe	B	From Leg	3.00	0.0000	150.00	No Ice	5.04	5.30	0.04
			0.00			1/2"	5.59	6.47	0.08
			0.00			Ice	6.11	7.36	0.14
						1" Ice	7.18	9.16	0.27
						2" Ice			
BXA-70063-6CF-EDIN-X_TIA w/ Mount Pipe	B	From Leg	3.00	0.0000	150.00	No Ice	7.81	5.80	0.06
			0.00			1/2"	8.36	6.95	0.12
			0.00			Ice	8.87	7.82	0.19
						1" Ice	9.93	9.60	0.35
						2" Ice			
(2) LPA-80080/4CF w/ Mount Pipe	B	From Leg	3.00	0.0000	150.00	No Ice	2.86	6.57	0.03
			0.00			1/2"	3.22	7.19	0.08
			0.00			Ice	3.59	7.84	0.13
						1" Ice	4.34	9.17	0.25
						2" Ice			
(2) BXA-171063-12CF-EDIN-X w/ Mount Pipe	C	From Leg	3.00	0.0000	150.00	No Ice	5.04	5.30	0.04
			0.00			1/2"	5.59	6.47	0.08
			0.00			Ice	6.11	7.36	0.14
						1" Ice	7.18	9.16	0.27
						2" Ice			
BXA-70063-6CF-EDIN-X_TIA w/ Mount Pipe	C	From Leg	3.00	0.0000	150.00	No Ice	7.81	5.80	0.06
			0.00			1/2"	8.36	6.95	0.12
			0.00			Ice	8.87	7.82	0.19
						1" Ice	9.93	9.60	0.35
						2" Ice			
(2) LPA-80080/4CF w/ Mount Pipe	C	From Leg	3.00	0.0000	150.00	No Ice	2.86	6.57	0.03
			0.00			1/2"	3.22	7.19	0.08
			0.00			Ice	3.59	7.84	0.13
						1" Ice	4.34	9.17	0.25
						2" Ice			
RRH2X40-AWS	A	From Leg	3.00	0.0000	150.00	No Ice	2.16	1.42	0.04
			0.00			1/2"	2.36	1.59	0.06
			0.00			Ice	2.57	1.77	0.08
						1" Ice	3.00	2.14	0.13
						2" Ice			
RRH2X40-AWS	B	From Leg	3.00	0.0000	150.00	No Ice	2.16	1.42	0.04
			0.00			1/2"	2.36	1.59	0.06
			0.00			Ice	2.57	1.77	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice 2" Ice	3.00	2.14	0.13
RRH2X40-AWS	C	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.16 2.36 2.57 3.00	1.42 1.59 1.77 2.14	0.04 0.06 0.08 0.13
RRH2x40 700	A	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.96 2.14 2.32 2.70	1.03 1.17 1.31 1.62	0.05 0.07 0.09 0.13
RRH2x40 700	B	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.96 2.14 2.32 2.70	1.03 1.17 1.31 1.62	0.05 0.07 0.09 0.13
RRH2x40 700	C	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.96 2.14 2.32 2.70	1.03 1.17 1.31 1.62	0.05 0.07 0.09 0.13
DB-T1-6Z-8AB-0Z : Distribution Box	A	From Leg	0.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.80 5.07 5.35 5.93	2.00 2.19 2.39 2.81	0.04 0.08 0.12 0.21
****									
Sector Mount [SM 502-3]	A	None		0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	29.82 42.21 54.43 78.49	29.82 42.21 54.43 78.49	1.67 2.27 3.05 5.18
6'x3" Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	1.72 2.29 2.67 3.44	1.72 2.29 2.67 3.44	0.05 0.06 0.08 0.13
6'x3" Mount Pipe	B	From Leg	0.00 0.00 0.00	0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	1.72 2.29 2.67 3.44	1.72 2.29 2.67 3.44	0.05 0.06 0.08 0.13
6'x3" Mount Pipe	C	From Leg	0.00 0.00 0.00	0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	1.72 2.29 2.67 3.44	1.72 2.29 2.67 3.44	0.05 0.06 0.08 0.13
APXV18-206516H-C-A20_TIA w/ Mount Pipe	A	From Leg	4.00 -6.00 0.00	0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	4.00 4.42 4.84 5.68	3.93 4.68 5.37 6.80	0.03 0.07 0.11 0.22
APXV18-206516H-C-A20_TIA w/ Mount Pipe	B	From Leg	4.00 -6.00 0.00	0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	4.00 4.42 4.84 5.68	3.93 4.68 5.37 6.80	0.03 0.07 0.11 0.22
APXV18-206516H-C-A20_TIA w/ Mount Pipe	C	From Leg	4.00 -6.00 0.00	0.0000	140.50	No Ice 1/2" Ice 1" Ice 2" Ice	4.00 4.42 4.84 5.68	3.93 4.68 5.37 6.80	0.03 0.07 0.11 0.22
APXV18-206517-C_TIA w/ Mount Pipe	A	From Leg	4.00 0.00	0.0000	140.50	No Ice 1/2"	5.40 5.96	4.70 5.86	0.06 0.10

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*Placement*		*C_AA_A Front*	*C_AA_A Side*	*Weight*
			ft ft ft	*°*	*ft*		*ft^2*	*ft^2*	*K*
			0.00			Ice	6.48	6.73	0.15
						1" Ice	7.55	8.51	0.28
						2" Ice			
APXV18-206517-C_TIA w/	B	From Leg	4.00	0.0000	140.50	No Ice	5.40	4.70	0.06
Mount Pipe			0.00			1/2"	5.96	5.86	0.10
			0.00			Ice	6.48	6.73	0.15
						1" Ice	7.55	8.51	0.28
						2" Ice			
APXV18-206517-C_TIA w/	C	From Leg	4.00	0.0000	140.50	No Ice	5.40	4.70	0.06
Mount Pipe			0.00			1/2"	5.96	5.86	0.10
			0.00			Ice	6.48	6.73	0.15
						1" Ice	7.55	8.51	0.28
						2" Ice			
LNX-6515DS-T4M_TIA w/	A	From Leg	4.00	0.0000	140.50	No Ice	11.67	9.83	0.09
Mount Pipe			6.00			1/2"	12.39	11.35	0.18
			0.00			Ice	13.12	12.90	0.28
						1" Ice	14.49	15.25	0.51
						2" Ice			
LNX-6515DS-T4M_TIA w/	B	From Leg	4.00	0.0000	140.50	No Ice	11.67	9.83	0.09
Mount Pipe			6.00			1/2"	12.39	11.35	0.18
			0.00			Ice	13.12	12.90	0.28
						1" Ice	14.49	15.25	0.51
						2" Ice			
LNX-6515DS-T4M_TIA w/	C	From Leg	4.00	0.0000	140.50	No Ice	11.67	9.83	0.09
Mount Pipe			6.00			1/2"	12.39	11.35	0.18
			0.00			Ice	13.12	12.90	0.28
						1" Ice	14.49	15.25	0.51
						2" Ice			
(2) RRUS 11	A	From Leg	4.00	0.0000	140.50	No Ice	2.78	1.19	0.05
			0.00			1/2"	2.99	1.33	0.07
			0.00			Ice	3.21	1.49	0.10
						1" Ice	3.66	1.83	0.15
						2" Ice			
(2) RRUS 11	B	From Leg	4.00	0.0000	140.50	No Ice	2.78	1.19	0.05
			0.00			1/2"	2.99	1.33	0.07
			0.00			Ice	3.21	1.49	0.10
						1" Ice	3.66	1.83	0.15
						2" Ice			
(2) RRUS 11	C	From Leg	4.00	0.0000	140.50	No Ice	2.78	1.19	0.05
			0.00			1/2"	2.99	1.33	0.07
			0.00			Ice	3.21	1.49	0.10
						1" Ice	3.66	1.83	0.15
						2" Ice			
IBR 1300 w/ Mount Pipe	B	From Leg	4.00	0.0000	140.50	No Ice	0.84	0.62	0.02
			2.00			1/2"	1.01	0.82	0.03
			0.00			Ice	1.19	1.04	0.04
						1" Ice	1.59	1.52	0.07
						2" Ice			
DC6-48-60-0-8F : SA	C	From Leg	0.50	0.0000	140.50	No Ice	0.85	0.85	0.03
Squid			0.00			1/2"	1.36	1.36	0.05
			0.00			Ice	1.53	1.53	0.07
						1" Ice	1.91	1.91	0.11
						2" Ice			
****									
Pipe Mount [PM 601-1]	B	From Leg	1.00	0.0000	135.00	No Ice	1.32	1.32	0.07
			0.00			1/2"	1.58	1.58	0.08
			0.00			Ice	1.84	1.84	0.09
						1" Ice	2.40	2.40	0.13
						2" Ice			
Pipe Mount [PM 601-1]	C	From Leg	1.00	0.0000	135.00	No Ice	1.32	1.32	0.07
			0.00			1/2"	1.58	1.58	0.08
			0.00			Ice	1.84	1.84	0.09
						1" Ice	2.40	2.40	0.13
						2" Ice			
****									

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert ft ft ft*	*Azimuth Adjustment °*	*Placement ft*		*C_AA_A Front ft^2*	*C_AA_A Side ft^2*	*Weight K*
6' x 3" Mount Pipe	A	From Leg	0.50	0.0000	125.00	No Ice	1.77	1.77	0.03
			0.00			1/2" Ice	2.13	2.13	0.04
			0.00			1" Ice	2.50	2.50	0.06
						2" Ice	3.27	3.27	0.11
4'x2" Mount Pipe	A	From Leg	0.50	0.0000	125.00	No Ice	0.87	0.87	0.01
			0.00			1/2" Ice	1.11	1.11	0.02
			0.00			1" Ice	1.36	1.36	0.03
						2" Ice	1.90	1.90	0.06
12'6"x2" Mount Pipe	A	From Leg	6.00	0.0000	125.00	No Ice	2.97	2.97	0.05
			0.00			1/2" Ice	4.25	4.25	0.07
			0.00			1" Ice	5.54	5.54	0.10
						2" Ice	8.05	8.05	0.18
Side Arm Mount [SO 602-1]	A	From Leg	0.50	0.0000	125.00	No Ice	2.58	10.83	0.15
			0.00			1/2" Ice	3.39	13.16	0.22
			0.00			1" Ice	4.18	15.84	0.31
						2" Ice	5.70	22.98	0.55
531-70 Dipole Antenna	A	From Leg	6.00	0.0000	125.00	No Ice	1.58	5.98	0.04
			0.00			1/2" Ice	2.68	10.20	0.05
			0.00			1" Ice	3.80	14.40	0.06
						2" Ice	6.04	22.90	0.09
***									
6'x4" Mount Pipe	B	From Leg	1.00	0.0000	125.00	No Ice	1.71	1.71	0.06
			0.00			1/2" Ice	2.62	2.62	0.08
			0.00			1" Ice	3.00	3.00	0.11
						2" Ice	3.78	3.78	0.17
8' Horizontal x 2" Mount Pipe	B	From Leg	0.50	0.0000	125.00	No Ice	1.90	0.05	0.03
			4.00			1/2" Ice	2.45	0.08	0.05
			0.00			1" Ice	3.01	0.11	0.07
						2" Ice	4.15	0.21	0.14
***									
***									
6' x 3" Mount Pipe	C	From Leg	0.50	0.0000	125.00	No Ice	1.77	1.77	0.03
			0.00			1/2" Ice	2.13	2.13	0.04
			0.00			1" Ice	2.50	2.50	0.06
						2" Ice	3.27	3.27	0.11
Side Arm Mount [SO 602-1]	C	From Leg	0.50	0.0000	125.00	No Ice	2.58	10.83	0.15
			0.00			1/2" Ice	3.39	13.16	0.22
			0.00			1" Ice	4.18	15.84	0.31
						2" Ice	5.70	22.98	0.55
ANT150F6	C	From Leg	6.00	0.0000	125.00	No Ice	4.80	4.80	0.03
			0.00			1/2" Ice	6.83	6.83	0.07
			10.00			1" Ice	8.87	8.87	0.11
						2" Ice	13.01	13.01	0.25
***									
6' x 3" Mount Pipe	A	From Leg	0.50	0.0000	109.00	No Ice	1.77	1.77	0.03
			0.00			1/2" Ice	2.13	2.13	0.04
			0.00			1" Ice	2.50	2.50	0.06
						2" Ice	3.27	3.27	0.11
4'x2" Mount Pipe	A	From Leg	6.00	0.0000	109.00	No Ice	0.87	0.87	0.01
			0.00			1/2" Ice	1.11	1.11	0.02
			0.00			1" Ice	1.36	1.36	0.03
						2" Ice	1.90	1.90	0.06
12'6"x2" Mount Pipe	A	From Leg	6.00	0.0000	109.00	No Ice	2.97	2.97	0.05

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
			0.00 0.00			1/2" Ice 1" Ice 2" Ice	4.25 5.54 8.05	4.25 5.54 8.05	0.07 0.10 0.18
Side Arm Mount [SO 602-1]	A	From Leg	0.50 0.00 0.00	0.0000	109.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.58 3.39 4.18 5.70	10.83 13.16 15.84 22.98	0.15 0.22 0.31 0.55
531-70 Dipole Antenna	A	From Leg	6.00 0.00 2.00	0.0000	109.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.58 2.68 3.80 6.04	5.98 10.20 14.40 22.90	0.04 0.05 0.06 0.09
***									
6' x 3" Mount Pipe	B	From Leg	0.50 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.77 2.13 2.50 3.27	1.77 2.13 2.50 3.27	0.03 0.04 0.06 0.11
4'x2" Mount Pipe	B	From Leg	6.00 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.87 1.11 1.36 1.90	0.87 1.11 1.36 1.90	0.01 0.02 0.03 0.06
Side Arm Mount [SO 602-1]	B	From Leg	0.50 0.00 0.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.58 3.39 4.18 5.70	10.83 13.16 15.84 22.98	0.15 0.22 0.31 0.55
CO-41A	B	From Leg	6.00 0.00 6.50	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.15 4.38 5.63 7.77	3.15 4.38 5.63 7.77	0.01 0.04 0.07 0.15
Beacon side markers	A	From Leg	0.50 0.00 0.00	0.0000	103.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.93 1.07 1.21 1.49	0.93 1.07 1.21 1.49	0.02 0.03 0.03 0.04
Beacon side markers	B	From Leg	0.50 0.00 0.00	0.0000	103.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.93 1.07 1.21 1.49	0.93 1.07 1.21 1.49	0.02 0.03 0.03 0.04
Beacon side markers	C	From Leg	0.50 0.00 0.00	0.0000	103.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.93 1.07 1.21 1.49	0.93 1.07 1.21 1.49	0.02 0.03 0.03 0.04
****									
6'x4" Mount Pipe	B	From Leg	1.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.73 2.62 3.00 3.78	1.73 2.62 3.00 3.78	0.06 0.08 0.11 0.17
8' Horizontal x 2" Mount Pipe	B	From Leg	0.50 4.00 0.00	0.0000	100.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.90 2.45 3.01 4.15	0.05 0.08 0.11 0.21	0.03 0.05 0.07 0.14
***									
6' x 3" Mount Pipe	A	From Leg	0.50 0.00 0.00	0.0000	85.00	No Ice 1/2" Ice	1.77 2.13 2.50	1.77 2.13 2.50	0.03 0.04 0.06

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		*C_AA_A Front* ft²	*C_AA_A Side* ft²	*Weight* K
						1" Ice	3.27	3.27	0.11
						2" Ice			
4'x2" Mount Pipe	A	From Leg	6.00	0.0000	85.00	No Ice	0.87	0.87	0.01
			0.00			1/2"	1.11	1.11	0.02
			0.00			Ice	1.36	1.36	0.03
						1" Ice	1.90	1.90	0.06
						2" Ice			
12'6"x2" Mount Pipe	A	From Leg	6.00	0.0000	85.00	No Ice	2.97	2.97	0.05
			0.00			1/2"	4.25	4.25	0.07
			2.00			Ice	5.54	5.54	0.10
						1" Ice	8.05	8.05	0.18
						2" Ice			
Side Arm Mount [SO 602-1]	A	From Leg	0.50	0.0000	85.00	No Ice	2.58	10.83	0.15
			0.00			1/2"	3.39	13.16	0.22
			0.00			Ice	4.18	15.84	0.31
						1" Ice	5.70	22.98	0.55
						2" Ice			
531-70 Dipole Antenna	A	From Leg	6.00	0.0000	85.00	No Ice	1.58	5.98	0.04
			0.00			1/2"	2.68	10.20	0.05
			2.00			Ice	3.80	14.40	0.06
						1" Ice	6.04	22.90	0.09
						2" Ice			
***									
6'x3" Mount Pipe	B	From Leg	0.50	0.0000	87.00	No Ice	1.79	1.79	0.05
			0.00			1/2"	2.29	2.29	0.06
			0.00			Ice	2.67	2.67	0.08
						1" Ice	3.44	3.44	0.13
						2" Ice			
4'x2" Mount Pipe	B	From Leg	3.00	0.0000	87.00	No Ice	0.87	0.87	0.01
			0.00			1/2"	1.11	1.11	0.02
			0.00			Ice	1.36	1.36	0.03
						1" Ice	1.90	1.90	0.06
						2" Ice			
Side Arm Mount [SO 601-1]	B	From Leg	0.50	0.0000	87.00	No Ice	1.04	5.32	0.16
			0.00			1/2"	1.41	6.43	0.20
			0.00			Ice	1.78	7.67	0.24
						1" Ice	2.52	10.67	0.36
						2" Ice			
ANT150F2	B	From Leg	3.00	0.0000	87.00	No Ice	1.23	1.23	0.01
			0.00			1/2"	1.53	1.53	0.02
			3.50			Ice	1.84	1.84	0.04
						1" Ice	2.49	2.49	0.07
						2" Ice			
***									
6'x3" Mount Pipe	B	From Leg	0.50	0.0000	66.00	No Ice	1.84	1.84	0.05
			0.00			1/2"	2.29	2.29	0.06
			0.00			Ice	2.67	2.67	0.08
						1" Ice	3.44	3.44	0.13
						2" Ice			
4'x2" Mount Pipe	B	From Leg	3.00	0.0000	66.00	No Ice	0.87	0.87	0.01
			0.00			1/2"	1.11	1.11	0.02
			0.00			Ice	1.36	1.36	0.03
						1" Ice	1.90	1.90	0.06
						2" Ice			
Side Arm Mount [SO 601-1]	B	From Leg	0.50	0.0000	66.00	No Ice	1.04	5.32	0.16
			0.00			1/2"	1.41	6.43	0.20
			0.00			Ice	1.78	7.67	0.24
						1" Ice	2.52	10.67	0.36
						2" Ice			
2' Square Panel Antenna	B	From Leg	3.00	0.0000	66.00	No Ice	4.80	1.63	0.01
			0.00			1/2"	5.07	1.80	0.04
			0.00			Ice	5.35	1.99	0.08
						1" Ice	5.93	2.37	0.17
						2" Ice			
Proposed									

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***									
DS2C03F36D-D	C	From Leg	4.00 -6.00 9.30	0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	7.29 9.75 12.23 17.24	7.29 9.75 12.23 17.24	0.07 0.12 0.19 0.37
DS7C09P36U-D	C	From Leg	4.00 6.00 7.00	0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.35 5.83 7.33 10.38	4.35 5.83 7.33 10.38	0.04 0.07 0.11 0.22
DS7C09P36U-D	C	From Leg	4.00 6.00 -7.00	0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.35 5.83 7.33 10.38	4.35 5.83 7.33 10.38	0.04 0.07 0.11 0.22
DS7C09P36U-D	C	From Leg	4.00 -6.00 -7.00	0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.35 5.83 7.33 10.38	4.35 5.83 7.33 10.38	0.04 0.07 0.11 0.22
Site Pro 1 VFA10-HD-S 10' Heavy Duty V-Frame	C	None		0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	11.40 17.30 22.60 35.00	7.00 11.30 15.30 24.20	0.55 0.65 0.80 0.95
(4) 7'x2.5" Mount Pipe	C	From Leg	4.00 1.67 0.00	0.0000	183.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.01 2.59 3.02 3.90	2.01 2.59 3.02 3.90	0.04 0.06 0.07 0.13
***									
Pipe Mount [PM 601-1]	A	From Leg	1.00 0.00 0.00	0.0000	100.00 - 98.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.32 1.58 1.84 2.40	1.32 1.58 1.84 2.40	0.07 0.08 0.09 0.13
Pipe Mount [PM 601-1]	A	From Leg	1.00 0.00 0.00	0.0000	80.00 - 91.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.32 1.58 1.84 2.40	1.32 1.58 1.84 2.40	0.07 0.08 0.09 0.13

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 K
PADX8-59A	A	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	68.1000		183.00	8.00	No Ice 1/2" Ice 1" Ice 2" Ice	50.30 51.29 52.28 54.27	0.29 0.55 0.81 1.34
PADX8-59A	B	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	29.2000		183.00	8.00	No Ice 1/2" Ice 1" Ice 2" Ice	50.30 51.29 52.28 54.27	0.29 0.55 0.81 1.34
PADX8-59A	B	Paraboloid	From	1.00	-7.0000		172.00	8.00	No Ice	50.30	0.29

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
		w/Radome	Leg	0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.28	0.81
									2" Ice	54.27	1.34
PADX8-59A	C	Paraboloid	From	1.00	0.0000		171.00	8.00	No Ice	50.30	0.29
		w/Radome	Leg	0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.28	0.81
									2" Ice	54.27	1.34
PA4-57A	A	Paraboloid	From	1.00	65.8000		177.00	4.00	No Ice	12.60	0.05
		w/Shroud (HP)	Leg	0.00					1/2" Ice	13.09	0.12
				0.00					1" Ice	13.58	0.18
									2" Ice	14.56	0.32
PR-900	C	Grid	From	1.00	-30.0000		168.00	3.18	No Ice	7.92	0.04
			Leg	0.00					1/2" Ice	8.34	0.08
				0.00					1" Ice	8.76	0.12
									2" Ice	9.60	0.20
PADX6-59A	B	Paraboloid	From	1.00	0.0000		135.00	6.00	No Ice	28.27	0.19
		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00					1" Ice	29.86	0.49
									2" Ice	31.44	0.79
PADX6-59A	C	Paraboloid	From	1.00	0.0000		135.00	6.00	No Ice	28.27	0.19
		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00					1" Ice	29.86	0.49
									2" Ice	31.44	0.79
PADX8-59A	B	Paraboloid	From	1.00	-18.4000		125.00	8.00	No Ice	50.30	0.29
		w/Radome	Leg	0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.28	0.81
									2" Ice	54.27	1.34
PADX8-59A	B	Paraboloid	From	1.00	-18.4000		100.00	8.00	No Ice	50.30	0.29
		w/Radome	Leg	0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.28	0.81
									2" Ice	54.27	1.34
Proposed											
SCX-W100AB	A	Paraboloid	From	1.00	-20.0000		98.00	3.29	No Ice	8.51	0.04
		w/Shroud (HP)	Leg	0.00					1/2" Ice	8.95	0.09
				0.00					1" Ice	9.38	0.13
									2" Ice	10.26	0.22
SCX-W100AB	A	Paraboloid	From	1.00	-35.5000		91.00	3.29	No Ice	8.51	0.04
		w/Shroud (HP)	Leg	0.00					1/2" Ice	8.95	0.09
				0.00					1" Ice	9.38	0.13
									2" Ice	10.26	0.22

Load Combinations

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	185 - 180	Leg	Max Tension	23	0.51	0.00	0.00
			Max. Compression	35	-7.65	0.08	-0.02
			Max. Mx	22	-0.46	1.91	-0.11
			Max. My	21	-1.27	-0.07	2.04
			Max. Vy	22	1.23	-1.46	-0.11
			Max. Vx	20	1.26	-0.08	-1.38
		Diagonal	Max Tension	22	2.02	0.00	0.00
			Max. Compression	18	-2.06	0.00	0.00
			Max. Mx	33	-0.95	0.40	-0.05
			Max. My	32	-0.26	0.40	-0.05
			Max. Vy	33	0.21	0.40	-0.05
			Max. Vx	32	0.01	0.00	0.00
		Top Girt	Max Tension	3	0.13	0.00	0.00
			Max. Compression	37	-1.18	0.00	0.00
			Max. Mx	26	-1.05	-2.09	0.00
			Max. My	26	-1.06	0.00	0.06
			Max. Vy	26	0.45	0.00	0.00
			Max. Vx	26	0.01	0.00	0.00
T2	180 - 160	Leg	Max Tension	23	10.80	-0.98	-0.20
			Max. Compression	27	-22.57	-0.06	0.03
			Max. Mx	22	2.99	-1.46	-0.11
			Max. My	21	-2.71	-0.06	-1.56
			Max. Vy	19	-1.42	1.07	-0.07
			Max. Vx	19	-1.50	-0.63	0.95
		Diagonal	Max Tension	16	6.96	0.00	0.00
			Max. Compression	18	-7.24	0.00	0.00
			Max. Mx	27	0.87	0.59	-0.07
			Max. My	35	0.73	0.58	-0.07
			Max. Vy	27	0.25	0.59	-0.07
			Max. Vx	35	0.01	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T3	160 - 140	Leg	Max Tension	23	36.97	-0.24	0.05
			Max. Compression	27	-60.72	-0.07	0.04
			Max. Mx	6	31.26	-1.00	0.04
			Max. My	25	-7.92	-0.11	1.11
			Max. Vy	6	-2.70	-0.42	0.30
			Max. Vx	8	2.70	-0.02	0.59
		Diagonal	Max Tension	16	14.23	0.00	0.00
			Max. Compression	16	-14.16	0.00	0.00
			Max. Mx	27	3.91	0.83	0.11
			Max. My	35	-0.82	0.82	-0.11
			Max. Vy	37	0.34	0.83	0.10
			Max. Vx	35	0.02	0.00	0.00
T4	140 - 120	Leg	Max Tension	23	74.90	-1.50	0.23
			Max. Compression	18	-101.97	1.10	0.15
			Max. Mx	22	71.52	-1.64	0.06
			Max. My	20	-12.85	-0.12	-2.43
			Max. Vy	22	0.72	-1.64	0.06
			Max. Vx	20	0.84	-0.12	-2.43
		Diagonal	Max Tension	16	18.70	0.00	0.00
			Max. Compression	16	-18.59	0.00	0.00
			Max. Mx	27	5.53	0.96	0.12
			Max. My	29	-3.78	0.93	0.13
			Max. Vy	37	0.37	0.95	0.12
			Max. Vx	29	-0.02	0.00	0.00
T5	120 - 100	Leg	Max Tension	23	120.80	-0.93	-0.03
			Max. Compression	18	-156.14	-0.46	-0.19
			Max. Mx	35	-54.70	-2.35	-1.20
			Max. My	20	-16.40	-0.56	-4.02
			Max. Vy	18	0.79	1.87	-0.18
			Max. Vx	20	0.88	-0.56	-4.02
		Diagonal	Max Tension	16	21.88	0.00	0.00
			Max. Compression	16	-21.29	0.00	0.00
			Max. Mx	36	3.06	1.18	0.13
			Max. My	28	-4.57	1.05	0.16
			Max. Vy	38	0.42	1.12	-0.14
			Max. Vx	28	-0.02	0.00	0.00
T6	100 - 93.33	Leg	Max Tension	23	147.49	-0.49	-0.03
			Max. Compression	18	-186.87	1.30	-0.12
			Max. Mx	35	-54.23	-2.35	-1.20
			Max. My	20	-17.22	-0.56	-4.02
			Max. Vy	31	-0.48	0.74	0.05
			Max. Vx	20	-0.75	-0.56	-4.02
		Diagonal	Max Tension	17	23.77	0.00	0.00
			Max. Compression	16	-24.06	0.00	0.00
			Max. Mx	26	-0.42	-1.47	0.00
			Max. My	26	-0.20	0.00	0.05
			Max. Vy	26	0.39	0.00	0.00
			Max. Vx	26	-0.01	0.00	0.00
T7	93.33 - 80	Leg	Max Tension	23	145.95	-1.09	-0.08
			Max. Compression	18	-186.49	-5.02	-0.26
			Max. Mx	27	-134.56	-5.46	0.01
			Max. My	20	-18.89	-0.89	-3.26
			Max. Vy	18	1.76	4.79	0.08
			Max. Vx	20	1.05	-0.89	-3.26
		Diagonal	Max Tension	17	30.00	0.22	0.03
			Max. Compression	16	-31.67	0.00	0.00
			Max. Mx	37	4.82	0.43	-0.11
			Max. My	37	-4.89	0.34	-0.11
			Max. Vy	37	0.24	0.43	-0.11
			Max. Vx	35	0.02	0.00	0.00
		Horizontal	Max Tension	18	3.24	0.00	0.00
			Max. Compression	18	-3.24	0.27	-0.01
			Max. Mx	37	-1.14	0.97	-0.03
			Max. My	37	-1.14	0.97	-0.03
			Max. Vy	37	-0.34	0.97	-0.03
			Max. Vx	37	0.01	0.97	-0.03
		Redund Horz 1 Bracing	Max Tension	18	3.24	0.00	0.00
			Max. Compression	18	-3.24	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	26	1.35	-0.18	0.00
			Max. My	26	1.43	0.00	0.01
			Max. Vy	26	-0.10	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	18	2.21	0.00	0.00
			Max. Compression	18	-2.21	0.00	0.00
			Max. Mx	26	1.00	-0.23	0.00
			Max. My	26	0.94	0.00	-0.01
			Max. Vy	26	0.10	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	37	-0.05	0.00	0.00
			Max. Mx	26	-0.05	-0.72	0.00
			Max. Vy	26	-0.21	0.00	0.00
T8	80 - 73.33	Leg	Max Tension	23	198.12	3.30	-0.12
			Max. Compression	18	-247.18	3.15	-0.12
			Max. Mx	27	-163.31	-5.46	0.01
			Max. My	20	-21.67	-0.89	-3.26
			Max. Vy	18	-1.34	3.15	-0.12
			Max. Vx	20	-0.48	-0.89	-3.26
		Diagonal	Max Tension	16	26.33	0.00	0.00
			Max. Compression	17	-25.69	0.00	0.00
			Max. Mx	26	1.06	-1.65	0.00
			Max. My	26	1.19	0.00	-0.05
			Max. Vy	26	0.41	0.00	0.00
			Max. Vx	26	-0.01	0.00	0.00
T9	73.33 - 60	Leg	Max Tension	23	196.72	-2.61	-0.02
			Max. Compression	18	-247.28	-6.17	-0.13
			Max. Mx	18	-247.28	-6.17	-0.13
			Max. My	20	-23.06	-1.22	-5.38
			Max. Vy	18	1.79	4.34	0.21
			Max. Vx	20	1.39	-1.22	-5.38
		Diagonal	Max Tension	17	32.23	0.00	0.00
			Max. Compression	16	-33.24	0.00	0.00
			Max. Mx	37	6.40	0.45	-0.12
			Max. My	37	-2.65	0.31	-0.12
			Max. Vy	37	0.26	0.45	-0.12
			Max. Vx	35	0.02	0.00	0.00
		Horizontal	Max Tension	18	4.29	0.00	0.00
			Max. Compression	18	-4.29	0.29	-0.01
			Max. Mx	37	-0.01	1.08	-0.03
			Max. My	37	-0.01	1.08	-0.03
			Max. Vy	37	-0.36	1.08	-0.03
			Max. Vx	37	0.01	1.08	-0.03
		Redund Horz 1 Bracing	Max Tension	18	4.29	0.00	0.00
			Max. Compression	18	-4.29	0.00	0.00
			Max. Mx	26	1.56	-0.20	0.00
			Max. My	26	1.66	0.00	0.01
			Max. Vy	26	-0.11	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	18	2.82	0.00	0.00
			Max. Compression	18	-2.82	0.00	0.00
			Max. Mx	26	1.24	-0.26	0.00
			Max. My	26	1.17	0.00	-0.01
			Max. Vy	26	0.10	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	33	-0.06	0.00	0.00
			Max. Mx	26	-0.06	-0.82	0.00
			Max. Vy	26	0.22	0.00	0.00
T10	60 - 53.33	Leg	Max Tension	23	248.07	3.82	0.04
			Max. Compression	18	-306.60	4.73	-0.22
			Max. Mx	18	-306.15	-6.17	-0.13
			Max. My	20	-25.27	-1.22	-5.38
			Max. Vy	18	-1.77	4.73	-0.22
			Max. Vx	24	0.64	-1.26	5.23

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Diagonal	Max Tension	16	28.16	0.00	0.00
			Max. Compression	17	-27.96	0.00	0.00
			Max. Mx	26	0.46	-1.82	0.00
			Max. My	26	0.60	0.00	-0.06
			Max. Vy	26	0.43	0.00	0.00
			Max. Vx	26	0.01	0.00	0.00
T11	53.33 - 40	Leg	Max Tension	23	246.16	-3.96	-0.05
			Max. Compression	18	-306.05	-9.55	-0.23
			Max. Mx	27	-197.36	-11.63	0.02
			Max. My	20	-26.61	-1.51	-5.05
			Max. Vy	27	2.87	-11.63	0.02
			Max. Vx	20	1.48	-1.51	-5.05
		Diagonal	Max Tension	17	34.45	0.00	0.00
			Max. Compression	16	-36.27	0.00	0.00
			Max. Mx	37	5.48	0.51	-0.13
			Max. My	27	-1.91	0.47	0.13
			Max. Vy	37	-0.28	0.51	-0.13
			Max. Vx	29	0.02	0.00	0.00
		Horizontal	Max Tension	18	5.32	0.00	0.00
			Max. Compression	18	-5.32	0.44	-0.01
			Max. Mx	37	0.18	1.43	-0.04
			Max. My	37	0.18	1.43	-0.04
			Max. Vy	37	-0.44	1.43	-0.04
			Max. Vx	37	-0.01	1.43	-0.04
		Redund Horz 1 Bracing	Max Tension	18	5.31	0.00	0.00
			Max. Compression	18	-5.31	0.00	0.00
			Max. Mx	26	2.13	-0.24	0.00
			Max. My	26	2.26	0.00	0.01
			Max. Vy	26	0.12	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	18	3.40	0.00	0.00
			Max. Compression	18	-3.40	0.00	0.00
			Max. Mx	26	1.27	-0.29	0.00
			Max. My	26	1.21	0.00	-0.01
			Max. Vy	26	0.11	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	33	-0.06	0.00	0.00
			Max. Mx	26	-0.06	-1.01	0.00
			Max. Vy	26	0.25	0.00	0.00
T12	40 - 33.33	Leg	Max Tension	23	299.81	6.56	0.03
			Max. Compression	18	-368.90	7.30	-0.35
			Max. Mx	27	-226.59	-11.63	0.02
			Max. My	20	-29.37	-1.51	-5.05
			Max. Vy	18	-2.65	7.30	-0.35
			Max. Vx	24	0.42	-1.57	4.94
		Diagonal	Max Tension	16	29.84	0.00	0.00
			Max. Compression	17	-29.31	0.00	0.00
			Max. Mx	26	0.36	-1.99	0.00
			Max. My	26	0.39	0.00	-0.06
			Max. Vy	26	0.45	0.00	0.00
			Max. Vx	26	0.01	0.00	0.00
T13	33.33 - 20	Leg	Max Tension	23	297.71	-6.16	-0.06
			Max. Compression	18	-368.57	-13.06	-0.17
			Max. Mx	18	-368.57	-13.06	-0.17
			Max. My	20	-31.13	-2.36	-9.07
			Max. Vy	18	3.41	8.88	0.41
			Max. Vx	20	2.04	-2.36	-9.07
		Diagonal	Max Tension	17	36.41	0.00	0.00
			Max. Compression	16	-38.15	0.00	0.00
			Max. Mx	37	6.18	0.61	-0.15
			Max. My	37	-3.71	0.43	-0.15
			Max. Vy	37	0.31	0.61	-0.15
			Max. Vx	35	0.02	0.00	0.00
		Horizontal	Max Tension	18	6.40	0.00	0.00
			Max. Compression	18	-6.40	0.48	-0.01
			Max. Mx	37	0.36	1.60	-0.05

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	37	0.36	1.60	-0.05
			Max. Vy	37	-0.46	1.60	-0.05
			Max. Vx	37	0.01	1.60	-0.05
		Redund Horz 1 Bracing	Max Tension	18	6.39	0.00	0.00
			Max. Compression	18	-6.39	0.00	0.00
			Max. Mx	26	2.01	-0.25	0.00
			Max. My	26	2.17	0.00	0.01
			Max. Vy	26	0.12	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	18	4.00	0.00	0.00
			Max. Compression	18	-4.00	0.00	0.00
			Max. Mx	26	2.03	-0.30	0.00
			Max. My	26	1.97	0.00	-0.01
			Max. Vy	26	0.12	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	33	-0.07	0.00	0.00
			Max. Mx	26	-0.07	-1.08	0.00
			Max. Vy	26	-0.26	0.00	0.00
T14	20 - 13.33	Leg	Max Tension	23	350.59	8.44	0.08
			Max. Compression	18	-431.48	9.15	-0.33
			Max. Mx	18	-430.82	-13.06	-0.17
			Max. My	20	-34.11	-2.36	-9.07
			Max. Vy	18	-3.46	9.15	-0.33
			Max. Vx	24	0.87	-2.45	8.93
		Diagonal	Max Tension	16	31.44	0.00	0.00
			Max. Compression	17	-31.09	0.00	0.00
			Max. Mx	26	1.70	-2.34	0.00
			Max. My	26	2.22	0.00	0.07
			Max. Vy	26	0.50	0.00	0.00
			Max. Vx	26	0.02	0.00	0.00
T15	13.33 - 0	Leg	Max Tension	23	348.91	-7.50	-0.05
			Max. Compression	18	-432.33	0.00	-0.00
			Max. Mx	18	-431.74	9.88	0.62
			Max. My	25	-29.93	1.10	-4.99
			Max. Vy	18	1.62	9.88	0.62
			Max. Vx	25	1.59	0.55	4.45
		Diagonal	Max Tension	17	37.92	0.00	0.00
			Max. Compression	16	-39.70	0.00	0.00
			Max. Mx	37	7.72	0.61	-0.15
			Max. My	31	-2.19	0.57	0.15
			Max. Vy	37	0.30	0.61	-0.15
			Max. Vx	33	-0.02	0.00	0.00
		Horizontal	Max Tension	18	7.48	0.00	0.00
			Max. Compression	18	-7.48	0.55	-0.01
			Max. Mx	37	-0.62	1.47	-0.04
			Max. My	37	-0.62	1.47	-0.04
			Max. Vy	37	-0.42	1.47	-0.04
			Max. Vx	37	0.01	1.47	-0.04
		Redund Horz 1 Bracing	Max Tension	18	7.50	0.00	0.00
			Max. Compression	18	-7.50	0.00	0.00
			Max. Mx	26	2.37	-0.30	0.00
			Max. My	26	2.56	0.00	0.01
			Max. Vy	26	-0.13	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	18	4.58	0.00	0.00
			Max. Compression	18	-4.58	0.00	0.00
			Max. Mx	26	1.56	-0.35	0.00
			Max. My	26	1.38	0.00	0.01
			Max. Vy	26	-0.13	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Inner Bracing	Max Tension	1	0.00	0.00	0.00
			Max. Compression	33	-0.07	0.00	0.00
			Max. Mx	26	-0.07	-1.07	0.00
			Max. Vy	26	0.24	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	474.47	65.35	-39.84
	Max. H_x	18	474.47	65.35	-39.84
	Max. H_z	5	-325.35	-44.34	35.98
	Min. Vert	7	-370.31	-54.00	33.45
	Min. H_x	7	-370.31	-54.00	33.45
	Min. H_z	18	474.47	65.35	-39.84
Leg B	Max. Vert	10	465.88	-65.98	-38.22
	Max. H_x	23	-384.40	56.80	33.00
	Max. H_z	25	-334.53	47.57	33.73
	Min. Vert	23	-384.40	56.80	33.00
	Min. H_x	10	465.88	-65.98	-38.22
	Min. H_z	10	465.88	-65.98	-38.22
Leg A	Max. Vert	2	465.16	-1.55	75.80
	Max. H_x	21	29.02	16.47	2.84
	Max. H_z	2	465.16	-1.55	75.80
	Min. Vert	15	-362.25	1.74	-62.89
	Min. H_x	8	37.95	-16.24	3.62
	Min. H_z	15	-362.25	1.74	-62.89

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	93.18	0.00	0.00	-1.80	28.48	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	111.82	-0.82	-131.15	-13710.65	133.17	-103.46
0.9 Dead+1.0 Wind 0 deg - No Ice	83.86	-0.82	-131.15	-13710.11	124.63	-103.46
1.2 Dead+1.0 Wind 30 deg - No Ice	111.82	61.71	-107.47	-11390.19	-6487.90	-117.41
0.9 Dead+1.0 Wind 30 deg - No Ice	83.86	61.71	-107.47	-11389.65	-6496.45	-117.41
1.2 Dead+1.0 Wind 60 deg - No Ice	111.82	104.01	-59.76	-6386.31	-11040.50	-129.18
0.9 Dead+1.0 Wind 60 deg - No Ice	83.86	104.01	-59.76	-6385.77	-11049.04	-129.18
1.2 Dead+1.0 Wind 90 deg - No Ice	111.82	124.50	-0.02	-21.62	-13169.59	-120.77
0.9 Dead+1.0 Wind 90 deg - No Ice	83.86	124.50	-0.02	-21.08	-13178.13	-120.77
1.2 Dead+1.0 Wind 120 deg - No Ice	111.82	114.72	65.36	6781.26	-11943.46	-11.82
0.9 Dead+1.0 Wind 120 deg - No Ice	83.86	114.72	65.36	6781.80	-11952.01	-11.82
1.2 Dead+1.0 Wind 150 deg - No Ice	111.82	62.91	106.96	11129.94	-6542.38	127.33
0.9 Dead+1.0 Wind 150 deg - No Ice	83.86	62.91	106.96	11130.48	-6550.92	127.33
1.2 Dead+1.0 Wind 180 deg - No Ice	111.82	-0.76	119.04	12502.60	158.56	108.60
0.9 Dead+1.0 Wind 180 deg - No Ice	83.86	-0.76	119.04	12503.14	150.01	108.60
1.2 Dead+1.0 Wind 210 deg - No Ice	111.82	-63.55	106.59	11234.62	6817.60	118.96

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
0.9 Dead+1.0 Wind 210 deg - No Ice	83.86	-63.55	106.59	11235.16	6809.06	118.96
1.2 Dead+1.0 Wind 240 deg - No Ice	111.82	-115.28	64.87	6810.62	12244.17	125.32
0.9 Dead+1.0 Wind 240 deg - No Ice	83.86	-115.28	64.87	6811.16	12235.62	125.32
1.2 Dead+1.0 Wind 270 deg - No Ice	111.82	-126.50	-0.25	-34.56	13549.84	126.87
0.9 Dead+1.0 Wind 270 deg - No Ice	83.86	-126.50	-0.25	-34.02	13541.30	126.87
1.2 Dead+1.0 Wind 300 deg - No Ice	111.82	-107.68	-61.31	-6498.83	11513.82	15.61
0.9 Dead+1.0 Wind 300 deg - No Ice	83.86	-107.68	-61.31	-6498.29	11505.28	15.61
1.2 Dead+1.0 Wind 330 deg - No Ice	111.82	-64.14	-109.37	-11484.02	6790.42	-117.97
0.9 Dead+1.0 Wind 330 deg - No Ice	83.86	-64.14	-109.37	-11483.48	6781.88	-117.97
1.2 Dead+1.0 Ice+1.0 Temp	434.42	-0.00	-0.00	-233.13	194.36	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	434.42	-0.09	-39.15	-4376.18	206.01	-28.35
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	434.42	19.26	-32.95	-3747.90	-1859.06	-47.67
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	434.42	33.10	-18.82	-2248.49	-3347.21	-68.24
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	434.42	38.75	-0.07	-245.42	-3943.53	-64.60
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	434.42	34.43	19.44	1815.82	-3449.65	-30.57
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	434.42	19.42	32.79	3229.81	-1866.37	7.50
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	434.42	-0.11	37.52	3743.00	210.58	29.21
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	434.42	-19.54	32.77	3251.89	2287.48	47.68
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	434.42	-34.62	19.41	1824.78	3891.46	66.97
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	434.42	-39.05	-0.05	-241.72	4378.69	64.90
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	434.42	-33.60	-18.96	-2252.75	3786.51	31.15
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	434.42	-19.56	-33.24	-3763.45	2275.11	-6.31
Dead+Wind 0 deg - Service	93.18	-0.17	-27.94	-2921.95	49.57	-22.04
Dead+Wind 30 deg - Service	93.18	13.15	-22.89	-2427.65	-1360.84	-25.01
Dead+Wind 60 deg - Service	93.18	22.16	-12.73	-1361.74	-2330.62	-27.52
Dead+Wind 90 deg - Service	93.18	26.52	-0.00	-5.94	-2784.15	-25.73
Dead+Wind 120 deg - Service	93.18	24.44	13.92	1443.19	-2522.97	-2.52
Dead+Wind 150 deg - Service	93.18	13.40	22.79	2369.54	-1372.44	27.12
Dead+Wind 180 deg - Service	93.18	-0.16	25.36	2661.94	54.98	23.13
Dead+Wind 210 deg - Service	93.18	-13.54	22.71	2391.84	1473.47	25.34
Dead+Wind 240 deg - Service	93.18	-24.56	13.82	1449.44	2629.43	26.70
Dead+Wind 270 deg - Service	93.18	-26.95	-0.05	-8.70	2907.56	27.03
Dead+Wind 300 deg - Service	93.18	-22.94	-13.06	-1385.70	2473.85	3.33
Dead+Wind 330 deg - Service	93.18	-13.66	-23.30	-2447.64	1467.68	-25.13

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-93.18	0.00	0.00	93.18	0.00	0.000%
2	-0.82	-111.82	-131.15	0.82	111.82	131.15	0.000%
3	-0.82	-83.86	-131.15	0.82	83.86	131.15	0.000%
4	61.71	-111.82	-107.47	-61.71	111.82	107.47	0.000%
5	61.71	-83.86	-107.47	-61.71	83.86	107.47	0.000%
6	104.01	-111.82	-59.76	-104.01	111.82	59.76	0.000%
7	104.01	-83.86	-59.76	-104.01	83.86	59.76	0.000%
8	124.50	-111.82	-0.02	-124.50	111.82	0.02	0.000%
9	124.50	-83.86	-0.02	-124.50	83.86	0.02	0.000%
10	114.72	-111.82	65.36	-114.72	111.82	-65.36	0.000%
11	114.72	-83.86	65.36	-114.72	83.86	-65.36	0.000%
12	62.91	-111.82	106.96	-62.91	111.82	-106.96	0.000%
13	62.91	-83.86	106.96	-62.91	83.86	-106.96	0.000%
14	-0.76	-111.82	119.04	0.76	111.82	-119.04	0.000%
15	-0.76	-83.86	119.04	0.76	83.86	-119.04	0.000%
16	-63.55	-111.82	106.59	63.55	111.82	-106.59	0.000%
17	-63.55	-83.86	106.59	63.55	83.86	-106.59	0.000%
18	-115.28	-111.82	64.87	115.28	111.82	-64.87	0.000%
19	-115.28	-83.86	64.87	115.28	83.86	-64.87	0.000%
20	-126.50	-111.82	-0.25	126.50	111.82	0.25	0.000%
21	-126.50	-83.86	-0.25	126.50	83.86	0.25	0.000%
22	-107.68	-111.82	-61.31	107.68	111.82	61.31	0.000%
23	-107.68	-83.86	-61.31	107.68	83.86	61.31	0.000%
24	-64.14	-111.82	-109.37	64.14	111.82	109.37	0.000%
25	-64.14	-83.86	-109.37	64.14	83.86	109.37	0.000%
26	0.00	-434.42	0.00	0.00	434.42	0.00	0.000%
27	-0.09	-434.42	-39.15	0.09	434.42	39.15	0.000%
28	19.26	-434.42	-32.95	-19.26	434.42	32.95	0.000%
29	33.10	-434.42	-18.82	-33.10	434.42	18.82	0.000%
30	38.75	-434.42	-0.07	-38.75	434.42	0.07	0.000%
31	34.43	-434.42	19.44	-34.43	434.42	-19.44	0.000%
32	19.42	-434.42	32.79	-19.42	434.42	-32.79	0.000%
33	-0.11	-434.42	37.52	0.11	434.42	-37.52	0.000%
34	-19.54	-434.42	32.77	19.54	434.42	-32.77	0.000%
35	-34.62	-434.42	19.41	34.62	434.42	-19.41	0.000%
36	-39.05	-434.42	-0.05	39.05	434.42	0.05	0.000%
37	-33.60	-434.42	-18.96	33.60	434.42	18.96	0.000%
38	-19.56	-434.42	-33.24	19.56	434.42	33.24	0.000%
39	-0.17	-93.18	-27.94	0.17	93.18	27.94	0.000%
40	13.15	-93.18	-22.89	-13.15	93.18	22.89	0.000%
41	22.16	-93.18	-12.73	-22.16	93.18	12.73	0.000%
42	26.52	-93.18	-0.00	-26.52	93.18	0.00	0.000%
43	24.44	-93.18	13.92	-24.44	93.18	-13.92	0.000%
44	13.40	-93.18	22.79	-13.40	93.18	-22.79	0.000%
45	-0.16	-93.18	25.36	0.16	93.18	-25.36	0.000%
46	-13.54	-93.18	22.71	13.54	93.18	-22.71	0.000%
47	-24.56	-93.18	13.82	24.56	93.18	-13.82	0.000%
48	-26.95	-93.18	-0.05	26.95	93.18	0.05	0.000%
49	-22.94	-93.18	-13.06	22.94	93.18	13.06	0.000%
50	-13.66	-93.18	-23.30	13.66	93.18	23.30	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	185 - 180	1.730	47	0.0666	0.0087
T2	180 - 160	1.659	47	0.0666	0.0085
T3	160 - 140	1.368	47	0.0657	0.0074
T4	140 - 120	1.080	47	0.0619	0.0062
T5	120 - 100	0.807	47	0.0540	0.0053
T6	100 - 93.33	0.566	47	0.0460	0.0043
T7	93.33 - 80	0.496	47	0.0426	0.0042
T8	80 - 73.33	0.379	47	0.0357	0.0036
T9	73.33 - 60	0.322	47	0.0330	0.0033

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T10	60 - 53.33	0.224	47	0.0274	0.0026
T11	53.33 - 40	0.178	47	0.0240	0.0023
T12	40 - 33.33	0.109	47	0.0170	0.0016
T13	33.33 - 20	0.076	47	0.0141	0.0013
T14	20 - 13.33	0.034	47	0.0081	0.0008
T15	13.33 - 0	0.017	43	0.0054	0.0005

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	6'x4" Mount Pipe	47	1.730	0.0666	0.0087	353497
183.00	PADX8-59A	47	1.701	0.0666	0.0086	353497
182.00	20' Horiz. 4"X4"x1/4"	47	1.687	0.0666	0.0085	353497
181.00	DB411-B	47	1.673	0.0666	0.0085	353497
177.00	PA4-57A	47	1.616	0.0666	0.0083	348524
172.00	PADX8-59A	47	1.543	0.0665	0.0081	576187
171.00	PADX8-59A	47	1.529	0.0664	0.0080	667320
168.00	PR-900	47	1.485	0.0663	0.0078	Inf
165.00	8' x 3" Mount Pipe	47	1.441	0.0661	0.0077	Inf
160.00	Sector Mount [SM 502-3]	47	1.368	0.0657	0.0074	891788
150.00	Sector Mount [SM 502-3]	47	1.223	0.0644	0.0068	503417
140.50	Sector Mount [SM 502-3]	47	1.087	0.0621	0.0063	364331
135.00	PADX6-59A	47	1.010	0.0602	0.0060	274592
125.00	PADX8-59A	47	0.873	0.0561	0.0055	178341
109.00	6' x 3" Mount Pipe	47	0.669	0.0498	0.0047	115403
108.00	6' x 3" Mount Pipe	47	0.657	0.0494	0.0046	112944
103.00	Beacon side markers	47	0.599	0.0473	0.0044	101341
100.00	PADX8-59A	47	0.566	0.0460	0.0043	87232
99.00	Pipe Mount [PM 601-1]	47	0.555	0.0455	0.0043	80412
98.00	SCX-W100AB	47	0.544	0.0450	0.0043	73429
91.00	SCX-W100AB	47	0.474	0.0413	0.0041	64902
87.00	6'x3" Mount Pipe	47	0.438	0.0392	0.0040	125246
85.50	Pipe Mount [PM 601-1]	47	0.425	0.0384	0.0039	198607
85.00	6' x 3" Mount Pipe	47	0.421	0.0381	0.0039	246791
80.00	Pipe Mount [PM 601-1]	47	0.379	0.0357	0.0036	723331
66.00	6'x3" Mount Pipe	47	0.266	0.0301	0.0029	170285

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	185 - 180	8.083	18	0.3111	0.0407
T2	180 - 160	7.751	18	0.3112	0.0397
T3	160 - 140	6.394	18	0.3070	0.0347
T4	140 - 120	5.050	18	0.2889	0.0292
T5	120 - 100	3.775	18	0.2520	0.0248
T6	100 - 93.33	2.645	18	0.2147	0.0204
T7	93.33 - 80	2.320	18	0.1989	0.0198
T8	80 - 73.33	1.770	18	0.1668	0.0169
T9	73.33 - 60	1.505	18	0.1540	0.0154
T10	60 - 53.33	1.047	18	0.1280	0.0123
T11	53.33 - 40	0.835	18	0.1118	0.0108
T12	40 - 33.33	0.511	18	0.0791	0.0077
T13	33.33 - 20	0.359	18	0.0655	0.0062
T14	20 - 13.33	0.162	19	0.0379	0.0037
T15	13.33 - 0	0.082	10	0.0253	0.0025

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	6'x4" Mount Pipe	18	8.083	0.3111	0.0407	75980
183.00	PADX8-59A	18	7.951	0.3112	0.0403	75980
182.00	20' Horiz. 4"X4"x1/4"	18	7.884	0.3112	0.0401	75980
181.00	DB411-B	18	7.818	0.3112	0.0399	75980
177.00	PA4-57A	18	7.550	0.3111	0.0390	75081
172.00	PADX8-59A	18	7.212	0.3106	0.0378	125435
171.00	PADX8-59A	18	7.144	0.3104	0.0376	145881
168.00	PR-900	18	6.940	0.3098	0.0368	285477
165.00	8' x 3" Mount Pipe	18	6.735	0.3090	0.0360	Inf
160.00	Sector Mount [SM 502-3]	18	6.394	0.3070	0.0347	186132
150.00	Sector Mount [SM 502-3]	18	5.717	0.3005	0.0319	108310
140.50	Sector Mount [SM 502-3]	18	5.083	0.2897	0.0294	79365
135.00	PADX6-59A	18	4.722	0.2808	0.0281	59334
125.00	PADX8-59A	18	4.083	0.2616	0.0260	38548
109.00	6' x 3" Mount Pipe	18	3.130	0.2324	0.0219	24747
108.00	6' x 3" Mount Pipe	18	3.074	0.2306	0.0217	24207
103.00	Beacon side markers	18	2.802	0.2210	0.0208	21669
100.00	PADX8-59A	18	2.645	0.2147	0.0204	18639
99.00	Pipe Mount [PM 601-1]	18	2.594	0.2124	0.0203	17182
98.00	SCX-W100AB	18	2.544	0.2101	0.0202	15691
91.00	SCX-W100AB	18	2.217	0.1930	0.0195	13876
87.00	6'x3" Mount Pipe	18	2.050	0.1830	0.0186	26777
85.50	Pipe Mount [PM 601-1]	18	1.989	0.1794	0.0183	42458
85.00	6' x 3" Mount Pipe	18	1.969	0.1782	0.0181	52757
80.00	Pipe Mount [PM 601-1]	18	1.770	0.1668	0.0169	154339
66.00	6'x3" Mount Pipe	18	1.245	0.1404	0.0137	36442

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	185	Leg	A325N	1.2500	6	0.43	87.22	0.005	1.05	Bolt Tension
		Diagonal	A325X	0.7500	1	2.02	12.62	0.160	1.05	Member Bearing
		Top Girt	A325X	0.7500	1	1.18	24.85	0.047	1.05	Bolt Shear
T2	180	Leg	A325N	1.2500	6	1.80	87.22	0.021	1.05	Bolt Tension
		Diagonal	A325X	0.7500	1	6.96	12.62	0.551	1.05	Member Bearing
T3	160	Leg	A325N	1.2500	6	6.04	87.22	0.069	1.05	Bolt Tension
		Diagonal	A325X	0.7500	1	14.23	15.77	0.902	1.05	Member Bearing
T4	140	Leg	A325N	1.2500	8	9.36	87.22	0.107	1.05	Bolt Tension
		Diagonal	A325X	0.6250	2	9.35	17.26	0.542	1.05	Bolt Shear
T5	120	Leg	A325N	1.5000	8	15.10	126.47	0.119	1.05	Bolt Tension
		Diagonal	A325X	0.7500	2	10.94	22.84	0.479	1.05	Member Block Shear
T6	100	Diagonal	A325X	1.0000	2	11.89	29.47	0.403	1.05	Member Block Shear
T7	93.33	Leg	A325N	1.5000	8	18.19	126.47	0.144	1.05	Bolt Tension
		Diagonal	A325X	1.0000	2	15.00	28.42	0.528	1.05	Member Block Shear
		Horizontal	A325N	1.0000	2	1.62	17.76	0.091	1.05	Member Block Shear
T8	80	Diagonal	A325X	0.8750	2	13.16	28.24	0.466	1.05	Member Block Shear
T9	73.33	Leg	A325N	1.5000	8	24.55	126.47	0.194	1.05	Bolt Tension
		Diagonal	A325X	0.8750	2	16.11	28.24	0.571	1.05	Member Block

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
										Shear
		Horizontal	A325N	0.8750	2	2.14	16.74	0.128	1.05	Member Block Shear
T10	60	Diagonal	A325X	0.8750	2	14.08	28.24	0.498	1.05	Member Block Shear
T11	53.33	Leg	A325N	1.5000	8	30.72	126.47	0.243	1.05	Bolt Tension
		Diagonal	A325X	0.8750	2	17.22	28.24	0.610	1.05	Member Block Shear
		Horizontal	A325N	0.8750	2	2.66	20.14	0.132	1.05	Member Block Shear
T12	40	Diagonal	A325X	1.0000	2	14.92	29.47	0.506	1.05	Member Block Shear
T13	33.33	Leg	A325N	1.5000	8	37.16	126.47	0.294	1.05	Bolt Tension
		Diagonal	A325X	1.0000	2	18.20	39.30	0.463	1.05	Member Block Shear
		Horizontal	A325N	1.0000	2	3.20	21.16	0.151	1.05	Member Block Shear
T14	20	Diagonal	A325X	1.0000	2	15.72	39.30	0.400	1.05	Member Block Shear
T15	13.33	Diagonal	A325X	1.0000	2	18.96	39.30	0.483	1.05	Member Block Shear
		Horizontal	A325N	1.0000	2	3.74	21.16	0.177	1.05	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 K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	185 - 180	P6x.28	5.01	5.01	26.8 K=1.00	5.5813	-7.65	238.34	0.032 [1]
T2	180 - 160	P6x.28	20.03	10.02	53.5 K=1.00	5.5813	-22.57	203.69	0.111 [1]
T3	160 - 140	P6x.28	20.03	10.02	53.5 K=1.00	5.5813	-60.72	203.69	0.298 [1]
T4	140 - 120	P6x.28	20.03	10.02	53.5 K=1.00	5.5813	-101.97	203.69	0.501 [1]
T5	120 - 100	P8x0.322	20.03	10.02	40.9 K=1.00	8.3993	-156.14	334.42	0.467 [1]
T6	100 - 93.33	P8x0.322	6.68	6.68	27.3 K=1.00	8.3993	-186.87	357.93	0.522 [1]
T7	93.33 - 80	P8x0.322	13.35	6.68	27.3 K=1.00	8.3993	-186.49	357.96	0.521 [1]
T8	80 - 73.33	P8x.5	6.68	6.68	27.9 K=1.00	12.7627	-247.19	542.64	0.456 [1]
T9	73.33 - 60	P8x.5	13.35	6.68	27.8 K=1.00	12.7627	-247.28	542.69	0.456 [1]
T10	60 - 53.33	P10x.365	6.68	6.68	21.8 K=1.00	11.9083	-306.60	517.53	0.592 [1]
T11	53.33 - 40	P10x.365	13.35	6.68	21.8 K=1.00	11.9083	-306.05	517.56	0.591 [1]
T12	40 - 33.33	P10x.5	6.68	6.68	22.1 K=1.00	16.1007	-368.90	699.12	0.528 [1]
T13	33.33 - 20	P10x.5	13.35	6.68	22.1 K=1.00	16.1007	-368.57	699.16	0.527 [1]
T14	20 - 13.33	P12x.5	6.68	6.68	18.5 K=1.00	19.2423	-431.48	844.51	0.511 [1]
T15	13.33 - 0	P12x.5	13.35	6.68	18.5	19.242	-432.33	844.54	0.512 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
					K=1.00	3			

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	185 - 180	L3 1/2x3 1/2x1/4	19.41	9.41	162.7 K=1.00	1.6900	-2.06	18.27	0.113 [1]
T2	180 - 160	L4x4x1/4	22.81	11.24	169.7 K=1.00	1.9400	-7.24	19.29	0.375 [1]
T3	160 - 140	L5x5x5/16	24.62	12.15	146.7 K=1.00	3.0300	-14.16	40.32	0.351 [1]
T4	140 - 120	L5x5x5/16	26.46	13.01	148.2 K=0.94	3.0300	-18.59	39.46	0.471 [1]
T5	120 - 100	L5x5x3/8	28.33	13.82	156.2 K=0.93	3.6100	-21.29	42.34	0.503 [1]
T6	100 - 93.33	L6x6x3/8	15.06	14.07	133.5 K=0.94	4.3600	-24.06	70.03	0.344 [1]
T7	93.33 - 80	L4x6x1/2	19.70	9.56	129.1 K=0.98	4.7500	-31.67	81.62	0.388 [1]
T8	80 - 73.33	L6x6x3/8	15.96	15.05	139.5 K=0.92	4.3600	-25.69	64.12	0.401 [1]
T9	73.33 - 60	L6x6x3/8	20.45	19.45	122.6 K=0.99	4.3600	-33.24	82.44	0.403 [1]
T10	60 - 53.33	L6x6x3/8	16.88	15.96	145.2 K=0.90	4.3600	-27.96	59.19	0.472 [1]
T11	53.33 - 40	L6x6x3/8	21.22	20.12	125.2 K=0.97	4.3600	-36.27	79.46	0.456 [1]
T12	40 - 33.33	L6x6x3/8	17.80	16.73	150.0 K=0.89	4.3600	-29.31	55.49	0.528 [1]
T13	33.33 - 20	L6x6x1/2	22.00	20.86	128.9 K=0.96	5.7500	-38.15	98.97	0.385 [1]
T14	20 - 13.33	L6x6x1/2	18.73	17.67	156.7 K=0.87	5.7500	-31.09	67.03	0.464 [1]
T15	13.33 - 0	L6x6x1/2	22.81	21.57	131.8 K=0.95	5.7500	-39.70	94.78	0.419 [1]

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L4x4x5/16	27.67	13.18	181.0 K=0.90	2.4000	-3.24	20.97	0.155 [1]
T9	73.33 - 60	L4x4x5/16	29.67	14.22	192.9 K=0.89	2.4000	-4.29	18.46	0.232 [1]
T11	53.33 - 40	L5x5x5/16	31.67	15.13	167.8 K=0.92	3.0300	-5.32	30.82	0.173 [1]
T13	33.33 - 20	L5x5x5/16	33.67	16.10	176.7 K=0.91	3.0300	-6.40	27.79	0.230 [1]
T15	13.33 - 0	L5x5x5/16	35.67	17.01	185.1 K=0.90	3.0300	-7.48	25.31	0.296 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	185 - 180	L5x5x5/16	18.50	17.68	213.4 K=1.00	3.0300	-1.18	19.04	0.062 [1]
		KL/R > 200 (C) - 6							

[1] P_u / ϕP_n controls

Redundant Horizontal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L3x3x1/4	6.92	6.56	132.9 K=1.00	1.4400	-3.24	23.32	0.139 [1]
T9	73.33 - 60	L3x3x1/4	7.42	7.06	143.1 K=1.00	1.4400	-4.29	20.14	0.213 [1]
T11	53.33 - 40	L3x3x5/16	7.92	7.47	152.2 K=1.00	1.7800	-5.31	22.00	0.241 [1]
T13	33.33 - 20	L3x3x5/16	8.42	7.97	162.4 K=1.00	1.7800	-6.39	19.32	0.331 [1]
T15	13.33 - 0	L3 1/2x4x5/16	8.92	8.39	137.9 K=1.00	2.2500	-7.50	33.89	0.221 [1]

[1] P_u / ϕP_n controls

Redundant Diagonal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L3x3x1/4	9.37	8.86	179.6 K=1.00	1.4400	-2.21	12.78	0.173 [1]
T9	73.33 - 60	L3x3x1/4	9.73	9.24	187.2 K=1.00	1.4400	-2.82	11.76	0.240 [1]
T11	53.33 - 40	L3x3x5/16	10.10	9.50	193.6 K=1.00	1.7800	-3.40	13.59	0.250 [1]
T13	33.33 - 20	L3x3x5/16	10.48	9.90	201.7 K=1.00	1.7800	-4.00	12.52	0.319 [1]
T15	13.33 - 0	L3 1/2x4x5/16	10.87	10.20	167.6 K=1.00	2.2500	-4.58	22.92	0.200 [1]

[1] P_u / ϕP_n controls

Inner Bracing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L3x3x1/4	13.84	13.84	280.4	1.4400	-0.05	5.24	0.010 [*1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
					K=1.00				
		KL/R > 250 (C) - 107							
T9	73.33 - 60	L3x3x1/4	14.84	14.84	300.7 K=1.00	1.4400	-0.06	4.56	0.013 [*1]
		KL/R > 250 (C) - 143							
T11	53.33 - 40	L3 1/2x3 1/2x1/4	15.84	15.84	273.8 K=1.00	1.6900	-0.06	6.45	0.010 [*1]
		KL/R > 250 (C) - 179							
T13	33.33 - 20	L3 1/2x3 1/2x1/4	16.84	16.84	291.1 K=1.00	1.6900	-0.07	5.71	0.012 [*1]
		KL/R > 250 (C) - 215							
T15	13.33 - 0	L3 1/2x3 1/2x1/4	17.84	17.84	308.4 K=1.00	1.6900	-0.07	5.09	0.013 [*1]
		KL/R > 250 (C) - 251							

[*] DL controls
[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	185 - 180	P6x.28	5.01	5.01	26.8	5.5813	0.51	251.16	0.002 [1]
T2	180 - 160	P6x.28	20.03	10.02	53.5	5.5813	10.80	251.16	0.043 [1]
T3	160 - 140	P6x.28	20.03	10.02	53.5	5.5813	36.26	251.16	0.144 [1]
T4	140 - 120	P6x.28	20.03	10.02	53.5	5.5813	74.90	251.16	0.298 [1]
T5	120 - 100	P8x0.322	20.03	10.02	40.9	8.3993	120.80	377.97	0.320 [1]
T6	100 - 93.33	P8x0.322	6.68	6.68	27.3	8.3993	147.49	377.97	0.390 [1]
T7	93.33 - 80	P8x0.322	13.35	6.68	27.3	8.3993	145.95	377.97	0.386 [1]
T8	80 - 73.33	P8x.5	6.68	6.68	27.9	12.7627	198.12	574.32	0.345 [1]
T9	73.33 - 60	P8x.5	13.35	6.68	27.8	12.7627	196.72	574.32	0.343 [1]
T10	60 - 53.33	P10x.365	6.68	6.68	21.8	11.9083	248.07	535.87	0.463 [1]
T11	53.33 - 40	P10x.365	13.35	6.68	21.8	11.9083	246.16	535.87	0.459 [1]
T12	40 - 33.33	P10x.5	6.68	6.68	22.1	16.1007	299.82	724.53	0.414 [1]
T13	33.33 - 20	P10x.5	13.35	6.68	22.1	16.1007	297.71	724.53	0.411 [1]
T14	20 - 13.33	P12x.5	6.68	6.68	18.5	19.2423	350.59	865.90	0.405 [1]
T15	13.33 - 0	P12x.5	13.35	6.68	18.5	19.2423	348.91	865.90	0.403 [1]

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	185 - 180	L3 1/2x3 1/2x1/4	19.41	9.41	105.1	1.1034	2.02	48.00	0.042 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T2	180 - 160	L4x4x1/4	22.81	11.24	109.2	1.2909	6.96	56.16	0.124 [1]
T3	160 - 140	L5x5x5/16	24.62	12.15	93.9	2.0674	14.23	89.93	0.158 [1]
T4	140 - 120	L5x5x5/16	26.46	13.01	100.9	2.0967	18.70	91.21	0.205 [1]
T5	120 - 100	L5x5x3/8	28.33	13.82	108.0	2.4614	21.88	107.07	0.204 [1]
T6	100 - 93.33	L6x6x3/8	15.06	14.07	93.6	2.9536	23.77	128.48	0.185 [1]
T7	93.33 - 80	L4x6x1/2	19.70	9.56	120.7	3.1406	30.00	136.62	0.220 [1]
T8	80 - 73.33	L6x6x3/8	15.96	15.05	99.4	2.9887	26.33	130.01	0.202 [1]
T9	73.33 - 60	L6x6x3/8	20.45	19.45	127.5	2.9887	32.23	130.01	0.248 [1]
T10	60 - 53.33	L6x6x3/8	16.88	15.96	105.2	2.9887	28.16	130.01	0.217 [1]
T11	53.33 - 40	L6x6x3/8	21.22	20.12	131.7	2.9887	34.45	130.01	0.265 [1]
T12	40 - 33.33	L6x6x3/8	17.80	16.73	110.5	2.9536	29.84	128.48	0.232 [1]
T13	33.33 - 20	L6x6x1/2	22.00	20.86	138.3	3.8906	36.41	169.24	0.215 [1]
T14	20 - 13.33	L6x6x1/2	18.73	17.67	117.7	3.8906	31.44	169.24	0.186 [1]
T15	13.33 - 0	L6x6x1/2	22.81	21.57	142.9	3.8906	37.92	169.24	0.224 [1]

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L4x4x5/16	27.67	13.18	130.4	1.5363	3.24	66.83	0.048 [1]
T9	73.33 - 60	L4x4x5/16	29.67	14.22	140.1	1.5656	4.29	68.10	0.063 [1]
T11	53.33 - 40	L5x5x5/16	31.67	15.13	117.6	2.0381	5.32	88.66	0.060 [1]
T13	33.33 - 20	L5x5x5/16	33.67	16.10	125.3	2.0088	6.40	87.38	0.073 [1]
T15	13.33 - 0	L5x5x5/16	35.67	17.01	132.3	2.0088	7.48	87.38	0.086 [1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	185 - 180	L5x5x5/16	18.50	17.68	137.2	2.0674	0.13	89.93	0.001 [1]

[1] P_u / ϕP_n controls

Redundant Horizontal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L3x3x1/4	6.92	6.56	84.6	1.4400	3.24	46.66	0.069 [1]
T9	73.33 - 60	L3x3x1/4	7.42	7.06	91.1	1.4400	4.29	46.66	0.092 [1]
T11	53.33 - 40	L3x3x5/16	7.92	7.47	97.2	1.7800	5.31	57.67	0.092 [1]
T13	33.33 - 20	L3x3x5/16	8.42	7.97	103.7	1.7800	6.39	57.67	0.111 [1]
T15	13.33 - 0	L3 1/2x4x5/16	8.92	8.39	94.1	2.2500	7.50	72.90	0.103 [1]

[1] P_u / ϕP_n controls

Redundant Diagonal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T7	93.33 - 80	L3x3x1/4	9.37	8.86	114.3	1.4400	2.21	46.66	0.047 [1]
T9	73.33 - 60	L3x3x1/4	9.73	9.24	119.2	1.4400	2.82	46.66	0.061 [1]
T11	53.33 - 40	L3x3x5/16	10.10	9.50	123.7	1.7800	3.40	57.67	0.059 [1]
T13	33.33 - 20	L3x3x5/16	10.48	9.90	128.8	1.7800	4.00	57.67	0.069 [1]
T15	13.33 - 0	L3 1/2x4x5/16	10.87	10.20	114.4	2.2500	4.58	72.90	0.063 [1]

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
T1	185 - 180	Leg	P6x.28	1	-7.65	250.26	3.1	Pass
T2	180 - 160	Leg	P6x.28	15	-22.57	213.87	10.6	Pass
T3	160 - 140	Leg	P6x.28	30	-60.72	213.87	28.4	Pass
T4	140 - 120	Leg	P6x.28	43	-101.97	213.87	47.7	Pass
T5	120 - 100	Leg	P8x0.322	58	-156.14	351.14	44.5	Pass
T6	100 - 93.33	Leg	P8x0.322	73	-186.87	375.83	49.7	Pass
T7	93.33 - 80	Leg	P8x0.322	85	-186.49	375.86	49.6	Pass
T8	80 - 73.33	Leg	P8x.5	109	-247.19	569.77	43.4	Pass
T9	73.33 - 60	Leg	P8x.5	121	-247.28	569.82	43.4	Pass
T10	60 - 53.33	Leg	P10x.365	145	-306.60	543.41	56.4	Pass
T11	53.33 - 40	Leg	P10x.365	157	-306.05	543.44	56.3	Pass
T12	40 - 33.33	Leg	P10x.5	181	-368.90	734.07	50.3	Pass
T13	33.33 - 20	Leg	P10x.5	193	-368.57	734.11	50.2	Pass
T14	20 - 13.33	Leg	P12x.5	217	-431.48	886.74	48.7	Pass
T15	13.33 - 0	Leg	P12x.5	229	-432.33	886.77	48.8	Pass
T1	185 - 180	Diagonal	L3 1/2x3 1/2x1/4	12	-2.06	19.18	10.7 15.2 (b)	Pass
T2	180 - 160	Diagonal	L4x4x1/4	21	-7.24	20.25	35.7 52.5 (b)	Pass
T3	160 - 140	Diagonal	L5x5x5/16	36	-14.16	42.34	33.5 86.0 (b)	Pass
T4	140 - 120	Diagonal	L5x5x5/16	51	-18.59	41.44	44.9 51.6 (b)	Pass
T5	120 - 100	Diagonal	L5x5x3/8	66	-21.29	44.46	47.9	Pass
T6	100 - 93.33	Diagonal	L6x6x3/8	83	-24.06	73.53	32.7 38.4 (b)	Pass
T7	93.33 - 80	Diagonal	L4x6x1/2	103	-31.67	85.70	37.0 50.3 (b)	Pass
T8	80 - 73.33	Diagonal	L6x6x3/8	119	-25.69	67.33	38.2 44.4 (b)	Pass
T9	73.33 - 60	Diagonal	L6x6x3/8	139	-33.24	86.57	38.4 54.3 (b)	Pass
T10	60 - 53.33	Diagonal	L6x6x3/8	155	-27.96	62.15	45.0 47.5 (b)	Pass
T11	53.33 - 40	Diagonal	L6x6x3/8	175	-36.27	83.43	43.5 58.1 (b)	Pass
T12	40 - 33.33	Diagonal	L6x6x3/8	191	-29.31	58.26	50.3	Pass
T13	33.33 - 20	Diagonal	L6x6x1/2	211	-38.15	103.92	36.7 44.1 (b)	Pass
T14	20 - 13.33	Diagonal	L6x6x1/2	227	-31.09	70.38	44.2	Pass
T15	13.33 - 0	Diagonal	L6x6x1/2	247	-39.70	99.52	39.9 46.0 (b)	Pass
T7	93.33 - 80	Horizontal	L4x4x5/16	76	-3.24	22.01	14.7	Pass
T9	73.33 - 60	Horizontal	L4x4x5/16	112	-4.29	19.38	22.1	Pass
T11	53.33 - 40	Horizontal	L5x5x5/16	148	-5.32	32.36	16.4	Pass
T13	33.33 - 20	Horizontal	L5x5x5/16	184	-6.40	29.18	21.9	Pass
T15	13.33 - 0	Horizontal	L5x5x5/16	220	-7.48	26.58	28.2	Pass
T1	185 - 180	Top Girt	L5x5x5/16	6	-1.18	19.99	5.9	Pass
T7	93.33 - 80	Redund Horz 1	L3x3x1/4	89	-3.24	24.49	13.2	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
		Bracing						
T9	73.33 - 60	Redund Horz 1 Bracing	L3x3x1/4	125	-4.29	21.14	20.3	Pass
T11	53.33 - 40	Redund Horz 1 Bracing	L3x3x5/16	176	-5.31	23.10	23.0	Pass
T13	33.33 - 20	Redund Horz 1 Bracing	L3x3x5/16	197	-6.39	20.29	31.5	Pass
T15	13.33 - 0	Redund Horz 1 Bracing	L3 1/2x4x5/16	248	-7.50	35.58	21.1	Pass
T7	93.33 - 80	Redund Diag 1 Bracing	L3x3x1/4	90	-2.21	13.42	16.4	Pass
T9	73.33 - 60	Redund Diag 1 Bracing	L3x3x1/4	126	-2.82	12.35	22.9	Pass
T11	53.33 - 40	Redund Diag 1 Bracing	L3x3x5/16	162	-3.40	14.27	23.8	Pass
T13	33.33 - 20	Redund Diag 1 Bracing	L3x3x5/16	198	-4.00	13.15	30.4	Pass
T15	13.33 - 0	Redund Diag 1 Bracing	L3 1/2x4x5/16	234	-4.58	24.06	19.0	Pass
T7	93.33 - 80	Inner Bracing	L3x3x1/4	107	-0.05	5.24	1.4	Pass
T9	73.33 - 60	Inner Bracing	L3x3x1/4	143	-0.06	4.56	1.5	Pass
T11	53.33 - 40	Inner Bracing	L3 1/2x3 1/2x1/4	179	-0.06	6.45	1.5	Pass
T13	33.33 - 20	Inner Bracing	L3 1/2x3 1/2x1/4	215	-0.07	5.71	1.5	Pass
T15	13.33 - 0	Inner Bracing	L3 1/2x3 1/2x1/4	251	-0.07	5.09	1.4	Pass
							Summary	
						Leg (T10)	56.4	Pass
						Diagonal (T3)	86.0	Pass
						Horizontal (T15)	28.2	Pass
						Top Girt (T1)	5.9	Pass
						Redund Horz 1 Bracing (T13)	31.5	Pass
						Redund Diag 1 Bracing (T13)	30.4	Pass
						Inner Bracing (T13)	1.5	Pass
						Bolt Checks	86.0	Pass
						RATING =	**86.0**	**Pass**

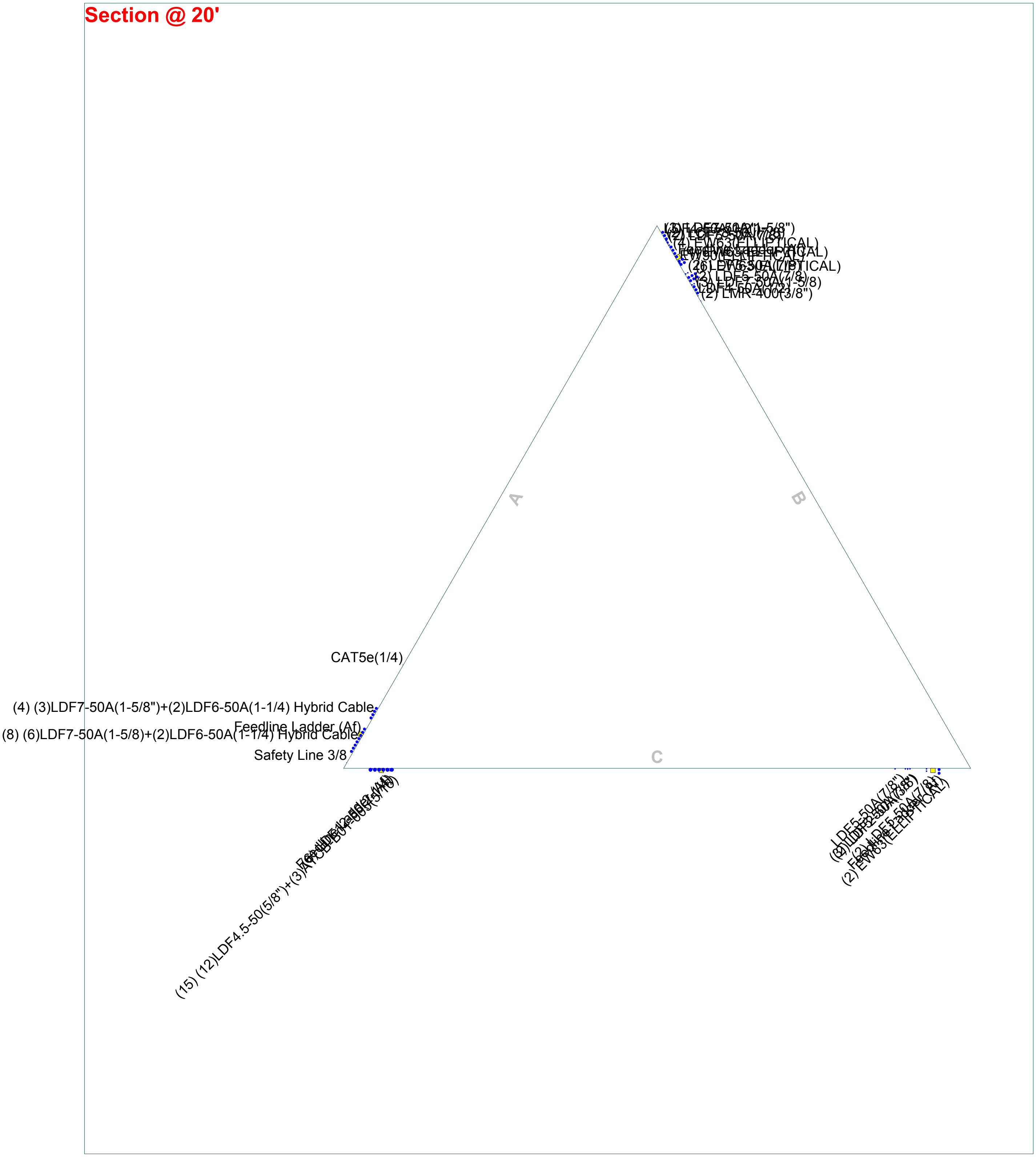
APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan

20'

Round Flat App In Face App Out Face



Black & Veatch Corp. 6800 W. 115th St., Suite 2292 Overland Park, KS 66211 Phone: FAX:	Job: **ES-038 TalcottRS**		
	Project: **405025**		
	Client: Eversource	Drawn by: TH	App'd:
	Code: TIA-222-H	Date: 07/07/20	Scale: NTS
	Path: C:\Users\hal92311\OneDrive - Black & Veatch\My Desktop\TalcottRS\Structural\ES-038 TalcottRS Structural Analysis.eri		Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

References

ANCHOR ROD ANALYSIS

Project Information

Site Name:ES-038 TalcottRS

TIA Revision: Rev-G / Rev-H (selected: Rev-H)

TIA-222-G 105% Allowable? No / Yes (selected: No)

Apply TIA-222-H Section 15.5? No / Yes (selected: Yes)

Max Leg Reactions

Compression	*Uplift*
$Axial\_C := 474kip$	$Axial\_U := 384 \cdot kip$
$Shear\_C := 77kip$	$Shear\_U := 66 \cdot kip$

Anchor Rod Data

Diameter of Anchor Rod: $D := 1.75 \cdot in$

Number of Anchor Rods: $N := 6$

Length from top of concrete to bottom of anchor rod leveling nut: $lar := 1.0 \cdot in$

Anchor Rod Grade: F1554-105 (selected) / A687 / A354-BC / A354-BD / A449 / A572-42 / A572-50 / A572-55 / A572-60 / A572-65 / A588-42 / A588-46 / A588-50 / A36M-42 / A36M-45 / A36M-50 / A36M-55 / A500-50 / A514-GR100 / A53-B-35 / A53-B-42 / A607-60 / A607-65 / S-128 / S-22

Threads in Shear Plane?: Yes / No (selected: Yes)

Thread Series: Coarse / Fine / 8-Thread (selected: Coarse)

Consider Base Plate Grout?: Yes / No (selected: No)

Grout Factor η: 0.90 / 0.70 / 0.55 / 0.50 (selected: 0.50)

Threads per Inch: $n = 5$ (Thread selection invalid if n = 0)

Rod Ultimate Strength: $Fu = 125 \cdot ksi$

Rod Yield Strength: $Fy = 105 \cdot ksi$

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

$$Z := \frac{1}{6} \cdot \left(D - \frac{0.9743in}{n}\right)^3 = 0.627 \cdot in^3$$

Radius of Gyration:

$$r := \left(\frac{1}{4}\right) \cdot \left(D - \frac{0.9743in}{n}\right) = 0.389 \cdot in$$

Net Area of Anchor Rod:

$$An := \frac{\pi}{4} \cdot \left(D - \frac{0.9743in}{n}\right)^2 = 1.899 \cdot in^2$$

TIA-222-G/H Section 4.9.6.1

Nominal Unthreaded Area of Anchor Rod:

$$Ab := \frac{\pi}{4} \cdot (D)^2 = 2.405 \cdot in^2$$

Anchor Rod Design Capacities

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

$Rnt := Fu \cdot An = 237.432 \cdot kip$

$\phi t = 0.75$

$\phi Rnt := \phi t \cdot Rnt = 178.074 \cdot kip$

Design Compression Strength:

$Rnc := Fy \cdot An = 199.443 \cdot kip$

$\phi c = 1$

$\phi Rnc := \phi c \cdot Rnc = 199.443 \cdot kip$

Design Buckling Strength: TIA-222-H Section 4.5.4.2

$K_0 := 1.2$

$Fcr = 104.847 \cdot ksi$

$Fe = 3.004 \times 10^4 \cdot ksi$

$Rnb := Fcr \cdot An = 199.151 \cdot kip$

$\phi c = 1$

$\phi Rnb := \phi c \cdot Rnb = 199.151 \cdot kip$

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

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

$Rnv = 150.33 \cdot kip$

$Rnvc := 0.6 \cdot Fy \cdot 0.5 \cdot An = 59.833 \cdot kip$ TIA-222-H Section 4.9.9

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

$\phi Rnv := \phi v \cdot Rnv = 112.748 \cdot kip$ $\phi Rnvc := \phi c \cdot Rnvc = 59.833 \cdot kip$

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

$Rmn := Fy \cdot Z = 65.818 \cdot kip \cdot in$

$\phi f = 0.9$

$\phi Rmn := \phi f \cdot Rmn = 59.236 \cdot kip \cdot in$

Anchor Rod Loading Demands

Tension Demand:

$$Put := \frac{Axial\_U}{N} = 64 \cdot kip$$

Compression Demand:

$$Puc := \frac{Axial\_C}{N} = 79 \cdot kip$$

Shear Demand:

$$Vut := \frac{Shear\_U}{N} = 11 \cdot kip$$

$$Vuc := \frac{Shear\_C}{N} = 12.833 \cdot kip$$

Moment Demand:

$$Mut := 0.65 \cdot lar \cdot Vut = 7.15 \cdot kip \cdot in$$

$$Muc := 0.65 \cdot lar \cdot Vuc = 8.342 \cdot kip \cdot in$$

Anchor Rod Interaction Check

TIA-222-G Section 4.9.9

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

$$SR\_g = 0.588$$

Anchor Rod Interaction Check

TIA-222-H Section 4.9.9

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

$SR\_Pt = 0.139$

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

$SR\_Pc = 0.442$

$$SR := \begin{cases} SR\_g & \text{if } TIA = \text{"Rev-G"} \\ \max(SR\_Pt, SR\_Pc) & \text{if } TIA = \text{"Rev-H"} \wedge S15 = \text{"No"} \\ \frac{\max(SR\_Pt, SR\_Pc)}{1.05} & \text{if } TIA = \text{"Rev-H"} \wedge S15 = \text{"Yes"} \end{cases} = 0.421$$

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

Anchor Rod Results

Axial Tension Demand:	$Put = 64 \cdot kip$
Axial Tension Capacity:	$\phi Rnt = 178.074 \cdot kip$
Axial Compression Demand:	$Puc = 79 \cdot kip$
Axial Compression Capacity:	$\phi Rnc = 199.443 \cdot kip$
Shear Tension Demand:	$Vut = 11 \cdot kip$
Tension Shear Capacity:	$\phi Rnv = 112.748 \cdot kip$
Shear Compression Demand:	$Vuc = 12.833 \cdot kip$
Compresison Shear Capacity:	$\phi R_{nvc} = 59.833 \cdot kip$
Moment Tension Demand:	M_{ut} = "Moment Not Considered" ·kip·in
Moment Compression Demand:	M_{uc} = "Moment Not Considered" ·kip·in
Moment Capacity:	ϕR_{mn} = "Moment Not Considered" ·kip·in

Governing Stress Ratio

$SR = 42.106 \cdot \%$

$Check_{SR}$ = "Passing"

SST Unit Base Foundation

ES-038
TalcottRS

TIA-222 Revision: H

Top & Bot. Pad Rein. Different?:	☐
Tower Centroid Offset?:	☑
Block Foundation?:	☐

Superstructure Analysis Reactions		
Global Moment, **M**:	14011	ft-kips
Global Axial, **P**:	112	kips
Global Shear, **V**:	132	kips
Leg Compression, P_{comp}:	474	kips
Leg Comp. Shear, V_{u_comp}:	77	kips
Leg Uplift, P_{uplift}:	384	kips
Leg Uplift. Shear, V_{u_uplift}:	66	kips
Tower Height, **H**:	185	ft
Base Face Width, **BW**:	37	ft
BP Dist. Above Fdn, bp_{dist}:	2	in

Foundation Analysis Checks				
	Capacity	**Demand**	**Rating***	**Check**
Lateral (Sliding) (kips)	902.29	132.00	**13.9%**	**Pass**
Bearing Pressure (ksf)	15.00	2.41	**15.3%**	**Pass**
*Overturning (kip*ft)*	33668.59	15838.53	**47.0%**	**Pass**
*Pier Flexure (Comp.) (kip*ft)*	3652.58	462.00	**12.0%**	**Pass**
*Pier Flexure (Tension) (kip*ft)*	1967.66	396.00	**19.2%**	**Pass**
Pier Compression (kip)	9560.40	504.54	**5.0%**	**Pass**
*Pad Flexure (kip*ft)*	1077.27	845.95	**74.8%**	**Pass**
Pad Shear - 1-way (kips)	614.00	137.84	**21.4%**	**Pass**
Pad Shear - Comp 2-way (ksi)	0.164	0.148	**85.7%**	**Pass**
*Flexural 2-way (Comp) (kip*ft)*	394.28	277.20	**67.0%**	**Pass**
Pad Shear - Tension 2-way (ksi)	0.164	0.130	**75.1%**	**Pass**
*Flexural 2-way (Tension) (kip*ft)*	394.28	237.60	**57.4%**	**Pass**

**Rating per TIA-222-H Section 15.5*

Soil Rating*:	**47.0%**
Structural Rating*:	**85.7%**

Pier Properties		
Pier Shape:	Circular	
Pier Diameter, **dpier**:	6.0	ft
Ext. Above Grade, **E**:	0.50	ft
Pier Rebar Size, **Sc**:	7	
Pier Rebar Quantity, **mc**:	34	
Pier Tie/Spiral Size, **St**:	3	
Pier Tie/Spiral Quantity, **mt**:	6	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, cc_{pier}:	3	in

Pad Properties		
Depth, **D**:	7.00	ft
Pad Width, **W**:	45.50	ft
Pad Thickness, **T**:	1.50	ft
Pad Rebar Size (Bottom), **Sp**:	7	
Pad Rebar Quantity (Bottom), **mp**:	30	
Pad Clear Cover, cc_{pad}:	3	in

Material Properties		
Rebar Grade, **Fy**:	60	ksi
Concrete Compressive Strength, **F'c**:	3	ksi
Dry Concrete Density, δ**c**:	150	pcf

Soil Properties		
Total Soil Unit Weight, γ:	100	pcf
Ultimate Gross Bearing, Qult:	20.000	ksf
Cohesion, **Cu**:	0.500	ksf
Friction Angle, φ:		degrees
SPT Blow Count, N_{blows}:		
Base Friction, μ:		
Neglected Depth, **N**:	3.3	ft
Foundation Bearing on Rock?	Yes	
Groundwater Depth, **gw**:	n/a	ft

<-- Toggle between Gross and Net

Version 3.2.1

TIA-222- H **ACI : 2014**

PHYSICAL PARAMETERS

Pier Height Above Water Table:	h_{pier_above} = (MIN(gw,D-T) + E)	h_{pier_above} =	6	ft
Pier Height Below Water Table:	h_{pier_below} = ((D-T) - MIN(gw,D-T))	h_{pier_below} =	0	ft
Buoyant Weight of Pier:	W_{pier} = (π/4) * (dpier^2) * hpier_above * δc / 1000 + (π/4) * (dpier^2) * hpier_below * (δc-62.4) / 1000	W_{pier} =	25.45	kips
Pad Height Above Water Table:	h_{pad_above} = IF(gw<=D-T,0,IF(gw>D,T,T-(D-gw)))	h_{pad_above} =	1.5	ft
Pad Height Below Water Table:	h_{pad_below} = (T-IF(gw<=D-T,0,IF(gw>D,T,T-(D-gw))))	h_{pad_below} =	0	ft
Buoyant Weight of Pad:	W_{pad} = (W^2) * hpad_above * δc / 1000 + (W^2) * hpad_below * (δc-62.4) / 1000	W_{pad} =	465.81	kips
Concrete weight:	W_c = V * δc	W_c =	542.1	kips
Soil weight:	W_s = (D - T) * (W² - 3*(dpier² / 4 * π)) * γ	W_s =	1092.0	kips
EIA/TIA-222 Load Factor:	LF = 1	LF =	1.00	

LATERAL RESISTANCE

Total Nominal Pp Resistance:	P_{p_total} = Pp_pier *Ap_piers + Pp_pad * Ap_pad	P_{p_total} =	167.93	kips
Factored Total Weight for Compression:	$P_{factored\_comp}$ = φD * (Wc + Ws + P / 1.2)	$P_{factored\_comp}$ =	1554.72	kips
Nominal Base Friction Resistance (Comp):	R_{s_comp} = Cu * W²	R_{s_comp} =	1035.13	kips
Lateral Resistance (Comp):	ΦVn = Φs * (Pp_total + Rs_comp)	ΦVn =	902.29	kips

Check **ΦVn = 902.29 kips >= Vu = 132.00 kips** **RATING: 14.63% OK**

PIER REINFORCEMENT

Pier / Column Compression

Pier Cross-Sectional Area:	A_1 = dpier^2 * π/4	A_1 =	4071.50	in²
Support Area (2H:1V Slope):	A_2 = (MIN((2*(W/2-(2/3)*BW*cos(30°)+Offset)),(W-BW),dpier+4*T))²*(π/4)	A_2 =	8171.28	in²
Compressive Resistance (H/D < 3):	$ΦP_{n1}$ = 0.65*0.85 * F'c * A1 * MIN(√(A2/A1),2)	$ΦP_{n1}$ =	9560.40	kips
Rebar:	$s_{\_pier}$ = 7; $m_{\_pier}$ = 34	d_{b_pier} = 0.875 in; A_{b_pier} = 0.6 in^2		
Provided area of steel:	A_{s_pier} = Ab_pier * m_pier	A_{s_pier} =	20.40	in^2
Compressive Resistance (H/D >= 3):	$ΦP_{n2}$ = 0.65 * 0.8 * (0.85 * (F\c) * (A_1 - As_pier) + ((Fy) * As_pier))	$ΦP_{n2}$ =	6008.24	kips
	H/D = (D - T + E) / dpier	H/D =	1.00	
Utilized Compressive Resistance:	$ΦP_n$ = Pn1	$ΦP_n$ =	9560.40	kips
Applied Compressive Force:	P_u = Pcomp + 1.2 * Wpier	P_u =	504.54	kips

Check **$ΦP_n$ = 9560.40 kips >= P_u = 504.54 kips** **RATING: 5.28% OK**

Pier Flexure

Cross-sectional area:	A_g = dpier² * π / 4	A_g =	4071.50	in^2
Min. area of steel (pier):	A_{smin_pier} = Ag * 0.005	A_{smin_pier} =	20.36	in^2
Cage Diameter:	d_o = dpier - 2 * cc - 2 * tie - d_b	d_o =	64.38	in

Check **A_{s_pier} = 20.40 in^2 >= A_{smin_pier} = 20.36 in^2** **OK**

Applied Moment to DSMC (Compression):	M_{u_comp} = IF(T>D,E,(D - T + E)) * Vu_comp	M_{u_comp} =	462.00	ft-kips
Pier Moment Capacity (Compression):	$ΦM_{n\_comp}$ = *from DSMC*	$ΦM_{n\_comp}$ =	3652.58	ft-kips

Check **M_{u_comp} = 462.00 ft-kips >= $ΦM_{n\_comp}$ = 3652.58 ft-kips** **RATING: 12.65% OK**

Applied Moment to DSMC (Tension):	$M_{u\_tension}$ = IF(T>D,E,(D - T + E)) * Vu_uplift	$M_{u\_tension}$ =	396.00	ft-kips
Pier Moment Capacity (Tension):	$ΦM_{n\_tension}$ = *from DSMC*	$ΦM_{n\_tension}$ =	1967.66	ft-kips

Check **M_{u_comp} = 396.00 ft-kips >= $ΦM_{n\_comp}$ = 1967.66 ft-kips** **RATING: 20.13% OK**

PAD REINFORCEMENT

Elastic Bearing Pressure for Soil Checks

Tower Cetroid offset from Fdn Centroid:	Offset = (1/2-1/3)*BW*sin(60°)	Offset =	5.34	ft	
Distance from Leg to Edge of Pad:	L_{edge} = (1/2)*W - Offset - (1/3)*BW*sin(60°)	L_{edge} =	6.73	ft	
*Overturning Moment (0.9*D LC):*	$M_{o\_0.9}$ = M + V * (D + E + bpdist/12) + (0.9/1.2)*(P+3*Wpier*1.2)*Offset	$M_{o\_0.9}$ =	15838.53	ft-kips	
*Overturning Moment (1.2*D LC):*	$M_{o\_1.2}$ = M + V * (D + E + bpdist/12) + (1.2/1.2)*(P+3*Wpier*1.2)*Offset	$M_{o\_1.2}$ =	16110.37	ft-kips	
Compressive Load for Bearing:	$P_{bearing}$ = Wc + Ws + P / 1.2	$P_{bearing}$ =	1727.47	kips	
*Load Eccentricity (0.9*D LC):*	$e_{c\_0.9}$ = Mo / 0.9*Pbearing	$e_{c\_0.9}$ =	10.19	ft	L/6 < e <= L/

*Load Eccentricity (1.2*D LC):*	$e_{c\_1.2}$ = Mo / 1.2*Pbearing	$e_{c\_1.2}$ =	7.77	ft	L/6 < e <= L/
Elastic Section Modulus:	S = W³ / 6	S =	15699.40	ft³	
*Positive Pressure (0.9*D LC):*	$P_{pos\_st\_0.9}$ = 0.9*Pbearing / Area + Mo / S	$P_{pos\_st\_0.9}$ =	1.76	ksf	
*Positive Pressure (1.2*D LC):*	$P_{pos\_st\_1.2}$ = 1.2*Pbearing / Area + Mo / S	$P_{pos\_st\_1.2}$ =	2.03	ksf	
*Negative Pressure (0.9*D LC):*	$P_{neg\_st\_0.9}$ = 0.9*Pbearing / Area - Mo / S **Note: The stress resultant is NOT within the kern. Bearing area has been adjusted below.**	$P_{neg\_st\_0.9}$ =	-0.26	ksf	
*Negative Pressure (1.2*D LC):*	$P_{neg\_st\_1.2}$ = 1.2*Pbearing / Area - Mo / S **Note: The stress resultant is NOT within the kern. Bearing area has been adjusted below.**	$P_{neg\_st\_1.2}$ =	-0.02	ksf	
*Adjusted Pressure (0.9*D LC):*	$P_{adj\_0.9}$ = (2 * 0.9*Pbearing) / (3 * W * (W / 2 - ec_0.9))	$P_{adj\_0.9}$ =	1.81	ksf	
*Adjusted Pressure (1.2*D LC):*	$P_{adj\_1.2}$ = (2 * 1.2*Pbearing) / (3 * W * (W / 2 - ec_1.2))	$P_{adj\_1.2}$ =	2.03	ksf	
*Maximum Pressure (0.9*D LC):*	$q_{u\_st\_0.9}$ = IF(Pneg ≥ 0, Ppos , Padj)	$q_{u\_st\_0.9}$ =	1.81	ksf	
*Maximum Pressure (1.2*D LC):*	$q_{u\_st\_1.2}$ = IF(Pneg ≥ 0, Ppos , Padj)	$q_{u\_st\_1.2}$ =	2.03	ksf	

One-Way Shear

Rebar: $s_{\_pad}$ = 7, $m_{\_pad}$ = 30 — *Equally spaced, top and bottom, both directions.* — d_{b_pad} = 0.875 in, A_{b_pad} = 0.6 in^2

Effective depth:	d_c = T - cc - 1.5 * db	d_c =	13.7	in
Distance from Edge of Pad to Column Face:	d' = Ledge - dpier/2	d' =	3.7	ft
Distance from Edge of Pad to dc from Column Face:	d'' = d' - d_c / 12	d'' =	2.59	ft
Distance to qs (0.9D LC):	$L'_{\_0.9}$ = (W / 2 - ec_0.9) * 3	$L'_{\_0.9}$ =	37.69	ft
Distance to qs (1.2D LC):	$L'_{\_1.2}$ = (W / 2 - ec_1.2) * 3	$L'_{\_1.2}$ =	44.93	ft
*Slope of qs (0.9*D LC):*	$sq_{s\_0.9}$ = IF(L' > W, (Ppos - Pneg) / W, qu / L')	$sq_{s\_0.9}$ =	0.05	kcf
*Slope of qs (1.2*D LC):*	$sq_{s\_1.2}$ = IF(L' > W, (Ppos - Pneg) / W, qu / L')	$sq_{s\_1.2}$ =	0.05	kcf
Nominal Shear Strength:	V_{n1} = 2 * W * √(F'c*1000) * dc	V_{n1} =	818.67	kips
Shear Reduction Factor:	$φ_{shear}$ = 0.75	$φ_{shear}$ =	0.75	
Design Shear Strength:	$φV_{n1}$ = φshear * V_{n1}	$φV_{n1}$ =	614.00	kips

Resisting Weight above Critical Section:

	Thickness (ft)	Unit Weight (kcf)	Weight (kip) (0.9*D LC)	Weight (kip) (1.2*D LC)
Soil Above Water Table:	5.5	0.100	58.29	77.71
Soil Below Water Table:	0	0.038	0.00	0.00
Pad Above Water Table:	1.5	0.150	23.84	31.79
Pad Below Water Table:	0	0.088	0.00	0.00
Total:			82.13	109.51

*Applied Shear (0.9*D LC):*	$V_{u1\_0.9}$ = 'Pad Shear and Moment Diagrams'!$AY$21	$V_{u1\_0.9}$ =	125.65	kips
*Applied Shear (1.2*D LC):*	$V_{u1\_1.2}$ = 'Pad Shear and Moment Diagrams'!$CG$21	$V_{u1\_1.2}$ =	137.84	kips

Check **$φV_{n1}$ = 614.00 kips >= V_{u1} = 137.84 kips** **RATING: 22.45% OK**

Two-Way Shear (Compression)

Avg. Effective Depth for Punching Shear:	d_{c_2} = T - cc - AVERAGE(0.5 * db , 1.5 * db)	d_{c_2} =	14.13	in
Radius of Two-Way Shear Plane:	r_{2way} = 0.5*(dpier + dc_2/12)	r_{2way} =	3.59	ft
Length to Edge of Pad from Pier Centroid:	L_{edge2} = W/2 - 2/3*SIN(60°)*BW + Offset	L_{edge2} =	6.73	ft
Length of Shear Perimeter to Deduct:	s = r_{2way} * (2 * ACOS(((r_{2way}-MAX(r_{2way}-L_{edge},0))/r_{2way}))	s =	0.00	ft
Pier Shape:	Pier Shape: Circular	Pier Shape:	Circular	
Pier Diameter:	d_{pier1} = d_{pier} * 12 in / ft	d_{pier1} =	72.00	in
Equivalent Square Pier Diameter:	d_{pier_sq} = √π / 2 * dpier	d_{pier_sq} =	63.81	in
Factor of transfer of Moment:	Y_f = 1/(1+(2/3)*√(dpier1/dpier1))	Y_f =	0.60	
Factor of transfer of eccentricity of Shear:	Y_v = 1 - Y_f	Y_v =	0.40	
Moment applied at base of Pier:	M_v = M_{u_comp} * 12 in / ft	M_v =	5544.00	kip*in
Circular Critical Perimeter:	P_{crit_cir} = (dpier+dc_2/12)*PI() - $L$171)*12	P_{crit_cir} =	270.57	in
Equivalent Square Critical Perimeter 1:	$P_{crit\_sq\_1}$ = 4*(dpier_sq+dc_2)	$P_{crit\_sq\_1}$ =	311.73	in
Equivalent Square Critical Perimeter 2:	$P_{crit\_sq\_2}$ = 2*(dpier_sq + dc_2) + (W*12-BW*12)	$P_{crit\_sq\_2}$ =	257.87	in
Equivalent Square Critical Perimeter 3:	$P_{crit\_sq\_3}$ = 2 * (dpier_sq + dc_2 + (W - BW * COS(RADIANS(30)) - Ledge2)*12)	$P_{crit\_sq\_3}$ =	317.35	in
Equivalent Square Critical Perimeter 4:	$P_{crit\_sq\_4}$ = 2 * (dpier_sq + dc_2 + Ledge2 * 12)	$P_{crit\_sq\_4}$ =	317.35	in
Equivalent Square Critical Perimeter 5:	$P_{crit\_sq\_5}$ = dpier_sq + dc_2 + 0.5*(W-BW)*12 + (W - BW * COS(RADIANS(30)) - Ledge2	$P_{crit\_sq\_5}$ =	209.68	in
Area of Concrete in Shear:	A_c = ((dpier1 + dc_2)*PI()) * dc_2	A_c =	3821.80	in^2
Eq. Square Area of Concrete in Shear (1):	$A_{c\_sq\_1}$ = $P_{crit\_sq\_1}$ * d_{c_2}	$A_{c\_sq\_1}$ =	4403.23	in^2

Eq. Square Area of Concrete in Shear (2):	$A_{c\_sq\_2}$ = $P_{crit\_sq\_2}$ * d_{c_2}	$A_{c\_sq\_2}$ =	3642.37	in^2
Eq. Square Area of Concrete in Shear (3):	$A_{c\_sq\_3}$ = $P_{crit\_sq\_3}$ * d_{c_2}	$A_{c\_sq\_3}$ =	4482.59	in^2
Eq. Square Area of Concrete in Shear (4):	$A_{c\_sq\_4}$ = $P_{crit\_sq\_4}$ * d_{c_2}	$A_{c\_sq\_4}$ =	4482.59	in^2
Eq. Square Area of Concrete in Shear (5):	$A_{c\_sq\_5}$ = $P_{crit\_sq\_5}$ * d_{c_2}	$A_{c\_sq\_5}$ =	2961.67	in^2
Polar Moment of Inertia at assumed Critical Section:	J_{c_cir} = dc_2*(dpier1+dc_2)^3/6 + ((dpier1+dc_2)*(dc_2^3))/6 + (dc_2*(dpier1+dc_2))*(dpier1+dc_2)^2/(IF($L$169=0,2,4))	J_{c_cir} =	6056134.75	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section 1:	$J_{c\_sq\_1}$ = (dc_2*(dpier_sq+dc_2)^3)/6 + ((dpier_sq+dc_2)*(dc_2^3))/6 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/2	$J_{c\_sq\_1}$ =	4493855.25	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_2}$ = (dc_2*(dpier_sq+dc_2)^3)/12 + ((dpier_sq+dc_2)*(dc_2^3))/12 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/2	$J_{c\_sq\_2}$ =	3918396.56	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_3}$ = (dc_2*(dpier_sq+dc_2)^3)/6 + ((dpier_sq+dc_2)*(dc_2^3))/6 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/4	$J_{c\_sq\_3}$ =	2822386.31	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_4}$ = (dc_2*(dpier_sq+dc_2)^3)/6 + ((dpier_sq+dc_2)*(dc_2^3))/6 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/4	$J_{c\_sq\_4}$ =	2822386.31	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_5}$ = (dc_2*(dpier_sq+dc_2)^3)/12 + ((dpier_sq+dc_2)*(dc_2^3))/12 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/4	$J_{c\_sq\_5}$ =	2246927.62	in^4
*Applied Shear Force (1.2*D LC):*	$V_{u\_1.2}$ = 1.2*W_{pier} + 1.2 * IF(OR($B$1="G",$B$1="H"), P_{comp} / 1.2, P_{comp})	$V_{u\_1.2}$ =	504.54	kip
*Controlling Shear Stress (1.2*D LC):*	$v_{u\_1.2\_controlling}$ = $V_{u\_1.2}$ / A_c + (Υ_v * M_v * (d_{pier1} + dc_2)/2) / J_{c_1}	$v_{u\_1.2\_controlling}$ =	0.148	ksi
*Eq. Sq. Controlling Shear Stress (1.2*D LC):*	$v_{u\_1.2\_controlling\_sq}$ = $V_{u\_1.2}$ / A_c + (Υ_v * M_v * (d_{pier_sq} + dc_2)/2) / J_c	$v_{u\_1.2\_controlling\_sq}$ =	0.209	ksi
Shear Stress Capacity:	Φv_n = φs * 4 * (√F'c*1000) / 1000	Φv_n =	0.164	ksi

Two-Way Shear (Compression, Flexural Component) [BOTTOM REINFORCEMENT]

Distance To Outside Edge:	$dist_{outside}$ = MIN((W-BW)/2,BW/2)*2	$dist_{outside}$ =	8.5	ft
Effective Pad Width:	$b_{\_pad}$ = MIN(dpier+3*T,W,dist_outside)	$b_{\_pad}$ =	8.50	ft
Bar Spacing:	B_{s_pad} = Bs_pad (see design checks below)	B_{s_pad} =	18.59	in
Fraction of Bars in Effective Width:	$m_{\_effective}$ = IF(b_pad=W,mp,12*b_pad/Bs_pad)	$m_{\_effective}$ =	5.49	
Area of Steel in Effective Width:	$A_{s\_effective}$ = VLOOKUP(Sp,Ref!$A$2:$C$12,3,0)*m_slab	$A_{s\_effective}$ =	3.29	in²
Depth of Equivalent Rectangular Stress Block:	$a_{\_effective}$ = $A_{s\_effective}$ * Fy / (0.85 * F'c * $b_{\_slab}$*12)	$a_{\_effective}$ =	0.76	in
	β_{pad} = β_{pad} (see design checks below)	β_{pad} =	0.85	
Distance from Top to Nuetral Axis:	$c_{\_effective}$ = $a_{\_effective}$ / β_{pad}	$c_{\_effective}$ =	0.89	
Effective depth:	dc = dc (see One-Way Shear check above)	dc =	13.6875	in
Modulus of Elasticity of Steel:	E_s = 29000 ksi	E_s =	29000	ksi
Strain in Steel:	$\varepsilon_{s\_effective}$ = 0.003 * (dc-c) / c	$\varepsilon_{s\_effective}$ =	0.04296	in/in
Compression-Controlled Strain Limit::	ε_c = F_y / E_s	ε_c =	0.00207	in/in
Tension-Controlled Strain Limit::	ε_t = 0.005	ε_t =	0.00500	in/in
Flexure Strength Reduction Factor:	$\varphi flex_{\_effective}$ = IF(εs>=εt,0.9,IF(εs<=εc,0.65,0.65+(0.9-0.65)*((εs-εc)/(εt-εc))))	$\varphi flex_{\_effective}$ =	0.9	
Nominal Flexural Strength:	$M_{n\_effective}$ = $A_{s\_effective}$ * (F_y) * (dc - $a_{\_effective}$ / 2) * (1/12)	$M_{n\_effective}$ =	219.05	ft-kips
Design Flexural Strength:	$\varphi M_{n\_effective}$ = φflex_effective * Mn_effective	$\varphi M_{n\_effective}$ =	197.14	ft-kips

Two-Way Shear (Compression, Flexural Component) [TOP REINFORCEMENT]

Bar Spacing:	$B_{s\_pad\_top}$ = IF(Input!$S$6=TRUE,(W*12 - 2 * ccpad - VLOOKUP(sptop,Ref!$A$2:$C$12,2	$B_{s\_pad\_top}$ =	8.50	in
Fraction of Bars in Effective Width:	$m_{\_effective\_top}$ = IF(b_pad=W,mp,12*b_pad/Bs_pad_top)	$m_{\_effective\_top}$ =	5.49	
Area of Steel in Effective Width:	$A_{s\_effective\_top}$ = VLOOKUP(Sptop,Ref!$A$2:$C$12,3,0)*m_slab	$A_{s\_effective\_top}$ =	3.29	in²
Depth of Equivalent Rectangular Stress Block:	$a_{\_effective\_top}$ = $A_{s\_effective\_top}$ * Fy / (0.85 * F'c * $b_{\_slab}$*12)	$a_{\_effective\_top}$ =	0.76	in
Distance from Top to Nuetral Axis:	$c_{\_effective\_top}$ = $a_{\_effective\_top}$ / β_{pad}	$c_{\_effective\_top}$ =	0.89	
Effective depth:	dc_top = T *12 - ccpad - 1.5 * VLOOKUP(sptop,Ref!$A$2:$C$12,2,0)	d_{c_top} =	13.6875	in
Strain in Steel:	$\varepsilon_{s\_effective\_top}$ = 0.003 * (dc_top-c_effective_top) / c_effective_top	$\varepsilon_{s\_effective\_top}$ =	0.04296	in/in
Flexure Strength Reduction Factor:	$\varphi flex_{\_effective\_top}$ = IF(εs>=εt,0.9,IF(εs<=εc,0.65,0.65+(0.9-0.65)*((εs-εc)/(εt-εc))))	$\varphi flex_{\_effective\_top}$ =	0.9	
Nominal Flexural Strength:	$M_{n\_effective\_top}$ = $A_{s\_effective\_top}$ * (F_y) * (dc_top - $a_{\_effective\_top}$ / 2) * (1/12)	$M_{n\_effective\_top}$ =	219.05	ft-kips
Design Flexural Strength:	$\varphi M_{n\_effective\_top}$ = φflex_effective * Mn_effective	$\varphi M_{n\_effective\_top}$ =	197.14	ft-kips

Applied Moment:	$Yf*M_{u\_comp}$ = Yf*M_{u_comp}	$Yf*M_{u\_comp}$ =	277.2	ft-kips

Check **$\varphi M_{n\_effective}$ = 394.28 ksi >= $Yf*M_{u\_comp}$ = 277.20 ksi** **RATING: 70.30% OK**

Two-Way Shear (Uplift)

Moment applied at base of Pier:	M_{v_tens} = $M_{u\_tension}$ * 12 in / ft	M_{v_tens} =	4752.00	kip*in
Diameter of Longitudinal Rebar Cage:	$d_{\_cage}$ = dpier*12-2*(ccpier+VLOOKUP(St,Ref!$A$2:$C$12,2,0))-VLOOKUP(Sc,Ref!$A$2:$C$12,2,0)	$d_{\_cage}$ =	64.38	in
Eq. Sq. Diameter of Longitudinal Rebar Cage:	$d_{\_cage\_sq}$ = SQRT(PI())/2*d_cage	$d_{\_cage\_sq}$ =	57.05	in
Steel Embedment Length:	L_{embed} = dc_2 (see One-Way Shear check above)	L_{embed} =	14.13	in
Radius of Two-Way Shear Plane:	r_{2way_tens} = 0.5*(d_cage/12 + Lembed/12)	r_{2way_tens} =	3.27	ft
	$r_{2way\_tens\_sq}$ = 0.5*(SQRT(PI())/2*d_cage/12 + Lembed/12)	$r_{2way\_tens\_sq}$ =	2.97	ft
Length of Shear Perimeter to Deduct:	s_{tens} = r_tens*RADIANS(2*ACOS(((r_tens-MAX(r_tens-Ledge,0))/r_tens))*180/PI())	s_{tens} =	0.00	ft
Eq. Sq. Length of Shear Perimeter to Deduct:	s_{tens_sq} = 0	s_{tens_sq} =	0.00	ft
Circular Critical Perimeter:	P_{crit_tens} = ((d_cage/12+Lembed/12)*PI() - stens)*12	P_{crit_tens} =	246.62	in
Equivalent Square Critical Perimeter 1:	$P_{crit\_tens\_sq\_1}$ = 4*(d_cage_sq+Lembed)	$P_{crit\_tens\_sq\_1}$ =	284.70	in
Equivalent Square Critical Perimeter 2:	$P_{crit\_tens\_sq\_2}$ = 2*(d_cage_sq + Lembed) + (W*12-BW*12)	$P_{crit\_tens\_sq\_2}$ =	244.35	in
Equivalent Square Critical Perimeter 3:	$P_{crit\_tens\_sq\_3}$ = 2 * (d_cage_sq + Lembed) + (W - BW * COS(RADIANS(30)) - Ledge2)*12)	$P_{crit\_tens\_sq\_3}$ =	303.84	in
Equivalent Square Critical Perimeter 4:	$P_{crit\_tens\_sq\_4}$ = 2 * (d_cage_sq + Lembed + Ledge2 * 12)	$P_{crit\_tens\_sq\_4}$ =	303.84	in
Equivalent Square Critical Perimeter 5:	$P_{crit\_tens\_sq\_5}$ = d_cage_sq + Lembed + 0.5*(W-BW)*12 + (W - BW * COS(RADIANS(30)) - Le	$P_{crit\_tens\_sq\_5}$ =	202.92	in
Area of Concrete in Shear:	A_{c_tens} = Pcrit_tens*Lembed	A_{c_tens} =	3483.44	in^2
Equivalent Square Area of Concrete in Shear:	$A_{c\_tens\_sq1}$ = Pcrit_tens_sq1*Lembed	$A_{c\_tens\_sq1}$ =	4021.44	in^2
	$A_{c\_tens\_sq2}$ = 'Pcrit_tens_sq2*Lembed	$A_{c\_tens\_sq2}$ =	3451.47	in^2
	$A_{c\_tens\_sq3}$ = Pcrit_tens_sq3*Lembed	$A_{c\_tens\_sq3}$ =	4291.69	in^2
	$A_{c\_tens\_sq4}$ = Pcrit_tens_sq4*Lembed	$A_{c\_tens\_sq4}$ =	4291.69	in^2
	$A_{c\_tens\_sq5}$ = Pcrit_tens_sq5*Lembed	$A_{c\_tens\_sq5}$ =	2866.22	in^2
Polar Moment of Inertia at assumed Critical Section:	J_{c_tens} = Lembed*(d_cage+Lembed)^3/6 + ((d_cage+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage+Lembed))*(d_cage+Lembed)^2/(IF(Ledge2=0,2,4))	J_{c_tens} =	2883862.50	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section 1:	$J_{c\_tens\_sq\_1}$ = (Lembed*(d_cage_sq+Lembed)^3)/6 + ((d_cage_sq+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/2	$J_{c\_tens\_sq\_1}$ =	3428865.15	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_2}$ = (Lembed*(d_cage_sq+Lembed)^3)/12 + ((d_cage_sq+Lembed)*(Lembed^3))/12 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/2	$J_{c\_tens\_sq\_2}$ =	2987720.45	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_3}$ = (Lembed*(d_cage_sq+Lembed)^3)/6 + ((d_cage_sq+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/4	$J_{c\_tens\_sq\_3}$ =	2155577.27	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_4}$ = (Lembed*(d_cage_sq+Lembed)^3)/6 + ((d_cage_sq+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/4	$J_{c\_tens\_sq\_4}$ =	2155577.27	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_5}$ = (Lembed*(d_cage_sq+Lembed)^3)/12 + ((d_cage_sq+Lembed)*(Lembed^3))/12 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/4	$J_{c\_tens\_sq\_5}$ =	1714432.57	in^4
*Applied Shear Force (0.9*D LC):*	$V_{u\_0.9\_tens}$ = MAX(-0.9*Wpier + 0.9 * IF(OR($B$1="G",$B$1="H"), Puplift / 0.9, Puplift),0)	$V_{u\_0.9\_tens}$ =	361.10	kip
*Controlling Shear Stress (0.9*D LC):*	$v_{u\_0.9\_controlling\_tens}$ = $V_{u\_0.9}$ / A_{c_tens} + (Y_v * M_v * (d_{cage} + Lembed)/2) / J_{c_tens}	$v_{u\_0.9\_controlling\_tens}$ =	0.130	ksi
*Equivalent Square Shear Stress (0.9*D LC):*	$v_{u\_0.9\_tens\_sq}$ = Vu_0.9_tens/Ac_tens_sq5 + (Yv * Mv_tens * (d_cage_sq + Lembed)/2) / Jc_t	$v_{u\_0.9\_tens\_sq}$ =	0.165	ksi
Shear Stress Capacity:	Φv_n = φs * 4 * (√F'c*1000) / 1000	Φv_n =	0.164	ksi

Check **Φv_n = 0.164 ksi >= v_{u_demand} = 0.130 ksi** **RATING: 78.83% OK**

Two-Way Shear (Uplift, Flexural Component)

Applied Moment:	$Yf*M_{u\_tension}$ = Yf*$M_{u\_tension}$	$Yf*M_{u\_tension}$ =	237.6	

Check **$\varphi M_{n\_effective}$ = 394.28 ksi >= 'f*$M_{u\_tension}$ = 237.60 ksi** **RATING: 60.26% OK**

Pad Flexure (Net Bearing Pressure)

	β_{pad} = IF(F'c <= 4, 0.85, IF(F'c >= 8, 0.65, 0.85 - (F'c - 4) * 0.05))	β_{pad} =	0.85	

Provided Steel:	A_{s_pad} = A_{b_pad} * $m_{\_pad}$	A_{s_pad} =	18.00	in^2
Depth of Equivalent Rectangular Stress Block:	a = A_{s_pad} * Fy / (0.85 * F'c * W)	a =	0.78	in
Distance from Top to Nuetral Axis:	c = a / β_{pad}	c =	0.91	in
Modulus of Elasticity of Steel:	E_s = 29000 ksi	E_s =	29000	ksi
Strain in Steel:	ε_s = 0.003 * (dc-c) / c	ε_s =	0.04200	in/in
Compression-Controlled Strain Limit::	ε_c = F_y / E_s	ε_c =	0.00207	in/in
Tension-Controlled Strain Limit::	ε_t = 0.005	ε_t =	0.00500	in/in
Flexure Strength Reduction Factor:	φflex = IF(εs>=εt,0.9,IF(εs<=εc,0.65,0.65+(0.9-0.65)*((εs-εc)/(εt-εc))))	φflex =	0.9	
Nominal Flexural Strength:	M_n = As$_{_pad}$ * (F_y) * (dc - a / 2) * (1/12)	M_n =	1196.97	ft-kips
Design Flexural Strength:	φM_n = φflex * Mn	φM_n =	1077.27	ft-kips
*Bearing Press. at Crit. Section (0.9*D LC):*	qmid_0.9 = qu_st_0.9 - sqs_0.9 * d'	qmid_0.9 =	1.63	ksf
*Bearing Press. at Crit. Section (1.2*D LC):*	qmid_1.2 = qu_st_1.2 - sqs_1.2 * d'	qmid_1.2 =	1.86	ksf

Resisting Weight above Critical Section:

	Thickness (ft)	Unit Weight (kcf)	Weight (kip) (0.9*D LC)	Weight (kip) (1.2*D LC)	Moment Arm (ft)	Resisting Moment (ft-kips) (0.9*D LC)	Resisting Moment (ft-kips) (1.2*D LC)
Soil Above Water Table:	5.5	0.100	83.98	111.97	1.864265015	156.55	208.74
Soil Below Water Table:	0	0.038	0.00	0.00	1.864265015	0.00	0.00
Pad Above Water Table:	1.5	0.150	34.35	45.80	1.864265015	64.04	85.39
Pad Below Water Table:	0	0.088	0.00	0.00	1.864265015	0.00	0.00
Total:			118.33	157.77		220.60	294.13

*Factored Bending Moment (0.9*D LC):*	Mu_pad_0.9 = 'Pad Shear and Moment Diagrams'!$AZ$21	Mu_pad_0.9 =	552.28	ft-kips
*Factored Bending Moment (1.2*D LC):*	Mu_pad_1.2 = 'Pad Shear and Moment Diagrams'!$CH$21	Mu_pad_1.2 =	845.95	ft-kips

Check **φM_n = 1077.27 ft-kips >= M_{u_pad} = 845.95 ft-kips** **RATING: 78.53% OK**

PIER DESIGN CHECKS

Minimum Steel

Min. area of steel (pier):	A_{st_c} = Ag * 0.005	A_{st_c} =	20.36	in^2

Check **A_{s_pier} = 20.40 in² >= A_{st_c} = 20.36 in²**

Bar Spacing

Bar separation:	B_{s_pier} = (do * π) / m_pier - db_pier	B_{s_pier} =	5.07	in

Check **18.00 in >= B_{s_pier} = 5.07 in** **RATING: 28.18% OK**

Vertical Rebar Development Length

Reinforcement location:	α_c = if space under bar > 12", 1.3, else use 1.0	α_c =	1.3	
Epoxy coating:	β_c = for non- epoxy coated, use 1.0	β_c =	1.0	
Max term:	$\alpha\beta_c$ = product of α x β not to exceed 1.7	$\alpha\beta_c$ =	1.3	
Reinforcement size:	γ_c = if bar size is 6 or less, 0.8, else use 1.0	γ_c =	1	
Light weight concrete:	λ_c = 1.0	λ_c =	1.0	
Spacing/cover:	$c_{\_c}$ = use smaller of half of bar spacing or concrete cover	$c_{\_c}$ =	3.0	in
Transverse bars:	k_{tr_c} = 0 in (per simplification)	k_{tr_c} =	0	in
Max term:	c_c' = MIN(2.5, (c_c + ktr_c) / db_c)	c_c' =	2.500	
Excess reinforcement:	R_c = Ast_c / As_c	R_c =	1.00	
Development (tensile):	$L_{dt}'_{\_c}$ = (3 / 40) * (Fy*1000 / √(F'c*1000)) * αβ_c * γ_c * λ_c * R_c * db_c / c_c'	$L_{dt}'_{\_c}$ =	37.30	in
Minimum length:	L_{d_min} = 12 inches	L_{d_min} =	12.0	in
Development length:	L_{dt_c} = MAX(Ld_min, Ldt'_c)	L_{dt_c} =	37.30	in
Development (comp.):	$L_{dc}'_{\_c}$ = 0.02 * db_c * Fy*1000 / √(F'c*1000)	$L_{dc}'_{\_c}$ =	19.17	in
	$L_{dc}''_{\_c}$ = 0.0003 * db_c * Fy*1000	$L_{dc}''_{\_c}$ =	15.75	in
Development length:	L_{dc_c} = MAX(8, Ldc'_c, Ldc"_c)	L_{dc_c} =	19.17	in
Length available in pier:	L_{vc} = D - T + E - cc	L_{vc} =	69.0	in

Check **L_{vc} = 69.00 in >= L_{dt_c} = 37.30 in** **OK**

Check **L_{vc} = 69.00 in >= L_{dc_c} = 19.17 in** **OK**

Length available in pad:	L_{vp} = T - ccpad	L_{vp} =	15.0	in

Check L_{vp} = **15.00 in** >= L_{dt_c} = **37.30 in** — **HOOKS**

Vertical Rebar Hook Ending

Bar size & clear cover:	α_h = =if bar <= 11, and cc >= 2.5", use 0.7, else use 1.0	α_h =	0.7	
Epoxy coating:	β_h = for non- epoxy coated, use 1.0	β_h =	1.0	
Light weight concrete:	λ_h = 1.0	λ_h =	1.0	
Development (hook):	L_{dh}' = 0.02 * αh * βh * λh * Fy*1000 / √(F'c*1000) * db_c	L_{dh}' =	13.4	in
Minimum length:	L_{dh_min} = the larger of: 8 * d_b or 6 in	L_{dh_min} =	7.0	in
Development length:	L_{dh} = MAX(Ldh_min, Ldh')	L_{dh} =	13.4	in

Check L_{vp} = **15.00 in** >= L_{dh} = **13.42 in** — **OK**

Hook tail length:	L_{h_tail} = 12 * db beyond the bend radius	L_{h_tail} =	14.0	in
Length available in pad:	L_{h_pad} = 12*MIN((W/2-(2/3)*BW*cos(30°)+Offset-dpier/2),(W-BW-dpier)/2) + ccpier - ccpad	L_{h_pad} =	15.0	in

Check L_{h_pad} = **15.00 in** >= L_{dh_tail} = **14.00 in** — **OK**

Pier Ties

Minimum size: [ACI 7.10.5.1]	$s_{\_t\_min}$ =IF(s_c <= 10, 3, 4)	$s_{\_t\_min}$ =	3	
z factor:	z_seismic = 0.5 if the SDC is A, B, or C, else 1.0	z_seismic =	0.5	

Tie parameters: $s_{\_t}$ = 3; $m_{\_t}$ = 6; d_{b_t} = 0.375 in; A_{b_t} = 0.11 in^2

Allowable tie spacing per vertical rebar:	$B_{s\_t\_max1}$ = 8 / z * db_c	$B_{s\_t\_max1}$ =	14	in
per tie size:	$B_{s\_t\_max2}$ = 24 / z * db_t	$B_{s\_t\_max2}$ =	18	in

PAD DESIGN CHECKS

Minimum Steel Required for Shrinkage

Shrinkage:	ρ_{sh} =	IF(Fy >= 60, 0.0018, 0.002)	ρ_{sh} =	0.0018	
Min. Required Shrinkage Steel:	$A_{st\_p\_sh}$ =	ρsh * W * T	$A_{st\_p\_sh}$ =	17.690	in^2

Check **A_{s_p} = 18.00 in^2 >= A_{st_p} = 17.69 in^2** **OK**

Pad Development Length

Reinforcement location:	α_p =	if space under bar > 12", 1.3, else use 1.0	α_p =	1	
Epoxy coating:	β_p =	for non- epoxy coated, use 1.0	β_p =	1.0	
Max term:	$\alpha\beta_p$ =	product of α x β not to exceed 1.7	$\alpha\beta_p$ =	1	
Reinforcement size:	γ_p =	if bar size is 6 or less, 0.8, else use 1.0	γ_p =	1	
Light weight concrete:	λ_p =	1.0	λ_p =	1.0	
Spacing/cover:	c_p =	use smaller of half of bar spacing or concrete cover	c_p =	3.44	in
Transverse bars:	k_{tr_p} =	0 in (per simplification)	k_{tr_p} =	0	in
Max term:	c_p' =	MIN(2.5, (c + ktr) / db)	c_p' =	2.500	
Required moment (φt = 0.9):	M_{nr} =	Mu_pad / φflex	M_{nr} =	939.9	ft-kips
Steel estimate:	A_{st_p}' =	Mn / (φt * Fy * dc)	A_{st_p}' =	15.260	in^2
	a_p =	Ast' * Fy / (β * F'c * W)	a_p =	0.66	in
Required steel:	$A_{st\_p\_st}$ =	M_{nr} / (Fy * (dc - ap / 2))	$A_{st\_p\_st}$ =	14.072	in^2
Excess reinforcement:	R_p =	Ast_p / As_p	R_p =	0.98	
Development (tensile):	L_d =	(3 / 40) * (Fy*1000 / √(F'c*1000)) * αβ * γ * λ * R * db / c'	L_d =	28.26	in
Minimum length:	L_{d_min} =	12 inches	L_{d_min} =	12.0	in
Development length:	L_{dp} =	MAX(Ld_min, Ldp')	L_{dp} =	28.26	in
Length available in pad:	L_{pad} =	12*MIN((W/2-(2/3)*BW*cos(30°)+Offset-dpier/2),(W-BW-dpier)/2)- ccpad	L_{pad} =	41.74	in

Check **L_{pad} = 41.74 in >= L_{dp} = 28.26 in** **OK**

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F, G, or H

Note: **Shaft assumed to have ties, not spiral, transverse reinforcing**

Site Data

ES-038
TalcottRS

Loads Already Factored		
For M (WL):	1.00	
For P (DL):	1.00	

Pier Properties		
Concrete:		
Pier Diameter =	6.0	ft
Concrete Area =	4071.5	in^2
Reinforcement:		
Clear Cover to **Tie**=	3.00	in
Horiz. **Tie** Bar Size=	3	
Vert. Cage Diameter =	5.36	ft
Vert. Cage Diameter =	64.38	in
Vertical Bar Size =	7	
Bar Diameter =	0.88	in
Bar Area =	0.6	in^2
Number of Bars =	34	
As Total=	20.4	in^2
A s/ Aconc, Rho:	0.0050	0.50%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:

(3)*(Sqrt(f'c)/Fy:	0.0027
200 / Fy:	0.0033

Minimum Rho Check:

Assumed Min. Rho:	0.50%	
Provided Rho:	0.50%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn. Pn		
per ACI 318 (10-2)	6008.24	kips
at Mu=(ϕ=0.65)Mn=	3142.84	ft-kips
Max Tu, (φ=0.9) Tn =	1101.6	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces		
TIA Revision:	H	
Max. Factored Shaft Mu:	396	ft-kips **(* Note)**
Max. Factored Shaft Pu:	384	kips
Max Axial Force Type:	Tension	

(*) Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

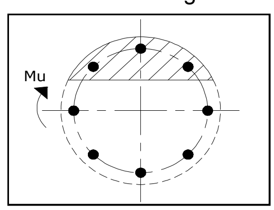
Load Factor	**Shaft Factored Loads**		
1.00	Mu:	396	ft-kips
1.00	Pu:	384	kips

Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2014	

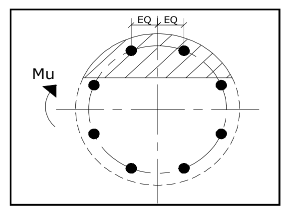
SOLVE <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **1**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**7.92**	in
Extreme Steel Strain, εt:	**0.0228**	
εt > 0.0050, Tension Controlled		
Reduction Factor,φ:	**0.900**	

Output Note: Negative Pu=Tension		
For Axial Compression, φ Pn = Pu:	-345.60	kips
Drilled Shaft Moment Capacity, φMn:	**1967.66**	ft-kips
Drilled Shaft Superimposed Mu:	**396.00**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**20.1%**

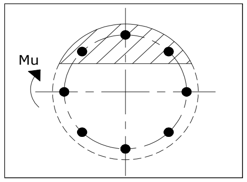
Maximum Allowable Moment of a Circular Pier

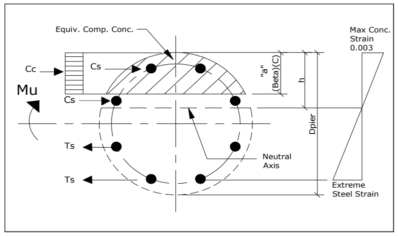
Pu: 384 kips (from Results Tab)
Axial Force type: Tension (from Results Tab)

For Internal Calculations:
Axial Load (Negative for Compression) = 384.00 kips

	Case 1	Case 2	
Reduction factor, ϕ2002 =	0.90	0.90	<-- ϕ based on ACI 318 2002, Section 9.3.2.2 and corresponding comentaries. Transition zone equation for ties: φ=0.48+83(εt). Transition zone equation for spirals: φ=0.57+67(εt).
Reduction factor, ϕ2005 =	0.90	0.90	<-- ϕ based on ACI 318 2005, Section 9.3.2.2 and corresponding comentaries. Transition zone equation for ties: φ=0.65+((εt)-0.002)(250/3). Transition zone equation for spirals: φ=0.70+((εt)-0.002)(200/3).
Reduction factor, ϕ2014 =	0.90	0.90	<-- ϕ based on ACI 318 2014, Section 21.2 and corresponding comentaries. Transition zone equation for ties: φ=0.65+0.25((εt-εty)/(0.005-εty). Transition zone equation for spirals: φ=0.75+0.15((εt-εty)/(0.005-εty).
ℹ ACI code:	0.90	0.90	

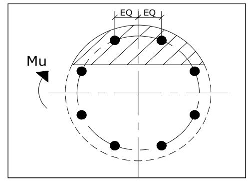
Case 1: Single Bar Near the Extreme Fiber





General Sketch (Variables) for both cases

Case 2: (2) Equidistant Bars Near the Extreme Fiber



Case 1

Neutral Axis

Distance from extreme edge to neutral axis, h = 7.92 in
Equivalent compression zone factor = 0.85
Distance from extreme edge to
equivalent compression zone factor, a = 6.74 in
Distance from centroid to neutral axis = 28.08 in

Compression Zone

Area of steel in compression zone, Asc = 3.00 in^2
Angle from centroid of pier to intersection of
equivalent compression zone and edge of pier = 35.62 deg <-- 1/2 of total angle
Area of concrete in compression, Acc = 192.13 in^2
Force in concrete = 0.85 * f'c * Acc, Fc = 489.93 kips <-- ϕ Not Involved = Concrete Pn
Total reinforcement forces, Fs = -873.93 kips <-- ϕ Not Involved = Total Steel Pn
Case 1, φ= 0.900
Axial (comp=negative), Pu = 384.00 kips <-- Pu
Balance Force in concrete, Fs+Fu = -489.93 kips
Shaft Comp. Capacity, ϕPn= **-345.60** kips <--φ Pn=Pu

Sum of the axial forces in the shaft = 0.00 kips OK

Maximum Moment

First moment of the concrete
area in compression about the centoid = 6144.56 in^3
Distance between centroid of concrete
in compression and centroid of pier = 31.98 in
Moment of concrete in compression = 15668.62 in-kips 1305.718 ft-kips
Total reinforcement moment = 10566.84 in-kips 880.5701 ft-kips
Nominal Moment strength of Drilled Shaft Mn = 26235.46 in-kips
Moment Capacity of Drilled Shaft, ϕMn = 23611.91 in-kips 1967.659 ft-kips

Case 1, φMn = 1967.66 ft-kips

Case 2

Neutral Axis

Distance from extreme edge to neutral axis, h = 7.92 in
Equivalent compression zone factor = 0.85
Distance from extreme edge to
equivalent compression zone factor, a = 6.73 in
Distance from centroid to neutral axis = 28.08 in

Compression Zone

Area of steel in compression zone, Asc = 2.40 in^2
Angle from centroid of pier to intersection of
equivalent compression zone and edge of pier = 35.61 deg <-- 1/2 of total angle
Area of concrete in compression, Acc = 192.03 in^2
Force in concrete = 0.85 * f'c * Acc, Fc = 489.67 kips <-- ϕ Not Involved = Concrete Pn
Total reinforcement forces, Fs = -873.67 kips <-- ϕ Not Involved = Total Steel Pn
Case 2, φ= 0.900
Axial (comp=negative), Pu = 384.00 kips <-- Pu
Balance Force in concrete, Fs+Fu = -489.67 kips
Shaft Comp. Capacity, ϕPn= **-345.60** kips <--φ Pn=Pu

Sum of the axial forces in concrete in the shaft= 0.00 kips OK

Maximum Moment

First moment of the concrete
area in compression about the centoid = 6141.57 in^3
Distance between centroid of concrete
in compression and centroid of pier = 31.98 in
Moment of concrete in compression = 15661.00 in-kips 1305.084 ft-kips
Total reinforcement moment = 10589.58 in-kips 882.4653 ft-kips
Nominal Moment strength of Drilled Shaft Mn = 26250.59 in-kips
Moment Capacity of Drilled Shaft, ϕMn = 23625.53 in-kips 1968.794 ft-kips

Case 2, φMn = 1968.79 ft-kips

Case 3: = Case 1, but Pu set at Max Axial Compression per ACI 318 (10-2) and phi=0.65.

Neutral Axis

Distance from extreme edge to neutral axis, h = 65.27 in
Equivalent compression zone factor = 0.85
Distance from extreme edge to
equivalent compression zone factor, a = 55.48 in
Distance from centroid to neutral axis = -29.27 in

Compression Zone

Area of steel in compression zone, Asc = 15.00 in^2
Angle from centroid of pier to intersection of
equivalent compression zone and edge of pier = 122.76 deg <-- 1/2 of total angle
Area of concrete in compression, Acc = 3366.47 in^2
Force in concrete = 0.85 * f'c * Acc, Fc = 8584.50 kips <-- ϕ Not Involved = Concrete Pn
Total reinforcement forces, Fs = 658.95 kips <-- ϕ Not Involved = Total Steel Pn
φ= 0.65
Magnified, Max Axial Comp, Pn, per ACI 318 (10-2)/(ϕ=0.65)= -9243.45 kips <-- (Pn per ACI 10-2)/ϕ
Balance Force in concrete, Fs+Fu = -8584.50 kips
Shaft Comp. Capacity, (ϕ=0.65)Pn= **6008.24** kips <--φ Pn=Pu

Sum of the axial forces in the shaft = 0.00 kips OK

Maximum Moment

First moment of the concrete
area in compression about the centoid = 18498.58 in^3
Distance between centroid of concrete
in compression and centroid of pier = 5.49 in
Moment of concrete in compression = 47171.37 in-kips 3930.948 ft-kips
Total reinforcement moment = 10850.35 in-kips 904.1957 ft-kips
Nominal Moment strength of Drilled Shaft Mn = 58021.72 in-kips
Moment Capacity of Drilled Shaft, (ϕ=0.65)Mn = 37714.12 in-kips 3142.843 ft-kips

Case 3, at Pmax, (φ=0.65)Mn = 3142.84 ft-kips

Final Results

Final Results		
Governing Orientation Case=	1	
phi, φ=	0.900	
Shaft ϕ*Mn=	**1967.66**	ft-kips
Distance from Edge of Shaft to N.A.=	7.92	in
Shaft Beta=	0.85	
Maximum Tensile Strain=	-0.02281	<------------ εt > 0.0050, Tension Controlled — TC
Shaft Tension Cap., φTn= (φ=0.9)*(Total As)(Fy)=	1101.60	kips
Shaft Max Comp, (φ=0.65)(0.80)[0.85*f'c*(Ag-Ast)+Ast*Fy]=	6008.24	kips

Individual Bars (Case 1)

Bar #	Angle from first bar (deg)	Distance to center of shaft (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in^2)	Stress (ksi)	Axial force (kips)	Moment (in-kips)
1	0.00	32.19	4.11	2.92	0.00156	0.60	45.14	25.56	822.57
2	10.59	31.64	3.56	2.38	0.00135	0.60	39.13	21.95	694.34
3	21.18	30.01	1.94	0.75	0.00073	0.60	21.28	11.24	337.29
4	31.76	27.37	-0.71	-1.90	-0.00027	0.00	-7.79	-4.67	-127.88
5	42.35	23.79	-4.29	-5.48	-0.00162	0.00	-47.09	-28.25	-672.03
6	52.94	19.40	-8.68	-9.87	-0.00329	0.00	-60.00	-36.00	-698.30
7	63.53	14.35	-13.73	-14.92	-0.00520	0.00	-60.00	-36.00	-516.50
8	74.12	8.81	-19.27	-20.46	-0.00729	0.00	-60.00	-36.00	-317.11
9	84.71	2.97	-25.11	-26.29	-0.00950	0.00	-60.00	-36.00	-106.92
10	95.29	-2.97	-31.05	-32.23	-0.01175	0.00	-60.00	-36.00	106.92
11	105.88	-8.81	-36.88	-38.07	-0.01396	0.00	-60.00	-36.00	317.11
12	116.47	-14.35	-42.42	-43.61	-0.01606	0.00	-60.00	-36.00	516.50
13	127.06	-19.40	-47.47	-48.66	-0.01797	0.00	-60.00	-36.00	698.30
14	137.65	-23.79	-51.86	-53.05	-0.01963	0.00	-60.00	-36.00	856.33
15	148.24	-27.37	-55.44	-56.63	-0.02099	0.00	-60.00	-36.00	985.19
16	158.82	-30.01	-58.09	-59.28	-0.02199	0.00	-60.00	-36.00	1080.50
17	169.41	-31.64	-59.72	-60.90	-0.02261	0.00	-60.00	-36.00	1139.02
18	180.00	-32.19	-60.26	-61.45	-0.02281	0.00	-60.00	-36.00	1158.75
19	190.59	-31.64	-59.72	-60.90	-0.02261	0.00	-60.00	-36.00	1139.02
20	201.18	-30.01	-58.09	-59.28	-0.02199	0.00	-60.00	-36.00	1080.50
21	211.76	-27.37	-55.44	-56.63	-0.02099	0.00	-60.00	-36.00	985.19
22	222.35	-23.79	-51.86	-53.05	-0.01963	0.00	-60.00	-36.00	856.33
23	232.94	-19.40	-47.47	-48.66	-0.01797	0.00	-60.00	-36.00	698.30
24	243.53	-14.35	-42.42	-43.61	-0.01606	0.00	-60.00	-36.00	516.50
25	254.12	-8.81	-36.88	-38.07	-0.01396	0.00	-60.00	-36.00	317.11
26	264.71	-2.97	-31.05	-32.23	-0.01175	0.00	-60.00	-36.00	106.92
27	275.29	2.97	-25.11	-26.29	-0.00950	0.00	-60.00	-36.00	-106.92
28	285.88	8.81	-19.27	-20.46	-0.00729	0.00	-60.00	-36.00	-317.11
29	296.47	14.35	-13.73	-14.92	-0.00520	0.00	-60.00	-36.00	-516.50
30	307.06	19.40	-8.68	-9.87	-0.00329	0.00	-60.00	-36.00	-698.30
31	317.65	23.79	-4.29	-5.48	-0.00162	0.00	-47.09	-28.25	-672.03
32	328.24	27.37	-0.71	-1.90	-0.00027	0.00	-7.79	-4.67	-127.88
33	338.82	30.01	1.94	0.75	0.00073	0.60	21.28	11.24	337.29
34	349.41	31.64	3.56	2.38	0.00135	0.60	39.13	21.95	694.34
				Min-->	-0.02281	3.00		-873.93	10566.84
									880.5701

(Case 2)

Bar #	Angle from first bar (deg)	Distance to center of shaft (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in^2)	Stress (ksi)	Axial force (kips)	Moment (in-kips)
1	5.29	32.05	3.97	2.78	0.00150	0.60	43.62	24.64	789.78
2	15.88	30.96	2.88	1.69	0.00109	0.60	31.63	17.45	540.22
3	26.47	28.81	0.73	-0.45	0.00028	0.60	8.07	4.84	139.46
4	37.06	25.69	-2.39	-3.58	-0.00091	0.00	-26.28	-15.77	-404.95
5	47.65	21.68	-6.39	-7.58	-0.00242	0.00	-60.00	-36.00	-780.64
6	58.24	16.94	-11.13	-12.32	-0.00422	0.00	-60.00	-36.00	-610.00
7	68.82	11.63	-16.45	-17.64	-0.00623	0.00	-60.00	-36.00	-418.59
8	79.41	5.91	-22.16	-23.35	-0.00839	0.00	-60.00	-36.00	-212.92
9	90.00	0.00	-28.08	-29.27	-0.01063	0.00	-60.00	-36.00	0.00
10	100.59	-5.91	-33.99	-35.18	-0.01287	0.00	-60.00	-36.00	212.92
11	111.18	-11.63	-39.71	-40.89	-0.01504	0.00	-60.00	-36.00	418.59
12	121.76	-16.94	-45.02	-46.21	-0.01705	0.00	-60.00	-36.00	610.00
13	132.35	-21.68	-49.76	-50.95	-0.01885	0.00	-60.00	-36.00	780.64
14	142.94	-25.69	-53.76	-54.95	-0.02036	0.00	-60.00	-36.00	924.70
15	153.53	-28.81	-56.89	-58.08	-0.02155	0.00	-60.00	-36.00	1037.27
16	164.12	-30.96	-59.04	-60.23	-0.02236	0.00	-60.00	-36.00	1114.52
17	174.71	-32.05	-60.13	-61.32	-0.02277	0.00	-60.00	-36.00	1153.81
18	185.29	-32.05	-60.13	-61.32	-0.02277	0.00	-60.00	-36.00	1153.81
19	195.88	-30.96	-59.04	-60.23	-0.02236	0.00	-60.00	-36.00	1114.52
20	206.47	-28.81	-56.89	-58.08	-0.02155	0.00	-60.00	-36.00	1037.27
21	217.06	-25.69	-53.76	-54.95	-0.02036	0.00	-60.00	-36.00	924.70
22	227.65	-21.68	-49.76	-50.95	-0.01885	0.00	-60.00	-36.00	780.64
23	238.24	-16.94	-45.02	-46.21	-0.01705	0.00	-60.00	-36.00	610.00
24	248.82	-11.63	-39.71	-40.89	-0.01504	0.00	-60.00	-36.00	418.59
25	259.41	-5.91	-33.99	-35.18	-0.01287	0.00	-60.00	-36.00	212.92
26	270.00	0.00	-28.08	-29.27	-0.01063	0.00	-60.00	-36.00	0.00
27	280.59	5.91	-22.16	-23.35	-0.00839	0.00	-60.00	-36.00	-212.92
28	291.18	11.63	-16.45	-17.64	-0.00623	0.00	-60.00	-36.00	-418.59
29	301.76	16.94	-11.13	-12.32	-0.00422	0.00	-60.00	-36.00	-610.00
30	312.35	21.68	-6.39	-7.58	-0.00242	0.00	-60.00	-36.00	-780.64
31	322.94	25.69	-2.39	-3.58	-0.00091	0.00	-26.28	-15.77	-404.95
32	333.53	28.81	0.73	-0.45	0.00028	0.60	8.07	4.84	139.46
33	344.12	30.96	2.88	1.69	0.00109	0.60	31.63	17.45	540.22
34	354.71	32.05	3.97	2.78	0.00150	0.60	43.62	24.64	789.78
				Min-->	-0.02277	2.40		-873.67	10589.58
									882.4653

Individual Bars (Case 3)

Bar #	Angle from first bar (deg)	Distance to center of shaft (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in^2)	Stress (ksi)	Axial force (kips)	Moment (in-kips)
1	0.00	32.19	61.46	51.67	0.00282	0.60	60.00	34.47	1109.50
2	10.59	31.64	60.91	51.12	0.00280	0.60	60.00	34.47	1090.61
3	21.18	30.01	59.28	49.49	0.00272	0.60	60.00	34.47	1034.58
4	31.76	27.37	56.64	46.85	0.00260	0.60	60.00	34.47	943.32
5	42.35	23.79	53.06	43.27	0.00244	0.60	60.00	34.47	819.93
6	52.94	19.40	48.67	38.88	0.00224	0.60	60.00	34.47	668.63
7	63.53	14.35	43.62	33.83	0.00200	0.60	58.14	33.35	478.52
8	74.12	8.81	38.08	28.29	0.00175	0.60	50.76	28.92	254.77
9	84.71	2.97	32.24	22.45	0.00148	0.60	42.97	24.25	72.03
10	95.29	-2.97	26.30	16.51	0.00121	0.60	35.06	19.50	-57.92
11	105.88	-8.81	20.46	10.67	0.00094	0.60	27.27	14.83	-130.67
12	116.47	-14.35	14.92	5.13	0.00069	0.60	19.89	10.40	-149.28
13	127.06	-19.40	9.87	0.08	0.00045	0.60	13.16	6.37	-123.48
14	137.65	-23.79	5.48	-4.31	0.00025	0.00	7.31	4.39	-104.31
15	148.24	-27.37	1.90	-7.89	0.00009	0.00	2.54	1.52	-41.67
16	158.82	-30.01	-0.74	-10.53	-0.00003	0.00	-0.99	-0.59	17.85
17	169.41	-31.64	-2.37	-12.16	-0.00011	0.00	-3.16	-1.89	59.95
18	180.00	-32.19	-2.92	-12.71	-0.00013	0.00	-3.89	-2.33	75.10
19	190.59	-31.64	-2.37	-12.16	-0.00011	0.00	-3.16	-1.89	59.95
20	201.18	-30.01	-0.74	-10.53	-0.00003	0.00	-0.99	-0.59	17.85
21	211.76	-27.37	1.90	-7.89	0.00009	0.00	2.54	1.52	-41.67
22	222.35	-23.79	5.48	-4.31	0.00025	0.00	7.31	4.39	-104.31
23	232.94	-19.40	9.87	0.08	0.00045	0.60	13.16	6.37	-123.48
24	243.53	-14.35	14.92	5.13	0.00069	0.60	19.89	10.40	-149.28
25	254.12	-8.81	20.46	10.67	0.00094	0.60	27.27	14.83	-130.67
26	264.71	-2.97	26.30	16.51	0.00121	0.60	35.06	19.50	-57.92
27	275.29	2.97	32.24	22.45	0.00148	0.60	42.97	24.25	72.03
28	285.88	8.81	38.08	28.29	0.00175	0.60	50.76	28.92	254.77
29	296.47	14.35	43.62	33.83	0.00200	0.60	58.14	33.35	478.52
30	307.06	19.40	48.67	38.88	0.00224	0.60	60.00	34.47	668.63
31	317.65	23.79	53.06	43.27	0.00244	0.60	60.00	34.47	819.93
32	328.24	27.37	56.64	46.85	0.00260	0.60	60.00	34.47	943.32
33	338.82	30.01	59.28	49.49	0.00272	0.60	60.00	34.47	1034.58
34	349.41	31.64	60.91	51.12	0.00280	0.60	60.00	34.47	1090.61
				Min-->	-0.00013	15.00		658.95	10850.35
									904.1957

TIA-222- H

FACTORED LOADS

Axial Load 0.9D:	$P_{\_0.9D}$ = 0.9 * Pcomp / 1.2	$P_{\_0.9D}$ =	84.00	kip
Axial Load 1.2D:	$P_{\_1.2D}$ = 1.2 * Pcomp / 1.2	$P_{\_1.2D}$ =	112.00	kip
Shear Load:	V_u = Vu_comp	V_u =	132.00	kip
Moment:	M_u = Mu	M_u =	14011.00	kip*ft

PASSIVE PRESSURE RESISTANCE

Force of Pp Applied on Pier:	$Force_{pier}$ = MIN(Vu,Sum(Pp!M2:M7)))	$Force_{pier}$ =	57.02	kip
Moment Arm of Pp on Pier:	M_{arm_pier} = D-T-Pp!O2 + T	M_{arm_pier} =	2.57	ft
Force of Pp Applied on Pad:	$Force_{pad}$ = MIN(Vu-$Force_{pier}$,SUM(Pp!M8:M13))	$Force_{pad}$ =	74.98	kip
Moment Arm of Pp on Pad:	M_{arm_pad} = D-Pp!O8	M_{arm_pad} =	0.74	ft
Unfactored Moment Resistance due to Passive Pressure:	$M_{R\_Pp} = Force_{pier}*M_{arm\_pier}+Force_{pad}*M_{arm\_pad}$	M_{R_Pp} =	202.03	kip*ft
Factored Moment Resistance due to Passive Pressure:	$\Phi M_{R\_Pp} = \Phi_s * M_{R\_Pp}$	ΦM_{R_Pp} =	151.52	kip*ft

ELASTIC BEARING PRESSURE & OVERTURNING MOMENT

*Compressive Load for Bearing (0.9*D LC):*	$P_{bearing\_0.9\_e}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_0.9_bearing_e	$P_{bearing\_0.9\_e}$ =	1554.72	kip	
*Compressive Load for Bearing (1.2*D LC):*	$P_{bearing\_1.2\_e}$ = P_1.2D+1.2*(Ws+Wc)+0.75*Wwedges_1.2_bearing_e	$P_{bearing\_1.2\_e}$ =	2072.96	kip	
*Factored Overturning Moment (0.9*D LC):*	$M_{overturning\_0.9}$ = M + V * (MAX(T,D) + E + bpdist/12) + (0.9)*(P/1.2+3*Wpier)*Offset	$M_{overturning\_0.9}$ =	15838.53	kip*ft	
*Factored Overturning Moment (1.2*D LC):*	$M_{overturning\_1.2}$ = M + V * (MAX(T,D) + E + bpdist/12) + (1.2)*(P/1.2+3*Wpier)*Offset	$M_{overturning\_1.2}$ =	16110.37	kip*ft	
Area of Pad:	Area = W^2	Area =	2070.25	ft^2	
Elastic Section Modulus of Pad:	S = W^3 / 6	S =	15699.40	ft^3	
*Preliminary Load Eccentricity (0.9*D LC):*	$pre\_ec_{\_0.9\_e} = M_{overturning}/P_{bearing\_0.9}$	$pre\_ec_{\_0.9\_e}$ =	10.19	ft	
*Preliminary Load Eccentricity (1.2*D LC):*	$pre\_ec_{\_1.2\_e} = M_{overturning}/P_{bearing\_1.2}$	$pre\_ec_{\_1.2\_e}$ =	7.77	ft	
*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):*	$ec_{\_0.9\_e}$ = *goal seek*	$ec_{\_0.9\_e}$ =	9.75	ft	L/6 < e <= l
*[Goal Seek] Load Eccentricity Iteration (1.2*D LC):*	$ec_{\_1.2\_e}$ = *goal seek*	$ec_{\_1.2\_e}$ =	7.58	ft	L/6 < e <= l
*Non-Bearing Length (0.9*D LC):*	$NBL_{\_0.9\_e}$ = W-(W/2-ec_0.9_e)*3	$NBL_{\_0.9\_e}$ =	6.49	ft	
*Non-Bearing Length (1.2*D LC):*	$NBL_{\_1.2\_e}$ = W-(W/2-ec_1.2_e)*3	$NBL_{\_1.2\_e}$ =	0.00	ft	
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):*	$\Phi M_{Resisting\_0.9\_e} = \Phi M_{R\_Pp}$ + SUM($\Phi M_{R\_wedges\_0.9}$,$\Phi M_{R\_shear\_0.9}$)	$\Phi M_{Resisting\_0.9\_e}$ =	683.00	kip*ft	
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (1.2*D LC):*	$\Phi M_{Resisting\_1.2\_e} = \Phi M_{R\_Pp}$ + SUM($\Phi M_{R\_wedges\_1.2}$,$\Phi M_{R\_shear\_1.2}$)	$\Phi M_{Resisting\_1.2\_e}$ =	390.44	kip*ft	
*Adjusted Overturning Moment (0.9*D LC):*	$M_{overturning\_0.9\_e} = M_{overturning} - \Phi M_{Resisting\_0.9}$	$M_{overturning\_0.9\_e}$ =	15155.52	kip*ft	
*Adjusted Overturning Moment (1.2*D LC):*	$M_{overturning\_1.2\_e} = M_{overturning} - \Phi M_{Resisting\_1.2}$	$M_{overturning\_1.2\_e}$ =	15719.93	kip*ft	
*Total Resistance to Overturning (0.9*D LC):*	$\Phi M_{Resisting\_qu\_0.9\_e} = P_{bearing\_0.9}*ec_{\_0.9\_p} + \Phi M_{Resisting\_0.9}$	$\Phi M_{Resisting\_qu\_0.9\_e}$ =	15838.53	kip*ft	
*Total Resistance to Overturning (1.2*D LC):*	$\Phi M_{Resisting\_qu\_1.2\_e} = P_{bearing\_1.2}*ec_{\_1.2\_p} + \Phi M_{Resisting\_1.2}$	$\Phi M_{Resisting\_qu\_1.2\_e}$ =	16110.37	kip*ft	
[Goal Seek] Moment Comparison Iteration (0.9D LC):	$\Delta M_{\_0.9\_e} = M_{overturning} - \Phi M_{Resisting\_qu\_0.9}$	$\Delta M_{\_0.9\_e}$ =	0.00	kip*ft	
[Goal Seek] Moment Comparison Iteration (1.2D LC):	$\Delta M_{\_1.2\_e} = M_{overturning} - \Phi M_{Resisting\_qu\_1.2}$	$\Delta M_{\_1.2\_e}$ =	0.00	kip*ft	

Bearing Pressures

*Orthogonal Bearing Pressure (0.9*D LC):*	$q_{u\_orth\_0.9\_e}$ = ((2/3)*Pbearing_0.9_e) / (W*(W/2-ec_0.9_e))	$q_{u\_orth\_0.9\_e}$ =	1.75	ksf
*Orthogonal Bearing Pressure (1.2*D LC):*	$q_{u\_orth\_1.2\_e}$ = ((2/3)*Pbearing_1.2_e) / (W*(W/2-ec_1.2_e))	$q_{u\_orth\_1.2\_e}$ =	2.00	ksf
Ultimate Gross Bearing Pressure:	Q_{ult} = Qult	Q_{ult} =	20.00	ksf
Factored Ultimate Gross Bearing Pressure:	Qa = φs * Qult	Qa =	15.00	ksf

Check **Qa = 15.00 ksf >= q_u = 2.00 ksf** **RATING: 13.35% OK**

Soil Wedges (Cohesionless Soil)

Soil (above pad) Height:	soilht = D-T	soilht =	5.50	ft
Soil (above pad & under water table) Height:	soilht_gw = MIN(soilht-gw,D-T)	soilht_gw =	0.00	ft
Soil Wedge Projection at Grade:	$Wedge_{\_proj}$ = 0	$Wedge_{\_proj}$ =	0.00	ft
Soil Wedge Projection at Water Table:	$Wedge_{\_proj\_gw}$ = 0	$Wedge_{\_proj\_gw}$ =	0.00	ft

Soil Wedges (Cohesionless Soil) (0.9*D LC)

Soil	Volume (ft^3)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	45.50	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00

(2) Partial Sides (above Water Table)	0.00	0.00	42.25	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	42.25	0.00
(1) Rear (above Water Table)	0.00	0.00	45.50	0.00
(1) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Eccentricity relative to W/2:

Total Moment Arm (ft) =	0.00
Soil Wedge Wt (kip)=	0.00

*Unfactored Resisting Moment of Wedges (0.9*D LC):* $M_{R\_wedges\_0.9\_e}$ = Total Moment Arm * Soil Wedge Wt — $M_{R\_wedges\_0.9\_e}$ = 0.00 kip*ft

*Factored Resisting Moment of Wedges (0.9*D LC):* $\Phi M_{R\_wedges\_0.9\_e}$ = 0.75*MR_wedges_0.9_e — $\Phi M_{R\_wedges\_0.9\_e}$ = 0.00 kip*ft

Soil Wedges (Cohesionless Soil) (1.2*D LC)

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	45.50	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	0.00	0.00	45.50	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	45.50	0.00
(1) Rear (above Water Table)	0.00	0.00	45.50	0.00
(1) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Eccentricity relative to W/2:

Total Moment Arm (ft) =	0.00
Soil Wedge Wt (kip)=	0.00

*Unfactored Resisting Moment of Wedges (1.2*D LC):* $M_{R\_wedges\_1.2\_e}$ = Total Moment Arm * Soil Wedge Wt — $M_{R\_wedges\_1.2\_e}$ = 0.00 kip*ft

*Factored Resisting Moment of Wedges (1.2*D LC):* $\Phi M_{R\_wedges\_1.2\_e}$ = 0.75*MR_wedges_1.2_e — $\Phi M_{R\_wedges\_1.2\_e}$ = 0.00 kip*ft

Soil Shear Strength (Cohesive Soil)

Soil Shear Strength (Cohesive Soil) (0.9*D LC)

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
Rear	100.10	25.03	45.50	1138.64
(2) Partial Sides	28.57	7.14	42.25	301.84
Total		32.17		1440.48

Eccentricity relative to W/2:

Total Moment Arm (ft) =	22.03
Soil Shear Strength (kip)=	32.17

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):* $M_{R\_shear\_0.9\_e}$ = Total Moment Arm * Soil Shear Strength — $M_{R\_shear\_0.9\_e}$ = 708.64 kip*ft

*Factored Resisting Moment of Soil Shear (0.9*D LC):* $\Phi M_{R\_shear\_0.9\_e}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) — $\Phi M_{R\_shear\_0.9\_e}$ = 531.48 kip*ft

Soil Shear Strength (Cohesive Soil) (1.2*D LC)

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
Rear	100.10	25.03	45.50	1138.64
(2) Partial Sides	0.00	0.00	45.50	0.00
Total		25.03		1138.64

Eccentricity relative to W/2:

Total Moment Arm (ft) =	22.75
Soil Shear Strength (kip)=	14.00

*Unfactored Resisting Moment of Soil Shear (1.2*D LC):* $M_{R\_shear\_1.2\_e}$ = Total Moment Arm * Soil Shear Strength — $M_{R\_shear\_1.2\_e}$ = 318.55 kip*ft

*Factored Resisting Moment of Soil Shear (1.2*D LC):* $\Phi M_{R\_shear\_1.2\_e}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) — $\Phi M_{R\_shear\_1.2\_e}$ = 238.91 kip*ft

DETERMINE MOMENT THAT WOULD CAUSE 100% OVERTURNING (ORTHOGONAL)

*Compressive Load for Bearing (0.9*D LC):*	$P_{\_100\_e}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_100_e	$P_{\_100\_e}$ =	1554.72	kip
Preliminary Factored Overturning Moment:	pre_$M_{overturning_100_e}$ = P_100_e * (W/2 - ((2/3) * P_100_e) / (W * ΦQult))	pre_$M_{overturning_100_e}$ =	33008.77	kip*ft
*Preliminary Load Eccentricity (0.9*D LC):*	pre_$ec_{_100_e}$ = pre_$M_{overturning_100}$ / $P_{\_100}$	pre_$ec_{_100_e}$ =	21.23	ft
*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):*	$ec_{\_100\_e}$ = *goal seek*	$ec_{\_100\_e}$ =	21.13	ft
*Non-Bearing Length (0.9*D LC):*	$NBL_{\_100\_e}$ = W-(W/2-ec_100_e)*3	$NBL_{\_100\_e}$ =	40.65	ft
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):*	$\Phi M_{Resisting\_100\_e}$ = ΦM_{R_Pp} + SUM($\Phi M_{R\_wedges\_100}$,$\Phi M_{R\_shear\_100}$)	$\Phi M_{Resisting\_100\_e}$ =	659.81	kip*ft
Moment Created by Shear:	M_{shear_e} = V_u * (D+E+bp_{dist}/12)	M_{shear_e} =	1012.00	kip*ft
*Adjusted Overturning Moment (0.9*D LC):*	$M_{overturning\_100\_e}$ = $M_{u\_max\_100}$ - ΦM_{R_Pp}	$M_{overturning\_100\_e}$ =	33517.06	kip*ft
*Total Resistance to Overturning (0.9*D LC):*	$\Phi M_{Resisting\_qu\_100\_e}$ = $P_{\_100}$*$ec_{\_100}$ + $\Phi M_{Resisting\_100}$	$\Phi M_{Resisting\_qu\_100\_e}$ =	33517.06	kip*ft
[Goal Seek] Moment Comparison Iteration (0.9D LC):	$\Delta M_{\_100\_e}$ = $M_{overturning}$ - $\Phi M_{Resisting\_qu\_100}$	$\Delta M_{\_100\_e}$ =	0.00	ft
Maximum Applied Moment from Superstructure Analysis:	$M_{u\_max\_100\_e}$ = pre_Moverturning_100 + ΦMResisting_100	$M_{u\_max\_100\_e}$ =	33668.59	kip*ft

L/6 < e <= l

Check **Mu_max_100_e = 33668.59 kip*ft >= Mu = 15838.53 kip*ft** **RATING: 47.04% OK**

Soil Wedges (Cohesionless Soil) (0.9*D LC)

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	45.50	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	0.00	0.00	25.17	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	25.17	0.00
(1) Rear (above Water Table)	0.00	0.00	45.50	0.00
(1) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Eccentricity relative to W/2:

Total Moment Arm (ft) =	0.00
Soil Wedge Wt (kip)=	0.00

*Unfactored Resisting Moment of Wedges (0.9*D LC):* $M_{R\_wedges\_100\_e}$ = Total Moment Arm * Soil Wedge Wt — $M_{R\_wedges\_100\_e}$ = 0.00 kip*ft

*Factored Resisting Moment of Wedges (0.9*D LC):*	$\Phi M_{R\_wedges\_100\_e}$ = 0.75*MR_wedges_100_e	$\Phi M_{R\_wedges\_100\_e}$ =	0.00	kip*ft

Soil Shear Strength (Cohesive Soil) (0.9*D LC)

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)	Eccentricity relative to W/2:	
Rear	100.10	25.03	45.50	1138.64	Total Moment Arm (ft) =	9.72
(2) Partial Sides	178.87	44.72	25.17	1125.71		
Total		69.74		2264.35	Soil Shear Strength (kip)=	69.74

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):*	$M_{R\_shear\_100\_e}$ = Total Moment Arm * Soil Shear Strength	$M_{R\_shear\_100\_e}$ =	677.72	kip*ft
*Factored Resisting Moment of Soil Shear (0.9*D LC):*	$\Phi M_{R\_shear\_100\_e}$ = 0.75 * (Total Moment Arm * Soil Shear Strength)	$\Phi M_{R\_shear\_100\_e}$ =	508.29	kip*ft

PASSIVE PRESSURE RESISTANCE (DIAGONAL DIRECTION)

Force of Pp Applied on Pier:	$Force_{pier}$ = MIN(Vu,Sum(Pp!M2:M7))	$Force_{pier}$ =	57.02	kip
Moment Arm of Pp on Pier:	M_{arm_pier} = D-T-Pp!O2 + T	M_{arm_pier} =	2.57	ft
Force of Pp Applied on Pad:	$Force_{pad\_dia}$ = MIN(Vu-$Force_{pier}$,SUM(Pp!M8:M13))	$Force_{pad\_dia}$ =	74.98	kip
Moment Arm of Pp on Pad:	M_{arm_pad} = D-Pp!O8	M_{arm_pad} =	0.74	ft
Unfactored Moment Resistance due to Passive Pressure:	M_{R_Pp} = $Force_{pier}$*M_{arm_pier}+$Force_{pad}$*M_{arm_pad}	M_{R_Pp} =	202.03	kip*ft
Factored Moment Resistance due to Passive Pressure:	$\Phi M_{R\_Pp\_dia}$ = Φ_s*M_{R_Pp}	$\Phi M_{R\_Pp\_dia}$ =	151.52	kip*ft

PLASTIC BEARING PRESSURE & OVERTURNING MOMENT (DIAGONAL DIRECTION)

*Compressive Load for Bearing (0.9*D LC):*	$P_{bearing\_0.9\_dia\_e}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_0.9_bearing_dia_e	$P_{bearing\_0.9\_dia\_e}$ =	1554.72	kip	
*Compressive Load for Bearing (1.2*D LC):*	$P_{bearing\_1.2\_dia\_e}$ = P_1.2D+1.2*(Ws+Wc)+0.75*Wwedges_1.2_bearing_dia_e	$P_{bearing\_1.2\_dia\_e}$ =	2072.96	kip	
Factored Overturning Moment:	$M_{overturning}$ = M_u + V_u * (D+E+bp_{dist}/12)	$M_{overturning}$ =	15023.00	kip*ft	
Area of Pad:	Area = W²	Area =	2070.25	ft²	
*Preliminary Load Eccentricity (0.9*D LC):*	$pre\_ec_{\_0.9\_e\_dia}$ = $M_{overturning}$/$P_{bearing\_0.9\_dia\_e}$	$pre\_ec_{\_0.9\_e\_dia}$ =	10.19	ft	
*Preliminary Load Eccentricity (1.2*D LC):*	$pre\_ec_{\_1.2\_e\_dia}$ = $M_{overturning}$/$P_{bearing\_1.2\_dia\_e}$	$pre\_ec_{\_1.2\_e\_dia}$ =	7.64	ft	
*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):*	$ec_{\_0.9\_e\_dia}$ = *goal seek*	$ec_{\_0.9\_e\_dia}$ =	9.78	ft	(L/6)*SQRT
*[Goal Seek] Load Eccentricity Iteration (1.2*D LC):*	$ec_{\_1.2\_e\_dia}$ = *goal seek*	$ec_{\_1.2\_e\_dia}$ =	7.42	ft	(L/6)*SQRT
Elastic Section Modulus in Diagonal Direction:	$S_{\_dia}$ = (W³)/(6*SQRT(2))	$S_{\_dia}$ =	11101.15	ft³	
*Slope of Bearing Pressure in Diagonal Direction (0.9*D LC):*	$slope_{\_dia\_e\_0.9}$ = D_1*($q_{max\_dia\_0.9\_e}$/(W/2*SQRT(2)+D_1))	$slope_{\_dia\_e\_0.9}$ =	0.71	ft/ft	

*Diagonal Bearing Pressure Solution (if bearing area is > Area/2) (0.9*D LC):*

	Wedge 1	Wedge 2	Total
	14.73	2.26	
Volume (ft³):	285.11	1269.60	1554.72
Distance to Centroid from Center of Foundation (ft):	-4.47	12.98	9.78

*Slope of Bearing Pressure in Diagonal Direction (1.2*D LC):*	$slope_{\_dia\_e\_1.2}$ = D_2*($q_{max\_dia\_1.2\_e}$/(W/2*SQRT(2)+D_2))	$slope_{\_dia\_e\_1.2}$ =	1.00	ft/ft

*Diagonal Bearing Pressure Solution (if bearing area is > Area/2) (1.2*D LC):*

	Wedge 1	Wedge 2	Total
	22.58	2.41	
Volume (ft³):	553.85	1519.10	2072.96
Distance to Centroid from Center of Foundation (ft):	-6.38	12.45	7.42

*Non-Bearing Length (0.9*D LC):*	$NBL_{\_0.9\_dia\_e}$ = 0	$NBL_{\_0.9\_dia\_e}$ =	24.66	ft
*Non-Bearing Length (1.2*D LC):*	$NBL_{\_1.2\_dia\_e}$ = 0	$NBL_{\_1.2\_dia\_e}$ =	13.56	ft
*Non-Bearing Length (0.9*D LC):*	$NBL_{\_0.9\_dia\_e\_2}$ = 0	$NBL_{\_0.9\_dia\_e\_2}$ =	0.00	ft
*Non-Bearing Length (1.2*D LC):*	$NBL_{\_1.2\_dia\_e\_2}$ = 0	$NBL_{\_1.2\_dia\_e\_2}$ =	0.00	ft
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):*	$\Phi M_{Resisting\_0.9\_dia\_e}$ = $\Phi M_{R\_Pp\_dia}$ + SUM($\Phi M_{R\_wedges\_0.9\_dia\_e}$,$\Phi M_{R\_shear\_0.9\_dia\_e}$)	$\Phi M_{Resisting\_0.9\_dia\_e}$ =	628.75	kip*ft
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (1.2*D LC):*	$\Phi M_{Resisting\_1.2\_dia\_e}$ = $\Phi M_{R\_Pp\_dia}$ + SUM($\Phi M_{R\_wedges\_1.2\_dia\_e)}$,$\Phi M_{R\_shear\_1.2\_dia\_e}$)	$\Phi M_{Resisting\_1.2\_dia\_e}$ =	457.82	kip*ft
*Adjusted Overturning Moment (0.9*D LC):*	$M_{overturning\_0.9\_dia\_e}$ = $M_{overturning}$ - $\Phi M_{Resisting\_0.9\_dia\_e}$	$M_{overturning\_0.9\_dia\_e}$ =	15209.78	kip*ft
*Adjusted Overturning Moment (1.2*D LC):*	$M_{overturning\_1.2\_dia\_e}$ = $M_{overturning}$ - $\Phi M_{Resisting\_1.2\_dia\_e}$	$M_{overturning\_1.2\_dia\_e}$ =	15380.71	kip*ft
*Total Resistance to Overturning (0.9*D LC):*	$\Phi M_{Resisting\_qu\_0.9\_dia\_e}$ = $P_{bearing\_0.9\_dia\_e}$*$ec_{\_0.9\_e\_dia}$ + $\Phi M_{Resisting\_0.9\_dia\_e}$	$\Phi M_{Resisting\_qu\_0.9\_dia\_e}$ =	15838.53	kip*ft
*Total Resistance to Overturning (1.2*D LC):*	$\Phi M_{Resisting\_qu\_1.2\_dia\_e}$ = $P_{bearing\_1.2\_dia\_e}$*$ec_{\_1.2\_e\_dia}$ + $\Phi M_{Resisting\_1.2\_dia\_e}$	$\Phi M_{Resisting\_qu\_1.2\_dia\_e}$ =	15838.53	kip*ft
[Goal Seek] Moment Comparison Iteration (0.9D LC):	$\Delta M_{\_0.9\_dia\_e}$ = $M_{overturning}$-$\Phi M_{Resisting\_qu\_0.9\_dia\_e}$	$\Delta M_{\_0.9\_dia\_e}$ =	0.00	kip*ft
[Goal Seek] Moment Comparison Iteration (1.2D LC):	$\Delta M_{\_1.2\_dia\_e}$ = $M_{overturning}$-$\Phi M_{Resisting\_qu\_1.2\_dia\_e}$	$\Delta M_{\_1.2\_dia\_e}$ =	0.00	kip*ft

Bearing Pressures

*Diagonal Bearing Pressure (0.9*D LC):*	$q_{u\_dia\_0.9\_e}$ = qmax_dia_0.9_e	$q_{u\_dia\_0.9\_e}$ =	2.26	ksf
*Diagonal Bearing Pressure (1.2*D LC):*	$q_{u\_dia\_1.2\_e}$ = qmax_dia_1.2_e	$q_{u\_dia\_1.2\_e}$ =	2.41	ksf
Ultimate Gross Bearing Pressure:	Q_{ult} = Qult	Q_{ult} =	20.00	ksf
Factored Ultimate Gross Bearing Pressure:	ΦQult = φs * Qult	Qa =	15.00	ksf

Check	**ΦQult =**	**15.00**	**ksf**	**>=**	**q_u =**	**2.41**	**ksf**	**RATING:**	**16.08%**	**OK**

Soil Wedges (Cohesionless Soil)

Soil (above pad) Height: soilht = D-T soilht = 5.50 ft

Soil (above pad & under water table) Height: soilht_gw = MIN(soilht-gw,D-T) soilht_gw = 0.00 ft

Soil Wedge Projection at Grade: $Wedge_{\_proj}$ = 0 $Wedge_{\_proj}$ = 0.00 ft

Soil Wedge Projection at Water Table: $Wedge_{\_proj\_gw}$ = 0 $Wedge_{\_proj\_gw}$ = 0.00 ft

Soil Wedges (Cohesionless Soil) (0.9*D LC)

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	0.00	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(1) End Prism (above Water Table)	0.00	0.00	0.00	0.00
(1) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Rear Sides (above Water Table)	0.00	0.00	0.00	0.00
(2) Rear Sides (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Eccentricity relative to W/2*SQRT(2):

Total Moment Arm (ft) =	0.00
Soil Wedge Wt (kip)=	0.00

*Unfactored Resisting Moment of Wedges (0.9*D LC):* $M_{R\_wedges\_0.9}$ = Total Moment Arm * Soil Wedge Wt $M_{R\_wedges\_0.9\_dia\_e}$ = 0.00 kip*ft

*Factored Resisting Moment of Wedges (0.9*D LC):* $\Phi M_{R\_wedges\_0.9}$ = 0.75*MR_wedges_0.9_dia $\Phi M_{R\_wedges\_0.9\_dia\_e}$ = 0.00 kip*ft

Soil Wedges (Cohesionless Soil) (1.2*D LC)

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	0.00	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(1) End Prism (above Water Table)	0.00	0.00	0.00	0.00
(1) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	0.00	0.00
(2) Rear (above Water Table)	0.00	0.00	0.00	0.00
(2) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Eccentricity relative to W/2*SQRT(2):

Total Moment Arm (ft) =	0.00
Soil Wedge Wt (kip)=	0.00

*Unfactored Resisting Moment of Wedges (1.2*D LC):* $M_{R\_wedges\_1.2}$ = Total Moment Arm * Soil Wedge Wt $M_{R\_wedges\_1.2\_dia\_e}$ = 0.00 kip*ft

*Factored Resisting Moment of Wedges (1.2*D LC):* $\Phi M_{R\_wedges\_1.2}$ = 0.75*MR_wedges_1.2_dia $\Phi M_{R\_wedges\_1.2\_dia\_e}$ = 0.00 kip*ft

Soil Shear Strength (Cohesive Soil)

Soil Shear Strength (Cohesive Soil) (0.9*D LC)

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) Rear	108.52	27.13	55.63	1509.17
(2) Partial Sides	0.00	0.00	32.17	0.00
Total		27.13		1509.17

Eccentricity relative to W/2*SQRT(2):

Total Moment Arm (ft) =	23.45
Soil Shear Strength (kip)=	27.13

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):* $M_{R\_shear\_0.9}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_0.9\_dia\_e}$ = 636.30 kip*ft

*Factored Resisting Moment of Soil Shear (0.9*D LC):* $\Phi M_{R\_shear\_0.9}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_0.9\_dia\_e}$ = 477.22 kip*ft

Soil Shear Strength (Cohesive Soil) (1.2*D LC)

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) Rear	59.66	14.92	59.55	888.29
(2) Partial Sides	0.00	0.00	32.17	0.00
Total		14.92		888.29

Eccentricity relative to W/2*SQRT(2):

Total Moment Arm (ft) =	27.38
Soil Shear Strength (kip)=	14.92

*Unfactored Resisting Moment of Soil Shear (1.2*D LC):* $M_{R\_shear\_1.2}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_1.2\_dia\_e}$ = 408.39 kip*ft

*Factored Resisting Moment of Soil Shear (1.2*D LC):* $\Phi M_{R\_shear\_1.2}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_1.2\_dia\_e}$ = 306.29 kip*ft

DETERMINE MOMENT THAT WOULD CAUSE 100% OVERTURNING (DIAGONAL)

*Compressive Load for Bearing (0.9*D LC):* $P_{\_100\_dia\_e}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_100_dia_e $P_{\_100\_dia\_e}$ = 1554.72 kip

Preliminary Factored Overturning Moment: $pre\_M_{overturning\_100\_dia\_e}$ = P_100_dia_e*(W*SQRT(2) - SQRT(6*P_100_dia_e/(2*ΦQult)))/2 $pre\_M_{overturning\_100\_dia\_e}$ = 36312.88 kip*ft

*Preliminary Load Eccentricity (0.9*D LC):* $pre\_ec_{\_100\_dia\_e}$ = $pre\_M_{overturning\_100\_dia\_e}/P_{\_100\_dia\_e}$ $pre\_ec_{\_100\_dia\_e}$ = 23.36 ft

*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):* $ec_{\_100\_dia\_e}$ = *goal seek* $ec_{\_100\_dia\_e}$ = 23.26 ft

*Non-Bearing Length (0.9*D LC):* $NBL_{\_100\_dia\_e}$ = W $NBL_{\_100\_dia\_e}$ = 45.50 ft

*Non-Bearing Length (0.9*D LC):* $NBL_{\_100\_dia\_e\_2}$ = MIN((2*ec_100_dia_e - W/2*SQRT(2))*SQRT(2),W) $NBL_{\_100\_dia\_e\_2}$ = 20.29 ft

*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):*	$\Phi M_{Resisting\_100\_dia\_e} = \Phi M_{R\_Pp\_dia} + SUM(\Phi M_{R\_wedges\_100\_dia}, \Phi M_{R\_shear\_100\_dia})$	$\Phi M_{Resisting\_100\_dia\_e}$ =	635.34	kip*ft
Moment Created by Shear:	$M_{shear\_e} = V_u * (D+E+bp_{dist}/12)$	M_{shear_e} =	1012.00	kip*ft
*Adjusted Overturning Moment (0.9*D LC):*	$M_{overturning\_100\_dia\_e} = M_{u\_max\_100\_dia} - \Phi M_{R\_Pp\_dia}$	$M_{overturning\_100\_dia\_e}$ =	36796.69	kip*ft
*Total Resistance to Overturning (0.9*D LC):*	$\Phi M_{Resisting\_qu\_100\_dia\_e} = P_{\_100\_dia\_e} * ec_{\_100\_dia\_e} + \Phi M_{Resisting\_100\_dia\_e}$	$\Phi M_{Resisting\_qu\_100\_dia\_e}$ =	36796.69	kip*ft
[Goal Seek] Moment Comparison Iteration (0.9D LC):	$\Delta M_{\_100\_dia\_e} = M_{overturning} - \Phi M_{Resisting\_qu\_100\_dia}$	$\Delta M_{\_100\_dia\_e}$ =	0.00	ft
Maximum Applied Moment from Superstructure Analysis:	$M_{u\_max\_100\_dia\_e}$ = pre_Moverturning_100_dia + ΦMResisting_100_dia	$M_{u\_max\_100\_dia\_e}$ =	36948.22	kip*ft

Check **Mu_max_100_dia_e = 36948.22 kip*ft >= Mu = 15687.00 kip*ft** **RATING: 42.46% OK**

Soil Wedges (Cohesionless Soil) (0.9*D LC)

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	0.00	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(1) End Prism (above Water Table)	0.00	0.00	0.00	0.00
(1) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Rear Sides (above Water Table)	0.00	0.00	0.00	0.00
(2) Rear Sides (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Eccentricity relative to W/2*SQRT(2):

Total Moment Arm (ft) =	0.00
Soil Wedge Wt (kip)=	0.00

*Unfactored Resisting Moment of Wedges (0.9*D LC):*	$M_{R\_wedges\_100\_dia\_e}$ = Total Moment Arm * Soil Wedge Wt	$M_{R\_wedges\_100\_dia\_e}$ =	0.00	kip*ft
*Factored Resisting Moment of Wedges (0.9*D LC):*	$\Phi M_{R\_wedges\_100\_dia\_e}$ = 0.75*MR_wedges_100_dia_e	$\Phi M_{R\_wedges\_100\_dia\_e}$ =	0.00	kip*ft

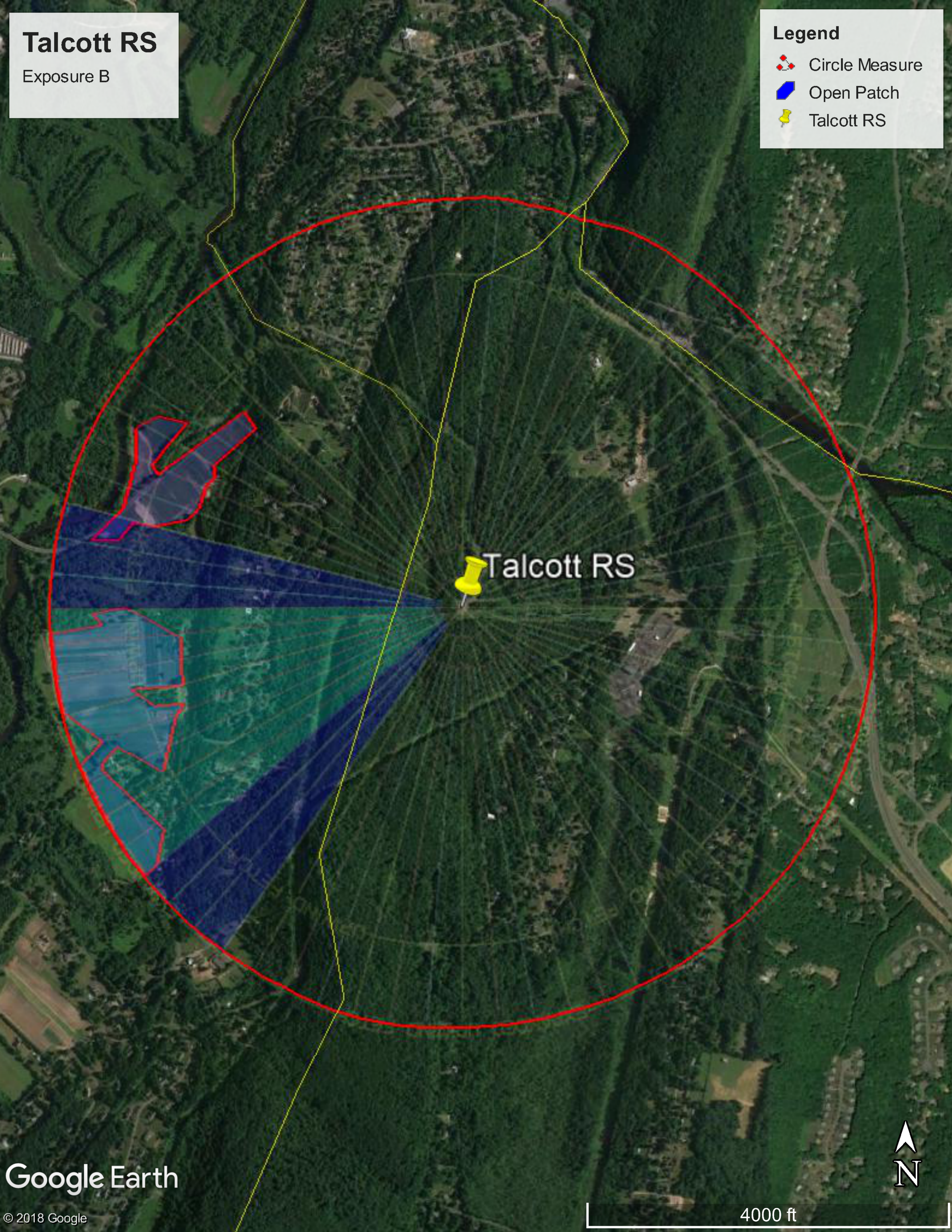
Soil Shear Strength (Cohesive Soil) (0.9*D LC)

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) Rear	200.20	50.05	48.26	2415.41
(2) Partial Sides	89.26	22.32	25.00	557.90
Total		72.37		2973.32

Eccentricity relative to W/2*SQRT(2):

Total Moment Arm (ft) =	8.91
Soil Shear Strength (kip)=	72.37

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):*	$M_{R\_shear\_100\_dia\_e}$ = Total Moment Arm * Soil Shear Strength	$M_{R\_shear\_100\_dia\_e}$ =	645.08	kip*ft
*Factored Resisting Moment of Soil Shear (0.9*D LC):*	$\Phi M_{R\_shear\_100\_dia\_e}$ = 0.75 * (Total Moment Arm * Soil Shear Strength)	$\Phi M_{R\_shear\_100\_dia\_e}$ =	483.81	kip*ft


Talcott RS
Exposure B
Legend
Circle Measure
Open Patch
Talcott RS
Talcott RS
Google Earth
© 2018 Google
4000 ft
N

ATTACHMENT D – PROOF OF DELIVERY OF NOTICE

Ref: CT587100-ES-033 Date: 03Nov20 SHIPPING: 0.00
Dep: BL GRAPHICS Wgt: 1.30 LBS SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6810

ORIGIN ID:RSPA (800) 301-3077
BL COMPANIES
355 RESEARCH PARKWAY
MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 1.30 LB
CAD: 0765627/CAFE3407
BILL THIRD PARTY

TO **HONORABLE SUZETTE DEBEATHAM-BROWN**
TOWN OF BLOOMFIELD
800 BLOOMFIELD AVENUE

BLOOMFIELD CT 06002
REF: CT587100-ES-033
DEPT: BL GRAPHICS

56DC3/51D8/05A2

FedEx Express

E

J201019110601uv

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 6810**

00 EHTA

06002
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: CT587100-ES-033 Date: 03Nov20 SHIPPING: 0.00
Dep: BL GRAPHICS Wgt: 1.30 LBS SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6820

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 1.30 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC3/51D8/05A2

TO **ROBERT E. SMITH, TOWN MANAGER**
TOWN OF BLOOMFIELD
800 BLOOMFIELD AVENUE

BLOOMFIELD CT 06002
REF: CT587100-ES-033

DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 6820**

00 EHTA

06002
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: CT587100-ES-033 Date: 03Nov20 SHIPPING: 0.00
Dep: BL GRAPHICS Wgt: 1.30 LBS SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6831

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 1.30 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC3/51DB/05A2

TO **JOSE GINER, LAND USE DIRECTOR**
TOWN OF BLOOMFIELD
800 BLOOMFIELD AVENUE

BLOOMFIELD CT 06002
REF: CT587100-ES-033
DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 6831**

00 EHTA

06002
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: CT587100-ES-033 Date: 03Nov20
Dep: BL GRAPHICS Wgt: 1.30 LBS

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 6842

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 03NOV20
ACTWGT: 1.30 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC3/51D8/05A2

TO

CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051
REF: CT587100-ES-033

DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

WED - 04 NOV 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 6842**

00 BDLA

06051
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

ATTACHMENT E - POWER DENSITY REPORT

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

Calculated Radio Frequency Emissions Report

ES-038 – Talcott RS

5 St. Andrews Road

Bloomfield, CT 06002

October 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 lattice tower at 5 St. Andrews Road in Bloomfield, CT. Eversource is proposing to install one omnidirectional antenna as part of its 220 MHz communications system.

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

Figure 1: View of ES-038 Talcott RS

Site Address	5 St. Andrews Road
Latitude	41° 53' 33.60" N
Longitude	72° 45' 56.50" W
Site Elevation AMSL	410'
Survey Engineer	Marc Salas
Survey Date/Time	6/17/2020; 6:45 AM – 7:30 AM

Table 1: Survey Information

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

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

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

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

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

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

3. Power Density Calculation Methods

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

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

Where:

EIRP = Effective Isotropic Radiated Power = 1.64 x ERP

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

H = Horizontal Distance from antenna

V = Vertical Distance from radiation center of antenna

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

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

4. Proposed Antenna Configuration

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

Operator	Antenna Model	TX Freq. (MHz)	Ant Gain (dBd)	Power ERP (Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	dBSpectra DS2C03F36D	217	3	124	4	30°	18.6	188

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

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

[2] Transmit antenna height listed for the proposed 217 MHz antenna is based on the Black & Veatch Structural Analysis Report dated August 10, 2020, the Black & Veatch site drawings dated September 25, 2020 (Rev. 0), 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 to the unavailability of the digital pattern for this specific antenna, the pattern of 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# 01116			
Calibration Date	May 2020			
Calibration Interval	24 Months			
Meter	NBM550, Serial# E-1069			
Calibration Date	May 2020			
Calibration Interval	24 Months			
Probe Specifications	**Frequency Range**	**Field Measured**	**Standard**	**Measurement Range**
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.2 – 600 % of Standard

Table 3: Instrumentation Information

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

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

6. Surveyed and Calculated % MPE Results

Measured and calculated results and a description of each survey location are detailed in the table below. Measurements were recorded on June 17, 2020 between 6:45 AM and 7:30 AM. The calculated % MPE contribution from the proposed equipment was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource (or a similar antenna) 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 14 measurements recorded in the vicinity of the site. The highest spatially averaged measurement was 21.56% (Average Uncontrolled / General Population MPE) and was recorded by the west of the power pole (Location 8). The highest composite (measured + calculated) % MPE value is calculated to be 21.58% (Average Uncontrolled / General Population) and is also calculated to occur at Location 8.

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	41.89258	-72.76555	51	< 1.00%	0.03%	< 1.03%
2	SE corner of compound	41.89267	-72.76537	88	< 1.00%	0.03%	< 1.03%
3	SW corner of compound	41.89255	-72.76578	50	< 1.00%	0.03%	< 1.03%
4	East of compound	41.89266	-72.76584	39	< 1.00%	0.02%	< 1.02%
5	NW corner of compound	41.89284	-72.76582	71	< 1.00%	0.03%	< 1.03%
6	South of compound	41.89250	-72.76550	81	< 1.00%	0.03%	< 1.03%
7	East of power pole	41.89235	-72.76554	123	2.10%	0.02%	< 1.02%
8	**West of power pole**	**41.89235**	**-72.76586**	**124**	**21.56%**	**0.02%**	**21.58%**
9	Along access road	41.89292	-72.76504	200	< 1.00%	0.03%	< 1.03%
10	Along access road	41.89339	-72.76456	407	< 1.00%	0.14%	< 1.14%
11	Along access road	41.89322	-72.76389	531	2.97%	0.12%	3.09%
12	Along access road	41.89369	-72.76251	944	5.63%	0.07%	5.70%
13	Along access road	41.89281	-72.76202	999	4.47%	0.05%	4.52%
14	Access road gate	41.89288	-72.76013	1515	8.17%	0.03%	8.20%

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.

Figure 2 below is an aerial view[5] of the rooftop 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 5 St. Andrews Road in Bloomfield, 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 21.56% MPE. This measurement was recorded at Location 8, west of the power pole directly to the south of the compound.

The highest composite (measured + calculated) power density is **21.58% of the FCC General Population MPE limit** with the proposed Eversource equipment is also calculated to also occur at Location 8.

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 (signature)	September 30, 2020
Report Prepared By:	Marc Salas RF Engineer C Squared Systems, LLC	Date
	Keith Vellante (signature)	October 1, 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

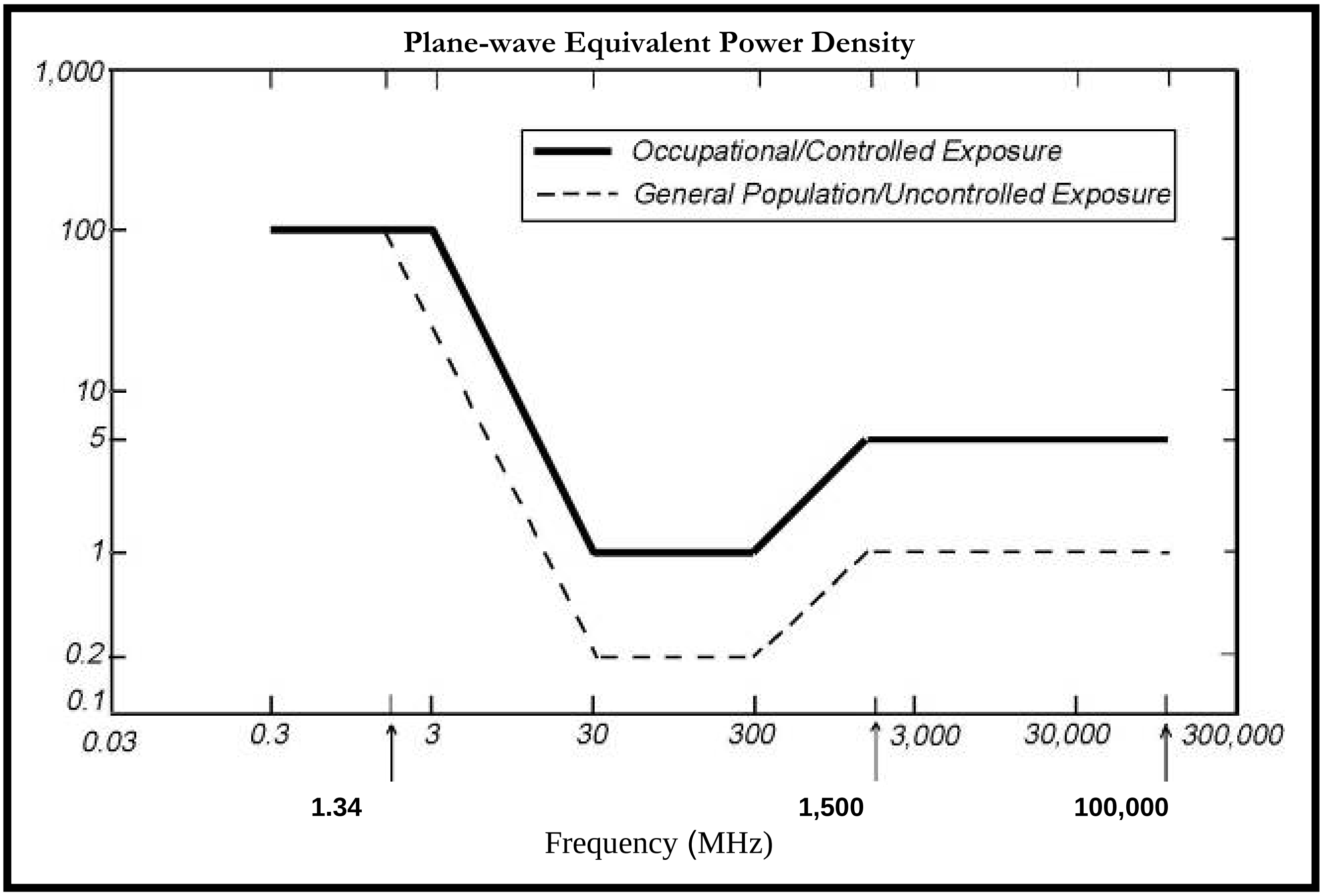


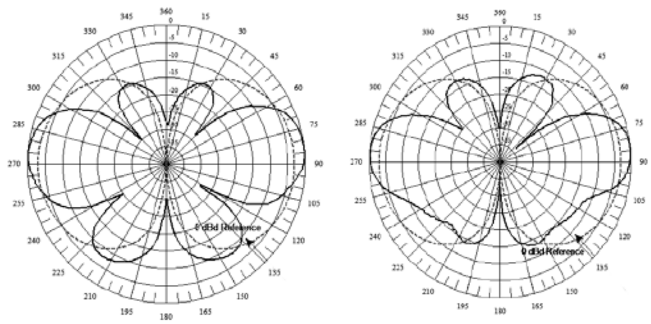
Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Eversource Antenna Data Sheet and Electrical Patterns

217 MHz

Manufacturer:	dbSpectra
Model #:	DS2C03F36D
Frequency Band:	217 - 222 MHz
Gain:	3 dBd
Vertical Beamwidth:	30°
Horizontal Beamwidth:	360°
Polarization:	Vertical-Polarization
Length:	18.6’

DS2C03F36D-N
DS2C03F36D-D



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