ROBINSON & COLE

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TS-VER-065-080201

ORIGINAL

February 1, 2008

RECEIVED
FEB 1 - 2008
CONNECTICUT
SITING COUNCIL

Via Hand Delivery

Mr. S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Request of Cellco Partnership d/b/a Verizon Wireless for an Order to Approve the Shared Use of a Tower Facility Off Center Hill Road, Hartland, Connecticut**

Dear Mr. Phelps:

Pursuant to Connecticut General Statutes §16-50aa, as amended, Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby requests an order from the Connecticut Siting Council ("Council") to approve the proposed shared use by Cellco of an existing telecommunications tower, owned by the Town of Hartland (the "Town"), located off Center Hill Road in Hartland, Connecticut. Cellco requests that the Council find that the proposed shared use of the tower satisfies the criteria stated in Connecticut General Statutes § 16-50aa and issue an order approving the proposed use. In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Wade E. Cole, First Selectman of the Town of Hartland. The Town is the owner of the property on which the tower is located.

Background

The Town tower is a 180-foot self-supporting lattice structure and is currently unoccupied. Cellco is licensed by the Federal Communications Commission (FCC) to provide wireless telecommunications services in the State of Connecticut, which includes the area to be served by Cellco's proposed Hartland installation. Cellco and the Town have agreed to the proposed shared use of this tower pursuant to mutually acceptable terms and conditions, and the Town has authorized Cellco to act on its

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behalf to apply for all necessary local, state and federal permits, approvals, and authorizations which may be required for the proposed shared use of this facility.

Cellco proposes to install a total of six (6) LPA-80080/6CF antennas and six (6) LPA-185080/12CF antennas at the 180-foot level on the tower and place a 12' x 30' equipment building within the fenced compound at the base of the tower. See Project Plans included behind Tab 1.

C.G.S. § 16-50aa(c)(1) provides that, upon written request for approval of a proposed shared use, "if the council finds that the proposed shared use of the facility is technically, legally, environmentally and economically feasible and meets public safety concerns, the council shall issue an order approving such shared use." The shared use of the tower satisfies those criteria as follows:

A. Technical Feasibility. The existing tower is structurally capable of supporting the proposed Cellco antennas. The proposed shared use of this tower therefore is technically feasible. A Structural Analysis Report verifying the structural integrity of the existing tower is included behind Tab 2.

B. Legal Feasibility. Under C.G.S. § 16-50aa, the Council has been authorized to issue orders approving the proposed shared use of existing towers like the Town facility in Hartland. This authority compliments the Council's existing authority under C.G.S. § 16-50p to issue orders approving the construction of new towers that are subject to the Council's jurisdiction. In addition, § 16-50x(a) directs the Council to "give such consideration to other state laws and municipal regulations as it shall deem appropriate" in ruling on requests for the shared use of existing towers facilities. Under the statutory authority vested in the Council, an order by the Council approving the requested shared use would permit the Applicant to obtain a building permit for the proposed installations.

C. Environmental Feasibility. The proposed shared use would have a minimal environmental effect, for the following reasons:

1. The proposed installations would have an insignificant incremental visual impact, and would not cause any significant change or alteration in the physical or environmental characteristics of the existing site. In particular, the proposed installations would not increase the height of the existing

tower, and would not extend the boundaries of the tower site outside the limits of the existing compound or Town property.

2. The proposed installations would not increase the noise levels at the existing facility by six decibels or more.

3. Operation of Cellco antennas at this site would not exceed the total radio frequency (RF) electromagnetic radiation power density level adopted by the Federal Communications Commission. The "worst-case" exposure calculated for operation of Cellco's facility (i.e., calculated at the base of the tower), would be 6.76% of the standard). See Power Density Calculation Table behind Tab 3.

4. The proposed installations, would not require any water or sanitary facilities, or generate air emissions or discharges to water or sanitary facilities, or generate air emissions or discharges to water bodies. After construction is complete the proposed installations would not generate any traffic other than periodic maintenance visits.

The proposed use of the Town tower would, therefore, have a minimal environmental effect, and is environmentally feasible.

E. Economic Feasibility. As previously mentioned, the Town and Cellco have entered into a mutual agreement to share the use of the tower on terms agreeable to the parties. The proposed tower sharing is therefore economically feasible.

F. Public Safety Concerns. As stated above, the tower is structurally capable of supporting the Cellco antennas. Cellco is not aware of any public safety concerns relative to the proposed sharing of the existing tower. In fact, the provision of new or improved telecommunications service through shared use of the existing tower is expected to enhance the safety and welfare of area residents.

Conclusion

For the reasons discussed above, the proposed shared use of the existing Town tower in Hartland, Connecticut satisfies the criteria stated in C.G.S. § 16-50aa and advances the General Assembly's and the Siting Council's goal of preventing the proliferation of towers in Connecticut. The Applicant therefore requests that the Siting Council issue an order approving the proposed shared use.

Thank you for your consideration of this matter.

Very truly yours,

Kenneth C. Baldwin

Enclosures
Copy to:
Allan D. Walker, Jr., Woodstock First Selectman
Sandy M. Carter
Michelle Kababik

Cellco Partnership

d.b.a. verizon wireless

WIRELESS COMMUNICATIONS FACILITY

HARTLAND
CENTER HILL ROAD
HARTLAND, CT

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT
TO: CENTER HILL ROAD, HARTLAND, CONNECTICUT

1. START AT 99 E RIVER DR	0.3 MI.
2. TURN LEFT TO STAY ON E RIVER DR	<0.1 MI.
3. TURN LEFT (WEST) ONTO US-44 [CONNECTICUT BLVD]	0.2 MI.
4. TAKE RAMP ONTO I-84 [US-44]	0.3 MI.
5. AT EXIT 50, TURN OFF ONTO RAMP	0.2 MI.
6. KEEP STRAIGHT ONTO US-44 [MORGAN ST]	9.4 MI.
7. KEEP STRAIGHT ONTO US-202 [US-44]	5.3 MI.
8. KEEP RIGHT ONTO US-44 [ALBANY TPKE]	6.2 MI.
9. TURN (NORTH-EAST) ONTO SR-181 [RIVER RD]	1.1 MI.
10. TURN (EAST) ONTO SR-181 [SR-318]	0.7 MI.
11. KEEP STRAIGHT ONTO SR-181 [PLEASANT VALLEY RD]	0.5 MI.
12. BEAR LEFT (NORTH) ONTO SR-181 [CENTER HILL RD]	4.3 MI.
13. ARRIVE AT SITE ENTRANCE ON CENTER HILL RD	

GENERAL NOTES

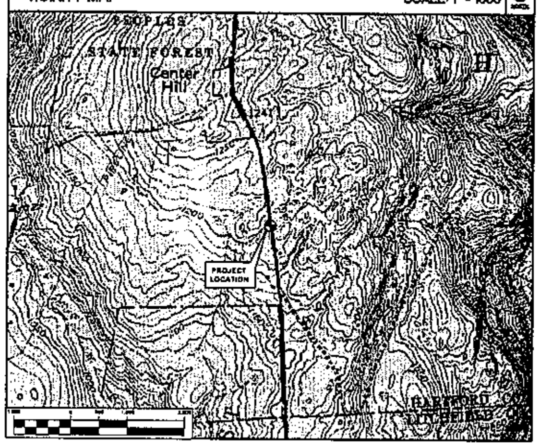
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF A 12'x30' PREFABRICATED WIRELESS EQUIPMENT SHELTER ON A CONCRETE FOUNDATION WITHIN THE EXISTING WIRELESS COMMUNICATIONS LEASE AREA.
2. A TOTAL OF TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED ON AN EXISTING 180' LATTICE TOWER AT A RAD CENTER ELEVATION OF 180' ABOVE THE EXISTING TOWER BASE PLATE.
3. ELECTRIC AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND TO THE PROPOSED EQUIPMENT SHELTER FROM A PROPOSED UTILITY BACKBOARD LOCATED OUTSIDE THE ENTRANCE TO THE EXISTING FENCED COMPOUND.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	HARTLAND
SITE ADDRESS:	CENTER HILL ROAD HARTLAND, CT
LESSEE/ TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON:	SANDY CARTER CELLCO PARTNERSHIP (860) 803-8219
TOWER COORDINATES:	LATITUDE: 41°-58'-43.32" LONGITUDE: 72°-58'-55.78" COORDINATES BASED CSC WEB LOG LAST UPDATED 11/5/07.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	A
C-1	COMPOUND PLAN AND ELEVATION	A

REVISIONS		
A	11/20/07	CSC - REVIEW

Cellco Partnership
d.b.a. verizon wireless

NATCOMM
CONSULTING ENGINEERS
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f: 203.488.8587
w: natcomm.com
e: info@nat-eng.com
63-2 N. Branford Rd.
Branford, CT 06405

HARTLAND

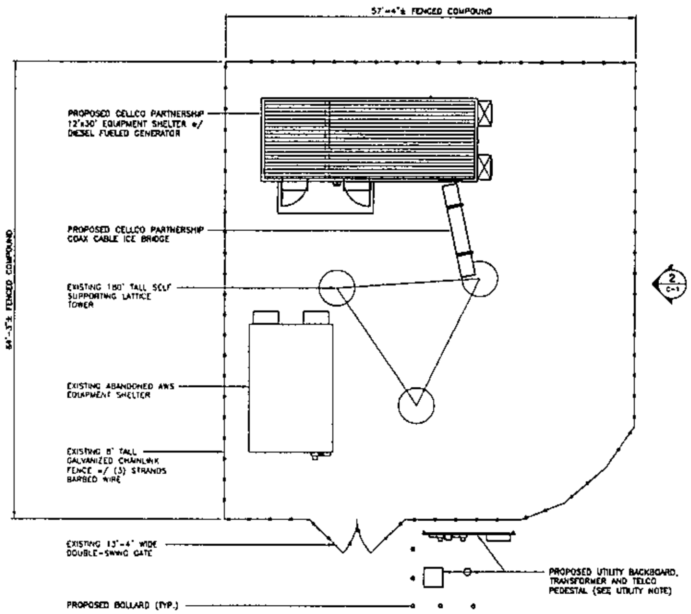
CENTER HILL ROAD
HARTLAND, CT

PROJECT NO:	07076
DRAWN BY:	DEB
CHECKED BY	CFC
SCALE:	AS NOTED
DATE:	10/24/07

TITLE SHEET

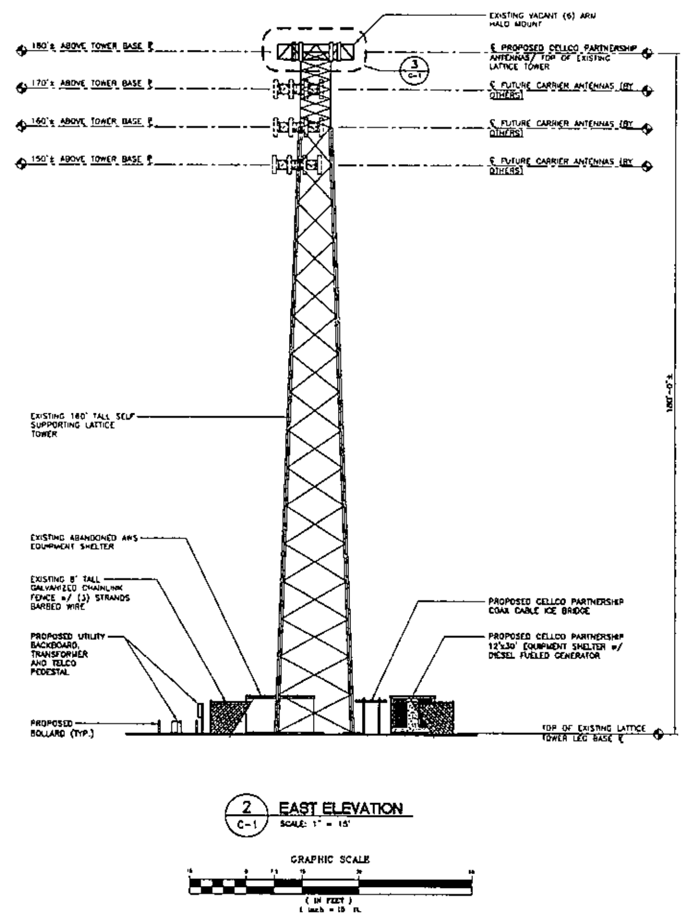
T-1

DWG. 1 OF 2

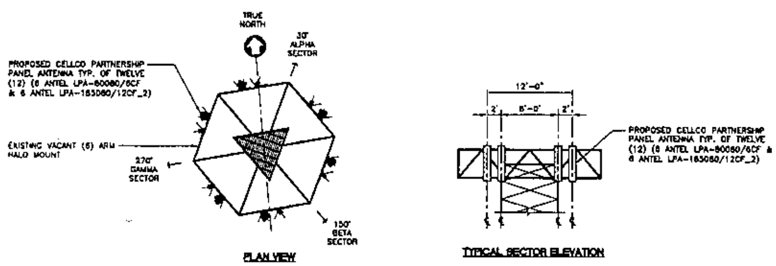


1 / C-1 COMPOUND PLAN
SCALE: 1/8" = 1'-0"

UTILITY NOTE:
UTILITY ROUTING, BACKBOARD LOCATION AND TRANSFORMER LOCATION TO BE COORDINATED WITH SITE OWNER AND LOCAL UTILITY COMPANY(S) DURING CONSTRUCTION DOCUMENT PHASE OF PROJECT.



2 / C-1 EAST ELEVATION
SCALE: 1" = 15'



3 / C-1 ANTENNA MOUNTING CONFIGURATION
NOT TO SCALE

REVISIONS		
A	11/2007	CSC REVIEW

Cellco Partnership
d.b.a. Verizon wireless

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HARTLAND

CENTER HILL ROAD
HARTLAND, CT

PROJECT NO:	07076
DRAWN BY:	DEB
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	10/24/07

COMPOUND PLAN AND ELEVATION

C-1
DWG. 2 OF 2

NATCOMM INC.
CONSULTING ENGINEERS

Structural Analysis Report

180' Existing Self Supporting
Lattice Tower

Center Hill Road
Hartland, CT

Natcomm Project No. 07076

Date: November 28, 2007

Prepared for:

Verizon Wireless
99 East River Road, 9^{th} Floor
East Hartford, CT 06108

p: 203.488.0580
f: 203.488.8587
w: nat-eng.com
63-2 N. Branford Rd.
Branford, CT 06405

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed on the existing self supporting lattice tower located in East Hartland, Connecticut. The host tower is a 180-ft, three legged, tapered lattice tower originally designed and manufactured by Valmont Structures; drawing no. 198204 dated April 4, 2006.

The tower is constructed of pipe legs, diagonal angle braces and horizontal angle braces. The tower members are all bolted together. The width of the tower face is 4-ft at the top and 20-ft at the base. The tower geometry and structure member sizes were taken from Valmont Structures' original design documents available in Section 4 of this report.

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The proposed and future loads considered in this analysis consist of the following:

- **VERIZON (Proposed):**
  Antennas: Six (6) Amphenol Antel, Inc. (Antel) LPA-80080/6CF and six (6) Antel LPA-185080/12CF_2 panel antennas mounted on the existing 6 arm halo mount with a RAD center elevation of 180-ft above the existing tower base plate .
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on a leg of the existing tower as specified in section 3 of this report.
- FUTURE CARRIER:
  Antennas: Twelve (12) RR90-17-00DP panel antennas mounted on three (3) PiROD 12-ft lightweight T-Frames with a RAD center elevation of 170-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on a leg of the existing tower as specified in section 3 of this report.
- FUTURE CARRIER:
  Antennas: Twelve (12) RR90-17-00DP panel antennas mounted on (3) PiROD 12-ft lightweight T-Frames with a RAD center elevation of 160-ft above the existing tower base plate .
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on a leg of the existing tower as specified in section 3 of this report.

- FUTURE CARRIER:
  Antennas: Twelve (12) RR90-17-00DP panel antennas mounted on (3) PiROD 12-ft lightweight T-Frames with a RAD center elevation of 150-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on a leg of the existing tower as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables to be routed as specified in section 3 of this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled RISATower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower legs, and the model assumes that the leg members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for 80mph basic wind speed (fastest mile) with no ice and 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice tower structure and its components.

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Hartland; v = 90 mph (3 second gust) equivalent to v = 75 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed Controls	
Load Cases:	<u>Load Case 1</u>; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	<u>Load Case 2</u>; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	<u>Load Case 3</u>; Seismic – not checked	*[Section 1610.1.3 of State Bldg. Code 1999] does not control in the design of this structure type*

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software RISATower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **85.7%** of its total capacity.

Foundation and Anchors

The existing foundation consists of three (3) 5-ft∅ reinforced concrete piers with a 28.5-ft square reinforced concrete pad concentrically bearing directly on existing sub grade. The sub grade conditions used in the analysis of the existing foundation were derived from Valmont Structures original design documents available in section 4 of this report. Tower legs are connected to the three (3) piers by means of (6) 1 1/4"∅, ASTM A687 anchor bolts per leg, embedded approximately 6-ft into the concrete foundation structure.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:
  - Uplift @ top of pedestal = **230.0** kips
  - Shear @ top of pedestal = **30.0** kips
  - Compression @ top of pedestal = **300.0** kips
- Base plates, anchor bolts and the foundation were found to be within allowable limits.
- Foundation resists two times the calculated wind load per the requirements of section 3108.4.2 of the 2005 CT State Building Code Supplement to the 2003 International Building Code (IBC).

Conclusion

This analysis shows that the subject tower and 6 arm halo mount **is adequate** to support the proposed antennas and associated hardware.

The analysis is based, in part, on the information provided to this office by Verizon Wireless. If the existing conditions are different than the information in this report, Natcomm, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

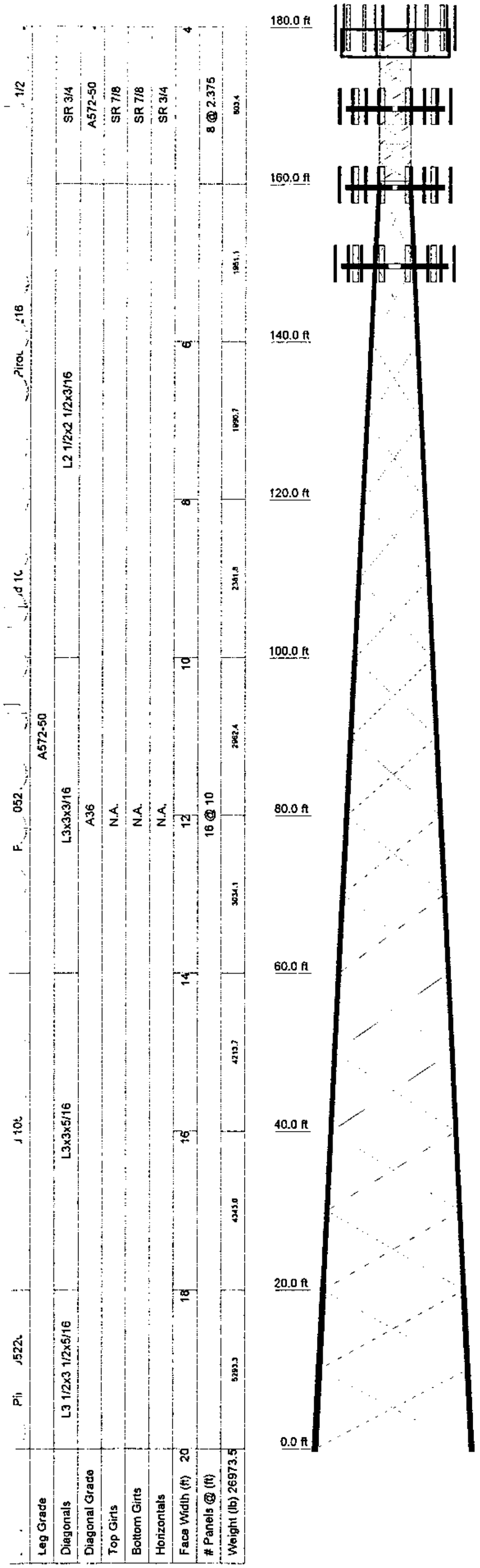
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Natcomm, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provide to Natcomm, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Natcomm, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

- RISATower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- RISATower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LPA-80080/6CF (Verizon)	180	(4) RR90-17-00DP (Future)	170
LPA-185080/12CF (Verizon)	180	(4) RR90-17-00DP (Future)	170
LPA-185080/12CF (Verizon)	180	(4) RR90-17-00DP (Future)	160
LPA-80080/6CF (Verizon)	180	PiROD 12' Lightweight T-Frame (Future)	160
LPA-80080/6CF (Verizon)	180		
LPA-185080/12CF (Verizon)	180	PiROD 12' Lightweight T-Frame (Future)	160
LPA-185080/12CF (Verizon)	180		
LPA-80080/6CF (Verizon)	180	PiROD 12' Lightweight T-Frame (Future)	160
LPA-80080/6CF (Verizon)	180	(4) RR90-17-00DP (Future)	160
LPA-185080/12CF (Verizon)	180	(4) RR90-17-00DP (Future)	160
LPA-185080/12CF (Verizon)	180	(4) RR90-17-00DP (Future)	150
LPA-80080/6CF (Verizon)	180	PiROD 12' Lightweight T-Frame (Future)	150
6 Arm Halo Mount	178		
PiROD 12' Lightweight T-Frame (Future)	170	PiROD 12' Lightweight T-Frame (Future)	150
PiROD 12' Lightweight T-Frame (Future)	170	PiROD 12' Lightweight T-Frame (Future)	150
PiROD 12' Lightweight T-Frame (Future)	170	(4) RR90-17-00DP (Future)	150
		(4) RR90-17-00DP (Future)	150
(4) RR90-17-00DP (Future)	170		

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 a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 85.7%

MAX. CORNER REACTIONS AT BASE:
DOWN: 299933 lb
UPLIFT: -229785 lb
SHEAR: 29596 lb

AXIAL 71884 lb
SHEAR 44264 lb
MOMENT 4779971 lb-ft
TORQUE 12337 lb-ft
69 mph WIND - 0.5000 in ICE

AXIAL 40578 lb
SHEAR 38343 lb
MOMENT 4138659 lb-ft
TORQUE 12241 lb-ft
REACTIONS - 80 mph WIND

NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **180' U20.0 Valmont Self-Support Lattic**		
	Project: **07076 - Center Hill Rd, Hartland, CT**		
	Client: Verizon	Drawn by: Staff	App'd:
	Code: TIA/EIA-222-F	Date: 10/21/07	Scale:
	Path: C:\Users\kieman214\Documents\Natcomm\07076 Hartland\ERI Files\180 Lattice Hartland.eri		Dwg N

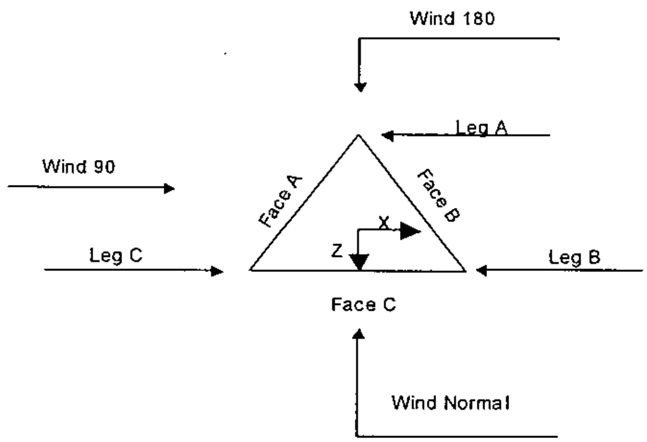
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 4.00 ft at the top and 20.00 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

- Basic wind speed of 80 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 69 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- Weld together tower sections have flange connections..
- Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
- Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
- Welds are fabricated with ER-70S-6 electrodes..
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333.
- Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Distribute Leg Loads As Uniform		Treat Feedline Bundles As Cylinder
	Consider Moments - Horizontals		Assume Legs Pinned		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Diagonals	√	Assume Rigid Index Plate	√	Calculate Redundant Bracing Forces
	Use Moment Magnification	√	Use Clear Spans For Wind Area		Ignore Redundant Members in FEA
√	Use Code Stress Ratios	√	Use Clear Spans For KL/r	√	SR Leg Bolts Resist Compression
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension	√	All Leg Panels Have Same Allowable
	Escalate Ice		Bypass Mast Stability Checks		Offset Girt At Foundation
	Always Use Max Kz		Use Azimuth Dish Coefficients	√	Consider Feedline Torque
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Include Angle Block Shear Check
√	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Poles
√	Leg Bolts Are At Top Of Section		SR Members Have Cut Ends		Include Shear-Torsion Interaction
	Secondary Horizontal Braces Leg	√	Sort Capacity Reports By Component		Always Use Sub-Critical Flow
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Use Top Mounted Sockets
	Add IBC .6D+W Combination				



Triangular Tower

Tower Section Geometry

Tower Section	*Tower Elevation* ft	*Assembly Database*	*Description*	*Section Width* ft	*Number of Sections*	*Section Length* ft
T1	180.00-160.00	pirod	V4 106778	4.00	1	20.00
T2	160.00-140.00		U6.0 105245	4.00	1	20.00
T3	140.00-120.00	pirod	U8.0 105216	6.00	1	20.00
T4	120.00-100.00	pirod	U10.0 105217 L2 1/2x3/16	8.00	1	20.00
T5	100.00-80.00	pirod	U12.0 105218	10.00	1	20.00
T6	80.00-60.00	pirod	U14.0 105218	12.00	1	20.00
T7	60.00-40.00	pirod	U16.0 105219	14.00	1	20.00
T8	40.00-20.00	pirod	U18.0 105219	16.00	1	20.00
T9	20.00-0.00		U20.0 105219 L3.5x5/16	18.00	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	180.00-160.00	2.38	X Brace	No	Steps	6.0000	6.0000
T2	160.00-140.00	10.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	10.00	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	10.00	X Brace	No	No	0.0000	0.0000
T5	100.00-80.00	10.00	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	10.00	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
T7	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	20.00-0.00	10.00	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 180.00-160.00	Solid Round	1 1/2	A572-50 (50 ksi)	Solid Round	3/4	A572-50 (50 ksi)
T2 160.00-140.00	Truss Leg	Pirod 105216	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 140.00-120.00	Truss Leg	Pirod 105216	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 120.00-100.00	Truss Leg	Pirod 105217	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T5 100.00-80.00	Truss Leg	Pirod 105218	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T6 80.00-60.00	Truss Leg	Pirod 105218	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T7 60.00-40.00	Truss Leg	Pirod 105219	A572-50 (50 ksi)	Single Angle	L3x3x5/16	A36 (36 ksi)
T8 40.00-20.00	Truss Leg	Pirod 105219	A572-50 (50 ksi)	Single Angle	L3x3x5/16	A36 (36 ksi)
T9 20.00-0.00	Truss Leg	Pirod 105220	A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x5/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 180.00-160.00	Solid Round	7/8	A572-50 (50 ksi)	Solid Round	7/8	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 180.00-160.00	None	Solid Round		A572-50 (50 ksi)	Solid Round	3/4	A572-50 (50 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Gusset Area (per face)* *ft²*	*Gusset Thickness* *in*	*Gusset Grade*	*Adjust. Factor* A_f	*Adjust. Factor* A_r	*Weight Mult.*	*Double Angle Stitch Bolt Spacing Diagonals* *in*	*Double Angle Stitch Bolt Spacing Horizontals* *in*
T1 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1	1	1.02	36.0000	36.0000
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T4 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T5 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T6 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T7 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T8 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T9 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000

Tower Section Geometry *(cont'd)*

			K Factors[1]							
Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*Legs*	*X Brace Diags* X Y	*K Brace Diags* X Y	*Single Diags* X Y	*Girts* X Y	*Horiz.* X Y	*Sec. Horiz.* X Y	*Inner Brace* X Y
T1 180.00-160.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 100.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 80.00-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 60.00-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 40.00-20.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T9 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*
T2 160.00-140.00	1	0.5	0.85	1	0.5	0.85
T3 140.00-120.00	1	0.5	0.85	1	0.5	0.85
T4 120.00-100.00	1	0.5	0.85	1	0.5	0.85
T5 100.00-80.00	1	0.5	0.85	1	0.5	0.85
T6 80.00-60.00	1	0.5	0.85	1	0.5	0.85
T7 60.00-40.00	1	0.5	0.85	1	0.5	0.85
T8 40.00-20.00	1	0.5	0.85	1	0.5	0.85
T9 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 180.00-160.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T2 160.00-140.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T3 140.00-120.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T4 120.00-100.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T5 100.00-80.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 80.00-60.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T7 60.00-40.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T8 40.00-20.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T9 20.00-0.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Connection Type*	*Leg*		*Diagonal*		*Top Girt*		*Bottom Girt*		*Mid Girt*		*Long Horizontal*		*Short Horizontal*	
		Bolt Size in	*No.*	*Bolt Size in*	*No.*	*Bolt Size in*	*No.*	*Bolt Size in*	*No.*	*Bolt Size in*	*No.*	*Bolt Size in*	*No.*	*Bolt Size in*	*No.*
T1 180.00-160.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 160.00-140.00	Flange	1.0000 A325N	6	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-80.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 80.00-60.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T7 60.00-40.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T8 40.00-20.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T9 20.00-0.00	Flange	1.2500 A325N	6	1.2500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 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*	*Component Type*	*Placement ft*	*Face Offset in*	*Lateral Offset (Frac FW)*	*#*	*# Per Row*	*Clear Spacing in*	*Width or Diameter in*	*Perimeter in*	*Weight plf*
1 5/8	A	No	Ar (Leg)	170.00 - 3.00	0.0000	0.08	24	12	0.5000 1.0000	1.9800		1.04
1 5/8	C	No	Ar (Leg)	150.00 - 3.00	0.0000	0.08	12	6	0.5000 1.0000	1.9800		1.04
1 5/8	A	No	Ar (Leg)	180.00 - 170.00	0.0000	0.08	12	12	0.5000 1.0000	1.9800		1.04
1 5/8	B	No	Ar (Leg)	160.00 - 3.00	0.0000	0.08	12	6	0.5000 1.0000	1.9800		1.04

Feed Line/Linear Appurtenances Section Areas

Tower Section	*Tower Elevation ft*	*Face*	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	*Weight lb*
T1	180.00-160.00	A	39.600	0.000	0.000	0.000	374.40
		B	39.600	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	49.500	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	29.700	0.000	0.000	0.000	124.80
T3	140.00-120.00	A	59.400	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	39.600	0.000	0.000	0.000	249.60
T4	120.00-100.00	A	59.400	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	39.600	0.000	0.000	0.000	249.60

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 lb
T5	100.00-80.00	A	59.400	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	39.600	0.000	0.000	0.000	249.60
T6	80.00-60.00	A	59.400	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	39.600	0.000	0.000	0.000	249.60
T7	60.00-40.00	A	59.400	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	39.600	0.000	0.000	0.000	249.60
T8	40.00-20.00	A	59.400	0.000	0.000	0.000	499.20
		B	59.400	0.000	0.000	0.000	249.60
		C	39.600	0.000	0.000	0.000	249.60
T9	20.00-0.00	A	50.490	0.000	0.000	0.000	424.32
		B	50.490	0.000	0.000	0.000	212.16
		C	33.660	0.000	0.000	0.000	212.16

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	180.00-160.00	A	0.500	4.967	45.467	0.000	0.000	973.14
		B		4.967	45.467	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.500	7.450	55.800	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		7.450	31.000	0.000	0.000	322.76
T3	140.00-120.00	A	0.500	9.933	66.133	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		9.933	41.333	0.000	0.000	645.52
T4	120.00-100.00	A	0.500	9.933	66.133	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		9.933	41.333	0.000	0.000	645.52
T5	100.00-80.00	A	0.500	9.933	66.133	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		9.933	41.333	0.000	0.000	645.52
T6	80.00-60.00	A	0.500	9.933	66.133	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		9.933	41.333	0.000	0.000	645.52
T7	60.00-40.00	A	0.500	9.933	66.133	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		9.933	41.333	0.000	0.000	645.52
T8	40.00-20.00	A	0.500	9.933	66.133	0.000	0.000	1297.51
		B		9.933	66.133	0.000	0.000	645.52
		C		9.933	41.333	0.000	0.000	645.52
T9	20.00-0.00	A	0.500	8.443	56.213	0.000	0.000	1102.89
		B		8.443	56.213	0.000	0.000	548.69
		C		8.443	35.133	0.000	0.000	548.69

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	180.00-160.00	0.0000	-8.5083	0.0000	-6.5782
T2	160.00-140.00	0.9935	-3.1228	0.7334	-2.6818
T3	140.00-120.00	0.0000	-3.2559	0.0000	-2.9038
T4	120.00-100.00	0.0000	-4.0528	0.0000	-3.6226
T5	100.00-80.00	0.0000	-4.6811	0.0000	-4.2196
T6	80.00-60.00	0.0000	-5.4369	0.0000	-4.9042
T7	60.00-40.00	0.0000	-6.0328	0.0000	-5.4438
T8	40.00-20.00	0.0000	-6.7181	0.0000	-6.0664
T9	20.00-0.00	0.0000	-6.4067	0.0000	-5.8101

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
6 Arm Halo Mount	C	None		0.0000	178.00	No Ice 1/2" Ice	41.70 53.60	41.70 53.60	2400.00 3200.00
PiROD 12' Lightweight T-Frame (Future)	A	From Leg	1.50 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
PiROD 12' Lightweight T-Frame (Future)	B	From Leg	1.50 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
PiROD 12' Lightweight T-Frame (Future)	C	From Leg	1.50 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
(4) RR90-17-00DP (Future)	A	From Leg	3.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
(4) RR90-17-00DP (Future)	B	From Leg	3.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
(4) RR90-17-00DP (Future)	C	From Leg	3.00 0.00 0.00	0.0000	170.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
PiROD 12' Lightweight T-Frame (Future)	A	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
PiROD 12' Lightweight T-Frame (Future)	B	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
PiROD 12' Lightweight T-Frame (Future)	C	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
(4) RR90-17-00DP (Future)	A	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
(4) RR90-17-00DP (Future)	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
(4) RR90-17-00DP (Future)	C	From Leg	3.00 0.00	0.0000	160.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		C_AA_A *Front* ft^2	C_AA_A *Side* ft^2	*Weight* *lb*
			0.00						
PiROD 12' Lightweight T-Frame (Future)	A	From Leg	1.50 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
PiROD 12' Lightweight T-Frame (Future)	B	From Leg	1.50 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
PiROD 12' Lightweight T-Frame (Future)	C	From Leg	1.50 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	10.20 16.20	10.20 16.20	253.00 355.00
(4) RR90-17-00DP (Future)	A	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
(4) RR90-17-00DP (Future)	B	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
(4) RR90-17-00DP (Future)	C	From Leg	3.00 0.00 0.00	0.0000	150.00	No Ice 1/2" Ice	4.36 4.77	1.97 2.31	18.00 40.42
LPA-80080/6CF (Verizon)	A	From Leg	3.00 -6.00 0.00	0.0000	180.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-185080/12CF (Verizon)	A	From Leg	3.00 -4.00 0.00	0.0000	180.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-185080/12CF (Verizon)	A	From Leg	3.00 4.00 0.00	0.0000	180.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-80080/6CF (Verizon)	A	From Leg	3.00 6.00 0.00	0.0000	180.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-80080/6CF (Verizon)	B	From Leg	3.00 -6.00 0.00	0.0000	180.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-185080/12CF (Verizon)	B	From Leg	3.00 -4.00 0.00	0.0000	180.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-185080/12CF (Verizon)	B	From Leg	3.00 4.00 0.00	0.0000	180.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-80080/6CF (Verizon)	B	From Leg	3.00 6.00 0.00	0.0000	180.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-80080/6CF (Verizon)	C	From Leg	3.00 -6.00 0.00	0.0000	180.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-185080/12CF (Verizon)	C	From Leg	3.00 -4.00 0.00	0.0000	180.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-185080/12CF (Verizon)	C	From Leg	3.00 4.00 0.00	0.0000	180.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-80080/6CF (Verizon)	C	From Leg	3.00 6.00 0.00	0.0000	180.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24

Truss-Leg Properties

Section Designation	Area in^2	Area Ice in^2	Self Weight lb	Ice Weight lb	Equiv. Diameter in	Equiv. Diameter Ice in	Leg Area in^2
Pirod 105216	1998.0891	3357.4497	505.25	428.24	6.9378	11.6578	3.6816
Pirod 105216	1998.0891	3357.4497	505.25	428.24	6.9378	11.6578	3.6816
Pirod 105217	2130.7479	3520.4599	619.35	443.34	7.3984	12.2238	5.3014
Pirod 105218	2263.4687	3690.8612	754.52	458.46	7.8593	12.8155	7.2158
Pirod 105218	2263.4687	3690.8612	754.52	458.46	7.8593	12.8155	7.2158
Pirod 105219	2441.8688	3942.2854	944.27	485.72	8.4787	13.6885	9.4248
Pirod 105219	2441.8688	3942.2854	944.27	485.72	8.4787	13.6885	9.4248
Pirod 105220	2578.8005	4132.5504	1121.16	500.74	8.9542	14.3491	11.9282

Tower Pressures - No Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 180.00-160.00	170.00	1.597	26	82.500	A	0.000	49.672	5.000	10.07	0.000	0.000
					B	0.000	49.672		10.07		
					C	0.000	11.767		42.49		
T2 160.00-140.00	150.00	1.541	25	122.111	A	7.894	72.665	23.165	28.76	0.000	0.000
					B	7.894	82.565		25.61		
					C	7.894	52.865		38.13		
T3 140.00-120.00	130.00	1.48	24	162.111	A	8.723	82.565	23.165	25.38	0.000	0.000
					B	8.723	82.565		25.38		
					C	8.723	62.765		32.40		
T4 120.00-100.00	110.00	1.411	23	202.528	A	9.970	84.103	24.703	26.26	0.000	0.000
					B	9.970	84.103		26.26		
					C	9.970	64.303		33.26		
T5 100.00-80.00	90.00	1.332	22	242.945	A	13.520	85.641	26.241	26.46	0.000	0.000
					B	13.520	85.641		26.46		
					C	13.520	65.841		33.07		
T6 80.00-60.00	70.00	1.24	20	282.945	A	15.144	85.641	26.241	26.04	0.000	0.000
					B	15.144	85.641		26.04		
					C	15.144	65.841		32.40		
T7 60.00-40.00	50.00	1.126	18	323.362	A	16.830	87.709	28.309	27.08	0.000	0.000
					B	16.830	87.709		27.08		
					C	16.830	67.909		33.41		
T8 40.00-20.00	30.00	1	16	363.362	A	18.566	87.709	28.309	26.64	0.000	0.000
					B	18.566	87.709		26.64		
					C	18.566	67.909		32.74		
T9 20.00-0.00	10.00	1	16	403.780	A	23.735	80.387	29.897	28.71	0.000	0.000
					B	23.735	80.387		28.71		
					C	23.735	63.557		34.25		

Tower Pressure - With Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.597	20	0.5000	84.167	A	45.467	25.026	8.333	11.82	0.000	0.000
						B	45.467	25.026		11.82		
						C	0.000	24.015		34.70		
T2 160.00-140.00	150.00	1.541	19	0.5000	123.780	A	63.694	49.532	38.924	34.38	0.000	0.000
						B	74.027	52.015		30.88		
						C	38.894	49.532		44.02		
T3 140.00-120.00	130.00	1.48	18	0.5000	163.780	A	74.856	52.346	38.924	30.60	0.000	0.000
						B	74.856	52.346		30.60		
						C	50.056	52.346		38.01		
T4 120.00-100.00	110.00	1.411	17	0.5000	204.197	A	76.104	54.735	40.814	31.19	0.000	0.000
						B	76.104	54.735		31.19		
						C	51.304	54.735		38.49		
T5 100.00-80.00	90.00	1.332	16	0.5000	244.614	A	79.653	57.229	42.789	31.26	0.000	0.000
						B	79.653	57.229		31.26		
						C	54.853	57.229		38.18		
T6 80.00-60.00	70.00	1.24	15	0.5000	284.614	A	81.278	57.771	42.789	30.77	0.000	0.000
						B	81.278	57.771		30.77		
						C	56.478	57.771		37.45		
T7 60.00-40.00	50.00	1.126	14	0.5000	325.031	A	82.963	61.248	45.704	31.69	0.000	0.000
						B	82.963	61.248		31.69		
						C	58.163	61.248		38.27		
T8 40.00-20.00	30.00	1	12	0.5000	365.031	A	84.700	61.826	45.704	31.19	0.000	0.000
						B	84.700	61.826		31.19		
						C	59.900	61.826		37.55		
T9 20.00-0.00	10.00	1	12	0.5000	405.448	A	79.948	63.135	47.910	33.48	0.000	0.000
						B	79.948	63.135		33.48		
						C	58.868	63.135		39.27		

Tower Pressure - Service

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.597	10	82.500	A	0.000	49.672	5.000	10.07	0.000	0.000
					B	0.000	49.672		10.07		
					C	0.000	11.767		42.49		
T2 160.00-140.00	150.00	1.541	10	122.111	A	7.894	72.665	23.165	28.76	0.000	0.000
					B	7.894	82.565		25.61		
					C	7.894	52.865		38.13		
T3 140.00-120.00	130.00	1.48	9	162.111	A	8.723	82.565	23.165	25.38	0.000	0.000
					B	8.723	82.565		25.38		
					C	8.723	62.765		32.40		
T4 120.00-100.00	110.00	1.411	9	202.528	A	9.970	84.103	24.703	26.26	0.000	0.000
					B	9.970	84.103		26.26		
					C	9.970	64.303		33.26		
T5 100.00-80.00	90.00	1.332	9	242.945	A	13.520	85.641	26.241	26.46	0.000	0.000
					B	13.520	85.641		26.46		
					C	13.520	65.841		33.07		
T6 80.00-60.00	70.00	1.24	8	282.945	A	15.144	85.641	26.241	26.04	0.000	0.000
					B	15.144	85.641		26.04		

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
					C	15.144	65.841		32.40		
T7 60.00-40.00	50.00	1.126	7	323.362	A	16.830	87.709	28.309	27.08	0.000	0.000
					B	16.830	87.709		27.08		
					C	16.830	67.909		33.41		
T8 40.00-20.00	30.00	1	6	363.362	A	18.566	87.709	28.309	26.64	0.000	0.000
					B	18.566	87.709		26.64		
					C	18.566	67.909		32.74		
T9 20.00-0.00	10.00	1	6	403.780	A	23.735	80.387	29.897	28.71	0.000	0.000
					B	23.735	80.387		28.71		
					C	23.735	63.557		34.25		

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	374.40	803.42	A	0.602	1.803	0.755	1	1	37.496	1982.89	99.14	B
			B	0.602	1.803	0.755	1	1	37.496			
			C	0.143	2.799	0.58	1	1	6.829			
T2 160.00-140.00	873.60	1951.13	A	0.66	1.779	0.792	1	1	65.441	3942.01	197.10	B
			B	0.741	1.784	0.85	1	1	78.063			
			C	0.498	1.903	0.696	1	1	44.701			
T3 140.00-120.00	998.40	1990.73	A	0.563	1.831	0.732	1	1	69.137	3440.42	172.02	B
			B	0.563	1.831	0.732	1	1	69.137			
			C	0.441	1.989	0.669	1	1	50.723			
T4 120.00-100.00	998.40	2381.77	A	0.464	1.95	0.68	1	1	67.163	3393.37	169.67	B
			B	0.464	1.95	0.68	1	1	67.163			
			C	0.367	2.134	0.639	1	1	51.033			
T5 100.00-80.00	998.40	2962.37	A	0.408	2.048	0.655	1	1	69.612	3487.34	174.37	B
			B	0.408	2.048	0.655	1	1	69.612			
			C	0.327	2.227	0.624	1	1	54.632			
T6 80.00-60.00	998.40	3034.06	A	0.356	2.157	0.635	1	1	69.501	3413.32	170.67	B
			B	0.356	2.157	0.635	1	1	69.501			
			C	0.286	2.333	0.612	1	1	55.425			
T7 60.00-40.00	998.40	4213.69	A	0.323	2.236	0.623	1	1	71.499	3305.89	165.29	B
			B	0.323	2.236	0.623	1	1	71.499			
			C	0.262	2.402	0.605	1	1	57.917			
T8 40.00-20.00	998.40	4343.02	A	0.292	2.316	0.614	1	1	72.387	3079.02	153.95	B
			B	0.292	2.316	0.614	1	1	72.387			
			C	0.238	2.474	0.599	1	1	59.236			
T9 20.00-0.00	848.64	5293.34	A	0.258	2.414	0.604	1	1	72.281	3204.48	160.22	B
			B	0.258	2.414	0.604	1	1	72.281			
			C	0.216	2.543	0.594	1	1	61.477			
Sum Weight:	8087.04	26973.54						OTM	2591422.76 lb-ft	29248.75		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	374.40	803.42	A	0.602	1.803	0.755	0.8	1	37.496	1982.89	99.14	B
			B	0.602	1.803	0.755	0.8	1	37.496			
			C	0.143	2.799	0.58	0.8	1	6.829			
T2 160.00-140.00	873.60	1951.13	A	0.66	1.779	0.792	0.8	1	63.863	3862.29	193.11	B
			B	0.741	1.784	0.85	0.8	1	76.484			
			C	0.498	1.903	0.696	0.8	1	43.122			
T3 140.00-120.00	998.40	1990.73	A	0.563	1.831	0.732	0.8	1	67.392	3353.61	167.68	B
			B	0.563	1.831	0.732	0.8	1	67.392			
			C	0.441	1.989	0.669	0.8	1	48.979			
T4 120.00-100.00	998.40	2381.77	A	0.464	1.95	0.68	0.8	1	65.169	3292.63	164.63	B
			B	0.464	1.95	0.68	0.8	1	65.169			
			C	0.367	2.134	0.639	0.8	1	49.039			
T5 100.00-80.00	998.40	2962.37	A	0.408	2.048	0.655	0.8	1	66.908	3351.88	167.59	B
			B	0.408	2.048	0.655	0.8	1	66.908			
			C	0.327	2.227	0.624	0.8	1	51.928			
T6 80.00-60.00	998.40	3034.06	A	0.356	2.157	0.635	0.8	1	66.473	3264.57	163.23	B
			B	0.356	2.157	0.635	0.8	1	66.473			
			C	0.286	2.333	0.612	0.8	1	52.396			
T7 60.00-40.00	998.40	4213.69	A	0.323	2.236	0.623	0.8	1	68.133	3150.26	157.51	B
			B	0.323	2.236	0.623	0.8	1	68.133			
			C	0.262	2.402	0.605	0.8	1	54.551			
T8 40.00-20.00	998.40	4343.02	A	0.292	2.316	0.614	0.8	1	68.674	2921.08	146.05	B
			B	0.292	2.316	0.614	0.8	1	68.674			
			C	0.238	2.474	0.599	0.8	1	55.523			
T9 20.00-0.00	848.64	5293.34	A	0.258	2.414	0.604	0.8	1	67.534	2994.03	149.70	B
			B	0.258	2.414	0.604	0.8	1	67.534			
			C	0.216	2.543	0.594	0.8	1	56.730			
Sum Weight:	8087.04	26973.54						OTM	2519868.09 lb-ft	28173.23		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	374.40	803.42	A	0.602	1.803	0.755	0.85	1	37.496	1982.89	99.14	B
			B	0.602	1.803	0.755	0.85	1	37.496			
			C	0.143	2.799	0.58	0.85	1	6.829			
T2 160.00-140.00	873.60	1951.13	A	0.66	1.779	0.792	0.85	1	64.257	3882.22	194.11	B
			B	0.741	1.784	0.85	0.85	1	76.879			
			C	0.498	1.903	0.696	0.85	1	43.517			
T3 140.00-120.00	998.40	1990.73	A	0.563	1.831	0.732	0.85	1	67.828	3375.31	168.77	B
			B	0.563	1.831	0.732	0.85	1	67.828			
			C	0.441	1.989	0.669	0.85	1	49.415			
T4 120.00-100.00	998.40	2381.77	A	0.464	1.95	0.68	0.85	1	65.667	3317.81	165.89	B
			B	0.464	1.95	0.68	0.85	1	65.667			
			C	0.367	2.134	0.639	0.85	1	49.538			
T5 100.00-80.00	998.40	2962.37	A	0.408	2.048	0.655	0.85	1	67.584	3385.75	169.29	B
			B	0.408	2.048	0.655	0.85	1	67.584			
			C	0.327	2.227	0.624	0.85	1	52.604			
T6 80.00-60.00	998.40	3034.06	A	0.356	2.157	0.635	0.85	1	67.230	3301.76	165.09	B
			B	0.356	2.157	0.635	0.85	1	67.230			
			C	0.286	2.333	0.612	0.85	1	53.153			
T7 60.00-40.00	998.40	4213.69	A	0.323	2.236	0.623	0.85	1	68.975	3189.16	159.46	B
			B	0.323	2.236	0.623	0.85	1	68.975			

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
			C	0.262	2.402	0.605	0.85	1	55.392			
T8 40.00-20.00	998.40	4343.02	A	0.292	2.316	0.614	0.85	1	69.602	2960.56	148.03	B
			B	0.292	2.316	0.614	0.85	1	69.602			
			C	0.238	2.474	0.599	0.85	1	56.451			
T9 20.00-0.00	848.64	5293.34	A	0.258	2.414	0.604	0.85	1	68.721	3046.64	152.33	B
			B	0.258	2.414	0.604	0.85	1	68.721			
			C	0.216	2.543	0.594	0.85	1	57.917			
Sum Weight:	8087.04	26973.54						OTM	2537756.75 lb-ft	28442.11		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
T1 180.00-160.00	973.14	1088.77	A	0.838	1.849	0.928	1	1	68.685	2793.46	139.67	B
			B	0.838	1.849	0.928	1	1	68.685			
			C	0.285	2.336	0.612	1	1	14.686			
T2 160.00-140.00	2265.80	3550.45	A	0.915	1.946	0.997	1	1	113.063	5255.26*	262.76	B
			B	1	2.1	1	1	1	126.042			
			C	0.714	1.778	0.83	1	1	80.018			
T3 140.00-120.00	2588.56	3618.62	A	0.777	1.801	0.878	1	1	120.797	4432.29	221.61	B
			B	0.777	1.801	0.878	1	1	120.797			
			C	0.625	1.791	0.769	1	1	90.330			
T4 120.00-100.00	2588.56	4089.79	A	0.641	1.784	0.779	1	1	118.764	4117.18	205.86	B
			B	0.641	1.784	0.779	1	1	118.764			
			C	0.519	1.876	0.708	1	1	90.031			
T5 100.00-80.00	2588.56	4824.60	A	0.56	1.835	0.73	1	1	121.413	4086.39	204.32	B
			B	0.56	1.835	0.73	1	1	121.413			
			C	0.458	1.96	0.677	1	1	93.602			
T6 80.00-60.00	2588.56	4946.27	A	0.489	1.915	0.692	1	1	121.239	3964.90	198.24	B
			B	0.489	1.915	0.692	1	1	121.239			
			C	0.401	2.061	0.652	1	1	94.154			
T7 60.00-40.00	2588.56	6260.79	A	0.444	1.984	0.67	1	1	124.023	3816.27	190.81	B
			B	0.444	1.984	0.67	1	1	124.023			
			C	0.367	2.132	0.639	1	1	97.290			
T8 40.00-20.00	2588.56	6445.33	A	0.401	2.061	0.652	1	1	125.021	3549.31	177.47	B
			B	0.401	2.061	0.652	1	1	125.021			
			C	0.333	2.211	0.627	1	1	98.647			
T9 20.00-0.00	2200.28	7597.94	A	0.353	2.165	0.634	1	1	119.945	3576.30	178.82	B
			B	0.353	2.165	0.634	1	1	119.945			
			C	0.301	2.294	0.616	1	1	97.770			
Sum Weight:	20970.57	42422.56			*2A_g limit			OTM	3270639.54 lb-ft	35591.37		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	973.14	1088.77	A	0.838	1.849	0.928	0.8	1	59.591	2423.63	121.18	B
			B	0.838	1.849	0.928	0.8	1	59.591			
			C	0.285	2.336	0.612	0.8	1	14.686			
T2 160.00-140.00	2265.80	3550.45	A	0.915	1.946	0.997	0.8	1	100.325	4958.85	247.94	B
			B	1	2.1	1	0.8	1	111.236			
			C	0.714	1.778	0.83	0.8	1	72.239			
T3 140.00-120.00	2588.56	3618.62	A	0.777	1.801	0.878	0.8	1	105.826	3882.97	194.15	B
			B	0.777	1.801	0.878	0.8	1	105.826			
			C	0.625	1.791	0.769	0.8	1	80.319			
T4 120.00-100.00	2588.56	4089.79	A	0.641	1.784	0.779	0.8	1	103.543	3589.53	179.48	B
			B	0.641	1.784	0.779	0.8	1	103.543			
			C	0.519	1.876	0.708	0.8	1	79.770			
T5 100.00-80.00	2588.56	4824.60	A	0.56	1.835	0.73	0.8	1	105.483	3550.22	177.51	B
			B	0.56	1.835	0.73	0.8	1	105.483			
			C	0.458	1.96	0.677	0.8	1	82.631			
T6 80.00-60.00	2588.56	4946.27	A	0.489	1.915	0.692	0.8	1	104.984	3433.29	171.66	B
			B	0.489	1.915	0.692	0.8	1	104.984			
			C	0.401	2.061	0.652	0.8	1	82.859			
T7 60.00-40.00	2588.56	6260.79	A	0.444	1.984	0.67	0.8	1	107.431	3305.70	165.29	B
			B	0.444	1.984	0.67	0.8	1	107.431			
			C	0.367	2.132	0.639	0.8	1	85.658			
T8 40.00-20.00	2588.56	6445.33	A	0.401	2.061	0.652	0.8	1	108.081	3068.39	153.42	B
			B	0.401	2.061	0.652	0.8	1	108.081			
			C	0.333	2.211	0.627	0.8	1	86.667			
T9 20.00-0.00	2200.28	7597.94	A	0.353	2.165	0.634	0.8	1	103.955	3099.55	154.98	B
			B	0.353	2.165	0.634	0.8	1	103.955			
			C	0.301	2.294	0.616	0.8	1	85.997			
Sum Weight:	20970.57	42422.56						OTM	2903661.50 lb-ft	31312.14		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 180.00-160.00	973.14	1088.77	A	0.838	1.849	0.928	0.85	1	61.865	2516.09	125.80	B
			B	0.838	1.849	0.928	0.85	1	61.865			
			C	0.285	2.336	0.612	0.85	1	14.686			
T2 160.00-140.00	2265.80	3550.45	A	0.915	1.946	0.997	0.85	1	103.509	5123.86	256.19	B
			B	1	2.1	1	0.85	1	114.938			
			C	0.714	1.778	0.83	0.85	1	74.184			
T3 140.00-120.00	2588.56	3618.62	A	0.777	1.801	0.878	0.85	1	109.569	4020.30	201.02	B
			B	0.777	1.801	0.878	0.85	1	109.569			
			C	0.625	1.791	0.769	0.85	1	82.822			
T4 120.00-100.00	2588.56	4089.79	A	0.641	1.784	0.779	0.85	1	107.348	3721.44	186.07	B
			B	0.641	1.784	0.779	0.85	1	107.348			
			C	0.519	1.876	0.708	0.85	1	82.335			
T5 100.00-80.00	2588.56	4824.60	A	0.56	1.835	0.73	0.85	1	109.465	3684.26	184.21	B
			B	0.56	1.835	0.73	0.85	1	109.465			
			C	0.458	1.96	0.677	0.85	1	85.374			
T6 80.00-60.00	2588.56	4946.27	A	0.489	1.915	0.692	0.85	1	109.048	3566.19	178.31	B
			B	0.489	1.915	0.692	0.85	1	109.048			
			C	0.401	2.061	0.652	0.85	1	85.683			
T7 60.00-40.00	2588.56	6260.79	A	0.444	1.984	0.67	0.85	1	111.579	3433.34	171.67	B
			B	0.444	1.984	0.67	0.85	1	111.579			

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
			C	0.367	2.132	0.639	0.85	1	88.566			
T8 40.00-20.00	2588.56	6445.33	A	0.401	2.061	0.652	0.85	1	112.316	3188.62	159.43	B
			B	0.401	2.061	0.652	0.85	1	112.316			
			C	0.333	2.211	0.627	0.85	1	89.662			
T9 20.00-0.00	2200.28	7597.94	A	0.353	2.165	0.634	0.85	1	107.952	3218.74	160.94	B
			B	0.353	2.165	0.634	0.85	1	107.952			
			C	0.301	2.294	0.616	0.85	1	88.940			
Sum Weight:	20970.57	42422.56						OTM	3009041.40 lb-ft	32472.85		

Tower Forces - Service - Wind Normal To Face

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
T1 180.00-160.00	374.40	803.42	A	0.602	1.803	0.755	1	1	37.496	774.57	38.73	B
			B	0.602	1.803	0.755	1	1	37.496			
			C	0.143	2.799	0.58	1	1	6.829			
T2 160.00-140.00	873.60	1951.13	A	0.66	1.779	0.792	1	1	65.441	1539.85	76.99	B
			B	0.741	1.784	0.85	1	1	78.063			
			C	0.498	1.903	0.696	1	1	44.701			
T3 140.00-120.00	998.40	1990.73	A	0.563	1.831	0.732	1	1	69.137	1343.92	67.20	B
			B	0.563	1.831	0.732	1	1	69.137			
			C	0.441	1.989	0.669	1	1	50.723			
T4 120.00-100.00	998.40	2381.77	A	0.464	1.95	0.68	1	1	67.163	1325.54	66.28	B
			B	0.464	1.95	0.68	1	1	67.163			
			C	0.367	2.134	0.639	1	1	51.033			
T5 100.00-80.00	998.40	2962.37	A	0.408	2.048	0.655	1	1	69.612	1362.24	68.11	B
			B	0.408	2.048	0.655	1	1	69.612			
			C	0.327	2.227	0.624	1	1	54.632			
T6 80.00-60.00	998.40	3034.06	A	0.356	2.157	0.635	1	1	69.501	1333.33	66.67	B
			B	0.356	2.157	0.635	1	1	69.501			
			C	0.286	2.333	0.612	1	1	55.425			
T7 60.00-40.00	998.40	4213.69	A	0.323	2.236	0.623	1	1	71.499	1291.36	64.57	B
			B	0.323	2.236	0.623	1	1	71.499			
			C	0.262	2.402	0.605	1	1	57.917			
T8 40.00-20.00	998.40	4343.02	A	0.292	2.316	0.614	1	1	72.387	1202.74	60.14	B
			B	0.292	2.316	0.614	1	1	72.387			
			C	0.238	2.474	0.599	1	1	59.236			
T9 20.00-0.00	848.64	5293.34	A	0.258	2.414	0.604	1	1	72.281	1251.75	62.59	B
			B	0.258	2.414	0.604	1	1	72.281			
			C	0.216	2.543	0.594	1	1	61.477			
Sum Weight:	8087.04	26973.54						OTM	1012274.51 lb-ft	11425.29		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	374.40	803.42	A	0.602	1.803	0.755	0.8	1	37.496	774.57	38.73	B
			B	0.602	1.803	0.755	0.8	1	37.496			
			C	0.143	2.799	0.58	0.8	1	6.829			
T2 160.00-140.00	873.60	1951.13	A	0.66	1.779	0.792	0.8	1	63.863	1508.71	75.44	B
			B	0.741	1.784	0.85	0.8	1	76.484			
			C	0.498	1.903	0.696	0.8	1	43.122			
T3 140.00-120.00	998.40	1990.73	A	0.563	1.831	0.732	0.8	1	67.392	1310.00	65.50	B
			B	0.563	1.831	0.732	0.8	1	67.392			
			C	0.441	1.989	0.669	0.8	1	48.979			
T4 120.00-100.00	998.40	2381.77	A	0.464	1.95	0.68	0.8	1	65.169	1286.18	64.31	B
			B	0.464	1.95	0.68	0.8	1	65.169			
			C	0.367	2.134	0.639	0.8	1	49.039			
T5 100.00-80.00	998.40	2962.37	A	0.408	2.048	0.655	0.8	1	66.908	1309.33	65.47	B
			B	0.408	2.048	0.655	0.8	1	66.908			
			C	0.327	2.227	0.624	0.8	1	51.928			
T6 80.00-60.00	998.40	3034.06	A	0.356	2.157	0.635	0.8	1	66.473	1275.22	63.76	B
			B	0.356	2.157	0.635	0.8	1	66.473			
			C	0.286	2.333	0.612	0.8	1	52.396			
T7 60.00-40.00	998.40	4213.69	A	0.323	2.236	0.623	0.8	1	68.133	1230.57	61.53	B
			B	0.323	2.236	0.623	0.8	1	68.133			
			C	0.262	2.402	0.605	0.8	1	54.551			
T8 40.00-20.00	998.40	4343.02	A	0.292	2.316	0.614	0.8	1	68.674	1141.05	57.05	B
			B	0.292	2.316	0.614	0.8	1	68.674			
			C	0.238	2.474	0.599	0.8	1	55.523			
T9 20.00-0.00	848.64	5293.34	A	0.258	2.414	0.604	0.8	1	67.534	1169.54	58.48	B
			B	0.258	2.414	0.604	0.8	1	67.534			
			C	0.216	2.543	0.594	0.8	1	56.730			
Sum Weight:	8087.04	26973.54						OTM	984323.47 lb-ft	11005.17		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
T1 180.00-160.00	374.40	803.42	A	0.602	1.803	0.755	0.85	1	37.496	774.57	38.73	B
			B	0.602	1.803	0.755	0.85	1	37.496			
			C	0.143	2.799	0.58	0.85	1	6.829			
T2 160.00-140.00	873.60	1951.13	A	0.66	1.779	0.792	0.85	1	64.257	1516.49	75.82	B
			B	0.741	1.784	0.85	0.85	1	76.879			
			C	0.498	1.903	0.696	0.85	1	43.517			
T3 140.00-120.00	998.40	1990.73	A	0.563	1.831	0.732	0.85	1	67.828	1318.48	65.92	B
			B	0.563	1.831	0.732	0.85	1	67.828			
			C	0.441	1.989	0.669	0.85	1	49.415			
T4 120.00-100.00	998.40	2381.77	A	0.464	1.95	0.68	0.85	1	65.667	1296.02	64.80	B
			B	0.464	1.95	0.68	0.85	1	65.667			
			C	0.367	2.134	0.639	0.85	1	49.538			
T5 100.00-80.00	998.40	2962.37	A	0.408	2.048	0.655	0.85	1	67.584	1322.56	66.13	B
			B	0.408	2.048	0.655	0.85	1	67.584			
			C	0.327	2.227	0.624	0.85	1	52.604			
T6 80.00-60.00	998.40	3034.06	A	0.356	2.157	0.635	0.85	1	67.230	1289.75	64.49	B
			B	0.356	2.157	0.635	0.85	1	67.230			
			C	0.286	2.333	0.612	0.85	1	53.153			
T7 60.00-40.00	998.40	4213.69	A	0.323	2.236	0.623	0.85	1	68.975	1245.77	62.29	B
			B	0.323	2.236	0.623	0.85	1	68.975			

Section Elevation *ft*	*Add Weight* *lb*	*Self Weight* *lb*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *lb*	*w* *plf*	*Ctrl. Face*
			C	0.262	2.402	0.605	0.85	1	55.392			
T8 40.00-20.00	998.40	4343.02	A	0.292	2.316	0.614	0.85	1	69.602	1156.47	57.82	B
			B	0.292	2.316	0.614	0.85	1	69.602			
			C	0.238	2.474	0.599	0.85	1	56.451			
T9 20.00-0.00	848.64	5293.34	A	0.258	2.414	0.604	0.85	1	68.721	1190.09	59.50	B
			B	0.258	2.414	0.604	0.85	1	68.721			
			C	0.216	2.543	0.594	0.85	1	57.917			
Sum Weight:	8087.04	26973.54						OTM	991311.23 lb-ft	11110.20		

Force Totals

Load Case	*Vertical Forces* *lb*	*Sum of Forces X* *lb*	*Sum of Forces Z* *lb*	*Sum of Overturning Moments,* M_x *lb-ft*	*Sum of Overturning Moments,* M_z *lb-ft*	*Sum of Torques* *lb-ft*
Leg Weight	18844.43					
Bracing Weight	8129.11					
Total Member Self-Weight	26973.54			-12432.17	-241.89	
Total Weight	40577.58			-12432.17	-241.89	
Wind 0 deg - No Ice		0.00	-38342.53	-4120367.98	-241.89	326.36
Wind 30 deg - No Ice		18767.94	-32507.03	-3523532.82	-2027376.79	-5799.94
Wind 60 deg - No Ice		32274.18	-18633.50	-2030622.74	-3495850.49	-10264.63
Wind 90 deg - No Ice		37535.89	0.00	-12432.17	-4054511.69	-12156.58
Wind 120 deg - No Ice		33205.60	19171.26	2041535.73	-3557818.66	-11001.28
Wind 150 deg - No Ice		18767.94	32507.03	3498668.47	-2027376.79	-6356.64
Wind 180 deg - No Ice		0.00	37267.01	4023948.96	-241.89	-319.76
Wind 210 deg - No Ice		-18767.94	32507.03	3498668.47	2026893.01	5799.94
Wind 240 deg - No Ice		-33205.60	19171.26	2041535.73	3557334.87	10674.93
Wind 270 deg - No Ice		-37535.89	0.00	-12432.17	4054027.91	12156.58
Wind 300 deg - No Ice		-32274.18	-18633.50	-2030622.74	3495366.71	10584.38
Wind 330 deg - No Ice		-18767.94	-32507.03	-3523532.82	2026893.01	6356.64
Member Ice	15449.03					
Total Weight Ice	71883.52			-32461.32	-625.59	
Wind 0 deg - Ice		0.00	-44263.89	-4744281.20	-625.59	321.20
Wind 30 deg - Ice		20572.68	-35632.93	-3886466.39	-2225736.45	-5779.58
Wind 60 deg - Ice		34627.73	-19992.33	-2204882.23	-3763368.99	-9949.02
Wind 90 deg - Ice		41145.37	0.00	-32461.32	-4450847.32	-12101.58
Wind 120 deg - Ice		38333.65	22131.94	2323448.62	-4081181.30	-11709.64
Wind 150 deg - Ice		20572.68	35632.93	3821543.76	-2225736.45	-6322.00
Wind 180 deg - Ice		0.00	39984.65	4312380.51	-625.59	-303.08
Wind 210 deg - Ice		-20572.68	35632.93	3821543.76	2224485.28	5779.58
Wind 240 deg - Ice		-38333.65	22131.94	2323448.62	4079930.13	11388.44
Wind 270 deg - Ice		-41145.37	0.00	-32461.32	4449596.15	12101.58
Wind 300 deg - Ice		-34627.73	-19992.33	-2204882.23	3762117.82	10252.10
Wind 330 deg - Ice		-20572.68	-35632.93	-3886466.39	2224485.28	6322.00
Total Weight	40577.58			-12432.17	-241.89	
Wind 0 deg - Service		0.00	-14977.55	-1604662.42	0.00	127.48
Wind 30 deg - Service		7331.23	-12698.06	-1371523.69	-791849.57	-2265.60
Wind 60 deg - Service		12607.10	-7278.71	-788355.69	-1365472.11	-4009.62
Wind 90 deg - Service		14662.46	0.00	0.00	-1583699.14	-4748.66
Wind 120 deg - Service		12970.94	7488.77	802331.21	-1389678.42	-4297.38
Wind 150 deg - Service		7331.23	12698.06	1371523.69	-791849.57	-2483.06
Wind 180 deg - Service		0.00	14557.42	1576711.38	0.00	-124.91
Wind 210 deg - Service		-7331.23	12698.06	1371523.69	791849.57	2265.60
Wind 240 deg - Service		-12970.94	7488.77	802331.21	1389678.42	4169.89

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Wind 270 deg - Service		-14662.46	0.00	0.00	1583699.14	4748.66
Wind 300 deg - Service		-12607.10	-7278.71	-788355.69	1365472.11	4134.52
Wind 330 deg - Service		-7331.23	-12698.06	-1371523.69	791849.57	2483.06

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
T1	180 - 160	Leg	Max Tension	4	27188.79	272.86	-169.23

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Compression	15	-31817.63	0.23	1522.63
			Max. Mx	23	-31004.88	1275.15	-835.52
			Max. My	15	-31817.63	0.23	1522.63
			Max. Vy	23	-3170.36	-310.00	191.40
			Max. Vx	15	-3762.11	0.23	1522.63
		Diagonal	Max Tension	16	3098.72	0.00	0.00
			Max. Compression	22	-3138.53	0.00	0.00
			Max. Mx	15	2644.47	-2.93	-0.14
			Max. My	23	-2756.44	-0.71	0.98
			Max. Vy	15	3.58	-2.93	-0.14
			Max. Vx	23	-0.43	0.00	0.00
		Horizontal	Max Tension	21	668.95	0.00	0.00
			Max. Compression	2	-493.56	0.00	0.00
			Max. Mx	14	119.39	4.59	0.00
			Max. My	18	65.27	0.00	-0.00
			Max. Vy	14	-4.59	0.00	0.00
			Max. Vx	18	0.00	0.00	0.00
		Top Girt	Max Tension	10	527.80	0.00	0.00
			Max. Compression	12	-544.36	0.00	0.00
			Max. Mx	14	10.48	5.85	0.00
			Max. My	18	10.88	0.00	-0.00
			Max. Vy	14	-5.85	0.00	0.00
			Max. Vx	18	0.00	0.00	0.00
		Bottom Girt	Max Tension	8	659.41	0.00	0.00
			Max. Compression	2	-584.45	0.00	0.00
			Max. Mx	14	55.65	5.85	0.00
			Max. My	18	56.69	0.00	-0.00
			Max. Vy	14	-5.85	0.00	0.00
			Max. Vx	18	0.00	0.00	0.00
T2	160 - 140	Leg	Max Tension	4	52327.61	-2407.92	54.14
			Max. Compression	15	-63564.09	3803.97	0.57
			Max. Mx	15	-63564.09	3803.97	0.57
			Max. My	18	-3960.45	-184.14	3579.13
			Max. Vy	21	-739.75	-2506.21	9.39
			Max. Vx	24	-846.71	-183.98	-3570.37
		Diagonal	Max Tension	20	7332.45	0.00	0.00
			Max. Compression	20	-7523.05	0.00	0.00
			Max. Mx	15	5853.06	68.24	-1.19
			Max. My	19	-7112.30	-33.10	26.47
			Max. Vy	15	-20.29	68.24	-1.19
			Max. Vx	19	-5.69	0.00	0.00
T3	140 - 120	Leg	Max Tension	17	87525.49	-3619.19	54.91
			Max. Compression	15	-105361.09	4052.18	1.06
			Max. Mx	15	-105361.09	4052.18	1.06
			Max. My	18	-7097.02	-81.25	4260.09
			Max. Vy	23	-154.69	4014.06	2.18
			Max. Vx	24	217.78	-81.25	-4250.69
		Diagonal	Max Tension	20	6801.87	0.00	0.00
			Max. Compression	20	-7108.57	0.00	0.00
			Max. Mx	15	5075.20	84.88	-3.23
			Max. My	24	-3650.70	11.47	-9.11
			Max. Vy	15	-24.43	84.88	-3.23
			Max. Vx	24	2.16	0.00	0.00
T4	120 - 100	Leg	Max Tension	17	117003.42	-3904.98	37.49
			Max. Compression	15	-141866.91	4348.26	-1.47
			Max. Mx	15	-141866.91	4348.26	-1.47
			Max. My	18	-10498.05	-15.87	4355.47
			Max. Vy	21	145.05	-4142.96	5.14
			Max. Vx	24	159.28	-15.85	-4351.48
		Diagonal	Max Tension	20	6270.70	0.00	0.00
			Max. Compression	20	-6473.68	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Mx	15	4872.93	66.91	-3.47
			Max. My	19	-496.17	39.18	7.40
			Max. Vy	15	-22.85	66.91	-3.47
			Max. Vx	19	1.75	0.00	0.00
T5	100 - 80	Leg	Max Tension	17	142751.62	-3993.34	29.81
			Max. Compression	15	-175384.81	4255.95	1.22
			Max. Mx	15	-158602.51	4348.26	-1.47
			Max. My	18	-11122.58	-15.89	4355.47
			Max. Vy	21	-137.39	-4142.96	5.14
			Max. Vx	18	189.89	-15.89	4355.47
		Diagonal	Max Tension	20	6217.61	0.00	0.00
			Max. Compression	20	-6433.94	0.00	0.00
			Max. Mx	15	5433.78	87.80	-4.79
			Max. My	24	-3104.28	35.08	-10.05
			Max. Vy	17	30.37	83.14	6.99
			Max. Vx	24	2.11	0.00	0.00
T6	80 - 60	Leg	Max Tension	17	165786.43	-3624.56	24.44
			Max. Compression	15	-206296.67	5279.32	-4.10
			Max. Mx	15	-206296.67	5279.32	-4.10
			Max. My	18	-15823.09	40.52	4647.92
			Max. Vy	23	-255.30	5259.54	-91.82
			Max. Vx	24	147.72	40.52	-4646.30
		Diagonal	Max Tension	20	6277.50	0.00	0.00
			Max. Compression	20	-6556.65	0.00	0.00
			Max. Mx	15	5282.08	95.04	-6.55
			Max. My	24	-3343.88	40.87	-10.78
			Max. Vy	17	33.38	88.78	8.40
			Max. Vx	24	2.17	0.00	0.00
T7	60 - 40	Leg	Max Tension	17	187128.49	-3644.34	19.37
			Max. Compression	15	-236568.84	3515.67	0.79
			Max. Mx	15	-220790.37	5279.32	-4.10
			Max. My	18	-16494.65	40.50	4647.92
			Max. Vy	21	-235.06	-4807.60	5.18
			Max. Vx	24	-211.74	40.51	-4646.29
		Diagonal	Max Tension	20	6660.97	0.00	0.00
			Max. Compression	20	-6889.09	0.00	0.00
			Max. Mx	15	5813.68	130.72	-10.17
			Max. My	25	-5617.98	58.48	-14.89
			Max. Vy	17	49.88	128.94	12.12
			Max. Vx	18	-2.85	0.00	0.00
T8	40 - 20	Leg	Max Tension	17	206006.82	-1512.57	29.46
			Max. Compression	15	-266038.05	-389.72	-0.66
			Max. Mx	17	205394.86	-9263.18	53.15
			Max. My	16	-19649.20	2052.48	-4298.70
			Max. Vy	21	880.65	-9233.79	1.46
			Max. Vx	18	211.53	2084.28	4273.31
		Diagonal	Max Tension	20	7806.97	0.00	0.00
			Max. Compression	20	-7308.52	0.00	0.00
			Max. Mx	15	6866.55	139.45	-11.87
			Max. My	25	-6161.11	70.76	-16.28
			Max. Vy	17	53.92	135.52	12.70
			Max. Vx	18	-2.98	0.00	0.00
T9	20 - 0	Leg	Max Tension	17	221896.77	4394.56	41.74
			Max. Compression	15	-295678.88	-0.00	0.00
			Max. Mx	15	-277676.42	12122.43	1.32
			Max. My	16	-24925.19	8078.89	-6595.92
			Max. Vy	21	-1478.66	-9233.79	1.46
			Max. Vx	18	756.27	8111.93	6552.69
		Diagonal	Max Tension	20	11106.20	0.00	0.00
			Max. Compression	20	-9358.38	0.00	0.00
			Max. Mx	17	2583.92	215.16	22.27

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. My	25	-8500.35	137.77	-26.52
			Max. Vy	17	70.12	215.16	22.27
			Max. Vx	25	4.15	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg C	Max. Vert	23	297074.95	20150.54	-12051.80
	Max. H_x	10	251382.14	21609.24	-12843.14
	Max. H_z	17	-229785.36	-25498.36	15024.82
	Min. Vert	17	-229785.36	-25498.36	15024.82
	Min. H_x	17	-229785.36	-25498.36	15024.82
	Min. H_z	10	251382.14	21609.24	-12843.14
Leg B	Max. Vert	19	297138.80	-20146.61	-12061.30
	Max. H_x	25	-229721.74	25492.97	15031.43
	Max. H_z	25	-229721.74	25492.97	15031.43
	Min. Vert	25	-229721.74	25492.97	15031.43
	Min. H_x	6	251406.64	-21604.84	-12851.79
	Min. H_z	6	251406.64	-21604.84	-12851.79
Leg A	Max. Vert	15	299932.95	10.20	23536.68
	Max. H_x	24	25849.89	1824.95	-4226.28
	Max. H_z	2	252471.47	9.68	25158.31
	Min. Vert	21	-226927.48	-8.41	-29533.89
	Min. H_x	19	-111196.05	-1828.42	-18163.64
	Min. H_z	21	-226927.48	-8.41	-29533.89

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	40577.58	0.00	-0.00	-12383.14	-241.91	-0.00
Dead+Wind 0 deg - No Ice	40577.58	0.00	-38342.52	-4138659.41	-246.68	330.25
Dead+Wind 30 deg - No Ice	40577.58	18767.94	-32507.03	-3539246.79	-2036436.74	-5819.48
Dead+Wind 60 deg - No Ice	40577.58	32274.18	-18633.50	-2039705.60	-3511501.00	-10327.45
Dead+Wind 90 deg - No Ice	40577.90	37536.07	-0.52	-12490.42	-4072645.48	-12241.50
Dead+Wind 120 deg - No Ice	40577.58	33205.60	19171.26	2050638.35	-3573678.96	-11071.07
Dead+Wind 150 deg - No Ice	40577.58	18767.94	32507.03	3514360.69	-2036459.30	-6383.52
Dead+Wind 180 deg - No Ice	40577.58	0.00	37267.01	4042035.29	-247.49	-323.56
Dead+Wind 210 deg - No Ice	40577.58	-18767.94	32507.03	3514362.49	2035965.69	5820.21
Dead+Wind 240 deg - No Ice	40577.58	-33205.60	19171.26	2050639.85	3573188.22	10740.83
Dead+Wind 270 deg - No Ice	40577.90	-37536.07	-0.52	-12491.31	4072156.50	12241.49
Dead+Wind 300 deg - No Ice	40577.58	-32274.18	-18633.50	-2039708.59	3511011.17	10651.01
Dead+Wind 330 deg - No Ice	40577.58	-18767.94	-32507.03	-3539249.46	2035944.64	6382.79
Dead+Ice+Temp	71883.52	-0.00	0.00	-32473.30	-631.81	0.05
Dead+Wind 0 deg+Ice+Temp	71883.51	-0.00	-44263.77	-4779971.44	-639.11	332.22
Dead+Wind 30 deg+Ice+Temp	71883.51	20572.66	-35632.84	-3916043.96	-2242727.39	-5853.80
Dead+Wind 60 deg+Ice+Temp	71883.52	34627.72	-19992.32	-2221743.83	-3792206.23	-10128.82
Dead+Wind 90 deg+Ice+Temp	71883.51	41145.28	-0.02	-32711.13	-4484814.91	-12337.44
Dead+Wind 120 deg+Ice+Temp	71883.51	38333.55	22131.89	2340991.83	-4111980.30	-11908.41
Dead+Wind 150 deg+Ice+Temp	71883.51	20572.62	35632.87	3850779.57	-2242729.32	-6415.60

Load Combination	Vertical lb	Shear$_x$ lb	Shear$_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead+Wind 180 deg+Ice+Temp	71883.52	-0.00	39984.65	4345518.92	-641.07	-313.64
Dead+Wind 210 deg+Ice+Temp	71883.51	-20572.62	35632.87	3850780.86	2241448.54	5854.83
Dead+Wind 240 deg+Ice+Temp	71883.51	-38333.55	22131.89	2340992.26	4110703.13	11576.20
Dead+Wind 270 deg+Ice+Temp	71883.51	-41145.28	-0.02	-32713.52	4483540.40	12337.44
Dead+Wind 300 deg+Ice+Temp	71883.52	-34627.72	-19992.32	-2221748.17	3790931.46	10442.46
Dead+Wind 330 deg+Ice+Temp	71883.51	-20572.66	-35632.84	-3916047.63	2241450.56	6414.58
Dead+Wind 0 deg - Service	40577.58	0.00	-14977.55	-1624288.49	-244.78	128.96
Dead+Wind 30 deg - Service	40577.58	7331.23	-12698.06	-1390132.09	-795656.18	-2278.67
Dead+Wind 60 deg - Service	40577.58	12607.10	-7278.71	-804351.52	-1371867.17	-4034.67
Dead+Wind 90 deg - Service	40577.58	14662.46	-0.00	-12448.17	-1591068.38	-4779.01
Dead+Wind 120 deg - Service	40577.58	12970.94	7488.77	793481.71	-1396151.01	-4324.71
Dead+Wind 150 deg - Service	40577.58	7331.23	12698.06	1365255.40	-795657.32	-2498.84
Dead+Wind 180 deg - Service	40577.58	-0.00	14557.42	1571378.75	-245.15	-126.63
Dead+Wind 210 deg - Service	40577.58	-7331.23	12698.06	1365255.57	795167.30	2278.77
Dead+Wind 240 deg - Service	40577.58	-12970.94	7488.77	793481.75	1395661.51	4195.70
Dead+Wind 270 deg - Service	40577.58	-14662.46	-0.00	-12448.52	1590579.25	4779.01
Dead+Wind 300 deg - Service	40577.58	-12607.10	-7278.71	-804352.17	1371378.02	4161.07
Dead+Wind 330 deg - Service	40577.58	-7331.23	-12698.06	-1390133.29	795165.63	2497.31

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-40577.58	-0.00	0.00	40577.58	0.00	0.000%
2	0.00	-40577.58	-38342.53	-0.00	40577.58	38342.52	0.000%
3	18767.94	-40577.58	-32507.03	-18767.94	40577.58	32507.03	0.000%
4	32274.18	-40577.58	-18633.50	-32274.18	40577.58	18633.50	0.000%
5	37535.89	-40577.58	-0.00	-37536.07	40577.90	0.52	0.001%
6	33205.60	-40577.58	19171.26	-33205.60	40577.58	-19171.26	0.000%
7	18767.94	-40577.58	32507.03	-18767.94	40577.58	-32507.03	0.000%
8	0.00	-40577.58	37267.01	-0.00	40577.58	-37267.01	0.000%
9	-18767.94	-40577.58	32507.03	18767.94	40577.58	-32507.03	0.000%
10	-33205.60	-40577.58	19171.26	33205.60	40577.58	-19171.26	0.000%
11	-37535.89	-40577.58	-0.00	37536.07	40577.90	0.52	0.001%
12	-32274.18	-40577.58	-18633.50	32274.18	40577.58	18633.50	0.000%
13	-18767.94	-40577.58	-32507.03	18767.94	40577.58	32507.03	0.000%
14	-0.00	-71883.52	-0.00	0.00	71883.52	-0.00	0.000%
15	0.00	-71883.52	-44263.89	0.00	71883.51	44263.77	0.000%
16	20572.68	-71883.52	-35632.93	-20572.66	71883.51	35632.84	0.000%
17	34627.73	-71883.52	-19992.33	-34627.72	71883.52	19992.32	0.000%
18	41145.37	-71883.52	-0.00	-41145.28	71883.51	0.02	0.000%
19	38333.65	-71883.52	22131.94	-38333.55	71883.51	-22131.89	0.000%
20	20572.68	-71883.52	35632.93	-20572.62	71883.51	-35632.87	0.000%
21	-0.00	-71883.52	39984.65	0.00	71883.52	-39984.65	0.000%
22	-20572.68	-71883.52	35632.93	20572.62	71883.51	-35632.87	0.000%
23	-38333.65	-71883.52	22131.94	38333.55	71883.51	-22131.89	0.000%
24	-41145.37	-71883.52	-0.00	41145.28	71883.51	0.02	0.000%
25	-34627.73	-71883.52	-19992.33	34627.72	71883.52	19992.32	0.000%
26	-20572.68	-71883.52	-35632.93	20572.66	71883.51	35632.84	0.000%
27	0.00	-40577.58	-14977.55	-0.00	40577.58	14977.55	0.000%
28	7331.23	-40577.58	-12698.06	-7331.23	40577.58	12698.06	0.000%
29	12607.10	-40577.58	-7278.71	-12607.10	40577.58	7278.71	0.000%
30	14662.46	-40577.58	-0.00	-14662.46	40577.58	0.00	0.000%
31	12970.94	-40577.58	7488.77	-12970.94	40577.58	-7488.77	0.000%
32	7331.23	-40577.58	12698.06	-7331.23	40577.58	-12698.06	0.000%
33	-0.00	-40577.58	14557.42	0.00	40577.58	-14557.42	0.000%
34	-7331.23	-40577.58	12698.06	7331.23	40577.58	-12698.06	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
35	-12970.94	-40577.58	7488.77	12970.94	40577.58	-7488.77	0.000%
36	-14662.46	-40577.58	-0.00	14662.46	40577.58	0.00	0.000%
37	-12607.10	-40577.58	-7278.71	12607.10	40577.58	7278.71	0.000%
38	-7331.23	-40577.58	-12698.06	7331.23	40577.58	12698.06	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000130
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000130
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000129
16	Yes	4	0.00000001	0.00000196
17	Yes	4	0.00000001	0.00000196
18	Yes	4	0.00000001	0.00000236
19	Yes	4	0.00000001	0.00000156
20	Yes	4	0.00000001	0.00000194
21	Yes	4	0.00000001	0.00000193
22	Yes	4	0.00000001	0.00000196
23	Yes	4	0.00000001	0.00000153
24	Yes	4	0.00000001	0.00000236
25	Yes	4	0.00000001	0.00000197
26	Yes	4	0.00000001	0.00000194
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	7.446	27	0.4364	0.0476
T2	160 - 140	5.626	27	0.3905	0.0386
T3	140 - 120	4.056	27	0.3290	0.0233
T4	120 - 100	2.809	27	0.2467	0.0156
T5	100 - 80	1.869	27	0.1858	0.0106
T6	80 - 60	1.156	27	0.1404	0.0073
T7	60 - 40	0.631	27	0.0951	0.0045
T8	40 - 20	0.283	27	0.0606	0.0028
T9	20 - 0	0.077	27	0.0265	0.0013

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	LPA-80080/6CF	27	7.446	0.4364	0.0476	65440
178.00	6 Arm Halo Mount	27	7.259	0.4320	0.0469	65440
170.00	PiROD 12' Lightweight T-Frame	27	6.518	0.4143	0.0439	32720
160.00	PiROD 12' Lightweight T-Frame	27	5.626	0.3905	0.0386	16979
150.00	PiROD 12' Lightweight T-Frame	27	4.802	0.3630	0.0308	15402

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	21.394	15	1.2216	0.1264
T2	160 - 140	16.295	15	1.1066	0.1032
T3	140 - 120	11.823	15	0.9433	0.0629
T4	120 - 100	8.225	15	0.7151	0.0419
T5	100 - 80	5.486	15	0.5419	0.0283
T6	80 - 60	3.399	15	0.4109	0.0193
T7	60 - 40	1.858	15	0.2791	0.0118
T8	40 - 20	0.835	15	0.1780	0.0074
T9	20 - 0	0.227	15	0.0778	0.0034

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	LPA-80080/6CF	15	21.394	1.2216	0.1264	25948
178.00	6 Arm Halo Mount	15	20.872	1.2108	0.1246	25948
170.00	PiROD 12' Lightweight T-Frame	15	18.800	1.1669	0.1170	12974
160.00	PiROD 12' Lightweight T-Frame	15	16.295	1.1066	0.1032	6730
150.00	PiROD 12' Lightweight T-Frame	15	13.958	1.0347	0.0829	5936

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T2	160	Leg	A325N	1.0000	6	5584.56	34556.70	0.162 ✔	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	7332.45	8156.25	0.899 ✔	1.333	Member Bearing
T9	20	Leg	A325N	1.2500	6	36440.10	53993.70	0.675 ✔	1.333	Bolt Tension
		Diagonal	A325N	1.2500	1	11106.20	16992.20	0.654 ✔	1.333	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P/P_a
T1	180 - 160	1 1/2	20.00	2.38	76.0 K=1.00	19.800	1.7672	-31817.60	34989.80	0.909 ✔
T2	160 - 140	Pirod 105216	20.03	10.02	45.4 K=1.00	25.051	3.6816	-63564.10	92228.10	0.689 ✔
T3	140 - 120	Pirod 105216	20.03	10.02	45.4 K=1.00	25.051	3.6816	-105361.00	92228.10	1.142 ✔
T4	120 - 100	Pirod 105217	20.03	10.02	37.8 K=1.00	26.132	5.3014	-141867.00	138539.00	1.024 ✔
T5	100 - 80	Pirod 105218	20.03	10.02	32.4 K=1.00	26.848	7.2158	-175385.00	193727.00	0.905 ✔
T6	80 - 60	Pirod 105218	20.03	10.02	32.4 K=1.00	26.848	7.2158	-206297.00	193727.00	1.065 ✔
T7	60 - 40	Pirod 105219	20.03	10.02	28.4 K=1.00	27.351	9.4248	-236569.00	257781.00	0.918 ✔
T8	40 - 20	Pirod 105219	20.03	10.02	28.4 K=1.00	27.351	9.4248	-266038.00	257781.00	1.032 ✔
T9	20 - 0	Pirod 105220	20.03	10.02	25.2 K=1.00	27.723	11.9282	-295679.00	330691.00	0.894 ✔

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V lb	Allow. V_a lb	Stress Ratio
T2	160 - 140	0.5	1.48	121.0	10.133	0.1963	732.97	2226.75	0.329 ✔
T3	140 - 120	0.5	1.48	121.0	10.133	0.1963	222.52	2226.75	0.100

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V lb	Allow. V_a lb	Stress Ratio
T4	120 - 100	0.5	1.47	120.0	10.279	0.1963	177.31	2258.95	0.078 ✔
T5	100 - 80	0.5	1.46	119.0	10.423	0.1963	197.18	2290.46	0.086 ✔
T6	80 - 60	0.5	1.46	119.0	10.423	0.1963	256.87	2290.46	0.112 ✔
T7	60 - 40	0.625	1.45	94.4	13.671	0.3068	246.84	4694.36	0.053 ✔
T8	40 - 20	0.625	1.45	94.4	13.671	0.3068	880.65	4694.36	0.188 ✔
T9	20 - 0	0.625	1.43	93.6	13.766	0.3068	1479.16	4726.89	0.313 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	3/4	4.65	2.25	129.8 K=0.90	8.865	0.4418	-3138.53	3916.38	0.801 ✔
T2	160 - 140	L2 1/2x2 1/2x3/16	11.42	5.00	121.3 K=1.00	10.097	0.9020	-7523.05	9107.43	0.826 ✔
T3	140 - 120	L2 1/2x2 1/2x3/16	12.50	5.84	136.4 K=0.96	8.027	0.9020	-6883.65	7240.08	0.951 ✔
T4	120 - 100	L2 1/2x2 1/2x3/16	13.80	6.54	149.3 K=0.94	6.697	0.9020	-6436.02	6040.72	1.065 ✔
T5	100 - 80	L3x3x3/16	15.24	7.29	140.4 K=0.96	7.571	1.0900	-6432.64	8251.92	0.780 ✔
T6	80 - 60	L3x3x3/16	16.80	8.09	152.7 K=0.94	6.402	1.0900	-6556.65	6978.45	0.940 ✔
T7	60 - 40	L3x3x5/16	18.45	8.93	167.2 K=0.92	5.343	1.7800	-6808.83	9510.22	0.716 ✔
T8	40 - 20	L3x3x5/16	19.30	9.36	174.0 K=0.91	4.933	1.7800	-7308.52	8781.58	0.832 ✔
T9	20 - 0	L3 1/2x3 1/2x5/16	21.03	10.01	174.1 K=1.00	4.928	2.0900	-9358.38	10300.30	0.909 ✔

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	3/4	4.00	3.88	173.6 K=0.70	4.955	0.4418	-493.56	2189.09	0.225 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	7/8	4.00	3.88	148.8 K=0.70	6.744	0.6013	-544.36	4055.56	0.134 ✔

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	7/8	4.00	3.88	148.8 K=0.70	6.744	0.6013	-584.45	4055.56	0.144 ✔

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	1 1/2	20.00	2.38	76.0	30.000	1.7672	27188.80	53014.40	0.513 ✔
T2	160 - 140	Pirod 105216	20.03	10.02	45.4	30.000	3.6816	52050.90	110447.00	0.471 ✔
T3	140 - 120	Pirod 105216	20.03	10.02	45.4	30.000	3.6816	87525.50	110447.00	0.792 ✔
T4	120 - 100	Pirod 105217	20.03	10.02	37.8	30.000	5.3014	117003.00	159043.00	0.736 ✔
T5	100 - 80	Pirod 105218	20.03	10.02	32.4	30.000	7.2158	142752.00	216475.00	0.659 ✔
T6	80 - 60	Pirod 105218	20.03	10.02	32.4	30.000	7.2158	165786.00	216475.00	0.766 ✔
T7	60 - 40	Pirod 105219	20.03	10.02	28.4	30.000	9.4248	187128.00	282743.00	0.662 ✔
T8	40 - 20	Pirod 105219	20.03	10.02	28.4	30.000	9.4248	206007.00	282743.00	0.729 ✔
T9	20 - 0	Pirod 105220	20.03	10.02	25.2	30.000	11.9282	221897.00	357847.00	0.620 ✔

Truss-Leg Diagonal Data

Section No.	Elevation ft	Diagonal Size	L_d ft	Kl/r	F_a ksi	A in^2	Actual V lb	Allow. V_a lb	Stress Ratio
T2	160 - 140	0.5	1.48	121.0	10.133	0.1963	732.97	2226.75	0.329 ✓
T3	140 - 120	0.5	1.48	121.0	10.133	0.1963	222.52	2226.75	0.100 ✓
T4	120 - 100	0.5	1.47	120.0	10.279	0.1963	177.31	2258.95	0.078 ✓
T5	100 - 80	0.5	1.46	119.0	10.423	0.1963	197.18	2290.46	0.086 ✓
T6	80 - 60	0.5	1.46	119.0	10.423	0.1963	256.87	2290.46	0.112 ✓
T7	60 - 40	0.625	1.45	94.4	13.671	0.3068	246.84	4694.36	0.053 ✓
T8	40 - 20	0.625	1.45	94.4	13.671	0.3068	880.65	4694.36	0.188 ✓
T9	20 - 0	0.625	1.43	93.6	13.766	0.3068	1479.16	4726.89	0.313 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	3/4	4.65	2.25	144.2	30.000	0.4418	3098.72	13253.60	0.234 ✓
T2	160 - 140	L2 1/2x2 1/2x3/16	11.42	5.00	80.1	21.600	0.9020	7332.45	19483.20	0.376 ✓
T3	140 - 120	L2 1/2x2 1/2x3/16	11.93	5.59	86.2	21.600	0.9020	6801.87	19483.20	0.349 ✓
T4	120 - 100	L2 1/2x2 1/2x3/16	13.13	6.22	96.0	21.600	0.9020	6270.70	19483.20	0.322 ✓
T5	100 - 80	L3x3x3/16	14.50	6.93	88.6	21.600	1.0900	6217.61	23544.00	0.264 ✓
T6	80 - 60	L3x3x3/16	16.01	7.70	98.4	21.600	1.0900	6277.50	23544.00	0.267 ✓
T7	60 - 40	L3x3x5/16	18.45	8.93	116.2	21.600	1.7800	6660.97	38448.00	0.173 ✓
T8	40 - 20	L3x3x5/16	20.16	9.79	127.4	21.600	1.7800	7806.97	38448.00	0.203 ✓
T9	20 - 0	L3 1/2x3 1/2x5/16	21.92	10.45	118.6	21.600	2.0900	11106.20	45144.00	0.246 ✓

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	3/4	4.00	3.88	248.0	30.000	0.4418	668.95	13253.60	0.050

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
										✔

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	7/8	4.00	3.88	212.6	30.000	0.6013	527.80	18039.60	0.029 ✔

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	180 - 160	7/8	4.00	3.88	212.6	30.000	0.6013	659.41	18039.60	0.037 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF^*P_{allow} lb	% Capacity	Pass Fail
T1	180 - 160	Leg	1 1/2	3	-31817.60	46641.40	68.2	Pass
T2	160 - 140	Leg	Pirod 105216	67	-63564.10	122940.05	51.7	Pass
T3	140 - 120	Leg	Pirod 105216	82	-105361.00	122940.05	85.7	Pass
T4	120 - 100	Leg	Pirod 105217	97	-141867.00	184672.48	76.8	Pass
T5	100 - 80	Leg	Pirod 105218	112	-175385.00	258238.08	67.9	Pass
T6	80 - 60	Leg	Pirod 105218	127	-206297.00	258238.08	79.9	Pass
T7	60 - 40	Leg	Pirod 105219	142	-236569.00	343622.06	68.8	Pass
T8	40 - 20	Leg	Pirod 105219	157	-266038.00	343622.06	77.4	Pass
T9	20 - 0	Leg	Pirod 105220	172	-295679.00	440811.08	67.1	Pass
T1	180 - 160	Diagonal	3/4	15	-3138.53	5220.53	60.1	Pass
T2	160 - 140	Diagonal	L2 1/2x2 1/2x3/16	70	-7523.05	12140.20	62.0 67.4 (b)	Pass
T3	140 - 120	Diagonal	L2 1/2x2 1/2x3/16	85	-6883.65	9651.03	71.3	Pass
T4	120 - 100	Diagonal	L2 1/2x2 1/2x3/16	100	-6436.02	8052.28	79.9	Pass
T5	100 - 80	Diagonal	L3x3x3/16	115	-6432.64	10999.81	58.5	Pass
T6	80 - 60	Diagonal	L3x3x3/16	130	-6556.65	9302.27	70.5	Pass
T7	60 - 40	Diagonal	L3x3x5/16	145	-6808.83	12677.12	53.7	Pass
T8	40 - 20	Diagonal	L3x3x5/16	166	-7308.52	11705.85	62.4	Pass
T9	20 - 0	Diagonal	L3 1/2x3 1/2x5/16	181	-9358.38	13730.30	68.2	Pass
T1	180 - 160	Horizontal	3/4	16	-493.56	2918.06	16.9	Pass
T1	180 - 160	Top Girt	7/8	5	-544.36	5406.06	10.1	Pass
T1	180 - 160	Bottom Girt	7/8	7	-584.45	5406.06	10.8	Pass
							Summary	
						Leg (T3)	85.7	Pass
						Diagonal	79.9	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
						(T4)		
						Horizontal (T1)	16.9	Pass
						Top Girt (T1)	10.1	Pass
						Bottom Girt (T1)	10.8	Pass
						Bolt Checks	67.4	Pass
						RATING =	**85.7**	**Pass**

ANCHOR BOLT ANALYSIS

Input Data

Max Pier Reactions:

Uplift:	$Uplift := 230 \cdot kips$	*user input*
Shear:	$Shear := 30 \cdot kips$	*user input*
Compression:	$Compression := 300 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A687

Number of Anchor Bolts = N	$N := 6$	*user input*	
Bolt Ultimate Strength:	$F_u := 150 \cdot ksi$	*user input*	
Bolt Yield Strength:	$Fy := 105 \cdot ksi$	*user input*	
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*	
Thickness of Anchor Bolts	$D := 1.25 in$	*user input*	
Threads per Inch:	$n := 8$	*user input*	
Coefficient of Friction:	$\mu := 0.55$	*user input*	(for baseplate with grout ASCE 10-97)

Anchor Bolt Area:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 1.227 \cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 \qquad A_n = 1.000 \cdot in^2$$

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

$$AllowableTension := 1.33 \cdot \left(0.33 \cdot A_g \cdot F_u\right) \qquad AllowableTension = 80.8 \cdot kips$$

Note: 1.33 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$$F_{net.area} := 1.33 \cdot \left(0.60 \cdot A_n \cdot Fy\right) \qquad F_{net.area} = 83.8 \cdot kips$$

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{Uplift}{N} \qquad MaxTension = 38.3 \cdot kips$$

Check Stresses:

$$\frac{MaxTension}{F_{net.area}} = 0.46$$

$$Condition1 := if\left(\frac{MaxTension}{F_{net.area}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

$$\boxed{Condition1 = \text{"OK"}}$$

Check Anchor Bolt Area:

Based on the ASCE 10-97 Design of Latticed Steel Transmission Structures

Required Area:

$$A_{s1} := \frac{Uplift}{Fy} + \frac{Shear}{\mu \cdot 0.85 \cdot Fy} \qquad A_{s1} = 2.8 \cdot in^2$$

$$A_{s2} := \left| \frac{Shear - (0.3 \cdot Compression)}{\mu \cdot 0.85 \cdot Fy} \right| \qquad A_{s2} = 1.2 \cdot in^2$$

Provided Area:

$$A_{sprovided} := A_n \cdot N \qquad A_{sprovided} = 6.0 \cdot in^2$$

$$Condition2 := if\left(\frac{A_{s1}}{A_{sprovided}} \le 1.00, "OK", "Overstressed"\right) \qquad \frac{A_{s1}}{A_{sprovided}} = 0.5$$

Condition2 = "OK"

$$Condition3 := if\left(\frac{A_{s2}}{A_{sprovided}} \le 1.00, "OK", "Overstressed"\right) \qquad \frac{A_{s2}}{A_{sprovided}} = 0.2$$

Condition3 = "OK"

PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower $M_t := 4780 \cdot kip \cdot ft$

Shear at Base of Tower $S_t := 44.3 \cdot kip$

Max Compressive Force $C_t := 300 \cdot kip$

Max Uplift $U_t := 230 \cdot kip$

Height of Tower $H_t := 180 \cdot ft$

Width of Tower at Base $W_t := 20 \cdot ft$

Weight of Tower $WT_t := 71 \cdot kip$

FOOTING DIMENSIONS:

Width of Footing $W_f := 28.5 \cdot ft$

Overall Depth of Footing $D_f := 6ft$

Length of Pier $L_p := 3.75 \cdot ft$

Extension of Pier Above Grade $L_{pag} := 0.5 \cdot ft$

Diameter of Pier $d_p := 5.0 \cdot ft$

Thickness of Footing $T_f := 2.75 \cdot ft$

Reinforement Cover: $Cvr := 3in$

MATERIAL PROPERTIES:

Compressive Strength of Concrete $f'c := 3500 \cdot psi$

Yield Strength of Steel Reinforcement $fy := 60000 \cdot psi$

Internal Friction Angle of Soil $\phi_s := 30 \cdot deg$

Allowable Bearing Capacity $q_s := 3000 \cdot psf$

Unit Weight of Soil $\gamma_s := 120 \cdot pcf$

Unit Weight of Concrete $\gamma_c := 150 \cdot pcf$

Depth to Neglect $n := 0 \cdot ft$

Cohesion of Clay Type Soil $c := 0 \cdot ksf$
Note: Use 0 for Sandy Soil

Coefficient of Lateral Soil Pressure $K_p := \dfrac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$ $K_p = 3$

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

STEEL REINFORCING:

PIER REINFORCEMENT:

Bar Size $BSpier := 8$ Bar Diameter $d_{bpier} := 1.0 \cdot in$

Number of Bars $NBpier := 18$ Bar Area $A_{bpier} := 0.79 \cdot in^2$

PAD REINFORCEMENT:

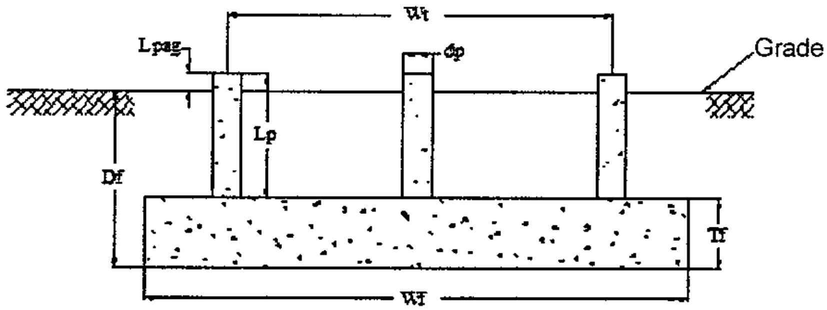
Bar Size $BS_{pad} := 9$ Bar Diameter $d_{bpad} := 1.128 \cdot in$

Number of Bars $NB_{pad} := 35$ Bar Area $A_{bpad} := 1.00 \cdot in^2$

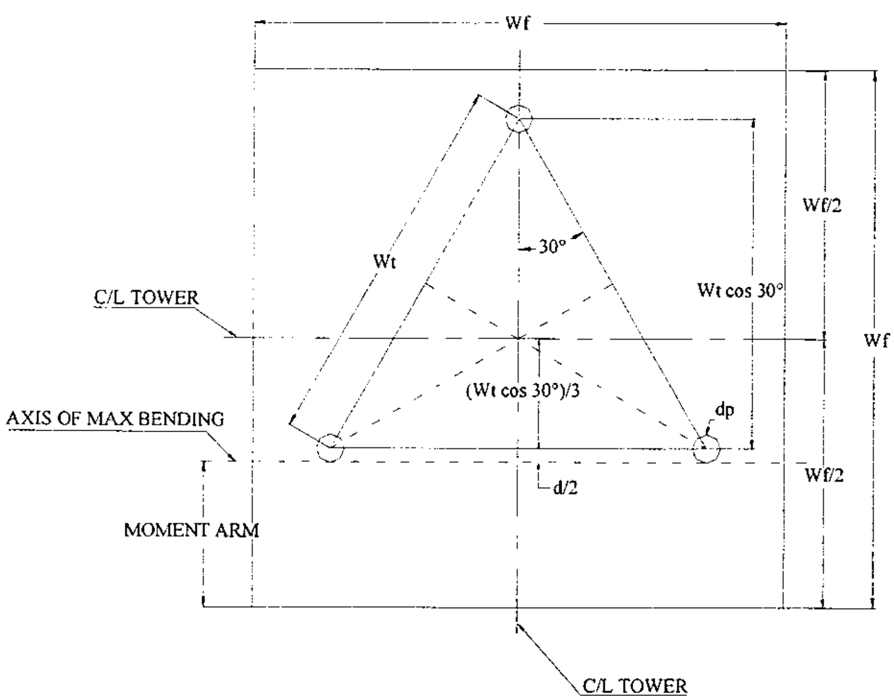
NATCOMM

Job	180' Valmont Lattice –Hartland	**Project No.**	07076	**Page**	2 of 10
Description	Foundation Analysis	**Computed by**	JEK	**Date**	10/16/2007

FOUNDATION OVERVIEW



ELEVATION



PLAN

STABILITY OF FOOTING

Factor of Safety Req'd: $FS_{req} := 2.0$

Passive Pressure:

$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p}$ — $P_{pn} = 0 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ — $P_{pt} = 1.17 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}]$ — $P_{top} = 1.17 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ — $P_{bot} = 2.16 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ — $P_{ave} = 1.665 \cdot ksf$

Shear:

$T_{pp} := if[n < (D_f - T_f), T_f, (D_f - n)]$ — $T_{pp} = 2.75 \cdot ft$

$A_{pp} := W_f \cdot T_{pp}$ — $A_{pp} = 78.375 \cdot ft^2$

Ultimate Shear: $S_u := P_{ave} \cdot A_{pp}$ — $S_u = 130.4944 \cdot kip$

Weight of Concrete Pad: $WT_c := (W_f{}^2 \cdot T_f) \cdot \gamma_c$ — $WT_c = 335.0531 \cdot kip$

Weight of Soil: above Footing: $WT_{s1} := W_f{}^2 (|D_f - T_f|) \cdot \gamma_s$ — $WT_{s1} = 316.7775 \cdot kip$

Weight of Soil Wedge at back face: $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f\right] \cdot \gamma_s$ — $WT_{s2} = 35.5417 \cdot kip$

Distance to center of Tower Leg from Edge of Footing:

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

$X_t := if(Pos_{tower} = 1, X_{t1}, X_{t2})$ — $X_t = 5.5897 \cdot ft$

Additional Offset of Footing:

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

$X_{off} := if(Pos_{tower} = 1, X_{off1}, X_{off2})$ — $X_{off} = 2.8868 \cdot ft$

Resisting Moment:

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

$M_r = 11246.7449 \cdot kip \cdot ft$

Overturning Moment: $M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off}$ — $M_{ot} = 5272.9093 \cdot kip \cdot ft$

Factor of Safety: $FS := \frac{M_r}{M_{ot}}$ — $FS = 2.1329$

SafetyCheck := if(FS > FS_{req}, "Okay", "No Good") — SafetyCheck = "Okay"

BEARING PRESSURE CHECK:

Pressure Applied:

$LOAD_{tot} := WT_c + WT_{s1} + WT_t$ $\qquad LOAD_{tot} = 722.8306 \cdot kip$

$A_{mat} := W_f^{\,2}$ $\qquad A_{mat} = 812.25 \cdot ft^2$

$S := \frac{W_f^{\,3}}{6}$ $\qquad S = 3858.1875 \cdot ft^3$

$P_{max} := \frac{LOAD_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$ $\qquad P_{max} = 2.2566 \cdot ksf$

$P_{min} := \frac{LOAD_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$ $\qquad P_{min} = -0.4768 \cdot ksf$

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

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

Distance to Resultant of Pressure Distribution:

$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3}$ $\qquad X_p = 7.843 \cdot ft$

Distance to Kern: $X_k := \frac{W_f}{3}$ $\qquad X_k = 9.5 \cdot ft$

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

Eccentricity: $e := \frac{M_{ot}}{LOAD_{tot}}$ $\qquad e = 7.2948$

Adjusted Soil Pressure: $q_a := \frac{2 \cdot LOAD_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$ $\qquad q_a = 2.431 \cdot ksf$

Revised Maximum: $q_{max} := if(X_p < X_k, q_a, P_{max})$ $\qquad q_{max} = 2.431 \cdot kip$

PressureCheck := if$(q_{max} < q_s,$ "Okay" , "No Good"$)$ $\qquad$ PressureCheck = "Okay"

CHECK PUNCHING AND BEAM SHEAR:

Load Factor: (EIA 3.1.1) $LF := if\left[H_t \le 700 \cdot ft, 1.3, if\left[H_t \ge 1200, 1.7, 1.3 + \left(\frac{H_t - 700}{1200 - 700}\right) \cdot 0.4\right]\right]$ $LF = 1.3$

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

$\phi_c := .85$ (ACI 9.3.2.3)

$d := T_f - Cvr - .5 \cdot in$ $d = 29.5 \cdot in$

Factored load: $FL := LF \cdot \frac{C_t}{W_f^2}$ $FL = 0.4801 \cdot ksf$

$V_{req} := \frac{FL \cdot \left(X_t - 0.5 \cdot d_p - d\right) \cdot W_f}{\phi_c}$ $V_{req} = 10.1652 \cdot kip$

ACI 11.3.1.1 $V_{Avail} := 2 \cdot \sqrt{fc \cdot psi} \cdot W_f \cdot d$ $V_{Avail} = 1193.7466 \cdot kip$

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

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

$b_o := \left(d_p + d\right) \cdot \pi$ $b_o = 23.431 \cdot ft$

$V_{req} := FL \cdot \frac{W_f^2 - \left(d_p + d\right)^2 \cdot \frac{\pi}{4}}{\phi_c}$ $V_{req} = 434.1444 \cdot kip$

$V_{Avail} := 4 \cdot \sqrt{fc \cdot psi} \cdot b_o \cdot d$ $V_{Avail} = 1962.8582 \cdot kip$

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

TENSILE REINFORCEMENT IN PAD:

$\phi_m := .90$ per ACI 9.3.2.2

Applied Moments:

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

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

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

Design Moment: $M_n := \frac{M_{nT} + M_{nS} + M_{nC}}{\phi_m}$ $\quad M_n = 2875.6623\cdot kips\cdot ft$

Required Reinforcement:

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

Effective Width: $b_{eff} := W_t\cdot\cos(30\cdot deg) + d_p$ $\quad b_{eff} = 267.8461\cdot in$

$A_s := \frac{M_n}{\phi_m\cdot fy\cdot d}$ $\quad A_s = 21.6622\cdot in^2$

$a := \frac{A_s\cdot fy}{\beta\cdot f'c\cdot b_{eff}}$ $\quad a = 1.6311\cdot in$

$A_s := \frac{M_n}{fy\cdot\left(d - \frac{a}{2}\right)}$ $\quad A_s = 20.0503\cdot in^2$

$\rho := \frac{A_s}{b_{eff}\cdot d}$ $\quad \rho = 0.0025$

Temperature and Shrinkage: (ACI 7.12.2.1b) $\rho_{sh} := \text{if}(fy \geq 60000 \cdot psi, 0.0018, 0.0020)$ $\rho_{sh} = 0.0018$

Area Required: $As := \text{if}\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$ $As = 20.0503 \cdot in^2$

Area Provided: $As_{prov} := A_{bpad} \cdot NB_{pad}$ $As_{prov} = 35 \cdot in^2$

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

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 12.2.3)

Bar Spacing: $B_{sPad} := \frac{W_f - 2 \cdot Cvr - NB_{pad} \cdot d_{bpad}}{NB_{pad} - 1}$ $B_{sPad} = 8.7212 \cdot in$

Development Length Factors:

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

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

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

Development Length: $L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpad}}} \cdot d_{bpad}$ $L_{dbt} = 32.2608 \cdot in$

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

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

Available Length in Pad: $L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr$ $L_{Pad} = 48 \cdot in$

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

REINFORCEMENT IN PIER:

Pier Area: $A_p := \frac{\pi \cdot {d_p}^2}{4}$ $\qquad A_p = 2827.4334 \cdot in^2$

(ACI 10.8.4 and 10.9.1) $A_{smin} := 0.01 \cdot 0.5 \cdot A_p$ $\qquad A_{smin} = 14.1372 \cdot in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $\qquad A_{sprov} = 14.22 \cdot in^2$

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

NOTE: Anchor Bolts are not accounted for in reinforcement calculation and will provide additional reinforcement to satisfy minimum requirement of steel.

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $\qquad B_{sPier} = 9.472 \cdot in$

Diamter of Reinforcement Cage: $Diam_{cage} := d_p - 2 \cdot Cvr$ $\qquad Diam_{cage} = 54 \cdot in$

Maximum Moment in Pier: $M_p := (S_t \cdot L_p) \cdot LF$ $\qquad M_p = 2591.55 \cdot kips \cdot in$

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

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

The required input is column diameter in inches, number of reinforcing bars, bar size number, factored axial load in kips and moment in kip inches: $\qquad (D \ \ N \ \ n \ \ P_u \ \ M_{xu}) := (60 \ \ 18 \ \ 8 \ \ 300 \ \ 2592)$

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

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

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio: $\qquad (\phi P_n \ \ \phi M_{xn} \ \ f_{sp} \ \ \rho) = (3783.7436 \ \ 32691.5445 \ \ -31.949 \ \ 0.005)$

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

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

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

DEVELOPMENT LENGTH OF PIER REINFORCEMENT:

TENSION (ACI 12.2.3)

Spacing and Cover: $Cvr = 3 \cdot in$ $\quad B_{sPier} = 9.472 \cdot in$

Factors for development:

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

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

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c+k_{tr}}{d_{bpier}}} \cdot d_{bpier} \qquad L_{dbt} = 25.3546 \cdot in$$

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

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

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot fy}{\sqrt{f'c \cdot psi}} \qquad L_{dbc1} = 20.2837 \cdot in$$

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

$$L_{dbc} := if\left(L_{dbc1} \ge L_{dbmin}, L_{dbc1}, L_{dbmin}\right) \qquad L_{dbc} = 20.2837 \cdot in$$

Available Length in Pier:

$L_{pier} := L_p - 3 \cdot in$ $\qquad L_{pier} = 42 \cdot in$

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

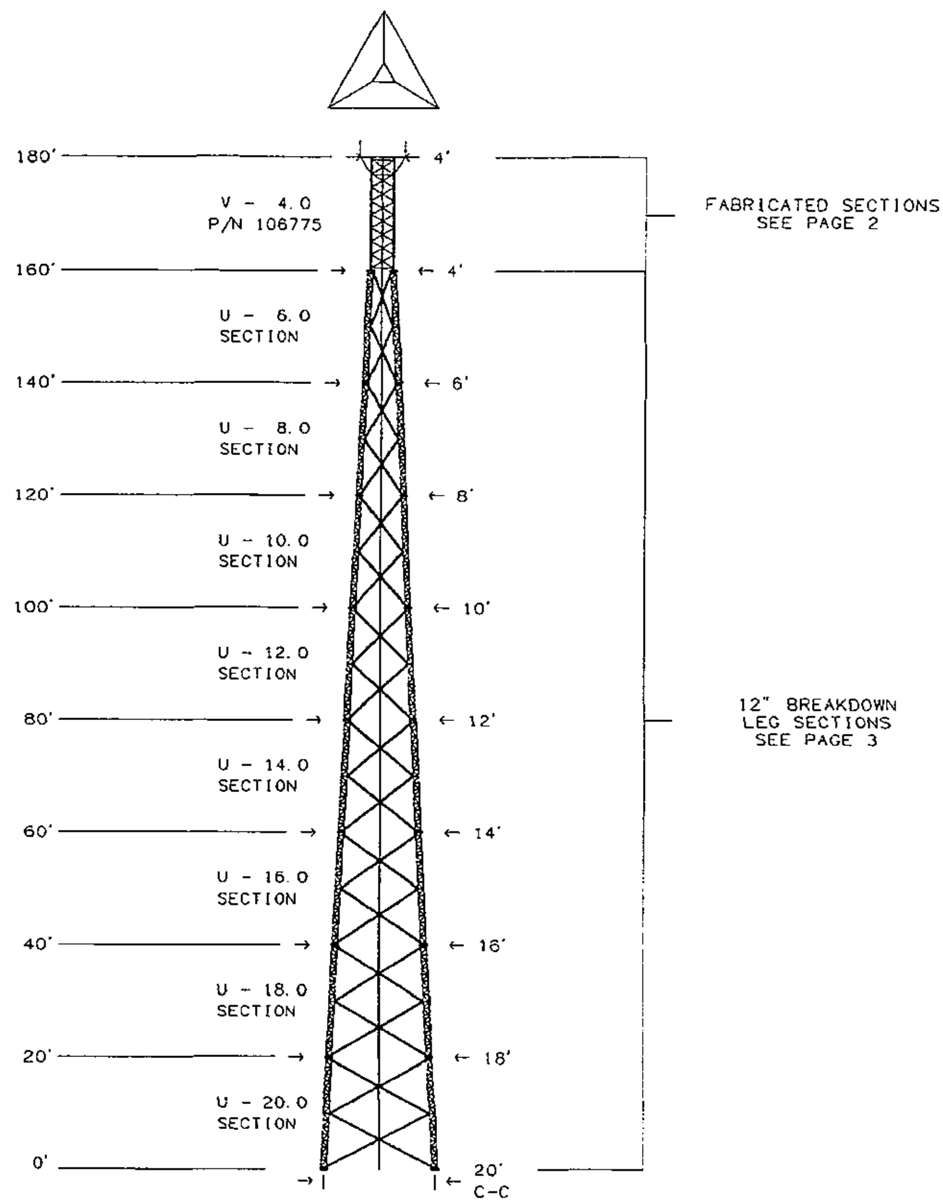
$L_{piercompression} := if(L_{pier} > L_{dbc}, \text{"Okay"}, \text{"No Good"})$ $\qquad L_{piercompression} = \text{"Okay"}$

Available Length in Pad:

$L_{pad} := T_f - 3 \cdot in$ $\qquad L_{pad} = 30 \cdot in$

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

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



ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

A	FOUNDATION PER SOIL REPORT	TMW	04/12/2006
REV	DESCRIPTION OF REVISIONS	INI	DATE

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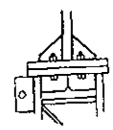
FABRICATED SECTION DATA 160' - 180' ELEVATION									
SECT LEN	SEC #	SECTION PART#	LEG SIZE	BRACE SIZE	SECT WT. *	BOLTS AT BOTTOM			
						DIAM	LENGTH	#
20'	V- 4.0	106775	1- 1/2 "	3/4 "	828#	1 "	3-1/2"	18

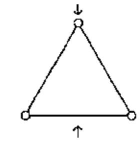
* THE WEIGHTS LISTED ARE THEORETICAL. THE ACTUAL WEIGHTS WILL VARY. ALL WEIGHTS SHOULD BE CONFIRMED IN THE FIELD PRIOR TO ERECTION.

FABRICATED SECTIONS
TRANSITION SIDE VIEW
AT 160' ELEVATION



USE 1 FLATWASHER UNDER EACH LOCKNUT ON LEG CONNECTION.

FABRICATED SECTIONS
GENERAL SECTION ASSEMBLY
TOP VIEW



THE MARKED LEG OF EACH SECTION IS STAMPED WITH THE 6 DIGITS OF THE TOWER SERIAL #. ASSEMBLE THE TOWER WITH MARKED LEGS TOGETHER. THE MARKED LEG MAY ALSO CONTAIN JOINT NUMBERS STARTING WITH 1 AT THE TOP OF THE BASE SECTION. IF SO, ERECT WITH JOINTS IN THE PROPER SEQUENCE.

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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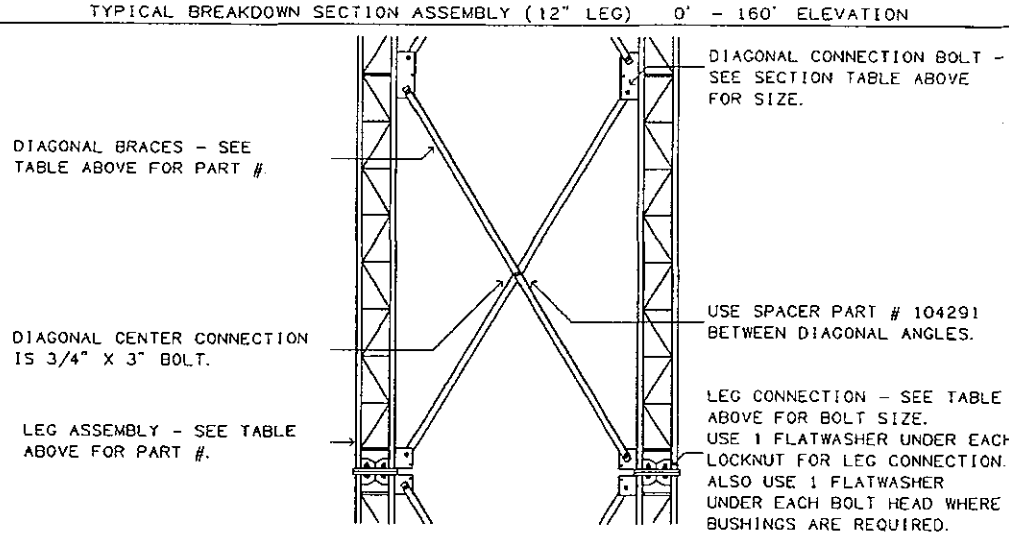
BREAKDOWN SECTION DATA (12" LEG) 0' - 160' ELEVATION												
SEC #	SECTION LENGTH	LEG SIZE	LEG PART#	TOP DIAG PART#	BOT DIAG PART#	DIAGONAL ANGLE FACE	THICK	SECTION WEIGHT	LEG CONNECT+ DIAM	LENGTH	DIAG CONNECT DIAM	LENGTH
U- 6.0	20'	1- 1/4"	195554	105898	105556	2-1/2"	3/16"	1921#	1 "	3-1/2"	1 "	2-1/4"
U- 8.0	20'	1- 1/4"	195554	105558	105561	2-1/2"	3/16"	1950#	1 "	3-1/2"	1 "	2-1/4"
U-10.0	20'	1- 1/2"	195555	105564	105567	2-1/2"	3/16"	2346#	1 "	3-1/2"	1 "	2-1/4"
U-12.0	20'	1- 3/4"	195557	105571	105574	3"	3/16"	2914#	1 "	3-1/2"	1 "	2-1/4"
U-14.0	20'	1- 3/4"	195557	105576	105579	3"	3/16"	2980#	1 "	4-1/4"	1 "	2-1/4"
U-16.0	20'	2 "	195559	113411	113412	3"	5/16"	4215#	1-1/4"	4-1/2"	1-1/4"	2-3/4"
U-18.0	20'	2 "	195559	128185	128186	3"	5/16"	4335#	1-1/4"	4-1/2"	1-1/4"	2-3/4"
U-20.0	20'	2- 1/4"	195560	105598	105601	3-1/2"	5/16"	5256#			1-1/4"	2-3/4"

* THE WEIGHTS LISTED ARE THEORETICAL. THE ACTUAL WEIGHTS WILL VARY. ALL WEIGHTS SHOULD BE CONFIRMED IN THE FIELD PRIOR TO ERECTION.

\+ USE 1 FLATWASHER UNDER EACH LOCKNUT, FOR LEG CONNECTION ONLY. ALSO USE 1 FLATWASHER UNDER EACH BOLT HEAD WHERE BUSHINGS ARE REQUIRED.

TYPICAL BREAKDOWN SECTION ASSEMBLY (12" LEG) 0' - 160' ELEVATION



ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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GENERAL NOTES

1. TOWER DESIGN CONFORMS TO STANDARD TIA-222-G UTILIZING AN 100 MPH 3-SEC GUST BASIC WIND SPEED WITH A STRUCTURE CLASS II, EXPOSURE B CRITERIA AND TOPOGRAPHIC CATEGORY 3, CREST HEIGHT=300', WITH NO ICE.
   TOWER DESIGN CONFORMS TO STANDARD TIA-222-G UTILIZING AN 40 MPH 3-SEC GUST BASIC WIND SPEED WITH A STRUCTURE CLASS II, EXPOSURE B CRITERIA AND TOPOGRAPHIC CATEGORY 3, CREST HEIGHT=300', WITH 1" RADIAL ICE.
2. NO TWIST AND SWAY LIMITATIONS SPECIFIED OR USED FOR THIS TOWER.
3. MATERIAL:
   (A) SOLID RODS TO ASTM A572 GRADE 50.
   (B) ANGLES TO ASTM A36.
   (C) PIPE TO ASTM A500 GRADE B.
   (D) STEEL PLATES TO ASTM A36.
   (E) CONNECTION BOLTS TO ASTM A325 OR ASTM A449 (Fu=120 KSI AND Fy=92 KSI) AND ANCHOR BOLTS TO ASTM A687 (Fu=150 KSI AND Fy=105 KSI).
4. BASE REACTIONS PER TIA-222-G FOR 100 MPH BASIC WIND SPEED WITH NO ICE:
   TOTAL WEIGHT = 53.1 KIPS. MAXIMUM COMPRESSION = 395.6 KIPS PER LEG.
   MOMENT = 6545.2 KIP-FT. MAXIMUM UPLIFT = 354.8 KIPS PER LEG.
   MAXIMUM SHEAR = 67.4 KIPS TOTAL.
5. BASE REACTIONS PER TIA-222-G FOR 40 MPH BASIC WIND SPEED WITH ICE:
   TOTAL WEIGHT = 223.2 KIPS.
   MOMENT = 1441.5 KIP-FT.
   MAXIMUM SHEAR = 13.8 KIPS TOTAL.
6. FINISH: ALL BOLTS ARE GALVANIZED IN ACCORDANCE WITH ASTM A153 (HOT DIPPED) OR ASTM B695 CLASS 50 (MECHANICAL). ALL OTHER STRUCTURAL MATERIALS ARE GALVANIZED IN ACCORDANCE WITH ASTM123.
7. ANTENNAS:
   180' -(5) DECIBEL -DB809K ON (1) 6 ARM HALO MOUNT WITH 1-5/8" LINES
   180' -(4) DECIBEL -DB224 ON SAME HALO MOUNT WITH 7/8" LINES
   180' -(2) DECIBEL -BD420 ON SAME HALO MOUNT WITH 1-1/4" LINES
   180' -(1) SCALA -PR950 ON SAME HALO MOUNT WITH 1-5/8" LINE
   170' -(12) EMS -FV90-1700 ON (3) 12' T-FRAMES WITH 1-5/8" LINES
   160' -(12) EMS -FV90-1700 ON (3) 12' T-FRAMES WITH 1-5/8" LINES
   150' -(12) EMS -FV90-1700 ON (3) 12' T-FRAMES WITH 1-5/8" LINES
   140' -(12) EMS -FV90-1700 ON (3) 12' T-FRAMES WITH 1-5/8" LINES
   130' -(12) EMS -FV90-1700 ON (3) 12' T-FRAMES WITH 1-5/8" LINES

   NOTE:
   (A) ELEVATIONS ARE TO THE BOTTOM OF THE ANTENNAS, EXCEPT FOR MICROWAVE DISHES, WHICH ARE TO THE CENTERLINE.
   (B) ALL TRANSMISSION LINES MUST BE PLACED ON PIROD SUPPLIED LINE BRACKETS PART # 125495 MOUNTED INSIDE THE TOWER WITH LINES PLACED IN A BACK-TO-BACK CONFIGURATION FOR WIND SHELTERING.
8. REMOVE FOUNDATION TEMPLATE PRIOR TO ERECTING TOWER. INSTALL BASE SECTION WITH MINIMUM OF 2" CLEARANCE ABOVE CONCRETE. SEE BASE SECTION PLACEMENT ON PAGE 7. PACK NON-SHRINK STRUCTURAL GROUT UNDER BASE SECTION AFTER LEVELING TOWER.
9. MIN. WELDS 5/16" UNLESS OTHERWISE SPECIFIED. ALL WELDING TO CONFORM TO AWS D1.1
10. ALL BOLTS AND NUTS MUST BE IN PLACE BEFORE THE ADJOINING SECTIONS ARE INSTALLED.
11. ALL STRUCTURAL BOLTS ARE TO BE TIGHTENED TO A SNUG TIGHT CONDITION AS DEFINED BY AISC SPECIFICATION UNLESS OTHERWISE NOTED. A MORE QUANTITATIVE ALTERNATIVE APPROACH TO ACHIEVING A SNUG TIGHT CONDITION IS TO TIGHTEN USING THE TORQUE VALUES FROM DRAWING 123107-A.
12. EIA GROUNDING FOR TOWER.

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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FOUNDATION NOTES

1. SOIL AS PER REPORT DR CLARENCE WELTI, DATED: 9/22/05
2. CONCRETE TO BE 3500 PSI @28 DAYS. REINFORCING BAR TO CONFORM TO ASTM A615 GRADE 60 SPECIFICATIONS. CONCRETE INSTALLATION TO CONFORM TO ACI-318 (2002) BUILDING REQUIREMENTS FOR REINFORCED CONCRETE. ALL CONCRETE TO BE PLACED AGAINST UNDISTURBED EARTH FREE OF WATER AND ALL FOREIGN OBJECTS AND MATERIALS. A MINIMUM OF THREE INCHES OF CONCRETE SHALL COVER ALL REINFORCEMENT. WELDING OF REBAR NOT PERMITTED.
3. A COLD JOINT IS PERMISSIBLE UPON CONSULTATION WITH PIROD. ALL COLD JOINTS SHALL BE COATED WITH BONDING AGENTS PRIOR TO SECOND POUR.
4. ALL FILL SHOULD BE PLACED IN LOOSE LEVEL LIFTS OF NO MORE THAN 12" THICK. FILL MATERIALS SHOULD BE CLEAN AND FREE OF ORGANIC AND FROZEN MATERIALS OR ANY OTHER DELETERIOUS MATERIALS. COMPACT FILL TO 95% OF MODIFIED PROCTOR MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D1557.
5. BENDING, STRAIGHTENING OR REALIGNING (HOT OR COLD) OF THE ANCHOR BOLTS BY ANY METHOD IS PROHIBITED.
6. CROWN TOP OF FOUNDATION FOR PROPER DRAINAGE.
7. FOUNDATION IS TO BEAR ON BEDROCK/INSITU CLAY AT APPROXIMATELY 6.0' BELOW GRADE. THE BEARING SURFACE IS TO BE FREE OF ANY LOOSE MATERIAL & SUBSEQUENTLY INSPECTED BY A QUALIFIED ON-SITE GEOTECHNICAL ENGINEER.
8. DIFFICULTIES DURING EXCAVATION MAY ARISE DUE TO THE PRESENCE OF BOULDERS, COBBLES, AND/OR SHALLOW BEDROCK. THE BOULDERS, COBBLES, AND/OR ROCK MUST BE REMOVED FROM THE EXCAVATION.
9. PNEUMATIC HAMMERS, RIPPERS, AND/OR BLASTING MAY BE REQUIRED TO REMOVE MATERIAL FROM THE EXCAVATION.
10. THE FOUNDATION MUST BEAR ENTIRELY ON COMPETENT BEDROCK OR SOIL. THE FOUNDATION IS NOT TO BEAR ON ANY COMBINATION OF SOIL AND BEDROCK AS THIS MAY CAUSE EXCESSIVE DIFFERENTIAL SETTLEMENT.
11. THE TOWER FOUNDATION MUST BEAR BELOW ALL EXISTING UNCONTROLLED FILL AT THIS SITE. A QUALIFIED ON-SITE GEOTECHNICAL ENGINEER MUST INSPECT THE BEARING SURFACE TO ENSURE THAT THE CAPACITY MEETS OR EXCEEDS THAT DISCLOSED IN THE REFERENCED SOIL REPORT.
12. ANY FILL DETECTED BENEATH THE BEARING SHOULD BE REMOVED AND REPLACED WITH COMPACTED FILL, AS DETAILED IN THE SOIL REPORT AND AS DIRECTED BY THE ON-SITE GEOTECHNICAL ENGINEER.
13. THE ON-SITE GEOTECHNICAL ENGINEER SHALL CONFIRM THAT THE INSITU SOIL STRENGTHS MEET OR EXCEED THOSE PARAMETERS GIVEN IN THE SOIL REPORT.

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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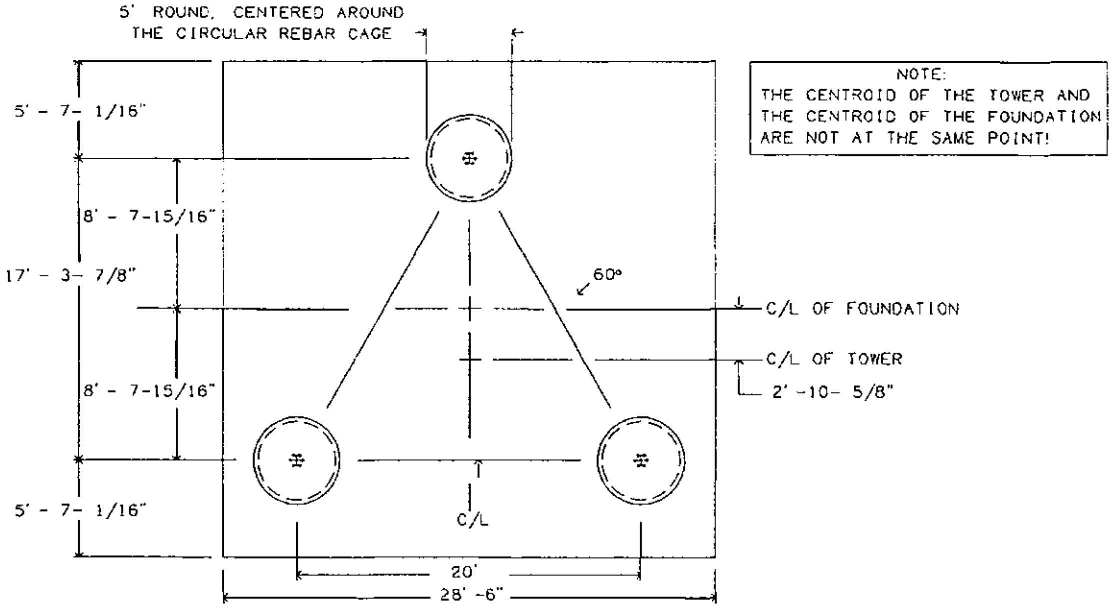

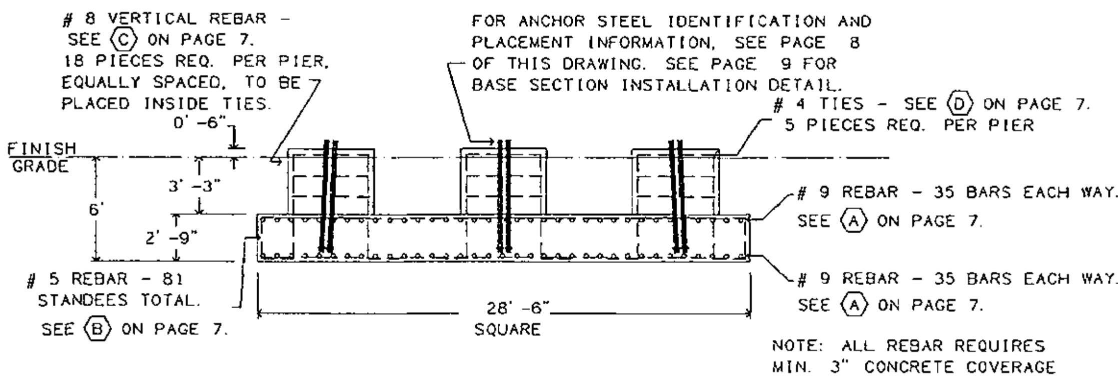

TOWER FOUNDATION

90.9 CUBIC YARDS CONCRETE REQUIRED

FOR INSTALLATION SPECIFICATIONS AND
ADDITIONAL INFORMATION, SEE PAGE 5
OF THIS DRAWING.

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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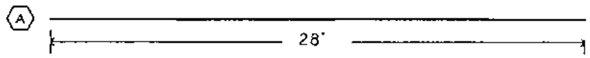
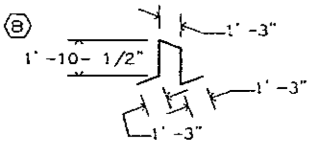
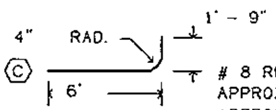


9 REBAR - 140 PIECES REQ. TOTAL
APPROX WT = 95.2# EACH, 13328# TOTAL

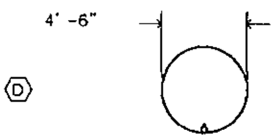
REBAR SUPPORTS MAY CONSIST OF ANY ACCEPTABLE MEANS OF SECURELY SUPPORTING THE TOP REINFORCEMENT GRID ABOVE THE BOTTOM REINFORCEMENT GRID WHILE MAINTAINING A SEPARATION OF 2'-3" (OUTSIDE REBAR TO OUTSIDE REBAR).



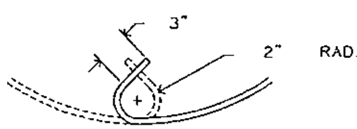
5 REBAR - 81 PIECES REQUIRED TOTAL
TYPE 26 STANDEE PLACED BETWEEN REBAR GRIDS ON NOMINAL 4' SPACING THROUGHOUT
APPROX UNBENT LENGTH = 7' - 5- 3/4"
APPROX WT = 7.8# EACH, 632# TOTAL



8 REBAR - 54 PIECES REQUIRED TOTAL
APPROX UNBENT LENGTH = 7' - 7- 3/8"
APPROX WT = 20.3# EACH, 1096# TOTAL



4 REBAR - 15 PIECES REQUIRED TOTAL
WITH 135 DEGREE HOOK ON EACH END
APPROX UNBENT LENGTH = 15' - 5- 1/8"
APPROX WT = 10.3# EACH, 155# TOTAL



DETAIL OF 135 DEGREE HOOKS

PLACE CIRCULAR TIES SO THAT HOOKS ON ADJACENT TIES ARE 180 DEGREES APART AND HOOKS ENCIRCLE A VERTICAL BAR. PLACE ONE TIE AT TOP OF PAD AND TWO TIES AT TOP OF PIER REBAR. EQUALLY SPACE REMAINING TIES ALONG PIER.

REBAR DETAIL

TOTAL APPROX REBAR WEIGHT = 15211#
REINFORCING BAR TO CONFORM TO
ASTM A615 GRADE 60 SPECIFICATIONS.

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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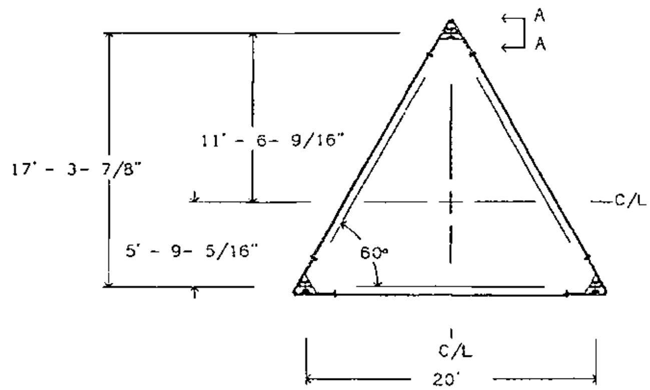
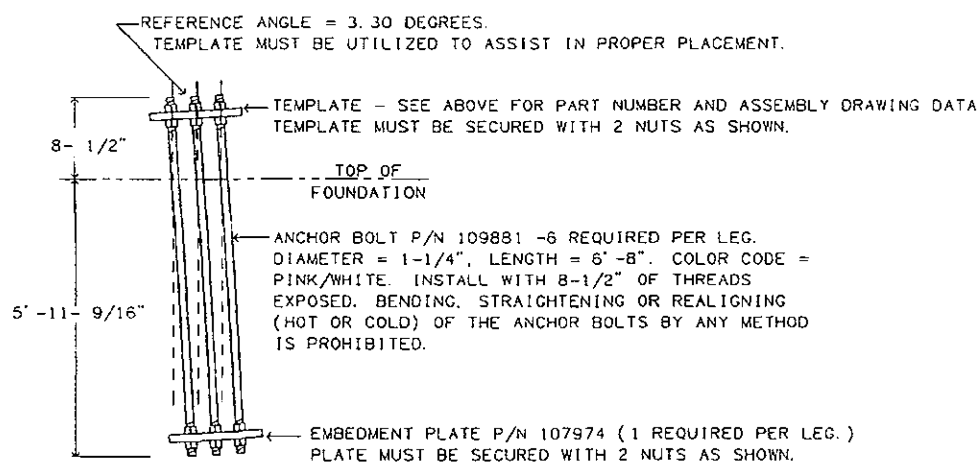


TEMPLATE ASSEMBLY P/N 159427 INCLUDES CORNER PLATE P/N 158387, IS REQUIRED FOR INSTALLATION AND MUST BE PLACED AS SHOWN. SEE DRAWING # 159394 FOR TEMPLATE ASSEMBLY DETAILS. CENTER OF TEMPLATE MUST BE PLACED OVER CENTER OF FOUNDATION +/- 3". EACH LEG MUST BE CENTERED IN PIER WITHIN +/- 10% OF PIER DIAMETER. TEMPLATE MUST BE LEVEL +/- 1 DEGREE. INSTALL TEMPLATE WITH SUFFICIENT SPACE BENEATH (2" MINIMUM) TO PERMIT FINISHING OF CONCRETE AND TO FACILITATE TEMPLATE REMOVAL PRIOR TO TOWER ERECTION.

SEE PAGE 9 FOR BASE SECTION INSTALLATION DETAIL.

TOWER ANCHOR STEEL PLACEMENT - TOP VIEW



VIEW A - A - ANCHOR BOLT INSTALLATION DETAIL (NOT TO SCALE)

ATTENTION CONTRACTOR INSTALLING THE ANCHOR BOLTS!

1-1/4" DIAMETER ANCHOR BOLTS FOR TAPERED TOWER.

VERIFY THE PART NUMBERS AND SIZES FOR ALL COMPONENTS ON THIS PAGE AND PAGE 9.

IF THERE ARE ANY DISCREPANCIES, PLEASE NOTIFY PIROD, INC., PRIOR TO INSTALLATION!!

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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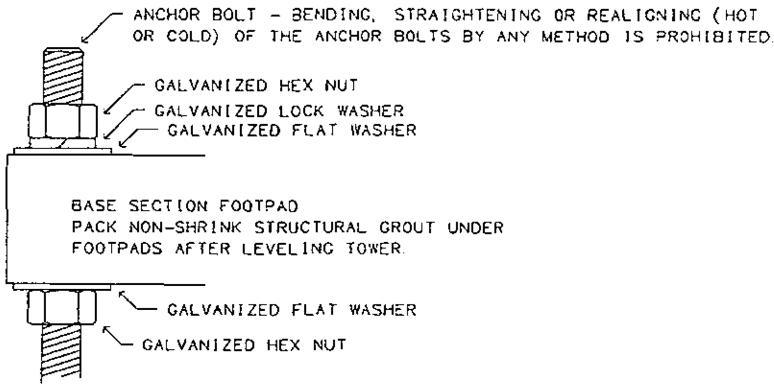

BASE SECTION INSTALLATION DETAIL

ROADRUNNER INSTALLATION SVCS.
EAST HARTLAND, CT
U-20.0 X 180'

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Site Name: Hartland, CT
Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissable Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW	1970	3	485	1455	180	0.0161	1.0	1.61%
VZW	875	9	300	2700	180	0.0300	0.583	5.14%

Total Percentage of Maximum Permissible Exposure 6.76%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case maximum values used.