EVERSOURCE
ENERGY

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

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

October 1, 2020

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

RE: **Notice of Exempt Modification**
Eversource Site # 2699
330 Pokorny Road, Haddam, CT 06438
Latitude: 41-26-36.95 N / Longitude: 72-33-59.26 W

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource") currently maintains multiple antennas and microwave dishes at various mounting heights on an existing 280-foot self-support tower located at 330 Pokorny Road in Haddam. See Attachment A, Parcel Map and Property Card. The tower and property are owned by Eversource. Eversource plans to install one 4-foot 3-inch tall omni-directional antenna, to be mounted at approximately 202 feet above ground level ("AGL"), one 5-foot 6-inch tall dipole antenna, to be mounted at approximately 177 feet AGL, and two 7/8-inch diameter coaxial cables. There will be no changes to the fenced compound, the tower or the antennas and equipment currently mounted on the tower. The tower and existing and proposed equipment on the tower are depicted on Attachment B, Construction Drawings, dated June 17, 2020 and Attachment C, Structural Analysis, dated June 11, 2020. While the Connecticut Siting Council (the "Council") did not approve the tower (constructed in 1970), Council jurisdiction was established in sub-petition PE1133-VER-20160912.

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 Robert McGarry, First Selectman for the Town of Haddam and Bill Warner, Town Planner for the Town of Haddam via private carrier. Proof of delivery is attached. See Attachment D, Proof of Delivery of Notice.

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

1. There will be no change to the height of the existing tower.
2. The proposed modifications will not require extension of the site boundary.
3. The proposed modification will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the new antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard as shown in the attached Radio Frequency Emissions Report, dated June 25, 2020 (Attachment E – Power Density Report).
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

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

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

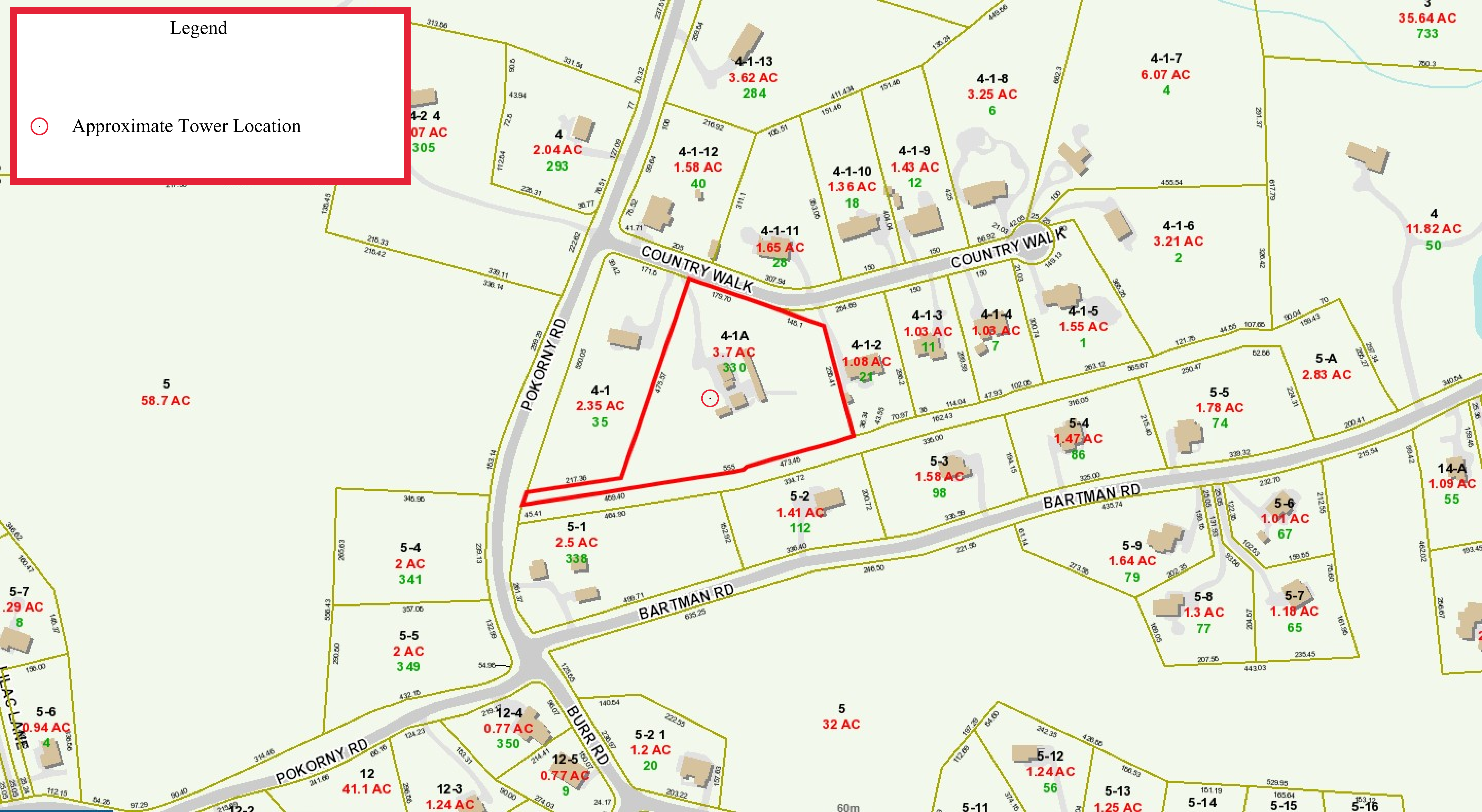
By: ______________________________
Kathleen M. Shanley
Manager – Transmission Siting

cc: Robert McGarry, First Selectman, Town of Haddam
Bill Warner, Town Planner, Town of Haddam

Attachments

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

ATTACHMENT A – PARCEL MAP AND PROPERTY CARD



Legend
⊙ Approximate Tower Location
4-1-13
3.62 AC
284
4-1-8
3.25 AC
6
4-1-7
6.07 AC
4
3
35.64 AC
733
4-2 4
07 AC
305
4
2.04 AC
293
4-1-12
1.58 AC
40
4-1-10
1.36 AC
18
4-1-9
1.43 AC
12
4-1-11
1.65 AC
28
4-1-6
3.21 AC
2
4
11.82 AC
50
COUNTRY WALK
COUNTRY WALK
4-1A
3.7 AC
330
4-1-2
1.08 AC
21
4-1-3
1.03 AC
11
4-1-4
1.03 AC
7
4-1-5
1.55 AC
1
5-A
2.83 AC
5
58.7 AC
4-1
2.35 AC
35
POKORNY RD
5-5
1.78 AC
74
5-4
1.47 AC
86
5-3
1.58 AC
98
14-A
1.09 AC
55
5-2
1.41 AC
112
5-1
2.5 AC
338
BARTMAN RD
5-6
1.01 AC
67
5-4
2 AC
341
5-9
1.64 AC
79
5-7
.29 AC
8
5-8
1.3 AC
77
5-7
1.18 AC
65
BARTMAN RD
5-5
2 AC
349
5
32 AC
LILAC LANE
5-6
0.94 AC
4
12-4
0.77 AC
350
BURR RD
5-2 1
1.2 AC
20
5-12
1.24 AC
56
POKORNY RD
12
41.1 AC
12-5
0.77 AC
9
12-3
1.24 AC
12-2
5-13
1.25 AC
5-14
5-15
5-16
5-11
60m

Property Location: 330 POKORNY RD **MAP ID:** 55/ 004/ 1A/ / **Bldg Name:** **State Use:** 350

Vision ID: 2699 **Account #** P0506400 **Bldg #:** 1 of 1 **Sec #:** 1 of 1 **Card** 1 of 1 **Print Date:** 08/09/2018 14:02

CURRENT OWNER	TOPO.		UTILITIES		STRT./ROAD		LOCATION	
CONN LIGHT + POWER CO TAX DEPT PO BOX 270 HARTFORD, CT 06141 Additional Owners:	10		6		1		2	Suburban
	03	Rolling	7					

SUPPLEMENTAL DATA

Other ID:			
Dev Lot			3.7
Census Tract	5901		R-2A
490 Penalty		Town Line?	
Section	2	Callback Ltr	
GIS ID:		*ASSOC PID#*	

CURRENT ASSESSMENT

Description	Code	Appraised Value	Assessed Value
UTL LAND	4-1	227,950	159,570
UTL OUTBL	4-3	5,740	4,020
	Total	233,690	163,590

6061
HADDAM, CT

VISION

RECORD OF OWNERSHIP	BK-VOL/PAGE	SALE DATE	q/u	v/i	SALE PRICE	V.C.
CONN LIGHT + POWER CO	132/ 86	08/29/1977	U	V		29

PREVIOUS ASSESSMENTS (HISTORY)

Yr.	Code	Assessed Value	Yr.	Code	Assessed Value	Yr.	Code	Assessed Value
2017	4-1	159,570	2016	4-1	89,570	2015	4-1	89,570
2017	4-3	4,020	2016	4-3	4,020	2015	4-3	4,020
	Total:	163,590		*Total:*	93,590		*Total:*	93,590

EXEMPTIONS

Year	Type	Description	Amount
		Total:	

OTHER ASSESSMENTS

Code	Description	Number	Amount	Comm. Int.

This signature acknowledges a visit by a Data Collector or Assessor

ASSESSING NEIGHBORHOOD

NBHD/ SUB	NBHD Name	Street Index Name	Tracing	Batch
0001/A				

NOTES

CELL TOWER LOT
VACANT W/OB -R2010 GATED
2014 I&E: NA
2017-BP TO ADD VERIZON ANTENNA; ADDED LA
ND LINE TO BE IN LINE W/ OTHER C-TOWERS
SITING COUNCIL INDICATES SPRINT, VERIZON
AND T-MOBILE AS TENANTS

APPRAISED VALUE SUMMARY

Appraised Bldg. Value (Card)	0
Appraised XF (B) Value (Bldg)	0
Appraised OB (L) Value (Bldg)	5,740
Appraised Land Value (Bldg)	227,950
Special Land Value	0
Total Appraised Parcel Value	233,690
Valuation Method:	C
Adjustment:	0
Net Total Appraised Parcel Value	233,690

BUILDING PERMIT RECORD

Permit ID	Issue Date	Type	Description	Amount	Insp. Date	% Comp.	Date Comp.	Comments
13480		BP	Permit	85,000		100	09/25/2017	ADD VZW ANTENNA,

VISIT/ CHANGE HISTORY

Date	Type	IS	ID	Cd.	Purpose/Result
08/17/2015			VA	20	Field Review
09/10/2010			NFB	99	Vacant Land - Inspected

LAND LINE VALUATION SECTION

B #	Use Code	Use Description	Zone	D	Front	Depth	Units		Unit Price	I. Factor	S.A.	C. Factor	ST. Idx	Adj.	Notes- Adj	Special Pricing Spec Use	Special Pricing Spec Calc	S Adj Fact	Adj. Unit Price	Land Value
1	350	Cell Tower	R-2A				2.00	AC	113,750.00	0.5385	C	1.00	CELI	1.00				1.00		122,510
1	350	Cell Tower					1.70	AC	3,200.00	1.0000	0	1.00		0.00				1.00		5,440
1	350	Cell Tower					1.00	BL	100,000.00	1.0000	0	1.00	CELI	1.00	LAND LEASE			1.00		100,000

Total Card Land Units: 3.70 AC **Parcel Total Land Area:** 3.7 AC **Total Land Value:** 227,950

Property Location: **330 POKORNY RD** ***MAP ID:*** **55/ 004/ 1A/ /** ***Bldg Name:*** ***State Use:*** **350**

Vision ID: 2699 ***Account #*** **P0506400** ***Bldg #:*** **1 of 1** ***Sec #:*** **1 of 1** ***Card*** **1** ***of*** **1** ***Print Date:*** **08/09/2018 14:02**

CONSTRUCTION DETAIL

Element	*Cd.*	*Ch.*	*Description*
Model	**00**		**Vacant**

CONSTRUCTION DETAIL (CONTINUED)

Element	*Cd.*	*Ch.*	*Description*

MIXED USE

Code	*Description*	*Percentage*
350	**Cell Tower**	**100**

COST/MARKET VALUATION

Adj. Base Rate:	**0.00**
Replace Cost	**0**
AYB	
Dep Code	
Remodel Rating	
Year Remodeled	
Dep %	
Functional Obslnc	
External Obslnc	
Cost Trend Factor	
Condition	
% Complete	
Overall % Cond	
Apprais Val	
Dep % Ovr	**0**
Dep Ovr Comment	
Misc Imp Ovr	**0**
Misc Imp Ovr Comment	
Cost to Cure Ovr	**0**
Cost to Cure Ovr Comment	

OB-OUTBUILDING & YARD ITEMS(L) / XF-BUILDING EXTRA FEATURES(B)

Code	*Description*	*Sub*	*Sub Descript*	*L/B*	*Units*	*Unit Price*	*Yr*	*Gde*	*Dp Rt*	*Cnd*	*%Cnd*	*Apr Value*
SHD1	**Shed**	**FR**	**Frame**	**L**	**638**	**12.00**	**1986**		**0**		**75**	**5,740**

BUILDING SUB-AREA SUMMARY SECTION

Code	*Description*	*Living Area*	*Gross Area*	*Eff. Area*	*Unit Cost*	*Undeprec. Value*
	Ttl. Gross Liv/Lease Area:	**0**	**0**			

No Photo On Record

ATTACHMENT B – CONSTRUCTION DRAWINGS

EVERSOURCE
ENERGY

GOOSE HILL RADIO
330 POKORNY ROAD
HADDAM, CT 06438

PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. INSTALL (1) NEW OMNI/WHIP ANTENNA AT ELEVATION 207'-1 1/2"± AGL
2. INSTALL (1) NEW DIPOLE ANTENNA AT ELEVATION 182'-9"± AGL
3. INSTALL (1) NEW RACK WITH DMR EQUIPMENT IN EXISTING SHELTER

GOVERNING CODES

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

GENERAL NOTES

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

SITE INFORMATION

SITE NAME:	GOOSE HILL RADIO
SITE ID NUMBER:	2699
SITE ADDRESS:	330 POKORNY ROAD HADDAM, CT 06438
MAP:	55
BLOCK:	004
LOT:	1A
ZONE:	R-2A
LATITUDE:	41° 26' 36.95" N
LONGITUDE:	72° 33' 59.26" W
ELEVATION:	659'± AMSL
FEMA/FIRM DESIGNATION:	X
ACREAGE:	3.7± AC (BOOK: 132, PAGE: 86)

CONTACT INFORMATION

APPLICANTS:
EVERSOURCE ENERGY
107 SELDEN STREET
BERLIN, CT 06037

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

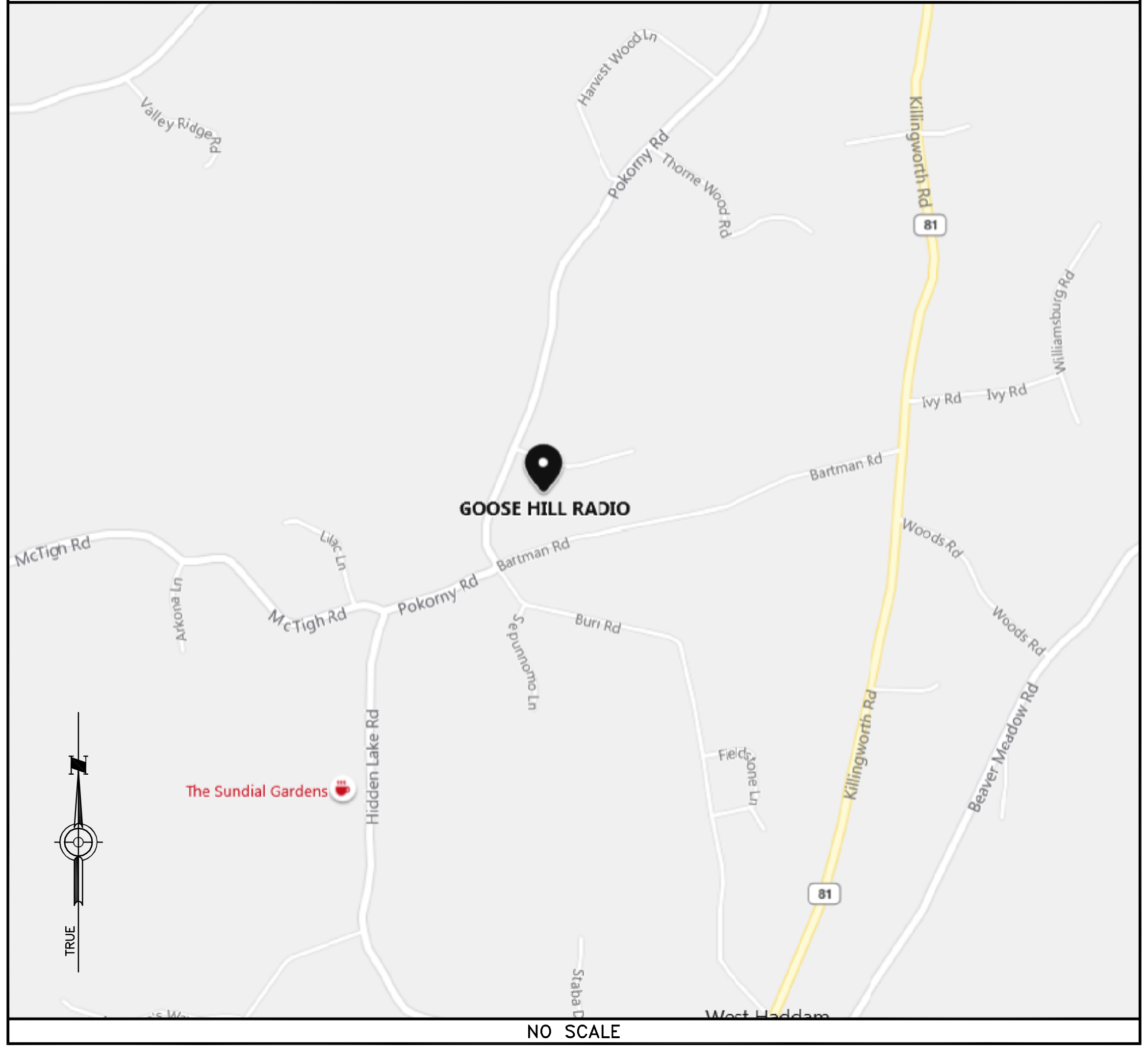
EVERSOURCE ENERGY PROJECT MANAGER:
NIKOLL PRECI
(860) 655-3079

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	06/17/20	ISSUED FOR FILING

JOSHUA J. RILEY
33208
Joshua Riley
06/17/2020

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.

GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T-1

SITE PLAN

NO SCALE

EVERSOURCE ENERGY

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

BLACK & VEATCH

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

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

REV	DATE	DESCRIPTION
0	06/17/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER

Joshua Riley

06/17/2020

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.

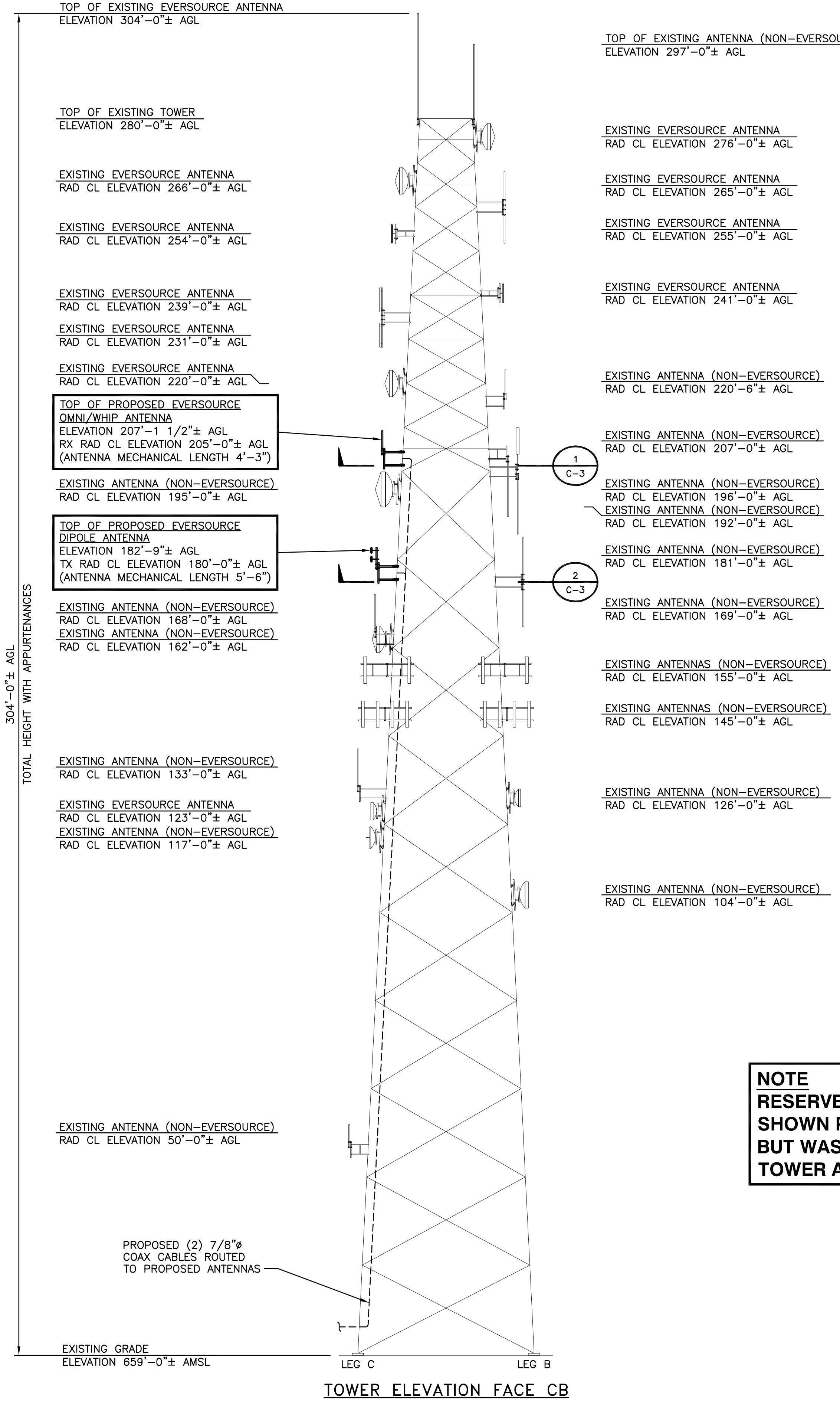
GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

SHEET TITLE

SITE PLAN

SHEET NUMBER

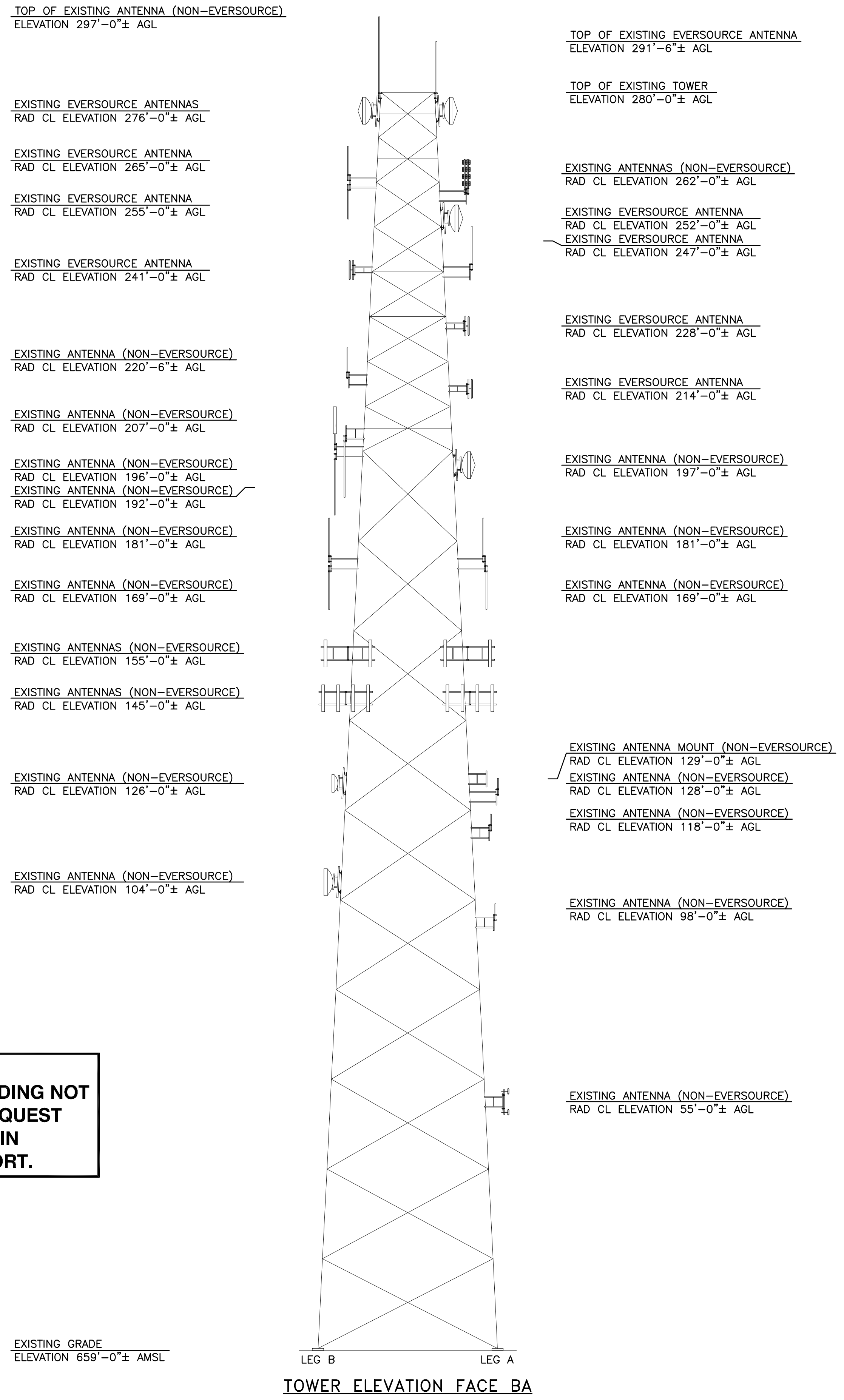
C-1



TOWER ELEVATION FACE CB

NO SCALE

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



TOWER ELEVATION FACE BA

NO SCALE

EVERSOURCE
ENERGY

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

BLACK & VEATCH

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

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REV	DATE	DESCRIPTION

JOSHUA J. RILEY
33208
06/17/2020

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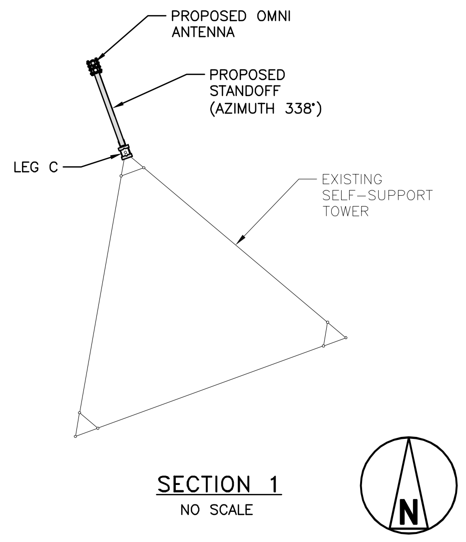
GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

SHEET TITLE

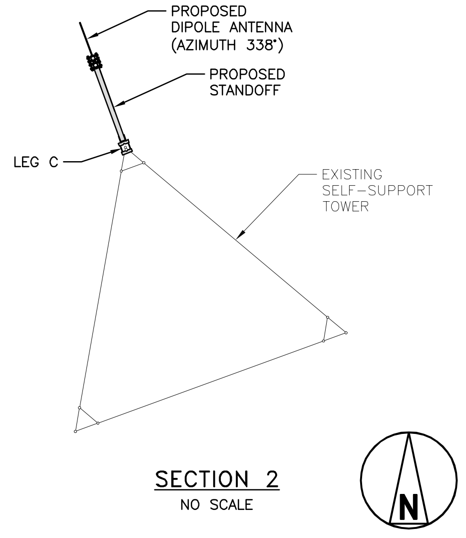
TOWER ELEVATION

SHEET NUMBER

C-2



SECTION 1
NO SCALE



SECTION 2
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
0	06/17/20	ISSUED FOR FILING

STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED
PROFESSIONAL ENGINEER

Joshua Riley

06/17/2020

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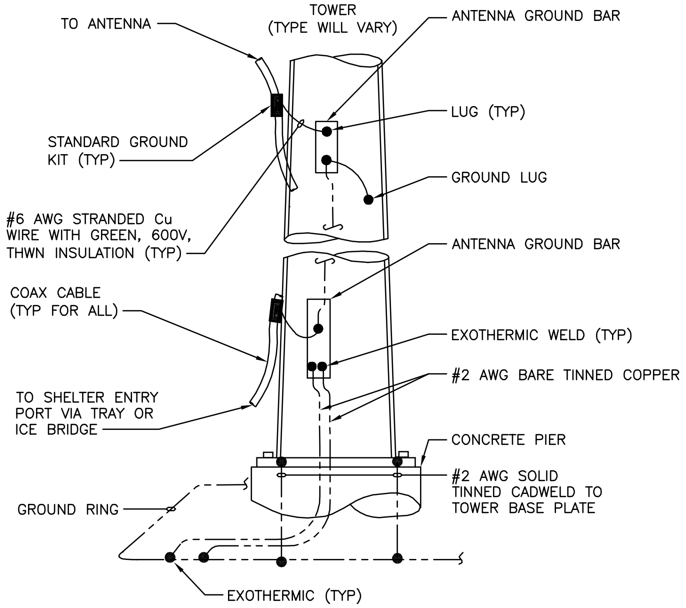
GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

SHEET TITLE
ANTENNA EQUIPMENT

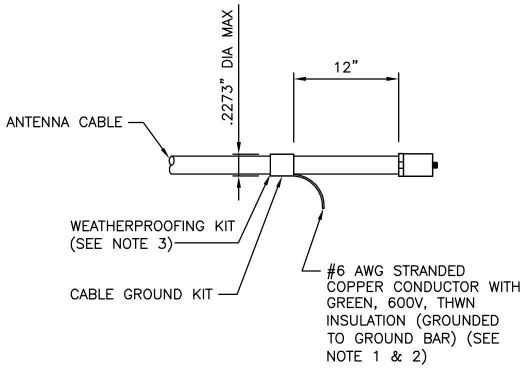
SHEET NUMBER
C-3



NOTE

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

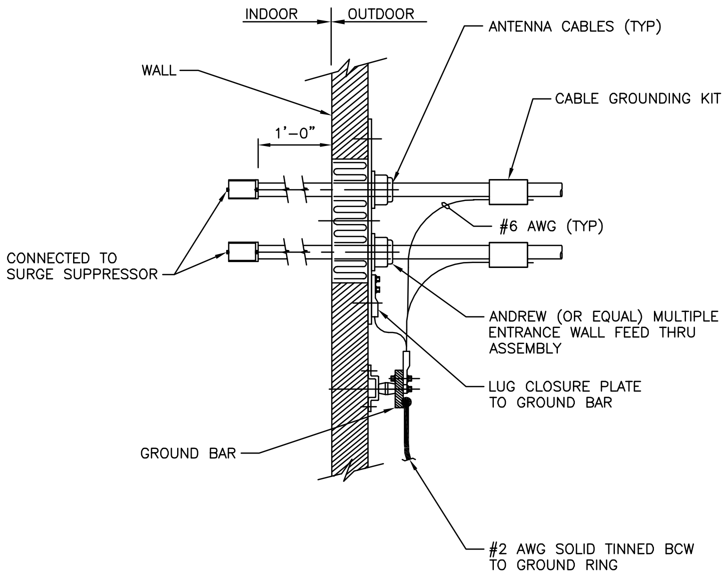
ANTENNA CABLE GROUNDING
NO SCALE



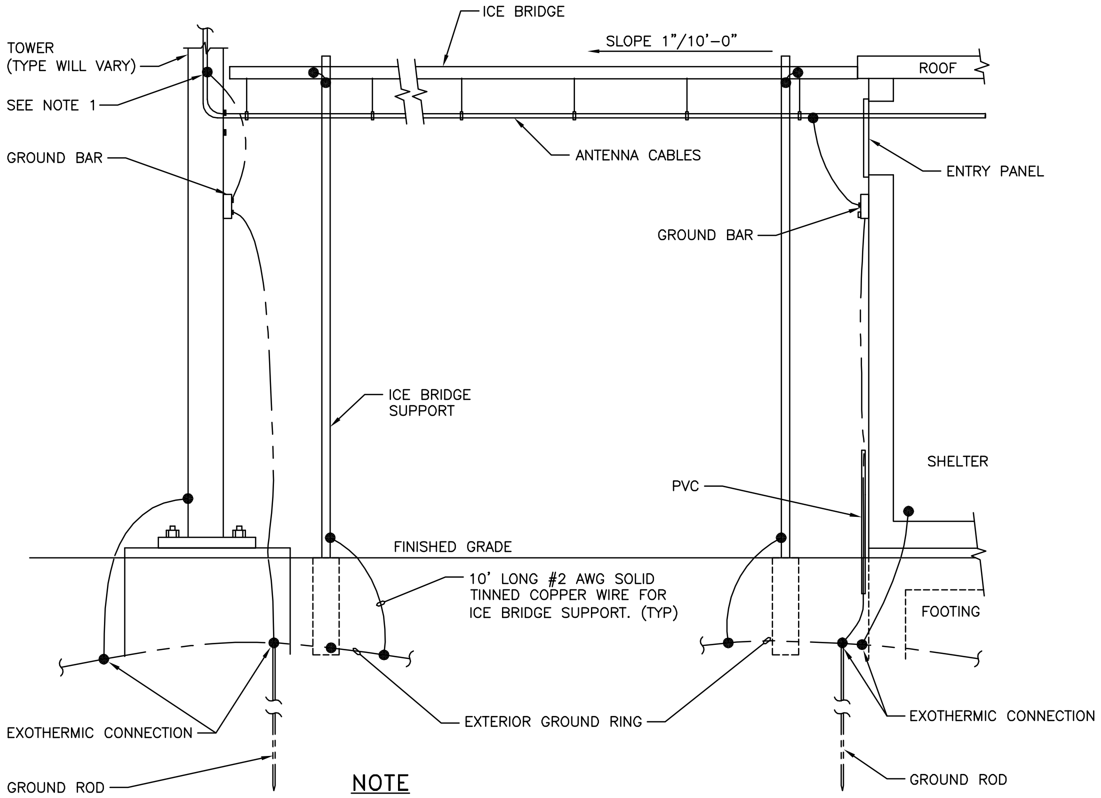
NOTES

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
DRAWN BY:	TYW
CHECKED BY:	TH

REV	DATE	DESCRIPTION
0	06/17/20	ISSUED FOR FILING

MARK P. STILES
34358
06/17/2020

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GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

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 A570, GR 50 AND ASTM A36
BOLTS:	ASTM A325
GRATING:	TYPE GW–2 (1"x3/16" BARS)
MISC. MATERIAL:	ASTM A36

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

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

SITE GENERAL

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

EVERSOURCE ENERGY

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

REV	DATE	DESCRIPTION
0	06/17/20	ISSUED FOR FILING

JOSHUA J. RILEY
33208
Joshua Riley
06/17/2020

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GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

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

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

REV	DATE	DESCRIPTION
0	06/17/20	ISSUED FOR FILING

MARK P. STILES
34358
06/17/2020

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GOOSE HILL ROAD
330 POKORNY ROAD
HADDAM, CT 06438

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
Ⓐ	KEY NOTES
CHAINLINK FENCE	— x — x — x — x — x —
WOOD FENCE	—□—□—□—□—□—□—□—
LEASE AREA	— — — — — — — — — — — — — — —
ICE BRIDGE	▨
CABLE TRAY	▦
GAS LINE	— G — G — G — G — G —
UNDERGROUND ELECTRICAL/TELCO	— E/T — E/T — E/T — E/T —
UNDERGROUND ELECTRICAL/CONTROL	— E/C — E/C — E/C — E/C —
UNDERGROUND ELECTRICAL	— E — E — E — E — E —
UNDERGROUND TELCO	— T — T — T — T — T —
PROPERTY LINE (PL)	— - - — - - — - - — - - —

ABBREVIATIONS

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

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STATE OF CONNECTICUT
JOSHUA J. RILEY
33208
LICENSED PROFESSIONAL ENGINEER

Joshua Riley

06/17/2020

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SHEET TITLE

NOTES
& SPECIFICATIONS

SHEET NUMBER

N-3

REFERENCE
CUTSHEETS

TELEWAVE, INC.®

195 - 260 MHz

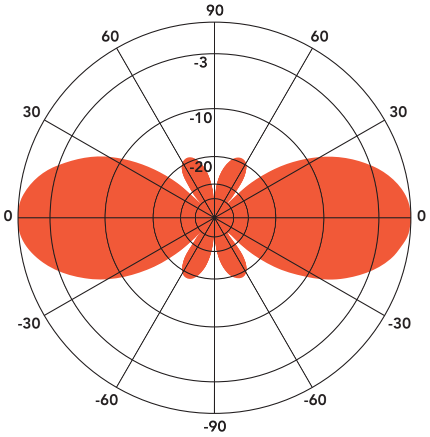
ANT220F2DIN

FIBERGLASS COLLINEAR ANTENNA 2.5 dBd

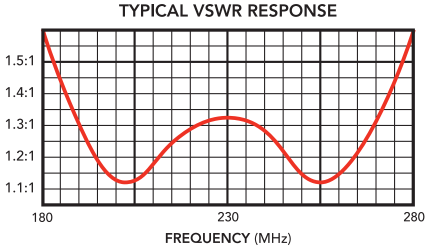
The Telewave ANT220F2 is an extremely rugged collinear antenna, with moderate gain and wide vertical beamwidth. This compact antenna produces 2.5 dBd gain, and is designed for operation in all environmental conditions. The antenna is constructed with brass and copper elements, with a path to ground potential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

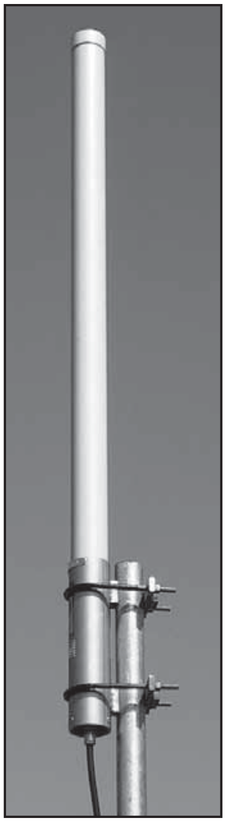
All junctions are fully soldered to prevent RF intermodulation, and each antenna is completely protected within a rugged, high-tech radome to ensure survivability in the worst environments. The "Cool Blue" radome provides maximum protection from corrosive gases, ultraviolet radiation, icing, salt spray, 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.**	51 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.)**	

220MHz EXPOSED DIPOLES 215-225 MHz

870 Series 220MHz Exposed Dipoles

The 870 Series 220MHz Exposed Dipoles are available in 1, 2, 4, 8 dipole configurations. All our antennas can be completely customized to your particular applications. Our antennas can be black anodized, adjustable, or fixed, side mount or top mount, and heavy-duty versions are available.

- Each antenna is offered in a 1/4, 3/8 or 1/2 wave spacing versions.
- The 87XA-70 has external cabling and a field-adjustable pattern.
- The 87XF-70 has internal cabling and fixed dipole-mast spacing.
- Heavy-duty versions are available. Please contact our Technical Support team for consultation.

Electrical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Frequency Range, MHz	215-225	215-225	215-225
Nominal Gain, dBd	2.0-2.5	5.0-5.5	8.0-8.5
Number of Dipoles	1	2	4
Bandwidth 1.5:1 VSWR, MHz	10	10	10
Polarization	Vertical	Vertical	Vertical
Pattern	Offset / bi	Offset / bi	Offset / bi
Power Rating, Watts	200	300	500
Nominal Impedance, Ohms	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground
Standard Termination	Type DIN Male	Type N Male	Type N Male
Mechanical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Length, in (mm)	66 (1676)	112 (2845)	200 (5080)
Width (1/2 Wave Spacing), in (mm)	31 (787)	31 (787)	32 (813)
Weight, lbs. (kg)	12.5 (5.7)	21 (9.5)	51 (23)
Rated Wind Velocity, No Ice, mph (km/h)	165 (266)	150 (241)	145 (233)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	140 (225)	130 (209)	105 (177)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	40 (18)	66 (30)	143 (65)
Bending Moment @ top clamp: 100 mph, ft.*lb (kg*m)	58 (8)	150 (21)	610 (84)
Projected Area, ft² (m²)	1.5 (0.14)	2.6 (0.24)	5.5 (0.51)
Mounting Information Mast O.D. (mm)	1.9" (48)	1.9" (48)	2.4" (60)

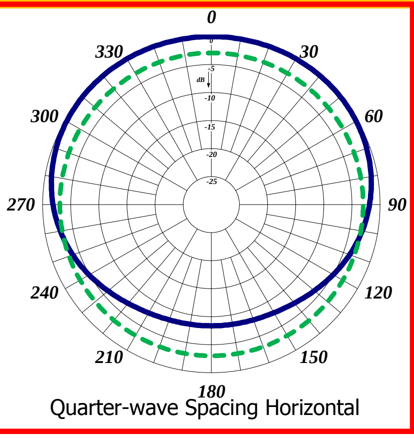
* See next page for ordering information (page 3) *

872F-70-2

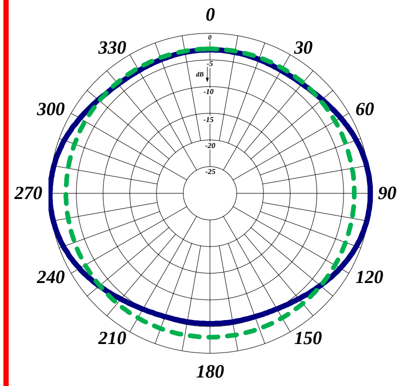
ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.

220MHz EXPOSED DIPOLES 215-225 MHz

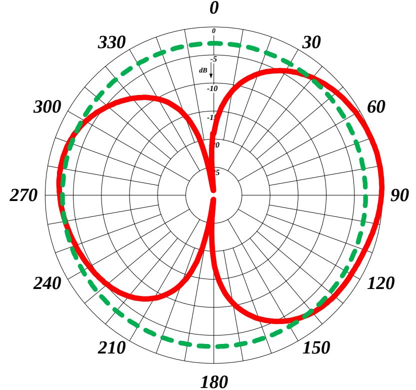
871F-70-2



Quarter-wave Spacing Horizontal

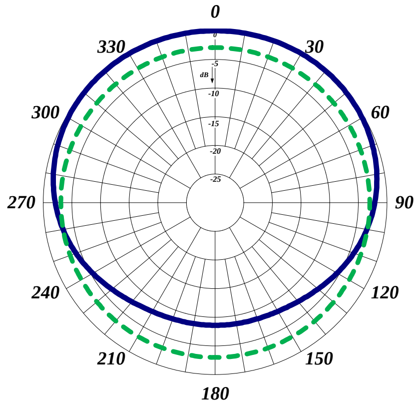


Half-wave Spacing Horizontal

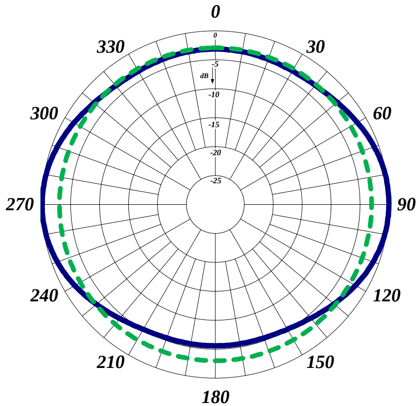


Half-wave Spacing Vertical

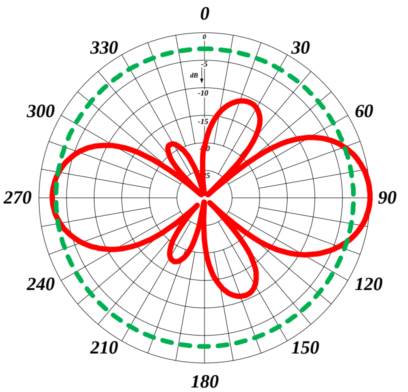
872F-70-2



Quarter-wave Spacing Horizontal

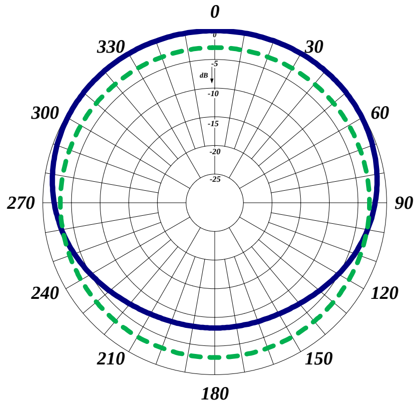


Half-wave Spacing Horizontal

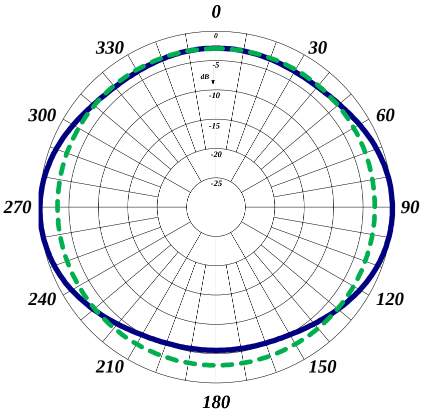


Half-wave Spacing Vertical

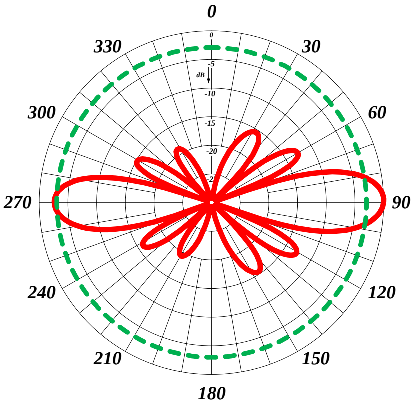
874F-70-2



Quarter-wave Spacing Horizontal



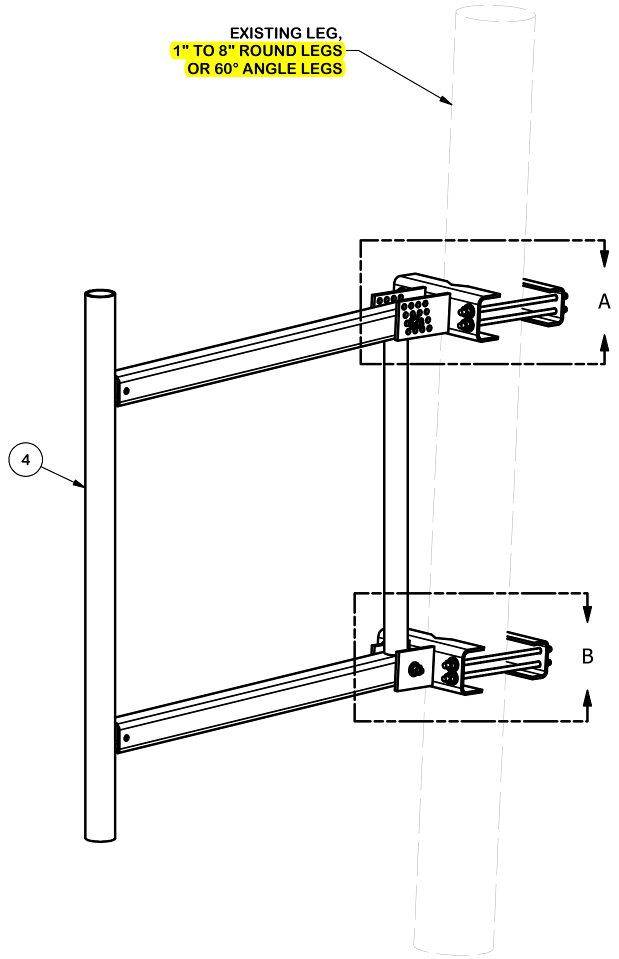
Half-wave Spacing Horizontal

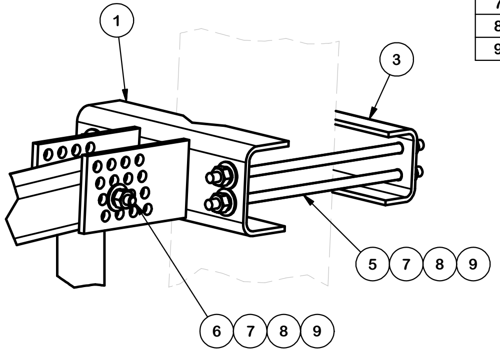


Half-wave Spacing Vertical

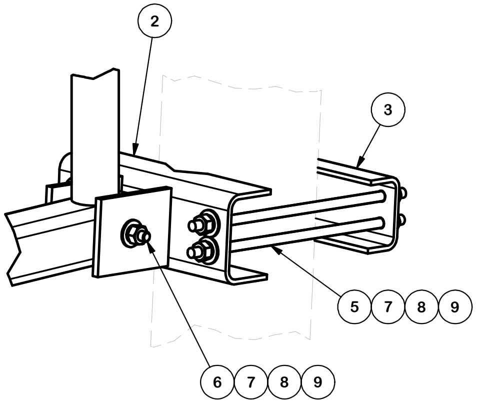
TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = 2.75"± DIAMETER.

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

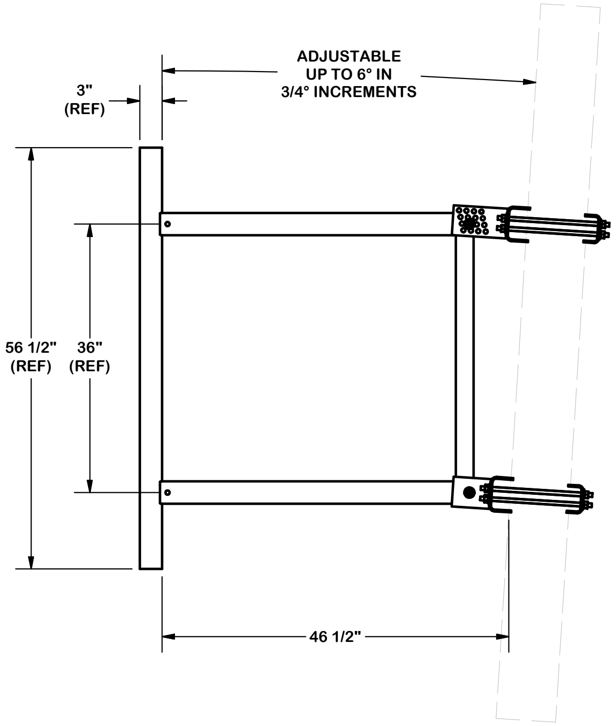




DETAIL A



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")*

PROPRIETARY NOTE:
THE DATA AND TECHNIQUES CONTAINED IN THIS DRAWING ARE PROPRIETARY INFORMATION OF VALMONT INDUSTRIES AND CONSIDERED A TRADE SECRET. ANY USE OR DISCLOSURE WITHOUT THE CONSENT OF VALMONT INDUSTRIES IS STRICTLY PROHIBITED.

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

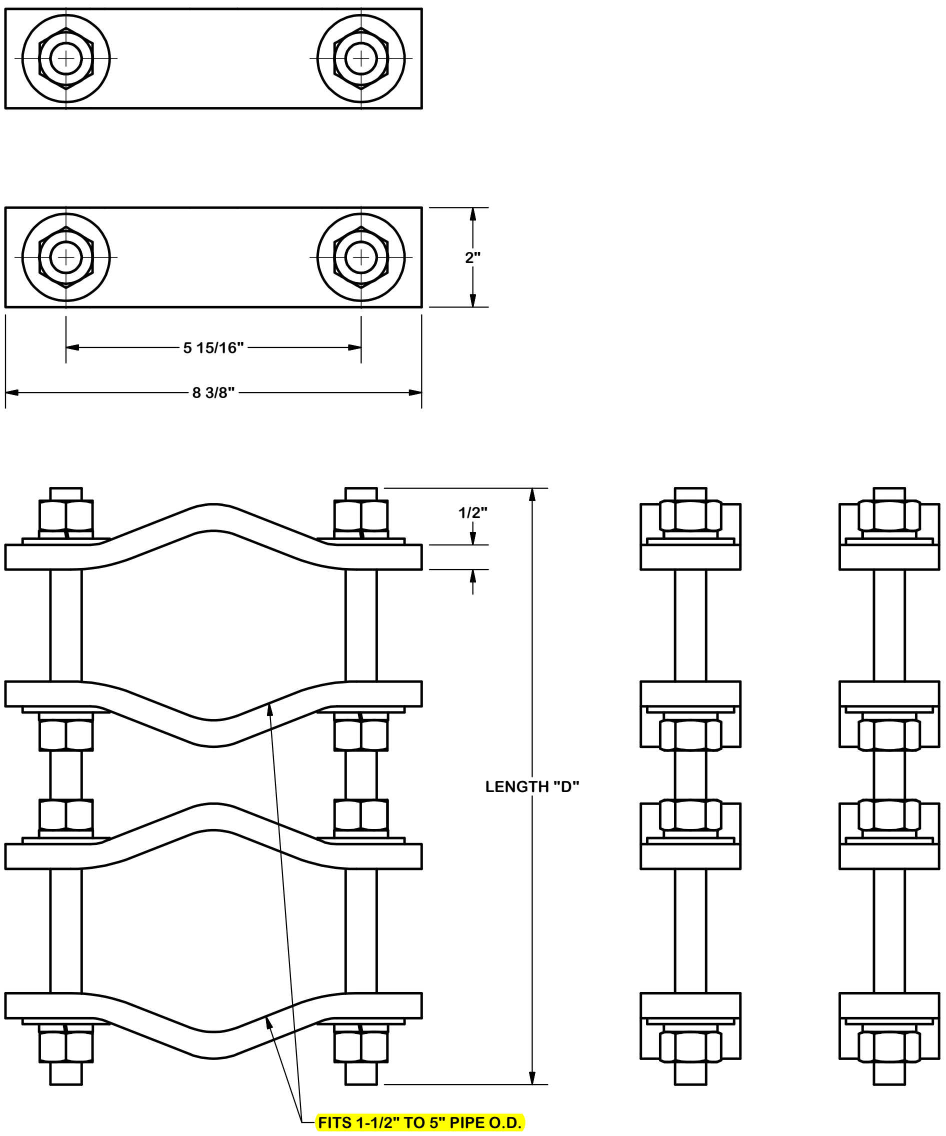
PAGE 1 OF 1

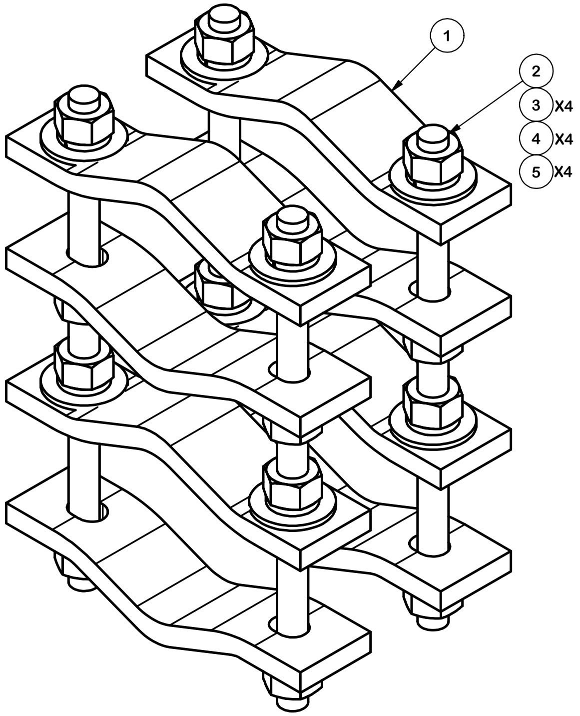
PARTS LIST

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: KC8 8/21/2012
ENG. APPROVAL
PART NO.: SEE ASSEMBLY "A"
CLASS: 81
SUB: 01
DRAWING USAGE: CUSTOMER
CHECKED BY: CEK 1/22/2013
DWG. NO.: DCPxxK
PAGE 1 OF 1

ATTACHMENT C – STRUCTURAL ANALYSIS REPORT

Date: **June 11, 2020**

BLACK & VEATCH
Building a world of difference.
Black & Veatch Corp.
6800 W. 115th St., Suite 2292
Overland Park, KS 66211
(913) 458-2522

Subject:	**Structural Analysis Report**	
Eversource Designation:	**Site Number:** **Site Name:**	ES-010 GooseHillRS
Engineering Firm Designation:	**Black & Veatch Corp. Project Number:**	405025
Site Data:	**330 Pokorny Road, Haddam, Middlesex, CT** **Latitude 41° *26' 36.95"*, Longitude -72° *33' 59.26"*** **280 Foot - Self Support Tower**	

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

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

LC1: Proposed Equipment Configuration	**Sufficient Capacity – 84.9%**

This analysis utilizes an ultimate 3-second gust wind speed of 140 mph as required by the 2018 Connecticut State Building Code. Applicable Standard references and design criteria are listed in Section 2 - Analysis Criteria.

Structural analysis prepared by: Sanyukta R. Arvikar / Changzhi Zang

Respectfully submitted by:

Joshua J. Riley, P.E.

Professional Engineer

JOSHUA J. RILEY
33208
Joshua Riley
06/11/2020

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1) INTRODUCTION

This tower is a 280 ft Self-Support tower designed by Valmont in February of 2012.

2) ANALYSIS CRITERIA

TIA-222 Revision: TIA-222-H
Risk Category: III
Wind Speed: 140 mph
Exposure Category: B
Topographic Factor: 1
Ice Thickness: 1.5 in
Wind Speed with Ice: 50 mph
Seismic Ss: 0.175
Seismic S1: 0.061
Service Wind Speed: 60 mph

Table 1 - Proposed Equipment Configuration

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
202.0	205.0	1	telewave	ANT220F2	1	7/8	-
	202.0	1	site pro 1	USF-4U [4' SO 203-1 + Vert. Pipe Support]			
177.0	180.0	1	comprod	871F-70-220-025	1	7/8	-
	177.0	1	site pro 1	USF-4U [4' SO 203-1 + Vert. Pipe Support]			

Table 2 – Other Considered Equipment

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Notes
279.0	289.0	1	decibel	DB538-G	2 1	7/8 1 5/8	1
		1	telewave	ANT150F6			
	286.0	1	kreco	CO-35A			
276.0	276.0	2	rfs celwave	PAL8-59	2	EW63	1
		2	tower mounts	Pipe Mount [PM 602-1]			
		1	rfs celwave	PAL8-59	1	EW63	2
		1	tower mounts	Pipe Mount [PM 602-1]			
266.0	266.0	1	rfs celwave	PAL8-59	1	EW63	1
		1	tower mounts	Pipe Mount [PM 602-1]			
260.0	265.0	1	commscope	DB589-Y	2 1	1 5/8 3/8	1
	260.0	1	unknown	12"x16"x6" TMA			
		1	tower mounts	Side Arm Mount [SO 308-1]			
	255.0	1	commscope	DB589-Y			
258.0	263.0	2	antennae	10-ft 8 Bay Dipole	2	7/8	1
	258.0	1	tower mounts	Side Arm Mount [SO 308-1]			
255.0	255.0	1	commscope	DB212-C	1	7/8	1

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Notes
		1	tower mounts	Side Arm Mount [SO 308-1]			
252.0	252.0	1	rfs celwave	PADX6-59A	2	EW63	1
		1	tower mounts	Pipe Mount [PM 602-1]			
240.0	247.0	1	kreco	CO-41A	2	7/8	1
	240.0	1	sinclair	SD110-SFXPASNM			
		2	tower mounts	Side Arm Mount [SO 308-1]			
235.0	240.5	1	sinclair	SE419-SF3P4LDF	2 2	1 5/8 1/2	1
	235.0	1	unknown	12"x16"x6" TMA			
		1	tower mounts	Side Arm Mount [SO 307-1]			
	229.5	1	sinclair	SE419-SF3P4LDF			
230.0	230.0	1	tower mounts	Side Arm Mount [SO 305-1]	1	7/8	1
		1	comprod	531-70 Dipole Antenna			
		1	rfs celwave	PAL8-59	1	EW63	2
		1	tower mounts	Pipe Mount [PM 602-1]			
220.0	220.0	1	rfs celwave	PAL8-59	1	EW63	1
		1	tower mounts	Pipe Mount [PM 602-1]			
216.0	220.0	1	telewave	ANT450F6	2	7/8	1
	216.0	1	sinclair	SD110-SFXPASNM			
		2	tower mounts	Sector Mount [SM 308-1]			
205.5	205.5	1	rfs celwave	PAD10-59AC	1	EW63	2
		1	tower mounts	Pipe Mount [PM 602-1]			
204.0	204.0	1	tower mounts	Side Arm Mount [SO 305-1]	1	1 5/8	1
		1	unknown	12"x16"x6" TMA			
	200.0	1	sinclair	SC479-HF1LDF (DXX-E5765)			
200.0	206.0	1	sinclair	SE419-SWBP4LDF(D00)	3 1	1 5/8 1/2	1
	202.0	1	telewave	ANT900D6-9			
	200.0	1	tower mounts	Side Arm Mount [SO 311-1]			
		1	tower mounts	Side Arm Mount [SO 308-1]			
	194.0	1	sinclair	SC479-HF1LDF(DXX-E5765)			
197.0	197.0	1	rfs celwave	PAL6	1	EW63	1
		1	tower mounts	Pipe Mount [PM 602-1]			
195.0	195.0	1	rfs celwave	PAD10-59AC	1	EW63	1
		1	tower mounts	Pipe Mount [PM 602-1]			
175.0	181.0	1	sinclair	SC479-HF1LDF	4 2	1 5/8 1/2	1
		1	antel	BCR-80010:90			
	175.0	2	tower mounts	Side Arm Mount [SO 308-1]			
		1	unknown	12"x16"x6" TMA			
	169.0	1	antel	BCR-80010:90			
		1	antel	SC479-HF1LDF			
168.0	172.0	1	telewave	ANT450-F6	1	7/8	1

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Notes
	168.0	1	tower mounts	Side Arm Mount [SO 311-1]			
163.0	163.0	1	rfs celwave	PA6-65AC	1	EW63	1
		1	tower mounts	Pipe Mount [PM 602-1]			
153.5	153.5	1	tower mounts	Sector Mount [SM 502-3]	6 4	1 5/8 1 1/4	1
		3	rfs celwave	APXVTM14 w/ Mount Pipe			
		3	commscope	NNVV-65B-R4 w/ Mount Pipe			
		3	alcatel lucent	TD-RRH8x20-25			
		3	alcatel lucent	FD-RRH-4x45-1900			
		6	alcatel lucent	FD-RRH-2x50-800			
145.0	145.0	3	commscope	HBXX-6517DS-A2M w/ Mount Pipe	-	-	1
		3	commscope	LNX6515DS-A1M w/ Mount Pipe			
		3	alcatel lucent	RC3DC-3315-PF-48-OVP			
		3	site pro 1	VFA12-HD 12' Heavy Duty V-Frame			
		6	commscope	NHH-65C-R2B w/ Mount Pipe	3	1 1/4	2
		3		B5/B13 RRH-BR04C			
		3	alcatel lucent	B2/B66A RRH-BR049			
		3	alcatel lucent	RVZDC-6627-PF-48			
		3	site pro 1	SFS-V Sector Frame Stabilizer			
		3	site pro 1	STU-K 10.5’ Tie back			
128.0	128.0	1	tower mounts	Side Arm Mount [SO 311-1]	-	-	1
126.0	126.0	1	kathrein	PRF-950	1	7/8	1
		1	tower mounts	Side Arm Mount [SO 308-1]			
125.0	131.0	1	kreco	CO-36A	1	7/8	1
	125.0	1	tower mounts	Side Arm Mount [SO 308-1]			
124.0	128.0	1	telewave	ANT450-F6	1	7/8	1
	124.0	1	tower mounts	Side Arm Mount [SO 308-1]			
123.0	123.0	1	rfs celwave	SBX4-W60AC	1	E60	1
		1	tower mounts	Pipe Mount [PM 602-1]			
117.0	117.0	1	unknown	Grid	1	7/8	1
		1	tower mounts	Side Arm Mount [SO 311-1]			
116.0	119.0	1	browning	BR6155 5' Omni	2	7/8	1
	116.0	1	tower mounts	Side Arm Mount [SO 311-1]			
	113.0	1	telewave	ANT400D			
104.0	104.0	1	tower mounts	Pipe Mount [PM 602-1]	1	EW63	1
		1	celwave	PA6-65AC			
95.0	98.0	1	browning	BR6155 5' Omni	1	7/8	1
	95.0	1	tower mounts	Side Arm Mount [SO 311-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Notes
55.0	55.0	1	aston wireless	V-1500 5' Dipole	1	7/8	1
		1	tower mounts	Side Arm Mount [SO 311-1]			
50.0	51.5	1	telewave	ANT790-S2	1	1/2	1
	50.0	1	tower mounts	Side Arm Mount [SO 311-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
GEOTECHNICAL REPORTS	Clarence Welti Assoc., Inc., dated 8/1/2011	-	Eversource
TOWER FOUNDATION DRAWINGS	Valmont, dated 2/29/2012	-	Eversource
TOWER MANUFACTURER DRAWINGS	Valmont, dated 2/29/2012	-	Eversource
TOWER STRUCTURAL ANALYSIS REPORT	Paul J. Ford, dated 04/15/2020	-	Eversource

3.1) Analysis Method

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

3.2) Assumptions

1) Tower and structures were built and maintained in accordance with the manufacturer's specifications.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
3) This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, appurtenance loading, tower/foundation details, and geotechnical data.
4) Tower loading is based on 2020 Antenna Inventory, the previous PJF SA dated on 04/15/2020 and 2018 drone mapping photos.
5) The existing base plate grout was considered in this analysis. Grout must be maintained and inspected periodically and must be replaced if damaged or cracked.

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
T1	280 - 260	Leg	BV_Valmont 207628	1	-4.23	150.21	47.2	Pass
T2	260 - 240	Leg	BV_Valmont 207628	26	-21.90	150.21	26.2	Pass
T3	240 - 220	Leg	BV_Valmont 207628	42	-71.00	150.21	47.3	Pass
T4	220 - 210	Leg	BV_Valmont 195557	63	-92.24	316.56	39.7	Pass
T5	210 - 200	Leg	BV_Valmont 195557	72	-113.41	316.56	44.3	Pass
T6	200 - 180	Leg	BV_Valmont 211843	84	-149.77	374.11	51.8	Pass
T7	180 - 160	Leg	BV_Valmont 208334	93	-204.19	473.71	43.1	Pass
T8	160 - 140	Leg	BV_Valmont 208334	102	-257.75	473.71	64.5	Pass
T9	140 - 120	Leg	BV_Valmont 208335	111	-318.06	585.13	54.4	Pass
T10	120 - 100	Leg	Valmont 238706	120	-379.92	708.42	53.6	Pass
T11	100 - 80	Leg	Valmont 238707	129	-441.90	843.61	52.4	Pass
T12	80 - 60	Leg	Valmont 238708	138	-503.58	843.61	59.7	Pass
T13	60 - 40	Leg	Valmont 238709	145	-564.86	990.75	57.0	Pass
T14	40 - 20	Leg	Valmont 238709	154	-628.95	990.75	63.5	Pass
T15	20 - 0	Leg	Valmont 238709	163	-687.91	990.75	69.4	Pass
T1	280 - 260	Diagonal	L3x3x5/16	12	-5.66	20.74	27.3	Pass
T2	260 - 240	Diagonal	L3x3x5/16	33	-7.34	16.96	43.3	Pass
T3	240 - 220	Diagonal	L4x4x1/4	54	-11.46	27.87	41.1 44.6 (b)	Pass
T4	220 - 210	Diagonal	L4x4x1/4	69	-13.35	25.26	52.9 78.2 (b)	Pass
T5	210 - 200	Diagonal	L4x4x1/4	75	-13.72	23.16	59.2 78.5 (b)	Pass
T6	200 - 180	Diagonal	2L3 1/2x3 1/2x1/4x3/8	90	-21.72	40.69	53.4 68.1 (b)	Pass
T7	180 - 160	Diagonal	2L3 1/2x3 1/2x1/4x3/8	99	-23.07	36.80	62.7 74.8 (b)	Pass
T8	160 - 140	Diagonal	2L4x4x1/4x3/8	108	-27.06	50.30	53.8 84.9 (b)	Pass
T9	140 - 120	Diagonal	2L4x4x3/8x3/8	117	-30.80	65.13	47.3 65.7 (b)	Pass
T10	120 - 100	Diagonal	2L4x4x3/8x3/8	126	-32.06	69.19	46.3	Pass
T11	100 - 80	Diagonal	2L4x4x3/8x3/8	135	-33.59	64.06	52.4	Pass
T12	80 - 60	Diagonal	2L5x5x5/16x3/8	144	-34.34	93.48	36.7 40.5 (b)	Pass
T13	60 - 40	Diagonal	2L5x5x5/16x3/8	153	-35.75	87.09	41.0 41.6 (b)	Pass
T14	40 - 20	Diagonal	2L5x5x5/16x3/8	162	-35.70	81.27	43.9	Pass
T15	20 - 0	Diagonal	2L5x5x5/16x3/8	171	-37.53	75.94	49.4	Pass
T1	280 - 260	Secondary Horizontal	L3x3x5/16	24	-1.83	25.04	7.3 19.7 (b)	Pass
T5	210 - 200	Secondary Horizontal	L3x3x5/16	80	-1.97	9.49	20.7 21.2 (b)	Pass
T1	280 - 260	Top Girt	L3 1/2x3 1/2x5/16	6	-0.37	18.54	2.0	Pass
T3	240 - 220	Top Girt	L5x5x3/8	43	-1.49	34.72	4.3 6.0 (b)	Pass
T3	240 - 220	Mid Girt	L5x5x3/8	46	-1.92	30.41	6.3 7.4 (b)	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
							Summary	
						Leg (T15)	69.4	Pass
						Diagonal (T8)	84.9	Pass
						Secondary Horizontal (T5)	21.2	Pass
						Top Girt (T3)	6.0	Pass
						Mid Girt (T3)	7.4	Pass
						Bolt Checks	84.9	Pass
						RATING =	84.9	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC1

Note	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	62.1	Pass
1	Base Foundation	0	62.7	Pass
1	Base Foundation Soil Interaction		55.8	Pass

Structure Rating (max from all components) =	**84.9%**

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

4.1) Recommendation

The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

Maximum Tower Deflections - Service Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*	*Check**
T1	280 - 260	11.513	39	0.3483	0.0666	OK
T2	260 - 240	10.04	39	0.3445	0.0658	OK
T3	240 - 220	8.592	39	0.3263	0.0625	OK
T4	220 - 210	7.236	39	0.292	0.0566	OK
T5	210 - 200	6.603	39	0.2803	0.0518	OK
T6	200 - 180	5.988	39	0.2662	0.0485	OK

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

1) Maximum Rotation = 4 Degrees

2) Maximum Deflection = 0.03 * Tower Height = 101 in.

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

Elevation (ft)	*MW Dish*	*Tilt (°)*	*Twist (°)*	*Diameter, D (ft)*	*Frequency, α (GHz)*	*Decibel Points*	*Deformation Limit (θ)**	*Deformation Limit Exceeded?*
276	PAL8-59	0.348	0.0665	8	10	10 dB	0.664	Not Exceeded
276	PAL8-59	0.348	0.0665	8	10	10 dB	0.664	Not Exceeded
276	PAL8-59	0.348	0.0665	8	10	10 dB	0.664	Not Exceeded
266	PAL8-59	0.3465	0.0663	8	10	10 dB	0.664	Not Exceeded
252	PADX6-59A	0.3398	0.0648	6	10	10 dB	0.885	Not Exceeded
230	PAL8-59	0.3088	0.0602	8	10	10 dB	0.664	Not Exceeded
220	PAL8-59	0.292	0.0566	8	10	10 dB	0.664	Not Exceeded
205.5	PAD10-59AC	0.2743	0.0501	10	10	10 dB	0.531	Not Exceeded
197	PAL6	0.2619	0.0476	6	10	10 dB	0.885	Not Exceeded
195	PAD10-59AC	0.259	0.0471	10	10	10 dB	0.531	Not Exceeded
163	PA6-65AC	0.2166	0.0371	6	10	10 dB	0.885	Not Exceeded
126	PRF-950	0.1601	0.0265	3.176	15	10 dB	1.115	Not Exceeded
123	SBX4-W60AC	0.1559	0.0259	4	15	10 dB	0.885	Not Exceeded
117	Grid	0.1475	0.0247	6	10	10 dB	0.885	Not Exceeded
104	PA6-65AC	0.1299	0.0217	6	10	10 dB	0.885	Not Exceeded

*Limit per TIA-222-H Annex D

Maximum Tower Deflections - Design Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*	*Combined Max*	*Check**
T1	280 - 260	11.513	39	0.3483	0.0666	0.355	OK
T2	260 - 240	10.04	39	0.3445	0.0658	0.351	OK
T3	240 - 220	8.592	39	0.3263	0.0625	0.332	OK
T4	220 - 210	7.236	39	0.292	0.0566	0.297	OK
T5	210 - 200	6.603	39	0.2803	0.0518	0.285	OK
T6	200 - 180	5.988	39	0.2662	0.0485	0.271	OK

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

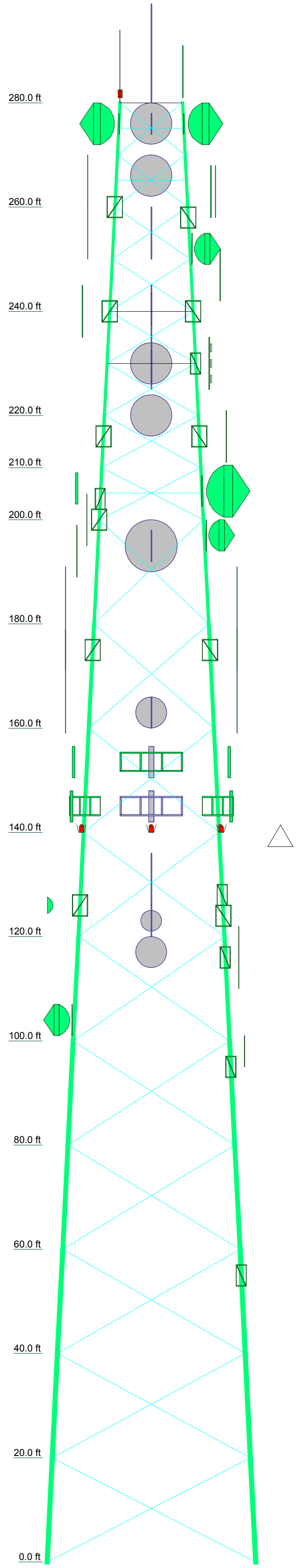
Critical Deflections of Tower at the MW Dish Elevations - Design Wind

Elevation ft	*Appurtenance*	*Gov. Load Comb.*	*Deflection in*	*Tilt °*	*Twist °*	*Radius of Curvature ft*
276	PAL8-59	39	11.218	0.348	0.0665	Inf
276	PAL8-59	39	11.218	0.348	0.0665	Inf
276	PAL8-59	39	11.218	0.348	0.0665	Inf
266	PAL8-59	39	10.481	0.3465	0.0663	443266.000
252	PADX6-59A	39	9.454	0.3398	0.0648	100532.000
230	PAL8-59	39	7.899	0.3088	0.0602	39724.000
220	PAL8-59	39	7.236	0.292	0.0566	36195
205.5	PAD10-59AC	39	6.323	0.2743	0.0501	52885
197	PAL6	39	5.81	0.2619	0.0476	29312
195	PAD10-59AC	39	5.693	0.259	0.0471	30263
163	PA6-65AC	47	4.006	0.2166	0.0371	45211
126	PRF-950	47	2.453	0.1601	0.0265	38965
123	SBX4-W60AC	47	2.347	0.1559	0.0259	41605
117	Grid	47	2.143	0.1475	0.0247	45096
104	PA6-65AC	47	1.734	0.1299	0.0217	47039

APPENDIX A

TNXTOWER OUTPUT

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Mid Girts	Sec. Horizontals	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	BV_Valmont 207628	A572-50	L3x3x5/16	A36	L3 1/2x3 1/2x5/16	N.A.	L3x3x5/16	12	8 @ 10	4.8
T2					N.A.		N.A.	14		4.2
T3			L4x4x1/4		L5x5x3/8	L5x5x3/8		16		5.7
T4	BV_Valmont 195557				N.A.	N.A.		18		2.0
T5							L3x3x5/16	19		2.4
T6	BV_Valmont 211843		2L3 1/2x3 1/2x1/4x3/8				N.A.	20		4.8
T7	BV_Valmont 208334							22		5.5
T8			2L4x4x1/4x3/8					24		5.9
T9	BV_Valmont 208335		2L4x4x3/8x3/8					26	10 @ 20	8.0
T10	Valmont 238706							28		9.0
T11	Valmont 238707							30		10.3
T12	Valmont 238708		2L5x5x5/16x3/8					32		10.8
T13	Valmont 238709							34		11.8
T14								36		12.0
T15								38		12.3
								40		109.4



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Flash Beacon Lighting	280	10' x 2" Horizontal Mount Pipe	175
ANT150F6	279	12"x16"x6" TMA	175
CO-35A	279	Side Arm Mount [SO 308-1]	175
6' x 2" Mount Pipe	279	SC479-HF1LDF	175
DB538-G	279	ANT450-F6	168
Pipe Mount [PM 602-1]	276	Side Arm Mount [SO 311-1]	168
Pipe Mount [PM 602-1]	276	Pipe Mount [PM 602-1]	163
Pipe Mount [PM 602-1]	276	6' x 2" Horizontal Mount Pipe	163
10' x 2" Horizontal Mount Pipe	276	PA6-65AC	163
10' x 2" Horizontal Mount Pipe	276	(2) FD-RRH-2x50-800	153.5
10' x 2" Horizontal Mount Pipe	276	FD-RRH-4x45-1900	153.5
PAL8-59	276	APXVTM14 w/ Mount Pipe	153.5
PAL8-59	276	Sector Mount [SM 502-3]	153.5
PAL8-59	276	APXVTM14 w/ Mount Pipe	153.5
Pipe Mount [PM 602-1]	266	APXVTM14 w/ Mount Pipe	153.5
10' x 2" Horizontal Mount Pipe	266	NNVV-65B-R4_TIA w/ Mount Pipe	153.5
PAL8-59	266	NNVV-65B-R4_TIA w/ Mount Pipe	153.5
12"x16"x6" TMA	260	NNVV-65B-R4_TIA w/ Mount Pipe	153.5
12' horizontal x 2" Pipe Mount	260	FD-RRH-4x45-1900	153.5
DB589-Y	260	TD-RRH8x20-25	153.5
Side Arm Mount [SO 308-1]	260	TD-RRH8x20-25	153.5
DB589-Y	260	TD-RRH8x20-25	153.5
Side Arm Mount [SO 308-1]	258	FD-RRH-4x45-1900	153.5
12' horizontal x 2" Pipe Mount	258	(2) FD-RRH-2x50-800	153.5
10-ft 8 Bay Dipole	258	(2) FD-RRH-2x50-800	153.5
10-ft 8 Bay Dipole	258	(2) NHH-65C-R2B_TIA w/ Mount Pipe	145
Side Arm Mount [SO 308-1]	255	(2) NHH-65C-R2B_TIA w/ Mount Pipe	145
12' horizontal x 2" Pipe Mount	255	(2) NHH-65C-R2B_TIA w/ Mount Pipe	145
12' x 2" Pipe Mount	255	B2/B66A RRH-BR049	145
DB212-C	255	B2/B66A RRH-BR049	145
Pipe Mount [PM 602-1]	252	B2/B66A RRH-BR049	145
4'x2" Horizontal Mount Pipe	252	B5/B13 RRH-BR04C	145
PADX6-59A	252	B5/B13 RRH-BR04C	145
12' x 2" Pipe Mount	240	B5/B13 RRH-BR04C	145
SD110-SFXPASNM	240	RVZDC-6627-PF-48	145
CO-41A	240	RVZDC-6627-PF-48	145
Side Arm Mount [SO 308-1]	240	RVZDC-6627-PF-48	145
Side Arm Mount [SO 308-1]	240	RC3DC-3315-PF-48-OVP	145
12' horizontal x 2" Pipe Mount	240	RC3DC-3315-PF-48-OVP	145
12' horizontal x 2" Pipe Mount	240	RC3DC-3315-PF-48-OVP	145
12"x16"x6" TMA	235	Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	145
Side Arm Mount [SO 307-1]	235	Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	145
10' x 2" Horizontal Mount Pipe	235	Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	145
15' x 2" Pipe Mount	235	Site Pro 1 SFS-V Sector Frame Stabilizer	145
SE419-SF3P4LDF	235	Site Pro 1 SFS-V Sector Frame Stabilizer	145
SE419-SF3P4LDF	235	Site Pro 1 SFS-V Sector Frame Stabilizer	145
10' x 2.375" Horizontal Mount Pipe	230	10'6"x2" Horizontal Pipe	145
Side Arm Mount [SO 305-1]	230	10'6"x2" Horizontal Pipe	145
12' x 2" Pipe Mount	230	10'6"x2" Horizontal Pipe	145
6' x 2" Horizontal Mount Pipe	230	HBXX-6517DS-A2M_TIA w/ Mount Pipe	145
531-70 Dipole Antenna	230	HBXX-6517DS-A2M_TIA w/ Mount Pipe	145
Pipe Mount [PM 602-1]	230	HBXX-6517DS-A2M_TIA w/ Mount Pipe	145
PAL8-59	230	LNX-6515DS-A1M_TIA w/ Mount Pipe	145
Pipe Mount [PM 602-1]	220	LNX-6515DS-A1M_TIA w/ Mount Pipe	145
5'-0" x 2" horizontal mount pipe	220	LNX-6515DS-A1M_TIA w/ Mount Pipe	145
PAL8-59	220	Beacon side markers	140
Side Arm Mount [SO 308-1]	216	Beacon side markers	140
12' horizontal x 2" Pipe Mount	216	Beacon side markers	140
Side Arm Mount [SO 308-1]	216	Side Arm Mount [SO 311-1]	128
12' horizontal x 2" Pipe Mount	216	Side Arm Mount [SO 308-1]	126
12' x 2" Pipe Mount	216	12' horizontal x 2" Pipe Mount	126
SD110-SFXPASNM	216	4' x 2" Pipe Mount	126
ANT450F6	216	PRF-950	126
Pipe Mount [PM 602-1]	205.5	Side Arm Mount [SO 308-1]	125
10' x 2" Horizontal Mount Pipe	205.5	12' horizontal x 2" Pipe Mount	125
PAD10-59AC	205.5	CO-36A	125
Side Arm Mount [SO 305-1]	204	Side Arm Mount [SO 308-1]	124
SC479-HF1LDF(DXX-E5765)	204	12' horizontal x 2" Pipe Mount	124
12"x16"x6" TMA	204	ANT450-F6	124
USF-4U [4' SO 203-1 + Vert. Pipe Support]	202	Pipe Mount [PM 602-1]	123
ANT220F2	202	6' x 2" Horizontal Mount Pipe	123
SC479-HF1LDF(DXX-E5765)	200	SBX4-W60AC	123
Side Arm Mount [SO 311-1]	200	Side Arm Mount [SO 311-1]	117
Side Arm Mount [SO 308-1]	200	3'x4" Mount Pipe	117
SE419-SWBPALDF(DXX) w/ Mount Pipe	200	10' x 2" Horizontal Mount Pipe	117
ANT900D69 UHF 4-bay dipole	200	Grid	117
Pipe Mount [PM 602-1]	197	ANT400D	116
10' x 2" Horizontal Mount Pipe	197	BR6155 5' Omni	116
PAL6	197	Side Arm Mount [SO 311-1]	116
10' x 2" Horizontal Mount Pipe	195	10' x 2" Horizontal Mount Pipe	104
Pipe Mount [PM 602-1]	195	Pipe Mount [PM 602-1]	104
PAD10-59AC	195	PA6-65AC	104
USF-4U [4' SO 203-1 + Vert. Pipe Support]	177	Side Arm Mount [SO 311-1]	95
871F-70-220-025	177	BR6155 5' Omni	95
Side Arm Mount [SO 308-1]	175	V-1500	55
BCR-80010:90	175	Side Arm Mount [SO 311-1]	55
BCR-80010:90	175	Side Arm Mount [SO 311-1]	50
SC479-HF1LDF	175	ANT790D	50

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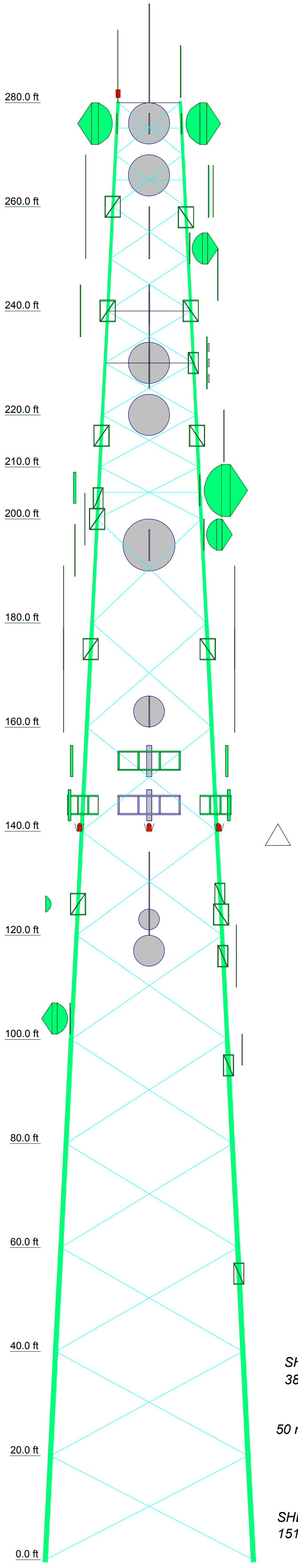
Job: ***ES-010 GooseHillRS***
Project:
Client: Eversource
Drawn by: TH
App'd:
Code: TIA-222-H
Date: 06/01/20
Scale: NTS
Path: C:\Users\hai92311\OneDrive - Black & Veatch\My Desktop\Structural\ES-010 GooseHillRS Structural Analysis.eri
Dwg No. E-1

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Mid Girts	Sec. Horizontals	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	BV_Valmont 207628	A572-50	L3x3x5/16	A36	L3 1/2x3 1/2x5/16	N.A.	L3x3x5/16	12	8 @ 10	4.8
T2					N.A.		N.A.	14		4.2
T3			L4x4x1/4		L5x5x3/8	L5x5x3/8		16		5.7
T4	BV_Valmont 195557				N.A.	N.A.		18		2.0
T5							L3x3x5/16	19		2.4
T6	BV_Valmont 211843		2L3 1/2x3 1/2x1/4x3/8				N.A.	20	10 @ 20	4.8
T7	BV_Valmont 208334							22		5.5
T8			2L4x4x1/4x3/8					24		5.9
T9	BV_Valmont 208335		2L4x4x3/8x3/8					26		8.0
T10	Valmont 238706							28		9.0
T11	Valmont 238707							30		10.3
T12	Valmont 238708		2L5x5x5/16x3/8					32		10.8
T13	Valmont 238709							34		11.8
T14								36		12.0
T15								38		12.3
								40		109.4



MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-H Standard.
2. Tower designed for a 140 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 50 mph basic wind with 1.50 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 84.9%

ALL REACTIONS
ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 718 K
SHEAR: 93 K

UPLIFT: -577 K
SHEAR: 77 K

AXIAL
444 K
SHEAR
38 K
MOMENT
6015 kip-ft

TORQUE 64 kip-ft
50 mph WIND - 1.5000 in ICE

AXIAL
171 K
SHEAR
151 K
MOMENT
22928 kip-ft

TORQUE 293 kip-ft
REACTIONS - 140 mph WIND

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Job: ***ES-010 GooseHillRS***
Project:
Client: Eversource
Drawn by: TH
App'd:
Code: TIA-222-H
Date: 06/01/20
Scale: NTS
Path: C:\Users\hai92311\OneDrive - Black & Veatch\My Desktop\Structural\ES-010 GooseHillRS Structural Analysis.eri
Dwg No. E-1

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 280.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 12.00 ft at the top and 40.00 ft at the base.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

1) Tower base elevation above sea level: 659.00 ft.
2) Basic wind speed of 140 mph.
3) Risk Category III.
4) Exposure Category B.
5) Simplified Topographic Factor Procedure for wind speed-up calculations is used.
6) Topographic Category: 1.
7) Crest Height: 0.00 ft.
8) Nominal ice thickness of 1.5000 in.
9) Ice thickness is considered to increase with height.
10) Ice density of 56 pcf.
11) A wind speed of 50 mph is used in combination with ice.
12) Temperature drop of 50 °F.
13) Deflections calculated using a wind speed of 60 mph.
14) Pressures are calculated at each section.
15) Stress ratio used in tower member design is 1.05.
16) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

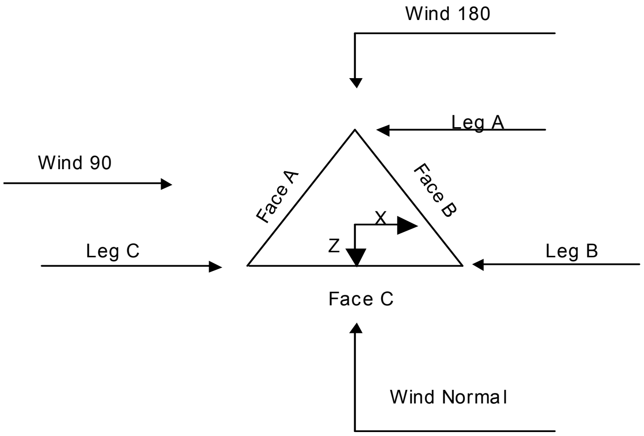
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
√ Secondary Horizontal 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	280.00-260.00			12.00	1	20.00
T2	260.00-240.00			14.00	1	20.00
T3	240.00-220.00			16.00	1	20.00
T4	220.00-210.00			18.00	1	10.00
T5	210.00-200.00			19.00	1	10.00
T6	200.00-180.00			20.00	1	20.00
T7	180.00-160.00			22.00	1	20.00
T8	160.00-140.00			24.00	1	20.00
T9	140.00-120.00			26.00	1	20.00
T10	120.00-100.00			28.00	1	20.00
T11	100.00-80.00			30.00	1	20.00
T12	80.00-60.00			32.00	1	20.00
T13	60.00-40.00			34.00	1	20.00
T14	40.00-20.00			36.00	1	20.00
T15	20.00-0.00			38.00	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	280.00-260.00	10.00	X Brace	No	Yes	0.0000	0.0000
T2	260.00-240.00	10.00	X Brace	No	No	0.0000	0.0000
T3	240.00-220.00	10.00	X Brace	No	No	0.0000	0.0000
T4	220.00-210.00	10.00	X Brace	No	No	0.0000	0.0000
T5	210.00-200.00	10.00	X Brace	No	Yes	0.0000	0.0000
T6	200.00-180.00	20.00	X Brace	No	No	0.0000	0.0000
T7	180.00-160.00	20.00	X Brace	No	No	0.0000	0.0000
T8	160.00-140.00	20.00	X Brace	No	No	0.0000	0.0000

Tower Section	*Tower Elevation ft*	*Diagonal Spacing ft*	*Bracing Type*	*Has K Brace End Panels*	*Has Horizontals*	*Top Girt Offset in*	*Bottom Girt Offset in*
T9	140.00-120.00	20.00	X Brace	No	No	0.0000	0.0000
T10	120.00-100.00	20.00	X Brace	No	No	0.0000	0.0000
T11	100.00-80.00	20.00	X Brace	No	No	0.0000	0.0000
T12	80.00-60.00	20.00	X Brace	No	No	0.0000	0.0000
T13	60.00-40.00	20.00	X Brace	No	No	0.0000	0.0000
T14	40.00-20.00	20.00	X Brace	No	No	0.0000	0.0000
T15	20.00-0.00	20.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Type*	*Leg Size*	*Leg Grade*	*Diagonal Type*	*Diagonal Size*	*Diagonal Grade*
T1 280.00-260.00	Truss Leg	BV_Valmont 207628	A572-50 (50 ksi)	Single Angle	L3x3x5/16	A36 (36 ksi)
T2 260.00-240.00	Truss Leg	BV_Valmont 207628	A572-50 (50 ksi)	Single Angle	L3x3x5/16	A36 (36 ksi)
T3 240.00-220.00	Truss Leg	BV_Valmont 207628	A572-50 (50 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T4 220.00-210.00	Truss Leg	BV_Valmont 195557	A572-50 (50 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T5 210.00-200.00	Truss Leg	BV_Valmont 195557	A572-50 (50 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T6 200.00-180.00	Truss Leg	BV_Valmont 211843	A572-50 (50 ksi)	Double Angle	2L3 1/2x3 1/2x1/4x3/8	A36 (36 ksi)
T7 180.00-160.00	Truss Leg	BV_Valmont 208334	A572-50 (50 ksi)	Double Angle	2L3 1/2x3 1/2x1/4x3/8	A36 (36 ksi)
T8 160.00-140.00	Truss Leg	BV_Valmont 208334	A572-50 (50 ksi)	Double Angle	2L4x4x1/4x3/8	A36 (36 ksi)
T9 140.00-120.00	Truss Leg	BV_Valmont 208335	A572-50 (50 ksi)	Double Angle	2L4x4x3/8x3/8	A36 (36 ksi)
T10 120.00-100.00	Truss Leg	Valmont 238706	A572-50 (50 ksi)	Double Angle	2L4x4x3/8x3/8	A36 (36 ksi)
T11 100.00-80.00	Truss Leg	Valmont 238707	A572-50 (50 ksi)	Double Angle	2L4x4x3/8x3/8	A36 (36 ksi)
T12 80.00-60.00	Truss Leg	Valmont 238708	A572-50 (50 ksi)	Double Angle	2L5x5x5/16x3/8	A36 (36 ksi)
T13 60.00-40.00	Truss Leg	Valmont 238709	A572-50 (50 ksi)	Double Angle	2L5x5x5/16x3/8	A36 (36 ksi)
T14 40.00-20.00	Truss Leg	Valmont 238709	A572-50 (50 ksi)	Double Angle	2L5x5x5/16x3/8	A36 (36 ksi)
T15 20.00-0.00	Truss Leg	Valmont 238709	A572-50 (50 ksi)	Double Angle	2L5x5x5/16x3/8	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Top Girt Type*	*Top Girt Size*	*Top Girt Grade*	*Bottom Girt Type*	*Bottom Girt Size*	*Bottom Girt Grade*
T1 280.00-260.00	Single Angle	L3 1/2x3 1/2x5/16	A36 (36 ksi)	Solid Round		A36 (36 ksi)
T3 240.00-220.00	Single Angle	L5x5x3/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T3 240.00-220.00	1	Single Angle	L5x5x3/8	A36 (36 ksi)	Solid Round		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
T1 280.00-260.00	Single Angle	L3x3x5/16	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)
T5 210.00-200.00	Single Angle	L3x3x5/16	A36 (36 ksi)	Solid Round		A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 280.00-260.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Mid-Pt	Mid-Pt	36.0000
T2 260.00-240.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T3 240.00-220.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T4 220.00-210.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T5 210.00-200.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	36.0000	36.0000	36.0000
T6 200.00-180.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T7 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T8 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T9 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T10 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T11 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T12 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	36.0000	36.0000
T13 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	0.0000	36.0000
T14 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	0.0000	36.0000
T15 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	Third-Pt	0.0000	36.0000

Tower Section Geometry *(cont'd)*

K Factors[1]

Tower Elevation ft	*Calc K Single Angles*	*Calc K Solid Rounds*	*Legs*	*X Brace Diags X Y*	*K Brace Diags X Y*	*Single Diags X Y*	*Girts X Y*	*Horiz. X Y*	*Sec. Horiz. X Y*	*Inner Brace X Y*
T1 280.00-260.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 260.00-240.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 240.00-220.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 220.00-210.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 210.00-200.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 200.00-180.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 180.00-160.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T9 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T10 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T11 100.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T12 80.00-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T13 60.00-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T14 40.00-20.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T15 20.00-0.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

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

Tower Section Geometry *(cont'd)*

	Truss-Leg K Factors					
	Truss-Legs Used As Leg Members			*Truss-Legs Used As Inner Members*		
Tower Elevation ft	*Leg Panels*	*X Brace Diagonals*	*Z Brace Diagonals*	*Leg Panels*	*X Brace Diagonals*	*Z Brace Diagonals*
T1 280.00-260.00	1	0.5	0.85	1	0.5	0.85
T2 260.00-240.00	1	0.5	0.85	1	0.5	0.85
T3 240.00-220.00	1	0.5	0.85	1	0.5	0.85
T4 220.00-210.00	1	0.5	0.85	1	0.5	0.85
T5 210.00-200.00	1	0.5	0.85	1	0.5	0.85
T6 200.00-180.00	1	0.5	0.85	1	0.5	0.85
T7 180.00-160.00	1	0.5	0.85	1	0.5	0.85
T8 160.00-140.00	1	0.5	0.85	1	0.5	0.85
T9 140.00-120.00	1	0.5	0.85	1	0.5	0.85
T10 120.00-100.00	1	0.5	0.85	1	0.5	0.85
T11 100.00-80.00	1	0.5	0.85	1	0.5	0.85
T12 80.00-	1	0.5	0.85	1	0.5	0.85

	Truss-Leg K Factors					
	Truss-Legs Used As Leg Members			Truss-Legs Used As Inner Members		
Tower Elevation ft	Leg Panels	X Brace Diagonals	Z Brace Diagonals	Leg Panels	X Brace Diagonals	Z Brace Diagonals
60.00						
T13 60.00-40.00	1	0.5	0.85	1	0.5	0.85
T14 40.00-20.00	1	0.5	0.85	1	0.5	0.85
T15 20.00-0.00	1	0.5	0.85	1	0.5	0.85

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 280.00-260.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 260.00-240.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 240.00-220.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 220.00-210.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 210.00-200.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 200.00-180.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 180.00-160.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T11 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T12 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T13 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T14 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T15 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower 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 280.00-260.00	Flange	1.0000 A325N	6	1.0000 A325N	1	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.0000 A325N	0	0.5000 A325N	1

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.*
T2 260.00-240.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 240.00-220.00	Flange	1.0000 A325N	6	1.0000 A325N	1	1.0000 A325N	1	0.6250 A325N	0	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0
T4 220.00-210.00	Flange	1.0000 A325N	0	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 210.00-200.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.5000 A325N	1
T6 200.00-180.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 180.00-160.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 160.00-140.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 140.00-120.00	Flange	1.0000 A325N	12	0.8750 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T10 120.00-100.00	Flange	1.0000 A325N	12	0.8750 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T11 100.00-80.00	Flange	1.2500 A325N	12	0.8750 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T12 80.00-60.00	Flange	1.2500 A325N	12	0.8750 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T13 60.00-40.00	Flange	1.2500 A325N	12	0.8750 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T14 40.00-20.00	Flange	1.2500 A325N	12	0.8750 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T15 20.00-0.00	Flange	1.2500 F1554-105	0	0.8750 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	*Face or Leg*	*Allow Shield*	*Exclude From Torque Calculation*	*Component Type*	*Placement ft*	*Face Offset in*	*Lateral Offset (Frac FW)*	*#*	*# Per Row*	*Clear Spacing in*	*Width or Diameter in*	*Perimeter in*	*Weight plf*
Feedline Ladder (Af)	A	No	No	Af (CaAa)	280.00 - 0.00	0.0000	0.4	1	1	3.0000	3.0000		8.40
LDF7-50A(1-5/8)	A	No	No	Ar (CaAa)	280.00 - 8.00	0.0000	0.445	1	1	0.5000	1.9800		0.82
LDF5-50A(7/8)	A	No	No	Ar (CaAa)	258.00 - 8.00	0.0000	0.44	2	2	0.5000	1.0300		0.33
LDF5-50A(7/8)	A	No	No	Ar (CaAa)	216.00 - 8.00	0.0000	0.435	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	A	No	No	Ar (CaAa)	126.00 - 125.00	0.0000	0.425	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	A	No	No	Ar (CaAa)	125.00 - 124.00	0.0000	0.425	2	2	0.5000	1.0300		0.33
LDF5-50A(7/8)	A	No	No	Ar (CaAa)	124.00 - 8.00	0.0000	0.425	3	3	0.5000	1.0300		0.33
LDF5-50A(7/8)	B	No	No	Ar (CaAa)	117.00 - 8.00	0.0000	-0.415	3	3	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	95.00 - 8.00	0.0000	-0.405	1	1	0.5000	1.0300		0.33
Safety Line 3/8	A	No	No	Ar (CaAa)	280.00 - 0.00	0.0000	-0.5	1	1	0.3750	0.3750		0.22
EW63(ELLIPTICAL) ***	A	No	No	Ar (CaAa)	252.00 - 8.00	0.0000	0.395	2	2	0.5000	2.0100		0.51
Feedline Ladder (Af)	B	No	No	Af (CaAa)	260.00 - 0.00	0.0000	0.44	1	1	3.0000	3.0000		8.40
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	154.00 - 8.00	0.0000	0.44	6	6	0.5000	1.9800		0.82

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
AVA6-50(1-1/4")	B	No	No	Ar (CaAa)	154.00 - 8.00	0.0000	0.42	4	4	0.5000	1.5600		0.45
***													
Feedline Ladder (Af)	B	No	No	Af (CaAa)	280.00 - 0.00	0.0000	-0.44	1	1	3.0000	3.0000		8.40
LDF4P-50A(1/2")	B	No	No	Ar (CaAa)	235.00 - 200.00	0.0000	-0.39	2	2	0.5000	0.6300		0.15
LDF4P-50A(1/2")	B	No	No	Ar (CaAa)	200.00 - 175.00	0.0000	-0.39	3	3	0.5000	0.6300		0.15
LDF4P-50A(1/2")	B	No	No	Ar (CaAa)	175.00 - 8.00	0.0000	-0.39	5	5	0.5000	0.6300		0.15
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	55.00 - 8.00	0.0000	-0.4	1	1	0.5000	1.0300		0.33
LDF4P-50A(1/2")	B	No	No	Ar (CaAa)	50.00 - 8.00	0.0000	-0.405	1	1	0.5000	0.6300		0.15
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	235.00 - 200.00	0.0000	-0.423	2	2	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	200.00 - 175.00	0.0000	-0.423	6	6	0.5000	1.9800		0.82
LDF7-50A(1-5/8)	B	No	No	Ar (CaAa)	175.00 - 8.00	0.0000	-0.423	10	10	0.5000	1.9800		0.82
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	197.00 - 162.00	0.0000	-0.455	2	2	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	162.00 - 104.00	0.0000	-0.455	3	3	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	B	No	No	Ar (CaAa)	104.00 - 8.00	0.0000	-0.455	4	4	0.5000	2.0100		0.51
***													
Feedline Ladder (Af)	C	No	No	Af (CaAa)	145.00 - 0.00	0.0000	-0.44	1	1	3.0000	3.0000		8.40
AVA6-50(1-1/4)	C	No	No	Ar (CaAa)	145.00 - 8.00	0.0000	-0.44	3	3	0.5000	1.5600		0.46
***													
Feedline Ladder (Af)	C	No	No	Af (CaAa)	280.00 - 0.00	0.0000	0.44	1	1	3.0000	3.0000		8.40
LDF7-50A(1-5/8)	C	No	No	Ar (CaAa)	260.00 - 8.00	0.0000	0.425	2	2	0.5000	1.9800		0.82
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	280.00 - 228.00	0.0000	0.415	2	2	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	228.00 - 216.00	0.0000	0.415	3	3	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	216.00 - 8.00	0.0000	0.415	4	3	0.5000	1.0300		0.33
LDF2-50A(3/8)	C	No	No	Ar (CaAa)	260.00 - 8.00	0.0000	0.435	1	1	0.4400	0.4400		0.08
E60	A	No	No	Ar (CaAa)	123.00 - 8.00	0.0000	0.45	1	1	0.5000	2.2000		1.10
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	255.00 - 240.00	0.0000	0.44	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	240.00 - 168.00	0.0000	0.44	3	3	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	168.00 - 8.00	0.0000	0.44	4	4	0.5000	1.0300		0.33
EW63(ELLIPTICAL)	C	No	No	Ar (CaAa)	276.00 - 266.00	0.0000	0.46	2	2	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	C	No	No	Ar (CaAa)	266.00 - 220.00	0.0000	0.46	3	2	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	C	No	No	Ar (CaAa)	220.00 - 8.00	0.0000	0.46	4	2	0.5000	2.0100		0.51
LDF4-50A(1/2)	C	No	No	Ar (CaAa)	280.00 - 8.00	0.0000	0.48	1	1	0.5000	0.6250		0.15
LDF2-50(3/8)	C	No	No	Ar (CaAa)	140.00 - 8.00	0.0000	0.47	1	1	0.4400	0.4400		0.08
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	266.00 - 220.00	0.0000	0.4	1	1	0.5000	1.0300		0.33
LDF5-50A(7/8)	C	No	No	Ar (CaAa)	220.00 - 8.00	0.0000	0.4	2	2	0.5000	1.0300		0.33
****Proposed													

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*
****													
LCF78-50J(7/8)	A	No	No	Ar (CaAa)	202.00 - 177.00	0.0000	0.37	1	1	0.5000	1.1000		0.53
LCF78-50J(7/8)	A	No	No	Ar (CaAa)	177.00 - 0.00	0.0000	0.37	2	2	0.5000	1.1000		0.53
***													
Reserved													
EW63(ELLIPTICAL)	A	No	No	Ar (CaAa)	280.00 - 230.00	0.0000	0.35	1	1	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	A	No	No	Ar (CaAa)	230.00 - 205.50	0.0000	0.35	2	2	0.5000	2.0100		0.51
EW63(ELLIPTICAL)	A	No	No	Ar (CaAa)	205.50 - 8.00	0.0000	0.35	3	3	0.5000	2.0100		0.51

Feed Line/Linear Appurtenances - Entered As Area

Description	*Face or Leg*	*Allow Shield*	*Exclude From Torque Calculation*	*Component Type*	*Placement* *ft*	*Total Number*	*C_AA_A* *ft²/ft*	*Weight* *plf*
***								

Feed Line/Linear Appurtenances Section Areas

Tower Section	*Tower Elevation* *ft*	*Face*	*A_R* *ft²*	*A_F* *ft²*	*C_AA_A In Face* *ft²*	*C_AA_A Out Face* *ft²*	*Weight* *K*
T1	280.00-260.00	A	0.000	0.000	18.730	0.000	0.20
		B	0.000	0.000	10.000	0.000	0.17
		C	0.000	0.000	23.626	0.000	0.21
T2	260.00-240.00	A	0.000	0.000	27.262	0.000	0.22
		B	0.000	0.000	20.000	0.000	0.34
		C	0.000	0.000	39.835	0.000	0.26
T3	240.00-220.00	A	0.000	0.000	32.900	0.000	0.24
		B	0.000	0.000	27.830	0.000	0.37
		C	0.000	0.000	45.294	0.000	0.28
T4	220.00-210.00	A	0.000	0.000	18.073	0.000	0.12
		B	0.000	0.000	15.220	0.000	0.19
		C	0.000	0.000	26.923	0.000	0.15
T5	210.00-200.00	A	0.000	0.000	19.811	0.000	0.13
		B	0.000	0.000	15.220	0.000	0.19
		C	0.000	0.000	27.335	0.000	0.15
T6	200.00-180.00	A	0.000	0.000	43.190	0.000	0.27
		B	0.000	0.000	54.374	0.000	0.46
		C	0.000	0.000	54.670	0.000	0.31
T7	180.00-160.00	A	0.000	0.000	45.060	0.000	0.28
		B	0.000	0.000	69.752	0.000	0.52
		C	0.000	0.000	55.494	0.000	0.31
T8	160.00-140.00	A	0.000	0.000	45.390	0.000	0.28
		B	0.000	0.000	103.328	0.000	0.64
		C	0.000	0.000	61.570	0.000	0.36
T9	140.00-120.00	A	0.000	0.000	47.570	0.000	0.29
		B	0.000	0.000	114.200	0.000	0.68
		C	0.000	0.000	76.970	0.000	0.51
T10	120.00-100.00	A	0.000	0.000	55.970	0.000	0.32
		B	0.000	0.000	120.257	0.000	0.70
		C	0.000	0.000	76.970	0.000	0.51

Tower Sectio n	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T11	100.00-80.00	A	0.000	0.000	55.970	0.000	0.32
		B	0.000	0.000	124.400	0.000	0.71
		C	0.000	0.000	78.515	0.000	0.51
T12	80.00-60.00	A	0.000	0.000	55.970	0.000	0.32
		B	0.000	0.000	124.400	0.000	0.71
		C	0.000	0.000	79.030	0.000	0.52
T13	60.00-40.00	A	0.000	0.000	55.970	0.000	0.32
		B	0.000	0.000	125.030	0.000	0.71
		C	0.000	0.000	80.575	0.000	0.52
T14	40.00-20.00	A	0.000	0.000	55.970	0.000	0.32
		B	0.000	0.000	125.660	0.000	0.71
		C	0.000	0.000	81.090	0.000	0.52
T15	20.00-0.00	A	0.000	0.000	39.642	0.000	0.27
		B	0.000	0.000	83.396	0.000	0.56
		C	0.000	0.000	56.654	0.000	0.45

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Sectio n	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	280.00-260.00	A	2.129	0.000	0.000	52.786	0.000	1.09
		B		0.000	0.000	18.514	0.000	0.50
		C		0.000	0.000	75.808	0.000	1.23
T2	260.00-240.00	A	2.112	0.000	0.000	87.941	0.000	1.49
		B		0.000	0.000	36.897	0.000	0.99
		C		0.000	0.000	134.918	0.000	2.06
T3	240.00-220.00	A	2.095	0.000	0.000	107.464	0.000	1.68
		B		0.000	0.000	71.033	0.000	1.38
		C		0.000	0.000	152.109	0.000	2.23
T4	220.00-210.00	A	2.081	0.000	0.000	60.196	0.000	0.91
		B		0.000	0.000	41.074	0.000	0.75
		C		0.000	0.000	82.782	0.000	1.20
T5	210.00-200.00	A	2.071	0.000	0.000	64.602	0.000	0.98
		B		0.000	0.000	40.965	0.000	0.74
		C		0.000	0.000	82.997	0.000	1.20
T6	200.00-180.00	A	2.055	0.000	0.000	139.347	0.000	2.13
		B		0.000	0.000	128.725	0.000	2.23
		C		0.000	0.000	165.257	0.000	2.38
T7	180.00-160.00	A	2.032	0.000	0.000	147.726	0.000	2.15
		B		0.000	0.000	154.226	0.000	2.65
		C		0.000	0.000	165.517	0.000	2.37
T8	160.00-140.00	A	2.007	0.000	0.000	148.262	0.000	2.13
		B		0.000	0.000	222.164	0.000	3.67
		C		0.000	0.000	177.821	0.000	2.58
T9	140.00-120.00	A	1.978	0.000	0.000	154.917	0.000	2.20
		B		0.000	0.000	245.279	0.000	3.98
		C		0.000	0.000	219.458	0.000	3.27
T10	120.00-100.00	A	1.946	0.000	0.000	181.204	0.000	2.54
		B		0.000	0.000	265.010	0.000	4.16
		C		0.000	0.000	217.438	0.000	3.20
T11	100.00-80.00	A	1.907	0.000	0.000	179.093	0.000	2.48
		B		0.000	0.000	271.223	0.000	4.20
		C		0.000	0.000	222.322	0.000	3.24
T12	80.00-60.00	A	1.860	0.000	0.000	176.508	0.000	2.40
		B		0.000	0.000	269.000	0.000	4.10
		C		0.000	0.000	221.639	0.000	3.18
T13	60.00-40.00	A	1.798	0.000	0.000	173.149	0.000	2.31
		B		0.000	0.000	270.341	0.000	4.03
		C		0.000	0.000	224.543	0.000	3.17
T14	40.00-20.00	A	1.709	0.000	0.000	168.264	0.000	2.17
		B		0.000	0.000	270.017	0.000	3.90
		C		0.000	0.000	220.628	0.000	3.02
T15	20.00-0.00	A	1.531	0.000	0.000	111.453	0.000	1.40
		B		0.000	0.000	169.508	0.000	2.43
		C		0.000	0.000	137.865	0.000	1.92

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	280.00-260.00	-7.3820	-4.7583	-10.8387	-3.4067
T2	260.00-240.00	-11.2225	-3.9528	-17.1970	-2.2819
T3	240.00-220.00	-10.0502	-7.5127	-16.6704	-7.7269
T4	220.00-210.00	-13.2893	-10.3463	-20.1870	-11.5056
T5	210.00-200.00	-12.3886	-10.3082	-19.3493	-12.2806
T6	200.00-180.00	-16.3990	-25.6448	-23.0442	-23.8253
T7	180.00-160.00	-16.9994	-33.6844	-24.4521	-29.9274
T8	160.00-140.00	-8.9252	-29.1963	-16.9180	-26.1111
T9	140.00-120.00	-2.0005	-25.5581	-10.5236	-21.8024
T10	120.00-100.00	-2.0712	-31.9636	-10.6732	-30.3763
T11	100.00-80.00	-1.4981	-34.0175	-9.7513	-32.3718
T12	80.00-60.00	-1.2906	-33.6489	-9.4076	-32.9389
T13	60.00-40.00	-0.7412	-34.4985	-8.1411	-34.1168
T14	40.00-20.00	-0.5556	-35.9619	-7.7376	-36.1322
T15	20.00-0.00	0.8412	-27.5514	-4.7654	-29.2153

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	Feedline Ladder (Af)	260.00 - 280.00	0.6000	0.5201
T1	2	LDF7-50A(1-5/8)	260.00 - 280.00	0.6000	0.5201
T1	10	Safety Line 3/8	260.00 - 280.00	0.6000	0.5201
T1	17	Feedline Ladder (Af)	260.00 - 280.00	0.6000	0.5201
T1	33	Feedline Ladder (Af)	260.00 - 280.00	0.6000	0.5201
T1	35	LDF5-50A(7/8)	260.00 - 280.00	0.6000	0.5201
T1	43	EW63(ELLIPTICAL)	266.00 - 276.00	0.6000	0.5201
T1	44	EW63(ELLIPTICAL)	260.00 - 266.00	0.6000	0.5201
T1	46	LDF4-50A(1/2)	260.00 - 280.00	0.6000	0.5201
T1	48	LDF5-50A(7/8)	260.00 - 266.00	0.6000	0.5201
T1	58	EW63(ELLIPTICAL)	260.00 - 280.00	0.6000	0.5201
T2	1	Feedline Ladder (Af)	240.00 - 260.00	0.6000	0.6000
T2	2	LDF7-50A(1-5/8)	240.00 - 260.00	0.6000	0.6000
T2	3	LDF5-50A(7/8)	240.00 - 258.00	0.6000	0.6000
T2	10	Safety Line 3/8	240.00 - 260.00	0.6000	0.6000
T2	11	EW63(ELLIPTICAL)	240.00 - 252.00	0.6000	0.6000
T2	13	Feedline Ladder (Af)	240.00 - 260.00	0.6000	0.6000
T2	17	Feedline Ladder (Af)	240.00 - 260.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T2	33	Feedline Ladder (Af)	240.00 - 260.00	0.6000	0.6000
T2	34	LDF7-50A(1-5/8)	240.00 - 260.00	0.6000	0.6000
T2	35	LDF5-50A(7/8)	240.00 - 260.00	0.6000	0.6000
T2	38	LDF2-50A(3/8)	240.00 - 260.00	0.6000	0.6000
T2	40	LDF5-50A(7/8)	240.00 - 255.00	0.6000	0.6000
T2	44	EW63(ELLIPTICAL)	240.00 - 260.00	0.6000	0.6000
T2	46	LDF4-50A(1/2)	240.00 - 260.00	0.6000	0.6000
T2	48	LDF5-50A(7/8)	240.00 - 260.00	0.6000	0.6000
T2	58	EW63(ELLIPTICAL)	240.00 - 260.00	0.6000	0.6000
T3	1	Feedline Ladder (Af)	220.00 - 240.00	0.6000	0.5793
T3	2	LDF7-50A(1-5/8)	220.00 - 240.00	0.6000	0.5793
T3	3	LDF5-50A(7/8)	220.00 - 240.00	0.6000	0.5793
T3	10	Safety Line 3/8	220.00 - 240.00	0.6000	0.5793
T3	11	EW63(ELLIPTICAL)	220.00 - 240.00	0.6000	0.5793
T3	13	Feedline Ladder (Af)	220.00 - 240.00	0.6000	0.5793
T3	17	Feedline Ladder (Af)	220.00 - 240.00	0.6000	0.5793
T3	18	LDF4P-50A(1/2")	220.00 - 235.00	0.6000	0.5793
T3	23	LDF7-50A(1-5/8)	220.00 - 235.00	0.6000	0.5793
T3	33	Feedline Ladder (Af)	220.00 - 240.00	0.6000	0.5793
T3	34	LDF7-50A(1-5/8)	220.00 - 240.00	0.6000	0.5793
T3	35	LDF5-50A(7/8)	228.00 - 240.00	0.6000	0.5793
T3	36	LDF5-50A(7/8)	220.00 - 228.00	0.6000	0.5793
T3	38	LDF2-50A(3/8)	220.00 - 240.00	0.6000	0.5793
T3	41	LDF5-50A(7/8)	220.00 - 240.00	0.6000	0.5793
T3	44	EW63(ELLIPTICAL)	220.00 - 240.00	0.6000	0.5793
T3	46	LDF4-50A(1/2)	220.00 - 240.00	0.6000	0.5793
T3	48	LDF5-50A(7/8)	220.00 - 240.00	0.6000	0.5793
T3	58	EW63(ELLIPTICAL)	230.00 - 240.00	0.6000	0.5793
T3	59	EW63(ELLIPTICAL)	220.00 - 230.00	0.6000	0.5793
T4	1	Feedline Ladder (Af)	210.00 - 220.00	0.6000	0.6000
T4	2	LDF7-50A(1-5/8)	210.00 - 220.00	0.6000	0.6000
T4	3	LDF5-50A(7/8)	210.00 - 220.00	0.6000	0.6000
T4	4	LDF5-50A(7/8)	210.00 - 216.00	0.6000	0.6000
T4	10	Safety Line 3/8	210.00 - 220.00	0.6000	0.6000
T4	11	EW63(ELLIPTICAL)	210.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			220.00		
T4	13	Feedline Ladder (Af)	210.00 - 220.00	0.6000	0.6000
T4	17	Feedline Ladder (Af)	210.00 - 220.00	0.6000	0.6000
T4	18	LDF4P-50A(1/2")	210.00 - 220.00	0.6000	0.6000
T4	23	LDF7-50A(1-5/8)	210.00 - 220.00	0.6000	0.6000
T4	33	Feedline Ladder (Af)	210.00 - 220.00	0.6000	0.6000
T4	34	LDF7-50A(1-5/8)	210.00 - 220.00	0.6000	0.6000
T4	36	LDF5-50A(7/8)	216.00 - 220.00	0.6000	0.6000
T4	37	LDF5-50A(7/8)	210.00 - 216.00	0.6000	0.6000
T4	38	LDF2-50A(3/8)	210.00 - 220.00	0.6000	0.6000
T4	41	LDF5-50A(7/8)	210.00 - 220.00	0.6000	0.6000
T4	45	EW63(ELLIPTICAL)	210.00 - 220.00	0.6000	0.6000
T4	46	LDF4-50A(1/2)	210.00 - 220.00	0.6000	0.6000
T4	49	LDF5-50A(7/8)	210.00 - 220.00	0.6000	0.6000
T4	59	EW63(ELLIPTICAL)	210.00 - 220.00	0.6000	0.6000
T5	1	Feedline Ladder (Af)	200.00 - 210.00	0.6000	0.6000
T5	2	LDF7-50A(1-5/8)	200.00 - 210.00	0.6000	0.6000
T5	3	LDF5-50A(7/8)	200.00 - 210.00	0.6000	0.6000
T5	4	LDF5-50A(7/8)	200.00 - 210.00	0.6000	0.6000
T5	10	Safety Line 3/8	200.00 - 210.00	0.6000	0.6000
T5	11	EW63(ELLIPTICAL)	200.00 - 210.00	0.6000	0.6000
T5	13	Feedline Ladder (Af)	200.00 - 210.00	0.6000	0.6000
T5	17	Feedline Ladder (Af)	200.00 - 210.00	0.6000	0.6000
T5	18	LDF4P-50A(1/2")	200.00 - 210.00	0.6000	0.6000
T5	23	LDF7-50A(1-5/8)	200.00 - 210.00	0.6000	0.6000
T5	33	Feedline Ladder (Af)	200.00 - 210.00	0.6000	0.6000
T5	34	LDF7-50A(1-5/8)	200.00 - 210.00	0.6000	0.6000
T5	37	LDF5-50A(7/8)	200.00 - 210.00	0.6000	0.6000
T5	38	LDF2-50A(3/8)	200.00 - 210.00	0.6000	0.6000
T5	41	LDF5-50A(7/8)	200.00 - 210.00	0.6000	0.6000
T5	45	EW63(ELLIPTICAL)	200.00 - 210.00	0.6000	0.6000
T5	46	LDF4-50A(1/2)	200.00 - 210.00	0.6000	0.6000
T5	49	LDF5-50A(7/8)	200.00 - 210.00	0.6000	0.6000
T5	54	LCF78-50J(7/8)	200.00 - 202.00	0.6000	0.6000
T5	59	EW63(ELLIPTICAL)	205.50 - 210.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T5	60	EW63(ELLIPTICAL)	200.00 - 205.50	0.6000	0.6000
T6	1	Feedline Ladder (Af)	180.00 - 200.00	0.6000	0.6000
T6	2	LDF7-50A(1-5/8)	180.00 - 200.00	0.6000	0.6000
T6	3	LDF5-50A(7/8)	180.00 - 200.00	0.6000	0.6000
T6	4	LDF5-50A(7/8)	180.00 - 200.00	0.6000	0.6000
T6	10	Safety Line 3/8	180.00 - 200.00	0.6000	0.6000
T6	11	EW63(ELLIPTICAL)	180.00 - 200.00	0.6000	0.6000
T6	13	Feedline Ladder (Af)	180.00 - 200.00	0.6000	0.6000
T6	17	Feedline Ladder (Af)	180.00 - 200.00	0.6000	0.6000
T6	19	LDF4P-50A(1/2")	180.00 - 200.00	0.6000	0.6000
T6	24	LDF7-50A(1-5/8)	180.00 - 200.00	0.6000	0.6000
T6	26	EW63(ELLIPTICAL)	180.00 - 197.00	0.6000	0.6000
T6	33	Feedline Ladder (Af)	180.00 - 200.00	0.6000	0.6000
T6	34	LDF7-50A(1-5/8)	180.00 - 200.00	0.6000	0.6000
T6	37	LDF5-50A(7/8)	180.00 - 200.00	0.6000	0.6000
T6	38	LDF2-50A(3/8)	180.00 - 200.00	0.6000	0.6000
T6	41	LDF5-50A(7/8)	180.00 - 200.00	0.6000	0.6000
T6	45	EW63(ELLIPTICAL)	180.00 - 200.00	0.6000	0.6000
T6	46	LDF4-50A(1/2)	180.00 - 200.00	0.6000	0.6000
T6	49	LDF5-50A(7/8)	180.00 - 200.00	0.6000	0.6000
T6	54	LCF78-50J(7/8)	180.00 - 200.00	0.6000	0.6000
T6	60	EW63(ELLIPTICAL)	180.00 - 200.00	0.6000	0.6000
T7	1	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T7	2	LDF7-50A(1-5/8)	160.00 - 180.00	0.6000	0.6000
T7	3	LDF5-50A(7/8)	160.00 - 180.00	0.6000	0.6000
T7	4	LDF5-50A(7/8)	160.00 - 180.00	0.6000	0.6000
T7	10	Safety Line 3/8	160.00 - 180.00	0.6000	0.6000
T7	11	EW63(ELLIPTICAL)	160.00 - 180.00	0.6000	0.6000
T7	13	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T7	17	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T7	19	LDF4P-50A(1/2")	175.00 - 180.00	0.6000	0.6000
T7	20	LDF4P-50A(1/2")	160.00 - 175.00	0.6000	0.6000
T7	24	LDF7-50A(1-5/8)	175.00 - 180.00	0.6000	0.6000
T7	25	LDF7-50A(1-5/8)	160.00 - 175.00	0.6000	0.6000
T7	26	EW63(ELLIPTICAL)	162.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			180.00		
T7	27	EW63(ELLIPTICAL)	160.00 - 162.00	0.6000	0.6000
T7	33	Feedline Ladder (Af)	160.00 - 180.00	0.6000	0.6000
T7	34	LDF7-50A(1-5/8)	160.00 - 180.00	0.6000	0.6000
T7	37	LDF5-50A(7/8)	160.00 - 180.00	0.6000	0.6000
T7	38	LDF2-50A(3/8)	160.00 - 180.00	0.6000	0.6000
T7	41	LDF5-50A(7/8)	168.00 - 180.00	0.6000	0.6000
T7	42	LDF5-50A(7/8)	160.00 - 168.00	0.6000	0.6000
T7	45	EW63(ELLIPTICAL)	160.00 - 180.00	0.6000	0.6000
T7	46	LDF4-50A(1/2)	160.00 - 180.00	0.6000	0.6000
T7	49	LDF5-50A(7/8)	160.00 - 180.00	0.6000	0.6000
T7	54	LCF78-50J(7/8)	177.00 - 180.00	0.6000	0.6000
T7	55	LCF78-50J(7/8)	160.00 - 177.00	0.6000	0.6000
T7	60	EW63(ELLIPTICAL)	160.00 - 180.00	0.6000	0.6000
T8	1	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T8	2	LDF7-50A(1-5/8)	140.00 - 160.00	0.6000	0.6000
T8	3	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T8	4	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T8	10	Safety Line 3/8	140.00 - 160.00	0.6000	0.6000
T8	11	EW63(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000
T8	13	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T8	14	LDF7-50A(1-5/8)	140.00 - 154.00	0.6000	0.6000
T8	15	AVA6-50(1-1/4")	140.00 - 154.00	0.6000	0.6000
T8	17	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T8	20	LDF4P-50A(1/2")	140.00 - 160.00	0.6000	0.6000
T8	25	LDF7-50A(1-5/8)	140.00 - 160.00	0.6000	0.6000
T8	27	EW63(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000
T8	30	Feedline Ladder (Af)	140.00 - 145.00	0.6000	0.6000
T8	31	AVA6-50(1-1/4)	140.00 - 145.00	0.6000	0.6000
T8	33	Feedline Ladder (Af)	140.00 - 160.00	0.6000	0.6000
T8	34	LDF7-50A(1-5/8)	140.00 - 160.00	0.6000	0.6000
T8	37	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T8	38	LDF2-50A(3/8)	140.00 - 160.00	0.6000	0.6000
T8	42	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T8	45	EW63(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	K_a *No Ice*	K_a *Ice*
T8	46	LDF4-50A(1/2)	140.00 - 160.00	0.6000	0.6000
T8	49	LDF5-50A(7/8)	140.00 - 160.00	0.6000	0.6000
T8	55	LCF78-50J(7/8)	140.00 - 160.00	0.6000	0.6000
T8	60	EW63(ELLIPTICAL)	140.00 - 160.00	0.6000	0.6000
T9	1	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T9	2	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T9	3	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T9	4	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T9	5	LDF5-50A(7/8)	125.00 - 126.00	0.6000	0.6000
T9	6	LDF5-50A(7/8)	124.00 - 125.00	0.6000	0.6000
T9	7	LDF5-50A(7/8)	120.00 - 124.00	0.6000	0.6000
T9	10	Safety Line 3/8	120.00 - 140.00	0.6000	0.6000
T9	11	EW63(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T9	13	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T9	14	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T9	15	AVA6-50(1-1/4")	120.00 - 140.00	0.6000	0.6000
T9	17	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T9	20	LDF4P-50A(1/2")	120.00 - 140.00	0.6000	0.6000
T9	25	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T9	27	EW63(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T9	30	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T9	31	AVA6-50(1-1/4)	120.00 - 140.00	0.6000	0.6000
T9	33	Feedline Ladder (Af)	120.00 - 140.00	0.6000	0.6000
T9	34	LDF7-50A(1-5/8)	120.00 - 140.00	0.6000	0.6000
T9	37	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T9	38	LDF2-50A(3/8)	120.00 - 140.00	0.6000	0.6000
T9	39	E60	120.00 - 123.00	0.6000	0.6000
T9	42	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T9	45	EW63(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T9	46	LDF4-50A(1/2)	120.00 - 140.00	0.6000	0.6000
T9	47	LDF2-50(3/8)	120.00 - 140.00	0.6000	0.6000
T9	49	LDF5-50A(7/8)	120.00 - 140.00	0.6000	0.6000
T9	55	LCF78-50J(7/8)	120.00 - 140.00	0.6000	0.6000
T9	60	EW63(ELLIPTICAL)	120.00 - 140.00	0.6000	0.6000
T10	1	Feedline Ladder (Af)	100.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			120.00		
T10	2	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T10	3	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T10	4	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T10	7	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T10	8	LDF5-50A(7/8)	100.00 - 117.00	0.6000	0.6000
T10	10	Safety Line 3/8	100.00 - 120.00	0.6000	0.6000
T10	11	EW63(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T10	13	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T10	14	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T10	15	AVA6-50(1-1/4")	100.00 - 120.00	0.6000	0.6000
T10	17	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T10	20	LDF4P-50A(1/2")	100.00 - 120.00	0.6000	0.6000
T10	25	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T10	27	EW63(ELLIPTICAL)	104.00 - 120.00	0.6000	0.6000
T10	28	EW63(ELLIPTICAL)	100.00 - 104.00	0.6000	0.6000
T10	30	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T10	31	AVA6-50(1-1/4)	100.00 - 120.00	0.6000	0.6000
T10	33	Feedline Ladder (Af)	100.00 - 120.00	0.6000	0.6000
T10	34	LDF7-50A(1-5/8)	100.00 - 120.00	0.6000	0.6000
T10	37	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T10	38	LDF2-50A(3/8)	100.00 - 120.00	0.6000	0.6000
T10	39	E60	100.00 - 120.00	0.6000	0.6000
T10	42	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T10	45	EW63(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T10	46	LDF4-50A(1/2)	100.00 - 120.00	0.6000	0.6000
T10	47	LDF2-50(3/8)	100.00 - 120.00	0.6000	0.6000
T10	49	LDF5-50A(7/8)	100.00 - 120.00	0.6000	0.6000
T10	55	LCF78-50J(7/8)	100.00 - 120.00	0.6000	0.6000
T10	60	EW63(ELLIPTICAL)	100.00 - 120.00	0.6000	0.6000
T11	1	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T11	2	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T11	3	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T11	4	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T11	7	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T11	8	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T11	9	LDF5-50A(7/8)	80.00 - 95.00	0.6000	0.6000
T11	10	Safety Line 3/8	80.00 - 100.00	0.6000	0.6000
T11	11	EW63(ELLIPTICAL)	80.00 - 100.00	0.6000	0.6000
T11	13	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T11	14	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T11	15	AVA6-50(1-1/4")	80.00 - 100.00	0.6000	0.6000
T11	17	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T11	20	LDF4P-50A(1/2")	80.00 - 100.00	0.6000	0.6000
T11	25	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T11	28	EW63(ELLIPTICAL)	80.00 - 100.00	0.6000	0.6000
T11	30	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T11	31	AVA6-50(1-1/4)	80.00 - 100.00	0.6000	0.6000
T11	33	Feedline Ladder (Af)	80.00 - 100.00	0.6000	0.6000
T11	34	LDF7-50A(1-5/8)	80.00 - 100.00	0.6000	0.6000
T11	37	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T11	38	LDF2-50A(3/8)	80.00 - 100.00	0.6000	0.6000
T11	39	E60	80.00 - 100.00	0.6000	0.6000
T11	42	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T11	45	EW63(ELLIPTICAL)	80.00 - 100.00	0.6000	0.6000
T11	46	LDF4-50A(1/2)	80.00 - 100.00	0.6000	0.6000
T11	47	LDF2-50(3/8)	80.00 - 100.00	0.6000	0.6000
T11	49	LDF5-50A(7/8)	80.00 - 100.00	0.6000	0.6000
T11	55	LCF78-50J(7/8)	80.00 - 100.00	0.6000	0.6000
T11	60	EW63(ELLIPTICAL)	80.00 - 100.00	0.6000	0.6000
T12	1	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T12	2	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T12	3	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	4	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	7	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	8	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	9	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	10	Safety Line 3/8	60.00 - 80.00	0.6000	0.6000
T12	11	EW63(ELLIPTICAL)	60.00 - 80.00	0.6000	0.6000
T12	13	Feedline Ladder (Af)	60.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			80.00		
T12	14	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T12	15	AVA6-50(1-1/4")	60.00 - 80.00	0.6000	0.6000
T12	17	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T12	20	LDF4P-50A(1/2")	60.00 - 80.00	0.6000	0.6000
T12	25	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T12	28	EW63(ELLIPTICAL)	60.00 - 80.00	0.6000	0.6000
T12	30	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T12	31	AVA6-50(1-1/4)	60.00 - 80.00	0.6000	0.6000
T12	33	Feedline Ladder (Af)	60.00 - 80.00	0.6000	0.6000
T12	34	LDF7-50A(1-5/8)	60.00 - 80.00	0.6000	0.6000
T12	37	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	38	LDF2-50A(3/8)	60.00 - 80.00	0.6000	0.6000
T12	39	E60	60.00 - 80.00	0.6000	0.6000
T12	42	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	45	EW63(ELLIPTICAL)	60.00 - 80.00	0.6000	0.6000
T12	46	LDF4-50A(1/2)	60.00 - 80.00	0.6000	0.6000
T12	47	LDF2-50(3/8)	60.00 - 80.00	0.6000	0.6000
T12	49	LDF5-50A(7/8)	60.00 - 80.00	0.6000	0.6000
T12	55	LCF78-50J(7/8)	60.00 - 80.00	0.6000	0.6000
T12	60	EW63(ELLIPTICAL)	60.00 - 80.00	0.6000	0.6000
T13	1	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T13	2	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T13	3	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	4	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	7	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	8	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	9	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	10	Safety Line 3/8	40.00 - 60.00	0.6000	0.6000
T13	11	EW63(ELLIPTICAL)	40.00 - 60.00	0.6000	0.6000
T13	13	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T13	14	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T13	15	AVA6-50(1-1/4")	40.00 - 60.00	0.6000	0.6000
T13	17	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T13	20	LDF4P-50A(1/2")	40.00 - 60.00	0.6000	0.6000

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	*K_a No Ice*	*K_a Ice*
T13	21	LDF5-50A(7/8)	40.00 - 55.00	0.6000	0.6000
T13	22	LDF4P-50A(1/2")	40.00 - 50.00	0.6000	0.6000
T13	25	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T13	28	EW63(ELLIPTICAL)	40.00 - 60.00	0.6000	0.6000
T13	30	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T13	31	AVA6-50(1-1/4)	40.00 - 60.00	0.6000	0.6000
T13	33	Feedline Ladder (Af)	40.00 - 60.00	0.6000	0.6000
T13	34	LDF7-50A(1-5/8)	40.00 - 60.00	0.6000	0.6000
T13	37	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	38	LDF2-50A(3/8)	40.00 - 60.00	0.6000	0.6000
T13	39	E60	40.00 - 60.00	0.6000	0.6000
T13	42	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	45	EW63(ELLIPTICAL)	40.00 - 60.00	0.6000	0.6000
T13	46	LDF4-50A(1/2)	40.00 - 60.00	0.6000	0.6000
T13	47	LDF2-50(3/8)	40.00 - 60.00	0.6000	0.6000
T13	49	LDF5-50A(7/8)	40.00 - 60.00	0.6000	0.6000
T13	55	LCF78-50J(7/8)	40.00 - 60.00	0.6000	0.6000
T13	60	EW63(ELLIPTICAL)	40.00 - 60.00	0.6000	0.6000
T14	1	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T14	2	LDF7-50A(1-5/8)	20.00 - 40.00	0.6000	0.6000
T14	3	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	4	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	7	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	8	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	9	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	10	Safety Line 3/8	20.00 - 40.00	0.6000	0.6000
T14	11	EW63(ELLIPTICAL)	20.00 - 40.00	0.6000	0.6000
T14	13	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T14	14	LDF7-50A(1-5/8)	20.00 - 40.00	0.6000	0.6000
T14	15	AVA6-50(1-1/4")	20.00 - 40.00	0.6000	0.6000
T14	17	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T14	20	LDF4P-50A(1/2")	20.00 - 40.00	0.6000	0.6000
T14	21	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	22	LDF4P-50A(1/2")	20.00 - 40.00	0.6000	0.6000
T14	25	LDF7-50A(1-5/8)	20.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			40.00		
T14	28	EW63(ELLIPTICAL)	20.00 - 40.00	0.6000	0.6000
T14	30	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T14	31	AVA6-50(1-1/4)	20.00 - 40.00	0.6000	0.6000
T14	33	Feedline Ladder (Af)	20.00 - 40.00	0.6000	0.6000
T14	34	LDF7-50A(1-5/8)	20.00 - 40.00	0.6000	0.6000
T14	37	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	38	LDF2-50A(3/8)	20.00 - 40.00	0.6000	0.6000
T14	39	E60	20.00 - 40.00	0.6000	0.6000
T14	42	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	45	EW63(ELLIPTICAL)	20.00 - 40.00	0.6000	0.6000
T14	46	LDF4-50A(1/2)	20.00 - 40.00	0.6000	0.6000
T14	47	LDF2-50(3/8)	20.00 - 40.00	0.6000	0.6000
T14	49	LDF5-50A(7/8)	20.00 - 40.00	0.6000	0.6000
T14	55	LCF78-50J(7/8)	20.00 - 40.00	0.6000	0.6000
T14	60	EW63(ELLIPTICAL)	20.00 - 40.00	0.6000	0.6000
T15	1	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T15	2	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T15	3	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	4	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	7	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	8	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	9	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	10	Safety Line 3/8	0.00 - 20.00	0.6000	0.6000
T15	11	EW63(ELLIPTICAL)	8.00 - 20.00	0.6000	0.6000
T15	13	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T15	14	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T15	15	AVA6-50(1-1/4")	8.00 - 20.00	0.6000	0.6000
T15	17	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T15	20	LDF4P-50A(1/2")	8.00 - 20.00	0.6000	0.6000
T15	21	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	22	LDF4P-50A(1/2")	8.00 - 20.00	0.6000	0.6000
T15	25	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T15	28	EW63(ELLIPTICAL)	8.00 - 20.00	0.6000	0.6000
T15	30	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T15	31	AVA6-50(1-1/4)	8.00 - 20.00	0.6000	0.6000
T15	33	Feedline Ladder (Af)	0.00 - 20.00	0.6000	0.6000
T15	34	LDF7-50A(1-5/8)	8.00 - 20.00	0.6000	0.6000
T15	37	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	38	LDF2-50A(3/8)	8.00 - 20.00	0.6000	0.6000
T15	39	E60	8.00 - 20.00	0.6000	0.6000
T15	42	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	45	EW63(ELLIPTICAL)	8.00 - 20.00	0.6000	0.6000
T15	46	LDF4-50A(1/2)	8.00 - 20.00	0.6000	0.6000
T15	47	LDF2-50(3/8)	8.00 - 20.00	0.6000	0.6000
T15	49	LDF5-50A(7/8)	8.00 - 20.00	0.6000	0.6000
T15	55	LCF78-50J(7/8)	0.00 - 20.00	0.6000	0.6000
T15	60	EW63(ELLIPTICAL)	8.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
miscl									
Flash Beacon Lighting	C	From Leg	0.00 0.00 1.00	0.0000	280.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.70 3.10 3.50 4.30	2.70 3.10 3.50 4.30	0.05 0.07 0.09 0.13
279									
ANT150F6	A	From Leg	0.00 0.00 10.00	0.0000	279.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.80 6.83 8.87 13.01	4.80 6.83 8.87 13.01	0.03 0.07 0.11 0.25
CO-35A	B	From Leg	0.00 0.00 7.00	0.0000	279.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.75 1.96 3.19 5.70	0.75 1.96 3.19 5.70	0.01 0.02 0.04 0.09
6' x 2" Mount Pipe	C	From Leg	0.00 0.00 3.00	0.0000	279.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.43 1.92 2.29 3.06	1.43 1.92 2.29 3.06	0.02 0.03 0.05 0.09
DB538-G	C	From Leg	0.00 0.00 10.00	0.0000	279.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.64 5.13 6.63 9.68	3.64 5.13 6.63 9.68	0.02 0.04 0.08 0.18
276									
Pipe Mount [PM 602-1]	B	From Leg	0.00 0.00 0.00	0.0000	276.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 3.21 3.64 4.54	2.78 3.21 3.64 4.54	0.09 0.11 0.14 0.21
Pipe Mount [PM 602-1]	C	From Leg	0.00 0.00 0.00	0.0000	276.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 3.21 3.64 4.54	2.78 3.21 3.64 4.54	0.09 0.11 0.14 0.21
Pipe Mount [PM 602-1]	A	From Leg	0.00 0.00 0.00	0.0000	276.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 3.21 3.64 4.54	2.78 3.21 3.64 4.54	0.09 0.11 0.14 0.21
10' x 2" Horizontal Mount Pipe	B	From Leg	0.00 0.00 0.00	0.0000	276.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.38 3.06 3.75 5.15	0.05 0.08 0.11 0.21	0.03 0.05 0.08 0.17
10' x 2" Horizontal Mount Pipe	C	From Leg	0.00 0.00 0.00	0.0000	276.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.38 3.06 3.75 5.15	0.05 0.08 0.11 0.21	0.03 0.05 0.08 0.17
10' x 2" Horizontal Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	276.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.38 3.06 3.75 5.15	0.05 0.08 0.11 0.21	0.03 0.05 0.08 0.17
266									
Pipe Mount [PM 602-1]	A	From Leg	0.00 0.00 0.00	0.0000	266.00	No Ice 1/2" Ice	2.78 3.21 3.64	2.78 3.21 3.64	0.09 0.11 0.14

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert ft ft ft*	*Azimuth Adjustment °*	*Placement ft*		*C_AA_A Front ft^2*	*C_AA_A Side ft^2*	*Weight K*
						1" Ice 2" Ice	4.54	4.54	0.21
10' x 2" Horizontal Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	266.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.38 3.06 3.75 5.15	0.05 0.08 0.11 0.21	0.03 0.05 0.08 0.17
260									
Side Arm Mount [SO 308-1]	C	From Leg	0.00 0.00 0.00	0.0000	260.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
12' horizontal x 2" Pipe Mount	C	From Face	0.00 0.00 0.00	0.0000	260.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.28 3.50 4.75 7.28	0.01 0.04 0.09 0.21	0.03 0.05 0.08 0.15
DB589-Y	C	From Leg	6.00 0.00 5.00	0.0000	260.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.38 2.31 3.27 4.81	1.38 2.31 3.27 4.81	0.01 0.02 0.04 0.09
DB589-Y	C	From Leg	6.00 0.00 -5.00	0.0000	260.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.38 2.31 3.27 4.81	1.38 2.31 3.27 4.81	0.01 0.02 0.04 0.09
12"x16"x6" TMA	C	From Leg	3.00 0.00 0.00	0.0000	260.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.20 1.34 1.48 1.79	0.60 0.70 0.81 1.06	0.05 0.06 0.07 0.10
258									
Side Arm Mount [SO 308-1]	B	From Leg	0.00 0.00 0.00	0.0000	258.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
12' horizontal x 2" Pipe Mount	B	From Leg	0.00 0.00 0.00	0.0000	258.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.28 3.50 4.75 7.28	0.01 0.04 0.09 0.21	0.03 0.05 0.08 0.15
10-ft 8 Bay Dipole	B	From Leg	5.00 0.00 5.00	0.0000	258.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.00 3.00 4.00 6.00	2.00 3.00 4.00 6.00	0.03 0.05 0.07 0.12
10-ft 8 Bay Dipole	B	From Leg	6.00 0.00 5.00	0.0000	258.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.00 3.00 4.00 6.00	2.00 3.00 4.00 6.00	0.03 0.05 0.07 0.12
255									
Side Arm Mount [SO 308-1]	A	From Leg	0.00 0.00 0.00	0.0000	255.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
12' horizontal x 2" Pipe Mount	A	From Face	0.00 0.00 0.00	0.0000	255.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.28 3.50 4.75 7.28	0.01 0.04 0.09 0.21	0.03 0.05 0.08 0.15

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
12' x 2" Pipe Mount	A	From Leg	6.00 0.00 0.00	0.0000	255.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.85 4.08 5.32 7.60	2.85 4.08 5.32 7.60	0.04 0.07 0.09 0.18
DB212-C	A	From Leg	6.00 0.00 0.00	0.0000	255.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.10 6.22 9.35 15.67	3.10 6.22 9.35 15.67	0.03 0.06 0.10 0.26
252									
Pipe Mount [PM 602-1]	B	From Leg	0.50 0.00 0.00	0.0000	252.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 3.21 3.64 4.54	2.78 3.21 3.64 4.54	0.09 0.11 0.14 0.21
4'x2" Horizontal Mount Pipe	B	From Leg	0.00 0.00 0.00	0.0000	252.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.95 1.23 1.52 2.13	0.05 0.08 0.11 0.21	0.03 0.04 0.05 0.09
240									
Side Arm Mount [SO 308-1]	B	From Leg	0.00 0.00 0.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
12' horizontal x 2" Pipe Mount	B	From Leg	0.00 0.00 0.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.28 3.50 4.75 7.28	0.01 0.04 0.09 0.21	0.03 0.05 0.08 0.15
CO-41A	B	From Leg	6.00 0.00 7.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.15 4.38 5.63 7.77	3.15 4.38 5.63 7.77	0.01 0.04 0.07 0.15
Side Arm Mount [SO 308-1]	C	From Leg	0.00 0.00 0.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
12' horizontal x 2" Pipe Mount	C	From Leg	0.00 0.00 0.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.28 3.50 4.75 7.28	0.01 0.04 0.09 0.21	0.03 0.05 0.08 0.15
12' x 2" Pipe Mount	C	From Leg	6.00 0.00 0.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.85 4.08 5.32 7.60	2.85 4.08 5.32 7.60	0.04 0.07 0.09 0.18
SD110-SFXPASNM	C	From Leg	6.00 0.00 0.00	0.0000	240.00	No Ice 1/2" Ice 1" Ice 2" Ice	9.00 10.58 12.16 15.32	9.00 10.58 12.16 15.32	0.03 0.09 0.14 0.27
235									
Side Arm Mount [SO 307-1]	A	From Leg	0.00 0.00 0.00	0.0000	235.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.08	2.66 4.48 6.37 10.73	0.05 0.07 0.11 0.22
10' x 2" Horizontal Mount Pipe	A	From Leg	0.00 0.00	0.0000	235.00	No Ice 1/2"	2.38 3.06	0.05 0.08	0.03 0.05

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert ft ft ft*	*Azimuth Adjustment °*	*Placement ft*		*C_AA_A Front ft^2*	*C_AA_A Side ft^2*	*Weight K*
			0.00			Ice	3.75	0.11	0.08
						1" Ice	5.15	0.21	0.17
						2" Ice			
15' x 2" Pipe Mount	A	From Leg	5.00	0.0000	235.00	No Ice	3.56	3.56	0.05
			0.00			1/2"	5.09	5.09	0.08
			0.00			Ice	6.64	6.64	0.12
						1" Ice	9.78	9.78	0.22
						2" Ice			
SE419-SF3P4LDF	A	From Leg	5.00	0.0000	235.00	No Ice	4.15	9.55	0.02
			0.00			1/2"	5.14	10.19	0.07
			5.50			Ice	6.10	10.83	0.12
						1" Ice	7.35	12.14	0.24
						2" Ice			
SE419-SF3P4LDF	A	From Leg	5.00	0.0000	235.00	No Ice	4.15	9.55	0.02
			0.00			1/2"	5.14	10.19	0.07
			-5.50			Ice	6.10	10.83	0.12
						1" Ice	7.35	12.14	0.24
						2" Ice			
12"x16"x6" TMA	A	From Leg	2.00	0.0000	235.00	No Ice	1.20	0.60	0.05
			0.00			1/2"	1.34	0.70	0.06
			0.00			Ice	1.48	0.81	0.07
						1" Ice	1.79	1.06	0.10
						2" Ice			
230									
Side Arm Mount [SO 305-1]	B	From Leg	0.00	0.0000	230.00	No Ice	0.53	1.52	0.03
			0.00			1/2"	0.78	2.07	0.04
			0.00			Ice	1.06	2.66	0.06
						1" Ice	1.73	3.91	0.13
						2" Ice			
12' x 2" Pipe Mount	B	From Leg	3.00	0.0000	230.00	No Ice	2.85	2.85	0.04
			0.00			1/2"	4.08	4.08	0.07
			0.00			Ice	5.32	5.32	0.09
						1" Ice	7.60	7.60	0.18
						2" Ice			
6' x 2" Horizontal Mount Pipe	B	From Leg	0.00	0.0000	230.00	No Ice	1.14	0.01	0.02
			0.00			1/2"	1.76	0.04	0.03
			0.00			Ice	2.14	0.09	0.04
						1" Ice	2.90	0.21	0.08
						2" Ice			
531-70 Dipole Antenna	B	From Leg	3.00	0.0000	230.00	No Ice	1.58	5.98	0.04
			0.00			1/2"	2.68	10.20	0.05
			0.00			Ice	3.80	14.40	0.06
						1" Ice	6.04	22.90	0.09
						2" Ice			
Pipe Mount [PM 602-1]	A	From Leg	0.50	0.0000	230.00	No Ice	2.78	2.78	0.09
			0.00			1/2"	3.21	3.21	0.11
			0.00			Ice	3.64	3.64	0.14
						1" Ice	4.54	4.54	0.21
						2" Ice			
10' x 2.375" Horizontal Mount Pipe	A	From Leg	0.00	0.0000	230.00	No Ice	2.38	0.01	0.04
			0.00			1/2"	3.41	0.05	0.05
			0.00			Ice	4.45	0.10	0.08
						1" Ice	5.91	0.24	0.15
						2" Ice			
220									
Pipe Mount [PM 602-1]	A	From Leg	0.50	0.0000	220.00	No Ice	2.78	2.78	0.09
			0.00			1/2"	3.21	3.21	0.11
			0.00			Ice	3.64	3.64	0.14
						1" Ice	4.54	4.54	0.21
						2" Ice			
5'-0" x 2" horizontal mount pipe	A	From Leg	0.00	0.0000	220.00	No Ice	1.19	0.01	0.02
			0.00			1/2"	1.69	0.05	0.03
			0.00			Ice	2.21	0.08	0.04
						1" Ice	3.26	0.16	0.07
						2" Ice			

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert ft ft ft*	*Azimuth Adjustment °*	*Placement ft*		*C_AA_A Front ft^2*	*C_AA_A Side ft^2*	*Weight K*
216									
Side Arm Mount [SO 308-1]	B	From Leg	0.00	0.0000	216.00	No Ice	0.41	3.06	0.05
			0.00			1/2"	0.81	5.10	0.08
			0.00			Ice	1.23	7.20	0.12
						1" Ice	2.09	11.96	0.25
						2" Ice			
12' horizontal x 2" Pipe Mount	B	From Leg	0.00	0.0000	216.00	No Ice	2.28	0.01	0.03
			0.00			1/2"	3.50	0.04	0.05
			0.00			Ice	4.75	0.09	0.08
						1" Ice	7.28	0.21	0.15
						2" Ice			
12' x 2" Pipe Mount	B	From Leg	6.00	0.0000	216.00	No Ice	2.85	2.85	0.04
			0.00			1/2"	4.08	4.08	0.07
			0.00			Ice	5.32	5.32	0.09
						1" Ice	7.60	7.60	0.18
						2" Ice			
SD110-SFXPASNM	B	From Leg	6.00	0.0000	216.00	No Ice	9.00	9.00	0.03
			0.00			1/2"	10.58	10.58	0.09
			0.00			Ice	12.16	12.16	0.14
						1" Ice	15.32	15.32	0.27
						2" Ice			
***									
Side Arm Mount [SO 308-1]	C	From Leg	0.00	0.0000	216.00	No Ice	0.41	3.06	0.05
			0.00			1/2"	0.81	5.10	0.08
			0.00			Ice	1.23	7.20	0.12
						1" Ice	2.09	11.96	0.25
						2" Ice			
12' horizontal x 2" Pipe Mount	C	From Leg	0.00	0.0000	216.00	No Ice	2.28	0.01	0.03
			0.00			1/2"	3.50	0.04	0.05
			0.00			Ice	4.75	0.09	0.08
						1" Ice	7.28	0.21	0.15
						2" Ice			
ANT450F6	C	From Leg	6.00	0.0000	216.00	No Ice	1.90	1.90	0.01
			0.00			1/2"	2.73	2.73	0.02
			4.00			Ice	3.40	3.40	0.04
						1" Ice	4.40	4.40	0.10
						2" Ice			
205.5									
Pipe Mount [PM 602-1]	B	From Leg	0.00	0.0000	205.50	No Ice	2.78	2.78	0.09
			0.00			1/2"	3.21	3.21	0.11
			0.00			Ice	3.64	3.64	0.14
						1" Ice	4.54	4.54	0.21
						2" Ice			
10' x 2" Horizontal Mount Pipe	B	From Leg	0.00	0.0000	205.50	No Ice	2.38	0.05	0.03
			0.00			1/2"	3.06	0.08	0.05
			0.00			Ice	3.75	0.11	0.08
						1" Ice	5.15	0.21	0.17
						2" Ice			
204									
Side Arm Mount [SO 305-1]	C	From Leg	0.00	0.0000	204.00	No Ice	0.53	1.52	0.03
			0.00			1/2"	0.78	2.07	0.04
			0.00			Ice	1.06	2.66	0.06
						1" Ice	1.73	3.91	0.13
						2" Ice			
SC479-HF1LDF(DXX-E5765)	C	From Leg	3.00	0.0000	204.00	No Ice	4.24	4.24	0.03
			0.00			1/2"	6.54	6.54	0.07
			-4.00			Ice	8.04	8.04	0.11
						1" Ice	10.81	10.81	0.23
						2" Ice			
12"x16"x6" TMA	C	From Leg	2.00	0.0000	204.00	No Ice	1.20	0.60	0.05
			0.00			1/2"	1.34	0.70	0.06
			0.00			Ice	1.48	0.81	0.07
						1" Ice	1.79	1.06	0.10
						2" Ice			
200									

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
Side Arm Mount [SO 308-1]	C	From Leg	0.00	0.0000	200.00	No Ice	0.41	3.06	0.05
			0.00			1/2" Ice	0.81	5.10	0.08
			0.00			1" Ice	1.23	7.20	0.12
						2" Ice	2.09	11.96	0.25
SE419-SWBPALDF(DXX) w/ Mount Pipe	C	From Leg	5.00	0.0000	200.00	No Ice	23.03	12.30	0.09
			0.00			1/2" Ice	23.83	13.93	0.24
			6.00			1" Ice	24.62	15.50	0.41
						2" Ice	26.16	17.99	0.78
SC479-HF1LDF(DXX-E5765)	C	From Leg	5.00	0.0000	200.00	No Ice	4.25	4.25	0.03
			0.00			1/2" Ice	6.54	6.54	0.07
			-6.00			1" Ice	8.04	8.04	0.11
						2" Ice	10.81	10.81	0.23
200									
Side Arm Mount [SO 311-1]	A	From Leg	0.00	0.0000	200.00	No Ice	1.67	4.53	0.06
			0.00			1/2" Ice	2.43	6.41	0.10
			0.00			1" Ice	3.21	8.37	0.15
						2" Ice	4.84	12.72	0.28
ANT900D69 UHF 4-bay dipole	A	From Leg	0.00	0.0000	200.00	No Ice	1.18	1.18	0.03
			0.00			1/2" Ice	1.57	1.57	0.05
			0.00			1" Ice	1.86	1.86	0.06
						2" Ice	2.47	2.47	0.10
197									
Pipe Mount [PM 602-1]	B	From Leg	0.50	0.0000	197.00	No Ice	2.78	2.78	0.09
			0.00			1/2" Ice	3.21	3.21	0.11
			0.00			1" Ice	3.64	3.64	0.14
						2" Ice	4.54	4.54	0.21
10' x 2" Horizontal Mount Pipe	B	From Leg	0.00	0.0000	197.00	No Ice	2.38	0.05	0.03
			0.00			1/2" Ice	3.06	0.08	0.05
			0.00			1" Ice	3.75	0.11	0.08
						2" Ice	5.15	0.21	0.17
195									
Pipe Mount [PM 602-1]	A	From Leg	0.00	0.0000	195.00	No Ice	2.78	2.78	0.09
			0.00			1/2" Ice	3.21	3.21	0.11
			0.00			1" Ice	3.64	3.64	0.14
						2" Ice	4.54	4.54	0.21
10' x 2" Horizontal Mount Pipe	A	From Leg	0.00	0.0000	195.00	No Ice	2.38	0.05	0.03
			0.00			1/2" Ice	3.06	0.08	0.05
			0.00			1" Ice	3.75	0.11	0.08
						2" Ice	5.15	0.21	0.17
175									
Side Arm Mount [SO 308-1]	B	From Leg	0.00	0.0000	175.00	No Ice	0.41	3.06	0.05
			0.00			1/2" Ice	0.81	5.10	0.08
			0.00			1" Ice	1.23	7.20	0.12
						2" Ice	2.09	11.96	0.25
BCR-80010:90	B	From Leg	6.00	0.0000	175.00	No Ice	3.55	3.55	0.04
			0.00			1/2" Ice	6.03	6.03	0.07
			6.00			1" Ice	6.80	6.80	0.11
						2" Ice	8.19	8.19	0.22
BCR-80010:90	B	From Leg	6.00	0.0000	175.00	No Ice	3.55	3.55	0.04
			0.00			1/2" Ice	6.03	6.03	0.07
			-6.00			1" Ice	6.80	6.80	0.11
						2" Ice	8.19	8.19	0.22
12"x16"x6" TMA	B	From Leg	2.00	0.0000	175.00	No Ice	1.20	0.60	0.05

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert ft ft ft*	*Azimuth Adjustment °*	*Placement ft*		*C_AA_A Front ft²*	*C_AA_A Side ft²*	*Weight K*
			0.00 0.00			1/2" Ice 1" Ice 2" Ice	1.34 1.48 1.79	0.70 0.81 1.06	0.06 0.07 0.10
Side Arm Mount [SO 308-1]	C	From Leg	0.00 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
SC479-HF1LDF	C	From Leg	6.00 0.00 6.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.54 6.54 8.04 10.81	4.54 6.54 8.04 10.81	0.03 0.07 0.11 0.23
SC479-HF1LDF	C	From Leg	6.00 0.00 -6.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	4.54 6.54 8.04 10.81	4.54 6.54 8.04 10.81	0.03 0.07 0.11 0.23
10' x 2" Horizontal Mount Pipe	C	From Leg	0.00 0.00 0.00	0.0000	175.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.38 3.06 3.75 5.15	0.05 0.08 0.11 0.21	0.03 0.05 0.08 0.17
165									
Side Arm Mount [SO 311-1]	A	From Leg	0.00 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.67 2.43 3.21 4.84	4.53 6.41 8.37 12.72	0.06 0.10 0.15 0.28
ANT450-F6	A	From Leg	3.00 0.00 4.00	0.0000	168.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.00 3.03 4.06 6.12	2.00 3.03 4.06 6.12	0.01 0.02 0.03 0.06
163									
Pipe Mount [PM 602-1]	A	From Leg	0.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 3.21 3.64 4.54	2.78 3.21 3.64 4.54	0.09 0.11 0.14 0.21
6' x 2" Horizontal Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	163.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.14 1.76 2.14 2.90	0.01 0.04 0.09 0.21	0.02 0.03 0.04 0.08
155									
Sector Mount [SM 502-3]	C	None		0.0000	153.50	No Ice 1/2" Ice 1" Ice 2" Ice	29.82 42.21 54.43 78.49	29.82 42.21 54.43 78.49	1.67 2.27 3.05 5.18
APXVTM14 w/ Mount Pipe	A	From Leg	3.00 0.00 0.00	0.0000	153.50	No Ice 1/2" Ice 1" Ice 2" Ice	6.58 7.03 7.47 8.38	4.96 5.75 6.47 7.94	0.08 0.13 0.19 0.34
APXVTM14 w/ Mount Pipe	B	From Leg	3.00 0.00 0.00	0.0000	153.50	No Ice 1/2" Ice 1" Ice 2" Ice	6.58 7.03 7.47 8.38	4.96 5.75 6.47 7.94	0.08 0.13 0.19 0.34
APXVTM14 w/ Mount Pipe	C	From Leg	3.00 0.00 0.00	0.0000	153.50	No Ice 1/2" Ice	6.58 7.03 7.47	4.96 5.75 6.47	0.08 0.13 0.19

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
						1" Ice	8.38	7.94	0.34
						2" Ice			
NNVV-65B-R4_TIA w/	A	From Leg	3.00	0.0000	153.50	No Ice	12.51	7.41	0.10
Mount Pipe			0.00			1/2"	13.11	8.60	0.19
			0.00			Ice	13.67	9.50	0.29
						1" Ice	14.82	11.33	0.52
						2" Ice			
NNVV-65B-R4_TIA w/	B	From Leg	3.00	0.0000	153.50	No Ice	12.51	7.41	0.10
Mount Pipe			0.00			1/2"	13.11	8.60	0.19
			0.00			Ice	13.67	9.50	0.29
						1" Ice	14.82	11.33	0.52
						2" Ice			
NNVV-65B-R4_TIA w/	C	From Leg	3.00	0.0000	153.50	No Ice	12.51	7.41	0.10
Mount Pipe			0.00			1/2"	13.11	8.60	0.19
			0.00			Ice	13.67	9.50	0.29
						1" Ice	14.82	11.33	0.52
						2" Ice			
TD-RRH8x20-25	A	From Leg	3.00	0.0000	153.50	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			0.00			Ice	4.56	1.90	0.13
						1" Ice	5.10	2.30	0.20
						2" Ice			
TD-RRH8x20-25	B	From Leg	3.00	0.0000	153.50	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			0.00			Ice	4.56	1.90	0.13
						1" Ice	5.10	2.30	0.20
						2" Ice			
TD-RRH8x20-25	C	From Leg	3.00	0.0000	153.50	No Ice	4.05	1.53	0.07
			0.00			1/2"	4.30	1.71	0.10
			0.00			Ice	4.56	1.90	0.13
						1" Ice	5.10	2.30	0.20
						2" Ice			
FD-RRH-4x45-1900	A	From Leg	3.00	0.0000	153.50	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08
			0.00			Ice	2.74	2.65	0.11
						1" Ice	3.19	3.09	0.17
						2" Ice			
FD-RRH-4x45-1900	B	From Leg	3.00	0.0000	153.50	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08
			0.00			Ice	2.74	2.65	0.11
						1" Ice	3.19	3.09	0.17
						2" Ice			
FD-RRH-4x45-1900	C	From Leg	3.00	0.0000	153.50	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08
			0.00			Ice	2.74	2.65	0.11
						1" Ice	3.19	3.09	0.17
						2" Ice			
(2) FD-RRH-2x50-800	A	From Leg	3.00	0.0000	153.50	No Ice	2.06	1.36	0.05
			0.00			1/2"	2.24	1.52	0.07
			0.00			Ice	2.43	1.68	0.09
						1" Ice	2.83	2.03	0.14
						2" Ice			
(2) FD-RRH-2x50-800	B	From Leg	3.00	0.0000	153.50	No Ice	2.06	1.36	0.05
			0.00			1/2"	2.24	1.52	0.07
			0.00			Ice	2.43	1.68	0.09
						1" Ice	2.83	2.03	0.14
						2" Ice			
(2) FD-RRH-2x50-800	C	From Leg	3.00	0.0000	153.50	No Ice	2.06	1.36	0.05
			0.00			1/2"	2.24	1.52	0.07
			0.00			Ice	2.43	1.68	0.09
						1" Ice	2.83	2.03	0.14
						2" Ice			
145									
Site Pro 1 VFA12-HD 12'	A	From Leg	0.00	0.0000	145.00	No Ice	13.20	9.20	0.66
Heavy Duty V-Frame			0.00			1/2"	19.50	14.60	0.80

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		*C_AA_A Front* *ft²*	*C_AA_A Side* *ft²*	*Weight* *K*
			0.00			Ice	25.80	19.50	1.01
						1" Ice	38.40	30.80	1.24
						2" Ice			
Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	B	From Leg	0.00	0.0000	145.00	No Ice	13.20	9.20	0.66
			0.00			1/2"	19.50	14.60	0.80
			0.00			Ice	25.80	19.50	1.01
						1" Ice	38.40	30.80	1.24
						2" Ice			
Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	C	From Leg	0.00	0.0000	145.00	No Ice	13.20	9.20	0.66
			0.00			1/2"	19.50	14.60	0.80
			0.00			Ice	25.80	19.50	1.01
						1" Ice	38.40	30.80	1.24
						2" Ice			
Site Pro 1 SFS-V Sector Frame Stabilizer	A	From Leg	0.00	0.0000	145.00	No Ice	2.84	2.67	0.07
			0.00			1/2"	3.30	3.09	0.08
			0.00			Ice	3.84	3.58	0.11
						1" Ice	4.68	4.35	0.14
						2" Ice			
Site Pro 1 SFS-V Sector Frame Stabilizer	B	From Leg	0.00	0.0000	145.00	No Ice	2.84	2.67	0.07
			0.00			1/2"	3.30	3.09	0.08
			0.00			Ice	3.84	3.58	0.11
						1" Ice	4.68	4.35	0.14
						2" Ice			
Site Pro 1 SFS-V Sector Frame Stabilizer	C	From Leg	0.00	0.0000	145.00	No Ice	2.84	2.67	0.07
			0.00			1/2"	3.30	3.09	0.08
			0.00			Ice	3.84	3.58	0.11
						1" Ice	4.68	4.35	0.14
						2" Ice			
10'6"x2" Horizontal Pipe	A	From Leg	0.00	0.0000	145.00	No Ice	2.49	0.01	0.04
			0.00			1/2"	3.57	0.05	0.06
			0.00			Ice	4.67	0.08	0.08
						1" Ice	6.32	0.16	0.15
						2" Ice			
10'6"x2" Horizontal Pipe	B	From Leg	0.00	0.0000	145.00	No Ice	2.49	0.01	0.04
			0.00			1/2"	3.57	0.05	0.06
			0.00			Ice	4.67	0.08	0.08
						1" Ice	6.32	0.16	0.15
						2" Ice			
10'6"x2" Horizontal Pipe	C	From Leg	0.00	0.0000	145.00	No Ice	2.49	0.01	0.04
			0.00			1/2"	3.57	0.05	0.06
			0.00			Ice	4.67	0.08	0.08
						1" Ice	6.32	0.16	0.15
						2" Ice			
HBXX-6517DS-A2M_TIA w/ Mount Pipe	A	From Leg	3.00	0.0000	145.00	No Ice	8.77	6.96	0.08
			0.00			1/2"	9.34	8.18	0.15
			0.00			Ice	9.89	9.14	0.23
						1" Ice	10.99	11.02	0.41
						2" Ice			
HBXX-6517DS-A2M_TIA w/ Mount Pipe	B	From Leg	3.00	0.0000	145.00	No Ice	8.77	6.96	0.08
			0.00			1/2"	9.34	8.18	0.15
			0.00			Ice	9.89	9.14	0.23
						1" Ice	10.99	11.02	0.41
						2" Ice			
HBXX-6517DS-A2M_TIA w/ Mount Pipe	C	From Leg	3.00	0.0000	145.00	No Ice	8.77	6.96	0.08
			0.00			1/2"	9.34	8.18	0.15
			0.00			Ice	9.89	9.14	0.23
						1" Ice	10.99	11.02	0.41
						2" Ice			
LNX-6515DS-A1M_TIA w/ Mount Pipe	A	From Leg	3.00	0.0000	145.00	No Ice	11.71	9.87	0.08
			0.00			1/2"	12.43	11.39	0.17
			0.00			Ice	13.17	12.94	0.27
						1" Ice	14.55	15.30	0.51
						2" Ice			
LNX-6515DS-A1M_TIA w/ Mount Pipe	B	From Leg	3.00	0.0000	145.00	No Ice	11.71	9.87	0.08
			0.00			1/2"	12.43	11.39	0.17

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
			0.00			Ice	13.17	12.94	0.27
						1" Ice	14.55	15.30	0.51
						2" Ice			
LNX-6515DS-A1M_TIA w/ Mount Pipe	C	From Leg	3.00	0.0000	145.00	No Ice	11.71	9.87	0.08
			0.00			1/2"	12.43	11.39	0.17
			0.00			Ice	13.17	12.94	0.27
						1" Ice	14.55	15.30	0.51
						2" Ice			
(2) NHH-65C-R2B_TIA w/ Mount Pipe	A	From Leg	3.00	0.0000	145.00	No Ice	11.63	9.79	0.08
			0.00			1/2"	12.35	11.31	0.17
			0.00			Ice	13.07	12.85	0.27
						1" Ice	14.44	15.19	0.51
						2" Ice			
(2) NHH-65C-R2B_TIA w/ Mount Pipe	B	From Leg	3.00	0.0000	145.00	No Ice	11.63	9.79	0.08
			0.00			1/2"	12.35	11.31	0.17
			0.00			Ice	13.07	12.85	0.27
						1" Ice	14.44	15.19	0.51
						2" Ice			
(2) NHH-65C-R2B_TIA w/ Mount Pipe	C	From Leg	3.00	0.0000	145.00	No Ice	11.63	9.79	0.08
			0.00			1/2"	12.35	11.31	0.17
			0.00			Ice	13.07	12.85	0.27
						1" Ice	14.44	15.19	0.51
						2" Ice			
B2/B66A RRH-BR049	A	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.25	0.08
			0.00			1/2"	2.05	1.39	0.10
			0.00			Ice	2.22	1.54	0.12
						1" Ice	2.60	1.86	0.18
						2" Ice			
B2/B66A RRH-BR049	B	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.25	0.08
			0.00			1/2"	2.05	1.39	0.10
			0.00			Ice	2.22	1.54	0.12
						1" Ice	2.60	1.86	0.18
						2" Ice			
B2/B66A RRH-BR049	C	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.25	0.08
			0.00			1/2"	2.05	1.39	0.10
			0.00			Ice	2.22	1.54	0.12
						1" Ice	2.60	1.86	0.18
						2" Ice			
B5/B13 RRH-BR04C	A	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.01	0.07
			0.00			1/2"	2.05	1.14	0.09
			0.00			Ice	2.22	1.28	0.11
						1" Ice	2.60	1.59	0.15
						2" Ice			
B5/B13 RRH-BR04C	B	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.01	0.07
			0.00			1/2"	2.05	1.14	0.09
			0.00			Ice	2.22	1.28	0.11
						1" Ice	2.60	1.59	0.15
						2" Ice			
B5/B13 RRH-BR04C	C	From Leg	3.00	0.0000	145.00	No Ice	1.88	1.01	0.07
			0.00			1/2"	2.05	1.14	0.09
			0.00			Ice	2.22	1.28	0.11
						1" Ice	2.60	1.59	0.15
						2" Ice			
RVZDC-6627-PF-48	A	From Leg	3.00	0.0000	145.00	No Ice	3.79	2.51	0.03
			0.00			1/2"	4.04	2.73	0.06
			0.00			Ice	4.30	2.95	0.10
						1" Ice	4.84	3.42	0.18
						2" Ice			
RVZDC-6627-PF-48	B	From Leg	3.00	0.0000	145.00	No Ice	3.79	2.51	0.03
			0.00			1/2"	4.04	2.73	0.06
			0.00			Ice	4.30	2.95	0.10
						1" Ice	4.84	3.42	0.18
						2" Ice			
RVZDC-6627-PF-48	C	From Leg	3.00	0.0000	145.00	No Ice	3.79	2.51	0.03
			0.00			1/2"	4.04	2.73	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
			0.00			Ice	4.30	2.95	0.10
						1" Ice	4.84	3.42	0.18
						2" Ice			
RC3DC-3315-PF-48-OVP	A	From Leg	3.00	0.0000	145.00	No Ice	3.79	2.51	0.03
			0.00			1/2"	4.04	2.72	0.06
			0.00			Ice	4.30	2.94	0.10
						1" Ice	4.84	3.41	0.18
						2" Ice			
RC3DC-3315-PF-48-OVP	B	From Leg	3.00	0.0000	145.00	No Ice	3.79	2.51	0.03
			0.00			1/2"	4.04	2.72	0.06
			0.00			Ice	4.30	2.94	0.10
						1" Ice	4.84	3.41	0.18
						2" Ice			
RC3DC-3315-PF-48-OVP	C	From Leg	3.00	0.0000	145.00	No Ice	3.79	2.51	0.03
			0.00			1/2"	4.04	2.72	0.06
			0.00			Ice	4.30	2.94	0.10
						1" Ice	4.84	3.41	0.18
						2" Ice			
140									
Beacon side markers	A	From Leg	0.50	0.0000	140.00	No Ice	0.93	0.93	0.02
			0.00			1/2"	1.07	1.07	0.03
			0.00			Ice	1.21	1.21	0.03
						1" Ice	1.49	1.49	0.04
						2" Ice			
Beacon side markers	B	From Leg	0.50	0.0000	140.00	No Ice	0.93	0.93	0.02
			0.00			1/2"	1.07	1.07	0.03
			0.00			Ice	1.21	1.21	0.03
						1" Ice	1.49	1.49	0.04
						2" Ice			
Beacon side markers	C	From Leg	0.50	0.0000	140.00	No Ice	0.93	0.93	0.02
			0.00			1/2"	1.07	1.07	0.03
			0.00			Ice	1.21	1.21	0.03
						1" Ice	1.49	1.49	0.04
						2" Ice			
128									
Side Arm Mount [SO 311-1]	B	From Leg	0.00	0.0000	128.00	No Ice	1.67	4.53	0.06
			0.00			1/2"	2.43	6.41	0.10
			0.00			Ice	3.21	8.37	0.15
						1" Ice	4.84	12.72	0.28
						2" Ice			
126									
Side Arm Mount [SO 308-1]	C	From Leg	0.00	0.0000	126.00	No Ice	0.41	3.06	0.05
			0.00			1/2"	0.81	5.10	0.08
			0.00			Ice	1.23	7.20	0.12
						1" Ice	2.09	11.96	0.25
						2" Ice			
12' horizontal x 2" Pipe Mount	C	From Leg	0.00	0.0000	126.00	No Ice	2.28	0.01	0.03
			0.00			1/2"	3.50	0.04	0.05
			0.00			Ice	4.75	0.09	0.08
						1" Ice	7.28	0.21	0.15
						2" Ice			
4' x 2" Pipe Mount	C	From Leg	6.00	0.0000	126.00	No Ice	0.79	0.79	0.03
			0.00			1/2"	1.03	1.03	0.04
			0.00			Ice	1.28	1.28	0.04
						1" Ice	1.81	1.81	0.07
						2" Ice			
125									
Side Arm Mount [SO 308-1]	A	From Leg	0.00	0.0000	125.00	No Ice	0.41	3.06	0.05
			0.00			1/2"	0.81	5.10	0.08
			0.00			Ice	1.23	7.20	0.12
						1" Ice	2.09	11.96	0.25
						2" Ice			
12' horizontal x 2" Pipe Mount	A	From Leg	0.00	0.0000	125.00	No Ice	2.28	0.01	0.03
			0.00			1/2"	3.50	0.04	0.05
			0.00			Ice	4.75	0.09	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice 2" Ice	7.28	0.21	0.15
CO-36A	A	From Leg	6.00 0.00 6.00	0.0000	125.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.70 3.93 5.17 7.52	2.70 3.93 5.17 7.52	0.01 0.03 0.06 0.14
124									
Side Arm Mount [SO 308-1]	B	From Leg	0.00 0.00 0.00	0.0000	124.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.41 0.81 1.23 2.09	3.06 5.10 7.20 11.96	0.05 0.08 0.12 0.25
12' horizontal x 2" Pipe Mount	B	From Leg	0.00 0.00 0.00	0.0000	124.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.28 3.50 4.75 7.28	0.01 0.04 0.09 0.21	0.03 0.05 0.08 0.15
ANT450-F6	B	From Leg	6.00 0.00 4.00	0.0000	124.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.00 3.03 4.06 6.12	2.00 3.03 4.06 6.12	0.01 0.02 0.03 0.06
123									
Pipe Mount [PM 602-1]	A	From Leg	0.00 0.00 0.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.78 3.21 3.64 4.54	2.78 3.21 3.64 4.54	0.09 0.11 0.14 0.21
6' x 2" Horizontal Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	123.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.14 1.76 2.14 2.90	0.01 0.04 0.09 0.21	0.02 0.03 0.04 0.08
117									
Side Arm Mount [SO 311-1]	A	From Leg	0.00 0.00 0.00	0.0000	117.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.67 2.43 3.21 4.84	4.53 6.41 8.37 12.72	0.06 0.10 0.15 0.28
3'x4" Mount Pipe	A	From Leg	3.00 0.00 0.00	0.0000	117.00	No Ice 1/2" Ice 1" Ice 2" Ice	0.81 1.12 1.33 1.77	0.81 1.12 1.33 1.77	0.03 0.04 0.05 0.09
10' x 2" Horizontal Mount Pipe	A	From Leg	0.00 0.00 0.00	0.0000	117.00	No Ice 1/2" Ice 1" Ice 2" Ice	2.38 3.06 3.75 5.15	0.05 0.08 0.11 0.21	0.03 0.05 0.08 0.17
116									
ANT400D	B	From Leg	3.00 0.00 -3.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.77 2.13 2.50 3.27	1.77 2.13 2.50 3.27	0.05 0.06 0.08 0.12
BR6155 5' Omni	B	From Leg	3.00 0.00 3.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.77 2.13 2.50 3.27	1.77 2.13 2.50 3.27	0.05 0.06 0.08 0.12
Side Arm Mount [SO 311-1]	B	From Leg	0.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice	1.67 2.43 3.21 4.84	4.53 6.41 8.37 12.72	0.06 0.10 0.15 0.28

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice			
117 ***107*** ***104***									
Pipe Mount [PM 602-1]	C	From Leg	0.50	0.0000	104.00	No Ice	2.78	2.78	0.09
			0.00			1/2" Ice	3.21	3.21	0.11
			0.00			1" Ice	3.64	3.64	0.14
						2" Ice	4.54	4.54	0.21
10' x 2" Horizontal Mount Pipe	C	From Leg	0.00	0.0000	104.00	No Ice	2.38	0.05	0.03
			0.00			1/2" Ice	3.06	0.08	0.05
			0.00			1" Ice	3.75	0.11	0.08
						2" Ice	5.15	0.21	0.17
95									
Side Arm Mount [SO 311-1]	B	From Leg	0.00	0.0000	95.00	No Ice	1.67	4.53	0.06
			0.00			1/2" Ice	2.43	6.41	0.10
			0.00			1" Ice	3.21	8.37	0.15
						2" Ice	4.84	12.72	0.28
BR6155 5' Omni	B	From Leg	3.00	0.0000	95.00	No Ice	1.77	1.77	0.05
			0.00			1/2" Ice	2.13	2.13	0.06
			3.00			1" Ice	2.50	2.50	0.08
						2" Ice	3.27	3.27	0.12
55									
Side Arm Mount [SO 311-1]	B	From Leg	0.00	0.0000	55.00	No Ice	1.67	4.53	0.06
			0.00			1/2" Ice	2.43	6.41	0.10
			0.00			1" Ice	3.21	8.37	0.15
						2" Ice	4.84	12.72	0.28
V-1500	B	From Leg	3.00	0.0000	55.00	No Ice	0.55	0.55	0.00
			0.00			1/2" Ice	1.07	1.07	0.01
			0.00			1" Ice	1.45	1.45	0.02
						2" Ice	2.09	2.09	0.04
50									
Side Arm Mount [SO 311-1]	A	From Leg	0.00	0.0000	50.00	No Ice	1.67	4.53	0.06
			0.00			1/2" Ice	2.43	6.41	0.10
			0.00			1" Ice	3.21	8.37	0.15
						2" Ice	4.84	12.72	0.28
ANT790D	A	From Leg	3.00	0.0000	50.00	No Ice	1.77	1.77	0.03
			0.00			1/2" Ice	2.13	2.13	0.04
			3.00			1" Ice	2.50	2.50	0.06
						2" Ice	3.27	3.27	0.11
* **									
USF-4U [4' SO 203-1 + Vert. Pipe Support]	A	From Leg	2.00	0.0000	202.00	No Ice	2.96	5.64	0.18
			0.00			1/2" Ice	3.76	6.73	0.22
			0.00			1" Ice	4.63	7.91	0.28
						2" Ice	6.57	10.43	0.43
ANT220F2	A	From Leg	3.00	0.0000	202.00	No Ice	1.03	1.03	0.01
			0.00			1/2" Ice	1.29	1.29	0.02
			3.00			1" Ice	1.56	1.56	0.03
						2" Ice	2.13	2.13	0.06
***									
USF-4U [4' SO 203-1 + Vert. Pipe Support]	A	From Leg	2.00	0.0000	177.00	No Ice	2.96	5.64	0.18
			0.00			1/2" Ice	3.76	6.73	0.22
			0.00			1" Ice	4.63	7.91	0.28
						2" Ice	6.57	10.43	0.43

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
871F-70-220-025	A	From Leg	3.00	0.0000	177.00	No Ice	2.61	2.61	0.01
			0.00			1/2" Ice	3.01	3.01	0.03
			3.00			1" Ice	3.41	3.41	0.05
						2" Ice	4.24	4.24	0.10

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
PAL8-59	B	Paraboloid w/Radome	From Leg	1.00	-15.0000		276.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.31	0.81
									2" Ice	54.36	1.34
PAL8-59	C	Paraboloid w/Radome	From Leg	1.00	-35.0000		276.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.31	0.81
									2" Ice	54.36	1.34
PAL8-59	A	Paraboloid w/Radome	From Leg	1.00	2.0000		276.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.31	0.81
									2" Ice	54.36	1.34
PAL8-59	A	Paraboloid w/Radome	From Leg	1.00	2.0000		266.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.31	0.81
									2" Ice	54.36	1.34
PADX6-59A	B	Paraboloid w/Radome	From Leg	1.00	50.0000		252.00	6.00	No Ice	28.30	0.19
				0.00					1/2" Ice	29.05	0.33
				0.00					1" Ice	29.80	0.48
									2" Ice	31.30	0.78
PAL8-59	A	Paraboloid w/Radome	From Leg	1.00	10.0000		230.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.31	0.81
									2" Ice	54.36	1.34
PAL8-59	A	Paraboloid w/Radome	From Leg	1.00	2.0000		220.00	8.00	No Ice	50.27	0.29
				0.00					1/2" Ice	51.29	0.55
				0.00					1" Ice	52.31	0.81
									2" Ice	54.36	1.34
PAD10-59AC	B	Paraboloid w/Radome	From Leg	1.00	14.0000		205.50	10.00	No Ice	78.50	0.58
				0.00					1/2" Ice	79.81	0.99
				0.00					1" Ice	81.13	1.40
									2" Ice	83.76	2.22
PAL6	B	Paraboloid w/Radome	From Leg	1.00	46.0000		197.00	6.00	No Ice	28.27	0.19
				0.00					1/2" Ice	29.05	0.33
				0.00					1" Ice	29.83	0.48
									2" Ice	31.39	0.78
PAD10-59AC	A	Paraboloid w/Radome	From Leg	1.00	35.0000		195.00	10.00	No Ice	78.50	0.58
				0.00					1/2" Ice	79.81	0.99
				0.00					1" Ice	81.13	1.40
									2" Ice	83.76	2.22
PA6-65AC	A	Paraboloid w/Radome	From Leg	1.00	35.0000		163.00	6.00	No Ice	28.27	0.09
				0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
									2" Ice	31.39	0.69
PRF-950	C	Grid	From Leg	6.00	0.0000		126.00	3.18	No Ice	7.92	0.04
				0.00					1/2" Ice	8.34	0.08

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
				0.00					1" Ice	8.76	0.12
									2" Ice	9.60	0.20
SBX4-W60AC	A	Paraboloid w/Shroud (HP)	From Leg	1.00	-16.5000		123.00	4.00	No Ice	12.57	0.09
				0.00					1/2" Ice	13.10	0.07
				0.00					1" Ice	13.62	0.00
									2" Ice	14.68	0.00
Grid	A	Grid	From Leg	3.00	0.0000		117.00	6.00	No Ice	28.30	0.09
				0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.80	0.39
									2" Ice	31.30	0.69
PA6-65AC	C	Paraboloid w/Radome	From Leg	1.00	37.0000		104.00	6.00	No Ice	28.27	0.09
				0.00					1/2" Ice	29.05	0.24
				0.00					1" Ice	29.83	0.39
									2" Ice	31.39	0.69

Truss-Leg Properties

Section Designation	Area in²	Area Ice in²	Self Weight K	Ice Weight K	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in²
BV_Valmont 207628	1991.1340	6842.6409	0.93	1.62	6.9137	23.7592	3.6816
BV_Valmont 207628	1991.1340	6828.2155	0.93	1.60	6.9137	23.7091	3.6816
BV_Valmont 207628	1991.1340	6812.7115	0.93	1.58	6.9137	23.6552	3.6816
BV_Valmont 195557	2262.7455	6944.2656	0.74	1.67	7.8568	24.1120	7.2158
BV_Valmont 195557	2262.7455	6935.5266	0.74	1.65	7.8568	24.0817	7.2158
BV_Valmont 211843	2416.6578	6993.6702	0.91	1.71	8.3912	24.2836	9.4248
BV_Valmont 208334	2551.3147	7045.5767	1.08	1.70	8.8587	24.4638	11.9282
BV_Valmont 208334	2551.3147	7023.2308	1.08	1.67	8.8587	24.3862	11.9282
BV_Valmont 208335	2692.5326	7070.0229	1.28	1.65	9.3491	24.5487	14.7262
Valmont 238706	2915.7326	7113.0482	1.55	1.67	10.1241	24.6981	17.8187
Valmont 238707	3237.3473	6769.7929	1.92	1.73	11.2408	23.5062	21.2058
Valmont 238708	3237.3473	6736.1257	1.92	1.65	11.2408	23.3893	21.2058
Valmont 238709	3410.1925	6764.3550	2.19	1.53	11.8409	23.4873	24.8873
Valmont 238709	3410.1925	6700.6556	2.19	1.39	11.8409	23.2662	24.8873
Valmont 238709	3410.1925	6574.2024	2.19	1.15	11.8409	22.8271	24.8873

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	280 - 260	Leg	Max Tension	15	6.72	-0.39	-0.06
			Max. Compression	2	-11.87	0.77	-0.22
			Max. Mx	14	0.37	1.29	0.06
			Max. My	24	-1.12	0.10	-1.71
			Max. Vy	3	-1.56	0.01	-0.06
			Max. Vx	25	-1.57	0.07	-0.47
		Diagonal	Max Tension	17	5.34	0.04	-0.00
			Max. Compression	16	-5.66	0.00	0.00
			Max. Mx	37	0.30	0.18	-0.02
			Max. My	28	-1.55	0.18	0.02
			Max. Vy	37	0.11	0.18	-0.02
			Max. Vx	28	0.01	0.00	0.00
		Secondary Horizontal	Max Tension	14	1.63	0.00	0.00
			Max. Compression	3	-1.83	0.03	0.01
			Max. Mx	34	0.01	0.14	0.03
			Max. My	28	0.21	0.14	0.03
			Max. Vy	34	0.10	0.14	0.03
			Max. Vx	28	-0.01	0.00	0.00
		Top Girt	Max Tension	3	0.30	0.00	0.00
			Max. Compression	22	-0.37	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	26	-0.18	-0.49	0.00
			Max. My	26	-0.17	0.00	0.01
			Max. Vy	26	-0.16	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T2	260 - 240	Leg	Max Tension	15	26.55	-0.89	0.08
			Max. Compression	2	-37.23	1.10	0.05
			Max. Mx	18	-35.61	1.20	-0.41
			Max. My	4	-3.33	-0.16	-1.46
			Max. Vy	22	0.62	-0.96	-0.03
			Max. Vx	4	0.91	-0.16	-1.46
		Diagonal	Max Tension	16	7.12	0.00	0.00
			Max. Compression	16	-7.34	0.00	0.00
			Max. Mx	38	1.09	0.23	0.03
			Max. My	28	-0.06	0.23	0.03
			Max. Vy	38	0.12	0.23	0.03
			Max. Vx	28	-0.01	0.00	0.00
T3	240 - 220	Leg	Max Tension	15	52.79	-1.14	-0.13
			Max. Compression	2	-71.00	0.53	-0.05
			Max. Mx	29	-11.01	-1.72	0.11
			Max. My	24	-6.77	-0.46	2.60
			Max. Vy	15	-1.05	-1.14	-0.13
			Max. Vx	18	-1.09	-0.52	-1.02
		Diagonal	Max Tension	17	11.12	0.00	0.00
			Max. Compression	16	-11.46	0.00	0.00
			Max. Mx	27	1.53	0.31	0.04
			Max. My	28	-3.44	0.28	0.04
			Max. Vy	37	0.16	0.31	-0.04
			Max. Vx	28	-0.01	0.00	0.00
		Top Girt	Max Tension	14	2.24	0.00	0.00
			Max. Compression	3	-1.49	0.00	0.00
			Max. Mx	26	1.59	-1.25	0.00
			Max. My	26	1.53	0.00	0.04
			Max. Vy	26	0.31	0.00	0.00
			Max. Vx	26	0.01	0.00	0.00
		Mid Girt	Max Tension	14	2.73	0.00	0.00
			Max. Compression	3	-1.92	0.00	0.00
			Max. Mx	26	1.78	-1.41	0.00
			Max. My	26	1.72	0.00	0.04
			Max. Vy	26	-0.33	0.00	0.00
			Max. Vx	26	-0.01	0.00	0.00
T4	220 - 210	Leg	Max Tension	15	70.18	-1.23	-0.02
			Max. Compression	2	-92.24	1.78	-0.17
			Max. Mx	27	-52.44	2.20	-0.01
			Max. My	24	-7.37	-0.46	2.60
			Max. Vy	14	-1.17	-1.33	-0.02
			Max. Vx	19	-1.28	-0.82	-1.81
		Diagonal	Max Tension	16	13.36	0.00	0.00
			Max. Compression	16	-13.35	0.00	0.00
			Max. Mx	38	2.31	0.38	0.05
			Max. My	35	1.62	0.37	-0.05
			Max. Vy	38	0.17	0.38	0.05
			Max. Vx	35	0.01	0.00	0.00
T5	210 - 200	Leg	Max Tension	15	88.08	-0.63	0.17
			Max. Compression	2	-113.40	4.65	-0.54
			Max. Mx	14	84.57	-6.10	0.03
			Max. My	21	-6.66	-0.58	-7.06
			Max. Vy	22	1.40	-2.10	-0.04
			Max. Vx	21	1.60	-0.58	-7.06
		Diagonal	Max Tension	13	13.41	0.11	0.00
			Max. Compression	12	-13.72	0.00	0.00
			Max. Mx	38	1.24	0.36	-0.05
			Max. My	28	-3.73	0.34	0.05
			Max. Vy	38	0.17	0.36	-0.05
			Max. Vx	28	0.01	0.00	0.00
		Secondary Horizontal	Max Tension	2	1.97	0.00	0.00
			Max. Compression	2	-1.97	0.08	0.00
			Max. Mx	38	-0.15	0.27	0.03
			Max. My	28	0.23	0.27	0.03

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
			Max. Vy	38	-0.14	0.27	0.03
			Max. Vx	28	0.01	0.00	0.00
T6	200 - 180	Leg	Max Tension	15	118.22	-5.95	0.03
			Max. Compression	2	-149.77	3.34	0.40
			Max. Mx	14	115.15	-6.10	0.03
			Max. My	21	-6.63	-0.58	-7.06
			Max. Vy	14	-1.60	-6.10	0.03
			Max. Vx	21	-2.04	-0.58	-7.06
		Diagonal	Max Tension	16	21.15	0.00	0.00
			Max. Compression	18	-21.72	0.00	0.00
			Max. Mx	37	3.05	-0.80	0.11
			Max. My	28	-6.17	-0.76	-0.13
			Max. Vy	37	-0.26	-0.80	0.11
			Max. Vx	28	0.02	0.00	0.00
T7	180 - 160	Leg	Max Tension	15	163.60	-3.53	-0.63
			Max. Compression	2	-204.19	7.88	0.36
			Max. Mx	14	157.62	-8.17	-0.39
			Max. My	20	-14.75	-0.36	-7.59
			Max. Vy	14	1.11	-8.17	-0.39
			Max. Vx	20	1.43	-0.36	-7.59
		Diagonal	Max Tension	16	23.23	0.00	0.00
			Max. Compression	16	-23.07	0.00	0.00
			Max. Mx	37	4.48	-0.90	-0.13
			Max. My	35	3.79	-0.89	0.13
			Max. Vy	37	-0.28	-0.90	-0.13
			Max. Vx	35	-0.02	0.00	0.00
T8	160 - 140	Leg	Max Tension	15	207.56	-8.11	-0.39
			Max. Compression	2	-257.75	9.03	0.05
			Max. Mx	14	198.81	-9.59	-0.16
			Max. My	21	-13.35	-0.38	-10.47
			Max. Vy	14	2.47	-9.59	-0.16
			Max. Vx	21	2.66	-0.38	-10.47
		Diagonal	Max Tension	16	26.36	0.00	0.00
			Max. Compression	18	-27.06	0.00	0.00
			Max. Mx	37	3.44	-1.14	0.16
			Max. My	35	-8.22	-1.09	0.17
			Max. Vy	37	-0.34	-1.14	0.16
			Max. Vx	35	-0.02	0.00	0.00
T9	140 - 120	Leg	Max Tension	15	256.99	-9.48	-0.16
			Max. Compression	2	-318.06	4.20	0.03
			Max. Mx	14	250.69	-9.59	-0.16
			Max. My	21	-14.16	-0.38	-10.47
			Max. Vy	14	-0.86	-9.59	-0.16
			Max. Vx	21	-1.02	-0.38	-10.47
		Diagonal	Max Tension	16	30.61	0.00	0.00
			Max. Compression	16	-30.80	0.00	0.00
			Max. Mx	37	5.76	-1.49	-0.20
			Max. My	29	-1.59	-1.44	-0.21
			Max. Vy	37	-0.43	-1.49	-0.20
			Max. Vx	29	0.02	0.00	0.00
T10	120 - 100	Leg	Max Tension	15	308.87	-4.04	0.00
			Max. Compression	2	-379.92	5.38	0.13
			Max. Mx	6	282.87	-5.80	0.46
			Max. My	21	-18.60	-0.37	-5.72
			Max. Vy	6	0.88	-5.80	0.46
			Max. Vx	13	0.97	-0.28	-5.64
		Diagonal	Max Tension	16	31.92	0.00	0.00
			Max. Compression	16	-32.06	0.00	0.00
			Max. Mx	37	4.02	-1.70	0.22
			Max. My	35	3.56	-1.69	0.23
			Max. Vy	37	-0.46	-1.70	0.22
			Max. Vx	35	-0.03	0.00	0.00
T11	100 - 80	Leg	Max Tension	15	360.49	-5.66	-0.19
			Max. Compression	2	-441.90	5.76	-0.05
			Max. Mx	33	-13.23	-6.70	-0.06
			Max. My	21	-19.75	-0.37	-5.72
			Max. Vy	33	0.66	-6.70	-0.06
			Max. Vx	21	-0.71	-0.37	-5.72
		Diagonal	Max Tension	16	33.19	0.00	0.00

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Axial K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
			Max. Compression	16	-33.59	0.00	0.00
			Max. Mx	37	6.83	-1.81	-0.23
			Max. My	35	-8.01	-1.76	0.25
			Max. Vy	37	-0.48	-1.81	-0.23
			Max. Vx	35	-0.03	0.00	0.00
T12	80 - 60	Leg	Max Tension	15	410.97	-5.25	0.04
			Max. Compression	2	-503.58	3.99	-0.04
			Max. Mx	35	-219.66	8.14	0.01
			Max. My	21	-24.96	-0.64	-8.04
			Max. Vy	33	-0.86	-6.70	-0.06
			Max. Vx	21	0.78	-0.64	-8.04
		Diagonal	Max Tension	16	34.21	0.00	0.00
			Max. Compression	16	-34.34	0.00	0.00
			Max. Mx	37	2.98	-2.34	0.29
			Max. My	29	-10.55	-2.26	-0.30
			Max. Vy	37	-0.57	-2.34	0.29
			Max. Vx	29	0.03	0.00	0.00
T13	60 - 40	Leg	Max Tension	15	460.08	-4.99	-0.04
			Max. Compression	18	-564.86	7.52	-0.35
			Max. Mx	33	-11.52	-12.42	-0.02
			Max. My	21	-26.34	-0.64	-8.04
			Max. Vy	33	1.17	-12.42	-0.02
			Max. Vx	21	-0.99	-0.64	-8.04
		Diagonal	Max Tension	16	35.18	0.00	0.00
			Max. Compression	16	-35.75	0.00	0.00
			Max. Mx	37	8.62	-2.35	-0.31
			Max. My	36	8.57	-2.35	0.32
			Max. Vy	37	-0.59	-2.35	-0.31
			Max. Vx	36	-0.03	0.00	0.00
T14	40 - 20	Leg	Max Tension	15	508.91	-6.13	0.03
			Max. Compression	18	-628.95	4.17	-0.27
			Max. Mx	33	1.65	-12.42	-0.02
			Max. My	21	-32.51	-0.87	-12.36
			Max. Vy	33	-1.31	-12.42	-0.02
			Max. Vx	21	1.06	-0.87	-12.36
		Diagonal	Max Tension	16	35.86	0.00	0.00
			Max. Compression	16	-35.70	0.00	0.00
			Max. Mx	37	0.83	-2.77	0.32
			Max. My	29	-13.16	-2.70	-0.35
			Max. Vy	37	-0.61	-2.77	0.32
			Max. Vx	29	0.03	0.00	0.00
T15	20 - 0	Leg	Max Tension	15	554.03	-5.69	-0.05
			Max. Compression	18	-687.91	0.00	0.00
			Max. Mx	35	-297.83	11.89	0.11
			Max. My	21	-33.87	-0.87	-12.36
			Max. Vy	14	-0.71	-5.97	-0.04
			Max. Vx	21	-1.07	-0.87	-12.36
		Diagonal	Max Tension	16	36.50	0.00	0.00
			Max. Compression	18	-37.53	0.00	0.00
			Max. Mx	28	12.15	-2.51	0.34
			Max. My	36	12.98	-2.33	0.36
			Max. Vy	28	-0.59	-2.51	0.34
			Max. Vx	36	-0.03	0.00	0.00

Maximum Reactions

Location	*Condition*	*Gov. Load Comb.*	*Vertical K*	*Horizontal, X K*	*Horizontal, Z K*
Leg C	Max. Vert	18	718.20	78.73	-49.27
	Max. H_x	18	718.20	78.73	-49.27
	Max. H_z	7	-564.27	-65.38	41.28
	Min. Vert	7	-564.27	-65.38	41.28
	Min. H_x	7	-564.27	-65.38	41.28
	Min. H_z	18	718.20	78.73	-49.27

Location	*Condition*	*Gov. Load Comb.*	*Vertical K*	*Horizontal, X K*	*Horizontal, Z K*
Leg B	Max. Vert	10	685.75	-74.87	-46.04
	Max. H_x	23	-553.11	63.25	39.36
	Max. H_z	23	-553.11	63.25	39.36
	Min. Vert	23	-553.11	63.25	39.36
	Min. H_x	10	685.75	-74.87	-46.04
	Min. H_z	10	685.75	-74.87	-46.04
Leg A	Max. Vert	2	711.23	-0.23	89.99
	Max. H_x	20	51.83	16.74	4.35
	Max. H_z	2	711.23	-0.23	89.99
	Min. Vert	15	-576.58	0.52	-76.88
	Min. H_x	9	40.83	-16.29	3.51
	Min. H_z	15	-576.58	0.52	-76.88

Tower Mast Reaction Summary

Load Combination	*Vertical K*	*Shear$_x$ K*	*Shear$_z$ K*	*Overturning Moment, M_x kip-ft*	*Overturning Moment, M_z kip-ft*	*Torque kip-ft*
Dead Only	142.10	-0.00	0.00	-70.07	-27.51	0.00
1.2 Dead+1.0 Wind 0 deg - No Ice	170.52	-0.17	-146.06	-22668.59	61.40	-15.89
0.9 Dead+1.0 Wind 0 deg - No Ice	127.89	-0.17	-146.06	-22647.57	69.65	-15.89
1.2 Dead+1.0 Wind 30 deg - No Ice	170.52	71.71	-125.71	-19165.12	-10844.44	-99.30
0.9 Dead+1.0 Wind 30 deg - No Ice	127.89	71.71	-125.71	-19144.10	-10836.19	-99.30
1.2 Dead+1.0 Wind 60 deg - No Ice	170.52	120.82	-70.53	-10667.26	-18137.69	-209.80
0.9 Dead+1.0 Wind 60 deg - No Ice	127.89	120.82	-70.53	-10646.24	-18129.44	-209.80
1.2 Dead+1.0 Wind 90 deg - No Ice	170.52	140.24	0.44	41.39	-20988.60	-275.41
0.9 Dead+1.0 Wind 90 deg - No Ice	127.89	140.24	0.44	62.41	-20980.35	-275.41
1.2 Dead+1.0 Wind 120 deg - No Ice	170.52	122.94	72.49	11056.49	-18772.87	-160.79
0.9 Dead+1.0 Wind 120 deg - No Ice	127.89	122.94	72.49	11077.51	-18764.61	-160.79
1.2 Dead+1.0 Wind 150 deg - No Ice	170.52	67.22	118.04	18397.09	-10531.68	-24.61
0.9 Dead+1.0 Wind 150 deg - No Ice	127.89	67.22	118.04	18418.11	-10523.42	-24.61
1.2 Dead+1.0 Wind 180 deg - No Ice	170.52	-0.47	138.69	21428.97	73.33	33.87
0.9 Dead+1.0 Wind 180 deg - No Ice	127.89	-0.47	138.69	21449.99	81.58	33.87
1.2 Dead+1.0 Wind 210 deg - No Ice	170.52	-73.65	126.59	19215.04	11266.84	113.84
0.9 Dead+1.0 Wind 210 deg - No Ice	127.89	-73.65	126.59	19236.06	11275.10	113.84
1.2 Dead+1.0 Wind 240 deg - No Ice	170.52	-131.01	75.99	11463.29	19835.97	225.59
0.9 Dead+1.0 Wind 240 deg - No Ice	127.89	-131.01	75.99	11484.31	19844.22	225.59
1.2 Dead+1.0 Wind 270 deg - No Ice	170.52	-143.03	1.17	173.55	21505.85	293.48
0.9 Dead+1.0 Wind 270 deg - No Ice	127.89	-143.03	1.17	194.57	21514.11	293.48
1.2 Dead+1.0 Wind 300 deg - No Ice	170.52	-116.97	-66.79	-10293.43	17890.57	176.14
0.9 Dead+1.0 Wind 300 deg - No Ice	127.89	-116.97	-66.79	-10272.41	17898.82	176.14
1.2 Dead+1.0 Wind 330 deg - No Ice	170.52	-67.15	-116.55	-18318.13	10468.27	37.65

Load Combination	*Vertical* *K*	*Shear$_x$* *K*	*Shear$_z$* *K*	*Overturning Moment, M$_x$* *kip-ft*	*Overturning Moment, M$_z$* *kip-ft*	*Torque* *kip-ft*
0.9 Dead+1.0 Wind 330 deg - No Ice	127.89	-67.15	-116.55	-18297.11	10476.52	37.65
1.2 Dead+1.0 Ice+1.0 Temp	443.89	0.00	0.00	-422.62	51.91	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	443.89	0.05	-36.16	-6015.01	59.40	-24.18
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	443.89	18.08	-31.52	-5236.43	-2691.10	-39.44
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	443.89	31.22	-18.21	-3168.07	-4649.38	-59.26
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	443.89	35.56	0.02	-407.58	-5327.23	-61.98
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	443.89	30.64	18.09	2362.71	-4644.71	-32.07
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	443.89	17.24	30.41	4309.84	-2630.63	6.02
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	443.89	-0.08	35.46	5071.94	65.30	26.89
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	443.89	-18.23	31.76	4434.22	2848.65	40.51
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	443.89	-32.34	18.99	2452.58	4951.67	60.62
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	443.89	-35.92	0.18	-388.66	5507.92	64.02
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	443.89	-30.03	-17.29	-3085.47	4671.46	34.74
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	443.89	-17.29	-30.09	-5108.14	2741.95	-2.84
Dead+Wind 0 deg - Service	142.10	-0.03	-26.83	-4218.24	-10.17	-2.92
Dead+Wind 30 deg - Service	142.10	13.17	-23.09	-3574.75	-2013.28	-18.24
Dead+Wind 60 deg - Service	142.10	22.19	-12.95	-2013.92	-3352.86	-38.53
Dead+Wind 90 deg - Service	142.10	25.76	0.08	-47.02	-3876.49	-50.59
Dead+Wind 120 deg - Service	142.10	22.58	13.31	1976.16	-3469.52	-29.53
Dead+Wind 150 deg - Service	142.10	12.35	21.68	3324.43	-1955.83	-4.52
Dead+Wind 180 deg - Service	142.10	-0.09	25.47	3881.31	-7.97	6.22
Dead+Wind 210 deg - Service	142.10	-13.53	23.25	3474.67	2047.98	20.91
Dead+Wind 240 deg - Service	142.10	-24.06	13.96	2050.88	3621.90	41.43
Dead+Wind 270 deg - Service	142.10	-26.27	0.21	-22.75	3928.61	53.90
Dead+Wind 300 deg - Service	142.10	-21.48	-12.27	-1945.25	3264.58	32.35
Dead+Wind 330 deg - Service	142.10	-12.33	-21.41	-3419.18	1901.30	6.92

Solution Summary

	Sum of Applied Forces			*Sum of Reactions*			
Load Comb.	*PX* *K*	*PY* *K*	*PZ* *K*	*PX* *K*	*PY* *K*	*PZ* *K*	*% Error*
1	0.00	-142.10	0.00	0.00	142.10	-0.00	0.000%
2	-0.17	-170.52	-146.06	0.17	170.52	146.06	0.000%
3	-0.17	-127.89	-146.06	0.17	127.89	146.06	0.000%
4	71.71	-170.52	-125.71	-71.71	170.52	125.71	0.000%
5	71.71	-127.89	-125.71	-71.71	127.89	125.71	0.000%
6	120.82	-170.52	-70.53	-120.82	170.52	70.53	0.000%
7	120.82	-127.89	-70.53	-120.82	127.89	70.53	0.000%
8	140.24	-170.52	0.44	-140.24	170.52	-0.44	0.000%
9	140.24	-127.89	0.44	-140.24	127.89	-0.44	0.000%
10	122.94	-170.52	72.49	-122.94	170.52	-72.49	0.000%
11	122.94	-127.89	72.49	-122.94	127.89	-72.49	0.000%
12	67.22	-170.52	118.04	-67.22	170.52	-118.04	0.000%
13	67.22	-127.89	118.04	-67.22	127.89	-118.04	0.000%

	Sum of Applied Forces			*Sum of Reactions*			
Load Comb.	*PX K*	*PY K*	*PZ K*	*PX K*	*PY K*	*PZ K*	*% Error*
14	-0.47	-170.52	138.69	0.47	170.52	-138.69	0.000%
15	-0.47	-127.89	138.69	0.47	127.89	-138.69	0.000%
16	-73.65	-170.52	126.59	73.65	170.52	-126.59	0.000%
17	-73.65	-127.89	126.59	73.65	127.89	-126.59	0.000%
18	-131.01	-170.52	75.99	131.01	170.52	-75.99	0.000%
19	-131.01	-127.89	75.99	131.01	127.89	-75.99	0.000%
20	-143.03	-170.52	1.17	143.03	170.52	-1.17	0.000%
21	-143.03	-127.89	1.17	143.03	127.89	-1.17	0.000%
22	-116.97	-170.52	-66.79	116.97	170.52	66.79	0.000%
23	-116.97	-127.89	-66.79	116.97	127.89	66.79	0.000%
24	-67.15	-170.52	-116.55	67.15	170.52	116.55	0.000%
25	-67.15	-127.89	-116.55	67.15	127.89	116.55	0.000%
26	0.00	-443.89	0.00	-0.00	443.89	-0.00	0.000%
27	0.05	-443.89	-36.16	-0.05	443.89	36.16	0.000%
28	18.08	-443.89	-31.52	-18.08	443.89	31.52	0.000%
29	31.22	-443.89	-18.21	-31.22	443.89	18.21	0.000%
30	35.56	-443.89	0.02	-35.56	443.89	-0.02	0.000%
31	30.64	-443.89	18.09	-30.64	443.89	-18.09	0.000%
32	17.24	-443.89	30.41	-17.24	443.89	-30.41	0.000%
33	-0.08	-443.89	35.46	0.08	443.89	-35.46	0.000%
34	-18.23	-443.89	31.76	18.23	443.89	-31.76	0.000%
35	-32.34	-443.89	18.99	32.34	443.89	-18.99	0.000%
36	-35.92	-443.89	0.18	35.92	443.89	-0.18	0.000%
37	-30.03	-443.89	-17.29	30.03	443.89	17.29	0.000%
38	-17.29	-443.89	-30.09	17.29	443.89	30.09	0.000%
39	-0.03	-142.10	-26.83	0.03	142.10	26.83	0.000%
40	13.17	-142.10	-23.09	-13.17	142.10	23.09	0.000%
41	22.19	-142.10	-12.95	-22.19	142.10	12.95	0.000%
42	25.76	-142.10	0.08	-25.76	142.10	-0.08	0.000%
43	22.58	-142.10	13.31	-22.58	142.10	-13.31	0.000%
44	12.35	-142.10	21.68	-12.35	142.10	-21.68	0.000%
45	-0.09	-142.10	25.47	0.09	142.10	-25.47	0.000%
46	-13.53	-142.10	23.25	13.53	142.10	-23.25	0.000%
47	-24.06	-142.10	13.96	24.06	142.10	-13.96	0.000%
48	-26.27	-142.10	0.21	26.27	142.10	-0.21	0.000%
49	-21.48	-142.10	-12.27	21.48	142.10	12.27	0.000%
50	-12.33	-142.10	-21.41	12.33	142.10	21.41	0.000%

Maximum Tower Deflections - Service Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*
T1	280 - 260	3.619	39	0.1103	0.0205
T2	260 - 240	3.152	39	0.1090	0.0203
T3	240 - 220	2.695	39	0.1031	0.0193
T4	220 - 210	2.267	39	0.0921	0.0175
T5	210 - 200	2.068	39	0.0883	0.0160
T6	200 - 180	1.875	39	0.0838	0.0150
T7	180 - 160	1.521	39	0.0752	0.0132
T8	160 - 140	1.207	39	0.0667	0.0111
T9	140 - 120	0.929	39	0.0568	0.0091
T10	120 - 100	0.696	39	0.0475	0.0078
T11	100 - 80	0.499	39	0.0391	0.0064
T12	80 - 60	0.334	39	0.0314	0.0051
T13	60 - 40	0.203	47	0.0231	0.0038
T14	40 - 20	0.106	47	0.0157	0.0025
T15	20 - 0	0.034	47	0.0080	0.0013

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
280.00	Flash Beacon Lighting	39	3.619	0.1103	0.0205	Inf
279.00	ANT150F6	39	3.595	0.1103	0.0205	Inf
276.00	PAL8-59	39	3.525	0.1102	0.0205	Inf
266.00	PAL8-59	39	3.292	0.1097	0.0205	Inf
260.00	Side Arm Mount [SO 308-1]	39	3.152	0.1090	0.0203	680541
258.00	Side Arm Mount [SO 308-1]	39	3.106	0.1087	0.0203	546140
255.00	Side Arm Mount [SO 308-1]	39	3.036	0.1081	0.0201	390899
252.00	PADX6-59A	39	2.967	0.1075	0.0200	300477
240.00	Side Arm Mount [SO 308-1]	39	2.695	0.1031	0.0193	157773
235.00	Side Arm Mount [SO 307-1]	39	2.585	0.1004	0.0190	137447
230.00	PAL8-59	39	2.476	0.0975	0.0186	122795
220.00	PAL8-59	39	2.267	0.0921	0.0175	110608
216.00	Side Arm Mount [SO 308-1]	39	2.187	0.0905	0.0169	152888
205.50	PAD10-59AC	39	1.980	0.0864	0.0155	166878
204.00	Side Arm Mount [SO 305-1]	39	1.951	0.0857	0.0153	133981
202.00	USF-4U [4' SO 203-1 + Vert. Pipe Support]	39	1.913	0.0848	0.0151	108306
200.00	Side Arm Mount [SO 308-1]	39	1.875	0.0838	0.0150	95831
197.00	PAL6	39	1.818	0.0825	0.0147	92833
195.00	PAD10-59AC	39	1.782	0.0816	0.0145	95739
177.00	USF-4U [4' SO 203-1 + Vert. Pipe Support]	39	1.472	0.0740	0.0129	134447
175.00	Side Arm Mount [SO 308-1]	39	1.439	0.0731	0.0127	135708
168.00	Side Arm Mount [SO 311-1]	39	1.328	0.0702	0.0120	139710
163.00	PA6-65AC	39	1.252	0.0681	0.0114	142488
153.50	Sector Mount [SM 502-3]	39	1.112	0.0636	0.0104	123641
145.00	Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	39	0.994	0.0593	0.0096	103952
140.00	Beacon side markers	39	0.929	0.0568	0.0091	97795
128.00	Side Arm Mount [SO 311-1]	39	0.784	0.0511	0.0083	118652
126.00	PRF-950	39	0.761	0.0502	0.0082	123775
125.00	Side Arm Mount [SO 308-1]	39	0.750	0.0498	0.0081	126506
124.00	Side Arm Mount [SO 308-1]	39	0.739	0.0493	0.0081	129343
123.00	SBX4-W60AC	39	0.728	0.0489	0.0080	132202
117.00	Grid	39	0.664	0.0462	0.0076	143274
116.00	ANT400D	39	0.654	0.0458	0.0075	143844
104.00	PA6-65AC	39	0.536	0.0407	0.0067	149125
95.00	Side Arm Mount [SO 311-1]	39	0.455	0.0371	0.0061	150603
55.00	Side Arm Mount [SO 311-1]	47	0.176	0.0212	0.0035	146720
50.00	Side Arm Mount [SO 311-1]	47	0.151	0.0194	0.0032	174390

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	280 - 260	19.301	2	0.5833	0.1118
T2	260 - 240	16.833	2	0.5770	0.1106
T3	240 - 220	14.408	2	0.5466	0.1051
T4	220 - 210	12.136	2	0.4893	0.0952
T5	210 - 200	11.076	2	0.4697	0.0870
T6	200 - 180	10.043	2	0.4461	0.0815
T7	180 - 160	8.171	19	0.4005	0.0717
T8	160 - 140	6.506	19	0.3559	0.0605
T9	140 - 120	5.025	19	0.3034	0.0497
T10	120 - 100	3.778	19	0.2543	0.0425
T11	100 - 80	2.720	19	0.2094	0.0350
T12	80 - 60	1.829	19	0.1687	0.0277
T13	60 - 40	1.114	19	0.1246	0.0208
T14	40 - 20	0.578	19	0.0850	0.0138
T15	20 - 0	0.184	19	0.0431	0.0068

Critical Deflections and Radius of Curvature - Design Wind

Elevation *ft*	*Appurtenance*	*Gov. Load Comb.*	*Deflection* *in*	*Tilt* *°*	*Twist* *°*	*Radius of Curvature* *ft*
280.00	Flash Beacon Lighting	2	19.301	0.5833	0.1118	771584
279.00	ANT150F6	2	19.177	0.5832	0.1118	771584
276.00	PAL8-59	2	18.807	0.5828	0.1118	771584
266.00	PAL8-59	2	17.572	0.5803	0.1114	275565
260.00	Side Arm Mount [SO 308-1]	2	16.833	0.5770	0.1106	164312
258.00	Side Arm Mount [SO 308-1]	2	16.587	0.5755	0.1103	123158
255.00	Side Arm Mount [SO 308-1]	2	16.219	0.5726	0.1096	81833
252.00	PADX6-59A	2	15.853	0.5691	0.1089	60482
240.00	Side Arm Mount [SO 308-1]	2	14.408	0.5466	0.1051	30049
235.00	Side Arm Mount [SO 307-1]	2	13.822	0.5326	0.1033	26375
230.00	PAL8-59	2	13.247	0.5173	0.1012	23788
220.00	PAL8-59	2	12.136	0.4893	0.0952	21708
216.00	Side Arm Mount [SO 308-1]	2	11.708	0.4811	0.0919	30037
205.50	PAD10-59AC	2	10.606	0.4596	0.0842	31295
204.00	Side Arm Mount [SO 305-1]	2	10.451	0.4560	0.0834	25293
202.00	USF-4U [4' SO 203-1 + Vert. Pipe Support]	2	10.246	0.4511	0.0824	20408
200.00	Side Arm Mount [SO 308-1]	2	10.043	0.4461	0.0815	18046
197.00	PAL6	2	9.745	0.4389	0.0800	17496
195.00	PAD10-59AC	2	9.549	0.4341	0.0791	18066
177.00	USF-4U [4' SO 203-1 + Vert. Pipe Support]	19	7.910	0.3941	0.0701	25693
175.00	Side Arm Mount [SO 308-1]	19	7.739	0.3898	0.0690	25906
168.00	Side Arm Mount [SO 311-1]	19	7.151	0.3745	0.0651	26559
163.00	PA6-65AC	19	6.745	0.3631	0.0623	27003
153.50	Sector Mount [SM 502-3]	19	6.002	0.3393	0.0567	23328
145.00	Site Pro 1 VFA12-HD 12' Heavy Duty V-Frame	19	5.375	0.3166	0.0521	19568
140.00	Beacon side markers	19	5.025	0.3034	0.0497	18392
128.00	Side Arm Mount [SO 311-1]	19	4.251	0.2733	0.0452	22290
126.00	PRF-950	19	4.130	0.2685	0.0445	23248
125.00	Side Arm Mount [SO 308-1]	19	4.070	0.2661	0.0442	23758
124.00	Side Arm Mount [SO 308-1]	19	4.010	0.2638	0.0439	24288
123.00	SBX4-W60AC	19	3.951	0.2614	0.0435	24822
117.00	Grid	19	3.608	0.2473	0.0414	26905
116.00	ANT400D	19	3.552	0.2450	0.0411	27016
104.00	PA6-65AC	19	2.918	0.2179	0.0365	28072
95.00	Side Arm Mount [SO 311-1]	19	2.481	0.1992	0.0331	28297
55.00	Side Arm Mount [SO 311-1]	19	0.966	0.1143	0.0190	27446
50.00	Side Arm Mount [SO 311-1]	19	0.828	0.1045	0.0173	32611

Bolt Design Data

Section No.	*Elevation* *ft*	*Component Type*	*Bolt Grade*	*Bolt Size* *in*	*Number Of Bolts*	*Maximum Load per Bolt* *K*	*Allowable Load per Bolt* *K*	*Ratio Load / Allowable*	*Allowable Ratio*	*Criteria*
T1	280	Leg	A325N	1.0000	6	1.04	54.52	0.019	1.05	Bolt Tension
		Diagonal	A325N	1.0000	1	5.34	19.47	0.274	1.05	Member Block Shear
		Secondary Horizontal	A325N	0.5000	1	1.83	8.84	0.207	1.05	Bolt Shear
		Top Girt	A325N	1.0000	1	0.30	26.27	0.011	1.05	Member Block Shear
T2	260	Leg	A325N	1.0000	6	4.42	54.52	0.081	1.05	Bolt Tension
		Diagonal	A325N	1.0000	1	7.12	19.47	0.366	1.05	Member Block Shear
T3	240	Leg	A325N	1.0000	6	8.74	54.52	0.160	1.05	Bolt Tension
		Diagonal	A325N	1.0000	1	11.12	23.73	0.469	1.05	Member Block Shear
		Top Girt	A325N	1.0000	1	2.24	35.34	0.063	1.05	Bolt Shear
		Mid Girt	A325N	1.0000	1	2.73	35.34	0.077	1.05	Bolt Shear

Section No.	*Elevation ft*	*Component Type*	*Bolt Grade*	*Bolt Size in*	*Number Of Bolts*	*Maximum Load per Bolt K*	*Allowable Load per Bolt K*	*Ratio Load / Allowable*	*Allowable Ratio*	*Criteria*
T4	220	Diagonal	A325N	1.0000	1	13.36	16.27	0.821	1.05	Member Block Shear
T5	210	Leg	A325N	1.0000	6	14.64	54.52	0.269	1.05	Bolt Tension
		Diagonal	A325N	1.0000	1	13.41	16.27	0.824	1.05	Member Block Shear
		Secondary Horizontal	A325N	0.5000	1	1.97	8.84	0.223	1.05	Bolt Shear
T6	200	Leg	A325N	1.0000	12	9.85	54.52	0.181	1.05	Bolt Tension
		Diagonal	A325N	0.8750	1	21.15	29.58	0.715	1.05	Member Bearing
T7	180	Leg	A325N	1.0000	12	13.63	54.52	0.250	1.05	Bolt Tension
		Diagonal	A325N	0.8750	1	23.23	29.58	0.785	1.05	Member Bearing
T8	160	Leg	A325N	1.0000	12	17.30	54.52	0.317	1.05	Bolt Tension
		Diagonal	A325N	0.8750	1	26.36	29.58	0.891	1.05	Member Bearing
T9	140	Leg	A325N	1.0000	12	21.42	54.52	0.393	1.05	Bolt Tension
		Diagonal	A325N	0.8750	1	30.61	44.37	0.690	1.05	Member Bearing
T10	120	Leg	A325N	1.0000	12	25.74	54.52	0.472	1.05	Bolt Tension
		Diagonal	A325N	0.8750	2	15.96	40.17	0.397	1.05	Member Block Shear
T11	100	Leg	A325N	1.2500	12	30.04	87.22	0.344	1.05	Bolt Tension
		Diagonal	A325N	0.8750	2	16.59	40.17	0.413	1.05	Member Block Shear
T12	80	Leg	A325N	1.2500	12	34.25	87.22	0.393	1.05	Bolt Tension
		Diagonal	A325N	0.8750	2	17.11	40.27	0.425	1.05	Member Block Shear
T13	60	Leg	A325N	1.2500	12	38.34	87.22	0.440	1.05	Bolt Tension
		Diagonal	A325N	0.8750	2	17.59	40.27	0.437	1.05	Member Block Shear
T14	40	Leg	A325N	1.2500	12	42.41	87.22	0.486	1.05	Bolt Tension
		Diagonal	A325N	0.8750	2	17.93	40.27	0.445	1.05	Member Block Shear
T15	20	Diagonal	A325N	0.8750	2	18.25	40.27	0.453	1.05	Member Block Shear

Compression Checks

Leg Design Data (Compression)

Section No.	*Elevation ft*	*Size*	*L ft*	*L_u ft*	*Kl/r*	*A in^2*	*P_u K*	*ϕP_n K*	*Ratio $\frac{P_u}{\phi P_n}$*
T1	280 - 260	BV_Valmont 207628	20.03	5.19	44.8 K=1.00	3.6816	-11.87	143.06	0.083[1]
T2	260 - 240	BV_Valmont 207628	20.03	10.02	44.8 K=1.00	3.6816	-37.23	143.06	0.260[1]
T3	240 - 220	BV_Valmont 207628	20.03	10.02	44.8 K=1.00	3.6816	-71.00	143.06	0.496[1]
T4	220 - 210	BV_Valmont 195557	10.02	10.02	31.9 K=1.00	7.2158	-92.24	301.49	0.306[1]
T5	210 - 200	BV_Valmont 195557	10.02	5.14	31.9 K=1.00	7.2158	-113.41	301.49	0.376[1]
T6	200 - 180	BV_Valmont 211843	20.03	20.03	48.8 K=1.00	9.4248	-149.77	356.29	0.420[1]
T7	180 - 160	BV_Valmont 208334	20.03	20.03	48.8 K=1.00	11.9282	-204.19	451.15	0.453[1]
T8	160 - 140	BV_Valmont 208334	20.03	20.03	48.8 K=1.00	11.9282	-257.75	451.15	0.571[1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T9	140 - 120	BV_Valmont 208335	20.03	20.03	48.7 K=1.00	14.7262	-318.06	557.27	0.571 [1]
T10	120 - 100	Valmont 238706	20.03	20.03	48.6 K=1.00	17.8187	-379.92	674.68	0.563 [1]
T11	100 - 80	Valmont 238707	20.03	20.03	48.5 K=1.00	21.2057	-441.90	803.44	0.550 [1]
T12	80 - 60	Valmont 238708	20.03	20.03	48.5 K=1.00	21.2057	-503.58	803.44	0.627 [1]
T13	60 - 40	Valmont 238709	20.03	20.03	48.4 K=1.00	24.8873	-564.86	943.57	0.599 [1]
T14	40 - 20	Valmont 238709	20.03	20.03	48.4 K=1.00	24.8873	-628.95	943.57	0.667 [1]
T15	20 - 0	Valmont 238709	20.03	20.03	48.4 K=1.00	24.8873	-687.91	943.57	0.729 [1]

[1] P_u / ϕP_n controls

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	ϕP_n K	A in^2	V_u K	ϕV_n K	Stress Ratio
T1	280 - 260	0.5	1.47	120.0	165.67	0.1963	1.66	3.36	0.495
T2	260 - 240	0.5	1.47	120.0	165.67	0.1963	0.93	3.36	0.275
T3	240 - 220	0.5	1.47	120.0	165.67	0.1963	0.89	3.36	0.265
T4	220 - 210	0.5	1.44	117.6	324.71	0.1963	1.45	3.47	0.417
T5	210 - 200	0.5	1.44	117.6	324.71	0.1963	1.61	3.47	0.465
T6	200 - 180	0.5	1.39	113.2	424.12	0.1963	2.05	3.76	0.544
T7	180 - 160	0.5	1.35	110.5	536.77	0.1963	1.49	3.93	0.380
T8	160 - 140	0.5	1.35	110.5	536.77	0.1963	2.66	3.93	0.677
T9	140 - 120	0.5	1.36	111.2	662.68	0.1963	1.02	3.85	0.266
T10	120 - 100	0.625	1.35	88.2	801.84	0.3068	0.98	7.66	0.127
T11	100 - 80	0.625	1.37	89.4	954.26	0.3068	0.71	8.77	0.081
T12	80 - 60	0.625	1.37	89.4	954.26	0.3068	0.86	8.77	0.099
T13	60 - 40	0.625	1.36	88.7	1119.93	0.3068	1.17	8.86	0.132
T14	40 - 20	0.625	1.36	88.7	1119.93	0.3068	1.31	8.86	0.148
T15	20 - 0	0.625	1.36	88.7	1119.93	0.3068	1.07	8.86	0.121

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	280 - 260	L3x3x5/16	16.80	7.88	160.6 K=1.00	1.7800	-5.66	19.76	0.287 [1]
T2	260 - 240	L3x3x5/16	18.45	8.72	177.6 K=1.00	1.7800	-7.34	16.15	0.455 [1]
T3	240 - 220	L4x4x1/4	20.16	9.58	144.6 K=1.00	1.9400	-11.46	26.54	0.432 [1]
T4	220 - 210	L4x4x1/4	21.03	10.07	151.9 K=1.00	1.9400	-13.35	24.06	0.555 [1]
T5	210 - 200	L4x4x1/4	21.92	10.51	158.7 K=1.00	1.9400	-13.72	22.06	0.622 [1]
T6	200 - 180	2L3 1/2x3 1/2x1/4x3/8	29.01	14.35	158.0 K=1.00	3.3800	-21.72	38.75	0.560 [1]
T7	180 - 160	2L3 1/2x3 1/2x1/4x3/8	30.49	15.09	166.1 K=1.00	3.3800	-23.07	35.05	0.658 [1]
T8	160 - 140	2L4x4x1/4x3/8	32.02	15.86	152.3 K=1.00	3.8800	-27.06	47.91	0.565 [1]
T9	140 - 120	2L4x4x3/8x3/8	33.61	16.65	162.5 K=1.00	5.7200	-30.80	62.03	0.497 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T10	120 - 100	2L4x4x3/8x3/8	35.23	17.36	157.6 K=0.93	5.7200	-32.06	65.89	0.486[1]
T11	100 - 80	2L4x4x3/8x3/8	36.90	18.19	163.8 K=0.92	5.7200	-33.59	61.01	0.550[1]
T12	80 - 60	2L5x5x5/16x3/8	38.59	19.04	139.5 K=0.96	6.0500	-34.34	89.02	0.386[1]
T13	60 - 40	2L5x5x5/16x3/8	40.32	19.90	144.5 K=0.95	6.0500	-35.75	82.95	0.431[1]
T14	40 - 20	2L5x5x5/16x3/8	42.06	20.77	149.6 K=0.94	6.0500	-35.70	77.40	0.461[1]
T15	20 - 0	2L5x5x5/16x3/8	43.83	21.66	154.7 K=0.93	6.0500	-37.53	72.33	0.519[1]

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	280 - 260	L3x3x5/16	12.48	11.23	146.2 K=1.00	1.7800	-1.83	23.85	0.077[1]
T5	210 - 200	L3x3x5/16	19.49	18.24	237.4 K=1.00	1.7800	-1.97	9.04	0.218[1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	280 - 260	L3 1/2x3 1/2x5/16	12.00	10.58	184.1 K=1.00	2.0900	-0.37	17.66	0.021[1]
T3	240 - 220	L5x5x3/8	16.00	14.58	176.8 K=1.00	3.6100	-1.49	33.07	0.045[1]

[1] P_u / ϕP_n controls

Mid Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T3	240 - 220	L5x5x3/8	17.00	15.58	188.9 K=1.00	3.6100	-1.92	28.96	0.066[1]

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	*Elevation* ft	*Size*	*L* ft	*L_u* ft	*Kl/r*	*A* in^2	*P_u* K	*ϕP_n* K	*Ratio* $\frac{P_u}{\phi P_n}$
T1	280 - 260	BV_Valmont 207628	20.03	4.82	44.8	3.6816	6.72	165.67	0.041 [1]
T2	260 - 240	BV_Valmont 207628	20.03	10.02	44.8	3.6816	26.55	165.67	0.160 [1]
T3	240 - 220	BV_Valmont 207628	20.03	10.02	44.8	3.6816	52.45	165.67	0.317 [1]
T4	220 - 210	BV_Valmont 195557	10.02	10.02	31.9	7.2158	70.18	324.71	0.216 [1]
T5	210 - 200	BV_Valmont 195557	10.02	4.88	31.9	7.2158	88.08	324.71	0.271 [1]
T6	200 - 180	BV_Valmont 211843	20.03	20.03	48.8	9.4248	118.22	424.12	0.279 [1]
T7	180 - 160	BV_Valmont 208334	20.03	20.03	48.8	11.9282	163.60	536.77	0.305 [1]
T8	160 - 140	BV_Valmont 208334	20.03	20.03	48.8	11.9282	207.56	536.77	0.387 [1]
T9	140 - 120	BV_Valmont 208335	20.03	20.03	48.7	14.7262	257.00	662.68	0.388 [1]
T10	120 - 100	Valmont 238706	20.03	20.03	48.6	17.8187	308.87	801.84	0.385 [1]
T11	100 - 80	Valmont 238707	20.03	20.03	48.5	21.2057	360.49	954.26	0.378 [1]
T12	80 - 60	Valmont 238708	20.03	20.03	48.5	21.2057	410.97	954.26	0.431 [1]
T13	60 - 40	Valmont 238709	20.03	20.03	48.4	24.8873	460.08	1119.93	0.411 [1]
T14	40 - 20	Valmont 238709	20.03	20.03	48.4	24.8873	508.92	1119.93	0.454 [1]
T15	20 - 0	Valmont 238709	20.03	20.03	48.4	24.8873	554.03	1119.93	0.495 [1]

[1] P_u / ϕP_n controls

Truss-Leg Diagonal Data

Section No.	*Elevation* ft	*Diagonal Size*	*L_d* ft	*Kl/r*	*ϕP_n* K	*A* in^2	*V_u* K	*ϕV_n* K	*Stress Ratio*
T1	280 - 260	0.5	1.47	120.0	165.67	0.1963	1.66	3.36	0.495
T2	260 - 240	0.5	1.47	120.0	165.67	0.1963	0.93	3.36	0.275
T3	240 - 220	0.5	1.47	120.0	165.67	0.1963	0.89	3.36	0.265
T4	220 - 210	0.5	1.44	117.6	324.71	0.1963	1.45	3.47	0.417
T5	210 - 200	0.5	1.44	117.6	324.71	0.1963	1.61	3.47	0.465
T6	200 - 180	0.5	1.39	113.2	424.12	0.1963	2.05	3.76	0.544
T7	180 - 160	0.5	1.35	110.5	536.77	0.1963	1.49	3.93	0.380
T8	160 - 140	0.5	1.35	110.5	536.77	0.1963	2.66	3.93	0.677
T9	140 - 120	0.5	1.36	111.2	662.68	0.1963	1.02	3.85	0.266
T10	120 - 100	0.625	1.35	88.2	801.84	0.3068	0.98	7.66	0.127
T11	100 - 80	0.625	1.37	89.4	954.26	0.3068	0.71	8.77	0.081
T12	80 - 60	0.625	1.37	89.4	954.26	0.3068	0.86	8.77	0.099
T13	60 - 40	0.625	1.36	88.7	1119.93	0.3068	1.17	8.86	0.132
T14	40 - 20	0.625	1.36	88.7	1119.93	0.3068	1.31	8.86	0.148
T15	20 - 0	0.625	1.36	88.7	1119.93	0.3068	1.07	8.86	0.121

Diagonal Design Data (Tension)

Section No.	*Elevation* ft	*Size*	*L* ft	*L_u* ft	*Kl/r*	*A* in^2	*P_u* K	*ϕP_n* K	*Ratio* $\frac{P_u}{\phi P_n}$
T1	280 - 260	L3x3x5/16	16.80	7.88	105.3	1.0713	5.34	46.60	0.114 [1]
T2	260 - 240	L3x3x5/16	18.45	8.72	116.2	1.0713	7.12	46.60	0.153 [1]
T3	240 - 220	L4x4x1/4	20.16	9.58	94.0	1.2441	11.12	54.12	0.206 [1]
T4	220 - 210	L4x4x1/4	21.03	10.07	98.2	1.2441	13.36	54.12	0.247 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T5	210 - 200	L4x4x1/4	21.92	10.51	102.5	1.2441	13.41	54.12	0.248[1]
T6	200 - 180	2L3 1/2x3 1/2x1/4x3/8	29.01	14.35	159.7	2.1600	21.15	93.96	0.225[1]
T7	180 - 160	2L3 1/2x3 1/2x1/4x3/8	30.49	15.09	167.8	2.1600	23.23	93.96	0.247[1]
T8	160 - 140	2L4x4x1/4x3/8	32.02	15.86	153.7	2.5350	26.36	110.27	0.239[1]
T9	140 - 120	2L4x4x3/8x3/8	33.61	16.65	163.9	3.7275	30.61	162.15	0.189[1]
T10	120 - 100	2L4x4x3/8x3/8	35.23	17.36	171.9	3.7275	31.92	162.15	0.197[1]
T11	100 - 80	2L4x4x3/8x3/8	36.90	18.19	180.0	3.7275	33.19	162.15	0.205[1]
T12	80 - 60	2L5x5x5/16x3/8	38.59	19.04	147.5	4.0687	34.21	176.99	0.193[1]
T13	60 - 40	2L5x5x5/16x3/8	40.32	19.90	154.1	4.0687	35.18	176.99	0.199[1]
T14	40 - 20	2L5x5x5/16x3/8	42.06	20.77	160.8	4.0687	35.86	176.99	0.203[1]
T15	20 - 0	2L5x5x5/16x3/8	43.83	21.66	167.5	4.0687	36.50	176.99	0.206[1]

[1] P_u / ϕP_n controls

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	280 - 260	L3x3x5/16	12.48	11.23	149.4	1.1885	1.63	51.70	0.031[1]
T5	210 - 200	L3x3x5/16	19.49	18.24	240.6	1.1885	1.97	51.70	0.038[1]

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	280 - 260	L3 1/2x3 1/2x5/16	12.00	10.58	122.2	1.3038	0.30	56.72	0.005[1]
T3	240 - 220	L5x5x3/8	16.00	14.58	115.4	2.3911	2.24	104.01	0.022[1]

[1] P_u / ϕP_n controls

Mid Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T3	240 - 220	L5x5x3/8	17.00	15.58	123.1	2.3911	2.73	104.01	0.026[1]

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
T1	280 - 260	Leg	BV_Valmont 207628	1	-4.23	150.21	47.2	Pass
T2	260 - 240	Leg	BV_Valmont 207628	26	-21.90	150.21	26.2	Pass
T3	240 - 220	Leg	BV_Valmont 207628	42	-71.00	150.21	47.3	Pass

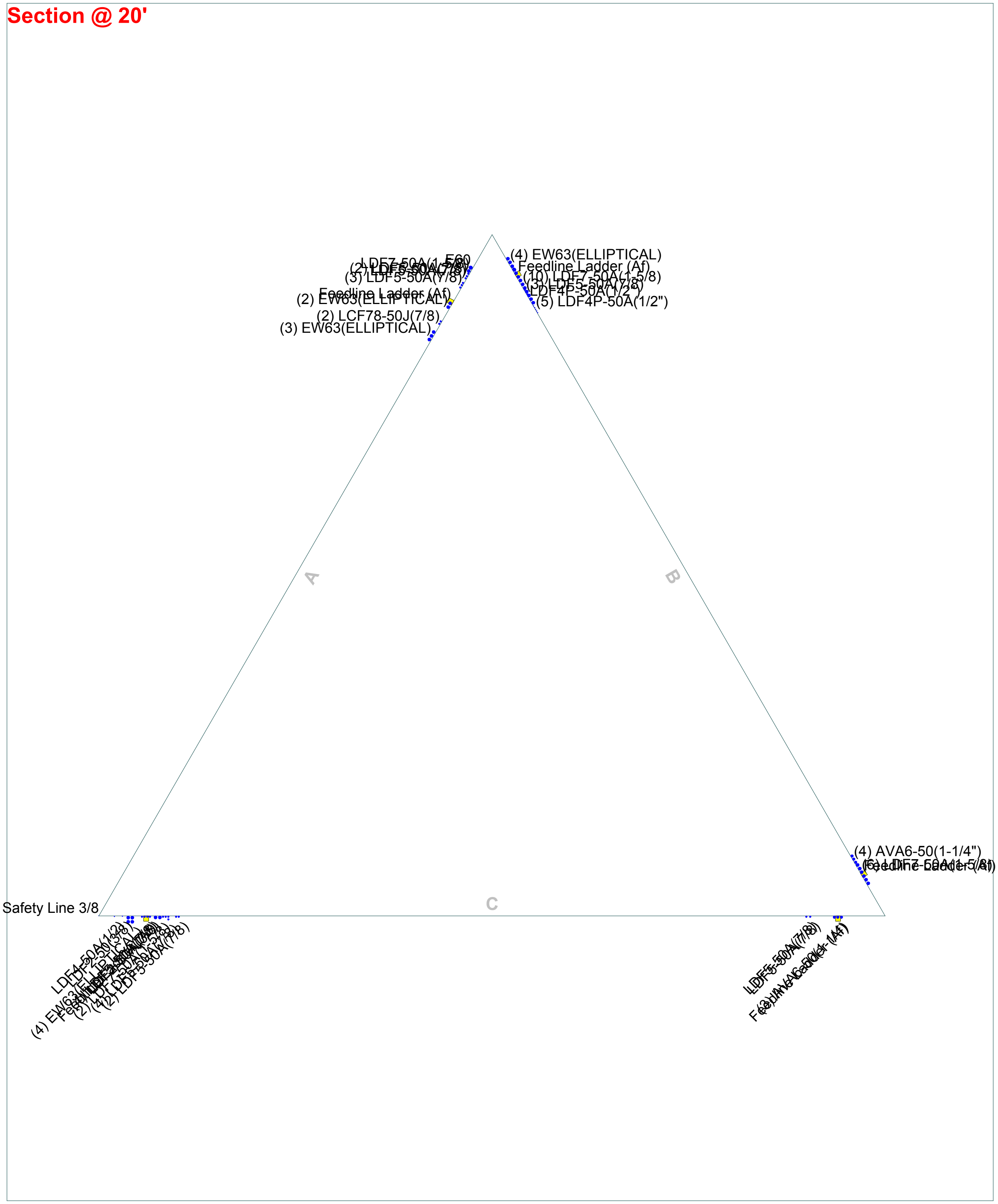
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
T4	220 - 210	Leg	BV_Valmont 195557	63	-92.24	316.56	39.7	Pass
T5	210 - 200	Leg	BV_Valmont 195557	72	-113.41	316.56	44.3	Pass
T6	200 - 180	Leg	BV_Valmont 211843	84	-149.77	374.11	51.8	Pass
T7	180 - 160	Leg	BV_Valmont 208334	93	-204.19	473.71	43.1	Pass
T8	160 - 140	Leg	BV_Valmont 208334	102	-257.75	473.71	64.5	Pass
T9	140 - 120	Leg	BV_Valmont 208335	111	-318.06	585.13	54.4	Pass
T10	120 - 100	Leg	Valmont 238706	120	-379.92	708.42	53.6	Pass
T11	100 - 80	Leg	Valmont 238707	129	-441.90	843.61	52.4	Pass
T12	80 - 60	Leg	Valmont 238708	138	-503.58	843.61	59.7	Pass
T13	60 - 40	Leg	Valmont 238709	145	-564.86	990.75	57.0	Pass
T14	40 - 20	Leg	Valmont 238709	154	-628.95	990.75	63.5	Pass
T15	20 - 0	Leg	Valmont 238709	163	-687.91	990.75	69.4	Pass
T1	280 - 260	Diagonal	L3x3x5/16	12	-5.66	20.74	27.3	Pass
T2	260 - 240	Diagonal	L3x3x5/16	33	-7.34	16.96	43.3	Pass
T3	240 - 220	Diagonal	L4x4x1/4	54	-11.46	27.87	41.1 44.6 (b)	Pass
T4	220 - 210	Diagonal	L4x4x1/4	69	-13.35	25.26	52.9 78.2 (b)	Pass
T5	210 - 200	Diagonal	L4x4x1/4	75	-13.72	23.16	59.2 78.5 (b)	Pass
T6	200 - 180	Diagonal	2L3 1/2x3 1/2x1/4x3/8	90	-21.72	40.69	53.4 68.1 (b)	Pass
T7	180 - 160	Diagonal	2L3 1/2x3 1/2x1/4x3/8	99	-23.07	36.80	62.7 74.8 (b)	Pass
T8	160 - 140	Diagonal	2L4x4x1/4x3/8	108	-27.06	50.30	53.8 84.9 (b)	Pass
T9	140 - 120	Diagonal	2L4x4x3/8x3/8	117	-30.80	65.13	47.3 65.7 (b)	Pass
T10	120 - 100	Diagonal	2L4x4x3/8x3/8	126	-32.06	69.19	46.3	Pass
T11	100 - 80	Diagonal	2L4x4x3/8x3/8	135	-33.59	64.06	52.4	Pass
T12	80 - 60	Diagonal	2L5x5x5/16x3/8	144	-34.34	93.48	36.7 40.5 (b)	Pass
T13	60 - 40	Diagonal	2L5x5x5/16x3/8	153	-35.75	87.09	41.0 41.6 (b)	Pass
T14	40 - 20	Diagonal	2L5x5x5/16x3/8	162	-35.70	81.27	43.9	Pass
T15	20 - 0	Diagonal	2L5x5x5/16x3/8	171	-37.53	75.94	49.4	Pass
T1	280 - 260	Secondary Horizontal	L3x3x5/16	24	-1.83	25.04	7.3 19.7 (b)	Pass
T5	210 - 200	Secondary Horizontal	L3x3x5/16	80	-1.97	9.49	20.7 21.2 (b)	Pass
T1	280 - 260	Top Girt	L3 1/2x3 1/2x5/16	6	-0.37	18.54	2.0	Pass
T3	240 - 220	Top Girt	L5x5x3/8	43	-1.49	34.72	4.3 6.0 (b)	Pass
T3	240 - 220	Mid Girt	L5x5x3/8	46	-1.92	30.41	6.3 7.4 (b)	Pass
							Summary	
						Leg (T15)	69.4	Pass
						Diagonal (T8)	84.9	Pass
						Secondary Horizontal (T5)	21.2	Pass
						Top Girt (T3)	6.0	Pass
						Mid Girt (T3)	7.4	Pass
						Bolt Checks	84.9	Pass
						RATING =	**84.9**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

Feed Line Plan
20'

Round Flat App In Face App Out Face Truss-Leg



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Building a world of difference.

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Phone:
FAX:

Job: **ES-010 GooseHillRS**
Project:
Client: Eversource
Drawn by: TH
App'd:
Code: TIA-222-H
Date: 06/01/20
Scale: NTS
Path: C:\Users\hal92311\OneDrive - Black & Veatch\My Desktop\Structural\Rev H\ES-010 GooseHillRS Structural Analysis.eri
Dwg No. E-7

APPENDIX C

ADDITIONAL CALCULATIONS

▶ References

ANCHOR ROD ANALYSIS

Project Information

Site Name:ES-010 GooseHillRS

TIA Revision: Rev-G [✓ Rev-H]

TIA-222-G 105% Allowable? [✓ No] Yes

Apply TIA-222-H Section 15.5? No [✓ Yes]

Max Leg Reactions

Compression	*Uplift*
$Axial\_C := 718 \cdot kip$	$Axial\_U := 577 \cdot kip$
$Shear\_C := 93 \cdot kip$	$Shear\_U := 77 \cdot kip$

Anchor Rod Data

Diameter of Anchor Rod: $D := 1.25 \cdot in$

Number of Anchor Rods: $N := 12$

Length from top of concrete to bottom of anchor rod leveling nut: $lar := 2.75 \cdot in$

Anchor Rod Grade:

[✓ F1554-105]
A687
A354-BC
A354-BD
A449
A572-42
A572-50
A572-55
A572-60
A572-65
A588-42
A588-46
A588-50
A36M-42
A36M-45
A36M-50
A36M-55
A500-50
A514-GR100
A53-B-35
A53-B-42
A607-60
A607-65
S-128
S-22

Threads in Shear Plane?: [✓ Yes] No

Thread Series: [✓ Coarse] Fine 8-Thread

Consider Base Plate Grout? [✓ Yes] No

Grout Factor η: 0.90 0.70 [✓ 0.55] 0.50

Threads per Inch: $n = 7$ (Thread selection invalid if n = 0)

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

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

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

$$Z := \frac{1}{6} \cdot \left(D - \frac{0.9743 in}{n} \right)^3 = 0.228 \cdot in^3$$

Radius of Gyration:

$$r := \left(\frac{1}{4} \right) \cdot \left(D - \frac{0.9743 in}{n} \right) = 0.278 \cdot in$$

Net Area of Anchor Rod:

$$An := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 in}{n} \right)^2 = 0.969 \cdot in^2$$

TIA-222-G/H Section 4.9.6.1

Nominal Unthreaded Area of Anchor Rod:

$$Ab := \frac{\pi}{4} \cdot (D)^2 = 1.227 \cdot in^2$$

Anchor Rod Design Capacities

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

$$Rnt := Fu \cdot An = 121.139 \cdot kip$$

$$\phi t = 0.75$$

$$\phi Rnt := \phi t \cdot Rnt = 90.854 \cdot kip$$

Design Compression Strength:

$$Rnc := Fy \cdot An = 101.756 \cdot kip$$

$$\phi c = 1$$

$$\phi Rnc := \phi c \cdot Rnc = 101.756 \cdot kip$$

Design Buckling Strength: TIA-222-H Section 4.5.4.2

$$K_0 := 1.2$$

$$Fcr = 102.748 \cdot ksi$$

$$Fe = 2.027 \times 10^3 \cdot ksi$$

$$Rnb := Fcr \cdot An = 99.574 \cdot kip$$

$$\phi c = 1$$

$$\phi Rnb := \phi c \cdot Rnb = 99.574 \cdot kip$$

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

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

$$Rnv = 76.699 \cdot kip$$

TIA-222-H Section 4.9.9

$$Rnvc := 0.6 \cdot Fy \cdot 0.5 \cdot An = 30.527 \cdot kip$$

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

$$\phi Rnv := \phi v \cdot Rnv = 57.524 \cdot kip \qquad \phi Rnvc := \phi c \cdot Rnvc = 30.527 \cdot kip$$

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

$$Rmn := Fy \cdot Z = 23.986 \cdot kip \cdot in$$

$$\phi f = 0.9$$

$$\phi Rmn := \phi f \cdot Rmn = 21.588 \cdot kip \cdot in$$

Anchor Rod Loading Demands

Tension Demand:

$$Put := \frac{Axial\_U}{N} = 48.083 \cdot kip$$

Compression Demand:

$$Puc := \frac{Axial\_C}{N} = 59.833 \cdot kip$$

Shear Demand:

$$Vut := \frac{Shear\_U}{N} = 6.417 \cdot kip$$

$$Vuc := \frac{Shear\_C}{N} = 7.75 \cdot kip$$

Moment Demand:

$$Mut := 0.65 \cdot lar \cdot Vut = 11.47 \cdot kip \cdot in$$

$$Muc := 0.65 \cdot lar \cdot Vuc = 13.853 \cdot kip \cdot in$$

Anchor Rod Interaction Check

TIA-222-G Section 4.9.9

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

$$SR\_g = 0.658$$

Anchor Rod Interaction Check

TIA-222-H Section 4.9.9

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

$$\mathrm{SR\_Pt} = 0.293$$

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

$$\mathrm{SR\_Pc} = 0.652$$

$$\mathrm{SR} := \left| \begin{array}{ll} \mathrm{SR\_g} & \text{if } \mathrm{TIA} = \text{"Rev-G"} \\ \max(\mathrm{SR\_Pt}, \mathrm{SR\_Pc}) & \text{if } \mathrm{TIA} = \text{"Rev-H"} \wedge \mathrm{S15} = \text{"No"} \\ \frac{\max(\mathrm{SR\_Pt}, \mathrm{SR\_Pc})}{1.05} & \text{if } \mathrm{TIA} = \text{"Rev-H"} \wedge \mathrm{S15} = \text{"Yes"} \end{array} \right. = 0.621$$

$$\mathrm{Check}_{\mathrm{SR}} := \left| \begin{array}{ll} \text{"Passing"} & \text{if } \mathrm{SR} \le 1.00 \wedge \mathrm{TIA} = \text{"Rev-G"} \wedge \mathrm{S105} = \text{"Yes"} \\ \text{"Acceptable"} & \text{if } 1.00 < \mathrm{SR} \le 1.05 \wedge \mathrm{TIA} = \text{"Rev-G"} \wedge \mathrm{S105} = \text{"Yes"} \\ \text{"Failing"} & \text{if } \mathrm{SR} > 1.05 \wedge \mathrm{TIA} = \text{"Rev-G"} \wedge \mathrm{S105} = \text{"Yes"} \\ \text{"Passing"} & \text{if } \mathrm{SR} \le 1.00 \wedge \mathrm{TIA} = \text{"Rev-G"} \wedge \mathrm{S105} = \text{"No"} \\ \text{"Failing"} & \text{if } \mathrm{SR} > 1.00 \wedge \mathrm{TIA} = \text{"Rev-G"} \wedge \mathrm{S105} = \text{"No"} \\ \text{"Passing"} & \text{if } \mathrm{SR} \le 1.0 \wedge \mathrm{TIA} = \text{"Rev-H"} \\ \text{"Failing"} & \text{if } \mathrm{SR} > 1.0 \wedge \mathrm{TIA} = \text{"Rev-H"} \end{array} \right. = \text{"Passing"}$$

Anchor Rod Results

Axial Tension Demand: $Put = 48.083 \cdot kip$

Axial Tension Capacity: $\phi Rnt = 90.854 \cdot kip$

Axial Compression Demand: $Puc = 59.833 \cdot kip$

Axial Compression Capacity: $\phi Rnc = 101.756 \cdot kip$

Shear Tension Demand: $Vut = 6.417 \cdot kip$

Tension Shear Capacity: $\phi Rnv = 57.524 \cdot kip$

Shear Compression Demand: $Vuc = 7.75 \cdot kip$

Compresison Shear Capacity: $\phi R_{nvc} = 30.527 \cdot kip$

Moment Tension Demand: $M_{ut} = 11.47 \cdot kip \cdot in$

Moment Compression Demand: $M_{uc} = 13.853 \cdot kip \cdot in$

Moment Capacity: $\phi R_{mn} = 21.588 \cdot kip \cdot in$

Governing Stress Ratio

$\boxed{SR = 62.139 \cdot \%}$

$\boxed{Check_{SR} = \text{"Passing"}}$

SST Unit Base Foundation

ES-010
GOOSEHILL RS

TIA-222 Revision: H

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

Superstructure Analysis Reactions

Global Moment, **M**:	22928	ft-kips
Global Axial, **P**:	171	kips
Global Shear, **V**:	151	kips
Leg Compression, $\mathbf{P}_{\mathbf{comp}}$:	718	kips
Leg Comp. Shear, $\mathbf{V}_{\mathbf{u\_comp}}$:	93	kips
Leg Uplift, $\mathbf{P}_{\mathbf{uplift}}$:	577	kips
Leg Uplift. Shear, $\mathbf{V}_{\mathbf{u\_uplift}}$:	77	kips
Tower Height, **H**:	280	ft
Base Face Width, **BW**:	40	ft
BP Dist. Above Fdn, $\mathbf{bp}_{\mathbf{dist}}$:	3	in

Foundation Analysis Checks

	Capacity	Demand	Rating*	Check
Lateral (Sliding) (kips)	472.56	151.00	**30.4%**	**Pass**
Bearing Pressure (ksf)	9.00	1.96	**21.8%**	**Pass**
*Overturning (kip*ft)*	44691.69	24923.80	**55.8%**	**Pass**
*Pier Flexure (Comp.) (kip*ft)*	4336.95	395.25	**8.7%**	**Pass**
*Pier Flexure (Tension) (kip*ft)*	2089.99	327.25	**14.9%**	**Pass**
Pier Compression (kip)	13059.63	736.18	**5.4%**	**Pass**
*Pad Flexure (kip*ft)*	12633.47	1048.27	**7.9%**	**Pass**
Pad Shear - 1-way (kips)	1233.26	196.61	**15.2%**	**Pass**
Pad Shear - Comp 2-way (ksi)	0.190	0.125	**62.7%**	**Pass**
*Flexural 2-way (Comp) (kip*ft)*	4855.73	237.15	**4.7%**	**Pass**
Pad Shear - Tension 2-way (ksi)	0.190	0.111	**55.8%**	**Pass**
*Flexural 2-way (Tension) (kip*ft)*	4855.73	196.35	**3.9%**	**Pass**

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

Soil Rating*:	**55.8%**
Structural Rating*:	**62.7%**

Pier Properties

Pier Shape:	Circular	
Pier Diameter, **dpier**:	5.5	ft
Ext. Above Grade, **E**:	0.50	ft
Pier Rebar Size, **Sc**:	9	
Pier Rebar Quantity, **mc**:	26	
Pier Tie/Spiral Size, **St**:	4	
Pier Tie/Spiral Quantity, **mt**:	8	
Pier Reinforcement Type:	Tie	
Pier Clear Cover, $\mathbf{cc}_{\mathbf{pier}}$:	3	in

Pad Properties

Depth, **D**:	6.00	ft
Pad Width, **W**:	49.50	ft
Pad Thickness, **T**:	2.25	ft
Pad Rebar Size (Bottom), **Sp**:	11	
Pad Rebar Quantity (Bottom), **mp**:	91	
Pad Clear Cover, $\mathbf{cc}_{\mathbf{pad}}$:	3	in

Material Properties

Rebar Grade, **Fy**:	60	ksi
Concrete Compressive Strength, **F'c**:	4	ksi
Dry Concrete Density, δ**c**:	150	pcf

Soil Properties

Total Soil Unit Weight, γ:	125	pcf
Ultimate Gross Bearing, Qult:	12.000	ksf
Cohesion, **Cu**:	0.000	ksf
Friction Angle, φ:	34	degrees
SPT Blow Count, $\mathbf{N}_{\mathbf{blows}}$:	50	
Base Friction, μ:	0.2	
Neglected Depth, **N**:	3.5	ft
Foundation Bearing on Rock?	No	
Groundwater Depth, **gw**:	7	ft

<-- Toggle between Gross and Net

Version 3.2.1

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

PHYSICAL PARAMETERS

Pier Height Above Water Table:	h_{pier_above} = (MIN(gw,D-T) + E)	h_{pier_above} = 4.25	ft
Pier Height Below Water Table:	h_{pier_below} = ((D-T) - MIN(gw,D-T))	h_{pier_below} = 0	ft
Buoyant Weight of Pier:	W_{pier} = (π/4) * (dpier^2) * hpier_above * δc / 1000 + (π/4) * (dpier^2) * hpier_below * (δc-62.4) / 1000	W_{pier} = 15.15	kips
Pad Height Above Water Table:	h_{pad_above} = IF(gw<=D-T,0,IF(gw>D,T,T-(D-gw)))	h_{pad_above} = 2.25	ft
Pad Height Below Water Table:	h_{pad_below} = (T-IF(gw<=D-T,0,IF(gw>D,T,T-(D-gw))))	h_{pad_below} = 0	ft
Buoyant Weight of Pad:	W_{pad} = (W^2) * hpad_above * δc / 1000 + (W^2) * hpad_below * (δc-62.4) / 1000	W_{pad} = 826.96	kips
Concrete weight:	W_c = V * δc	W_c = 872.4	kips
Soil weight:	W_s = (D - T) * (W² - 3*(dpier² / 4 * π)) * γ	W_s = 1115.1	kips
EIA/TIA-222 Load Factor:	LF = 1	LF = 1.00	

LATERAL RESISTANCE

Total Nominal Pp Resistance:	P_{p_total} = Pp_pier *Ap_piers + Pp_pad * Ap_pad	P_{p_total} = 246.67	kips
Factored Total Weight for Compression:	$P_{factored\_comp}$ = φD * (Wc + Ws + P / 1.2)	$P_{factored\_comp}$ = 1917.04	kips
Nominal Base Friction Resistance (Comp):	R_{s_comp} = P * μ	R_{s_comp} = 383.41	kips
Lateral Resistance (Comp):	ΦVn = Φs * (Pp_total + Rs_comp)	ΦVn = 472.56	kips

Check **ΦVn = 472.56 kips >= Vu = 151.00 kips** **RATING: 31.95% OK**

PIER REINFORCEMENT

Pier / Column Compression

Pier Cross-Sectional Area:	A_1 = dpier^2 * π/4	A_1 = 3421.19	in²
Support Area (2H:1V Slope):	A_2 = (MIN((2*(W/2-(2/3)*BW*cos(30°)+Offset)),(W-BW),dpier+4*T))²*(π/4)	A_2 = 10207.03	in²
Compressive Resistance (H/D < 3):	$ΦP_{n1}$ = 0.65*0.85 * F'c * A1 * MIN(√(A2/A1),2)	$ΦP_{n1}$ = 13059.63	kips
Rebar:	$s_{\_pier}$ = 9 $m_{\_pier}$ = 26	d_{b_pier} = 1.128 in A_{b_pier} = 1 in^2	
Provided area of steel:	A_{s_pier} = Ab_pier * m_pier	A_{s_pier} = 26.00	in^2
Compressive Resistance (H/D >= 3):	$ΦP_{n2}$ = 0.65 * 0.8 * (0.85 * (F\c) * (A_1 - As_pier) + ((Fy) * As_pier))	$ΦP_{n2}$ = 6813.90	kips
	H/D = (D - T + E) / dpier	H/D = 0.77	
Utilized Compressive Resistance:	$ΦP_n$ = Pn1	$ΦP_n$ = 13059.63	kips
Applied Compressive Force:	P_u = Pcomp + 1.2 * Wpier	P_u = 736.18	kips

Check **$ΦP_n$ = 13059.63 kips >= P_u = 736.18 kips** **RATING: 5.64% OK**

Pier Flexure

Cross-sectional area:	A_g = dpier² * π / 4	A_g = 3421.19	in^2
Min. area of steel (pier):	A_{smin_pier} = Ag * 0.005	A_{smin_pier} = 17.11	in^2
Cage Diameter:	d_o = dpier - 2 * cc - 2 * tie - d_b	d_o = 57.87	in

Check **A_{s_pier} = 26.00 in^2 >= A_{smin_pier} = 17.11 in^2** **OK**

Applied Moment to DSMC (Compression):	M_{u_comp} = IF(T>D,E,(D - T + E)) * Vu_comp	M_{u_comp} = 395.25	ft-kips
Pier Moment Capacity (Compression):	$ΦM_{n\_comp}$ = *from DSMC*	$ΦM_{n\_comp}$ = 4336.95	ft-kips

Check **M_{u_comp} = 395.25 ft-kips >= $ΦM_{n\_comp}$ = 4336.95 ft-kips** **RATING: 9.11% OK**

Applied Moment to DSMC (Tension):	$M_{u\_tension}$ = IF(T>D,E,(D - T + E)) * Vu_uplift	$M_{u\_tension}$ = 327.25	ft-kips
Pier Moment Capacity (Tension):	$ΦM_{n\_tension}$ = *from DSMC*	$ΦM_{n\_tension}$ = 2089.99	ft-kips

Check **M_{u_comp} = 327.25 ft-kips >= $ΦM_{n\_comp}$ = 2089.99 ft-kips** **RATING: 15.66% OK**

PAD REINFORCEMENT

Elastic Bearing Pressure for Soil Checks

Tower Cetroid offset from Fdn Centroid:	Offset = (1/2-1/3)*BW*sin(60°)	Offset =	5.77	ft	
Distance from Leg to Edge of Pad:	L_{edge} = (1/2)*W - Offset - (1/3)*BW*sin(60°)	L_{edge} =	7.43	ft	
*Overturning Moment (0.9*D LC):*	$M_{o\_0.9}$ = M + V * (D + E + bpdist/12) + (0.9/1.2)*(P+3*Wpier*1.2)*Offset	$M_{o\_0.9}$ =	24923.80	ft-kips	
*Overturning Moment (1.2*D LC):*	$M_{o\_1.2}$ = M + V * (D + E + bpdist/12) + (1.2/1.2)*(P+3*Wpier*1.2)*Offset	$M_{o\_1.2}$ =	25249.32	ft-kips	
Compressive Load for Bearing:	$P_{bearing}$ = Wc + Ws + P / 1.2	$P_{bearing}$ =	2130.04	kips	
*Load Eccentricity (0.9*D LC):*	$e_{c\_0.9}$ = Mo / 0.9*Pbearing	$e_{c\_0.9}$ =	13.00	ft	L/6 < e <= L
*Load Eccentricity (1.2*D LC):*	$e_{c\_1.2}$ = Mo / 1.2*Pbearing	$e_{c\_1.2}$ =	9.88	ft	L/6 < e <= L
Elastic Section Modulus:	S = W³ / 6	S =	20214.56	ft³	
*Positive Pressure (0.9*D LC):*	$P_{pos\_st\_0.9}$ = 0.9*Pbearing / Area + Mo / S	$P_{pos\_st\_0.9}$ =	2.02	ksf	
*Positive Pressure (1.2*D LC):*	$P_{pos\_st\_1.2}$ = 1.2*Pbearing / Area + Mo / S	$P_{pos\_st\_1.2}$ =	2.29	ksf	
*Negative Pressure (0.9*D LC):*	$P_{neg\_st\_0.9}$ = 0.9*Pbearing / Area - Mo / S	$P_{neg\_st\_0.9}$ =	-0.45	ksf	
	Note: The stress resultant is NOT within the kern. Bearing area has been adjusted below.				
*Negative Pressure (1.2*D LC):*	$P_{neg\_st\_1.2}$ = 1.2*Pbearing / Area - Mo / S	$P_{neg\_st\_1.2}$ =	-0.21	ksf	
	Note: The stress resultant is NOT within the kern. Bearing area has been adjusted below.				
*Adjusted Pressure (0.9*D LC):*	$P_{adj\_0.9}$ = (2 * 0.9*Pbearing) / (3 * W * (W / 2 - ec_0.9))	$P_{adj\_0.9}$ =	2.20	ksf	
*Adjusted Pressure (1.2*D LC):*	$P_{adj\_1.2}$ = (2 * 1.2*Pbearing) / (3 * W * (W / 2 - ec_1.2))	$P_{adj\_1.2}$ =	2.31	ksf	
*Maximum Pressure (0.9*D LC):*	$q_{u\_st\_0.9}$ = IF(Pneg ≥ 0, Ppos , Padj)	$q_{u\_st\_0.9}$ =	2.20	ksf	
*Maximum Pressure (1.2*D LC):*	$q_{u\_st\_1.2}$ = IF(Pneg ≥ 0, Ppos , Padj)	$q_{u\_st\_1.2}$ =	2.31	ksf	

One-Way Shear

Rebar:	$s_{\_pad}$ = 11 $m_{\_pad}$ = 91	*Equally spaced, top and bottom, both directions.*	d_{b_pad} = A_{b_pad} =	1.41 1.56	in in^2
Effective depth:	d_c = T - cc - 1.5 * db	d_c =	21.9	in	
Distance from Edge of Pad to Column Face:	d' = Ledge - dpier/2	d' =	4.7	ft	
Distance from Edge of Pad to dc from Column Face:	d'' = d' - d_c / 12	d'' =	2.86	ft	
Distance to qs (0.9D LC):	$L'_{\_0.9}$ = (W / 2 - ec_0.9) * 3	$L'_{\_0.9}$ =	35.25	ft	
Distance to qs (1.2D LC):	$L'_{\_1.2}$ = (W / 2 - ec_1.2) * 3	$L'_{\_1.2}$ =	44.62	ft	
*Slope of qs (0.9*D LC):*	$sq_{s\_0.9}$ = IF(L' > W, (Ppos - Pneg) / W, qu / L')	$sq_{s\_0.9}$ =	0.06	kcf	
*Slope of qs (1.2*D LC):*	$sq_{s\_1.2}$ = IF(L' > W, (Ppos - Pneg) / W, qu / L')	$sq_{s\_1.2}$ =	0.05	kcf	
Nominal Shear Strength:	V_{n1} = 2 * W * √(F'c*1000) * dc	V_{n1} =	1644.35	kips	
Shear Reduction Factor:	$φ_{shear}$ = 0.75	$φ_{shear}$ =	0.75		
Design Shear Strength:	$φV_{n1}$ = φshear * V_{n1}	$φV_{n1}$ =	1233.26	kips	

Resisting Weight above Critical Section:

	Thickness (ft)	Unit Weight (kcf)	Weight (kip) (0.9*D LC)	Weight (kip) (1.2*D LC)
Soil Above Water Table:	3.75	0.125	59.64	79.51
Soil Below Water Table:	0	0.063	0.00	0.00
Pad Above Water Table:	2.25	0.150	42.94	57.25
Pad Below Water Table:	0	0.088	0.00	0.00
Total:			102.57	136.77

*Applied Shear (0.9*D LC):*	$V_{u1\_0.9}$ = 'Pad Shear and Moment Diagrams'!$AY$21	$V_{u1\_0.9}$ =	196.61	kips
*Applied Shear (1.2*D LC):*	$V_{u1\_1.2}$ = 'Pad Shear and Moment Diagrams'!$CG$21	$V_{u1\_1.2}$ =	186.99	kips

Check **$φV_{n1}$ = 1233.26 kips >= V_{u1} = 196.61 kips** **RATING: 15.94% OK**

Two-Way Shear (Compression)

Avg. Effective Depth for Punching Shear:	d_{c_2} = T - cc - AVERAGE(0.5 * db , 1.5 * db)	d_{c_2} =	22.59	in
Radius of Two-Way Shear Plane:	r_{2way} = 0.5*(dpier + dc_2/12)	r_{2way} =	3.69	ft
Length to Edge of Pad from Pier Centroid:	L_{edge2} = W/2 - 2/3*SIN(60°)*BW + Offset	L_{edge2} =	7.43	ft
Length of Shear Perimeter to Deduct:	s = r_{2way} * (2 * ACOS(((r_{2way}-MAX(r_{2way}-L_{edge},0))/r_{2way}))	s =	0.00	ft

Pier Shape:	Pier Shape: Circular	Pier Shape:	Circular	
Pier Diameter:	d_{pier1} = d_{pier} * 12 in / ft	d_{pier1} =	66.00	in
Equivalent Square Pier Diameter:	d_{pier_sq} = √π / 2 * dpier	d_{pier_sq} =	58.49	in
Factor of transfer of Moment:	Υ_f = 1/(1+(2/3)*√(dpier1/dpier1))	Υ_f =	0.60	
Factor of transfer of eccentricity of Shear:	Υ_v = 1 - Υ_f	Υ_v =	0.40	
Moment applied at base of Pier:	M_v = M_{u_comp} * 12 in / ft	M_v =	4743.00	kip*in
Circular Critical Perimeter:	P_{crit_cir} = (dpier+dc_2/12)*PI() - $L$171)*12	P_{crit_cir} =	278.31	in
Equivalent Square Critical Perimeter 1:	$P_{crit\_sq\_1}$ = 4*(dpier_sq+dc_2)	$P_{crit\_sq\_1}$ =	324.32	in
Equivalent Square Critical Perimeter 2:	$P_{crit\_sq\_2}$ = 2*(dpier_sq + dc_2) + (W*12-BW*12)	$P_{crit\_sq\_2}$ =	276.16	in
Equivalent Square Critical Perimeter 3:	$P_{crit\_sq\_3}$ = 2 * (dpier_sq + dc_2 + (W - BW * COS(RADIANS(30)) - Ledge2)*12)	$P_{crit\_sq\_3}$ =	340.47	in
Equivalent Square Critical Perimeter 4:	$P_{crit\_sq\_4}$ = 2 * (dpier_sq + dc_2 + Ledge2 * 12)	$P_{crit\_sq\_4}$ =	340.47	in
Equivalent Square Critical Perimeter 5:	$P_{crit\_sq\_5}$ = dpier_sq + dc_2 + 0.5*(W-BW)*12 + (W - BW * COS(RADIANS(30)) - Led	$P_{crit\_sq\_5}$ =	227.23	in
Area of Concrete in Shear:	A_c = ((dpier1 + dc_2)*PI()) * dc_2	A_c =	6287.11	in^2
Eq. Square Area of Concrete in Shear (1):	$A_{c\_sq\_1}$ = $P_{crit\_sq\_1}$ * d_{c_2}	$A_{c\_sq\_1}$ =	7326.48	in^2
Eq. Square Area of Concrete in Shear (2):	$A_{c\_sq\_2}$ = $P_{crit\_sq\_2}$ * d_{c_2}	$A_{c\_sq\_2}$ =	6238.50	in^2
Eq. Square Area of Concrete in Shear (3):	$A_{c\_sq\_3}$ = $P_{crit\_sq\_3}$ * d_{c_2}	$A_{c\_sq\_3}$ =	7691.21	in^2
Eq. Square Area of Concrete in Shear (4):	$A_{c\_sq\_4}$ = $P_{crit\_sq\_4}$ * d_{c_2}	$A_{c\_sq\_4}$ =	7691.21	in^2
Eq. Square Area of Concrete in Shear (5):	$A_{c\_sq\_5}$ = $P_{crit\_sq\_5}$ * d_{c_2}	$A_{c\_sq\_5}$ =	5133.24	in^2
Polar Moment of Inertia at assumed Critical Section:	J_{c_cir} = dc_2*(dpier1+dc_2)^3/6 + ((dpier1+dc_2)*(dc_2^3))/6 + (dc_2*(dpier1+dc_2))*(dpier1+dc_2)^2/(IF($L$169=0,2,4))	J_{c_cir} =	10640989.87	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section 1:	$J_{c\_sq\_1}$ = (dc_2*(dpier_sq+dc_2)^3)/6 + ((dpier_sq+dc_2)*(dc_2^3))/6 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/2	$J_{c\_sq\_1}$ =	8183310.87	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_2}$ = (dc_2*(dpier_sq+dc_2)^3)/12 + ((dpier_sq+dc_2)*(dc_2^3))/12 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/2	$J_{c\_sq\_2}$ =	7101978.87	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_3}$ = (dc_2*(dpier_sq+dc_2)^3)/6 + ((dpier_sq+dc_2)*(dc_2^3))/6 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/4	$J_{c\_sq\_3}$ =	5172987.43	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_4}$ = (dc_2*(dpier_sq+dc_2)^3)/6 + ((dpier_sq+dc_2)*(dc_2^3))/6 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/4	$J_{c\_sq\_4}$ =	5172987.43	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_sq\_5}$ = (dc_2*(dpier_sq+dc_2)^3)/12 + ((dpier_sq+dc_2)*(dc_2^3))/12 + (dc_2*(dpier_sq+dc_2)*(dpier_sq+dc_2)^2)/4	$J_{c\_sq\_5}$ =	4091655.43	in^4
*Applied Shear Force (1.2*D LC):*	$V_{u\_1.2}$ = 1.2*W_{pier} + 1.2 * IF(OR($B$1="G",$B$1="H"), P_{comp} / 1.2, P_{comp})	$V_{u\_1.2}$ =	736.18	kip
*Controlling Shear Stress (1.2*D LC):*	$v_{u\_1.2\_controlling}$ = $V_{u\_1.2}$ / A_c + (Υ_v * M_v * (d_{pier1} + dc_2)/2) / J_{c_1}	$v_{u\_1.2\_controlling}$ =	0.125	ksi
*Eq. Sq. Controlling Shear Stress (1.2*D LC):*	$v_{u\_1.2\_controlling\_sq}$ = $V_{u\_1.2}$ / A_c + (Υ_v * M_v * (d_{pier_sq} + dc_2)/2) / J_c	$v_{u\_1.2\_controlling\_sq}$ =	0.162	ksi
Shear Stress Capacity:	Φv_n = φs * 4 * (√F'c*1000) / 1000	Φv_n =	0.190	ksi

Check **Φv_n = 0.190 ksi >= v_{u_demand} = 0.125 ksi** **RATING: 65.88% OK**

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

Distance To Outside Edge:	$dist_{outside}$ = MIN((W-BW)/2,BW/2)*2	$dist_{outside}$ =	9.5	ft
Effective Pad Width:	b_{pad} = MIN(dpier+3*T,W,dist_outside)	b_{pad} =	9.50	ft
Bar Spacing:	B_{s_pad} = Bs_pad (see design checks below)	B_{s_pad} =	6.52	in
Fraction of Bars in Effective Width:	$m_{effective}$ = IF(b_pad=W,mp,12*b_pad/Bs_pad)	$m_{effective}$ =	17.49	
Area of Steel in Effective Width:	$A_{s\_effective}$ = VLOOKUP(Sp,Ref!$A$2:$C$12,3,0)*m_slab	$A_{s\_effective}$ =	27.29	in²
Depth of Equivalent Rectangular Stress Block:	$a_{effective}$ = $A_{s\_effective}$ * Fy / (0.85 * F'c * b_{slab}*12)	$a_{effective}$ =	4.22	in

	β_{pad} = β_{pad} (see design checks below)	β_{pad} =	0.85	
Distance from Top to Nuetral Axis:	$c_{\_effective}$ = $a_{\_effective}$ / β_{pad}	$c_{\_effective}$ =	4.97	
Effective depth:	dc = dc (see One-Way Shear check above)	dc =	21.885	in
Modulus of Elasticity of Steel:	E_s = 29000 ksi	E_s =	29000	ksi
Strain in Steel:	$\varepsilon_{s\_effective}$ = 0.003 * (dc-c) / c	$\varepsilon_{s\_effective}$ =	0.01021	in/in
Compression-Controlled Strain Limit::	ε_c = F_y / E_s	ε_c =	0.00207	in/in
Tension-Controlled Strain Limit::	ε_t = 0.005	ε_t =	0.00500	in/in
Flexure Strength Reduction Factor:	φflex$_{\_effective}$ = IF(εs>=εt,0.9,IF(εs<=εc,0.65,0.65+(0.9-0.65)*((εs-εc)/(εt-εc))))	φflex$_{\_effective}$ =	0.9	
Nominal Flexural Strength:	$M_{n\_effective}$ = $A_{s\_effective}$ * (F_y) * (dc - $a_{\_effective}$ / 2) * (1/12)	$M_{n\_effective}$ =	2697.63	ft-kips
Design Flexural Strength:	φ$M_{n_effective}$ = φflex_effective * Mn_effective	φ$M_{n_effective}$ =	2427.86	ft-kips

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

Bar Spacing:	$B_{s\_pad\_top}$ = `IF(Input!$S$6=TRUE,(W*12 - 2 * ccpad - VLOOKUP(sptop,Ref!$A$2:$C$`	$B_{s\_pad\_top}$ =	9.50	in
Fraction of Bars in Effective Width:	$m_{\_effective\_top}$ = IF(b_pad=W,mp,12*b_pad/Bs_pad_top)	$m_{\_effective\_top}$ =	17.49	
Area of Steel in Effective Width:	$A_{s\_effective\_top}$ = `VLOOKUP(Sptop,Ref!$A$2:$C$12,3,0)*m_slab`	$A_{s\_effective\_top}$ =	27.29	in²
Depth of Equivalent Rectangular Stress Block:	$a_{\_effective\_top}$ = $A_{s\_effective\_top}$ * Fy / (0.85 * F'c * b_{slab}*12)	$a_{\_effective\_top}$ =	4.22	in
Distance from Top to Nuetral Axis:	$c_{\_effective\_top}$ = $a_{\_effective\_top}$ / β_{pad}	$c_{\_effective\_top}$ =	4.97	
Effective depth:	dc_top = `T *12 - ccpad - 1.5 * VLOOKUP(sptop,Ref!$A$2:$C$12,2,0)`	d_{c_top} =	21.885	in
Strain in Steel:	$\varepsilon_{s\_effective\_top}$ = 0.003 * (dc_top-c_effective_top) / c_effective_top	$\varepsilon_{s\_effective\_top}$ =	0.01021	in/in
Flexure Strength Reduction Factor:	φflex$_{\_effective\_top}$ = IF(εs>=εt,0.9,IF(εs<=εc,0.65,0.65+(0.9-0.65)*((εs-εc)/(εt-εc))))	φflex$_{\_effective\_top}$ =	0.9	
Nominal Flexural Strength:	$M_{n\_effective\_top}$ = $A_{s\_effective\_top}$ * (F_y) * (dc_top - $a_{\_effective\_top}$ / 2) * (1/12)	$M_{n\_effective\_top}$ =	2697.63	ft-kips
Design Flexural Strength:	φ$M_{n_effective_top}$ = φflex_effective * Mn_effective	φ$M_{n_effective_top}$ =	2427.86	ft-kips
Applied Moment:	Yf*M_{u_comp} = Yf*M_{u_comp}	Yf*M_{u_comp} =	237.15	ft-kips

Check **φ$M_{n_effective}$ = 4855.73 ksi >= Yf*M_{u_comp} = 237.15 ksi RATING: 4.88% OK**

Two-Way Shear (Uplift)

Moment applied at base of Pier:	M_{v_tens} = $M_{u\_tension}$ * 12 in / ft	M_{v_tens} =	3927.00	kip*in
Diameter of Longitudinal Rebar Cage:	$d_{\_cage}$ = `dpier*12-2*(ccpier+VLOOKUP(St,Ref!$A$2:$C$12,2,0))-VLOOKUP(Sc,Ref!$A$2:$C$12,2,0)`	$d_{\_cage}$ =	57.87	in
Eq. Sq. Diameter of Longitudinal Rebar Cage:	$d_{\_cage\_sq}$ = SQRT(PI())/2*d_cage	$d_{\_cage\_sq}$ =	51.29	in
Steel Embedment Length:	L_{embed} = dc_2 (see One-Way Shear check above)	L_{embed} =	22.59	in
Radius of Two-Way Shear Plane:	r_{2way_tens} = 0.5*(d_cage/12 + Lembed/12)	r_{2way_tens} =	3.35	ft
	$r_{2way\_tens\_sq}$ = 0.5*(SQRT(PI())/2*d_cage/12 + Lembed/12)	$r_{2way\_tens\_sq}$ =	3.08	ft
Length of Shear Perimeter to Deduct:	s_{tens} = r_tens*RADIANS(2*ACOS(((r_tens-MAX(r_tens-Ledge,0))/r_tens))*180/PI())	s_{tens} =	0.00	ft
Eq. Sq. Length of Shear Perimeter to Deduct:	s_{tens_sq} = 0	s_{tens_sq} =	0.00	ft
Circular Critical Perimeter:	P_{crit_tens} = ((d_cage/12+Lembed/12)*PI() - stens)*12	P_{crit_tens} =	252.78	in
Equivalent Square Critical Perimeter 1:	$P_{crit\_tens\_sq\_1}$ = 4*(d_cage_sq+Lembed)	$P_{crit\_tens\_sq\_1}$ =	295.51	in
Equivalent Square Critical Perimeter 2:	$P_{crit\_tens\_sq\_2}$ = 2*(d_cage_sq + Lembed) + (W*12-BW*12)	$P_{crit\_tens\_sq\_2}$ =	261.76	in
Equivalent Square Critical Perimeter 3:	$P_{crit\_tens\_sq\_3}$ = 2 * (d_cage_sq + Lembed) + (W - BW * COS(RADIANS(30)) - Ledge2)*1	$P_{crit\_tens\_sq\_3}$ =	326.06	in
Equivalent Square Critical Perimeter 4:	$P_{crit\_tens\_sq\_4}$ = 2 * (d_cage_sq + Lembed + Ledge2 * 12)	$P_{crit\_tens\_sq\_4}$ =	326.06	in
Equivalent Square Critical Perimeter 5:	$P_{crit\_tens\_sq\_5}$ = d_cage_sq + Lembed + 0.5*(W-BW)*12 + (W - BW * COS(RADIANS(30))	$P_{crit\_tens\_sq\_5}$ =	220.03	in
Area of Concrete in Shear:	A_{c_tens} = Pcrit_tens*Lembed	A_{c_tens} =	5710.27	in^2
Equivalent Square Area of Concrete in Shear:	$A_{c\_tens\_sq1}$ = Pcrit_tens_sq1*Lembed	$A_{c\_tens\_sq1}$ =	6675.59	in^2

	$A_{c\_tens\_sq2}$ =	'Pcrit_tens_sq2*Lembed	$A_{c\_tens\_sq2}$ =	5913.06	in^2
	$A_{c\_tens\_sq3}$ =	Pcrit_tens_sq3*Lembed	$A_{c\_tens\_sq3}$ =	7365.77	in^2
	$A_{c\_tens\_sq4}$ =	Pcrit_tens_sq4*Lembed	$A_{c\_tens\_sq4}$ =	7365.77	in^2
	$A_{c\_tens\_sq5}$ =	Pcrit_tens_sq5*Lembed	$A_{c\_tens\_sq5}$ =	4970.51	in^2
Polar Moment of Inertia at assumed Critical Section:	J_{c_tens} =	Lembed*(d_cage+Lembed)^3/6 + ((d_cage+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage+Lembed))*(d_cage+Lembed)^2/(IF(Ledge2=0,2,4))	J_{c_tens} =	5057768.18	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section 1:	$J_{c\_tens\_sq\_1}$ =	(Lembed*(d_cage_sq+Lembed)^3)/6 + ((d_cage_sq+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/2	$J_{c\_tens\_sq\_1}$ =	6214413.79	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_2}$ =	(Lembed*(d_cage_sq+Lembed)^3)/12 + ((d_cage_sq+Lembed)*(Lembed^3))/12 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/2	$J_{c\_tens\_sq\_2}$ =	5384383.81	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_3}$ =	(Lembed*(d_cage_sq+Lembed)^3)/6 + ((d_cage_sq+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/4	$J_{c\_tens\_sq\_3}$ =	3937236.87	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_4}$ =	(Lembed*(d_cage_sq+Lembed)^3)/6 + ((d_cage_sq+Lembed)*(Lembed^3))/6 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/4	$J_{c\_tens\_sq\_4}$ =	3937236.87	in^4
Eq. Square Polar Moment of Inertia at assumed Critical Section:	$J_{c\_tens\_sq\_5}$ =	(Lembed*(d_cage_sq+Lembed)^3)/12 + ((d_cage_sq+Lembed)*(Lembed^3))/12 + (Lembed*(d_cage_sq+Lembed)*(d_cage_sq+Lembed)^2)/4	$J_{c\_tens\_sq\_5}$ =	3107206.89	in^4
*Applied Shear Force (0.9*D LC):*	$V_{u\_0.9\_tens}$ =	MAX(-0.9*Wpier + 0.9 * IF(OR($B$1="G",$B$1="H"), Puplift / 0.9, Puplift),	$V_{u\_0.9\_tens}$ =	563.37	kip
*Controlling Shear Stress (0.9*D LC):*	$v_{u\_0.9\_controlling\_tens}$ =	$V_{u\_0.9} / A_{c\_tens} + (Y_v * M_v * (d_{cage} + Lembed)/2) / J_{c\_tens}$	$v_{u\_0.9\_controlling\_tens}$ =	0.111	ksi
*Equivalent Square Shear Stress (0.9*D LC):*	$v_{u\_0.9\_tens\_sq}$ =	Vu_0.9_tens/Ac_tens_sq5 + (Yv * Mv_tens * (d_cage_sq + Lembed)/2) /	$v_{u\_0.9\_tens\_sq}$ =	0.132	ksi
Shear Stress Capacity:	Φv_n =	φs * 4 * (√F'c*1000) / 1000	Φv_n =	0.190	ksi

Check **Φv_n = 0.190 ksi** **>=** **v_{u_demand} = 0.111 ksi** **RATING: 58.58%** **OK**

Two-Way Shear (Uplift, Flexural Component)

Applied Moment:	$Yf*M_{u\_tension}$ =	$Yf*M_{u\_tension}$	$Yf*M_{u\_tension}$ =	196.35	

Check **$\varphi M_{n\_effective}$ = 4855.73 ksi** **>=** **'f*$M_{u\_tension}$ = 196.35 ksi** **RATING: 4.04%** **OK**

Pad Flexure (Net Bearing Pressure)

	β_{pad} =	IF(F'c <= 4, 0.85, IF(F'c >= 8, 0.65, 0.85 - (F'c - 4) * 0.05))	β_{pad} =	0.85	
Provided Steel:	A_{s_pad} =	A_{b_pad} * m_pad	A_{s_pad} =	141.96	in^2
Depth of Equivalent Rectangular Stress Block:	a =	A_{s_pad} * Fy / (0.85 * F'c * W)	a =	4.22	in
Distance from Top to Nuetral Axis:	c =	a / β_{pad}	c =	4.96	in
Modulus of Elasticity of Steel:	E_s =	29000 ksi	E_s =	29000	ksi
Strain in Steel:	ε_s =	0.003 * (dc-c) / c	ε_s =	0.01023	in/in
Compression-Controlled Strain Limit::	ε_c =	F_y / E_s	ε_c =	0.00207	in/in
Tension-Controlled Strain Limit::	ε_t =	0.005	ε_t =	0.00500	in/in
Flexure Strength Reduction Factor:	φflex =	IF(εs>=εt,0.9,IF(εs<=εc,0.65,0.65+(0.9-0.65)*((εs-εc)/(εt-εc))))	φflex =	0.9	
Nominal Flexural Strength:	M_n =	As_{pad} * (F_y) * (dc - a / 2) * (1/12)	M_n =	14037.19	ft-kips
Design Flexural Strength:	φM_n =	φflex * Mn	φM_n =	12633.47	ft-kips
*Bearing Press. at Crit. Section (0.9*D LC):*	qmid_0.9 =	qu_st_0.9 - sqs_0.9 * d'	qmid_0.9 =	1.91	ksf
*Bearing Press. at Crit. Section (1.2*D LC):*	qmid_1.2 =	qu_st_1.2 - sqs_1.2 * d'	qmid_1.2 =	2.07	ksf

Resisting Weight above Critical Section:

	Thickness (ft)	Unit Weight (kcf)	Weight (kip) (0.9*D LC)	Weight (kip) (1.2*D LC)	Moment Arm (ft)	Resisting Moment (ft-kips) (0.9*D LC)	Resisting Moment (ft-kips) (1.2*D LC)
Soil Above Water Table:	3.75	0.125	97.72	130.29	2.339745962	228.64	304.86
Soil Below Water Table:	0	0.063	0.00	0.00	2.339745962	0.00	0.00

Pad Above Water Table:	2.25	0.150	70.36	93.81	2.339745962	164.62	219.50
Pad Below Water Table:	0	0.088	0.00	0.00	2.339745962	0.00	0.00
Total:			168.08	224.11		393.26	524.35

*Factored Bending Moment (0.9*D LC):*	Mu_pad_0.9 = 'Pad Shear and Moment Diagrams'!$AZ$21	Mu_pad_0.9 =	1048.27	ft-kips
*Factored Bending Moment (1.2*D LC):*	Mu_pad_1.2 = 'Pad Shear and Moment Diagrams'!$CH$21	Mu_pad_1.2 =	830.58	ft-kips

Check **φM_n = 12633.47 ft-kips >= M_{u_pad} = 1048.27 ft-kips RATING: 8.30% OK**

PIER DESIGN CHECKS

Minimum Steel

Min. area of steel (pier):	A_{st_c} = Ag * 0.005	A_{st_c} =	17.11	in^2

Check **A_{s_pier} = 26.00 in² >= A_{st_c} = 17.11 in² RATING: 65.79% OK**

Bar Spacing

Bar separation:	B_{s_pier} = (do * π) / m_pier - db_pier	B_{s_pier} =	5.86	in

Check **18.00 in >= B_{s_pier} = 5.86 in RATING: 32.58% OK**

Vertical Rebar Development Length

Reinforcement location:	α_c = if space under bar > 12", 1.3, else use 1.0	α_c =	1.3	
Epoxy coating:	β_c = for non- epoxy coated, use 1.0	β_c =	1.0	
Max term:	$\alpha\beta_c$ = product of α x β not to exceed 1.7	$\alpha\beta_c$ =	1.3	
Reinforcement size:	γ_c = if bar size is 6 or less, 0.8, else use 1.0	γ_c =	1	
Light weight concrete:	λ_c = 1.0	λ_c =	1.0	
Spacing/cover:	c _c = use smaller of half of bar spacing or concrete cover	c _c =	3.5	in
Transverse bars:	k_{tr_c} = 0 in (per simplification)	k_{tr_c} =	0	in
Max term:	c_c' = MIN(2.5, (c_c + ktr_c) / db_c)	c_c' =	2.500	
Excess reinforcement:	R_c = Ast_c / As_c	R_c =	0.66	
Development (tensile):	$L_{dt}'{}_{\_c}$ = (3 / 40) * (Fy*1000 / √(F'c*1000)) * αβ_c * γ_c * λ_c * R_c * db_c / c_c'	$L_{dt}'{}_{\_c}$ =	27.46	in
Minimum length:	L_{d_min} = 12 inches	L_{d_min} =	12.0	in
Development length:	L_{dt_c} = MAX(Ld_min, Ldt'_c)	L_{dt_c} =	27.46	in
Development (comp.):	$L_{dc}'{}_{\_c}$ = 0.02 * db_c * Fy*1000 / √(F'c*1000)	$L_{dc}'{}_{\_c}$ =	21.40	in
	$L_{dc}''{}_{\_c}$ = 0.0003 * db_c * Fy*1000	$L_{dc}''{}_{\_c}$ =	20.30	in
Development length:	L_{dc_c} = MAX(8, Ldc'_c, Ldc"_c)	L_{dc_c} =	21.40	in
Length available in pier:	L_{vc} = D - T + E - cc	L_{vc} =	48.0	in

Check **L_{vc} = 48.00 in >= L_{dt_c} = 27.46 in OK**

Check **L_{vc} = 48.00 in >= L_{dc_c} = 21.40 in OK**

Length available in pad:	L_{vp} = T - ccpad	L_{vp} =	24.0	in

Check **L_{vp} = 24.00 in >= L_{dt_c} = 27.46 in HOOKS**

Check **L_{vp} = 24.00 in >= L_{dc_c} = 21.40 in OK**

Vertical Rebar Hook Ending

Bar size & clear cover:	α_h = =if bar <= 11, and cc >= 2.5", use 0.7, else use 1.0	α_h =	0.7	
Epoxy coating:	β_h = for non- epoxy coated, use 1.0	β_h =	1.0	
Light weight concrete:	λ_h = 1.0	λ_h =	1.0	
Development (hook):	L_{dh}' = 0.02 * αh * βh * λh * Fy*1000 / √(F'c*1000) * db_c	L_{dh}' =	15.0	in

Minimum length: L_{dh_min} = the larger of: 8 * d_b or 6 in L_{dh_min} = 9.0 in

Development length: L_{dh} = MAX(Ldh_min, Ldh') L_{dh} = 15.0 in

Check **L_{vp} = 24.00 in >= L_{dh} = 14.98 in** **OK**

Hook tail length: L_{h_tail} = 12 * db beyond the bend radius L_{h_tail} = 19.2 in

Length available in pad: L_{h_pad} = 12*MIN((W/2-(2/3)*BW*cos(30°)+Offset-dpier/2),(W-BW-dpier)/2) + ccpier - ccpad L_{h_pad} = 24.0 in

Check **L_{h_pad} = 24.00 in >= L_{dh_tail} = 19.18 in** **OK**

Pier Ties

Minimum size:
[ACI 7.10.5.1] $s_{\_t\_min}$ =IF(s_c <= 10, 3, 4) $s_{\_t\_min}$ = 3

z factor: z_seismic = 0.5 if the SDC is A, B, or C, else 1.0 z_seismic = 0.5

Tie parameters:
$s_{\_t}$ = 4 d_{b_t} = 0.5 in
$m_{\_t}$ = 8 A_{b_t} = 0.2 in^2

Allowable tie spacing
per vertical rebar: $B_{s\_t\_max1}$ = 8 / z * db_c $B_{s\_t\_max1}$ = 18.048 in

per tie size: $B_{s\_t\_max2}$ = 24 / z * db_t $B_{s\_t\_max2}$ = 24 in

per pier diameter:	$B_{s\_t\_max3}$ =	di / (4 * z^2)	$B_{s\_t\_max3}$ =	66	in
per seismic zone:	$B_{s\_t\_max4}$ =	12" in active seismic zones, else 18"	$B_{s\_t\_max4}$ =	18	in
Maximum tie spacing:	$B_{s\_t\_max}$ =	MIN(Bs_t_max1, Bs_t_max2, Bs_t_max3, Bs_t_max4)	$B_{s\_t\_max}$ =	18	in
Minimum required ties:	$m_{\_t\_min}$ =	(D - T + E) / Bs_t_max + 2	$m_{\_t\_min}$ =	5.00	

Check **$m_{\_t}$ =** **8.00** **>=** **$m_{\_t\_min}$ =** **5.00** **OK**

PAD DESIGN CHECKS

Minimum Steel Required for Shrinkage

Shrinkage:	ρ_{sh} =	IF(Fy >= 60, 0.0018, 0.002)	ρ_{sh} =	0.0018	
Min. Required Shrinkage Steel:	$A_{st\_p\_sh}$ =	ρsh * W * T	$A_{st\_p\_sh}$ =	28.868	in^2

Check **A_{s_p} =** **141.96** **in^2** **>=** **A_{st_p} =** **28.87** **in^2** **OK**

Bar Separation

Bar separation:	B_{s_pad} =	(W - 2 * cc - db) / (m - 1)	B_{s_pad} =	6.52	in

Check **18"** **>=** **B_{s_p} =** **6.52** **in** **>=** **2"** **OK**

Pad Development Length

Reinforcement location:	α_p =	if space under bar > 12", 1.3, else use 1.0	α_p =	1.3	
Epoxy coating:	β_p =	for non- epoxy coated, use 1.0	β_p =	1.0	
Max term:	$\alpha\beta_p$ =	product of α x β not to exceed 1.7	$\alpha\beta_p$ =	1.3	
Reinforcement size:	γ_p =	if bar size is 6 or less, 0.8, else use 1.0	γ_p =	1	
Light weight concrete:	λ_p =	1.0	λ_p =	1.0	
Spacing/cover:	c_p =	use smaller of half of bar spacing or concrete cover	c_p =	3.71	in
Transverse bars:	k_{tr_p} =	0 in (per simplification)	k_{tr_p} =	0	in
Max term:	c_p' =	MIN(2.5, (c + ktr) / db)	c_p' =	2.500	
Required moment (φt = 0.9):	M_{nr} =	Mu_pad / φflex	M_{nr} =	1164.7	ft-kips
Steel estimate:	A_{st_p}' =	Mn / (φt * Fy * dc)	A_{st_p}' =	11.827	in^2
	a_p =	Ast' * Fy / (β * F'c * W)	a_p =	0.35	in
Required steel:	$A_{st\_p\_st}$ =	M_{nr} / (Fy * (dc - ap / 2))	$A_{st\_p\_st}$ =	10.730	in^2
Excess reinforcement:	R_p =	Ast_p / As_p	R_p =	0.20	
Development (tensile):	L_d =	(3 / 40) * (Fy*1000 / √(F'c*1000)) * αβ * γ * λ * R * db / c'	L_d =	10.61	in
Minimum length:	L_{d_min} =	12 inches	L_{d_min} =	12.0	in
Development length:	L_{dp} =	MAX(Ld_min, Ldp')	L_{dp} =	12.00	in
Length available in pad:	L_{pad} =	12*MIN((W/2-(2/3)*BW*cos(30°)+Offset-dpier/2),(W-BW-dpier)/2)- ccpad	L_{pad} =	53.15	in

Check **L_{pad} =** **53.15** **in** **>=** **L_{dp} =** **12.00** **in** **OK**

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

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

Site Data

ES-010
GOOSEHILL RS

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

Pier Properties		
Concrete:		
Pier Diameter =	5.5	ft
Concrete Area =	3421.2	in^2
Reinforcement:		
Clear Cover to **Tie**=	3.00	in
Horiz. **Tie** Bar Size=	4	
Vert. Cage Diameter =	4.82	ft
Vert. Cage Diameter =	57.87	in
Vertical Bar Size =	9	
Bar Diameter =	1.13	in
Bar Area =	1	in^2
Number of Bars =	26	
As Total=	26	in^2
A s/ Aconc, Rho:	0.0076	0.76%

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

(3)*(Sqrt(f'c)/Fy: 0.0032
200 / Fy: 0.0033

Minimum Rho Check:

Assumed Min. Rho: 0.50%
Provided Rho: 0.76% OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn. Pn per ACI 318 (10-2)	6813.90	kips
at Mu=(ϕ=0.65)Mn=	3245.58	ft-kips
Max Tu, (φ=0.9) Tn =	1404	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces		
TIA Revision:	H	
Max. Factored Shaft Mu:	327.25	ft-kips **(* Note)**
Max. Factored Shaft Pu:	577	kips
Max Axial Force Type:	Tension	

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

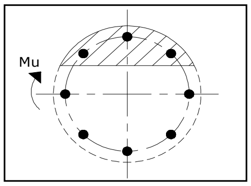
Load Factor	**Shaft Factored Loads**		
1.00	Mu:	327.25	ft-kips
1.00	Pu:	577	kips

Material Properties		
Concrete Comp. strength, f'c =	4000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2014	

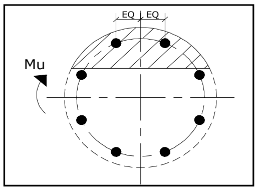
SOLVE <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **1**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**7.42**	in
Extreme Steel Strain, εt:	**0.0220**	

εt > 0.0050, Tension Controlled

Reduction Factor,φ: **0.900**

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	-519.30	kips
Drilled Shaft Moment Capacity, φMn:	**2089.99**	ft-kips
Drilled Shaft Superimposed Mu:	**327.25**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR: 15.7%

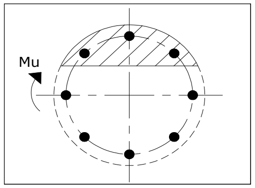
Maximum Allowable Moment of a Circular Pier

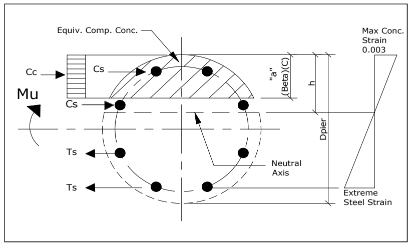
Pu: 577 kips (from Results Tab)
Axial Force type: Tension (from Results Tab)

For Internal Calculations:
Axial Load (Negative for Compression) = 577.00 kips

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

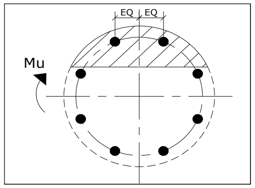
Case 1: Single Bar Near the Extreme Fiber





General Sketch (Variables) for both cases

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



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

Neutral Axis

Distance from extreme edge to neutral axis, h = 7.42 in
Equivalent compression zone factor = 0.85
Distance from extreme edge to
equivalent compression zone factor, a = 6.30 in
Distance from centroid to neutral axis = 25.58 in

Compression Zone

Area of steel in compression zone, Asc = 3.00 in^2
Angle from centroid of pier to intersection of
equivalent compression zone and edge of pier = 36.01 deg <-- 1/2 of total angle
Area of concrete in compression, Acc = 166.48 in^2
Force in concrete = 0.85 * f`c * Acc, Fc = 566.05 kips <-- φ Not Involved = Concrete Pn
Total reinforcement forces, Fs = -1143.05 kips <-- φ Not Involved = Total Steel Pn
Case 1, φ= 0.900
Axial (comp=negative), Pu = 577.00 kips <-- Pu
Balance Force in concrete, Fs+Fu = -566.05 kips
Shaft Comp. Capacity, φPn= **-519.30** kips <--φ Pn=Pu

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

Maximum Moment

First moment of the concrete
area in compression about the centoid = 4867.81 in^3
Distance between centroid of concrete
in compression and centroid of pier = 29.24 in
Moment of concrete in compression = 16550.57 in-kips 1379.214 ft-kips
Total reinforcement moment = 11316.00 in-kips 942.9999 ft-kips
Nominal Moment strength of Drilled Shaft Mn = 27866.57 in-kips
Moment Capacity of Drilled Shaft, φMn = 25079.91 in-kips 2089.992 ft-kips

Case 1, φMn = 2089.99 ft-kips

Final Results		
Governing Orientation Case=	**1**	
phi, φ=	0.900	
Shaft φ*Mn=	**2089.99**	ft-kips
Distance from Edge of Shaft to N.A.=	7.42	in
Shaft Beta=	0.85	
Maximum Tensile Strain=	-0.02205	<------------
Shaft Tension Cap., φTn= (φ=0.9)*(Total As)(Fy)=	1404.00	kips
Shaft Max Comp, (φ=0.65)(0.80)[0.85*f'c*(Ag-Ast)+Ast*Fy]=	6813.90	kips

ϵt > 0.0050, Tension Controlled TC

Individual Bars

Bar #	Angle from first bar (deg)	Distance to center of shaft (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in^2)	Stress (ksi)	Axial force (kips)	Moment (in-kips)
1	0.00	28.94	3.35	2.24	0.00136	1.00	39.33	35.93	1039.77
2	13.85	28.10	2.51	1.40	0.00102	1.00	29.47	26.07	732.48
3	27.69	25.62	0.04	-1.07	0.00002	0.00	0.46	0.46	11.75
4	41.54	21.66	-3.92	-5.04	-0.00159	0.00	-46.02	-46.02	-996.73
5	55.38	16.44	-9.14	-10.26	-0.00370	0.00	-60.00	-60.00	-986.25
6	69.23	10.26	-15.32	-16.43	-0.00620	0.00	-60.00	-60.00	-615.65
7	83.08	3.49	-22.09	-23.21	-0.00894	0.00	-60.00	-60.00	-209.27
8	96.92	-3.49	-29.07	-30.18	-0.01176	0.00	-60.00	-60.00	209.27
9	110.77	-10.26	-35.84	-36.96	-0.01450	0.00	-60.00	-60.00	615.65
10	124.62	-16.44	-42.02	-43.13	-0.01699	0.00	-60.00	-60.00	986.25
11	138.46	-21.66	-47.24	-48.35	-0.01911	0.00	-60.00	-60.00	1299.53
12	152.31	-25.62	-51.20	-52.32	-0.02071	0.00	-60.00	-60.00	1537.29
13	166.15	-28.10	-53.68	-54.79	-0.02171	0.00	-60.00	-60.00	1685.71
14	180.00	-28.94	-54.52	-55.63	-0.02205	0.00	-60.00	-60.00	1736.16
15	193.85	-28.10	-53.68	-54.79	-0.02171	0.00	-60.00	-60.00	1685.71
16	207.69	-25.62	-51.20	-52.32	-0.02071	0.00	-60.00	-60.00	1537.29
17	221.54	-21.66	-47.24	-48.35	-0.01911	0.00	-60.00	-60.00	1299.53
18	235.38	-16.44	-42.02	-43.13	-0.01699	0.00	-60.00	-60.00	986.25
19	249.23	-10.26	-35.84	-36.96	-0.01450	0.00	-60.00	-60.00	615.65
20	263.08	-3.49	-29.07	-30.18	-0.01176	0.00	-60.00	-60.00	209.27
21	276.92	3.49	-22.09	-23.21	-0.00894	0.00	-60.00	-60.00	-209.27
22	290.77	10.26	-15.32	-16.43	-0.00620	0.00	-60.00	-60.00	-615.65
23	304.62	16.44	-9.14	-10.26	-0.00370	0.00	-60.00	-60.00	-986.25
24	318.46	21.66	-3.92	-5.04	-0.00159	0.00	-46.02	-46.02	-996.73
25	332.31	25.62	0.04	-1.07	0.00002	0.00	0.46	0.46	11.75
26	346.15	28.10	2.51	1.40	0.00102	1.00	29.47	26.07	732.48
				Min-->	-0.02205	3.00		-1143.05	11316.00
									942.9999

Neutral Axis

Distance from extreme edge to neutral axis, h = 7.44 in
Equivalent compression zone factor = 0.85
Distance from extreme edge to
equivalent compression zone factor, a = 6.32 in
Distance from centroid to neutral axis = 25.56 in

Compression Zone

Area of steel in compression zone, Asc = 4.00 in^2
Angle from centroid of pier to intersection of
equivalent compression zone and edge of pier = 36.06 deg <-- 1/2 of total angle
Area of concrete in compression, Acc = 167.20 in^2
Force in concrete = 0.85 * f`c * Acc, Fc = 568.48 kips <-- φ Not Involved = Concrete Pn
Total reinforcement forces, Fs = -1145.48 kips <-- φ Not Involved = Total Steel Pn
Case 2, φ= 0.900
Axial (comp=negative), Pu = 577.00 kips <-- Pu
Balance Force in concrete, Fs+Fu = -568.48 kips
Shaft Comp. Capacity, φPn= **-519.30** kips <--φ Pn=Pu

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

Maximum Moment

First moment of the concrete
area in compression about the centoid = 4886.95 in^3
Distance between centroid of concrete
in compression and centroid of pier = 29.23 in
Moment of concrete in compression = 16615.62 in-kips 1384.635 ft-kips
Total reinforcement moment = 11270.98 in-kips 939.248 ft-kips
Nominal Moment strength of Drilled Shaft Mn = 27886.60 in-kips
Moment Capacity of Drilled Shaft, φMn = 25097.94 in-kips 2091.495 ft-kips

Case 2, φMn = 2091.49 ft-kips

Bar #	Angle from first bar (deg)	Distance to center of shaft (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in^2)	Stress (ksi)	Axial force (kips)	Moment (in-kips)
1	6.92	28.73	3.16	2.05	0.00128	1.00	37.01	33.61	965.31
2	20.77	27.06	1.49	0.38	0.00060	1.00	17.48	14.08	381.00
3	34.62	23.81	-1.75	-2.86	-0.00070	0.00	-20.43	-20.43	-486.50
4	48.46	19.19	-6.37	-7.49	-0.00257	0.00	-60.00	-60.00	-1151.29
5	62.31	13.45	-12.11	-13.23	-0.00488	0.00	-60.00	-60.00	-806.83
6	76.15	6.92	-18.64	-19.75	-0.00752	0.00	-60.00	-60.00	-415.49
7	90.00	0.00	-25.56	-26.68	-0.01031	0.00	-60.00	-60.00	0.00
8	103.85	-6.92	-32.49	-33.60	-0.01310	0.00	-60.00	-60.00	415.49
9	117.69	-13.45	-39.01	-40.12	-0.01573	0.00	-60.00	-60.00	806.83
10	131.54	-19.19	-44.75	-45.86	-0.01805	0.00	-60.00	-60.00	1151.29
11	145.38	-23.81	-49.37	-50.49	-0.01991	0.00	-60.00	-60.00	1428.83
12	159.23	-27.06	-52.62	-53.73	-0.02122	0.00	-60.00	-60.00	1623.34
13	173.08	-28.73	-54.29	-55.40	-0.02189	0.00	-60.00	-60.00	1723.50
14	186.92	-28.73	-54.29	-55.40	-0.02189	0.00	-60.00	-60.00	1723.50
15	200.77	-27.06	-52.62	-53.73	-0.02122	0.00	-60.00	-60.00	1623.34
16	214.62	-23.81	-49.37	-50.49	-0.01991	0.00	-60.00	-60.00	1428.83
17	228.46	-19.19	-44.75	-45.86	-0.01805	0.00	-60.00	-60.00	1151.29
18	242.31	-13.45	-39.01	-40.12	-0.01573	0.00	-60.00	-60.00	806.83
19	256.15	-6.92	-32.49	-33.60	-0.01310	0.00	-60.00	-60.00	415.49
20	270.00	0.00	-25.56	-26.68	-0.01031	0.00	-60.00	-60.00	0.00
21	283.85	6.92	-18.64	-19.75	-0.00752	0.00	-60.00	-60.00	-415.49
22	297.69	13.45	-12.11	-13.23	-0.00488	0.00	-60.00	-60.00	-806.83
23	311.54	19.19	-6.37	-7.49	-0.00257	0.00	-60.00	-60.00	-1151.29
24	325.38	23.81	-1.75	-2.86	-0.00070	0.00	-20.43	-20.43	-486.50
25	339.23	27.06	1.49	0.38	0.00060	1.00	17.48	14.08	381.00
26	353.08	28.73	3.16	2.05	0.00128	1.00	37.01	33.61	965.31
				Min-->	-0.02189	4.00		-1145.48	11270.98
									939.248

Neutral Axis

Distance from extreme edge to neutral axis, h = 60.03 in
Equivalent compression zone factor = 0.85
Distance from extreme edge to
equivalent compression zone factor, a = 51.03 in
Distance from centroid to neutral axis = -27.03 in

Compression Zone

Area of steel in compression zone, Asc = 19.00 in^2
Angle from centroid of pier to intersection of
equivalent compression zone and edge of pier = 123.11 deg <-- 1/2 of total angle
Area of concrete in compression, Acc = 2838.13 in^2
Force in concrete = 0.85 * f`c * Acc, Fc = 9649.64 kips <-- φ Not Involved = Concrete Pn
Total reinforcement forces, Fs = 833.29 kips <-- φ Not Involved = Total Steel Pn
φ= 0.65
Magnified, Max Axial Comp, Pn, per ACI 318 (10-2)/(φ=0.65)= -10482.93 kips <-- (Pn per ACI 10-2)/φ
Balance Force in concrete, Fs+Fu = -9649.64 kips
Shaft Comp. Capacity, (φ=0.65)Pn= **6813.90** kips <--φ Pn=Pu

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

Maximum Moment

First moment of the concrete
area in compression about the centoid = 14080.72 in^3
Distance between centroid of concrete
in compression and centroid of pier = 4.96 in
Moment of concrete in compression = 47874.45 in-kips 3989.537 ft-kips
Total reinforcement moment = 12043.95 in-kips 1003.663 ft-kips
Nominal Moment strength of Drilled Shaft Mn = 59918.40 in-kips
Moment Capacity of Drilled Shaft, (φ=0.65)Mn = 38946.96 in-kips 3245.58 ft-kips

Case 3, at Pmax, (φ=0.65)Mn = 3245.58 ft-kips

Individual Bars

Bar #	Angle from first bar (deg)	Distance to center of shaft (in)	Distance to neutral axis (in)	Distance to equivalent comp. zone (in)	Strain	Area of steel in compression (in^2)	Stress (ksi)	Axial force (kips)	Moment (in-kips)
1	0.00	28.94	55.97	46.96	0.00280	1.00	60.00	56.60	1637.78
2	13.85	28.10	55.12	46.12	0.00275	1.00	60.00	56.60	1590.19
3	27.69	25.62	52.65	43.65	0.00263	1.00	60.00	56.60	1450.18
4	41.54	21.66	48.69	39.68	0.00243	1.00	60.00	56.60	1225.89
5	55.38	16.44	43.47	34.46	0.00217	1.00	60.00	56.60	930.36
6	69.23	10.26	37.29	28.29	0.00186	1.00	54.04	50.64	519.66
7	83.08	3.49	30.52	21.51	0.00153	1.00	44.23	40.83	142.40
8	96.92	-3.49	23.54	14.54	0.00118	1.00	34.12	30.72	-107.14
9	110.77	-10.26	16.77	7.76	0.00084	1.00	24.30	20.90	-214.48
10	124.62	-16.44	10.59	1.59	0.00053	1.00	15.35	11.95	-196.45
11	138.46	-21.66	5.37	-3.63	0.00027	0.00	7.78	7.78	-168.59
12	152.31	-25.62	1.41	-7.60	0.00007	0.00	2.04	2.04	-52.29
13	166.15	-28.10	-1.07	-10.07	-0.00005	0.00	-1.54	-1.54	43.38
14	180.00	-28.94	-1.91	-10.91	-0.00010	0.00	-2.76	-2.76	79.94
15	193.85	-28.10	-1.07	-10.07	-0.00005	0.00	-1.54	-1.54	43.38
16	207.69	-25.62	1.41	-7.60	0.00007	0.00	2.04	2.04	-52.29
17	221.54	-21.66	5.37	-3.63	0.00027	0.00	7.78	7.78	-168.59
18	235.38	-16.44	10.59	1.59	0.00053	1.00	15.35	11.95	-196.45
19	249.23	-10.26	16.77	7.76	0.00084	1.00	24.30	20.90	-214.48
20	263.08	-3.49	23.54	14.54	0.00118	1.00	34.12	30.72	-107.14
21	276.92	3.49	30.52	21.51	0.00153	1.00	44.23	40.83	142.40
22	290.77	10.26	37.29	28.29	0.00186	1.00	54.04	50.64	519.66
23	304.62	16.44	43.47	34.46	0.00217	1.00	60.00	56.60	930.36
24	318.46	21.66	48.69	39.68	0.00243	1.00	60.00	56.60	1225.89
25	332.31	25.62	52.65	43.65	0.00263	1.00	60.00	56.60	1450.18
26	346.15	28.10	55.12	46.12	0.00275	1.00	60.00	56.60	1590.19
				Min-->	-0.00010	19.00		833.29	12043.95
									1003.663

TIA-222- H

Solve

*Highlighted cells have been modified

FACTORED LOADS

Axial Load 0.9D:	$P_{\_0.9D}$ = 0.9 * P / 1.2	$P_{\_0.9D}$ =	128.25	kip
Axial Load 1.2D:	$P_{\_1.2D}$ = 1.2 * P / 1.2	$P_{\_1.2D}$ =	171.00	kip
Shear Load:	V_u = V	V_u =	151.00	kip
Moment:	M_u = Mu	M_u =	22928.00	kip*ft

PASSIVE PRESSURE RESISTANCE

Force of Pp Applied on Pier:	$Force_{pier}$ = MIN(Vu,Sum(Pp!M2:M7))	$Force_{pier}$ =	6.61	kip
Moment Arm of Pp on Pier:	M_{arm_pier} = D-T-Pp!O2 + T	M_{arm_pier} =	2.37	ft
Force of Pp Applied on Pad:	$Force_{pad}$ = MIN(Vu-Forcepier,SUM(Pp!M8:M13))	$Force_{pad}$ =	144.39	kip
Moment Arm of Pp on Pad:	M_{arm_pad} = D-Pp!O8	M_{arm_pad} =	1.04	ft
Unfactored Moment Resistance due to Passive Pressure:	M_{R_Pp} = $Force_{pier}$*M_{arm_pier}+$Force_{pad}$*M_{arm_pad}	M_{R_Pp} =	165.63	kip*ft
Factored Moment Resistance due to Passive Pressure:	ΦM_{R_Pp} = Φs*MR_Pp	ΦM_{R_Pp} =	124.23	kip*ft

PLASTIC BEARING PRESSURE & OVERTURNING MOMENT

*Compressive Load for Bearing (0.9*D LC):*	$P_{bearing\_0.9}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_0.9_bearing	$P_{bearing\_0.9}$ =	1951.12	kip	
*Compressive Load for Bearing (1.2*D LC):*	$P_{bearing\_1.2}$ = P_1.2D+1.2*(Ws+Wc)+0.75*Wwedges_1.2_bearing	$P_{bearing\_1.2}$ =	2556.05	kip	
*Factored Overturning Moment (0.9*D LC):*	$M_{overturning\_0.9}$ = M + V * (MAX(T,D) + E + bpdist/12) + (0.9)*(P/1.2+3*Wpier)*Offset	$M_{overturning\_0.9}$ =	24923.80	kip*ft	
*Factored Overturning Moment (1.2*D LC):*	$M_{overturning\_1.2}$ = M + V * (MAX(T,D) + E + bpdist/12) + (1.2)*(P/1.2+3*Wpier)*Offset	$M_{overturning\_1.2}$ =	25249.32	kip*ft	
Area of Pad:	Area = W²	Area =	2450.25	ft^2	
Plastic Section Modulus of Pad:	Z = W³ / 4	Z =	30321.8438	ft³	
*Preliminary Load Eccentricity (0.9*D LC):*	$pre\_ec_{\_0.9\_p}$ = $M_{overturning}/P_{bearing\_0.9}$	$pre\_ec_{\_0.9\_p}$ =	12.77	ft	
*Preliminary Load Eccentricity (1.2*D LC):*	$pre\_ec_{\_1.2\_p}$ = $M_{overturning}/P_{bearing\_1.2}$	$pre\_ec_{\_1.2\_p}$ =	9.88	ft	
*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):*	$ec_{\_0.9\_p}$ = *goal seek*	$ec_{\_0.9\_p}$ =	12.38	ft	L/4 < e <= L/2
*[Goal Seek] Load Eccentricity Iteration (1.2*D LC):*	$ec_{\_1.2\_p}$ = *goal seek*	$ec_{\_1.2\_p}$ =	9.83	ft	e <= L/4
*Non-Bearing Length (0.9*D LC):*	$NBL_{\_0.9}$ = 2*ec_0.9_p	$NBL_{\_0.9}$ =	24.75	ft	
*Non-Bearing Length (1.2*D LC):*	$NBL_{\_1.2}$ = 0	$NBL_{\_1.2}$ =	0.00	ft	
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):*	$\Phi M_{Resisting\_0.9}$ = ΦM_{R_Pp} + SUM($\Phi M_{R\_wedges\_0.9}$,$\Phi M_{R\_shear\_0.9}$)	$\Phi M_{Resisting\_0.9}$ =	778.73	kip*ft	
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (1.2*D LC):*	$\Phi M_{Resisting\_1.2}$ = ΦM_{R_Pp} + SUM($\Phi M_{R\_wedges\_1.2}$,$\Phi M_{R\_shear\_1.2}$)	$\Phi M_{Resisting\_1.2}$ =	124.23	kip*ft	
*Adjusted Overturning Moment (0.9*D LC):*	$M_{overturning\_adj\_0.9}$ = $M_{overturning}$ - $\Phi M_{Resisting\_0.9}$	$M_{overturning\_0.9}$ =	24145.07	kip*ft	
*Adjusted Overturning Moment (1.2*D LC):*	$M_{overturning\_adj\_1.2}$ = $M_{overturning}$ - $\Phi M_{Resisting\_1.2}$	$M_{overturning\_1.2}$ =	25125.09	kip*ft	
*Total Resistance to Overturning (0.9*D LC):*	$\Phi M_{Resisting\_qu\_0.9}$ = $P_{bearing\_0.9}$*$ec_{\_0.9\_p}$ + $\Phi M_{Resisting\_0.9}$	$\Phi M_{Resisting\_qu\_0.9}$ =	24923.80	kip*ft	
*Total Resistance to Overturning (1.2*D LC):*	$\Phi M_{Resisting\_qu\_1.2}$ = $P_{bearing\_1.2}$*$ec_{\_1.2\_p}$ + $\Phi M_{Resisting\_1.2}$	$\Phi M_{Resisting\_qu\_1.2}$ =	25249.32	kip*ft	
[Goal Seek] Moment Comparison Iteration (0.9D LC):	$\Delta M_{\_0.9}$ = $M_{overturning}$-$\Phi M_{Resisting\_qu\_0.9}$	$\Delta M_{\_0.9}$ =	0.00	ft	
[Goal Seek] Moment Comparison Iteration (1.2D LC):	$\Delta M_{\_1.2}$ = $M_{overturning}$-$\Phi M_{Resisting\_qu\_1.2}$	$\Delta M_{\_1.2}$ =	0.00	ft	

Bearing Pressures

*Orthogonal Bearing Pressure (0.9*D LC):*	$q_{u\_orth\_0.9}$ = Pbearing_0.9/(W*(W-2*ec_0.9_p))	$q_{u\_orth\_0.9}$ =	1.59	ksf
*Orthogonal Bearing Pressure (1.2*D LC):*	$q_{u\_orth\_1.2}$ = MAX(Pbearing_1.2/Area + Moverturning_1.2/Z, Pbearing_1.2/Area - Moverturning_1.2/Z)	$q_{u\_orth\_1.2}$ =	1.87	ksf
Ultimate Gross Bearing Pressure:	Q_{ult} = Qult	Q_{ult} =	12.00	ksf
Factored Ultimate Gross Bearing Pressure:	ΦQult = φs * Qult	Qa =	9.00	ksf

Check **ΦQult =** **9.00** **ksf** **>=** **q_u =** **1.87** **ksf** **RATING:** **20.80%** **OK**

Soil Wedges (Cohesionless Soil)

0.74871697 1 Load Resistance Factors (only utilize requi

Soil (above pad) Height:	soilht = D-T	soilht =	3.75	ft
Soil (above pad & under water table) Height:	soilht_gw = MIN(soilht-gw,D-T)	soilht_gw =	0.00	ft
Soil Wedge Projection Grade:	$Wedge_{\_proj}$ = TAN(ϕ*PI()/180)*soilht	$Wedge_{\_proj}$ =	2.53	ft
Soil Wedge Projection at Water Table:	$Wedge_{\_proj\_gw}$ = TAN(ϕ*PI()/180)*(soilht_gw)	$Wedge_{\_proj\_gw}$ =	0.00	ft

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

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	15.99	2.00	50.45	100.86
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	234.76	29.35	37.12	1089.44
(2) Partial Sides (below Water Table)	0.00	0.00	37.12	0.00
(1) Rear (above Water Table)	234.76	29.35	50.34	1477.32
(1) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	485.52	60.69		2667.62

Wedge Eccentricity relative to W/2:

Total Moment Arm (ft) =	19.21
Soil Wedge Wt (kip)=	45.44

*Unfactored Resisting Moment of Wedges (0.9*D LC):*	$M_{R\_wedges\_0.9}$ = Total Moment Arm * Soil Wedge Wt	$M_{R\_wedges\_0.9}$ =	872.67	kip*ft
*Factored Resisting Moment of Wedges (0.9*D LC):*	$\Phi M_{R\_wedges\_0.9}$ = 0.75*MR_wedges_0.9	$\Phi M_{R\_wedges\_0.9}$ =	654.50	kip*ft

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

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	0.00	0.00	49.50	0.00
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	0.00	0.00	49.50	0.00
(2) Partial Sides (below Water Table)	0.00	0.00	49.50	0.00
(1) Rear (above Water Table)	0.00	0.00	50.34	0.00
(1) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	0.00	0.00		0.00

Wedge Eccentricity relative to W/2:

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

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

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

Soil Shear Strength (Cohesive Soil)

Effective Soil Unit Weight: γ_{eff_shear} = γ γ_{eff_shear} = 0.1250 kcf

Depth to Mid-Layer of Soil: $H_{\_shear}$ = ((D - T) - N) / 2 + N $H_{\_shear}$ = 3.63 ft

Cohesion at Mid-Layer of Soil: S_u = 0 S_u = 0.00 ksf

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

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
Rear	12.38	0.00	49.50	0.00
(2) Partial Sides	12.38	0.00	37.12	0.00
Total		0.00		0.00

Wedge Eccentricity relative to W/2:

Total Moment Arm (ft) =	0.00
Soil Shear Strength (kip)=	0.00

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):* $M_{R\_shear\_0.9}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_0.9}$ = 0.00 kip*ft

*Factored Resisting Moment of Soil Shear (0.9*D LC):* $\Phi M_{R\_shear\_0.9}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_0.9}$ = 0.00 kip*ft

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

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
Rear	0.00	0.00	49.50	0.00
(2) Partial Sides	0.00	0.00	49.50	0.00
Total		0.00		0.00

Wedge Eccentricity relative to W/2:

Total Moment Arm (ft) =	0.00
Soil Shear Strength (kip)=	0.00

*Unfactored Resisting Moment of Soil Shear (1.2*D LC):* $M_{R\_shear\_1.2}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_1.2}$ = 0.00 kip*ft

*Factored Resisting Moment of Soil Shear (1.2*D LC):* $\Phi M_{R\_shear\_1.2}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_1.2}$ = 0.00 kip*ft

DETERMINE MOMENT THAT WOULD CAUSE 100% OVERTURNING (ORTHOGONAL)

*Compressive Load for Bearing (0.9*D LC):* $P_{\_100}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_100 $P_{\_100}$ = 1979.83 kip

Preliminary Factored Overturning Moment: pre_$M_{overturning_100}$ = (W/2-($P_{\_100}$/ΦQult)/(2*W))*$P_{\_100}$ pre_$M_{overturning_100}$ = 43861.19 kip*ft

*Preliminary Load Eccentricity (0.9*D LC):* pre_ec$_{\_100}$ = pre_$M_{overturning_100}$ / $P_{\_100}$ pre_ec$_{\_100}$ = 22.15 ft

*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):* ec$_{\_100}$ = *goal seek* ec$_{\_100}$ = 22.09 ft L/4 < e <= L/2

*Non-Bearing Length (0.9*D LC):* NBL$_{\_100}$ = 2*ec_100 NBL$_{\_100}$ = 44.18 ft

*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):* $\Phi M_{Resisting\_100}$ = ΦM_{R_Pp} + SUM($\Phi M_{R\_wedges\_100}$,$\Phi M_{R\_shear\_100}$) $\Phi M_{Resisting\_100}$ = 830.50 kip*ft

Moment Created by Shear: M_{shear} = V_u * (D+E+bp_{dist}/12) M_{shear} = 1019.25 kip*ft

*Adjusted Overturning Moment (0.9*D LC):* $M_{overturning\_100}$ = $M_{u\_max\_100}$ - ΦM_{R_Pp} $M_{overturning\_100}$ = 44567.46 kip*ft

*Total Resistance to Overturning (0.9*D LC):* $\Phi M_{Resisting\_qu\_100}$ = $P_{\_100}$*ec$_{\_100}$ + $\Phi M_{Resisting\_100}$ $\Phi M_{Resisting\_qu\_100}$ = 44567.46 kip*ft

[Goal Seek] Moment Comparison Iteration (0.9D LC): $\Delta M_{\_100}$ = $M_{overturning}$ - $\Phi M_{Resisting\_qu\_100}$ $\Delta M_{\_100}$ = 0.00 ft

Maximum Applied Moment from Superstructure Analysis: $M_{u\_max\_100}$ = pre_Moverturning_100 + ΦMResisting_100 $M_{u\_max\_100}$ = 44691.69 kip*ft

Check **Mu_max_100 = 44691.69 kip*ft >= Mu = 24923.80 kip*ft** **RATING: 55.77% OK**

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

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	15.99	2.00	50.45	100.86
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	419.08	52.39	27.41	1435.82
(2) Partial Sides (below Water Table)	0.00	0.00	27.41	0.00
(1) Rear (above Water Table)	234.76	29.35	50.34	1477.32
(1) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	669.84	83.73		3014.00

Wedge Eccentricity relative to W/2:

Total Moment Arm (ft) =	11.25
Soil Wedge Wt (kip)=	83.73

*Unfactored Resisting Moment of Wedges (0.9*D LC):* $M_{R\_wedges\_100}$ = Total Moment Arm * Soil Wedge Wt $M_{R\_wedges\_100}$ = 941.69 kip*ft

*Factored Resisting Moment of Wedges (0.9*D LC):* $\Phi M_{R\_wedges\_100}$ = 0.75*MR_wedges_100 $\Phi M_{R\_wedges\_100}$ = 706.27 kip*ft

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

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
Rear	12.38	0.00	49.50	0.00
(2) Partial Sides	22.09	0.00	27.41	0.00
Total		0.00		0.00

Wedge Eccentricity relative to W/2:

Total Moment Arm (ft) =	0.00
Soil Shear Strength (kip)=	0.00

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):* $M_{R\_shear\_100}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_100}$ = 0.00 kip*ft

*Factored Resisting Moment of Soil Shear (0.9*D LC):* $\Phi M_{R\_shear\_100}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_100}$ = 0.00 kip*ft

PASSIVE PRESSURE RESISTANCE (DIAGONAL DIRECTION)

Force of Pp Applied on Pier: $Force_{pier}$ = MIN(Vu,Sum(Pp!M2:M7))) $Force_{pier}$ = 6.61 kip

Moment Arm of Pp on Pier: M_{arm_pier} = D-T-Pp!O2 + T M_{arm_pier} = 2.37 ft

Force of Pp Applied on Pad: $Force_{pad\_dia}$ = MIN(V_u-$Force_{pier}$,SUM(Pp!M8:M13)) $Force_{pad\_dia}$ = 144.39 kip

Moment Arm of Pp on Pad:	M_{arm_pad} = D-Pp!O8	M_{arm_pad} =	1.04	ft
Unfactored Moment Resistance due to Passive Pressure:	$M_{R\_Pp\_dia} = Force_{pier} * M_{arm\_pier} + Force_{pad} * M_{arm\_pad}$	$M_{R\_Pp\_dia}$ =	165.63	kip*ft
Factored Moment Resistance due to Passive Pressure:	$\Phi M_{R\_Pp\_dia} = \Phi_s * M_{R\_Pp\_dia}$	$\Phi M_{R\_Pp\_dia}$ =	124.23	kip*ft

PLASTIC BEARING PRESSURE & OVERTURNING MOMENT (DIAGONAL DIRECTION)

*Compressive Load for Bearing (0.9*D LC):*	$P_{bearing\_0.9\_dia}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_0.9_bearing_dia	$P_{bearing\_0.9\_dia}$ =	1978.61	kip	
*Compressive Load for Bearing (1.2*D LC):*	$P_{bearing\_1.2\_dia}$ = P_1.2D+1.2*(Ws+Wc)+0.75*Wwedges_1.2_bearing_dia	$P_{bearing\_1.2\_dia}$ =	2613.88	kip	
Factored Overturning Moment:	$M_{overturning} = M_u + V_u * (D+E+bp_{dist}/12)$	$M_{overturning}$ =	23947.25	kip*ft	
Area of Pad:	Area = W²	Area =	2450.25	ft^2	
Plastic Section Modulus of Pad:	$Z_{\_dia}$ = W³ / (3*SQRT(2))	$Z_{\_dia}$ =	28587.71	ft³	
*Preliminary Load Eccentricity (0.9*D LC):*	$pre\_ec_{\_0.9\_p\_dia} = M_{overturning}/P_{bearing\_0.9\_dia}$	$pre\_ec_{\_0.9\_p\_dia}$ =	12.60	ft	
*Preliminary Load Eccentricity (1.2*D LC):*	$pre\_ec_{\_1.2\_p\_dia} = M_{overturning}/P_{bearing\_1.2\_dia}$	$pre\_ec_{\_1.2\_p\_dia}$ =	9.54	ft	
*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):*	$ec_{\_0.9\_p\_dia}$ = *goal seek*	$ec_{\_0.9\_p\_dia}$ =	12.17	ft	(L/4)*SQRT(2)/2 < e <= (L/2)*SQRT(2)
*[Goal Seek] Load Eccentricity Iteration (1.2*D LC):*	$ec_{\_1.2\_p\_dia}$ = *goal seek*	$ec_{\_1.2\_p\_dia}$ =	9.20	ft	(L/4)*SQRT(2)/2 < e <= (L/2)*SQRT(2)
*Non-Bearing Length (0.9*D LC):*	$NBL_{\_0.9\_dia}$ = SQRT(2)*ec_0.9_p_dia	$NBL_{\_0.9\_dia}$ =	17.21	ft	
*Non-Bearing Length (1.2*D LC):*	$NBL_{\_1.2\_dia}$ = SQRT(2)*ec_1.2_p_dia	$NBL_{\_1.2\_dia}$ =	13.01	ft	
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):*	$\Phi M_{Resisting\_0.9} = \Phi M_{R\_Pp\_dia} + SUM(\Phi M_{R\_wedges\_0.9\_dia}, \Phi M_{R\_shear\_0.9\_dia})$	$\Phi M_{Resisting\_0.9\_dia}$ =	841.17	kip*ft	
*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (1.2*D LC):*	$\Phi M_{Resisting\_1.2} = \Phi M_{R\_Pp\_dia} + SUM(\Phi M_{R\_wedges\_1.2\_dia}, \Phi M_{R\_shear\_1.2\_dia})$	$\Phi M_{Resisting\_1.2\_dia}$ =	882.81	kip*ft	
*Adjusted Overturning Moment (0.9*D LC):*	$M_{overturning\_0.9\_dia} = M_{overturning} - \Phi M_{Resisting\_0.9\_dia}$	$M_{overturning\_0.9\_dia}$ =	24082.63	kip*ft	
*Adjusted Overturning Moment (1.2*D LC):*	$M_{overturning\_1.2\_dia} = M_{overturning} - \Phi M_{Resisting\_1.2\_dia}$	$M_{overturning\_1.2\_dia}$ =	24041.00	kip*ft	
*Total Resistance to Overturning (0.9*D LC):*	$\Phi M_{Resisting\_qu\_0.9\_dia} = P_{bearing\_0.9\_dia} * ec_{\_0.9\_p\_dia} + \Phi M_{Resisting\_0.9\_dia}$	$\Phi M_{Resisting\_qu\_0.9\_dia}$ =	24923.80	kip*ft	
*Total Resistance to Overturning (1.2*D LC):*	$\Phi M_{Resisting\_qu\_1.2\_dia} = P_{bearing\_1.2\_dia} * ec_{\_1.2\_p\_dia} + \Phi M_{Resisting\_1.2\_dia}$	$\Phi M_{Resisting\_qu\_1.2\_dia}$ =	24923.80	kip*ft	
[Goal Seek] Moment Comparison Iteration (0.9D LC):	$\Delta M_{\_0.9\_dia} = M_{overturning} - \Phi M_{Resisting\_qu\_0.9\_dia}$	$\Delta M_{\_0.9\_dia}$ =	0.00	kip*ft	
[Goal Seek] Moment Comparison Iteration (1.2D LC):	$\Delta M_{\_1.2\_dia} = M_{overturning} - \Phi M_{Resisting\_qu\_1.2\_dia}$	$\Delta M_{\_1.2\_dia}$ =	0.00	kip*ft	

Bearing Pressures

*Diagonal Bearing Pressure (0.9*D LC):*	$q_{u\_dia\_0.9}$ = Pbearing_0.9_dia/((W-(SQRT(2))*ec_0.9_p_dia))^2	$q_{u\_dia\_0.9}$ =	1.90	ksf
*Diagonal Bearing Pressure (1.2*D LC):*	$q_{u\_dia\_1.2}$ = Pbearing_1.2_dia/((W-(SQRT(2))*ec_1.2_p_dia))^2	$q_{u\_dia\_1.2}$ =	1.96	ksf
Ultimate Gross Bearing Pressure:	Q_{ult} = Qult	Q_{ult} =	12.00	ksf
Factored Ultimate Gross Bearing Pressure:	ΦQult = φs * Qult	Qa =	9.00	ksf

Check **ΦQult = 9.00 ksf >= q_u = 1.96 ksf** **RATING: 21.81% OK**

Soil Wedges (Cohesionless Soil)

1 1

Soil (above pad) Height:	soilht = D-T	soilht =	3.75	ft
Soil (above pad & under water table) Height:	soilht_gw = MIN(soilht-gw,D-T)	soilht_gw =	0.00	ft
Soil Wedge Projection at Grade:	$Wedge_{\_proj}$ = TAN(ϕ*PI()/180)*soilht	$Wedge_{\_proj}$ =	2.53	ft
Soil Wedge Projection at Water Table:	$Wedge_{\_proj\_gw}$ = TAN(ϕ*PI()/180)*(soilht_gw)	$Wedge_{\_proj\_gw}$ =	0.00	ft

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

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	15.99	2.00	35.00	69.98
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(1) End Prism (above Water Table)	8.00	1.00	70.90	70.87
(1) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	163.27	20.41	28.47	581.02
(2) Partial Sides (below Water Table)	0.00	0.00	0.00	0.00
(2) Rear (above Water Table)	469.52	58.69	52.95	3107.63
(2) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	656.78	82.10		3829.51

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

Total Moment Arm (ft) = 11.64

Soil Wedge Wt (kip)= 82.10

*Unfactored Resisting Moment of Wedges (0.9*D LC):*	$M_{R\_wedges\_0.9}$ = Total Moment Arm * Soil Wedge Wt	$M_{R\_wedges\_0.9\_dia}$ =	955.93	kip*ft
*Factored Resisting Moment of Wedges (0.9*D LC):*	$\Phi M_{R\_wedges\_0.9}$ = 0.75*MR_wedges_0.9_dia	$\Phi M_{R\_wedges\_0.9\_dia}$ =	716.95	kip*ft

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

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	15.99	2.00	35.00	69.98
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(1) End Prism (above Water Table)	8.00	1.00	70.90	70.87
(1) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	123.38	15.42	29.96	461.98
(2) Partial Sides (below Water Table)	0.00	0.00	0.00	0.00
(2) Rear (above Water Table)	469.52	58.69	52.95	3107.63
(2) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	616.89	77.11		3710.47

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

Total Moment Arm (ft) = 13.12

Soil Wedge Wt (kip)= 77.11

*Unfactored Resisting Moment of Wedges (1.2*D LC):*	$M_{R\_wedges\_1.2}$ = Total Moment Arm * Soil Wedge Wt	$M_{R\_wedges\_1.2\_dia}$ =	1011.44	kip*ft
*Factored Resisting Moment of Wedges (1.2*D LC):*	$\Phi M_{R\_wedges\_1.2}$ = 0.75*MR_wedges_1.2_dia	$\Phi M_{R\_wedges\_1.2\_dia}$ =	758.58	kip*ft

Soil Shear Strength (Cohesive Soil)

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

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) Rear	24.75	0.00	52.50	0.00
(2) Partial Sides	8.61	0.00	28.92	0.00
Total		0.00		0.00

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

Total Moment Arm (ft) =	0.00
Soil Shear Strength (kip)=	0.00

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):* $M_{R\_shear\_0.9}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_0.9\_dia}$ = 0.00 kip*ft

*Factored Resisting Moment of Soil Shear (0.9*D LC):* $\Phi M_{R\_shear\_0.9}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_0.9\_dia}$ = 0.00 kip*ft

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

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) Rear	24.75	0.00	52.50	0.00
(2) Partial Sides	6.50	0.00	30.40	0.00
Total		0.00		0.00

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

Total Moment Arm (ft) =	0.00
Soil Shear Strength (kip)=	0.00

*Unfactored Resisting Moment of Soil Shear (1.2*D LC):* $M_{R\_shear\_1.2}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_1.2\_dia}$ = 0.00 kip*ft

*Factored Resisting Moment of Soil Shear (1.2*D LC):* $\Phi M_{R\_shear\_1.2}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_1.2\_dia}$ = 0.00 kip*ft

DETERMINE MOMENT THAT WOULD CAUSE 100% OVERTURNING (DIAGONAL)

*Compressive Load for Bearing (0.9*D LC):* $P_{\_100\_dia}$ = P_0.9D+0.9*(Ws+Wc)+0.75*Wwedges_100_dia $P_{\_100\_dia}$ = 1994.01 kip

Preliminary Factored Overturning Moment: pre_$M_{overturning_100_dia}$ = (P_100_dia/(SQRT(2)))*(W-SQRT(P_100_dia/ΦQult)) pre_$M_{overturning_100_dia}$ = 48806.65 kip*ft

*Preliminary Load Eccentricity (0.9*D LC):* pre_$ec_{_100_dia}$ = pre_$M_{overturning_100_dia}$ / $P_{bearing\_0.9}$ pre_$ec_{_100_dia}$ = 24.48 ft

*[Goal Seek] Load Eccentricity Iteration (0.9*D LC):* $ec_{\_100\_dia}$ = *goal seek* $ec_{\_100\_dia}$ = 24.41 ft (L/4)*SQRT(2)/2 < e <= (L/2)*SQRT(2)

*Non-Bearing Length (0.9*D LC):* $NBL_{\_100\_dia}$ = SQRT(2)*ec_100_dia $NBL_{\_100\_dia}$ = 34.53 ft

*Total Factored Resisting Moment due to Pp and Soil Wedges / Shear (0.9*D LC):* $\Phi M_{Resisting\_100\_dia}$ = $\Phi M_{R\_Pp\_dia}$ + SUM($\Phi M_{R\_wedges\_100\_dia}$,$\Phi M_{R\_shear\_100\_dia}$) $\Phi M_{Resisting\_100\_dia}$ = 552.64 kip*ft

Moment Created by Shear: M_{shear} = V_u * (D+E+bp_{dist}/12) M_{shear} = 1019.25 kip*ft

*Adjusted Overturning Moment (0.9*D LC):* $M_{overturning\_100\_dia}$ = $M_{u\_max\_100\_dia}$ - $\Phi M_{R\_Pp\_dia}$ $M_{overturning\_100\_dia}$ = 49235.07 kip*ft

*Total Resistance to Overturning (0.9*D LC):* $\Phi M_{Resisting\_qu\_100\_dia}$ = $P_{bearing\_0.9}$*$ec_{\_100\_dia}$ + $\Phi M_{Resisting\_100\_dia}$ $\Phi M_{Resisting\_qu\_100\_dia}$ = 49235.07 kip*ft

[Goal Seek] Moment Comparison Iteration (0.9D LC): $\Delta M_{\_100\_dia}$ = $M_{overturning}$ - $\Phi M_{Resisting\_qu\_100\_dia}$ $\Delta M_{\_100\_dia}$ = 0.00 ft

Maximum Applied Moment from Superstructure Analysis: $M_{u\_max\_100\_dia}$ = pre_Moverturning_100_dia + ΦMResisting_100_dia $M_{u\_max\_100\_dia}$ = 49359.29 kip*ft

Check Mu_max_100_dia = 49359.29 kip*ft >= Mu = 24923.80 kip*ft RATING: 50.49% OK

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

Soil	Volume (ft³)	Soil Weight (kips)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) End Prisms (above Water Table)	15.99	2.00	35.00	69.98
(2) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(1) End Prism (above Water Table)	8.00	1.00	70.90	70.87
(1) End Prisms (below Water Table)	0.00	0.00	0.00	0.00
(2) Partial Sides (above Water Table)	327.50	40.94	22.35	914.85
(2) Partial Sides (below Water Table)	0.00	0.00	0.00	0.00
(2) Rear (above Water Table)	469.52	58.69	52.95	3107.63
(2) Rear (below Water Table)	0.00	0.00	0.00	0.00
Total	821.01	102.63		4163.34

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

Total Moment Arm (ft) =	5.57
Soil Wedge Wt (kip)=	102.63

*Unfactored Resisting Moment of Wedges (0.9*D LC):* $M_{R\_wedges\_100\_dia}$ = Total Moment Arm * Soil Wedge Wt $M_{R\_wedges\_100\_dia}$ = 571.22 kip*ft

*Factored Resisting Moment of Wedges (0.9*D LC):* $\Phi M_{R\_wedges\_100\_dia}$ = 0.75*MR_wedges_100_dia $\Phi M_{R\_wedges\_100\_dia}$ = 428.42 kip*ft

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

Plane	Area (ft²)	Resistance (kip)	Moment Arm (ft)	Unfactored Resisting Moment (kip*ft)
(2) Rear	24.75	0.00	52.50	0.00
(2) Partial Sides	17.26	0.00	22.79	0.00
Total		0.00		0.00

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

Total Moment Arm (ft) =	0.00
Soil Shear Strength (kip)=	0.00

*Unfactored Resisting Moment of Soil Shear (0.9*D LC):* $M_{R\_shear\_100\_dia}$ = Total Moment Arm * Soil Shear Strength $M_{R\_shear\_100\_dia}$ = 0.00 kip*ft

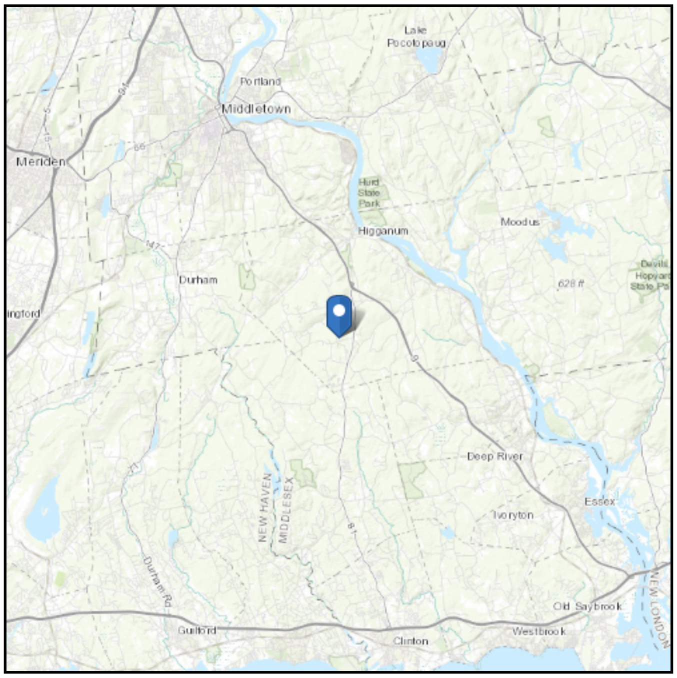
*Factored Resisting Moment of Soil Shear (0.9*D LC):* $\Phi M_{R\_shear\_100\_dia}$ = 0.75 * (Total Moment Arm * Soil Shear Strength) $\Phi M_{R\_shear\_100\_dia}$ = 0.00 kip*ft

ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: III
Soil Class: D - Stiff Soil

Elevation: 658.67 ft (NAVD 88)
Latitude: 41.443598
Longitude: -72.566462



Wind

Results:

Wind Speed:	138 Vmph
10-year MRI	78 Vmph
25-year MRI	88 Vmph
50-year MRI	95 Vmph
100-year MRI	104 Vmph

Data Source: ASCE/SEI 7-10, Fig. 26.5-1B and Figs. CC-1–CC-4, incorporating errata of March 12, 2014

Date Accessed: Tue Feb 25 2020

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-10 Standard. Wind speeds correspond to approximately a 3% probability of exceedance in 50 years (annual exceedance probability = 0.000588, MRI = 1,700 years).

Site is in a hurricane-prone region as defined in ASCE/SEI 7-10 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.

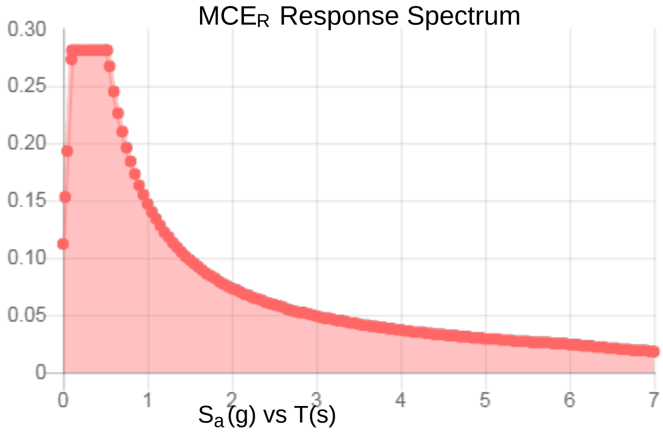
Seismic

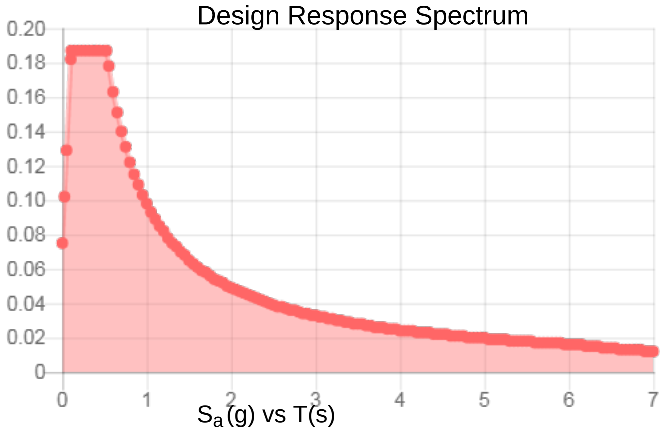
Site Soil Class: D - Stiff Soil

Results:

S_S :	0.176	S_{DS} :	0.187
S_1 :	0.061	S_{D1} :	0.098
F_a :	1.6	T_L :	6
F_v :	2.4	PGA :	0.089
S_{MS} :	0.281	PGA_M :	0.143
S_{M1} :	0.147	F_{PGA} :	1.6
		I_e :	1.25

Seismic Design Category B





Data Accessed: Tue Feb 25 2020

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

Ice

Results:

Ice Thickness:	0.75 in.
Concurrent Temperature:	15 F
Gust Speed:	50 mph
Data Source:	Standard ASCE/SEI 7-10, Figs. 10-2 through 10-8
Date Accessed:	Tue Feb 25 2020

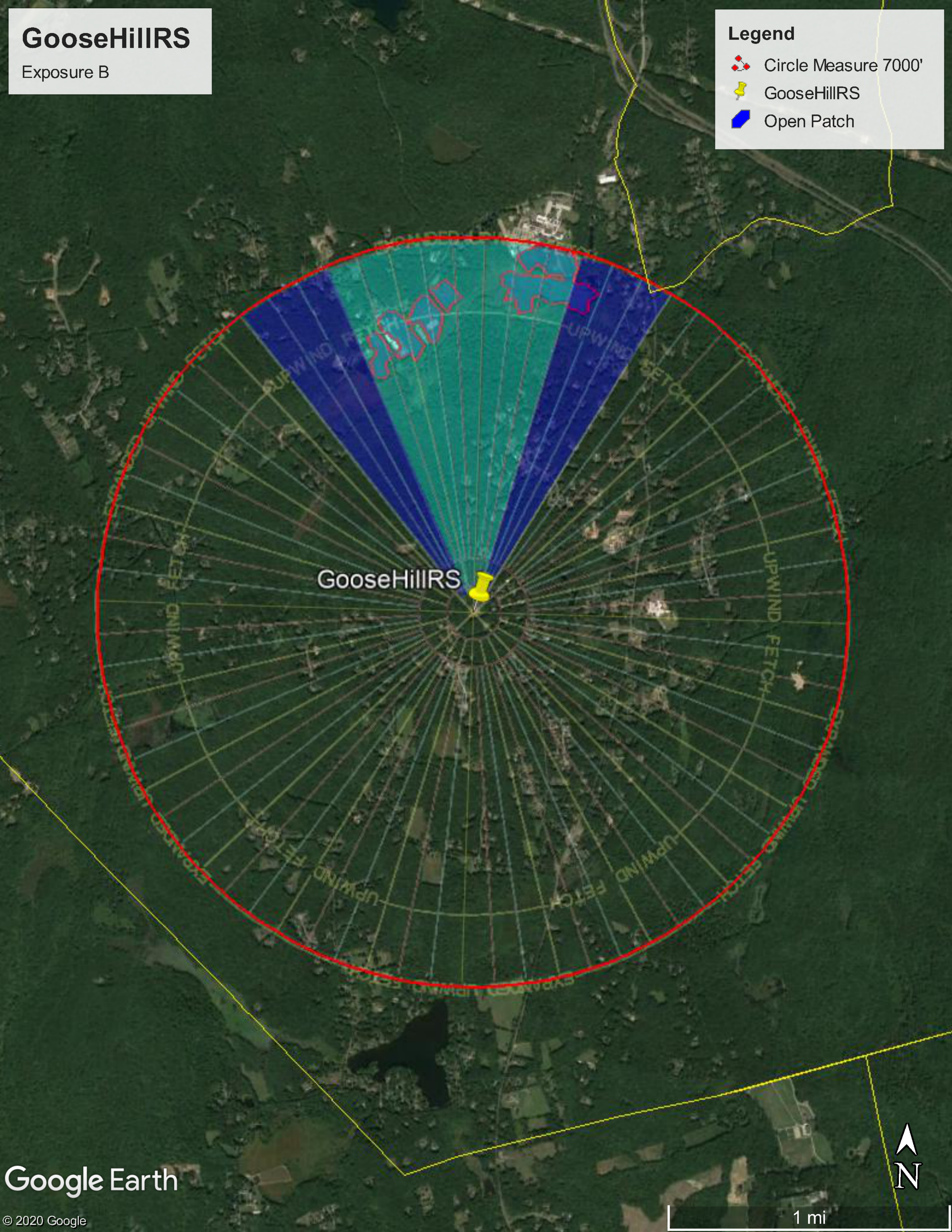
Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 50-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided "as is" and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.


GooseHillRS
Exposure B
Legend
Circle Measure 7000'
GooseHillRS
Open Patch
UPWIND FETCH
EXPANDED FETCH
GooseHillRS
Google Earth
© 2020 Google
N
1 mi

ATTACHMENT D – PROOF OF DELIVERY OF NOTICE

Ref: CT587100-ES010 G Date: 01Oct20 SHIPPING: 0.00
Dep: BL GRAPHICS Wgt: 1.30 LBS SPECIAL: 0.00
HANDLING: 0.00
DV: 0.00 TOTAL: 0.00

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4666

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 1.30 LB
CAD: 0765627/CAFE3311

BILL THIRD PARTY

565C2/A27E/05A2

TO **BILL WARNER, TOWN PLANNER**
TOWN OF HADDAM
30 FIELD PARK DRIVE

HADDAM CT 06438

REF: CT587100-ES010 GOOSE HILL

DEPT: BL GRAPHICS

FedEx
Express

E

J191219082001uv

FRI - 02 OCT 12:00P
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 4666**

00 RSPA

06438
CT-US **BDL**

Ref: CT587100-ES010 G Date: 01Oct20
Dep: BL GRAPHICS Wgt: 1.30 LBS
DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4655

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 1.30 LB MAN
CAD: 0765627/CAFE3311

BILL THIRD PARTY

TO **HONORABLE ROBERT MCGARRY**
TOWN OF HADDAM
30 FIELD PARK DRIVE

HADDAM CT 06438
REF: CT587100-ES010 GOOSE HILL
DEPT: BL GRAPHICS

565C2/A27E/05A2

FedEx
Express

E

J19121908200 1uv

FRI - 02 OCT 12:00P
PRIORITY OVERNIGHT

TRK#
0201 **9151 3346 4655**

00 RSPA

06438
CT-US **BDL**

Ref: CT587100-ES010 G Date: 01Oct20
Dep: BL GRAPHICS Wgt: 1.30 LBS
DV: 0.00

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

Svcs: PRIORITY OVERNIGHT
TRCK: 9151 3346 4644

ORIGIN ID:RSPA (800) 301-3077

BL COMPANIES
355 RESEARCH PARKWAY

MERIDEN, CT 06450
UNITED STATES US

SHIP DATE: 01OCT20
ACTWGT: 1.30 LB
CAD: 0765627/CAFE3311

BILL THIRD PARTY

565C2/A27E/05A2

TO

CONNECTICUT SITING COUNCIL
10 FRANKLIN SQUARE

NEW BRITAIN CT 06051
REF: CT587100-ES010 GOOSE HILL
DEPT: BL GRAPHICS

FedEx
Express

E

J191219082001uv

FRI - 02 OCT 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **9151 3346 4644**

00 BDLA

06051
CT-US **BDL**

ATTACHMENT E - POWER DENSITY REPORT

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

Calculated Radio Frequency Emissions Report

EVERSOURCE ENERGY

ES-010

330 Pokorny Road

Haddam, CT

June 25, 2020

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed Eversource installation on the self-support tower at 330 Pokorny Road in Haddam, CT. Eversource is proposing to install two omnidirectional antennas – one transmit and one receive-only antenna – as part of its 220 MHz communications system.

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

Figure 1: View of ES-010 Goose Hill

Site Address	330 Pokorny Road
Latitude	41° 26' 36.95" N
Longitude	72° 33' 59.26" W
Site Elevation AMSL	658’
Survey Engineer	Marc Salas
Survey Date/Time	6/24/2020; 8:30 AM – 9:15 AM

Table 1: Survey Information

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

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

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

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

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

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

4. 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.

5. 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	Comprod 871F-70-220	217	2.5	124	4	~110°	5.5	180

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

---

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

[2] Transmit antenna height is based on the Black & Veatch Structural Analysis Report dated June 11, 2020.

6. Measurement Procedure

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

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

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

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

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

Manufacturer	Narda Microwave			
Probe	EA 5091, Serial# 0116			
Calibration Date	May 2020			
Calibration Interval	24 Months			
Meter	NBM550, Serial# E-1069			
Calibration Date	May 2020			
Calibration Interval	24 Months			
Probe Specifications	**Frequency Range**	**Field Measured**	**Standard**	**Measurement Range**
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.2 – 600 % of Standard

Table 3: Instrumentation Information

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

---

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

7. 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 24, 2020 between 8:30 AM and 9:15 AM. The calculated % MPE contribution from the proposed equipment modifications was then added to the measured % MPE values in the “Composite % MPE” column. These calculated values incorporate the antenna pattern of the antenna model specified by Eversource to determine the “Off Beam Loss” factor shown in the power density formula from Section 4. All % MPE values are in reference to the FCC Uncontrolled/General Population exposure limit.

Table 4 below lists 13 measurements recorded in the vicinity of the tower. The highest spatially averaged measurement was 6.88% (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 7.48% (Average Uncontrolled/General Population) and is also calculated to occur at 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**	**41.44348**	**-72.56651**	**44**	**6.88%**	**0.60%**	**7.48%**
2	SW corner of fenced compound	41.44342	-72.56641	66	4.84%	0.85%	5.69%
3	SE corner of fenced compound	41.44349	-72.56614	96	2.57%	1.06%	3.63%
4	N side of tower	41.44370	-72.56642	38	1.11%	0.52%	1.63%
5	SW entrance road to compound	41.44338	-72.56668	100	1.08%	1.05%	2.14%
6	SW (halfway down access road)	41.44297	-72.56720	304	< 1.00%	0.50%	< 1.50%
7	341 Pokorny Road / Access road)	41.44293	-72.56801	491	< 1.00%	0.25%	< 1.25%
8	West of tower (Pokorny Rd.)	41.44318	-72.56797	441	< 1.00%	0.30%	< 1.30%
9	Intersection of Bartman Rd. / Pokorny Rd.	41.44198	-72.56800	724	1.57%	0.14%	1.71%
10	112 Bartman Rd.	41.44248	-72.56566	463	2.78%	0.27%	3.05%
11	74 Bartman Rd.	41.44297	-72.56277	1036	2.67%	0.07%	2.74%
12	Intersection of Bartman Rd. / Country Walk	41.44452	-72.56732	411	4.19%	0.33%	4.52%
13	Cul de sac (End of Country Walk)	41.44450	-72.56372	819	3.63%	0.11%	3.74%

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

---

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

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

Figure 2: Measurement Points – Zoom In

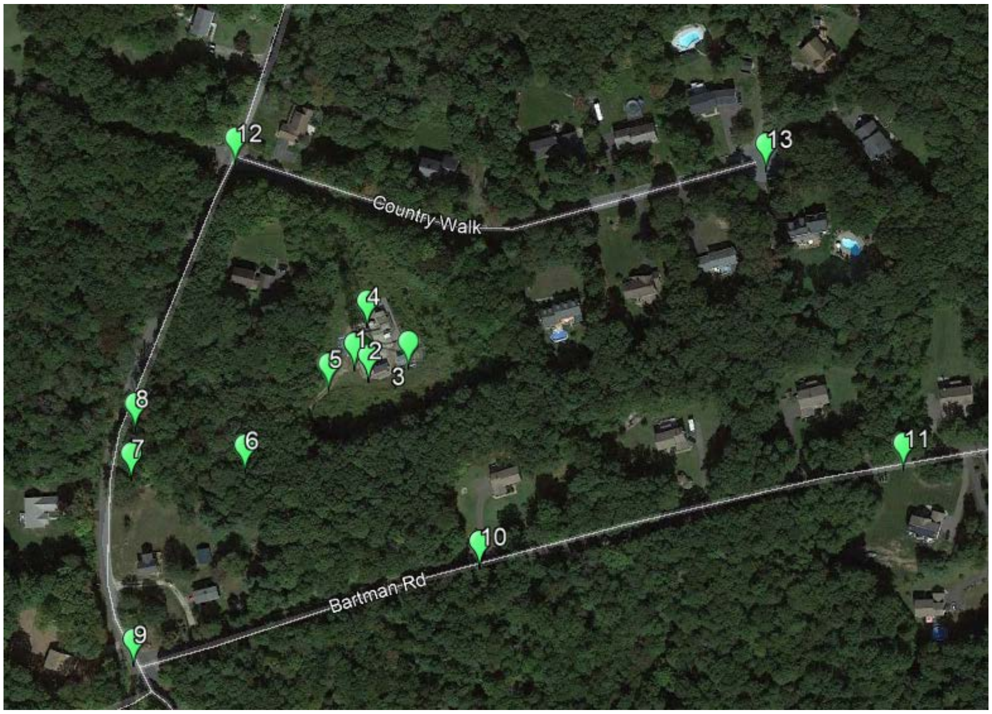

Figure 3: All Measurement Points

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

8. Conclusion

A number of accessible areas around the tower at 330 Pokorny Road, Haddam, Middlesex, CT were surveyed and found to be well within the mandated General Population/Uncontrolled limits for Maximum Permissible Exposure, as delineated in the Federal Communications Commission's Radio Frequency exposure rules published in 47 CFR 1.1307(b)(1)-(b)(3).

The highest spatially averaged % MPE measurement of all surveyed points based on the 1997 FCC standard for exposure to the general population is 6.88% MPE. This measurement was recorded at Location 1, at the compound access gate.

The highest composite (measured + calculated) power density is **7.48% of the FCC General Population MPE limit** with the proposed Eversource equipment and is also calculated to occur at Location 1.

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.

9. 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.

June 25, 2020

Report Prepared By: Cory Goulet
Associate RF Engineer
C Squared Systems, LLC

Date

Keith Vellante

June 26, 2020

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

Date

Attachment A: References

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

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

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

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

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

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

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

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

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

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

---

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

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

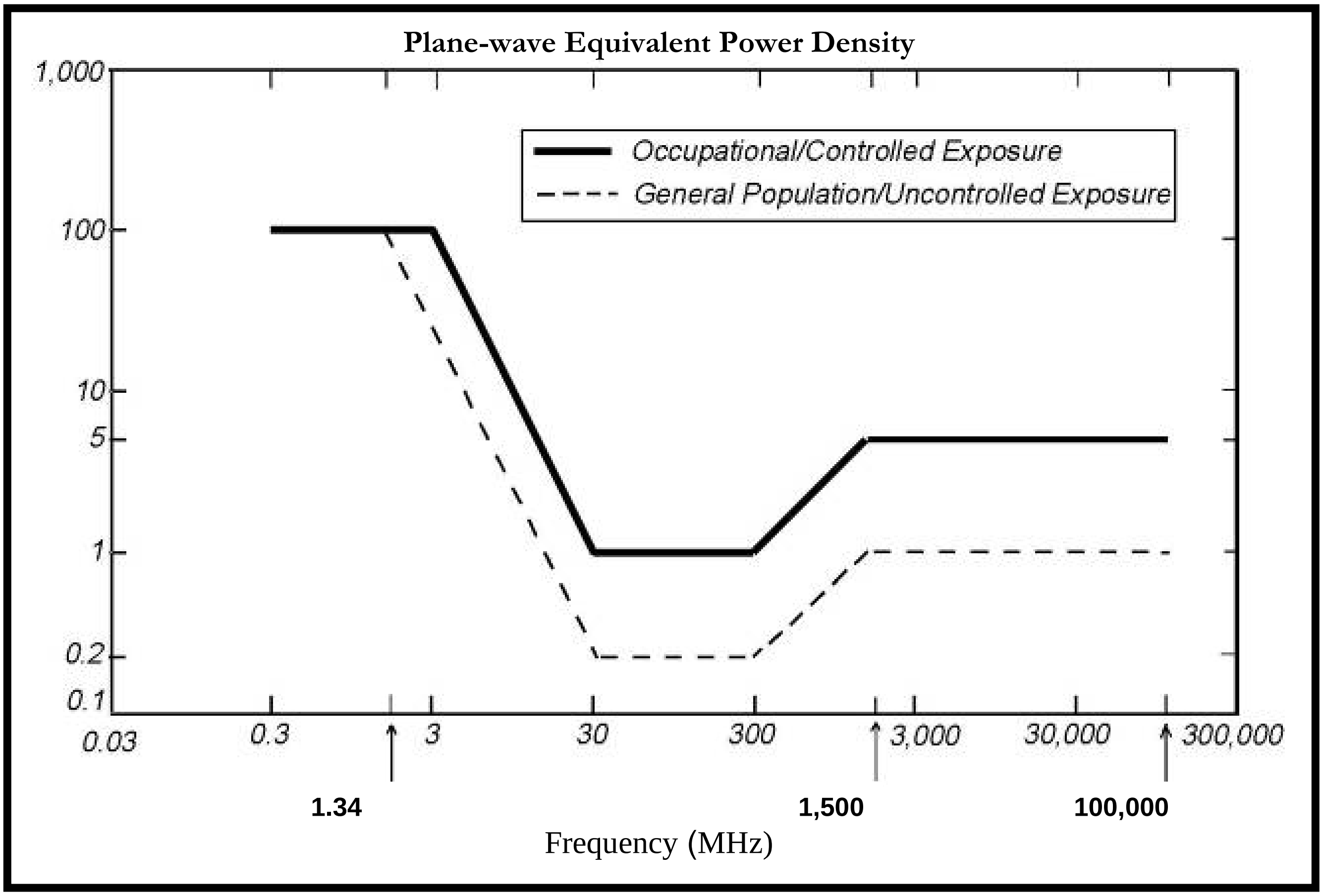
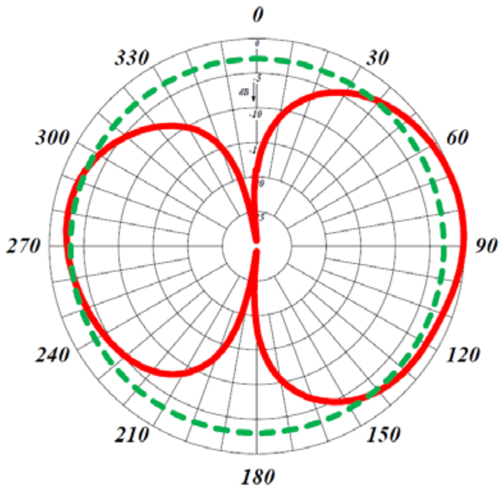


Figure 4: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Eversource Antenna Data Sheet and Electrical Patterns[8]

217 MHz

Manufacturer:	Comprod
Model #:	871F-70-220
Frequency Band:	215 - 225 MHz
Gain:	2.5 dBd
Vertical Beamwidth:	~ 110°
Horizontal Beamwidth:	360°
Polarization:	Vertical-Polarization
Length:	5.5'



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