EVERSOURCE ENERGY

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

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

January 28, 2021

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

RE: **Notice of Exempt Modification**
Eversource Site # 00025400
389 Ekonk Hill Road, Sterling, CT 06354
Latitude: 41-39-49.54 N / Longitude: 71-50-56.29 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains multiple antennas at various mounting heights on an existing 140-foot self-support tower located at 389 Ekonk Hill Road in Sterling. 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 Connecticut State Police tower. See Attachment B, Letter of Authorization. Eversource plans to install two 3.66-feet tall omni-directional antennas to be mounted at 117 feet above ground level ("AGL") and two 7/8-inch diameter coaxial cables. One of the proposed antennas will be mounted inverted on the antenna mount assembly. The antennas will be mounted to the existing tower on new 4-foot stand-off mounts. See Attachment C, Mount Analysis. There will be no changes to the area of the fenced compound, the tower or the existing antennas and equipment currently mounted on the tower. The tower and existing and proposed equipment are depicted on Attachment D, Construction Drawings, dated December 16, 2020 and Attachment E, Structural Analysis, dated November 25, 2020. The Connecticut Siting Council approved the self-support tower at this location in Docket No. 157 in March 1993.

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

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies ("R.C.S.A.") §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this notice is being delivered to

Lincoln A. Cooper, First Selectman for the Town of Sterling and Melissa Gil, Zoning Enforcement Officer for the Town of Sterling 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 the extension of the site boundary.
3. The proposed modification will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the new antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard as shown in the attached Radio Frequency Emissions Report, dated December 18, 2020 (Attachment G – Power Density Report).
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, Eversource respectfully submits that the proposed modifications to the above referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2). One original copy of this notice 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 Lincoln A. Cooper, First Selectman, Town of Sterling
Melissa Gil, Zoning Enforcement Officer, Town of Sterling
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

ATTACHMENT A – PARCEL MAP AND PROPERTY CARD


Legend
Approximate Tower Location
C16
1 AC
363
72
8
2.6 AC
393
21
9.91 AC
422
396
7
0.2 AC
389
9
4.6 AC
419
21A
0.25 AC
426
9A
1.4 AC
421
34
10
47.8 AC
60m

tyler clt division

RESIDENTIAL PROPERTY RECORD CARD 2016

TOWN OF STERLING

Situs : 389 EKONK HILL RD | **Map ID: 00025400** | **Class: State** | Card: 1 of 1 | Printed: March 9, 2016

CURRENT OWNER

CONNECTICUT STATE OF

389 EKONK HILL ROAD
STERLING CT 06377

GENERAL INFORMATION

Living Units	0
Neighborhood	200
Alternate Id	03633-034-0007
Vol / Pg	14/540
District	
Zoning	
Class	400

Property Notes

FORMER FIRE TOWER
CTS SITE # 49 800-842-0200 ASK

Land Information

Type		Size	Influence Factors	Influence %	Value
Primary	AC	0.2000			25,600

Total Acres: .2
Spot: Location:

Assessment Information

	Assessed	Appraised	Cost	Income	
Land	17,920	25,600	25,600	0	25,600
Building	12,750	18,210	18,210	0	18,210
Total	30,670	43,810	43,810	0	43,810

Manual Override Reason
Base Date of Value 10-01-2012
Value Flag COST APPROACH **Effective Date of Value** 10-01-2016
Gross Building:

Entrance Information

Date	ID	Entry Code	Source
02/28/07	AS	Exterior	Other

Permit Information

Date Issued	Number	Price	Purpose	% Complet

Sales/Ownership History

Transfer Date	Price	Type	Validity	Deed Reference	Deed Type	Grantee

tyler clt division

RESIDENTIAL PROPERTY RECORD CARD 2016

TOWN OF STERLING

Situs : 389 EKONK HILL RD | Parcel Id: 00025400 | Class: State | Card: 1 of 1 | Printed: March 9, 2016

Dwelling Information

Style		Year Built	
Story height		Eff Year Built	
Attic		Year Remodeled	
Exterior Walls		Amenities	
Masonry Trim	x		
Color		In-law Apt	No

Basement

Basement		# Car Bsmt Gar	
FBLA Size	x	FBLA Type	
Rec Rm Size	x	Rec Rm Type	

Heating & Cooling / Fireplaces

Heat Type		Stacks	
Fuel Type		Openings	
System Type		Pre-Fab	

Room Detail

Bedrooms		Full Baths	
Family Rooms		Half Baths	
Kitchens		Extra Fixtures	
Total Rooms			
Kitchen Type		Bath Type	
Kitchen Remod		Bath Remod	

Adjustments

Int vs Ext		Unfinished Area	
Cathedral Ceiling	x	Unheated Area	

Grade & Depreciation

Grade	C	Market Adj	
Condition		Functional	
CDU	AVERAGE	Economic	
Cost & Design	0	% Good Ovr	
% Complete			

Dwelling Computations

Base Price		% Good	
Plumbing		% Good Override	
Basement		Functional	
Heating		Economic	
Attic		% Complete	
Other Features	0	C&D Factor	
		Adj Factor	
Subtotal		Additions	
Ground Floor Area			
Total Living Area		Dwelling Value	

Building Notes

ID	Code	Description	Area
A	SH1	WORKSHOP	0

A

Outbuilding Data

Type	Size 1	Size 2	Area	Qty	Yr Blt	Grade	Condition	Value
Wkshp	18 x	50	900	1	2000	A	3	18,210

Condominium / Mobile Home Information

Complex Name			
Condo Model			
Unit Number			
Unit Level		Unit Location	
Unit Parking		Unit View	
Model (MH)		Model Make (MH)	

Addition Details

Line #	Low	1st	2nd	3rd	Value

ATTACHMENT B – LETTER OF AUTHORIZATION

STATE OF CONNECTICUT
DEPARTMENT OF EMERGENCY SERVICES AND PUBLIC PROTECTION

April 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: Ekonk Hill Road, Sterling, CT
Latitude: 41-39-49.29" Longitude: 71-50-56.47"

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 Ekonk Hill Road, Sterling, 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

1111 Country Club Road
Middletown, CT 06457
Phone: (860) 685-8280/Fax: (860) 685-8345
An Affirmative Action/Equal Employment Opportunity Employer

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

November 30, 2020

MOUNT EVALUATION LETTER

Site Number:	25400
Site Name:	EKONK CSP
Site Data:	389 Ekonk Hill Rd. Sterling, CT 06354
Latitude:	41° 39’ 49.54”
Longitude:	-71° 50’ 56.29”

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) =	17.9%

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	-	120.875	117	1	Omni	Telewave	ANT220F2
Eversource	1	-	113.125	117	1	Omni	Telewave	ANT220F2

2. ANALYSIS CRITERIA SUMMARY

ANALYSIS CRITERIA	
STANDARD	TIA-222-H
WIND SPEED	Ultimate of 145 mph
WIND SPEED WITH ICE	50 mph with 2" radial ice thickness
EXPOSURE CATEGORY	C
RISK CATEGORY	III
TOPO CATEGORY	Flat
CREST HEIGHT	N/A

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	14.9%	Pass	2.0%	Pass
Bracing: Pipe 2.0 Std	17.9%	Pass	2.4%	Pass
Mount Pipe: Pipe 3.0 Std	7.7%	Pass	4.0%	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)
ANT220F2	11

BLACK & VEATCH

Client: Eversource | Computed By: Joohwan Jung
Site Name: EKONK CSP (25400) | Date: 11/30/2020
Verified By: JW
Title: MOUNT ANALYSIS REPORT | Date: 11/30/2020

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 =	145	mph		
Height Above Ground, z =	120.875	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.32		$K_e = e^{-0.0000362*zs}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
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 =	67.35	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)
ANT220F2	3.67	0.23	0.23	1.70	1.29	86.59	1.70	1.29	86.59

BLACK & VEATCH

Client: Eversource | Computed By: Joohwan Jung
Site Name: EKONK CSP (25400) | Date: 11/30/2020
Verified By: JW
Title: MOUNT ANALYSIS REPORT | Date: 11/30/2020

Member 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 =	145	mph		
Height Above Ground, z =	120.875	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.32		$K_e = e^{-0.0000362 \cdot zs}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
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 =	67.35	psf		
Gust Effect Factor, G_h =	1.00		$F_M = q_z G_h C_f D_p$	2.6.11.2

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	33.67
Bracing: Pipe 2.0 Std	0.20		1.2	0.20	16.00
Mount Pipe: Pipe 3.0 Std	0.29		1.2	0.29	23.57

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 =	120.875	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	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} =	1.00		$T_{iz} = T_i I K_{iz} (K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.14			
Factored Ice Thickness, T_{iz} =	2.62	in	$DL_{ice}=[(H_{ice}*D_{ice}*W_{ice}) - (H*W*D)]*56pcf$	
Grating Ice Dead Load, D_{Gice} =	12.22	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)
ANT220F2	4.10	0.67	0.67	1.63	91.03

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 =	120.875	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	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} =	1.00		$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.14			
Factored Ice Thickness, T_{iz} =	2.62	in	Aiz = pi*Tiz*(Dc+Tiz)	2.6.10
Grating Ice Dead Load, D_{Gice} =	12.22	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	0.69	0.69	0.35	0.39	21.95
Bracing: Pipe 2.0 Std	0.63		0.20	0.29	15.98
Mount Pipe: Pipe 3.0 Std	0.73		0.29	0.35	19.58

BLACK & VEATCH	Client: Eversource	Computed By: Joohwan Jung
	Site Name: EKONK CSP (25400)	Date: 11/30/2020
		Verified By: JW
	Title: MOUNT ANALYSIS REPORT	Date: 11/30/2020

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 =	120.875	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.32	psf	$K_e = e^{-0.0000362 \cdot zs}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
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, $q_{z(ice)}$ =	8.008			
Factored Ice Thickness, T_{iz} =	2.62	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)
ANT220F2	4.10	0.67	0.67	-	2.37	19.00	-	2.37	19.00

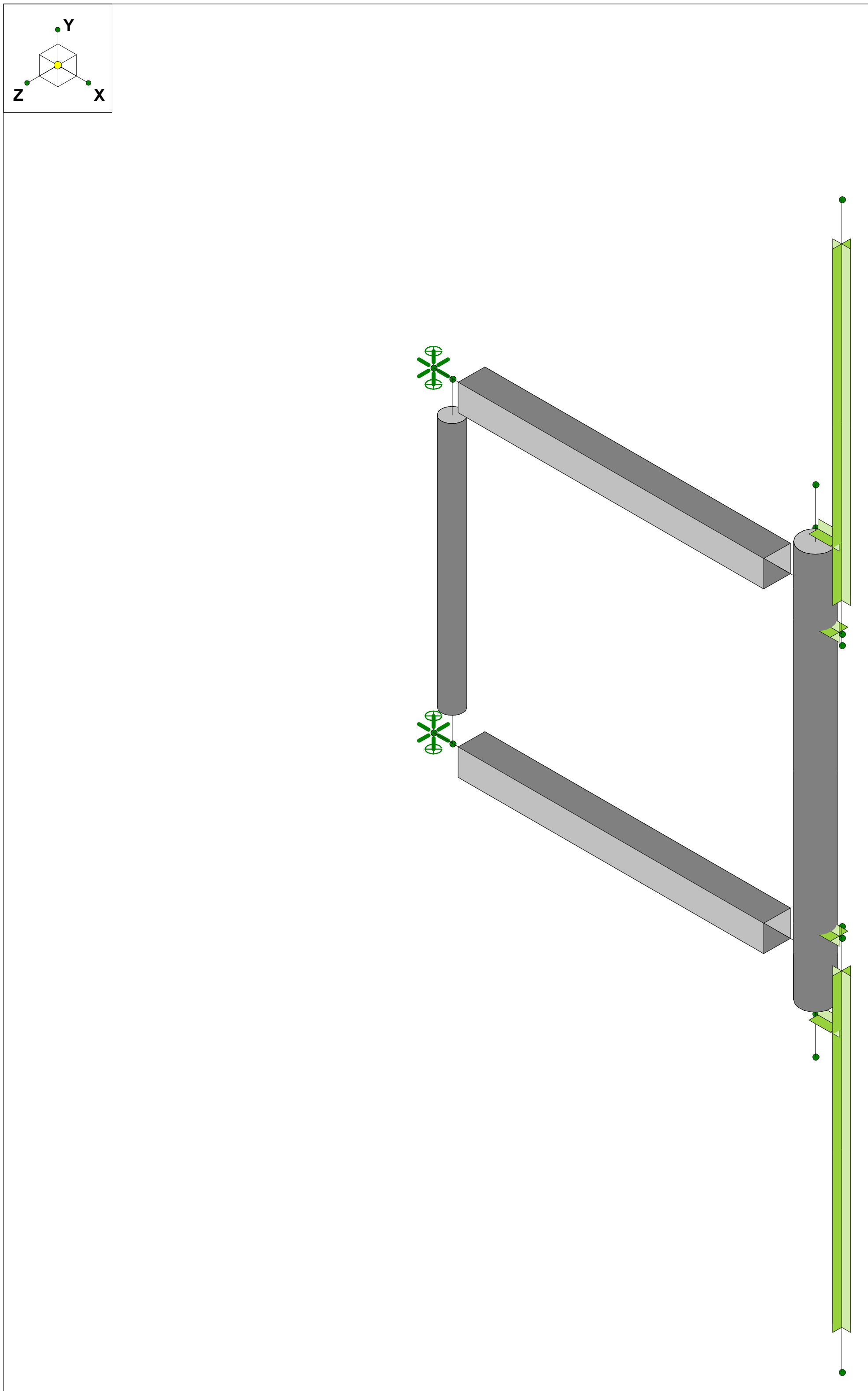
Member Ice Wind Loading

			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 =	120.875	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.32	psf	$K_e = e^{-0.000032 * zs}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
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, $q_{z(ice)}$ =	8.008			
Factored Ice Thickness, T_{iz} =	2.62	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

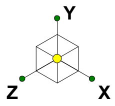
Member Ice Wind Loads

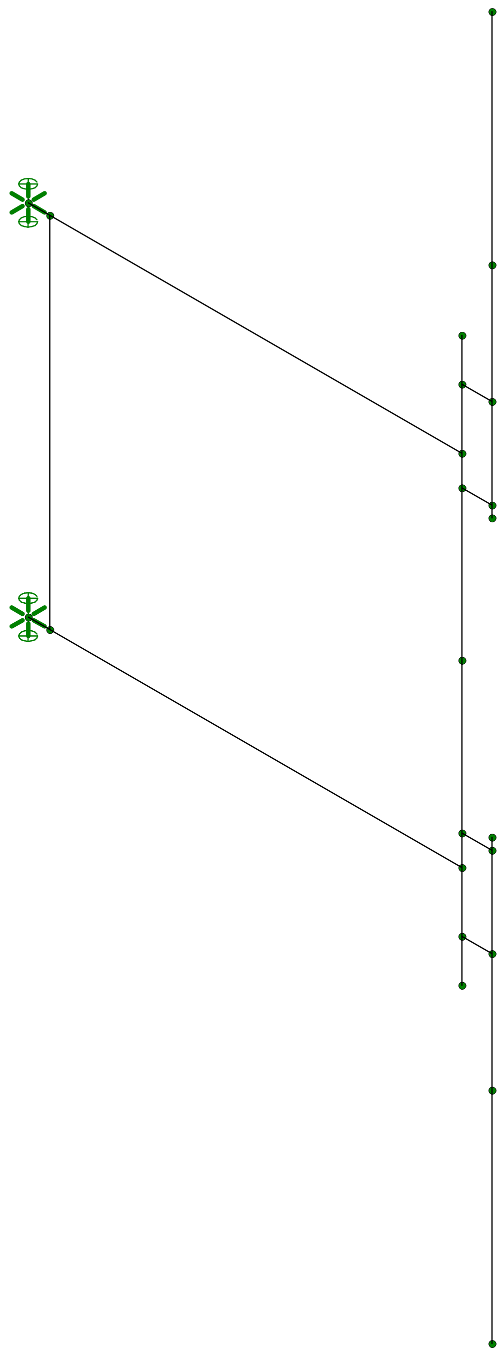
Name	Depth w/ Ice (ft)	Width w/ Ice (ft)	C_f	$D_{p(ice)}$ (ft)	$F_{M(ice)}$ (lb/ft)
Arm: HSS3X3X3/16	0.69	0.69	2	0.69	10.99
Bracing: Pipe 2.0 Std	0.63		1.2	0.63	6.10
Mount Pipe: Pipe 3.0 Std	0.73		1.2	0.73	7.00

APPENDIX 2:
RISA PRINTOUTS

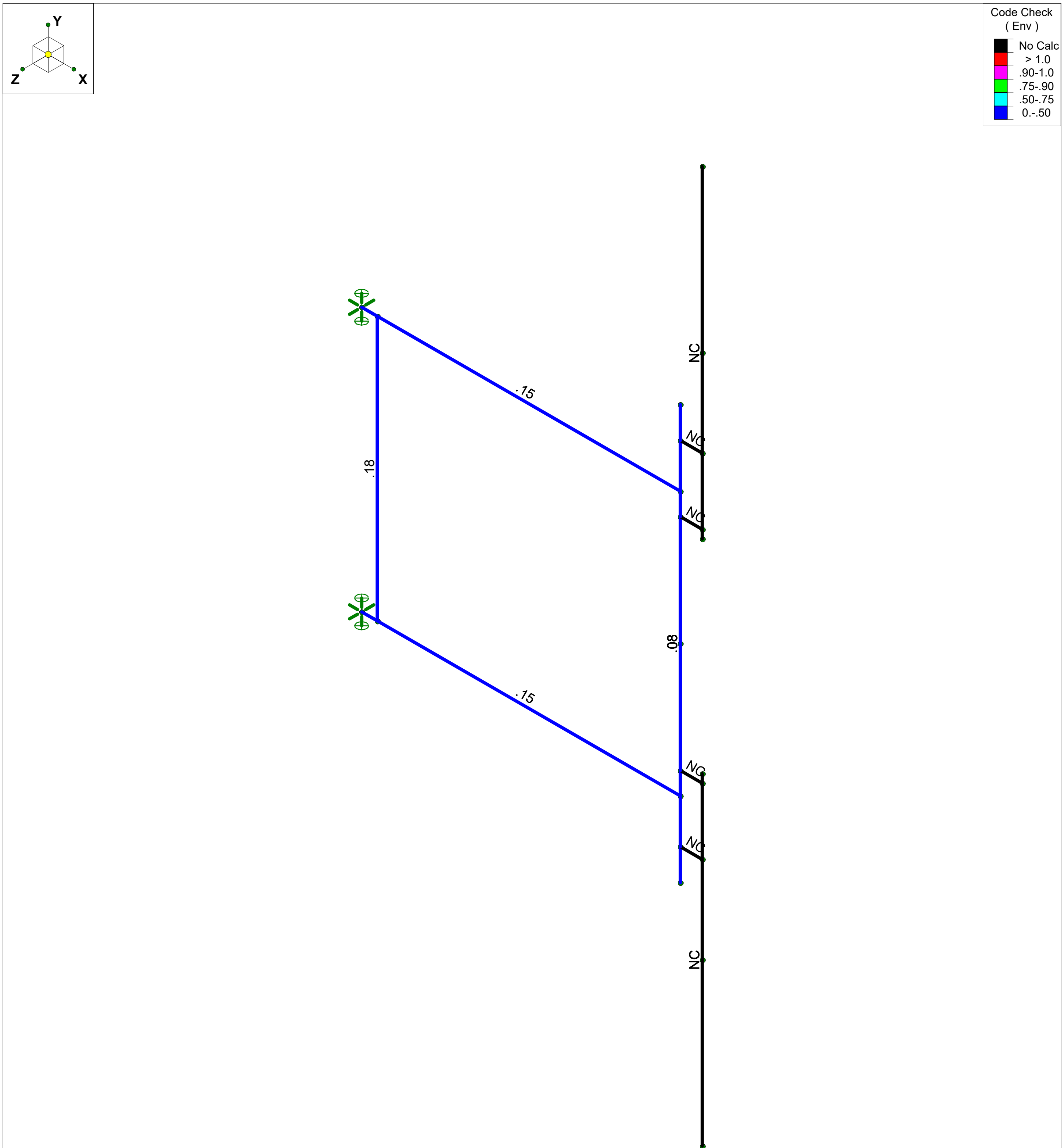


Black & Veatch	EKONK CSP USF-4U Model	SK - 1
Joohwan Jung		Nov 30, 2020 at 12:55 PM
405025.2021.2200		EKONK CSP USF-4U Model.r3d



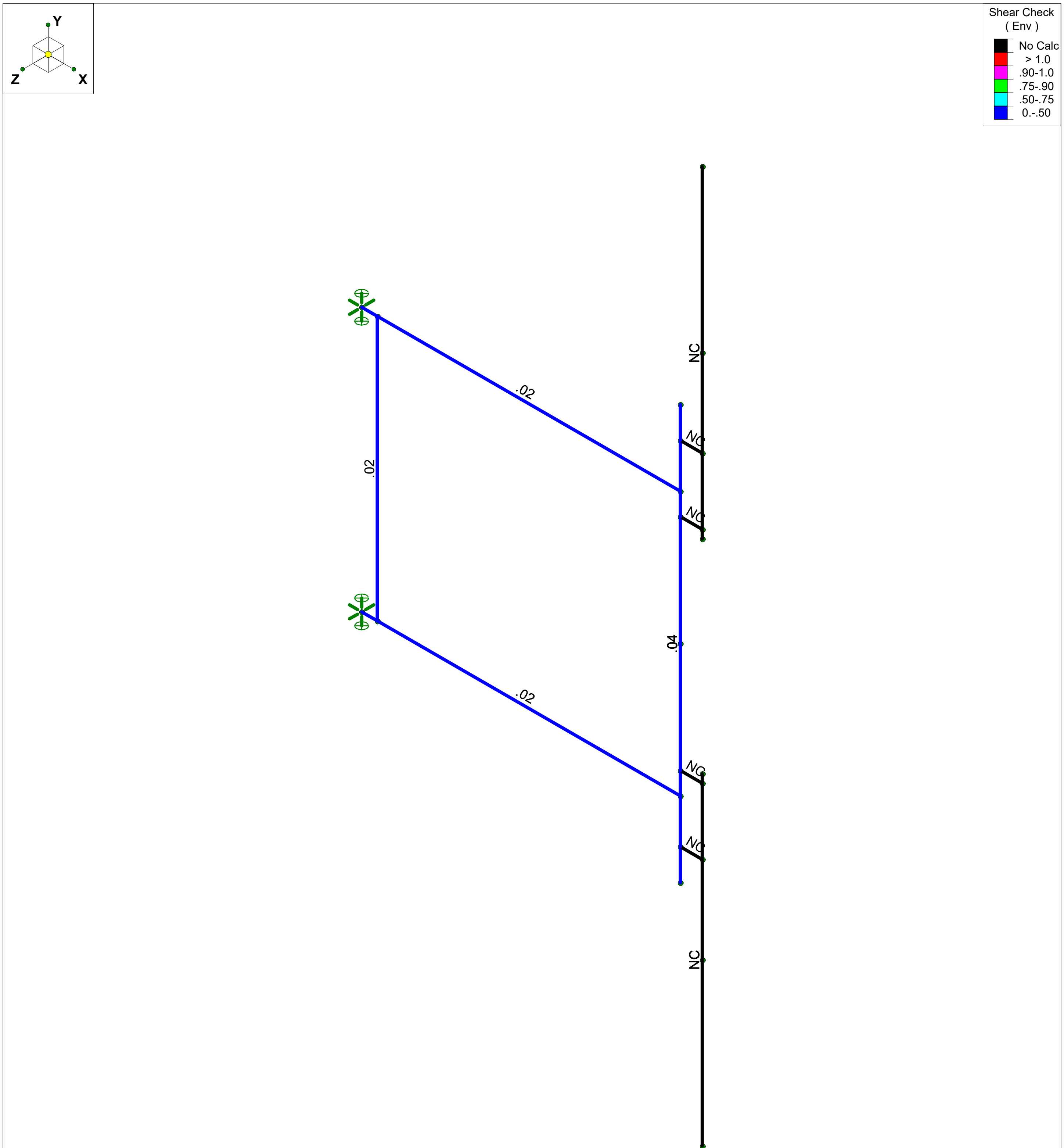


Black & Veatch	EKONK CSP USF-4U Model	SK - 2
Joohwan Jung		Nov 30, 2020 at 12:55 PM
405025.2021.2200		EKONK CSP USF-4U Model.r3d



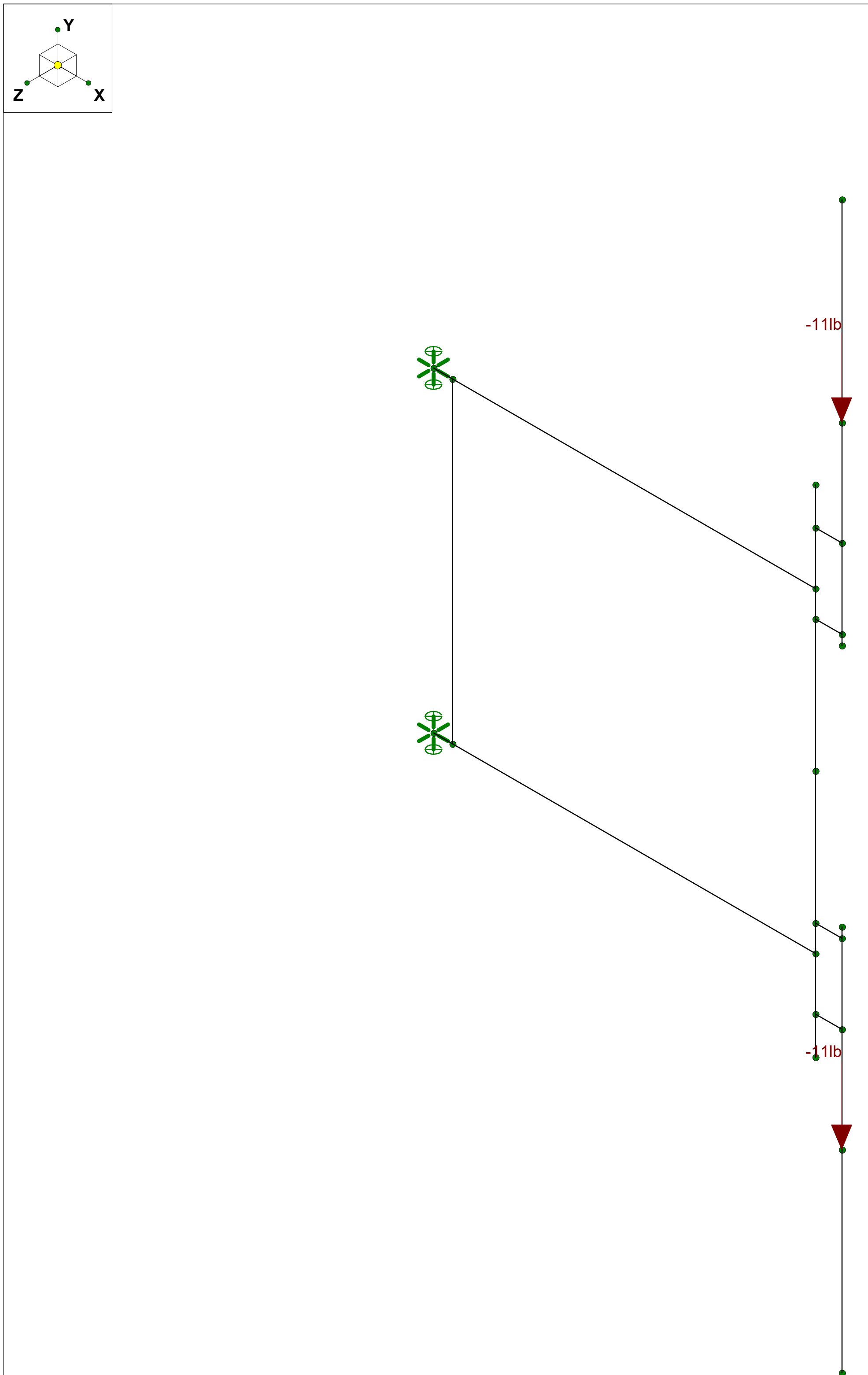
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	EKONK CSP USF-4U Model	SK - 3
Joohwan Jung		Nov 30, 2020 at 12:55 PM
405025.2021.2200		EKONK CSP USF-4U Model.r3d



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	EKONK CSP USF-4U Model	SK - 4
Joohwan Jung		Nov 30, 2020 at 12:55 PM
405025.2021.2200		EKONK CSP USF-4U Model.r3d



Loads: BLC 1, DL
Envelope Only Solution

Black & Veatch	EKONK CSP USF-4U Model	SK - 5
Joohwan Jung		Nov 30, 2020 at 12:55 PM
405025.2021.2200		EKONK CSP USF-4U Model.r3d

(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	N12	N13			RIGID	None	None	RIGID	Typical
7	M7	N15	N14			RIGID	None	None	RIGID	Typical
8	M8	N17	N18			RIGID	None	None	RIGID	Typical
9	M9	N20	N21			RIGID	None	None	RIGID	Typical
10	M10	N23	N22			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

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		
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		

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
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...
1	WIND LOAD COMBOS (145 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														
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														

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...
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	.043	16	.043												
19	1.2DL + 1.5LM + WL (30 DEG)	Y...	Y		1	1.2	3	1.5	5	.043	17	.043												
20	1.2DL + 1.5LM + WL (60 DEG)	Y...	Y		1	1.2	3	1.5	6	.043	18	.043												
21	1.2DL + 1.5LM + WL (90 DEG)	Y...	Y		1	1.2	3	1.5	7	.043	19	.043												
22	1.2DL + 1.5LM + WL (120 DEG)	Y...	Y		1	1.2	3	1.5	8	.043	20	.043												
23	1.2DL + 1.5LM + WL (150 DEG)	Y...	Y		1	1.2	3	1.5	9	.043	21	.043												
24	1.2DL + 1.5LM + WL (180 DEG)	Y...	Y		1	1.2	3	1.5	10	.043	22	.043												
25	1.2DL + 1.5LM + WL (210 DEG)	Y...	Y		1	1.2	3	1.5	11	.043	23	.043												
26	1.2DL + 1.5LM + WL (240 DEG)	Y...	Y		1	1.2	3	1.5	12	.043	24	.043												
27	1.2DL + 1.5LM + WL (270 DEG)	Y...	Y		1	1.2	3	1.5	13	.043	25	.043												
28	1.2DL + 1.5LM + WL (300 DEG)	Y...	Y		1	1.2	3	1.5	14	.043	26	.043												
29	1.2DL + 1.5LM + WL (330 DEG)	Y...	Y		1	1.2	3	1.5	15	.043	27	.043												
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	171.231	2	333.96	38	288.134	5	0	43	761.925	11	0	43
2		min	-646.41	38	-27.449	2	-288.134	11	0	2	-761.925	5	0	2
3	N3	max	646.849	32	332.292	32	288.128	5	0	43	762.375	11	0	43
4		min	-171.572	8	-27.505	8	-288.128	11	0	2	-762.375	5	0	2
5	Totals:	max	576.263	2	615.971	38	576.262	5						
6		min	-576.263	8	134.644	2	-576.262	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	.149	2.266	11	.020	0	y	38	55265....	59535	5171.25	5171.25	2...	H1-1b
2	M2	HSS3X3X3	.149	2.266	11	.020	0	y	32	55265....	59535	5171.25	5171.25	2...	H1-1b
3	M3	PIPE_2.0	.179	36	32	.024	36		32	28843....	32130	1871.6...	1871.6...	2...	H1-1b
4	M4	PIPE_3.0	.077	42.964	17	.040	10.5...		17	57908....	65205	5748.75	5748.75	1...	H1-1b

APPENDIX 3:
ATTACHMENTS

TELEWAVE, INC.®

195 - 260 MHz

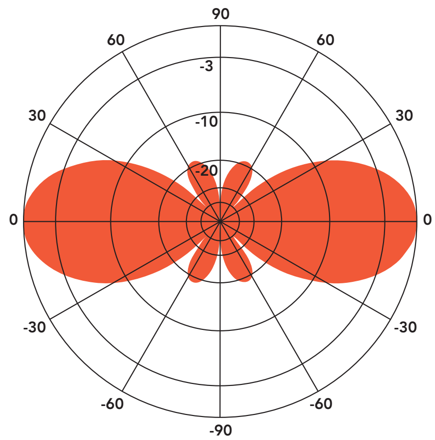
ANT220F2DIN

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

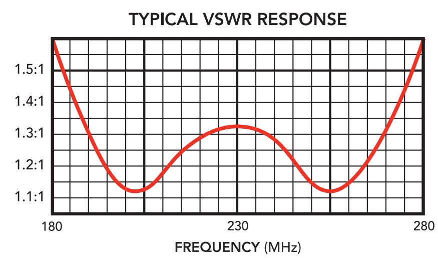
The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection. The ANT220F2 is an excellent choice for wireless PTC systems in urban or rural areas.

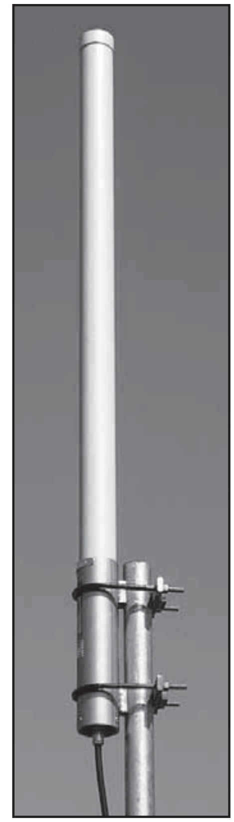
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray,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

The ANT220F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.



ANT220F2 - 230 MHz
Vertical Plane
Gain = 2.58 dBd





ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.

SPECIFICATIONS			
Frequency (continuous)	195-260 MHz	**Dimensions (L x base diam.) in.**	44 x 2.75
Gain	2.5 dBd	**Tower weight (antenna + clamps)**	11 lb.
Power rating (typ.)	500 watts	**Shipping weight**	14 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	200 / 150 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	1.1 ft.^{2}
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	44 lb.
Vertical beamwidth	38°	**Bending moment at top clamp**	47 ft. lb.
Termination	7-16 DIN-F	**(100 MPH, 40 PSF flat plate equiv.)**	

TELEWAVE, INC.®

195 - 260 MHz

ANT220F2-I w/DIN CONNECTOR to be used for the inverted antenna.

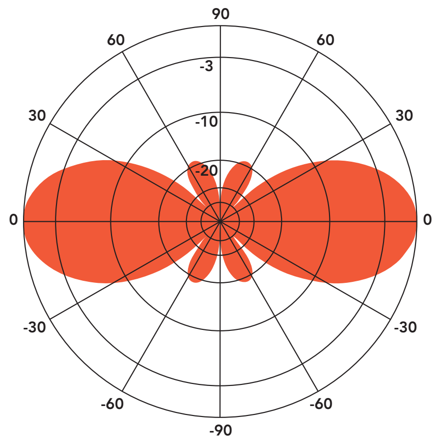
ANT220F2

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

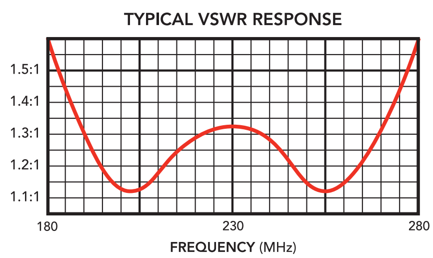
The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection. The ANT220F2 is an excellent choice for wireless PTC systems in urban or rural areas.

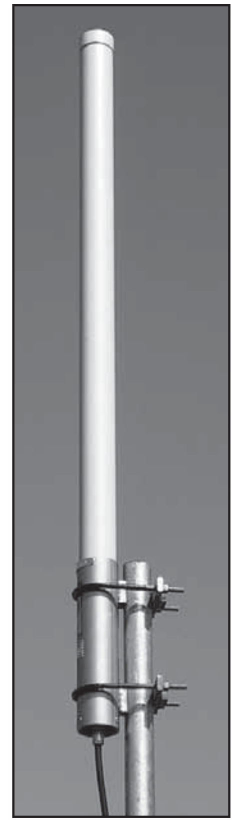
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray,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

The ANT220F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.



ANT220F2 - 230 MHz
Vertical Plane
Gain = 2.58 dBd

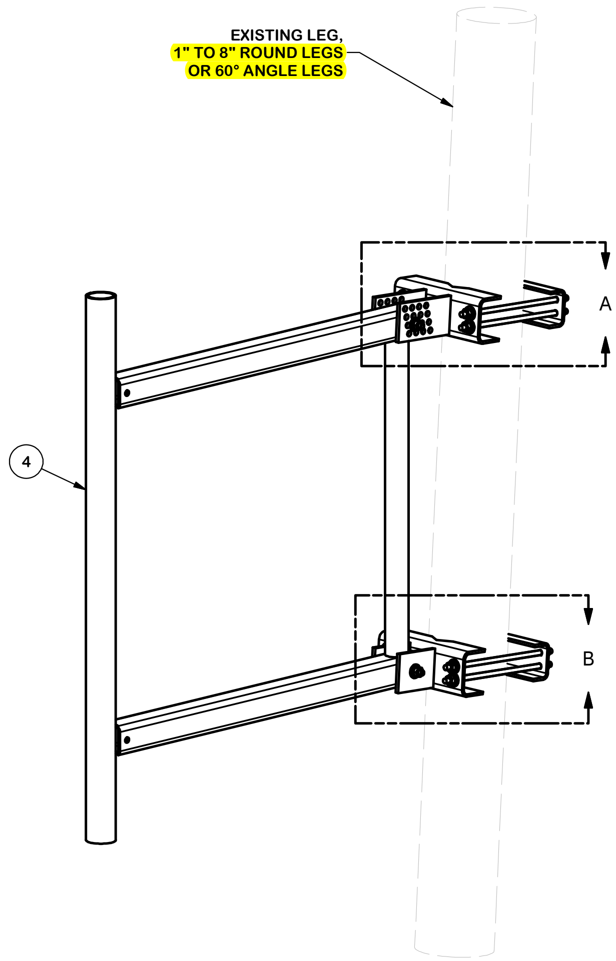


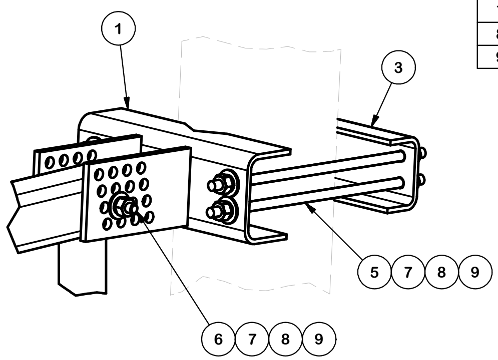


(1) ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.

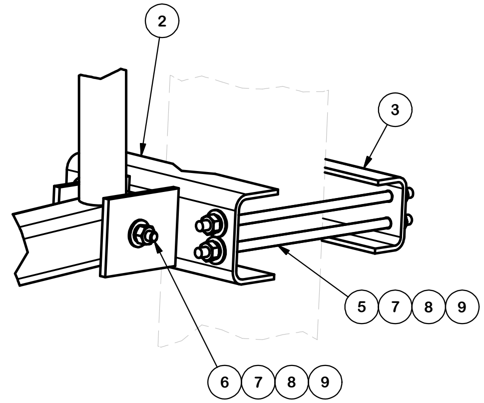
SPECIFICATIONS			
Frequency (continuous)	195-260 MHz	**Dimensions (L x base diam.) in.**	44 x 2.75
Gain	2.5 dBd	**Tower weight (antenna + clamps)**	11 lb.
Power rating (typ.)	500 watts	**Shipping weight**	14 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	200 / 150 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	1.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	44 lb.
Vertical beamwidth	38°	**Bending moment at top clamp**	47 ft. lb.
Termination	7-16 DIN-F opt.	**(100 MPH, 40 PSF flat plate equiv.)**	

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

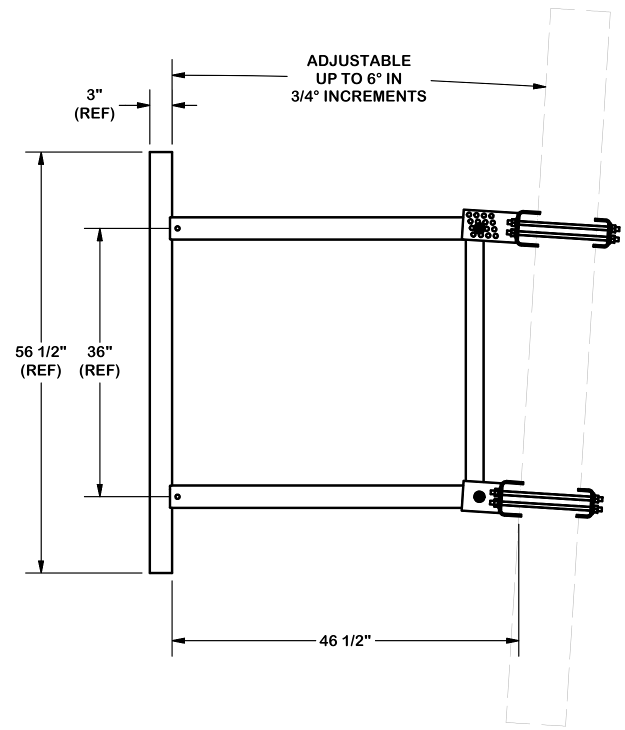




DETAIL A



DETAIL B



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

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

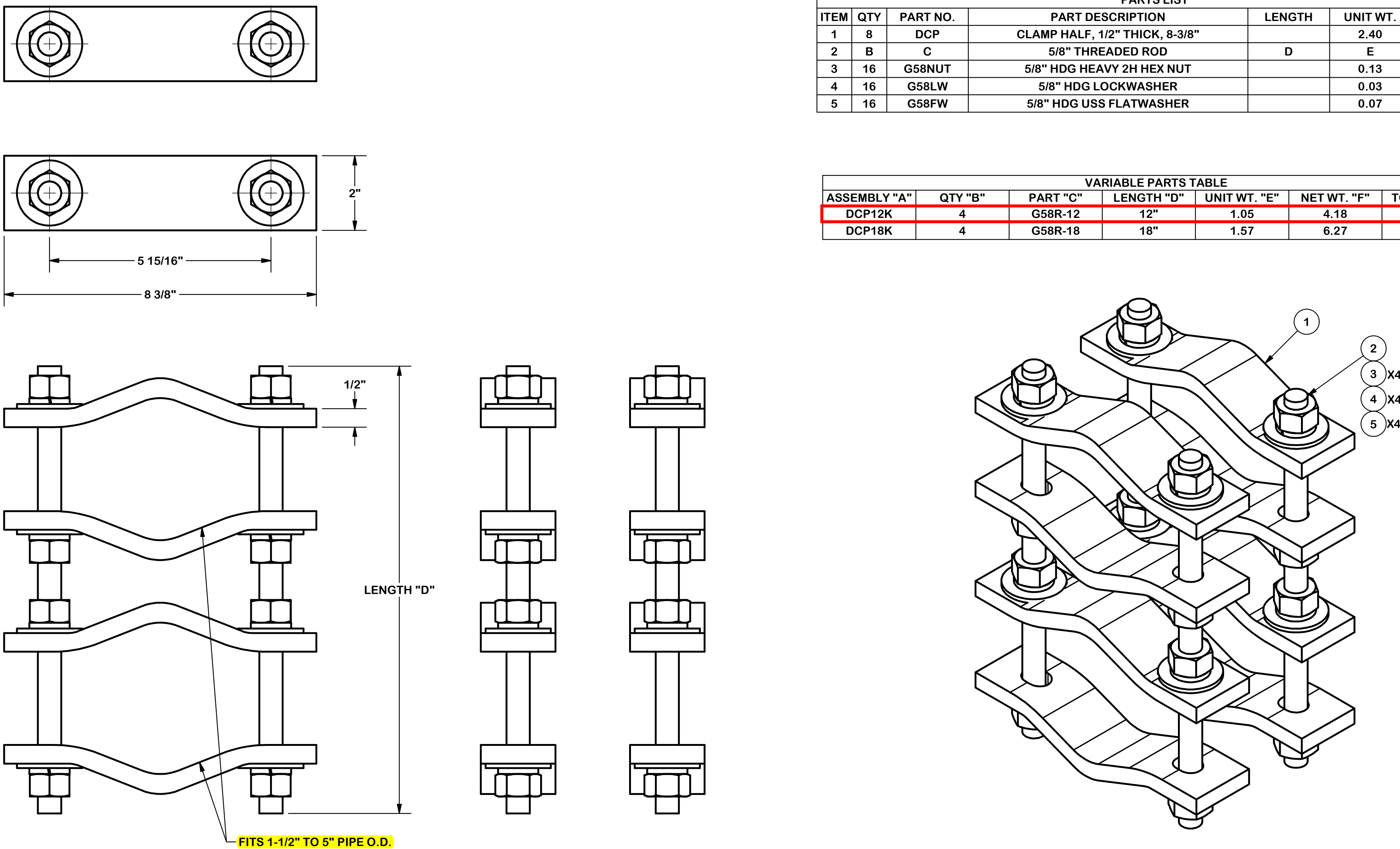
Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

CPD NO.		DRAWN BY	ENG. APPROVAL	PART NO.
		RCH 2/4/2011		USF-4U
CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	BMC 2/16/2011	USF-4U

A TOTAL OF ONE (1) CLAMP SET REQUIRED.

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

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



TOLERANCE NOTES

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

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

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.
	KC8 8/21/2012		SEE ASSEMBLY "A"

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

ATTACHMENT D – CONSTRUCTION DRAWINGS

EVERSOURCE ENERGY

EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (2) NEW OMNI/WHIP ANTENNAS, (1) AT THE ELEVATION 115'–5 1/4"± AGL AND (1) AT THE ELEVATION 122'–2 11/16"± AGL
2. REMOVE (2) EXISTING ANTENNAS AND THEIR ASSOCIATED COAX, (1) AT ELEVATION 108'–0"± AGL AND (1) AT ELEVATION 86'–0"± AGL
3. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING EQUIPMENT ROOM

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:	EKONK CSP
SITE ID NUMBER:	#00025400
SITE ADDRESS:	389 EKONK HILL ROAD STERLING, CT 06354
MAP:	3633
BLOCK:	34
LOT:	7
LATITUDE:	41° 39' 49.54" N
LONGITUDE:	71° 50' 56.29" W
ELEVATION:	672'± AMSL
FEMA/FIRM DESIGNATION:	C
ACREAGE:	0.20± AC (BOOK: 14, PAGE: 540)

CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

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

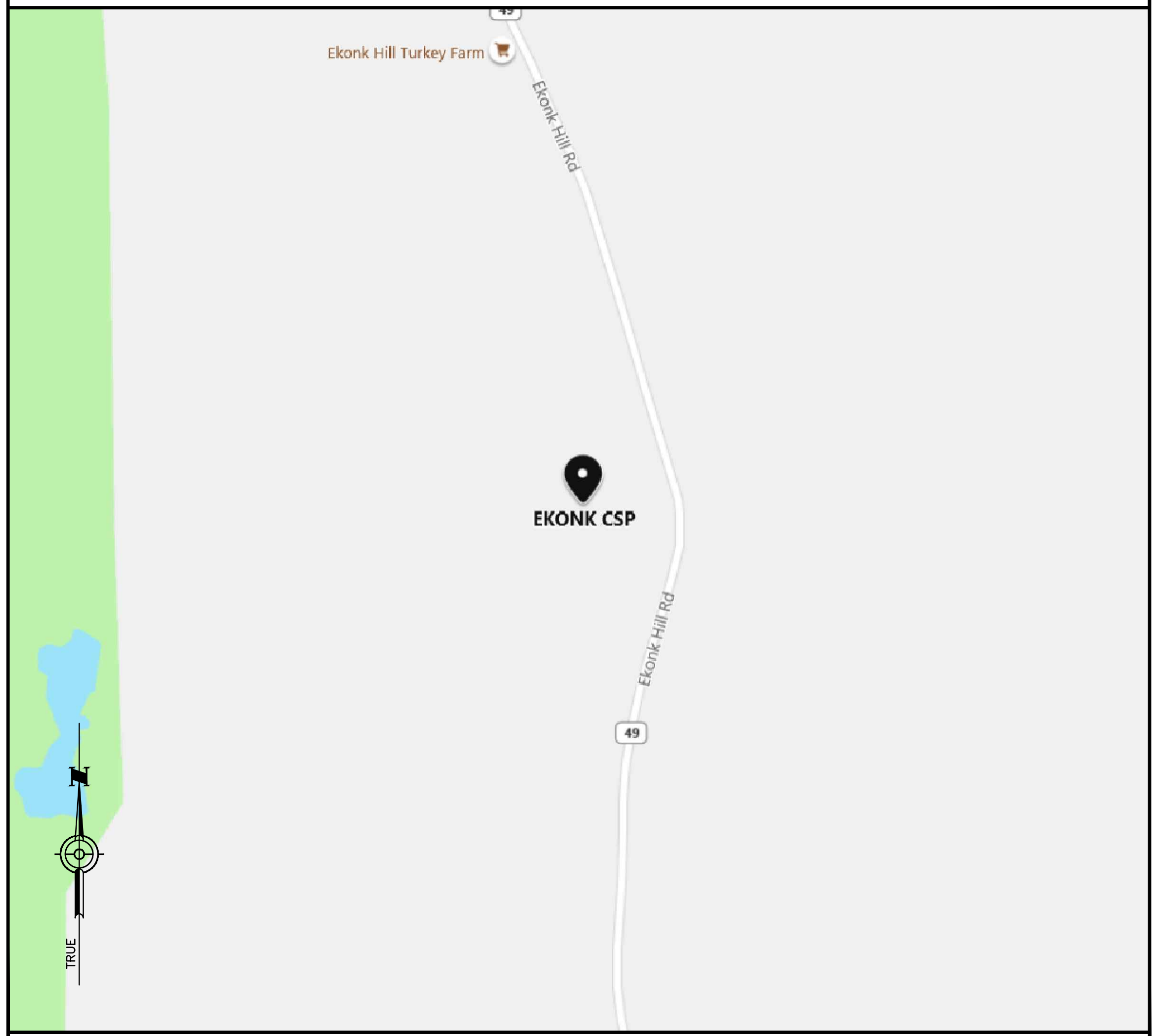
EVERSOURCE ENERGY PROJECT MANAGER:
NIKOLL PRECI
(860) 655–3079

POWER PROVIDER:
EVERSOURCE ENERGY
(800) 286–2000

TELCO PROVIDER:
FRONTIER
(800) 921–8102

CALL BEFORE YOU DIG:
(800) 922–4455

LOCATION MAP



NO SCALE

DESIGN TYPE

SITE UPGRADE
SELF–SUPPORT TOWER

DRAWING INDEX

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

DO NOT SCALE DRAWINGS

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

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

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

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

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

REV	DATE	DESCRIPTION
0	12/16/20	ISSUED FOR FILING

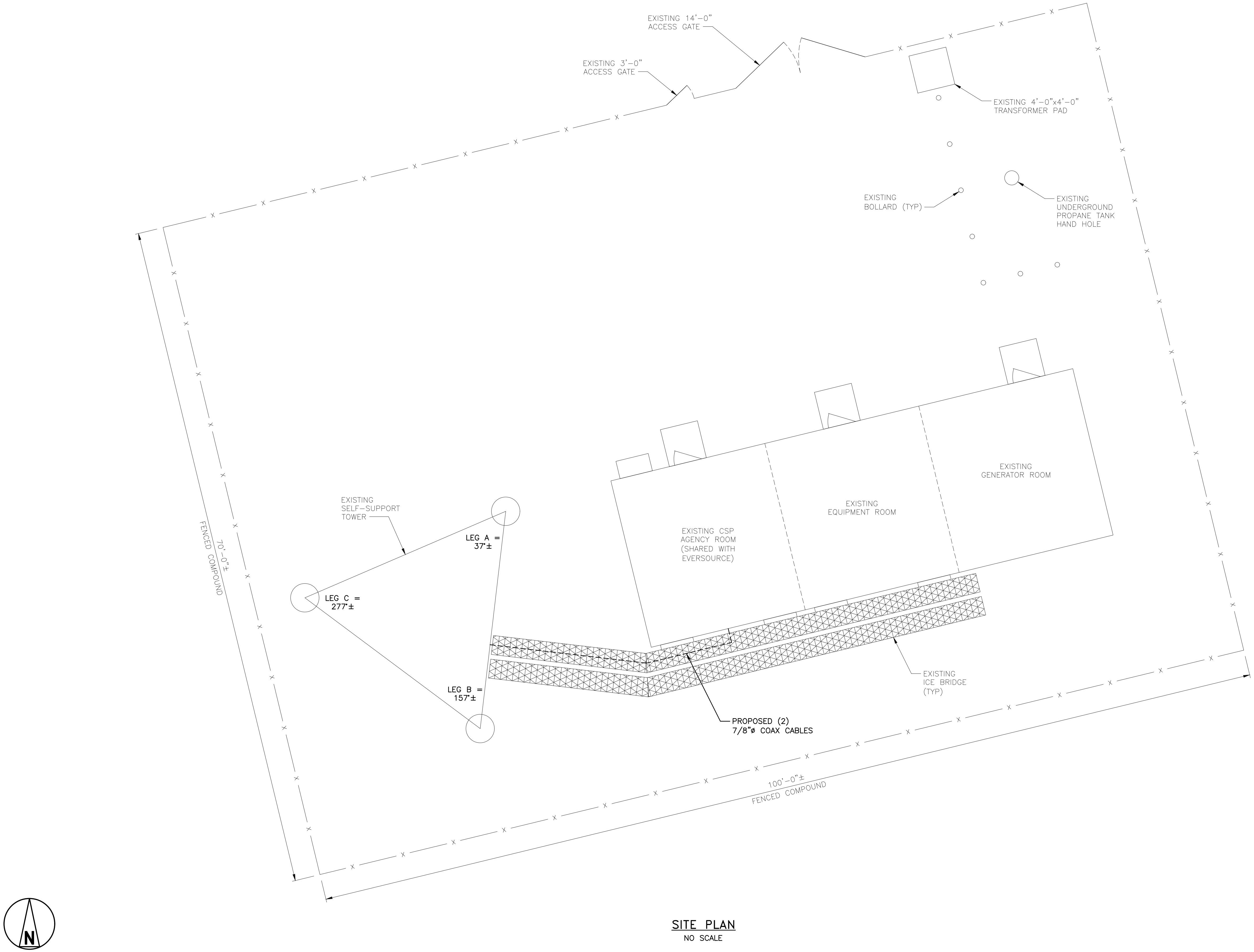
STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED
PROFESSIONAL ENGINEER
12/16/2020

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

EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1



SITE PLAN
NO SCALE

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

BLACK & VEATCH
6800 W 115TH ST, SUITE 2292
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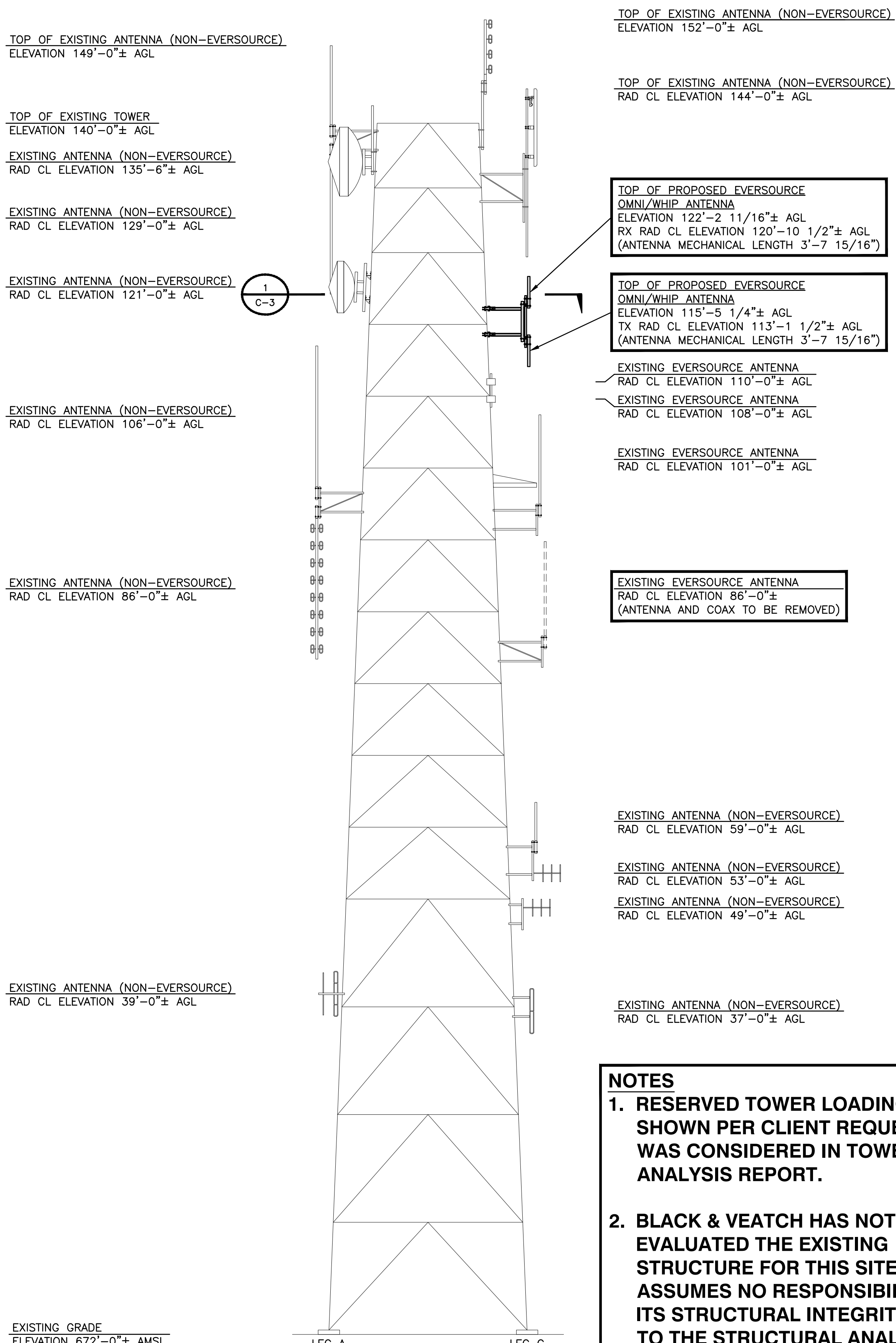
EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE
SITE PLAN

SHEET NUMBER
C-1

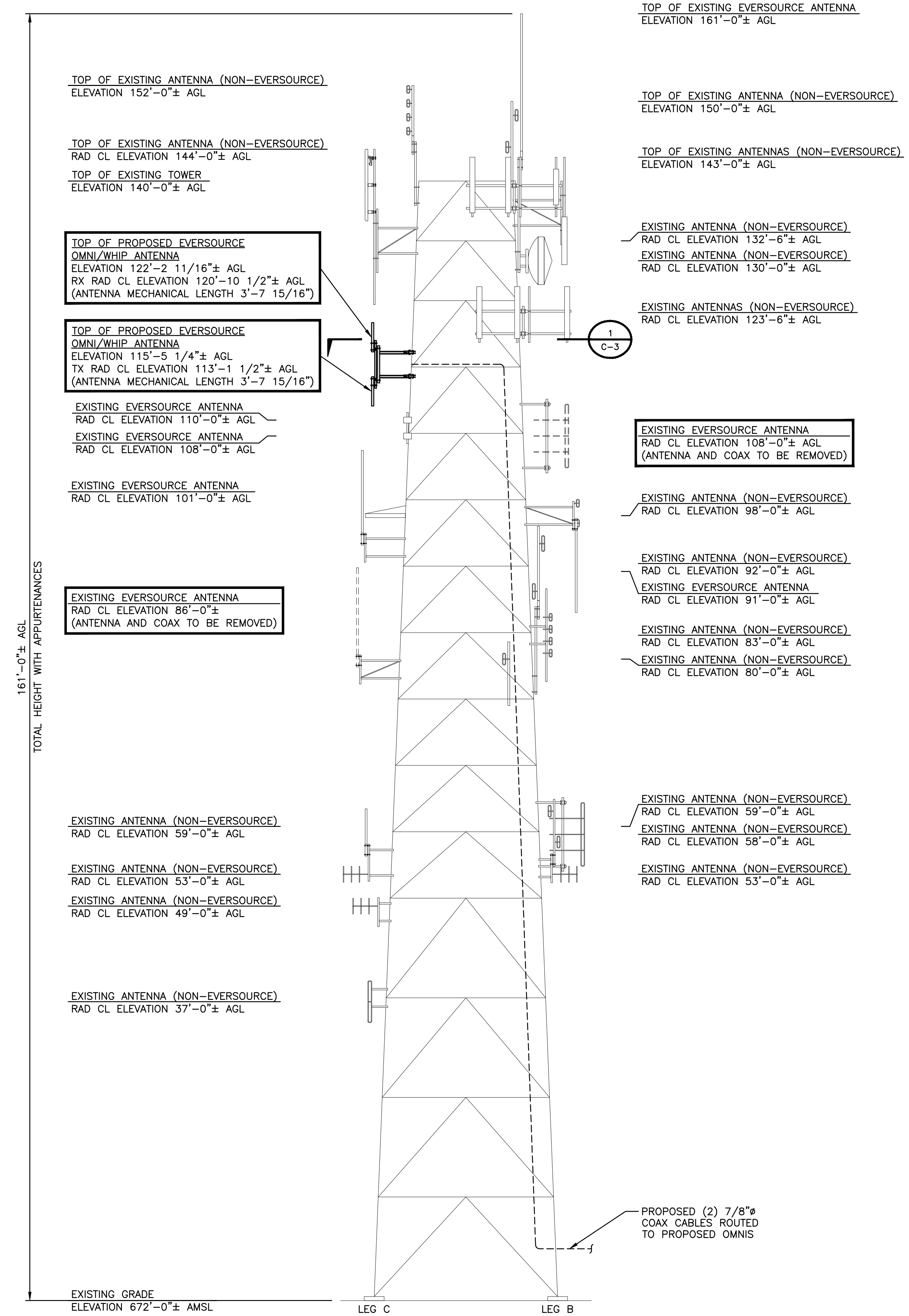


TOWER ELEVATION FACE AC

NO SCALE

NOTES

1. RESERVED TOWER LOADING NOT SHOWN PER CLIENT REQUEST BUT WAS CONSIDERED IN TOWER ANALYSIS REPORT.
2. 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.



TOWER ELEVATION FACE CB

NO SCALE

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

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

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

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

12/16/2020

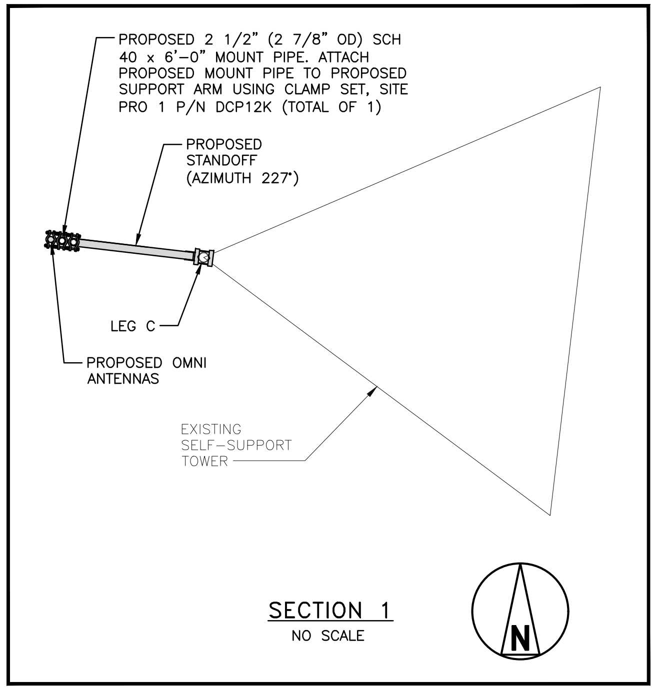
EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE

TOWER ELEVATION & ANTENNA EQUIPMENT

SHEET NUMBER

C-2



SECTION 1
NO SCALE

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

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

PROJECT NO:	403093
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STATE OF CONNECTICUT · JOSHUA J. RILEY · 33208 · LICENSED · PROFESSIONAL ENGINEER
12/16/2020

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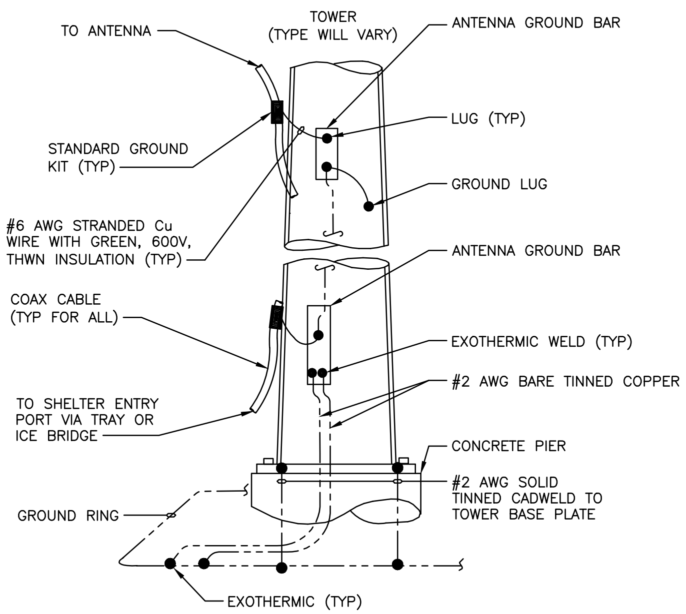
EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE
ANTENNA EQUIPMENT

SHEET NUMBER
C-3

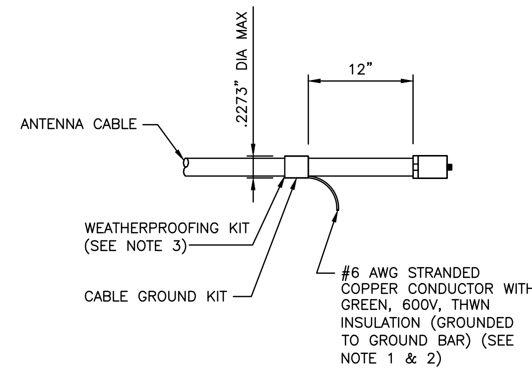


NOTE

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

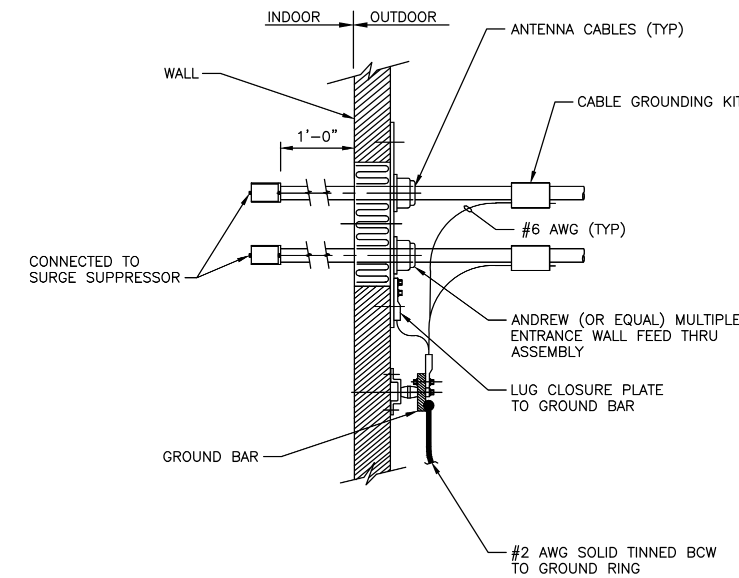


NOTES

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.

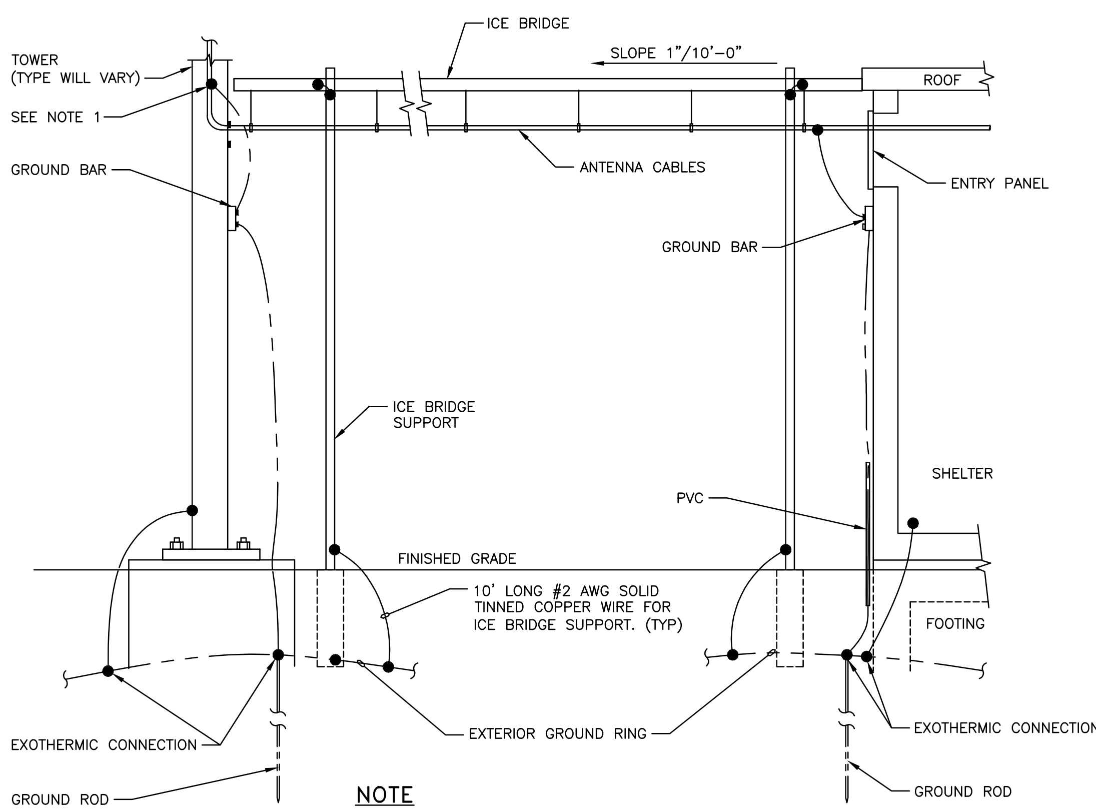
CONNECTION OF CABLE GROUND KIT TO ANTENNA CABLE

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) 458–2522

PROJECT NO:	403093
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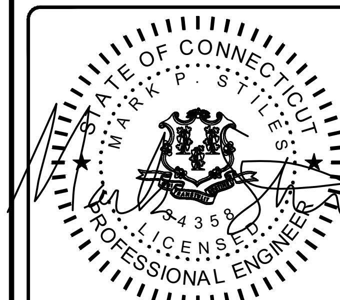


12/16/2020

EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

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 AND ASTM 572, GR 50
ANGLE:	ASTM A36
BOLTS:	ASTM A325
GRATING:	TYPE GW–2 (1"x3/16" BARS)
MISC. MATERIAL:	ASTM A36

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

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

SITE GENERAL

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

EVERSOURCE ENERGY

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

BLACK & VEATCH

6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–2522

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

REV	DATE	DESCRIPTION
0	12/16/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED
PROFESSIONAL ENGINEER
12/16/2020

EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE

NOTES & SPECIFICATIONS

SHEET NUMBER

N-1

ELECTRICAL

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

GROUNDING

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

ANTENNA & CABLE NOTES

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

EVERSOURCE ENERGY

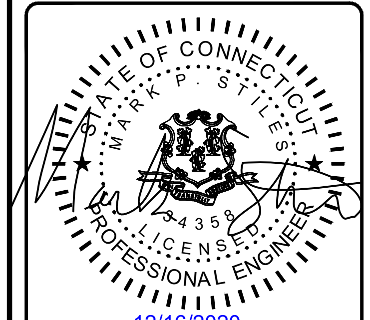
107 SELDEN STREET
BERLIN, CT 06037
PHONE: (800) 286–2000

BLACK & VEATCH

6800 W 115TH ST, SUITE 2292
OVERLAND PARK, KS 66211
PHONE: (913) 458–2522

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

REV	DATE	DESCRIPTION
0	12/16/20	ISSUED FOR FILING



12/16/2020

EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE

NOTES & SPECIFICATIONS

SHEET NUMBER

N-2

SYMBOLS

●	EXOTHERMIC CONNECTION
■	COMPRESSION CONNECTION
	5/8"øx10'-0" COPPER CLAD STEEL GROUND ROD.
	TEST GROUND ROD WITH INSPECTION SLEEVE
— - - -	GROUNDING CONDUCTOR
(A)	KEY NOTES

CHAINLINK FENCE	—— X —— X —— X —— X —— X ——
WOOD FENCE	
LEASE AREA	— — — — — —
ICE BRIDGE	
CABLE TRAY	
GAS LINE	—— G —— G —— G —— G —— G ——
UNDERGROUND ELECTRICAL/TELCO	—— E/T —— E/T —— E/T —— E/T ——
UNDERGROUND ELECTRICAL/CONTROL	—— E/C —— E/C —— E/C —— E/C ——
UNDERGROUND ELECTRICAL	—— E —— E —— E —— E —— E ——
UNDERGROUND TELCO	—— T —— T —— T —— T —— T ——
PROPERTY LINE (PL)	—— — — —— — — —— — — ——

ABBREVIATIONS

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

EVERSOURCE ENERGY

107 SELDEN STREET
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BLACK & VEATCH

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EKONK CSP
389 EKONK HILL ROAD
STERLING, CT 06354

SHEET TITLE

NOTES & SPECIFICATIONS

SHEET NUMBER

N-3

REFERENCE CUTSHEETS

ANT220F2DIN

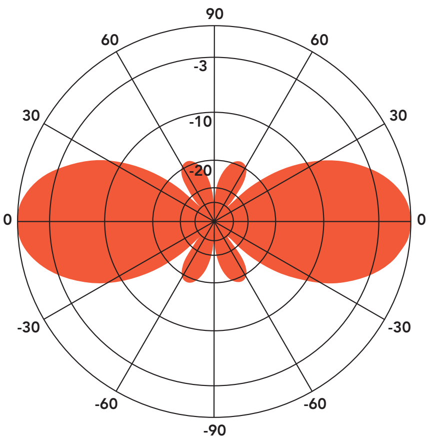
FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection. The ANT220F2 is an excellent choice for wireless PTC systems in urban or rural areas.

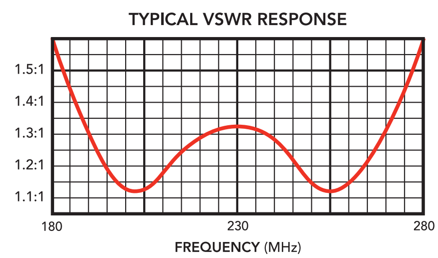
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray,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

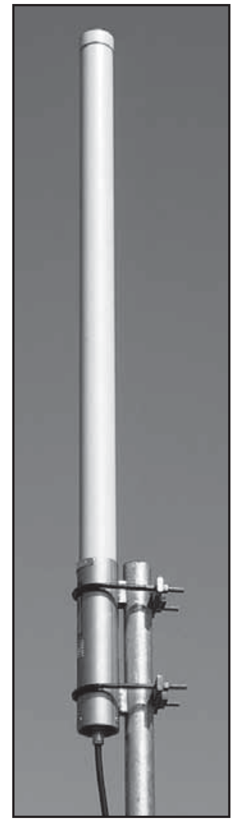
The ANT220F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.

ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.



ANT220F2 - 230 MHz
Vertical Plane
Gain = 2.58 dBd





SPECIFICATIONS			
Frequency (continuous)	195-260 MHz	**Dimensions (L x base diam.) in.**	44 x 2.75
Gain	2.5 dBd	**Tower weight (antenna + clamps)**	11 lb.
Power rating (typ.)	500 watts	**Shipping weight**	14 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	200 / 150 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	1.1 ft.²
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	44 lb.
Vertical beamwidth	38°	**Bending moment at top clamp**	47 ft. lb.
Termination	7-16 DIN-F	**(100 MPH, 40 PSF flat plate equiv.)**	

TELEWAVE, INC.

195 - 260 MHz

ANT220F2-I w/DIN CONNECTOR to be used for the inverted antenna.

ANT220F2

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential for lightning impulse protection. The ANT220F2 is an excellent choice for wireless PTC systems in urban or rural areas.

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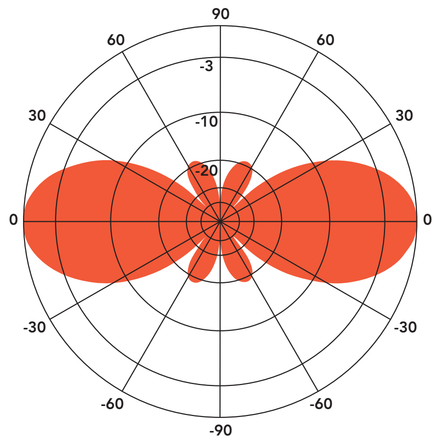
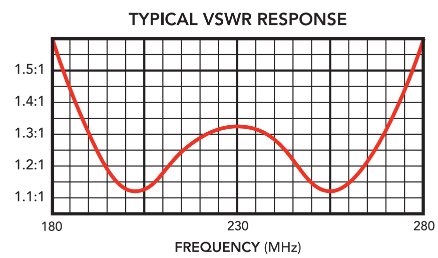
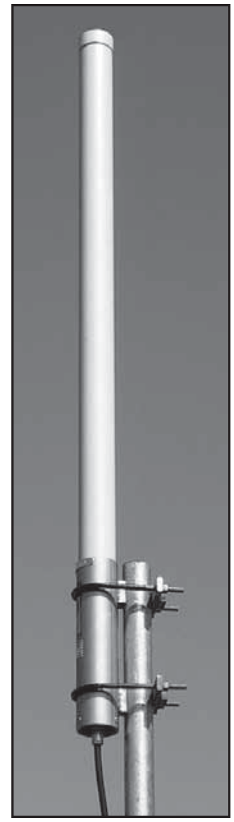
The ANT220F2 includes the ANTC485 dual clamp set for mounting to a 1.5" to 3" O.D. support pipe, and a 24" removable RG-213 DIN-Male jumper.



ANT220F2 - 230 MHz
Vertical Plane
Gain = 2.58 dBd

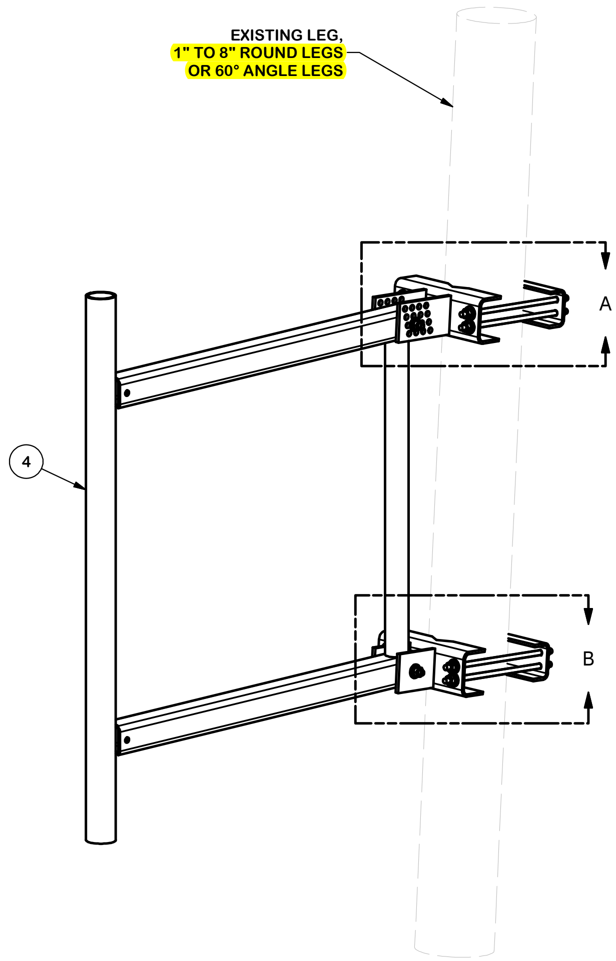




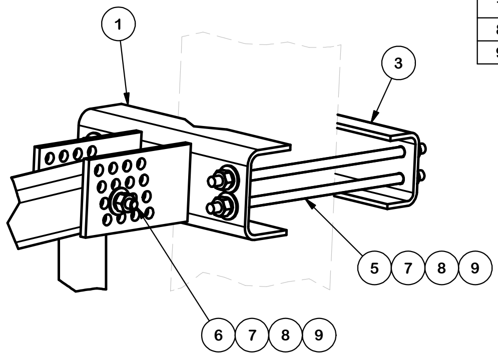
(1) ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.

SPECIFICATIONS			
Frequency (continuous)	195-260 MHz	**Dimensions (L x base diam.) in.**	44 x 2.75
Gain	2.5 dBd	**Tower weight (antenna + clamps)**	11 lb.
Power rating (typ.)	500 watts	**Shipping weight**	14 lb.
Impedance	50 ohms	**Wind rating / with 0.5" ice**	200 / 150 MPH
VSWR	1.5:1 or less	**Maximum exposed area**	1.1 ft.^{2}
Pattern	Omnidirectional	**Lateral thrust at 100 MPH**	44 lb.
Vertical beamwidth	38°	**Bending moment at top clamp**	47 ft. lb.
Termination	7-16 DIN-F opt.	**(100 MPH, 40 PSF flat plate equiv.)**	

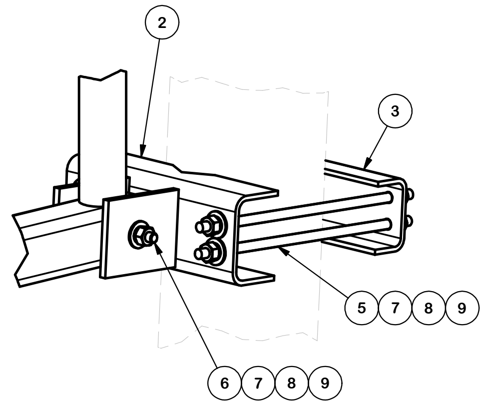
TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = 5.0"± DIAMETER.



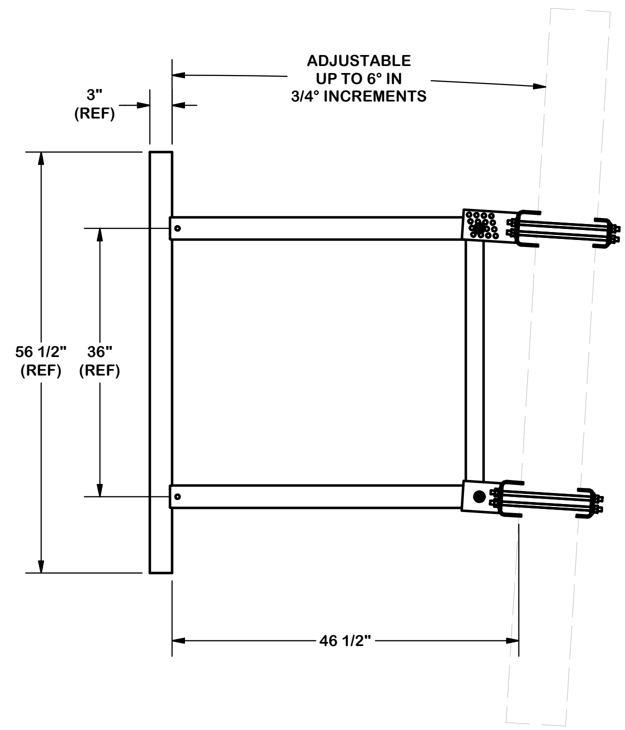
PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	CFM	UPPER GATE FOOT WELDMENT		13.90	13.90
2	1	CFS	LOWER GATE FOOT WELDMENT		12.72	12.72
3	2	GBB	GATE BACKING BAR		4.53	9.06
4	1	4PBG	48" PIPE MOUNT STANDOFF ARM		113.96	113.96
5	8	G12R-12	1/2" x 12" GALV. THREADED ROD		0.67	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

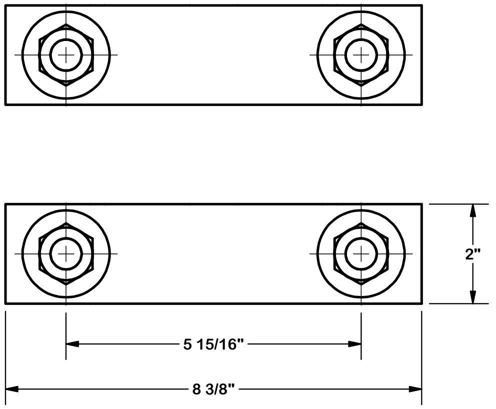
TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

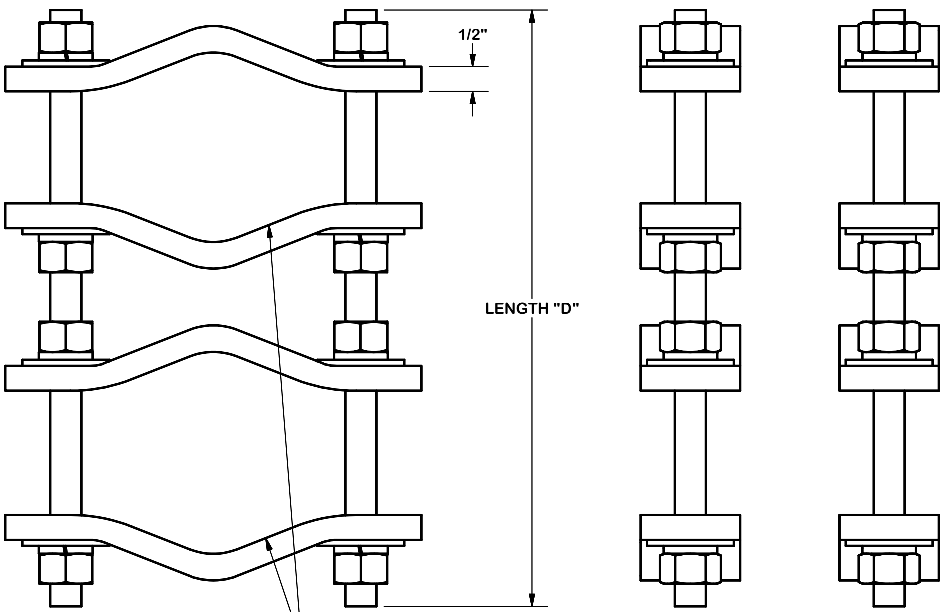
DESCRIPTION
48" ULTIMATE UNIVERSAL
STANDOFF FRAME

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

CPD NO.		DRAWN BY	ENG. APPROVAL	PART NO.
		RCH 2/4/2011		USF-4U
CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	BMC 2/16/2011	USF-4U

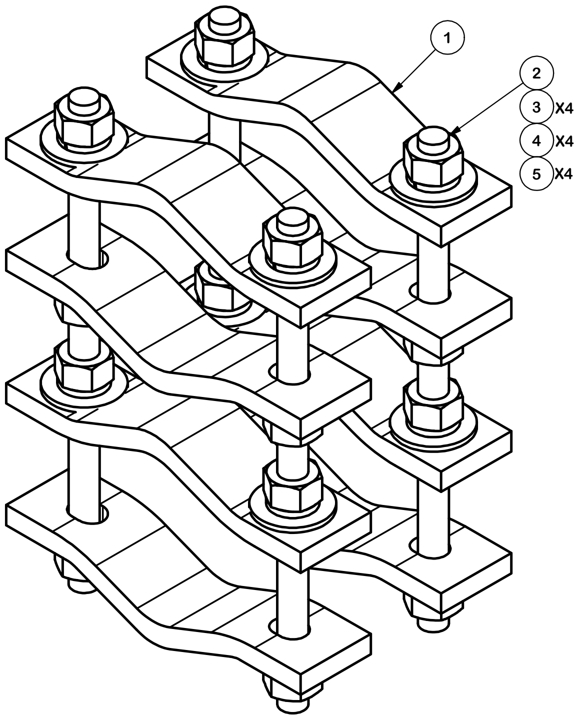
A TOTAL OF ONE (1) CLAMP SET REQUIRED.





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

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



TOLERANCE NOTES

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

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

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.
	KC8 8/21/2012		SEE ASSEMBLY "A"

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

ATTACHMENT E – STRUCTURAL ANALYSIS

Submitted to
Eversource Energy
107 Selden Street
Berlin, CT 06037

Submitted by
AECOM
500 Enterprise Drive,
Suite 3B
Rocky Hill, CT 06067
November 25, 2020

DETAILED STRUCTURAL ANALYSIS AND MODIFICATION OF AN EXISTING 140' SELF SUPPORTING LATTICE TOWER AND FOUNDATION FOR PROPOSED ANTENNA ARRANGEMENT

Site Name: Connecticut State Police Tower #49
Site Address: 389 Ekonk Hill Road
Sterling, Connecticut

60627154
EVS-011 (b1) Revision 1

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis and modification of the 140' self-supporting lattice tower located at 389 Ekonk Hill Road in Sterling, Connecticut.

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

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

The proposed Eversource antenna upgrades are listed below:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
<u>Remove:</u> **(1) DB212 Dipole Antenna (Centerline Elevation @ 108') w/ (1) 7/8" Coax Cable** **(1) Kreco CO-41AN Omni Antenna (Centerline Elevation @ 86') w/ (1) 7/8" Coax Cable**	**Eversource (Existing)**	**@ 108'** **@ 86'**
<u>Install:</u> **(1) ANT220F2 Telewave Omni Antenna (Installed Antenna Centerline Elevation @ 120.875')** **(1) SitePro1 USF-4U Antenna Mount Assembly (installed at Centerline Elevation 117')** **(1) 6' long Antenna Mount Pipe (2-7/8" ODx0.203) w/ (2) DCP12K Attachment Clamps** **(2) RFS LCF78-50J 7/8" Diameter Coaxial Cable (Feedline Length 138')** **(1) (inverted) ANT220F2 Telewave Omni Antenna (Installed Antenna Centerline Elevation @ 113.125')**	**Eversource (Proposed)**	**@ 113.125' – 120.875'**

The results of an initial structural analysis indicated that the existing tower did not have enough capacity for the proposed loading conditions above. The tower structure require modifications shown on SK-1 through SK-3. **Once the modifications indicated on sheets SK-1 through SK-3 are performed, the modified structure, existing anchor bolts and foundation are considered structurally adequate with the existing and proposed antenna loading herein.**

The results of the analysis indicate the modified tower's sway (deflection) is 0.4068 degrees and the modified tower's twist (rotation) is 0.3405 degrees. These figures combined are within the Connecticut State Police requirements of 0.75 degrees for combined twist (rotation) and sway (deflection) when applying the TIA/EIA-222-F design conditions.

The maximum structural capacity rating (after modification) calculated herein is **<u>99.2 %</u>**

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

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

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

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

1. EXECUTIVE SUMMARY *(continued)*

This analysis is based on:

1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) 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 358813TP, noted as revision C, dated October 24, 1995.
3) Existing CSP Antenna inventory provided by Connecticut State Police via e-mail on December 12, 2012.
4) Existing Antenna inventory obtained from Black & Veatch Structural analysis, project 400056, dated March 12, 2019.
5) Proposed Eversource antenna inventory, obtained via e-mail dated February 7, 2020.
6) Geotechnical Evaluation report of existing soil conditions performed by Milone and MacBroom, signed and sealed on April 10, 2020.
7) Previous structural analysis and evaluation, performed by AECOM, on behalf of Eversource, project 60627154 / EVS-011, signed and sealed on March 17, 2020.
8) Updates to CSP inventory obtained via e-mail dated April 28, 2020.
9) Update to Eversource inventory obtained via e-mail dated June 25, 2020, with an additional update of future antenna removals, obtained via e-mail dated September 1, 2020.
10) Previous structural analysis and evaluation performed by AECOM on behalf of Eversource energy, project 60627154 / EVS-011 (b1), signed and sealed on September 4, 2020.
11) Antenna and mount configuration as specified within Section 2 and 6 of this report.
12) 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 assumption of the antenna and mount configuration as well as the physical condition of the tower. 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/mcd

cc: DJR – URS
CF/Book

2. INTRODUCTION

The subject tower is located at 389 Ekonk Hill Road in Sterling, CT. The structure is a 140' self-supporting three-legged steel tapered lattice tower designed and manufactured by Stainless Incorporated.

The tower geometry and structure member sizes were taken from the original construction drawings prepared by Stainless, Inc., dated November 9, 1995, as stated in the Executive Summary of this report.

The structural analysis was conducted in accordance with the following:

- 2018 International Building Code (compliant with the TIA-222-H design loads)
- 2015 International Building Code with 2018 Connecticut State Building Code Amendments for a wind speed of 112 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.
- Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) and 90 mph (fastest mile) concurrent with 0.5 ice, analyzed under the TIA/EIA-222-F design Standard.

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

Antenna Type	***Carrier***	***Mount***	***Centerline Elevation***	***Cable***
(1) 20'x3" Diameter Omni Antenna	CSP (existing)	*Shared with below Mount @ 137.5'*	151'	(1) 1-5/8"
(1) 20' Multi Array Dipole	CSP (existing)	*Shared with below Mount @ 134.5'*	147.5'	(1) 1-5/8"
(1) 20'x2" Diameter Omni Antenna	CSP (existing)	Shared with below Mount @ 133'	146'	(1) 1-5/8"
(1) Junction Box (10"x8"x4")	CSP (existing)	*Shared with below Mount @ 137.5'*	141'	(1) 7/8"
(1) Panel Antenna (3'x6"x3") w/ Antenna Pipe Mount (2) AP14-850/105 Panel Antennas	CSP (existing)	*Shared with below Mount @ 137.5'*	140.5'	(2) 1-5/8" (1) 7/8"
(1) TMA Unit	CSP (existing)	(1) 4' Sector Mount (1) 15'x4" Pipe Mount	137.5'	(1) 1-5/8" (1) 1/2"
(1) RFS PAD10-65 10' Dish with Radome	CSP (existing)	(1) 6' Side Arm Mount (1) 10'x4" Pipe Mount (1) 14'x3" Pipe Mount (1) 20'x2.5" Mount Pipe (1) 12'x3" Mount Pipe @ 134.5'	135'	(1) WEP65
(1) PA8-65 8' Dish with Radome Pipe mounted to Tower Leg	CSP (existing)	(1) 6' Side Arm Mount	133'	(1) WEP65

Antenna Type	*Carrier*	*Mount*	*Centerline Elevation*	*Cable*
(1) RFS PA8-65 8' Dish with Radome	CSP (existing)	Shared with Pipe Mount @ 137.5'	130'	(1) WEP65
(1) AP14-850/105 w/ Mount Pipe (inverted position)	CSP (existing)	*Shared with above Sector Mount @ 135'*	125'	(2) 1-5/8"
(3) 8'x2"x6" Panel Antenna w/ Mount Pipes (1) TMA Unit	CSP (existing)	*Shared with Sector Mount @ 121.5'* (1) 8'x2" Pipe Mount	123.5'	(3) 7/8"
------	CSP (existing)	(1) 4' Sector Mount @ 121.5	121'	------
(1) RFS PA8-65 8' Dish with Radome	CSP (existing)	Pipe Mount to Leg	121'	(1) WEP65
(1) (inverted) 20'x2" Diameter Omni Antenna	CSP (existing)	*Shared with above Mount @ 133'*	120'	(1) 1-5/8"
(1) Telewave ANT220F2 Omni Antenna (CL @ 120.875') (1) (inverted) Telewave ANT220F2 Antenna (CL @ 113.125')	**Eversource (Proposed)**	**(1) SitePro1 USF-4U Side-Mount @ 117' (1) 2-7/8" OD x 6' Mount Pipe**	**117'**	**(2) LCF78-50JA-A7**
(1) 12"x12" Panel Antenna	CSP (existing)	(1) 6'x2" Horizontal Pipe @ 109'	110'	(1) 7/8"
(1) 12"x12" Panel Antenna	CSP (existing)	*Shared with above Mount @ 109'*	108'	(1) 7/8"
------	CSP (existing)	(1) 12'x2" Horizontal Pipe	108'	------
(1) 20'x2" Diameter Omni Antenna	CSP (existing)	Shared with below Mount @ 96'	106'	(1) 7/8"
(1) MD-S6 Ice Shield for Dish @ 94'	CSP (existing)	Shared with below mount @ 95'	102'	-----
(1) 3' Yagi	CSP (existing)	(1) 6' Side-Arm Mount	100'	(1) 7/8"
------	CSP (existing)	(1) 6' Side-Arm Mount (1) 10'x4" Mount Pipe @ 96'	96'	-------
(1) Telewave ANT490	CSP (existing)	(1) Pipe mounted to Leg	95'	(1) 7/8" Coax (LDF)
------	CSP (existing)	(1) 15'x4" Pipe Mount (1) 8'x4" Pipe Mount	95'	--------
(1) Single Dipole Antenna	CSP (existing)	(1) 12'x2" Horizontal Pipe @ 83'	95'	(1) 1/2"
(1) RFS PA6-65 6'Dish with Radome	CSP (existing)	Shared with Above mount @ 95'	94'	(1) EW63
(1) 10'x2" Diameter Omni Antenna	CSP (existing)	*Shared with above Mount @ 100'*	94'	(1) 7/8"

Antenna Type	*Carrier*	*Mount*	*Centerline Elevation*	*Cable*
(1) 20'x2" Dia. Omni Antenna	CSP (existing)	(1) 6' Side-Arm Mount @ 87'	93'	(1) 7/8"
(1) 20' Multi-Array Dipole (inverted)	CSP (existing)	Shared with above Mount	86'	(1) 7/8"
-----	CSP (existing)	Side-Arm Mount @ 79'	86'	-----
(1) 7' Whip Antenna	CSP (existing)	6' Side-Arm Mount @ 54'	59'	(1) 7/8"
(1) Single Dipole Antenna	CSP (existing)	(1) 12'x2" Horizontal Pipe @ 58'	58'	(1) 1/2"
(1) 2-Bay Dipole Antenna	CSP (existing)	(1) 6'x2" Pipe Mount	58'	(1) 1/2"
(1) 3' Yagi Antenna	CSP (existing)	Leg Mounted	53'	(1) 1/2"

NOTES: Antenna ID Numbering obtained from Connecticut State Police inventory, dated January, 27, 2014

This structural analysis of the communications tower was performed by AECOM, on behalf of Eversource. The purpose of this analysis was to investigate the structural integrity of the modified tower and existing foundation for existing antenna loads in compliance with the 2018 Connecticut State Building Code and the forthcoming TIA-222-H Standard. This analysis was conducted to evaluate stress on the tower and the effect forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

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

The structural analysis was conducted using TNX Tower version 8.0.7.5 and used the following conditions for this tower review (following the TIA-222-H Standard):

- Structure Class 3 – (Essential Communications)
    - NOTE: ASCE 7 and CT State Building Code Applied Risk Category 4 for design wind loads (see below)
- Topographic Category 1 – (No Abrupt elevation changes to location of structure)
- Exposure Class C – (Open Terrain with scattered obstructions)
- Load Conditions:
    - Two load conditions were evaluated as shown which were compared to design stresses according to AISC and TIA-222-H Standard.

Basic Wind Speed:

- IBC 2018 w/ 2018 CT State Building Code Amendment:
    - (2018) IBC Section 1609.1.1 – Determination of Wind Loads – Exception 5 "Designs using TIA-222" applies for determination of Design Wind Load obtained as "V.ult" are to be converted to "V.asd" when applying the TIA-222-H design Standard (under Section 1609.3) for Basic Wind Speed.
    - (2018) CT State Building Code Amendment to the IBC Section 1609.3 wind loads are obtained from Appendix N of the State Building Code.
        - **V.ult = 145 mph** (3-Second Gust) Wind Design Parameter for the Town of Sterling, Connecticut for Risk Category four (IV) for essential communications (Connecticut State Police). NOTE: Because the State of Connecticut has not officially published the design wind-speeds, use of the State of Connecticut wind-speeds per municipality (indicated above).

Load Condition 1 = 145 mph (3-second gust) Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 50 mph (3-second gust) Wind Load (with ice) + Ice Load + Tower Dead Load

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

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

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS (cont.)

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

Seismic event consideration factors/values for design:

- S.s = 0.170 (2018 CT State Building Code – Location Specific Value)
- S.1 = 0.061 (2018 CT State Building Code – Location Specific Value)
- Site Classification = "D"
- Seismic Design Category = "C" – (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)

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

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

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

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

NOTE 1: The above **bolded** load combination is considered to create the governing design loads per the results of the analysis.
NOTE 2: The above "Dead Load Guy Assemblies" are not considered as part of the analysis and are considered as a value of zero.
NOTE 3: The "Load effects due to temperature" do not apply for structures that are self-sustaining (from the TIA-222-H Standard)

4. FINDINGS AND EVALUATION

The combined axial and bending stresses on the tower structure were evaluated to compare with the strength design in accordance with AISC (LRFD). The results of an initial analysis indicated the existing tower did not have enough capacity to support the proposed loading conditions. The tower structure require modifications shown on SK-1 through SK-3. Once the modifications indicated on sheets SK-1 through SK-3 are performed, the modified structure along with the existing foundation and anchor bolts are considers structurally adequate with the wind load classification specified with the existing and proposed antenna loading noted herein.

The modified tower deflection (sway) is 0.4702 degrees, and the modified tower rotation (twist) is 0.3488 degrees with a wind velocity of 90 mph concurrent with 0.5" ice. The tower deflection and rotation ARE within the Connecticut State Police specification of 0.75 degrees of combined deflection (sway) and rotation (twist).

Tower Base Reactions (Factored):

Description	Current (TIA-222-H)
Pier Compression (kips)	320
Pier Uplift (kips)	279
Overall Overturning (kip-ft)	6071
Overall Shear (kips)	75.1
Shear per Leg (kips)	41.8

Proposed Tower Component Stress vs. Capacity Summary

Component / (Section No.)	Controlling Component/ Elevation	Stress (% capacity)	Pass/Fail
Leg (T4)	Compression / HSS 5x0.375 / 50' – 75'	93.2	**Pass**
Diagonal (T5)	Compression / (2)L3-1/2x3x1/4 w/ 3/8" gap / 25'-50'	99.2	**Pass**
Horizontal (T6)	Compression / L4x4x1/4 / 0' – 25'	83.4	**Pass**
Top Girt (T1)	Compression / L3x3x1/4 / 125' – 140'	6.8	**Pass**
Inner Bracing Member (T6)	Compression / L2-1/2x2-1/2x3/6 / 0' – 25'	0.6	**Pass**
Bolt Checks (T3)	Member Bearing on Bolt / (1) A325X 5/8" diameter Bolt / 120'-140'	85.2	**Pass**

Foundation Summary

Component	Required	Computed	% Capacity	Pass/Fail
Tower Anchor Rod Capacity (TIA-222-H – 4.9.9)	Ratio < 1.0	0.90	90.0	Pass
Foundation Overturn Resistance	18465 kip*ft	6596 kip*ft	47.63	Pass
Ultimate Soil Bearing Pressure	4ksf * 0.75 Reduction = 3.00 ksf	1.5903 ksf	53.1	Pass
Ultimate Punching Shear (ACI 318-14)	1358 kip	368 kip	27.1	Pass

Structure Rating (Maximum from all components) =	**99.2 %**	**Pass**

4. FINDINGS AND EVALUATION (cont.)

Maximum Deformations – Proposed Condition

TIA-222-G 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	0.1331	0.2545	4.0	4.20

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

Description	Current	Total	Allowable
Tower Twist (degrees)	0.3405	**0.7473**	0.750
Tower Sway (degrees)	0.4068		

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

5. CONCLUSIONS AND RECOMMENDATIONS

The results of an initial structural analysis indicated that the existing tower did not have enough capacity for the proposed loading conditions above. The tower structure require modifications shown on SK-1 through SK-3. **Once the modifications indicated on sheets SK-1 through SK-3 are performed, the modified structure, existing anchor bolts and foundation are considered structurally adequate with the existing and proposed antenna loading herein.**

The results of the analysis indicate the modified tower's sway (deflection) is 0.4068 degrees and the modified tower's twist (rotation) is 0.3405 degrees. These figures combined are within the Connecticut State Police requirements of 0.75 degrees for combined twist (rotation) and sway (deflection) when applying the TIA/EIA-222-F design conditions.

The maximum structural capacity rating (after modification) calculated herein is **99.2 %**

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report from Black & Veatch, referenced in Section 1 of 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 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 recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading conditions.

6. DRAWINGS AND DATA

REINFORCEMENT DRAWINGS SK-1 THROUGH SK-3

GENERAL CONSTRUCTION NOTES

1. ALL WORK SHALL COMPLY WITH THE CONNECTICUT STATE BUILDING AND LIFE SAFETY CODES, SUPPLEMENTS AND AMENDMENTS.

2. CONTRACTOR IS TO REVIEW ALL DRAWINGS AND NOTES IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUB-CONTRACTORS AND ALL RELATED PARTIES. THE SUB-CONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.

3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON DRAWINGS OR WRITTEN IN SPECIFICATIONS.

4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.

5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION AND ELECTRICAL SUB-CONTRACTORS SHALL PAY FOR THEIR PERMITS.

6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS ON SITE AT ALL TIMES AND ENSURE THE DISTRIBUTION OF NEW DRAWINGS TO SUB-CONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. CONTRACTOR SHALL FURNISH 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.

7. INSTALLATION OF THIS WIRELESS COMMUNICATIONS EQUIPMENT SITE REQUIRES WORK IN THE IMMEDIATE VICINITY OF EXISTING OPERATING TELECOMMUNICATION SYSTEMS. THE CONTRACTOR SHALL PROVIDE AND COORDINATE THE METHODS OF PROTECTION WITH THE VARIOUS TELECOMMUNICATION CARRIERS AND THE TOWER OWNER. THERE SHALL BE NO INTERRUPTION OF OPERATION WITHOUT TIMELY COORDINATION WITH AND APPROVAL BY THE VARIOUS COMMUNICATIONS OPERATORS INCLUDING THE CONNECTICUT STATE POLICE.

8. THE REINFORCEMENT OF PORTIONS OF THIS TOWER STRUCTURE WILL AFFECT CRITICAL CONNECTICUT STATE POLICE ANTENNAS.

9. NO MOVEMENT, ALTERATION, OR DISCONNECTION OF CONNECTICUT STATE POLICE ANTENNAS MAY OCCUR WITHOUT THE NOTIFICATION AND APPROVAL OF THE CONNECTICUT STATE POLICE. CONTACT THE NETWORK CONTROL CENTER AT 860-865-8008.

10. TOWER REINFORCING WORK AFFECTING CRITICAL CONNECTICUT STATE POLICE ANTENNAS MAY BE REQUIRED TO BE CONDUCTED AT TIMES AS DETERMINED BY THE REQUIREMENTS OF THE CONNECTICUT STATE POLICE.

11. IT SHALL BE MANDATORY TO USE STEEL MATERIALS PLANNED FOR CONSTRUCTION THAT ARE MANUFACTURED IN THE UNITED STATES OF AMERICA. MATERIAL SPECIFICATION DOCUMENTS SHALL BE MADE AVAILABLE TO VERIFY STEEL FABRICATION PRIOR TO PURCHASE AND IMPLEMENTATION. DEVIATIONS FROM THIS SHALL REQUIRE EXPRESSED WRITTEN PERMISSION FROM THE ENGINEER AND CONNECTICUT STATE POLICE.

12. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER MFR'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR ARCHITECT.

13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.

14. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ARCHITECT FOR REVIEW. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTAL TO THE ARCHITECT FOR REVIEW.

15. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA. SUBMIT ANY DISCREPANCIES FROM THE DRAWINGS TO THE ARCHITECT.

16. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURE AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.

17. CONTRACTOR SHALL COMPLY WITH OWNER ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

18. DIMENSIONS OF EXISTING TOWER ARE BASED ON MANUFACTURER'S DRAWINGS PREPARED BY STAINLESS INC., DATED NOVEMBER 9, 1995, AND ARE NOT GUARANTEED. CONTRACTOR SHALL TAKE FIELD DIMENSIONS AS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK AND SHALL ASSUME FULL RESPONSIBILITY FOR THEIR ACCURACY. WHEN SHOP DRAWINGS BASED ON FIELD MEASUREMENT ARE SUBMITTED FOR REVIEW, DIMENSIONS ARE PROVIDED FOR THE ENGINEER'S REFERENCE ONLY.

19. TOWER INVENTORY IS BASED ON INFORMATION OBTAINED BY THE STRUCTURAL ANALYSIS PERFORMED BY BLACK AND VEATCH DATED MARCH 12, 2019.

20. CONTRACTOR TO VERIFY REQUIRED CLEARANCES INCLUDING BUT NOT LIMITED TO EXISTING BUILDINGS, EQUIPMENT PADS AND SHELTERS PRIOR TO COMMENCING WORK.

21. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION. NO MEMBER OF THE TOWER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY. THE CONTRACTOR SHALL BE AWARE OF WEATHER AND WIND CONDITIONS AND NOT PERFORM MEMBER REPLACEMENT IN A WIND.

STRUCTURAL NOTES

STRUCTURAL STEEL MATERIAL TO BE PROVIDED:

HSS TUBE .... ASTM A501 Gr. B (50ksi, MIN)
(REPLACEMENT) ANGLE .... ASTM A529 Gr. 50 (50ksi, MIN)
STRUCTURAL PLATES A36

STRUCTURAL STEEL SHALL CONFORM TO ALL THE REQUIREMENTS OF THE ASTM SPECIFICATION, AS REFERENCED IN THE CODE.

UNLESS OTHERWISE NOTED, ALL STEEL WILL BE GALVANIZED IN ACCORDANCE WITH ASTM 123 AFTER FABRICATION. TOUCH UP ALL DAMAGED GALVANIZED STEEL WITH APPROVED COLD ZINC, "GALVANOX", "DRY GALV", "ZINC-IT", OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURERS GUIDELINES. TOUCH-UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT APPLIED IN SHOP OR FIELD.

SHOP AND ERECTION DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL STEEL WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. SUBMIT 2 SETS OF PRINTS FOR THE ENGINEER REVIEW.

MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

THE OMISSION OF ANY MATERIAL THAT WAS SHOWN ON THE CONTRACT DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR OF PROVIDING THE SAME.

CONNECTIONS / FIELD ASSEMBLY:

BOLTED CONNECTIONS: UNLESS OTHERWISE NOTED, ALL JOINTS ARE SLIP CRITICAL TYPE, REQUIRING 5/8" & 1" DIA. A325-X BOLTS, A563 NUTS AND F436 WASHERS, ALL GALVANIZED. BEVELED WASHERS SHALL BE USED ON BEAM FLANGES HAVING A SLOPE GREATER THAN 1:20.

STRUCTURE IS DESIGNED TO BE LEVEL AND PLUMB, SELF-SUPPORTING AND STABLE AFTER WORK IS COMPLETED.

COMMENCEMENT OF WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

INSPECTIONS:

SPECIAL INSPECTIONS ARE REQUIRED PER THE CODE FOR STRUCTURAL STEEL WORK.

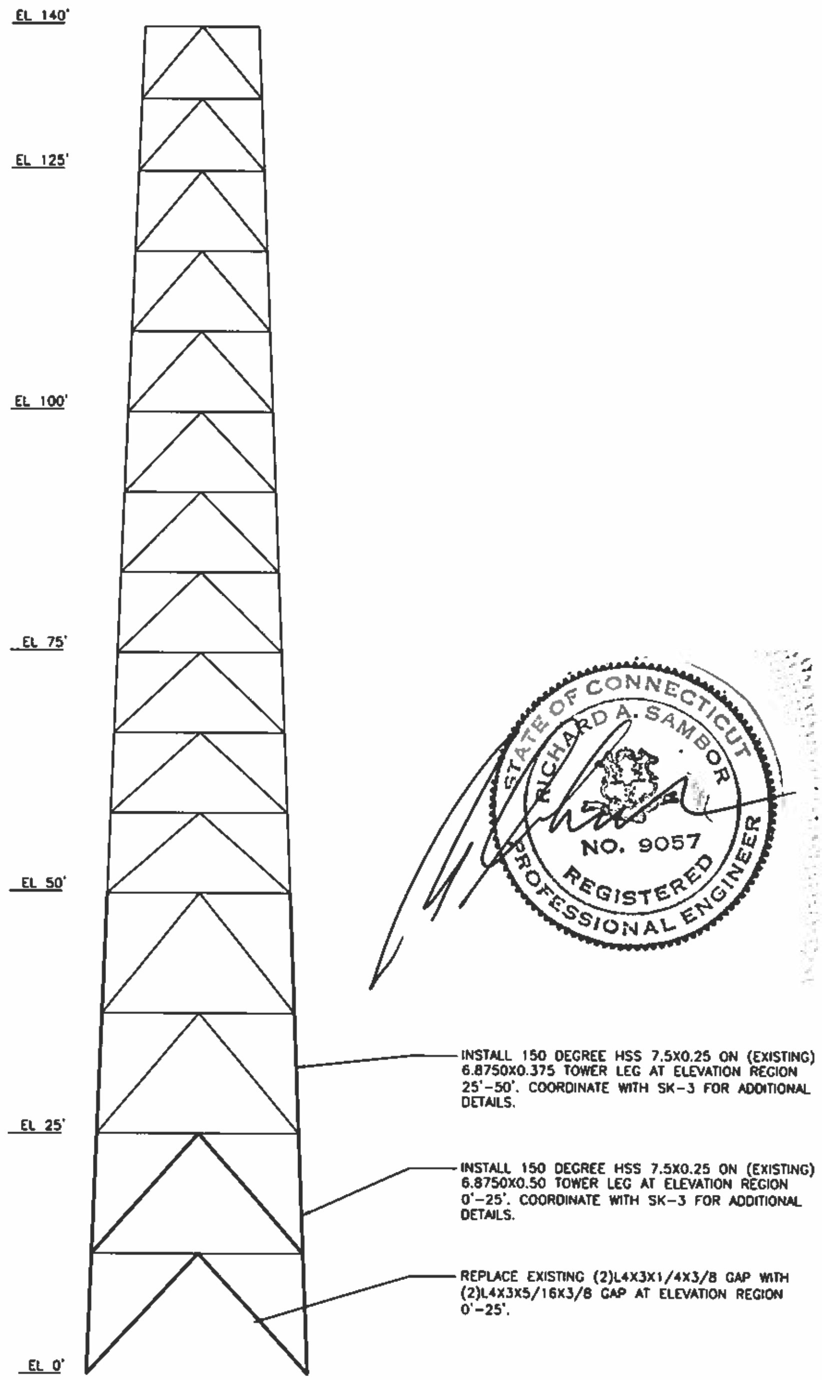
OWNER WILL SUPPLY THE SERVICES OF A SPECIAL INSPECTOR AND TESTING AGENTS AS REQUIRED BY AUTHORITY HAVING JURISDICTION. CONTRACTOR SHALL COORDINATE INSPECTIONS OF FABRICATOR'S AND ERECTOR'S WORK AND MATERIALS TO MEET THE REQUIREMENTS OF THE STATEMENT OF SPECIAL INSPECTIONS FOR THE PROJECT.

COPIES OF TESTING AND INSPECTION REPORTS WILL BE PROVIDED TO THE OWNER, BUILDING OFFICIAL, ENGINEER OF RECORD AND CONTRACTOR.

STATE OF CONNECTICUT
RICHARD A. SAMBOR
NO. 9057
REGISTERED
PROFESSIONAL ENGINEER

PROJECT NO. 60627154 Designed by: MCD Drawn by: GAT Checked by: DJR Approved by: RAS	AECOM 500 ENTERPRISE DRIVE ROCKY HILL, CONNECTICUT (860)-529-8882	EVERSOURCE CSP TOWER #49 SITE ADDRESS: 389 EKONK HILL ROAD STERLING, CONNECTICUT	REV. / DATE: / DESCRIPTION Scale: AS NOTED / Date: 11/25/20 Job No. / File No.	Dwg. No. SK-1 Dwg. 1 of 3

NOTES:
1. REFER TO STRUCTURAL NOTES ON SK-1 FOR STEEL GRADE REQUIREMENTS FOR REPLACEMENT MEMBERS.
2. CONTRACTOR SHALL FIELD VERIFY EXISTING TOWER INFORMATION AND ANGLE MEMBER ORIENTATION PRIOR TO ORDERING MATERIALS.
3. HSS TUBES ATTACHED TO TOWER STRUCTURE SHALL USE U-BOLTS FOR ATTACHMENT. U-BOLT MATERIALS SHALL BE OF MINIMUM ASTM A449 AS STATED IN THE TIA/222 FOR ROUND U-BOLT CONNECTIONS.
4. REINFORCEMENT OF TOWER IS REQUIRED FOR ALL 3 SIDES OF EXISTING TOWER STRUCTURE.
5. CONNECTION BOLTS FOR REPLACEMENT MEMBERS SHALL BE REPLACED IN KIND. EXISTING BOLTS SHALL NOT BE RE-USED FOR CONNECTING REPLACEMENT MEMBERS.



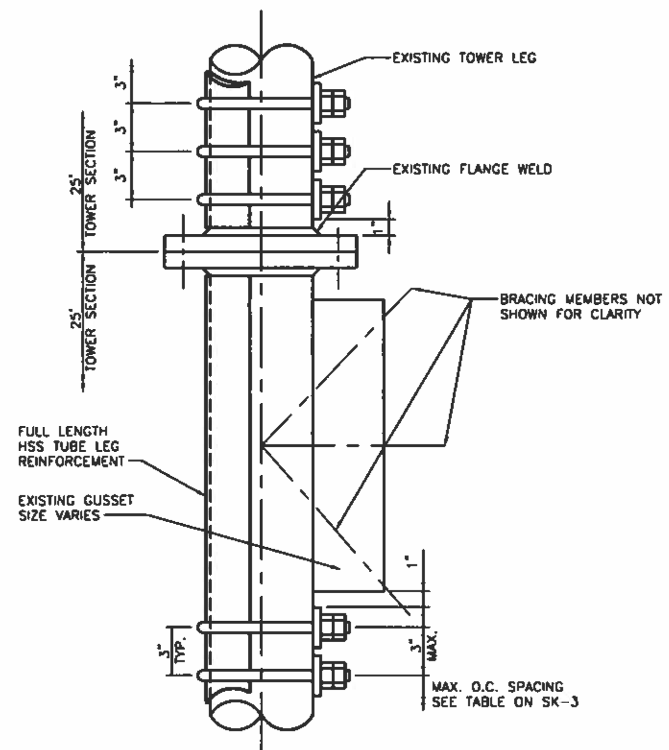
STATE OF CONNECTICUT RICHARD A. SAMBOR NO. 9057 REGISTERED PROFESSIONAL ENGINEER

1 / SK-2 TOWER ELEVATION
SCALE: 1"=20'

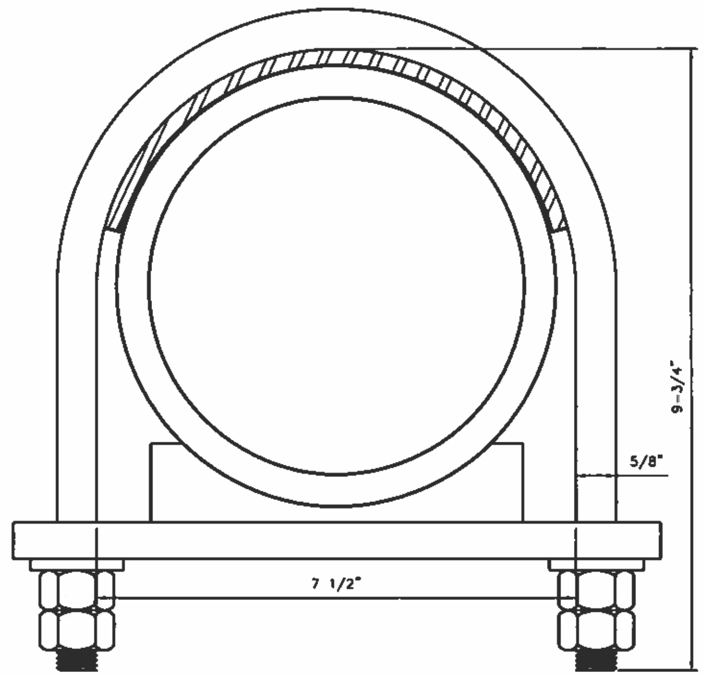
PROJECT NO. 60627154	AECOM 500 ENTERPRISE DRIVE ROCKY HILL, CONNECTICUT (860)-529-8882	EVERSOURCE	Dwg. No. SK-2
Designed by: MCD		SITE ADDRESS: CSP TOWER #49 389 EKONK HILL ROAD STERLING, CONNECTICUT	REV. / DATE: / DESCRIPTION
Drawn by: GAT			Scale: AS NOTED / Date: 11/25/20
Checked by: DJR			Job No. / File No.
Approved by: RAS			Dwg. 2 of 3

ELEVATION	EXISTING TOWER LEG DIAMETER HSS TUBE SIZE (IN)	HSS TUBE REINFORCING DIMENSIONS (IN)	U-BOLT -AT-ENDS (EACH END) OF 25' SECTIONS SPACED AS INDICATED C-TO-C # (PER TOWER LEG)	MIN. U-BOLTS REMAIN PER LEG	TOTAL U-BOLTS PER LEG PER 25' SECTION	DIAMETER U-BOLTS (IN)	MIN. SPACING REMAINING U-BOLTS C-TO-C (IN)	MAX. SPACING REMAINING U-BOLTS C-TO-C (IN)
0'-25'	6.875x0.50	7.5x0.25	10	20	38	5/8	11	12
25'-50'	6.875x0.4	7.5x0.25	10	20	38	5/8	11	12

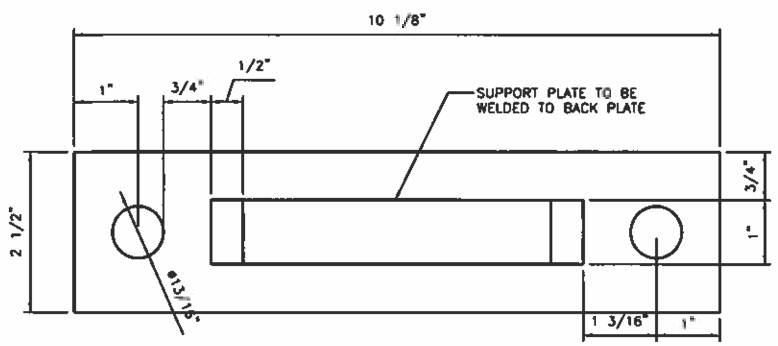
NOTES:
- U-BOLTS SHALL MEET THE STRENGTH REQUIREMENTS OF ASTM A449. BASIS OF DESIGN IS PORTLAND BOLT OF PORTLAND, OREGON, USA. ALTERNATIVE SUPPLIER SHALL MATCH OR EXCEED QUALITY OF PORTLAND BOLT
- CONTRACTOR SHALL TAKE SPECIFIC CARE WHEN INSTALLING U-BOLTS AND NOT ALLOW ANY VISUAL DEFORMATION OF THE EXISTING TOWER LEG MEMBERS.
- 150 DEGREE HSS TUBE REFERS TO THE REQUIRED PORTION OF HSS TUBING TO BE INSTALLED FOR REINFORCING.
- SPACING DIMENSIONS FOR U-BOLTS ARE MAXIMUM ALLOWABLE DISTANCES (CENTER-TO-CENTER). ADDITIONAL U-BOLTS MAY BE REQUIRED DUE TO INTERRUPTION CAUSED BY EXISTING TOWER CONDITIONS. SHOP DRAWINGS SHALL ILLUSTRATE ACTUAL BOLT SPACING REQUIRED BASED ON VERIFIED FIELD CONDITIONS.
- 150 DEGREE TUBES SHALL BE CONTINUOUS, SINGLE PIECE MEMBERS APPROXIMATELY 25' LENGTH (TO BE FIELD VERIFIED BEFORE ORDERING).



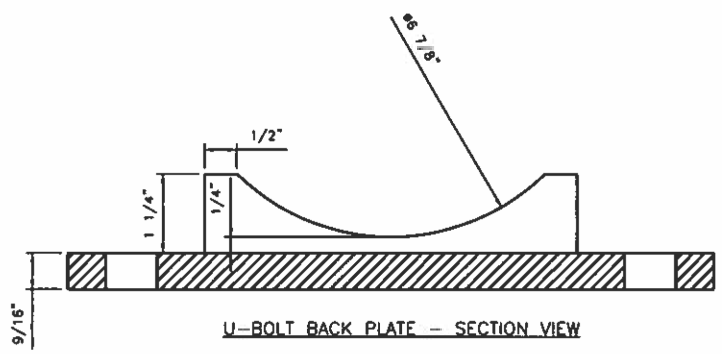
3 / SK-3 REINFORCEMENT DETAIL
SCALE: 1" = 1'-0"



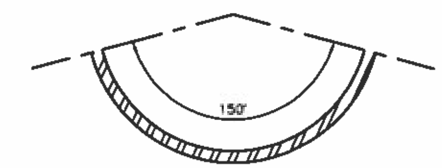
1 / SK-3 U-BOLT FOR LEG REINFORCEMENT
SCALE: N.T.S.



U-BOLT BACK PLATE – PLAN VIEW

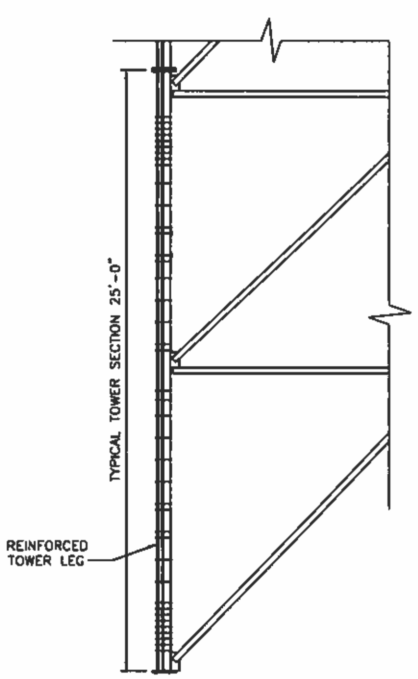


U-BOLT BACK PLATE – SECTION VIEW



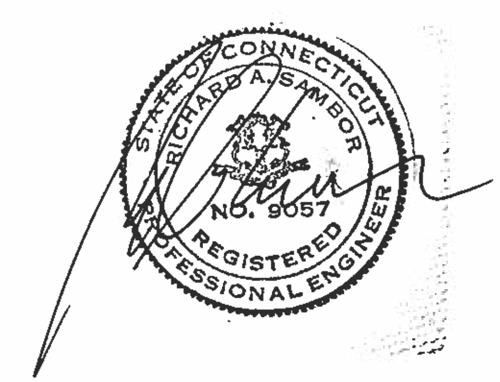
PLAN VIEW OF 150 DEGREE HSS TUBE

2 / SK-3 HSS TUBE DETAILS
SCALE: N.T.S.



4 / SK-3 DIAGRAMATIC U-BOLT LAYOUT AT TOWER SECTIONS
SCALE: 1/8" = 1'-0"

NOTE: ABOVE IMAGE IS DIAGRAMMATIC REPRESENTATION OF CLAMP SPACING. IMAGE MAY VARY FROM FIELD CONDITIONS WHICH SHALL BE VERIFIED PRIOR TO PURCHASE AND INSTALLATION OF PROPOSED REINFORCEMENT.



PROJECT NO. 60627154 Designed by: MCD Drawn by: GAT Checked by: DJR Approved by: RAS	AECOM 500 ENTERPRISE DRIVE ROCKY HILL, CONNECTICUT (860)-529-8882	EVERSOURCE SITE ADDRESS: CSP TOWER #49 389 EKONK HILL ROAD STERLING, CONNECTICUT	REV. DATE: DESCRIPTION Scale: AS NOTED Date: 11/25/20 Job No. File No. Dwg. No. SK-3 Dwg. 3 of 3

U-BOLTED CONNECTION CALCULATIONS

Leg Property - HSS 6.8750x0.5 with Built up 150 deg HSS 7.50x0.250 (Elevations 0' - 20')

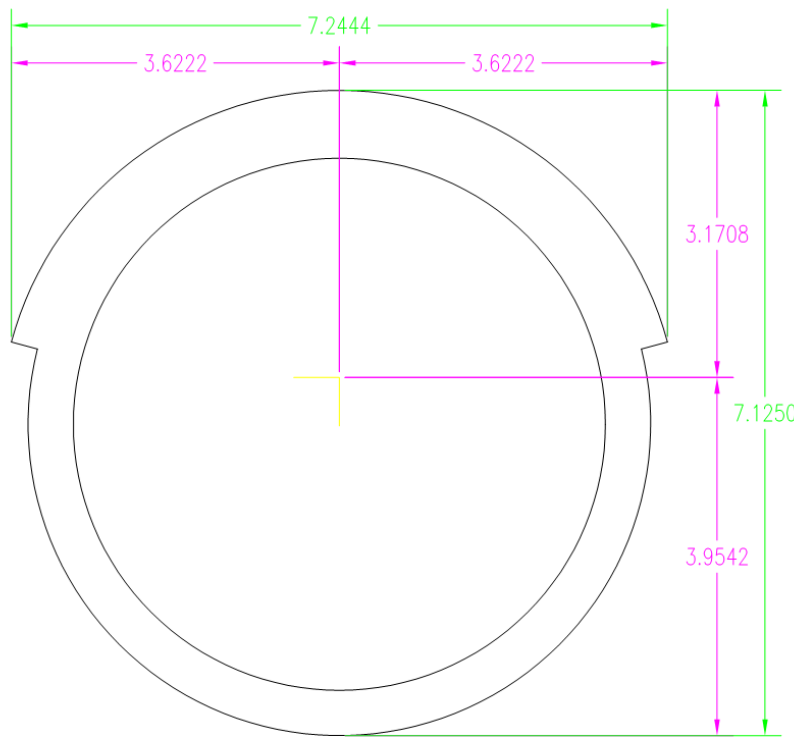
$Height_{sect} := 7.1250in$

$D_{Leg} := 6.8750in$

$Width_{sect} := 7.2444in$

$WindApplied := max(Height_{sect}, Width_{sect}) = 7.2444 \cdot in$

$Perimeter_{sect} := 41.34639in$



$Steel_{Modulus} := 29000ksi$

$Steel_{Density} := 490pcf$

$Section_{Area} := 12.53795in^2$

$I_{x.Section} := 66.21877in^4$

$I_{y.Section} := 65.03705in^4$

$d_{yT.Section} := 3.6222in$

$d_{yB.Section} := 3.6222in$

$d_{xT.Section} := 3.1708in$

$d_{xB.Section} := 3.9542in$

$$S_{y.TOP.Section} := \frac{I_{y.Section}}{d_{yT.Section}} = 17.955124 \cdot in^3$$

$$S_{y.BOTTOM.Section} := \frac{I_{y.Section}}{d_{yB.Section}} = 17.955124 \cdot in^3$$

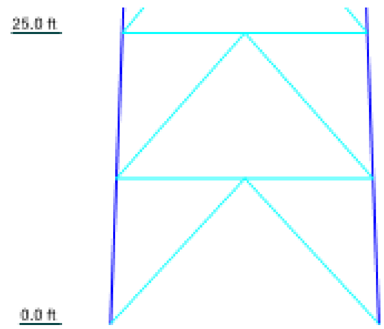
$$S_{x.TOP.Section} := \frac{I_{x.Section}}{d_{xT.Section}} = 20.8839315 \cdot in^3$$

$$S_{x.BOTTOM.Section} := \frac{I_{x.Section}}{d_{xB.Section}} = 16.7464392 \cdot in^3$$

NOTE: The intent of this additional steel identified as HSS 7.5x0.25 is additional steel required to address the Connecticut State Police requirment for combined Twist and Sway to be below 0.75 degrees.

The following calculation is shown to determine the maximum number of clamps required for a development length at the end of the reinforcing member (similar to welds at ends of built-up sections).
Per TIA-222 Standard, the use of AISC Group "A" bolts shall be considered as design criteria for the number of bolts required for installation.

Elevation Length --> $L_{total} := 25ft$



Number of Bays within Elevation Region:

$Num_{bays} := 2$

Maximum Length of unbraced Leg-->

$$L_{max.Unbraced} := \frac{L_{total}}{Num_{bays}} = 150 \cdot in$$

Existing Leg - Prior to MODification --> 6.8750x0.50" (t)) (60 ksi Yield Strength) - Reference: Stainless Original Construction Drawings

$K_{unbraced} := 1.0$ (Conservative Assumption)

$r_{existing.leg} := 2.26082in$

$F_{y.leg} := 60ksi$

$A_{existing.leg} := 10.01383in^2$

Slenderness Check [AISC B4.1a]

$$Slenderness_{CHECK} := if\left(\frac{8.6250in}{0.3125in} < 0.11 \cdot \frac{Steel_{Modulus}}{F_{y.leg}}, \text{"Not Slender - Compression"}, \text{"Slender - Compression"}\right)$$

$$\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{existing.leg}} = 66.35$$

$Slenderness_{CHECK} = \text{"Not Slender - Compression"}$

For Non-Slender Members, Apply AISC Equation E3-2

$$F_e := \frac{\pi^2 \cdot 29000ksi}{\left(\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{existing.leg}}\right)^2} = 65.02 \cdot ksi$$

$$F_{cr} := \left[0.658^{\left(\frac{F_{y.leg}}{F_e}\right)}\right] \cdot F_{y.leg} = 40.78 \cdot ksi$$

Existing Leg Strength - Prior to MODification --> (ϕ = 0.90 - Compression - LRFD [AISC Chapter E])

$$P_{Str.Leg} := 0.90 \cdot F_{cr} \cdot A_{existing.leg} = 367.5 \cdot kip$$

Built-up / Reinforcement Section additional to the existing Leg member:

Determine governing radius of gyration of material:

$$A_{reinf} := 12.53795in^2$$

$$I_{x.reinf} := 66.21877in^4$$

$$I_{y.reinf} := 65.03705in^4$$

$$r_{design.reinf} := \min\left(\sqrt{\frac{I_{x.reinf}}{A_{reinf}}}, \sqrt{\frac{I_{y.reinf}}{A_{reinf}}}\right) = 2.28 \cdot in$$

$$\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{design.reinf}} = 65.86$$

$$F_{e.reinf} := \frac{\pi^2 \cdot 29000ksi}{\left(\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{design.reinf}}\right)^2} = 65.99 \cdot ksi$$

$$F_{cr.BU} := \left[0.658^{\left(\frac{50ksi}{F_{e.reinf}}\right)}\right] \cdot 50ksi = 36.41 \cdot ksi$$

Existing Leg Strength - Prior to MODification --> (ϕ = 0.90 - Compression - LRFD [AISC Chapter E])

$$P_{Str.Reinf} := 0.90 \cdot F_{cr.BU} \cdot A_{reinf} = 410.87 \cdot kip$$

Difference in materials required to be Developed at end points of reinforcing:

$$U_{Bolt.Design.Force} := P_{Str.Reinf} - P_{Str.Leg} = 43.37 \cdot kip$$ <------ INSERT THIS VALUE INTO TABLE (Next Page)

TIA-222-G U-Bolt Strength Design Check:

$V_{us} := 43.5kip$ $\quad F_{y.UBolt} := 92ksi$ $\quad dia_{UBolt} := \frac{5}{8}in$

$$\left(\frac{V_{us}}{\phi_u \cdot R_{ns}}\right)^2 + \left(\frac{T_{ur}}{\phi_u \cdot R_{nr}}\right)^2 \le 1.0$$

$T_{ur} := 0kip$ $\quad FU_{UBolt} := 120ksi$ $\quad A_{g.UBolt} := \left(\frac{\pi}{4}\right)\cdot(dia_{UBolt})^2$

$\phi_u := 1.00$ $\quad N_{UBolt.Ends} := 10$ $\quad R_{ns} := 0.30\cdot(2\cdot T_p - T_{ut})$

$T_{ut} := 0kip$ $\quad T_p := 10000lbf$ <-- Installation Pretension Force - Manual Input

$R_{ns} := 0.30\cdot(2\cdot T_p - T_{ut})$ $\quad R_{ns} = 6.00\cdot kip$

Maximum U-Bolt Tension Capacity, where the tensile capacity of each leg of the U-Bolt shall not exceed 0.85 Fy*Ag of bolt used.

$Check_{UBolt} := if(T_p < 0.85\cdot F_{y.UBolt}\cdot A_{g.UBolt}, "OK for Use", "NOT ok for Use")$ $\quad Check_{UBolt} = "OK for Use"$

$R_{nr} := 0.5\cdot D_{Leg}\cdot R_{ns}$

$$UBolt_{Str.Ratio} := \left(\frac{\frac{V_{us}}{N_{UBolt.Ends}}}{\phi_u\cdot R_{ns}}\right)^2 + \left(\frac{T_{ur}}{\phi_u\cdot R_{nr}}\right)^2$$

$UBolt_{Str.Ratio} = 0.53$

$Check_{UBolt} := if(UBolt_{Str.Ratio} \le 1.0, "OK for Use", "NOT ok for Use")$ $\quad Check_{UBolt} = "OK for Use"$

CHECK Existing Leg Capacity for Pipe Crushing Capacity (localized impact) to select maximum permissible U-Bolt Diameter Limit:

$$R_u := \phi\cdot\left[5.5\cdot F_y\cdot t^2\left(1 + 0.25\cdot\frac{l_b}{D}\right)\cdot Q_f\right]$$ [AISC Equation K1-2]

$F_{y.leg} = 60\cdot ksi$

$D := 6.8750in$

$t := 0.50in\cdot 0.93$

$l_b := 1.5in$ (Localized Bearing on HSS - Coordinate dimension with "Connection Plate Ht." (following Page))

$U := 1$ Assuming @ Capacity value (Conservative Assumption)

$Q_f := 1 - 0.3\cdot U\cdot(1 + U)$ $\quad Q_f = 0.4$ [AISC Equation K1-5]

$$R_{u.crushingHSS} := 0.9\cdot\left[5.5\cdot F_{y.leg}\cdot t^2\left(1 + 0.25\cdot\frac{l_b}{D}\right)\cdot Q_f\right]$$

$R_{u.crushingHSS} = 27.09\cdot kip$

$Check_{UBolt.Leg} := if(R_{ns} < R_{u.crushingHSS}, "OK for Use", "NOT ok for Use")$ $\quad Check_{UBolt.Leg} = "OK for Use"$

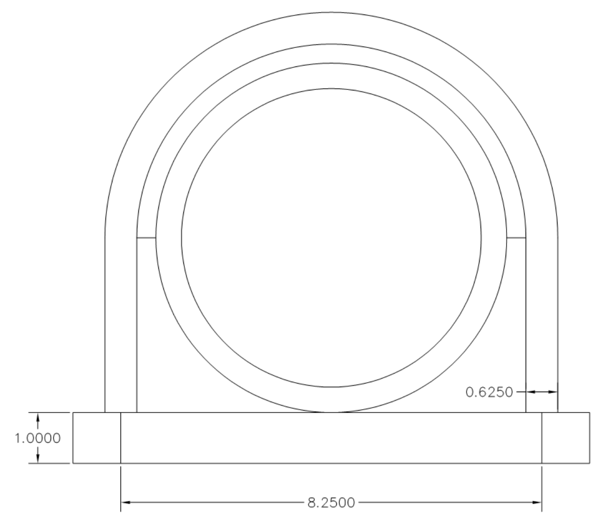
CHECK Plastic Bending Capacity of connecting Plates to hold U-Bolt and Clamped reinforcing pipe to leg:

$$\sigma := \frac{M}{Z} = \frac{P_a}{\left(\frac{b \cdot d^2}{4}\right)} \quad \text{--->} \quad P := \frac{1 \cdot (0.9 \cdot \sigma) \cdot \left(\frac{b \cdot d^2}{4}\right)}{a}$$

$\sigma := 50000\text{psi}$ $\quad d_{Plate.Thick} := 0.5\text{in} + 0.5625\text{in}$ $\quad L_{clamp.ends} := 2.25\text{in}$

$b_{PlateHeight} := 2.5\text{in}$

NOTE: "d.Plate.Thick" considering average thickness of plate and pipe support backing for plate thickness (Image Below)



$$P_{U\_Bolt.Plate} := \frac{1 \cdot (0.9 \cdot \sigma) \cdot \left(\frac{b_{PlateHeight} \cdot d_{Plate.Thick}{}^2}{4}\right)}{L_{clamp.ends}} = 14111.33 \cdot \text{lbf}$$

$Check_{UBolt.Plate} := \text{if}\left(T_p < P_{U\_Bolt.Plate}, \text{"OK for Use"}, \text{"NOT ok for Use"}\right)$ $\quad Check_{UBolt.Plate} = \text{"OK for Use"}$

U-Bolt CHECK Summary for all parts of U-bolting to address Reinforcing Tube at ends to develop Reinforcement properties

$Check_{UBolt} = \text{"OK for Use"}$ $\quad \frac{T_p}{\left(0.85 \cdot F_{y.UBolt} \cdot A_{g.UBolt}\right)} = 0.42$ $\quad Check_{UBolt.Leg} = \text{"OK for Use"}$

$\frac{R_{ns}}{R_{u.crushingHSS}} = 0.22$

$Check_{UBolt.Plate} = \text{"OK for Use"}$ $\quad \frac{T_p}{P_{U\_Bolt.Plate}} = 0.71$

AECOM

				Page	of
Job	140' Stainless Tower - Sterling, CT	Project No.	EVS-011 (b1)	Sheet 6	of 6
Description	U-Bolted Connecting Pipes Design - TNX T6 Sect.	Computed by	MCD	Date	11/25/20
	TIA-222-H Design Standard - Tower MODification	Checked by		Date	

Design Required for Remainder of Clamps required for installation to keep Reinforcement attached to Leg:

Consider --> 150 deg. HSS 7.50x0.250

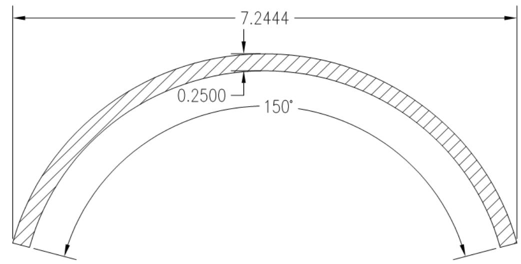
$I_{x.Pipe} := 1.59793\,in^4$

$I_{y.Pipe} := 12.62626\,in^4$

$A_{pipe} := 2.37256\,in^2$

```
----------------   REGIONS   ----------------

Area:                      2.37256 sq in
Perimeter:                 19.48046 in
Bounding box:          X: -3.62222  --  3.62222 in
                       Y: -1.77012  --  1.07401 in
Centroid:              X: 0.00000 in
                       Y: 0.00000 in
Moments of inertia:    X: 1.59793 sq in sq in
                       Y: 12.62626 sq in sq in
Product of inertia:   XY: 0.00000 sq in sq in
Radii of gyration:     X: 0.82067 in
                       Y: 2.30690 in
Principal moments (sq in sq in) and X-Y directions about centroid:
                       I: 1.59793 along [1.00000 0.00000]
                       J: 12.62626 along [0.00000 1.00000]
```



$$r_{design.Pipe} := \min\left(\sqrt{\frac{I_{x.Pipe}}{A_{pipe}}}, \sqrt{\frac{I_{y.Pipe}}{A_{pipe}}}\right) = 0.82 \cdot in$$

Determine the minimum number of clamps per bay to keep the effective strength of the "bonded" bracing ends:

$$KL_{Leg} := \frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{existing.leg}} = 66.35$$

Enter Minimum # of clamps here ---> $Num_{clamps.min} := 13$

$$KL_{Reinf} := \frac{\frac{L_{max.Unbraced}}{\left(Num_{clamps.min} - 1\right)}}{r_{design.Pipe}} = 15.23$$

$$Min_{clamps} := if\left(KL_{Reinf} < KL_{Leg}, \text{"Number of Clamps Determined"}, \text{"Add clamp"}\right)$$

Min_{clamps} = "Number of Clamps Determined"

Determine maximim of separation of u-bolts per bay to keep effective strength of the "bonded bracing ends:

$$\frac{L_{max.Unbraced}}{Num_{clamps.min}} = 11.54 \cdot in$$

The figure to the left is always considered rounded down. This indicates the maximum permissible spacing of any U-bolt clamps not associated to the "bonding" ends of the reinforcement to the tower structure.

Leg Property - HSS 6.8750x0.375 with Built up 150 deg HSS 7.50x0.250 (Elevations 20' - 40')

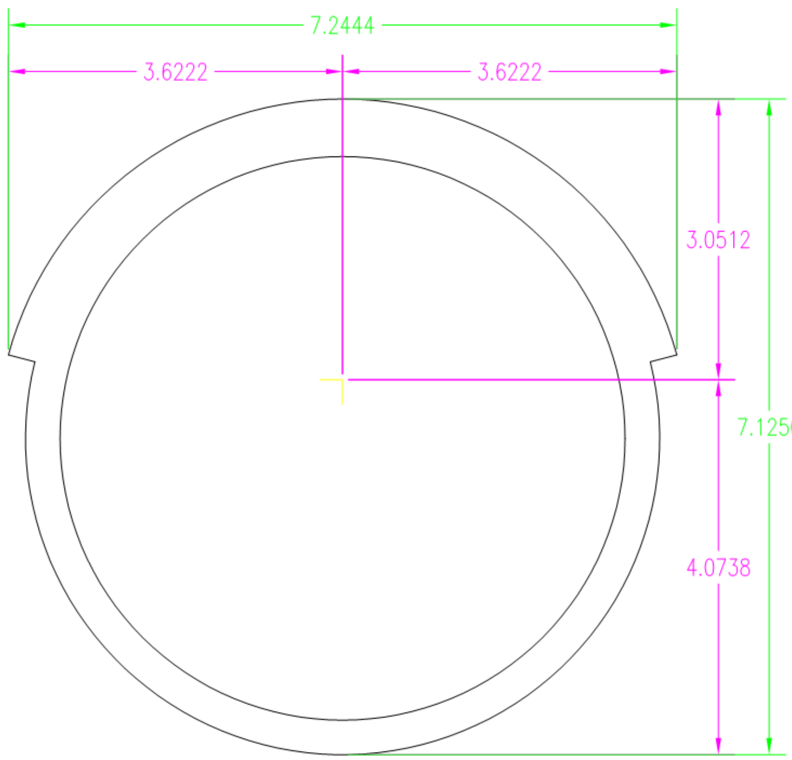
$Height_{sect} := 7.1250in$

$D_{Leg} := 6.8750in$

$Width_{sect} := 7.2444in$

$WindApplied := max(Height_{sect}, Width_{sect}) = 7.2444 \cdot in$

$Perimeter_{sect} := 41.34639in$



$Steel_{Modulus} := 29000ksi$

$Steel_{Density} := 490pcf$

$Section_{Area} := 12.53795in^2$

$I_{x.Section} := 66.21877in^4$

$I_{y.Section} := 65.03705in^4$

$d_{yT.Section} := 3.6222in$

$d_{yB.Section} := 3.6222in$

$d_{xT.Section} := 3.0512in$

$d_{xB.Section} := 4.0738in$

$$S_{y.TOP.Section} := \frac{I_{y.Section}}{d_{yT.Section}} = 17.955124 \cdot in^3$$

$$S_{y.BOTTOM.Section} := \frac{I_{y.Section}}{d_{yB.Section}} = 17.955124 \cdot in^3$$

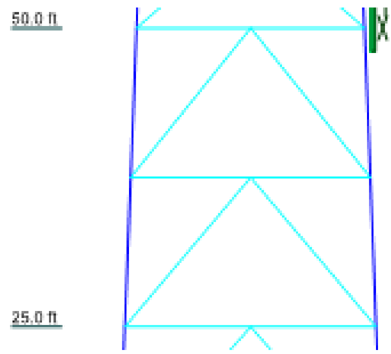
$$S_{x.TOP.Section} := \frac{I_{x.Section}}{d_{xT.Section}} = 21.7025334 \cdot in^3$$

$$S_{x.BOTTOM.Section} := \frac{I_{x.Section}}{d_{xB.Section}} = 16.2547916 \cdot in^3$$

NOTE: The intent of this additional steel identified as HSS 7.5x0.25 is additional steel required to address the Connecticut State Police requirment for combined Twist and Sway to be below 0.75 degrees.

The following calculation is shown to determine the maximum number of clamps required for a development length at the end of the reinforcing member (similar to welds at ends of built-up sections).
Per TIA-222 Standard, the use of AISC Group "A" bolts shall be considered as design criteria for the number of bolts required for installation.

Elevation Length --> $L_{total} := 25ft$



Number of Bays within Elevation Region:

$Num_{bays} := 2$

Maximum Length of unbraced Leg-->

$$L_{max.Unbraced} := \frac{L_{total}}{Num_{bays}} = 150 \cdot in$$

Existing Leg - Prior to MODification --> 6.8750x0.370" (t)) (60 ksi Yield Strength) - Reference: Stainless Original Construction Drawings

$K_{unbraced} := 1.0$ (Conservative Assumption)

$r_{existing.leg} := 2.30192in$

$F_{y.leg} := 60ksi$

$A_{existing.leg} := 7.65763in^2$

Slenderness Check [AISC B4.1a]

$$Slenderness_{CHECK} := if\left(\frac{8.6250in}{0.3125in} < 0.11 \cdot \frac{Steel_{Modulus}}{F_{y.leg}}, \text{"Not Slender - Compression"}, \text{"Slender - Compression"}\right)$$

$$\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{existing.leg}} = 65.16$$

$Slenderness_{CHECK} = \text{"Not Slender - Compression"}$

For Non-Slender Members, Apply AISC Equation E3-2

$$F_e := \frac{\pi^2 \cdot 29000ksi}{\left(\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{existing.leg}}\right)^2} = 67.41 \cdot ksi$$

$$F_{cr} := \left[0.658^{\left(\frac{F_{y.leg}}{F_e}\right)}\right] \cdot F_{y.leg} = 41.34 \cdot ksi$$

Existing Leg Strength - Prior to MODification --> (ϕ = 0.90 - Compression - LRFD [AISC Chapter E])

$$P_{Str.Leg} := 0.90 \cdot F_{cr} \cdot A_{existing.leg} = 284.89 \cdot kip$$

Built-up / Reinforcement Section additional to the existing Leg member:

Determine governing radius of gyration of material:

$A_{reinf} := 10.18176in^2$

$I_{x.reinf} := 54.83656in^4$

$I_{y.reinf} := 54.42957in^4$

$r_{design.reinf} := \min\left(\sqrt{\frac{I_{x.reinf}}{A_{reinf}}}, \sqrt{\frac{I_{y.reinf}}{A_{reinf}}}\right) = 2.31 \cdot in$

$\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{design.reinf}} = 64.88$

```
----------------   REGIONS   ----------------

Area:                    10.18176 sq in
Perimeter:               42.13179 in
Bounding box:         X: -3.62222  --  3.62222 in
                      Y: -4.07382  --  3.05118 in
Centroid:             X: 0.00000 in
                      Y: 0.00000 in
Moments of inertia:   X: 54.83656 sq in sq in
                      Y: 54.42957 sq in sq in
Product of inertia:  XY: 0.00000 sq in sq in
Radii of gyration:    X: 2.32072 in
                      Y: 2.31210 in
Principal moments (sq in sq in) and X-Y directions about centroid:
                      I: 54.83656 along [1.00000 0.00000]
                      J: 54.42957 along [0.00000 1.00000]
```

$$F_{e.reinf} := \frac{\pi^2 \cdot 29000ksi}{\left(\frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{design.reinf}}\right)^2} = 68 \cdot ksi$$

$$F_{cr.BU} := \left[0.658^{\left(\frac{50ksi}{F_{e.reinf}}\right)}\right] \cdot 50ksi = 36.76 \cdot ksi$$

Existing Leg Strength - Prior to MODification --> (ϕ = 0.90 - Compression - LRFD [AISC Chapter E])

$P_{Str.Reinf} := 0.90 \cdot F_{cr.BU} \cdot A_{reinf} = 336.81 \cdot kip$

Difference in materials required to be Developed at end points of reinforcing:

$U_{Bolt.Design.Force} := P_{Str.Reinf} - P_{Str.Leg} = 51.91 \cdot kip$ <------ INSERT THIS VALUE INTO TABLE (Next Page)

TIA-222-G U-Bolt Strength Design Check:

$V_{us} := 52.0kip$ $\quad F_{y.UBolt} := 92ksi$ $\quad dia_{UBolt} := \frac{5}{8}in$

$$\left(\frac{V_{us}}{\phi_u \cdot R_{ns}}\right)^2 + \left(\frac{T_{ur}}{\phi_u \cdot R_{nr}}\right)^2 \le 1.0$$

$T_{ur} := 0kip$ $\quad FU_{UBolt} := 120ksi$ $\quad A_{g.UBolt} := \left(\frac{\pi}{4}\right)\cdot(dia_{UBolt})^2$

$\phi_u := 1.00$ $\quad N_{UBolt.Ends} := 10$ $\quad R_{ns} := 0.30\cdot(2\cdot T_p - T_{ut})$

$T_{ut} := 0kip$ $\quad T_p := 10000lbf$ <-- Installation Pretension Force - Manual Input

$R_{ns} := 0.30\cdot(2\cdot T_p - T_{ut})$ $\quad R_{ns} = 6.00\cdot kip$

Maximum U-Bolt Tension Capacity, where the tensile capacity of each leg of the U-Bolt shall not exceed 0.85 Fy*Ag of bolt used.

$Check_{UBolt} := if(T_p < 0.85\cdot F_{y.UBolt}\cdot A_{g.UBolt}, \text{"OK for Use"}, \text{"NOT ok for Use"})$ $\quad Check_{UBolt} = \text{"OK for Use"}$

$R_{nr} := 0.5\cdot D_{Leg}\cdot R_{ns}$

$$UBolt_{Str.Ratio} := \left(\frac{\frac{V_{us}}{N_{UBolt.Ends}}}{\phi_u \cdot R_{ns}}\right)^2 + \left(\frac{T_{ur}}{\phi_u \cdot R_{nr}}\right)^2 \qquad UBolt_{Str.Ratio} = 0.75$$

$Check_{UBolt} := if(UBolt_{Str.Ratio} \le 1.0, \text{"OK for Use"}, \text{"NOT ok for Use"})$ $\quad Check_{UBolt} = \text{"OK for Use"}$

CHECK Existing Leg Capacity for Pipe Crushing Capacity (localized impact) to select maximum permissible U-Bolt Diameter Limit:

$$R_u := \phi\cdot\left[5.5\cdot F_y\cdot t^2\left(1 + 0.25\cdot\frac{l_b}{D}\right)\cdot Q_f\right]$$ [AISC Equation K1-2]

$F_{y.leg} = 60\cdot ksi$

$D := 6.8750in$

$t := 0.375in\cdot 0.93$

$l_b := 1.5in$ (Localized Bearing on HSS - Coordinate dimension with "Connection Plate Ht." (following Page))

$U := 1$ Assuming @ Capacity value (Conservative Assumption)

$Q_f := 1 - 0.3\cdot U\cdot(1 + U)$ $\quad Q_f = 0.4$ [AISC Equation K1-5]

$$R_{u.crushingHSS} := 0.9\cdot\left[5.5\cdot F_{y.leg}\cdot t^2\left(1 + 0.25\cdot\frac{l_b}{D}\right)\cdot Q_f\right] \qquad R_{u.crushingHSS} = 15.24\cdot kip$$

$Check_{UBolt.Leg} := if(R_{ns} < R_{u.crushingHSS}, \text{"OK for Use"}, \text{"NOT ok for Use"})$ $\quad Check_{UBolt.Leg} = \text{"OK for Use"}$

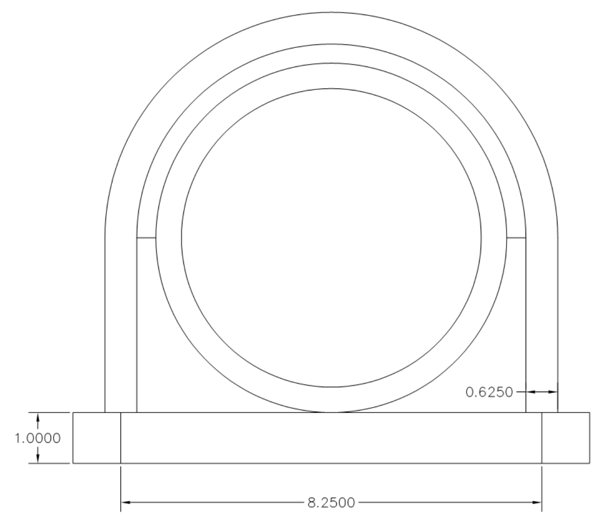
CHECK Plastic Bending Capacity of connecting Plates to hold U-Bolt and Clamped reinforcing pipe to leg:

$$\sigma := \frac{M}{Z} = \frac{P_a}{\left(\frac{b \cdot d^2}{4}\right)} \quad \text{--->} \quad P := \frac{1 \cdot (0.9 \cdot \sigma) \cdot \left(\frac{b \cdot d^2}{4}\right)}{a}$$

$\sigma := 50000\text{psi}$ $\qquad d_{Plate.Thick} := 0.375\text{in} + 0.5625\text{in}$ $\qquad L_{clamp.ends} := 2.25\text{in}$

$b_{PlateHeight} := 2.5\text{in}$

NOTE: "d.Plate.Thick" considering average thickness of plate and pipe support backing for plate thickness (Image Below)



$$P_{U\_Bolt.Plate} := \frac{1 \cdot (0.9 \cdot \sigma) \cdot \left(\frac{b_{PlateHeight} \cdot d_{Plate.Thick}{}^2}{4}\right)}{L_{clamp.ends}} = 10986.33 \cdot \text{lbf}$$

$Check_{UBolt.Plate} := \text{if}\left(T_p < P_{U\_Bolt.Plate}, \text{"OK for Use"}, \text{"NOT ok for Use"}\right)$ $\qquad Check_{UBolt.Plate} = \text{"OK for Use"}$

U-Bolt CHECK Summary for all parts of U-bolting to address Reinforcing Tube at ends to develop Reinforcement properties

$Check_{UBolt} = \text{"OK for Use"}$ $\qquad \frac{T_p}{\left(0.85 \cdot F_{y.UBolt} \cdot A_{g.UBolt}\right)} = 0.42$ $\qquad Check_{UBolt.Leg} = \text{"OK for Use"}$

$\frac{R_{ns}}{R_{u.crushingHSS}} = 0.39$

$Check_{UBolt.Plate} = \text{"OK for Use"}$ $\qquad \frac{T_p}{P_{U\_Bolt.Plate}} = 0.91$

Design Required for Remainder of Clamps required for installation to keep Reinforcement attached to Leg:

Consider --> 150 deg. HSS 7.50x0.250

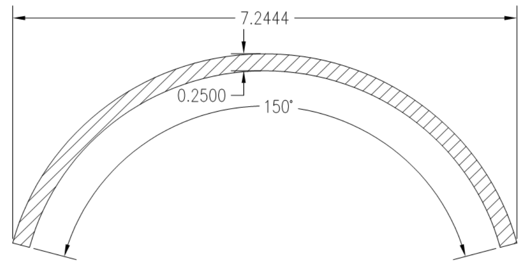
$$I_{x.Pipe} := 1.59793 in^4$$

$$I_{y.Pipe} := 12.62626 in^4$$

$$A_{pipe} := 2.37256 in^2$$

```
----------------   REGIONS   ----------------

Area:                    2.37256 sq in
Perimeter:               19.48046 in
Bounding box:         X: -3.62222  --  3.62222 in
                      Y: -1.77012  --  1.07401 in
Centroid:             X: 0.00000 in
                      Y: 0.00000 in
Moments of inertia:   X: 1.59793 sq in sq in
                      Y: 12.62626 sq in sq in
Product of inertia:  XY: 0.00000 sq in sq in
Radii of gyration:    X: 0.82067 in
                      Y: 2.30690 in
Principal moments (sq in sq in) and X-Y directions about centroid:
                      I: 1.59793 along [1.00000 0.00000]
                      J: 12.62626 along [0.00000 1.00000]
```



$$r_{design.Pipe} := \min\left(\sqrt{\frac{I_{x.Pipe}}{A_{pipe}}}, \sqrt{\frac{I_{y.Pipe}}{A_{pipe}}}\right) = 0.82 \cdot in$$

Determine the minimum number of clamps per bay to keep the effective strength of the "bonded" bracing ends:

$$KL_{Leg} := \frac{K_{unbraced} \cdot L_{max.Unbraced}}{r_{existing.leg}} = 65.16$$

Enter Minimum # of clamps here ---> $Num_{clamps.min} := 13$

$$KL_{Reinf} := \frac{\frac{L_{max.Unbraced}}{\left(Num_{clamps.min} - 1\right)}}{r_{design.Pipe}} = 15.23$$

$$Min_{clamps} := \text{if}\left(KL_{Reinf} < KL_{Leg}, \text{"Number of Clamps Determined"}, \text{"Add clamp"}\right)$$

$$Min_{clamps} = \text{"Number of Clamps Determined"}$$

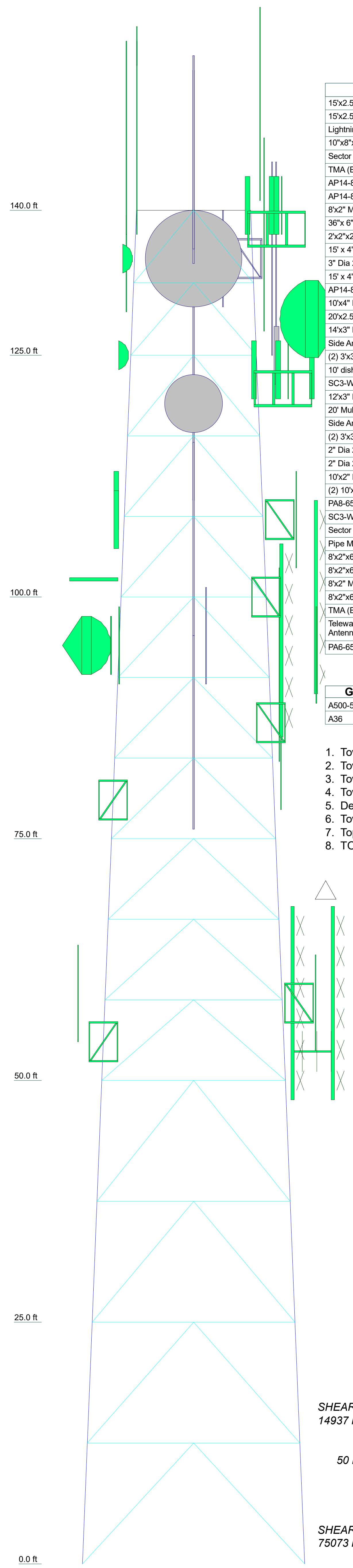
Determine maximim of separation of u-bolts per bay to keep effective strength of the "bonded bracing ends:

$$\frac{L_{max.Unbraced}}{Num_{clamps.min}} = 11.54 \cdot in$$

The figure to the left is always considered rounded down. This indicates the maximum permissible spacing of any U-bolt clamps not associated to the "bonding" ends of the reinforcement to the tower structure.

TNX TOWER INPUT / OUTPUT SUMMARY

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Inner Bracing	Face Width (ft)	# Panels @ (ft)	Weight (lb)
T1	HSS5x0.25	A500-50	2L2 1/2x2x3/16x3/8	A36	L3x3x1/4		N.A.	11.8	2 @ 7.5	1617.9
T2	HSS5x0.25		2L3x2 1/2x1/4x3/8	A36		L3x3x1/4		13	9 @ 8.33333	3628.8
T3	HSS5x.375		2L3x2 1/2x1/4x3/8			L3x4x1/4		15	9 @ 8.33333	4420.6
T4	HSS5x.375		2L3x2 1/2x1/4x3/8		N.A.	2L3x2 1/2x1/4x3/8	L2 1/2x2 1/2x3/16	17	9 @ 8.33333	5214.1
T5	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)		2L3 1/2x3x1/4x3/8			L4x4x1/4		19	4 @ 12.5	5900.7
T6	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50		2L4x3x5/16x3/8	A529-50		L4x4x1/4		21 / 23	4 @ 12.5	7479.9
										28260.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
15'x2.5" Horizontal Pipe (E)	140.5	Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed) (Eversource Mount @ 107' - PROPOSED)	117
15'x2.5" Extension Pipe	140	6' x2.5" - Sch 40 Antenna Pipe (Vertical) (Eversource Mount)	117
Lightning Rod 5/8"x4'	140	Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 95' - PROPOSED)	113.125
10"x8"x4" Junction Box (E)	137.5	6'x2" Horizontal Pipe (E)	109
Sector Mount [SM 403-1] (E)	137.5	12"x12" Panel Antenna (E)	109
TMA (E)	137.5	12"x12" Panel Antenna (E)	109
AP14-850/105 w/Mount Pipe (E)	137.5	(2) 4'x2" Horizontal Mount Pipe (E)	108
AP14-850/105 w/Mount Pipe (E)	137.5	12'x2" Horizontal Pipe (E)	108
8'x2" Mount Pipe (E)	137.5	10'x2" Horizontal Pipe (E)	100
36"x 6"x3" panel antenna w/ Mount Pipe (E)	137.5	3' Yagi (E)	100
2'x2"x2" Vertical Tube (E)	137.5	Side Arm Mount [SO 601-1] (E)	100
15' x 4" Mount Pipe (E)	137.5	2" Dia 10' Omni (E)	100
3" Dia 20' Omni (E)	137.5	(2) 3'x3"x3" Horizontal Angle (E)	100
15' x 4" Mount Pipe (E)	137	(2) 3'x3"x3" Horizontal Angle (E)	96
AP14-850/105 w/Mount Pipe (E)	135	2" Dia 20' Omni (E)	96
10'x4" Mount Pipe (E)	135	20' Multi Array Dipole (E)	96
20'x2.5" Mount Pipe (E)	135	10'x4" Mount Pipe (E)	96
14'x3" Mount Pipe (E)	135	Side Arm Mount [SO 601-1] (E)	96
Side Arm Mount [SO 601-1] (E)	135	MD-S6 (for 6' MW) : Ice Shield (E)	95
(2) 3'x3"x3" Horizontal Angle (E)	135	ANT450F6 (CSP Add)	95
10' dish (E)	135	8'x4" Mount Pipe (E)	95
SC3-W100AD (CSP - Existing @ 135')	135	15' x 4" Mount Pipe (E)	95
12'x3" Mount Pipe (E)	134.5	PA6-65 (Diversity CSP)	95
20' Multi Array Dipole (E)	134.5	10'x2" Horizontal Pipe (E)	92
Side Arm Mount [SO 601-1] (E)	133	2" Dia 20' Omni (E)	87
(2) 3'x3"x3" Horizontal Angle (E)	133	Side Arm Mount [SO 601-1] (E)	87
2" Dia 20' Omni (E)	133	12'x2" Horizontal Pipe (E)	83
2" Dia 20' Omni (E)	133	Single Bay Dipole (E)	83
10'x2" Horizontal Pipe (E)	132.5	Side Arm Mount [SO 601-1] (E)	79
(2) 10'x2" Horizontal Pipe (E)	130	(2) 4'x2" Horizontal Mount Pipe (E)	58
PA8-65 (E)	128.75	12'x2" Horizontal Pipe (E)	58
SC3-W100AD (CSP - Existing @ 125')	125	Single Dipole Antenna (E)	58
Sector Mount [SM 403-1] (E)	121	Side Arm Mount [SO 601-1] (E)	54
Pipe Mount [PM 602-1] (E)	121	7' Whip (E)	54
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	121	3' Yagi (E)	53
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	121	6'x2" Mount Pipe (E)	52
8'x2" Mount Pipe (E)	121	Single Bay Dipole Antenna (E)	52
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	121		
TMA (E)	121		
Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 110' - PROPOSED)	120.875		
PA6-65 (E)	120		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A529-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Windham County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-H Standard.
3. Tower designed for a 145 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category III.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 99.2%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 320154 lb
SHEAR: 41762 lb

UPLIFT: -279131 lb
SHEAR: 37045 lb

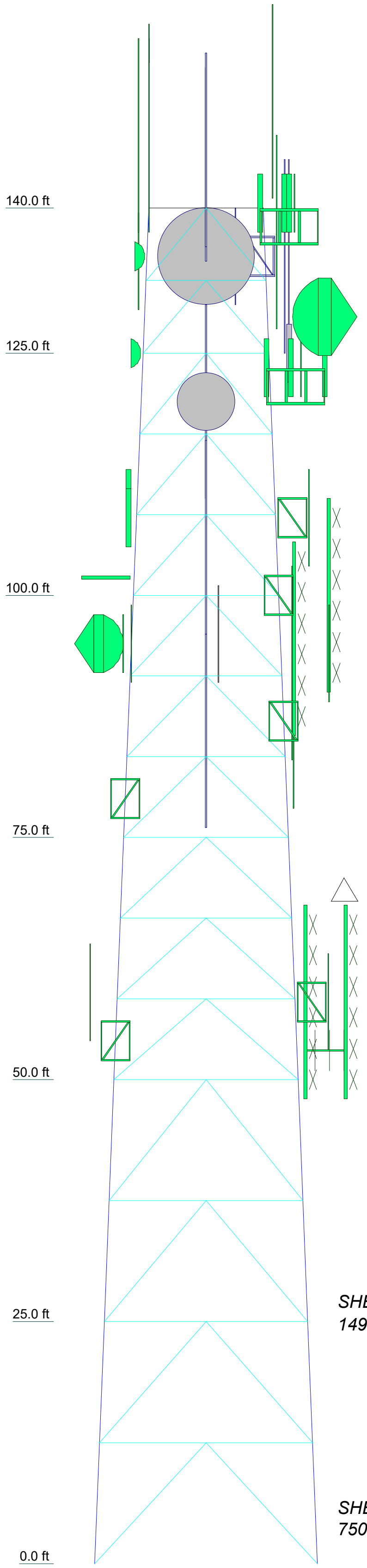
AXIAL 101482 lb
SHEAR 14937 lb
MOMENT 1391 kip-ft
TORQUE 57 kip-ft
50 mph WIND - 1.000 in ICE

AXIAL 47277 lb
SHEAR 75073 lb
MOMENT 6071 kip-ft
TORQUE 219 kip-ft
REACTIONS - 145 mph WIND

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

Job:	140' Self-Suporting Lattice Tower
Project:	CSP Tower - Stearling, CT (Ekonk Hill)
Client:	EVS-011 / Eversource / Modification / Phase (b) / TIA-222-H Applied
Drawn by:	MCD
App'd:	
Code:	TIA-222-H
Date:	11/25/20
Scale:	NTS
Path:	C:\Users\michael.dallckas\Desktop\20201119_EVS-011 B1 Mod_Sterling_CT\2_TIA-222-H\20200903_EVS_H_Ekonk Structural Analysis.eri
Dwg No.	E-1

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Inner Bracing	Face Width (ft)	# Panels @ (ft)	Weight (lb)
T1	HSS5x0.25	A500-50	2L2 1/2x2x3/16x3/8	A36	L3x3x1/4	L3x3x1/4	N.A.	11.8	2 @ 7.5	1617.9
T2	HSS5x0.25	A500-50	2L2 1/2x2x3/16x3/8	A36	N.A.	L3x3x1/4	N.A.	13	9 @ 8.33333	3626.8
T3	HSS5x.375	A500-50	2L3x2 1/2x1/4x3/8	A36	N.A.	L3x4x1/4	N.A.	15	9 @ 8.33333	4420.6
T4	HSS5x.375	A500-50	2L3x2 1/2x1/4x3/8	A36	N.A.	2L3x2 1/2x1/4x3/8	L2 1/2x2 1/2x3/16	17	9 @ 8.33333	5214.1
T5	A	A500-50	2L3 1/2x3x1/4x3/8	A36	N.A.	L4x4x1/4	L2 1/2x2 1/2x3/16	19	4 @ 12.5	5900.7
T6	B	A500-50	2L4x3x5/16x3/8	A529-50	N.A.	L4x4x1/4	L2 1/2x2 1/2x3/16	21 / 23	4 @ 12.5	7479.9
										28260.0



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	B	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A529-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Windham County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-H Standard.
3. Tower designed for a 145 mph basic wind in accordance with the TIA-222-H Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category III.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 99.2%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 320154 lb
SHEAR: 41762 lb

UPLIFT: -279131 lb
SHEAR: 37045 lb

AXIAL 101482 lb
SHEAR 14937 lb
MOMENT 1391 kip-ft
TORQUE 57 kip-ft
50 mph WIND - 1.000 in ICE

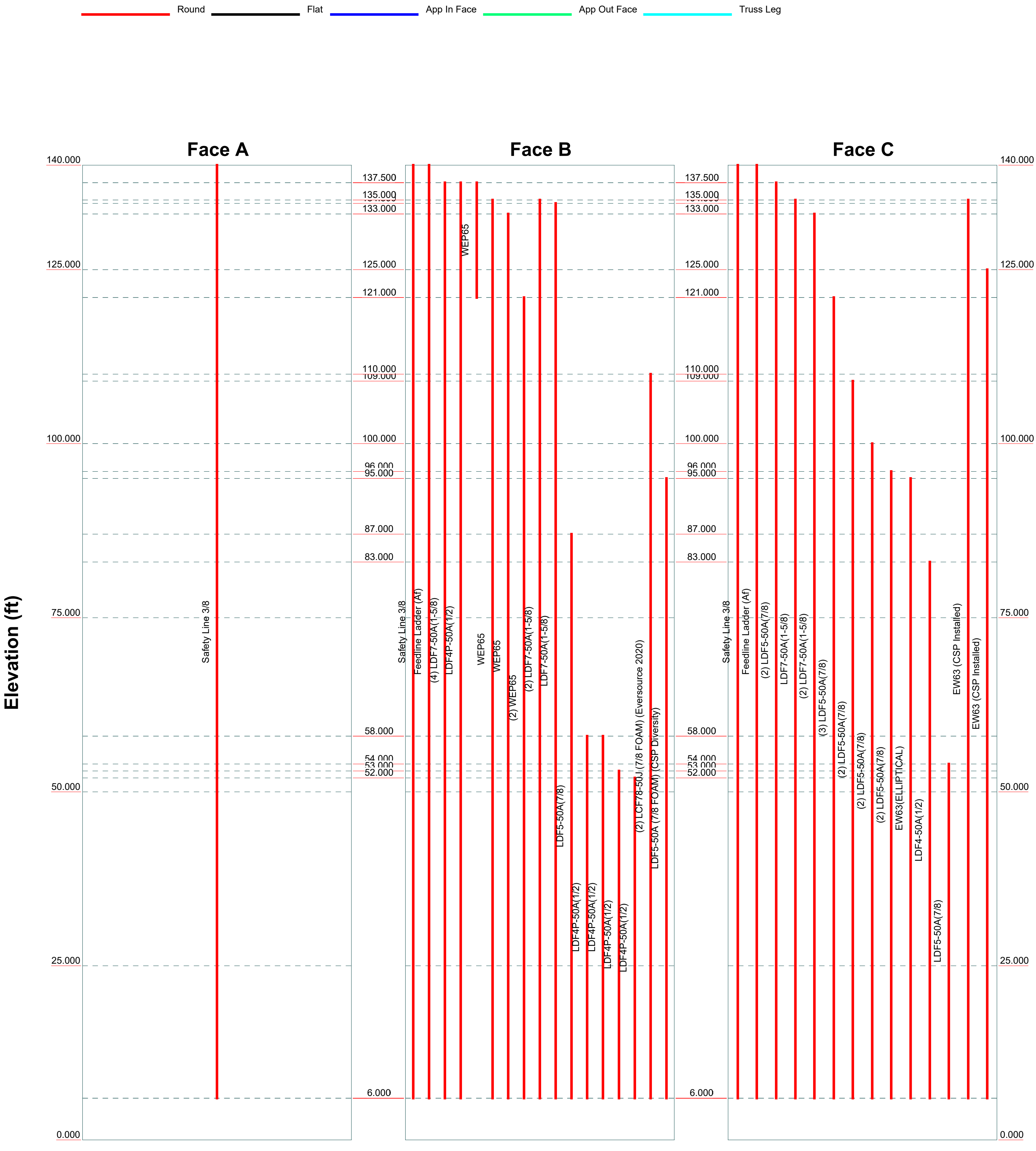
AXIAL 47277 lb
SHEAR 75073 lb
MOMENT 6071 kip-ft
TORQUE 219 kip-ft
REACTIONS - 145 mph WIND

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

Job:	***140' Self-Suporting Lattice Tower***
Project:	***CSP Tower - Stearling, CT (Ekonk Hill)***
Client:	EVS-011 / Eversource / Modification / Phase (b) / TIA-222-H Applied — Drawn by: MCD — App'd:
Code:	TIA-222-H — Date: 11/25/20 — Scale: NTS
Path:	C:\Users\michael.dalickas\Desktop\20201119_EVS-011 B1 Mod_Sterling_CT\2_TIA-222-H\20200903_EVS_H_Ekonk Structural Analysis.eri — Dwg No. E-1

TNX TOWER FEEDLINE DISTRIBUTION CHART

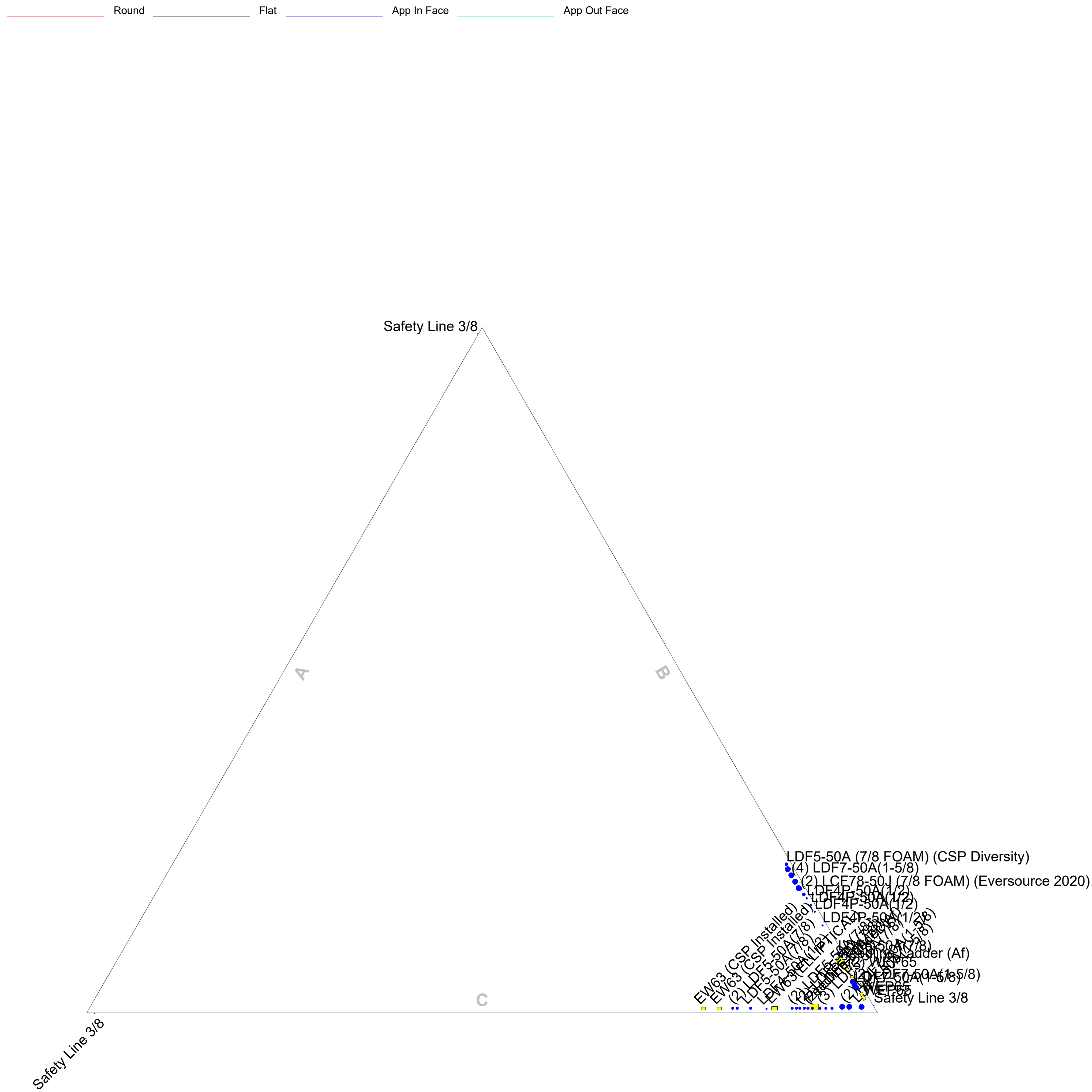
Feed Line Distribution Chart
0' - 140'



AECOM	Job: ***140' Self-Suporting Lattice Tower***				
500 Enterprise Drive, Suite 3B	Project: ***CSP Tower - Stearling, CT (Ekonk Hill)***				
Rocky Hill, CT	Client: EVS-011 / Eversource / Modification / Phase (b) / TIA-222-H Applied	Drawn by: MCD		App'd:	
Phone: 860-263-5800	Code: TIA-222-H	Date: 11/25/20		Scale: NTS	
FAX: 860-812-2094	Path: C:\Users\michael.dalickas\Desktop\20201119_EVS-011 B1 Mod_Sterling_CT\2_TIA-222-H\20200903_EVS_H_Ekonk Structural Analysis.eri			Dwg No. E-7	

TNX TOWER FEEDLINE PLAN

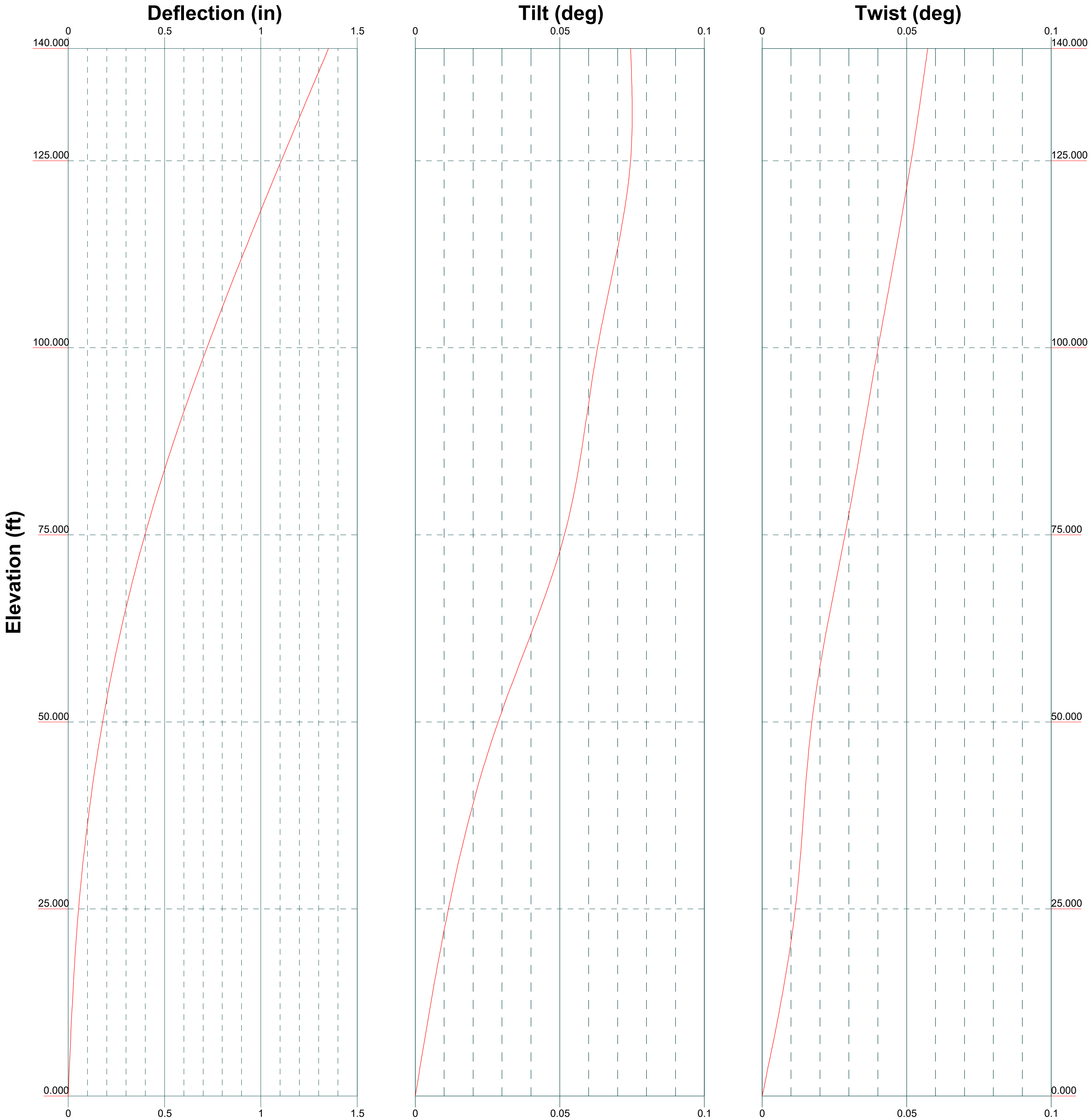
Feed Line Plan



AECOM	Job: 140' Self-Suporting Lattice Tower		
500 Enterprise Drive, Suite 3B	Project: CSP Tower - Stearling, CT (Ekonk Hill)		
Rocky Hill, CT	Client: EVS-011 / Eversource / Modification / Phase (b) / TIA-222-H Applied	Drawn by: MCD	App'd:
Phone: 860-263-5800	Code: TIA-222-H	Date: 11/25/20	Scale: NTS
FAX: 860-812-2094	Path: C:\Users\michael.dalickas\Desktop\20201119_EVS-011 B1 Mod_Sterling_CT\2_TIA-222-H\20200903_EVS_H_Ekonk Structural Analysis.eri		Dwg No. E-7

TNX TOWER DEFLECTION, TILT AND TWIST

TIA-222-H - Service - 60 mph **Maximum Values**



AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***140' Self-Suporting Lattice Tower***		
	Project: ***CSP Tower - Stearling, CT (Ekonk Hill)***		
	Client: EVS-011 / Eversource / Modification / Phase (b) / TIA-222-H Applied	Drawn by: MCD	App'd:
	Code: TIA-222-H	Date: 11/25/20	Scale: NTS
	Path: C:\Users\michael.dalickas\Desktop\20201119_EVS-011 B1 Mod_Sterling_CT\2_TIA-222-H\20200903_EVS_H_Ekonk Structural Analysis.eri		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 140.000 ft above the ground line.
The base of the tower is set at an elevation of 0.000 ft above the ground line.
The face width of the tower is 11.800 ft at the top and 23.000 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

- Tower is located in Windham County, Connecticut.
- Tower base elevation above sea level: 0.000 ft.
- Basic wind speed of 145 mph.
- Risk Category III.
- Exposure Category C.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.000 ft.
- Nominal ice thickness of 1.000 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.
- 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

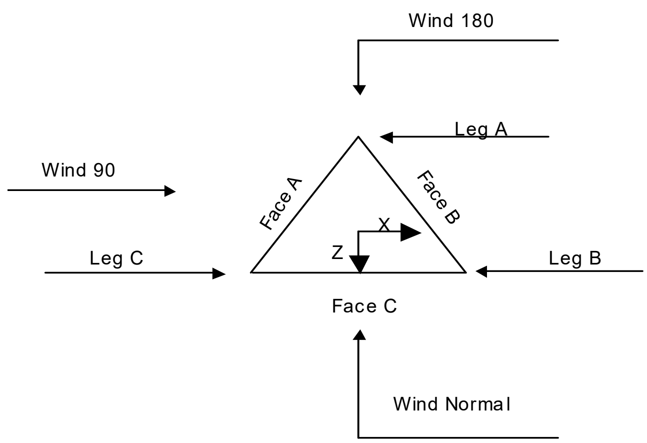
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
√ Leg Bolts Are At Top Of Section
√ Secondary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

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

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

Poles

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



Triangular Tower

Tower Section Geometry

Tower Section	*Tower Elevation* ft	*Assembly Database*	*Description*	*Section Width* ft	*Number of Sections*	*Section Length* ft
T1	140.000-125.000			11.800	1	15.000
T2	125.000-100.000			13.000	1	25.000
T3	100.000-75.000			15.000	1	25.000
T4	75.000-50.000			17.000	1	25.000
T5	50.000-25.000			19.000	1	25.000
T6	25.000-0.000			21.000	1	25.000

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	140.000-125.000	7.500	K Brace Down	No	Yes	0.000	0.000
T2	125.000-100.000	8.333	K Brace Down	No	Yes	0.000	0.000
T3	100.000-75.000	8.333	K Brace Down	No	Yes	0.000	0.000
T4	75.000-50.000	8.333	K Brace Down	No	Yes	0.000	0.000
T5	50.000-25.000	12.500	K Brace Down	No	Yes	0.000	0.000
T6	25.000-0.000	12.500	K Brace Down	No	Yes	0.000	0.000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Type*	*Leg Size*	*Leg Grade*	*Diagonal Type*	*Diagonal Size*	*Diagonal Grade*
T1 140.000-125.000	Pipe	HSS5x0.25	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x3/16x3/8	A36 (36 ksi)
T2 125.000-100.000	Pipe	HSS5x0.25	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T3 100.000-75.000	Pipe	HSS5x.375	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T4 75.000-50.000	Pipe	HSS5x.375	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T5 50.000-25.000	Arbitrary Shape	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	A500-50 (50 ksi)	Double Angle	2L3 1/2x3x1/4x3/8	A36 (36 ksi)
T6 25.000-0.000	Arbitrary Shape	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50	A500-50 (50 ksi)	Double Angle	2L4x3x5/16x3/8	A529-50 (50 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 140.000-125.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T2 125.000-100.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T3 100.000-75.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x4x1/4	A36 (36 ksi)
T4 75.000-50.000	None	Flat Bar		A36 (36 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T5 50.000-25.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T6 25.000-0.000	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*
T2 125.000-100.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 100.000-75.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 75.000-50.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 50.000-25.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 25.000-0.000	Equal Angle		A36	Single Angle	L2 1/2x2 1/2x3/16	A36

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Tower Elevation *ft*	*Secondary Horizontal Type*	*Secondary Horizontal Size*	*Secondary Horizontal Grade*	*Inner Bracing Type*	*Inner Bracing Size*	*Inner Bracing Grade*
			(36 ksi)			(36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Gusset Area (per face)* *ft²*	*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 140.000-125.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	39.700	Mid-Pt	Mid-Pt
T2 125.000-100.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	44.850	Mid-Pt	Mid-Pt
T3 100.000-75.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	47.620	Mid-Pt	Mid-Pt
T4 75.000-50.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	50.560	Mid-Pt	Mid-Pt
T5 50.000-25.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	65.310	Mid-Pt	Mid-Pt
T6 25.000-0.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	67.950	Mid-Pt	Mid-Pt

Tower Section Geometry *(cont'd)*

			K Factors[1]							
Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*Legs*	*X Brace Diags* *X* *Y*	*K Brace Diags* *X* *Y*	*Single Diags* *X* *Y*	*Girts* *X* *Y*	*Horiz.* *X* *Y*	*Sec. Horiz.* *X* *Y*	*Inner Brace* *X* *Y*
T1 140.000-125.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 125.000-100.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 100.000-75.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 75.000-50.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 50.000-25.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 25.000-0.000	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 140.000-125.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T2 125.000-100.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T3 100.000-75.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T4 75.000-50.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T5 50.000-25.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T6 25.000-0.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	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 140.000-125.000	Flange	0.750 A325X	0	0.750 A325X	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T2 125.000-100.000	Flange	0.750 A325X	6	0.750 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T3 100.000-75.000	Flange	0.750 A325X	6	0.750 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T4 75.000-50.000	Flange	0.750 A325X	6	0.750 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T5 50.000-25.000	Flange	1.000 A325X	6	1.000 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T6 25.000-0.000	Flange	1.000 A325X	8	1.000 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Safety Line 3/8	A	No	No	Ar (CaAa)	140.000 - 6.000	0.000	0.49	1	1	0.375	0.375		0.22
Safety Line 3/8	B	No	No	Ar (CaAa)	140.000 - 6.000	0.000	0.49	1	1	0.375	0.375		0.22
Safety Line 3/8	C	No	No	Ar (CaAa)	140.000 - 6.000	0.000	0.49	1	1	0.375	0.375		0.22
Feedline Ladder (Af)	B	No	No	Af (CaAa)	140.000 - 6.000	-1.000	0.42	1	1	3.000	3.000		8.40
Feedline Ladder (Af)	C	No	No	Af (CaAa)	140.000 - 6.000	-1.000	-0.42	1	1	3.000	3.000		8.40
***													
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	137.500 - 6.000	-1.000	0.3	4	4	0.500	1.980		0.82
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	137.500 - 6.000	-1.000	-0.32	2	2	0.500	1.030		0.33
LDF4P-50A(1/2)	B	No	No	Ar (CaAa)	137.500 - 6.000	-1.000	0.33	1	1	0.500	0.630		0.15
LDF7-50A(1-5/8)	C	No	No	Ar (CaAa)	135.000 - 6.000	-1.000	-0.48	1	1	0.500	1.980		0.82
WEP65	B	No	No	Af (CaAa)	137.500 - 121.000	-1.000	0.44	1	1	1.584	1.584		0.53
WEP65	B	No	No	Af (CaAa)	135.000 - 6.000	-1.000	0.47	1	1	1.584	1.584		0.53
WEP65	B	No	No	Af (CaAa)	133.000 - 6.000	-1.000	0.475	1	1	1.584	1.584		0.53
WEP65	B	No	No	Af (CaAa)	121.000 - 6.000	-1.000	0.44	2	2	1.584	1.584		0.53
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	135.000 - 6.000	-1.000	0.455	2	2	0.500	1.980		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	134.500 - 6.000	-1.000	0.455	1	1	0.500	1.980		0.82
LDF7-50A(1-5/8)	C	No	No	Ar (CaAa)	133.000 - 6.000	-1.000	-0.46	2	2	0.500	1.980		0.82
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	121.000 - 6.000	-1.000	-0.435	3	3	1.030	1.030		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	109.000 - 6.000	-1.000	-0.415	2	2	0.500	1.030		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	100.000 - 6.000	-1.000	-0.405	2	2	0.500	1.030		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	87.000 - 6.000	-1.000	0.41	1	1	0.500	1.030		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	96.000 - 6.000	-1.000	-0.395	2	2	0.500	1.030		0.33
EW63(ELLIPTICAL)	C	No	No	Af (CaAa)	95.000 - 6.000	-1.000	-0.37	1	1	0.500	2.010		0.51
LDF4-50A(1/2)	C	No	No	Ar (CaAa)	83.000 - 6.000	-1.000	-0.36	1	1	0.625	0.625		0.15
LDF4P-50A(1/2)	B	No	No	Ar (CaAa)	58.000 - 6.000	-1.000	0.37	1	1	0.500	0.630		0.15
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	54.000 - 6.000	-1.000	-0.34	1	1	0.500	1.030		0.33
LDF4P-50A(1/2)	B	No	No	Ar (CaAa)	58.000 - 6.000	-1.000	0.35	1	1	0.500	0.630		0.15
LDF4P-50A(1/2)	B	No	No	Ar (CaAa)	53.000 - 6.000	-1.000	0.34	1	1	0.500	0.630		0.15
LDF4P-50A(1/2)	B	No	No	Ar (CaAa)	52.000 - 6.000	-1.000	0.34	1	1	0.500	0.630		0.15
****Proposed ****													
* CSP Add													

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
Dishes													
EW63 (CSP Installed)	C	No	No	Af (CaAa)	135.000 - 6.000	-1.000	-0.3	1	1	1.574	1.574		0.51
EW63 (CSP Installed)	C	No	No	Af (CaAa)	125.000 - 6.000	-1.000	-0.28	1	1	1.574	1.574		0.51
* EVS Proposed (2020 Inventory)													
LCF78-50J (7/8 FOAM) (Eversource 2020)	B	No	No	Ar (CaAa)	110.000 - 6.000	-1.000	0.32	2	2	1.100	1.100		0.53
LDF5-50A (7/8 FOAM) (CSP Diversity)	B	No	No	Ar (CaAa)	95.000 - 6.000	-1.000	0.28	1	1	1.090	1.090		0.33

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	140.000-125.000	A	0.000	0.000	0.563	0.000	3.30
		B	0.000	0.000	32.641	0.000	212.53
		C	0.000	0.000	18.409	0.000	163.97
T2	125.000-100.000	A	0.000	0.000	0.938	0.000	5.50
		B	0.000	0.000	77.200	0.000	424.23
		C	0.000	0.000	54.899	0.000	345.73
T3	100.000-75.000	A	0.000	0.000	0.938	0.000	5.50
		B	0.000	0.000	84.971	0.000	452.81
		C	0.000	0.000	76.107	0.000	402.01
T4	75.000-50.000	A	0.000	0.000	0.938	0.000	5.50
		B	0.000	0.000	88.178	0.000	461.90
		C	0.000	0.000	80.080	0.000	411.07
T5	50.000-25.000	A	0.000	0.000	0.938	0.000	5.50
		B	0.000	0.000	93.155	0.000	473.75
		C	0.000	0.000	82.243	0.000	418.00
T6	25.000-0.000	A	0.000	0.000	0.713	0.000	4.18
		B	0.000	0.000	70.798	0.000	360.05
		C	0.000	0.000	62.505	0.000	317.68

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	140.000-125.000	A	1.322	0.000	0.000	4.527	0.000	44.39
		B		0.000	0.000	71.365	0.000	894.47
		C		0.000	0.000	44.307	0.000	566.75
T2	125.000-100.000	A	1.300	0.000	0.000	7.438	0.000	72.01

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
		B		0.000	0.000	170.921	0.000	1998.30
		C		0.000	0.000	139.585	0.000	1571.33
T3	100.000-75.000	A	1.268	0.000	0.000	7.276	0.000	69.11
		B		0.000	0.000	195.448	0.000	2204.05
		C		0.000	0.000	204.627	0.000	2087.03
T4	75.000-50.000	A	1.226	0.000	0.000	7.067	0.000	65.44
		B		0.000	0.000	205.279	0.000	2259.15
		C		0.000	0.000	213.806	0.000	2129.92
T5	50.000-25.000	A	1.165	0.000	0.000	6.761	0.000	60.28
		B		0.000	0.000	223.911	0.000	2358.62
		C		0.000	0.000	215.521	0.000	2090.05
T6	25.000-0.000	A	1.044	0.000	0.000	4.678	0.000	38.55
		B		0.000	0.000	161.563	0.000	1602.09
		C		0.000	0.000	155.361	0.000	1418.39

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	140.000-125.000	17.557	10.578	22.822	13.178
T2	125.000-100.000	25.392	15.639	33.049	19.107
T3	100.000-75.000	31.622	18.832	41.682	23.662
T4	75.000-50.000	34.915	20.770	46.725	26.519
T5	50.000-25.000	30.847	18.889	47.470	27.386
T6	25.000-0.000	26.044	16.112	41.893	24.308

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	Safety Line 3/8	125.00 - 140.00	0.6000	0.6000
T1	2	Safety Line 3/8	125.00 - 140.00	0.6000	0.6000
T1	3	Safety Line 3/8	125.00 - 140.00	0.6000	0.6000
T1	4	Feedline Ladder (Af)	125.00 - 140.00	0.6000	0.6000
T1	5	Feedline Ladder (Af)	125.00 - 140.00	0.6000	0.6000
T1	7	LDF7-50A(1-5/8)	125.00 - 137.50	0.6000	0.6000
T1	8	LDF5-50A(7/8)	125.00 - 137.50	0.6000	0.6000
T1	9	LDF4P-50A(1/2)	125.00 - 137.50	0.6000	0.6000
T1	10	LDF7-50A(1-5/8)	125.00 - 135.00	0.6000	0.6000
T1	11	WEP65	125.00 - 137.50	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	12	WEP65	125.00 - 135.00	0.6000	0.6000
T1	13	WEP65	125.00 - 133.00	0.6000	0.6000
T1	15	LDF7-50A(1-5/8)	125.00 - 135.00	0.6000	0.6000
T1	16	LDF7-50A(1-5/8)	125.00 - 134.50	0.6000	0.6000
T1	17	LDF7-50A(1-5/8)	125.00 - 133.00	0.6000	0.6000
T1	36	EW63	125.00 - 135.00	0.6000	0.6000
T2	1	Safety Line 3/8	100.00 - 125.00	0.6000	0.6000
T2	2	Safety Line 3/8	100.00 - 125.00	0.6000	0.6000
T2	3	Safety Line 3/8	100.00 - 125.00	0.6000	0.6000
T2	4	Feedline Ladder (Af)	100.00 - 125.00	0.6000	0.6000
T2	5	Feedline Ladder (Af)	100.00 - 125.00	0.6000	0.6000
T2	7	LDF7-50A(1-5/8)	100.00 - 125.00	0.6000	0.6000
T2	8	LDF5-50A(7/8)	100.00 - 125.00	0.6000	0.6000
T2	9	LDF4P-50A(1/2)	100.00 - 125.00	0.6000	0.6000
T2	10	LDF7-50A(1-5/8)	100.00 - 125.00	0.6000	0.6000
T2	11	WEP65	121.00 - 125.00	0.6000	0.6000
T2	12	WEP65	100.00 - 125.00	0.6000	0.6000
T2	13	WEP65	100.00 - 125.00	0.6000	0.6000
T2	14	WEP65	100.00 - 121.00	0.6000	0.6000
T2	15	LDF7-50A(1-5/8)	100.00 - 125.00	0.6000	0.6000
T2	16	LDF7-50A(1-5/8)	100.00 - 125.00	0.6000	0.6000
T2	17	LDF7-50A(1-5/8)	100.00 - 125.00	0.6000	0.6000
T2	18	LDF5-50A(7/8)	100.00 - 121.00	0.6000	0.6000
T2	20	LDF5-50A(7/8)	100.00 - 109.00	0.6000	0.6000
T2	36	EW63	100.00 - 125.00	0.6000	0.6000
T2	37	EW63	100.00 - 125.00	0.6000	0.6000
T2	39	LCF78-50J (7/8 FOAM)	100.00 - 110.00	0.6000	0.6000
T3	1	Safety Line 3/8	75.00 - 100.00	0.6000	0.6000
T3	2	Safety Line 3/8	75.00 - 100.00	0.6000	0.6000
T3	3	Safety Line 3/8	75.00 - 100.00	0.6000	0.6000
T3	4	Feedline Ladder (Af)	75.00 - 100.00	0.6000	0.6000
T3	5	Feedline Ladder (Af)	75.00 - 100.00	0.6000	0.6000
T3	7	LDF7-50A(1-5/8)	75.00 - 100.00	0.6000	0.6000
T3	8	LDF5-50A(7/8)	75.00 - 100.00	0.6000	0.6000
T3	9	LDF4P-50A(1/2)	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
T3	10	LDF7-50A(1-5/8)	75.00 - 100.00	0.6000	0.6000
T3	12	WEP65	75.00 - 100.00	0.6000	0.6000
T3	13	WEP65	75.00 - 100.00	0.6000	0.6000
T3	14	WEP65	75.00 - 100.00	0.6000	0.6000
T3	15	LDF7-50A(1-5/8)	75.00 - 100.00	0.6000	0.6000
T3	16	LDF7-50A(1-5/8)	75.00 - 100.00	0.6000	0.6000
T3	17	LDF7-50A(1-5/8)	75.00 - 100.00	0.6000	0.6000
T3	18	LDF5-50A(7/8)	75.00 - 100.00	0.6000	0.6000
T3	20	LDF5-50A(7/8)	75.00 - 100.00	0.6000	0.6000
T3	21	LDF5-50A(7/8)	75.00 - 100.00	0.6000	0.6000
T3	22	LDF5-50A(7/8)	75.00 - 87.00	0.6000	0.6000
T3	23	LDF5-50A(7/8)	75.00 - 96.00	0.6000	0.6000
T3	24	EW63(ELLIPTICAL)	75.00 - 95.00	0.6000	0.6000
T3	25	LDF4-50A(1/2)	75.00 - 83.00	0.6000	0.6000
T3	36	EW63	75.00 - 100.00	0.6000	0.6000
T3	37	EW63	75.00 - 100.00	0.6000	0.6000
T3	39	LCF78-50J (7/8 FOAM)	75.00 - 100.00	0.6000	0.6000
T3	41	LDF5-50A (7/8 FOAM)	75.00 - 95.00	0.6000	0.6000
T4	1	Safety Line 3/8	50.00 - 75.00	0.6000	0.6000
T4	2	Safety Line 3/8	50.00 - 75.00	0.6000	0.6000
T4	3	Safety Line 3/8	50.00 - 75.00	0.6000	0.6000
T4	4	Feedline Ladder (Af)	50.00 - 75.00	0.6000	0.6000
T4	5	Feedline Ladder (Af)	50.00 - 75.00	0.6000	0.6000
T4	7	LDF7-50A(1-5/8)	50.00 - 75.00	0.6000	0.6000
T4	8	LDF5-50A(7/8)	50.00 - 75.00	0.6000	0.6000
T4	9	LDF4P-50A(1/2)	50.00 - 75.00	0.6000	0.6000
T4	10	LDF7-50A(1-5/8)	50.00 - 75.00	0.6000	0.6000
T4	12	WEP65	50.00 - 75.00	0.6000	0.6000
T4	13	WEP65	50.00 - 75.00	0.6000	0.6000
T4	14	WEP65	50.00 - 75.00	0.6000	0.6000
T4	15	LDF7-50A(1-5/8)	50.00 - 75.00	0.6000	0.6000
T4	16	LDF7-50A(1-5/8)	50.00 - 75.00	0.6000	0.6000
T4	17	LDF7-50A(1-5/8)	50.00 - 75.00	0.6000	0.6000
T4	18	LDF5-50A(7/8)	50.00 - 75.00	0.6000	0.6000
T4	20	LDF5-50A(7/8)	50.00 - 75.00	0.6000	0.6000
T4	21	LDF5-50A(7/8)	50.00 - 75.00	0.6000	0.6000
T4	22	LDF5-50A(7/8)	50.00 - 75.00	0.6000	0.6000
T4	23	LDF5-50A(7/8)	50.00 - 75.00	0.6000	0.6000
T4	24	EW63(ELLIPTICAL)	50.00 - 75.00	0.6000	0.6000
T4	25	LDF4-50A(1/2)	50.00 - 75.00	0.6000	0.6000
T4	27	LDF4P-50A(1/2)	50.00 - 58.00	0.6000	0.6000
T4	28	LDF5-50A(7/8)	50.00 - 54.00	0.6000	0.6000
T4	29	LDF4P-50A(1/2)	50.00 - 58.00	0.6000	0.6000
T4	30	LDF4P-50A(1/2)	50.00 - 53.00	0.6000	0.6000
T4	31	LDF4P-50A(1/2)	50.00 - 52.00	0.6000	0.6000
T4	36	EW63	50.00 - 75.00	0.6000	0.6000
T4	37	EW63	50.00 - 75.00	0.6000	0.6000
T4	39	LCF78-50J (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T4	41	LDF5-50A (7/8 FOAM)	50.00 - 75.00	0.6000	0.6000
T5	1	Safety Line 3/8	25.00 - 50.00	0.6000	0.6000
T5	2	Safety Line 3/8	25.00 - 50.00	0.6000	0.6000
T5	3	Safety Line 3/8	25.00 - 50.00	0.6000	0.6000
T5	4	Feedline Ladder (Af)	25.00 - 50.00	0.6000	0.6000
T5	5	Feedline Ladder (Af)	25.00 - 50.00	0.6000	0.6000
T5	7	LDF7-50A(1-5/8)	25.00 - 50.00	0.6000	0.6000
T5	8	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	9	LDF4P-50A(1/2)	25.00 - 50.00	0.6000	0.6000
T5	10	LDF7-50A(1-5/8)	25.00 - 50.00	0.6000	0.6000
T5	12	WEP65	25.00 - 50.00	0.6000	0.6000
T5	13	WEP65	25.00 - 50.00	0.6000	0.6000
T5	14	WEP65	25.00 - 50.00	0.6000	0.6000
T5	15	LDF7-50A(1-5/8)	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*
T5	16	LDF7-50A(1-5/8)	25.00 - 50.00	0.6000	0.6000
T5	17	LDF7-50A(1-5/8)	25.00 - 50.00	0.6000	0.6000
T5	18	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	20	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	21	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	22	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	23	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	24	EW63(ELLIPTICAL)	25.00 - 50.00	0.6000	0.6000
T5	25	LDF4-50A(1/2)	25.00 - 50.00	0.6000	0.6000
T5	27	LDF4P-50A(1/2)	25.00 - 50.00	0.6000	0.6000
T5	28	LDF5-50A(7/8)	25.00 - 50.00	0.6000	0.6000
T5	29	LDF4P-50A(1/2)	25.00 - 50.00	0.6000	0.6000
T5	30	LDF4P-50A(1/2)	25.00 - 50.00	0.6000	0.6000
T5	31	LDF4P-50A(1/2)	25.00 - 50.00	0.6000	0.6000
T5	36	EW63	25.00 - 50.00	0.6000	0.6000
T5	37	EW63	25.00 - 50.00	0.6000	0.6000
T5	39	LCF78-50J (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T5	41	LDF5-50A (7/8 FOAM)	25.00 - 50.00	0.6000	0.6000
T6	1	Safety Line 3/8	6.00 - 25.00	0.6000	0.6000
T6	2	Safety Line 3/8	6.00 - 25.00	0.6000	0.6000
T6	3	Safety Line 3/8	6.00 - 25.00	0.6000	0.6000
T6	4	Feedline Ladder (Af)	6.00 - 25.00	0.6000	0.6000
T6	5	Feedline Ladder (Af)	6.00 - 25.00	0.6000	0.6000
T6	7	LDF7-50A(1-5/8)	6.00 - 25.00	0.6000	0.6000
T6	8	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	9	LDF4P-50A(1/2)	6.00 - 25.00	0.6000	0.6000
T6	10	LDF7-50A(1-5/8)	6.00 - 25.00	0.6000	0.6000
T6	12	WEP65	6.00 - 25.00	0.6000	0.6000
T6	13	WEP65	6.00 - 25.00	0.6000	0.6000
T6	14	WEP65	6.00 - 25.00	0.6000	0.6000
T6	15	LDF7-50A(1-5/8)	6.00 - 25.00	0.6000	0.6000
T6	16	LDF7-50A(1-5/8)	6.00 - 25.00	0.6000	0.6000
T6	17	LDF7-50A(1-5/8)	6.00 - 25.00	0.6000	0.6000
T6	18	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	20	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	21	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	22	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	23	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	24	EW63(ELLIPTICAL)	6.00 - 25.00	0.6000	0.6000
T6	25	LDF4-50A(1/2)	6.00 - 25.00	0.6000	0.6000
T6	27	LDF4P-50A(1/2)	6.00 - 25.00	0.6000	0.6000
T6	28	LDF5-50A(7/8)	6.00 - 25.00	0.6000	0.6000
T6	29	LDF4P-50A(1/2)	6.00 - 25.00	0.6000	0.6000
T6	30	LDF4P-50A(1/2)	6.00 - 25.00	0.6000	0.6000
T6	31	LDF4P-50A(1/2)	6.00 - 25.00	0.6000	0.6000
T6	36	EW63	6.00 - 25.00	0.6000	0.6000
T6	37	EW63	6.00 - 25.00	0.6000	0.6000
T6	39	LCF78-50J (7/8 FOAM)	6.00 - 25.00	0.6000	0.6000
T6	41	LDF5-50A (7/8 FOAM)	6.00 - 25.00	0.6000	0.6000

Discrete Tower Loads

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		C_AA_A *Front* *ft*²	C_AA_A *Side* *ft*²	*Weight* *lb*
LEG B LOADING									
3" Dia 20' Omni	B	From Leg	1.000	0.0000	137.500	No Ice	4.000	4.000	55.00
(E)			0.000			1/2" Ice	6.000	6.000	100.00
			13.500			1" Ice	8.000	8.000	145.00
2'x2"x2" Vertical Tube	B	From Leg	1.000	0.0000	137.500	No Ice	0.522	0.522	6.10
(E)			0.000			1/2" Ice	0.674	0.674	10.28
			4.500			1" Ice	0.833	0.833	16.47
15' x 4" Mount Pipe	B	From Leg	1.500	0.0000	137.500	No Ice	4.421	4.421	180.00
(E)			0.000			1/2" Ice	8.296	8.296	226.59
			0.000			1" Ice	9.858	9.858	282.94
10"x8"x4" Junction Box	B	From Leg	1.500	0.0000	137.500	No Ice	0.667	0.333	10.00
(E)			0.000			1/2" Ice	0.770	0.415	15.67
			3.500			1" Ice	0.881	0.504	22.96
Sector Mount [SM 403-1]	B	From Leg	3.000	0.0000	137.500	No Ice	10.220	7.050	291.16
(E)			0.000			1/2" Ice	14.320	10.130	422.38
			0.500			1" Ice	18.420	13.210	553.60
TMA	B	From Leg	3.000	0.0000	137.500	No Ice	0.600	0.407	10.00
(E)			0.000			1/2" Ice	0.704	0.497	15.41
			0.500			1" Ice	0.815	0.593	22.44
AP14-850/105 w/Mount Pipe	B	From Leg	3.000	0.0000	137.500	No Ice	10.758	8.136	78.91
(E)			6.000			1/2" Ice	11.457	9.799	157.97
			3.000			1" Ice	12.147	11.158	248.15
AP14-850/105 w/Mount Pipe	B	From Leg	3.000	0.0000	137.500	No Ice	10.758	8.136	78.91
(E)			1.000			1/2" Ice	11.457	9.799	157.97
			3.000			1" Ice	12.147	11.158	248.15
8'x2" Mount Pipe	B	From Leg	3.000	0.0000	137.500	No Ice	1.900	1.900	30.00
(E)			-1.000			1/2" Ice	2.728	2.728	43.56
			3.000			1" Ice	3.401	3.401	63.19
36"x 6"x3" panel antenna w/	B	From Leg	3.000	0.0000	137.500	No Ice	2.250	2.041	30.00
Mount Pipe			0.000			1/2" Ice	2.541	2.511	57.85
(E)			3.000			1" Ice	2.842	2.998	85.48
***									
14'x3" Mount Pipe	B	From Face	3.000	0.0000	135.000	No Ice	4.134	4.134	110.00
(E)			5.000			1/2" Ice	6.338	6.338	140.79
			0.000			1" Ice	7.792	7.792	184.57
Side Arm Mount [SO 601-1]	B	From Face	0.000	0.0000	135.000	No Ice	1.220	6.300	158.70
(E)			5.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
(2) 3'x3"x3" Horizontal Angle	B	From Face	0.000	0.0000	135.000	No Ice	0.900	0.075	10.00
(E)			5.000			1/2" Ice	1.120	0.112	23.39
			0.000			1" Ice	1.348	0.156	34.99
20'x2.5" Mount Pipe	B	From Face	3.500	0.0000	135.000	No Ice	5.750	5.750	120.00
(E)			5.000			1/2" Ice	7.782	7.782	157.48
			0.000			1" Ice	9.831	9.831	211.75
AP14-850/105 w/Mount Pipe	B	From Face	3.500	0.0000	135.000	No Ice	10.759	8.141	78.91
(E)			5.000			1/2" Ice	11.457	9.799	157.97
			-10.000			1" Ice	12.147	11.158	248.15
***									
10'x4" Mount Pipe	B	From Face	0.000	0.0000	135.000	No Ice	2.953	2.953	130.00
(E)			0.000			1/2" Ice	5.238	5.238	156.61
			0.000			1" Ice	5.846	5.846	194.65
***									
Sector Mount [SM 403-1]	B	From Leg	3.000	0.0000	121.000	No Ice	10.220	7.050	291.16
(E)			0.000			1/2" Ice	14.320	10.130	422.38
			0.500			1" Ice	18.420	13.210	553.60
8'x2"x6" Panel Antenna w/	B	From Leg	3.000	0.0000	121.000	No Ice	2.904	8.938	60.00
Mount Pipe			6.000			1/2" Ice	3.921	10.450	115.24

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
(E)			2.500			1" Ice	4.952	11.986	176.84
8'x2"x6" Panel Antenna w/ Mount Pipe	B	From Leg	3.000	0.0000	121.000	No Ice	2.904	8.938	60.00
			1.000			1/2" Ice	3.921	10.450	115.24
(E)			2.500			1" Ice	4.952	11.986	176.84
8'x2" Mount Pipe	B	From Leg	3.000	0.0000	121.000	No Ice	1.900	1.900	30.00
(E)			-1.000			1/2" Ice	2.728	2.728	43.56
			2.500			1" Ice	3.401	3.401	63.19
8'x2"x6" Panel Antenna w/ Mount Pipe	B	From Leg	3.000	0.0000	121.000	No Ice	2.904	8.938	60.00
			-6.000			1/2" Ice	3.921	10.450	115.24
(E)			2.500			1" Ice	4.952	11.986	176.84
TMA	B	From Leg	3.000	0.0000	121.000	No Ice	0.600	0.407	10.00
(E)			3.000			1/2" Ice	0.704	0.497	15.41
			2.500			1" Ice	0.815	0.593	22.44
***									
(2) 4'x2" Horizontal Mount Pipe	B	From Leg	2.000	0.0000	108.000	No Ice	0.866	0.866	14.61
			0.000			1/2" Ice	1.111	1.111	21.93
(E)			0.000			1" Ice	1.365	1.365	32.08
12'x2" Horizontal Pipe	B	From Leg	4.000	0.0000	108.000	No Ice	2.850	2.850	40.00
(E)			0.000			1/2" Ice	4.078	4.078	65.20
			0.000			1" Ice	5.323	5.323	94.29
***									
Side Arm Mount [SO 601-1]	B	From Leg	0.000	45.0000	100.000	No Ice	1.220	6.300	158.70
(E)			0.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
(2) 3'x3"x3" Horizontal Angle	B	From Leg	3.000	45.0000	100.000	No Ice	0.900	0.900	10.00
(E)			0.000			1/2" Ice	1.120	1.120	23.39
			0.000			1" Ice	1.348	1.348	34.99
3' Yagi	B	From Leg	6.000	45.0000	100.000	No Ice	2.083	2.083	30.95
(E)			0.000			1/2" Ice	3.787	3.787	52.87
			0.000			1" Ice	5.517	5.517	85.27
2" Dia 10' Omni	B	From Leg	6.000	0.0000	100.000	No Ice	2.000	2.000	10.00
(E)			0.000			1/2" Ice	3.030	3.030	25.00
			-6.000			1" Ice	4.060	4.060	40.00
***									
Side Arm Mount [SO 601-1]	B	From Leg	0.000	45.0000	87.000	No Ice	1.220	6.300	158.70
(E)			0.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
2" Dia 20' Omni	B	From Leg	1.000	0.0000	87.000	No Ice	4.000	4.000	20.00
(E)			0.000			1/2" Ice	6.025	6.025	51.77
			6.000			1" Ice	8.067	8.067	95.12
***									
12'x2" Horizontal Pipe	B	From Leg	1.000	0.0000	83.000	No Ice	2.850	2.850	40.00
(E)			0.000			1/2" Ice	4.078	4.078	65.20
			0.000			1" Ice	5.323	5.323	94.29
Single Bay Dipole	B	From Leg	1.000	0.0000	83.000	No Ice	5.400	5.400	32.00
(E)			0.000			1/2" Ice	9.240	9.240	41.60
			12.500			1" Ice	13.080	13.080	51.20
***									
(2) 4'x2" Horizontal Mount Pipe	B	From Leg	2.000	90.0000	58.000	No Ice	0.866	0.866	14.61
			0.000			1/2" Ice	1.111	1.111	21.93
(E)			0.000			1" Ice	1.365	1.365	32.08
12'x2" Horizontal Pipe	B	From Leg	4.000	90.0000	58.000	No Ice	2.850	2.850	40.00
(E)			0.000			1/2" Ice	4.078	4.078	65.20
			0.000			1" Ice	5.323	5.323	94.29
Single Dipole Antenna	B	From Leg	6.000	90.0000	58.000	No Ice	5.400	5.400	32.00
(E)			0.000			1/2" Ice	9.240	9.240	41.60
			0.000			1" Ice	13.080	13.080	51.20

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*Placement*		C_AA_A *Front*	C_AA_A *Side*	*Weight*
			ft ft ft	°	*ft*		*ft²*	*ft²*	*lb*
***									
3' Yagi	B	From Leg	1.000	0.0000	53.000	No Ice	2.083	2.083	30.95
(E)			0.000			1/2" Ice	3.787	3.787	52.87
			0.000			1" Ice	5.517	5.517	85.27
***									
6'x2" Mount Pipe	B	From Leg	1.000	0.0000	52.000	No Ice	1.425	1.425	20.00
(E)			0.000			1/2" Ice	1.925	1.925	32.74
			0.000			1" Ice	2.294	2.294	47.63
Single Bay Dipole Antenna	B	From Leg	1.000	0.0000	52.000	No Ice	5.400	5.400	32.00
(E)			0.000			1/2" Ice	9.240	9.240	41.60
			6.000			1" Ice	13.080	13.080	51.20
***									
***									
LEG A LOADING									
15' x 4" Mount Pipe	A	From Leg	1.500	0.0000	137.000	No Ice	4.422	4.422	180.00
(E)			0.000			1/2" Ice	8.296	8.296	226.59
			7.500			1" Ice	9.858	9.858	282.94
***									
Side Arm Mount [SO 601-1]	A	From Leg	0.000	90.0000	133.000	No Ice	1.220	6.300	158.70
(E)			0.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
(2) 3'x3"x3" Horizontal Angle	A	From Leg	3.000	90.0000	133.000	No Ice	0.900	0.900	10.00
(E)			0.000			1/2" Ice	1.120	1.120	23.39
			0.000			1" Ice	1.348	1.348	34.99
2" Dia 20' Omni	A	From Leg	3.000	0.0000	133.000	No Ice	4.000	4.000	20.00
(E)			0.000			1/2" Ice	6.025	6.025	51.77
			13.000			1" Ice	8.067	8.067	95.12
2" Dia 20' Omni	A	From Leg	3.000	0.0000	133.000	No Ice	4.000	4.000	20.00
(E)			0.000			1/2" Ice	6.025	6.025	51.77
			-13.000			1" Ice	8.067	8.067	95.12
***									
Pipe Mount [PM 602-1]	A	From Leg	1.000	0.0000	121.000	No Ice	5.250	5.250	93.00
(E)			0.000			1/2" Ice	6.500	6.500	117.74
			0.000			1" Ice	7.750	7.750	142.48
***									
Side Arm Mount [SO 601-1]	A	From Leg	0.000	90.0000	96.000	No Ice	1.220	6.300	158.70
(E)			0.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
(2) 3'x3"x3" Horizontal Angle	A	From Leg	3.000	90.0000	96.000	No Ice	0.900	0.900	10.00
(E)			0.000			1/2" Ice	1.120	1.120	23.39
			0.000			1" Ice	1.348	1.348	34.99
2" Dia 20' Omni	A	From Leg	3.000	0.0000	96.000	No Ice	4.000	4.000	20.00
(E)			0.000			1/2" Ice	6.025	6.025	51.77
			10.000			1" Ice	8.067	8.067	95.12
20' Multi Array Dipole	A	From Leg	3.000	0.0000	96.000	No Ice	5.400	5.400	32.00
(E)			0.000			1/2" Ice	9.240	9.240	41.60
			-10.000			1" Ice	13.080	13.080	51.20
10'x4" Mount Pipe	B	From Face	0.000	0.0000	96.000	No Ice	3.061	3.061	130.00
(E)			-5.000			1/2" Ice	5.238	5.238	156.61
			0.000			1" Ice	5.846	5.846	194.65
***									
***									
LEG C LOADING									
15'x2.5" Extension Pipe	C	From Leg	0.000	0.0000	140.000	No Ice	4.313	4.313	90.00
			0.000			1/2" Ice	5.845	5.845	118.20
			7.500			1" Ice	7.394	7.394	159.12
Lightning Rod 5/8"x4'	C	From Leg	0.000	0.0000	140.000	No Ice	0.250	0.250	4.18

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.000			1/2" Ice	0.664	0.664	6.99
			17.000			1" Ice	0.973	0.973	12.47
***									
12'x3" Mount Pipe	C	From Leg	1.000	0.0000	134.500	No Ice	3.545	3.545	120.00
(E)			0.000			1/2" Ice	5.438	5.438	152.84
			0.000			1" Ice	6.692	6.692	190.51
20' Multi Array Dipole	C	From Leg	1.000	0.0000	134.500	No Ice	5.400	5.400	32.00
(E)			0.000			1/2" Ice	9.240	9.240	41.60
			13.000			1" Ice	13.080	13.080	51.20
***									
6'x2" Horizontal Pipe	C	From Leg	1.000	0.0000	109.000	No Ice	1.425	0.007	20.00
(E)			0.000			1/2" Ice	1.925	0.039	32.74
			0.000			1" Ice	2.294	0.070	47.63
12"x12" Panel Antenna	C	From Leg	1.000	0.0000	109.000	No Ice	1.200	0.600	50.00
(E)			0.000			1/2" Ice	1.337	0.704	60.34
			1.000			1" Ice	1.481	0.815	72.81
12"x12" Panel Antenna	C	From Leg	1.000	0.0000	109.000	No Ice	1.200	0.600	50.00
(E)			0.000			1/2" Ice	1.337	0.704	60.34
			-1.000			1" Ice	1.481	0.815	72.81
***									
MD-S6 (for 6' MW) : Ice Shield	C	From Leg	3.000	0.0000	95.000	No Ice	1.667	0.800	440.00
			0.000			1/2" Ice	2.237	1.081	612.94
(E)			7.000			1" Ice	2.815	1.370	792.90
8'x4" Mount Pipe	C	From Leg	1.000	0.0000	95.000	No Ice	2.369	2.369	90.00
(E)			0.000			1/2" Ice	3.840	3.840	111.53
			0.000			1" Ice	4.333	4.333	142.23
15' x 4" Mount Pipe	C	From Leg	1.000	0.0000	95.000	No Ice	4.596	4.596	180.00
(E)			0.000			1/2" Ice	8.296	8.296	226.59
			0.000			1" Ice	9.858	9.858	282.94
***									
Side Arm Mount [SO 601-1]	C	From Leg	0.000	0.0000	79.000	No Ice	1.220	6.300	158.70
(E)			0.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
***									
Side Arm Mount [SO 601-1]	C	From Leg	0.000	0.0000	54.000	No Ice	1.220	6.300	158.70
(E)			0.000			1/2" Ice	1.850	8.610	196.52
			0.000			1" Ice	2.480	10.920	234.34
7' Whip	C	From Leg	3.000	0.0000	54.000	No Ice	1.744	1.744	37.30
(E)			0.000			1/2" Ice	2.599	2.599	53.68
			5.000			1" Ice	3.294	3.294	75.57
***									
MISCL MPs inside tower*									
15'x2.5" Horizontal Pipe	B	From Leg	0.000	0.0000	140.500	No Ice	4.313	0.014	90.00
(E)			0.000			1/2" Ice	5.845	0.084	118.20
			0.000			1" Ice	7.394	0.154	159.12
10'x2" Horizontal Pipe	A	From Leg	0.000	0.0000	132.500	No Ice	2.375	0.009	36.53
(E)			0.000			1/2" Ice	3.403	0.047	54.38
			0.000			1" Ice	4.448	0.084	78.74
(2) 10'x2" Horizontal Pipe	B	From Leg	0.000	0.0000	130.000	No Ice	2.375	0.009	36.53
(E)			0.000			1/2" Ice	3.403	0.047	54.38
			0.000			1" Ice	4.448	0.084	78.74
10'x2" Horizontal Pipe	B	From Leg	0.000	0.0000	100.000	No Ice	2.375	0.009	36.53
(E)			0.000			1/2" Ice	3.403	0.047	54.38
			0.000			1" Ice	4.448	0.084	78.74
10'x2" Horizontal Pipe	B	From Leg	0.000	0.0000	92.000	No Ice	2.375	0.009	36.53
(E)			0.000			1/2" Ice	3.403	0.047	54.38

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*Placement*		C_AA_A *Front*	C_AA_A *Side*	*Weight*
			ft ft ft	*°*	*ft*		*ft²*	*ft²*	*lb*
			0.000			1" Ice	4.448	0.084	78.74
Proposed									
Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed) (Eversource Mount @ 107' - PROPOSED)	A	From Leg	0.000 0.000 0.000	0.0000	117.000	No Ice 1/2" Ice 1" Ice	2.483 3.247 4.029	5.145 6.910 8.675	165.00 318.00 474.00
Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 110' - PROPOSED)	A	From Leg	0.000 0.000 3.000	0.0000	120.875	No Ice 1/2" Ice 1" Ice	1.029 1.290 1.560	1.029 1.290 1.560	14.00 22.80 34.62
Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 95' - PROPOSED)	A	From Leg	0.000 0.000 3.000	0.0000	113.125	No Ice 1/2" Ice 1" Ice	1.029 1.290 1.560	1.029 1.290 1.560	14.00 22.80 34.62
*									
ANT450F6 (CSP Add)	C	From Leg	0.000 0.000 0.000	0.0000	95.000	No Ice 1/2" Ice 1" Ice	1.900 2.728 3.401	1.900 2.728 3.401	8.00 22.34 41.96
6' x2.5" - Sch 40 Antenna Pipe (Vertical) (Eversource Mount)	A	From Leg	0.000 0.000 0.000	0.0000	117.000	No Ice 1/2" Ice 1" Ice	1.693 2.088 2.460	1.693 2.088 2.460	35.00 47.75 64.62

Dishes

Description	*Face or Leg*	*Dish Type*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*3 dB Beam Width*	*Elevation*	*Outside Diameter*		*Aperture Area*	*Weight*
				ft	*°*	*°*	*ft*	*ft*		*ft²*	*lb*
PA8-65 (E)	B	Paraboloid w/Radome	From Leg	3.000 0.000 0.000	Worst		128.750	8.000	No Ice 1/2" Ice 1" Ice	50.270 51.292 52.314	290.00 550.00 810.00
10' dish (E)	A	Paraboloid w/Radome	From Leg	2.000 0.000 0.000	Worst		135.000	10.000	No Ice 1/2" Ice 1" Ice	78.540 79.850 81.170	700.00 410.00 770.00
PA6-65 (E)	A	Paraboloid w/Radome	From Leg	1.000 0.000 0.000	Worst		120.000	6.000	No Ice 1/2" Ice 1" Ice	28.270 29.050 29.831	90.00 240.00 390.00
SC3-W100AD (CSP - Existing @ 135')	C	Paraboloid w/o Radome	From Leg	0.250 0.000 0.000	Worst		135.000	3.000	No Ice 1/2" Ice 1" Ice	7.070 7.470 7.860	40.00 78.35 116.69
SC3-W100AD (CSP - Existing @ 125')	C	Paraboloid w/o Radome	From Leg	0.250 0.000 0.000	Worst		125.000	3.000	No Ice 1/2" Ice 1" Ice	7.070 7.470 7.860	40.00 78.35 116.69
PA6-65 (Diversity CSP)	C	Paraboloid w/Radome	From Leg	1.000 0.000 0.000	Worst		95.000	6.000	No Ice 1/2" Ice 1" Ice	28.270 29.050 29.831	90.00 240.00 390.00

222-H Verification Constants

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

222-H Section Verification ArRr By Element

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft^2	A_r w/Ice ft^2	A_rR_r ft^2	A_rR_r w/Ice ft^2
T1 140.000-125.000	1	HSS5x0.25	70.012	36.904	C	0.14	0.241	6.257	9.564	2.785	5.574
	1	HSS5x0.25	70.012	36.904	A	0.14	0.241	6.257	9.564	2.785	5.574
	2	HSS5x0.25	70.012	36.904	C	0.14	0.241	6.257	9.564	2.785	5.574
	2	HSS5x0.25	70.012	36.904	B	0.14	0.241	6.257	9.564	2.785	5.574
	3	HSS5x0.25	70.012	36.904	B	0.14	0.241	6.257	9.564	2.785	5.574
	3	HSS5x0.25	70.012	36.904	A	0.14	0.241	6.257	9.564	2.785	5.574
					A		Sum:	12.513	19.128	5.570	11.148
					B			12.513	19.128	5.570	11.148
					C			12.513	19.128	5.570	11.148
T2 125.000-100.000	22	HSS5x0.25	68.817	36.07	C	0.133	0.223	10.428	15.850	4.662	9.174
	22	HSS5x0.25	68.817	36.07	A	0.133	0.223	10.428	15.850	4.662	9.174
	23	HSS5x0.25	68.817	36.07	C	0.133	0.223	10.428	15.850	4.662	9.174
	23	HSS5x0.25	68.817	36.07	B	0.133	0.223	10.428	15.850	4.662	9.174
	24	HSS5x0.25	68.817	36.07	B	0.133	0.223	10.428	15.850	4.662	9.174
	24	HSS5x0.25	68.817	36.07	A	0.133	0.223	10.428	15.850	4.662	9.174
					A		Sum:	20.856	31.701	9.325	18.349
					B			20.856	31.701	9.325	18.349
					C			20.856	31.701	9.325	18.349
T3 100.000-75.000	61	HSS5x.375	67.02	34.83	C	0.124	0.206	10.428	15.716	4.700	9.044
	61	HSS5x.375	67.02	34.83	A	0.124	0.206	10.428	15.716	4.700	9.044
	62	HSS5x.375	67.02	34.83	C	0.124	0.206	10.428	15.716	4.700	9.044
	62	HSS5x.375	67.02	34.83	B	0.124	0.206	10.428	15.716	4.700	9.044
	63	HSS5x.375	67.02	34.83	B	0.124	0.206	10.428	15.716	4.700	9.044
	63	HSS5x.375	67.02	34.83	A	0.124	0.206	10.428	15.716	4.700	9.044
					A		Sum:	20.856	31.432	9.401	18.088
					B			20.856	31.432	9.401	18.088
					C			20.856	31.432	9.401	18.088
T4 75.000-50.000	100	HSS5x.375	64.688	33.244	C	0.116	0.192	10.428	15.541	4.774	8.906
	100	HSS5x.375	64.688	33.244	A	0.116	0.192	10.428	15.541	4.774	8.906
	101	HSS5x.375	64.688	33.244	C	0.116	0.192	10.428	15.541	4.774	8.906
	101	HSS5x.375	64.688	33.244	B	0.116	0.192	10.428	15.541	4.774	8.906
	102	HSS5x.375	64.688	33.244	B	0.116	0.192	10.428	15.541	4.774	8.906
	102	HSS5x.375	64.688	33.244	A	0.116	0.192	10.428	15.541	4.774	8.906
					A		Sum:	20.856	31.082	9.549	17.811
					B			20.856	31.082	9.549	17.811

Section Elevation ft	Elem. Num.	Size	C	C w/Ice	Face	e	e w/Ice	A_r ft²	A_r w/Ice ft²	A_rR_r ft²	A_rR_r w/Ice ft²
					C			20.856	31.082	9.549	17.811
T5 50.000-25.000					A		Sum:	0.000	0.000	0.000	0.000
					B			0.000	0.000	0.000	0.000
					C			0.000	0.000	0.000	0.000
T6 25.000-0.000					A		Sum:	0.000	0.000	0.000	0.000
					B			0.000	0.000	0.000	0.000
					C			0.000	0.000	0.000	0.000

222-H Section Verification Tables - No Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 140.000-125.000	132.500		1.343	1	1		61	A	0.14	5.570
								B	0.14	5.570
								C	0.14	5.570
T2 125.000-100.000	112.500		1.297	1	1		59	A	0.133	9.325
								B	0.133	9.325
								C	0.133	9.325
T3 100.000-75.000	87.500		1.231	1	1		56	A	0.124	9.401
								B	0.124	9.401
								C	0.124	9.401
T4 75.000-50.000	62.500		1.146	1	1		52	A	0.116	9.549
								B	0.116	9.549
								C	0.116	9.549
T5 50.000-25.000	37.500		1.029	1	1		47	A	0.125	0.000
								B	0.125	0.000
								C	0.125	0.000
T6 25.000-0.000	12.500		0.85	1	1		39	A	0.123	0.000
								B	0.123	0.000
								C	0.123	0.000

222-H Section Verification Tables - Ice

Section Elevation ft	z_{wind} ft	z_{ice} ft	K_z	K_h	K_{zt}	t_z in	q_z psf	Face	e	A_rR_r ft²
T1 140.000-125.000	132.500	132.500	1.343	1	1	1.322	7	A	0.241	19.029
								B	0.241	19.029
								C	0.241	19.029
T2 125.000-100.000	112.500	112.500	1.297	1	1	1.300	7	A	0.223	31.366
								B	0.223	31.366
								C	0.223	31.366
T3 100.000-75.000	87.500	87.500	1.231	1	1	1.268	7	A	0.206	31.949
								B	0.206	31.949
								C	0.206	31.949
T4 75.000-50.000	62.500	62.500	1.146	1	1	1.226	6	A	0.192	32.377
								B	0.192	32.377

Section Elevation ft	*z_{wind} ft*	*z_{ice} ft*	*K_z*	*K_h*	*K_{zt}*	*t_z in*	*q_z psf*	*Face*	*e*	*A_rR_r ft²*
								C	0.192	32.377
T5 50.000-25.000	37.500	37.500	1.029	1	1	1.165	6	A	0.175	11.138
								B	0.175	11.138
								C	0.175	11.138
T6 25.000-0.000	12.500	12.500	0.85	1	1	1.044	5	A	0.166	10.622
								B	0.166	10.622
								C	0.166	10.622

222-H Section Verification Tables - Service

Section Elevation ft	*z_{wind} ft*	*z_{ice} ft*	*K_z*	*K_h*	*K_{zt}*	*t_z in*	*q_z psf*	*Face*	*e*	*A_rR_r ft²*
T1 140.000-125.000	132.500		1.343	1	1		11	A	0.14	5.570
								B	0.14	5.570
								C	0.14	5.570
T2 125.000-100.000	112.500		1.297	1	1		10	A	0.133	9.325
								B	0.133	9.325
								C	0.133	9.325
T3 100.000-75.000	87.500		1.231	1	1		10	A	0.124	9.401
								B	0.124	9.401
								C	0.124	9.401
T4 75.000-50.000	62.500		1.146	1	1		9	A	0.116	9.549
								B	0.116	9.549
								C	0.116	9.549
T5 50.000-25.000	37.500		1.029	1	1		8	A	0.125	0.000
								B	0.125	0.000
								C	0.125	0.000
T6 25.000-0.000	12.500		0.85	1	1		7	A	0.123	0.000
								B	0.123	0.000
								C	0.123	0.000

Force Totals

Load Case	*Vertical Forces lb*	*Sum of Forces X lb*	*Sum of Forces Z lb*	*Sum of Overturning Moments, M_x kip-ft*	*Sum of Overturning Moments, M_z kip-ft*	*Sum of Torques kip-ft*
Leg Weight	10328.23					
Bracing Weight	17931.74					
Total Member Self-Weight	28259.97			23.79	-44.52	
Total Weight	39397.70			23.79	-44.52	
Wind 0 deg - No Ice		0.00	-73347.98	-6120.13	-44.52	185.44
Wind 30 deg - No Ice		35734.18	-61893.41	-5228.86	-3077.14	218.51
Wind 45 deg - No Ice		50155.57	-50155.57	-4244.21	-4312.52	205.43
Wind 60 deg - No Ice		60116.08	-34708.03	-2945.65	-5187.74	170.35
Wind 90 deg - No Ice		69113.20	0.00	23.79	-5949.83	73.82
Wind 120 deg - No Ice		62487.91	36077.41	3054.94	-5294.64	-25.99
Wind 135 deg - No Ice		49270.23	49270.23	4197.55	-4218.28	-71.92
Wind 150 deg - No Ice		33634.59	58256.82	5005.65	-2920.80	-113.07
Wind 180 deg - No Ice		0.00	67690.71	5827.56	-44.52	-185.44
Wind 210 deg - No Ice		-35734.18	61893.41	5276.44	2988.09	-218.51
Wind 225 deg - No Ice		-50155.57	50155.57	4291.78	4223.47	-205.43

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 240 deg - No Ice		-65015.41	37536.67	3163.30	5393.27	-170.35
Wind 270 deg - No Ice		-69113.20	0.00	23.79	5860.79	-73.82
Wind 300 deg - No Ice		-57588.57	-33248.78	-2837.29	4911.02	25.99
Wind 315 deg - No Ice		-47270.09	-47270.09	-4029.71	4008.98	71.92
Wind 330 deg - No Ice		-33634.59	-58256.82	-4958.08	2831.76	113.07
Member Ice	28311.65					
Total Weight Ice	93602.36			104.60	-188.12	
Wind 0 deg - Ice		0.00	-14810.97	-1131.85	-188.12	49.52
Wind 30 deg - Ice		7283.22	-12614.91	-958.54	-801.92	56.51
Wind 45 deg - Ice		10234.68	-10234.68	-760.34	-1053.06	53.08
Wind 60 deg - Ice		12374.77	-7144.58	-501.35	-1237.66	45.36
Wind 90 deg - Ice		14094.56	0.00	104.60	-1383.84	21.84
Wind 120 deg - Ice		12418.02	7169.55	706.87	-1231.30	-4.55
Wind 135 deg - Ice		9975.72	9975.72	946.26	-1029.79	-17.32
Wind 150 deg - Ice		6984.47	12097.45	1129.06	-779.60	-29.50
Wind 180 deg - Ice		0.00	14163.54	1303.73	-188.12	-49.52
Wind 210 deg - Ice		-7283.22	12614.91	1167.73	425.68	-56.51
Wind 225 deg - Ice		-10234.68	10234.68	969.53	676.81	-53.08
Wind 240 deg - Ice		-12935.46	7468.29	729.20	893.72	-45.36
Wind 270 deg - Ice		-14094.56	0.00	104.60	1007.59	-21.84
Wind 300 deg - Ice		-11857.32	-6845.83	-479.03	822.74	4.55
Wind 315 deg - Ice		-9746.82	-9746.82	-723.88	640.35	17.32
Wind 330 deg - Ice		-6984.47	-12097.45	-919.87	403.35	29.50
Total Weight	39397.70			23.79	-44.52	
Wind 0 deg - Service		0.00	-12558.99	-1046.54	-11.83	31.75
Wind 30 deg - Service		6118.58	-10597.68	-893.93	-531.09	37.41
Wind 45 deg - Service		8587.87	-8587.87	-725.33	-742.62	35.18
Wind 60 deg - Service		10293.36	-5942.87	-502.99	-892.48	29.17
Wind 90 deg - Service		11833.89	0.00	5.46	-1022.96	12.64
Wind 120 deg - Service		10699.48	6177.34	524.46	-910.78	-4.45
Wind 135 deg - Service		8436.28	8436.28	720.11	-726.48	-12.31
Wind 150 deg - Service		5759.07	9975.01	858.47	-504.32	-19.36
Wind 180 deg - Service		0.00	11590.32	999.20	-11.83	-31.75
Wind 210 deg - Service		-6118.58	10597.68	904.84	507.43	-37.41
Wind 225 deg - Service		-8587.87	8587.87	736.24	718.96	-35.18
Wind 240 deg - Service		-11132.25	6427.21	543.02	919.25	-29.17
Wind 270 deg - Service		-11833.89	0.00	5.46	999.31	-12.64
Wind 300 deg - Service		-9860.59	-5693.01	-484.43	836.68	4.45
Wind 315 deg - Service		-8093.81	-8093.81	-688.60	682.23	12.31
Wind 330 deg - Service		-5759.07	-9975.01	-847.56	480.66	19.36

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 45 deg - No Ice
7	0.9 Dead+1.0 Wind 45 deg - No Ice
8	1.2 Dead+1.0 Wind 60 deg - No Ice
9	0.9 Dead+1.0 Wind 60 deg - No Ice
10	1.2 Dead+1.0 Wind 90 deg - No Ice
11	0.9 Dead+1.0 Wind 90 deg - No Ice

Comb. No.	Description
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 lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	140 - 125	Leg	Max Tension	9	3069.45	-0.87	-0.99
			Max. Compression	40	-8340.25	0.06	0.01
			Max. Mx	18	-586.30	2.88	1.12
			Max. My	26	-1623.56	-0.04	4.37
			Max. Vy	18	2418.27	-2.45	1.12
			Max. Vx	10	-3321.45	-0.04	2.60
		Diagonal	Max Tension	33	9859.20	0.00	0.00
			Max. Compression	32	-10005.69	0.00	0.00
			Max. Mx	34	-59.18	0.14	0.00
			Max. My	34	-246.30	0.00	-0.01
			Max. Vy	34	57.70	0.00	0.00
			Max. Vx	34	2.03	0.00	0.00
		Horizontal	Max Tension	19	6796.87	0.02	0.01
			Max. Compression	2	-6911.98	0.00	0.00
			Max. Mx	38	-183.88	0.08	0.02
			Max. My	43	-725.85	0.08	0.02
			Max. Vy	38	59.82	0.08	0.02
			Max. Vx	40	-4.21	0.00	0.00
		Top Girt	Max Tension	19	1919.85	0.02	0.01
			Max. Compression	2	-1983.45	0.00	0.00
			Max. Mx	38	-44.23	0.07	0.02
			Max. My	43	-319.23	0.07	0.02
			Max. Vy	38	56.34	0.07	0.02
			Max. Vx	37	4.06	0.00	0.00
T2	125 - 100	Leg	Max Tension	9	39484.00	0.03	-0.22
			Max. Compression	12	-47391.91	0.72	-0.02
			Max. Mx	28	8658.14	1.55	-0.36
			Max. My	20	-3349.70	-0.03	-2.50
			Max. Vy	28	-868.48	-0.90	-0.11
			Max. Vx	20	1388.11	-0.03	2.13
		Diagonal	Max Tension	33	15538.81	0.00	0.00
			Max. Compression	32	-15809.07	0.00	0.00
			Max. Mx	34	-85.22	0.25	0.00
			Max. My	34	-428.65	0.00	-0.01
			Max. Vy	34	-87.98	0.00	0.00
			Max. Vx	34	3.04	0.00	0.00
		Horizontal	Max Tension	32	10518.39	0.00	0.00
			Max. Compression	3	-10486.13	0.00	0.00
			Max. Mx	38	-491.33	0.11	0.00
			Max. My	24	2640.20	0.02	-0.02
			Max. Vy	38	69.43	0.11	0.00
			Max. Vx	24	-4.00	0.02	-0.02
		Inner Bracing	Max Tension	25	5.80	0.00	0.00
			Max. Compression	8	-10.21	0.00	0.00
			Max. Mx	34	-6.52	-0.07	0.00
			Max. Vy	34	41.38	0.00	0.00
T3	100 - 75	Leg	Max Tension	9	87989.75	-0.49	-0.20
			Max. Compression	12	-102016.01	0.50	-0.06
			Max. Mx	8	52540.49	1.02	-0.09
			Max. My	32	-3851.40	-0.04	-1.58
			Max. Vy	28	-705.24	-0.70	0.02
			Max. Vx	4	-939.24	-0.01	-0.70
		Diagonal	Max Tension	3	18891.29	0.00	0.00
			Max. Compression	2	-19223.39	0.00	0.00
			Max. Mx	34	-309.61	0.29	0.00
			Max. My	34	-504.02	0.00	-0.01
			Max. Vy	34	-98.21	0.00	0.00
			Max. Vx	34	3.18	0.00	0.00
		Horizontal	Max Tension	32	13508.18	0.00	0.00
			Max. Compression	3	-13821.77	0.00	0.00
			Max. Mx	38	-784.44	0.16	0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	24	-1148.32	0.03	-0.05
			Max. Vy	38	-88.57	0.16	0.01
			Max. Vx	24	-7.32	0.03	-0.05
		Inner Bracing	Max Tension	25	12.68	0.00	0.00
			Max. Compression	8	-17.36	0.00	0.00
			Max. Mx	34	-7.40	-0.09	0.00
			Max. Vy	34	-46.17	0.00	0.00
T4	75 - 50	Leg	Max Tension	9	143648.36	-0.52	-0.25
			Max. Compression	24	-163277.41	0.73	0.37
			Max. Mx	3	-158708.73	0.73	-0.26
			Max. My	4	-11836.62	-0.02	-1.12
			Max. Vy	2	321.53	0.53	-0.16
			Max. Vx	4	-689.00	-0.01	-0.77
		Diagonal	Max Tension	3	20814.80	0.00	0.00
			Max. Compression	2	-21264.60	0.00	0.00
			Max. Mx	34	-166.95	0.34	0.00
			Max. My	34	-641.20	0.00	-0.01
			Max. Vy	34	107.60	0.00	0.00
			Max. Vx	34	-3.31	0.00	0.00
		Horizontal	Max Tension	2	15557.93	0.00	0.00
			Max. Compression	3	-15994.57	0.00	0.00
			Max. Mx	38	-955.43	-0.27	-0.00
			Max. My	24	-2594.59	-0.05	0.04
			Max. Vy	38	-133.43	-0.27	-0.00
			Max. Vx	24	5.97	-0.04	0.04
		Inner Bracing	Max Tension	25	7.68	0.00	0.00
			Max. Compression	8	-13.84	0.00	0.00
			Max. Mx	34	-8.80	-0.12	0.00
			Max. Vy	34	50.41	0.00	0.00
T5	50 - 25	Leg	Max Tension	9	191429.03	-1.18	-0.43
			Max. Compression	24	-217924.27	1.18	0.44
			Max. Mx	25	-182913.30	1.30	0.41
			Max. My	4	-13221.19	-0.03	-1.69
			Max. Vy	25	-327.50	1.30	0.41
			Max. Vx	4	551.78	-0.03	-1.69
		Diagonal	Max Tension	3	27740.39	0.00	0.00
			Max. Compression	2	-28208.78	0.00	0.00
			Max. Mx	34	-9.80	0.55	0.00
			Max. My	34	-2.71	0.00	0.02
			Max. Vy	34	134.22	0.00	0.00
			Max. Vx	34	4.82	0.00	0.00
		Horizontal	Max Tension	2	17505.37	0.00	0.00
			Max. Compression	3	-18359.46	0.00	0.00
			Max. Mx	38	-1264.50	0.26	0.00
			Max. My	24	-2864.59	0.03	-0.06
			Max. Vy	38	116.18	0.26	0.00
			Max. Vx	24	6.54	0.03	-0.06
		Inner Bracing	Max Tension	25	8.96	0.00	0.00
			Max. Compression	8	-16.30	0.00	0.00
			Max. Mx	34	-10.16	-0.13	0.00
			Max. Vy	34	52.78	0.00	0.00
T6	25 - 0	Leg	Max Tension	9	250055.82	-1.42	-0.28
			Max. Compression	24	-286354.37	0.00	0.00
			Max. Mx	25	-248912.54	1.51	0.27
			Max. My	4	-16330.51	-0.05	-1.68
			Max. Vy	25	349.77	1.51	0.27
			Max. Vx	4	-499.81	-0.05	-1.68
		Diagonal	Max Tension	3	28914.34	0.00	0.00
			Max. Compression	2	-29523.03	0.00	0.00
			Max. Mx	34	-390.41	0.73	0.00
			Max. My	34	-46.83	0.00	0.02

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial lb*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
			Max. Vy	34	-172.06	0.00	0.00
			Max. Vx	34	-5.87	0.00	0.00
		Horizontal	Max Tension	2	19390.79	0.00	0.00
			Max. Compression	3	-20012.73	0.00	0.00
			Max. Mx	38	-1342.55	0.26	0.00
			Max. My	24	-3082.33	0.05	-0.06
			Max. Vy	38	114.09	0.24	0.01
			Max. Vx	24	6.40	0.05	-0.06
		Inner Bracing	Max Tension	25	7.40	0.00	0.00
			Max. Compression	8	-16.87	0.00	0.00
			Max. Mx	34	-11.31	-0.15	0.00
			Max. Vy	34	-53.38	0.00	0.00

Maximum Reactions

Location	*Condition*	*Gov. Load Comb.*	*Vertical lb*	*Horizontal, X lb*	*Horizontal, Z lb*
Leg C	Max. Vert	24	320154.02	38126.55	-17040.84
	Max. H_x	24	320154.02	38126.55	-17040.84
	Max. H_z	7	-273672.52	-32835.61	15695.39
	Min. Vert	9	-279131.37	-33996.52	14715.69
	Min. H_x	9	-279131.37	-33996.52	14715.69
	Min. H_z	24	320154.02	38126.55	-17040.84
Leg B	Max. Vert	12	314614.25	-34349.78	-20586.42
	Max. H_x	27	-235551.33	30443.00	10427.48
	Max. H_z	33	-229278.88	23074.84	21470.05
	Min. Vert	29	-265461.49	30166.34	18168.76
	Min. H_x	12	314614.25	-34349.78	-20586.42
	Min. H_z	16	262176.24	-24715.00	-22419.34
Leg A	Max. Vert	2	313949.17	4685.44	40618.40
	Max. H_x	28	154106.20	7879.79	19042.73
	Max. H_z	2	313949.17	4685.44	40618.40
	Min. Vert	19	-272623.24	-4632.03	-35875.58
	Min. H_x	13	-137163.36	-8549.32	-18705.02
	Min. H_z	19	-272623.24	-4632.03	-35875.58

Tower Mast Reaction Summary

Load Combination	*Vertical lb*	*$Shear_x$ lb*	*$Shear_z$ lb*	*Overturning Moment, M_x kip-ft*	*Overturning Moment, M_z kip-ft*	*Torque kip-ft*
Dead Only	39397.70	0.00	0.00	23.79	-44.52	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	47277.24	0.00	-73347.98	-5939.52	-53.43	185.44
0.9 Dead+1.0 Wind 0 deg - No Ice	35457.93	-0.00	-73347.98	-5946.66	-40.07	185.44
1.2 Dead+1.0 Wind 30 deg - No Ice	47277.24	35734.18	-61893.41	-5072.76	-2998.67	218.50
0.9 Dead+1.0 Wind 30 deg - No Ice	35457.93	35734.18	-61893.41	-5079.89	-2985.31	218.50
1.2 Dead+1.0 Wind 45 deg - No Ice	47277.24	50155.57	-50155.57	-4116.76	-4198.73	205.43

Load Combination	*Vertical* *lb*	*Shear$_x$* *lb*	*Shear$_z$* *lb*	*Overturning Moment, M_x* *kip-ft*	*Overturning Moment, M_z* *kip-ft*	*Torque* *kip-ft*
0.9 Dead+1.0 Wind 45 deg - No Ice	35457.93	50155.57	-50155.57	-4123.90	-4185.38	205.43
1.2 Dead+1.0 Wind 60 deg - No Ice	47277.24	60116.08	-34708.03	-2857.12	-5051.54	170.35
0.9 Dead+1.0 Wind 60 deg - No Ice	35457.93	60116.08	-34708.03	-2864.26	-5038.19	170.35
1.2 Dead+1.0 Wind 90 deg - No Ice	47277.24	69113.20	-0.00	28.54	-5795.38	73.82
0.9 Dead+1.0 Wind 90 deg - No Ice	35457.93	69113.20	-0.00	21.41	-5782.02	73.82
1.2 Dead+1.0 Wind 120 deg - No Ice	47277.24	62487.91	36077.41	2974.66	-5156.25	-25.99
0.9 Dead+1.0 Wind 120 deg - No Ice	35457.93	62487.91	36077.41	2967.52	-5142.89	-25.99
1.2 Dead+1.0 Wind 135 deg - No Ice	47277.24	49270.23	49270.23	4087.50	-4112.38	-71.92
0.9 Dead+1.0 Wind 135 deg - No Ice	35457.93	49270.23	49270.23	4080.37	-4099.03	-71.92
1.2 Dead+1.0 Wind 150 deg - No Ice	47277.24	33634.59	58256.82	4876.28	-2852.27	-113.07
0.9 Dead+1.0 Wind 150 deg - No Ice	35457.93	33634.59	58256.82	4869.15	-2838.91	-113.07
1.2 Dead+1.0 Wind 180 deg - No Ice	47277.24	0.00	67690.72	5672.83	-53.43	-185.44
0.9 Dead+1.0 Wind 180 deg - No Ice	35457.93	0.00	67690.72	5665.69	-40.07	-185.44
1.2 Dead+1.0 Wind 210 deg - No Ice	47277.24	-35734.18	61893.41	5129.85	2891.81	-218.50
0.9 Dead+1.0 Wind 210 deg - No Ice	35457.93	-35734.18	61893.41	5122.71	2905.17	-218.50
1.2 Dead+1.0 Wind 225 deg - No Ice	47277.24	-50155.57	50155.57	4173.85	4091.88	-205.43
0.9 Dead+1.0 Wind 225 deg - No Ice	35457.93	-50155.57	50155.57	4166.72	4105.24	-205.43
1.2 Dead+1.0 Wind 240 deg - No Ice	47277.24	-65015.41	37536.67	3076.10	5225.10	-170.35
0.9 Dead+1.0 Wind 240 deg - No Ice	35457.93	-65015.41	37536.67	3068.96	5238.45	-170.35
1.2 Dead+1.0 Wind 270 deg - No Ice	47277.24	-69113.20	0.00	28.54	5688.53	-73.82
0.9 Dead+1.0 Wind 270 deg - No Ice	35457.93	-69113.20	0.00	21.41	5701.88	-73.82
1.2 Dead+1.0 Wind 300 deg - No Ice	47277.24	-57588.57	-33248.78	-2755.68	4768.99	25.99
0.9 Dead+1.0 Wind 300 deg - No Ice	35457.93	-57588.57	-33248.78	-2762.81	4782.35	25.99
1.2 Dead+1.0 Wind 315 deg - No Ice	47277.24	-47270.09	-47270.09	-3915.94	3891.06	71.92
0.9 Dead+1.0 Wind 315 deg - No Ice	35457.93	-47270.09	-47270.09	-3923.07	3904.41	71.92
1.2 Dead+1.0 Wind 330 deg - No Ice	47277.24	-33634.59	-58256.82	-4819.20	2745.42	113.07
0.9 Dead+1.0 Wind 330 deg - No Ice	35457.93	-33634.59	-58256.82	-4826.33	2758.77	113.07
1.2 Dead+1.0 Ice+1.0 Temp	101481.90	0.00	0.00	109.35	-197.03	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	101481.90	0.00	-14810.97	-1085.93	-197.03	49.52
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	101481.90	7283.22	-12614.91	-918.51	-790.46	56.50
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	101481.90	10234.68	-10234.68	-727.02	-1033.40	53.08

Load Combination	*Vertical* *lb*	*Shear$_x$* *lb*	*Shear$_z$* *lb*	*Overturning Moment, M_x* *kip-ft*	*Overturning Moment, M_z* *kip-ft*	*Torque* *kip-ft*
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	101481.90	12374.77	-7144.58	-476.79	-1212.25	45.36
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	101481.90	14094.56	0.00	109.35	-1354.30	21.84
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	101481.90	12418.02	7169.55	692.19	-1206.53	-4.55
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	101481.90	9975.72	9975.72	924.03	-1011.70	-17.32
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	101481.90	6984.47	12097.45	1101.00	-769.55	-29.49
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	101481.90	0.00	14163.54	1269.41	-197.03	-49.52
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	101481.90	-7283.22	12614.91	1137.22	396.41	-56.50
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	101481.90	-10234.68	10234.68	945.73	639.35	-53.08
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	101481.90	-12935.46	7468.29	713.10	848.70	-45.36
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	101481.90	-14094.56	0.00	109.35	960.25	-21.84
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	101481.90	-11857.32	-6845.83	-455.87	781.98	4.55
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	101481.90	-9746.82	-9746.82	-692.87	605.20	17.32
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	101481.90	-6984.47	-12097.45	-882.29	375.50	29.49
Dead+Wind 0 deg - Service	39397.70	0.00	-12558.99	-998.09	-44.52	31.75
Dead+Wind 30 deg - Service	39397.70	6118.58	-10597.68	-849.68	-548.82	37.41
Dead+Wind 45 deg - Service	39397.70	8587.87	-8587.87	-685.99	-754.30	35.17
Dead+Wind 60 deg - Service	39397.70	10293.36	-5942.87	-470.31	-900.32	29.17
Dead+Wind 90 deg - Service	39397.70	11833.89	-0.00	23.79	-1027.69	12.64
Dead+Wind 120 deg - Service	39397.70	10699.48	6177.34	528.23	-918.25	-4.45
Dead+Wind 135 deg - Service	39397.70	8436.28	8436.28	718.78	-739.52	-12.31
Dead+Wind 150 deg - Service	39397.70	5759.07	9975.01	853.84	-523.75	-19.36
Dead+Wind 180 deg - Service	39397.70	0.00	11590.32	990.23	-44.52	-31.75
Dead+Wind 210 deg - Service	39397.70	-6118.58	10597.68	897.26	459.78	-37.41
Dead+Wind 225 deg - Service	39397.70	-8587.87	8587.87	733.57	665.26	-35.17
Dead+Wind 240 deg - Service	39397.70	-11132.25	6427.21	545.60	859.29	-29.17
Dead+Wind 270 deg - Service	39397.70	-11833.89	0.00	23.79	938.64	-12.64
Dead+Wind 300 deg - Service	39397.70	-9860.59	-5693.01	-452.94	781.19	4.45
Dead+Wind 315 deg - Service	39397.70	-8093.81	-8093.81	-651.61	630.87	12.31
Dead+Wind 330 deg - Service	39397.70	-5759.07	-9975.01	-806.27	434.71	19.36

Solution Summary

	Sum of Applied Forces			*Sum of Reactions*			
Load Comb.	*PX* *lb*	*PY* *lb*	*PZ* *lb*	*PX* *lb*	*PY* *lb*	*PZ* *lb*	*% Error*
1	0.00	-39397.70	0.00	-0.00	39397.70	-0.00	0.000%
2	0.00	-47277.24	-73347.98	-0.00	47277.24	73347.98	0.000%
3	0.00	-35457.93	-73347.98	0.00	35457.93	73347.98	0.000%
4	35734.18	-47277.24	-61893.41	-35734.18	47277.24	61893.41	0.000%
5	35734.18	-35457.93	-61893.41	-35734.18	35457.93	61893.41	0.000%
6	50155.57	-47277.24	-50155.57	-50155.57	47277.24	50155.57	0.000%
7	50155.57	-35457.93	-50155.57	-50155.57	35457.93	50155.57	0.000%
8	60116.08	-47277.24	-34708.03	-60116.08	47277.24	34708.03	0.000%
9	60116.08	-35457.93	-34708.03	-60116.08	35457.93	34708.03	0.000%
10	69113.20	-47277.24	0.00	-69113.20	47277.24	0.00	0.000%

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	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
11	69113.20	-35457.93	0.00	-69113.20	35457.93	0.00	0.000%
12	62487.91	-47277.24	36077.41	-62487.91	47277.24	-36077.41	0.000%
13	62487.91	-35457.93	36077.41	-62487.91	35457.93	-36077.41	0.000%
14	49270.23	-47277.24	49270.23	-49270.23	47277.24	-49270.23	0.000%
15	49270.23	-35457.93	49270.23	-49270.23	35457.93	-49270.23	0.000%
16	33634.59	-47277.24	58256.82	-33634.59	47277.24	-58256.82	0.000%
17	33634.59	-35457.93	58256.82	-33634.59	35457.93	-58256.82	0.000%
18	-0.00	-47277.24	67690.71	-0.00	47277.24	-67690.72	0.000%
19	-0.00	-35457.93	67690.71	-0.00	35457.93	-67690.72	0.000%
20	-35734.18	-47277.24	61893.41	35734.18	47277.24	-61893.41	0.000%
21	-35734.18	-35457.93	61893.41	35734.18	35457.93	-61893.41	0.000%
22	-50155.57	-47277.24	50155.57	50155.57	47277.24	-50155.57	0.000%
23	-50155.57	-35457.93	50155.57	50155.57	35457.93	-50155.57	0.000%
24	-65015.41	-47277.24	37536.67	65015.41	47277.24	-37536.67	0.000%
25	-65015.41	-35457.93	37536.67	65015.41	35457.93	-37536.67	0.000%
26	-69113.20	-47277.24	0.00	69113.20	47277.24	-0.00	0.000%
27	-69113.20	-35457.93	0.00	69113.20	35457.93	-0.00	0.000%
28	-57588.57	-47277.24	-33248.78	57588.57	47277.24	33248.78	0.000%
29	-57588.57	-35457.93	-33248.78	57588.57	35457.93	33248.78	0.000%
30	-47270.09	-47277.24	-47270.09	47270.09	47277.24	47270.09	0.000%
31	-47270.09	-35457.93	-47270.09	47270.09	35457.93	47270.09	0.000%
32	-33634.59	-47277.24	-58256.82	33634.59	47277.24	58256.82	0.000%
33	-33634.59	-35457.93	-58256.82	33634.59	35457.93	58256.82	0.000%
34	0.00	-101481.90	0.00	-0.00	101481.90	-0.00	0.000%
35	0.00	-101481.90	-14810.97	-0.00	101481.90	14810.97	0.000%
36	7283.22	-101481.90	-12614.91	-7283.22	101481.90	12614.91	0.000%
37	10234.68	-101481.90	-10234.68	-10234.68	101481.90	10234.68	0.000%
38	12374.77	-101481.90	-7144.58	-12374.77	101481.90	7144.58	0.000%
39	14094.56	-101481.90	0.00	-14094.56	101481.90	-0.00	0.000%
40	12418.02	-101481.90	7169.55	-12418.02	101481.90	-7169.55	0.000%
41	9975.72	-101481.90	9975.72	-9975.72	101481.90	-9975.72	0.000%
42	6984.47	-101481.90	12097.45	-6984.47	101481.90	-12097.45	0.000%
43	-0.00	-101481.90	14163.54	-0.00	101481.90	-14163.54	0.000%
44	-7283.22	-101481.90	12614.91	7283.22	101481.90	-12614.91	0.000%
45	-10234.68	-101481.90	10234.68	10234.68	101481.90	-10234.68	0.000%
46	-12935.46	-101481.90	7468.29	12935.46	101481.90	-7468.29	0.000%
47	-14094.56	-101481.90	0.00	14094.56	101481.90	-0.00	0.000%
48	-11857.32	-101481.90	-6845.83	11857.32	101481.90	6845.83	0.000%
49	-9746.82	-101481.90	-9746.82	9746.82	101481.90	9746.82	0.000%
50	-6984.47	-101481.90	-12097.45	6984.47	101481.90	12097.45	0.000%
51	0.00	-39397.70	-12558.99	-0.00	39397.70	12558.99	0.000%
52	6118.58	-39397.70	-10597.68	-6118.58	39397.70	10597.68	0.000%
53	8587.87	-39397.70	-8587.87	-8587.87	39397.70	8587.87	0.000%
54	10293.36	-39397.70	-5942.87	-10293.36	39397.70	5942.87	0.000%
55	11833.89	-39397.70	0.00	-11833.89	39397.70	0.00	0.000%
56	10699.48	-39397.70	6177.34	-10699.48	39397.70	-6177.34	0.000%
57	8436.28	-39397.70	8436.28	-8436.28	39397.70	-8436.28	0.000%
58	5759.07	-39397.70	9975.01	-5759.07	39397.70	-9975.01	0.000%
59	-0.00	-39397.70	11590.32	-0.00	39397.70	-11590.32	0.000%
60	-6118.58	-39397.70	10597.68	6118.58	39397.70	-10597.68	0.000%
61	-8587.87	-39397.70	8587.87	8587.87	39397.70	-8587.87	0.000%
62	-11132.25	-39397.70	6427.21	11132.25	39397.70	-6427.21	0.000%
63	-11833.89	-39397.70	0.00	11833.89	39397.70	-0.00	0.000%
64	-9860.59	-39397.70	-5693.01	9860.59	39397.70	5693.01	0.000%
65	-8093.81	-39397.70	-8093.81	8093.81	39397.70	8093.81	0.000%
66	-5759.07	-39397.70	-9975.01	5759.07	39397.70	9975.01	0.000%

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	140 - 125	1.3506	56	0.0763	0.0545
T2	125 - 100	1.1055	56	0.0753	0.0513
T3	100 - 75	0.7203	56	0.0651	0.0410
T4	75 - 50	0.3981	56	0.0504	0.0302
T5	50 - 25	0.1793	56	0.0278	0.0199
T6	25 - 0	0.0536	62	0.0137	0.0088

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.500	15'x2.5" Horizontal Pipe	56	1.3506	0.0763	0.0545	806141
140.000	15'x2.5" Extension Pipe	56	1.3506	0.0763	0.0545	806141
137.500	3" Dia 20' Omni	56	1.3095	0.0763	0.0541	806141
137.000	15' x 4" Mount Pipe	56	1.3013	0.0763	0.0540	806141
135.000	10' dish	56	1.2684	0.0762	0.0536	806141
134.500	12'x3" Mount Pipe	56	1.2602	0.0762	0.0535	732861
133.000	Side Arm Mount [SO 601-1]	56	1.2357	0.0762	0.0532	575817
132.500	10'x2" Horizontal Pipe	56	1.2275	0.0762	0.0531	537428
130.000	(2) 10'x2" Horizontal Pipe	56	1.1867	0.0760	0.0526	403073
128.750	PA8-65	56	1.1663	0.0759	0.0523	358427
125.000	SC3-W100AD	56	1.1055	0.0753	0.0513	273913
121.000	Sector Mount [SM 403-1]	56	1.0414	0.0743	0.0500	228614
120.875	Telewave ANT220F2 - Omni Antenna	56	1.0394	0.0743	0.0499	227542
120.000	PA6-65	56	1.0254	0.0740	0.0496	220357
117.000	Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed)	56	0.9779	0.0730	0.0485	198883
113.125	Telewave ANT220F2 - Omni Antenna	56	0.9174	0.0714	0.0469	176647
109.000	6'x2" Horizontal Pipe	56	0.8540	0.0695	0.0451	157860
108.000	(2) 4'x2" Horizontal Mount Pipe	56	0.8388	0.0691	0.0447	153892
100.000	Side Arm Mount [SO 601-1]	56	0.7203	0.0651	0.0410	126108
96.000	Side Arm Mount [SO 601-1]	56	0.6632	0.0631	0.0392	109815
95.000	PA6-65	56	0.6492	0.0626	0.0388	106041
92.000	10'x2" Horizontal Pipe	56	0.6079	0.0611	0.0374	96102
87.000	Side Arm Mount [SO 601-1]	56	0.5416	0.0584	0.0353	83119
83.000	12'x2" Horizontal Pipe	56	0.4911	0.0560	0.0336	75011
79.000	Side Arm Mount [SO 601-1]	56	0.4432	0.0534	0.0319	68361
58.000	(2) 4'x2" Horizontal Mount Pipe	56	0.2385	0.0347	0.0233	78408
54.000	Side Arm Mount [SO 601-1]	56	0.2078	0.0311	0.0217	83281
53.000	3' Yagi	56	0.2004	0.0302	0.0212	84523
52.000	6'x2" Mount Pipe	56	0.1933	0.0294	0.0208	85671

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	140 - 125	7.4635	25	0.4039	0.3183
T2	125 - 100	6.1719	25	0.4019	0.2994
T3	100 - 75	4.0816	25	0.3548	0.2395
T4	75 - 50	2.2894	25	0.2785	0.1766
T5	50 - 25	1.0517	25	0.1554	0.1165
T6	25 - 0	0.3140	25	0.0775	0.0514

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.500	15'x2.5" Horizontal Pipe	25	7.4635	0.4039	0.3183	310138
140.000	15'x2.5" Extension Pipe	25	7.4635	0.4039	0.3183	310138
137.500	3" Dia 20' Omni	25	7.2480	0.4044	0.3157	310138
137.000	15' x 4" Mount Pipe	25	7.2049	0.4044	0.3152	310138
135.000	10' dish	25	7.0324	0.4047	0.3130	310138
134.500	12'x3" Mount Pipe	25	6.9894	0.4047	0.3124	281944
133.000	Side Arm Mount [SO 601-1]	25	6.8601	0.4047	0.3107	221527
132.500	10'x2" Horizontal Pipe	25	6.8170	0.4047	0.3101	206759
130.000	(2) 10'x2" Horizontal Pipe	25	6.6018	0.4044	0.3069	155069
128.750	PA8-65	25	6.4942	0.4040	0.3052	137982
125.000	SC3-W100AD	25	6.1719	0.4019	0.2994	99249
121.000	Sector Mount [SM 403-1]	25	5.8290	0.3978	0.2919	69634
120.875	Telewave ANT220F2 - Omni Antenna	25	5.8183	0.3976	0.2916	68930
120.000	PA6-65	25	5.7435	0.3964	0.2898	64349
117.000	Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed)	25	5.4879	0.3919	0.2832	52384
113.125	Telewave ANT220F2 - Omni Antenna	25	5.1601	0.3848	0.2740	42239
109.000	6'x2" Horizontal Pipe	25	4.8151	0.3761	0.2635	35020
108.000	(2) 4'x2" Horizontal Mount Pipe	25	4.7322	0.3739	0.2608	33627
100.000	Side Arm Mount [SO 601-1]	25	4.0816	0.3548	0.2395	25014
96.000	Side Arm Mount [SO 601-1]	25	3.7666	0.3449	0.2289	21278
95.000	PA6-65	25	3.6891	0.3425	0.2263	20454
92.000	10'x2" Horizontal Pipe	25	3.4602	0.3350	0.2186	18322
87.000	Side Arm Mount [SO 601-1]	25	3.0916	0.3213	0.2059	15610
83.000	12'x2" Horizontal Pipe	25	2.8102	0.3088	0.1960	13958
79.000	Side Arm Mount [SO 601-1]	25	2.5423	0.2947	0.1862	12624
58.000	(2) 4'x2" Horizontal Mount Pipe	25	1.3889	0.1934	0.1364	14413
54.000	Side Arm Mount [SO 601-1]	25	1.2140	0.1736	0.1266	15316
53.000	3' Yagi	25	1.1723	0.1688	0.1241	15546
52.000	6'x2" Mount Pipe	25	1.1314	0.1642	0.1216	15756

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load per Bolt lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	140	Diagonal	A325X	0.750	1	9859.20	17943.80	0.549 ✔	1	Member Block

Section No.	*Elevation* *ft*	*Component Type*	*Bolt Grade*	*Bolt Size* *in*	*Number Of Bolts*	*Maximum Load per Bolt* *lb*	*Allowable Load per Bolt* *lb*	*Ratio Load / Allowable*	*Allowable Ratio*	*Criteria*
										Shear
		Horizontal	A325X	0.625	2	3398.44	10263.30	0.331 ✔	1	Member Block Shear
T2	125	Leg	A325X	0.750	6	2088.95	30101.40	0.069 ✔	1	Bolt Tension
		Diagonal	A325X	0.750	1	15538.80	25230.00	0.616 ✔	1	Member Bearing
		Horizontal	A325X	0.625	2	5259.20	10263.30	0.512 ✔	1	Member Block Shear
T3	100	Leg	A325X	0.750	6	9058.28	30101.40	0.301 ✔	1	Bolt Tension
		Diagonal	A325X	0.750	1	18891.30	25230.00	0.749 ✔	1	Member Bearing
		Horizontal	A325X	0.625	2	6754.09	10263.30	0.658 ✔	1	Member Block Shear
T4	75	Leg	A325X	0.750	6	17733.70	30101.40	0.589 ✔	1	Bolt Tension
		Diagonal	A325X	0.750	1	20814.80	25230.00	0.825 ✔	1	Member Bearing
		Horizontal	A325X	0.625	2	7778.97	20526.60	0.379 ✔	1	Member Block Shear
T5	50	Leg	A325X	1.000	6	27114.60	54517.00	0.497 ✔	1	Bolt Tension
		Diagonal	A325X	1.000	1	27740.40	32540.60	0.852 ✔	1	Member Block Shear
		Horizontal	A325X	0.625	2	8752.69	11622.70	0.753 ✔	1	Member Block Shear
T6	25	Leg	A325X	1.000	8	27590.10	54517.00	0.506 ✔	1	Bolt Tension
		Diagonal	A325X	1.000	1	28914.30	45703.10	0.633 ✔	1	Member Block Shear
		Horizontal	A325X	0.625	2	9695.40	11622.70	0.834 ✔	1	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	*Elevation* *ft*	*Size*	*L* *ft*	L_u *ft*	*Kl/r*	*A* in^2	P_u *lb*	ϕP_n *lb*	*Ratio* $\frac{P_u}{\phi P_n}$
T1	140 - 125	HSS5x0.25	15.016	7.508	53.4 K=1.00	3.489	-8340.25	127478.00	0.065 [1] ✔
T2	125 - 100	HSS5x0.25	25.027	8.342	59.3 K=1.00	3.489	-47391.90	121395.00	0.390 [1] ✔
T3	100 - 75	HSS5x.375	25.027	8.342	60.7 K=1.00	5.099	-102016.00	175270.00	0.582 [1] ✔
T4	75 - 50	HSS5x.375	25.027	8.342	60.7 K=1.00	5.099	-163277.00	175270.00	0.932 [1] ✔
T5	50 - 25	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	25.027	12.513	64.9 K=1.00	10.182	-217924.00	336588.00	0.647 [1] ✔
T6	25 - 0	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50	25.027	12.513	65.9 K=1.00	12.538	-286354.00	410589.00	0.697 [1] ✔

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

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	140 - 125	2L2 1/2x2x3/16x3/8	9.926	9.337	152.9 K=1.00	1.620	-10005.70	18914.00	0.529 [1] ✔
T2	125 - 100	2L3x2 1/2x1/4x3/8	11.213	10.631	141.3 K=1.00	2.630	-15809.10	36138.60	0.437 [1] ✔
T3	100 - 75	2L3x2 1/2x1/4x3/8	11.905	11.343	150.5 K=1.00	2.630	-19223.40	32035.00	0.600 [1] ✔
T4	75 - 50	2L3x2 1/2x1/4x3/8	12.639	12.091	160.2 K=1.00	2.630	-21264.60	28408.30	0.749 [1] ✔
T5	50 - 25	2L3 1/2x3x1/4x3/8	16.327	15.525	174.2 K=1.00	3.130	-28208.80	28440.50	0.992 [1] ✔
T6	25 - 0	2L4x3x5/16x3/8	16.988	16.209	182.8 K=1.00	4.180	-29523.00	34725.70	0.850 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	140 - 125	L3x3x1/4	12.400	5.794	118.7 K=1.01	1.440	-6911.98	28864.70	0.239 [1] ✔
T2	125 - 100	L3x3x1/4	14.333	6.760	133.0 K=0.97	1.440	-10486.10	23292.70	0.450 [1] ✔
T3	100 - 75	L3x4x1/4	16.333	7.760	137.6 K=0.96	1.690	-13821.80	25546.20	0.541 [1] ✔
T4	75 - 50	2L3x2 1/2x1/4x3/8	18.333	8.760	136.3 K=1.00	2.630	-15994.60	38714.80	0.413 [1] ✔
T5	50 - 25	2L 'a' > 44.052 in - 106 L4x4x1/4	20.000	9.500	137.9 K=0.96	1.940	-18359.50	29211.70	0.628 [1] ✔
T6	25 - 0	L4x4x1/4	22.000	10.500	149.4 K=0.94	1.940	-20012.70	24886.20	0.804 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	140 - 125	L3x3x1/4	11.800	5.692	117.7 K=1.02	1.440	-1983.45	29263.40	0.068 [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 lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T2	125 - 100	L2 1/2x2 1/2x3/16	7.167	7.167	173.7 K=1.00	0.902	-9.41	8552.99	0.001 [1]
T3	100 - 75	L2 1/2x2 1/2x3/16	8.167	8.167	198.0 K=1.00	0.902	-16.70	6586.62	0.003 [1]
T4	75 - 50	L2 1/2x2 1/2x3/16	9.167	9.167	222.2 K=1.00	0.902	-13.49	5227.92	0.003 [1]
T5	50 - 25	L2 1/2x2 1/2x3/16	10.000	10.000	242.4 K=1.00	0.902	-16.21	4392.91	0.004 [1]
T6	25 - 0	L2 1/2x2 1/2x3/16 KL/R > 250 (C) - 180	11.000	11.000	266.7 K=1.00	0.902	-16.42	3630.50	0.005 [1]

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	140 - 125	HSS5x0.25	15.016	7.508	53.4	3.489	3069.45	157023.00	0.020 [1]
T2	125 - 100	HSS5x0.25	25.027	8.342	59.3	3.489	39484.00	157023.00	0.251 [1]
T3	100 - 75	HSS5x.375	25.027	8.342	60.7	5.099	87989.80	229474.00	0.383 [1]
T4	75 - 50	HSS5x.375	25.027	8.342	60.7	5.099	143648.00	229474.00	0.626 [1]
T5	50 - 25	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	25.027	12.513	64.9	10.182	191429.00	458179.00	0.418 [1]
T6	25 - 0	SterlingCT HSS7.5x0.25	25.027	12.513	65.9	12.538	250056.00	564208.00	0.443 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
		(150deg) on HSS 6.8750x0.50							✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	140 - 125	2L2 1/2x2x3/16x3/8	9.926	9.337	145.4	0.969	9859.20	42147.40	0.234 [1] ✔
T2	125 - 100	2L3x2 1/2x1/4x3/8	11.213	10.631	138.4	1.644	15538.80	71530.30	0.217 [1] ✔
T3	100 - 75	2L3x2 1/2x1/4x3/8	11.905	11.343	147.5	1.644	18891.30	71530.30	0.264 [1] ✔
T4	75 - 50	2L3x2 1/2x1/4x3/8	12.639	12.091	157.0	1.644	20814.80	71530.30	0.291 [1] ✔
T5	50 - 25	2L3 1/2x3x1/4x3/8	16.327	15.525	171.4	1.926	27740.40	83764.70	0.331 [1] ✔
T6	25 - 0	2L4x3x5/16x3/8	16.988	16.209	156.3	2.608	28914.30	127123.00	0.227 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
T1	140 - 125	L3x3x1/4	12.400	5.794	116.0	0.939	6796.87	40862.80	0.166 [1] ✔
T2	125 - 100	L3x3x1/4	14.333	6.760	89.8	0.939	10518.40	40862.80	0.257 [1] ✔
T3	100 - 75	L3x4x1/4	16.333	7.760	106.5	1.127	13508.20	49019.10	0.276 [1] ✔
T4	75 - 50	2L3x2 1/2x1/4x3/8	18.333	8.760	113.8	1.691	15557.90	73569.40	0.211 [1] ✔
T5	50 - 25	2L 'a' > 44.052 in - 106 L4x4x1/4	20.000	9.500	93.1	1.314	17505.40	57175.30	0.306 [1] ✔
T6	25 - 0	L4x4x1/4	22.000	10.500	102.7	1.314	19390.80	57175.30	0.339 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $P_u / \phi P_n$
T1	140 - 125	L3x3x1/4	11.800	5.692	110.2	1.440	1919.85	46656.00	0.041 [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 lb	ϕP_n lb	Ratio $P_u / \phi P_n$
T2	125 - 100	L2 1/2x2 1/2x3/16	6.833	6.833	105.4	0.902	5.80	29224.80	0.000 [1] ✔
T3	100 - 75	L2 1/2x2 1/2x3/16	7.833	7.833	120.8	0.902	12.68	29224.80	0.000 [1] ✔
T4	75 - 50	L2 1/2x2 1/2x3/16	8.500	8.500	131.1	0.902	7.68	29224.80	0.000 [1] ✔
T5	50 - 25	L2 1/2x2 1/2x3/16	9.500	9.500	146.5	0.902	8.96	29224.80	0.000 [1] ✔
T6	25 - 0	L2 1/2x2 1/2x3/16	10.500	10.500	162.0	0.902	7.40	29224.80	0.000 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
T1	140 - 125	Leg	HSS5x0.25	1	-1195.17	127478.00	5.1	Pass
		Leg	HSS5x0.25	2	-8340.25	127478.00	6.5	Pass
		Leg	HSS5x0.25	3	-2680.23	127478.00	7.3	Pass
T2	125 - 100	Leg	HSS5x0.25	22	-44174.30	121395.00	36.4	Pass
		Leg	HSS5x0.25	23	-47391.90	121395.00	39.0	Pass
		Leg	HSS5x0.25	24	-45378.00	121395.00	37.4	Pass
T3	100 - 75	Leg	HSS5x.375	61	-100495.00	175270.00	57.3	Pass
		Leg	HSS5x.375	62	-102016.00	175270.00	58.2	Pass
		Leg	HSS5x.375	63	-99581.20	175270.00	56.8	Pass
T4	75 - 50	Leg	HSS5x.375	100	-163277.00	175270.00	93.2	Pass
		Leg	HSS5x.375	101	-163184.00	175270.00	93.1	Pass
		Leg	HSS5x.375	102	-160710.00	175270.00	91.7	Pass
T5	50 - 25	Leg	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	139	-217924.00	336588.00	64.7	Pass
		Leg	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	140	-216336.00	336588.00	64.3	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Leg	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	141	-214097.00	336588.00	63.6	Pass
T6	25 - 0	Leg	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50	166	-286354.00	410589.00	69.7	Pass
		Leg	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50	167	-282361.00	410589.00	68.8	Pass
		Leg	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50	168	-280939.00	410589.00	68.4	Pass
T1	140 - 125	Diagonal	2L2 1/2x2x3/16x3/8	8	-6980.62	18914.00	36.9 37.0 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	9	-6769.54	18914.00	35.8 38.0 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	11	-9975.91	18914.00	52.7 54.9 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	12	-10005.70	18914.00	52.9 54.8 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	14	-5709.65	18914.00	30.2 32.0 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	15	-5888.03	18914.00	31.1	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	16	-2347.75	19389.40	12.1	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	17	-2288.91	19389.40	11.8 12.3 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	18	-2619.83	19389.40	13.5 14.0 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	19	-2646.99	19389.40	13.7 13.9 (b)	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	20	-1116.22	19389.40	5.8	Pass
		Diagonal	2L2 1/2x2x3/16x3/8	21	-1129.06	19389.40	5.8	Pass
T2	125 - 100	Diagonal	2L3x2 1/2x1/4x3/8	26	-13774.70	36138.60	38.1 51.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	27	-13222.90	36138.60	36.6 53.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	29	-15727.30	36138.60	43.5 61.6 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	30	-15809.10	36138.60	43.7 61.3 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	32	-7939.24	36138.60	22.0 31.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	33	-8154.81	36138.60	22.6 30.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	38	-12926.80	37062.30	34.9 48.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	39	-12464.10	37062.30	33.6 50.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	41	-15619.20	37062.30	42.1 61.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	42	-15692.40	37062.30	42.3 61.0 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	44	-7886.01	37062.30	21.3 31.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	45	-8127.70	37062.30	21.9 30.3 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	50	-10965.70	37987.80	28.9 41.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	51	-10622.40	37987.80	28.0 42.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	53	-13093.90	37987.80	34.5 51.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	54	-13161.10	37987.80	34.6 51.0 (b)	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Diagonal	2L3x2 1/2x1/4x3/8	56	-6267.76	37987.80	16.5 24.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	57	-6431.36	37987.80	16.9 23.9 (b)	Pass
T3	100 - 75	Diagonal	2L3x2 1/2x1/4x3/8	65	-18235.10	32035.00	56.9 68.0 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	66	-17455.00	32035.00	54.5 70.9 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	68	-18907.30	32035.00	59.0 74.9 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	69	-19223.40	32035.00	60.0 73.8 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	71	-10628.90	32035.00	33.2 41.0 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	72	-10651.70	32035.00	33.3 40.9 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	77	-16931.60	32865.50	51.5 63.3 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	78	-16243.00	32865.50	49.4 65.8 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	80	-18106.50	32865.50	55.1 70.9 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	81	-18199.50	32865.50	55.4 70.6 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	83	-10543.30	32865.50	32.1 40.7 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	84	-10569.90	32865.50	32.2 40.6 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	89	-15449.70	33703.10	45.8 57.7 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	90	-14819.50	33703.10	44.0 60.0 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	92	-17074.50	33703.10	50.7 66.9 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	93	-17166.20	33703.10	50.9 66.6 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	95	-9097.21	33703.10	27.0 35.4 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	96	-9214.17	33703.10	27.3 35.0 (b)	Pass
T4	75 - 50	Diagonal	2L3x2 1/2x1/4x3/8	104	-20761.60	28408.30	73.1 76.8 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	105	-19761.00	28408.30	69.6 80.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	107	-20438.00	28408.30	71.9 82.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	108	-21264.60	28408.30	74.9 79.4 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	110	-11638.80	28408.30	41.0 44.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	111	-11650.60	28408.30	41.0 44.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	116	-19603.90	29143.60	67.3 72.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	117	-18671.40	29143.60	64.1 76.0 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	119	-19681.10	29143.60	67.5 78.7 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	120	-20288.10	29143.60	69.6 76.5 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	122	-11322.90	29143.60	38.9	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
							43.3 (b)	
		Diagonal	2L3x2 1/2x1/4x3/8	123	-11340.20	29143.60	38.9 43.3 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	128	-19024.40	29888.70	63.7 70.6 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	129	-18170.50	29888.70	60.8 73.8 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	131	-19331.80	29888.70	64.7 76.8 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	132	-19794.70	29888.70	66.2 75.2 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	134	-11130.20	29888.70	37.2 42.7 (b)	Pass
		Diagonal	2L3x2 1/2x1/4x3/8	135	-11146.20	29888.70	37.3 42.6 (b)	Pass
T5	50 - 25	Diagonal	2L3 1/2x3x1/4x3/8	143	-27951.60	28440.50	98.3	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	144	-26341.60	28440.50	92.6	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	146	-26709.20	28440.50	93.9	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	147	-28208.80	28440.50	99.2	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	149	-15456.90	28440.50	54.3	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	150	-15464.80	28440.50	54.4	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	155	-26747.10	29171.20	91.7	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	156	-25395.50	29171.20	87.1	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	158	-25856.60	29171.20	88.6	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	159	-27132.70	29171.20	93.0	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	161	-14696.20	29171.20	50.4	Pass
		Diagonal	2L3 1/2x3x1/4x3/8	162	-14703.20	29171.20	50.4	Pass
T6	25 - 0	Diagonal	2L4x3x5/16x3/8	170	-29464.80	34725.70	84.8	Pass
		Diagonal	2L4x3x5/16x3/8	171	-27465.60	34725.70	79.1	Pass
		Diagonal	2L4x3x5/16x3/8	173	-27784.80	34725.70	80.0	Pass
		Diagonal	2L4x3x5/16x3/8	174	-29523.00	34725.70	85.0	Pass
		Diagonal	2L4x3x5/16x3/8	176	-16829.00	34725.70	48.5	Pass
		Diagonal	2L4x3x5/16x3/8	177	-16836.00	34725.70	48.5	Pass
		Diagonal	2L4x3x5/16x3/8	182	-28907.90	35669.80	81.0	Pass
		Diagonal	2L4x3x5/16x3/8	183	-27095.20	35669.80	76.0	Pass
		Diagonal	2L4x3x5/16x3/8	185	-27390.90	35669.80	76.8	Pass
		Diagonal	2L4x3x5/16x3/8	186	-29047.70	35669.80	81.4	Pass
		Diagonal	2L4x3x5/16x3/8	188	-16223.00	35669.80	45.5	Pass
		Diagonal	2L4x3x5/16x3/8	189	-16230.30	35669.80	45.5	Pass
T1	140 - 125	Horizontal	L3x3x1/4	7	-5611.30	28864.70	19.4 27.2 (b)	Pass
		Horizontal	L3x3x1/4	10	-6911.98	28864.70	23.9 33.1 (b)	Pass
		Horizontal	L3x3x1/4	13	-4811.04	28864.70	16.7 23.1 (b)	Pass
T2	125 - 100	Horizontal	L3x3x1/4	25	-9274.88	23292.70	39.8 44.0 (b)	Pass
		Horizontal	L3x3x1/4	28	-10486.10	23292.70	45.0 51.2 (b)	Pass
		Horizontal	L3x3x1/4	31	-5519.33	23292.70	23.7 26.2 (b)	Pass
		Horizontal	L3x3x1/4	37	-8776.43	25206.20	34.8 41.7 (b)	Pass
		Horizontal	L3x3x1/4	40	-10240.40	25206.20	40.6 49.5 (b)	Pass
		Horizontal	L3x3x1/4	43	-5651.39	25206.20	22.4 26.8 (b)	Pass
		Horizontal	L3x3x1/4	49	-7292.23	27289.10	26.7 34.7 (b)	Pass
		Horizontal	L3x3x1/4	52	-8442.80	27289.10	30.9 40.5 (b)	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Horizontal	L3x3x1/4	55	-4411.69	27289.10	16.2 21.0 (b)	Pass
T3	100 - 75	Horizontal	L3x4x1/4	64	-13124.90	25546.20	51.4 62.0 (b)	Pass
		Horizontal	L3x4x1/4	67	-13821.80	25546.20	54.1 65.8 (b)	Pass
		Horizontal	L3x4x1/4	70	-7627.94	25546.20	29.9 37.4 (b)	Pass
		Horizontal	L3x4x1/4	76	-12118.80	27377.50	44.3 57.3 (b)	Pass
		Horizontal	L3x4x1/4	79	-12926.20	27377.50	47.2 61.7 (b)	Pass
		Horizontal	L3x4x1/4	82	-7594.79	27377.50	27.7 36.8 (b)	Pass
		Horizontal	L3x4x1/4	88	-10837.80	29413.10	36.8 51.2 (b)	Pass
		Horizontal	L3x4x1/4	91	-11914.70	29413.10	40.5 56.9 (b)	Pass
		Horizontal	L3x4x1/4	94	-6572.03	29413.10	22.3 31.1 (b)	Pass
T4	75 - 50	Horizontal	2L3x2 1/2x1/4x3/8	103	-15626.40	38714.80	40.4	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	106	-15994.60	38714.80	41.3	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	109	-8578.33	38714.80	22.2	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	115	-14465.10	41661.20	34.7	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	118	-14964.00	41661.20	35.9	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	121	-8206.10	41661.20	19.7 20.3 (b)	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	127	-13876.70	44816.50	31.0 32.7 (b)	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	130	-14425.80	44816.50	32.2 34.2 (b)	Pass
		Horizontal	2L3x2 1/2x1/4x3/8	133	-8000.11	44816.50	17.9 19.7 (b)	Pass
T5	50 - 25	Horizontal	L4x4x1/4	142	-18206.20	29211.70	62.3 74.5 (b)	Pass
		Horizontal	L4x4x1/4	145	-18359.50	29211.70	62.8 75.3 (b)	Pass
		Horizontal	L4x4x1/4	148	-9958.70	29211.70	34.1 42.4 (b)	Pass
		Horizontal	L4x4x1/4	154	-16769.00	31810.10	52.7 70.0 (b)	Pass
		Horizontal	L4x4x1/4	157	-16999.30	31810.10	53.4 71.1 (b)	Pass
		Horizontal	L4x4x1/4	160	-9005.29	31810.10	28.3 39.3 (b)	Pass
T6	25 - 0	Horizontal	L4x4x1/4	169	-19981.20	24886.20	80.3 83.2 (b)	Pass
		Horizontal	L4x4x1/4	172	-20012.70	24886.20	80.4 83.4 (b)	Pass
		Horizontal	L4x4x1/4	175	-11225.70	24886.20	45.1 48.4 (b)	Pass
		Horizontal	L4x4x1/4	181	-19219.50	26919.10	71.4 79.3 (b)	Pass
		Horizontal	L4x4x1/4	184	-19299.40	26919.10	71.7 79.7 (b)	Pass
		Horizontal	L4x4x1/4	187	-10630.90	26919.10	39.5 45.4 (b)	Pass
T1	140 - 125	Top Girt	L3x3x1/4	4	-1850.89	29263.40	6.3	Pass
		Top Girt	L3x3x1/4	5	-1983.45	29263.40	6.8	Pass
		Top Girt	L3x3x1/4	6	-1103.04	29263.40	3.8	Pass
T2	125 - 100	Inner Bracing	L2 1/2x2 1/2x3/16	34	-9.29	8552.99	0.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$øP_{allow}$ lb	% Capacity	Pass Fail
		Inner Bracing	L2 1/2x2 1/2x3/16	35	-9.30	8552.99	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	36	-9.41	8552.99	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	46	-10.12	9407.78	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	47	-10.13	9407.78	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	48	-10.21	9407.78	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	58	-9.44	10397.40	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	59	-9.44	10397.40	0.4	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	60	-9.46	10397.40	0.4	Pass
T3	100 - 75	Inner Bracing	L2 1/2x2 1/2x3/16	73	-16.31	6586.62	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	74	-16.41	6586.62	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	75	-16.70	6586.62	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	85	-17.01	7159.11	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	86	-17.09	7159.11	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	87	-17.36	7159.11	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	97	-16.52	7809.62	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	98	-16.56	7809.62	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	99	-16.82	7809.62	0.5	Pass
T4	75 - 50	Inner Bracing	L2 1/2x2 1/2x3/16	112	-13.17	5227.92	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	113	-13.25	5227.92	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	114	-13.49	5227.92	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	124	-13.12	5629.93	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	125	-13.20	5629.93	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	126	-13.44	5629.93	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	136	-13.53	6080.15	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	137	-13.61	6080.15	0.5	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	138	-13.85	6080.15	0.5	Pass
T5	50 - 25	Inner Bracing	L2 1/2x2 1/2x3/16	151	-15.78	4392.91	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	152	-15.91	4392.91	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	153	-16.21	4392.91	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	163	-15.88	4867.49	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	164	-16.01	4867.49	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	165	-16.30	4867.49	0.6	Pass
T6	25 - 0	Inner Bracing	L2 1/2x2 1/2x3/16	178	-16.03	3630.50	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	179	-16.16	3630.50	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	180	-16.42	3630.50	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	190	-16.45	3984.50	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	191	-16.58	3984.50	0.6	Pass
		Inner Bracing	L2 1/2x2 1/2x3/16	192	-16.87	3984.50	0.6	Pass
							Summary	
						Leg (T4)	93.2	Pass
						Diagonal (T5)	99.2	Pass
						Horizontal (T6)	83.4	Pass
						Top Girt (T1)	6.8	Pass
						Inner Bracing (T6)	0.6	Pass
						Bolt Checks	85.2	Pass
						RATING =	**99.2**	**Pass**

ANCHOR BOLT ANALYSIS

ANCHOR BOLT ANALYSIS

Input Data

Tower Reactions:

Uplift:	$Uplift := 279.123 \cdot kips$	*user input*
Shear:	$Shear := 41.761 \cdot kips$	*user input*
Compression:	$Compression := 320.111 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A36 - Assumed and previously implemented by Stainless for design

Number of Anchor Bolts = N	$N := 6$	*user input*	
Bolt Ultimate Strength:	$F_u := 58 \cdot ksi$	*user input*	
Bolt Yield Strength:	$Fy := 36 \cdot ksi$	*user input*	
Bolt Modulus:	$E := 29000 \cdot ksi$	*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:	$E := 29000 \cdot ksi$	*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:

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

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:

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

$T_u = 46.52 \cdot kip$ $\quad T_{ub} := T_u$

Compression Force:

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

$P_{uc} = 53.35 \cdot kip$ $\quad P_{ucb} := P_{uc}$

Shear Force:

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

$V_u = 6.96 \cdot kip$ $\quad V_{ub} := V_u$

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):

$\phi_c := 1.00$

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:

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

$$R_{nc} = 68.38 \cdot ft \cdot kip$$

$$\phi_c \cdot R_{nc} = 68.38 \cdot ft \cdot kip$$

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:

$$R_{nvc} := 0.6 \cdot Fy \cdot \frac{A_n}{2}$$

$$R_{nvc} = 20.51 \cdot ft \cdot kip$$

$$\phi_c \cdot R_{nvc} = 20.51 \cdot ft \cdot kip$$

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:

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

$$\left[\frac{T_{ub}}{(\phi_t \cdot R_{nt})}\right]^2 + \left(\frac{V_{ub}}{\phi_v \cdot R_{nv}}\right)^2 = 0.33$$

TIA-222-H 4.9.9 Combined Shear and Compression:

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

$$\left[\frac{P_{ucb}}{(\phi_c \cdot R_{nc})}\right] + \left(\frac{V_{ub}}{\phi_c \cdot R_{nvc}}\right)^2 = 0.90$$

NOTE: Larger ratio number shown above Governs design Capacity.

Combined Shear and Tension/Compression Check:

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

ShearAndTensionCheck = "OK"

FOUNDATION ANALYSIS

PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower	$M_t := 6071 \cdot kip \cdot ft$
Shear at Base of Tower	$S_t := 75.035 kip$
Max Compressive Force	$C_t := 320.111 kip$
Max Uplift	$U_t := 279.123 kip$
Height of Tower	$H_t := 140 \cdot ft$
Width of Tower at Base	$W_t := 23.0 \cdot ft$
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	$W_f := 36 \cdot ft$
Overall Depth of Footing	$D_f := 6.0 ft$
Length of Pier	$L_p := 4.50 \cdot ft$
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:	$Cvr := 3in$

MATERIAL PROPERTIES:

Compressive Strength of Concrete	$f'c := 3000 \cdot psi$	Unit Weight of Soil	$\gamma_s := 125 \cdot pcf$
Yield Strength of Steel Reinforcement	$fy := 60000 \cdot psi$	Unit Weight of Concrete	$\gamma_c := 150 \cdot pcf$
Internal Friction Angle of Soil	$\phi_s := 34.0 \cdot deg$	Depth to Neglect	$n := 1.0 \cdot ft$
Allowable Bearing Capacity	$q_s := 4000 \cdot psf$	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 $K_p := \dfrac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$ $K_p = 3.5371$

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	$d_{bpier} := 1.128 in$
Number of Bars	$NBpier := 10$	Bar Area	$A_{bpier} := 1.00 \cdot in^2$

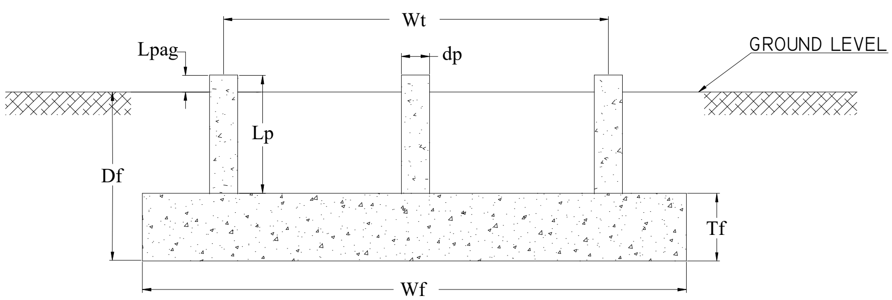
PAD REINFORCEMENT:

Bar Size	$BS_{pad} := 9$	Bar Diameter	$d_{bpad} := 1.1280 \cdot in$
Number of Bars	$NB_{pad} := 37$	Bar Area	$A_{bpad} := 1.33 \cdot in^2$

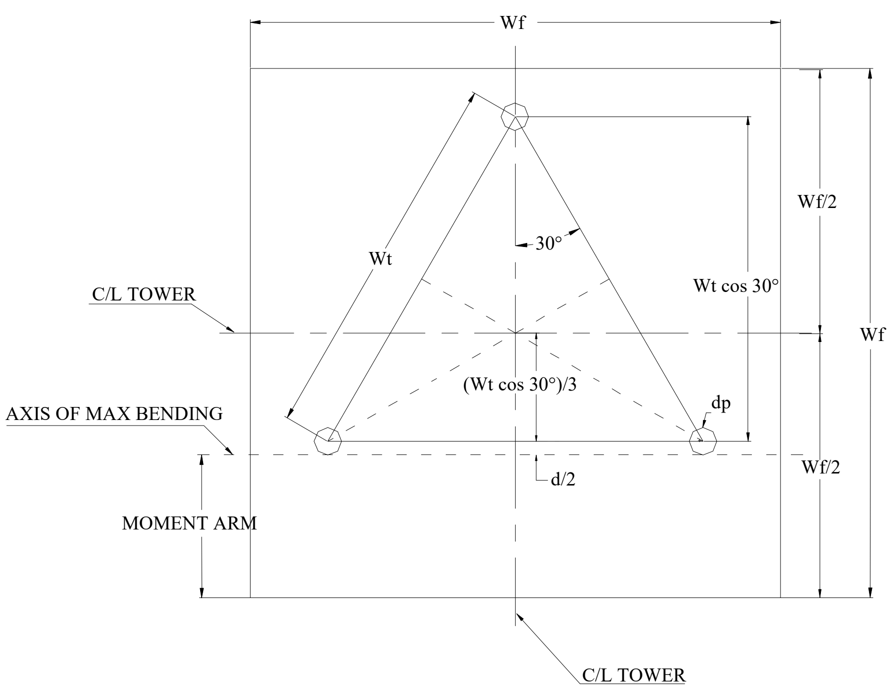
NOTE: Exisitng Steel Reinforcement is average of total Rebar installed - Variable Size/spacing from Stainless Inc.

				Page	of
Job	140' Stainless Lattice Tower - Sterling, CT	Project No.	EVS-011 (b.1)	Sheet 2	of 10
Description	Foundation Analysis (TIA-222-H)	Computed by	MCD	Date	11/25/20
	Modification Report	Checked by		Date	

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:

$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p}$ $\qquad P_{pn} = 0.4421 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $\qquad P_{pt} = 1.5475 \cdot ksf$

$P_{top} := if\left[n < (D_f - T_f), P_{pt}, P_{pn}\right]$ $\qquad P_{top} = 1.5475 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $\qquad P_{bot} = 2.6528 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $\qquad P_{ave} = 2.1002 \cdot ksf$

Shear:

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

$A_{pp} := W_f \cdot T_{pp}$ $\qquad A_{pp} = 90 \cdot ft^2$

Ultimate Shear:

$S_u := P_{ave} \cdot A_{pp}$ $\qquad S_u = 189.0155 \cdot kip$

Weight of Concrete Pad:

$WT_c := \left(W_f^2 \cdot T_f\right) \cdot \gamma_c$ $\qquad WT_c = 486 \cdot kip$

Weight of Soil: above Footing:

$WT_{s1} := W_f^2 \left(\left|D_f - T_f\right|\right) \cdot \gamma_s$ $\qquad WT_{s1} = 567 \cdot kip$

Weight of Soil Wedge at back face:

$WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f\right] \cdot \gamma_s$ $\qquad WT_{s2} = 37.9411 \cdot kip$

Distance to center of Tower Leg from Edge of Footing:

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

$X_t := if(Pos_{tower} = 1, X_{t1}, X_{t2})$ $\qquad X_t = 11.3605 \cdot ft$

Additional Offset of Footing:

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

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

Resisting Moment:

$$M_r := \left[0.9(WT_c + WT_{s1})\right] \cdot \frac{W_f}{2} + 0.90 \cdot \left[WT_t \cdot \left(\frac{W_f}{2} - X_{off}\right)\right] + 0.90 \cdot \left(S_u \cdot \frac{T_{pp}}{3}\right) \ldots$$
$$+ WT_{s2} \cdot 0.90 \cdot \left(W_f + \frac{T_{pp} \cdot \tan(\phi_s)}{3}\right)$$

$\phi_{OT} := 0.75$ ***TIA-222-H REDUCTION FACTOR*** $\qquad M_r = 18465.0471 \cdot kip \cdot ft$

Overturning Moment:

$M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off}$ $\qquad M_{ot} = 6596.245 \cdot kip \cdot ft$

Overturn Ratio (%):

$Ratio_{Stability} := \frac{M_{ot}}{M_r \cdot \phi_{OT}}$ $\qquad Ratio_{Stability} = 47.63 \cdot \%$

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

BEARING PRESSURE CHECK:

Pressure Applied:

$LOAD_{tot} := (WT_c + WT_{s1} + WT_t) \cdot 0.9$ $\qquad LOAD_{tot} = 948.6 \cdot kip$

$A_{mat} := W_f^{\,2}$ $\qquad A_{mat} = 1296 \cdot ft^2$

$S := \dfrac{W_f^{\,3}}{6}$ $\qquad S = 7776 \cdot ft^3$

$P_{max} := \dfrac{LOAD_{tot}}{A_{mat}} + \dfrac{M_{ot}}{S}$ $\qquad P_{max} = 1.5802 \cdot ksf$

$P_{min} := \dfrac{LOAD_{tot}}{A_{mat}} - \dfrac{M_{ot}}{S}$ $\qquad P_{min} = -0.1163 \cdot ksf$

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

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

Distance to Resultant of Pressure Distribution:

$X_p := \dfrac{P_{max}}{\dfrac{P_{max} - P_{min}}{W_f}} \cdot \dfrac{1}{3}$ $\qquad X_p = 11.1771 \cdot ft$

Distance to Kern: $X_k := \dfrac{W_f}{3}$ $\qquad X_k = 12 \cdot ft$

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

Eccentricity: $e := \dfrac{M_{ot}}{LOAD_{tot}}$ $\qquad e = 6.9537$

Adjusted Soil Pressure: $q_a := \dfrac{2 \cdot LOAD_{tot}}{3 \cdot W_f \cdot \left(\dfrac{W_f}{2} - e\right)}$ $\qquad q_a = 1.5903 \cdot ksf$

Revised Maximum: $q_{max} := if(X_p < X_k, q_a, P_{max})$ $\qquad q_{max} = 1.5903 \cdot ksf$

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

CHECK PUNCHING AND BEAM SHEAR:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 318-14)

$\phi_c := 0.85$ (ACI 318-14)

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

Factored load: $FL := \frac{C_t}{W_f^2}$ $\qquad FL = 0.247 \cdot ksf$

$V_{req} := \frac{FL \cdot (X_t - 0.5 \cdot d_p - d) \cdot W_f}{\phi_c}$ $\qquad V_{req} = 74.8196 \cdot kip$

ACI 318-14 $\qquad V_{Avail} := 2 \cdot \sqrt{f'c \cdot psi} \cdot W_f \cdot d$ $\qquad V_{Avail} = 1254.0656 \cdot kip$

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

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 318-14)

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

$V_{req} := FL \cdot \frac{W_f^2 - (d_p + d)^2 \cdot \frac{\pi}{4}}{\phi_c}$ $\qquad V_{req} = 367.8045 \cdot kip$

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

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

TENSILE REINFORCEMENT IN PAD:

$\phi_m := 0.90$ per ACI 318-14

Applied Moments:

$$M_{nT} := \left[U_t \cdot \left(W_t \cdot \sin(60 \cdot deg) - \frac{d_p}{2}\right) + S_t \cdot \left(D_f + L_{pag}\right)\right] - WT_t \cdot 1.2 \cdot X_{off}$$

$$M_{nS} := -1 \cdot \left[\frac{1}{2} \cdot \left(\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot deg) - \frac{d_p}{2}\right)^2 \cdot 0.9W_t \cdot \left[\gamma_s \cdot \left(T_{pp} - T_f\right)\right] \ldots \right. \\ \left. + 0.9WT_{s2} \cdot \left[\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot deg) - \frac{d_p}{2} + \left(D_f - n\right) \cdot \tan\left(\phi_s\right)\right]\right]$$

$$M_{nC} := -1 \cdot \left[\frac{1}{2} \cdot \left(\frac{W_f}{2} + \frac{W_t}{3} \cdot \cos(30 \cdot deg) - \frac{d_p}{2}\right)^2 \cdot 0.9W_t \cdot \left(\gamma_c \cdot T_f\right)\right]$$

Design Moment: $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m}$ $M_n = 2943.5246 \cdot kips \cdot ft$

Required Reinforcement:

ACI 318-14 $\beta := \text{if}\left[f'c \le 4000 \cdot psi, .85, \text{if}\left[f'c \ge 8000 \cdot psi, .65, .85 - \left(\dfrac{\frac{f'c}{psi} - 4000}{1000}\right) \cdot .05\right]\right]$ $\beta = 0.85$

Effective Width: $b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p$ $b_{eff} = 287.023 \cdot in$

$A_s := \dfrac{M_n}{\phi_m \cdot fy \cdot d}$ $A_s = 24.6836 \cdot in^2$

$a := \dfrac{A_s \cdot fy}{\beta \cdot f'c \cdot b_{eff}}$ $a = 2.0235 \cdot in$

$A_s := \dfrac{M_n}{fy \cdot \left(d - \frac{a}{2}\right)}$ $A_s = 23.0971 \cdot in^2$

$\rho := \dfrac{A_s}{b_{eff} \cdot d}$ $d = 26.5 \cdot in$ $\rho = 0.003$

Temperature and Shrinkage:
(ACI 318-14)

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

Area Required:

$As := \text{if}\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$ — $As = 23.0971 \cdot in^2$

Area Provided:

$As_{prov} := A_{bpad} \cdot NB_{pad}$ — $As_{prov} = 49.21 \cdot in^2$

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

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 318-14)

Bar Spacing:

$B_{sPad} := \frac{W_f - 2 \cdot Cvr - NB_{pad} \cdot d_{bpad}}{NB_{pad} - 1}$ — $B_{sPad} = 10.674 \cdot in$

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:

$c := \text{if}\left(Cvr < \frac{B_{sPad}}{2}, Cvr, \frac{B_{sPad}}{2}\right)$ — $c = 3 \cdot in$

Transverse Reinforcement Index: As allowed by ACI 318-14 — $k_{tr} := 0$

Development Length:

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

$L_{dbt} = 34.8457 \cdot in$

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

Minimum Development Length:
(ACI 318-14)

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

Available Length in Pad:

$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr$ — $L_{Pad} = 75 \cdot in$

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

REINFORCEMENT IN PIER:

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

(ACI 318-14) $\quad A_{smin} := 0.01 \cdot 0.5 \cdot A_p$ $\qquad A_{smin} = 9.0478 \cdot in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $\qquad A_{sprov} = 10 \cdot in^2$

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

Bar Spacing In Pier: $\quad B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $\qquad B_{sPier} = 13.9516 \cdot in$

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

Maximum Moment in Pier: $\quad M_p := (S_t \cdot L_p)$ $\qquad M_p = 4051.89 \cdot kips \cdot in$

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

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

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: $\quad (D \;\; N \;\; n \;\; P_u \;\; M_{xu}) := (48 \;\; 11 \;\; 9 \;\; 557 \;\; 6100)$

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

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

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio: $\quad (\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) = (1876.9904 \;\; 20555.909 \;\; -55.1572 \;\; 0.0061)$

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

$AxialLoadCheck := if(\phi P_n \ge P_u, "Okay", "No Good")$ $\qquad AxialLoadCheck = "Okay"$

$BendingCheck := if(\phi M_{xn} \ge M_{xu}, "Okay", "No Good")$ $\qquad BendingCheck = "Okay"$

DEVELOPMENT LENGTH OF PIER REINFORCEMENT:

TENSION (ACI 318-14)

Spacing and Cover: $Cvr = 3 \cdot in$ $B_{sPier} = 13.9516 \cdot in$

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 318-14 $k_{tr} := 0$

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

Minimum Development Length: (ACI 318-14) $L_{dbmin} := 12 \cdot in$

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

COMPRESSION: (ACI 318-14)

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

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

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

Available Length in Pier:

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

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

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

Available Length in Pad:

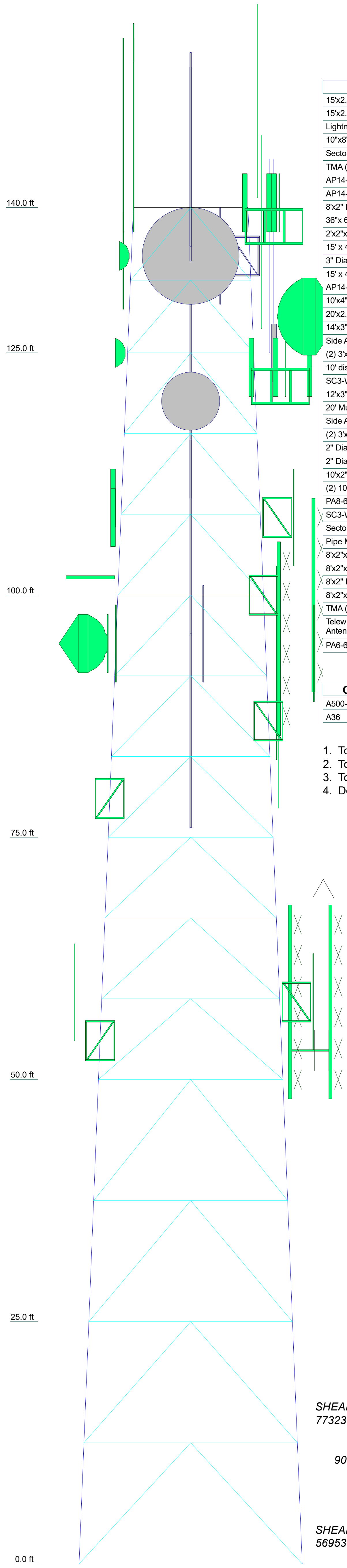
$L_{pad} := T_f - 3 \cdot in$ $\qquad L_{pad} = 27 \cdot in$

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

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

ANALYSIS UNDER TIA-222-F DESIGN CRITERIA (DESPP / CSP)

Section	T1	T2	T3	T4	T5	T6
Legs	HSS5x0.25		HSS5x.375		SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50
Leg Grade	A500-50					
Diagonals	2L2 1/2x2x3/16x3/8	2L3x2 1/2x1/4x3/8			2L3 1/2x3x1/4x3/8	2L4x3x5/16x3/8
Diagonal Grade	A36					A529-50
Top Girts	L3x3x1/4	N.A.				
Horizontals	L3x3x1/4		L3x4x1/4	2L3x2 1/2x1/4x3/8	L4x4x1/4	
Inner Bracing	N.A.	L2 1/2x2 1/2x3/16				
Face Width (ft)	11.8 / 13	15	17	19	21	23
# Panels @ (ft)	2 @ 7.5	9 @ 8.33333			4 @ 12.5	
Weight (lb) 28260.0	1617.9	3626.8	4420.6	5214.1	5900.7	7479.9



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
15'x2.5" Horizontal Pipe (E)	140.5	Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed) (Eversource Mount @ 117' - PROPOSED)	117
15'x2.5" Extension Pipe	140	6' x2.5" - Sch 40 Antenna Pipe (Vertical) (Eversource Mount Pipe)	117
Lightning Rod 5/8"x4'	140	Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 113.125' - PROPOSED)	113.125
10"x8"x4" Junction Box (E)	137.5	6'x2" Horizontal Pipe (E)	109
Sector Mount [SM 403-1] (E)	137.5	12"x12" Panel Antenna (E)	109
TMA (E)	137.5	12"x12" Panel Antenna (E)	109
AP14-850/105 w/Mount Pipe (E)	137.5	(2) 4'x2" Horizontal Mount Pipe (E)	108
AP14-850/105 w/Mount Pipe (E)	137.5	12'x2" Horizontal Pipe (E)	108
8'x2" Mount Pipe (E)	137.5	10'x2" Horizontal Pipe (E)	100
36"x 6"x3" panel antenna w/ Mount Pipe (E)	137.5	3' Yagi (E)	100
2'x2"x2" Vertical Tube (E)	137.5	Side Arm Mount [SO 601-1] (E)	100
15' x 4" Mount Pipe (E)	137.5	2" Dia 10' Omni (E)	100
3" Dia 20' Omni (E)	137.5	(2) 3'x3"x3" Horizontal Angle (E)	100
15' x 4" Mount Pipe (E)	137	(2) 3'x3"x3" Horizontal Angle (E)	96
AP14-850/105 w/Mount Pipe (E)	135	2" Dia 20' Omni (E)	96
10'x4" Mount Pipe (E)	135	20' Multi Array Dipole (E)	96
20'x2.5" Mount Pipe (E)	135	10'x4" Mount Pipe (E)	96
14'x3" Mount Pipe (E)	135	Side Arm Mount [SO 601-1] (E)	96
Side Arm Mount [SO 601-1] (E)	135	MD-S6 (for 6' MW) : Ice Shield (E)	95
(2) 3'x3"x3" Horizontal Angle (E)	135	ANT450F6 (CSP Add)	95
10' dish (E)	135	8'x4" Mount Pipe (E)	95
SC3-W100AD (CSP - Existing @ 135')	135	15' x 4" Mount Pipe (E)	95
12'x3" Mount Pipe (E)	134.5	PA6-65 (Diversity CSP)	95
20' Multi Array Dipole (E)	134.5	10'x2" Horizontal Pipe (E)	92
Side Arm Mount [SO 601-1] (E)	133	2" Dia 20' Omni (E)	87
(2) 3'x3"x3" Horizontal Angle (E)	133	Side Arm Mount [SO 601-1] (E)	87
2" Dia 20' Omni (E)	133	12'x2" Horizontal Pipe (E)	83
2" Dia 20' Omni (E)	133	Single Bay Dipole (E)	83
10'x2" Horizontal Pipe (E)	132.5	Side Arm Mount [SO 601-1] (E)	79
(2) 10'x2" Horizontal Pipe (E)	130	(2) 4'x2" Horizontal Mount Pipe (E)	58
PA8-65 (E)	128.75	12'x2" Horizontal Pipe (E)	58
SC3-W100AD (CSP - Existing @ 125')	125	Single Dipole Antenna (E)	58
Sector Mount [SM 403-1] (E)	121	Side Arm Mount [SO 601-1] (E)	54
Pipe Mount [PM 602-1] (E)	121	7' Whip (E)	54
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	121	3' Yagi (E)	53
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	121	6'x2" Mount Pipe (E)	52
8'x2" Mount Pipe (E)	121	Single Bay Dipole Antenna (E)	52
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	121		
TMA (E)	121		
Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 120.875' - PROPOSED)	120.875		
PA6-65 (E)	120		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A529-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Windham County, Connecticut.
2. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 90 mph wind.

MAX. CORNER REACTIONS AT BASE:
DOWN: 333334 lb
SHEAR: 42748 lb

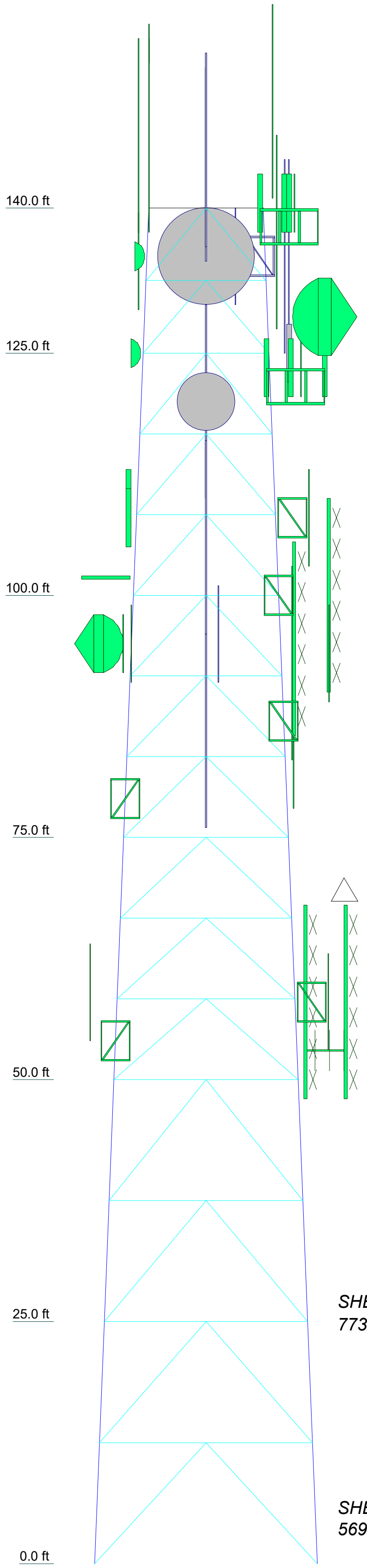
UPLIFT: -276546 lb
SHEAR: 38427 lb

AXIAL 58240 lb
SHEAR 77323 lb — *MOMENT 6253 kip-ft*
TORQUE 248 kip-ft
90 mph WIND - 0.500 in ICE

AXIAL 39409 lb
SHEAR 56953 lb — *MOMENT 4653 kip-ft*
TORQUE 175 kip-ft
REACTIONS - 90 mph WIND

AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***140' Self-Supporting Lattice Tower***		
	Project: ***CSP Tower - Sterling, CT***		
	Client: EVS-011 / Eversource / MODification / Phase (b) / DESPP/CSP Loads	Drawn by: MCD	App'd:
	Code: TIA/EIA-222-F	Date: 11/25/20	Scale: NTS
	Path:		Dwg No. E-1

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Horizontals	Inner Bracing	Face Width (ft)	# Panels @ (ft)	Weight (lb)
T1			2L2 1/2x2x3/16x3/8		L3x3x1/4		N.A.	11.8	2 @ 7.5	1617.9
T2	HSS5x0.25					L3x3x1/4		13		3626.8
T3			2L3x2 1/2x1/4x3/8	A36		L3x4x1/4		15	9 @ 8.33333	4420.6
T4	HSS5x.375	A500-50			N.A.	2L3x2 1/2x1/4x3/8	L2 1/2x2 1/2x3/16	17		5214.1
T5	A		2L3 1/2x3x1/4x3/8			L4x4x1/4		19	4 @ 12.5	5900.7
T6	B		2L4x3x5/16x3/8	A529-50				21		7479.9
								23		28260.0



SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	B	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A529-50	50 ksi	65 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

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4. Deflections are based upon a 90 mph wind.

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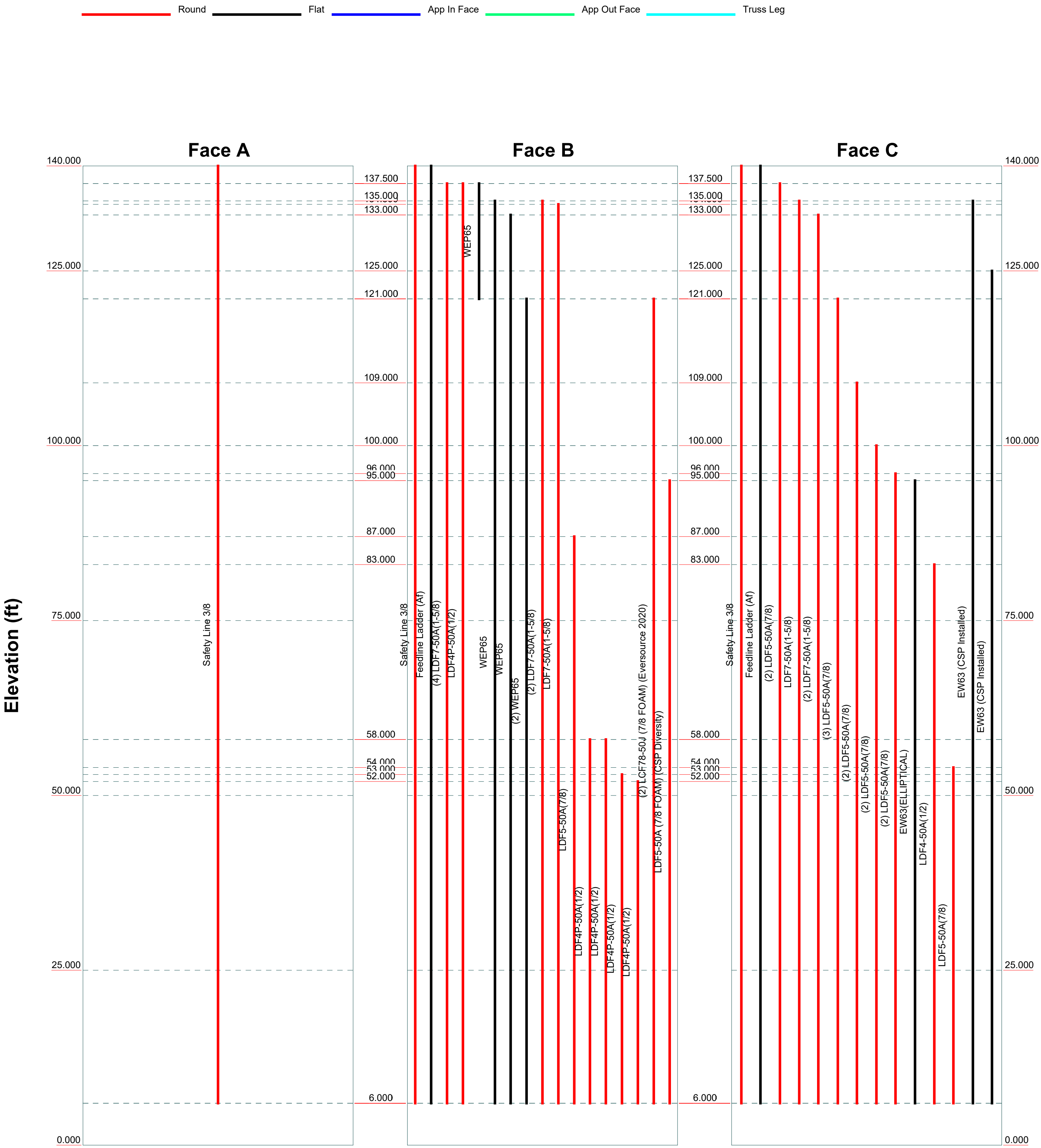
AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***140' Self-Supporting Lattice Tower***		
	Project: ***CSP Tower - Sterling, CT***		
	Client: EVS-011 / Eversource / MODification / Phase (b) / DESPP/CSP Loads	Drawn by: MCD	App'd:
	Code: TIA/EIA-222-F	Date: 11/25/20	Scale: NTS
	Path:		Dwg No. E-1

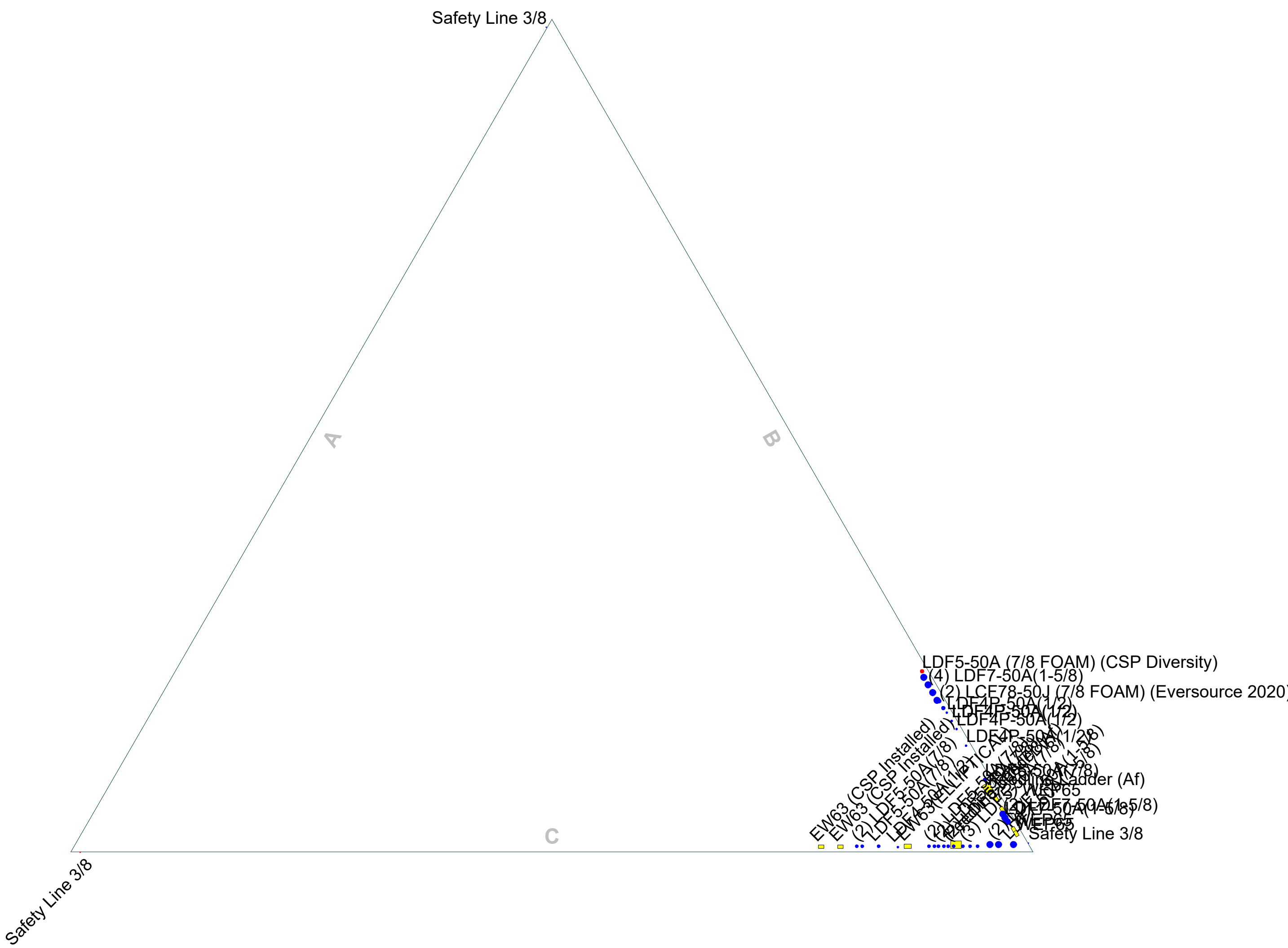
Feed Line Distribution Chart
0' - 140'



AECOM	Job: ***140' Self-Supporting Lattice Tower***			
500 Enterprise Drive, Suite 3B	Project: ***CSP Tower - Sterling, CT***			
Rocky Hill, CT	Client: EVS-011 / Eversource / MODification / Phase (b) / DESPP/CSP Loads	Drawn by: MCD	App'd:	
Phone: 860-263-5800	Code: TIA/EIA-222-F	Date: 11/25/20	Scale: NTS	
FAX: 860-812-2094	Path:		Dwg No. E-7	

Feed Line Plan

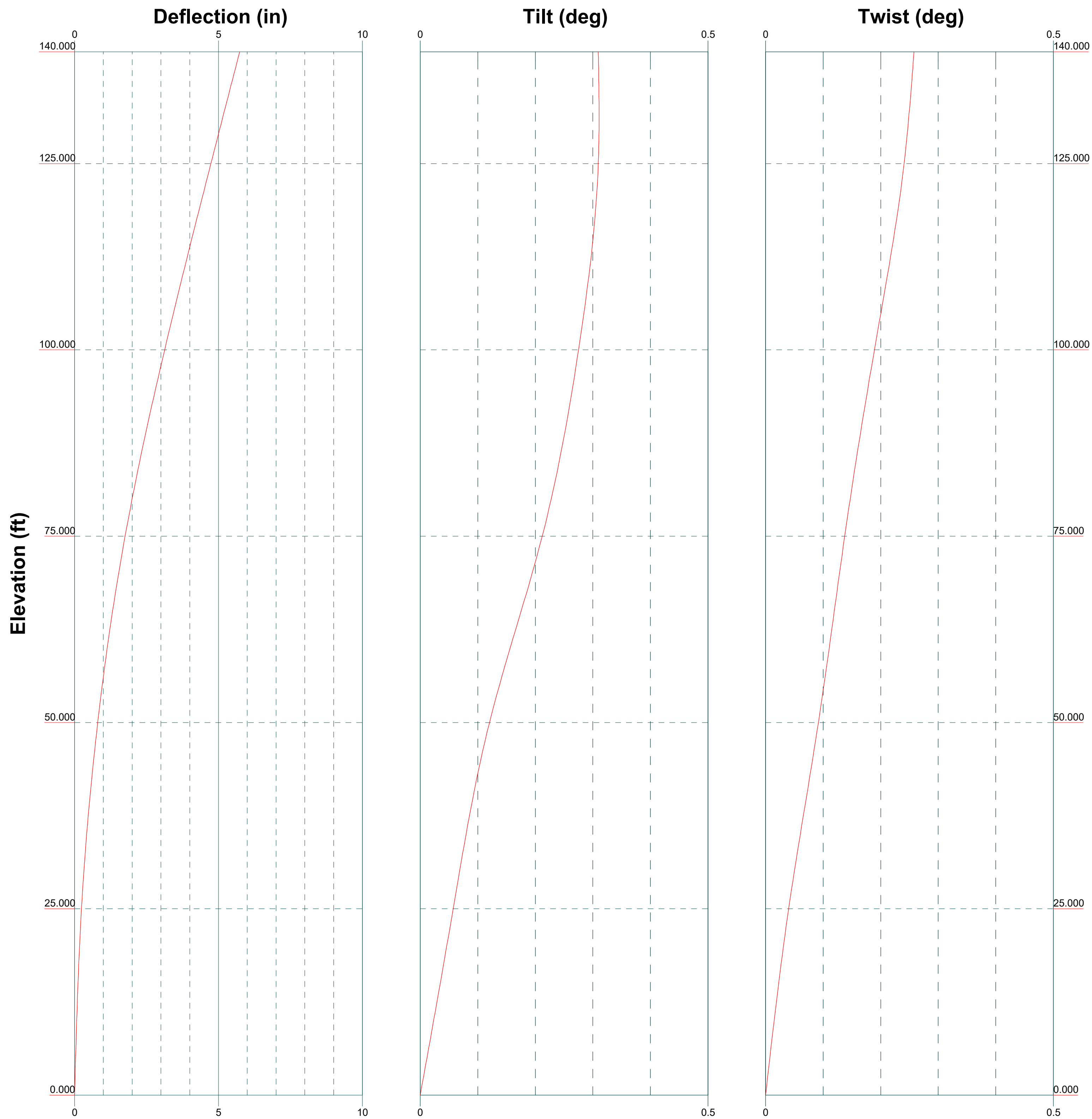
Round — Flat — App In Face — App Out Face



AECOM 500 Enterprise Drive, Suite 3B Rocky Hill, CT Phone: 860-263-5800 FAX: 860-812-2094	Job: ***140' Self-Supporting Lattice Tower***		
	Project: ***CSP Tower - Sterling, CT***		
	Client: EVS-011 / Eversource / MODification / Phase (b) / DESPP/CSP Loads	Drawn by: MCD	App'd:
	Code: TIA/EIA-222-F	Date: 11/25/20	Scale: NTS
	Path:		Dwg No. E-7

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

Maximum Values



AECOM	Job: *140' Self-Supporting Lattice Tower*		
500 Enterprise Drive, Suite 3B	Project: *CSP Tower - Sterling, CT*		
Rocky Hill, CT	Client: EVS-011 / Eversource / MODification / Phase (b) / DESPP/CSP Loads	Drawn by: MCD	App'd:
Phone: 860-263-5800	Code: TIA/EIA-222-F	Date: 11/25/20	Scale: NTS
FAX: 860-812-2094	Path:		Dwg No. E-5

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 140.000 ft above the ground line.
The base of the tower is set at an elevation of 0.000 ft above the ground line.
The face width of the tower is 11.800 ft at the top and 23.000 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

- Tower is located in Windham County, Connecticut.
- Basic wind speed of 90 mph.
- Nominal ice thickness of 0.500 in.
- Ice density of 56 pcf.
- A wind speed of 90 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 90 mph.
- 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

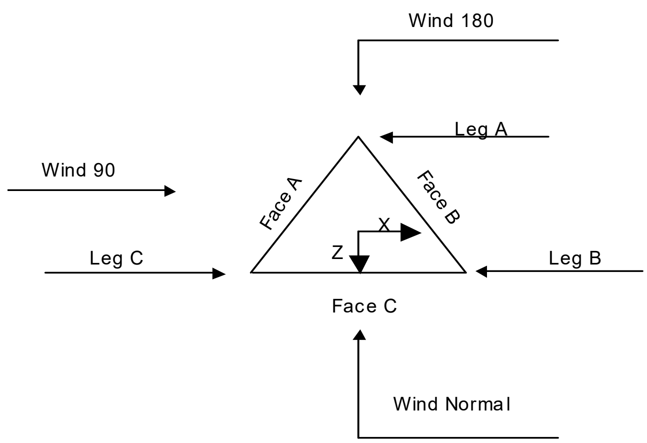
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
√ Leg Bolts Are At Top Of Section
√ Secondary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

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

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

Poles

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



Triangular Tower

Tower Section Geometry

Tower Section	*Tower Elevation* *ft*	*Assembly Database*	*Description*	*Section Width* *ft*	*Number of Sections*	*Section Length* *ft*
T1	140.000-125.000			11.800	1	15.000
T2	125.000-100.000			13.000	1	25.000
T3	100.000-75.000			15.000	1	25.000
T4	75.000-50.000			17.000	1	25.000
T5	50.000-25.000			19.000	1	25.000
T6	25.000-0.000			21.000	1	25.000

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	140.000-125.000	7.500	K Brace Down	No	Yes	0.000	0.000
T2	125.000-100.000	8.333	K Brace Down	No	Yes	0.000	0.000
T3	100.000-75.000	8.333	K Brace Down	No	Yes	0.000	0.000
T4	75.000-50.000	8.333	K Brace Down	No	Yes	0.000	0.000
T5	50.000-25.000	12.500	K Brace Down	No	Yes	0.000	0.000
T6	25.000-0.000	12.500	K Brace Down	No	Yes	0.000	0.000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Type*	*Leg Size*	*Leg Grade*	*Diagonal Type*	*Diagonal Size*	*Diagonal Grade*
T1 140.000-125.000	Pipe	HSS5x0.25	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x3/16x3/8	A36 (36 ksi)
T2 125.000-100.000	Pipe	HSS5x0.25	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T3 100.000-75.000	Pipe	HSS5x.375	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T4 75.000-50.000	Pipe	HSS5x.375	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T5 50.000-25.000	Arbitrary Shape	SterlingCT HSS 7.5x0.25 (150deg) on HSS 6.8750x0.375 (T5)	A500-50 (50 ksi)	Double Angle	2L3 1/2x3x1/4x3/8	A36 (36 ksi)
T6 25.000-0.000	Arbitrary Shape	SterlingCT HSS7.5x0.25 (150deg) on HSS 6.8750x0.50	A500-50 (50 ksi)	Double Angle	2L4x3x5/16x3/8	A529-50 (50 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 140.000-125.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T2 125.000-100.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T3 100.000-75.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x4x1/4	A36 (36 ksi)
T4 75.000-50.000	None	Flat Bar		A36 (36 ksi)	Double Angle	2L3x2 1/2x1/4x3/8	A36 (36 ksi)
T5 50.000-25.000	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T6 25.000-0.000	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*
T2 125.000-100.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 100.000-75.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 75.000-50.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 50.000-25.000	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 25.000-0.000	Equal Angle		A36	Single Angle	L2 1/2x2 1/2x3/16	A36

Tower Elevation *ft*	*Secondary Horizontal Type*	*Secondary Horizontal Size*	*Secondary Horizontal Grade*	*Inner Bracing Type*	*Inner Bracing Size*	*Inner Bracing Grade*
			(36 ksi)			(36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Gusset Area (per face)* ft^2	*Gusset Thickness* *in*	*Gusset Grade*	*Adjust. Factor* A_f	*Adjust. Factor* A_r	*Weight Mult.*	*Double Angle Stitch Bolt Spacing Diagonals* *in*	*Double Angle Stitch Bolt Spacing Horizontals* *in*	*Double Angle Stitch Bolt Spacing Redundants* *in*
T1 140.000-125.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	39.700	Mid-Pt	Mid-Pt
T2 125.000-100.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	44.850	Mid-Pt	Mid-Pt
T3 100.000-75.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	47.620	Mid-Pt	Mid-Pt
T4 75.000-50.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	50.560	Mid-Pt	Mid-Pt
T5 50.000-25.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	65.310	Mid-Pt	Mid-Pt
T6 25.000-0.000	0.000	0.000	A36 (36 ksi)	1.05	1	1.05	67.950	Mid-Pt	Mid-Pt

Tower Section Geometry *(cont'd)*

			K Factors[1]							
Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*Legs*	*X Brace Diags* *X* *Y*	*K Brace Diags* *X* *Y*	*Single Diags* *X* *Y*	*Girts* *X* *Y*	*Horiz.* *X* *Y*	*Sec. Horiz.* *X* *Y*	*Inner Brace* *X* *Y*
T1 140.000-125.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 125.000-100.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 100.000-75.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 75.000-50.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 50.000-25.000	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 25.000-0.000	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 140.000-125.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T2 125.000-100.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T3 100.000-75.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T4 75.000-50.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T5 50.000-25.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75
T6 25.000-0.000	0.000	1	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	0.75	0.000	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 140.000-125.000	Flange	0.750 A325X	0	0.750 A325X	1	0.625 A325N	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T2 125.000-100.000	Flange	0.750 A325X	6	0.750 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T3 100.000-75.000	Flange	0.750 A325X	6	0.750 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T4 75.000-50.000	Flange	0.750 A325X	6	0.750 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T5 50.000-25.000	Flange	1.000 A325X	6	1.000 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0
T6 25.000-0.000	Flange	1.000 A325X	8	1.000 A325X	1	0.625 A325X	0	0.625 A325N	0	0.625 A325N	0	0.625 A325X	2	0.625 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	*Face or Leg*	*Allow Shield*	*Exclude From Torque Calculation*	*Component Type*	*Placement ft*	*Face Offset in*	*Lateral Offset (Frac FW)*	*#*	*# Per Row*	*Clear Spacing in*	*Width or Diameter in*	*Perimeter in*	*Weight plf*
Safety Line 3/8	A	No	No	Ar (CaAa)	140.000 - 6.000	0.000	0.49	1	1	0.375	0.375		0.22
Safety Line 3/8	B	No	No	Ar (CaAa)	140.000 - 6.000	0.000	0.49	1	1	0.375	0.375		0.22
Safety Line 3/8	C	No	No	Ar (CfAe)	140.000 - 6.000	0.000	0.49	1	1	0.375	0.375		0.22
Feedline Ladder (Af)	B	No	No	Af (CfAe)	140.000 - 6.000	-1.000	0.42	1	1	3.000	3.000	10.200	8.40
Feedline Ladder (Af)	C	No	No	Af (CfAe)	140.000 - 6.000	-1.000	-0.42	1	1	3.000	3.000	10.200	8.40
***													
LDF7-50A(1-5/8)	B	Yes	No	Ar (CaAa)	137.500 - 6.000	-1.000	0.3	4	4	0.500	1.980		0.82
LDF5-50A(7/8)	C	Yes	No	Ar (CaAa)	137.500 - 6.000	-1.000	-0.32	2	2	0.500	1.030		0.33
LDF4P-50A(1/2)	B	Yes	No	Ar (CaAa)	137.500 - 6.000	-1.000	0.33	1	1	0.500	0.630		0.15
LDF7-50A(1-5/8)	C	Yes	No	Ar (CaAa)	135.000 - 6.000	-1.000	-0.48	1	1	0.500	1.980		0.82
WEP65	B	Yes	No	Af (CfAe)	137.500 - 121.000	-1.000	0.44	1	1	1.584	1.584	5.128	0.53
WEP65	B	Yes	No	Af (CfAe)	135.000 - 6.000	-1.000	0.47	1	1	1.584	1.584	5.128	0.53
WEP65	B	Yes	No	Af (CfAe)	133.000 - 6.000	-1.000	0.475	1	1	1.584	1.584	5.128	0.53
WEP65	B	Yes	No	Af (CfAe)	121.000 - 6.000	-1.000	0.44	2	2	1.584	1.584	5.128	0.53
LDF7-50A(1-5/8)	B	Yes	No	Ar (CaAa)	135.000 - 6.000	-1.000	0.455	2	2	0.500	1.980		0.82
LDF7-50A(1-5/8)	B	Yes	No	Ar (CaAa)	134.500 - 6.000	-1.000	0.455	1	1	0.500	1.980		0.82
LDF7-50A(1-5/8)	C	Yes	No	Ar (CaAa)	133.000 - 6.000	-1.000	-0.46	2	2	0.500	1.980		0.82
LDF5-50A(7/8)	C	Yes	No	Ar (CaAa)	121.000 - 6.000	-1.000	-0.435	3	3	1.030	1.030		0.33
LDF5-50A(7/8)	C	Yes	No	Ar (CaAa)	109.000 - 6.000	-1.000	-0.415	2	2	0.500	1.030		0.33
LDF5-50A(7/8)	C	Yes	No	Ar (CaAa)	100.000 - 6.000	-1.000	-0.405	2	2	0.500	1.030		0.33
LDF5-50A(7/8)	B	Yes	No	Ar (CaAa)	87.000 - 6.000	-1.000	0.41	1	1	0.500	1.030		0.33
LDF5-50A(7/8)	C	Yes	No	Ar (CaAa)	96.000 - 6.000	-1.000	-0.395	2	2	0.500	1.030		0.33
EW63(ELLIPTICAL)	C	Yes	No	Af (CfAe)	95.000 - 6.000	-1.000	-0.37	1	1	0.500	2.010	6.315	0.51
LDF4-50A(1/2)	C	Yes	No	Ar (CaAa)	83.000 - 6.000	-1.000	-0.36	1	1	0.625	0.625		0.15
LDF4P-50A(1/2)	B	Yes	No	Ar (CaAa)	58.000 - 6.000	-1.000	0.37	1	1	0.500	0.630		0.15
LDF5-50A(7/8)	C	Yes	No	Ar (CaAa)	54.000 - 6.000	-1.000	-0.34	1	1	0.500	1.030		0.33
LDF4P-50A(1/2)	B	Yes	No	Ar (CaAa)	58.000 - 6.000	-1.000	0.35	1	1	0.500	0.630		0.15
LDF4P-50A(1/2)	B	Yes	No	Ar (CaAa)	53.000 - 6.000	-1.000	0.34	1	1	0.500	0.630		0.15
LDF4P-50A(1/2)	B	Yes	No	Ar (CaAa)	52.000 - 6.000	-1.000	0.34	1	1	0.500	0.630		0.15
****Proposed ****													
* CSP Add													

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
Dishes													
EW63 (CSP Installed)	C	Yes	No	Af (CfAe)	135.000 - 6.000	-1.000	-0.3	1	1	1.574	1.574	5.067	0.51
EW63 (CSP Installed)	C	Yes	No	Af (CfAe)	125.000 - 6.000	-1.000	-0.28	1	1	1.574	1.574	5.067	0.51
* EVS Proposed (2020 Inventory)													
LCF78-50J (7/8 FOAM) (Eversource 2020)	B	Yes	No	Ar (CaAa)	121.000 - 6.000	-1.000	0.32	2	2	1.100	1.100		0.53
LDF5-50A (7/8 FOAM) (CSP Diversity)	B	Yes	No	Ar (CfAe)	95.000 - 6.000	-1.000	0.28	1	1	1.090	1.090		0.33

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	140.000-125.000	A	0.000	0.000	0.563	0.000	3.30
		B	0.000	7.775	17.091	0.000	212.53
		C	0.469	5.062	7.723	0.000	163.97
T2	125.000-100.000	A	0.000	0.000	0.938	0.000	5.50
		B	0.000	18.919	41.782	0.000	435.89
		C	0.781	12.809	28.343	0.000	345.73
T3	100.000-75.000	A	0.000	0.000	0.938	0.000	5.50
		B	1.817	19.446	43.898	0.000	452.81
		C	0.781	16.159	42.851	0.000	402.01
T4	75.000-50.000	A	0.000	0.000	0.938	0.000	5.50
		B	2.271	19.446	46.560	0.000	461.90
		C	0.781	16.997	45.150	0.000	411.07
T5	50.000-25.000	A	0.000	0.000	0.938	0.000	5.50
		B	2.271	19.446	51.538	0.000	473.75
		C	0.781	16.997	47.313	0.000	418.00
T6	25.000-0.000	A	0.000	0.000	0.713	0.000	4.18
		B	1.726	14.779	39.169	0.000	360.05
		C	0.594	12.918	35.958	0.000	317.68

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	140.000-125.000	A	0.500	0.000	0.000	2.063	0.000	11.32
		B		0.000	10.303	33.269	0.000	434.20
		C		1.719	6.451	14.396	0.000	284.20
T2	125.000-100.000	A	0.500	0.000	0.000	3.438	0.000	18.86

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
		B		0.000	25.641	80.016	0.000	978.69
		C		2.865	16.976	53.594	0.000	723.91
T3	100.000-75.000	A	0.500	0.000	0.000	3.438	0.000	18.86
		B		3.483	26.391	84.132	0.000	1039.53
		C		2.865	21.437	85.726	0.000	941.56
T4	75.000-50.000	A	0.500	0.000	0.000	3.438	0.000	18.86
		B		4.354	26.391	90.194	0.000	1080.12
		C		2.865	22.552	91.133	0.000	981.30
T5	50.000-25.000	A	0.500	0.000	0.000	3.438	0.000	18.86
		B		4.354	26.391	103.071	0.000	1146.50
		C		2.865	22.552	95.396	0.000	1007.85
T6	25.000-0.000	A	0.500	0.000	0.000	2.612	0.000	14.34
		B		3.309	20.057	78.334	0.000	871.34
		C		2.177	17.140	72.501	0.000	765.97

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	140.000-125.000	A	0.000	0.000	0.000	0.000
		B	0.000	0.737	1.359	1.987
		C	0.000	0.339	0.591	0.914
T2	125.000-100.000	A	0.000	0.000	0.000	0.000
		B	0.000	1.792	3.552	5.377
		C	0.000	1.243	2.295	3.730
T3	100.000-75.000	A	0.000	0.000	0.000	0.000
		B	0.000	1.907	3.704	5.720
		C	0.000	1.836	3.325	5.508
T4	75.000-50.000	A	0.000	0.000	0.000	0.000
		B	0.000	1.985	3.774	5.956
		C	0.000	1.905	3.413	5.715
T5	50.000-25.000	A	0.000	0.000	0.000	0.000
		B	0.000	1.635	3.658	6.038
		C	0.000	1.453	3.185	5.367
T6	25.000-0.000	A	0.000	0.000	0.000	0.000
		B	0.000	1.203	2.914	4.811
		C	0.000	1.069	2.537	4.275

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	140.000-125.000	23.015	13.080	22.349	11.876
T2	125.000-100.000	32.581	19.047	31.738	17.590
T3	100.000-75.000	39.145	23.547	37.361	21.276
T4	75.000-50.000	43.273	26.110	42.055	24.023
T5	50.000-25.000	41.237	25.487	43.422	25.197
T6	25.000-0.000	35.893	22.417	39.565	23.208

AECOM
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Rocky Hill, CT
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Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert (ft ft ft)	Azimuth Adjustment (°)	Placement (ft)		C_AA_A Front (ft²)	C_AA_A Side (ft²)	Weight (lb)
LEG B LOADING									
3" Dia 20' Omni (E)	B	From Leg	1.000 0.000 13.500	0.0000	137.500	No Ice 1/2" Ice	4.000 6.000	4.000 6.000	55.00 100.00
2'x2"x2" Vertical Tube (E)	B	From Leg	1.000 0.000 4.500	0.0000	137.500	No Ice 1/2" Ice	0.522 0.674	0.522 0.674	6.10 10.28
15' x 4" Mount Pipe (E)	B	From Leg	1.500 0.000 0.000	0.0000	137.500	No Ice 1/2" Ice	4.421 8.296	4.421 8.296	180.00 226.59
10"x8"x4" Junction Box (E)	B	From Leg	1.500 0.000 3.500	0.0000	137.500	No Ice 1/2" Ice	0.667 0.770	0.333 0.415	10.00 15.67
Sector Mount [SM 403-1] (E)	B	From Leg	3.000 0.000 0.500	0.0000	137.500	No Ice 1/2" Ice	10.220 14.320	7.050 10.130	291.16 422.38
TMA (E)	B	From Leg	3.000 0.000 0.500	0.0000	137.500	No Ice 1/2" Ice	0.600 0.704	0.407 0.497	10.00 15.41
AP14-850/105 w/Mount Pipe (E)	B	From Leg	3.000 6.000 3.000	0.0000	137.500	No Ice 1/2" Ice	10.764 11.457	8.226 9.799	78.91 157.97
AP14-850/105 w/Mount Pipe (E)	B	From Leg	3.000 1.000 3.000	0.0000	137.500	No Ice 1/2" Ice	10.764 11.457	8.226 9.799	78.91 157.97
8'x2" Mount Pipe (E)	B	From Leg	3.000 -1.000 3.000	0.0000	137.500	No Ice 1/2" Ice	1.900 2.728	1.900 2.728	30.00 43.56
36"x 6"x3" panel antenna w/ Mount Pipe (E)	B	From Leg	3.000 0.000 3.000	0.0000	137.500	No Ice 1/2" Ice	2.250 2.541	2.041 2.511	30.00 57.85
***									
14'x3" Mount Pipe (E)	B	From Face	3.000 5.000 0.000	0.0000	135.000	No Ice 1/2" Ice	4.134 6.338	4.134 6.338	110.00 140.79
Side Arm Mount [SO 601-1] (E)	B	From Face	0.000 5.000 0.000	0.0000	135.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
(2) 3'x3"x3" Horizontal Angle (E)	B	From Face	0.000 5.000 0.000	0.0000	135.000	No Ice 1/2" Ice	0.900 1.120	0.075 0.112	10.00 23.39
20'x2.5" Mount Pipe (E)	B	From Face	3.500 5.000 0.000	0.0000	135.000	No Ice 1/2" Ice	5.750 7.782	5.750 7.782	120.00 157.48
AP14-850/105 w/Mount Pipe (E)	B	From Face	3.500 5.000 -10.000	0.0000	135.000	No Ice 1/2" Ice	10.764 11.457	8.226 9.799	78.91 157.97
***									
10'x4" Mount Pipe (E)	B	From Face	0.000 0.000 0.000	0.0000	135.000	No Ice 1/2" Ice	2.953 5.238	2.953 5.238	130.00 156.61
***									

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
Sector Mount [SM 403-1] (E)	B	From Leg	3.000 0.000 0.500	0.0000	121.000	No Ice 1/2" Ice	10.220 14.320	7.050 10.130	291.16 422.38
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	B	From Leg	3.000 6.000 2.500	0.0000	121.000	No Ice 1/2" Ice	2.904 3.921	8.938 10.450	60.00 115.24
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	B	From Leg	3.000 1.000 2.500	0.0000	121.000	No Ice 1/2" Ice	2.904 3.921	8.938 10.450	60.00 115.24
8'x2" Mount Pipe (E)	B	From Leg	3.000 -1.000 2.500	0.0000	121.000	No Ice 1/2" Ice	1.900 2.728	1.900 2.728	30.00 43.56
8'x2"x6" Panel Antenna w/ Mount Pipe (E)	B	From Leg	3.000 -6.000 2.500	0.0000	121.000	No Ice 1/2" Ice	2.904 3.921	8.938 10.450	60.00 115.24
TMA (E)	B	From Leg	3.000 3.000 2.500	0.0000	121.000	No Ice 1/2" Ice	0.600 0.704	0.407 0.497	10.00 15.41
***									
(2) 4'x2" Horizontal Mount Pipe (E)	B	From Leg	2.000 0.000 0.000	0.0000	108.000	No Ice 1/2" Ice	0.866 1.111	0.866 1.111	14.61 21.93
12'x2" Horizontal Pipe (E)	B	From Leg	4.000 0.000 0.000	0.0000	108.000	No Ice 1/2" Ice	2.850 4.078	2.850 4.078	40.00 65.20
***									
Side Arm Mount [SO 601-1] (E)	B	From Leg	0.000 0.000 0.000	45.0000	100.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
(2) 3'x3"x3" Horizontal Angle (E)	B	From Leg	3.000 0.000 0.000	45.0000	100.000	No Ice 1/2" Ice	0.900 1.120	0.900 1.120	10.00 23.39
3' Yagi (E)	B	From Leg	6.000 0.000 0.000	45.0000	100.000	No Ice 1/2" Ice	2.083 3.787	2.083 3.787	30.95 52.87
2" Dia 10' Omni (E)	B	From Leg	6.000 0.000 -6.000	0.0000	100.000	No Ice 1/2" Ice	2.000 3.030	2.000 3.030	10.00 25.00
***									
Side Arm Mount [SO 601-1] (E)	B	From Leg	0.000 0.000 0.000	45.0000	87.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
2" Dia 20' Omni (E)	B	From Leg	1.000 0.000 6.000	0.0000	87.000	No Ice 1/2" Ice	4.000 6.025	4.000 6.025	20.00 51.77
***									
12'x2" Horizontal Pipe (E)	B	From Leg	1.000 0.000 0.000	0.0000	83.000	No Ice 1/2" Ice	2.850 4.078	2.850 4.078	40.00 65.20
Single Bay Dipole (E)	B	From Leg	1.000 0.000 12.500	0.0000	83.000	No Ice 1/2" Ice	5.400 9.240	5.400 9.240	32.00 41.60
***									
(2) 4'x2" Horizontal Mount Pipe (E)	B	From Leg	2.000 0.000 0.000	90.0000	58.000	No Ice 1/2" Ice	0.866 1.111	0.866 1.111	14.61 21.93
12'x2" Horizontal Pipe	B	From Leg	4.000	90.0000	58.000	No Ice	2.850	2.850	40.00

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *lb*
(E)			0.000 0.000			1/2" Ice	4.078	4.078	65.20
Single Dipole Antenna (E)	B	From Leg	6.000 0.000 0.000	90.0000	58.000	No Ice 1/2" Ice	5.400 9.240	5.400 9.240	32.00 41.60
***									
3' Yagi (E)	B	From Leg	1.000 0.000 0.000	0.0000	53.000	No Ice 1/2" Ice	2.083 3.787	2.083 3.787	30.95 52.87
***									
6'x2" Mount Pipe (E)	B	From Leg	1.000 0.000 0.000	0.0000	52.000	No Ice 1/2" Ice	1.425 1.925	1.425 1.925	20.00 32.74
Single Bay Dipole Antenna (E)	B	From Leg	1.000 0.000 6.000	0.0000	52.000	No Ice 1/2" Ice	5.400 9.240	5.400 9.240	32.00 41.60
***									
***									
LEG A LOADING									
15' x 4" Mount Pipe (E)	A	From Leg	1.500 0.000 7.500	0.0000	137.000	No Ice 1/2" Ice	4.422 8.296	4.422 8.296	180.00 226.59
***									
Side Arm Mount [SO 601-1] (E)	A	From Leg	0.000 0.000 0.000	90.0000	133.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
(2) 3'x3"x3" Horizontal Angle (E)	A	From Leg	3.000 0.000 0.000	90.0000	133.000	No Ice 1/2" Ice	0.900 1.120	0.900 1.120	10.00 23.39
2" Dia 20' Omni (E)	A	From Leg	3.000 0.000 13.000	0.0000	133.000	No Ice 1/2" Ice	4.000 6.025	4.000 6.025	20.00 51.77
2" Dia 20' Omni (E)	A	From Leg	3.000 0.000 -13.000	0.0000	133.000	No Ice 1/2" Ice	4.000 6.025	4.000 6.025	20.00 51.77
***									
Pipe Mount [PM 602-1] (E)	A	From Leg	1.000 0.000 0.000	0.0000	121.000	No Ice 1/2" Ice	5.250 6.500	5.250 6.500	93.00 117.74
***									
Side Arm Mount [SO 601-1] (E)	A	From Leg	0.000 0.000 0.000	90.0000	96.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
(2) 3'x3"x3" Horizontal Angle (E)	A	From Leg	3.000 0.000 0.000	90.0000	96.000	No Ice 1/2" Ice	0.900 1.120	0.900 1.120	10.00 23.39
2" Dia 20' Omni (E)	A	From Leg	3.000 0.000 10.000	0.0000	96.000	No Ice 1/2" Ice	4.000 6.025	4.000 6.025	20.00 51.77
20' Multi Array Dipole (E)	A	From Leg	3.000 0.000 -10.000	0.0000	96.000	No Ice 1/2" Ice	5.400 9.240	5.400 9.240	32.00 41.60
10'x4" Mount Pipe (E)	B	From Face	0.000 -5.000 0.000	0.0000	96.000	No Ice 1/2" Ice	3.061 5.238	3.061 5.238	130.00 156.61
***									
***									

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *lb*
LEG C LOADING									
15'x2.5" Extension Pipe	C	From Leg	0.000 0.000 7.500	0.0000	140.000	No Ice 1/2" Ice	4.313 5.845	4.313 5.845	90.00 118.20
Lightning Rod 5/8"x4'	C	From Leg	0.000 0.000 17.000	0.0000	140.000	No Ice 1/2" Ice	0.250 0.664	0.250 0.664	4.18 6.99
***									
12'x3" Mount Pipe (E)	C	From Leg	1.000 0.000 0.000	0.0000	134.500	No Ice 1/2" Ice	3.545 5.438	3.545 5.438	120.00 152.84
20' Multi Array Dipole (E)	C	From Leg	1.000 0.000 13.000	0.0000	134.500	No Ice 1/2" Ice	5.400 9.240	5.400 9.240	32.00 41.60
***									
6'x2" Horizontal Pipe (E)	C	From Leg	1.000 0.000 0.000	0.0000	109.000	No Ice 1/2" Ice	1.425 1.925	0.007 0.039	20.00 32.74
12"x12" Panel Antenna (E)	C	From Leg	1.000 0.000 1.000	0.0000	109.000	No Ice 1/2" Ice	1.200 1.337	0.600 0.704	50.00 60.34
12"x12" Panel Antenna (E)	C	From Leg	1.000 0.000 -1.000	0.0000	109.000	No Ice 1/2" Ice	1.200 1.337	0.600 0.704	50.00 60.34
***									
MD-S6 (for 6' MW) : Ice Shield (E)	C	From Leg	3.000 0.000 7.000	0.0000	95.000	No Ice 1/2" Ice	1.667 2.237	0.800 1.081	440.00 612.94
8'x4" Mount Pipe (E)	C	From Leg	1.000 0.000 0.000	0.0000	95.000	No Ice 1/2" Ice	2.369 3.840	2.369 3.840	90.00 111.53
15' x 4" Mount Pipe (E)	C	From Leg	1.000 0.000 0.000	0.0000	95.000	No Ice 1/2" Ice	4.596 8.296	4.596 8.296	180.00 226.59
***									
Side Arm Mount [SO 601-1] (E)	C	From Leg	0.000 0.000 0.000	0.0000	79.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
***									
Side Arm Mount [SO 601-1] (E)	C	From Leg	0.000 0.000 0.000	0.0000	54.000	No Ice 1/2" Ice	1.220 1.850	6.300 8.610	158.70 196.52
7' Whip (E)	C	From Leg	3.000 0.000 5.000	0.0000	54.000	No Ice 1/2" Ice	1.744 2.599	1.744 2.599	37.30 53.68
***									
MISCL MPs inside tower*									
15'x2.5" Horizontal Pipe (E)	B	From Leg	0.000 0.000 0.000	0.0000	140.500	No Ice 1/2" Ice	4.313 5.845	0.014 0.084	90.00 118.20
10'x2" Horizontal Pipe (E)	A	From Leg	0.000 0.000 0.000	0.0000	132.500	No Ice 1/2" Ice	2.375 3.403	0.009 0.047	36.53 54.38
(2) 10'x2" Horizontal Pipe (E)	B	From Leg	0.000 0.000 0.000	0.0000	130.000	No Ice 1/2" Ice	2.375 3.403	0.009 0.047	36.53 54.38

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft²*	*C_AA_A Side* *ft²*	*Weight* *lb*
10'x2" Horizontal Pipe (E)	B	From Leg	0.000 0.000 0.000	0.0000	100.000	No Ice 1/2" Ice	2.375 3.403	0.009 0.047	36.53 54.38
10'x2" Horizontal Pipe (E)	B	From Leg	0.000 0.000 0.000	0.0000	92.000	No Ice 1/2" Ice	2.375 3.403	0.009 0.047	36.53 54.38
Proposed									
Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed) (Eversource Mount @ 117' - PROPOSED)	A	From Leg	0.000 0.000 0.000	0.0000	117.000	No Ice 1/2" Ice	2.483 3.247	5.145 6.910	165.00 318.00
Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 120.875' - PROPOSED)	A	From Leg	0.000 0.000 3.000	0.0000	120.875	No Ice 1/2" Ice	1.029 1.290	1.029 1.290	14.00 22.80
Telewave ANT220F2 - Omni Antenna (Eversource Antenna CL @ 113.125' - PROPOSED)	A	From Leg	0.000 0.000 3.000	0.0000	113.125	No Ice 1/2" Ice	1.029 1.290	1.029 1.290	14.00 22.80
*									
ANT450F6 (CSP Add)	C	From Leg	0.000 0.000 0.000	0.0000	95.000	No Ice 1/2" Ice	1.900 2.728	1.900 2.728	8.00 22.34
6' x2.5" - Sch 40 Antenna Pipe (Vertical) (Eversource Mount Pipe)	A	From Leg	0.000 0.000 0.000	0.0000	117.000	No Ice 1/2" Ice	1.725 2.088	1.725 2.088	35.00 47.75

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* *lb*
PA8-65 (E)	B	Paraboloid w/Radome	From Leg	3.000 0.000 0.000	Worst		128.750	8.000	No Ice 1/2" Ice	50.270 51.292	290.00 550.00
10' dish (E)	A	Paraboloid w/Radome	From Leg	2.000 0.000 0.000	Worst		135.000	10.000	No Ice 1/2" Ice	78.540 79.850	700.00 410.00
PA6-65 (E)	A	Paraboloid w/Radome	From Leg	1.000 0.000 0.000	Worst		120.000	6.000	No Ice 1/2" Ice	28.270 29.050	90.00 240.00
SC3-W100AD (CSP - Existing @ 135')	C	Paraboloid w/o Radome	From Leg	0.250 0.000 0.000	Worst		135.000	3.000	No Ice 1/2" Ice	7.070 7.470	40.00 78.35
SC3-W100AD (CSP - Existing @ 125')	C	Paraboloid w/o Radome	From Leg	0.250 0.000 0.000	Worst		125.000	3.000	No Ice 1/2" Ice	7.070 7.470	40.00 78.35
PA6-65 (Diversity CSP)	C	Paraboloid w/Radome	From Leg	1.000 0.000	Worst		95.000	6.000	No Ice 1/2" Ice	28.270 29.050	90.00 240.00

Description	*Face or Leg*	*Dish Type*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*3 dB Beam Width*	*Elevation*	*Outside Diameter*	*Aperture Area*	*Weight*
				ft	*°*	*°*	*ft*	*ft*	*ft²*	*lb*
				0.000						

Force Totals

Load Case	*Vertical Forces*	*Sum of Forces X*	*Sum of Forces Z*	*Sum of Overturning Moments, M_x*	*Sum of Overturning Moments, M_z*	*Sum of Torques*
	lb	*lb*	*lb*	*kip-ft*	*kip-ft*	*kip-ft*
Leg Weight	10328.23					
Bracing Weight	17931.74					
Total Member Self-Weight	28259.97			23.81	-44.59	
Total Weight	39409.36			23.81	-44.59	
Wind 0 deg - No Ice		0.00	-56953.02	-4704.90	-44.59	170.33
Wind 30 deg - No Ice		26669.17	-46192.35	-3872.43	-2294.08	175.25
Wind 45 deg - No Ice		37289.90	-37289.90	-3130.39	-3198.78	163.34
Wind 60 deg - No Ice		45148.88	-26066.72	-2187.40	-3874.52	140.58
Wind 90 deg - No Ice		53338.33	0.00	23.81	-4543.58	74.88
Wind 120 deg - No Ice		49322.77	28476.51	2388.16	-4139.77	-14.43
Wind 135 deg - No Ice		37289.90	37289.90	3178.01	-3198.78	-59.06
Wind 150 deg - No Ice		26669.17	46192.35	3920.05	-2294.08	-100.37
Wind 180 deg - No Ice		0.00	52133.44	4446.23	-44.59	-155.39
Wind 210 deg - No Ice		-26669.17	46192.35	3920.05	2204.91	-175.25
Wind 225 deg - No Ice		-37289.90	37289.90	3178.01	3109.61	-163.34
Wind 240 deg - No Ice		-49322.77	28476.51	2388.16	4050.60	-155.89
Wind 270 deg - No Ice		-53338.33	0.00	23.81	4454.41	-74.88
Wind 300 deg - No Ice		-45148.88	-26066.72	-2187.40	3785.34	14.81
Wind 315 deg - No Ice		-37289.90	-37289.90	-3130.39	3109.61	59.06
Wind 330 deg - No Ice		-26669.17	-46192.35	-3872.43	2204.91	100.37
Member Ice	10193.49					
Total Weight Ice	58239.56			55.43	-94.98	
Wind 0 deg - Ice		0.00	-77323.33	-6268.52	-94.98	236.46
Wind 30 deg - Ice		36772.93	-63692.59	-5213.27	-3136.86	247.22
Wind 45 deg - Ice		51559.60	-51559.60	-4218.14	-4368.55	231.18
Wind 60 deg - Ice		62602.13	-36143.36	-2946.43	-5294.34	199.69
Wind 90 deg - Ice		73545.87	0.00	55.43	-6178.75	105.50
Wind 120 deg - Ice		66963.97	38661.67	3217.40	-5571.68	-20.96
Wind 135 deg - Ice		51559.60	51559.60	4329.00	-4368.55	-83.59
Wind 150 deg - Ice		36772.93	63692.59	5324.12	-3136.86	-141.72
Wind 180 deg - Ice		0.00	72286.71	6059.14	-94.98	-220.59
Wind 210 deg - Ice		-36772.93	63692.59	5324.12	2946.90	-247.22
Wind 225 deg - Ice		-51559.60	51559.60	4329.00	4178.59	-231.18
Wind 240 deg - Ice		-66963.97	38661.67	3217.40	5381.72	-215.50
Wind 270 deg - Ice		-73545.87	0.00	55.43	5988.79	-105.50
Wind 300 deg - Ice		-62602.13	-36143.36	-2946.43	5104.38	20.90
Wind 315 deg - Ice		-51559.60	-51559.60	-4218.14	4178.59	83.59
Wind 330 deg - Ice		-36772.93	-63692.59	-5213.27	2946.90	141.72
Total Weight	39409.36			23.81	-44.59	
Wind 0 deg - Service		0.00	-56953.02	-4723.26	-11.83	170.33
Wind 30 deg - Service		26669.17	-46192.35	-3890.79	-2261.33	175.25
Wind 45 deg - Service		37289.90	-37289.90	-3148.74	-3166.03	163.34
Wind 60 deg - Service		45148.88	-26066.72	-2205.76	-3841.76	140.58
Wind 90 deg - Service		53338.33	0.00	5.46	-4510.82	74.88
Wind 120 deg - Service		49322.77	28476.51	2369.81	-4107.01	-14.43
Wind 135 deg - Service		37289.90	37289.90	3159.65	-3166.03	-59.06
Wind 150 deg - Service		26669.17	46192.35	3901.70	-2261.33	-100.37
Wind 180 deg - Service		0.00	52133.44	4427.88	-11.83	-155.39

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 210 deg - Service		-26669.17	46192.35	3901.70	2237.67	-175.25
Wind 225 deg - Service		-37289.90	37289.90	3159.65	3142.37	-163.34
Wind 240 deg - Service		-49322.77	28476.51	2369.81	4083.35	-155.89
Wind 270 deg - Service		-53338.33	0.00	5.46	4487.16	-74.88
Wind 300 deg - Service		-45148.88	-26066.72	-2205.76	3818.10	14.81
Wind 315 deg - Service		-37289.90	-37289.90	-3148.74	3142.37	59.06
Wind 330 deg - Service		-26669.17	-46192.35	-3890.79	2237.67	100.37

Load Combinations

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

Comb. No.	Description
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	140 - 125	5.7353	40	0.3090	0.2581
T2	125 - 100	4.7354	40	0.3074	0.2401
T3	100 - 75	3.1284	40	0.2727	0.1894
T4	75 - 50	1.7531	40	0.2142	0.1400
T5	50 - 25	0.8025	40	0.1196	0.0923
T6	25 - 0	0.2378	40	0.0596	0.0410

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.500	15'x2.5" Horizontal Pipe	40	5.7353	0.3090	0.2581	448707
140.000	15'x2.5" Extension Pipe	40	5.7353	0.3090	0.2581	448707
137.500	3" Dia 20' Omni	40	5.5682	0.3093	0.2555	448707
137.000	15' x 4" Mount Pipe	40	5.5348	0.3093	0.2549	448707
135.000	10' dish	40	5.4012	0.3095	0.2528	448707
134.500	12'x3" Mount Pipe	40	5.3678	0.3095	0.2522	407917
133.000	Side Arm Mount [SO 601-1]	40	5.2677	0.3095	0.2506	320506
132.500	10'x2" Horizontal Pipe	40	5.2344	0.3095	0.2500	299139
130.000	(2) 10'x2" Horizontal Pipe	40	5.0677	0.3092	0.2470	224354
128.750	PA8-65	40	4.9845	0.3090	0.2454	199216
125.000	SC3-W100AD	40	4.7354	0.3074	0.2401	142348
121.000	Sector Mount [SM 403-1]	40	4.4709	0.3044	0.2335	99015
120.875	Telewave ANT220F2 - Omni Antenna	40	4.4627	0.3043	0.2332	97989
120.000	PA6-65	40	4.4050	0.3034	0.2317	91328
117.000	Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed)	40	4.2082	0.3001	0.2260	74032
113.125	Telewave ANT220F2 - Omni Antenna	40	3.9562	0.2949	0.2182	59481
109.000	6'x2" Horizontal Pipe	40	3.6912	0.2885	0.2093	49189
108.000	(2) 4'x2" Horizontal Mount Pipe	40	3.6275	0.2868	0.2071	47184
100.000	Side Arm Mount [SO 601-1]	40	3.1284	0.2727	0.1894	34671
96.000	Side Arm Mount [SO 601-1]	40	2.8867	0.2654	0.1808	29099
95.000	PA6-65	40	2.8273	0.2635	0.1788	27879
92.000	10'x2" Horizontal Pipe	40	2.6517	0.2576	0.1729	24756
87.000	Side Arm Mount [SO 601-1]	40	2.3689	0.2470	0.1630	20862
83.000	12'x2" Horizontal Pipe	40	2.1529	0.2375	0.1552	18530
79.000	Side Arm Mount [SO 601-1]	40	1.9473	0.2266	0.1475	16671
58.000	(2) 4'x2" Horizontal Mount Pipe	40	1.0614	0.1488	0.1081	18771
54.000	Side Arm Mount [SO 601-1]	40	0.9272	0.1336	0.1003	19890
53.000	3' Yagi	40	0.8951	0.1299	0.0983	20172

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
52.000	6'x2" Mount Pipe	40	0.8637	0.1264	0.0964	20429

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	140 - 125	7.5766	24	0.4068	0.3405
T2	125 - 100	6.2644	24	0.4040	0.3181
T3	100 - 75	4.1597	24	0.3587	0.2594
T4	75 - 50	2.3467	24	0.2832	0.1942
T5	50 - 25	1.0819	24	0.1593	0.1293
T6	25 - 0	0.3224	24	0.0798	0.0577

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.500	15'x2.5" Horizontal Pipe	24	7.5766	0.4068	0.3405	295513
140.000	15'x2.5" Extension Pipe	24	7.5766	0.4068	0.3405	295513
137.500	3" Dia 20' Omni	24	7.3572	0.4071	0.3372	295513
137.000	15' x 4" Mount Pipe	24	7.3133	0.4071	0.3366	295513
135.000	10' dish	24	7.1379	0.4072	0.3339	295513
134.500	12'x3" Mount Pipe	24	7.0940	0.4072	0.3332	268649
133.000	Side Arm Mount [SO 601-1]	24	6.9626	0.4072	0.3311	211081
132.500	10'x2" Horizontal Pipe	24	6.9188	0.4071	0.3304	197009
130.000	(2) 10'x2" Horizontal Pipe	24	6.7002	0.4066	0.3266	147757
128.750	PA8-65	24	6.5910	0.4062	0.3247	131277
125.000	SC3-W100AD	24	6.2644	0.4040	0.3181	96298
121.000	Sector Mount [SM 403-1]	24	5.9179	0.4000	0.3100	71545
120.875	Telewave ANT220F2 - Omni Antenna	24	5.9071	0.3998	0.3097	70941
120.000	PA6-65	24	5.8317	0.3987	0.3078	66973
117.000	Sitepro1 USF-4U Mount Assembly (Ca = 1.4 assumed)	24	5.5740	0.3943	0.3009	56183
113.125	Telewave ANT220F2 - Omni Antenna	24	5.2441	0.3875	0.2923	46461
109.000	6'x2" Horizontal Pipe	24	4.8972	0.3791	0.2824	39047
108.000	(2) 4'x2" Horizontal Mount Pipe	24	4.8139	0.3770	0.2799	37593
100.000	Side Arm Mount [SO 601-1]	24	4.1597	0.3587	0.2594	28247
96.000	Side Arm Mount [SO 601-1]	24	3.8422	0.3492	0.2489	23419
95.000	PA6-65	24	3.7641	0.3468	0.2463	22354
92.000	10'x2" Horizontal Pipe	24	3.5330	0.3393	0.2384	19662
87.000	Side Arm Mount [SO 601-1]	24	3.1604	0.3257	0.2253	16375
83.000	12'x2" Horizontal Pipe	24	2.8754	0.3134	0.2148	14444
79.000	Side Arm Mount [SO 601-1]	24	2.6036	0.2993	0.2045	12923
58.000	(2) 4'x2" Horizontal Mount Pipe	24	1.4277	0.1977	0.1509	14425
54.000	Side Arm Mount [SO 601-1]	24	1.2485	0.1777	0.1403	15265
53.000	3' Yagi	24	1.2057	0.1729	0.1376	15476
52.000	6'x2" Mount Pipe	24	1.1637	0.1682	0.1348	15666

Program Version 8.0.7.5 - 8/3/2020 File:C:/Users/michael.dalickas/Desktop/20201119_EVS-011 B1 Mod_Sterling_CT/1_TIA-222-F/20201119_EVS_DESPP_Ekonk Structural Analysis.eri

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

ATTACHMENT F – PROOF OF DELIVERY OF NOTICE

Ref: ES-056 EKONK Date: 27Jan21 SHIPPING: 0.00
Dep: BL GRAPHICS Wgt: 1.90 LBS SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9544 9955 4483

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 27JAN21
ACTWGT: 1.90 LB
CAD: 0765627/CAFE3407

BILL THIRD PARTY

TO **HONORABLE LINCOLN A. COOPER**
TOWN OF STERLING
1183 PLAINFIELD PIKE

ONECO CT 06373

REF: ES-056 EKONK

DEPT: BL GRAPHICS

56DC1/1136/05A2

FedEx
Express

E

J201019110601uv

THU - 28 JAN 4:30P
PRIORITY OVERNIGHT

TRK# 0201 **9544 9955 4483**

00 GONA

06373
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

Ref: ES-056 EKONK   Date: 27Jan21   SHIPPING: 0.00
Dep: BL GRAPHICS   Wgt: 1.90 LBS   SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00   TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9544 9955 4494

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

SHIP DATE: 27JAN21
ACTWGT: 1.90 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC1/1136/05A2

TO **MILISSA GIL**
TOWN OF WESTBROOK
1183 PLAINFIELD PIKE

ONECO CT 06373

REF: ES-056 EKONK
DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

THU - 28 JAN 4:30P
PRIORITY OVERNIGHT

TRK# 0201 **9544 9955 4494**

00 GONA

06373
CT-US **BDL**

Ref: ES-056 EKONK Date: 27Jan21 SHIPPING: 0.00
Dep: BL GRAPHICS Wgt: 1.90 LBS SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9544 9955 4509

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 27JAN21
ACTWGT: 1.90 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC1/1136/05A2

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

MIDDLETOWN CT 06457
REF: ES-056 EKONK
DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

THU - 28 JAN 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9544 9955 4509**

00 BDLA

06457
CT-US **BDL**

Ref: ES-056 EKONK
Dep: BL GRAPHICS

Date: 27Jan21
Wgt: 1.90 LBS

DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9544 9955 4510

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 27JAN21
ACTWGT: 1.90 LB MAN
CAD: 0765627/CAFE3407

BILL THIRD PARTY

56DC1/1136/05A2

TO

CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051
REF: ES-056 EKONK
DEPT: BL GRAPHICS

FedEx
Express

E

J201019110601uv

THU - 28 JAN 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9544 9955 4510**

00 BDLA

06051
CT-US **BDL**

Part # 156148-434 RIT EXP 09/21

ATTACHMENT G - POWER DENSITY REPORT

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

Calculated Radio Frequency Emissions Report

ES-056

389 Ekonk Hill Road

Sterling, CT 06354

December 18, 2020

Table of Contents

List of Tables

List of Figures

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed Eversource installation on the tower at 389 Ekonk Hill Road in Sterling, CT. Eversource is proposing to install two omnidirectional antenna as part of its 220 MHz communications system. The upper antenna will be used for receive only while the lower antenna will be used for transmit only.

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-056 Ekonk

Site Address	389 Ekonk Hill Road
Latitude	41° 39' 49.5" N
Longitude	71° 50' 56.3" W
Site Elevation AMSL	672’
Survey Engineer	Marc Salas
Survey Date/Time	6/25/2020; 12:00 PM – 1:00 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 ERP (Watts)	Number of Channels	Vertical Beamwidth	Length (ft)	Antenna Centerline Height (ft)
Eversource	Telewave ANT220F2	217	2.5	124	4	38°	3.67	113.1

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

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

[2] Transmit antenna height listed for the proposed installation is based on the lower of the two proposed antennas referenced in the AECOM Structural Analysis report dated November 25, 2020 (Rev. 1). The upper antenna is intended for receive-only.

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.

<table>
<tr><td>Manufacturer</td><td colspan="4">Narda Microwave</td></tr>
<tr><td>Probe</td><td colspan="4">EA 5091, Serial# 01116</td></tr>
<tr><td>Calibration Date</td><td colspan="4">May 2020</td></tr>
<tr><td>Calibration Interval</td><td colspan="4">24 Months</td></tr>
<tr><td>Meter</td><td colspan="4">NBM550, Serial# E-1069</td></tr>
<tr><td>Calibration Date</td><td colspan="4">May 2020</td></tr>
<tr><td>Calibration Interval</td><td colspan="4">24 Months</td></tr>
<tr><td rowspan="2">Probe Specifications</td><td>Frequency Range</td><td>Field Measured</td><td>Standard</td><td>Measurement Range</td></tr>
<tr><td>300 KHz-50 GHz</td><td>Electric Field</td><td>U.S. FCC 1997 Occupational/Controlled</td><td>0.2 – 600 % of Standard</td></tr>
</table>

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 25, 2020 between 12:00 PM and 1:00 PM. The calculated % MPE contribution from the proposed equipment modifications was then added to the measured % MPE values in the "Composite % MPE" column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the "Off Beam Loss" factor shown in the power density formula from Section 3. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 11 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 9.75% (Average Uncontrolled / General Population MPE) and was recorded at Location 1 by the compound access gate. The highest composite (measured + calculated) % MPE value is calculated to be 9.84% (Average Uncontrolled / General Population) and is calculated to occur at the same location (location #1).

Meas. Location	Location Description	Latitude	Longitude	Dist. From Site (feet)	Measured % MPE (Uncontrolled / General)	Calculated % MPE (Eversource Proposed)	Composite % MPE (Uncontrolled / General)
1	**Compound access gate**	**41.6638**	**-71.8489**	**32**	**9.75%**	**0.09%**	**9.84%**
2	NW corner of fenced compound	41.6638	-71.8492	57	6.42%	0.08%	6.50%
3	SW corner of fenced compound	41.6636	-71.8491	77	2.83%	0.05%	2.88%
4	South middle of fenced compound	41.6636	-71.8489	60	< 1.00%	0.08%	< 1.08%
5	SE corner of fenced compound	41.6636	-71.8487	82	2.60%	0.04%	2.65%
6	Near NE corner of fenced compound	41.6639	-71.8488	81	4.02%	0.05%	4.06%
7	Along access road	41.6641	-71.8481	272	< 1.00%	0.54%	< 1.54%
8	Access road gate	41.6646	-71.8466	723	< 1.00%	0.15%	< 1.15%
9	Near 419 Ekonk Hill Road mailbox	41.6624	-71.8463	880	3.34%	0.11%	3.45%
10	Near 396 Ekonk Hill Road	41.6642	-71.8462	777	3.62%	0.13%	3.76%
11	Southern Intersection of Still Road and Shelton Road	41.6660	-71.8469	1006	1.16%	0.09%	1.25%

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 values 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 at 389 Ekonk Hill Road in Sterling, 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 9.75% MPE. This measurement was recorded at Location 1 by the compound access gate.

The highest composite (measured + calculated) power density is **9.84% of the FCC General Population MPE limit** with the proposed Eversource equipment is calculated to also occur at Location 1 by the compound access gate.

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

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

8. Statement of Certification

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

Marc Salas (signature) — December 18, 2020

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

Keith Vellante (signature) — December 21, 2020

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

Attachment A: References

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

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

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

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

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

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

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

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

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

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

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

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

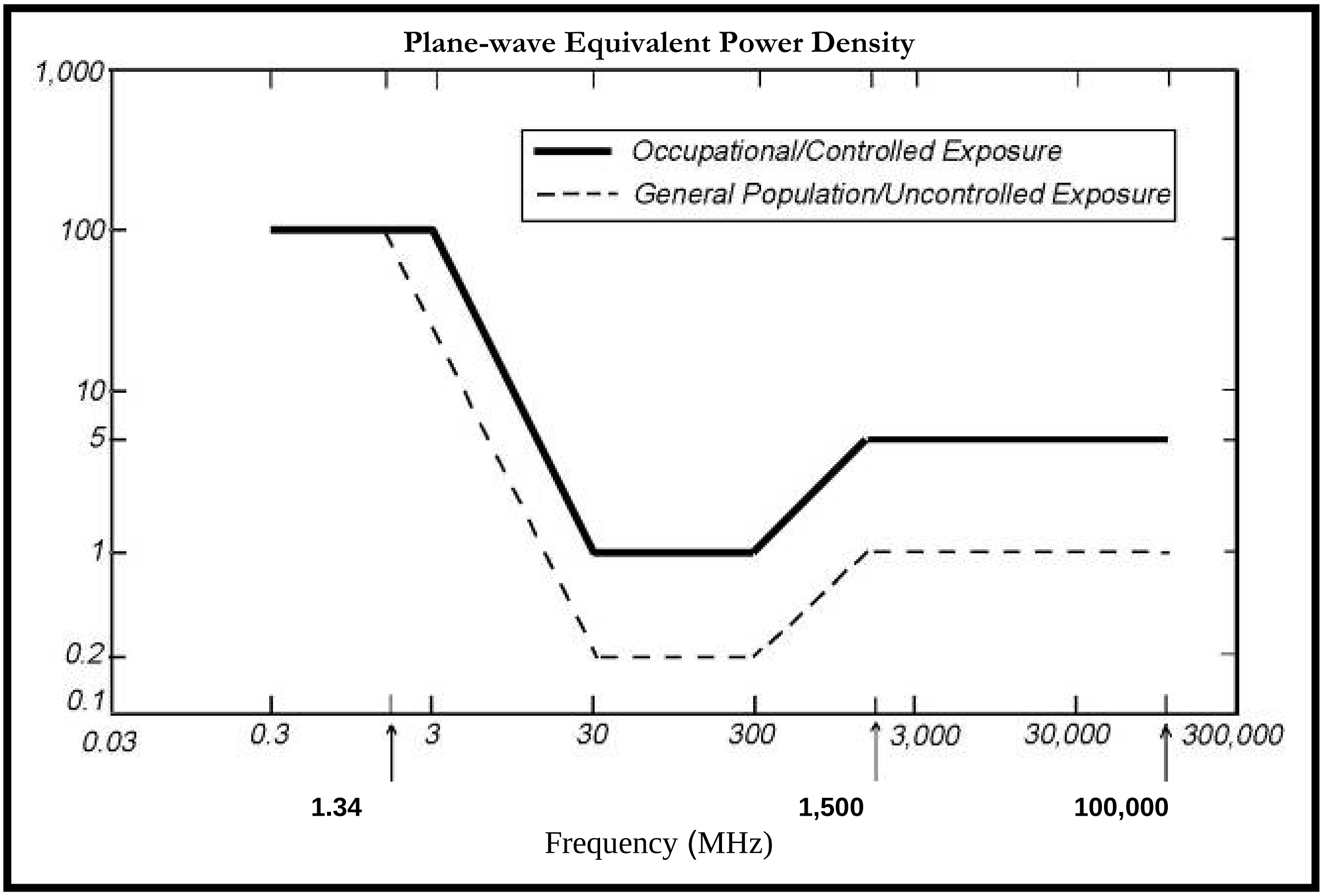

Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Eversource Antenna Data Sheet and Electrical Patterns

217 MHz

Manufacturer:	Telewave
Model #:	ANT220F2
Frequency Band:	195 - 260 MHz
Gain:	2.5 dBd
Vertical Beamwidth:	38°
Horizontal Beamwidth:	360°
Polarization:	Vertical-Polarization
Length:	3.6’