EVERSOURCE ENERGY

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

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

January 15, 2021

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

RE: **Notice of Exempt Modification**
Eversource Site # ES-068 Southbury Cassidy
Cassidy Road (AKA Spruce Brook Road), Southbury, CT 06488
Latitude: 41-30-24.5 N / Longitude: 73-17-0.5 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains two antennas on an existing 180-foot self-support tower located at Cassidy Road in Southbury. See Attachment A, Parcel Map and Property Card. The tower and property are owned by the State of Connecticut Department of Emergency Services and Public Protection ("DESPP"). Eversource and DESPP have entered into an agreement allowing the modification of Eversource's equipment on the DESPP tower. See Attachment B, Letter of Authorization. Eversource plans to install two 14-foot 3-inch tall omni-directional antennas, one of which will be inverted, to be mounted at 130 feet above ground level, and two 7/8-inch diameter coaxial cables. There will be no changes to the area of the fenced compound, the tower or the existing Eversource antennas and equipment currently mounted on the tower. The antennas will be mounted to the existing tower on new 4-foot stand-off mounts. See Attachment C, Mount Analysis. The tower and existing and proposed equipment are depicted on Attachment D, Construction Drawings, dated April 29, 2020 and Attachment E, Structural Analysis, dated October 27, 2020. The tower, a replacement for a previously existing tower, was the subject of an exempt modification filed by the Department of Public Safety, Division of State Police in August 1989. .

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 Jeff Manville, First Selectman for the Town of Southbury and Kathy Castagnetta, Land Use Administrator for

the Town of Southbury, via private carrier. Proof of delivery is attached. See Attachment F, 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 an 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 November 23, 2020 (Attachment G – Power Density Report)[1].
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure, antenna mounts, and its foundation can support the proposed loading.

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

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

By: _____
Kathleen M. Shanley
Manager – Transmission Siting

cc: Honorable Jeff Manville, First Selectman, Town of Southbury
Kathy Castagnetta, Land Use Administrator, Town of Southbury
DESPP

Attachments

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

[1] Any receive-only antennas are not included in the Power Density Report, as they are irrelevant in terms of the % MPE calculations.

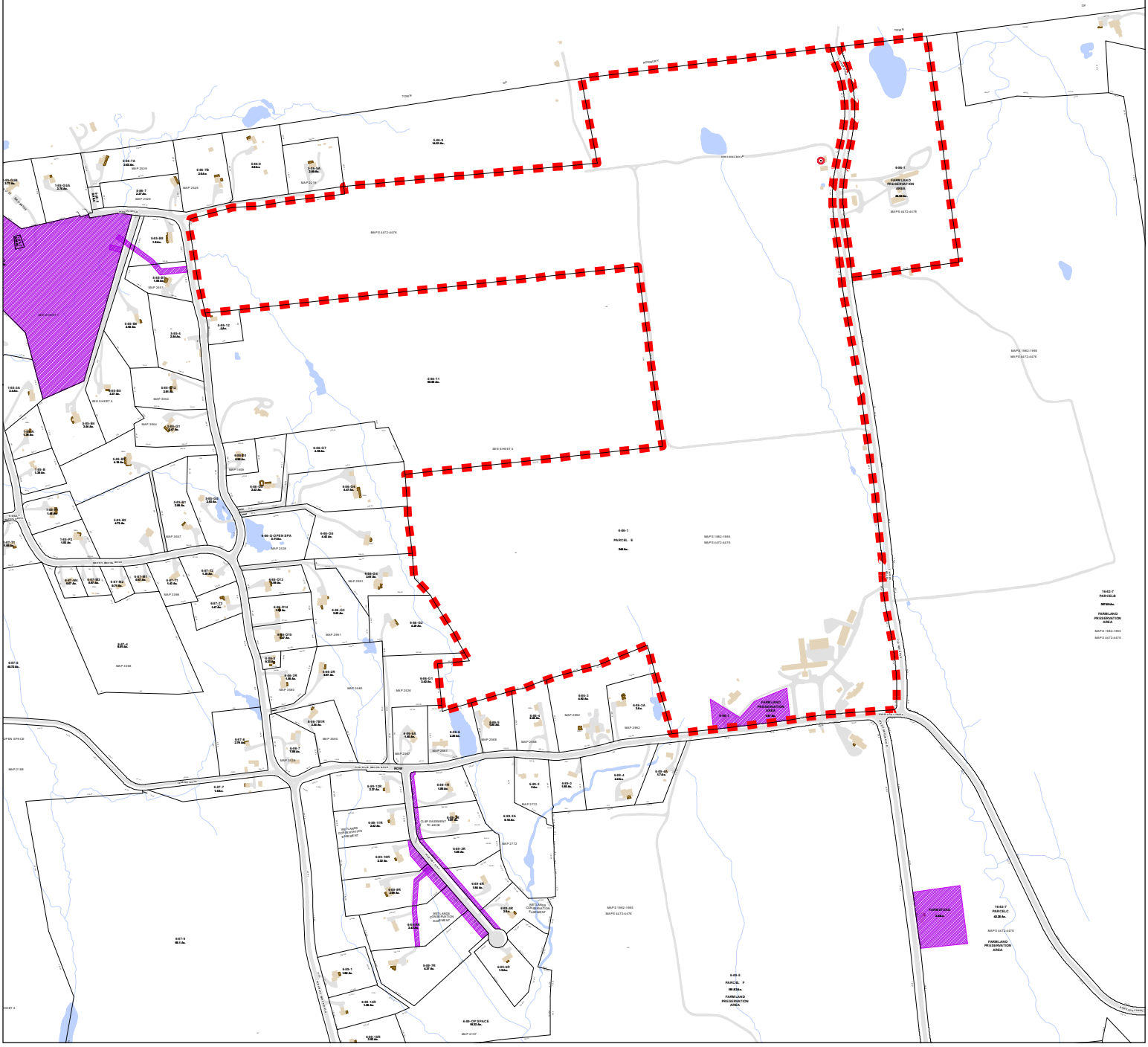
ATTACHMENT A – PARCEL MAP AND PROPERTY CARD

Town of Southbury Connecticut - Assessment Parcel Map

Parcel: 6-86-1 **Location:** SPRUCE BROOK ROAD

Legend

⊙ Approximate Tower Location



N

Approximate Scale: 1 inch = 900 feet

0 260 520 780 1,040 Feet

Map Produced Augustl 2019

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

Town of Southbury, CT

Property Listing Report

Map Block Lot	Building #	Section #	Account
6-86-1			00000320

Property Information

Property Location	SPRUCE BROOK ROAD
Owner	CONN STATE OF
Co-Owner	SOUTHBURY TRAINING SCHOOL
Mailing Address	25 SIGOURNEY STREET HARTFORD CT 06106
Land Use	900 Exempt Vac
Land Class	E
Zoning Code	R-80
Census Tract	4472-4476

Street Index	
Acreage	240
Utilities	
Lot Setting/Desc	
Additional Info	

Photo

Sketch

Primary Construction Details

Year Built		Bedrooms		Exterior Walls	
Stories		Full Bathrooms		Exterior Walls 2	
Building Style		Half Bathrooms		Interior Walls	
Building Use		Extra Fixtures		Interior Walls 2	
Building Condition		Bath Style		Heating Type	
Interior Floors 1		Kitchen Style		Heating Fuel	
Interior Floors 2		Roof Style		Sq. Ft. Basement	
Percent Good		Roof Cover		Fin BSMT Quality	
Total Rooms		AC Percent		Percent Basement	
Basement Garages		PLN FPL		Basement Access	
Occupancy		DET FPL		% Attic Finished	
Building Grade		Gas Fireplace		LF Dormer	
Foundation					

Report Created On 2/27/2020

Town of Southbury, CT

Property Listing Report

Map Block Lot	Building #	Section #	Account
6-86-1			00000320

Valuation Summary

(Assessed value = 70% of Appraised Value)

Item	Appraised	Assessed
Buildings	0	0
Extras	0	0
Improvements		
Outbuildings	0	0
Land	1771200	1239840
Total	1771200	1239840

Outbuilding and Extra Features

Type	Description

Sub Areas

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

Sales History

Owner of Record	Book/ Page	Sale Date	Sale Price
CONN STATE OF	0/ 0		0

Report Created On 2/27/2020

ATTACHMENT B – LETTER OF AUTHORIZATION

STATE OF CONNECTICUT

DEPARTMENT OF EMERGENCY SERVICES AND PUBLIC PROTECTION

January 7, 2020

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Letter of Authorization** – Co-location on Connecticut State Police tower
Property address: Cassidy Road, Southbury, CT
Latitude: 41-30-24.42" Longitude: 73-17-0.51"

To Whom It May Concern:

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

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

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

Yours truly,

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

ATTACHMENT C – MOUNT ANALYSIS

BLACK & VEATCH
Building a world of difference.
BLACK & VEATCH CORPORATION
6800 W 115TH ST, SUITE 2292, OVERLAND PARK, KS 66211
+1 913-458-2522 | RILEYJJ@BV.COM

December 1, 2020

MOUNT EVALUATION LETTER

Site Number: ES-068
Site Name: SOUTHBURY CASSIDY
Site Data: Cassidy Rd. (Southbury Tracing School)
Southbury, CT 06488
Latitude: 41° 30' 24.5"
Longitude: -73° 17' 0.5"

Black & Veatch Corporation is pleased to submit this "Mount Evaluation Letter" to determine the structural integrity of antenna mounting system on the above-mentioned site. The purpose of this evaluation is to determine the capacity of the system in supporting the final loading in the attached "Loading Summary".

Based on our evaluation we have determined the existing antenna mounting system to be: **SUFFICIENT**

Structure Rating (max from all components) =	38.0%

Proposed Mounting System
SitePro 1 (USF-4U) 48" Ultimate Universal Stand-off Frame

The proposed mounting system will be capable of supporting the proposed equipment, under the following conditions:

- Contractor shall be responsible for the means and methods of construction.
- Contractor shall inspect the condition of all existing and proposed structural members, all relevant members and connections and report any deficiencies to the engineer prior to installation of any new antennas and other equipment.

The scope of this evaluation pertains only to the proposed antenna mounting system and does not include examination of the loads imparted by the antenna mounting system to the existing tower and its structural components. This document was prepared based on information provided to Black & Veatch. If existing conditions do not reflect those represented, this analysis is no longer valid.

Please contact Josh Riley in our Overland Park Office
at 913-458-2522 if you have any questions or comments.

Sincerely,
Black & Veatch Corporation

Prepared By: Joohwan Jung
Submitted By: Josh Riley, P.E.

12/01/2020

TABLE OF CONTENTS

1. LOADING SUMMARY

Appurtenance								
Carrier	Position	Sector	Antenna RAD Center (ft)	Mount Centerline (ft)	Qty	Type	Manufacturer	Model
Eversource	1	-	137	130	1	Omni	Telewave	ANT220F6
Eversource	1	-	123	130	1	Omni	Telewave	ANT220F6

2. ANALYSIS CRITERIA SUMMARY

ANALYSIS CRITERIA	
STANDARD	TIA-222-H
WIND SPEED	Ultimate of 130 mph
WIND SPEED WITH ICE	50 mph with 2" radial ice thickness
EXPOSURE CATEGORY	C
RISK CATEGORY	III
TOPO CATEGORY	Hill
CREST HEIGHT	98 ft

3. REFERENCES

- American Institute of Steel Construction, AISC 15th Edition
- Telecommunications Industry Association Standard, TIA-222-H & 2018 Connecticut State Building Code
- Antenna Mount Assembly Drawing (Model: USF-4U) by SitePro 1, dated 02/16/2011

4. ASSUMPTIONS

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

- The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- The configuration of antennas, mounts, and other appurtenances are as specified in the Loading Summary and the referenced drawings.
- All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
- Sector frame center line: located equidistant between top & bottom boom; Platform center line: located at the base perimeter of platform, unless otherwise specified.
- Steel grades have been assumed as follows, unless noted otherwise:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Rectangular)	ASTM 500 (GR B-46)
Pipe	ASTM A53 (GR B-35)
Connection Bolts	ASTM A325

5. RESULTS SUMMARY

Name	Bending Stress Ratio		Shear Stress Ratio	
Arm: HSS3X3X3/16	34.4%	Pass	7.2%	Pass
Bracing: Pipe 2.0 Std	38.0%	Pass	4.9%	Pass
Mount Pipe: Pipe 3.0 Std	33.1%	Pass	8.3%	Pass

*Von Mises SR = (Max Von Mises Value From RISA-3D)/(0.9*Fy)

**Capacity rating per TIA-222-H Section 15.5.

APPENDIX 1:
MOUNT ANALYSIS REPORT

Dead and Live Loads

Maintenance Live Load: L_V = 250 lb
Installation Live Load: L_M = 0 lb

Appurtenance Dead Loads	
Name	Weight (lb)
ANT220F6	35

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: SOUTHBURY CASSIDY (ES-068)		Date: 12/1/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 12/1/2020

Appurtenance Wind Loading

			Equations	TIA-222-H
Exposure Category =	C		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Basic Wind Speed, V =	130	mph		
Height Above Ground, z =	137	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	98 ft	ft		
Velocity Pressure Coefficient, K_z =	1.35		$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.07			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factor, K_e =	1.000		$F_A = q_z G_h (EPA)$	2.6.11.2
Wind Velocity Pressure, q_z =	59.24	psf		
Gust Effect Factor, G_h =	1.00		$F_M = q_z G_h C_f D_p$	2.6.11.2

Appurtenance Wind Loads

Name	Height (ft)	Width (ft)	Depth (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
ANT220F6	14.25	0.23	0.23	2.00	5.88	348.21	2.00	5.88	348.21

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	SOUTHBURY CASSIDY (ES-068)	Date: 12/1/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 12/1/2020

Member Wind Loading

			TIA-222-H
Exposure Category =	C		
Risk Category =	III		
Topographic Category =	1		
Basic Wind Speed, V =	130	mph	
Height Above Ground, z =	137	ft	
Crest Height, H =	98 ft	ft	
Velocity Pressure Coefficient, K_z =	1.35		2.6.5.2
Topographic Factor, K_{zt} =	1.07		2.6.6.2.1
Wind Directionality Factor, K_d =	0.95		2.6.6.2.1
Shielding Factor, K_a =	0.90		2.6.8
Ground Elevation Factor, K_e =	1.000		2.6.11.6
Wind Velocity Pressure, q_z =	59.24	psf	2.6.11.2
Gust Effect Factor, G_h =	1.00		2.6.11.2

Equations

$K_z = 2.01\ (z / z_g)^{2/\alpha}$

$K_h = e^{(f \cdot z / H)}$

$K_{zt} = [1 + K_c K_t / K_h]^2$

$K_e = e^{-0.000032 \cdot zs}$

$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$

$F_A = q_z G_h (EPA)$

$F_M = q_z G_h C_f D_p$

Member Wind Loads

Name	Depth (ft)	Width (ft)	C_f	D_p (ft)	F_M (lb)
Arm: HSS3X3X3/16	0.25	0.25	2	0.25	29.62
Bracing: Pipe 2.0 Std	0.20		1.2	0.20	14.07
Mount Pipe: Pipe 3.0 Std	0.29		1.2	0.29	20.73

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	SOUTHBURY CASSIDY (ES-068)	Date:	12/1/2020
		Verified By:	JW
Title:	MOUNT ANALYSIS REPORT	Date:	12/1/2020

BLACK & VEATCH

Appurtenance Ice Dead Loading

			Equations	TIA-222-H
Exposure Category =	C			
Risk Category =	III		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Topographic Category =	1			
Height Above Ground, z =	137	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	98 ft	ft		
Design Ice Thickness, T_i =	2.00	in	$K_{iz} = (z/33)^{0.10}$	2.6.10
Importance Factor, I =	1.15			
Topographic Factor, K_{zt} =	1.07		$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.15			
Factored Ice Thickness, T_{iz} =	2.71	in	$DL_{ice}=[(H_{ice}*D_{ice}*W_{ice}) - (H*W*D)]*56pcf$	
Grating Ice Dead Load, D_{Gice} =	12.65	psf		

Appurtenance Ice Dead Loads

Name	Height w/ ice (ft)	Width w/ice (ft)	Depth w/ ice (ft)	V_{ice} (ft^3)	DL_{ice} (lb)
ANT220F6	14.70	0.68	0.68	6.07	340.03

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	SOUTHBURY CASSIDY (ES-068)	Date: 12/1/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 12/1/2020

Member Ice Dead Loading

			Equations	TIA-222-H
Exposure Category =	C			
Risk Category =	III		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Topographic Category =	1			
Height Above Ground, z =	137	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	98 ft	ft		
Design Ice Thickness, T_i =	2.00	in	$K_{iz} = (z/33)^{0.10}$	2.6.10
Importance Factor, I =	1.15			
Topographic Factor, K_{zt} =	1.07		$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.15			
Factored Ice Thickness, T_{iz} =	2.71	in	Aiz = pi*Tiz*(Dc+Tiz)	2.6.10
Grating Ice Dead Load, D_{Gice} =	12.65	psf		
			DL_{ice}=Aiz*56pcf	

Member Ice Dead Loads

Name	Depth w/ ice (ft)	Width w/ ice (ft)	Dc (ft)	Aiz (ft^2)	DL_{ice} (lb/ft)
Arm: HSS3X3X3/16	0.70	0.70	0.35	0.41	23.04
Bracing: Pipe 2.0 Std	0.65		0.20	0.30	16.85
Mount Pipe: Pipe 3.0 Std	0.74		0.29	0.37	20.58

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	SOUTHBURY CASSIDY (ES-068)	Date: 12/1/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 12/1/2020

Appurtenance Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	C		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	137	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	98 ft	ft		
Velocity Pressure Coefficient, K_z =	1.35	psf	$K_e = e^{-0.000032 \cdot zs}$	2.6.8
Topographic Factor, K_{zt} =	1.07			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	1.000		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	8.763			
Factored Ice Thickness, T_{iz} =	2.71	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Appurtenance Ice Wind Loads

Name	Height w/ Ice (ft)	Width w/ Ice (ft)	Depth w/ Ice (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
ANT220F6	14.70	0.68	0.68	-	12.37	108.40	-	12.37	108.40

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	SOUTHBURY CASSIDY (ES-068)	Date:	12/1/2020
		Verified By:	JW
Title:	MOUNT ANALYSIS REPORT	Date:	12/1/2020

BLACK & VEATCH

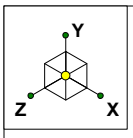
Member Ice Wind Loading

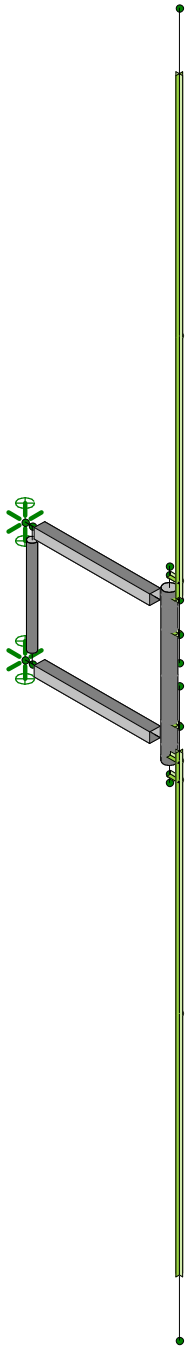
				TIA-222-H
Exposure Category =	C		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	137	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	98 ft	ft		
Velocity Pressure Coefficient, K_z =	1.35	psf	$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.07			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	1.000		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	8.763			
Factored Ice Thickness, T_{iz} =	2.71	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Member Ice Wind Loads

Name	Depth w/ Ice (ft)	Width w/ Ice (ft)	C_f	$D_{p(ice)}$ (ft)	$F_{M(ice)}$ (lb/ft)
Arm: HSS3X3X3/16	0.70	0.70	2	0.70	12.30
Bracing: Pipe 2.0 Std	0.65		1.2	0.65	6.83
Mount Pipe: Pipe 3.0 Std	0.74		1.2	0.74	7.82

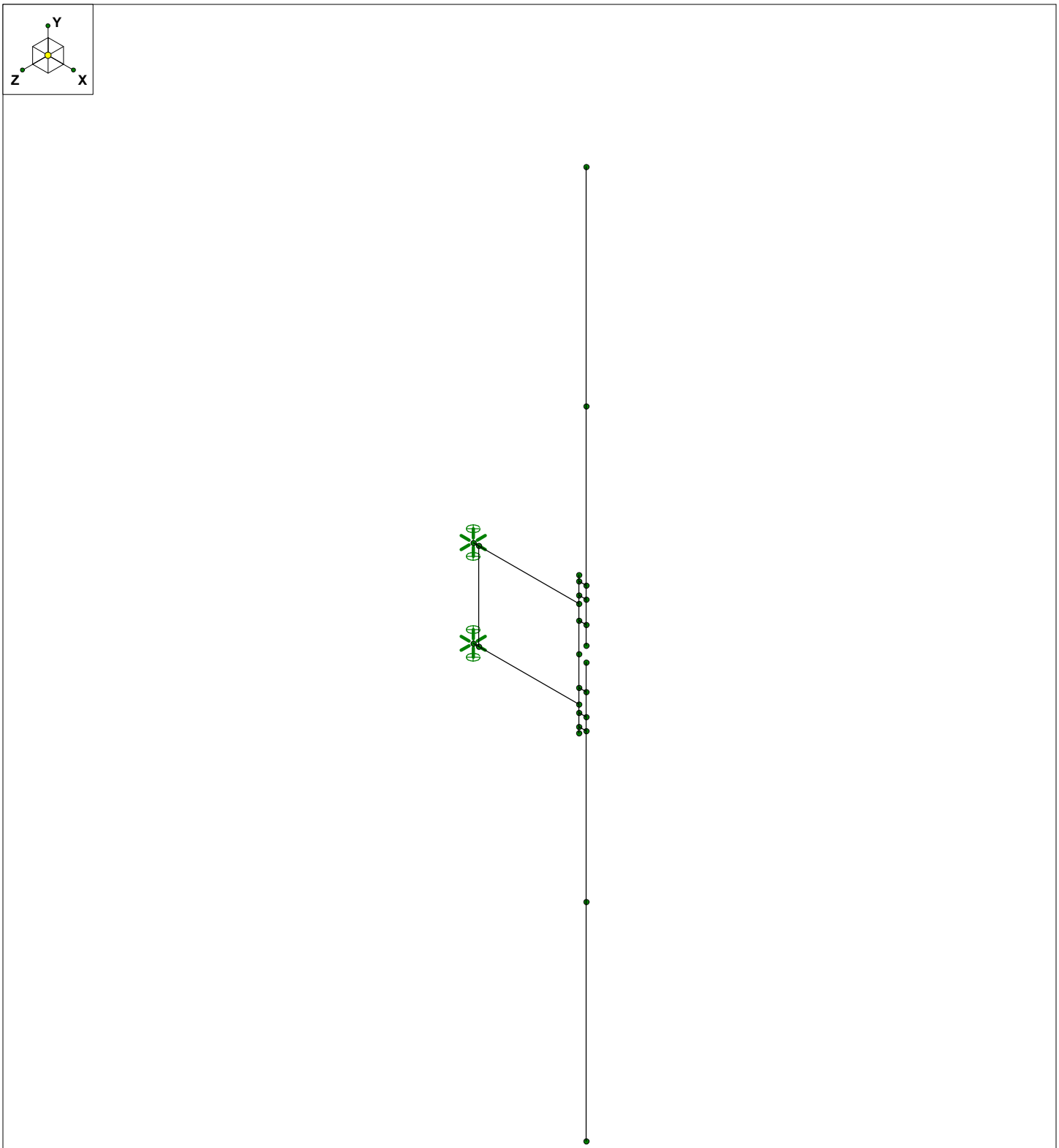
APPENDIX 2:
RISA PRINTOUTS





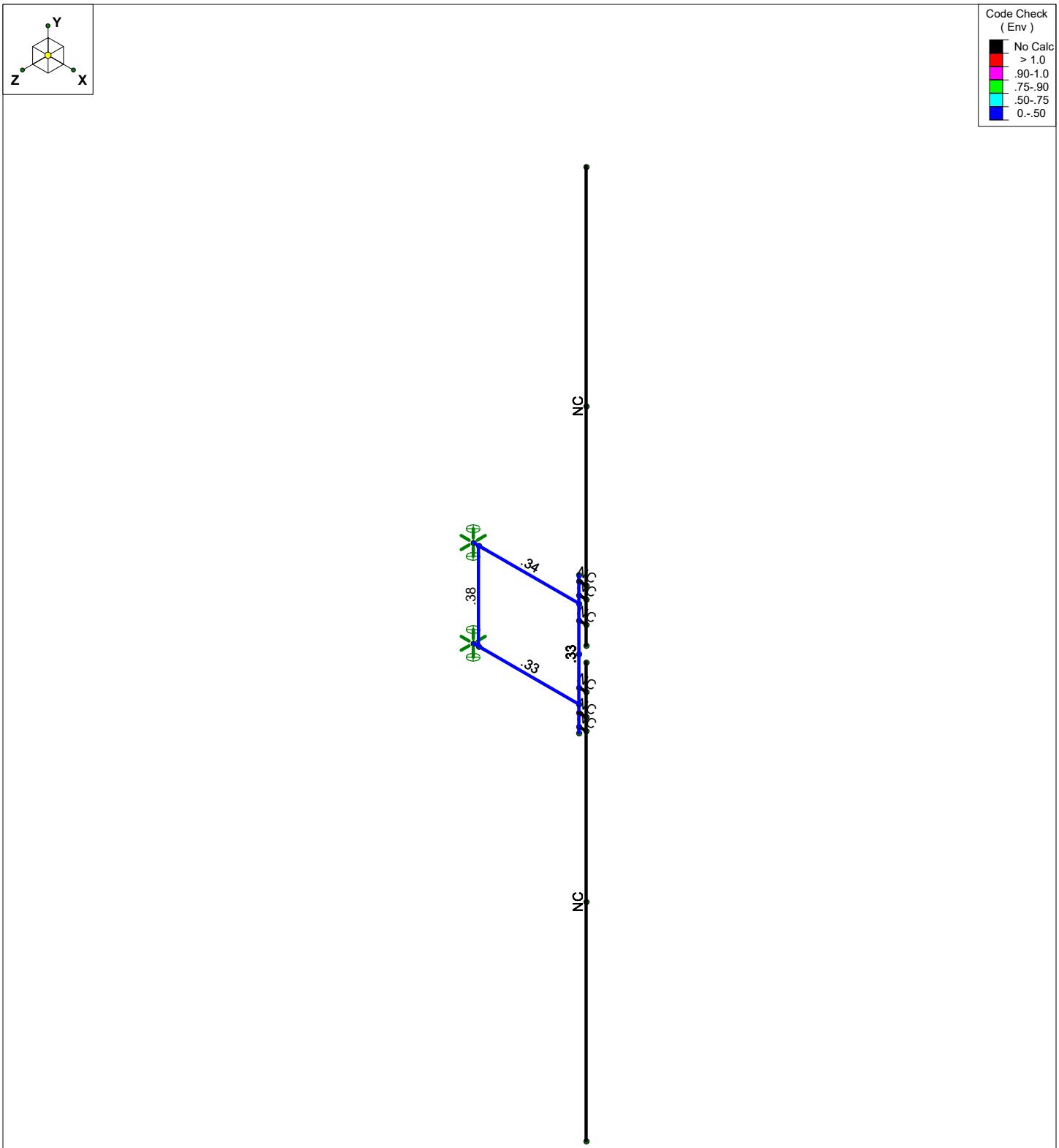
Envelope Only Solution

Black & Veatch	SOUTHBURYCASSIDY USF-4U Model	SK - 1
Joohwan Jung		Dec 1, 2020 at 10:14 AM
405025.2021.2200		SOUTHBURYCASSIDY USF-4U M...



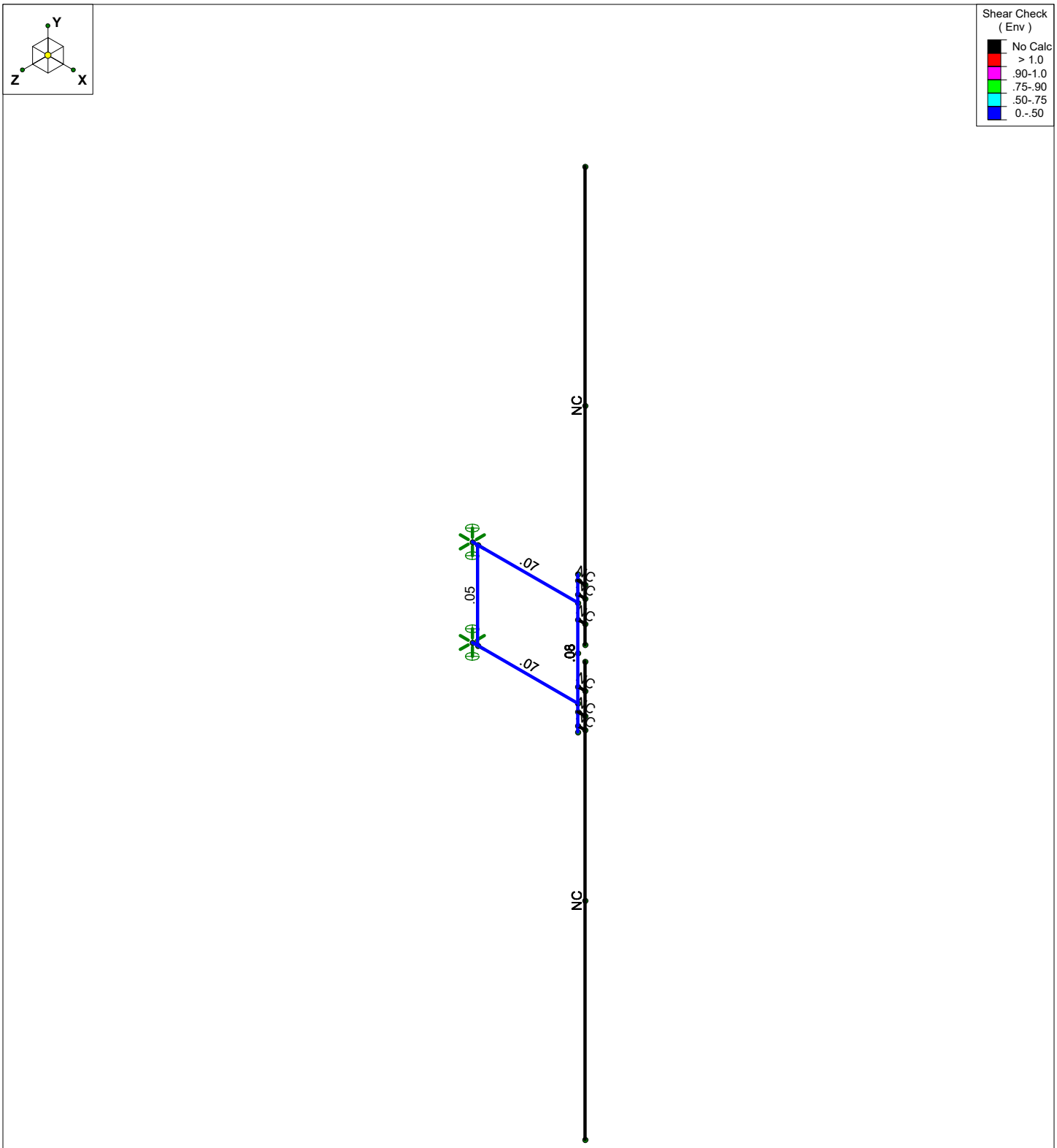
Envelope Only Solution

Black & Veatch	SOUTHBURYCASSIDY USF-4U Model	SK - 2
Joohwan Jung		Dec 1, 2020 at 10:14 AM
405025.2021.2200		SOUTHBURYCASSIDY USF-4U M...



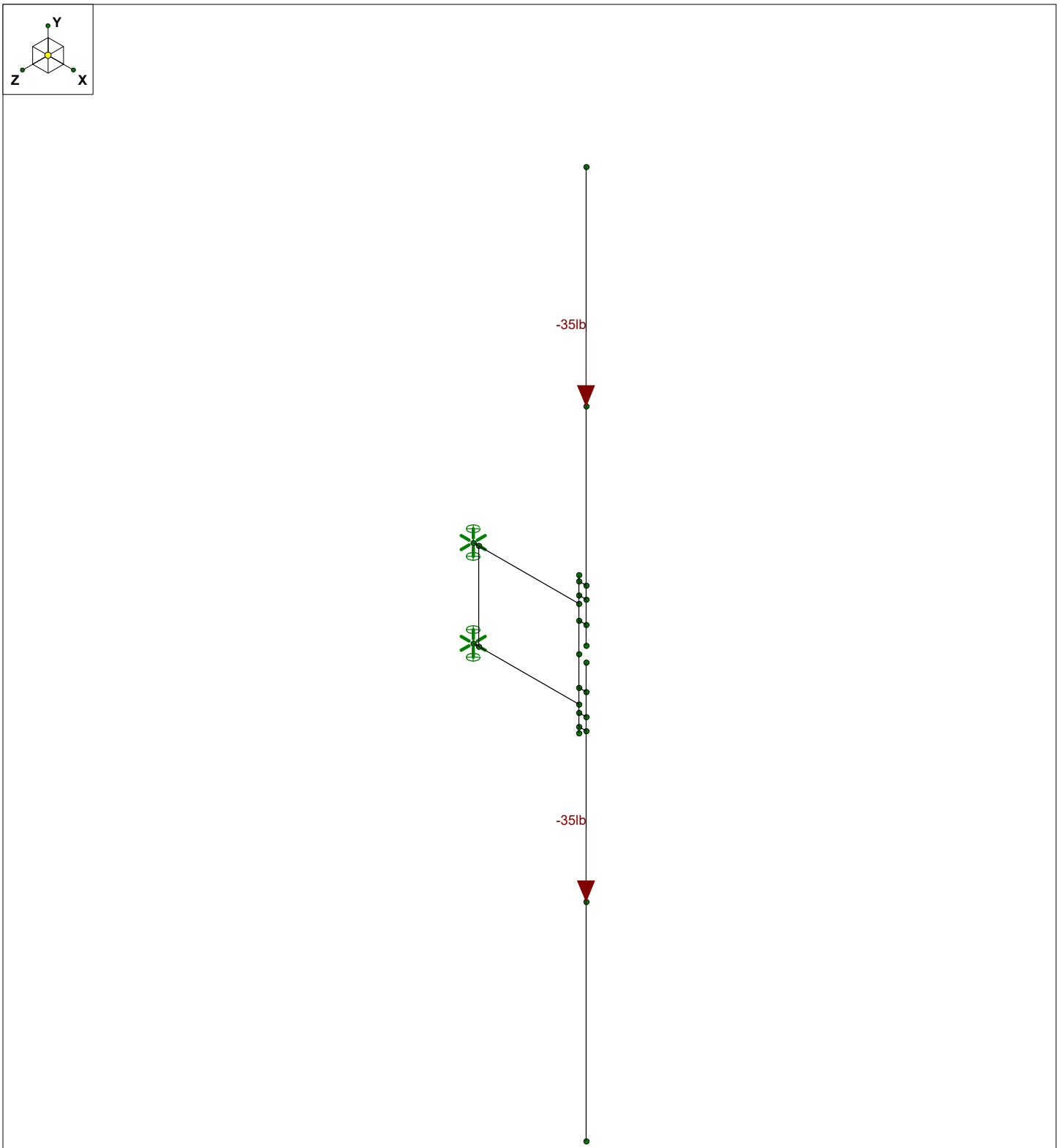
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	SOUTHBURYCASSIDY USF-4U Model	SK - 3
Joohwan Jung		Dec 1, 2020 at 10:14 AM
405025.2021.2200		SOUTHBURYCASSIDY USF-4U M...



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	SOUTHBURYCASSIDY USF-4U Model	SK - 4
Joohwan Jung		Dec 1, 2020 at 10:14 AM
405025.2021.2200		SOUTHBURYCASSIDY USF-4U M...



Loads: BLC 1, DL
Envelope Only Solution

Black & Veatch	SOUTHBURYCASSIDY USF-4U Model	SK - 5
Joohwan Jung		Dec 1, 2020 at 10:14 AM
405025.2021.2200		SOUTHBURYCASSIDY USF-4U M...

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	None

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-16
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.4	65	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Arm	HSS3X3X3	Beam	SquareTube	A53 Gr.B	Typical	1.89	2.46	2.46	4.03
2	Bracing	PIPE_2.0	Column	Pipe	A53 Gr.B	Typical	1.02	.627	.627	1.25
3	Mount Pipe	PIPE_3.0	Column	Pipe	A53 Gr.B	Typical	2.07	2.85	2.85	5.69

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
1	gen_Conc3NW	3155	1372	.15	.6	.145
2	gen_Conc4NW	3644	1584	.15	.6	.145
3	gen_Conc3LW	2085	906	.15	.6	.11
4	gen_Conc4LW	2408	1047	.15	.6	.11
5	gen_Alum	10100	4077	.3	1.29	.173
6	gen_Steel	29000	11154	.3	.65	.49
7	gen_Plywood	1800	38	0	.3	.035
8	RIGID	1e+6		.3	0	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N1	Reaction	Reaction	Reaction		Reaction	
2	N3	Reaction	Reaction	Reaction		Reaction	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2			Arm	Beam	SquareTube	A53 Gr.B	Typical
2	M2	N3	N4			Arm	Beam	SquareTube	A53 Gr.B	Typical
3	M3	N5	N6			Bracing	Column	Pipe	A53 Gr.B	Typical
4	M4	N7	N8			Mount Pipe	Column	Pipe	A53 Gr.B	Typical
5	M5	N9	N10			RIGID	None	None	RIGID	Typical
6	M6	N11	N12			RIGID	None	None	RIGID	Typical
7	M7	N14	N13			RIGID	None	None	RIGID	Typical
8	M8	N17	N16			RIGID	None	None	RIGID	Typical
9	M9	N19	N20			RIGID	None	None	RIGID	Typical
10	M10	N22	N23			RIGID	None	None	RIGID	Typical
11	M11	N24	N25			RIGID	None	None	RIGID	Typical
12	M12	N26	N27			RIGID	None	None	RIGID	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
1	M1						Yes				None
2	M2						Yes				None
3	M3						Yes	** NA **			None
4	M4						Yes	** NA **			None
5	M5						Yes	** NA **			None
6	M6						Yes	** NA **			None
7	M7						Yes	** NA **			None
8	M8						Yes	** NA **			None
9	M9						Yes	** NA **			None
10	M10						Yes	** NA **			None
11	M11						Yes	** NA **			None
12	M12						Yes	** NA **			None

Hot Rolled Steel Design Parameters

	Label	Shape	Length[in]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Arm	43.5			Lbyy						Lateral
2	M2	Arm	43.5			Lbyy						Lateral
3	M3	Bracing	36									Lateral
4	M4	Mount Pipe	56.5									Lateral

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
1	DL	DL		-1		2				
2	Maintenance LL - LV	LL				1				
3	Installation LL - LM	LL				1				
4	Wind - 0 Deg (X)	WL				2		4		
5	Wind - 30 Deg (X)	WL				2		4		
6	Wind - 60 Deg (X)	WL				2		4		
7	Wind - 90 Deg (X)	WL				2		4		
8	Wind - 120 Deg (X)	WL				2		4		

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
9	Wind - 150 Deg (X)	WL				2		4		
10	Wind - 180 Deg (X)	WL				2		4		
11	Wind - 210 Deg (X)	WL				2		4		
12	Wind - 240 Deg (X)	WL				2		4		
13	Wind - 270 Deg (X)	WL				2		4		
14	Wind - 300 Deg (X)	WL				2		4		
15	Wind - 330 Deg (X)	WL				2		4		
16	Wind - 0 Deg (Z)	WL				2		4		
17	Wind - 30 Deg (Z)	WL				2		4		
18	Wind - 60 Deg (Z)	WL				2		4		
19	Wind - 90 Deg (Z)	WL				2		4		
20	Wind - 120 Deg (Z)	WL				2		4		
21	Wind - 150 Deg (Z)	WL				2		4		
22	Wind - 180 Deg (Z)	WL				2		4		
23	Wind - 210 Deg (Z)	WL				2		4		
24	Wind - 240 Deg (Z)	WL				2		4		
25	Wind - 270 Deg (Z)	WL				2		4		
26	Wind - 300 Deg (Z)	WL				2		4		
27	Wind - 330 Deg (Z)	WL				2		4		
28	Ice DL	DL				2		4		
29	Ice Wind - 0 Deg (X)	WL				2		4		
30	Ice Wind - 30 Deg (X)	WL				2		4		
31	Ice Wind - 60 Deg (X)	WL				2		4		
32	Ice Wind - 90 Deg (X)	WL				2		4		
33	Ice Wind - 120 Deg (X)	WL				2		4		
34	Ice Wind - 150 Deg (X)	WL				2		4		
35	Ice Wind - 180 Deg (X)	WL				2		4		
36	Ice Wind - 210 Deg (X)	WL				2		4		
37	Ice Wind - 240 Deg (X)	WL				2		4		
38	Ice Wind - 270 Deg (X)	WL				2		4		
39	Ice Wind - 300 Deg (X)	WL				2		4		
40	Ice Wind - 330 Deg (X)	WL				2		4		
41	Ice Wind - 0 Deg (Z)	WL				2		4		
42	Ice Wind - 30 Deg (Z)	WL				2		4		
43	Ice Wind - 60 Deg (Z)	WL				2		4		
44	Ice Wind - 90 Deg (Z)	WL				2		4		
45	Ice Wind - 120 Deg (Z)	WL				2		4		
46	Ice Wind - 150 Deg (Z)	WL				2		4		
47	Ice Wind - 180 Deg (Z)	WL				2		4		
48	Ice Wind - 210 Deg (Z)	WL				2		4		
49	Ice Wind - 240 Deg (Z)	WL				2		4		
50	Ice Wind - 270 Deg (Z)	WL				2		4		
51	Ice Wind - 300 Deg (Z)	WL				2		4		
52	Ice Wind - 330 Deg (Z)	WL				2		4		

Load Combinations

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	WIND LOAD COMBOS (130 MPH)																									
2	1.2DL + WL (0 DEG)	Y...	Y		1	1.2	4	1	16	1																
3	1.2DL + WL (30 DEG)	Y...	Y		1	1.2	5	1	17	1																
4	1.2DL + WL (60 DEG)	Y...	Y		1	1.2	6	1	18	1																
5	1.2DL + WL (90 DEG)	Y...	Y		1	1.2	7	1	19	1																
6	1.2DL + WL (120 DEG)	Y...	Y		1	1.2	8	1	20	1																
7	1.2DL + WL (150 DEG)	Y...	Y		1	1.2	9	1	21	1																
8	1.2DL + WL (180 DEG)	Y...	Y		1	1.2	10	1	22	1																

Load Combinations (Continued)

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
9	1.2DL + WL (210 DEG)	Y...	Y		1	1.2	11	1	23	1																
10	1.2DL + WL (240 DEG)	Y...	Y		1	1.2	12	1	24	1																
11	1.2DL + WL (270 DEG)	Y...	Y		1	1.2	13	1	25	1																
12	1.2DL + WL (300 DEG)	Y...	Y		1	1.2	14	1	26	1																
13	1.2DL + WL (330 DEG)	Y...	Y		1	1.2	15	1	27	1																
14																										
15	MOUNT LOAD COMBOS (30 MPH)																									
16	1.4DL	Y...	Y		1	1.4																				
17	1.2DL + 1.5LV	Y...	Y		1	1.2	2	1.5																		
18	1.2DL + 1.5LM + WL (0 DEG)	Y...	Y		1	1.2	3	1.5	4	.053	16	.053														
19	1.2DL + 1.5LM + WL (30 DEG)	Y...	Y		1	1.2	3	1.5	5	.053	17	.053														
20	1.2DL + 1.5LM + WL (60 DEG)	Y...	Y		1	1.2	3	1.5	6	.053	18	.053														
21	1.2DL + 1.5LM + WL (90 DEG)	Y...	Y		1	1.2	3	1.5	7	.053	19	.053														
22	1.2DL + 1.5LM + WL (120 DEG)	Y...	Y		1	1.2	3	1.5	8	.053	20	.053														
23	1.2DL + 1.5LM + WL (150 DEG)	Y...	Y		1	1.2	3	1.5	9	.053	21	.053														
24	1.2DL + 1.5LM + WL (180 DEG)	Y...	Y		1	1.2	3	1.5	10	.053	22	.053														
25	1.2DL + 1.5LM + WL (210 DEG)	Y...	Y		1	1.2	3	1.5	11	.053	23	.053														
26	1.2DL + 1.5LM + WL (240 DEG)	Y...	Y		1	1.2	3	1.5	12	.053	24	.053														
27	1.2DL + 1.5LM + WL (270 DEG)	Y...	Y		1	1.2	3	1.5	13	.053	25	.053														
28	1.2DL + 1.5LM + WL (300 DEG)	Y...	Y		1	1.2	3	1.5	14	.053	26	.053														
29	1.2DL + 1.5LM + WL (330 DEG)	Y...	Y		1	1.2	3	1.5	15	.053	27	.053														
30																										
31	ICE LOAD COMBOS (2", 50 MPH)																									
32	1.2DL + Ice DL + Ice WL (0 DEG)	Y...	Y		1	1.2	28	1	29	1	41	1														
33	1.2DL + Ice DL + Ice WL (30 DEG)	Y...	Y		1	1.2	28	1	30	1	42	1														
34	1.2DL + Ice DL + Ice WL (60 DEG)	Y...	Y		1	1.2	28	1	31	1	43	1														
35	1.2DL + Ice DL + Ice WL (90 DEG)	Y...	Y		1	1.2	28	1	32	1	44	1														
36	1.2DL + Ice DL + Ice WL (120 DEG)	Y...	Y		1	1.2	28	1	33	1	45	1														
37	1.2DL + Ice DL + Ice WL (150 DEG)	Y...	Y		1	1.2	28	1	34	1	46	1														
38	1.2DL + Ice DL + Ice WL (180 DEG)	Y...	Y		1	1.2	28	1	35	1	47	1														
39	1.2DL + Ice DL + Ice WL (210 DEG)	Y...	Y		1	1.2	28	1	36	1	48	1														
40	1.2DL + Ice DL + Ice WL (240 DEG)	Y...	Y		1	1.2	28	1	37	1	49	1														
41	1.2DL + Ice DL + Ice WL (270 DEG)	Y...	Y		1	1.2	28	1	38	1	50	1														
42	1.2DL + Ice DL + Ice WL (300 DEG)	Y...	Y		1	1.2	28	1	39	1	51	1														
43	1.2DL + Ice DL + Ice WL (330 DEG)	Y...	Y		1	1.2	28	1	40	1	52	1														
44																										

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	363.219	2	1116.13	8	555.178	5	0	43	1768.488	11	0	43
2		min	-1481.161	38	-923.607	2	-555.178	11	0	2	-1768.488	5	0	2
3	N3	max	1463.269	32	1115.854	2	495.811	5	0	43	1680.614	11	0	43
4		min	-305.514	8	-923.883	8	-495.811	11	0	2	-1680.614	5	0	2
5	Totals:	max	1050.978	2	1186.811	32	1050.99	5						
6		min	-1050.978	8	192.247	8	-1050.99	11						

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear...	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
1	M1	HSS3X3X3	.344	0	11	.072	2.266	z	11	55265....	59535	5171.25	5171.25	2...	H1-1b
2	M2	HSS3X3X3	.327	0	11	.068	0	y	2	55265....	59535	5171.25	5171.25	2...	H1-1b
3	M3	PIPE_2.0	.380	0	32	.049	36		32	28843....	32130	1871.6...	1871.6...	2...	H1-1b
4	M4	PIPE_3.0	.331	16.479	11	.083	40.6...		38	57908....	65205	5748.75	5748.75	3...	H1-1b

APPENDIX 3:
ATTACHMENTS

TELEWAVE, INC.

216 - 225 MHz

ANT220F6 DIN

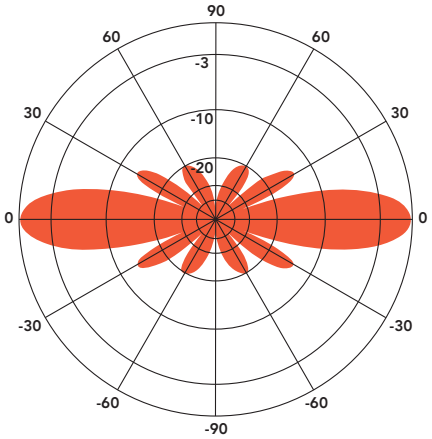
FIBERGLASS COLLINEAR ANTENNA 6 dBd

The Telewave ANT220F6 is an extremely rugged, medium-gain, fiberglass collinear antenna, designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, connected at DC ground potential for lightning impulse protection. The ANT220F6 is an excellent choice for wireless PTC systems in urban or rural areas.

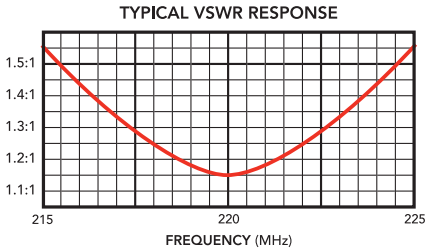
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray,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

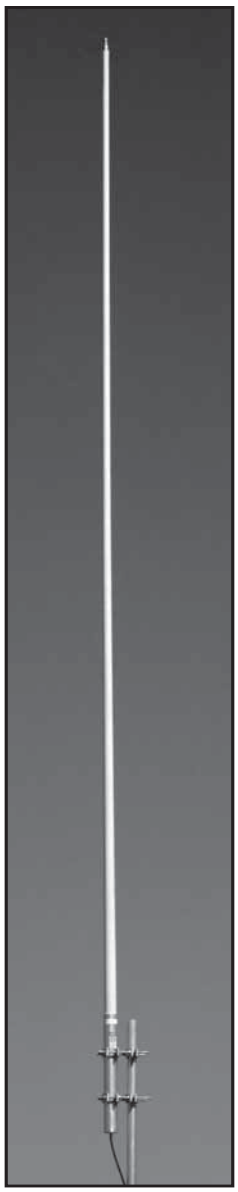
The ANT220F6 includes an ANTC482 dual clamp set for mounting to a 1.5" to 3.5" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper. Stand-off and top mounts are also available.

NOTE: THIS ANTENNA IS SHIPPED VIA TRUCK FREIGHT ONLY



ANT220F6 - 221 MHz
Vertical Plane
Gain = 6.11 dBd





SPECIFICATIONS			
Frequency (continuous)	216-225 MHz	**Dimensions (L x base diam.) in.**	171 x 2.75
Gain	6 dBd	**Tower weight (antenna + clamps)**	35 lb.
Power rating (typ.)	500 watts	**Shipping weight**	50 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	150 / 125 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	3.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	122 lb.
Vertical beamwidth	20°	**Bending moment at top clamp**	494 ft. lb.
Termination	7-16 DIN-F	**(100 MPH, 40 PSF flat plate equiv.)**	

TELEWAVE, INC.

216 - 225 MHz

ANT220F6-I w/DIN CONNECTOR to be used for the inverted antenna.

ANT220F6

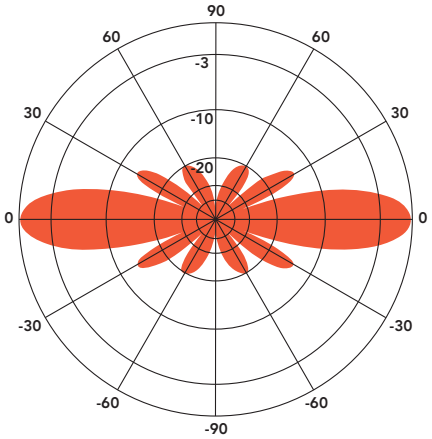
FIBERGLASS COLLINEAR ANTENNA 6 dBd

The Telewave ANT220F6 is an extremely rugged, medium-gain, fiberglass collinear antenna, designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, connected at DC ground potential for lightning impulse protection. The ANT220F6 is an excellent choice for wireless PTC systems in urban or rural areas.

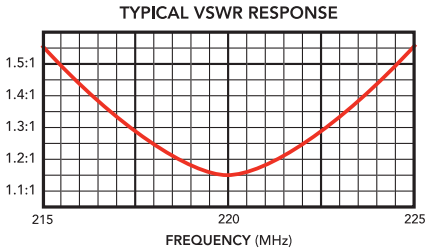
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray,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

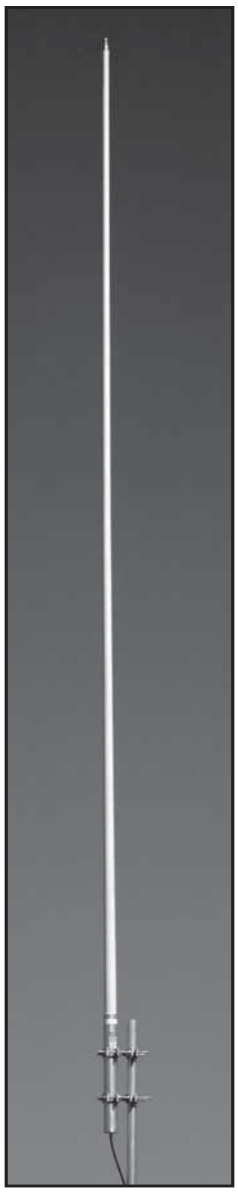
The ANT220F6 includes an ANTC482 dual clamp set for mounting to a 1.5" to 3.5" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper. Stand-off and top mounts are also available.

NOTE: THIS ANTENNA IS SHIPPED VIA TRUCK FREIGHT ONLY



ANT220F6 - 221 MHz
Vertical Plane
Gain = 6.11 dBd

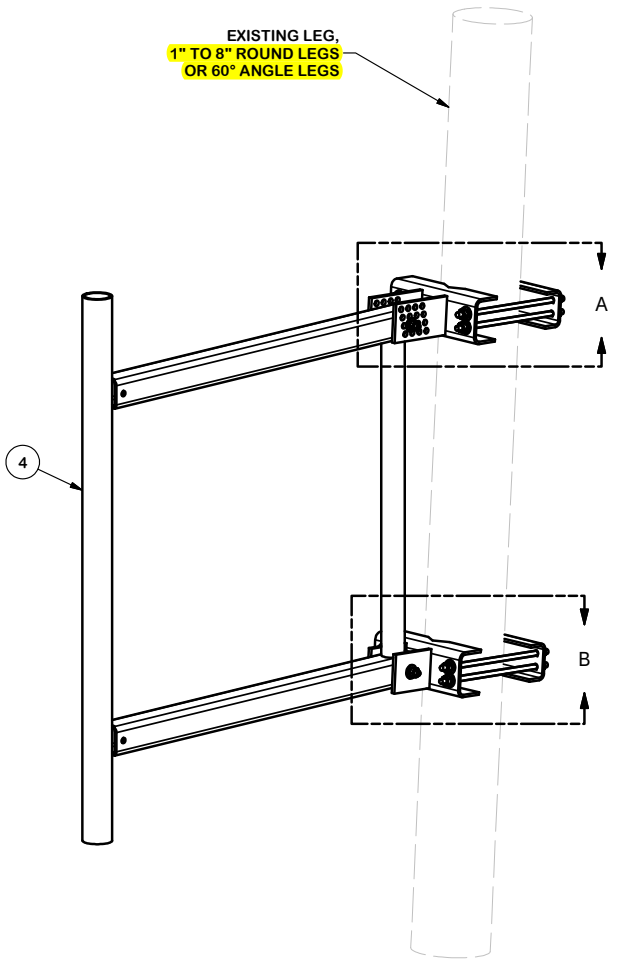


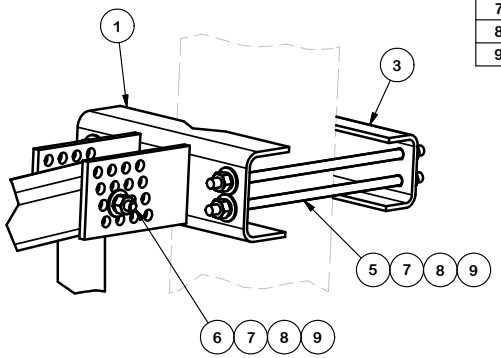


SPECIFICATIONS			
Frequency (continuous)	216-225 MHz	**Dimensions (L x base diam.) in.**	171 x 2.75
Gain	6 dBd	**Tower weight (antenna + clamps)**	35 lb.
Power rating (typ.)	500 watts	**Shipping weight**	50 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	150 / 125 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	3.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	122 lb.
Vertical beamwidth	20°	**Bending moment at top clamp**	494 ft. lb.
Termination	7-16 DIN-F	**(100 MPH, 40 PSF flat plate equiv.)**	

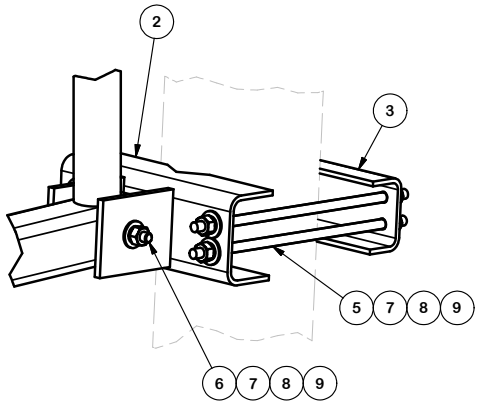
TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = 5.0" ± DIAMETER.

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

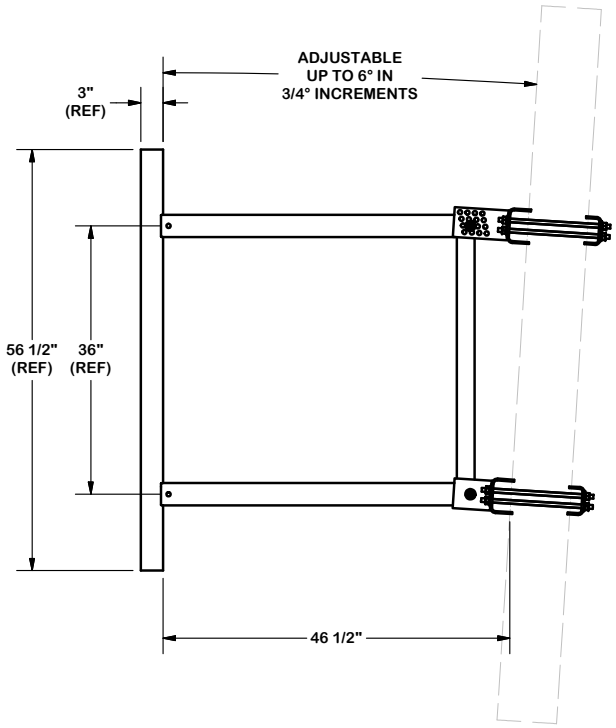




DETAIL A



DETAIL B



TOLERANCE NOTES

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

DESCRIPTION: 48" ULTIMATE UNIVERSAL STANDOFF FRAME

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

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

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

ATTACHMENT D – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (2) NEW OMNI/WHIP ANTENNAS, (1) AT ELEVATION 145'–0"± AGL AND (1) ELEVATION 130'–0" AGL
2. INSTALL (1) NEW RACK WITH NEW DMR EQUIPMENT IN EXISTING SHELTER

GOVERNING CODES

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

GENERAL NOTES

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

SITE INFORMATION

SITE NAME:	SOUTHBURY CASSIDY
SITE ID NUMBER:	#6
SITE ADDRESS:	CASSIDY RD (SOUTHBURY TRAINING SCHOOL) SOUTHBURY, CT 06488
MAP:	6
BLOCK:	86
LOT:	1
ZONE:	R–80
LATITUDE:	41° 30' 24.5" N
LONGITUDE:	73° 17' 0.5" W
ELEVATION:	756'± AMSL
FEMA/FIRM DESIGNATION:	X

CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

PROPERTY OWNER:
STATE OF CONNECTICUT
25 SIGOURNEY STREET
HARTFORD, CT 06106

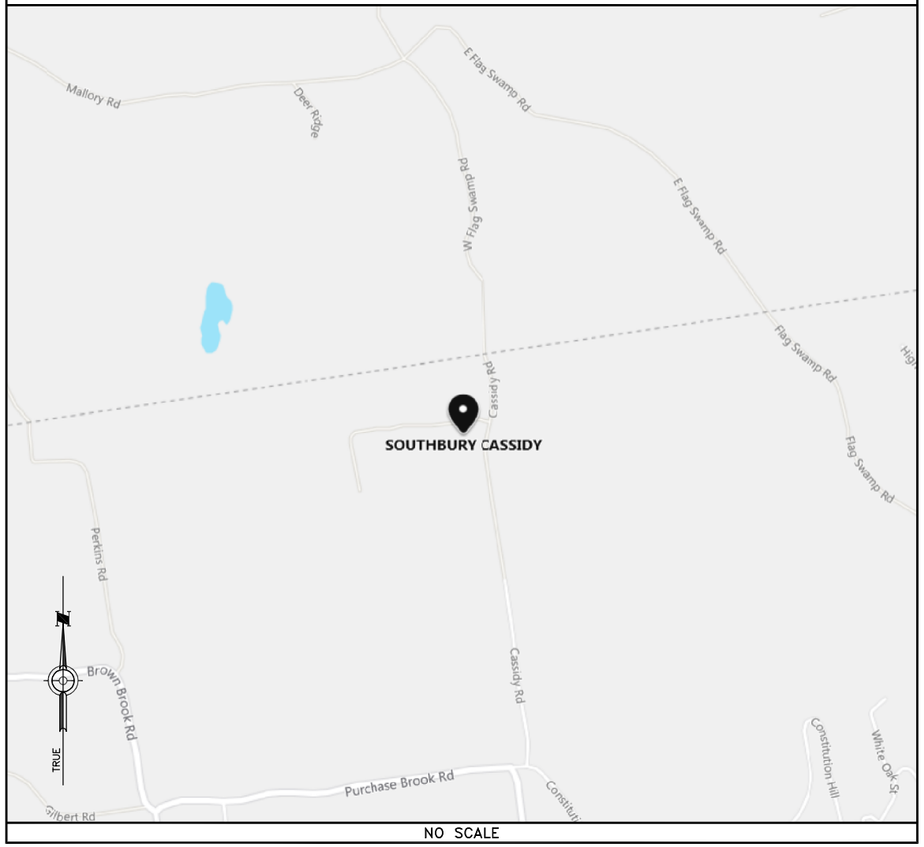
EVERSOURCE ENERGY
PROJECT MANAGER:
NIKOLL PRECI
(860) 655–3079

POWER PROVIDER:
EVERSOURCE ENERGY
(800) 286–2000

TELCO PROVIDER:
FRONTIER
(800) 921–8102

CALL BEFORE YOU DIG:
(800) 922–4455

LOCATION MAP



NO SCALE

DESIGN TYPE

SITE UPGRADE
SELF–SUPPORT TOWER

DRAWING INDEX

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

DO NOT SCALE DRAWINGS

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

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

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

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

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

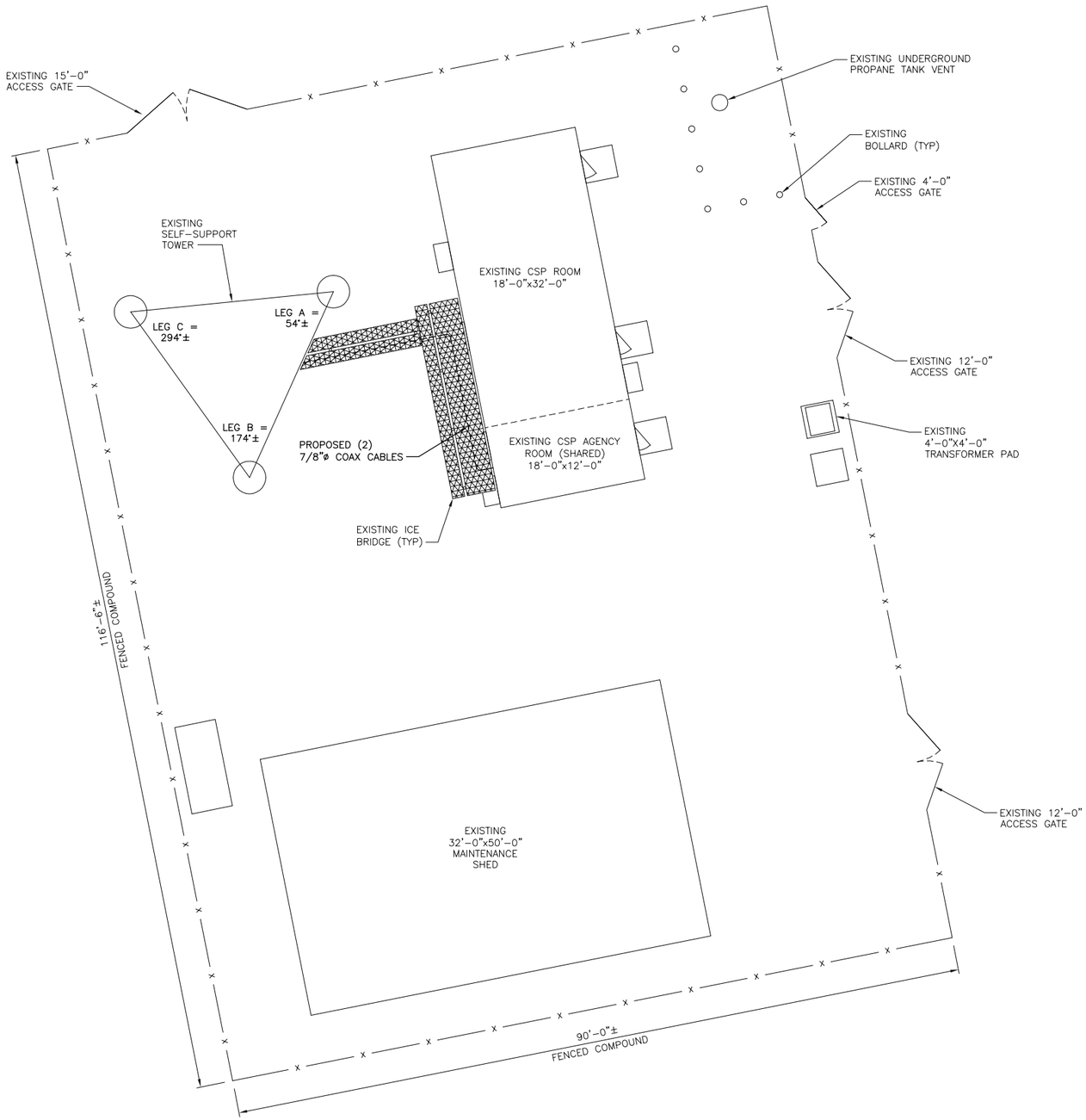
REV	DATE	DESCRIPTION
0	04/29/20	ISSUED FOR FILING

STATE OF CONNECTICUT · JOSHUA J. RILEY · 33208 · LICENSED PROFESSIONAL ENGINEER
04/29/2020

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1



SITE PLAN
NO SCALE

N

EVERSOURCE ENERGY

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

BLACK & VEATCH

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

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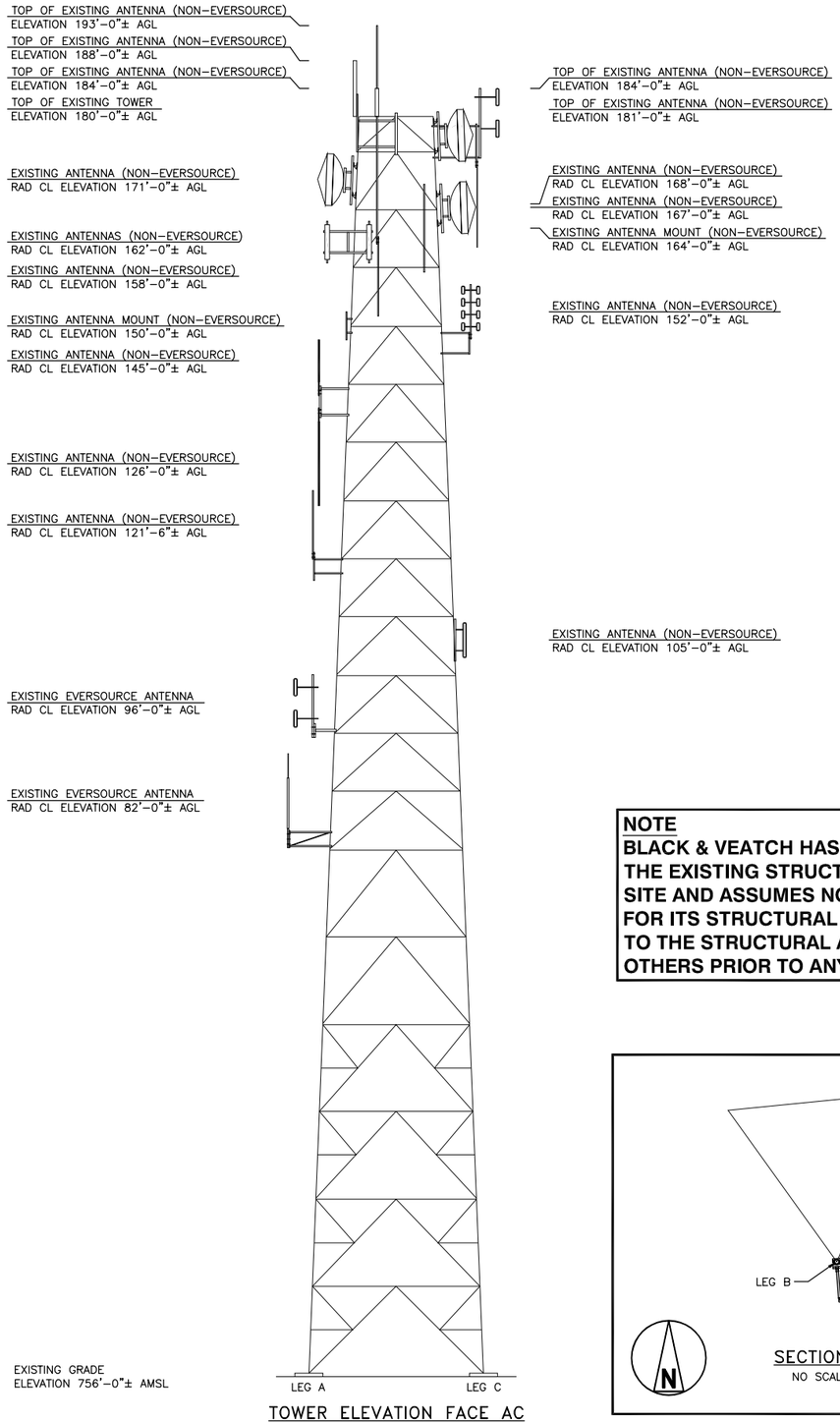
SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

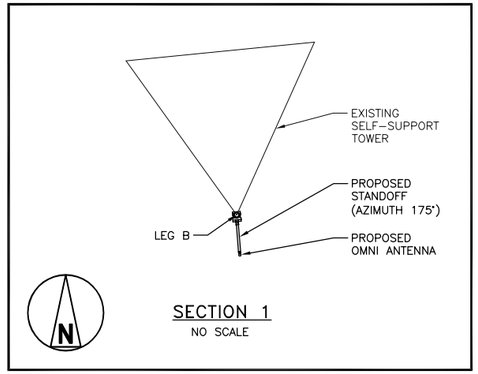
SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

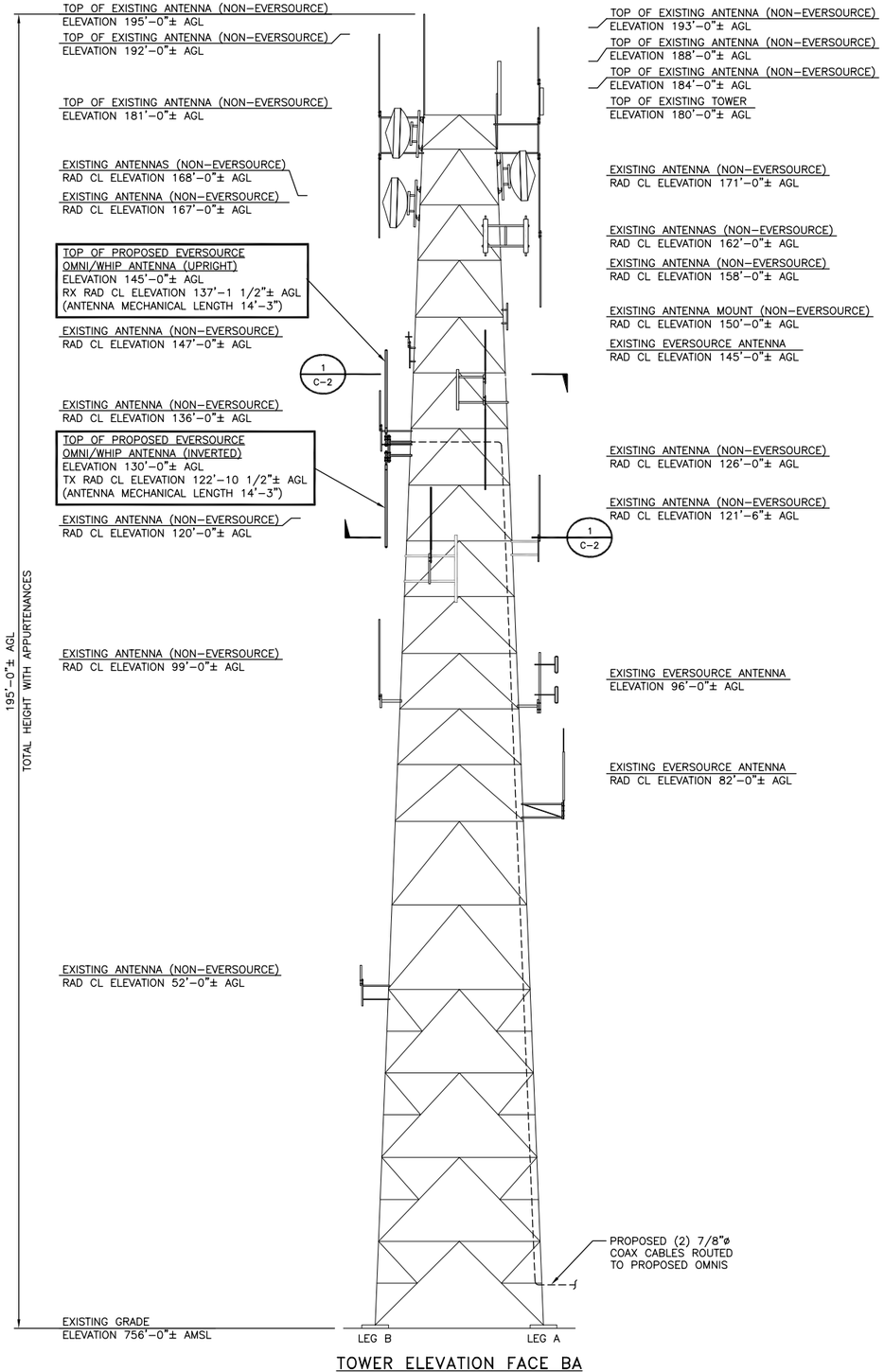


TOWER ELEVATION FACE AC
NO SCALE

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



SECTION 1
NO SCALE



TOWER ELEVATION FACE BA
NO SCALE

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

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

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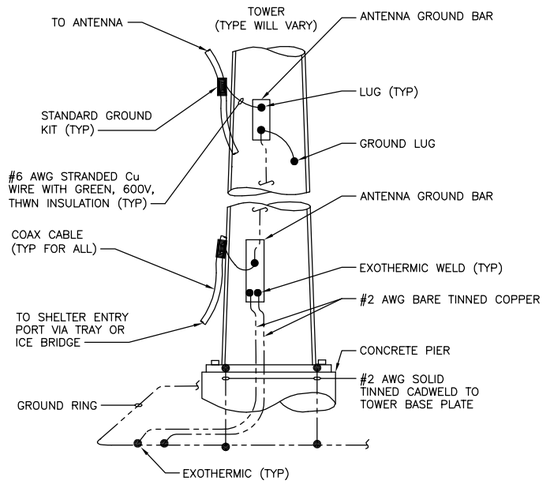
STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
04/29/2020

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

SHEET TITLE
TOWER ELEVATION

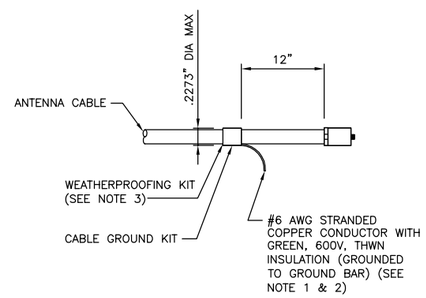
SHEET NUMBER
C-2



NOTE

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

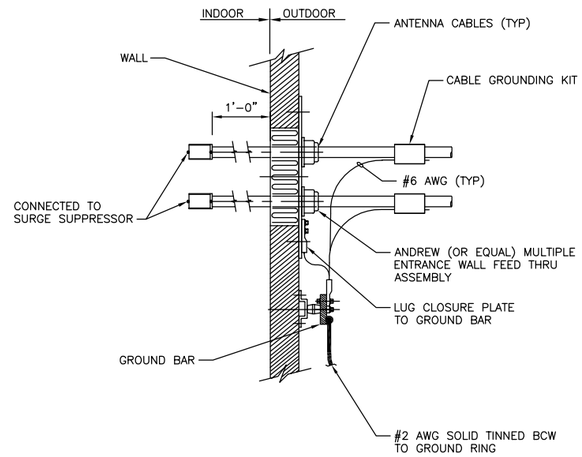
ANTENNA CABLE GROUNDING
NO SCALE



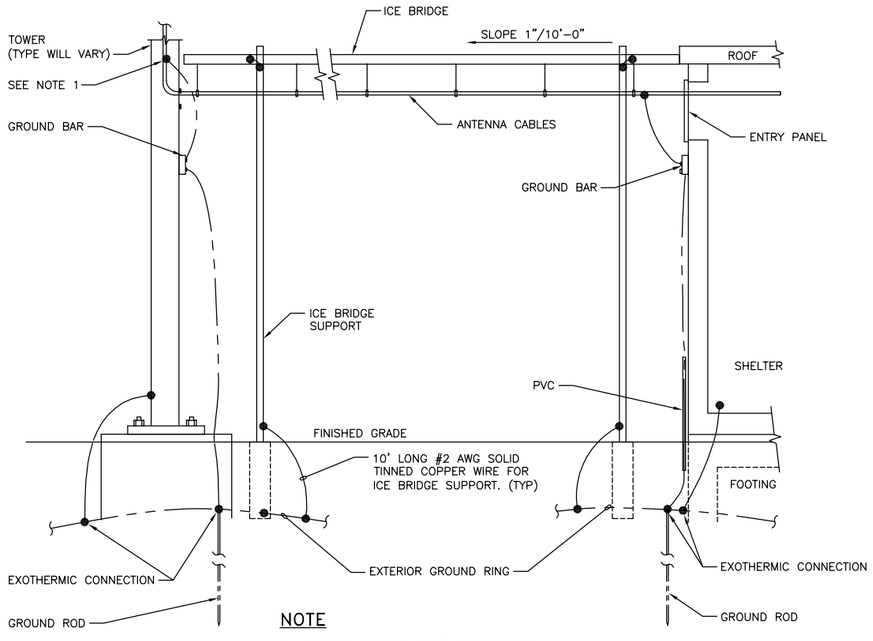
NOTES

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

CONNECTION OF CABLE GROUND
KIT TO ANTENNA CABLE
NO SCALE



CABLE INSTALLATION WITH WALL
FEED THRU ASSEMBLY
NO SCALE



NOTE

1. PROVIDE GROUND KIT 6" BEFORE TURN

ICE BRIDGE AND ANTENNA
CABLE DETAIL
NO SCALE

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

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

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

REV	DATE	DESCRIPTION
0	04/29/20	ISSUED FOR FILING

STATE OF CONNECTICUT
MARK P. STILES
24358
LICENSED
PROFESSIONAL ENGINEER
04/29/2020

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

SHEET TITLE
GROUNDING
DETAILS

SHEET NUMBER
G-1

DESIGN BASIS

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

GENERAL CONDITIONS

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

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

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

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

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

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

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

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

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

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

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

THERMAL & MOISTURE PROTECTION

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

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

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

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

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

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

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

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

SUBMITTALS

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

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

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

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

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

STEEL

1. MATERIAL:

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

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

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

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

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

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

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

SITE GENERAL

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

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

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

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

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

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

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

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

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

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

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

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

REV	DATE	DESCRIPTION
0	04/29/20	ISSUED FOR FILING

04/29/2020

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
N-1

ELECTRICAL

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

GROUNDING

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

ANTENNA & CABLE NOTES

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

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

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

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

REV	DATE	DESCRIPTION
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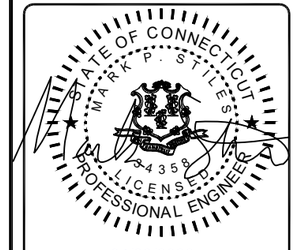

04/29/2020

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

SHEET TITLE
NOTES
& SPECIFICATIONS

SHEET NUMBER
N-2

SYMBOLS

●	EXOTHERMIC CONNECTION
■	COMPRESSION CONNECTION
⏚●	5/8"ø x 10'-0" COPPER CLAD STEEL GROUND ROD.
⏚◉	TEST GROUND ROD WITH INSPECTION SLEEVE
– – –	GROUNDING CONDUCTOR
(A)	KEY NOTES
FENCE	X X X X X
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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PROJECT NO:	403093
DRAWN BY:	TYW
CHECKED BY:	THM

REV	DATE	DESCRIPTION
0	04/29/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER
04/29/2020

SOUTHBURY CASSIDY
CASSIDY RD (SOUTHBURY TRAINING SCHOOL)
SOUTHBURY, CT 06488

SHEET TITLE
NOTES & SPECIFICATIONS

SHEET NUMBER
N-3

REFERENCE CUTSHEETS

TELEWAVE, INC.

216 - 225 MHz

ANT220F6

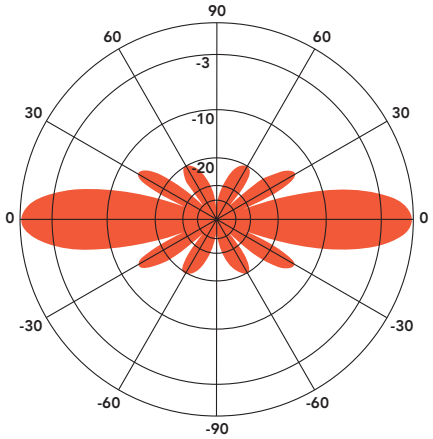
FIBERGLASS COLLINEAR ANTENNA 6 dBd

The Telewave ANT220F6 is an extremely rugged, medium-gain, fiberglass collinear antenna, designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, connected at DC ground potential for lightning impulse protection. The ANT220F6 is an excellent choice for wireless PTC systems in urban or rural areas.

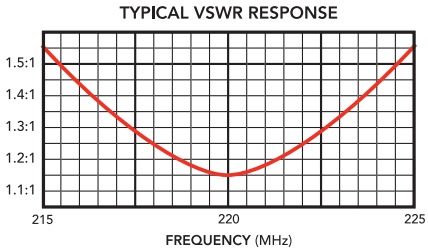
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray,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

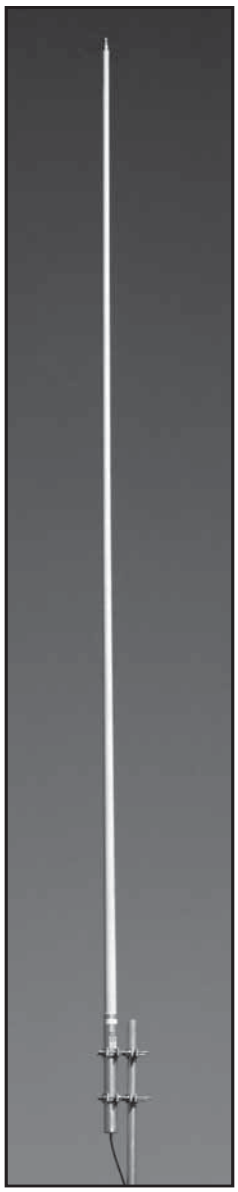
The ANT220F6 includes an ANTC482 dual clamp set for mounting to a 1.5" to 3.5" O.D. support pipe, and a 24" removable RG-213 N-Male jumper. Stand-off and top mounts are also available.

NOTE: THIS ANTENNA IS SHIPPED VIA TRUCK FREIGHT ONLY



ANT220F6 - 221 MHz
Vertical Plane
Gain = 6.11 dBd





Mast OD

SPECIFICATIONS			
Frequency (continuous)	216-225 MHz	**Dimensions (L x base diam.) in.**	171 x 2.75
Gain	6 dBd	**Tower weight (antenna + clamps)**	35 lb.
Power rating (typ.)	500 watts	**Shipping weight**	50 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	150 / 125 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	3.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	122 lb.
Vertical beamwidth	20°	**Bending moment at top clamp**	494 ft. lb.
Termination	Recessed N Female 7-16 DIN-F opt.	**(100 MPH, 40 PSF flat plate equiv.)**	

TELEWAVE, INC.

216 - 225 MHz

ANT220F6-I w/DIN CONNECTOR to be used for the inverted antenna.

ANT220F6

FIBERGLASS COLLINEAR ANTENNA 6 dBd

The Telewave ANT220F6 is an extremely rugged, medium-gain, fiberglass collinear antenna, designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, connected at DC ground potential for lightning impulse protection. The ANT220F6 is an excellent choice for wireless PTC systems in urban or rural areas.

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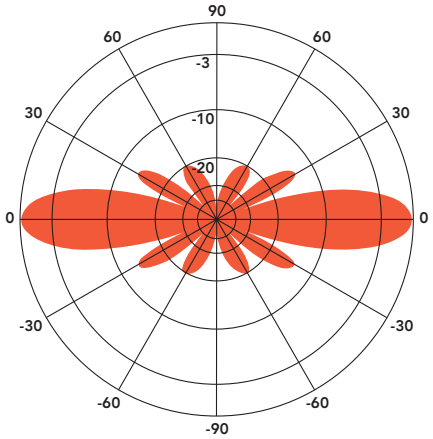
NOTE: THIS ANTENNA IS SHIPPED VIA TRUCK FREIGHT ONLY



ANT220F6 - 221 MHz
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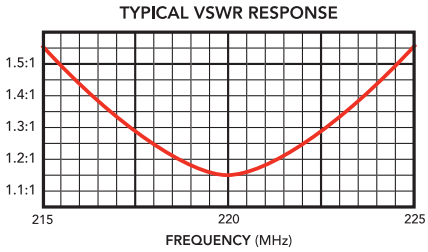
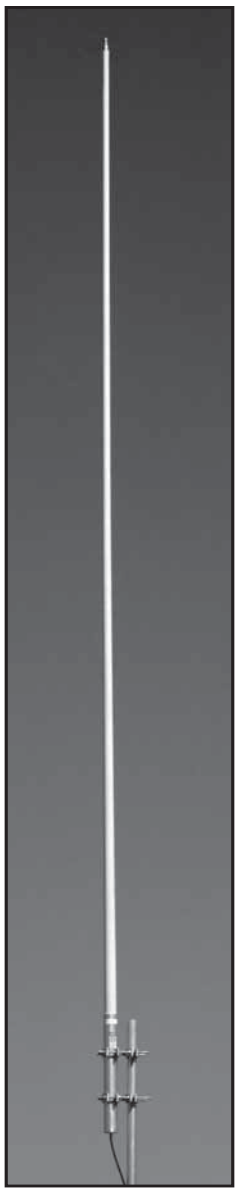


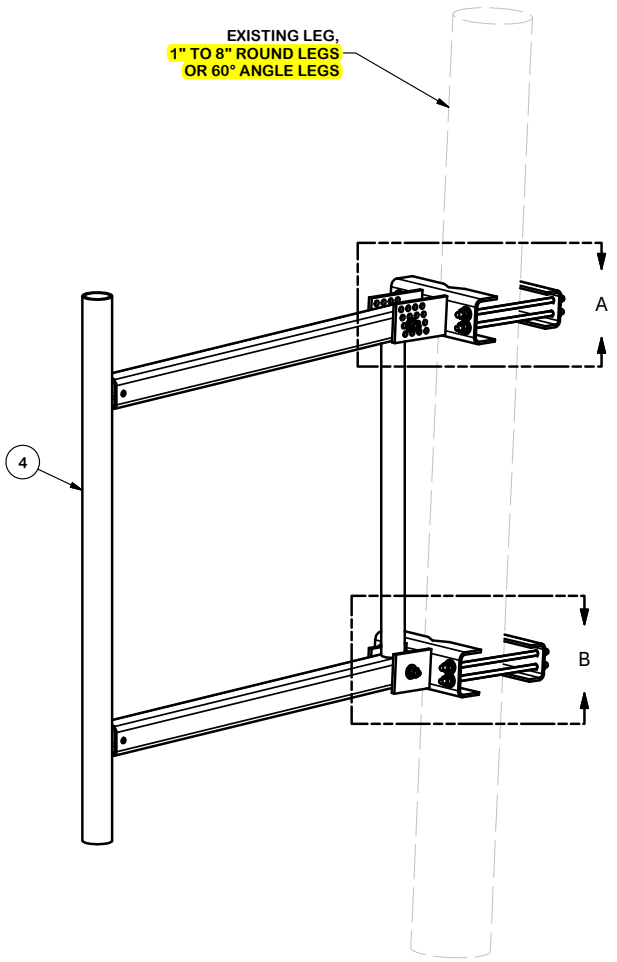


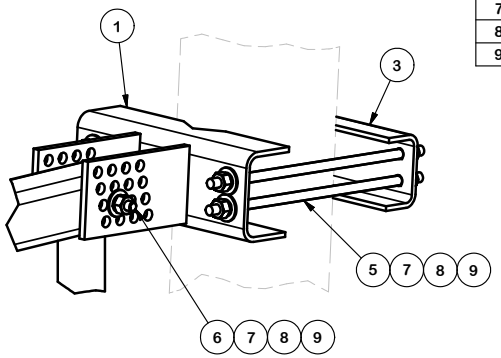
Mast OD

SPECIFICATIONS			
Frequency (continuous)	216-225 MHz	**Dimensions (L x base diam.) in.**	171 x 2.75
Gain	6 dBd	**Tower weight (antenna + clamps)**	35 lb.
Power rating (typ.)	500 watts	**Shipping weight**	50 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	150 / 125 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	3.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	122 lb.
Vertical beamwidth	20°	**Bending moment at top clamp**	494 ft. lb.
Termination	Recessed N Female 7-16 DIN-F opt.	**(100 MPH, 40 PSF flat plate equiv.)**	

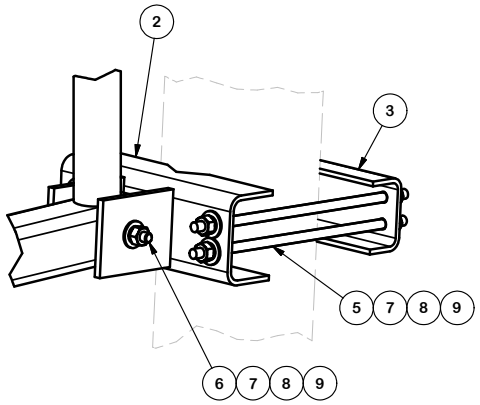
TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = 5.0" ± DIAMETER.

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

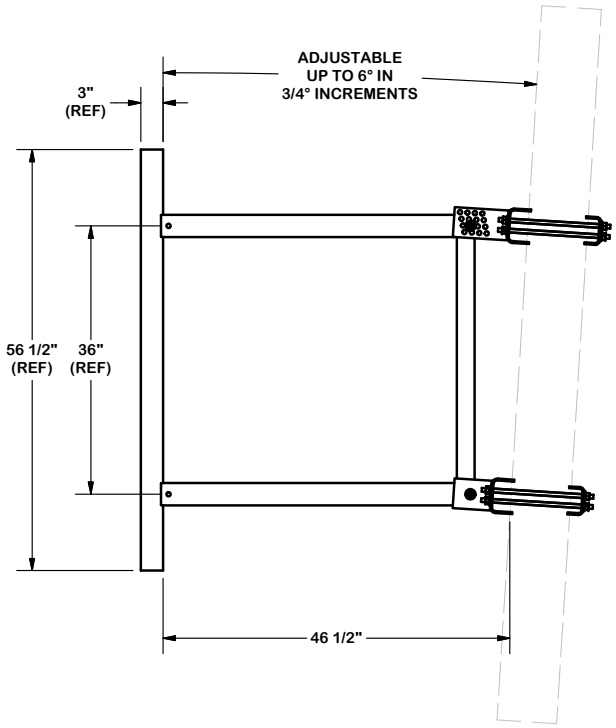




DETAIL A



DETAIL B



TOLERANCE NOTES

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

DESCRIPTION: 48" ULTIMATE UNIVERSAL STANDOFF FRAME

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

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81	01	CUSTOMER	BMC 2/16/2011	USF-4U

ATTACHMENT E – STRUCTURAL ANALYSIS

AECOM

Submitted to
Eversource Energy
107 Selden Street
Berlin, CT 06037

Submitted by
AECOM
1255 Broad Street
Suite 201
Clifton, NJ 07013
October 27, 2020

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF AN EXISTING 180’ SELF SUPPORTING LATTICE TOWER AND FOUNDATION FOR PROPOSED ANTENNA ARRANGEMENT

EVERSOURCE ENERGY

Site Name: Southbury
Site Address: Cassidy Road
Southbury, Connecticut

60627193
EVS-016 Rev. 2 (b)
Eversource ES-068

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 180' self-supporting lattice tower structure located at Cassidy Road in Southbury, Connecticut.

The structural analysis was conducted in accordance with the 2018 Connecticut State Building Code, the TIA-222-H[1] Standard, 2015 International Building Code, the 2018 Connecticut State Building Code Amendments, the AISC[2] Load Resistance Factor Design (LRFD), the ASCE 7[3] design Code.

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

The proposed Eversource antenna inventory is listed below:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove:		
(1) 12' Dipole Antenna **(1) 10' Antenna Pipe mounted to Leg** **(1) 7/8" Coaxial Cable**	**CSP (Existing)**	**@ 147'**
(1) Mark P-25A48GR Grid Dish **(1) 7/8" Coaxial Cable**	**CSP (Existing)**	**@ 147'**
(1) Celwave PD-320 Dipole Antenna **(1) 7/8" Coaxial Cable**	**CSP (Existing)**	**@ 125'**
Install:		
(1) Telewave ANT220F6 Omni Antenna (Antenna Centerline Install @ 137') **(1) RFS LCF78-50JA-A7 Cellflex Coaxial Cable**	**Eversource (Proposed)**	**@ 123'-137'**
(1) Telewave ANT220F6 Omni Antenna (Antenna Centerline Install @ 123') **(1) RFS LCF78-50JA-A7 Cellflex Coaxial Cable**		
(1) SitePro USF-4U (Mount Centerline Install @ 130')		

The results of the structural analysis indicate that:

1. The existing steel tower structure IS considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
2. The existing tower anchor bolts ARE considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
3. The existing foundation IS considered structurally adequate for the proposed antenna load classification with the wind classification specified herein.
4. The controlling structural capacity for all tower and foundation components for the proposed antenna loading is **98.2%**

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

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

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

1. EXECUTIVE SUMMARY - *continued*

This analysis is based on:

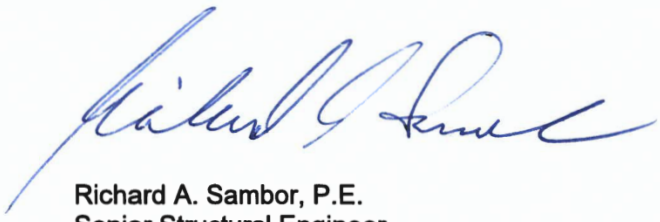
1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry and structural member sizes utilized in the preparation of this report were obtained from manufacturer's original design documents prepared by Stainless, Inc. report number 358808TP, noted as revision C, dated January 27, 1995.
3) Previous structural analysis and evaluation performed by URS Corporation on behalf of Northeast Utilities, project 36917363 / NU1042, signed and sealed September 27, 2012
4) Connecticut State Police (CSP) antenna inventory obtained via e-mail dated January 27, 2014.
5) Tower Mapping and Inventory by D&K Nationwide Communications, Ind. dated March 15, 2016.
6) Proposed antenna inventory provided by Pyramid Network Services, LLC., dated June 20, 2016.
7) Connecticut State Police (CSP) antenna inventory removal obtained via e-mail dated July 21, 2020.
8) Antenna and mount configuration as specified within Section 2 and 6 of this report.
9) Coax cable orientation as specified in section 6 of this report.

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

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

Sincerely,

AECOM,



Richard A. Sambor, P.E.
Senior Structural Engineer
RAS/cmc

2. INTRODUCTION

The subject tower is located at Cassidy Road in Southbury, Connecticut. The structure is an existing 180' self supporting steel tapered lattice tower, designed and manufactured by Stainless Incorporated.

The structural analysis was conducted in accordance with the following:

- 2018 International Building Code (compliant with the TIA-222-H design loads)
- 2015 International Building Code with 2018 Connecticut State Building Code Amendments for an ultimate wind speed of 130 mph (3-second gust)
- 2016 AISC Load Resistance Factor Design (LRFD)
- 2016 ASCE 7 Minimum Design Loads for Buildings and Other Structures for the ice thickness referenced in the TIA-222-H Standard.

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

Antenna Type	***Carrier***	***Mount***	***Antenna Centerline Elevation***	***Cable***
(1) 10' Lightning Rod	D&K-33 (existing)	Tower Mounted	190'	-----
-----	D&K-34 (existing)	(2) 10' Sidearm Mounts	180'	(1) 7/8" (unattached)
(1) Sinclair SC479-HF1LDF (D00-E6085) Omni Antenna (Troop A)	CSP (Existing)	*Shared Mount @ 180'*	180'	(1) AVA7-50
(1) Sinclair SC479-HF1LDF Omni Antenna	D&K-32 CSP-34 (existing)	*Shared mount @ 180'*	180'	(1) 1-5/8"
(1) Bird 432E-83I-01T TTA Unit (Troop A)	CSP (Existing)	*Shared Mount @ 180'*	180'	(1) AVA7-50 (1) 1/2" Connected to CSP-35
(1) (inverted) Sinclair SC479-HF1LDF (D00I-E6085) Omni Antenna (Troop A)	CSP (Existing)	*Shared Mount @ 180'*	180'	(1) 1/2" from TTA Unit
(1) (inverted) Sinclair SC479-HF1LDF Omni Antenna	D&K-30 CSP-35 (existing)	*Shared mount @ 180'*	180'	(1) 1-5/8"
(1) Sinclair SE419-SWBPALDF (D00) Panel Antenna (Troop L)	CSP (Existing)	*Shared Mount @ 180'*	180'	(1) AVA7-50
(1) Sinclair SC479-HF1LDF Omni Antenna	D&K-29 CSP-37 (existing)	*Shared mount @ 180'*	180'	(1) 1-5/8"
(1) Bird 432E-83I-01T TTA Unit (Troop L)	CSP (Existing)	*Shared Mount @ 180'*	180'	(1) AVA7-50 (1) 1/2" Connected to CSP-17
(1) Sinclair SE419-SWBPALDF (D00) Panel Antenna (Troop L)	D&K-24 CSP-17 (Existing)	*Shared mount @ 180'*	180'	(1) 1/2" from TTA Unit
-----	D&K-25 (existing)	Pipe Mount on Leg	176'	-----

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) RFS PA6-65 6' Dish with Radome	D&K-28 CSP-4 (existing)	Pipe Mount on Leg	175'	(1) WEP65
(1) RFS PA6-65 6' Dish with Radome	D&K-27 CSP-6 (existing)	Pipe Mount on Leg	173'	(1) WEP65
(1) Sinclair SE419-SWBPALDF (D00) Panel Antenna (Troop L)	CSP (Existing)	Shared Mount @ 180'	170'	(1) 1/2" from TTA Unit
(1) RFS PA6-65 6' Dish with Radome	D&K-23 CSP-3 (existing)	Pipe Mount on Leg	169'	(1) WEP65
-----	D&K-19 (existing)	Pipe Mount on Leg	166'	-----
(1) RFS PA6-65 6' Dish with Radome	D&K-22 CSP-2 (existing)	Pipe Mount on Leg	163'	(1) WEP65
(1) RFS PA6-65 6' Dish with Radome	D&K-21 CSP-5 (existing)	Pipe Mount on Leg	163'	(1) WEP65
(1) (inverted) Sinclair SC479-HF1LDF Omni Antenna	D&K-18 CSP-38 (existing)	*Shared mount @ 180'*	156'	(1) 1-5/8"
(1) Decibel DB222 Dipole Antenna	D&K-16 (existing)	6' Sidearm	147'	(1) 7/8"
(1) 3' Folded Dipole Antenna	D&K-15 (existing)	*Shared with below Mount*	147'	(1) 7/8"
-----	D&K-13 (existing)	Pipe Mount on Face	147'	(1) 7/8" (unattached)
(1) 6' Omni Antenna	D&K-12 (existing)	*Shared with below Mount*	141'	(1) 7/8"
(1) Telewave ANT220F6 Omni Antenna	**Eversource (Proposed)**	**(1) SitePro USF-4U (Mount Centerline Install @ 130')**	**137'**	**(1) 7/8"**
(1) Telewave ANT220F6 Omni Antenna	**Eversource (Proposed)**	(1) SitePro USF-4U (Mount Centerline Install @ 130') *shared mount @130'*	**123'**	**(1) 7/8"**
-----	D&K-8 (existing)	3' Standoff	114'	-----
(1) 15' Omni Antenna	D&K-7 (existing)	5' Standoff	111'	(1) 7/8"
(1) RFS 1151-3N Omni Antenna	D&K-6 NEU-26 (existing)	3' Standoff	110'	(1) 7/8"
(1) Comprod 531-70 Dipole Antenna	D&K-5 DOT-19	1' Sidearm	103'	(1) 7/8"

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
	(existing)			
(1) 10’ Omni Antenna	D&K-4 CSP-28 (existing)	3’ Sidearm	95’	(1) 1/2”
(1) Telewave VHF150 Dipole Antenna	D&K-3 CSP-27 (existing)	3’ Sidearm	95’	(1) 1/2"
(1) Kreco CO-41N Omni Antenna	D&K-2 NEU-44 (existing)	5’ Sidearm	76’	(1) 7/8”
(1) Decibel DB803 Omni Antenna	D&K-1 CSP-29 (existing)	3’ Standoff	48’	(1) 1/2"

NOTES: Antenna ID numbering obtained from Tower Mapping and Existing inventory via tower climb, performed by D&K Nationwide Communications, Inc. on March 15, 2016.

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

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

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

The structural analysis was conducted using TNX Tower version 8.0.7.4 and used the following conditions for this tower review (following the TIA-222-H Standard):

- Structure Class 3 – (Essential Communications)
    - NOTE: ASCE 7 and CT State Building Code Applied Risk Category 4 for design wind loads (see below)
- Topographic Category 3 – (Tower location on top of hill – rolling wind conditions considered)
    - Crest Height used for analysis: (approximate elevations listed below)
        - Tower Base Elevation = 775 feet
        - High point (2 mile Radius) = 857 feet (Ref. Bronson Mountain (NE of tower location)
        - Low Point (2 mile Radius) = 200 feet (Ref. Shepaug River (NW of tower location)
        - "H" = (Avg of High/Low) – Base Elevation = (857+200)/2 – 775 = 98 feet
- Exposure Class C – (Open Terrain with scattered obstructions)
- Load Conditions:
    - Two load conditions were evaluated as shown which were compared to design stresses according to AISC and TIA-222-H Standard.

Basic Wind Speed:

- IBC 2018 w/ 2018 CT State Building Code Amendment:
    - (2018) IBC Section 1609.1.1 – Determination of Wind Loads – Exception 5 "Designs using TIA-222" applies for determination of Design Wind Load obtained as "V.ult" are to be converted to "V.asd" when applying the TIA-222-H design Standard (under Section 1609.3) for Basic Wind Speed.
        - Due to tnxTower program options for TIA-222-H, the program appears to perform tower analysis with speeds according to ASCE 7-16 V.ult loads, therefore, V.ult speeds are to be used.
    - (2018) CT State Building Code Amendment to the IBC Section 1609.3 wind loads are obtained from Appendix N of the State Building Code.
        - **V.ult = 130 mph** (3-Second Gust) Wind Design Parameter for the Town of Southbury, Connecticut for Risk Category four (IV) for essential communications (Connecticut State Police). NOTE: Because the State of Connecticut has not officially published the design wind-speeds, use the state of Connecticut wind-speeds per municipality (indicated above).

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

Ice thickness used for this analysis is **1.0 inch** (assumed to start at the base of the tower) and is considered to increase in thickness with height. The initial ice thickness for design is referenced in the Annex of TIA-222-H and follows the same design criteria as the ASCE 7 Standard.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS (cont.)

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

Seismic event consideration factors/values for design:

- S.s = 0.198 (2018 CT State Building Code – Location Specific Value)
- S.1 = 0.065 (2018 CT State Building Code – Location Specific Value)
- Site Classification = “D”
- Seismic Design Category = “A” – (2018 International Building Code)
- F.a = 1.6 (Obtained from TIA-222-H Table 2-11 Considering above conditions)
- F.v = 2.4 (Obtained from TIA-222-H Table 2-12 Considering above conditions)

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

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

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

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

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

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

4. FINDINGS AND EVALUATION

Combined axial and bending stresses on the existing tower structure were evaluated to compare with strength design in accordance with AISC (LRFD). The calculated stresses for the tower structure, anchor bolts and foundation were within the required design strength under the existing configuration and loading (stated herein). Detailed analysis calculations for the proposed load condition are provided in Section 6 of this report.

Tower Base Reactions:

Description	Current (TIA/EIA-222-H)
Axial Load (kips)	47
Pier Compression (kips)	351
Pier Uplift (kips)	302
Overall Overturning (kip-ft)	7252
Overall Shear (kips)	79
Shear per Leg (kips)	44

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

TABLE 3: Tower Component Stress vs. Capacity Summary:

Component/ (Section No.)	Existing Component Size	Controlling Component/Elevation	Stress (% capacity)	Pass/Fail
Tower Leg (T8)	HSS 6.875x0.5”	Compression/0’-25’	69.4 %	**Pass**
Diagonal (T8)	(2)L3x3-1/2x1/4	Compression/0’-25’	98.2 %	**Pass**
Horizontal (T8)	L4x4x1/4	Compression/0’-25’	89.7 %	**Pass**
Top Girt (T8)	L4x4x1/4	Compression/0’-25’	76.7 %	**Pass**
Red. Horizontal Bracing (T8)	L2 1/2x2 1/2x3/16	Compression/0’-25’	41.0 %	**Pass**
Red. Diagonal Bracing (T8)	L3x3x1/4	Compression/0’-25’	25.4 %	**Pass**
Inner Bracing (T7)	L2 1/2x2 1/2x3/16	Compression/25’-50’	6.5 %	**Pass**
Bolt Checks	(1) A325X 1” Dia. Bolt	Diagonal Member Bearing (Block Shear) / 0’-25’	98.2 %	**Pass**

Foundation Summary:

Component	Required	Computed	% Capacity	Pass/Fail
Anchor Rod Capacity (TIA-222-H – 4.9.9)	Ratio < 1.0	0.79	79.0 %	Pass
Overturning Moment Factor of Safety TIA-222-H Conditions	Resist OT * (0.75) Reduction Factor (TIA-222-H – Section 9.7) 16903 Kip*ft	7726 kip*ft	60.94 %	Pass
Bearing Pressure (TIA-222-H Conditions)	2.250 ksf max	1.5691 ksf	69.7 %	Pass

4. FINDINGS AND EVALUATION (cont.)

Maximum Deformations – Proposed Condition

ANSI/TIA-222-H Section 2.8.2 - Limit State Deformations

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

Load Case Description	Current		Allowable	
	Sway (degree)	Displacement (Feet)	Sway (degree)	Displacement (Feet)
Service Wind Load	0.1155	0.2286	4.0	5.4

5. CONCLUSIONS AND RECOMMENDATIONS

The results of the structural analysis indicate that:

1. The existing steel tower structure IS considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
2. The existing tower anchor bolts ARE considered structurally adequate for the proposed antenna loading with the wind classification specified herein.
3. The existing foundation IS considered structurally adequate for the proposed antenna load classification with the wind classification specified herein.
4. The controlling structural capacity for all tower and foundation components for the proposed antenna loading is **98.2%**

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report.
2. Tower is properly installed and maintained.
3. All members are as specified in the original design documents and are in good condition.
4. All required members are in place.
5. All bolts are in place and are properly tightened.
6. Tower is in plumb condition.
7. All member protective coatings are in good condition.
8. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9. Foundations are in good condition without defects and were properly constructed to support original design loads as specified in the original design documents.

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

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

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

Ongoing and Periodic Inspection and Maintenance:

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

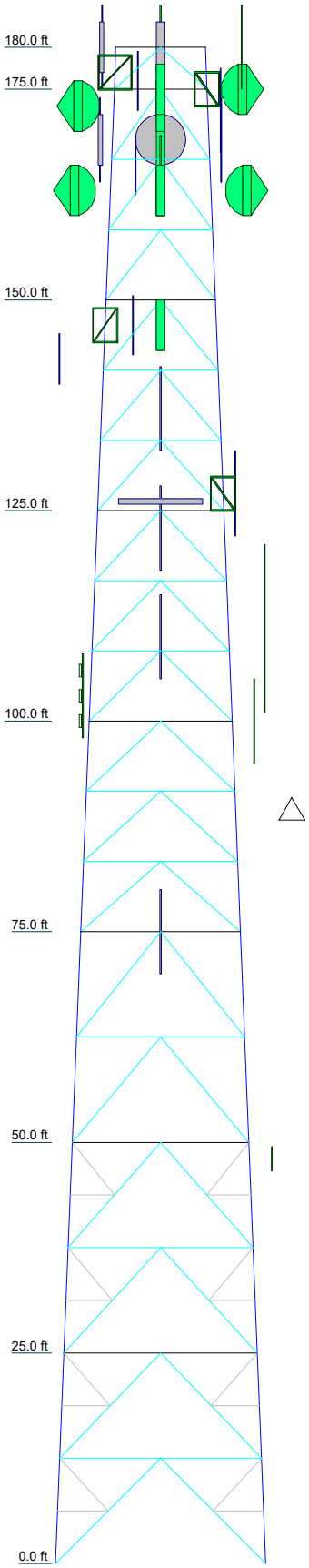
The owner shall refer to TIA-222-H Section 14.2 for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection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

6. DRAWINGS AND DATA

TNX TOWER INPUT / OUTPUT SUMMARY

Section	T1	T2	T3	T4	T5	T6	T7	T8
Legs		HSS5x.25	HSS5x.5		HSS6.875x.5			
Leg Grade		A500-50		A572-60				
Diagonals		2L2 1/2x2x3/16		2L3x2 1/2x1/4		2L3 1/2x3x1/4	2L3x3 1/2x1/4	
Diagonal Grade				A36				
Top Girts	A		L3x3x1/4		L4x4x1/4			
Horizontals	N.A.	L2 1/2x2 1/2x3/16	L3x3x1/4		L4x4x1/4			
Red. Horizontals				N.A.			L2 1/2x2 1/2x3/16	
Red. Diagonals				N.A.			L3x3x1/4	
Inner Bracing		N.A.		L2 1/2x2x3/16		L2 1/2x2 1/2x3/16	L3x3x1/4	
Face Width (ft)	10.599	10.999	12.9991	14.9993	16.9994	18.9996	20.9997	22.9999
# Panels @ (ft)	1 @ 5			12 @ 8.33333			6 @ 12.5	
Weight (K)	0.6	2.2	3.4	4.5	5.0	5.4	6.3	6.6

34.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
SC479-HF1LDF (DK-29 / CSP-37)	180	PA6-65AC (DK-23 / CSP-3)	169
SC479-HF1LDF (DK-32 / CSP-34)	180	7'x2" Antenna Mount Pipe (DK-34)	166
Lightning Rod 2"x10' (DK-33 / Tower)	180	7'x2" Antenna Mount Pipe (DK-19)	166
SC479-HF1LDF (D00-E6085) (Troop A P25 TX)	180	Dish Antenna Pipe Mount (DK-21 / CSP-5)	163
SC479-HF1LDF (D00I-E6085) (Troop A P25 Diversity RX)	180 - 165	PA6-65AC (DK-21 / CSP-5)	163
SE419-SWBPALDF(D00) (Troop L P25 TX)	180	Dish Antenna Pipe Mount (DK-22 / CSP-2)	163
SE419-SWBPALDF(D00) (Troop A P25 Diversity RX)	180	PA6-65AC (DK-22 / CSP-2)	163
432E-83I-01T TTA Unit (Troop A P25 TX / RX)	178	7'x2" Antenna Mount Pipe (DK-13)	147
432E-83I-01T TTA Unit (Troop L P25 TX / RX)	178	Dish Antenna Pipe Mount (DK-14,15 / CSP-18)	147
5" Side Mount Standoff (DK-34)	177	3' Yagi (DK-15)	147
5" Side Mount Standoff (DK-34)	177	10' 4-Bay Dipole (DK-16)	147
7'x2" Antenna Mount Pipe (DK-25)	176	6' Side Mount Standoff (1) (DK-16)	147
(inverted) SC479-HF1LDF (DK-18 / CSP-38)	175 - 163	6'x1" Whip Antenna w/ Mount (DK-12)	146 - 140
5" Side Mount Standoff (DK-18, 20,24, 26,29 / CSP-38,16,17,39, 37)	175	ANT220F6 w/clamps (Eversource)	137.1
5" Side Mount Standoff (DK-18, 20,24, 26,29 / CSP-38,16,17,39, 37)	175	Site Pro USF-4U (Eversource)	130 - 122.9
Dish Antenna Pipe Mount (DK-28 / CSP-4)	175	6' Side Mount Standoff (1) (DK-10)	127
(inverted) SC479-HF1LDF (DK-30 / CSP-35)	175 - 163	6' Side Mount Standoff (1) (DK-10)	127
5" Side Mount Standoff (DK-30, 31, 32 / CSP-35, 36, 34)	175	7' Omni (Whip) Antenna (DK-10)	127
5" Side Mount Standoff (DK-30, 31, 32 / CSP-35, 36, 34)	175	ANT220F6 w/clamps (Eversource)	122.9
SC479-HF1LDF (D00I-E6085) (Troop A P25 RX)	175 - 163	3' Side Mount Standoff (DK-8)	114
5" Side Mount Standoff (Troop A P25 TX / RX)	175	15' Omni (Whip) Antenna (DK-7)	111
5" Side Mount Standoff (Troop A P25 TX / RX)	175	1151-3 (DK-6 / NEU-26)	110
SE419-SWBPALDF(D00) (Troop L P25 RX)	175 - 163	3' Side Mount Standoff (DK-6 / NEU-26)	110
PA6-65AC (DK-28 / CSP-4)	175	5" Side Mount Standoff (DK-7)	110
Dish Antenna Pipe Mount (DK-27 / CSP-6)	173	1' Side Mount Standoff (DK-5 / DOT-19)	103
PA6-65AC (DK-27 / CSP-6)	173	531-70 Dipole (DK-5 / DOT-19)	103
Dish Antenna Pipe Mount (DK-23 / CSP-3)	169	6' Dipole Antenna (DK-3 / CSP-27)	100
		3' Side Mount Standoff (DK-3 / CSP-27)	100
		2" Dia 10' Omni (DK-4 / CSP-28)	100
		3' Side Mount Standoff (DK-4 / CSP-28)	100
		2" Dia 14' Omni (DK-2 / NEU-44)	75
		5' Side Mount Standoff (DK-2 / NEU-44)	75
		DB803M-Y (DK-1 / CSP-29)	48
		3' Side Mount Standoff (DK-1 / CSP-29)	48

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	L3x3x1/4		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A572-60	60 ksi	75 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 3 with Crest Height of 98.00 ft

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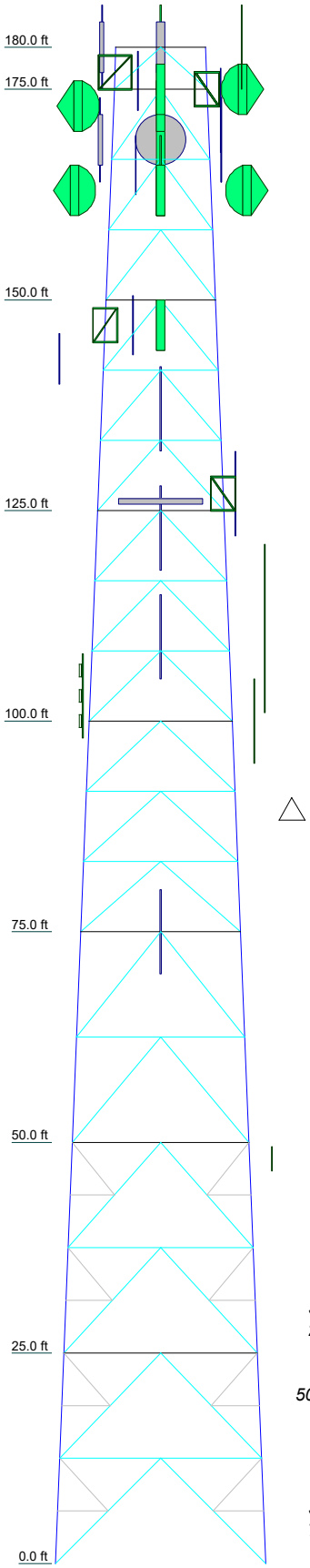
Phone: (973) 883-8663
FAX: (973) 883-8500

Job: ***180' Self-Supporting Lattice Tower***			
Project: ***Connecticut State Police Tower - Southbury, CT - Rev.***			
Client: Eversource	Drawn by: christina.carlos	App'd:	
Code: TIA-222-H	Date: 11/11/20	Scale: NTS	
Path:		Dwg No. E-1	

Section	T1	T2	T3	T4	T5	T6	T7	T8	
Legs		HSS5x.25		HSS5x.5		A572-60	HSS6.875x.5		
Leg Grade		A500-50							
Diagonals		2L2 1/2x2x3/16		2L3x2 1/2x1/4		2L3 1/2x3x1/4	2L3x3 1/2x1/4		
Diagonal Grade					A36				
Top Girts	A		L3x3x1/4			L4x4x1/4			
Horizontals	N.A.	L2 1/2x2 1/2x3/16	L3x3x1/4			L4x4x1/4			
Red. Horizontals				N.A.			L2 1/2x2 1/2x3/16		
Red. Diagonals				N.A.			L3x3x1/4		
Inner Bracing		N.A.		L2 1/2x2 1/2x3/16		L2 1/2x2 1/2x3/16		L3x3x1/4	
Face Width (ft)	10.599	10.999	12.9991	14.9993	16.9994	18.9996	20.9997	22.9999	25
# Panels @ (ft)	1 @ 5			12 @ 8.33333			6 @ 12.5		34.0
Weight (K)	0.6	2.2	3.4	4.5	5.0	5.4	6.3	6.6	



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	L3x3x1/4		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A572-60	60 ksi	75 ksi
A36	36 ksi	58 ksi			

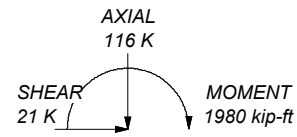
TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 130 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 3 with Crest Height of 98.00 ft
7. TOWER RATING: 98.2%

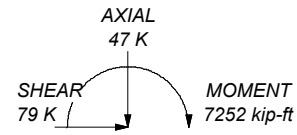
ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 351 K
SHEAR: 44 K

UPLIFT: -302 K
SHEAR: 39 K



TORQUE 56 kip-ft
50 mph WIND - 1.0000 in ICE



TORQUE 131 kip-ft
REACTIONS - 130 mph WIND

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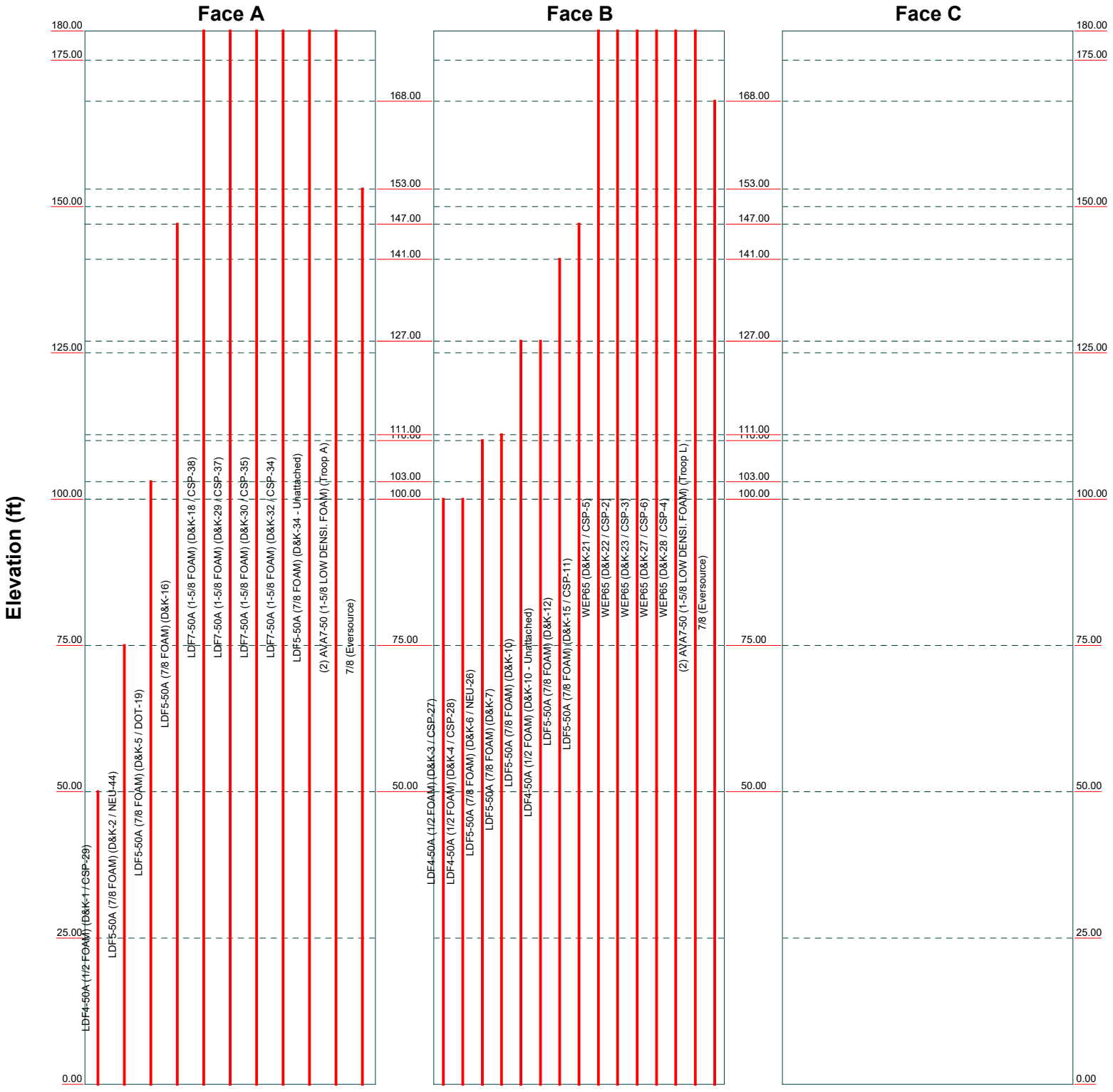
Client: Eversource	Drawn by: christina.carlos	App'd:	
Code: TIA-222-H	Date: 11/11/20	Scale: NTS	
Path:		Dwg No. E-1	

TNX TOWER FEEDLINE DISTRIBUTION CHART

Feed Line Distribution Chart
0' - 180'

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



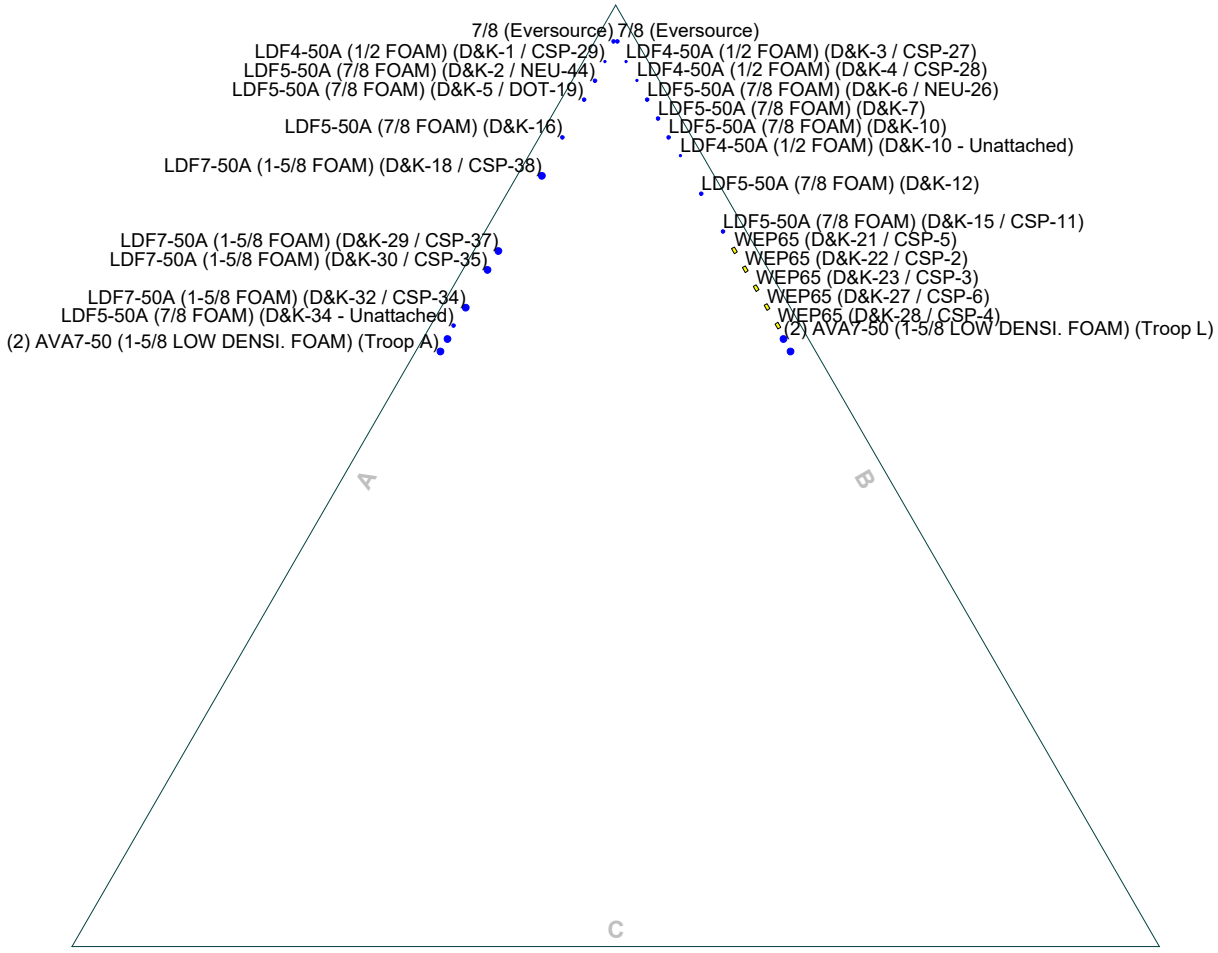
AECOM
1255 Broad St. Suite 201
Clifton, NJ 07013
Phone: (973) 883-8663
FAX: (973) 883-8500

Job: ***180' Self-Supporting Lattice Tower***			
Project: ***Connecticut State Police Tower - Southbury, CT - Rev.***			
Client: Eversource	Drawn by: christina.carlos	App'd:	
Code: TIA-222-H	Date: 11/11/20	Scale: NTS	
Path:		Dwg No. E-7	

TNX TOWER FEEDLINE PLAN

Feed Line Plan

Round Flat App In Face App Out Face



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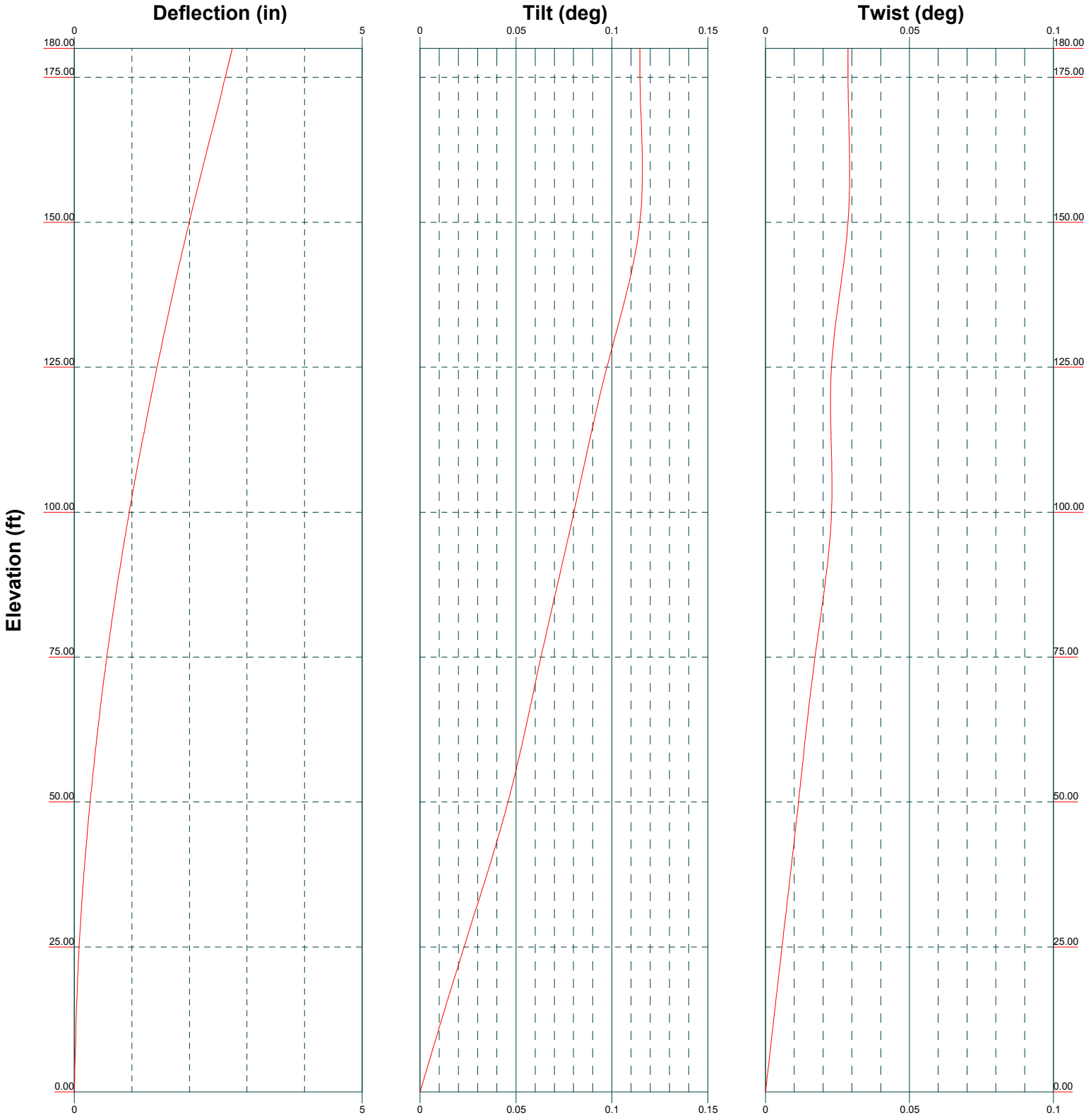
Path:		Dwg No. E-7

TNX DEFLECTION, TILT AND TWIST

TIA-222-H - Service - 60 mph

Maximum Values



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Client: Eversource	Drawn by: christina.carlos	App'd:	
Code: TIA-222-H	Date: 11/11/20	Scale: NTS	
Path:		Dwg No. E-5	

TNX TOWER DETAILED OUTPUT

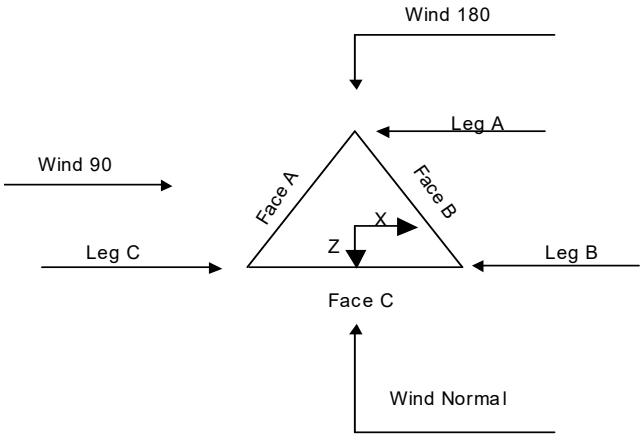
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 10.60 ft at the top and 25.00 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

Tower base elevation above sea level: 0.00 ft.
Basic wind speed of 130 mph.
Risk Category III.
Exposure Category C.
Simplified Topographic Factor Procedure for wind speed-up calculations is used.
Topographic Category: 3.
Crest Height: 98.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	180.00-175.00			10.60	1	5.00
T2	175.00-150.00			11.00	1	25.00
T3	150.00-125.00			13.00	1	25.00
T4	125.00-100.00			15.00	1	25.00
T5	100.00-75.00			17.00	1	25.00
T6	75.00-50.00			19.00	1	25.00
T7	50.00-25.00			21.00	1	25.00
T8	25.00-0.00			23.00	1	25.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	180.00-175.00	5.00	K Brace Down	No	Yes	0.0000	0.0000
T2	175.00-150.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T3	150.00-125.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T4	125.00-100.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T5	100.00-75.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T6	75.00-50.00	12.50	K Brace Down	No	Yes	0.0000	0.0000
T7	50.00-25.00	12.50	K1 Down	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
T8	25.00-0.00	12.50	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 180.00-175.00	Pipe	HSS5x.25	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x3/16	A36 (36 ksi)
T2 175.00-150.00	Pipe	HSS5x.25	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x3/16	A36 (36 ksi)
T3 150.00-125.00	Pipe	HSS5x.25	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4	A36 (36 ksi)
T4 125.00-100.00	Pipe	HSS5x.5	A572-60 (60 ksi)	Double Angle	2L3x2 1/2x1/4	A36 (36 ksi)
T5 100.00-75.00	Pipe	HSS5x.5	A572-60 (60 ksi)	Double Angle	2L3x2 1/2x1/4	A36 (36 ksi)
T6 75.00-50.00	Pipe	HSS6.875x.5	A572-60 (60 ksi)	Double Angle	2L3 1/2x3x1/4	A36 (36 ksi)
T7 50.00-25.00	Pipe	HSS6.875x.5	A572-60 (60 ksi)	Double Angle	2L3x3 1/2x1/4	A36 (36 ksi)
T8 25.00-0.00	Pipe	HSS6.875x.5	A572-60 (60 ksi)	Double Angle	2L3x3 1/2x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.00-175.00	Single Angle	L3x3x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T2 175.00-150.00	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 150.00-125.00	Single Angle	L3x3x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T4 125.00-100.00	Single Angle	L3x3x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T5 100.00-75.00	Single Angle	L4x4x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T6 75.00-50.00	Single Angle	L4x4x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T7 50.00-25.00	Single Angle	L4x4x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T8 25.00-0.00	Single Angle	L4x4x1/4	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
T1 180.00-175.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T2 175.00-150.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 150.00-125.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T4 125.00-100.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T5 100.00-75.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T6 75.00-50.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T7 50.00-25.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T8 25.00-0.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	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
T3 150.00-125.00	Solid Round		A572-50 (50 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T4 125.00-100.00	Solid Round		A572-50 (50 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T5 100.00-75.00	Solid Round		A572-50 (50 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T6 75.00-50.00	Solid Round		A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 50.00-25.00	Solid Round		A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T8 25.00-0.00	Solid Round		A572-50 (50 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T7 50.00-25.00	A36 (36 ksi)	Horizontal (1)	Single Angle	L2 1/2x2 1/2x3/16	1
		Diagonal (1)	Single Angle	L3x3x1/4	1
T8 25.00-0.00	A36 (36 ksi)	Horizontal (1)	Single Angle	L2 1/2x2 1/2x3/16	1
		Diagonal (1)	Single Angle	L3x3x1/4	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 180.00-175.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T2 175.00-150.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T3 150.00-125.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T4 125.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T5 100.00-75.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T6 75.00-50.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T7 50.00-25.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000
T8 25.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Third-Pt	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1]: Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	Yes	1	1	1	1	1	1	1	1
180.00-175.00				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1
175.00-150.00				1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
150.00-125.00				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
125.00-100.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
100.00-75.00				1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1
75.00-50.00				1	1	1	1	1	1	1
T7	Yes	Yes	1	1	1	1	1	1	1	1
50.00-25.00				1	1	1	1	1	1	1
T8 25.00-0.00	Yes	Yes	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.00-175.00	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 175.00-150.00	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 150.00-125.00	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 125.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 100.00-75.00	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 75.00-50.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 50.00-25.00	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 25.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-175.00	Flange	0.0000 A325X	0	0.7500 A325X	1	0.6250 A325X	2	0.0000 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T2 175.00-150.00	Flange	0.7500 A325X	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T3 150.00-125.00	Flange	0.7500 A325X	6	0.7500 A325X	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T4 125.00-100.00	Flange	0.7500 A325X	6	0.7500 A325X	1	0.6250 A325X	2	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T5 100.00-75.00	Flange	1.0000 A325X	6	0.7500 A325X	1	0.6250 A325X	2	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T6 75.00-50.00	Flange	1.0000 A325X	8	0.7500 A325X	1	0.6250 A325X	2	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T7 50.00-25.00	Flange	1.0000 A325X	8	1.0000 A325X	1	0.6250 A325X	2	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T8 25.00-0.00	Flange	1.0000 A325X	8	1.0000 A325X	1	0.6250 A325X	2	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325X	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
***** D&K Inventory LDF4-50A (1/2 FOAM)	A	No	No	Ar (CaAa)	50.00 - 0.00	-5.0000	0.45	1	1	0.6300	0.6300		0.15

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
(D&K-1 / CSP-29)													
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	75.00 - 0.00	-5.0000	0.43	1	1	1.0900	1.0900		0.33
(D&K-2 / NEU-44)													
LDF4-50A (1/2 FOAM)	B	No	No	Ar (CaAa)	100.00 - 0.00	-5.0000	-0.45	1	1	0.6300	0.6300		0.15
(D&K-3 / CSP-27)													
LDF4-50A (1/2 FOAM)	B	No	No	Ar (CaAa)	100.00 - 0.00	-5.0000	-0.43	1	1	0.6300	0.6300		0.15
(D&K-4 / CSP-28)													
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	103.00 - 0.00	-5.0000	0.41	1	1	1.0900	1.0900		0.33
(D&K-5 / DOT-19)													
LDF5-50A (7/8 FOAM)	B	No	No	Ar (CaAa)	110.00 - 0.00	-5.0000	-0.41	1	1	1.0900	1.0900		0.33
(D&K-6 / NEU-26)													
LDF5-50A (7/8 FOAM)	B	No	No	Ar (CaAa)	111.00 - 0.00	-5.0000	-0.39	1	1	1.0900	1.0900		0.33
(D&K-7)													
*** No Coax for D&K-8 ***													
LDF5-50A (7/8 FOAM)	B	No	No	Ar (CaAa)	127.00 - 0.00	-5.0000	-0.37	1	1	1.0900	1.0900		0.33
(D&K-10)													
LDF4-50A (1/2 FOAM)	B	No	No	Ar (CaAa)	127.00 - 0.00	-5.0000	-0.35	1	1	0.6300	0.6300		0.15
(D&K-10 - Unattached)													
LDF5-50A (7/8 FOAM)	B	No	No	Ar (CaAa)	141.00 - 0.00	-5.0000	-0.31	1	1	1.0900	1.0900		0.33
(D&K-12)													
*** No Coax for D&K-13 ***													
LDF5-50A (7/8 FOAM)	B	No	No	Ar (CaAa)	147.00 - 0.00	-5.0000	-0.27	1	1	1.0900	1.0900		0.33
(D&K-15 / CSP-11)													
LDF5-50A (7/8 FOAM)	A	No	No	Ar (CaAa)	147.00 - 0.00	-5.0000	0.37	1	1	1.0900	1.0900		0.33
(D&K-16)													
LDF7-50A (1-5/8 FOAM)	A	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	0.33	1	1	1.9800	1.9800		0.82
(D&K-18 / CSP-38)													
*** No Coax for D&K-19 ***													
WEP65 (D&K-21 / CSP-5)	B	No	No	Af (CaAa)	180.00 - 0.00	-5.0000	-0.25	1	1	1.5836	1.5836		0.53
WEP65 (D&K-22 /	B	No	No	Af (CaAa)	180.00 - 0.00	-5.0000	-0.23	1	1	1.5836	1.5836		0.53

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
CSP-2) WEP65 (D&K-23 / CSP-3) *** No Coax for D&K-25 ***	B	No	No	Af (CaAa)	180.00 - 0.00	-5.0000	-0.21	1	1	1.5836	1.5836		0.53
WEP65 (D&K-27 / CSP-6)	B	No	No	Af (CaAa)	180.00 - 0.00	-5.0000	-0.19	1	1	1.5836	1.5836		0.53
WEP65 (D&K-28 / CSP-4)	B	No	No	Af (CaAa)	180.00 - 0.00	-5.0000	-0.17	1	1	1.5836	1.5836		0.53
LDF7-50A (1-5/8 FOAM) (D&K-29 / CSP-37)	A	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	0.25	1	1	1.9800	1.9800		0.82
LDF7-50A (1-5/8 FOAM) (D&K-30 / CSP-35)	A	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	0.23	1	1	1.9800	1.9800		0.82
LDF7-50A (1-5/8 FOAM) (D&K-32 / CSP-34) *** No Coax for D&K-25 ***	A	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	0.19	1	1	1.9800	1.9800		0.82
LDF5-50A (7/8 FOAM) (D&K-34 - Unattached) *** PNS Proposed	A	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	0.17	1	1	1.0900	1.0900		0.33
AVA7-50 (1-5/8 LOW DENSI. FOAM) (Troop A)	A	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	0.15	2	2	1.9800	1.9800		0.72
AVA7-50 (1-5/8 LOW DENSI. FOAM) (Troop L) **Eversource Equipment**	B	No	No	Ar (CaAa)	180.00 - 0.00	-5.0000	-0.15	2	2	1.9800	1.9800		0.72
7/8 (Eversource)	A	No	No	Ar (CaAa)	153.00 - 0.00	-4.0000	0.47	1	1	1.1100	1.1100		0.54
7/8 (Eversource) **	B	No	No	Ar (CaAa)	168.00 - 0.00	-4.0000	-0.47	1	1	1.1100	1.1100		0.54

Feed Line/Linear Appurtenances - Entered As Area

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

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-175.00	A	0.000	0.000	6.485	0.000	0.03
		B	0.000	0.000	8.578	0.000	0.02
		C	0.000	0.000	0.000	0.000	0.00
T2	175.00-150.00	A	0.000	0.000	32.758	0.000	0.13
		B	0.000	0.000	44.889	0.000	0.11
		C	0.000	0.000	0.000	0.000	0.00
T3	150.00-125.00	A	0.000	0.000	37.598	0.000	0.15
		B	0.000	0.000	50.152	0.000	0.13
		C	0.000	0.000	0.000	0.000	0.00
T4	125.00-100.00	A	0.000	0.000	38.252	0.000	0.15
		B	0.000	0.000	57.705	0.000	0.15
		C	0.000	0.000	0.000	0.000	0.00
T5	100.00-75.00	A	0.000	0.000	40.650	0.000	0.16
		B	0.000	0.000	64.016	0.000	0.17
		C	0.000	0.000	0.000	0.000	0.00
T6	75.00-50.00	A	0.000	0.000	43.375	0.000	0.16
		B	0.000	0.000	64.016	0.000	0.17
		C	0.000	0.000	0.000	0.000	0.00
T7	50.00-25.00	A	0.000	0.000	44.950	0.000	0.17
		B	0.000	0.000	64.016	0.000	0.17
		C	0.000	0.000	0.000	0.000	0.00
T8	25.00-0.00	A	0.000	0.000	44.950	0.000	0.17
		B	0.000	0.000	64.016	0.000	0.17
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	180.00-175.00	A	1.374	0.000	0.000	17.558	0.000	0.22
		B		0.000	0.000	19.651	0.000	0.22
		C		0.000	0.000	0.000	0.000	0.00
T2	175.00-150.00	A	1.367	0.000	0.000	88.699	0.000	1.09
		B		0.000	0.000	104.931	0.000	1.16
		C		0.000	0.000	0.000	0.000	0.00
T3	150.00-125.00	A	1.356	0.000	0.000	105.102	0.000	1.28
		B		0.000	0.000	123.080	0.000	1.37
		C		0.000	0.000	0.000	0.000	0.00
T4	125.00-100.00	A	1.348	0.000	0.000	107.041	0.000	1.30
		B		0.000	0.000	151.571	0.000	1.68
		C		0.000	0.000	0.000	0.000	0.00
T5	100.00-75.00	A	1.346	0.000	0.000	115.245	0.000	1.39
		B		0.000	0.000	178.981	0.000	1.97

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C		0.000	0.000	0.000	0.000	0.00
T6	75.00-50.00	A	1.350	0.000	0.000	124.943	0.000	1.51
		B		0.000	0.000	179.339	0.000	1.98
		C		0.000	0.000	0.000	0.000	0.00
T7	50.00-25.00	A	1.359	0.000	0.000	133.788	0.000	1.60
		B		0.000	0.000	180.036	0.000	2.00
		C		0.000	0.000	0.000	0.000	0.00
T8	25.00-0.00	A	1.328	0.000	0.000	131.959	0.000	1.56
		B		0.000	0.000	177.581	0.000	1.93
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	180.00-175.00	0.8207	-12.9378	0.6195	-17.1482
T2	175.00-150.00	1.0362	-17.0492	0.7114	-21.7910
T3	150.00-125.00	1.2255	-20.2256	1.0665	-27.7913
T4	125.00-100.00	1.5259	-24.1641	1.5559	-34.0592
T5	100.00-75.00	1.5663	-27.0579	1.6674	-40.5982
T6	75.00-50.00	1.7859	-31.7585	1.8336	-46.7314
T7	50.00-25.00	1.6943	-30.9401	1.7917	-47.6011
T8	25.00-0.00	1.7947	-32.5916	1.9160	-50.3103

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	20	LDF7-50A (1-5/8 FOAM)	175.00 - 180.00	0.6000	0.6000
T1	23	WEP65	175.00 - 180.00	0.6000	0.6000
T1	24	WEP65	175.00 - 180.00	0.6000	0.6000
T1	25	WEP65	175.00 - 180.00	0.6000	0.6000
T1	29	WEP65	175.00 - 180.00	0.6000	0.6000
T1	30	WEP65	175.00 - 180.00	0.6000	0.6000
T1	31	LDF7-50A (1-5/8 FOAM)	175.00 - 180.00	0.6000	0.6000
T1	32	LDF7-50A (1-5/8 FOAM)	175.00 - 180.00	0.6000	0.6000
T1	34	LDF7-50A (1-5/8 FOAM)	175.00 - 180.00	0.6000	0.6000
T1	36	LDF5-50A (7/8 FOAM)	175.00 - 180.00	0.6000	0.6000
T1	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	175.00 - 180.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	175.00 - 180.00	0.6000	0.6000
T2	20	LDF7-50A (1-5/8 FOAM)	150.00 - 175.00	0.6000	0.6000
T2	23	WEP65	150.00 - 175.00	0.6000	0.6000
T2	24	WEP65	150.00 - 175.00	0.6000	0.6000
T2	25	WEP65	150.00 - 175.00	0.6000	0.6000
T2	29	WEP65	150.00 - 175.00	0.6000	0.6000
T2	30	WEP65	150.00 - 175.00	0.6000	0.6000
T2	31	LDF7-50A (1-5/8 FOAM)	150.00 - 175.00	0.6000	0.6000
T2	32	LDF7-50A (1-5/8 FOAM)	150.00 - 175.00	0.6000	0.6000
T2	34	LDF7-50A (1-5/8 FOAM)	150.00 - 175.00	0.6000	0.6000
T2	36	LDF5-50A (7/8 FOAM)	150.00 - 175.00	0.6000	0.6000
T2	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	150.00 - 175.00	0.6000	0.6000
T2	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	150.00 - 175.00	0.6000	0.6000
T2	41	7/8	150.00 - 153.00	0.6000	0.6000
T2	42	7/8	150.00 - 168.00	0.6000	0.6000
T3	11	LDF5-50A (7/8 FOAM)	125.00 - 127.00	0.6000	0.6000
T3	12	LDF4-50A (1/2 FOAM)	125.00 - 127.00	0.6000	0.6000
T3	14	LDF5-50A (7/8 FOAM)	125.00 - 141.00	0.6000	0.6000
T3	17	LDF5-50A (7/8 FOAM)	125.00 - 147.00	0.6000	0.6000
T3	18	LDF5-50A (7/8 FOAM)	125.00 - 147.00	0.6000	0.6000
T3	20	LDF7-50A (1-5/8 FOAM)	125.00 - 150.00	0.6000	0.6000
T3	23	WEP65	125.00 - 150.00	0.6000	0.6000
T3	24	WEP65	125.00 - 150.00	0.6000	0.6000
T3	25	WEP65	125.00 - 150.00	0.6000	0.6000
T3	29	WEP65	125.00 - 150.00	0.6000	0.6000
T3	30	WEP65	125.00 - 150.00	0.6000	0.6000
T3	31	LDF7-50A (1-5/8 FOAM)	125.00 - 150.00	0.6000	0.6000
T3	32	LDF7-50A (1-5/8 FOAM)	125.00 - 150.00	0.6000	0.6000
T3	34	LDF7-50A (1-5/8 FOAM)	125.00 - 150.00	0.6000	0.6000
T3	36	LDF5-50A (7/8 FOAM)	125.00 - 150.00	0.6000	0.6000
T3	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	125.00 - 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	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	125.00 - 150.00	0.6000	0.6000
T3	41	7/8	125.00 - 150.00	0.6000	0.6000
T3	42	7/8	125.00 - 150.00	0.6000	0.6000
T4	6	LDF5-50A (7/8 FOAM)	100.00 - 103.00	0.6000	0.6000
T4	7	LDF5-50A (7/8 FOAM)	100.00 - 110.00	0.6000	0.6000
T4	8	LDF5-50A (7/8 FOAM)	100.00 - 111.00	0.6000	0.6000
T4	11	LDF5-50A (7/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	12	LDF4-50A (1/2 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	14	LDF5-50A (7/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	17	LDF5-50A (7/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	18	LDF5-50A (7/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	20	LDF7-50A (1-5/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	23	WEP65	100.00 - 125.00	0.6000	0.6000
T4	24	WEP65	100.00 - 125.00	0.6000	0.6000
T4	25	WEP65	100.00 - 125.00	0.6000	0.6000
T4	29	WEP65	100.00 - 125.00	0.6000	0.6000
T4	30	WEP65	100.00 - 125.00	0.6000	0.6000
T4	31	LDF7-50A (1-5/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	32	LDF7-50A (1-5/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	34	LDF7-50A (1-5/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	36	LDF5-50A (7/8 FOAM)	100.00 - 125.00	0.6000	0.6000
T4	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	100.00 - 125.00	0.6000	0.6000
T4	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	100.00 - 125.00	0.6000	0.6000
T4	41	7/8	100.00 - 125.00	0.6000	0.6000
T4	42	7/8	100.00 - 125.00	0.6000	0.6000
T5	4	LDF4-50A (1/2 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	5	LDF4-50A (1/2 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	6	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	7	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	8	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	11	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	12	LDF4-50A (1/2 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	14	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	17	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	18	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	20	LDF7-50A (1-5/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	23	WEP65	75.00 - 100.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	24	WEP65	75.00 - 100.00	0.6000	0.6000
T5	25	WEP65	75.00 - 100.00	0.6000	0.6000
T5	29	WEP65	75.00 - 100.00	0.6000	0.6000
T5	30	WEP65	75.00 - 100.00	0.6000	0.6000
T5	31	LDF7-50A (1-5/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	32	LDF7-50A (1-5/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	34	LDF7-50A (1-5/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	36	LDF5-50A (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T5	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	75.00 - 100.00	0.6000	0.6000
T5	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	75.00 - 100.00	0.6000	0.6000
T5	41	7/8	75.00 - 100.00	0.6000	0.6000
T5	42	7/8	75.00 - 100.00	0.6000	0.6000
T6	3	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	4	LDF4-50A (1/2 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	5	LDF4-50A (1/2 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	6	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	7	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	8	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	11	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	12	LDF4-50A (1/2 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	14	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	17	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	18	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	20	LDF7-50A (1-5/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	23	WEP65	50.00 - 75.00	0.6000	0.6000
T6	24	WEP65	50.00 - 75.00	0.6000	0.6000
T6	25	WEP65	50.00 - 75.00	0.6000	0.6000
T6	29	WEP65	50.00 - 75.00	0.6000	0.6000
T6	30	WEP65	50.00 - 75.00	0.6000	0.6000
T6	31	LDF7-50A (1-5/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	32	LDF7-50A (1-5/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	34	LDF7-50A (1-5/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	36	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T6	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	50.00 - 75.00	0.6000	0.6000
T6	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	50.00 - 75.00	0.6000	0.6000
T6	41	7/8	50.00 - 75.00	0.6000	0.6000
T6	42	7/8	50.00 - 75.00	0.6000	0.6000
T7	2	LDF4-50A (1/2 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	3	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	4	LDF4-50A (1/2 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	5	LDF4-50A (1/2 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	6	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	7	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	8	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	11	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	12	LDF4-50A (1/2 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	14	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	17	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	18	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	20	LDF7-50A (1-5/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	23	WEP65	25.00 - 50.00	0.6000	0.6000
T7	24	WEP65	25.00 - 50.00	0.6000	0.6000
T7	25	WEP65	25.00 - 50.00	0.6000	0.6000
T7	29	WEP65	25.00 - 50.00	0.6000	0.6000
T7	30	WEP65	25.00 - 50.00	0.6000	0.6000
T7	31	LDF7-50A (1-5/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	32	LDF7-50A (1-5/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	34	LDF7-50A (1-5/8 FOAM)	25.00 - 50.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T7	36	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T7	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	25.00 - 50.00	0.6000	0.6000
T7	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	25.00 - 50.00	0.6000	0.6000
T7	41	7/8	25.00 - 50.00	0.6000	0.6000
T7	42	7/8	25.00 - 50.00	0.6000	0.6000
T8	2	LDF4-50A (1/2 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	3	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	4	LDF4-50A (1/2 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	5	LDF4-50A (1/2 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	6	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	7	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	8	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	11	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	12	LDF4-50A (1/2 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	14	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	17	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	18	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	20	LDF7-50A (1-5/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	23	WEP65	0.00 - 25.00	0.6000	0.6000
T8	24	WEP65	0.00 - 25.00	0.6000	0.6000
T8	25	WEP65	0.00 - 25.00	0.6000	0.6000
T8	29	WEP65	0.00 - 25.00	0.6000	0.6000
T8	30	WEP65	0.00 - 25.00	0.6000	0.6000
T8	31	LDF7-50A (1-5/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	32	LDF7-50A (1-5/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	34	LDF7-50A (1-5/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	36	LDF5-50A (7/8 FOAM)	0.00 - 25.00	0.6000	0.6000
T8	38	AVA7-50 (1-5/8 LOW DENSI. FOAM)	0.00 - 25.00	0.6000	0.6000
T8	39	AVA7-50 (1-5/8 LOW DENSI. FOAM)	0.00 - 25.00	0.6000	0.6000
T8	41	7/8	0.00 - 25.00	0.6000	0.6000
T8	42	7/8	0.00 - 25.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
*** D&K Climb Inventory ***									
DB803M-Y (D&K-1 / CSP-29)	B	From Leg	3.00 0.00 0.00	0.0000	48.00	No Ice 1/2" Ice 1" Ice	0.50 0.68 0.87	0.50 0.68 0.87	0.00 0.01 0.02
3' Side Mount Standoff (D&K-1 / CSP-29)	B	None		0.0000	48.00	No Ice 1/2" Ice 1" Ice	2.72 4.91 7.10	2.72 4.91 7.10	0.05 0.09 0.13
2" Dia 14' Omni (D&K-2 / NEU-44)	A	From Leg	5.00 0.00	0.0000	75.00	No Ice 1/2" Ice	2.00 3.03	2.00 3.03	0.01 0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	4.06	4.06	0.04
5' Side Mount Standoff (D&K-2 / NEU-44)	A	None		0.0000	75.00	No Ice	4.97	4.97	0.07
						1/2" Ice	6.12	6.12	0.13
						1" Ice	7.27	7.27	0.19
6' Dipole Antenna (D&K-3 / CSP-27)	A	From Leg	3.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice 1" Ice	7.00 7.47 7.95	2.02 2.90 3.79	0.08 0.12 0.17
3' Side Mount Standoff (D&K-3 / CSP-27)	A	None		0.0000	100.00	No Ice	2.72	2.72	0.05
						1/2" Ice	4.91	4.91	0.09
						1" Ice	7.10	7.10	0.13
2" Dia 10' Omni (D&K-4 / CSP-28)	B	From Leg	3.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice 1" Ice	2.00 3.03 4.06	2.00 3.03 4.06	0.01 0.03 0.04
3' Side Mount Standoff (D&K-4 / CSP-28)	B	None		0.0000	100.00	No Ice	2.72	2.72	0.05
						1/2" Ice	4.91	4.91	0.09
						1" Ice	7.10	7.10	0.13
531-70 Dipole (D&K-5 / DOT-19)	C	From Leg	1.00 0.00 0.00	0.0000	103.00	No Ice 1/2" Ice 1" Ice	3.23 5.00 6.78	2.63 4.39 6.17	0.04 0.06 0.09
1' Side Mount Standoff (D&K-5 / DOT-19)	C	None		0.0000	103.00	No Ice	2.72	2.72	0.05
						1/2" Ice	4.91	4.91	0.09
						1" Ice	7.10	7.10	0.13
1151-3 (D&K-6 / NEU-26)	A	From Leg	3.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice 1" Ice	4.18 5.73 7.30	4.18 5.73 7.30	0.02 0.05 0.09
3' Side Mount Standoff (D&K-6 / NEU-26)	A	None		0.0000	110.00	No Ice	2.72	2.72	0.05
						1/2" Ice	4.91	4.91	0.09
						1" Ice	7.10	7.10	0.13
15' Omni (Whip) Antenna (D&K-7)	B	From Leg	5.00 0.00 0.00	0.0000	111.00	No Ice 1/2" Ice 1" Ice	4.00 6.00 8.00	4.00 6.00 8.00	0.06 0.10 0.14
5" Side Mount Standoff (D&K-7)	B	None		0.0000	110.00	No Ice	4.97	4.97	0.07
						1/2" Ice	6.12	6.12	0.13
						1" Ice	7.27	7.27	0.19
3' Side Mount Standoff (D&K-8)	C	None		0.0000	114.00	No Ice	2.72	2.72	0.05
						1/2" Ice	4.91	4.91	0.09
						1" Ice	7.10	7.10	0.13
7' Omni (Whip) Antenna (D&K-10)	B	From Face	6.00 0.00 0.00	0.0000	127.00	No Ice 1/2" Ice 1" Ice	2.00 3.03 4.06	2.00 3.03 4.06	0.01 0.02 0.03
6' Side Mount Standoff (1) (D&K-10)	B	From Leg	0.00 0.00 0.00	45.0000	127.00	No Ice 1/2" Ice 1" Ice	4.97 6.12 7.27	4.97 6.12 7.27	0.07 0.13 0.19
6' Side Mount Standoff (1) (D&K-10)	B	From Leg	0.00 0.00 0.00	-45.0000	127.00	No Ice 1/2" Ice 1" Ice	4.97 6.12 7.27	4.97 6.12 7.27	0.07 0.13 0.19
6'x1" Whip Antenna w/ Mount (D&K-12)	A	From Face	10.00 0.00 0.00	0.0000	146.00 - 140.00	No Ice 1/2" Ice 1" Ice	2.02 3.14 4.13	2.02 3.14 4.13	0.05 0.07 0.10
7'x2" Antenna Mount Pipe (D&K-13)	A	From Face	0.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice 1" Ice	1.66 2.39 2.83	1.66 2.39 2.83	0.03 0.04 0.06
Dish Antenna Pipe Mount (D&K-14,15 / CSP-18)	B	None		0.0000	147.00	No Ice	1.32	1.32	0.04
						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
3' Yagi (D&K-15)	B	From Leg	1.00 0.00	0.0000	147.00	No Ice 1/2" Ice	2.08 3.79	2.08 3.79	0.03 0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	5.52	5.52	0.09
10' 4-Bay Dipole (D&K-16)	C	From Face	6.00	0.0000	147.00	No Ice	4.00	4.00	0.06
			0.00			1/2" Ice	6.00	6.00	0.10
			0.00			1" Ice	8.00	8.00	0.14
6' Side Mount Standoff (1) (D&K-16)	C	From Leg	0.00	45.0000	147.00	No Ice	4.97	4.97	0.07
			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
(inverted) SC479-HF1LDF (D&K-18 / CSP-38)	A	From Face	5.00	0.0000	163.00 - 175.00	No Ice	5.06	5.06	0.03
			0.00			1/2" Ice	6.54	6.54	0.07
			0.00			1" Ice	8.04	8.04	0.11
5" Side Mount Standoff (D&K-18, 20,24, 26,29 / CSP-38,16,17,39, 37)	A	From Leg	0.00	-45.0000	175.00	No Ice	4.97	4.97	0.07
			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
5" Side Mount Standoff (D&K-18, 20,24, 26,29 / CSP-38,16,17,39, 37)	A	From Leg	0.00	45.0000	175.00	No Ice	4.97	4.97	0.07
			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
7'x2" Antenna Mount Pipe (D&K-19)	A	From Face	0.00	0.0000	166.00	No Ice	1.66	1.66	0.03
			0.00			1/2" Ice	2.39	2.39	0.04
			0.00			1" Ice	2.83	2.83	0.06
Dish Antenna Pipe Mount (D&K-21 / CSP-5)	C	None		0.0000	163.00	No Ice	1.32	1.32	0.04
						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
Dish Antenna Pipe Mount (D&K-22 / CSP-2)	B	None		0.0000	163.00	No Ice	1.32	1.32	0.04
						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
Dish Antenna Pipe Mount (D&K-23 / CSP-3)	A	None		0.0000	169.00	No Ice	1.32	1.32	0.04
						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
7'x2" Antenna Mount Pipe (D&K-25)	A	From Face	0.00	0.0000	176.00	No Ice	1.66	1.66	0.03
			0.00			1/2" Ice	2.39	2.39	0.04
			0.00			1" Ice	2.83	2.83	0.06
Dish Antenna Pipe Mount (D&K-27 / CSP-6)	C	None		0.0000	173.00	No Ice	1.32	1.32	0.04
						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
Dish Antenna Pipe Mount (D&K-28 / CSP-4)	B	None		0.0000	175.00	No Ice	1.32	1.32	0.04
						1/2" Ice	1.58	1.58	0.06
						1" Ice	1.84	1.84	0.07
SC479-HF1LDF (D&K-29 / CSP-37)	A	From Face	5.00	0.0000	180.00	No Ice	4.59	4.59	0.03
			0.00			1/2" Ice	6.54	6.54	0.07
			0.00			1" Ice	8.04	8.04	0.11
(inverted) SC479-HF1LDF (D&K-30 / CSP-35)	B	From Face	5.00	0.0000	163.00 - 175.00	No Ice	5.06	5.06	0.03
			0.00			1/2" Ice	6.54	6.54	0.07
			0.00			1" Ice	8.04	8.04	0.11
5" Side Mount Standoff (D&K-30, 31, 32 / CSP-35, 36, 34)	B	From Leg	0.00	-45.0000	175.00	No Ice	4.97	4.97	0.07
			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
5" Side Mount Standoff (D&K-30, 31, 32 / CSP-35, 36, 34)	B	From Leg	0.00	45.0000	175.00	No Ice	4.97	4.97	0.07
			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
SC479-HF1LDF (D&K-32 / CSP-34)	B	From Leg	5.00	0.0000	180.00	No Ice	4.59	4.59	0.03
			0.00			1/2" Ice	6.54	6.54	0.07
			0.00			1" Ice	8.04	8.04	0.11
Lightning Rod 2"x10' (D&K-33 / Tower)	A	None		0.0000	180.00	No Ice	2.00	2.00	0.08
						1/2" Ice	3.02	3.02	0.10
						1" Ice	4.07	4.07	0.12
7'x2" Antenna Mount Pipe (D&K-34)	C	From Face	10.00	0.0000	166.00	No Ice	1.66	1.66	0.03
			0.00			1/2" Ice	2.39	2.39	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	2.83	2.83	0.06
5" Side Mount Standoff	C	From Leg	0.00	-45.0000	177.00	No Ice	4.97	4.97	0.07
(D&K-34)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
5" Side Mount Standoff	C	From Leg	0.00	45.0000	177.00	No Ice	4.97	4.97	0.07
(D&K-34)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
***PNS									
SC479-HF1LDF	B	From Leg	5.00	0.0000	180.00	No Ice	5.06	5.06	0.03
(D00-E6085)			0.00			1/2" Ice	6.54	6.54	0.07
(Troop A P25 TX)			0.00			1" Ice	8.04	8.04	0.11
432E-83I-01T TTA Unit	B	From Face	2.50	0.0000	178.00	No Ice	2.85	0.97	0.03
(Troop A P25 TX / RX)			0.00			1/2" Ice	3.06	1.11	0.04
			0.00			1" Ice	3.28	1.26	0.07
SC479-HF1LDF	B	From Face	5.00	0.0000	163.00 - 175.00	No Ice	5.06	5.06	0.03
(D00I-E6085)			0.00			1/2" Ice	6.54	6.54	0.07
(Troop A P25 RX)			0.00			1" Ice	8.04	8.04	0.11
5" Side Mount Standoff	B	From Leg	0.00	-45.0000	175.00	No Ice	4.97	4.97	0.07
(Troop A P25 TX / RX)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
5" Side Mount Standoff	B	From Leg	0.00	45.0000	175.00	No Ice	4.97	4.97	0.07
(Troop A P25 TX / RX)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00			1" Ice	7.27	7.27	0.19
SC479-HF1LDF	B	From Face	5.00	0.0000	165.00 - 180.00	No Ice	5.06	5.06	0.03
(D00I-E6085)			0.00			1/2" Ice	6.54	6.54	0.07
(Troop A P25 Diversity RX)			0.00			1" Ice	8.04	8.04	0.11
SE419-SWBPALDF(D00)	A	From Leg	5.00	0.0000	180.00	No Ice	25.03	9.55	0.05
(Troop L P25 TX)			0.00			1/2" Ice	25.87	10.19	0.17
			0.00			1" Ice	26.70	10.82	0.31
432E-83I-01T TTA Unit	A	From Face	2.50	0.0000	178.00	No Ice	2.85	0.97	0.03
(Troop L P25 TX / RX)			0.00			1/2" Ice	3.06	1.11	0.04
			0.00			1" Ice	3.28	1.26	0.07
SE419-SWBPALDF(D00)	A	From Face	5.00	0.0000	163.00 - 175.00	No Ice	25.03	9.55	0.05
(Troop L P25 RX)			0.00			1/2" Ice	25.87	10.19	0.17
			0.00			1" Ice	26.70	10.82	0.31
SE419-SWBPALDF(D00)	A	From Face	5.00	0.0000	180.00	No Ice	25.03	9.55	0.05
(Troop A P25 Diversity RX)			0.00			1/2" Ice	25.87	10.19	0.17
			0.00			1" Ice	26.70	10.82	0.31
Eversource Equipment									
ANT220F6 w/clamps	A	From Leg	4.00	0.0000	122.90	No Ice	1.96	1.96	0.05
(Eversource)			0.00			1/2" Ice	2.69	2.69	0.09
			0.00			1" Ice	3.42	3.42	0.12
ANT220F6 w/clamps	A	From Leg	4.00	0.0000	137.10	No Ice	1.96	1.96	0.05
(Eversource)			0.00			1/2" Ice	2.69	2.69	0.09
			0.00			1" Ice	3.42	3.42	0.12
Site Pro USF-4U	A	From Leg	0.50	0.0000	122.90 - 130.00	No Ice	1.25	2.50	0.17
(Eversource)			0.00			1/2" Ice	1.49	2.76	0.20
			0.00			1" Ice	1.73	3.03	0.23
**									

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 ft²	Weight K
PA6-65AC	C	Paraboloid	From	2.00	Worst		163.00	6.00	No Ice	28.27	0.09
(D&K-21 / CSP-5)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
PA6-65AC	C	Paraboloid	From	2.00	Worst		173.00	6.00	No Ice	28.27	0.09
(D&K-27 / CSP-6)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
PA6-65AC	A	Paraboloid	From	2.00	Worst		169.00	6.00	No Ice	28.27	0.09
(D&K-23 / CSP-3)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
PA6-65AC	B	Paraboloid	From	2.00	Worst		163.00	6.00	No Ice	28.27	0.09
(D&K-22 / CSP-2)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
PA6-65AC	B	Paraboloid	From	2.00	Worst		175.00	6.00	No Ice	28.27	0.09
(D&K-28 / CSP-4)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg % %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	177.50	1.428	54	56.080	A	5.526	4.171	4.171	43.02	6.485	0.000
180.00-175.00					B	5.526	4.171		43.02	8.578	0.000
					C	5.526	4.171		43.02	0.000	0.000
T2	162.50	1.402	54	310.401	A	19.556	20.856	20.856	51.61	32.758	0.000
175.00-150.00					B	19.556	20.856		51.61	44.889	0.000
					C	19.556	20.856		51.61	0.000	0.000
T3	137.50	1.353	53	360.405	A	25.949	20.856	20.856	44.56	37.598	0.000
150.00-125.00					B	25.949	20.856		44.56	50.152	0.000
					C	25.949	20.856		44.56	0.000	0.000
T4	112.50	1.297	53	410.409	A	28.497	20.856	20.856	42.26	38.252	0.000
125.00-100.00					B	28.497	20.856		42.26	57.705	0.000
					C	28.497	20.856		42.26	0.000	0.000
T5	87.50	1.231	54	460.412	A	35.414	20.856	20.856	37.06	40.650	0.000
100.00-75.00					B	35.414	20.856		37.06	64.016	0.000
					C	35.414	20.856		37.06	0.000	0.000
T6 75.00-50.00	62.50	1.146	56	514.325	A	30.954	28.676	28.676	48.09	43.375	0.000
					B	30.954	28.676		48.09	64.016	0.000
					C	30.954	28.676		48.09	0.000	0.000
T7 50.00-25.00	37.50	1.029	59	564.329	A	42.216	28.676	28.676	40.45	44.950	0.000
					B	42.216	28.676		40.45	64.016	0.000
					C	42.216	28.676		40.45	0.000	0.000
T8 25.00-0.00	12.50	0.85	62	614.333	A	45.019	28.676	28.676	38.91	44.950	0.000
					B	45.019	28.676		38.91	64.016	0.000
					C	45.019	28.676		38.91	0.000	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	177.50	1.428	8	1.3742	57.226	A	5.526	12.072	6.464	36.73	17.558	0.000
180.00-175.00						B	5.526	12.072		36.73	19.651	0.000
						C	5.526	12.072		36.73	0.000	0.000
T2	162.50	1.402	8	1.3669	316.101	A	19.556	53.642	32.258	44.07	88.699	0.000
175.00-150.00						B	19.556	53.642		44.07	104.931	0.000
						C	19.556	53.642		44.07	0.000	0.000
T3	137.50	1.353	8	1.3560	366.060	A	25.949	55.626	32.168	39.43	105.102	0.000
150.00-125.00						B	25.949	55.626		39.43	123.080	0.000
						C	25.949	55.626		39.43	0.000	0.000
T4	112.50	1.297	8	1.3482	416.031	A	28.497	57.716	32.103	37.24	107.041	0.000
125.00-100.00						B	28.497	57.716		37.24	151.571	0.000
						C	28.497	57.716		37.24	0.000	0.000
T5 100.00-75.00	87.50	1.231	8	1.3456	466.024	A	35.414	59.982	32.081	33.63	115.245	0.000
						B	35.414	59.982		33.63	178.981	0.000
						C	35.414	59.982		33.63	0.000	0.000
T6 75.00-50.00	62.50	1.146	8	1.3502	519.956	A	30.954	62.606	39.940	42.69	124.943	0.000
						B	30.954	62.606		42.69	179.339	0.000
						C	30.954	62.606		42.69	0.000	0.000
T7 50.00-25.00	37.50	1.029	9	1.3591	569.996	A	42.216	75.873	40.014	33.88	133.788	0.000
						B	42.216	75.873		33.88	180.036	0.000
						C	42.216	75.873		33.88	0.000	0.000
T8 25.00-0.00	12.50	0.85	9	1.3278	619.870	A	45.019	77.047	39.753	32.57	131.959	0.000
						B	45.019	77.047		32.57	177.581	0.000
						C	45.019	77.047		32.57	0.000	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	177.50	1.428	12	56.080	A	5.526	4.171	4.171	43.02	6.485	0.000
180.00-175.00					B	5.526	4.171		43.02	8.578	0.000
					C	5.526	4.171		43.02	0.000	0.000
T2	162.50	1.402	11	310.401	A	19.556	20.856	20.856	51.61	32.758	0.000
175.00-150.00					B	19.556	20.856		51.61	44.889	0.000
					C	19.556	20.856		51.61	0.000	0.000
T3	137.50	1.353	11	360.405	A	25.949	20.856	20.856	44.56	37.598	0.000
150.00-125.00					B	25.949	20.856		44.56	50.152	0.000
					C	25.949	20.856		44.56	0.000	0.000
T4	112.50	1.297	11	410.409	A	28.497	20.856	20.856	42.26	38.252	0.000
125.00-100.00					B	28.497	20.856		42.26	57.705	0.000
					C	28.497	20.856		42.26	0.000	0.000
T5	87.50	1.231	11	460.412	A	35.414	20.856	20.856	37.06	40.650	0.000
100.00-75.00					B	35.414	20.856		37.06	64.016	0.000
					C	35.414	20.856		37.06	0.000	0.000
T6 75.00-50.00	62.50	1.146	12	514.325	A	30.954	28.676	28.676	48.09	43.375	0.000
					B	30.954	28.676		48.09	64.016	0.000
					C	30.954	28.676		48.09	0.000	0.000
T7 50.00-25.00	37.50	1.029	13	564.329	A	42.216	28.676	28.676	40.45	44.950	0.000
					B	42.216	28.676		40.45	64.016	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	42.216	28.676		40.45	0.000	0.000
T8 25.00-0.00	12.50	0.85	13	614.333	A	45.019	28.676	28.676	38.91	44.950	0.000
					B	45.019	28.676		38.91	64.016	0.000
					C	45.019	28.676		38.91	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	54	1	1	7.506	1.34	268.34	C
180.00-175.00			B	0.173	2.689		1	1	7.506			
			C	0.173	2.689		1	1	7.506			
T2	0.24	2.24	A	0.13	2.846	54	1	1	29.144	5.90	235.84	C
175.00-150.00			B	0.13	2.846		1	1	29.144			
			C	0.13	2.846		1	1	29.144			
T3	0.28	3.43	A	0.13	2.847	53	1	1	35.563	6.93	277.37	C
150.00-125.00			B	0.13	2.847		1	1	35.563			
			C	0.13	2.847		1	1	35.563			
T4	0.30	4.46	A	0.12	2.884	53	1	1	38.046	7.53	301.12	C
125.00-100.00			B	0.12	2.884		1	1	38.046			
			C	0.12	2.884		1	1	38.046			
T5	0.32	4.96	A	0.122	2.876	54	1	1	44.939	8.76	350.36	C
100.00-75.00			B	0.122	2.876		1	1	44.939			
			C	0.122	2.876		1	1	44.939			
T6	0.33	5.41	A	0.116	2.901	56	1	1	42.488	8.86	354.55	C
75.00-50.00			B	0.116	2.901		1	1	42.488			
			C	0.116	2.901		1	1	42.488			
T7	0.34	6.26	A	0.126	2.863	59	1	1	53.880	10.98	439.34	C
50.00-25.00			B	0.126	2.863		1	1	53.880			
			C	0.126	2.863		1	1	53.880			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	62	1	1	56.606	12.09	483.67	C
			B	0.12	2.885		1	1	56.606			
			C	0.12	2.885		1	1	56.606			
Sum Weight:	2.19	33.96						OTM	4880.02 kip-ft	62.40		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	54	0.825	1	6.539	1.22	244.47	C
180.00-175.00			B	0.173	2.689		0.825	1	6.539			
			C	0.173	2.689		0.825	1	6.539			
T2	0.24	2.24	A	0.13	2.846	54	0.825	1	25.721	5.45	218.10	C
175.00-150.00			B	0.13	2.846		0.825	1	25.721			
			C	0.13	2.846		0.825	1	25.721			
T3	0.28	3.43	A	0.13	2.847	53	0.825	1	31.022	6.35	254.07	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
150.00-125.00			B	0.13	2.847		0.825	1	31.022			
			C	0.13	2.847		0.825	1	31.022			
T4	0.30	4.46	A	0.12	2.884	53	0.825	1	33.059	6.88	275.23	C
125.00-100.00			B	0.12	2.884		0.825	1	33.059			
			C	0.12	2.884		0.825	1	33.059			
T5	0.32	4.96	A	0.122	2.876	54	0.825	1	38.742	7.95	317.84	C
100.00-75.00			B	0.122	2.876		0.825	1	38.742			
			C	0.122	2.876		0.825	1	38.742			
T6	0.33	5.41	A	0.116	2.901	56	0.825	1	37.071	8.12	324.87	C
75.00-50.00			B	0.116	2.901		0.825	1	37.071			
			C	0.116	2.901		0.825	1	37.071			
T7	0.34	6.26	A	0.126	2.863	59	0.825	1	46.492	9.93	397.03	C
50.00-25.00			B	0.126	2.863		0.825	1	46.492			
			C	0.126	2.863		0.825	1	46.492			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	62	0.825	1	48.728	10.89	435.60	C
			B	0.12	2.885		0.825	1	48.728			
			C	0.12	2.885		0.825	1	48.728			
Sum Weight:	2.19	33.96						OTM	4461.69 kip-ft	56.79		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	54	0.8	1	6.401	1.21	241.06	C
180.00-175.00			B	0.173	2.689		0.8	1	6.401			
			C	0.173	2.689		0.8	1	6.401			
T2	0.24	2.24	A	0.13	2.846	54	0.8	1	25.233	5.39	215.57	C
175.00-150.00			B	0.13	2.846		0.8	1	25.233			
			C	0.13	2.846		0.8	1	25.233			
T3	0.28	3.43	A	0.13	2.847	53	0.8	1	30.373	6.27	250.74	C
150.00-125.00			B	0.13	2.847		0.8	1	30.373			
			C	0.13	2.847		0.8	1	30.373			
T4	0.30	4.46	A	0.12	2.884	53	0.8	1	32.347	6.79	271.54	C
125.00-100.00			B	0.12	2.884		0.8	1	32.347			
			C	0.12	2.884		0.8	1	32.347			
T5	0.32	4.96	A	0.122	2.876	54	0.8	1	37.857	7.83	313.19	C
100.00-75.00			B	0.122	2.876		0.8	1	37.857			
			C	0.122	2.876		0.8	1	37.857			
T6	0.33	5.41	A	0.116	2.901	56	0.8	1	36.297	8.02	320.63	C
75.00-50.00			B	0.116	2.901		0.8	1	36.297			
			C	0.116	2.901		0.8	1	36.297			
T7	0.34	6.26	A	0.126	2.863	59	0.8	1	45.436	9.77	390.98	C
50.00-25.00			B	0.126	2.863		0.8	1	45.436			
			C	0.126	2.863		0.8	1	45.436			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	62	0.8	1	47.603	10.72	428.73	C
			B	0.12	2.885		0.8	1	47.603			
			C	0.12	2.885		0.8	1	47.603			
Sum Weight:	2.19	33.96						OTM	4401.93 kip-ft	55.99		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	54	0.85	1	6.678	1.24	247.88	C
180.00-175.00			B	0.173	2.689		0.85	1	6.678			
			C	0.173	2.689		0.85	1	6.678			
T2	0.24	2.24	A	0.13	2.846	54	0.85	1	26.210	5.52	220.64	C
175.00-150.00			B	0.13	2.846		0.85	1	26.210			
			C	0.13	2.846		0.85	1	26.210			
T3	0.28	3.43	A	0.13	2.847	53	0.85	1	31.670	6.43	257.40	C
150.00-125.00			B	0.13	2.847		0.85	1	31.670			
			C	0.13	2.847		0.85	1	31.670			
T4	0.30	4.46	A	0.12	2.884	53	0.85	1	33.772	6.97	278.93	C
125.00-100.00			B	0.12	2.884		0.85	1	33.772			
			C	0.12	2.884		0.85	1	33.772			
T5	0.32	4.96	A	0.122	2.876	54	0.85	1	39.627	8.06	322.49	C
100.00-75.00			B	0.122	2.876		0.85	1	39.627			
			C	0.122	2.876		0.85	1	39.627			
T6	0.33	5.41	A	0.116	2.901	56	0.85	1	37.845	8.23	329.11	C
75.00-50.00			B	0.116	2.901		0.85	1	37.845			
			C	0.116	2.901		0.85	1	37.845			
T7	0.34	6.26	A	0.126	2.863	59	0.85	1	47.547	10.08	403.07	C
50.00-25.00			B	0.126	2.863		0.85	1	47.547			
			C	0.126	2.863		0.85	1	47.547			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	62	0.85	1	49.854	11.06	442.46	C
			B	0.12	2.885		0.85	1	49.854			
			C	0.12	2.885		0.85	1	49.854			
Sum Weight:	2.19	33.96						OTM	4521.45 kip-ft	57.59		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.43	1.52	A	0.308	2.276	8	1	1	12.784	0.35	69.86	C
180.00-175.00			B	0.308	2.276		1	1	12.784			
			C	0.308	2.276		1	1	12.784			
T2	2.26	5.89	A	0.232	2.494	8	1	1	50.706	1.63	65.35	C
175.00-150.00			B	0.232	2.494		1	1	50.706			
			C	0.232	2.494		1	1	50.706			
T3	2.65	8.24	A	0.223	2.521	8	1	1	58.148	1.89	75.59	C
150.00-125.00			B	0.223	2.521		1	1	58.148			
			C	0.223	2.521		1	1	58.148			
T4	2.98	9.61	A	0.207	2.572	8	1	1	61.728	2.09	83.59	C
125.00-100.00			B	0.207	2.572		1	1	61.728			
			C	0.207	2.572		1	1	61.728			
T5	3.36	10.86	A	0.205	2.58	8	1	1	69.922	2.41	96.33	C
100.00-75.00			B	0.205	2.58		1	1	69.922			
			C	0.205	2.58		1	1	69.922			
T6	3.48	10.93	A	0.18	2.664	8	1	1	66.718	2.52	100.70	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
75.00-50.00			B	0.18	2.664		1	1	66.718			
			C	0.18	2.664		1	1	66.718			
T7	3.60	13.21	A	0.207	2.572	9	1	1	85.902	3.03	121.09	C
50.00-25.00			B	0.207	2.572		1	1	85.902			
			C	0.207	2.572		1	1	85.902			
T8 25.00-0.00	3.49	13.82	A	0.197	2.606	9	1	1	89.240	3.27	130.87	C
			B	0.197	2.606		1	1	89.240			
			C	0.197	2.606		1	1	89.240			
Sum Weight:	22.24	74.07						OTM	1344.91 kip-ft	17.19		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.43	1.52	A	0.308	2.276	8	0.825	1	11.817	0.33	66.87	C
180.00-175.00			B	0.308	2.276		0.825	1	11.817			
			C	0.308	2.276		0.825	1	11.817			
T2	2.26	5.89	A	0.232	2.494	8	0.825	1	47.284	1.58	63.06	C
175.00-150.00			B	0.232	2.494		0.825	1	47.284			
			C	0.232	2.494		0.825	1	47.284			
T3	2.65	8.24	A	0.223	2.521	8	0.825	1	53.607	1.81	72.54	C
150.00-125.00			B	0.223	2.521		0.825	1	53.607			
			C	0.223	2.521		0.825	1	53.607			
T4	2.98	9.61	A	0.207	2.572	8	0.825	1	56.742	2.00	80.17	C
125.00-100.00			B	0.207	2.572		0.825	1	56.742			
			C	0.207	2.572		0.825	1	56.742			
T5	3.36	10.86	A	0.205	2.58	8	0.825	1	63.725	2.30	92.01	C
100.00-75.00			B	0.205	2.58		0.825	1	63.725			
			C	0.205	2.58		0.825	1	63.725			
T6	3.48	10.93	A	0.18	2.664	8	0.825	1	61.301	2.42	96.66	C
75.00-50.00			B	0.18	2.664		0.825	1	61.301			
			C	0.18	2.664		0.825	1	61.301			
T7	3.60	13.21	A	0.207	2.572	9	0.825	1	78.514	2.89	115.47	C
50.00-25.00			B	0.207	2.572		0.825	1	78.514			
			C	0.207	2.572		0.825	1	78.514			
T8 25.00-0.00	3.49	13.82	A	0.197	2.606	9	0.825	1	81.362	3.11	124.45	C
			B	0.197	2.606		0.825	1	81.362			
			C	0.197	2.606		0.825	1	81.362			
Sum Weight:	22.24	74.07						OTM	1289.80 kip-ft	16.44		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.43	1.52	A	0.308	2.276	8	0.8	1	11.679	0.33	66.44	C
180.00-175.00			B	0.308	2.276		0.8	1	11.679			
			C	0.308	2.276		0.8	1	11.679			
T2	2.26	5.89	A	0.232	2.494	8	0.8	1	46.795	1.57	62.73	C
175.00-150.00			B	0.232	2.494		0.8	1	46.795			
			C	0.232	2.494		0.8	1	46.795			
T3	2.65	8.24	A	0.223	2.521	8	0.8	1	52.958	1.80	72.10	C
150.00-125.00			B	0.223	2.521		0.8	1	52.958			
			C	0.223	2.521		0.8	1	52.958			
T4	2.98	9.61	A	0.207	2.572	8	0.8	1	56.029	1.99	79.68	C
125.00-100.00			B	0.207	2.572		0.8	1	56.029			
			C	0.207	2.572		0.8	1	56.029			
T5	3.36	10.86	A	0.205	2.58	8	0.8	1	62.840	2.28	91.39	C
100.00-75.00			B	0.205	2.58		0.8	1	62.840			
			C	0.205	2.58		0.8	1	62.840			
T6	3.48	10.93	A	0.18	2.664	8	0.8	1	60.527	2.40	96.09	C
75.00-50.00			B	0.18	2.664		0.8	1	60.527			
			C	0.18	2.664		0.8	1	60.527			
T7	3.60	13.21	A	0.207	2.572	9	0.8	1	77.459	2.87	114.67	C
50.00-25.00			B	0.207	2.572		0.8	1	77.459			
			C	0.207	2.572		0.8	1	77.459			
T8 25.00-0.00	3.49	13.82	A	0.197	2.606	9	0.8	1	80.236	3.09	123.53	C
			B	0.197	2.606		0.8	1	80.236			
			C	0.197	2.606		0.8	1	80.236			
Sum Weight:	22.24	74.07						OTM	1281.92 kip-ft	16.34		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.43	1.52	A	0.308	2.276	8	0.85	1	11.955	0.34	67.29	C
180.00-175.00			B	0.308	2.276		0.85	1	11.955			
			C	0.308	2.276		0.85	1	11.955			
T2	2.26	5.89	A	0.232	2.494	8	0.85	1	47.773	1.58	63.38	C
175.00-150.00			B	0.232	2.494		0.85	1	47.773			
			C	0.232	2.494		0.85	1	47.773			
T3	2.65	8.24	A	0.223	2.521	8	0.85	1	54.256	1.82	72.98	C
150.00-125.00			B	0.223	2.521		0.85	1	54.256			
			C	0.223	2.521		0.85	1	54.256			
T4	2.98	9.61	A	0.207	2.572	8	0.85	1	57.454	2.02	80.66	C
125.00-100.00			B	0.207	2.572		0.85	1	57.454			
			C	0.207	2.572		0.85	1	57.454			
T5	3.36	10.86	A	0.205	2.58	8	0.85	1	64.610	2.32	92.63	C
100.00-75.00			B	0.205	2.58		0.85	1	64.610			
			C	0.205	2.58		0.85	1	64.610			
T6	3.48	10.93	A	0.18	2.664	8	0.85	1	62.075	2.43	97.24	C
75.00-50.00			B	0.18	2.664		0.85	1	62.075			
			C	0.18	2.664		0.85	1	62.075			
T7	3.60	13.21	A	0.207	2.572	9	0.85	1	79.569	2.91	116.27	C
50.00-25.00			B	0.207	2.572		0.85	1	79.569			
			C	0.207	2.572		0.85	1	79.569			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T8 25.00-0.00	3.49	13.82	A	0.197	2.606	9	0.85	1	82.487	3.13	125.36	C
			B	0.197	2.606		0.85	1	82.487			
			C	0.197	2.606		0.85	1	82.487			
Sum Weight:	22.24	74.07						OTM	1297.67 kip-ft	16.55		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	12	1	1	7.506	0.29	57.16	C
180.00-175.00			B	0.173	2.689		1	1	7.506			
			C	0.173	2.689		1	1	7.506			
T2	0.24	2.24	A	0.13	2.846	11	1	1	29.144	1.26	50.24	C
175.00-150.00			B	0.13	2.846		1	1	29.144			
			C	0.13	2.846		1	1	29.144			
T3	0.28	3.43	A	0.13	2.847	11	1	1	35.563	1.48	59.08	C
150.00-125.00			B	0.13	2.847		1	1	35.563			
			C	0.13	2.847		1	1	35.563			
T4	0.30	4.46	A	0.12	2.884	11	1	1	38.046	1.60	64.14	C
125.00-100.00			B	0.12	2.884		1	1	38.046			
			C	0.12	2.884		1	1	38.046			
T5	0.32	4.96	A	0.122	2.876	11	1	1	44.939	1.87	74.63	C
100.00-75.00			B	0.122	2.876		1	1	44.939			
			C	0.122	2.876		1	1	44.939			
T6	0.33	5.41	A	0.116	2.901	12	1	1	42.488	1.89	75.53	C
75.00-50.00			B	0.116	2.901		1	1	42.488			
			C	0.116	2.901		1	1	42.488			
T7	0.34	6.26	A	0.126	2.863	13	1	1	53.880	2.34	93.59	C
50.00-25.00			B	0.126	2.863		1	1	53.880			
			C	0.126	2.863		1	1	53.880			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	13	1	1	56.606	2.58	103.03	C
			B	0.12	2.885		1	1	56.606			
			C	0.12	2.885		1	1	56.606			
Sum Weight:	2.19	33.96						OTM	1039.53 kip-ft	13.29		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	12	0.825	1	6.539	0.26	52.08	C
180.00-175.00			B	0.173	2.689		0.825	1	6.539			
			C	0.173	2.689		0.825	1	6.539			
T2	0.24	2.24	A	0.13	2.846	11	0.825	1	25.721	1.16	46.46	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
175.00-150.00			B	0.13	2.846		0.825	1	25.721			
			C	0.13	2.846		0.825	1	25.721			
T3	0.28	3.43	A	0.13	2.847	11	0.825	1	31.022	1.35	54.12	C
150.00-125.00			B	0.13	2.847		0.825	1	31.022			
			C	0.13	2.847		0.825	1	31.022			
T4	0.30	4.46	A	0.12	2.884	11	0.825	1	33.059	1.47	58.63	C
125.00-100.00			B	0.12	2.884		0.825	1	33.059			
			C	0.12	2.884		0.825	1	33.059			
T5	0.32	4.96	A	0.122	2.876	11	0.825	1	38.742	1.69	67.71	C
100.00-75.00			B	0.122	2.876		0.825	1	38.742			
			C	0.122	2.876		0.825	1	38.742			
T6	0.33	5.41	A	0.116	2.901	12	0.825	1	37.071	1.73	69.20	C
75.00-50.00			B	0.116	2.901		0.825	1	37.071			
			C	0.116	2.901		0.825	1	37.071			
T7	0.34	6.26	A	0.126	2.863	13	0.825	1	46.492	2.11	84.57	C
50.00-25.00			B	0.126	2.863		0.825	1	46.492			
			C	0.126	2.863		0.825	1	46.492			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	13	0.825	1	48.728	2.32	92.79	C
			B	0.12	2.885		0.825	1	48.728			
			C	0.12	2.885		0.825	1	48.728			
Sum Weight:	2.19	33.96						OTM	950.42 kip-ft	12.10		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	12	0.8	1	6.401	0.26	51.35	C
180.00-175.00			B	0.173	2.689		0.8	1	6.401			
			C	0.173	2.689		0.8	1	6.401			
T2	0.24	2.24	A	0.13	2.846	11	0.8	1	25.233	1.15	45.92	C
175.00-150.00			B	0.13	2.846		0.8	1	25.233			
			C	0.13	2.846		0.8	1	25.233			
T3	0.28	3.43	A	0.13	2.847	11	0.8	1	30.373	1.34	53.41	C
150.00-125.00			B	0.13	2.847		0.8	1	30.373			
			C	0.13	2.847		0.8	1	30.373			
T4	0.30	4.46	A	0.12	2.884	11	0.8	1	32.347	1.45	57.84	C
125.00-100.00			B	0.12	2.884		0.8	1	32.347			
			C	0.12	2.884		0.8	1	32.347			
T5	0.32	4.96	A	0.122	2.876	11	0.8	1	37.857	1.67	66.72	C
100.00-75.00			B	0.122	2.876		0.8	1	37.857			
			C	0.122	2.876		0.8	1	37.857			
T6	0.33	5.41	A	0.116	2.901	12	0.8	1	36.297	1.71	68.30	C
75.00-50.00			B	0.116	2.901		0.8	1	36.297			
			C	0.116	2.901		0.8	1	36.297			
T7	0.34	6.26	A	0.126	2.863	13	0.8	1	45.436	2.08	83.29	C
50.00-25.00			B	0.126	2.863		0.8	1	45.436			
			C	0.126	2.863		0.8	1	45.436			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	13	0.8	1	47.603	2.28	91.33	C
			B	0.12	2.885		0.8	1	47.603			
			C	0.12	2.885		0.8	1	47.603			
Sum Weight:	2.19	33.96						OTM	937.69	11.93		

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
									kip-ft			

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	0.58	A	0.173	2.689	12	0.85	1	6.678	0.26	52.80	C
180.00-175.00			B	0.173	2.689		0.85	1	6.678			
			C	0.173	2.689		0.85	1	6.678			
T2	0.24	2.24	A	0.13	2.846	11	0.85	1	26.210	1.17	47.00	C
175.00-150.00			B	0.13	2.846		0.85	1	26.210			
			C	0.13	2.846		0.85	1	26.210			
T3	0.28	3.43	A	0.13	2.847	11	0.85	1	31.670	1.37	54.83	C
150.00-125.00			B	0.13	2.847		0.85	1	31.670			
			C	0.13	2.847		0.85	1	31.670			
T4	0.30	4.46	A	0.12	2.884	11	0.85	1	33.772	1.49	59.42	C
125.00-100.00			B	0.12	2.884		0.85	1	33.772			
			C	0.12	2.884		0.85	1	33.772			
T5	0.32	4.96	A	0.122	2.876	11	0.85	1	39.627	1.72	68.70	C
100.00-75.00			B	0.122	2.876		0.85	1	39.627			
			C	0.122	2.876		0.85	1	39.627			
T6	0.33	5.41	A	0.116	2.901	12	0.85	1	37.845	1.75	70.11	C
75.00-50.00			B	0.116	2.901		0.85	1	37.845			
			C	0.116	2.901		0.85	1	37.845			
T7	0.34	6.26	A	0.126	2.863	13	0.85	1	47.547	2.15	85.86	C
50.00-25.00			B	0.126	2.863		0.85	1	47.547			
			C	0.126	2.863		0.85	1	47.547			
T8 25.00-0.00	0.34	6.62	A	0.12	2.885	13	0.85	1	49.854	2.36	94.25	C
			B	0.12	2.885		0.85	1	49.854			
			C	0.12	2.885		0.85	1	49.854			
Sum Weight:	2.19	33.96						OTM	963.15 kip-ft	12.27		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	12.52					
Bracing Weight	21.44					
Total Member Self-Weight	33.96			-16.42	-1.34	
Total Weight	39.30			-16.42	-1.34	
Wind 0 deg - No Ice		-0.60	-78.22	-7402.48	104.71	14.47
Wind 30 deg - No Ice		36.15	-63.28	-6049.38	-3421.75	-52.92
Wind 45 deg - No Ice		50.87	-50.92	-4868.35	-4851.18	-82.33
Wind 60 deg - No Ice		61.83	-35.38	-3378.56	-5928.22	-106.13

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 90 deg - No Ice		73.34	0.60	89.63	-7025.86	-130.90
Wind 120 deg - No Ice		67.98	39.63	3768.45	-6448.32	-120.60
Wind 135 deg - No Ice		53.99	54.04	5154.53	-5170.20	-102.79
Wind 150 deg - No Ice		37.19	63.88	6122.58	-3605.45	-77.98
Wind 180 deg - No Ice		0.60	71.81	6891.54	-107.40	-14.47
Wind 210 deg - No Ice		-36.15	63.28	6016.53	3419.07	52.92
Wind 225 deg - No Ice		-50.87	50.92	4835.50	4848.49	82.33
Wind 240 deg - No Ice		-67.38	38.59	3584.75	6339.57	106.13
Wind 270 deg - No Ice		-73.34	-0.60	-122.48	7023.18	130.90
Wind 300 deg - No Ice		-62.43	-36.43	-3562.25	6031.59	120.60
Wind 315 deg - No Ice		-51.72	-51.77	-5018.34	4998.48	102.79
Wind 330 deg - No Ice		-37.19	-63.88	-6155.43	3602.76	77.98
Member Ice	40.10					
Total Weight Ice	107.81			-156.99	-8.11	
Wind 0 deg - Ice		-0.09	-20.71	-2038.12	8.13	4.67
Wind 30 deg - Ice		9.96	-17.34	-1737.07	-911.24	-23.81
Wind 45 deg - Ice		14.05	-14.06	-1436.70	-1288.17	-36.09
Wind 60 deg - Ice		17.15	-9.85	-1052.00	-1574.98	-45.91
Wind 90 deg - Ice		20.07	0.09	-140.75	-1842.50	-55.71
Wind 120 deg - Ice		17.98	10.44	797.64	-1645.76	-50.58
Wind 135 deg - Ice		14.49	14.49	1167.95	-1333.40	-42.69
Wind 150 deg - Ice		10.12	17.43	1439.33	-939.36	-31.90
Wind 180 deg - Ice		0.09	19.86	1661.15	-24.35	-4.67
Wind 210 deg - Ice		-9.96	17.34	1423.09	895.02	23.81
Wind 225 deg - Ice		-14.05	14.06	1122.72	1271.95	36.09
Wind 240 deg - Ice		-17.89	10.28	769.51	1613.31	45.91
Wind 270 deg - Ice		-20.07	-0.09	-173.23	1826.28	55.71
Wind 300 deg - Ice		-17.25	-10.01	-1080.13	1575.00	50.58
Wind 315 deg - Ice		-14.18	-14.19	-1459.66	1294.92	42.69
Wind 330 deg - Ice		-10.12	-17.43	-1753.31	923.15	31.90
Total Weight	39.30			-16.42	-1.34	
Wind 0 deg - Service		-0.13	-16.66	-1575.62	21.28	3.08
Wind 30 deg - Service		7.70	-13.48	-1287.39	-729.92	-11.27
Wind 45 deg - Service		10.84	-10.85	-1035.81	-1034.42	-17.54
Wind 60 deg - Service		13.17	-7.54	-718.46	-1263.84	-22.61
Wind 90 deg - Service		15.62	0.13	20.33	-1497.66	-27.88
Wind 120 deg - Service		14.48	8.44	803.98	-1374.64	-25.69
Wind 135 deg - Service		11.50	11.51	1099.24	-1102.37	-21.90
Wind 150 deg - Service		7.92	13.61	1305.46	-769.05	-16.61
Wind 180 deg - Service		0.13	15.30	1469.26	-23.91	-3.08
Wind 210 deg - Service		-7.70	13.48	1282.86	727.29	11.27
Wind 225 deg - Service		-10.84	10.85	1031.29	1031.79	17.54
Wind 240 deg - Service		-14.35	8.22	764.85	1349.41	22.61
Wind 270 deg - Service		-15.62	-0.13	-24.85	1495.03	27.88
Wind 300 deg - Service		-13.30	-7.76	-757.59	1283.81	25.69
Wind 315 deg - Service		-11.02	-11.03	-1067.76	1063.74	21.90
Wind 330 deg - Service		-7.92	-13.61	-1309.98	766.42	16.61

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

Comb. No.	Description
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 45 deg - No Ice
7	0.9 Dead+1.0 Wind 45 deg - No Ice
8	1.2 Dead+1.0 Wind 60 deg - No Ice
9	0.9 Dead+1.0 Wind 60 deg - No Ice
10	1.2 Dead+1.0 Wind 90 deg - No Ice
11	0.9 Dead+1.0 Wind 90 deg - No Ice
12	1.2 Dead+1.0 Wind 120 deg - No Ice
13	0.9 Dead+1.0 Wind 120 deg - No Ice
14	1.2 Dead+1.0 Wind 135 deg - No Ice
15	0.9 Dead+1.0 Wind 135 deg - No Ice
16	1.2 Dead+1.0 Wind 150 deg - No Ice
17	0.9 Dead+1.0 Wind 150 deg - No Ice
18	1.2 Dead+1.0 Wind 180 deg - No Ice
19	0.9 Dead+1.0 Wind 180 deg - No Ice
20	1.2 Dead+1.0 Wind 210 deg - No Ice
21	0.9 Dead+1.0 Wind 210 deg - No Ice
22	1.2 Dead+1.0 Wind 225 deg - No Ice
23	0.9 Dead+1.0 Wind 225 deg - No Ice
24	1.2 Dead+1.0 Wind 240 deg - No Ice
25	0.9 Dead+1.0 Wind 240 deg - No Ice
26	1.2 Dead+1.0 Wind 270 deg - No Ice
27	0.9 Dead+1.0 Wind 270 deg - No Ice
28	1.2 Dead+1.0 Wind 300 deg - No Ice
29	0.9 Dead+1.0 Wind 300 deg - No Ice
30	1.2 Dead+1.0 Wind 315 deg - No Ice
31	0.9 Dead+1.0 Wind 315 deg - No Ice
32	1.2 Dead+1.0 Wind 330 deg - No Ice
33	0.9 Dead+1.0 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 175	Leg	Max Tension	13	0.02	-0.00	-0.00
			Max. Compression	35	-1.62	0.07	0.06
			Max. Mx	13	-0.14	0.63	0.07
			Max. My	25	-0.26	-0.27	-0.94
			Max. Vy	18	-0.90	0.00	0.00
			Max. Vx	26	-1.03	-0.00	-0.00
		Diagonal	Max Tension	15	1.46	0.00	0.00
			Max. Compression	14	-1.58	0.00	0.00
			Max. Mx	50	0.16	0.09	0.00
			Max. My	40	-0.11	0.00	0.00
			Max. Vy	50	0.05	0.00	0.00
			Max. Vx	40	0.00	0.00	0.00
		Top Girt	Max Tension	29	1.25	0.01	0.00
			Max. Compression	12	-1.27	0.02	0.00
			Max. Mx	48	-0.17	0.06	0.01
			Max. My	35	0.09	0.05	0.01
			Max. Vy	48	0.05	0.06	0.01
			Max. Vx	35	-0.00	0.00	0.00
T2	175 - 150	Leg	Max Tension	29	18.94	-0.49	0.18
			Max. Compression	12	-22.31	0.37	0.07
			Max. Mx	13	-9.75	1.36	0.01
			Max. My	24	3.01	-0.69	-1.56
			Max. Vy	13	0.84	1.36	0.01
			Max. Vx	26	1.20	0.03	-1.39
		Diagonal	Max Tension	17	9.35	0.00	0.00
			Max. Compression	16	-9.47	0.00	0.00
			Max. Mx	50	2.00	0.15	0.00
			Max. My	40	0.07	0.00	0.01
			Max. Vy	50	0.06	0.00	0.00
			Max. Vx	40	-0.00	0.00	0.00
		Horizontal	Max Tension	32	5.79	0.00	0.00
			Max. Compression	15	-5.82	0.02	0.01
			Max. Mx	48	0.16	0.06	0.02
			Max. My	35	0.18	0.06	0.02
			Max. Vy	48	0.05	0.06	0.02
			Max. Vx	35	-0.00	0.00	0.00
		Top Girt	Max Tension	30	3.56	0.01	0.01
			Max. Compression	13	-3.54	0.01	0.00
			Max. Mx	38	-0.15	0.05	0.01
			Max. My	35	0.29	0.05	0.02
			Max. Vy	38	0.04	0.05	0.01
			Max. Vx	35	-0.00	0.00	0.00
T3	150 - 125	Leg	Max Tension	29	55.76	-0.34	-0.15
			Max. Compression	12	-62.99	0.36	0.13
			Max. Mx	13	-34.72	0.38	0.03
			Max. My	26	-5.39	-0.00	-0.48
			Max. Vy	25	-0.27	0.37	-0.01
			Max. Vx	2	0.36	-0.19	-0.43
		Diagonal	Max Tension	15	11.01	0.00	0.00
			Max. Compression	14	-11.28	0.00	0.00
			Max. Mx	50	2.49	0.24	0.00
			Max. My	40	0.08	0.00	0.01
			Max. Vy	50	-0.09	0.00	0.00
			Max. Vx	40	-0.00	0.00	0.00
		Horizontal	Max Tension	16	7.43	0.04	-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. Compression	15	-7.50	0.04	0.00
			Max. Mx	48	0.32	0.12	0.00
			Max. My	12	0.02	0.00	-0.02
			Max. Vy	48	-0.07	0.12	0.00
			Max. Vx	12	0.00	0.01	-0.02
		Top Girt	Max Tension	16	6.25	0.03	-0.00
			Max. Compression	15	-6.30	0.03	0.00
			Max. Mx	48	-0.22	0.09	0.00
			Max. My	12	0.18	0.01	-0.02
			Max. Vy	48	-0.06	0.09	0.00
			Max. Vx	12	0.00	0.01	-0.02
		Inner Bracing	Max Tension	15	0.11	0.00	0.00
			Max. Compression	15	-0.11	0.00	0.00
			Max. Mx	34	-0.01	-0.07	0.00
			Max. My	12	0.00	0.00	-0.00
			Max. Vy	34	0.04	0.00	0.00
			Max. Vx	12	0.00	0.00	0.00
T4	125 - 100	Leg	Max Tension	29	95.61	-0.51	-0.11
			Max. Compression	12	-108.57	0.41	0.08
			Max. Mx	13	-91.70	0.52	0.11
			Max. My	10	-2.59	-0.01	0.59
			Max. Vy	25	-0.32	0.51	-0.06
			Max. Vx	10	-0.43	-0.01	0.59
		Diagonal	Max Tension	15	13.51	0.00	0.00
			Max. Compression	14	-13.81	0.00	0.00
			Max. Mx	50	3.26	0.29	0.00
			Max. My	40	0.23	0.00	0.01
			Max. Vy	50	-0.10	0.00	0.00
			Max. Vx	40	0.00	0.00	0.00
		Horizontal	Max Tension	16	9.68	0.05	-0.00
			Max. Compression	15	-9.82	0.05	0.00
			Max. Mx	48	0.52	0.14	0.00
			Max. My	12	-0.33	0.02	-0.02
			Max. Vy	48	-0.08	0.14	0.00
			Max. Vx	12	0.00	0.02	-0.02
		Top Girt	Max Tension	16	8.22	0.04	-0.00
			Max. Compression	15	-8.29	0.04	0.00
			Max. Mx	48	-0.32	0.12	0.00
			Max. My	12	-0.11	0.02	-0.02
			Max. Vy	48	-0.07	0.12	0.00
			Max. Vx	12	0.00	0.02	-0.02
		Inner Bracing	Max Tension	15	0.14	0.00	0.00
			Max. Compression	15	-0.14	0.00	0.00
			Max. Mx	34	-0.01	-0.09	0.00
			Max. My	12	0.00	0.00	-0.00
			Max. Vy	34	-0.04	0.00	0.00
			Max. Vx	12	0.00	0.00	0.00
T5	100 - 75	Leg	Max Tension	29	139.62	-0.34	-0.10
			Max. Compression	12	-159.13	0.56	0.18
			Max. Mx	13	-157.19	0.56	0.18
			Max. My	10	-4.75	-0.03	0.86
			Max. Vy	18	-0.34	-0.38	-0.03
			Max. Vx	26	-0.37	-0.00	-0.50
		Diagonal	Max Tension	15	15.49	0.00	0.00
			Max. Compression	14	-15.88	0.00	0.00
			Max. Mx	50	3.79	0.34	0.00
			Max. My	40	0.29	0.00	0.01
			Max. Vy	50	-0.11	0.00	0.00
			Max. Vx	40	-0.00	0.00	0.00
		Horizontal	Max Tension	14	11.68	0.11	0.01
			Max. Compression	15	-11.82	0.09	0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	48	0.74	0.24	0.01
			Max. My	12	-0.73	0.01	-0.04
			Max. Vy	48	-0.11	0.24	0.01
			Max. Vx	12	0.01	0.01	-0.04
		Top Girt	Max Tension	16	10.43	0.08	-0.00
			Max. Compression	15	-10.57	0.08	0.01
			Max. Mx	48	-0.50	0.21	0.01
			Max. My	12	-0.43	0.01	-0.04
			Max. Vy	48	-0.11	0.21	0.01
			Max. Vx	12	0.01	0.01	-0.04
		Inner Bracing	Max Tension	15	0.18	0.00	0.00
			Max. Compression	15	-0.18	0.00	0.00
			Max. Mx	34	-0.01	-0.11	0.00
			Max. My	12	0.17	0.00	-0.00
			Max. Vy	34	0.05	0.00	0.00
			Max. Vx	12	0.00	0.00	0.00
T6	75 - 50	Leg	Max Tension	29	177.80	-1.47	-0.28
			Max. Compression	12	-203.76	-1.01	0.37
			Max. Mx	12	-203.31	1.63	0.28
			Max. My	10	-6.60	-0.14	2.17
			Max. Vy	12	0.44	1.63	0.28
			Max. Vx	26	0.45	-0.20	-2.17
		Diagonal	Max Tension	15	21.23	0.00	0.00
			Max. Compression	14	-21.68	0.00	0.00
			Max. Mx	50	5.39	0.57	0.00
			Max. My	40	0.66	0.00	0.02
			Max. Vy	50	-0.14	0.00	0.00
			Max. Vx	40	-0.01	0.00	0.00
		Horizontal	Max Tension	14	13.58	0.13	0.01
			Max. Compression	15	-13.90	0.10	0.01
			Max. Mx	48	0.99	0.28	0.01
			Max. My	12	-0.94	0.02	-0.05
			Max. Vy	48	-0.13	0.28	0.01
			Max. Vx	12	0.01	0.02	-0.05
		Top Girt	Max Tension	14	12.52	0.12	0.01
			Max. Compression	15	-12.80	0.09	0.01
			Max. Mx	48	-0.66	0.26	0.01
			Max. My	12	-0.73	0.01	-0.04
			Max. Vy	48	-0.12	0.26	0.01
			Max. Vx	12	0.01	0.01	-0.04
		Inner Bracing	Max Tension	15	0.22	0.00	0.00
			Max. Compression	15	-0.22	0.00	0.00
			Max. Mx	34	-0.01	-0.15	0.00
			Max. My	12	0.21	0.00	-0.00
			Max. Vy	34	-0.06	0.00	0.00
			Max. Vx	12	0.00	0.00	0.00
T7	50 - 25	Leg	Max Tension	29	223.18	3.72	-0.55
			Max. Compression	12	-257.78	-5.36	0.60
			Max. Mx	12	-257.70	6.71	-0.46
			Max. My	26	-17.53	-0.59	-3.98
			Max. Vy	12	2.05	6.71	-0.46
			Max. Vx	26	1.20	-0.59	-3.98
		Diagonal	Max Tension	31	23.73	-0.13	-0.01
			Max. Compression	14	-25.13	0.00	0.00
			Max. Mx	30	13.33	-0.19	0.02
			Max. My	41	-7.48	-0.12	-0.04
			Max. Vy	49	0.09	-0.16	0.03
			Max. Vx	49	0.01	0.00	0.00
		Horizontal	Max Tension	14	15.63	0.15	0.01
			Max. Compression	15	-16.41	0.12	0.01
			Max. Mx	48	1.16	0.34	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. My	12	-0.91	0.04	-0.05
			Max. Vy	48	-0.14	0.34	0.00
			Max. Vx	12	0.01	0.04	-0.05
		Top Girt	Max Tension	14	14.52	0.14	0.01
			Max. Compression	15	-15.07	0.11	0.01
			Max. Mx	48	-1.06	0.31	0.00
			Max. My	12	-1.09	0.03	-0.05
			Max. Vy	48	-0.13	0.31	0.01
			Max. Vx	12	0.01	0.03	-0.05
		Redund Horz 1 Bracing	Max Tension	12	4.47	0.00	0.00
			Max. Compression	12	-4.47	0.00	0.00
			Max. Mx	34	0.47	-0.04	0.00
			Max. My	47	1.34	0.00	0.00
			Max. Vy	34	-0.03	0.00	0.00
			Max. Vx	47	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	12	3.41	0.00	0.00
			Max. Compression	12	-3.41	0.00	0.00
			Max. Mx	50	1.14	-0.08	0.00
			Max. My	40	0.45	0.00	-0.00
			Max. Vy	50	0.04	0.00	0.00
			Max. Vx	40	-0.00	0.00	0.00
		Inner Bracing	Max Tension	15	0.26	0.00	0.00
			Max. Compression	15	-0.26	0.00	0.00
			Max. Mx	34	-0.01	-0.18	0.00
			Max. My	12	0.25	0.00	-0.00
			Max. Vy	34	0.06	0.00	0.00
			Max. Vx	12	0.00	0.00	0.00
T8	25 - 0	Leg	Max Tension	29	274.23	4.16	-0.59
			Max. Compression	12	-318.67	-0.00	0.00
			Max. Mx	12	-287.18	7.17	-0.49
			Max. My	26	-19.08	-0.60	-4.12
			Max. Vy	12	2.16	7.17	-0.49
			Max. Vx	26	1.25	-0.60	-4.12
		Diagonal	Max Tension	15	26.60	-0.09	0.01
			Max. Compression	14	-27.67	0.00	0.00
			Max. Mx	30	13.98	-0.21	0.01
			Max. My	49	-7.84	-0.14	0.04
			Max. Vy	49	0.10	-0.18	0.03
			Max. Vx	49	0.01	0.00	0.00
		Horizontal	Max Tension	14	18.18	0.17	0.01
			Max. Compression	15	-19.20	0.14	0.01
			Max. Mx	48	1.42	0.34	0.01
			Max. My	12	-1.03	0.06	-0.05
			Max. Vy	48	0.14	0.34	0.01
			Max. Vx	12	0.01	0.06	-0.05
		Top Girt	Max Tension	14	16.92	0.16	0.01
			Max. Compression	15	-17.66	0.13	0.01
			Max. Mx	48	-1.33	0.36	0.00
			Max. My	12	-1.22	0.05	-0.05
			Max. Vy	48	-0.14	0.36	0.00
			Max. Vx	12	0.01	0.05	-0.05
		Redund Horz 1 Bracing	Max Tension	12	5.52	0.00	0.00
			Max. Compression	12	-5.52	0.00	0.00
			Max. Mx	41	1.84	-0.05	0.00
			Max. My	47	0.78	0.00	0.00
			Max. Vy	41	-0.03	0.00	0.00
			Max. Vx	47	-0.00	0.00	0.00
		Redund Diag 1	Max Tension	12	4.00	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
		Bracing					
			Max. Compression	12	-4.00	0.00	0.00
			Max. Mx	40	1.34	-0.09	0.00
			Max. My	40	0.48	0.00	-0.00
			Max. Vy	40	0.04	0.00	0.00
			Max. Vx	40	-0.00	0.00	0.00
		Inner Bracing	Max Tension	15	0.31	0.00	0.00
			Max. Compression	15	-0.31	0.00	0.00
			Max. Mx	34	-0.01	-0.27	0.00
			Max. My	12	0.30	0.00	-0.00
			Max. Vy	34	0.09	0.00	0.00
			Max. Vx	12	0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	24	342.03	35.98	-23.54
	Max. H_x	24	342.03	35.98	-23.54
	Max. H_z	7	-285.58	-29.97	22.27
	Min. Vert	9	-294.04	-31.71	21.17
	Min. H_x	9	-294.04	-31.71	21.17
	Min. H_z	24	342.03	35.98	-23.54
Leg B	Max. Vert	12	350.67	-36.34	-24.16
	Max. H_x	29	-302.45	32.06	21.82
	Max. H_z	31	-294.96	30.33	23.07
	Min. Vert	29	-302.45	32.06	21.82
	Min. H_x	12	350.67	-36.34	-24.16
	Min. H_z	14	332.21	-33.09	-24.56
Leg A	Max. Vert	2	347.82	0.36	43.28
	Max. H_x	27	17.39	12.10	1.16
	Max. H_z	2	347.82	0.36	43.28
	Min. Vert	19	-297.32	-0.38	-38.37
	Min. H_x	11	7.58	-12.10	0.44
	Min. H_z	19	-297.32	-0.38	-38.37

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	39.30	0.00	0.00	-16.42	-1.34	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	47.16	-0.60	-78.22	-7190.18	104.68	14.47
0.9 Dead+1.0 Wind 0 deg - No Ice	35.37	-0.60	-78.22	-7181.38	105.01	14.46
1.2 Dead+1.0 Wind 30 deg - No Ice	47.16	36.15	-63.28	-5877.95	-3320.87	-52.96
0.9 Dead+1.0 Wind 30 deg - No Ice	35.37	36.15	-63.28	-5869.85	-3318.68	-52.95
1.2 Dead+1.0 Wind 45 deg - No Ice	47.16	50.87	-50.92	-4730.63	-4710.19	-82.38

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
0.9 Dead+1.0 Wind 45 deg - No Ice	35.37	50.87	-50.92	-4723.15	-4707.24	-82.36
1.2 Dead+1.0 Wind 60 deg - No Ice	47.16	61.83	-35.38	-3283.31	-5757.63	-106.19
0.9 Dead+1.0 Wind 60 deg - No Ice	35.37	61.83	-35.38	-3276.61	-5754.11	-106.17
1.2 Dead+1.0 Wind 90 deg - No Ice	47.16	73.34	0.60	86.31	-6824.49	-130.99
0.9 Dead+1.0 Wind 90 deg - No Ice	35.37	73.34	0.60	91.18	-6820.39	-130.96
1.2 Dead+1.0 Wind 120 deg - No Ice	47.16	67.98	39.63	3657.31	-6262.15	-120.71
0.9 Dead+1.0 Wind 120 deg - No Ice	35.37	67.98	39.63	3660.27	-6258.37	-120.68
1.2 Dead+1.0 Wind 135 deg - No Ice	47.16	53.99	54.04	5003.68	-5023.32	-102.89
0.9 Dead+1.0 Wind 135 deg - No Ice	35.37	53.99	54.04	5005.91	-5020.19	-102.87
1.2 Dead+1.0 Wind 150 deg - No Ice	47.16	37.19	63.88	5944.64	-3505.30	-78.05
0.9 Dead+1.0 Wind 150 deg - No Ice	35.37	37.19	63.88	5946.36	-3502.99	-78.03
1.2 Dead+1.0 Wind 180 deg - No Ice	47.16	0.60	71.81	6691.03	-108.08	-14.46
0.9 Dead+1.0 Wind 180 deg - No Ice	35.37	0.60	71.81	6692.48	-107.53	-14.46
1.2 Dead+1.0 Wind 210 deg - No Ice	47.16	-36.15	63.28	5838.35	3317.81	52.97
0.9 Dead+1.0 Wind 210 deg - No Ice	35.37	-36.15	63.28	5840.13	3316.43	52.96
1.2 Dead+1.0 Wind 225 deg - No Ice	47.16	-50.87	50.92	4690.90	4707.19	82.38
0.9 Dead+1.0 Wind 225 deg - No Ice	35.37	-50.87	50.92	4693.31	4705.05	82.37
1.2 Dead+1.0 Wind 240 deg - No Ice	47.16	-67.38	38.59	3473.18	6152.56	106.19
0.9 Dead+1.0 Wind 240 deg - No Ice	35.37	-67.38	38.59	3476.26	6149.65	106.17
1.2 Dead+1.0 Wind 270 deg - No Ice	47.16	-73.34	-0.60	-126.36	6821.24	130.99
0.9 Dead+1.0 Wind 270 deg - No Ice	35.37	-73.34	-0.60	-121.34	6817.95	130.96
1.2 Dead+1.0 Wind 300 deg - No Ice	47.16	-62.43	-36.43	-3467.53	5860.70	120.70
0.9 Dead+1.0 Wind 300 deg - No Ice	35.37	-62.43	-36.43	-3460.71	5857.92	120.68
1.2 Dead+1.0 Wind 315 deg - No Ice	47.16	-51.72	-51.77	-4881.07	4857.28	102.88
0.9 Dead+1.0 Wind 315 deg - No Ice	35.37	-51.72	-51.77	-4873.48	4855.04	102.87
1.2 Dead+1.0 Wind 330 deg - No Ice	47.16	-37.19	-63.88	-5984.33	3501.75	78.05
0.9 Dead+1.0 Wind 330 deg - No Ice	35.37	-37.19	-63.88	-5976.15	3500.24	78.04
1.2 Dead+1.0 Ice+1.0 Temp	115.67	0.00	0.00	-161.10	-8.42	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	115.67	-0.09	-20.71	-1979.64	7.91	4.68
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	115.67	9.96	-17.34	-1688.65	-881.15	-23.89
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	115.67	14.05	-14.06	-1398.12	-1245.77	-36.19

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
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	115.67	17.15	-9.85	-1026.04	-1523.30	-46.04
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	115.67	20.07	0.09	-144.84	-1782.23	-55.87
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	115.67	17.98	10.44	762.24	-1592.03	-50.73
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	115.67	14.49	14.49	1120.26	-1290.31	-42.82
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	115.67	10.12	17.43	1382.65	-909.52	-31.99
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	115.67	0.09	19.86	1596.93	-24.79	-4.68
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	115.67	-9.96	17.34	1366.30	864.31	23.88
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	115.67	-14.05	14.06	1075.77	1228.94	36.20
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	115.67	-17.89	10.28	733.92	1558.80	46.05
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	115.67	-20.07	-0.09	-177.55	1765.37	55.86
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	115.67	-17.25	-10.01	-1054.37	1522.80	50.72
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	115.67	-14.18	-14.19	-1421.26	1252.04	42.82
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	115.67	-10.12	-17.43	-1705.00	892.62	31.99
Dead+Wind 0 deg - Service	39.30	-0.13	-16.66	-1543.40	21.29	3.08
Dead+Wind 30 deg - Service	39.30	7.70	-13.48	-1263.92	-708.18	-11.28
Dead+Wind 45 deg - Service	39.30	10.84	-10.85	-1019.59	-1004.02	-17.55
Dead+Wind 60 deg - Service	39.30	13.17	-7.54	-711.40	-1227.06	-22.62
Dead+Wind 90 deg - Service	39.30	15.62	0.13	6.20	-1454.26	-27.90
Dead+Wind 120 deg - Service	39.30	14.48	8.44	766.59	-1334.47	-25.70
Dead+Wind 135 deg - Service	39.30	11.50	11.51	1053.29	-1070.66	-21.91
Dead+Wind 150 deg - Service	39.30	7.92	13.61	1253.64	-747.41	-16.62
Dead+Wind 180 deg - Service	39.30	0.13	15.30	1412.60	-24.00	-3.09
Dead+Wind 210 deg - Service	39.30	-7.70	13.48	1231.00	705.49	11.28
Dead+Wind 225 deg - Service	39.30	-10.84	10.85	986.67	1001.35	17.55
Dead+Wind 240 deg - Service	39.30	-14.35	8.22	727.38	1309.13	22.62
Dead+Wind 270 deg - Service	39.30	-15.62	-0.13	-39.08	1451.56	27.90
Dead+Wind 300 deg - Service	39.30	-13.30	-7.76	-750.61	1247.01	25.71
Dead+Wind 315 deg - Service	39.30	-11.02	-11.03	-1051.61	1033.36	21.91
Dead+Wind 330 deg - Service	39.30	-7.92	-13.61	-1286.56	744.70	16.62

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	-39.30	0.00	0.00	39.30	0.00	0.000%
2	-0.60	-47.16	-78.22	0.60	47.16	78.22	0.000%
3	-0.60	-35.37	-78.22	0.60	35.37	78.22	0.000%
4	36.15	-47.16	-63.28	-36.15	47.16	63.28	0.000%
5	36.15	-35.37	-63.28	-36.15	35.37	63.28	0.000%
6	50.87	-47.16	-50.92	-50.87	47.16	50.92	0.000%
7	50.87	-35.37	-50.92	-50.87	35.37	50.92	0.000%
8	61.83	-47.16	-35.38	-61.83	47.16	35.38	0.000%
9	61.83	-35.37	-35.38	-61.83	35.37	35.38	0.000%
10	73.34	-47.16	0.60	-73.34	47.16	-0.60	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
11	73.34	-35.37	0.60	-73.34	35.37	-0.60	0.000%
12	67.98	-47.16	39.63	-67.98	47.16	-39.63	0.000%
13	67.98	-35.37	39.63	-67.98	35.37	-39.63	0.000%
14	53.99	-47.16	54.04	-53.99	47.16	-54.04	0.000%
15	53.99	-35.37	54.04	-53.99	35.37	-54.04	0.000%
16	37.19	-47.16	63.88	-37.19	47.16	-63.88	0.000%
17	37.19	-35.37	63.88	-37.19	35.37	-63.88	0.000%
18	0.60	-47.16	71.81	-0.60	47.16	-71.81	0.000%
19	0.60	-35.37	71.81	-0.60	35.37	-71.81	0.000%
20	-36.15	-47.16	63.28	36.15	47.16	-63.28	0.000%
21	-36.15	-35.37	63.28	36.15	35.37	-63.28	0.000%
22	-50.87	-47.16	50.92	50.87	47.16	-50.92	0.000%
23	-50.87	-35.37	50.92	50.87	35.37	-50.92	0.000%
24	-67.38	-47.16	38.59	67.38	47.16	-38.59	0.000%
25	-67.38	-35.37	38.59	67.38	35.37	-38.59	0.000%
26	-73.34	-47.16	-0.60	73.34	47.16	0.60	0.000%
27	-73.34	-35.37	-0.60	73.34	35.37	0.60	0.000%
28	-62.43	-47.16	-36.43	62.43	47.16	36.43	0.000%
29	-62.43	-35.37	-36.43	62.43	35.37	36.43	0.000%
30	-51.72	-47.16	-51.77	51.72	47.16	51.77	0.000%
31	-51.72	-35.37	-51.77	51.72	35.37	51.77	0.000%
32	-37.19	-47.16	-63.88	37.19	47.16	63.88	0.000%
33	-37.19	-35.37	-63.88	37.19	35.37	63.88	0.000%
34	0.00	-115.67	0.00	0.00	115.67	0.00	0.000%
35	-0.09	-115.67	-20.71	0.09	115.67	20.71	0.000%
36	9.96	-115.67	-17.34	-9.96	115.67	17.34	0.000%
37	14.05	-115.67	-14.06	-14.05	115.67	14.06	0.000%
38	17.15	-115.67	-9.85	-17.15	115.67	9.85	0.000%
39	20.07	-115.67	0.09	-20.07	115.67	-0.09	0.000%
40	17.98	-115.67	10.44	-17.98	115.67	-10.44	0.000%
41	14.49	-115.67	14.49	-14.49	115.67	-14.49	0.000%
42	10.12	-115.67	17.43	-10.12	115.67	-17.43	0.000%
43	0.09	-115.67	19.86	-0.09	115.67	-19.86	0.000%
44	-9.96	-115.67	17.34	9.96	115.67	-17.34	0.000%
45	-14.05	-115.67	14.06	14.05	115.67	-14.06	0.000%
46	-17.89	-115.67	10.28	17.89	115.67	-10.28	0.000%
47	-20.07	-115.67	-0.09	20.07	115.67	0.09	0.000%
48	-17.25	-115.67	-10.01	17.25	115.67	10.01	0.000%
49	-14.18	-115.67	-14.19	14.18	115.67	14.19	0.000%
50	-10.12	-115.67	-17.43	10.12	115.67	17.43	0.000%
51	-0.13	-39.30	-16.66	0.13	39.30	16.66	0.000%
52	7.70	-39.30	-13.48	-7.70	39.30	13.48	0.000%
53	10.84	-39.30	-10.85	-10.84	39.30	10.85	0.000%
54	13.17	-39.30	-7.54	-13.17	39.30	7.54	0.000%
55	15.62	-39.30	0.13	-15.62	39.30	-0.13	0.000%
56	14.48	-39.30	8.44	-14.48	39.30	-8.44	0.000%
57	11.50	-39.30	11.51	-11.50	39.30	-11.51	0.000%
58	7.92	-39.30	13.61	-7.92	39.30	-13.61	0.000%
59	0.13	-39.30	15.30	-0.13	39.30	-15.30	0.000%
60	-7.70	-39.30	13.48	7.70	39.30	-13.48	0.000%
61	-10.84	-39.30	10.85	10.84	39.30	-10.85	0.000%
62	-14.35	-39.30	8.22	14.35	39.30	-8.22	0.000%
63	-15.62	-39.30	-0.13	15.62	39.30	0.13	0.000%
64	-13.30	-39.30	-7.76	13.30	39.30	7.76	0.000%
65	-11.02	-39.30	-11.03	11.02	39.30	11.03	0.000%
66	-7.92	-39.30	-13.61	7.92	39.30	13.61	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000097
3	Yes	4	0.00000001	0.00000085
4	Yes	4	0.00000001	0.00000076
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000115
13	Yes	4	0.00000001	0.00000100
14	Yes	4	0.00000001	0.00000110
15	Yes	4	0.00000001	0.00000095
16	Yes	4	0.00000001	0.00000086
17	Yes	4	0.00000001	0.00000073
18	Yes	4	0.00000001	0.00000075
19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00000001
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000091
23	Yes	4	0.00000001	0.00000077
24	Yes	4	0.00000001	0.00000106
25	Yes	4	0.00000001	0.00000092
26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000082
33	Yes	4	0.00000001	0.00000071
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001
51	Yes	4	0.00000001	0.00000001
52	Yes	4	0.00000001	0.00000001
53	Yes	4	0.00000001	0.00000001
54	Yes	4	0.00000001	0.00000001
55	Yes	4	0.00000001	0.00000001
56	Yes	4	0.00000001	0.00000001
57	Yes	4	0.00000001	0.00000001
58	Yes	4	0.00000001	0.00000001
59	Yes	4	0.00000001	0.00000001

60	Yes	4	0.00000001	0.00000001
61	Yes	4	0.00000001	0.00000001
62	Yes	4	0.00000001	0.00000001
63	Yes	4	0.00000001	0.00000001
64	Yes	4	0.00000001	0.00000001
65	Yes	4	0.00000001	0.00000001
66	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 175	2.744	56	0.1155	0.0306
T2	175 - 150	2.623	56	0.1156	0.0302
T3	150 - 125	1.996	51	0.1120	0.0274
T4	125 - 100	1.438	51	0.0954	0.0250
T5	100 - 75	0.955	51	0.0808	0.0212
T6	75 - 50	0.565	56	0.0606	0.0167
T7	50 - 25	0.276	56	0.0433	0.0117
T8	25 - 0	0.084	56	0.0231	0.0062

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	SC479-HF1LDF	56	2.744	0.1155	0.0306	108001
178.00	432E-83I-01T TTA Unit	56	2.696	0.1156	0.0304	108001
177.00	5" Side Mount Standoff	56	2.671	0.1156	0.0303	108001
176.00	7'x2" Antenna Mount Pipe	56	2.647	0.1156	0.0303	108001
175.00	PA6-65AC	56	2.623	0.1156	0.0302	108001
173.00	PA6-65AC	56	2.573	0.1156	0.0300	105940
170.00	SC479-HF1LDF (D00I-E6085)	56	2.498	0.1156	0.0297	143794
169.00	PA6-65AC	56	2.473	0.1156	0.0296	168747
166.00	7'x2" Antenna Mount Pipe	56	2.397	0.1155	0.0292	351980
165.00	SC479-HF1LDF (D00I-E6085)	56	2.372	0.1155	0.0291	551653
163.00	PA6-65AC	56	2.321	0.1153	0.0289	Inf
147.00	7'x2" Antenna Mount Pipe	51	1.924	0.1105	0.0271	72488
146.00	6'x1" Whip Antenna w/ Mount	51	1.901	0.1099	0.0270	73491
143.00	6'x1" Whip Antenna w/ Mount	51	1.831	0.1081	0.0267	77710
140.00	6'x1" Whip Antenna w/ Mount	51	1.762	0.1061	0.0264	82416
137.10	ANT220F6 w/clamps	51	1.697	0.1040	0.0262	87541
130.00	Site Pro USF-4U	51	1.543	0.0988	0.0256	103054
127.00	7' Omni (Whip) Antenna	51	1.480	0.0967	0.0253	110484
126.45	Site Pro USF-4U	51	1.468	0.0963	0.0252	111530
122.90	ANT220F6 w/clamps	51	1.394	0.0940	0.0248	112273
114.00	3' Side Mount Standoff	51	1.216	0.0890	0.0236	96992
111.00	15' Omni (Whip) Antenna	51	1.158	0.0874	0.0231	92256
110.00	1151-3	51	1.139	0.0868	0.0229	90777
103.00	531-70 Dipole	51	1.009	0.0827	0.0218	81660
100.00	6' Dipole Antenna	51	0.955	0.0808	0.0212	78808
75.00	2" Dia 14' Omni	56	0.565	0.0606	0.0167	69976
48.00	DB803M-Y	56	0.257	0.0418	0.0113	86406

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 175	12.940	12	0.5448	0.1436
T2	175 - 150	12.366	12	0.5451	0.1417
T3	150 - 125	9.409	12	0.5284	0.1285
T4	125 - 100	6.775	12	0.4492	0.1176
T5	100 - 75	4.500	12	0.3802	0.0998
T6	75 - 50	2.660	12	0.2850	0.0786
T7	50 - 25	1.300	12	0.2035	0.0549
T8	25 - 0	0.393	12	0.1085	0.0290

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	SC479-HF1LDF	12	12.940	0.5448	0.1436	22818
178.00	432E-83I-01T TTA Unit	12	12.711	0.5449	0.1429	22818
177.00	5" Side Mount Standoff	12	12.596	0.5450	0.1425	22818
176.00	7'x2" Antenna Mount Pipe	12	12.481	0.5450	0.1421	22818
175.00	PA6-65AC	12	12.366	0.5451	0.1417	22818
173.00	PA6-65AC	12	12.133	0.5452	0.1409	22449
170.00	SC479-HF1LDF (D00I-E6085)	12	11.779	0.5452	0.1394	30907
169.00	PA6-65AC	12	11.660	0.5451	0.1389	36635
166.00	7'x2" Antenna Mount Pipe	12	11.302	0.5447	0.1373	78670
165.00	SC479-HF1LDF (D00I-E6085)	12	11.182	0.5445	0.1368	126318
163.00	PA6-65AC	12	10.942	0.5437	0.1357	278207
147.00	7'x2" Antenna Mount Pipe	12	9.070	0.5214	0.1271	15384
146.00	6'x1" Whip Antenna w/ Mount	12	8.959	0.5187	0.1267	15595
143.00	6'x1" Whip Antenna w/ Mount	12	8.629	0.5100	0.1254	16487
140.00	6'x1" Whip Antenna w/ Mount	12	8.306	0.5004	0.1242	17501
137.10	ANT220F6 w/clamps	12	7.999	0.4906	0.1231	18606
130.00	Site Pro USF-4U	12	7.271	0.4657	0.1201	22010
127.00	7' Omni (Whip) Antenna	12	6.972	0.4556	0.1187	23651
126.45	Site Pro USF-4U	12	6.917	0.4538	0.1184	23881
122.90	ANT220F6 w/clamps	12	6.570	0.4429	0.1165	24013
114.00	3' Side Mount Standoff	12	5.728	0.4189	0.1107	20538
111.00	15' Omni (Whip) Antenna	12	5.454	0.4112	0.1085	19541
110.00	1151-3	12	5.364	0.4086	0.1077	19230
103.00	531-70 Dipole	12	4.752	0.3894	0.1022	17309
100.00	6' Dipole Antenna	12	4.500	0.3802	0.0998	16707
75.00	2" Dia 14' Omni	12	2.660	0.2850	0.0786	14876
48.00	DB803M-Y	12	1.210	0.1968	0.0529	18339

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load per Bolt K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	180	Diagonal	A325X	0.7500	1	1.46	17.94	0.081 ✔	1	Member Block Shear
		Top Girt	A325X	0.6250	2	0.62	10.26	0.061 ✔	1	Member Block Shear
T2	175	Leg	A325X	0.7500	6	0.25	30.10	0.008 ✔	1	Bolt Tension
		Diagonal	A325X	0.7500	1	9.35	17.94	0.521 ✔	1	Member Block Shear
		Horizontal	A325X	0.6250	2	2.90	7.19	0.403 ✔	1	Member Block Shear
T3	150	Leg	A325X	0.7500	6	5.15	30.10	0.171 ✔	1	Bolt Tension
		Diagonal	A325X	0.7500	1	11.01	25.23	0.436 ✔	1	Member Bearing
		Horizontal	A325X	0.6250	2	3.72	10.26	0.362 ✔	1	Member Block Shear
T4	125	Leg	A325X	0.7500	6	11.44	30.10	0.380 ✔	1	Bolt Tension
		Diagonal	A325X	0.7500	1	13.51	25.23	0.535 ✔	1	Member Bearing
		Horizontal	A325X	0.6250	2	4.84	10.26	0.471 ✔	1	Member Block Shear
		Top Girt	A325X	0.6250	2	4.11	10.26	0.400 ✔	1	Member Block Shear
T5	100	Leg	A325X	1.0000	6	18.32	54.52	0.336 ✔	1	Bolt Tension
		Diagonal	A325X	0.7500	1	15.49	25.23	0.614 ✔	1	Member Bearing
		Horizontal	A325X	0.6250	2	5.84	11.62	0.502 ✔	1	Member Block Shear
		Top Girt	A325X	0.6250	2	5.21	11.62	0.449 ✔	1	Member Block Shear
T6	75	Leg	A325X	1.0000	8	19.35	54.52	0.355 ✔	1	Bolt Tension
		Diagonal	A325X	0.7500	1	21.23	25.23	0.841 ✔	1	Member Bearing
		Horizontal	A325X	0.6250	2	6.79	11.62	0.584 ✔	1	Member Block Shear
		Top Girt	A325X	0.6250	2	6.26	11.62	0.539 ✔	1	Member Block Shear
T7	50	Leg	A325X	1.0000	8	24.94	54.52	0.457 ✔	1	Bolt Tension
		Diagonal	A325X	1.0000	1	23.73	27.10	0.875 ✔	1	Member Block Shear
		Horizontal	A325X	0.6250	2	7.81	11.62	0.672 ✔	1	Member Block Shear
		Top Girt	A325X	0.6250	2	7.26	11.62	0.625 ✔	1	Member Block Shear
T8	25	Leg	A325X	1.0000	8	31.00	54.52	0.569 ✔	1	Bolt Tension
		Diagonal	A325X	1.0000	1	26.60	27.10	0.982 ✔	1	Member Block Shear
		Horizontal	A325X	0.6250	2	9.09	11.62	0.782 ✔	1	Member Block Shear
		Top Girt	A325X	0.6250	2	8.46	11.62	0.728 ✔	1	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 175	HSS5x.25	5.01	5.01	35.6 K=1.00	3.4894	-1.62	143.13	0.011 [1] ✔
T2	175 - 150	HSS5x.25	25.03	8.34	59.3 K=1.00	3.4894	-22.31	121.40	0.184 [1] ✔
T3	150 - 125	HSS5x.25	25.03	8.34	59.3 K=1.00	3.4894	-62.99	121.40	0.519 [1] ✔
T4	125 - 100	HSS5x.5	25.03	8.34	62.1 K=1.00	6.6249	-108.57	255.02	0.426 [1] ✔
T5	100 - 75	HSS5x.5	25.03	8.34	62.1 K=1.00	6.6249	-159.13	255.02	0.624 [1] ✔
T6	75 - 50	HSS6.875x.5	25.03	12.51	66.1 K=1.00	9.3640	-203.76	344.70	0.591 [1] ✔
T7	50 - 25	HSS6.875x.5	25.03	6.26	33.0 K=1.00	9.3640	-257.78	459.46	0.561 [1] ✔
T8	25 - 0	HSS6.875x.5	25.03	6.26	33.0 K=1.00	9.3640	-318.67	459.46	0.694 [1] ✔

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 175	2L2 1/2x2x3/16	7.43	6.88	104.5 K=1.00	1.6200	-1.58	38.28	0.041 [1] ✔
T2	175 - 150	2L2 1/2x2x3/16	10.57	9.96	151.3 K=1.00	1.6200	-9.47	20.26	0.468 [1] ✔
T3	150 - 125	2L3x2 1/2x1/4	11.21	10.63	135.0 K=1.00	2.6300	-11.28	41.31	0.273 [1] ✔
T4	125 - 100	2L3x2 1/2x1/4	11.90	11.34	144.0 K=1.00	2.6300	-13.81	36.29	0.381 [1] ✔
T5	100 - 75	2L3x2 1/2x1/4	12.64	12.09	153.5 K=1.00	2.6300	-15.88	31.94	0.497 [1] ✔
T6	75 - 50	2L3 1/2x3x1/4	16.33	15.61	168.8 K=1.00	3.1300	-21.68	31.45	0.689 [1] ✔
T7	50 - 25	2L3x3 1/2x1/4	16.99	16.23	128.1 K=1.00	3.1300	-25.13	54.56	0.461 [1] ✔
T8	25 - 0	2L3x3 1/2x1/4	17.68	16.94	133.8 K=1.00	3.1300	-27.67	50.08	0.553 [1] ✔

[1] $P_u / \phi P_n$ 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 $\frac{P_u}{\phi P_n}$
T2	175 - 150	L2 1/2x2 1/2x3/16	12.33	5.76	135.0 K=0.97	0.9020	-5.82	14.17	0.411 [1] ✔
T3	150 - 125	L3x3x1/4	14.33	6.76	133.0 K=0.97	1.4400	-7.50	23.29	0.322 [1] ✔
T4	125 - 100	L3x3x1/4	16.33	7.76	148.5 K=0.94	1.4400	-9.82	18.70	0.525 [1] ✔
T5	100 - 75	L4x4x1/4	18.33	8.76	129.4 K=0.98	1.9400	-11.82	33.18	0.356 [1] ✔
T6	75 - 50	L4x4x1/4	20.00	9.52	138.0 K=0.96	1.9400	-13.90	29.14	0.477 [1] ✔
T7	50 - 25	L4x4x1/4	22.00	10.52	149.5 K=0.94	1.9400	-16.41	24.83	0.661 [1] ✔
T8	25 - 0	L4x4x1/4	24.00	11.52	161.1 K=0.93	1.9400	-19.20	21.41	0.897 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 175	L3x3x1/4	10.60	4.89	109.6 K=1.10	1.4400	-1.27	32.26	0.039 [1] ✔
T2	175 - 150	L2 1/2x2 1/2x3/16	11.00	5.29	126.3 K=0.98	0.9020	-3.54	16.17	0.219 [1] ✔
T3	150 - 125	L3x3x1/4	13.00	6.29	125.8 K=0.99	1.4400	-6.30	26.05	0.242 [1] ✔
T4	125 - 100	L3x3x1/4	15.00	7.09	138.2 K=0.96	1.4400	-8.29	21.59	0.384 [1] ✔
T5	100 - 75	L4x4x1/4	17.00	8.09	121.7 K=1.00	1.9400	-10.57	37.12	0.285 [1] ✔
T6	75 - 50	L4x4x1/4	19.00	9.02	132.3 K=0.97	1.9400	-12.80	31.73	0.404 [1] ✔
T7	50 - 25	L4x4x1/4	21.00	10.02	143.8 K=0.95	1.9400	-15.07	26.85	0.561 [1] ✔
T8	25 - 0	L4x4x1/4	23.00	11.02	155.3 K=0.93	1.9400	-17.66	23.02	0.767 [1] ✔

[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 $\frac{P_u}{\phi P_n}$

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	50 - 25	L2 1/2x2 1/2x3/16	5.50	5.21	126.4 K=1.00	0.9020	-4.47	16.16	0.276 [1] ✔
T8	25 - 0	L2 1/2x2 1/2x3/16	6.00	5.71	138.5 K=1.00	0.9020	-5.52	13.46	0.410 [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	50 - 25	L3x3x1/4	8.16	7.72	156.5 K=1.00	1.4400	-3.32	16.84	0.197 [1] ✔
T8	25 - 0	L3x3x1/4	8.49	8.07	163.6 K=1.00	1.4400	-3.91	15.40	0.254 [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 $\frac{P_u}{\phi P_n}$
T3	150 - 125	L2 1/2x2x3/16	6.50	6.50	182.7 K=1.00	0.8090	-0.11	6.94	0.016 [1] ✔
T4	125 - 100	L2 1/2x2x3/16	7.50	7.50	210.8 K=1.00	0.8090	-0.14	5.21	0.028 [1] ✔
T5	100 - 75	L2 1/2x2x3/16	8.50	8.50	238.9 K=1.00	0.8090	-0.18	4.06	0.045 [1] ✔
T6	75 - 50	L2 1/2x2 1/2x3/16	9.50	9.50	230.3 K=1.00	0.9020	-0.22	4.87	0.046 [1] ✔
T7	50 - 25	L2 1/2x2 1/2x3/16	10.50	10.50	254.5 K=1.00	0.9020	-0.26	3.98	0.065 [1] ✔
T8	25 - 0	KL/R > 250 (C) - 235 L3x3x1/4	11.50	11.50	233.1 K=1.00	1.4400	-0.31	7.58	0.040 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 175	HSS5x.25	5.01	5.01	35.6	3.4894	0.02	157.02	0.000 [1] ✔
T2	175 - 150	HSS5x.25	25.03	8.34	59.3	3.4894	18.94	157.02	0.121 [1] ✔
T3	150 - 125	HSS5x.25	25.03	8.34	59.3	3.4894	55.76	157.02	0.355 [1] ✔
T4	125 - 100	HSS5x.5	25.03	8.34	62.1	6.6249	95.61	357.75	0.267 [1] ✔
T5	100 - 75	HSS5x.5	25.03	8.34	62.1	6.6249	139.62	357.75	0.390 [1] ✔
T6	75 - 50	HSS6.875x.5	25.03	12.51	66.1	9.3640	177.80	505.65	0.352 [1] ✔
T7	50 - 25	HSS6.875x.5	25.03	6.26	33.0	9.3640	223.18	505.65	0.441 [1] ✔
T8	25 - 0	HSS6.875x.5	25.03	6.26	33.0	9.3640	274.23	505.65	0.542 [1] ✔

[1] $P_u / \phi P_n$ controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 175	2L2 1/2x2x3/16	7.43	6.88	108.6	0.9689	1.46	42.15	0.035 [1] ✔
T2	175 - 150	2L2 1/2x2x3/16	10.57	9.96	155.4	0.9689	9.35	42.15	0.222 [1] ✔
T3	150 - 125	2L3x2 1/2x1/4	11.21	10.63	138.4	1.6444	11.01	71.53	0.154 [1] ✔
T4	125 - 100	2L3x2 1/2x1/4	11.90	11.34	147.5	1.6444	13.51	71.53	0.189 [1] ✔
T5	100 - 75	2L3x2 1/2x1/4	12.64	12.09	157.0	1.6444	15.49	71.53	0.217 [1] ✔
T6	75 - 50	2L3 1/2x3x1/4	16.33	15.61	171.7	2.0194	21.23	87.84	0.242 [1] ✔
T7	50 - 25	2L3x3 1/2x1/4	16.99	16.23	130.8	1.9256	23.73	83.76	0.283 [1] ✔
T8	25 - 0	2L3x3 1/2x1/4	17.68	16.94	136.4	1.9256	26.60	83.76	0.318 [1] ✔

[1] $P_u / \phi P_n$ 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 $\frac{P_u}{\phi P_n}$
T2	175 - 150	L2 1/2x2 1/2x3/16	12.33	5.76	137.8	0.5710	5.79	24.84	0.233 [1] ✔
T3	150 - 125	L3x3x1/4	14.33	6.76	89.8	0.9394	7.43	40.86	0.182 [1] ✔
T4	125 - 100	L3x3x1/4	16.33	7.76	102.7	0.9394	9.68	40.86	0.237 [1] ✔
T5	100 - 75	L4x4x1/4	18.33	8.76	86.0	1.3144	11.68	57.18	0.204 [1] ✔
T6	75 - 50	L4x4x1/4	20.00	9.52	93.2	1.3144	13.58	57.18	0.238 [1] ✔
T7	50 - 25	L4x4x1/4	22.00	10.52	102.8	1.3144	15.63	57.18	0.273 [1] ✔
T8	25 - 0	L4x4x1/4	24.00	11.52	112.4	1.3144	18.18	57.18	0.318 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 175	L3x3x1/4	10.60	4.89	98.5	0.9394	1.25	40.86	0.031 [1] ✔
T2	175 - 150	L2 1/2x2 1/2x3/16	11.00	5.29	122.4	0.9020	3.56	29.22	0.122 [1] ✔
T3	150 - 125	L3x3x1/4	13.00	6.29	81.2	1.4400	6.25	46.66	0.134 [1] ✔
T4	125 - 100	L3x3x1/4	15.00	7.09	94.1	0.9394	8.22	40.86	0.201 [1] ✔
T5	100 - 75	L4x4x1/4	17.00	8.09	79.6	1.3144	10.43	57.18	0.182 [1] ✔
T6	75 - 50	L4x4x1/4	19.00	9.02	88.4	1.3144	12.52	57.18	0.219 [1] ✔
T7	50 - 25	L4x4x1/4	21.00	10.02	98.0	1.3144	14.52	57.18	0.254 [1] ✔
T8	25 - 0	L4x4x1/4	23.00	11.02	107.6	1.3144	16.92	57.18	0.296 [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 $\frac{P_u}{\phi P_n}$

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	50 - 25	L2 1/2x2 1/2x3/16	5.50	5.21	80.4	0.9020	4.47	29.22	0.153 [1] ✔
T8	25 - 0	L2 1/2x2 1/2x3/16	6.00	5.71	88.1	0.9020	5.52	29.22	0.189 [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	50 - 25	L3x3x1/4	8.01	7.56	97.5	1.4400	3.41	46.66	0.073 [1] ✔
T8	25 - 0	L3x3x1/4	8.33	7.90	102.0	1.4400	4.00	46.66	0.086 [1] ✔

[1] P_u / ϕP_n controls

Inner Bracing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T3	150 - 125	L2 1/2x2x3/16	6.50	6.50	130.0	0.8090	0.11	26.21	0.004 [1] ✔
T4	125 - 100	L2 1/2x2x3/16	7.50	7.50	150.1	0.8090	0.14	26.21	0.005 [1] ✔
T5	100 - 75	L2 1/2x2x3/16	8.50	8.50	170.1	0.8090	0.18	26.21	0.007 [1] ✔
T6	75 - 50	L2 1/2x2 1/2x3/16	9.50	9.50	146.5	0.9020	0.22	29.22	0.008 [1] ✔
T7	50 - 25	L2 1/2x2 1/2x3/16	10.50	10.50	162.0	0.9020	0.26	29.22	0.009 [1] ✔
T8	25 - 0	L3x3x1/4	11.50	11.50	148.4	1.4400	0.31	46.66	0.007 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	180 - 175	Leg	HSS5x.25	3	-1.62	143.13	2.3	Pass
T2	175 - 150	Leg	HSS5x.25	14	-22.31	121.40	18.4	Pass
T3	150 - 125	Leg	HSS5x.25	44	-62.99	121.40	51.9	Pass
T4	125 - 100	Leg	HSS5x.5	83	-108.57	255.02	42.6	Pass
T5	100 - 75	Leg	HSS5x.5	122	-159.13	255.02	62.4	Pass
T6	75 - 50	Leg	HSS6.875x.5	161	-203.76	344.70	59.1	Pass
T7	50 - 25	Leg	HSS6.875x.5	188	-257.78	459.46	56.1	Pass
T8	25 - 0	Leg	HSS6.875x.5	239	-318.67	459.46	69.4	Pass
T1	180 - 175	Diagonal	2L2 1/2x2x3/16	9	-1.58	38.28	4.1	Pass
							8.1 (b)	
T2	175 - 150	Diagonal	2L2 1/2x2x3/16	23	-9.47	20.26	46.8	Pass
							52.1 (b)	
T3	150 - 125	Diagonal	2L3x2 1/2x1/4	53	-11.28	41.31	27.3	Pass
							43.6 (b)	
T4	125 - 100	Diagonal	2L3x2 1/2x1/4	92	-13.81	36.29	38.1	Pass
							53.5 (b)	
T5	100 - 75	Diagonal	2L3x2 1/2x1/4	131	-15.88	31.94	49.7	Pass
							61.4 (b)	
T6	75 - 50	Diagonal	2L3 1/2x3x1/4	170	-21.68	31.45	68.9	Pass
							84.1 (b)	
T7	50 - 25	Diagonal	2L3x3 1/2x1/4	201	-25.13	54.56	46.1	Pass
							87.5 (b)	
T8	25 - 0	Diagonal	2L3x3 1/2x1/4	252	-27.67	50.08	55.3	Pass
							98.2 (b)	
T2	175 - 150	Horizontal	L2 1/2x2 1/2x3/16	22	-5.82	14.17	41.1	Pass
T3	150 - 125	Horizontal	L3x3x1/4	52	-7.50	23.29	32.2	Pass
							36.2 (b)	
T4	125 - 100	Horizontal	L3x3x1/4	91	-9.82	18.70	52.5	Pass
T5	100 - 75	Horizontal	L4x4x1/4	130	-11.82	33.18	35.6	Pass
							50.2 (b)	
T6	75 - 50	Horizontal	L4x4x1/4	169	-13.90	29.14	47.7	Pass
							58.4 (b)	
T7	50 - 25	Horizontal	L4x4x1/4	200	-16.41	24.83	66.1	Pass
							67.2 (b)	
T8	25 - 0	Horizontal	L4x4x1/4	251	-19.20	21.41	89.7	Pass
T1	180 - 175	Top Girt	L3x3x1/4	5	-1.27	32.26	3.9	Pass
							6.1 (b)	
T2	175 - 150	Top Girt	L2 1/2x2 1/2x3/16	17	-3.54	16.17	21.9	Pass
T3	150 - 125	Top Girt	L3x3x1/4	47	-6.30	26.05	24.2	Pass
T4	125 - 100	Top Girt	L3x3x1/4	86	-8.29	21.59	38.4	Pass
							40.0 (b)	
T5	100 - 75	Top Girt	L4x4x1/4	125	-10.57	37.12	28.5	Pass
							44.9 (b)	
T6	75 - 50	Top Girt	L4x4x1/4	164	-12.80	31.73	40.4	Pass
							53.9 (b)	
T7	50 - 25	Top Girt	L4x4x1/4	191	-15.07	26.85	56.1	Pass
							62.5 (b)	
T8	25 - 0	Top Girt	L4x4x1/4	242	-17.66	23.02	76.7	Pass
T7	50 - 25	Redund Horz 1 Bracing	L2 1/2x2 1/2x3/16	202	-4.47	16.16	27.6	Pass
T8	25 - 0	Redund Horz 1 Bracing	L2 1/2x2 1/2x3/16	253	-5.52	13.46	41.0	Pass
T7	50 - 25	Redund Diag 1 Bracing	L3x3x1/4	199	-3.32	16.84	19.7	Pass
T8	25 - 0	Redund Diag 1 Bracing	L3x3x1/4	254	-3.91	15.40	25.4	Pass
T3	150 - 125	Inner Bracing	L2 1/2x2x3/16	79	-0.11	6.94	1.6	Pass
T4	125 - 100	Inner Bracing	L2 1/2x2x3/16	118	-0.14	5.21	2.8	Pass
T5	100 - 75	Inner Bracing	L2 1/2x2x3/16	157	-0.18	4.06	4.5	Pass
T6	75 - 50	Inner Bracing	L2 1/2x2 1/2x3/16	184	-0.22	4.87	4.6	Pass
T7	50 - 25	Inner Bracing	L2 1/2x2 1/2x3/16	235	-0.26	3.98	6.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T8	25 - 0	Inner Bracing	L3x3x1/4	286	-0.31	7.58	4.0	Pass
							Summary	
						Leg (T8)	69.4	Pass
						Diagonal (T8)	98.2	Pass
						Horizontal (T8)	89.7	Pass
						Top Girt (T8)	76.7	Pass
						Redund Horz 1 Bracing (T8)	41.0	Pass
						Redund Diag 1 Bracing (T8)	25.4	Pass
						Inner Bracing (T7)	6.5	Pass
						Bolt Checks	98.2	Pass
						RATING =	**98.2**	**Pass**

ANCHOR BOLT ANALYSIS

ANCHOR BOLT ANALYSIS

Input Data

Tower Reactions:

Uplift:	Uplift := 302·kips	*user input*
Shear:	Shear := 44·kips	*user input*
Compression:	Compression := 351·kips	*user input*

Anchor Bolt Data:

Use ASTM A36 Use ASTM A36 per page 4.1 of structural analysis dated November 23, 1993

Number of Anchor Bolts = N	N := 6	*user input*	
Bolt Ultimate Strength:	$F_u := 58 \cdot ksi$	*user input*	
Bolt Yield Strength:	Fy := 36·ksi	*user input*	
Bolt Modulus:	E := 29000·ksi	*user input*	
Thickness of Anchor Bolts	D := 1.75in	*user input*	
Threads per Inch:	n := 5	*user input*	
Coefficient of Friction:	$\mu := 0.55$	*user input*	(for baseplate with grout ASCE 10-15)
Length from top of pier to bottom of leveling nut:	$L_{ar} := 0in$	*user input*	
Bolt Modulus:	E := 29000·ksi	*user input*	

Anchor Bolt Section Properties:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 2.41\cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 1.9\cdot in^2$$

Net Diameter:

$$D_n := D - \frac{0.9743 in}{n} \qquad D_n = 1.56\cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.39\cdot in$$

Plastic Section Modulus of Bolt:

$$Z_x := \frac{D_n^3}{6} \qquad Z_x = 0.63\cdot in^3$$

Forces:

Tension Force:

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

$T_u = 50.33\cdot kip$ $\quad T_{ub} := T_u$

Compression Force:

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

$P_{uc} = 58.5\cdot kip$ $\quad P_{ucb} := P_{uc}$

Shear Force:

$$V_u := \frac{Shear}{N}$$

$V_u = 7.33\cdot kip$ $\quad V_{ub} := V_u$

Resistance Factor for Flexure (TIA-222-H 4.9.9):

$\phi_f := 0.9$

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

$\phi_c := 0.9$

Resistance Factor for Tension (TIA-222-H 4.9.9):

$\phi_t := 0.75$

Resistance Factor for Shear (TIA-222-H 4.9.9):

$\phi_v := 0.75$

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

Design Tensile Strength, Rnt:

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

$R_{nt} = 110.17 \cdot ft \cdot kip$

$\phi_t \cdot R_{nt} = 82.63 \cdot ft \cdot kip$

Design Compression Strength, Rnc:

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

$R_{nc} = 86.59 \cdot ft \cdot kip$

$\phi_c \cdot R_{nc} = 77.93 \cdot ft \cdot kip$

Design Shear Strength (Tension), Rnv:

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

$R_{nv} = 69.75 \cdot ft \cdot kip$

$\phi_v \cdot R_{nv} = 52.31 \cdot ft \cdot kip$

Design Shear Strength (Compression), Rnvc:

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

$R_{nvc} = 38.97 \cdot ft \cdot kip$

$\phi_c \cdot R_{nvc} = 35.07 \cdot ft \cdot kip$

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

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

TIA-222-H 4.9.9 Combined Shear and Tension:

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

$$\left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 + \left(\frac{V_{ub}}{\phi_v \cdot R_{nv}}\right)^2 = 0.39$$

TIA-222-H 4.9.9 Combined Shear and Compression:

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

$$\left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2 = 0.79$$

NOTE: Larger ratio number shown above Governs design Capacity.

Combined Shear and Tension/Compression Check:

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

ShearAndTensionCheck = "OK"

FOUNDATION ANALYSIS

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PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower	$M_t := 7252 \cdot kip \cdot ft$
Shear at Base of Tower	$S_t := 79 \cdot kip$
Max Compressive Force	$C_t := 351 \cdot kip$
Max Uplift	$U_t := 302 \cdot kip$
Height of Tower	$H_t := 180 \cdot ft$
Width of Tower at Base	$W_t := 25 \cdot ft$
Weight of Tower	$WT_t := 1.0 \cdot kip$

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

FOOTING DIMENSIONS:

Width of Footing	$W_f := 37.5 \cdot ft$
Overall Depth of Footing	$D_f := 5 ft$
Length of Pier	$L_p := 3.5 \cdot ft$
Extension of Pier Above Grade	$L_{pag} := 1 \cdot ft$
Diameter of Pier	$d_p := 4.0 \cdot ft$
Thickness of Footing	$T_f := 2.5 \cdot ft$
Reinforement Cover:	$Cvr := 3 in$

MATERIAL PROPERTIES:

Compressive Strength of Concrete	$f'c := 3000 \cdot psi$	Unit Weight of Soil	$\gamma_s := 100 \cdot pcf$
Yield Strength of Steel Reinforcement	$fy := 60000 \cdot psi$	Unit Weight of Concrete	$\gamma_c := 150 \cdot pcf$
Internal Friction Angle of Soil	$\phi_s := 34. \cdot deg$	Depth to Neglect	$n := 2.5 \cdot ft$
Allowable Bearing Capacity	$q_s := 1500 \cdot psf$	Cohesion of Clay Type Soil	$c := 0 \cdot ksf$
Ultimate Bearing Capacity	$R_s := 2 \cdot q_s$	Note: Use 0 for Sandy Soil	

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

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

STEEL REINFORCING:

PIER REINFORCEMENT:

Bar Size	$BSpier := 9$	Bar Diameter	$d_{bpier} := 1.1280 \cdot in$
Number of Bars	$NBpier := 11$	Bar Area	$A_{bpier} := 1.0 \cdot in^2$

PAD REINFORCEMENT:

Bar Size	$BS_{pad} := 8$	Bar Diameter	$d_{bpad} := 1.00 \cdot in$
Number of Bars	$NB_{pad} := 50$	Bar Area	$A_{bpad} := 0.790 \cdot in^2$

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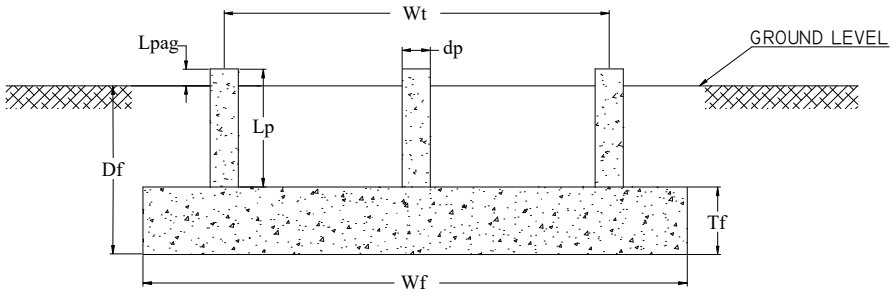
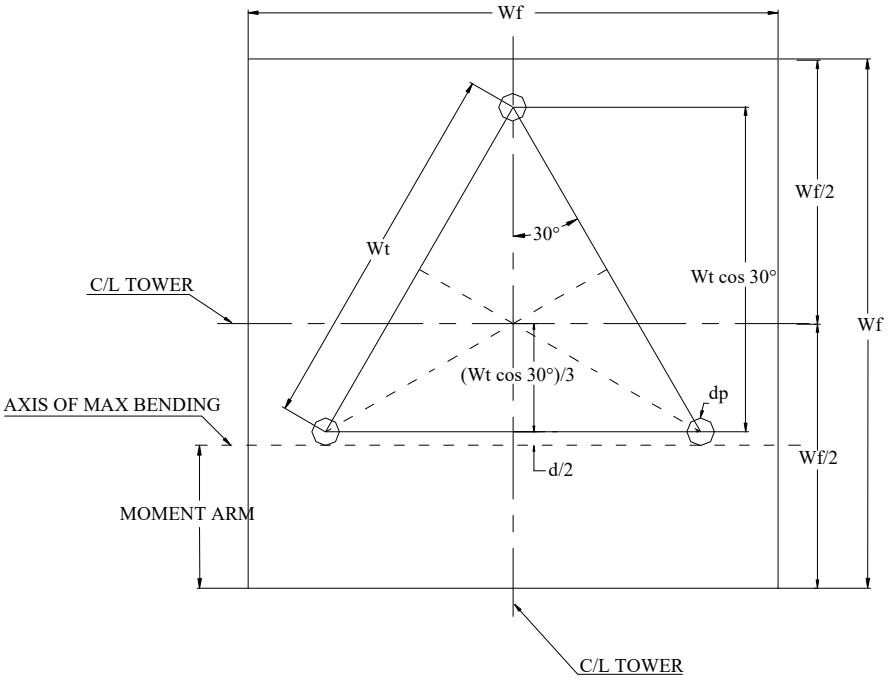
FOUNDATION OVERVIEW



ELEVATION



PLAN

STABILITY OF FOOTING

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

Passive Pressure:

$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pn} = 0.8843 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pt} = 0.8843 \cdot ksf$

$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}]$ $\quad P_{top} = 0.8843 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{bot} = 1.7686 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $\quad P_{ave} = 1.3264 \cdot ksf$

Shear:

$T_{pp} := \text{if}[n < (D_f - T_f), T_f, (D_f - n)]$ $\quad T_{pp} = 2.5 \cdot ft$

$A_{pp} := W_f \cdot T_{pp}$ $\quad A_{pp} = 93.75 \cdot ft^2$

Ultimate Shear:

$S_u := P_{ave} \cdot A_{pp}$ $\quad S_u = 124.3523 \cdot kip$

Weight of Concrete Pad:

$WT_c := (W_f^2 \cdot T_f) \cdot \gamma_c$ $\quad WT_c = 527.3438 \cdot kip$

Weight of Soil: above Footing:

$WT_{s1} := W_f^2 (|D_f - T_f|) \cdot \gamma_s$ $\quad WT_{s1} = 351.5625 \cdot kip$

Weight of Soil Wedge at back face:

$WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f \right] \cdot \gamma_s$ $\quad WT_{s2} = 7.9044 \cdot kip$

Distance to center of Tower Leg from Edge of Footing:

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

$X_t := \text{if}(Pos_{tower} = 1, X_{t1}, X_{t2})$ $\quad X_t = 11.5331 \cdot ft$

Additional Offset of Footing:

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

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

Resisting Moment:

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

$\phi_{OT} := 0.75$ ***ANSI/TIA-222-H REDUCTION FACTOR*** $\quad M_r = 16902.727 \cdot kip \cdot ft$

Overturning Moment:

$M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off}$ $\quad M_{ot} = 7726 \cdot kip \cdot ft$

Overturn Ratio (%):

$Ratio_{Stability} := \frac{M_{ot}}{M_r \cdot \phi_{OT}}$ $\quad Ratio_{Stability} = 60.94 \cdot \%$

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

BEARING PRESSURE CHECK:

Pressure Applied:

$LOAD_{tot} := WT_c + WT_{s1} + WT_t$ $\quad LOAD_{tot} = 879.9062 \cdot kip$

$A_{mat} := W_f^{\,2}$ $\quad A_{mat} = 1406.25 \cdot ft^2$

$S := \frac{W_f^{\,3}}{6}$ $\quad S = 8789.0625 \cdot ft^3$

$P_{max} := \frac{LOAD_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$ $\quad P_{max} = 1.5048 \cdot ksf$

$P_{min} := \frac{LOAD_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$ $\quad P_{min} = -0.2533 \cdot ksf$

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

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

Distance to Resultant of Pressure Distribution:

$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3}$ $\quad X_p = 10.6988 \cdot ft$

Distance to Kern:

$X_k := \frac{W_f}{3}$ $\quad X_k = 12.5 \cdot ft$

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

Eccentricity:

$e := \frac{M_{ot}}{LOAD_{tot}}$ $\quad e = 8.7805$

Adjusted Soil Pressure:

$q_a := \frac{2 \cdot LOAD_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$ $\quad q_a = 1.5691 \cdot ksf$

Revised Maximum:

$q_{max} := if\left(X_p < X_k, q_a, P_{max}\right)$ $\quad q_{max} = 1.5691 \cdot ksf$

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

CHECK PUNCHING AND BEAM SHEAR:

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

$\phi_c := 0.85$ (ACI 9.3.2.3)

$d := T_f - Cvr - .5 \cdot in$ $d = 26.5 \cdot in$

Factored load: $FL := \frac{C_t}{W_f^2}$ $FL = 0.2496 \cdot ksf$

$V_{req} := \frac{FL \cdot \left(X_t - 0.5 \cdot d_p - d\right) \cdot W_f}{\phi_c}$ $V_{req} = 80.6588 \cdot kip$

ACI 11.3.1.1 $V_{Avail} := 2 \cdot \sqrt{f'c \cdot psi} \cdot W_f \cdot d$ $V_{Avail} = 1306.3183 \cdot kip$

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

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

$b_o := \left(d_p + d\right) \cdot \pi$ $b_o = 19.5041 \cdot ft$

$V_{req} := FL \cdot \frac{W_f^2 - \left(d_p + d\right)^2 \cdot \frac{\pi}{4}}{\phi_c}$ $V_{req} = 404.0519 \cdot kip$

$V_{Avail} := 4 \cdot \sqrt{f'c \cdot psi} \cdot b_o \cdot d$ $V_{Avail} = 1358.8535 \cdot kip$

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

TENSILE REINFORCEMENT IN PAD:

$\phi_m := 0.90$ per ACI 9.3.2.2

Applied Moments:

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

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

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

Design Moment: $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m}$ $M_n = 3903.5182 \cdot kips \cdot ft$

Required Reinforcement:

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

Effective Width: $b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p$ $b_{eff} = 307.8076 \cdot in$

$A_s := \dfrac{M_n}{\phi_m \cdot fy \cdot d}$ $A_s = 32.7339 \cdot in^2$

$a := \dfrac{A_s \cdot fy}{\beta \cdot f'c \cdot b_{eff}}$ $a = 2.5022 \cdot in$

$A_s := \dfrac{M_n}{fy \cdot \left(d - \dfrac{a}{2}\right)}$ $A_s = 30.9203 \cdot in^2$

$\rho := \dfrac{A_s}{b_{eff} \cdot d}$ $\rho = 0.0038$

Temperature and Shrinkage: (ACI 7.12.2.1b)

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

Area Required: $As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$ $As = 30.9203 \cdot in^2$

Area Provided: $As_{prov} := A_{bpad} \cdot NB_{pad}$ $As_{prov} = 39.5 \cdot in^2$

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

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 12.2.3)

Bar Spacing: $B_{sPad} := \frac{W_f - 2 \cdot Cvr - NB_{pad} \cdot d_{bpad}}{NB_{pad} - 1}$ $B_{sPad} = 8.0408 \cdot in$

Development Length Factors:

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

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

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

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

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

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

Available Length in Pad: $L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr$ $L_{Pad} = 72 \cdot in$

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

REINFORCEMENT IN PIER:

(ACI 10.8.4 and 10.9.1)

$A_p := \frac{\pi \cdot d_p^{\,2}}{4}$ $\quad A_p = 1809.5574 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p$ $\quad A_{smin} = 9.0478 \cdot in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $\quad A_{sprov} = 11 \cdot in^2$

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

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $\quad B_{sPier} = 12.5808 \cdot in$

Diamter of Reinforcement Cage: $Diam_{cage} := d_p - 2 \cdot Cvr$ $\quad Diam_{cage} = 42 \cdot in$

Maximum Moment in Pier: $M_p := \left(S_t \cdot L_p\right)$ $\quad M_p = 3318 \cdot kips \cdot in$

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

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

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

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := (48 \;\; 11 \;\; 9 \;\; 460 \;\; 4385)$

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

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

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

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = (2066.097 \;\; 19695.2939 \;\; -46.1531 \;\; 0.0061)$

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

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

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

DEVELOPMENT LENGTH OF PIER REINFORCEMENT:

TENSION (ACI 12.2.3)

Spacing and Cover: $Cvr = 3\cdot in$ $B_{sPier} = 12.5808\cdot in$

Factors for development:

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

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

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

$$L_{dbt} := \frac{3}{40}\cdot\frac{fy}{\sqrt{f'c\cdot psi}}\cdot\frac{\alpha\cdot\beta\cdot\gamma\cdot\lambda}{\frac{c+k_{tr}}{d_{bpier}}}\cdot d_{bpier} \qquad L_{dbt} = 34.8457\cdot in$$

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

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

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02\cdot d_{bpier}\cdot fy}{\sqrt{f'c\cdot psi}} \qquad L_{dbc1} = 24.7132\cdot in$$

$L_{dbmin} := 0.0003\cdot\frac{in^2}{lb}\cdot\left(d_{bpier}\cdot fy\right)$ $L_{dbmin} = 20.304\cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right)$ $L_{dbc} = 24.7132\cdot in$

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Available Length in Pier:

$L_{pier} := L_p - 3 \cdot in$ $\quad L_{pier} = 39 \cdot in$

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

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

Available Length in Pad:

$L_{pad} := T_f - 3 \cdot in$ $\quad L_{pad} = 27 \cdot in$

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

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

About AECOM

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

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ATTACHMENT F – PROOF OF DELIVERY OF NOTICE

After printing this label:
1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
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ATTACHMENT G - POWER DENSITY REPORT

C Squared Systems, LLC
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Auburn, NH 03032
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Calculated Radio Frequency Emissions Report

ES-068

Cassidy Road

Southbury, CT 06488

November 23, 2020

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1. Introduction

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

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

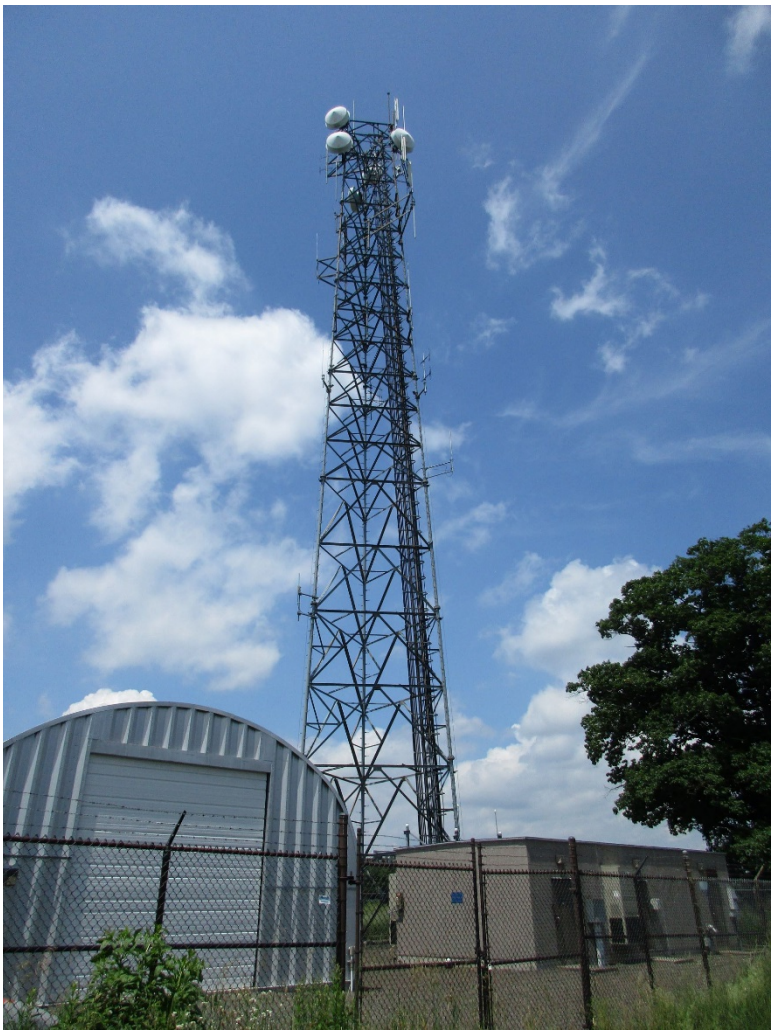


Figure 1: View of ES-068 Southbury Cassidy

Site Address	Cassidy Road
Latitude	41° 30' 24.5" N
Longitude	73° 17' 0.5" W
Site Elevation AMSL	756’
Survey Engineer	Marc Salas
Survey Date/Time	6/23/2020; 11:15 AM – 12:00 PM

Table 1: Survey Information

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

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

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

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

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

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

3. Power Density Calculation Methods

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

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

Where:

EIRP = Effective Isotropic Radiated Power = 1.64 x ERP

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

H = Horizontal Distance from antenna

V = Vertical Distance from radiation center of antenna

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

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

4. Proposed Antenna Configuration

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

Operator	Antenna Model	TX Freq. (MHz)	Ant Gain (dBd)	Power per Channel (ERP -Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	Telewave ANT220F6	217	6.2	124	4	20°	14.25	123

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

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

[2] Transmit antenna height is based on the AECOM Detailed Structural Analysis Report dated October 27, 2020.

5. Measurement Procedure

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

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

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

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

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

Manufacturer	Narda Microwave			
Probe	EA 5091, Serial# 0116			
Calibration Date	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 23, 2020 between 11:15 AM and 12:00 PM. The calculated % MPE contribution from the proposed equipment was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the "Off Beam Loss" factor shown in the power density formula from Section 3. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 10 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 6.95% (Average Uncontrolled/General Population MPE) and was recorded at Location 2 by the northern access gate on the east side of the compound. The highest composite (measured + calculated) % MPE value is calculated to be 6.99% (Average Uncontrolled/General Population) and is also calculated to occur at Location 2.

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 (#1)	41.50673	-73.28317	88	6.46%	0.10%	6.55%
2	**Compound access gate (#2)**	**41.50685**	**-73.28319**	**80**	**6.95%**	**0.05%**	**6.99%**
3	Gate on Cassidy Road to State Property, N of compound	41.50698	-73.28321	96	6.40%	0.13%	6.53%
4	Split of Cassidy Road and gravel drive, between the tower and water tank	41.50657	-73.28304	146	2.04%	0.10%	2.13%
5	along gravel drive, ~ 275' N of measurement point 4	41.50731	-73.28282	255	< 1.00%	0.07%	< 1.07%
6	near the end of the gravel drive, N of the site	41.50903	-73.28311	820	< 1.00%	0.10%	< 1.10%
7	SE of the site, southern driveway entrance to home across street	41.50584	-73.28297	378	< 1.00%	0.03%	< 1.03%
8	S on Cassidy Road, near gated farm field entrance	41.50469	-73.28277	795	< 1.00%	0.10%	< 1.10%
9	S on Cassidy Road, at intersection with Toms Hill Road	41.50218	-73.28229	1720	1.94%	0.03%	1.97%
10	S on Cassidy Road, near accessway to agricultural buildings	41.49939	-73.28192	2742	2.62%	0.01%	2.63%

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

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

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

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

Figure 2: Measurement Points – Zoom In

Figure 3: All Measurement Points

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

7. Conclusion

A number of accessible areas around the tower off of Cassidy Road in Southbury, 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 6.95% MPE. This measurement was recorded at Location 2 by the compound access gate.

The highest composite (measured + calculated) power density is **6.99% of the FCC General Population MPE limit** with the proposed Eversource equipment and is also calculated to occur at Location 2.

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.

Keith Vellante

November 23, 2020

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

Date

Attachment A: References

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

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

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

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

(A) Limits for Occupational/Controlled Exposure[7]

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

(B) Limits for General Population/Uncontrolled Exposure[8]

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

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

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

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

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

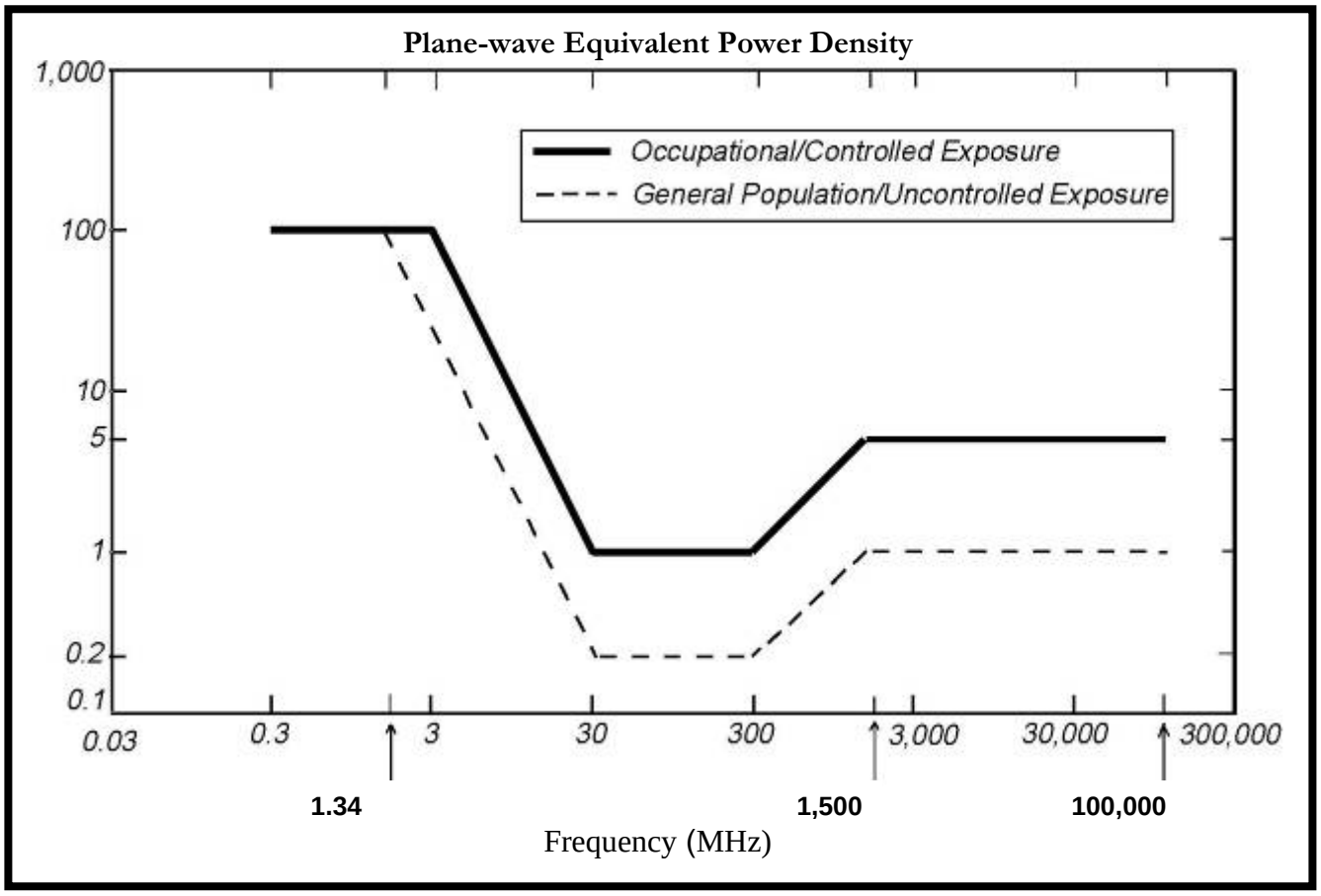
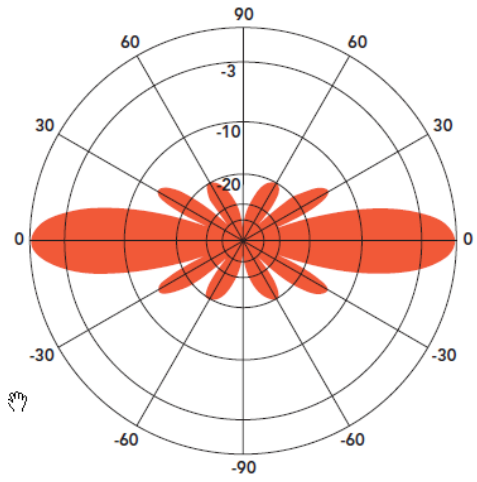


Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

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

217 MHz

Manufacturer:	Telewave
Model #:	ANT220F6
Frequency Band:	216 - 225 MHz
Gain:	6.2 dBd
Vertical Beamwidth:	20°
Horizontal Beamwidth:	360°
Polarization:	Vertical-Polarization
Length:	14.25’



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