ROBINSON & COLE LLP

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

ORIGINAL

July 18, 2011

David Martin
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-164-100208– Cellco Partnership d/b/a Verizon Wireless**
482 Pigeon Hill Road, Windsor, Connecticut

Dear Mr. Martin:

On March 15, 2010, the Siting Council acknowledged receipt of Cellco's notice of intent to modify the above-referenced telecommunications facility. This modification involved the addition of three (3) new LTE antennas, requiring some reinforcement of the tower. Follow that approval, Cellco also notified the Council of its intent to install six (6) cable diplexers on its antenna platform.

Attached is a letter from Centek Engineering certifying that the tower reinforcement was completed in accordance with the modification plans and that the tower, with the three new antenna and cable diplexers, does not exceed 100% of its post-construction structural rating. Construction activity associated with these modifications has now been completed.

If you have any questions regarding any of these materials, please do not hesitate to contact me or Rachel Mayo.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Sandy M. Carter
Brian Ragozzine
Mark Gauger

CENTEK engineering

Centered on Solutions℠

July 11, 2011

Mr. Mark Gauger
Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Re: Exiting Telecommunications Tower Modification Certification Letter

Project:	**Verizon ~ Windsor** 482 Pigeon Hill Road Windsor, Connecticut
Engineer:	**Centek Engineering** 63-2 North Branford Road Branford, CT 06405
Contractor:	**Construction Services of Branford** 63-2 North Branford Road , Branford CT 06405

Centek Project No.: 10179.CO22

Dear Mr. Gauger,

We are providing this "Existing Telecommunications Tower Modification Certification Letter" with regard to the antenna upgrade by Verizon Wireless at the above referenced project.

The following are the basis for substantiating compliance with the design documents prepared by Centek Engineering:

- Review of the structural analysis prepared for Verizon Wireless by Centek Engineering entitled "Proposed Verizon Wireless LTE Antenna Installation," Rev-1 dated 2/3/2010 and the updated Centek Engineering analysis Rev-2 dated 7/9/2010.
- Review of the structural analysis prepared for AT&T by Centek Engineering entitled "Proposed AT&T UMTS Antenna Upgrade," Rev-2 dated 8/20/2010.
- Review of the rock anchor reinforcement drawing prepared by Centek Engineering, entitled SSK-1, dated 1/4/2011.
- Field observations by Centek personnel of antenna installation on 7/7/2011 confirming compliance with the above referenced documents.
- The tower and foundation do not exceed 100 percent of their post-construction structural rating with the implemented reinforcements.

The work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in general compliance with the documents referenced above.

Sincerely,

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16804
LICENSED
PROFESSIONAL ENGINEER

Carlo F. Centore, PE
Principal ~Structural Engineer

CC: Rachel Mayo, Tim Parks,

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: siting.council@ct.gov

Internet: ct.gov/csc

Daniel F. Caruso
Chairman

March 15, 2010

Kenneth C. Baldwin
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-164-100208** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 482 Pigeon Hill Road, Windsor, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- The tower and foundation shall be modified per the attached drawings of the structural analysis report dated February 3, 2010 and sealed by Carlo F. Centore, P.E.;
- The tower and foundation shall not exceed 100 percent of their respective post-construction structural ratings; and
- Not more than 45 days after completion of construction, a signed letter from a Professional Engineer duly licensed in the State of Connecticut shall be submitted to the Council to certify that the modifications have been properly completed and the tower and foundation do not exceed 100 percent of their respective post-construction structural ratings.

The proposed modifications are to be implemented as specified here and in your notice dated February 8, 2010, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65.

Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP/laf

c: The Honorable Donald Trinks, Mayor, Town of Windsor
Peter Souza, Town Manager, Town of Windsor
Eric Barz, Town Planner, Town of Windsor

ROBINSON & COLE

EM-VER-164-100208

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
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Direct (860) 275-8345

ORIGINAL

February 8, 2010

Via Hand Delivery

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

Re: **Notice of Exempt Modification**
482 Pigeon Hill Road, Windsor, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains wireless telecommunications antennas at the 156-foot level on the existing 160-foot lattice tower on the tower at the above-referenced address. The Council approved Cellco's use of this facility in 1986 in Docket No. 58. Cellco now intends to modify its installation by adding two (2) BXA-70040/6CF_2 LTE (700 MHz) antennas and one (1) BXA-70063/6CF_4 antenna, for a total of fifteen (15) antennas at the same level on the tower. The tower and underlying property are owned by Cellco. Attached behind Tab 1 are the specifications for the proposed replacement antennas.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Peter P. Souza, Town Manager for the Town of Windsor.

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

1. The proposed modifications will not result in any increase in the overall height of the existing structure. Cellco's new LTE antennas will be located at the same height as the existing antennas.

2. The proposed modifications do not involve any ground-mounted equipment and, therefore, will not require an extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The installation of three (3) LTE antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for the modified facility is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that, with modifications, the tower and foundation can support the proposed modifications. (See Tab 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Peter P. Souza, Windsor Town Manager
Sandy M. Carter

Slant ±45° Dual Polarized Panel 40° / 16.0 dBd
696-900 MHz

BXA-70040/6CF __ 2°
When ordering replace "__" with connector type.

Mechanical specifications

Length	1804	mm	71.1	in
Width	600	mm	23.6	in
Depth	200	mm	7.9	in
Depth with z-bracket	240	mm	9.4	in
Weight [4]	17	kg	37.5	lbs
Wind Area Fore/Aft	1.08	m^2	11.7	ft^2
Wind Area Side	0.36	m^2	3.9	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	1543	N	347	lbf
Side	545	N	123	lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in.

Mounting Bracket Kit	36210003
Downtilt Bracket Kit	36210004

Electrical specifications

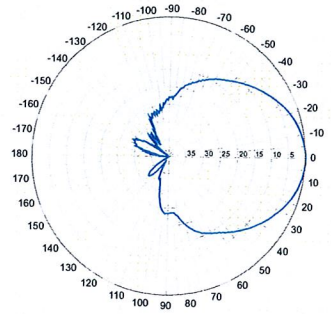
Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -27 dB
Gain [1]	16.0 dBd 18.0 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	40°
Vertical Beamwidth	10°
Electrical downtilt [5]	2°
Null fill [1]	5%
Lightning protection	Direct ground

Patented Dipole Design: U.S. Patent No. 6,608,600 B2

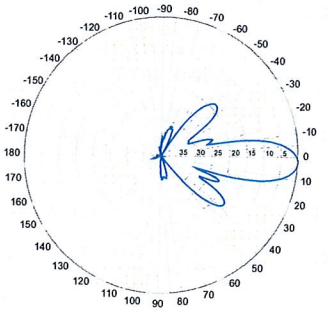
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector.
E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

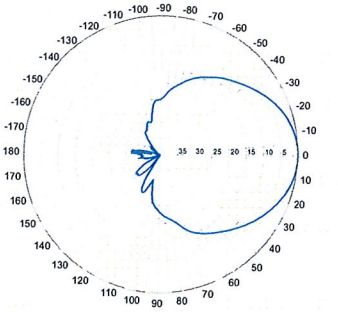
Radiation-pattern[1]
750 MHz



Horizontal



850 MHz



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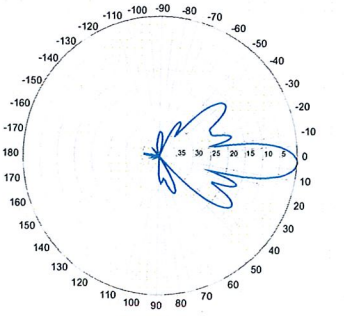
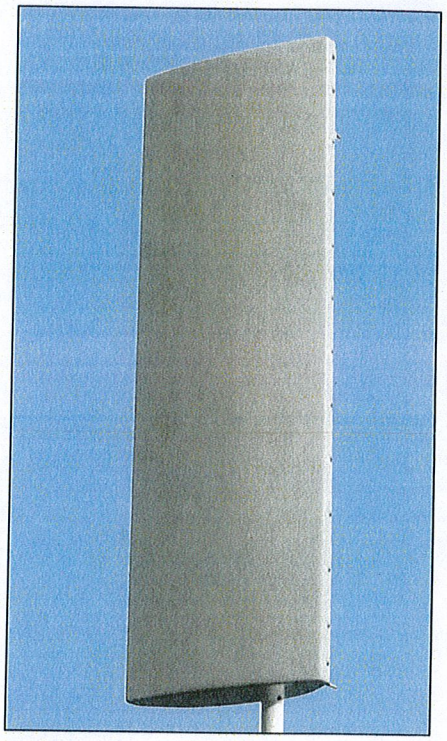


Vertical

696-900 MHz



Featuring our Exclusive 3T Technology™ Antenna Design:

- Watercut brass feedline assembly for consistent performance.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad band-width and superior performance.
- Air as insulation for virtually no internal signal loss.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date 5/13/09

815.399.0001 • antel@antelinc.com • www.antelinc.com

Amphenol Antel, Inc.
The Antenna Technology Company

Slant ±45° Dual Polarized, Panel 63° / 14.5 dBd
696-900 MHz

Mechanical specifications

Length	1804 mm	71.0 in
Width	285 mm	11.2 in
Depth	114 mm	4.5 in
Depth with z-bracket	154 mm	6.1 in
Weight [4]	7.9 kg	17.0 lbs
Wind Area Fore/Aft	0.51 m^2	5.5 ft^2
Wind Area Side	0.21 m^2	2.2 ft^2
Max Wind Survivability	>201 km/hr	>125 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	753 N	169 lbf
Side	351 N	79 lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in

Mounting Bracket Kit	36210003
Downtilt Bracket Kit	36210004

Electrical specifications

Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -25 dB
Gain [1]	14.5 dBd 16.5 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	63°
Vertical Beamwidth	11°
Electrical downtilt [5]	4°
Null fill [1]	5%
Lightning protection	Direct ground

Patented Dipole Design: U.S. Patent No. 6,608,600 B2

1) Typical values.
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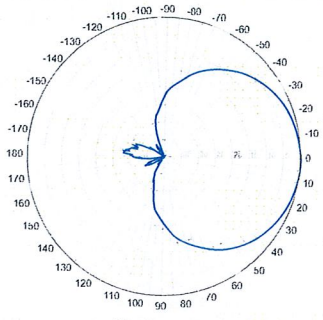
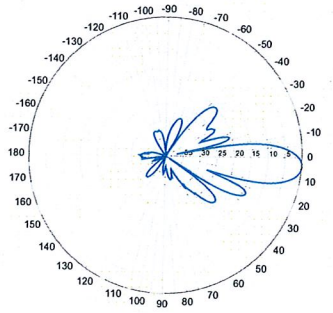
Radiation-pattern[1]
750 MHz

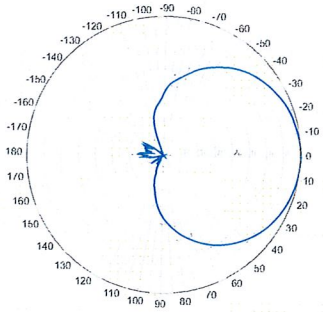


Horizontal

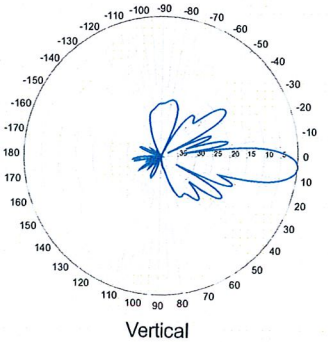


Vertical

850 MHz



Horizontal

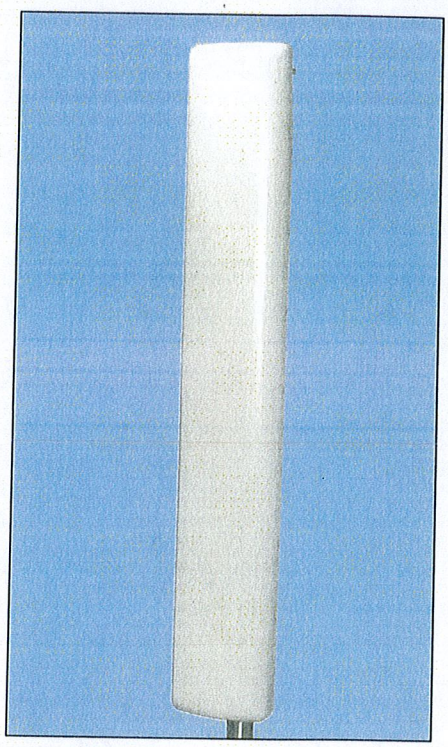


Vertical

696-900 MHz

BXA-70063/6CF ___ 4°

When ordering replace "___" with connector type.



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- A non-collinear system with access to every radiating element for broad band-width and superior performance.
- Air as insulation for virtually no internal signal loss.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date 04/09/09

815.399.0001 • antel@antelinc.com • www.antelinc.com

Amphenol Antel, Inc.
The Antenna Technology Company

	General	Power	Density					
Site Name: Windsor								
Tower Height: Verizon @ 155'								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*Cingular TDMA	16	100	169	0.0201	880	0.5867	3.43%	
*Cingular GSM	2	296	169	0.0075	880	0.5867	1.27%	
*Cingular GSM	2	427	169	0.0108	1930	1.0000	1.08%	
*T-Mobile GSM	8	162	145	0.0222	1945	1.0000	2.22%	
*T-Mobile UMTS	2	711	145	0.0243	2100	1.0000	2.43%	
*Town of Windsor			163	0.0009	454	0.3027	0.30%	
*Town of Windsor			131	0.0012	454	0.3027	0.40%	
*Town of Windsor			112	0.0032	454	0.3027	1.06%	
Verizon	**3**	**243**	**156**	**0.0108**	**1970**	**1.0000**	**1.08%**	
Verizon	**9**	**286**	**156**	**0.0380**	**869**	**0.5793**	**6.56%**	
Verizon	**1**	**828**	**156**	**0.0122**	**757**	**0.4973**	**2.46%**	
								22.3%
* Source: Siting Council								

NATCOMM INC
CONSULTING ENGINEERS

Structural Analysis Report

160' Existing ROHN Lattice Tower

Proposed Verizon Wireless
LTE Antenna Installation

Verizon Site Ref: Windsor

482 Pigeon Hill Road
Windsor, CT

Natcomm Project No. 10001-CO.8

~~Date: December 9, 2009~~
Rev 1: February 3, 2010

Prepared for:

Verizon Wireless
99 East River Road, 9th 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

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SECTION 4– REFERENCE MATERIALS

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by Verizon Wireless on the existing self supporting lattice tower located in Windsor, Connecticut.

The host tower is a 160-ft, three legged, tapered lattice tower originally designed and manufactured by UNR-ROHN. The manufacturer's drawings and calculations were unavailable for use in this report. The tower geometry and structure member sizes were taken from a structural analysis report prepared by Natcomm, Inc; project no. 09009.CO8, Rev. 1 dated April 30, 2009. Foundation information was taken from a dispersive wave propagation testing report prepared by FDH Engineering; project no. 08-04006E N1, dated April 18, 2008. Antenna and appurtenance inventory were taken from the aforementioned Natcomm, Inc. structural analysis report, a tower mapping report prepared by CSB Communications, dated January 22, 2010 and a Verizon RF data sheet.

Copies of the aforementioned structural report prepared by FDH, the tower mapping report prepared by CSB Communications and the Verizon RF data sheet are available for reference in Section 4 of this report.

The tower is made of eight (8) tapered vertical sections consisting of structural steel pipe legs. Diagonal lateral support bracing consists of structural steel angle shapes. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by welded and bolted gusset connections. The width of the tower face is 8.56-ft at the top and 22.85-ft at the base.

Verizon Wireless proposes the installation of three (3) additional panel antennas. Replacement of three existing Verizon 20'-ft boom frame mounts with three Valmont 13-ft Lightweight T-frames shall be required prior to the installation of the aforementioned Verizon panel antennas. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna configuration.

Antenna and Appurtenance Summary

The existing tower supports several communication antennas. The existing and proposed loads considered in the analysis consist of the following:

- AT&T (Existing):
  Antennas: Three (3) MB96RR900200DPBL panel antennas and six (6) TMA's mounted on a 10-ft x 4-in ∅ pipe with a RAD center elevation of ±167.75-ft above the existing tower base.
  Coax Cables: Nine (9) 1-1/4" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.

- UNKNOWN (EXISTING):
  Antenna: One (1) 15-ft x 2-in ∅ Omni-directional (whip) antenna mounted with an elevation of ±167.5-ft above the tower base.
  Coax Cable: One (1) 7/8" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- T-MOBILE (Existing):
  Antennas: Six (6) RFS APXV18-209014, three (3) RFS APX16DWV-16DWVS-C-A20 panel antennas and nine (9) TMA's mounted on three (3) 15-ft Wireless Frames with a RAD center elevation of ±147-ft above the existing tower base.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 15-ft x 2-in ∅ Omni-directional (whip) antenna on a 4-ft side mount standoff with an elevation of ±127.5-ft above the tower base.
  Coax Cable: One (1) 7/8" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 8-ft ∅ dish antenna on a 5-ft x 4.5-in ∅ pipe mount with an elevation of ±111.33-ft above the tower base.
  Coax Cable: One (1) EW63 cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 6-ft ∅ dish antenna on a 5-ft x 4.5-in ∅ pipe mount with an elevation of ±102-ft above the tower base.
  Coax Cable: One (1) EW90 ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 16-ft x 2-in ∅ Omni-directional (whip) antenna on a 4-ft side mount standoff with an elevation of ±108-ft above the tower base.
  Coax Cable: One (1) 7/8" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 6-ft ∅ dish antenna on a 5-ft x 4.5-in ∅ pipe mount with an elevation of ±94-ft above the tower base.
  Coax Cable: One (1) EW63 cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 10-ft ∅ dish antenna on a 6-ft 8-in x 4-in ∅ pipe mount with an elevation of ±72-ft above the tower base.
  Coax Cable: One (1) EW63 cable running on a leg/face of the existing tower as specified in Section 3 of this report.

- UNKNOWN (EXISTING):
  Antenna: One (1) empty 4-ft side mount standoff with an elevation of ±47-ft above the tower base.
  Coax Cables: Not applicable.
- UNKNOWN (Existing):
  Antenna: One (1) 12-ft x 1-1/2-in ∅ Omni-directional (whip) antenna on a 4-ft side mount standoff with an elevation of ±45.41-ft above the tower base.
  Coax Cable: One (1) 1/2-in ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- **VERIZON (Existing to be Relocated):**
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the face of the existing tower re-configured in 2 rows of 6 cables, as specified in Section 3 of this report.
- **VERIZON (Existing to Removed/Reinstalled):**
  Antennas: Six (6) Antel LPA-80063-4CF, six (6) Decibel DB948F85T2E-M panel antennas and three existing 20-ft Boom Gates shall be removed. Re-install aforementioned panel antennas on three (3) Valmont 15-ft T-Frames (P/N 860109) with a RAD center elevation of ±156.5-ft above the existing tower base.
- **VERIZON (Proposed):**
  Antennas: Two (2) Antel BXA-70040/6CF and one (1) Antel BXA-70063/6CF panel antennas mounted on three (3) Valmont 15-ft T-Frames (P/N 860109) with a RAD center elevation of ±156.5-ft above the existing tower base.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the face of the existing tower configured in 2 rows of 3 cables, adjacent to the re-configured existing coax 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 shall 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 80 mph 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]*
	Windsor; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed Controls	
Load Cases:	Load Case 1; 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]*
	Load Case 2; 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]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] 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 NOT found** to be within allowable limits. However, with the implementation of the reinforcements outlined in drawings S-1 thru S-3 of Section 3 of this report the tower shall be considered to be within the allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **119.5%** of its total capacity without the reinforcements and at **98.7%** with the reinforcements.

	Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Existing Tower	Leg (T3)	100'-0"-120'-0"	119.5%	FAIL
	Diagonal Bolts (T4)	80'-0"-100'-0"	101.4%	FAIL
Reinforced Tower	**Leg (T4)**	**80'-0"-100'-0"**	**98.7%**	**PASS**
	Diagonal (T5)	**60'-0"-80'-0"**	**94.9%**	**PASS**

Foundation and Anchors

The existing foundation consists of three (3) 3-ft ∅ reinforced concrete piers on three (3) 8-ft square reinforced concrete pads concentrically bearing directly on existing sub grade. The existing foundation locations and dimensions were taken from the aforementioned FDH dispersive wave propagation testing report available in Section 4 of this report. Allowable soil bearing pressure was assumed to be 4,500 psi for the analysis. Tower legs are connected to the three (3) piers by means of (6) 7/8" ∅, ASTM A354 Grade BC anchor bolts per leg, embedded 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 leg reactions developed from the governing Load Case 1 of the proposed reinforced tower condition were used in the verification of the foundation and anchor bolts:

Leg Reactions	Vector	Proposed Load (kips)
Leg	Shear	**22**
	Compression	**183**
	Uplift	**157**

- The anchor bolts were found to be within allowable limits.

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	76.9%	**PASS**

- The foundation **was NOT found** to be within allowable limits. Reinforcement of the existing foundation is required. Refer to drawings S-1 thru S-3 within Section 3 of this report for more information.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
(3) Reinf. Conc. Pad and Pier (exist. condition)	Uplift	2.00	1.10	**FAIL**
(3) Reinf. Conc. Pad and Pier w Reinf. Conc. Mat (proposed condition)	OM[2]	2.00	**2.46**	**PASS**

Note 1: FS denotes Factor of Safety
Note 2: OM denotes Overturning Moment

Conclusion And Recommendations

This analysis indicates that the subject tower **is NOT adequate** to support the proposed antenna configuration without reinforcement of the existing tower and foundation system. Natcomm Inc., recommends that the above listed items be addressed with Verizon Wireless so that a determination may be made as to the whether reinforcement of the subject tower is practicable.

Reinforcement/modification recommendations are as follows and are outlined in Section 3 of this report:

- Natcomm recommends the replacement of the existing Verizon 20-ft Boom Gates with three (3) Valmont 15-ft T-Frames (P/N 860109) with a RAD center elevation of ±156.5-ft above the existing tower base.
- Natcomm recommends the installation of proposed L2-1/2x2-1/2x3/16 secondary horizontal angle braces at tower section (T3~100'-120').
- Natcomm recommends the replacement of the existing 1/2" Ø A325N diagonal bolts at tower section (T4~80'-100') with 1/2" Ø A325X diagonal bolts.
- Natcomm recommends a proposed 8-ft thick reinforced concrete mat within the boundary of the existing tower. Refer to drawing S2 located in Section 3 of this report.

Conclusion And Recommendations- cont.

This report is not intended to serve as a specification for remedial items recommended herein. Site specific engineering documents for remedial work are included in Section 3 of this report, specifically drawings S-1 thru S-3.

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

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16694
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, EIT
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.

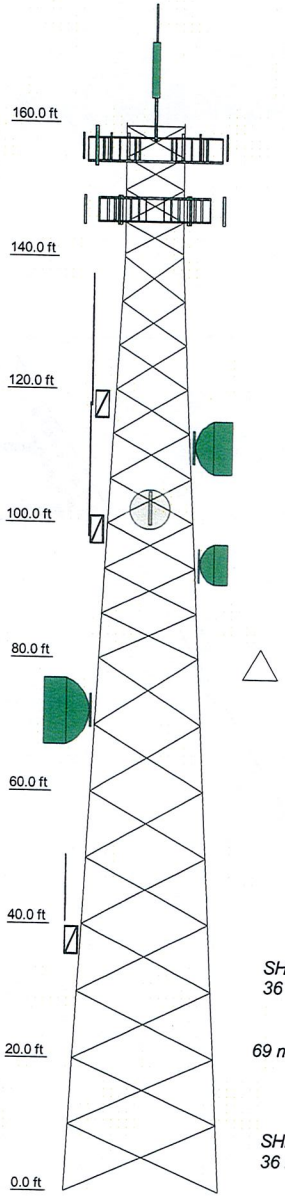
RISATower Features:

- 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.

Risa Tower Calculations

(Un-reinforced)

Section	T8	T7	T6	T5	T4	T3	T2	T1
Legs	ROHN 6 EHS	ROHN 5 EH		ROHN 4 EH	ROHN 3 EH	ROHN 2.5 EH	ROHN 2.5 STD	
Leg Grade	A572-50							
Diagonals	L4x4x1/4	L3 1/2x3 1/2x1/4		L3x3x1/4	L3x3x3/16	L2 1/2x2 1/2x3/16	L2x2x3/16	L1 3/4x1 3/4x3/16
Diagonal Grade	A36							
Top Girts	N.A.							L1 3/4x1 3/4x3/16
Face Width (ft) 22.85	20.85	18.69	16.69	14.66	12.6	10.56	8.56	
# Panels @ (ft)	8 @ 10				9 @ 6.66667			4 @ 4.75
Weight (K) 15.3	3.3	2.8	2.7	2.0	1.6	1.2	0.9	0.9



MAX. CORNER REACTIONS
DOWN: 190 K
UPLIFT: -163 K
SHEAR: 22 K

AXIAL
49 K
SHEAR
36 K
MOMENT
3444 kip-ft

TORQUE 14 kip-ft
69 mph WIND - 0.5000 in ICE

AXIAL
27 K
SHEAR
36 K
MOMENT
3492 kip-ft

TORQUE 18 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
MB96RR900200DPBL (ATT)	167.75	(2) APXV18-209014 (T-Mobile)	147
MB96RR900200DPBL (ATT)	167.75	(2) APXV18-209014 (T-Mobile)	147
MB96RR900200DPBL (ATT)	167.75	(2) APXV18-209014 (T-Mobile)	147
15' x 2" Dia Omni (Unknown)	167.5	APX16DWV-16DWVS-C-A20 (T-Mobile)	147
(2) CG1900W850 TMA (ATT)	163	APX16DWV-16DWVS-C-A20 (T-Mobile)	147
(2) CG1900W850 TMA (ATT)	163	APX16DWV-16DWVS-C-A20 (T-Mobile)	147
(2) CG1900W850 TMA (ATT)	163	TMA (T-Mobile)	147
10'0"x4" Pipe Mount (ATT)	162.33	TMA (T-Mobile)	147
LPA-80063-4CF (Verizon)	156.5	TMA (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	(2) TMA 10"x8"x3" (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	(2) TMA 10"x8"x3" (T-Mobile)	147
LPA-80063-4CF (Verizon)	156.5	(2) TMA 10"x8"x3" (T-Mobile)	147
LPA-80063-4CF (Verizon)	156.5	15' Frame (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	15' x 2" Dia Omni (Unknown)	127.5
DB948F85T2E-M (Verizon)	156.5	4' Side Mount Standoff (Unknown)	117.75
LPA-80063-4CF (Verizon)	156.5	5'0"x4.5" Pipe Mount (Unknown)	111.33
LPA-80063-4CF (Verizon)	156.5	8 FT DISH (Unknown)	111.33
DB948F85T2E-M (Verizon)	156.5	16' x 2" Dia Omni (Unknown)	108
DB948F85T2E-M (Verizon)	156.5	5'0"x4.5" Pipe Mount (Unknown)	102.2
LPA-80063-4CF (Verizon)	156.5	6 FT DISH (Unknown)	102
BXA-70040/6CF (Verizon Proposed)	156.5	4' Side Mount Standoff (Unknown)	99
BXA-70040/6CF (Verizon Proposed)	156.5	6 FT DISH (Unknown)	94
BXA-70063/6CF (Verizon Proposed)	156.5	5'0"x4.5" Pipe Mount (Unknown)	93.83
20' Boom Gate (Verizon)	156	5'0"x4.5" Pipe Mount (Unknown)	72.1
20' Boom Gate (Verizon)	156	10 FT DISH (Unknown)	72
20' Boom Gate (Verizon)	156	4' Side Mount Standoff (Vacant) (Unknown)	47
15' Frame (T-Mobile)	147	12' x 1-1/2" Dia Omni (Unknown)	45.41
15' Frame (T-Mobile)	147	4' Side Mount Standoff (Unknown)	37.58

MATERIAL STRENGTH

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

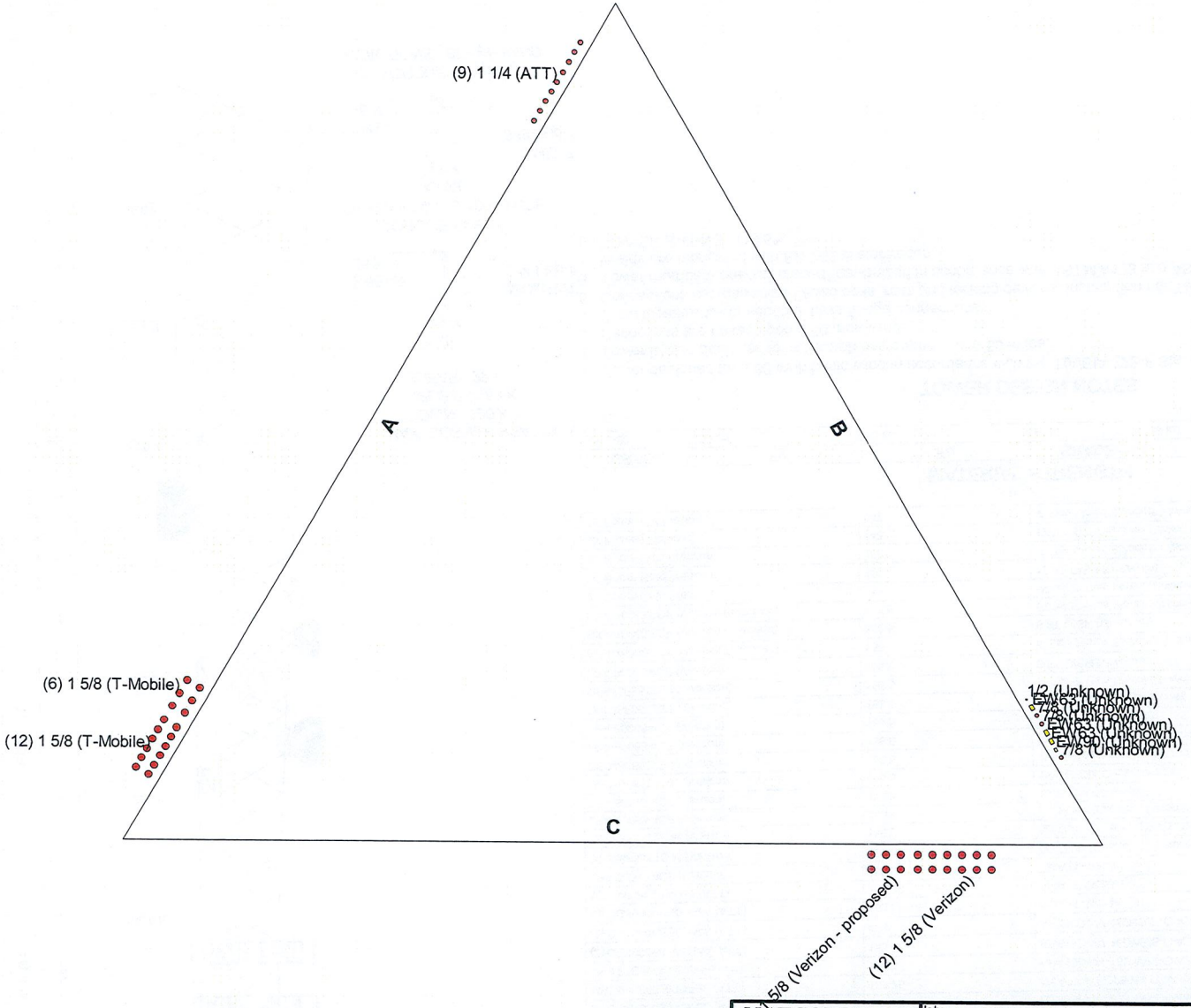
TOWER DESIGN NOTES

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: 119.5%

NATCOMM INC
63-2 N Branford Rd
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: 160' ROHN SSV Self-Support Lattice - Unreinforced - Rev 1		
Project: 10001.CO8 - 482 Pigeon Hill Road, Windsor, CT		
Client: Verizon Wireless	Drawn by: Staff	App'd:
Code: TIA/EIA-222-F	Date: 02/03/10	Scale: NTS
Path: J:\Jobs\1000100 WI\CO8 - Windsor, 482 Pigeon Hill Rd , Windsor, CT\Rev 1\Calculations\ER Rles\160 Lattice Windsor.eri		Dwg No. E-1

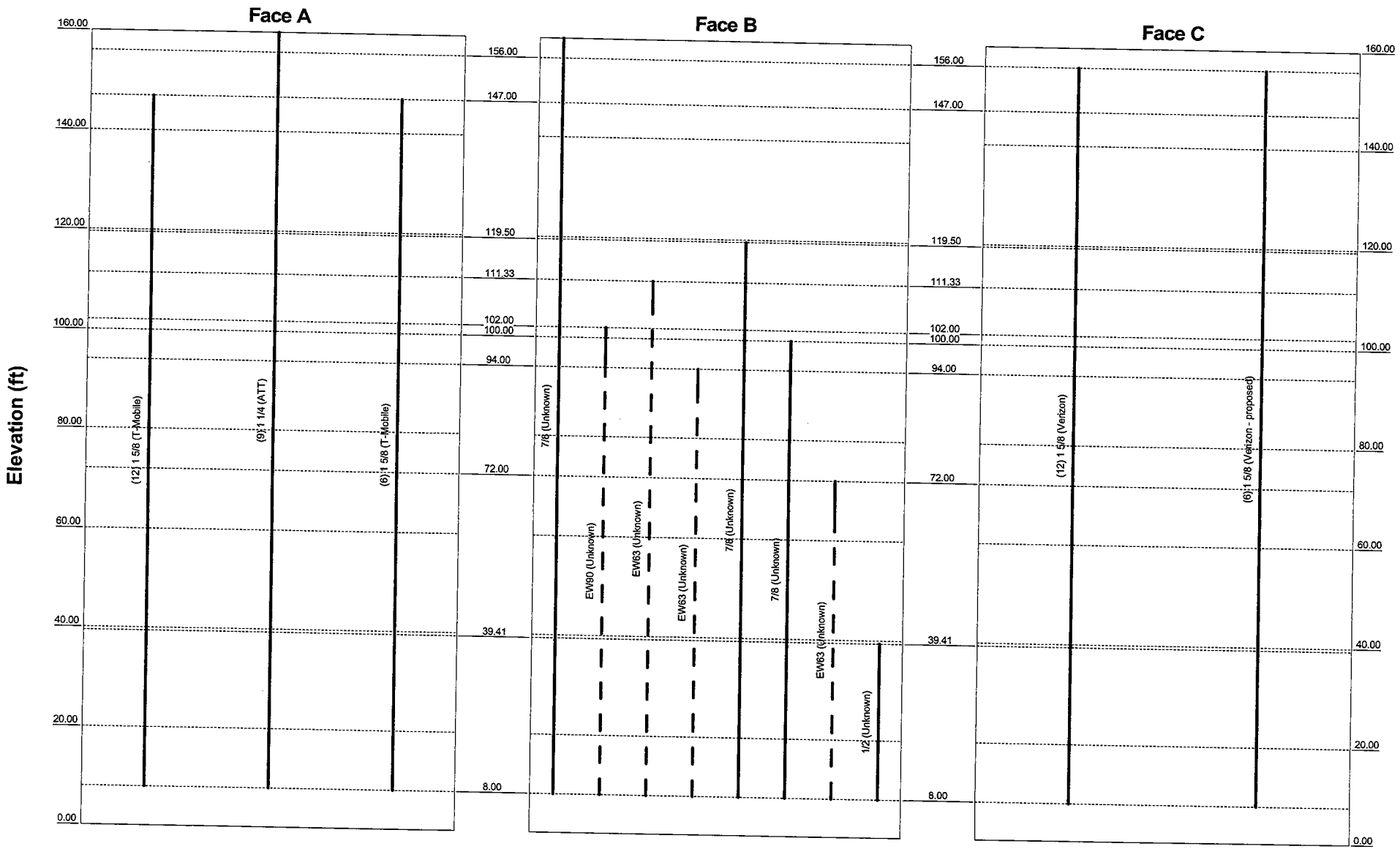
Feedline Plan



MATCOMM INC 63-2 N Branford Rd Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: ***160' ROHN SSV Self-Support Lattice - Unreinforced - Rev 1***		
	Project: ***10001.CO8 - 482 Pigeon Hill Road, Windsor, CT***		
	Client: Verizon Wireless	Drawn by: Staff	App'd:
	Code: TIA/EIA-222-F	Date: 02/03/10	Scale: NTS
	Path: J:\Jobs\1000100 WilCO8 - Windsor, 482 Pigeon Hill Rd , Windsor, CT\Rev 1\Calculations\ER Files\160 Lattice Windsor.eri		Dwg No. E-7

Feedline Distribution Chart
0' - 160'

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



NATCOMM INC 63-2 N Branford Rd Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: 160' ROHN SSV Self-Support Lattice - Unreinforced - Rev 1		
	Project: 10001.CO8 - 482 Pigeon Hill Road, Windsor, CT		
	Client: Verizon Wireless	Drawn by: Staff	App'd:
	Code: TIA/EIA-222-F	Date: 02/03/10	Scale: NTS
	Path: J:\Jobs\1000\100 WinCO8 - Windsor, 482 Pigeon Hill Rd., Windsor, CT\Rev 1\Calculations\ER Files\160 Lattice Windsor.eri		Dwg No. E-7

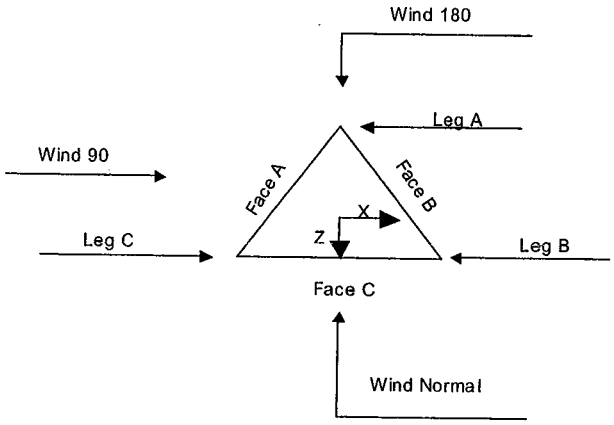
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 160.00 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 8.56 ft at the top and 22.85 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	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	160.00-140.00			8.56	1	20.00
T2	140.00-120.00			8.56	1	20.00
T3	120.00-100.00			10.56	1	20.00
T4	100.00-80.00			12.60	1	20.00
T5	80.00-60.00			14.66	1	20.00
T6	60.00-40.00			16.69	1	20.00
T7	40.00-20.00			18.69	1	20.00
T8	20.00-0.00			20.85	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	160.00-140.00	4.75	X Brace	No	No	6.0000	6.0000
T2	140.00-120.00	6.67	X Brace	No	No	0.0000	0.0000
T3	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T4	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T5	80.00-60.00	10.00	X Brace	No	No	0.0000	0.0000
T6	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T7	40.00-20.00	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
T8	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 160.00-140.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T2 140.00-120.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T3 120.00-100.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 100.00-80.00	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T5 80.00-60.00	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T6 60.00-40.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T7 40.00-20.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T8 20.00-0.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Equal Angle	L4x4x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 160.00-140.00	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft²	in					in	in
T5 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T7 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T8 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry (cont'd)

Tower Elevation	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors[1] 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
ft										
T1 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 100.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 80.00-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 60.00-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 40.00-20.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 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)

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1 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
T2 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
T3 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

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
T4 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
T5 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
T6 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
T7 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
T8 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 160.00-140.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 140.00-120.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	0
T3 120.00-100.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	2
T4 100.00-80.00	Flange	0.8750 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 80.00-60.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 60.00-40.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T7 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T8 20.00-0.00	Flange	0.8750 A354-BC	6	0.6250 A325X	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	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 (Verizon)	C	Yes	Ar (CfAe)	156.00 - 8.00	2.0000	-0.35	12	6	1.9800	1.9800		1.04
1 5/8 (T-Mobile)	A	Yes	Ar (CfAe)	147.00 - 8.00	2.0000	-0.4	12	6	1.0000 1.9800	1.9800		1.04
1 1/4 (ATT)	A	Yes	Ar (CfAe)	160.00 - 8.00	2.0000	0.4	9	9	1.5500	1.5500		0.66
7/8 (Unknown)	B	Yes	Ar (CfAe)	160.00 - 8.00	2.0000	0.4	1	1	1.1100	1.1100		0.54
EW90 (Unknown)	B	Yes	Af (CfAe)	102.00 - 8.00	2.0000	0.39	1	1	0.9869	0.9869	3.2550	0.32
EW63 (Unknown)	B	Yes	Af (CfAe)	111.33 - 8.00	2.0000	0.38	1	1	1.5742	1.5742	5.0668	0.51

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
EW63 (Unknown)	B	Yes	Af (CfAe)	94.00 - 8.00	2.0000	0.37	1	1	1.5742	1.5742	5.0668	0.51
7/8 (Unknown)	B	Yes	Ar (CfAe)	119.50 - 8.00	2.0000	0.36	1	1	1.1100	1.1100		0.54
7/8 (Unknown)	B	Yes	Ar (CfAe)	100.00 - 8.00	2.0000	0.35	1	1	1.1100	1.1100		0.54
EW63 (Unknown)	B	Yes	Af (CfAe)	72.00 - 8.00	2.0000	0.34	1	1	1.5742	1.5742	5.0668	0.51
1/2 (Unknown)	B	Yes	Ar (CfAe)	39.41 - 8.00	2.0000	0.33	1	1	0.5800	0.5800		0.25
1 5/8 (T-Mobile)	A	Yes	Ar (CfAe)	147.00 - 8.00	2.0000	-0.34	6	3	1.9800	1.9800		1.04
1 5/8 (Verizon - proposed)	C	Yes	Ar (CfAe)	156.00 - 8.00	2.0000	-0.28	6	3	1.9800	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 K
T1	160.00-140.00	A	33.645	0.000	0.000	0.000	0.25
		B	1.850	0.000	0.000	0.000	0.01
		C	23.760	0.000	0.000	0.000	0.30
T2	140.00-120.00	A	52.950	0.000	0.000	0.000	0.49
		B	1.850	0.000	0.000	0.000	0.01
		C	29.700	0.000	0.000	0.000	0.37
T3	120.00-100.00	A	52.950	0.000	0.000	0.000	0.49
		B	3.654	1.651	0.000	0.000	0.03
		C	29.700	0.000	0.000	0.000	0.37
T4	100.00-80.00	A	52.950	0.000	0.000	0.000	0.49
		B	5.550	6.105	0.000	0.000	0.06
		C	29.700	0.000	0.000	0.000	0.37
T5	80.00-60.00	A	52.950	0.000	0.000	0.000	0.49
		B	5.550	8.466	0.000	0.000	0.07
		C	29.700	0.000	0.000	0.000	0.37
T6	60.00-40.00	A	52.950	0.000	0.000	0.000	0.49
		B	5.550	9.516	0.000	0.000	0.07
		C	29.700	0.000	0.000	0.000	0.37
T7	40.00-20.00	A	52.950	0.000	0.000	0.000	0.49
		B	6.488	9.516	0.000	0.000	0.07
		C	29.700	0.000	0.000	0.000	0.37
T8	20.00-0.00	A	31.770	0.000	0.000	0.000	0.30
		B	3.910	5.710	0.000	0.000	0.04
		C	17.820	0.000	0.000	0.000	0.22

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	160.00-140.00	A	0.500	45.203	8.692	0.000	0.000	0.72
		B		3.517	0.000	0.000	0.000	0.03
		C		35.760	0.000	0.000	0.000	0.74

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T2	140.00-120.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		3.517	0.000	0.000	0.000	0.03
		C		44.700	0.000	0.000	0.000	0.92
T3	120.00-100.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		6.945	2.391	0.000	0.000	0.08
		C		44.700	0.000	0.000	0.000	0.92
T4	100.00-80.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		10.550	9.105	0.000	0.000	0.18
		C		44.700	0.000	0.000	0.000	0.92
T5	80.00-60.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		10.550	12.466	0.000	0.000	0.21
		C		44.700	0.000	0.000	0.000	0.92
T6	60.00-40.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		10.550	13.960	0.000	0.000	0.23
		C		44.700	0.000	0.000	0.000	0.92
T7	40.00-20.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		13.106	13.960	0.000	0.000	0.25
		C		44.700	0.000	0.000	0.000	0.92
T8	20.00-0.00	A	0.500	34.870	14.900	0.000	0.000	0.85
		B		7.910	8.376	0.000	0.000	0.15
		C		26.820	0.000	0.000	0.000	0.55

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	160.00-140.00	A	0.000	2.279	2.490	3.988
		B	0.000	0.149	0.137	0.260
		C	0.000	1.512	1.758	2.646
T2	140.00-120.00	A	0.000	2.532	3.232	5.063
		B	0.000	0.107	0.113	0.215
		C	0.000	1.364	1.813	2.728
T3	120.00-100.00	A	0.000	2.395	3.821	5.987
		B	0.000	0.280	0.383	0.701
		C	0.000	1.290	2.144	3.226
T4	100.00-80.00	A	0.000	2.310	4.423	6.929
		B	0.000	0.589	0.974	1.767
		C	0.000	1.245	2.481	3.734
T5	80.00-60.00	A	0.000	1.640	3.142	4.921
		B	0.000	0.495	0.832	1.484
		C	0.000	0.884	1.762	2.652
T6	60.00-40.00	A	0.000	1.588	3.549	5.560
		B	0.000	0.512	1.010	1.792
		C	0.000	0.856	1.991	2.996
T7	40.00-20.00	A	0.000	1.550	3.462	5.424
		B	0.000	0.547	1.046	1.915
		C	0.000	0.835	1.942	2.923
T8	20.00-0.00	A	0.000	0.912	2.330	3.649
		B	0.000	0.323	0.705	1.292
		C	0.000	0.492	1.307	1.967

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	160.00-140.00	1.5133	-1.3377	2.0070	-2.2324
T2	140.00-120.00	-3.9845	2.5492	-2.5620	1.2866
T3	120.00-100.00	-2.7479	3.1507	-1.1270	1.8672
T4	100.00-80.00	-0.3025	3.9208	1.5038	2.7805
T5	80.00-60.00	0.7205	4.8879	2.7939	3.6297
T6	60.00-40.00	1.1934	4.9404	3.3323	3.7963
T7	40.00-20.00	1.7603	5.4633	4.4436	4.3379
T8	20.00-0.00	1.2223	3.6659	3.2011	3.0631

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10'0"x4" Pipe Mount (ATT)	A	None			0.0000	162.33	No Ice	4.50	4.50	0.11
							1/2" Ice	5.24	5.24	0.14
MB96RR900200DPBL (ATT)	A	None			0.0000	167.75	No Ice	11.47	7.58	0.04
							1/2" Ice	12.08	8.17	0.10
MB96RR900200DPBL (ATT)	B	None			0.0000	167.75	No Ice	11.47	7.58	0.04
							1/2" Ice	12.08	8.17	0.10
MB96RR900200DPBL (ATT)	C	None			0.0000	167.75	No Ice	11.47	7.58	0.04
							1/2" Ice	12.08	8.17	0.10
(2) CG1900W850 TMA (ATT)	A	None			0.0000	163.00	No Ice	1.29	0.32	0.02
							1/2" Ice	1.44	0.42	0.02
(2) CG1900W850 TMA (ATT)	B	None			0.0000	163.00	No Ice	1.29	0.32	0.02
							1/2" Ice	1.44	0.42	0.02
(2) CG1900W850 TMA (ATT)	C	None			0.0000	163.00	No Ice	1.29	0.32	0.02
							1/2" Ice	1.44	0.42	0.02
20' Boom Gate (Verizon)	A	From Leg	2.50		0.0000	156.00	No Ice	28.39	20.72	0.64
			0.00				1/2" Ice	40.39	30.06	0.93
			0.00							
20' Boom Gate (Verizon)	B	From Leg	2.50		0.0000	156.00	No Ice	28.39	20.72	0.64
			0.00				1/2" Ice	40.39	30.06	0.93
			0.00							
20' Boom Gate (Verizon)	C	From Leg	2.50		0.0000	156.00	No Ice	28.39	20.72	0.64
			0.00				1/2" Ice	40.39	30.06	0.93
			0.00							
LPA-80063-4CF (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	7.00	6.08	0.02
			-6.00				1/2" Ice	7.41	6.48	0.07
			0.00							
DB948F85T2E-M (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	1.92	3.26	0.01
			-4.00				1/2" Ice	2.22	3.62	0.03
			0.00							
DB948F85T2E-M (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	1.92	3.26	0.01
			4.00				1/2" Ice	2.22	3.62	0.03
			0.00							
LPA-80063-4CF (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	7.00	6.08	0.02
			6.00				1/2" Ice	7.41	6.48	0.07
			0.00							
LPA-80063-4CF (Verizon)	B	From Leg	5.00		0.0000	156.50	No Ice	7.00	6.08	0.02
			-6.00				1/2" Ice	7.41	6.48	0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
DB948F85T2E-M (Verizon)	B	From Leg	5.00 -4.00 0.00	0.0000	156.50	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
DB948F85T2E-M (Verizon)	B	From Leg	5.00 4.00 0.00	0.0000	156.50	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
LPA-80063-4CF (Verizon)	B	From Leg	5.00 6.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
LPA-80063-4CF (Verizon)	C	From Leg	5.00 -6.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
DB948F85T2E-M (Verizon)	C	From Leg	5.00 -4.00 0.00	0.0000	156.50	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
DB948F85T2E-M (Verizon)	C	From Leg	5.00 4.00 0.00	0.0000	156.50	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
LPA-80063-4CF (Verizon)	C	From Leg	5.00 6.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
BXA-70040/6CF (Verizon Proposed)	A	From Leg	5.00 0.00 0.00	0.0000	156.50	No Ice 1/2" Ice	16.31 16.93	5.72 6.17	0.04 0.12
BXA-70040/6CF (Verizon Proposed)	B	From Leg	5.00 0.00 0.00	0.0000	156.50	No Ice 1/2" Ice	16.31 16.93	5.72 6.17	0.04 0.12
BXA-70063/6CF (Verizon Proposed)	C	From Leg	5.00 0.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.73 8.27	3.76 4.19	0.02 0.06
15' Frame (T-Mobile)	A	From Leg	0.50 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	9.55 13.15	3.80 5.40	0.35 0.49
15' Frame (T-Mobile)	B	From Leg	0.50 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	9.55 13.15	3.80 5.40	0.35 0.49
15' Frame (T-Mobile)	C	From Leg	0.50 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	9.55 13.15	3.80 5.40	0.35 0.49
(2) APXV18-209014 (T-Mobile)	A	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	3.57 3.91	2.00 2.33	0.01 0.03
(2) APXV18-209014 (T-Mobile)	B	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	3.57 3.91	2.00 2.33	0.01 0.03
(2) APXV18-209014 (T-Mobile)	C	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	3.57 3.91	2.00 2.33	0.01 0.03
APX16DWV-16DWVS-C-A20 (T-Mobile)	A	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-C-A20 (T-Mobile)	B	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-C-A20	C	From Leg	4.00 0.00	0.0000	147.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(T-Mobile)			0.00							
TMA (T-Mobile)	A	From Leg	1.00 0.00 0.00		0.0000	147.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
TMA (T-Mobile)	B	From Leg	1.00 0.00 0.00		0.0000	147.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
TMA (T-Mobile)	C	From Leg	1.00 0.00 0.00		0.0000	147.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
(2) TMA 10"x8"x3" (T-Mobile)	A	From Leg	1.00 0.00 0.00		0.0000	147.00	No Ice 1/2" Ice	0.78 0.90	0.29 0.38	0.02 0.02
(2) TMA 10"x8"x3" (T-Mobile)	B	From Leg	1.00 0.00 0.00		0.0000	147.00	No Ice 1/2" Ice	0.78 0.90	0.29 0.38	0.02 0.02
(2) TMA 10"x8"x3" (T-Mobile)	C	From Leg	1.00 0.00 0.00		0.0000	147.00	No Ice 1/2" Ice	0.78 0.90	0.29 0.38	0.02 0.02
4' Side Mount Standoff (Unknown)	C	From Leg	1.75 0.00 0.00		0.0000	99.00	No Ice 1/2" Ice	2.72 4.91	2.72 4.91	0.05 0.09
16' x 2" Dia Omni (Unknown)	C	From Leg	3.50 0.00 0.00		0.0000	108.00	No Ice 1/2" Ice	3.20 4.83	3.20 4.83	0.04 0.06
4' Side Mount Standoff (Unknown)	C	From Leg	2.25 0.00 0.00		0.0000	117.75	No Ice 1/2" Ice	2.72 4.91	2.72 4.91	0.05 0.09
15' x 2" Dia Omni (Unknown)	C	From Leg	4.50 0.00 0.00		0.0000	127.50	No Ice 1/2" Ice	3.00 4.53	3.00 4.53	0.04 0.06
5'0"x4.5" Pipe Mount (Unknown)	C	From Leg	0.75 0.00 0.00		0.0000	72.10	No Ice 1/2" Ice	1.76 2.08	1.76 2.08	0.05 0.07
4' Side Mount Standoff (Unknown)	C	From Leg	1.50 0.00 0.00		0.0000	37.58	No Ice 1/2" Ice	2.72 4.91	2.72 4.91	0.05 0.09
12' x 1-1/2" Dia Omni (Unknown)	C	From Leg	3.00 0.00 0.00		0.0000	45.41	No Ice 1/2" Ice	1.80 3.02	1.80 3.02	0.03 0.04
15' x 2" Dia Omni (Unknown)	A	From Leg	0.75 0.00 0.00		0.0000	167.50	No Ice 1/2" Ice	3.00 4.53	3.00 4.53	0.04 0.06
5'0"x4.5" Pipe Mount (Unknown)	A	From Leg	0.92 0.00 0.00		0.0000	102.20	No Ice 1/2" Ice	1.76 2.08	1.76 2.08	0.05 0.07
5'0"x4.5" Pipe Mount (Unknown)	B	From Leg	0.75 0.00 0.00		0.0000	111.33	No Ice 1/2" Ice	1.76 2.08	1.76 2.08	0.05 0.07
5'0"x4.5" Pipe Mount (Unknown)	B	From Leg	0.75 0.00 0.00		0.0000	93.83	No Ice 1/2" Ice	1.76 2.08	1.76 2.08	0.05 0.07
4' Side Mount Standoff (Vacant) (Unknown)	A	From Leg	1.50 0.00 0.00		0.0000	47.00	No Ice 1/2" Ice	2.72 4.91	2.72 4.91	0.05 0.09

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter		Aperture Area	Weight
				ft ft ft	°	°	ft	ft		ft²	K
10 FT DISH	C	Paraboloid	From	1.00	10.0000		72.00	10.00	No Ice	78.54	0.32
(Unknown)		w/Shroud (HP)	Leg	0.00					1/2" Ice	79.81	0.73
				0.00							
6 FT DISH	A	Paraboloid	From	1.00	-50.0000		102.00	6.00	No Ice	28.27	0.14
(Unknown)		w/Radome	Leg	0.00					1/2" Ice	29.05	0.29
				0.00							
8 FT DISH	B	Paraboloid	From	1.00	-30.0000		111.33	8.00	No Ice	50.30	0.25
(Unknown)		w/Shroud (HP)	Leg	0.00					1/2" Ice	51.29	0.51
				0.00							
6 FT DISH	B	Paraboloid	From	1.00	0.0000		94.00	6.00	No Ice	28.27	0.14
(Unknown)		w/Shroud (HP)	Leg	0.00					1/2" Ice	29.05	0.29
				0.00							

Tower Pressures - No Ice

$G_H = 1.129$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft²		ft²	ft²	ft²		ft²	ft²
T1 160.00-140.00	150.00	1.541	25	175.992	A	9.825	43.228	9.583	18.06	0.000	0.000
					B	12.178	11.433		40.59	0.000	0.000
					C	10.557	33.343		21.83	0.000	0.000
T2 140.00-120.00	130.00	1.48	24	195.998	A	8.136	62.549	9.599	13.58	0.000	0.000
					B	11.255	11.449		42.28	0.000	0.000
					C	9.555	39.299		19.65	0.000	0.000
T3 120.00-100.00	110.00	1.411	23	236.398	A	12.540	62.550	9.600	12.78	0.000	0.000
					B	17.630	13.254		31.08	0.000	0.000
					C	14.218	39.300		17.94	0.000	0.000
T4 100.00-80.00	90.00	1.332	22	278.441	A	17.869	64.637	11.687	14.17	0.000	0.000
					B	27.424	17.237		26.17	0.000	0.000
					C	19.811	41.387		19.10	0.000	0.000
T5 80.00-60.00	70.00	1.24	20	321.010	A	15.036	67.976	15.026	18.10	0.000	0.000
					B	25.812	20.576		32.39	0.000	0.000
					C	16.415	44.726		24.58	0.000	0.000
T6 60.00-40.00	50.00	1.126	18	363.083	A	19.571	71.524	18.574	20.39	0.000	0.000
					B	31.626	24.124		33.32	0.000	0.000
					C	21.130	48.274		26.76	0.000	0.000
T7 40.00-20.00	30.00	1	16	404.685	A	21.784	71.529	18.579	19.91	0.000	0.000
					B	33.715	25.067		31.61	0.000	0.000
					C	23.304	48.279		25.95	0.000	0.000
T8 20.00-0.00	10.00	1	16	448.055	A	28.936	53.890	22.120	26.71	0.000	0.000
					B	36.270	26.030		35.51	0.000	0.000
					C	29.959	39.940		31.65	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.129$

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 160.00-140.00	150.00	1.541	19	0.5000	177.658	A	17.018	62.878	12.917	16.17	0.000	0.000
						B	12.055	23.322		36.51	0.000	0.000
						C	9.669	54.202		20.22	0.000	0.000
T2 140.00-120.00	130.00	1.48	18	0.5000	197.666	A	31.138	74.207	12.938	12.28	0.000	0.000
						B	11.154	22.032		38.99	0.000	0.000
						C	8.640	61.958		18.33	0.000	0.000
T3 120.00-100.00	110.00	1.411	17	0.5000	238.067	A	35.209	75.206	12.939	11.72	0.000	0.000
						B	18.053	26.149		29.27	0.000	0.000
						C	13.136	62.893		17.02	0.000	0.000
T4 100.00-80.00	90.00	1.332	16	0.5000	280.110	A	40.197	78.264	15.026	12.68	0.000	0.000
						B	29.630	32.418		24.22	0.000	0.000
						C	18.558	65.913		17.79	0.000	0.000
T5 80.00-60.00	70.00	1.24	15	0.5000	322.678	A	38.089	80.900	18.365	15.43	0.000	0.000
						B	29.160	34.479		28.86	0.000	0.000
						C	15.525	68.240		21.92	0.000	0.000
T6 60.00-40.00	50.00	1.126	14	0.5000	364.752	A	42.394	85.047	21.913	17.19	0.000	0.000
						B	35.289	38.557		29.67	0.000	0.000
						C	20.124	72.363		23.69	0.000	0.000
T7 40.00-20.00	30.00	1	12	0.5000	406.354	A	44.655	85.699	21.919	16.82	0.000	0.000
						B	37.291	41.691		27.75	0.000	0.000
						C	22.323	72.997		23.00	0.000	0.000
T8 20.00-0.00	10.00	1	12	0.5000	449.724	A	42.517	67.233	25.459	23.20	0.000	0.000
						B	38.350	40.862		32.14	0.000	0.000
						C	29.299	59.604		28.64	0.000	0.000

Tower Pressure - Service

$G_H = 1.129$

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 160.00-140.00	150.00	1.541	10	175.992	A	9.825	43.228	9.583	18.06	0.000	0.000
					B	12.178	11.433		40.59	0.000	0.000
					C	10.557	33.343		21.83	0.000	0.000
T2 140.00-120.00	130.00	1.48	9	195.998	A	8.136	62.549	9.599	13.58	0.000	0.000
					B	11.255	11.449		42.28	0.000	0.000
					C	9.555	39.299		19.65	0.000	0.000
T3 120.00-100.00	110.00	1.411	9	236.398	A	12.540	62.550	9.600	12.78	0.000	0.000
					B	17.630	13.254		31.08	0.000	0.000
					C	14.218	39.300		17.94	0.000	0.000
T4 100.00-80.00	90.00	1.332	9	278.441	A	17.869	64.637	11.687	14.17	0.000	0.000
					B	27.424	17.237		26.17	0.000	0.000
					C	19.811	41.387		19.10	0.000	0.000
T5 80.00-60.00	70.00	1.24	8	321.010	A	15.036	67.976	15.026	18.10	0.000	0.000
					B	25.812	20.576		32.39	0.000	0.000
					C	16.415	44.726		24.58	0.000	0.000
T6 60.00-40.00	50.00	1.126	7	363.083	A	19.571	71.524	18.574	20.39	0.000	0.000
					B	31.626	24.124		33.32	0.000	0.000

Section Elevation ft	z ft	K_z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	21.130	48.274		26.76	0.000	0.000
T7 40.00-20.00	30.00	1	6	404.685	A	21.784	71.529	18.579	19.91	0.000	0.000
					B	33.715	25.067		31.61	0.000	0.000
					C	23.304	48.279		25.95	0.000	0.000
T8 20.00-0.00	10.00	1	6	448.055	A	28.936	53.890	22.120	26.71	0.000	0.000
					B	36.270	26.030		35.51	0.000	0.000
					C	29.959	39.940		31.65	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	1	1	36.469	2.38	119.14	A
			B	0.134	2.831	0.579	1	1	18.800			
			C	0.249	2.439	0.602	1	1	30.620			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	1	1	47.938	2.82	140.83	A
			B	0.116	2.901	0.577	1	1	17.860			
			C	0.249	2.44	0.602	1	1	33.201			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	1	1	51.413	3.02	150.90	A
			B	0.131	2.844	0.579	1	1	25.300			
			C	0.226	2.51	0.596	1	1	37.647			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	1	1	57.607	3.27	163.62	A
			B	0.16	2.734	0.583	1	1	37.475			
			C	0.22	2.531	0.595	1	1	44.422			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	1	1	56.100	3.10	155.12	A
			B	0.145	2.792	0.581	1	1	37.760			
			C	0.19	2.628	0.589	1	1	42.737			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	1	1	62.636	3.18	158.81	A
			B	0.154	2.758	0.582	1	1	45.667			
			C	0.191	2.626	0.589	1	1	49.545			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	1	1	64.495	2.98	148.93	A
			B	0.145	2.789	0.581	1	1	48.273			
			C	0.177	2.675	0.586	1	1	51.593			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	1	1	60.593	2.97	148.34	A
			B	0.139	2.812	0.58	1	1	51.364			
			C	0.156	2.75	0.582	1	1	53.221			
Sum Weight:	6.63	15.29						OTM	1845.10 kip-ft	23.71		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.825	1	34.749	2.27	113.53	A
			B	0.134	2.831	0.579	0.825	1	16.669			
			C	0.249	2.439	0.602	0.825	1	28.773			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.825	1	46.515	2.73	136.65	A
			B	0.116	2.901	0.577	0.825	1	15.890			
			C	0.249	2.44	0.602	0.825	1	31.529			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	0.825	1	49.218	2.89	144.46	A
			B	0.131	2.844	0.579	0.825	1	22.215			
			C	0.226	2.51	0.596	0.825	1	35.158			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.825	1	54.480	3.09	154.74	A
			B	0.16	2.734	0.583	0.825	1	32.676			
			C	0.22	2.531	0.595	0.825	1	40.955			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.825	1	53.469	2.96	147.85	A
			B	0.145	2.792	0.581	0.825	1	33.242			
			C	0.19	2.628	0.589	0.825	1	39.864			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.825	1	59.211	3.00	150.13	A
			B	0.154	2.758	0.582	0.825	1	40.133			
			C	0.191	2.626	0.589	0.825	1	45.848			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.825	1	60.683	2.80	140.13	A
			B	0.145	2.789	0.581	0.825	1	42.373			
			C	0.177	2.675	0.586	0.825	1	47.515			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.825	1	55.529	2.72	135.94	A
			B	0.139	2.812	0.58	0.825	1	45.017			
			C	0.156	2.75	0.582	0.825	1	47.978			
Sum Weight:	6.63	15.29						OTM	1760.59 kip-ft	22.47		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.8	1	34.504	2.25	112.72	A
			B	0.134	2.831	0.579	0.8	1	16.364			
			C	0.249	2.439	0.602	0.8	1	28.509			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.8	1	46.311	2.72	136.05	A
			B	0.116	2.901	0.577	0.8	1	15.609			
			C	0.249	2.44	0.602	0.8	1	31.290			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	0.8	1	48.905	2.87	143.54	A
			B	0.131	2.844	0.579	0.8	1	21.774			
			C	0.226	2.51	0.596	0.8	1	34.803			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.8	1	54.033	3.07	153.47	A
			B	0.16	2.734	0.583	0.8	1	31.990			
			C	0.22	2.531	0.595	0.8	1	40.459			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.8	1	53.093	2.94	146.81	A
			B	0.145	2.792	0.581	0.8	1	32.597			
			C	0.19	2.628	0.589	0.8	1	39.453			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.8	1	58.722	2.98	148.89	A
			B	0.154	2.758	0.582	0.8	1	39.342			
			C	0.191	2.626	0.589	0.8	1	45.320			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.8	1	60.138	2.78	138.87	A
			B	0.145	2.789	0.581	0.8	1	41.530			
			C	0.177	2.675	0.586	0.8	1	46.933			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.8	1	54.806	2.68	134.17	A
			B	0.139	2.812	0.58	0.8	1	44.110			
			C	0.156	2.75	0.582	0.8	1	47.229			
Sum Weight:	6.63	15.29						OTM	1748.51 kip-ft	22.29		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.85	1	34.995	2.29	114.33	A
			B	0.134	2.831	0.579	0.85	1	16.973			
			C	0.249	2.439	0.602	0.85	1	29.037			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.85	1	46.718	2.74	137.25	A
			B	0.116	2.901	0.577	0.85	1	16.171			
			C	0.249	2.44	0.602	0.85	1	31.768			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	0.85	1	49.532	2.91	145.38	A
			B	0.131	2.844	0.579	0.85	1	22.655			
			C	0.226	2.51	0.596	0.85	1	35.514			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.85	1	54.926	3.12	156.00	A
			B	0.16	2.734	0.583	0.85	1	33.361			
			C	0.22	2.531	0.595	0.85	1	41.450			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.85	1	53.845	2.98	148.89	A
			B	0.145	2.792	0.581	0.85	1	33.888			
			C	0.19	2.628	0.589	0.85	1	40.274			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.85	1	59.701	3.03	151.37	A
			B	0.154	2.758	0.582	0.85	1	40.923			
			C	0.191	2.626	0.589	0.85	1	46.376			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.85	1	61.227	2.83	141.38	A
			B	0.145	2.789	0.581	0.85	1	43.216			
			C	0.177	2.675	0.586	0.85	1	48.098			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.85	1	56.252	2.75	137.72	A
			B	0.139	2.812	0.58	0.85	1	45.923			
			C	0.156	2.75	0.582	0.85	1	48.727			
Sum Weight:	6.63	15.29						OTM	1772.66 kip-ft	22.65		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	1	1	59.344	2.50	125.22	A
			B	0.199	2.599	0.59	1	1	25.820			
			C	0.36	2.15	0.636	1	1	44.136			
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	1	1	84.186	3.22	160.76	A
			B	0.168	2.707	0.584	1	1	24.028			
			C	0.357	2.155	0.635	1	1	47.987			
T3 120.00-100.00	2.42	1.88	A	0.464	1.952	0.68	1	1	86.326	3.30	164.82	A
			B	0.186	2.645	0.588	1	1	33.417			
			C	0.319	2.246	0.622	1	1	52.257			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	1	1	91.946	3.43	171.62	A
			B	0.222	2.526	0.595	1	1	48.920			
			C	0.302	2.292	0.616	1	1	59.185			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	1	1	89.813	3.29	164.42	A
			B	0.197	2.605	0.59	1	1	49.497			
			C	0.26	2.409	0.604	1	1	56.767			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	1	1	96.166	3.26	163.20	A
			B	0.202	2.588	0.591	1	1	58.072			
			C	0.254	2.427	0.603	1	1	63.744			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	1	1	98.002	3.05	152.40	A
			B	0.194	2.615	0.589	1	1	61.858			
			C	0.235	2.485	0.598	1	1	65.980			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	1	1	82.881	2.82	141.15	A
			B	0.176	2.678	0.586	1	1	62.288			
			C	0.198	2.604	0.59	1	1	64.461			
Sum Weight:	18.01	22.06						OTM	1978.20 kip-ft	24.87		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	0.825	1	56.366	2.38	118.94	A
			B	0.199	2.599	0.59	0.825	1	23.710			
			C	0.36	2.15	0.636	0.825	1	42.444			
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	0.825	1	78.737	3.01	150.35	A
			B	0.168	2.707	0.584	0.825	1	22.076			
			C	0.357	2.155	0.635	0.825	1	46.475			
T3 120.00-100.00	2.42	1.88	A	0.464	1.952	0.68	0.825	1	80.165	3.06	153.05	A
			B	0.186	2.645	0.588	0.825	1	30.258			
			C	0.319	2.246	0.622	0.825	1	49.958			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	0.825	1	84.912	3.17	158.49	A
			B	0.222	2.526	0.595	0.825	1	43.734			
			C	0.302	2.292	0.616	0.825	1	55.938			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	0.825	1	83.147	3.04	152.22	A
			B	0.197	2.605	0.59	0.825	1	44.394			
			C	0.26	2.409	0.604	0.825	1	54.051			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	0.825	1	88.747	3.01	150.61	A
			B	0.202	2.588	0.591	0.825	1	51.897			
			C	0.254	2.427	0.603	0.825	1	60.222			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	0.825	1	90.187	2.80	140.25	A
			B	0.194	2.615	0.589	0.825	1	55.332			
			C	0.235	2.485	0.598	0.825	1	62.073			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	0.825	1	75.441	2.57	128.48	A
			B	0.176	2.678	0.586	0.825	1	55.577			
			C	0.198	2.604	0.59	0.825	1	59.334			
Sum Weight:	18.01	22.06						OTM	1843.28 kip-ft	23.05		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	0.8	1	55.941	2.36	118.04	A
			B	0.199	2.599	0.59	0.8	1	23.409			
			C	0.36	2.15	0.636	0.8	1	42.202			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	0.8	1	77.958	2.98	148.86	A
			B	0.168	2.707	0.584	0.8	1	21.798			
			C	0.357	2.155	0.635	0.8	1	46.259			
T3 120.00-100.00	2.42	1.88	A	0.464	1.952	0.68	0.8	1	79.285	3.03	151.37	A
			B	0.186	2.645	0.588	0.8	1	29.807			
			C	0.319	2.246	0.622	0.8	1	49.629			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	0.8	1	83.907	3.13	156.61	A
			B	0.222	2.526	0.595	0.8	1	42.994			
			C	0.302	2.292	0.616	0.8	1	55.474			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	0.8	1	82.195	3.01	150.47	A
			B	0.197	2.605	0.59	0.8	1	43.665			
			C	0.26	2.409	0.604	0.8	1	53.662			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	0.8	1	87.687	2.98	148.81	A
			B	0.202	2.588	0.591	0.8	1	51.015			
			C	0.254	2.427	0.603	0.8	1	59.719			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	0.8	1	89.071	2.77	138.51	A
			B	0.194	2.615	0.589	0.8	1	54.400			
			C	0.235	2.485	0.598	0.8	1	61.515			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	0.8	1	74.378	2.53	126.67	A
			B	0.176	2.678	0.586	0.8	1	54.618			
			C	0.198	2.604	0.59	0.8	1	58.602			
Sum Weight:	18.01	22.06						OTM	1824.00 kip-ft	22.79		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	0.85	1	56.791	2.40	119.84	A
			B	0.199	2.599	0.59	0.85	1	24.011			
			C	0.36	2.15	0.636	0.85	1	42.686			
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	0.85	1	79.515	3.04	151.84	A
			B	0.168	2.707	0.584	0.85	1	22.355			
			C	0.357	2.155	0.635	0.85	1	46.691			
T3 120.00-100.00	2.42	1.88	A	0.464	1.952	0.68	0.85	1	81.045	3.09	154.73	A
			B	0.186	2.645	0.588	0.85	1	30.710			
			C	0.319	2.246	0.622	0.85	1	50.286			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	0.85	1	85.917	3.21	160.36	A
			B	0.222	2.526	0.595	0.85	1	44.475			
			C	0.302	2.292	0.616	0.85	1	56.402			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	0.85	1	84.099	3.08	153.96	A
			B	0.197	2.605	0.59	0.85	1	45.123			
			C	0.26	2.409	0.604	0.85	1	54.439			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	0.85	1	89.806	3.05	152.41	A
			B	0.202	2.588	0.591	0.85	1	52.779			
			C	0.254	2.427	0.603	0.85	1	60.725			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	0.85	1	91.303	2.84	141.99	A
			B	0.194	2.615	0.589	0.85	1	56.264			
			C	0.235	2.485	0.598	0.85	1	62.631			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	0.85	1	76.504	2.61	130.29	A
			B	0.176	2.678	0.586	0.85	1	56.536			
			C	0.198	2.604	0.59	0.85	1	60.067			
Sum Weight:	18.01	22.06						OTM	1862.55	23.31		

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

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	1	1	36.469	0.93	46.54	A
			B	0.134	2.831	0.579	1	1	18.800			
			C	0.249	2.439	0.602	1	1	30.620			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	1	1	47.938	1.10	55.01	A
			B	0.116	2.901	0.577	1	1	17.860			
			C	0.249	2.44	0.602	1	1	33.201			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	1	1	51.413	1.18	58.95	A
			B	0.131	2.844	0.579	1	1	25.300			
			C	0.226	2.51	0.596	1	1	37.647			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	1	1	57.607	1.28	63.91	A
			B	0.16	2.734	0.583	1	1	37.475			
			C	0.22	2.531	0.595	1	1	44.422			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	1	1	56.100	1.21	60.59	A
			B	0.145	2.792	0.581	1	1	37.760			
			C	0.19	2.628	0.589	1	1	42.737			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	1	1	62.636	1.24	62.04	A
			B	0.154	2.758	0.582	1	1	45.667			
			C	0.191	2.626	0.589	1	1	49.545			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	1	1	64.495	1.16	58.18	A
			B	0.145	2.789	0.581	1	1	48.273			
			C	0.177	2.675	0.586	1	1	51.593			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	1	1	60.593	1.16	57.95	A
			B	0.139	2.812	0.58	1	1	51.364			
			C	0.156	2.75	0.582	1	1	53.221			
Sum Weight:	6.63	15.29						OTM	720.74 kip-ft	9.26		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.825	1	34.749	0.89	44.35	A
			B	0.134	2.831	0.579	0.825	1	16.669			
			C	0.249	2.439	0.602	0.825	1	28.773			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.825	1	46.515	1.07	53.38	A
			B	0.116	2.901	0.577	0.825	1	15.890			
			C	0.249	2.44	0.602	0.825	1	31.529			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	0.825	1	49.218	1.13	56.43	A
			B	0.131	2.844	0.579	0.825	1	22.215			
			C	0.226	2.51	0.596	0.825	1	35.158			
T4 100.00-	0.92	1.63	A	0.296	2.306	0.615	0.825	1	54.480	1.21	60.44	A

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
80.00			B	0.16	2.734	0.583	0.825	1	32.676			
			C	0.22	2.531	0.595	0.825	1	40.955			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.825	1	53.469	1.16	57.75	A
			B	0.145	2.792	0.581	0.825	1	33.242			
			C	0.19	2.628	0.589	0.825	1	39.864			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.825	1	59.211	1.17	58.64	A
			B	0.154	2.758	0.582	0.825	1	40.133			
			C	0.191	2.626	0.589	0.825	1	45.848			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.825	1	60.683	1.09	54.74	A
			B	0.145	2.789	0.581	0.825	1	42.373			
			C	0.177	2.675	0.586	0.825	1	47.515			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.825	1	55.529	1.06	53.10	A
			B	0.139	2.812	0.58	0.825	1	45.017			
			C	0.156	2.75	0.582	0.825	1	47.978			
Sum Weight:	6.63	15.29						OTM	687.73 kip-ft	8.78		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.8	1	34.504	0.88	44.03	A
			B	0.134	2.831	0.579	0.8	1	16.364			
			C	0.249	2.439	0.602	0.8	1	28.509			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.8	1	46.311	1.06	53.15	A
			B	0.116	2.901	0.577	0.8	1	15.609			
			C	0.249	2.44	0.602	0.8	1	31.290			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	0.8	1	48.905	1.12	56.07	A
			B	0.131	2.844	0.579	0.8	1	21.774			
			C	0.226	2.51	0.596	0.8	1	34.803			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.8	1	54.033	1.20	59.95	A
			B	0.16	2.734	0.583	0.8	1	31.990			
			C	0.22	2.531	0.595	0.8	1	40.459			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.8	1	53.093	1.15	57.35	A
			B	0.145	2.792	0.581	0.8	1	32.597			
			C	0.19	2.628	0.589	0.8	1	39.453			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.8	1	58.722	1.16	58.16	A
			B	0.154	2.758	0.582	0.8	1	39.342			
			C	0.191	2.626	0.589	0.8	1	45.320			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.8	1	60.138	1.08	54.25	A
			B	0.145	2.789	0.581	0.8	1	41.530			
			C	0.177	2.675	0.586	0.8	1	46.933			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.8	1	54.806	1.05	52.41	A
			B	0.139	2.812	0.58	0.8	1	44.110			
			C	0.156	2.75	0.582	0.8	1	47.229			
Sum Weight:	6.63	15.29						OTM	683.01 kip-ft	8.71		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.85	1	34.995	0.89	44.66	A
			B	0.134	2.831	0.579	0.85	1	16.973			
			C	0.249	2.439	0.602	0.85	1	29.037			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.85	1	46.718	1.07	53.61	A
			B	0.116	2.901	0.577	0.85	1	16.171			
			C	0.249	2.44	0.602	0.85	1	31.768			
T3 120.00-100.00	0.90	1.20	A	0.318	2.25	0.621	0.85	1	49.532	1.14	56.79	A
			B	0.131	2.844	0.579	0.85	1	22.655			
			C	0.226	2.51	0.596	0.85	1	35.514			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.85	1	54.926	1.22	60.94	A
			B	0.16	2.734	0.583	0.85	1	33.361			
			C	0.22	2.531	0.595	0.85	1	41.450			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.85	1	53.845	1.16	58.16	A
			B	0.145	2.792	0.581	0.85	1	33.888			
			C	0.19	2.628	0.589	0.85	1	40.274			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.85	1	59.701	1.18	59.13	A
			B	0.154	2.758	0.582	0.85	1	40.923			
			C	0.191	2.626	0.589	0.85	1	46.376			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.85	1	61.227	1.10	55.23	A
			B	0.145	2.789	0.581	0.85	1	43.216			
			C	0.177	2.675	0.586	0.85	1	48.098			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.85	1	56.252	1.08	53.80	A
			B	0.139	2.812	0.58	0.85	1	45.923			
			C	0.156	2.75	0.582	0.85	1	48.727			
Sum Weight:	6.63	15.29						OTM	692.45 kip-ft	8.85		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	6.55					
Bracing Weight	8.74					
Total Member Self-Weight	15.29			16.61	4.96	
Total Weight	27.29			16.61	4.96	
Wind 0 deg - No Ice		0.45	-34.85	-3337.28	-15.89	-0.97
Wind 30 deg - No Ice		18.53	-29.01	-2792.83	-1765.73	9.49
Wind 45 deg - No Ice		25.49	-23.45	-2252.16	-2447.67	11.39
Wind 60 deg - No Ice		30.62	-16.49	-1575.50	-2953.10	13.06
Wind 90 deg - No Ice		35.59	-0.13	20.77	-3428.62	15.81
Wind 120 deg - No Ice		32.08	16.79	1653.10	-3065.12	15.79
Wind 135 deg - No Ice		25.51	23.19	2290.61	-2465.46	15.05
Wind 150 deg - No Ice		18.06	29.16	2856.58	-1752.38	13.56
Wind 180 deg - No Ice		-0.03	33.64	3294.87	-13.56	2.75
Wind 210 deg - No Ice		-18.24	28.91	2821.64	1760.05	-10.97
Wind 225 deg - No Ice		-25.21	23.32	2279.27	2444.51	-13.38
Wind 240 deg - No Ice		-31.68	17.05	1648.50	3044.26	-15.17
Wind 270 deg - No Ice		-35.37	-0.04	0.01	3432.84	-17.91
Wind 300 deg - No Ice		-30.84	-16.30	-1589.81	3003.81	-16.79
Wind 315 deg - No Ice		-25.59	-23.46	-2277.33	2493.11	-17.59
Wind 330 deg - No Ice		-18.54	-29.04	-2809.77	1809.80	-16.53
Member Ice	6.77					
Total Weight Ice	49.07			40.49	16.64	
Wind 0 deg - Ice		0.34	-34.71	-3280.02	1.01	1.14

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 30 deg - Ice		17.83	-28.51	-2710.14	-1685.13	8.69
Wind 45 deg - Ice		24.57	-23.01	-2179.02	-2343.64	9.85
Wind 60 deg - Ice		29.54	-16.14	-1514.57	-2830.44	10.74
Wind 90 deg - Ice		34.53	-0.09	43.82	-3304.70	12.05
Wind 120 deg - Ice		31.51	16.87	1670.00	-2985.70	11.18
Wind 135 deg - Ice		24.59	22.82	2264.33	-2357.31	10.32
Wind 150 deg - Ice		17.47	28.63	2814.71	-1675.14	8.90
Wind 180 deg - Ice		-0.02	32.79	3222.95	2.27	0.49
Wind 210 deg - Ice		-17.60	28.44	2787.92	1706.40	-9.84
Wind 225 deg - Ice		-24.36	22.91	2255.42	2366.90	-11.37
Wind 240 deg - Ice		-31.21	17.07	1666.14	2995.45	-12.61
Wind 270 deg - Ice		-34.36	-0.03	27.66	3333.68	-13.68
Wind 300 deg - Ice		-29.70	-16.00	-1525.82	2895.02	-11.99
Wind 315 deg - Ice		-24.65	-23.03	-2198.57	2404.22	-12.26
Wind 330 deg - Ice		-17.84	-28.54	-2723.32	1744.73	-11.17
Total Weight	27.29			16.61	4.96	
Wind 0 deg - Service		0.18	-13.62	-1307.46	-6.22	-0.38
Wind 30 deg - Service		7.24	-11.33	-1094.78	-689.75	3.71
Wind 45 deg - Service		9.96	-9.16	-883.58	-956.13	4.45
Wind 60 deg - Service		11.96	-6.44	-619.26	-1153.56	5.10
Wind 90 deg - Service		13.90	-0.05	4.28	-1339.31	6.17
Wind 120 deg - Service		12.53	6.56	641.91	-1197.32	6.17
Wind 135 deg - Service		9.96	9.06	890.93	-963.08	5.88
Wind 150 deg - Service		7.05	11.39	1112.02	-684.54	5.30
Wind 180 deg - Service		-0.01	13.14	1283.22	-5.31	1.07
Wind 210 deg - Service		-7.12	11.29	1098.37	687.51	-4.29
Wind 225 deg - Service		-9.85	9.11	886.50	954.87	-5.23
Wind 240 deg - Service		-12.37	6.66	640.11	1189.15	-5.92
Wind 270 deg - Service		-13.82	-0.01	-3.83	1340.94	-7.00
Wind 300 deg - Service		-12.05	-6.37	-624.85	1173.35	-6.56
Wind 315 deg - Service		-10.00	-9.16	-893.42	973.86	-6.87
Wind 330 deg - Service		-7.24	-11.34	-1101.40	706.94	-6.46

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp

Comb. No.	Description
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	160 - 140	Leg	Max Tension	10	17.85	0.02	1.41
			Max. Compression	7	-21.54	-0.97	-0.59
			Max. Mx	7	-21.54	1.28	0.78
			Max. My	2	-21.45	-0.02	-1.50
			Max. Vy	7	4.51	-0.97	-0.59
			Max. Vx	2	-5.26	0.02	1.14
		Diagonal	Max Tension	17	4.17	0.00	0.00
			Max. Compression	9	-4.17	0.00	0.00
			Max. Mx	34	1.86	0.02	-0.00
			Max. My	9	-4.17	0.00	0.01
			Max. Vy	34	0.01	0.02	-0.00
			Max. Vx	9	0.00	0.00	0.00
		Top Girt	Max Tension	27	0.07	0.00	0.00
			Max. Compression	19	-0.19	0.00	0.00
			Max. Mx	30	-0.18	-0.04	0.00
			Max. My	28	-0.05	0.00	0.00
			Max. Vy	30	0.02	0.00	0.00
			Max. Vx	28	-0.00	0.00	0.00
T2	140 - 120	Leg	Max Tension	10	35.27	-0.01	-0.05
			Max. Compression	7	-40.06	-0.02	0.01
			Max. Mx	7	-25.20	1.14	0.02
			Max. My	6	-1.56	0.01	0.34

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	2	0.23	1.14	-0.02
			Max. Vx	34	-0.11	0.03	0.06
		Diagonal	Max Tension	9	3.69	0.00	0.00
			Max. Compression	17	-3.88	0.00	0.00
			Max. Mx	24	3.15	0.03	-0.00
			Max. My	26	-3.70	0.00	0.01
			Max. Vy	32	0.02	0.03	0.00
			Max. Vx	33	0.00	0.00	0.00
T3	120 - 100	Leg	Max Tension	10	55.18	-0.21	0.10
			Max. Compression	24	-63.29	0.27	0.15
			Max. Mx	15	48.09	0.45	0.23
			Max. My	12	10.13	-0.23	-0.74
			Max. Vy	15	-0.43	-0.39	0.23
			Max. Vx	12	0.59	-0.23	0.42
		Diagonal	Max Tension	14	4.98	0.00	0.00
			Max. Compression	14	-5.06	0.00	0.00
			Max. Mx	24	3.57	0.06	-0.00
			Max. My	31	-4.35	0.00	0.01
			Max. Vy	24	-0.02	0.06	-0.00
			Max. Vx	31	-0.00	0.00	0.00
T4	100 - 80	Leg	Max Tension	15	77.08	-0.04	-0.06
			Max. Compression	24	-88.43	0.17	-0.18
			Max. Mx	22	68.20	-0.46	-0.05
			Max. My	17	-6.44	0.03	0.41
			Max. Vy	15	0.32	-0.19	0.08
			Max. Vx	3	0.39	-0.01	-0.28
		Diagonal	Max Tension	14	5.56	0.00	0.00
			Max. Compression	14	-5.57	0.00	0.00
			Max. Mx	24	4.13	0.08	-0.01
			Max. My	22	-4.43	0.02	-0.01
			Max. Vy	24	-0.03	0.08	-0.01
			Max. Vx	22	0.00	0.00	0.00
T5	80 - 60	Leg	Max Tension	15	97.23	-0.57	0.40
			Max. Compression	30	-111.72	-0.12	0.01
			Max. Mx	5	83.01	-0.80	-0.13
			Max. My	17	-9.00	0.07	0.89
			Max. Vy	5	0.73	-0.80	-0.13
			Max. Vx	17	-0.79	0.07	0.89
		Diagonal	Max Tension	6	7.43	0.00	0.00
			Max. Compression	14	-7.51	0.00	0.00
			Max. Mx	27	4.42	0.11	0.01
			Max. My	31	-6.45	0.04	0.02
			Max. Vy	32	0.04	0.10	0.01
			Max. Vx	31	-0.00	0.00	0.00
T6	60 - 40	Leg	Max Tension	15	119.19	-0.42	0.01
			Max. Compression	30	-137.55	-0.33	0.00
			Max. Mx	32	108.54	-1.14	0.04
			Max. My	17	-10.71	-0.01	0.50
			Max. Vy	22	0.19	-1.13	-0.01
			Max. Vx	17	-0.10	-0.01	0.50
		Diagonal	Max Tension	23	7.62	0.00	0.00
			Max. Compression	14	-7.63	0.00	0.00
			Max. Mx	24	5.11	0.16	-0.01
			Max. My	24	-0.33	0.14	-0.02
			Max. Vy	32	0.05	0.16	-0.01
			Max. Vx	24	0.00	0.00	0.00
T7	40 - 20	Leg	Max Tension	15	139.20	-0.31	0.02
			Max. Compression	30	-162.13	-0.88	0.02
			Max. Mx	32	126.67	-1.86	0.02
			Max. My	9	-3.73	-0.06	-0.58
			Max. Vy	22	0.31	-1.85	-0.02

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	11	0.10	-0.06	0.56
		Diagonal	Max Tension	23	7.93	0.00	0.00
			Max. Compression	23	-7.81	0.00	0.00
			Max. Mx	32	5.32	0.19	-0.02
			Max. My	31	-7.67	0.11	0.02
			Max. Vy	32	0.06	0.19	-0.02
			Max. Vx	31	-0.00	0.00	0.00
T8	20 - 0	Leg	Max Tension	15	158.28	-0.57	0.04
			Max. Compression	30	-185.68	-0.00	-0.00
			Max. Mx	24	-172.08	2.14	-0.01
			Max. My	14	-8.27	-0.06	-1.16
			Max. Vy	22	-0.36	-1.85	-0.02
			Max. Vx	11	0.18	-0.08	1.14
		Diagonal	Max Tension	23	9.05	0.00	0.00
			Max. Compression	23	-8.88	0.00	0.00
			Max. Mx	32	3.99	0.30	0.02
			Max. My	31	-8.75	0.19	0.04
			Max. Vy	32	0.08	0.30	0.02
			Max. Vx	31	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	30	190.38	17.52	-9.64
	Max. H_x	13	184.46	19.22	-10.55
	Max. H_z	21	-142.02	-17.50	10.50
	Min. Vert	5	-160.42	-17.28	9.51
	Min. H_x	22	-146.56	-18.27	10.19
	Min. H_z	13	184.46	19.22	-10.55
Leg B	Max. Vert	24	190.05	-17.59	-9.66
	Max. H_x	32	-149.69	18.37	10.20
	Max. H_z	33	-145.19	17.61	10.50
	Min. Vert	15	-163.01	17.41	9.44
	Min. H_x	7	185.49	-19.36	-10.55
	Min. H_z	7	185.49	-19.36	-10.55
Leg A	Max. Vert	19	182.91	-0.02	19.42
	Max. H_x	14	9.09	2.28	0.77
	Max. H_z	2	178.21	-0.07	21.25
	Min. Vert	10	-157.88	0.08	-19.10
	Min. H_x	6	8.04	-2.36	0.80
	Min. H_z	27	-147.30	0.01	-20.50

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	27.29	0.00	0.00	16.61	4.96	-0.00
Dead+Wind 0 deg - No Ice	27.29	0.45	-34.85	-3346.64	-15.88	-0.99
Dead+Wind 30 deg - No Ice	27.29	18.53	-29.01	-2800.67	-1770.59	9.51
Dead+Wind 45 deg - No Ice	27.29	25.49	-23.45	-2258.48	-2454.45	11.44

Load Combination	Vertical K	Shear$_x$ K	Shear$_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 60 deg - No Ice	27.29	30.62	-16.49	-1579.90	-2961.31	13.12
Dead+Wind 90 deg - No Ice	27.29	35.59	-0.13	20.89	-3438.14	15.89
Dead+Wind 120 deg - No Ice	27.29	32.08	16.79	1657.83	-3073.58	15.87
Dead+Wind 135 deg - No Ice	27.29	25.51	23.19	2297.14	-2472.28	15.12
Dead+Wind 150 deg - No Ice	27.29	18.06	29.16	2864.66	-1757.24	13.61
Dead+Wind 180 deg - No Ice	27.29	-0.03	33.64	3304.15	-13.64	2.77
Dead+Wind 210 deg - No Ice	27.29	-18.24	28.91	2829.61	1764.88	-11.00
Dead+Wind 225 deg - No Ice	27.29	-25.21	23.32	2285.73	2451.27	-13.43
Dead+Wind 240 deg - No Ice	27.29	-31.68	17.05	1653.16	3052.67	-15.24
Dead+Wind 270 deg - No Ice	27.29	-35.37	-0.04	0.03	3442.40	-18.00
Dead+Wind 300 deg - No Ice	27.29	-30.84	-16.30	-1594.30	3012.19	-16.87
Dead+Wind 315 deg - No Ice	27.29	-25.59	-23.46	-2283.75	2500.06	-17.66
Dead+Wind 330 deg - No Ice	27.29	-18.55	-29.04	-2817.68	1814.84	-16.57
Dead+Ice+Temp	49.07	0.00	-0.00	40.69	16.71	0.00
Dead+Wind 0 deg+Ice+Temp	49.07	0.34	-34.71	-3295.84	1.09	1.07
Dead+Wind 30 deg+Ice+Temp	49.07	17.83	-28.51	-2723.23	-1693.14	8.74
Dead+Wind 45 deg+Ice+Temp	49.07	24.57	-23.01	-2189.54	-2354.84	9.94
Dead+Wind 60 deg+Ice+Temp	49.07	29.54	-16.14	-1521.87	-2844.02	10.87
Dead+Wind 90 deg+Ice+Temp	49.07	34.53	-0.09	44.10	-3320.53	12.24
Dead+Wind 120 deg+Ice+Temp	49.07	31.51	16.87	1678.24	-2999.86	11.39
Dead+Wind 135 deg+Ice+Temp	49.07	24.59	22.82	2275.39	-2368.74	10.50
Dead+Wind 150 deg+Ice+Temp	49.07	17.47	28.63	2828.37	-1683.16	9.06
Dead+Wind 180 deg+Ice+Temp	49.07	-0.02	32.79	3238.57	2.23	0.56
Dead+Wind 210 deg+Ice+Temp	49.07	-17.60	28.44	2801.44	1714.49	-9.88
Dead+Wind 225 deg+Ice+Temp	49.07	-24.36	22.91	2266.37	2378.37	-11.46
Dead+Wind 240 deg+Ice+Temp	49.07	-31.21	17.07	1674.27	3009.69	-12.75
Dead+Wind 270 deg+Ice+Temp	49.07	-34.36	-0.03	27.80	3349.67	-13.87
Dead+Wind 300 deg+Ice+Temp	49.07	-29.70	-16.00	-1533.26	2908.93	-12.19
Dead+Wind 315 deg+Ice+Temp	49.07	-24.65	-23.03	-2209.24	2415.75	-12.45
Dead+Wind 330 deg+Ice+Temp	49.07	-17.84	-28.54	-2736.50	1753.09	-11.32
Dead+Wind 0 deg - Service	27.29	0.18	-13.62	-1297.15	-3.18	-0.39
Dead+Wind 30 deg - Service	27.29	7.24	-11.33	-1083.88	-688.61	3.72
Dead+Wind 45 deg - Service	27.29	9.96	-9.16	-872.09	-955.75	4.47
Dead+Wind 60 deg - Service	27.29	11.96	-6.44	-607.01	-1153.75	5.12
Dead+Wind 90 deg - Service	27.29	13.90	-0.05	18.31	-1340.01	6.21
Dead+Wind 120 deg - Service	27.29	12.53	6.56	657.74	-1197.61	6.20
Dead+Wind 135 deg - Service	27.29	9.96	9.06	907.48	-962.72	5.91
Dead+Wind 150 deg - Service	27.29	7.05	11.39	1129.17	-683.41	5.32
Dead+Wind 180 deg - Service	27.29	-0.01	13.14	1300.85	-2.30	1.08
Dead+Wind 210 deg - Service	27.29	-7.12	11.29	1115.48	692.45	-4.30
Dead+Wind 225 deg - Service	27.29	-9.85	9.11	903.02	960.57	-5.24
Dead+Wind 240 deg - Service	27.29	-12.37	6.66	655.92	1195.50	-5.95
Dead+Wind 270 deg - Service	27.29	-13.82	-0.01	10.16	1347.74	-7.03
Dead+Wind 300 deg - Service	27.29	-12.05	-6.37	-612.64	1179.68	-6.59
Dead+Wind 315 deg - Service	27.29	-10.00	-9.16	-881.96	979.62	-6.90
Dead+Wind 330 deg - Service	27.29	-7.24	-11.34	-1090.53	711.95	-6.48

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-27.29	0.00	0.00	27.29	0.00	0.000%
2	0.45	-27.29	-34.85	-0.45	27.29	34.85	0.000%
3	18.53	-27.29	-29.01	-18.53	27.29	29.01	0.000%
4	25.49	-27.29	-23.45	-25.49	27.29	23.45	0.000%
5	30.62	-27.29	-16.49	-30.62	27.29	16.49	0.000%
6	35.59	-27.29	-0.13	-35.59	27.29	0.13	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
7	32.08	-27.29	16.79	-32.08	27.29	-16.79	0.000%
8	25.51	-27.29	23.19	-25.51	27.29	-23.19	0.000%
9	18.06	-27.29	29.16	-18.06	27.29	-29.16	0.000%
10	-0.03	-27.29	33.64	0.03	27.29	-33.64	0.000%
11	-18.24	-27.29	28.91	18.24	27.29	-28.91	0.000%
12	-25.21	-27.29	23.32	25.21	27.29	-23.32	0.000%
13	-31.68	-27.29	17.05	31.68	27.29	-17.05	0.000%
14	-35.37	-27.29	-0.04	35.37	27.29	0.04	0.000%
15	-30.84	-27.29	-16.30	30.84	27.29	16.30	0.000%
16	-25.59	-27.29	-23.46	25.59	27.29	23.46	0.000%
17	-18.54	-27.29	-29.04	18.55	27.29	29.04	0.002%
18	0.00	-49.07	0.00	-0.00	49.07	0.00	0.000%
19	0.34	-49.07	-34.71	-0.34	49.07	34.71	0.000%
20	17.83	-49.07	-28.51	-17.83	49.07	28.51	0.000%
21	24.57	-49.07	-23.01	-24.57	49.07	23.01	0.000%
22	29.54	-49.07	-16.14	-29.54	49.07	16.14	0.000%
23	34.53	-49.07	-0.09	-34.53	49.07	0.09	0.000%
24	31.51	-49.07	16.87	-31.51	49.07	-16.87	0.000%
25	24.59	-49.07	22.82	-24.59	49.07	-22.82	0.000%
26	17.47	-49.07	28.63	-17.47	49.07	-28.63	0.000%
27	-0.02	-49.07	32.79	0.02	49.07	-32.79	0.000%
28	-17.60	-49.07	28.44	17.60	49.07	-28.44	0.000%
29	-24.36	-49.07	22.91	24.36	49.07	-22.91	0.000%
30	-31.21	-49.07	17.07	31.21	49.07	-17.07	0.000%
31	-34.36	-49.07	-0.03	34.36	49.07	0.03	0.000%
32	-29.70	-49.07	-16.00	29.70	49.07	16.00	0.000%
33	-24.65	-49.07	-23.03	24.65	49.07	23.03	0.000%
34	-17.84	-49.07	-28.54	17.84	49.07	28.54	0.000%
35	0.18	-27.29	-13.62	-0.18	27.29	13.62	0.000%
36	7.24	-27.29	-11.33	-7.24	27.29	11.33	0.000%
37	9.96	-27.29	-9.16	-9.96	27.29	9.16	0.000%
38	11.96	-27.29	-6.44	-11.96	27.29	6.44	0.000%
39	13.90	-27.29	-0.05	-13.90	27.29	0.05	0.000%
40	12.53	-27.29	6.56	-12.53	27.29	-6.56	0.000%
41	9.96	-27.29	9.06	-9.96	27.29	-9.06	0.000%
42	7.05	-27.29	11.39	-7.05	27.29	-11.39	0.000%
43	-0.01	-27.29	13.14	0.01	27.29	-13.14	0.000%
44	-7.12	-27.29	11.29	7.12	27.29	-11.29	0.000%
45	-9.85	-27.29	9.11	9.85	27.29	-9.11	0.000%
46	-12.37	-27.29	6.66	12.37	27.29	-6.66	0.000%
47	-13.82	-27.29	-0.01	13.82	27.29	0.01	0.000%
48	-12.05	-27.29	-6.37	12.05	27.29	6.37	0.000%
49	-10.00	-27.29	-9.16	10.00	27.29	9.16	0.000%
50	-7.24	-27.29	-11.34	7.24	27.29	11.34	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	0.00000222
3	Yes	4	0.00000001	0.00000354
4	Yes	4	0.00000001	0.00000417
5	Yes	4	0.00000001	0.00000439
6	Yes	4	0.00000001	0.00000365
7	Yes	4	0.00000001	0.00000244

8	Yes	4	0.00000001	0.00000218
9	Yes	4	0.00000001	0.00000270
10	Yes	4	0.00000001	0.00000380
11	Yes	4	0.00000001	0.00000268
12	Yes	4	0.00000001	0.00000222
13	Yes	4	0.00000001	0.00000207
14	Yes	4	0.00000001	0.00000278
15	Yes	4	0.00000001	0.00000391
16	Yes	4	0.00000001	0.00000365
17	Yes	4	0.00000001	0.00000305
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000285
20	Yes	4	0.00000001	0.00000669
21	Yes	4	0.00000001	0.00000797
22	Yes	4	0.00000001	0.00000838
23	Yes	4	0.00000001	0.00000676
24	Yes	4	0.00000001	0.00000293
25	Yes	4	0.00000001	0.00000307
26	Yes	4	0.00000001	0.00000563
27	Yes	4	0.00000001	0.00000778
28	Yes	4	0.00000001	0.00000515
29	Yes	4	0.00000001	0.00000346
30	Yes	4	0.00000001	0.00000262
31	Yes	4	0.00000001	0.00000554
32	Yes	4	0.00000001	0.00000773
33	Yes	4	0.00000001	0.00000737
34	Yes	4	0.00000001	0.00000589
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	5.038	40	0.2916	0.0122
T2	140 - 120	3.798	40	0.2757	0.0136
T3	120 - 100	2.700	40	0.2268	0.0143
T4	100 - 80	1.823	40	0.1749	0.0116
T5	80 - 60	1.149	40	0.1274	0.0089
T6	60 - 40	0.661	40	0.0903	0.0063
T7	40 - 20	0.314	40	0.0609	0.0039
T8	20 - 0	0.093	40	0.0296	0.0017

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.75	MB96RR900200DPBL	40	5.038	0.2916	0.0122	126094
167.50	15' x 2" Dia Omni	40	5.038	0.2916	0.0122	126094
163.00	(2) CG1900W850 TMA	40	5.038	0.2916	0.0122	126094
162.33	10'0"x4" Pipe Mount	40	5.038	0.2916	0.0122	126094
156.50	LPA-80063-4CF	40	4.817	0.2903	0.0124	126094
156.00	20' Boom Gate	40	4.786	0.2901	0.0124	126094
147.00	15' Frame	40	4.223	0.2845	0.0130	48498
127.50	15' x 2" Dia Omni	40	3.088	0.2474	0.0144	22794
117.75	4' Side Mount Standoff	40	2.590	0.2207	0.0142	20101
111.33	8 FT DISH	40	2.293	0.2037	0.0134	21532
108.00	16' x 2" Dia Omni	40	2.148	0.1951	0.0129	22413
102.20	5'0"x4.5" Pipe Mount	40	1.909	0.1804	0.0119	24041
102.00	6 FT DISH	40	1.901	0.1799	0.0119	24091
99.00	4' Side Mount Standoff	40	1.785	0.1724	0.0114	24616
94.00	6 FT DISH	40	1.601	0.1600	0.0107	24643
93.83	5'0"x4.5" Pipe Mount	40	1.594	0.1596	0.0107	24638
72.10	5'0"x4.5" Pipe Mount	40	0.936	0.1114	0.0079	27860
72.00	10 FT DISH	40	0.934	0.1112	0.0079	27912
47.00	4' Side Mount Standoff (Vacant)	40	0.422	0.0711	0.0047	39661
45.41	12' x 1-1/2" Dia Omni	40	0.396	0.0688	0.0045	40177
37.58	4' Side Mount Standoff	40	0.280	0.0572	0.0036	39798

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	12.859	7	0.7437	0.0313
T2	140 - 120	9.695	7	0.7032	0.0347
T3	120 - 100	6.895	7	0.5785	0.0366
T4	100 - 80	4.657	7	0.4462	0.0296
T5	80 - 60	2.936	7	0.3253	0.0228
T6	60 - 40	1.690	7	0.2307	0.0162
T7	40 - 20	0.803	7	0.1556	0.0100
T8	20 - 0	0.237	7	0.0757	0.0044

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.75	MB96RR900200DPBL	7	12.859	0.7437	0.0313	49457
167.50	15' x 2" Dia Omni	7	12.859	0.7437	0.0313	49457
163.00	(2) CG1900W850 TMA	7	12.859	0.7437	0.0313	49457
162.33	10'0"x4" Pipe Mount	7	12.859	0.7437	0.0313	49457
156.50	LPA-80063-4CF	7	12.294	0.7403	0.0318	49457
156.00	20' Boom Gate	7	12.214	0.7398	0.0319	49457
147.00	15' Frame	7	10.778	0.7256	0.0333	19022

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
127.50	15' x 2" Dia Omni	7	7.885	0.6310	0.0369	8955
117.75	4' Side Mount Standoff	7	6.614	0.5629	0.0362	7903
111.33	8 FT DISH	7	5.856	0.5196	0.0343	8462
108.00	16' x 2" Dia Omni	7	5.486	0.4978	0.0330	8801
102.20	5'0"x4.5" Pipe Mount	7	4.877	0.4603	0.0305	9441
102.00	6 FT DISH	7	4.857	0.4590	0.0304	9461
99.00	4' Side Mount Standoff	7	4.560	0.4399	0.0292	9669
94.00	6 FT DISH	7	4.089	0.4083	0.0274	9681
93.83	5'0"x4.5" Pipe Mount	7	4.074	0.4072	0.0273	9679
72.10	5'0"x4.5" Pipe Mount	7	2.393	0.2845	0.0203	10934
72.00	10 FT DISH	7	2.386	0.2840	0.0202	10954
47.00	4' Side Mount Standoff (Vacant)	7	1.078	0.1816	0.0121	15528
45.41	12' x 1-1/2" Dia Omni	7	1.012	0.1757	0.0116	15731
37.58	4' Side Mount Standoff	7	0.717	0.1462	0.0093	15584

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325N	0.6250	4	4.46	13.25	0.337 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4.17	4.12	1.012 ✓	1.333	Bolt Shear
T2	140	Leg	A325N	0.6250	4	8.82	13.50	0.653 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.88	4.12	0.940 ✓	1.333	Bolt Shear
T3	120	Leg	A325N	0.7500	4	13.79	19.44	0.710 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	5.06	4.12	1.226 ✓	1.333	Bolt Shear
T4	100	Leg	A325N	0.8750	4	19.27	26.46	0.728 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	5.57	4.12	**1.351** ✗	1.333	Bolt Shear
T5	80	Leg	A325N	1.0000	4	24.31	34.56	0.703 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7.51	6.44	1.165 ✓	1.333	Bolt Shear
T6	60	Leg	A325N	1.0000	4	29.80	34.56	0.862 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7.63	6.44	1.185 ✓	1.333	Bolt Shear
T7	40	Leg	A325N	1.0000	6	23.20	34.56	0.671 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7.93	6.44	1.231 ✓	1.333	Bolt Shear
T8	20	Leg	A354-BC	0.8750	6	26.38	24.80	1.064 ✓	1.333	Bolt Tension
		Diagonal	A325X	0.6250	1	9.05	8.16	1.109 ✓	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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	ROHN 2.5 STD	20.00	4.75	60.2 K=1.00	22.690	1.7040	-21.54	38.66	0.557 ✓
T2	140 - 120	ROHN 2.5 STD	20.03	6.68	84.6 K=1.00	18.081	1.7040	-40.06	30.81	1.300 ✓
T3	120 - 100	ROHN 2.5 EH	20.03	6.68	86.7 K=1.00	17.634	2.2535	-63.29	39.74	**1.593** ✗
T4	100 - 80	H1-3 (1.59 CR) - 53 ROHN 3 EH	20.04	6.68	70.5 K=1.00	20.840	3.0159	-88.43	62.85	**1.407** ✗
T5	80 - 60	H1-3 (1.41 CR) - 74 ROHN 4 EH	20.03	10.02	81.4 K=1.00	18.730	4.4074	-111.72	82.55	**1.353** ✗
T6	60 - 40	H1-3 (1.35 CR) - 94 ROHN 5 EH	20.03	10.02	65.4 K=1.00	21.782	6.1120	-137.55	133.13	1.033 ✓
T7	40 - 20	ROHN 5 EH	20.04	10.02	65.4 K=1.00	21.778	6.1120	-162.13	133.11	1.218 ✓
T8	20 - 0	ROHN 6 EHS	20.03	10.02	54.0 K=1.00	23.713	6.7133	-185.68	159.19	1.166 ✓

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	9.79	4.64	162.2 K=1.00	5.674	0.6211	-4.17	3.52	1.184 ✓
T2	140 - 120	L2x2x3/16	12.21	6.05	184.1 K=1.00	4.404	0.7150	-3.74	3.15	1.188 ✓
T3	120 - 100	L2 1/2x2 1/2x3/16	13.96	6.92	167.8 K=1.00	5.305	0.9020	-5.06	4.78	1.057 ✓
T4	100 - 80	L3x3x3/16	15.79	7.81	157.3 K=1.00	6.038	1.0900	-5.57	6.58	0.847 ✓
T5	80 - 60	L3x3x1/4	19.03	9.46	191.7 K=1.00	4.065	1.4400	-7.51	5.85	1.282 ✓
T6	60 - 40	L3 1/2x3 1/2x1/4	20.76	10.27	177.5 K=1.00	4.740	1.6900	-7.63	8.01	0.953 ✓
T7	40 - 20	L3 1/2x3 1/2x1/4	22.64	11.23	194.1 K=1.00	3.962	1.6900	-7.48	6.70	1.118 ✓
T8	20 - 0	L4x4x1/4	23.58	11.63	175.5 K=1.00	4.848	1.9400	-8.88	9.41	0.944 ✓

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	8.56	8.32	225.0 K=0.77	2.950	0.6211	-0.19	1.83	0.102 ✓
		KL/R > 200 (C) - 4								

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	ROHN 2.5 STD	20.00	4.75	60.2	30.000	1.7040	17.85	51.12	0.349 ✓
T2	140 - 120	ROHN 2.5 STD	20.03	6.68	84.6	30.000	1.7040	35.27	51.12	0.690 ✓
T3	120 - 100	ROHN 2.5 EH	20.03	6.68	86.7	30.000	2.2535	55.18	67.61	0.816 ✓
T4	100 - 80	H1-3 (1.56 CR) - 54 ROHN 3 EH	20.04	6.68	70.5	30.000	3.0159	77.08	90.48	0.852 ✓
T5	80 - 60	H1-3 (1.41 CR) - 74 ROHN 4 EH	20.03	10.02	81.4	30.000	4.4074	97.23	132.22	0.735 ✓
T6	60 - 40	H1-3 (1.35 CR) - 95 ROHN 5 EH	20.03	10.02	65.4	30.000	6.1120	119.19	183.36	0.650 ✓
T7	40 - 20	ROHN 5 EH	20.04	10.02	65.4	30.000	6.1120	139.20	183.36	0.759 ✓
T8	20 - 0	ROHN 6 EHS	20.03	10.02	54.0	30.000	6.7133	158.29	201.40	0.786 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	9.79	4.64	106.3	21.600	0.6211	4.17	13.42	0.311 ✓
T2	140 - 120	L2x2x3/16	11.12	5.51	109.4	21.600	0.7150	3.69	15.44	0.239 ✓
T3	120 - 100	L2 1/2x2 1/2x3/16	13.96	6.92	108.5	21.600	0.9020	4.98	19.48	0.256 ✓
T4	100 - 80	L3x3x3/16	15.17	7.50	97.3	21.600	1.0900	5.56	23.54	0.236 ✓
T5	80 - 60	L3x3x1/4	19.03	9.46	123.7	21.600	1.4400	7.43	31.10	0.239 ✓

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T6	60 - 40	L3 1/2x3 1/2x1/4	20.76	10.27	114.5	21.600	1.6900	7.62	36.50	0.209 ✓
T7	40 - 20	L3 1/2x3 1/2x1/4	22.64	11.23	125.1	21.600	1.6900	7.93	36.50	0.217 ✓
T8	20 - 0	L4x4x1/4	24.49	12.08	117.3	21.600	1.9400	9.05	41.90	0.216 ✓

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	8.56	8.32	186.0	21.600	0.6211	0.07	13.42	0.005 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	160 - 140	Leg	ROHN 2.5 STD	2	-21.54	51.54	41.8	Pass
T2	140 - 120	Leg	ROHN 2.5 STD	32	-40.06	41.07	97.5	Pass
T3	120 - 100	Leg	ROHN 2.5 EH	53	-63.29	52.97	119.5	Fail ✗
T4	100 - 80	Leg	ROHN 3 EH	74	-88.43	83.78	105.6	Fail ✗
T5	80 - 60	Leg	ROHN 4 EH	94	-111.72	110.04	101.5	Fail ✗
T6	60 - 40	Leg	ROHN 5 EH	109	-137.55	177.46	77.5	Pass
T7	40 - 20	Leg	ROHN 5 EH	124	-162.13	177.43	91.4	Pass
T8	20 - 0	Leg	ROHN 6 EHS	139	-185.68	212.20	87.5	Pass
T1	160 - 140	Diagonal	L1 3/4x1 3/4x3/16	9	-4.17	4.70	88.8	Pass
T2	140 - 120	Diagonal	L2x2x3/16	38	-3.74	4.20	89.1	Pass
T3	120 - 100	Diagonal	L2 1/2x2 1/2x3/16	55	-5.06	6.38	79.3	Pass
T4	100 - 80	Diagonal	L3x3x3/16	76	-5.57	8.77	92.0 (b) 63.5 101.4 (b)	Fail ✗
T5	80 - 60	Diagonal	L3x3x1/4	97	-7.51	7.80	96.2	Pass
T6	60 - 40	Diagonal	L3 1/2x3 1/2x1/4	112	-7.63	10.68	71.5	Pass
T7	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	128	-7.48	8.93	88.9 (b) 83.9	Pass
T8	20 - 0	Diagonal	L4x4x1/4	149	-8.88	12.54	92.3 (b) 70.8	Pass
T1	160 - 140	Top Girt	L1 3/4x1 3/4x3/16	4	-0.19	2.44	83.2 (b) 7.7	Pass
						Summary		
						Leg (T3)	119.5	Fail ✗
						Diagonal (T4)	101.4	Fail ✗
						Top Girt (T1)	7.7	Pass
						Bolt Checks	101.4	Fail ✗
						RATING =	**119.5**	**Fail ✗**

Program Version 5.3.1.0 - 10/3/2008 File:J:/Jobs/1000100.WI/CO8 - Windsor; 482 Pigeon Hill Rd., Windsor, CT/Rev 1/Calculations/ERI Files/160 Lattice Windsor.eri

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

Subject:	Lattice Tower Pad and Pier Foundation Check
Location:	Windsor, CT
Rev. 1: 02/02/10	Prepared by: TJL. Checked by: C.F.C. Job No. 10001.CO8

Pad and Pier Foundation:

Input Data:

(Existing Condition)

Tower Data

Max Uplift Force =	Uplift := 163·kips	(User Input from RISATower)	
Max Shear Force =	Shear := 22·kips	(User Input from RISATower)	
Max Compressive Force =	Compression := 190·kips	(User Input from RISATower)	
Tower Height =	$H_t := 160 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 11.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 9.5 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 2.0 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 3.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 3.5 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 8 \cdot ft$	(User Input)	

Material Properties:

Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 4500 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	Bouyancy := 0	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	Z := 2	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Calculated Factors:

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := if(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}) = 150 \cdot pcf$

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 120 \cdot pcf$

Cross Sectional Area 1 of Resisting Pyramid = $B_1 := W_f^2 = 64$

Cross Sectional Area 2 of Resisting Pyramid = $B_2 := \left[2\left(L_p - L_{pag} - n\right)\cdot\tan\left(\Phi_s\right) + W_f\right]^2 = 277.6$

Volume of Concrete = $V_{conc} := \left[\left(W_f^2 \cdot T_f\right) + \frac{d_p^2 \cdot \pi}{4} L_p\right] = 291.2 \cdot ft^3$

Volume of Soil = $V_{soil} := \left[\frac{\left(L_p - L_{pag} - n\right)}{3}\cdot\left(B_1 + B_2 + \sqrt{B_1 \cdot B_2}\right)\right] - \frac{d_p^2 \cdot \pi}{4}\left(L_p - L_{pag}\right) = 1134.1$

Weight of Concrete = $WT_c := V_{conc} \cdot \gamma_c = 43.7 \cdot kip$

Weight of Soil = $WT_s := V_{soil} \cdot \gamma_s = 136.1 \cdot kip$

Total Weight = $WT_{tot} := WT_c + WT_s = 179.8 \cdot kip$

Factor of Safety Actual = $FS := \frac{WT_{tot}}{Uplift} = 1.1$

Factor of Safety Required = $FS_{req} := 2$

$Uplift\_Check := if\left(FS \geq FS_{req}, "Okay", "No\ Good"\right)$

$Uplift\_Check = "No\ Good"$

Bearing Pressure Caused by Footing:

Weight of Soil Above Footing = $WT_{soil} := \left[\left(W_f^2 - \frac{\pi d_p^2}{4}\right)\cdot\left(L_p - L_{pag} - n\right)\right]\cdot\gamma_s = 51.2 \cdot kips$

Area of the Mat = $A_{mat} := W_f^2 = 64$

Maximum Pressure in Mat = $P_{max} := \frac{WT_c + WT_{soil} + Compression}{A_{mat}} = 4.45 \cdot ksf$

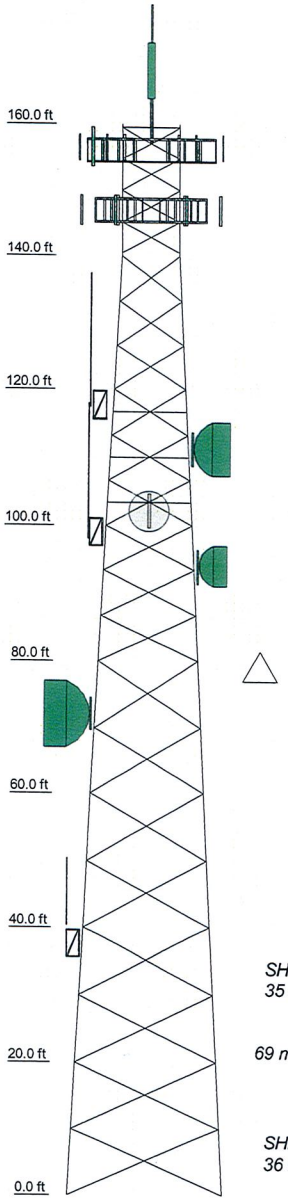
$Max\_Pressure\_Check := if\left(P_{max} < q_s, "Okay", "No\ Good"\right)$

$Max\_Pressure\_Check = "Okay"$

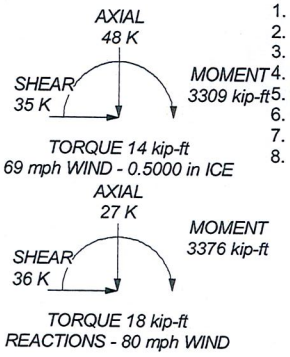
Risa Tower Calculations

(with Reinforcement)

Section	T8	T7	T6	T5	T4	T3	T2	T1
Legs	ROHN 6 EHS	ROHN 5 EH		ROHN 4 EH	ROHN 3 EH	ROHN 2.5 EH	ROHN 2.5 STD	
Leg Grade	A572-50							
Diagonals	L4x4x1/4	L3 1/2x3 1/2x1/4		L3x3x1/4	L3x3x3/16	L2 1/2x2 1/2x3/16	L2x2x3/16	L1 3/4x1 3/4x3/16
Diagonal Grade	A36							
Top Girts		N.A.						L1 3/4x1 3/4x3/16
Sec. Horizontals		N.A.				L2 1/2x2 1/2x3/16	N.A.	
Face Width (ft)	22.85	20.85	18.69	16.69	14.66	12.6	10.56	8.56
# Panels @ (ft)	3 @ 15.6	8 @ 10				9 @ 6.66667		4 @ 4.75
Weight (K)	3.3	2.8	2.7	2.0	1.6	1.5	0.9	0.9



MAX. CORNER REACTIONS
DOWN: 183 K
UPLIFT: -157 K
SHEAR: 22 K



TORQUE 14 kip-ft
69 mph WIND - 0.5000 in ICE

TORQUE 18 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
MB96RR900200DPBL (ATT)	167.75	(2) APXV18-209014 (T-Mobile)	147
MB96RR900200DPBL (ATT)	167.75	APX16DWV-16DWVS-C-A20 (T-Mobile)	147
MB96RR900200DPBL (ATT)	167.75	APX16DWV-16DWVS-C-A20 (T-Mobile)	147
15' x 2" Dia Omni (Unknown)	167.5	APX16DWV-16DWVS-C-A20 (T-Mobile)	147
(2) CG1900W850 TMA (ATT)	163	TMA (T-Mobile)	147
(2) CG1900W850 TMA (ATT)	163	TMA (T-Mobile)	147
(2) CG1900W850 TMA (ATT)	163	TMA (T-Mobile)	147
10'0"x4" Pipe Mount (ATT)	162.33	(2) TMA 10"x8"x3" (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	(2) TMA 10"x8"x3" (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	(2) TMA 10"x8"x3" (T-Mobile)	147
LPA-80063-4CF (Verizon)	156.5	15' Frame (T-Mobile)	147
LPA-80063-4CF (Verizon)	156.5	15' Frame (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	15' Frame (T-Mobile)	147
DB948F85T2E-M (Verizon)	156.5	(2) APXV18-209014 (T-Mobile)	147
LPA-80063-4CF (Verizon)	156.5	15' x 2" Dia Omni (Unknown)	127.5
LPA-80063-4CF (Verizon)	156.5	4' Side Mount Standoff (Unknown)	117.75
DB948F85T2E-M (Verizon)	156.5	5'0"x4.5" Pipe Mount (Unknown)	111.33
DB948F85T2E-M (Verizon)	156.5	8 FT DISH (Unknown)	111.33
LPA-80063-4CF (Verizon)	156.5	16' x 2" Dia Omni (Unknown)	108
BXA-70040/6CF (Verizon Proposed)	156.5	5'0"x4.5" Pipe Mount (Unknown)	102.2
BXA-70040/6CF (Verizon Proposed)	156.5	6 FT DISH (Unknown)	102
BXA-70063/6CF (Verizon Proposed)	156.5	4' Side Mount Standoff (Unknown)	99
LPA-80063-4CF (Verizon)	156.5	6 FT DISH (Unknown)	94
Valmont 15' T-Frame P/N 860109 (Verizon - proposed)	156	5'0"x4.5" Pipe Mount (Unknown)	93.83
		5'0"x4.5" Pipe Mount (Unknown)	72.1
Valmont 15' T-Frame P/N 860109 (Verizon - proposed)	156	10 FT DISH (Unknown)	72
		4' Side Mount Standoff (Vacant) (Unknown)	47
Valmont 15' T-Frame P/N 860109 (Verizon - proposed)	156	12' x 1-1/2" Dia Omni (Unknown)	45.41
		4' Side Mount Standoff (Unknown)	37.58
(2) APXV18-209014 (T-Mobile)	147		

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: 98.7%

NATCOMM INC
63-2 N Branford Rd
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: ***160' ROHN SSV Self-Support Lattice - Reinforced - Rev 1***			
Project: ***10001.CO8 - 482 Pigeon Hill Road, Windsor, CT***			
Client: Verizon Wireless	Drawn by: Staff	App'd:	
Code: TIA/EIA-222-F	Date: 02/03/10	Scale: NTS	
Path:		Dwg No. E-1	

RISATower	Job: 160' ROHN SSV Self-Support Lattice - Reinforced - Rev 1	Page: 1 of 33
NATCOMM INC 63-2 N Branford Rd Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 10001.CO8 - 482 Pigeon Hill Road, Windsor, CT	Date: 10:19:19 02/03/10
	Client: Verizon Wireless	Designed by: Staff

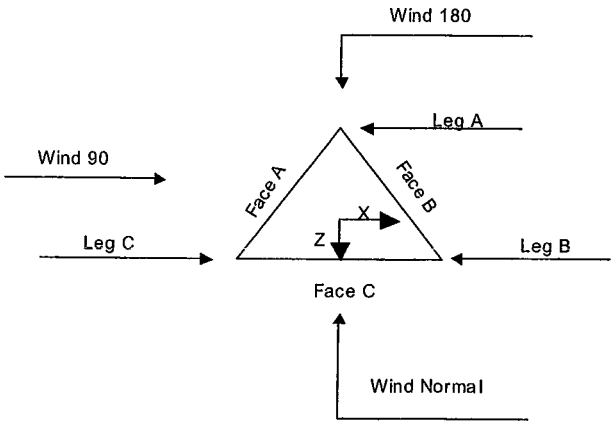
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 160.00 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 8.56 ft at the top and 22.85 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	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	160.00-140.00			8.56	1	20.00
T2	140.00-120.00			8.56	1	20.00
T3	120.00-100.00			10.56	1	20.00
T4	100.00-80.00			12.60	1	20.00
T5	80.00-60.00			14.66	1	20.00
T6	60.00-40.00			16.69	1	20.00
T7	40.00-20.00			18.69	1	20.00
T8	20.00-0.00			20.85	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	160.00-140.00	4.75	X Brace	No	No	6.0000	6.0000
T2	140.00-120.00	6.67	X Brace	No	No	0.0000	0.0000
T3	120.00-100.00	6.67	X Brace	No	Yes	0.0000	0.0000
T4	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T5	80.00-60.00	10.00	X Brace	No	No	0.0000	0.0000
T6	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T7	40.00-20.00	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
T8	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 160.00-140.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T2 140.00-120.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T3 120.00-100.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T4 100.00-80.00	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T5 80.00-60.00	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T6 60.00-40.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T7 40.00-20.00	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T8 20.00-0.00	Pipe	ROHN 6 EHS	A572-50 (50 ksi)	Equal Angle	L4x4x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 160.00-140.00	Equal Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T3 120.00-100.00	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft^2	in					in	in
T1 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T7 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T8 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

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

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 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
T2 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
T3 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
T4 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
T5 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
T6 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
T7 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
T8 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 160.00-140.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 140.00-120.00	Flange	0.6250 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	0
T3 120.00-100.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	2
T4 100.00-80.00	Flange	0.8750 A325N	4	0.5000 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 80.00-60.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 60.00-40.00	Flange	1.0000 A325N	4	0.6250 A325N	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T7 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T8 20.00-0.00	Flange	0.8750 A354-BC	6	0.6250 A325X	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	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 (Verizon)	C	Yes	Ar (CfAe)	156.00 - 8.00	2.0000	-0.35	12	6	1.9800	1.9800		1.04
1 5/8 (T-Mobile)	A	Yes	Ar (CfAe)	147.00 - 8.00	2.0000	-0.4	12	6	1.0000 1.9800	1.9800		1.04
1 1/4 (ATT)	A	Yes	Ar (CfAe)	160.00 - 8.00	2.0000	0.4	9	9	1.5500	1.5500		0.66

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
7/8 (Unknown)	B	Yes	Ar (CfAe)	160.00 - 8.00	2.0000	0.4	1	1	1.1100	1.1100		0.54
EW90 (Unknown)	B	Yes	Af (CfAe)	102.00 - 8.00	2.0000	0.39	1	1	0.9869	0.9869	3.2550	0.32
EW63 (Unknown)	B	Yes	Af (CfAe)	111.33 - 8.00	2.0000	0.38	1	1	1.5742	1.5742	5.0668	0.51
EW63 (Unknown)	B	Yes	Af (CfAe)	94.00 - 8.00	2.0000	0.37	1	1	1.5742	1.5742	5.0668	0.51
7/8 (Unknown)	B	Yes	Ar (CfAe)	119.50 - 8.00	2.0000	0.36	1	1	1.1100	1.1100		0.54
7/8 (Unknown)	B	Yes	Ar (CfAe)	100.00 - 8.00	2.0000	0.35	1	1	1.1100	1.1100		0.54
EW63 (Unknown)	B	Yes	Af (CfAe)	72.00 - 8.00	2.0000	0.34	1	1	1.5742	1.5742	5.0668	0.51
1/2 (Unknown)	B	Yes	Ar (CfAe)	39.41 - 8.00	2.0000	0.33	1	1	0.5800	0.5800		0.25
1 5/8 (T-Mobile)	A	Yes	Ar (CfAe)	147.00 - 8.00	2.0000	-0.34	6	3	1.9800	1.9800		1.04
1 5/8 (Verizon - proposed)	C	Yes	Ar (CfAe)	156.00 - 8.00	2.0000	-0.28	6	3	1.9800	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 K
T1	160.00-140.00	A	33.645	0.000	0.000	0.000	0.25
		B	1.850	0.000	0.000	0.000	0.01
		C	23.760	0.000	0.000	0.000	0.30
T2	140.00-120.00	A	52.950	0.000	0.000	0.000	0.49
		B	1.850	0.000	0.000	0.000	0.01
		C	29.700	0.000	0.000	0.000	0.37
T3	120.00-100.00	A	52.950	0.000	0.000	0.000	0.49
		B	3.654	1.651	0.000	0.000	0.03
		C	29.700	0.000	0.000	0.000	0.37
T4	100.00-80.00	A	52.950	0.000	0.000	0.000	0.49
		B	5.550	6.105	0.000	0.000	0.06
		C	29.700	0.000	0.000	0.000	0.37
T5	80.00-60.00	A	52.950	0.000	0.000	0.000	0.49
		B	5.550	8.466	0.000	0.000	0.07
		C	29.700	0.000	0.000	0.000	0.37
T6	60.00-40.00	A	52.950	0.000	0.000	0.000	0.49
		B	5.550	9.516	0.000	0.000	0.07
		C	29.700	0.000	0.000	0.000	0.37
T7	40.00-20.00	A	52.950	0.000	0.000	0.000	0.49
		B	6.488	9.516	0.000	0.000	0.07
		C	29.700	0.000	0.000	0.000	0.37
T8	20.00-0.00	A	31.770	0.000	0.000	0.000	0.30
		B	3.910	5.710	0.000	0.000	0.04
		C	17.820	0.000	0.000	0.000	0.22

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	160.00-140.00	A	0.500	45.203	8.692	0.000	0.000	0.72
		B		3.517	0.000	0.000	0.000	0.03
		C		35.760	0.000	0.000	0.000	0.74
T2	140.00-120.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		3.517	0.000	0.000	0.000	0.03
		C		44.700	0.000	0.000	0.000	0.92
T3	120.00-100.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		6.945	2.391	0.000	0.000	0.08
		C		44.700	0.000	0.000	0.000	0.92
T4	100.00-80.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		10.550	9.105	0.000	0.000	0.18
		C		44.700	0.000	0.000	0.000	0.92
T5	80.00-60.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		10.550	12.466	0.000	0.000	0.21
		C		44.700	0.000	0.000	0.000	0.92
T6	60.00-40.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		10.550	13.960	0.000	0.000	0.23
		C		44.700	0.000	0.000	0.000	0.92
T7	40.00-20.00	A	0.500	58.117	24.833	0.000	0.000	1.41
		B		13.106	13.960	0.000	0.000	0.25
		C		44.700	0.000	0.000	0.000	0.92
T8	20.00-0.00	A	0.500	34.870	14.900	0.000	0.000	0.85
		B		7.910	8.376	0.000	0.000	0.15
		C		26.820	0.000	0.000	0.000	0.55

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	160.00-140.00	A	0.000	2.279	2.490	3.988
		B	0.000	0.149	0.137	0.260
		C	0.000	1.512	1.758	2.646
T2	140.00-120.00	A	0.000	2.532	3.232	5.063
		B	0.000	0.107	0.113	0.215
		C	0.000	1.364	1.813	2.728
T3	120.00-100.00	A	0.000	3.432	5.476	8.579
		B	0.000	0.402	0.549	1.004
		C	0.000	1.849	3.072	4.623
T4	100.00-80.00	A	0.000	2.310	4.423	6.929
		B	0.000	0.589	0.974	1.767
		C	0.000	1.245	2.481	3.734
T5	80.00-60.00	A	0.000	1.640	3.142	4.921
		B	0.000	0.495	0.832	1.484
		C	0.000	0.884	1.762	2.652
T6	60.00-40.00	A	0.000	1.588	3.549	5.560
		B	0.000	0.512	1.010	1.792
		C	0.000	0.856	1.991	2.996
T7	40.00-20.00	A	0.000	1.550	3.462	5.424
		B	0.000	0.547	1.046	1.915
		C	0.000	0.835	1.942	2.923
T8	20.00-0.00	A	0.000	0.912	2.330	3.649
		B	0.000	0.323	0.705	1.292
		C	0.000	0.492	1.307	1.967

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	160.00-140.00	1.5133	-1.3377	2.0070	-2.2324
T2	140.00-120.00	-3.9845	2.5492	-2.5620	1.2866
T3	120.00-100.00	-2.3794	2.7282	-0.9133	1.5844
T4	100.00-80.00	-0.3025	3.9208	1.5038	2.7805
T5	80.00-60.00	0.7205	4.8879	2.7939	3.6297
T6	60.00-40.00	1.1934	4.9404	3.3323	3.7963
T7	40.00-20.00	1.7603	5.4633	4.4436	4.3379
T8	20.00-0.00	1.2223	3.6659	3.2011	3.0631

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10'0"x4" Pipe Mount (ATT)	A	None			0.0000	162.33	No Ice	4.50	4.50	0.11
							1/2" Ice	5.24	5.24	0.14
MB96RR900200DPBL (ATT)	A	None			0.0000	167.75	No Ice	11.47	7.58	0.04
							1/2" Ice	12.08	8.17	0.10
MB96RR900200DPBL (ATT)	B	None			0.0000	167.75	No Ice	11.47	7.58	0.04
							1/2" Ice	12.08	8.17	0.10
MB96RR900200DPBL (ATT)	C	None			0.0000	167.75	No Ice	11.47	7.58	0.04
							1/2" Ice	12.08	8.17	0.10
(2) CG1900W850 TMA (ATT)	A	None			0.0000	163.00	No Ice	1.29	0.32	0.02
							1/2" Ice	1.44	0.42	0.02
(2) CG1900W850 TMA (ATT)	B	None			0.0000	163.00	No Ice	1.29	0.32	0.02
							1/2" Ice	1.44	0.42	0.02
(2) CG1900W850 TMA (ATT)	C	None			0.0000	163.00	No Ice	1.29	0.32	0.02
							1/2" Ice	1.44	0.42	0.02
LPA-80063-4CF (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	7.00	6.08	0.02
			-6.00				1/2" Ice	7.41	6.48	0.07
			0.00							
DB948F85T2E-M (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	1.92	3.26	0.01
			-4.00				1/2" Ice	2.22	3.62	0.03
			0.00							
DB948F85T2E-M (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	1.92	3.26	0.01
			4.00				1/2" Ice	2.22	3.62	0.03
			0.00							
LPA-80063-4CF (Verizon)	A	From Leg	5.00		0.0000	156.50	No Ice	7.00	6.08	0.02
			6.00				1/2" Ice	7.41	6.48	0.07
			0.00							
LPA-80063-4CF (Verizon)	B	From Leg	5.00		0.0000	156.50	No Ice	7.00	6.08	0.02
			-6.00				1/2" Ice	7.41	6.48	0.07
			0.00							
DB948F85T2E-M (Verizon)	B	From Leg	5.00		0.0000	156.50	No Ice	1.92	3.26	0.01
			-4.00				1/2" Ice	2.22	3.62	0.03
			0.00							
DB948F85T2E-M (Verizon)	B	From Leg	5.00		0.0000	156.50	No Ice	1.92	3.26	0.01
			4.00				1/2" Ice	2.22	3.62	0.03

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
LPA-80063-4CF (Verizon)	B	From Leg	5.00 6.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
LPA-80063-4CF (Verizon)	C	From Leg	5.00 -6.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
DB948F85T2E-M (Verizon)	C	From Leg	5.00 -4.00 0.00	0.0000	156.50	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
DB948F85T2E-M (Verizon)	C	From Leg	5.00 4.00 0.00	0.0000	156.50	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
LPA-80063-4CF (Verizon)	C	From Leg	5.00 6.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	0.02 0.07
BXA-70040/6CF (Verizon Proposed)	A	From Leg	5.00 0.00 0.00	0.0000	156.50	No Ice 1/2" Ice	16.31 16.93	5.72 6.17	0.04 0.12
BXA-70040/6CF (Verizon Proposed)	B	From Leg	5.00 0.00 0.00	0.0000	156.50	No Ice 1/2" Ice	16.31 16.93	5.72 6.17	0.04 0.12
BXA-70063/6CF (Verizon Proposed)	C	From Leg	5.00 0.00 0.00	0.0000	156.50	No Ice 1/2" Ice	7.73 8.27	3.76 4.19	0.02 0.06
15' Frame (T-Mobile)	A	From Leg	0.50 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	9.55 13.15	3.80 5.40	0.35 0.49
15' Frame (T-Mobile)	B	From Leg	0.50 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	9.55 13.15	3.80 5.40	0.35 0.49
15' Frame (T-Mobile)	C	From Leg	0.50 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	9.55 13.15	3.80 5.40	0.35 0.49
(2) APXV18-209014 (T-Mobile)	A	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	3.57 3.91	2.00 2.33	0.01 0.03
(2) APXV18-209014 (T-Mobile)	B	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	3.57 3.91	2.00 2.33	0.01 0.03
(2) APXV18-209014 (T-Mobile)	C	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	3.57 3.91	2.00 2.33	0.01 0.03
APX16DWV-16DWVS-C-A20 (T-Mobile)	A	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-C-A20 (T-Mobile)	B	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-C-A20 (T-Mobile)	C	From Leg	4.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
TMA (T-Mobile)	A	From Leg	1.00 0.00 0.00	0.0000	147.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02
TMA (T-Mobile)	B	From Leg	1.00 0.00	0.0000	147.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	0.02 0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
TMA	C	From Leg	1.00	0.0000	147.00	No Ice	0.95	0.37	0.02
(T-Mobile)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) TMA 10"x8"x3"	A	From Leg	1.00	0.0000	147.00	No Ice	0.78	0.29	0.02
(T-Mobile)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
(2) TMA 10"x8"x3"	B	From Leg	1.00	0.0000	147.00	No Ice	0.78	0.29	0.02
(T-Mobile)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
(2) TMA 10"x8"x3"	C	From Leg	1.00	0.0000	147.00	No Ice	0.78	0.29	0.02
(T-Mobile)			0.00			1/2" Ice	0.90	0.38	0.02
			0.00						
4' Side Mount Standoff	C	From Leg	1.75	0.0000	99.00	No Ice	2.72	2.72	0.05
(Unknown)			0.00			1/2" Ice	4.91	4.91	0.09
			0.00						
16' x 2" Dia Omni	C	From Leg	3.50	0.0000	108.00	No Ice	3.20	3.20	0.04
(Unknown)			0.00			1/2" Ice	4.83	4.83	0.06
			0.00						
4' Side Mount Standoff	C	From Leg	2.25	0.0000	117.75	No Ice	2.72	2.72	0.05
(Unknown)			0.00			1/2" Ice	4.91	4.91	0.09
			0.00						
15' x 2" Dia Omni	C	From Leg	4.50	0.0000	127.50	No Ice	3.00	3.00	0.04
(Unknown)			0.00			1/2" Ice	4.53	4.53	0.06
			0.00						
5'0"x4.5" Pipe Mount	C	From Leg	0.75	0.0000	72.10	No Ice	1.76	1.76	0.05
(Unknown)			0.00			1/2" Ice	2.08	2.08	0.07
			0.00						
4' Side Mount Standoff	C	From Leg	1.50	0.0000	37.58	No Ice	2.72	2.72	0.05
(Unknown)			0.00			1/2" Ice	4.91	4.91	0.09
			0.00						
12' x 1-1/2" Dia Omni	C	From Leg	3.00	0.0000	45.41	No Ice	1.80	1.80	0.03
(Unknown)			0.00			1/2" Ice	3.02	3.02	0.04
			0.00						
15' x 2" Dia Omni	A	From Leg	0.75	0.0000	167.50	No Ice	3.00	3.00	0.04
(Unknown)			0.00			1/2" Ice	4.53	4.53	0.06
			0.00						
5'0"x4.5" Pipe Mount	A	From Leg	0.92	0.0000	102.20	No Ice	1.76	1.76	0.05
(Unknown)			0.00			1/2" Ice	2.08	2.08	0.07
			0.00						
5'0"x4.5" Pipe Mount	B	From Leg	0.75	0.0000	111.33	No Ice	1.76	1.76	0.05
(Unknown)			0.00			1/2" Ice	2.08	2.08	0.07
			0.00						
5'0"x4.5" Pipe Mount	B	From Leg	0.75	0.0000	93.83	No Ice	1.76	1.76	0.05
(Unknown)			0.00			1/2" Ice	2.08	2.08	0.07
			0.00						
4' Side Mount Standoff	A	From Leg	1.50	0.0000	47.00	No Ice	2.72	2.72	0.05
(Vacant)			0.00			1/2" Ice	4.91	4.91	0.09
(Unknown)			0.00						
Valmont 15' T-Frame P/N	A	From Leg	2.00	0.0000	156.00	No Ice	13.90	13.90	0.39
860109			0.00			1/2" Ice	20.00	20.00	0.53
(Verizon - proposed)			0.00						
Valmont 15' T-Frame P/N	B	From Leg	2.00	0.0000	156.00	No Ice	13.90	13.90	0.39
860109			0.00			1/2" Ice	20.00	20.00	0.53
(Verizon - proposed)			0.00						
Valmont 15' T-Frame P/N	C	From Leg	2.00	0.0000	156.00	No Ice	13.90	13.90	0.39
860109			0.00			1/2" Ice	20.00	20.00	0.53

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft	C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - proposed)			0.00					

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
10 FT DISH (Unknown)	C	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	10.0000		72.00	10.00	No Ice 1/2" Ice	78.54 79.81	0.32 0.73
6 FT DISH (Unknown)	A	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	-50.0000		102.00	6.00	No Ice 1/2" Ice	28.27 29.05	0.14 0.29
8 FT DISH (Unknown)	B	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	-30.0000		111.33	8.00	No Ice 1/2" Ice	50.30 51.29	0.25 0.51
6 FT DISH (Unknown)	B	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	0.0000		94.00	6.00	No Ice 1/2" Ice	28.27 29.05	0.14 0.29

Tower Pressures - No Ice

$G_H = 1.129$

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 160.00-140.00	150.00	1.541	25	175.992	A	9.825	43.228	9.583	18.06	0.000	0.000
					B	12.178	11.433		40.59	0.000	0.000
					C	10.557	33.343		21.83	0.000	0.000
T2 140.00-120.00	130.00	1.48	24	195.998	A	8.136	62.549	9.599	13.58	0.000	0.000
					B	11.255	11.449		42.28	0.000	0.000
					C	9.555	39.299		19.65	0.000	0.000
T3 120.00-100.00	110.00	1.411	23	236.398	A	17.967	62.550	9.600	11.92	0.000	0.000
					B	24.546	13.254		25.40	0.000	0.000
					C	20.372	39.300		16.09	0.000	0.000
T4 100.00-80.00	90.00	1.332	22	278.441	A	17.869	64.637	11.687	14.17	0.000	0.000
					B	27.424	17.237		26.17	0.000	0.000
					C	19.811	41.387		19.10	0.000	0.000
T5 80.00-60.00	70.00	1.24	20	321.010	A	15.036	67.976	15.026	18.10	0.000	0.000
					B	25.812	20.576		32.39	0.000	0.000
					C	16.415	44.726		24.58	0.000	0.000
T6 60.00-40.00	50.00	1.126	18	363.083	A	19.571	71.524	18.574	20.39	0.000	0.000
					B	31.626	24.124		33.32	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	21.130	48.274		26.76	0.000	0.000
T7 40.00-20.00	30.00	1	16	404.685	A	21.784	71.529	18.579	19.91	0.000	0.000
					B	33.715	25.067		31.61	0.000	0.000
					C	23.304	48.279		25.95	0.000	0.000
T8 20.00-0.00	10.00	1	16	448.055	A	28.936	53.890	22.120	26.71	0.000	0.000
					B	36.270	26.030		35.51	0.000	0.000
					C	29.959	39.940		31.65	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.129$

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 160.00-140.00	150.00	1.541	19	0.5000	177.658	A	17.018	62.878	12.917	16.17	0.000	0.000
						B	12.055	23.322		36.51	0.000	0.000
						C	9.669	54.202		20.22	0.000	0.000
T2 140.00-120.00	130.00	1.48	18	0.5000	197.666	A	31.138	74.207	12.938	12.28	0.000	0.000
						B	11.154	22.032		38.99	0.000	0.000
						C	8.640	61.958		18.33	0.000	0.000
T3 120.00-100.00	110.00	1.411	17	0.5000	238.067	A	39.698	77.002	12.939	11.09	0.000	0.000
						B	24.831	28.860		24.10	0.000	0.000
						C	18.821	65.167		15.41	0.000	0.000
T4 100.00-80.00	90.00	1.332	16	0.5000	280.110	A	40.197	78.264	15.026	12.68	0.000	0.000
						B	29.630	32.418		24.22	0.000	0.000
						C	18.558	65.913		17.79	0.000	0.000
T5 80.00-60.00	70.00	1.24	15	0.5000	322.678	A	38.089	80.900	18.365	15.43	0.000	0.000
						B	29.160	34.479		28.86	0.000	0.000
						C	15.525	68.240		21.92	0.000	0.000
T6 60.00-40.00	50.00	1.126	14	0.5000	364.752	A	42.394	85.047	21.913	17.19	0.000	0.000
						B	35.289	38.557		29.67	0.000	0.000
						C	20.124	72.363		23.69	0.000	0.000
T7 40.00-20.00	30.00	1	12	0.5000	406.354	A	44.655	85.699	21.919	16.82	0.000	0.000
						B	37.291	41.691		27.75	0.000	0.000
						C	22.323	72.997		23.00	0.000	0.000
T8 20.00-0.00	10.00	1	12	0.5000	449.724	A	42.517	67.233	25.459	23.20	0.000	0.000
						B	38.350	40.862		32.14	0.000	0.000
						C	29.299	59.604		28.64	0.000	0.000

Tower Pressure - Service

$G_H = 1.129$

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 160.00-140.00	150.00	1.541	10	175.992	A	9.825	43.228	9.583	18.06	0.000	0.000
					B	12.178	11.433		40.59	0.000	0.000
					C	10.557	33.343		21.83	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T2 140.00-120.00	130.00	1.48	9	195.998	A	8.136	62.549	9.599	13.58	0.000	0.000
					B	11.255	11.449		42.28	0.000	0.000
					C	9.555	39.299		19.65	0.000	0.000
T3 120.00-100.00	110.00	1.411	9	236.398	A	17.967	62.550	9.600	11.92	0.000	0.000
					B	24.546	13.254		25.40	0.000	0.000
					C	20.372	39.300		16.09	0.000	0.000
T4 100.00-80.00	90.00	1.332	9	278.441	A	17.869	64.637	11.687	14.17	0.000	0.000
					B	27.424	17.237		26.17	0.000	0.000
					C	19.811	41.387		19.10	0.000	0.000
T5 80.00-60.00	70.00	1.24	8	321.010	A	15.036	67.976	15.026	18.10	0.000	0.000
					B	25.812	20.576		32.39	0.000	0.000
					C	16.415	44.726		24.58	0.000	0.000
T6 60.00-40.00	50.00	1.126	7	363.083	A	19.571	71.524	18.574	20.39	0.000	0.000
					B	31.626	24.124		33.32	0.000	0.000
					C	21.130	48.274		26.76	0.000	0.000
T7 40.00-20.00	30.00	1	6	404.685	A	21.784	71.529	18.579	19.91	0.000	0.000
					B	33.715	25.067		31.61	0.000	0.000
					C	23.304	48.279		25.95	0.000	0.000
T8 20.00-0.00	10.00	1	6	448.055	A	28.936	53.890	22.120	26.71	0.000	0.000
					B	36.270	26.030		35.51	0.000	0.000
					C	29.959	39.940		31.65	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	1	1	36.469	2.38	119.14	A
			B	0.134	2.831	0.579	1	1	18.800			
			C	0.249	2.439	0.602	1	1	30.620			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	1	1	47.938	2.82	140.83	A
			B	0.116	2.901	0.577	1	1	17.860			
			C	0.249	2.44	0.602	1	1	33.201			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	1	1	57.321	3.28	164.02	A
			B	0.16	2.735	0.583	1	1	32.273			
			C	0.252	2.43	0.602	1	1	44.050			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	1	1	57.607	3.27	163.62	A
			B	0.16	2.734	0.583	1	1	37.475			
			C	0.22	2.531	0.595	1	1	44.422			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	1	1	56.100	3.10	155.12	A
			B	0.145	2.792	0.581	1	1	37.760			
			C	0.19	2.628	0.589	1	1	42.737			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	1	1	62.636	3.18	158.81	A
			B	0.154	2.758	0.582	1	1	45.667			
			C	0.191	2.626	0.589	1	1	49.545			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	1	1	64.495	2.98	148.93	A
			B	0.145	2.789	0.581	1	1	48.273			
			C	0.177	2.675	0.586	1	1	51.593			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	1	1	60.593	2.97	148.34	A
			B	0.139	2.812	0.58	1	1	51.364			
			C	0.156	2.75	0.582	1	1	53.221			
Sum Weight:	6.63	15.61						OTM	1873.96 kip-ft	23.98		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.825	1	34.749	2.27	113.53	A
			B	0.134	2.831	0.579	0.825	1	16.669			
			C	0.249	2.439	0.602	0.825	1	28.773			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.825	1	46.515	2.73	136.65	A
			B	0.116	2.901	0.577	0.825	1	15.890			
			C	0.249	2.44	0.602	0.825	1	31.529			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	0.825	1	54.177	3.10	155.02	A
			B	0.16	2.735	0.583	0.825	1	27.978			
			C	0.252	2.43	0.602	0.825	1	40.485			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.825	1	54.480	3.09	154.74	A
			B	0.16	2.734	0.583	0.825	1	32.676			
			C	0.22	2.531	0.595	0.825	1	40.955			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.825	1	53.469	2.96	147.85	A
			B	0.145	2.792	0.581	0.825	1	33.242			
			C	0.19	2.628	0.589	0.825	1	39.864			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.825	1	59.211	3.00	150.13	A
			B	0.154	2.758	0.582	0.825	1	40.133			
			C	0.191	2.626	0.589	0.825	1	45.848			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.825	1	60.683	2.80	140.13	A
			B	0.145	2.789	0.581	0.825	1	42.373			
			C	0.177	2.675	0.586	0.825	1	47.515			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.825	1	55.529	2.72	135.94	A
			B	0.139	2.812	0.58	0.825	1	45.017			
			C	0.156	2.75	0.582	0.825	1	47.978			
Sum Weight:	6.63	15.61						OTM	1783.82 kip-ft	22.68		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.8	1	34.504	2.25	112.72	A
			B	0.134	2.831	0.579	0.8	1	16.364			
			C	0.249	2.439	0.602	0.8	1	28.509			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.8	1	46.311	2.72	136.05	A
			B	0.116	2.901	0.577	0.8	1	15.609			
			C	0.249	2.44	0.602	0.8	1	31.290			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	0.8	1	53.728	3.07	153.74	A
			B	0.16	2.735	0.583	0.8	1	27.364			
			C	0.252	2.43	0.602	0.8	1	39.976			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.8	1	54.033	3.07	153.47	A
			B	0.16	2.734	0.583	0.8	1	31.990			
			C	0.22	2.531	0.595	0.8	1	40.459			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.8	1	53.093	2.94	146.81	A
			B	0.145	2.792	0.581	0.8	1	32.597			
			C	0.19	2.628	0.589	0.8	1	39.453			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.8	1	58.722	2.98	148.89	A
			B	0.154	2.758	0.582	0.8	1	39.342			
			C	0.191	2.626	0.589	0.8	1	45.320			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.8	1	60.138	2.78	138.87	A
			B	0.145	2.789	0.581	0.8	1	41.530			
			C	0.177	2.675	0.586	0.8	1	46.933			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.8	1	54.806	2.68	134.17	A
			B	0.139	2.812	0.58	0.8	1	44.110			
			C	0.156	2.75	0.582	0.8	1	47.229			
Sum Weight:	6.63	15.61						OTM	1770.95 kip-ft	22.49		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.85	1	34.995	2.29	114.33	A
			B	0.134	2.831	0.579	0.85	1	16.973			
			C	0.249	2.439	0.602	0.85	1	29.037			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.85	1	46.718	2.74	137.25	A
			B	0.116	2.901	0.577	0.85	1	16.171			
			C	0.249	2.44	0.602	0.85	1	31.768			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	0.85	1	54.626	3.13	156.31	A
			B	0.16	2.735	0.583	0.85	1	28.591			
			C	0.252	2.43	0.602	0.85	1	40.994			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.85	1	54.926	3.12	156.00	A
			B	0.16	2.734	0.583	0.85	1	33.361			
			C	0.22	2.531	0.595	0.85	1	41.450			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.85	1	53.845	2.98	148.89	A
			B	0.145	2.792	0.581	0.85	1	33.888			
			C	0.19	2.628	0.589	0.85	1	40.274			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.85	1	59.701	3.03	151.37	A
			B	0.154	2.758	0.582	0.85	1	40.923			
			C	0.191	2.626	0.589	0.85	1	46.376			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.85	1	61.227	2.83	141.38	A
			B	0.145	2.789	0.581	0.85	1	43.216			
			C	0.177	2.675	0.586	0.85	1	48.098			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.85	1	56.252	2.75	137.72	A
			B	0.139	2.812	0.58	0.85	1	45.923			
			C	0.156	2.75	0.582	0.85	1	48.727			
Sum Weight:	6.63	15.61						OTM	1796.70 kip-ft	22.86		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	1	1	59.344	2.50	125.22	A
			B	0.199	2.599	0.59	1	1	25.820			
			C	0.36	2.15	0.636	1	1	44.136			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	1	1	84.186	3.22	160.76	A
			B	0.168	2.707	0.584	1	1	24.028			
			C	0.357	2.155	0.635	1	1	47.987			
T3 120.00-100.00	2.42	2.44	A	0.49	1.913	0.693	1	1	93.025	3.48	174.11	A
			B	0.226	2.513	0.596	1	1	42.030			
			C	0.353	2.165	0.633	1	1	60.102			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	1	1	91.946	3.43	171.62	A
			B	0.222	2.526	0.595	1	1	48.920			
			C	0.302	2.292	0.616	1	1	59.185			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	1	1	89.813	3.29	164.42	A
			B	0.197	2.605	0.59	1	1	49.497			
			C	0.26	2.409	0.604	1	1	56.767			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	1	1	96.166	3.26	163.20	A
			B	0.202	2.588	0.591	1	1	58.072			
			C	0.254	2.427	0.603	1	1	63.744			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	1	1	98.002	3.05	152.40	A
			B	0.194	2.615	0.589	1	1	61.858			
			C	0.235	2.485	0.598	1	1	65.980			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	1	1	82.881	2.82	141.15	A
			B	0.176	2.678	0.586	1	1	62.288			
			C	0.198	2.604	0.59	1	1	64.461			
Sum Weight:	18.01	22.62						OTM	1998.64 kip-ft	25.06		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	0.825	1	56.366	2.38	118.94	A
			B	0.199	2.599	0.59	0.825	1	23.710			
			C	0.36	2.15	0.636	0.825	1	42.444			
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	0.825	1	78.737	3.01	150.35	A
			B	0.168	2.707	0.584	0.825	1	22.076			
			C	0.357	2.155	0.635	0.825	1	46.475			
T3 120.00-100.00	2.42	2.44	A	0.49	1.913	0.693	0.825	1	86.078	3.22	161.10	A
			B	0.226	2.513	0.596	0.825	1	37.685			
			C	0.353	2.165	0.633	0.825	1	56.809			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	0.825	1	84.912	3.17	158.49	A
			B	0.222	2.526	0.595	0.825	1	43.734			
			C	0.302	2.292	0.616	0.825	1	55.938			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	0.825	1	83.147	3.04	152.22	A
			B	0.197	2.605	0.59	0.825	1	44.394			
			C	0.26	2.409	0.604	0.825	1	54.051			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	0.825	1	88.747	3.01	150.61	A
			B	0.202	2.588	0.591	0.825	1	51.897			
			C	0.254	2.427	0.603	0.825	1	60.222			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	0.825	1	90.187	2.80	140.25	A
			B	0.194	2.615	0.589	0.825	1	55.332			
			C	0.235	2.485	0.598	0.825	1	62.073			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	0.825	1	75.441	2.57	128.48	A
			B	0.176	2.678	0.586	0.825	1	55.577			
			C	0.198	2.604	0.59	0.825	1	59.334			
Sum Weight:	18.01	22.62						OTM	1860.99	23.21		

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

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	0.8	1	55.941	2.36	118.04	A
			B	0.199	2.599	0.59	0.8	1	23.409			
			C	0.36	2.15	0.636	0.8	1	42.202			
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	0.8	1	77.958	2.98	148.86	A
			B	0.168	2.707	0.584	0.8	1	21.798			
			C	0.357	2.155	0.635	0.8	1	46.259			
T3 120.00-100.00	2.42	2.44	A	0.49	1.913	0.693	0.8	1	85.086	3.18	159.25	A
			B	0.226	2.513	0.596	0.8	1	37.064			
			C	0.353	2.165	0.633	0.8	1	56.338			
T4 100.00-80.00	2.51	2.52	A	0.423	2.02	0.661	0.8	1	83.907	3.13	156.61	A
			B	0.222	2.526	0.595	0.8	1	42.994			
			C	0.302	2.292	0.616	0.8	1	55.474			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	0.8	1	82.195	3.01	150.47	A
			B	0.197	2.605	0.59	0.8	1	43.665			
			C	0.26	2.409	0.604	0.8	1	53.662			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	0.8	1	87.687	2.98	148.81	A
			B	0.202	2.588	0.591	0.8	1	51.015			
			C	0.254	2.427	0.603	0.8	1	59.719			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	0.8	1	89.071	2.77	138.51	A
			B	0.194	2.615	0.589	0.8	1	54.400			
			C	0.235	2.485	0.598	0.8	1	61.515			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	0.8	1	74.378	2.53	126.67	A
			B	0.176	2.678	0.586	0.8	1	54.618			
			C	0.198	2.604	0.59	0.8	1	58.602			
Sum Weight:	18.01	22.62						OTM	1841.33 kip-ft	22.94		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	1.48	1.48	A	0.45	1.974	0.673	0.85	1	56.791	2.40	119.84	A
			B	0.199	2.599	0.59	0.85	1	24.011			
			C	0.36	2.15	0.636	0.85	1	42.686			
T2 140.00-120.00	2.36	1.39	A	0.533	1.861	0.715	0.85	1	79.515	3.04	151.84	A
			B	0.168	2.707	0.584	0.85	1	22.355			
			C	0.357	2.155	0.635	0.85	1	46.691			
T3 120.00-100.00	2.42	2.44	A	0.49	1.913	0.693	0.85	1	87.071	3.26	162.96	A
			B	0.226	2.513	0.596	0.85	1	38.305			
			C	0.353	2.165	0.633	0.85	1	57.279			
T4 100.00-	2.51	2.52	A	0.423	2.02	0.661	0.85	1	85.917	3.21	160.36	A

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
80.00			B	0.222	2.526	0.595	0.85	1	44.475			
			C	0.302	2.292	0.616	0.85	1	56.402			
T5 80.00-60.00	2.55	2.78	A	0.369	2.129	0.639	0.85	1	84.099	3.08	153.96	A
			B	0.197	2.605	0.59	0.85	1	45.123			
			C	0.26	2.409	0.604	0.85	1	54.439			
T6 60.00-40.00	2.56	3.63	A	0.349	2.173	0.632	0.85	1	89.806	3.05	152.41	A
			B	0.202	2.588	0.591	0.85	1	52.779			
			C	0.254	2.427	0.603	0.85	1	60.725			
T7 40.00-20.00	2.58	3.83	A	0.321	2.242	0.622	0.85	1	91.303	2.84	141.99	A
			B	0.194	2.615	0.589	0.85	1	56.264			
			C	0.235	2.485	0.598	0.85	1	62.631			
T8 20.00-0.00	1.55	4.55	A	0.244	2.456	0.6	0.85	1	76.504	2.61	130.29	A
			B	0.176	2.678	0.586	0.85	1	56.536			
			C	0.198	2.604	0.59	0.85	1	60.067			
Sum Weight:	18.01	22.62						OTM	1880.66 kip-ft	23.47		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	1	1	36.469	0.93	46.54	A
			B	0.134	2.831	0.579	1	1	18.800			
			C	0.249	2.439	0.602	1	1	30.620			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	1	1	47.938	1.10	55.01	A
			B	0.116	2.901	0.577	1	1	17.860			
			C	0.249	2.44	0.602	1	1	33.201			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	1	1	57.321	1.28	64.07	A
			B	0.16	2.735	0.583	1	1	32.273			
			C	0.252	2.43	0.602	1	1	44.050			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	1	1	57.607	1.28	63.91	A
			B	0.16	2.734	0.583	1	1	37.475			
			C	0.22	2.531	0.595	1	1	44.422			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	1	1	56.100	1.21	60.59	A
			B	0.145	2.792	0.581	1	1	37.760			
			C	0.19	2.628	0.589	1	1	42.737			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	1	1	62.636	1.24	62.04	A
			B	0.154	2.758	0.582	1	1	45.667			
			C	0.191	2.626	0.589	1	1	49.545			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	1	1	64.495	1.16	58.18	A
			B	0.145	2.789	0.581	1	1	48.273			
			C	0.177	2.675	0.586	1	1	51.593			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	1	1	60.593	1.16	57.95	A
			B	0.139	2.812	0.58	1	1	51.364			
			C	0.156	2.75	0.582	1	1	53.221			
Sum Weight:	6.63	15.61						OTM	732.02 kip-ft	9.37		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.825	1	34.749	0.89	44.35	A
			B	0.134	2.831	0.579	0.825	1	16.669			
			C	0.249	2.439	0.602	0.825	1	28.773			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.825	1	46.515	1.07	53.38	A
			B	0.116	2.901	0.577	0.825	1	15.890			
			C	0.249	2.44	0.602	0.825	1	31.529			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	0.825	1	54.177	1.21	60.56	A
			B	0.16	2.735	0.583	0.825	1	27.978			
			C	0.252	2.43	0.602	0.825	1	40.485			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.825	1	54.480	1.21	60.44	A
			B	0.16	2.734	0.583	0.825	1	32.676			
			C	0.22	2.531	0.595	0.825	1	40.955			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.825	1	53.469	1.16	57.75	A
			B	0.145	2.792	0.581	0.825	1	33.242			
			C	0.19	2.628	0.589	0.825	1	39.864			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.825	1	59.211	1.17	58.64	A
			B	0.154	2.758	0.582	0.825	1	40.133			
			C	0.191	2.626	0.589	0.825	1	45.848			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.825	1	60.683	1.09	54.74	A
			B	0.145	2.789	0.581	0.825	1	42.373			
			C	0.177	2.675	0.586	0.825	1	47.515			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.825	1	55.529	1.06	53.10	A
			B	0.139	2.812	0.58	0.825	1	45.017			
			C	0.156	2.75	0.582	0.825	1	47.978			
Sum Weight:	6.63	15.61						OTM	696.81 kip-ft	8.86		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.8	1	34.504	0.88	44.03	A
			B	0.134	2.831	0.579	0.8	1	16.364			
			C	0.249	2.439	0.602	0.8	1	28.509			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.8	1	46.311	1.06	53.15	A
			B	0.116	2.901	0.577	0.8	1	15.609			
			C	0.249	2.44	0.602	0.8	1	31.290			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	0.8	1	53.728	1.20	60.05	A
			B	0.16	2.735	0.583	0.8	1	27.364			
			C	0.252	2.43	0.602	0.8	1	39.976			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.8	1	54.033	1.20	59.95	A
			B	0.16	2.734	0.583	0.8	1	31.990			
			C	0.22	2.531	0.595	0.8	1	40.459			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.8	1	53.093	1.15	57.35	A
			B	0.145	2.792	0.581	0.8	1	32.597			
			C	0.19	2.628	0.589	0.8	1	39.453			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.8	1	58.722	1.16	58.16	A
			B	0.154	2.758	0.582	0.8	1	39.342			
			C	0.191	2.626	0.589	0.8	1	45.320			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.8	1	60.138	1.08	54.25	A
			B	0.145	2.789	0.581	0.8	1	41.530			
			C	0.177	2.675	0.586	0.8	1	46.933			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.8	1	54.806	1.05	52.41	A
			B	0.139	2.812	0.58	0.8	1	44.110			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
Sum Weight:	6.63	15.61	C	0.156	2.75	0.582	0.8	1 OTM	47.229 691.78 kip-ft	8.79		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 160.00-140.00	0.56	0.90	A	0.301	2.292	0.616	0.85	1	34.995	0.89	44.66	A
			B	0.134	2.831	0.579	0.85	1	16.973			
			C	0.249	2.439	0.602	0.85	1	29.037			
T2 140.00-120.00	0.88	0.86	A	0.361	2.147	0.636	0.85	1	46.718	1.07	53.61	A
			B	0.116	2.901	0.577	0.85	1	16.171			
			C	0.249	2.44	0.602	0.85	1	31.768			
T3 120.00-100.00	0.90	1.52	A	0.341	2.194	0.629	0.85	1	54.626	1.22	61.06	A
			B	0.16	2.735	0.583	0.85	1	28.591			
			C	0.252	2.43	0.602	0.85	1	40.994			
T4 100.00-80.00	0.92	1.63	A	0.296	2.306	0.615	0.85	1	54.926	1.22	60.94	A
			B	0.16	2.734	0.583	0.85	1	33.361			
			C	0.22	2.531	0.595	0.85	1	41.450			
T5 80.00-60.00	0.93	1.99	A	0.259	2.412	0.604	0.85	1	53.845	1.16	58.16	A
			B	0.145	2.792	0.581	0.85	1	33.888			
			C	0.19	2.628	0.589	0.85	1	40.274			
T6 60.00-40.00	0.94	2.65	A	0.251	2.435	0.602	0.85	1	59.701	1.18	59.13	A
			B	0.154	2.758	0.582	0.85	1	40.923			
			C	0.191	2.626	0.589	0.85	1	46.376			
T7 40.00-20.00	0.94	2.78	A	0.231	2.497	0.597	0.85	1	61.227	1.10	55.23	A
			B	0.145	2.789	0.581	0.85	1	43.216			
			C	0.177	2.675	0.586	0.85	1	48.098			
T8 20.00-0.00	0.57	3.28	A	0.185	2.647	0.587	0.85	1	56.252	1.08	53.80	A
			B	0.139	2.812	0.58	0.85	1	45.923			
			C	0.156	2.75	0.582	0.85	1	48.727			
Sum Weight:	6.63	15.61						OTM	701.84 kip-ft	8.93		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	6.55					
Bracing Weight	9.06					
Total Member Self-Weight	15.61			16.61	4.96	
Total Weight	26.84			16.61	4.96	
Wind 0 deg - No Ice		0.45	-34.20	-3222.39	-15.89	-0.93
Wind 30 deg - No Ice		18.18	-28.40	-2689.15	-1705.87	9.50
Wind 45 deg - No Ice		24.99	-22.95	-2166.94	-2362.45	11.39
Wind 60 deg - No Ice		30.00	-16.13	-1514.84	-2848.03	13.03

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 90 deg - No Ice		34.88	-0.13	20.77	-3308.91	15.75
Wind 120 deg - No Ice		31.51	16.46	1595.65	-2965.63	15.73
Wind 135 deg - No Ice		25.01	22.69	2205.39	-2380.24	14.98
Wind 150 deg - No Ice		17.71	28.55	2752.91	-1692.53	13.49
Wind 180 deg - No Ice		-0.03	32.92	3173.55	-13.56	2.70
Wind 210 deg - No Ice		-17.89	28.30	2717.97	1700.20	-10.99
Wind 225 deg - No Ice		-24.71	22.81	2194.05	2359.29	-13.38
Wind 240 deg - No Ice		-31.11	16.72	1591.06	2944.76	-15.15
Wind 270 deg - No Ice		-34.67	-0.04	0.01	3313.13	-17.86
Wind 300 deg - No Ice		-30.21	-15.94	-1529.15	2898.75	-16.72
Wind 315 deg - No Ice		-25.09	-22.96	-2192.12	2407.89	-17.52
Wind 330 deg - No Ice		-18.19	-28.43	-2706.10	1749.94	-16.46
Member Ice	7.01					
Total Weight Ice	48.44			40.49	16.64	
Wind 0 deg - Ice		0.34	-33.91	-3146.40	1.01	1.18
Wind 30 deg - Ice		17.42	-27.80	-2592.40	-1617.16	8.71
Wind 45 deg - Ice		23.99	-22.43	-2082.61	-2247.23	9.84
Wind 60 deg - Ice		28.82	-15.73	-1446.20	-2712.03	10.72
Wind 90 deg - Ice		33.70	-0.09	43.82	-3168.76	12.00
Wind 120 deg - Ice		30.82	16.47	1603.20	-2869.99	11.12
Wind 135 deg - Ice		24.01	22.24	2167.93	-2260.90	10.25
Wind 150 deg - Ice		17.06	27.92	2696.97	-1607.17	8.84
Wind 180 deg - Ice		-0.02	31.96	3086.22	2.27	0.45
Wind 210 deg - Ice		-17.19	27.73	2670.19	1638.42	-9.85
Wind 225 deg - Ice		-23.78	22.33	2159.02	2270.50	-11.37
Wind 240 deg - Ice		-30.51	16.67	1599.33	2879.74	-12.59
Wind 270 deg - Ice		-33.54	-0.03	27.66	3197.73	-13.63
Wind 300 deg - Ice		-28.98	-15.59	-1457.46	2776.61	-11.93
Wind 315 deg - Ice		-24.07	-22.44	-2102.16	2307.82	-12.20
Wind 330 deg - Ice		-17.43	-27.83	-2605.58	1676.76	-11.11
Total Weight	26.84			16.61	4.96	
Wind 0 deg - Service		0.18	-13.36	-1262.58	-6.22	-0.36
Wind 30 deg - Service		7.10	-11.09	-1054.29	-666.37	3.71
Wind 45 deg - Service		9.76	-8.96	-850.30	-922.84	4.45
Wind 60 deg - Service		11.72	-6.30	-595.57	-1112.52	5.09
Wind 90 deg - Service		13.63	-0.05	4.28	-1292.55	6.15
Wind 120 deg - Service		12.31	6.43	619.47	-1158.46	6.14
Wind 135 deg - Service		9.77	8.86	857.65	-929.79	5.85
Wind 150 deg - Service		6.92	11.15	1071.52	-661.15	5.27
Wind 180 deg - Service		-0.01	12.86	1235.83	-5.31	1.05
Wind 210 deg - Service		-6.99	11.06	1057.87	664.13	-4.29
Wind 225 deg - Service		-9.65	8.91	853.22	921.59	-5.22
Wind 240 deg - Service		-12.15	6.53	617.67	1150.29	-5.92
Wind 270 deg - Service		-13.54	-0.01	-3.83	1294.18	-6.98
Wind 300 deg - Service		-11.80	-6.23	-601.16	1132.31	-6.53
Wind 315 deg - Service		-9.80	-8.97	-860.13	940.57	-6.84
Wind 330 deg - Service		-7.11	-11.11	-1060.91	683.56	-6.43

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	160 - 140	Leg	Max Tension	10	16.11	0.02	1.27
			Max. Compression	7	-19.31	-0.88	-0.53
			Max. Mx	7	-19.31	1.15	0.71
			Max. My	2	-19.21	-0.02	-1.35
			Max. Vy	7	4.07	-0.88	-0.53
			Max. Vx	2	-4.75	0.02	1.03
		Diagonal	Max Tension	17	3.78	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	9	-3.79	0.00	0.00
			Max. Mx	34	1.64	0.02	-0.00
			Max. My	17	-3.74	0.00	-0.00
			Max. Vy	34	0.01	0.02	-0.00
			Max. Vx	17	-0.00	0.00	0.00
		Top Girt	Max Tension	3	0.00	0.00	0.00
			Max. Compression	19	-0.08	0.00	0.00
			Max. Mx	30	-0.07	-0.04	0.00
			Max. My	28	-0.05	0.00	0.00
			Max. Vy	30	0.02	0.00	0.00
			Max. Vx	28	-0.00	0.00	0.00
T2	140 - 120	Leg	Max Tension	10	32.08	0.03	-0.04
			Max. Compression	7	-36.39	-0.08	0.03
			Max. Mx	7	-22.64	1.03	0.02
			Max. My	6	-1.31	0.01	0.31
			Max. Vy	2	0.21	1.03	-0.02
			Max. Vx	34	-0.10	0.03	0.05
		Diagonal	Max Tension	9	3.39	0.00	0.00
			Max. Compression	17	-3.54	0.00	0.00
			Max. Mx	24	2.87	0.03	-0.00
			Max. My	26	-3.33	0.00	0.01
			Max. Vy	32	0.02	0.03	0.00
			Max. Vx	33	0.00	0.00	0.00
T3	120 - 100	Leg	Max Tension	10	50.82	-0.09	0.01
			Max. Compression	24	-58.16	0.16	0.19
			Max. Mx	15	44.04	0.43	0.21
			Max. My	12	8.92	0.26	-0.79
			Max. Vy	15	-0.36	-0.28	0.21
			Max. Vx	12	0.67	-0.22	0.54
		Diagonal	Max Tension	14	4.86	0.00	0.00
			Max. Compression	14	-4.91	0.00	0.00
			Max. Mx	24	3.38	0.06	-0.00
			Max. My	31	-4.18	0.01	0.01
			Max. Vy	24	-0.02	0.06	-0.00
			Max. Vx	31	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	24	1.01	0.00	0.00
			Max. Compression	24	-1.01	0.00	0.00
			Max. Mx	18	0.10	-0.10	0.00
			Max. My	31	0.09	0.00	0.00
			Max. Vy	18	-0.03	0.00	0.00
			Max. Vx	31	-0.00	0.00	0.00
T4	100 - 80	Leg	Max Tension	15	72.18	-0.04	-0.06
			Max. Compression	24	-82.73	0.16	-0.18
			Max. Mx	22	62.84	-0.45	-0.05
			Max. My	17	-6.29	0.03	0.41
			Max. Vy	15	0.34	-0.20	0.07
			Max. Vx	3	0.38	-0.01	-0.27
		Diagonal	Max Tension	14	5.45	0.00	0.00
			Max. Compression	14	-5.47	0.00	0.00
			Max. Mx	24	4.03	0.08	-0.01
			Max. My	22	-4.31	0.02	-0.01
			Max. Vy	24	-0.03	0.08	-0.01
			Max. Vx	22	0.00	0.00	0.00
T5	80 - 60	Leg	Max Tension	15	91.98	-0.57	0.40
			Max. Compression	30	-105.59	-0.13	0.01
			Max. Mx	5	88.96	-0.80	-0.13
			Max. My	17	-8.85	0.07	0.87
			Max. Vy	5	0.73	-0.80	-0.13
			Max. Vx	17	-0.79	0.07	0.87
		Diagonal	Max Tension	6	7.34	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	14	-7.40	0.00	0.00
			Max. Mx	27	4.29	0.11	0.01
			Max. My	31	-6.31	0.05	0.01
			Max. Vy	32	0.04	0.10	0.01
			Max. Vx	28	-0.00	0.00	0.00
T6	60 - 40	Leg	Max Tension	15	113.61	-0.41	0.01
			Max. Compression	30	-131.04	-0.34	0.00
			Max. Mx	32	102.33	-1.13	0.05
			Max. My	17	-10.56	-0.01	0.47
			Max. Vy	22	0.19	-1.12	-0.01
			Max. Vx	17	-0.10	-0.01	0.47
		Diagonal	Max Tension	23	7.51	0.00	0.00
			Max. Compression	14	-7.54	0.00	0.00
			Max. Mx	24	5.02	0.16	-0.01
			Max. My	24	-0.34	0.14	-0.02
			Max. Vy	32	0.05	0.16	-0.01
			Max. Vx	24	0.00	0.00	0.00
T7	40 - 20	Leg	Max Tension	15	133.40	-0.30	0.02
			Max. Compression	30	-155.36	-0.90	0.02
			Max. Mx	32	120.18	-1.84	0.02
			Max. My	9	-3.57	-0.06	-0.55
			Max. Vy	22	0.30	-1.84	-0.02
			Max. Vx	11	0.10	-0.06	0.54
		Diagonal	Max Tension	23	7.86	0.00	0.00
			Max. Compression	23	-7.73	0.00	0.00
			Max. Mx	32	5.24	0.19	-0.02
			Max. My	31	-7.58	0.11	0.02
			Max. Vy	32	0.06	0.19	-0.02
			Max. Vx	31	-0.00	0.00	0.00
T8	20 - 0	Leg	Max Tension	15	152.30	-0.55	0.04
			Max. Compression	30	-178.69	-0.00	0.00
			Max. Mx	24	-165.19	2.12	-0.01
			Max. My	14	-8.12	-0.06	-1.12
			Max. Vy	22	-0.36	-1.84	-0.02
			Max. Vx	11	0.18	-0.08	1.10
		Diagonal	Max Tension	23	8.97	0.00	0.00
			Max. Compression	23	-8.79	0.00	0.00
			Max. Mx	32	3.93	0.29	0.02
			Max. My	31	-8.66	0.19	0.03
			Max. Vy	32	0.08	0.29	0.02
			Max. Vx	31	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	30	183.33	17.04	-9.37
	Max. H_x	13	178.45	18.83	-10.33
	Max. H_z	21	-135.50	-17.06	10.24
	Min. Vert	5	-154.39	-16.88	9.28
	Min. H_x	22	-139.78	-17.81	9.93
	Min. H_z	13	178.45	18.83	-10.33
Leg B	Max. Vert	24	183.00	-17.12	-9.39
	Max. H_x	32	-142.90	17.91	9.94
	Max. H_z	33	-138.66	17.16	10.24
	Min. Vert	15	-156.98	17.01	9.22

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg A	Min. H_x	7	179.49	-18.97	-10.33
	Min. H_z	7	179.49	-18.97	-10.33
	Max. Vert	19	175.86	-0.02	18.88
	Max. H_x	14	8.94	2.27	0.76
	Max. H_z	2	172.21	-0.07	20.81
	Min. Vert	10	-151.84	0.08	-18.63
	Min. H_x	6	7.89	-2.36	0.80
	Min. H_z	27	-140.52	0.01	-19.96

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	26.84	0.00	0.00	16.61	4.96	-0.00
Dead+Wind 0 deg - No Ice	26.84	0.45	-34.20	-3230.72	-15.89	-0.95
Dead+Wind 30 deg - No Ice	26.84	18.18	-28.40	-2696.12	-1710.22	9.53
Dead+Wind 45 deg - No Ice	26.84	24.99	-22.95	-2172.54	-2368.50	11.44
Dead+Wind 60 deg - No Ice	26.84	30.00	-16.13	-1518.74	-2855.35	13.09
Dead+Wind 90 deg - No Ice	26.84	34.88	-0.13	20.89	-3317.39	15.83
Dead+Wind 120 deg - No Ice	26.84	31.51	16.46	1599.87	-2973.18	15.80
Dead+Wind 135 deg - No Ice	26.84	25.01	22.69	2211.20	-2386.32	15.04
Dead+Wind 150 deg - No Ice	26.84	17.71	28.55	2760.09	-1696.86	13.54
Dead+Wind 180 deg - No Ice	26.84	-0.03	32.92	3181.80	-13.63	2.72
Dead+Wind 210 deg - No Ice	26.84	-17.89	28.30	2725.06	1704.50	-11.00
Dead+Wind 225 deg - No Ice	26.84	-24.71	22.81	2199.80	2365.31	-13.42
Dead+Wind 240 deg - No Ice	26.84	-31.11	16.72	1595.21	2952.27	-15.21
Dead+Wind 270 deg - No Ice	26.84	-34.67	-0.04	0.04	3321.64	-17.94
Dead+Wind 300 deg - No Ice	26.84	-30.21	-15.94	-1533.13	2906.21	-16.80
Dead+Wind 315 deg - No Ice	26.84	-25.09	-22.96	-2197.81	2414.10	-17.59
Dead+Wind 330 deg - No Ice	26.84	-18.19	-28.43	-2713.12	1754.45	-16.51
Dead+Ice+Temp	48.44	0.00	-0.00	40.68	16.70	0.00
Dead+Wind 0 deg+Ice+Temp	48.44	0.34	-33.91	-3160.53	1.08	1.12
Dead+Wind 30 deg+Ice+Temp	48.44	17.42	-27.80	-2604.02	-1624.30	8.75
Dead+Wind 45 deg+Ice+Temp	48.44	23.99	-22.43	-2091.94	-2257.21	9.93
Dead+Wind 60 deg+Ice+Temp	48.44	28.82	-15.73	-1452.67	-2724.11	10.84
Dead+Wind 90 deg+Ice+Temp	48.44	33.70	-0.09	44.09	-3182.85	12.17
Dead+Wind 120 deg+Ice+Temp	48.44	30.82	16.47	1610.57	-2882.66	11.31
Dead+Wind 135 deg+Ice+Temp	48.44	24.01	22.24	2177.77	-2270.94	10.42
Dead+Wind 150 deg+Ice+Temp	48.44	17.06	27.92	2709.13	-1614.31	8.98
Dead+Wind 180 deg+Ice+Temp	48.44	-0.02	31.96	3100.11	2.23	0.51
Dead+Wind 210 deg+Ice+Temp	48.44	-17.19	27.73	2682.21	1645.64	-9.89
Dead+Wind 225 deg+Ice+Temp	48.44	-23.78	22.33	2168.76	2280.56	-11.45
Dead+Wind 240 deg+Ice+Temp	48.44	-30.51	16.67	1606.61	2892.48	-12.72
Dead+Wind 270 deg+Ice+Temp	48.44	-33.54	-0.03	27.80	3211.97	-13.80
Dead+Wind 300 deg+Ice+Temp	48.44	-28.98	-15.59	-1464.05	2789.01	-12.11
Dead+Wind 315 deg+Ice+Temp	48.44	-24.07	-22.44	-2111.62	2318.10	-12.38
Dead+Wind 330 deg+Ice+Temp	48.44	-17.43	-27.83	-2617.29	1684.23	-11.25
Dead+Wind 0 deg - Service	26.84	0.18	-13.36	-1251.87	-3.18	-0.37
Dead+Wind 30 deg - Service	26.84	7.10	-11.09	-1043.04	-665.03	3.72
Dead+Wind 45 deg - Service	26.84	9.76	-8.96	-838.52	-922.17	4.47
Dead+Wind 60 deg - Service	26.84	11.72	-6.30	-583.12	-1112.35	5.11
Dead+Wind 90 deg - Service	26.84	13.63	-0.05	18.30	-1292.84	6.18
Dead+Wind 120 deg - Service	26.84	12.31	6.43	635.10	-1158.39	6.17
Dead+Wind 135 deg - Service	26.84	9.77	8.86	873.90	-929.14	5.88
Dead+Wind 150 deg - Service	26.84	6.92	11.15	1088.32	-659.82	5.29
Dead+Wind 180 deg - Service	26.84	-0.01	12.86	1253.05	-2.30	1.06

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 210 deg - Service	26.84	-6.99	11.06	1074.63	668.86	-4.30
Dead+Wind 225 deg - Service	26.84	-9.65	8.91	869.45	926.99	-5.24
Dead+Wind 240 deg - Service	26.84	-12.15	6.53	633.28	1156.28	-5.94
Dead+Wind 270 deg - Service	26.84	-13.54	-0.01	10.15	1300.56	-7.01
Dead+Wind 300 deg - Service	26.84	-11.80	-6.23	-588.75	1138.28	-6.56
Dead+Wind 315 deg - Service	26.84	-9.80	-8.97	-848.39	946.04	-6.87
Dead+Wind 330 deg - Service	26.84	-7.11	-11.11	-1049.68	688.36	-6.45

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-26.84	0.00	0.00	26.84	0.00	0.000%
2	0.45	-26.84	-34.20	-0.45	26.84	34.20	0.000%
3	18.18	-26.84	-28.40	-18.18	26.84	28.40	0.000%
4	24.99	-26.84	-22.95	-24.99	26.84	22.95	0.000%
5	30.00	-26.84	-16.13	-30.00	26.84	16.13	0.000%
6	34.88	-26.84	-0.13	-34.88	26.84	0.13	0.000%
7	31.51	-26.84	16.46	-31.51	26.84	-16.46	0.000%
8	25.01	-26.84	22.69	-25.01	26.84	-22.69	0.000%
9	17.71	-26.84	28.55	-17.71	26.84	-28.55	0.000%
10	-0.03	-26.84	32.92	0.03	26.84	-32.92	0.000%
11	-17.89	-26.84	28.30	17.89	26.84	-28.30	0.000%
12	-24.71	-26.84	22.81	24.71	26.84	-22.81	0.000%
13	-31.11	-26.84	16.72	31.11	26.84	-16.72	0.000%
14	-34.67	-26.84	-0.04	34.67	26.84	0.04	0.000%
15	-30.21	-26.84	-15.94	30.21	26.84	15.94	0.000%
16	-25.09	-26.84	-22.96	25.09	26.84	22.96	0.000%
17	-18.19	-26.84	-28.43	18.19	26.84	28.43	0.002%
18	0.00	-48.44	0.00	-0.00	48.44	0.00	0.000%
19	0.34	-48.44	-33.91	-0.34	48.44	33.91	0.000%
20	17.42	-48.44	-27.80	-17.42	48.44	27.80	0.000%
21	23.99	-48.44	-22.43	-23.99	48.44	22.43	0.000%
22	28.82	-48.44	-15.73	-28.82	48.44	15.73	0.000%
23	33.70	-48.44	-0.09	-33.70	48.44	0.09	0.000%
24	30.82	-48.44	16.47	-30.82	48.44	-16.47	0.000%
25	24.01	-48.44	22.24	-24.01	48.44	-22.24	0.000%
26	17.06	-48.44	27.92	-17.06	48.44	-27.92	0.000%
27	-0.02	-48.44	31.96	0.02	48.44	-31.96	0.000%
28	-17.19	-48.44	27.73	17.19	48.44	-27.73	0.000%
29	-23.78	-48.44	22.33	23.78	48.44	-22.33	0.000%
30	-30.51	-48.44	16.67	30.51	48.44	-16.67	0.000%
31	-33.54	-48.44	-0.03	33.54	48.44	0.03	0.000%
32	-28.98	-48.44	-15.59	28.98	48.44	15.59	0.000%
33	-24.07	-48.44	-22.44	24.07	48.44	22.44	0.000%
34	-17.43	-48.44	-27.83	17.43	48.44	27.83	0.000%
35	0.18	-26.84	-13.36	-0.18	26.84	13.36	0.000%
36	7.10	-26.84	-11.09	-7.10	26.84	11.09	0.000%
37	9.76	-26.84	-8.96	-9.76	26.84	8.96	0.000%
38	11.72	-26.84	-6.30	-11.72	26.84	6.30	0.000%
39	13.63	-26.84	-0.05	-13.63	26.84	0.05	0.000%
40	12.31	-26.84	6.43	-12.31	26.84	-6.43	0.000%
41	9.77	-26.84	8.86	-9.77	26.84	-8.86	0.000%
42	6.92	-26.84	11.15	-6.92	26.84	-11.15	0.000%
43	-0.01	-26.84	12.86	0.01	26.84	-12.86	0.000%
44	-6.99	-26.84	11.06	6.99	26.84	-11.06	0.000%
45	-9.65	-26.84	8.91	9.65	26.84	-8.91	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
46	-12.15	-26.84	6.53	12.15	26.84	-6.53	0.000%
47	-13.54	-26.84	-0.01	13.54	26.84	0.01	0.000%
48	-11.80	-26.84	-6.23	11.80	26.84	6.23	0.000%
49	-9.80	-26.84	-8.97	9.80	26.84	8.97	0.000%
50	-7.11	-26.84	-11.11	7.11	26.84	11.11	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	0.00000500
3	Yes	4	0.00000001	0.00000696
4	Yes	4	0.00000001	0.00000707
5	Yes	4	0.00000001	0.00000649
6	Yes	4	0.00000001	0.00000582
7	Yes	4	0.00000001	0.00000735
8	Yes	4	0.00000001	0.00000695
9	Yes	4	0.00000001	0.00000473
10	Yes	4	0.00000001	0.00000444
11	Yes	4	0.00000001	0.00001023
12	Yes	4	0.00000001	0.00001141
13	Yes	4	0.00000001	0.00001051
14	Yes	4	0.00000001	0.00000562
15	Yes	4	0.00000001	0.00000558
16	Yes	4	0.00000001	0.00000567
17	Yes	4	0.00000001	0.00000466
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000462
20	Yes	4	0.00000001	0.00000822
21	Yes	4	0.00000001	0.00000794
22	Yes	4	0.00000001	0.00000785
23	Yes	4	0.00000001	0.00000685
24	Yes	4	0.00000001	0.00000653
25	Yes	4	0.00000001	0.00000642
26	Yes	4	0.00000001	0.00000613
27	Yes	4	0.00000001	0.00000700
28	Yes	4	0.00000001	0.00001013
29	Yes	4	0.00000001	0.00001046
30	Yes	4	0.00000001	0.00000942
31	Yes	4	0.00000001	0.00000614
32	Yes	4	0.00000001	0.00000699
33	Yes	4	0.00000001	0.00000676
34	Yes	4	0.00000001	0.00000541
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001

47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	4.770	40	0.2726	0.0122
T2	140 - 120	3.612	40	0.2581	0.0135
T3	120 - 100	2.581	40	0.2139	0.0142
T4	100 - 80	1.751	40	0.1662	0.0115
T5	80 - 60	1.107	40	0.1218	0.0089
T6	60 - 40	0.639	40	0.0867	0.0063
T7	40 - 20	0.305	40	0.0586	0.0039
T8	20 - 0	0.091	40	0.0286	0.0017

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.75	MB96RR900200DPBL	40	4.770	0.2726	0.0122	139999
167.50	15' x 2" Dia Omni	40	4.770	0.2726	0.0122	139999
163.00	(2) CG1900W850 TMA	40	4.770	0.2726	0.0122	139999
162.33	10'0"x4" Pipe Mount	40	4.770	0.2726	0.0122	139999
156.50	LPA-80063-4CF	40	4.564	0.2713	0.0124	139999
156.00	Valmont 15' T-Frame P/N 860109	40	4.534	0.2712	0.0124	139999
147.00	15' Frame	40	4.009	0.2661	0.0129	53846
127.50	15' x 2" Dia Omni	40	2.946	0.2325	0.0143	25222
117.75	4' Side Mount Standoff	40	2.478	0.2083	0.0141	22185
111.33	8 FT DISH	40	2.197	0.1928	0.0133	23679
108.00	16' x 2" Dia Omni	40	2.059	0.1849	0.0128	24596
102.20	5'0"x4.5" Pipe Mount	40	1.833	0.1713	0.0119	26258
102.00	6 FT DISH	40	1.825	0.1709	0.0118	26308
99.00	4' Side Mount Standoff	40	1.715	0.1639	0.0114	26784
94.00	6 FT DISH	40	1.539	0.1523	0.0106	26601
93.83	5'0"x4.5" Pipe Mount	40	1.533	0.1520	0.0106	26589
72.10	5'0"x4.5" Pipe Mount	40	0.903	0.1067	0.0079	29381
72.00	10 FT DISH	40	0.901	0.1065	0.0079	29435
47.00	4' Side Mount Standoff (Vacant)	40	0.408	0.0683	0.0047	41597
45.41	12' x 1-1/2" Dia Omni	40	0.383	0.0662	0.0045	42118
37.58	4' Side Mount Standoff	40	0.272	0.0551	0.0036	41592

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	12.173	7	0.6950	0.0311
T2	140 - 120	9.218	7	0.6582	0.0345
T3	120 - 100	6.590	7	0.5453	0.0364
T4	100 - 80	4.473	7	0.4240	0.0295
T5	80 - 60	2.829	7	0.3109	0.0227
T6	60 - 40	1.633	7	0.2214	0.0161
T7	40 - 20	0.779	7	0.1497	0.0100
T8	20 - 0	0.231	7	0.0730	0.0044

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167.75	MB96RR900200DPBL	7	12.173	0.6950	0.0311	54977
167.50	15' x 2" Dia Omni	7	12.173	0.6950	0.0311	54977
163.00	(2) CG1900W850 TMA	7	12.173	0.6950	0.0311	54977
162.33	10'0"x4" Pipe Mount	7	12.173	0.6950	0.0311	54977
156.50	LPA-80063-4CF	7	11.646	0.6919	0.0317	54977
156.00	Valmont 15' T-Frame P/N 860109	7	11.571	0.6914	0.0318	54977
147.00	15' Frame	7	10.231	0.6785	0.0332	21145
127.50	15' x 2" Dia Omni	7	7.521	0.5930	0.0367	9913
117.75	4' Side Mount Standoff	7	6.326	0.5311	0.0360	8725
111.33	8 FT DISH	7	5.610	0.4916	0.0341	9308
108.00	16' x 2" Dia Omni	7	5.259	0.4715	0.0328	9658
102.20	5'0"x4.5" Pipe Mount	7	4.681	0.4370	0.0304	10314
102.00	6 FT DISH	7	4.662	0.4358	0.0303	10334
99.00	4' Side Mount Standoff	7	4.379	0.4181	0.0291	10524
94.00	6 FT DISH	7	3.931	0.3887	0.0273	10454
93.83	5'0"x4.5" Pipe Mount	7	3.916	0.3877	0.0272	10450
72.10	5'0"x4.5" Pipe Mount	7	2.308	0.2724	0.0202	11535
72.00	10 FT DISH	7	2.302	0.2720	0.0201	11556
47.00	4' Side Mount Standoff (Vacant)	7	1.044	0.1746	0.0120	16287
45.41	12' x 1-1/2" Dia Omni	7	0.980	0.1690	0.0116	16492
37.58	4' Side Mount Standoff	7	0.695	0.1407	0.0092	16288

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325N	0.6250	4	4.03	13.30	0.303 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.79	4.12	0.919 ✓	1.333	Bolt Shear
T2	140	Leg	A325N	0.6250	4	8.02	13.50	0.594 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	3.54	4.12	0.859 ✓	1.333	Bolt Shear
T3	120	Leg	A325N	0.7500	4	12.69	19.44	0.653 ✓	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4.91	4.12	1.190 ✓	1.333	Bolt Shear
		Secondary	A325X	0.7500	2	0.50	9.79	0.052 ✓	1.333	Member Bearing

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T4	100	Horizontal Leg	A325N	0.8750	4	18.05	26.46	0.682 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.5000	1	5.45	4.76	1.146 ✔	1.333	Member Bearing
T5	80	Leg	A325N	1.0000	4	22.99	34.56	0.665 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7.40	6.44	1.149 ✔	1.333	Bolt Shear
T6	60	Leg	A325N	1.0000	4	28.40	34.56	0.822 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7.54	6.44	1.171 ✔	1.333	Bolt Shear
T7	40	Leg	A325N	1.0000	6	22.23	34.56	0.643 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7.86	6.44	1.219 ✔	1.333	Bolt Shear
T8	20	Leg	A354-BC	0.8750	6	25.38	24.80	1.023 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.6250	1	8.97	8.16	1.099 ✔	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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	ROHN 2.5 STD	20.00	4.75	60.2 K=1.00	22.690	1.7040	-19.31	38.66	0.499 ✔
T2	140 - 120	ROHN 2.5 STD	20.03	6.68	84.6 K=1.00	18.081	1.7040	-36.39	30.81	1.181 ✔
T3	120 - 100	ROHN 2.5 EH	20.03	3.44	44.7 K=1.00	25.153	2.2535	-58.16	56.68	1.026 ✔
T4	100 - 80	ROHN 3 EH	20.04	6.68	70.5 K=1.00	20.840	3.0159	-82.73	62.85	1.316 ✔
T5	80 - 60	ROHN 4 EH	20.03	10.02	81.4 K=1.00	18.730	4.4074	-105.59	82.55	1.279 ✔
T6	60 - 40	ROHN 5 EH	20.03	10.02	65.4 K=1.00	21.782	6.1120	-131.04	133.13	0.984 ✔
T7	40 - 20	ROHN 5 EH	20.04	10.02	65.4 K=1.00	21.778	6.1120	-155.36	133.11	1.167 ✔
T8	20 - 0	ROHN 6 EHS	20.03	10.02	54.0 K=1.00	23.713	6.7133	-178.69	159.19	1.122 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	9.79	4.64	162.2 K=1.00	5.674	0.6211	-3.79	3.52	1.075 ✓
T2	140 - 120	L2x2x3/16	12.21	6.05	184.1 K=1.00	4.404	0.7150	-3.48	3.15	1.105 ✓
T3	120 - 100	L2 1/2x2 1/2x3/16	13.96	6.92	167.8 K=1.00	5.305	0.9020	-4.91	4.78	1.025 ✓
T4	100 - 80	L3x3x3/16	15.79	7.81	157.3 K=1.00	6.038	1.0900	-5.47	6.58	0.831 ✓
T5	80 - 60	L3x3x1/4	19.03	9.46	191.7 K=1.00	4.065	1.4400	-7.40	5.85	1.265 ✓
T6	60 - 40	L3 1/2x3 1/2x1/4	20.76	10.27	177.5 K=1.00	4.740	1.6900	-7.54	8.01	0.941 ✓
T7	40 - 20	L3 1/2x3 1/2x1/4	22.64	11.23	194.1 K=1.00	3.962	1.6900	-7.42	6.70	1.108 ✓
T8	20 - 0	L4x4x1/4	24.49	12.08	182.3 K=1.00	4.492	1.9400	-8.15	8.71	0.935 ✓

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	120 - 100	L2 1/2x2 1/2x3/16	12.25	11.53	224.7 K=0.80	2.956	0.9020	-1.01	2.67	0.378 ✓

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16 KL/R > 200 (C) - 4	8.56	8.32	225.0 K=0.77	2.950	0.6211	-0.08	1.83	0.046 ✓

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	ROHN 2.5 STD	20.00	4.75	60.2	30.000	1.7040	16.11	51.12	0.315 ✓

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T2	140 - 120	ROHN 2.5 STD	20.03	6.68	84.6	30.000	1.7040	32.08	51.12	0.627 ✓
T3	120 - 100	ROHN 2.5 EH	20.03	3.44	44.7	30.000	2.2535	50.82	67.61	0.752 ✓
T4	100 - 80	ROHN 3 EH	20.04	6.68	70.5	30.000	3.0159	72.18	90.48	0.798 ✓
T5	80 - 60	ROHN 4 EH	20.03	10.02	81.4	30.000	4.4074	91.98	132.22	0.696 ✓
T6	60 - 40	ROHN 5 EH	20.03	10.02	65.4	30.000	6.1120	113.61	183.36	0.620 ✓
T7	40 - 20	ROHN 5 EH	20.04	10.02	65.4	30.000	6.1120	133.40	183.36	0.728 ✓
T8	20 - 0	ROHN 6 EHS	20.03	10.02	54.0	30.000	6.7133	152.30	201.40	0.756 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	9.79	4.64	106.3	21.600	0.6211	3.78	13.42	0.282 ✓
T2	140 - 120	L2x2x3/16	11.12	5.51	109.4	21.600	0.7150	3.39	15.44	0.219 ✓
T3	120 - 100	L2 1/2x2 1/2x3/16	13.96	6.92	108.5	21.600	0.9020	4.86	19.48	0.250 ✓
T4	100 - 80	L3x3x3/16	15.17	7.50	97.3	21.600	1.0900	5.45	23.54	0.232 ✓
T5	80 - 60	L3x3x1/4	19.03	9.46	123.7	21.600	1.4400	7.34	31.10	0.236 ✓
T6	60 - 40	L3 1/2x3 1/2x1/4	20.76	10.27	114.5	21.600	1.6900	7.51	36.50	0.206 ✓
T7	40 - 20	L3 1/2x3 1/2x1/4	22.64	11.23	125.1	21.600	1.6900	7.86	36.50	0.215 ✓
T8	20 - 0	L4x4x1/4	24.49	12.08	117.3	21.600	1.9400	8.97	41.90	0.214 ✓

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	120 - 100	L2 1/2x2 1/2x3/16	12.25	11.53	185.3	21.600	0.9020	1.01	19.48	0.052 ✓

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 140	L1 3/4x1 3/4x3/16	8.56	8.32	186.0	21.600	0.6211	0.00	13.42	0.000 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	160 - 140	Leg	ROHN 2.5 STD	2	-19.31	51.54	37.5	Pass
T2	140 - 120	Leg	ROHN 2.5 STD	32	-36.39	41.07	88.6	Pass
T3	120 - 100	Leg	ROHN 2.5 EH	53	-58.16	75.56	77.0	Pass
T4	100 - 80	Leg	ROHN 3 EH	83	-82.73	83.78	98.7	Pass
T5	80 - 60	Leg	ROHN 4 EH	103	-105.59	110.04	96.0	Pass
T6	60 - 40	Leg	ROHN 5 EH	118	-131.04	177.46	73.8	Pass
T7	40 - 20	Leg	ROHN 5 EH	133	-155.36	177.43	87.6	Pass
T8	20 - 0	Leg	ROHN 6 EHS	148	-178.69	212.20	84.2	Pass
T1	160 - 140	Diagonal	L1 3/4x1 3/4x3/16	9	-3.79	4.70	80.6	Pass
T2	140 - 120	Diagonal	L2x2x3/16	38	-3.48	4.20	82.9	Pass
T3	120 - 100	Diagonal	L2 1/2x2 1/2x3/16	55	-4.91	6.38	76.9	Pass
T4	100 - 80	Diagonal	L3x3x3/16	85	-5.47	8.77	89.3 (b) 62.3	Pass
T5	80 - 60	Diagonal	L3x3x1/4	106	-7.40	7.80	86.0 (b) 94.9	Pass
T6	60 - 40	Diagonal	L3 1/2x3 1/2x1/4	121	-7.54	10.68	70.6	Pass
T7	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	137	-7.42	8.93	87.8 (b) 83.1	Pass
T8	20 - 0	Diagonal	L4x4x1/4	152	-8.15	11.62	91.5 (b) 70.1	Pass
T3	120 - 100	Secondary Horizontal	L2 1/2x2 1/2x3/16	62	-1.01	3.55	82.5 (b) 28.4	Pass
T1	160 - 140	Top Girt	L1 3/4x1 3/4x3/16	4	-0.08	2.44	3.4	Pass
							Summary	
						Leg (T4)	98.7	Pass
						Diagonal (T5)	94.9	Pass
						Secondary Horizontal (T3)	28.4	Pass
						Top Girt (T1)	3.4	Pass
						Bolt Checks	91.5	Pass
						RATING =	**98.7**	**Pass**

NATCOMM ENG. CONSULTING ENGINEERS
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63-2 N. Branford Rd., Branford, CT 06405

Subject:	Lattice Tower Pad and Pier Foundation Check
Location:	Windsor, CT
Rev. 1: 02/02/10	Prepared by: TJL. Checked by: C.F.C. Job No. 10001.CO8

Pad and Pier Foundation:

Input Data:

(With Proposed Reinforcement)

Tower Data

Max Uplift Force =	Uplift := 157·kips	(User Input from RISATower)	(Leg)
Max Shear Force =	Shear := 22·kips	(User Input from RISATower)	(Leg)
Max Compressive Force =	Compression := 183·kips	(User Input from RISATower)	(Leg)
Base Shear =	$Shear_{tot}$:= 36·kips	(User Input from RISATower)	(Tower)
Base Compression =	$Comp_{tot}$:= 48·kips	(User Input from RISATower)	(Tower)
Base Moment =	Moment := 3376·ft·kips	(User Input from RISATower)	(Tower)
Tower Height =	H_t := 160·ft	(User Input)	

Footing Data:

Overall Depth of Footing =	D_f := 11.0ft	(User Input)	
Length of Pier =	L_p := 9.5ft	(User Input)	
Extension of Pier Above Grade =	L_{pag} := 2.0ft	(User Input)	
Diameter of Pier =	d_p := 3.0ft	(User Input)	
Thickness of Footing =	T_f := 3.5ft	(User Input)	
Width of Footing =	W_f := 8·ft	(User Input)	

Material Properties:

Internal Friction Angle of Soil =	Φ_s := 30·deg	(User Input)	
Allowable Soil Bearing Capacity =	q_s := 4500·psf	(User Input)	
Unit Weight of Soil =	γ_{soil} := 120·pcf	(User Input)	
Unit Weight of Concrete =	γ_{conc} := 150·pcf	(User Input)	
Foundation Bouyancy =	Bouyancy := 0	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	n := 0·ft	(User Input)	
Cohesion of Clay Type Soil =	c := 0·ksf	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	Z := 2	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	μ := 0.45	(User Input)	

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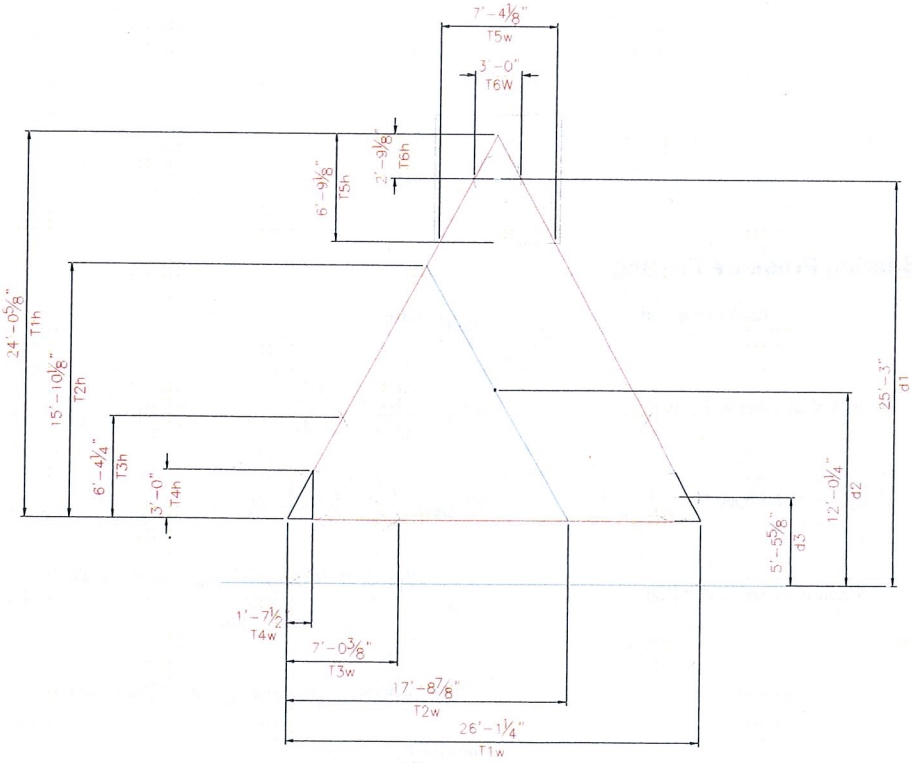
Subject:	Lattice Tower Pad and Pier Foundation Check
Location:	Windsor, CT
Rev. 1: 02/02/10	Prepared by: TJL. Checked by: C.F.C. Job No. 10001.CO8

Proposed Concrete Mat Propperties:

Triangle One Width =	$T1_w := 26.10ft$	(User Input)
Triangle One Height =	$T1_h := 24.05ft$	(User Input)
Triangle Two Width =	$T2_w := 17.74ft$	(User Input)
Triangle Two Height =	$T2_h := 15.84ft$	(User Input)
Triangle Three Width =	$T3_w := 7.03ft$	(User Input)
Triangle Three Height =	$T3_h := 6.35ft$	(User Input)
Triangle Four Width =	$T4_w := 1.63ft$	(User Input)
Triangle Four Height =	$T4_h := 3.0ft$	(User Input)
Triangle Five Width =	$T5_w := 7.34ft$	(User Input)
Triangle Five Height =	$T5_h := 6.76ft$	(User Input)
Triangle Six Width =	$T6_w := 3.0ft$	(User Input)
Triangle Six Height =	$T6_h := 2.76ft$	(User Input)
Thickness of Mat =	$Mat_t := 8ft$	(User Input)
Distance To Centroids:	$d_1 := 25.25ft$	(User Input)
	$d_2 := 12.02ft$	(User Input)
	$d_3 := 5.47ft$	(User Input)



Uplift Check:

Adjusted Concrete Unit Weight =

$$\gamma_c := if\left(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}\right) = 150 \cdot pcf$$

Adjusted Soil Unit Weight =

$$\gamma_s := if\left(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}\right) = 120 \cdot pcf$$

Cross Sectional Area 1 of Resisting Pyramid =

$$B_1 := W_f^2 = 64\,ft^2$$

Cross Sectional Area 2 of Resisting Pyramid =

$$B_2 := \left[2\left(L_p - L_{pag} - n\right) \cdot \tan\left(\Phi_s\right) + W_f\right]^2 = 277.6\,ft^2$$

Volume of Concrete Pad and Pier =

$$V_{pp} := \left[\left(W_f^2 \cdot T_f\right) + \frac{d_p^2 \cdot \pi}{4} L_p\right] = 291.2 \cdot ft^3$$

Volume of Soil =

$$V_{soil} := \left[\frac{\left(L_p - L_{pag} - n\right)}{3} \cdot \left(B_1 + B_2 + \sqrt{B_1 \cdot B_2}\right)\right] \cdot \frac{3}{4} - \frac{d_p^2 \cdot \pi}{4}\left(L_p - L_{pag}\right) = 837 \cdot ft^3$$

Note: 3/4 reduction taken for amount soil used due to the concrete put in place for the mat.

Weight of Concrete =

$$WT_c := \left(V_{pp} + V_{mat}\right) \cdot \gamma_c = 205.1 \cdot kip$$

Weight of Soil =

$$WT_s := V_{soil} \cdot \gamma_s = 100.5 \cdot kip$$

Bearing Pressure Footing:

Area of the Pad =

$$A_{pad} := 64 \cdot ft^2$$

Weight of Soil Above Footing =

$$WT_{soil} := \left[\left(W_f^2 - \frac{\pi d_p^2}{4}\right) \cdot \left(L_p - L_{pag} - n\right)\right] \cdot \frac{3}{4} \cdot \gamma_s = 38.43 \cdot kips$$

Weight of Mat Above Footing =

$$WT_{mat} := \frac{1}{2} \cdot \left(T3_w \cdot T3_h - T4_w \cdot T4_h - \frac{d_p^2 \cdot \pi}{4}\right) \cdot Mat_t \cdot \gamma_c = 19.61 \cdot kips$$

Maximum Pressure in Pad =

$$P_{max} := \frac{V_{pp} \cdot \gamma_c + WT_{soil} + WT_{mat} + Compression}{A_{pad}} = 4.45 \cdot ksf$$

$$Pressure\_Check := if\left(P_{max} \le q_s, "Okay", "No\ Good"\right)$$

Pressure_Check = "Okay"

Overturning Moment Check:

Overturning Moment = $M_{ot} := Moment + Shear_{tot} \cdot (L_p + T_f) = 3844 \cdot kip \cdot ft$

Total Volume of the Concrete Mat = $V_{mat.tot} := \frac{1}{2} \cdot \left[T1_w \cdot T1_h - (T4_w \cdot T4_h) \cdot 2 - (T6_w \cdot T6_h) - \left(\frac{d_p^{\,2} \cdot \pi}{4} \right) \cdot 3 \right] \cdot Mat_t = 2354 \cdot ft^3$

Weight of Concrete Mat = $WT_{mat.tot} := V_{mat.tot} \cdot \gamma_c = 353.1 \cdot kips$

Weight of Concrete Pad and Pier = $WT_{pp} := V_{pp} \cdot \gamma_c = 43.7 \cdot kips$

Resisting Moment = $M_r := (WT_{pp} + WT_s) \cdot d_1 + (WT_{pp} + WT_s) \cdot d_3 \cdot 2 + WT_{mat.tot} \cdot d_2 = 9460.7 ft \cdot kips$

Factor of Safety = $\frac{M_r}{M_{ot}} = 2.46$

$Overturning\_Moment := if\left(\frac{M_r}{M_{ot}} > 2, "OK", "NG" \right)$

Overturning_Moment = "OK"

Bearing Pressure Whole Foundation:

Cross Sectional Area of Base = $A_{mat} := \frac{1}{2} \cdot \left[T1_w \cdot T1_h - (T3_w \cdot T3_h) \cdot 2 - T5_w \cdot T5_h \right] = 244.4 ft^2$

Cross Sectional Area of Base = $A := A_{pad} \cdot 3 + A_{mat} = 436.403 ft^2$

Section Modulus of Foundation = $S := \frac{A_{pad} \cdot d_1^{\,2} + A_{pad} \cdot d_3^{\,2} \cdot 2 + A_{mat} \cdot d_2^{\,2}}{d_2} = 6651 \cdot ft^3$

Total Weight = $P := (WT_{pp} + WT_{soil}) \cdot 3 + WT_{mat.tot} = 599.4 \cdot kips$

Max Pressure = $q_{max} := \frac{P}{A} + \frac{M_{ot}}{S} = 1.95 \cdot ksf$

$Max\_Pressure\_Check := if(q_{max} < q_s, "OK", "NG")$

Max_Pressure_Check = "OK"

Minimum Pressure in Mat = $P_{min} := \frac{P}{A} - \frac{M_{ot}}{S} = 0.795 \cdot ksf$

$Min\_Pressure\_Check := if\left[(P_{min} \geq 0) \cdot (P_{min} < q_s), "Okay", "No Good" \right]$

Min_Pressure_Check = "Okay"

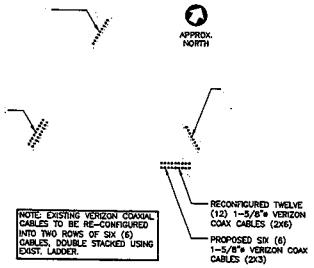
Concrete Mat Reinforcement:

Note: Reinforcement calculation for mat based on temperature and shrinkage steel requirements. Top and bottom reinforcement combined to account for required amount

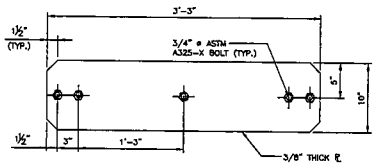
Reinforcement = $Reinf := .0018 \cdot Mat_t \cdot 1 \cdot ft = 2.07 \cdot in^2$

Use #8 bars @ 9" O.C.

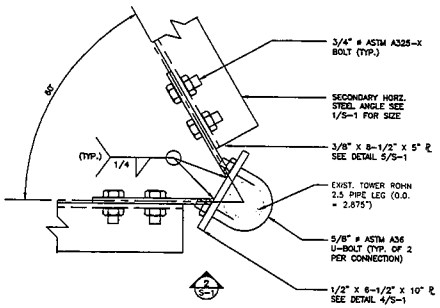
Proposed Tower and Foundation Reinforcement Drawings



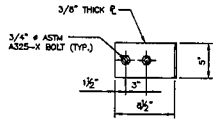
7 / S-1 **COAXIAL CABLE CONFIGURATION PLAN**
SCALE: 1/4" = 1'-0"



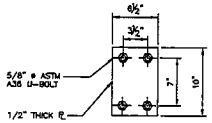
6 / S-1 **PLATE P3**
SCALE: 1-1/2" = 1'-0"



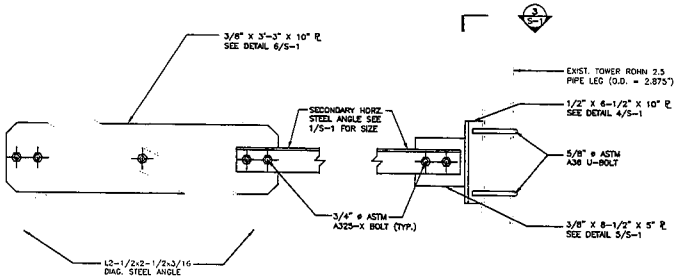
3 / S-1 **CONNECTION DETAIL PLAN**
SCALE: 3" = 1'-0"



5 / S-1 **PLATE P2**
SCALE: 1-1/2" = 1'-0"



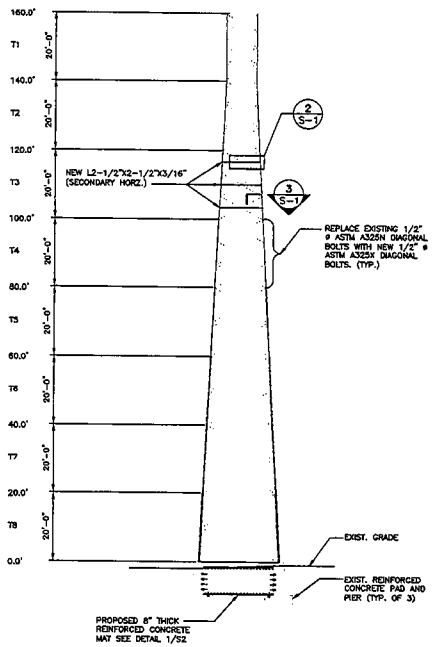
4 / S-1 **PLATE P1**
SCALE: 1-1/2" = 1'-0"



2 / S-1 **CONNECTION DETAIL ELEVATION**
SCALE: 1-1/2" = 1'-0"

NOTES:

1. THE REPLACEMENT OF TOWER MEMBERS SHALL BE DONE ONE AT A TIME AND SHALL BE DONE WITH LESS THAN 15 MPH WIND PRESENT. NO MEMBER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY.
2. ALL REINFORCEMENT SHOWN FOR DIAGONALS, AND HORIZONTALS APPLY TO ALL SIDES OF THE TOWER.
3. ALL REPLACEMENT MEMBERS SHALL BE INSTALLED WITH A325-X BOLTS (SIZE TO MATCH EXISTING)
4. ALL NEW SECONDARY HORIZONTAL MEMBERS SHALL BE INSTALLED WITH 3/4"ø A325-X BOLTS.



1 / S-1 **TOWER ELEVATION**
SCALE: 1/16" = 1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	02/03/10	TJL	CPC	REVISED PER TOWER MAPPING REPORT DATED 01.22.10.
0	1/5/10	TJL	CPC	ISSUED FOR REVIEW

DESIGNED BY: TJL
DRAWN BY: TJL
CHK'D BY: CPC

PROFESSIONAL ENGINEER SEAL

Cellco Partnership
d.b.a. Verizon Wireless

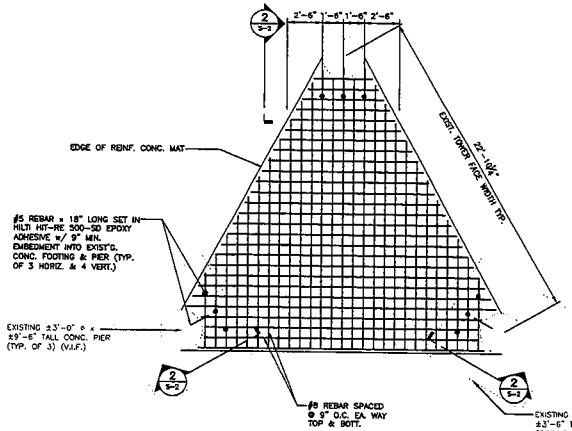
NATCOMM

VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
STRATFORD NORTH
110' 88V ROHN LATTICE TOWER
630 JAMES FARM ROAD
STRATFORD, CT

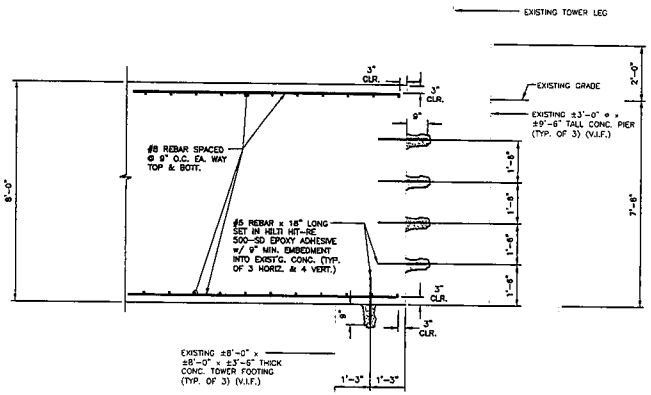
DATE: 1/5/10
SCALE: AS NOTED
JOB NO.: 10001.C08

TOWER REINFORCEMENT DETAILS

S-1
Sheet No. 1 of 2



1 S-2 **TOWER FOUNDATION REINFORCEMENT PLAN**
SCALE: 1/4" = 1'-0"



2 S-2 **TOWER FOUNDATION REINFORCEMENT SECTION**
SCALE: 1/2" = 1'-0"

DESIGN BASIS

GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2005 CONNECTICUT SUPPLEMENT.

1. DESIGN CRITERIA:
   - WIND SPEED OF 80 MPH (FASTEST MILE) AND 69 MPH (FASTEST MILE) CONCURRENT WITH 0.5" OF RADIAL ICE PER EIA/TIA 222 F-98.
   - SEISMIC LOAD: PER ASCE 7-95 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES (DOES NOT GOVERN).

GENERAL NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES".
2. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY, MAINTAIN EXISTING SITE OPERATIONS, COORDINATE WORK WITH TOWER OWNER.
3. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WORK, AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
5. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
7. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.
8. TOWER REINFORCING SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.
9. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER REINFORCEMENT.
10. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

FOUNDATION LOADING (UNFACTORED):	
BASE MOMENT (ft-kips)	3376
UPLIFT (kips)	157
SHEAR (kips)	22
COMPRESSION (kips)	183

NOTES:

1. TOWER BASE REACTIONS BASED ON TOWER ANALYSIS PREPARED BY NATCOMM INC., FOR VERIZON WIRELESS, DATED FEBRUARY 03, 2009.

SITE NOTES

1. THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" TO HAVE EXISTING UTILITIES MARKED IN FIELD PRIOR TO EXCAVATION.
2. ACTIVE EXISTING UTILITIES, WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, PRIOR TO PROCEEDING, SHOULD ANY UNCOVERED EXISTING UTILITY PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. ALL RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED OFF SITE AND BE LEGALLY DISPOSED, AT NO ADDITIONAL COST.
4. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREAS.
5. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
6. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
7. THE AREAS OF THE COMPOUND DISTURBED BY THE WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION.
8. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
9. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
10. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE-MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.
11. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.

EARTHWORK NOTES

1. COMPACTED GRAVEL FILL SHALL BE FURNISHED AND PLACED AS A FOUNDATION FOR STRUCTURES, WHERE SHOWN ON THE CONTRACT DRAWINGS OR DIRECTED BY THE ENGINEER.
2. CRUSHED STONE FILL SHALL BE PLACED IN 12" MAX. LIFTS AND CONSOLIDATED USING A HAND OPERATED VIBRATORY PLATE COMPACTOR WITH A MINIMUM OF 2 PASSSES OF COMPACTOR PER LIFT.
3. COMPACTED GRAVEL FILL TO BE WELL GRADED BANK RUN GRAVEL MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE DESIGNATION	% PASSING
1 ½"	100
No. 4	40-70
No. 100	5-20
No. 200	4-8

4. CRUSHED STONE TO BE UNIFORMLY GRADED, CLEAN, HARD PROCESS AGGREGATE MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE DESIGNATION	% PASSING
1"	100
¾"	90-100
⅜"	0-15
#8	0-5

5. SELECT BACKFILL FOR FOUNDATION WALLS SHALL BE FREE OF ORGANIC MATERIAL, TOPSOIL, DEBRIS AAND BOULDERS LARGER THAN 6".
6. GRAVEL AND GRANULAR FILL SHALL BE INSTALLED IN 8" MAX. LIFTS. COMPACTED TO 95% MIN. AT MAX. DRY DENSITY.
7. NON WOVEN GEOTEXTILE FOR SEPARATION PURPOSES SHALL BE MIRAFI 140N, OR ENGINEER APPROVED EQUAL.

FOUNDATION CONSTRUCTION NOTES

1. ALL FOOTINGS SHALL BE PLACED ON SUITABLE, COMPACTED SOIL HAVING ADEQUATE BEARING CAPACITY AND FREE OF ORGANIC CONTENT, CLAY, OR OTHER UNSUITABLE MATERIAL. ADDITIONAL EXCAVATION MAY BE REQUIRED BELOW FOOTING ELEVATIONS INDICATED IF UNSUITABLE MATERIAL IS ENCOUNTERED.
2. SUBGRADE PREPARATION: IF UNSUITABLE SOIL IS ENCOUNTERED, REMOVE ALL UNSUITABLE MATERIALS FROM BELOW PROPOSED STRUCTURE FOUNDATIONS AND COMPACT EXPOSED SOIL SURFACES. PLACE AND COMPACT APPROVED GRAVEL FILL. PLACEMENT OF ALL COMPACTED FILL MUST BE UNDER SUPERVISION OF AN APPROVED TESTING LABORATORY. FILL SHALL BE COMPACTED IN LAYERS NOT TO EXCEED 10" BEFORE COMPACTION. DETERMINE MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D1557-70 AND MAKE ONE (1) FIELD DENSITY TEST IN ACCORDANCE WITH ASTM D2167-66 FOR EACH 50 CUBIC YARDS OF COMPACTED FILL BUT NOT LESS THAN ONE (1) PER LAYER, TO INSURE COMPACTION TO 95% OF MAX. DRY DENSITY.
3. ALL SOIL SURROUNDING AND UNDER ALL FOOTINGS SHALL BE KEPT REASONABLY DRY AND PROTECTED FROM FREEZING AND FROST ACTION DURING THE COURSE OF CONSTRUCTION.
4. WHERE GROUNDWATER IS ENCOUNTERED, DEWATERING SHALL BE ACCOMPLISHED CONTINUOUSLY AND COMPLETELY DURING FOUNDATION CONSTRUCTION. PROVIDE CRUSHED STONE AS REQUIRED TO STABILIZE FOOTING SUBGRADE.
5. ALL FOOTINGS ARE TO REST ON FIRM SOIL, REGARDLESS OF ELEVATIONS SHOWN ON THE DRAWINGS, BUT IN NO CASE MAY FOOTING ELEVATIONS BE HIGHER THAN INDICATED ON THE FOUNDATION PLAN, UNLESS SPECIFICALLY DIRECTED BY THE ENGINEER.
6. FOUNDATION WATERPROOFING AND DAMPPROOFING SHALL COMPLY WITH BUILDING CODE REQUIREMENTS UNLESS A MORE SUBSTANTIAL SYSTEM IS INDICATED OR SPECIFIED.

CONCRETE CONSTRUCTION NOTES

1. CONCRETE CONSTRUCTION SHALL CONFORM TO THE FOLLOWING STANDARDS:

   ACI 211 – STANDARD PRACTICE FOR SELECTING PROPORTIONS FOR NORMAL AND HEAVYWEIGHT CONCRETE.

   ACI 301 – SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS.

   ACI 302 – GUIDE FOR CONCRETE FLOOR AND SLAB CONSTRUCTION

   ACI 304 – RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE.

   ACI 306.1 STANDARD SPECIFICATION FOR COLD WEATHER CONCRETING

   ACI 318 – BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.

2. CONCRETE SHALL DEVELOP COMPRESSIVE STRENGTH IN 28 DAYS AS FOLLOWS:

   SLABS ON GRADE 4,000 PSI
   ALL OTHER CONCRETE 3,000 PSI

   - PORTLAND CEMENT: ASTM C150, TYPE II, (540 LBS/CUBIC YARD)
   - AGGREGATE: ASTM C33, No. 67, TYPICAL
   - WATER: POTABLE WITH MAXIMUM WATER CEMENT RATIO OF .55
   - SLUMP: 3" TO 4"
   - ADMIXTURES: USE AIR ENTRAINING AGENT CONFORMING TO ASTM C260 WITH 4 TO 6% TOTAL AIR. USE WATER REDUCING AGENT CONFORMING TO ASTM C494, TYPE A, IN ALL CONCRETE. CALCIUM CHLORIDE MAY NOT BE USED TO ACCELERATE THE CONCRETE SETTING TIME.

3. REINFORCING STEEL SHALL BE 60,000 PSI YIELD STRENGTH.
4. WELDED WIRE FABRIC SHALL CONFORM TO ASTM- A-185.
5. ALL DETAILING, FABRICATION, AND ERECTION OF REINFORCING BARS, UNLESS OTHERWISE NOTED, MUST FOLLOW THE LATEST ACI CODE AND LATEST ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES".
6. CONCRETE COVER OVER REINFORCING SHALL CONFORM TO THE FOLLOWING, UNLESS OTHERWISE SHOWN:

   BOTTOM OF FOOTINGS 3 INCHES

   SURFACES NOT EXPOSED TO EARTH OR WEATHER 1-1/2 INCHES

   BARS BONDED TO GROUNDING SYSTEM 3 INCHES MIN

7. NO STEEL WIRE, METAL FORM TIES, OR ANY OTHER METAL SHALL REMAIN WITHIN THE REQUIRED COVER OF ANY CONCRETE SURFACE.
8. ALL REINFORCEMENT SHALL BE CONTINUOUS UNLESS OTHERWISE NOTED. SPLICES SHALL BE WELL STAGGERED. ADDITIONAL BARS AND SPECIAL BENDING DETAILS ARE REQUIRED AT INTERSECTING WALLS AND AT CORNERS. SUCH DETAILS SHALL COMPLY WITH ACI 315 RECOMMENDATIONS UNLESS OTHERWISE SHOWN.
9. NO TACK WELDING OF REINFORCING WILL BE PERMITTED.
10. NO CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 1% CHLORIDE BY WEIGHT OF ADMIXTURE SHALL BE USED IN THE CONCRETE.
11. UNLESS OTHERWISE NOTED, ALL LAP SPLICES SHALL BE 48 BAR DIAMETERS.
12. SLAB ON GRADE FINISHES:

    EXTERIOR SLAB: NON-SLIP BROOM FINISH
    INTERIOR SLAB: STEEL TROWEL FINISH

13. INSPECTION AND TESTING OF CONCRETE WORK SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY, PAID BY THE OWNER, AND APPROVED BY THE ARCHITECT. THE INSPECTOR SHALL OBSERVE CONDITION OF SOILS AND FORMWORK BEFORE FOOTINGS ARE PLACED, SIZE, SPACING AND LOCATION OF REINFORCEMENT, AND PLACEMENT OF CONCRETE.
14. THE TESTING COMPANY SHALL ALSO OBTAIN A MINIMUM OF THREE (3) COMPRESSIVE STRENGTH TEST SPECIMENS FOR EACH CONCRETE MIX DESIGN. ONE SPECIMEN TESTED AT 7 DAYS, ONE AT 28 DAYS, AND ONE HELD IN RESERVE FOR FUTURE TESTING, IF NEEDED.
15. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ARCHITECT WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

DESIGNED BY: T.H.
DRAWN BY: T.H.
CHK'D BY: CPC

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	02/03/10	T.H.	CPC	REVISED PER TOWER MAPPING REPORT DATED 01.22.10.
0	1/5/10	T.H.	CPC	ISSUED FOR REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. Verizon Wireless

NATCOMM
WIRELESS COMMUNICATIONS FACILITY PLANNING & DESIGN
[illegible]

VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
STRATFORD NORTH
110' SBY ROHN LATTICE TOWER
630 JAMES FARM ROAD
STRATFORD, CT

DATE: 1/5/10
SCALE: AS NOTED
JOB NO. 10001.006

FOUNDATION REINFORCEMENT DETAILS & NOTES

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Sheet No. 2 of 2

STRUCTURAL NOTES

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD)
   - A. STRUCTURAL STEEL (W SHAPES)---ASTM A992, (FY = 50 KSI)
   - B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36, (FY = 36 KSI)
   - C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   - D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   - E. PIPE---ASTM A53 (FY = 35 KSI)
   - F. CONNECTION BOLTS---ASTM A325-N
   - G. U-BOLTS---ASTM A36
   - H. ANCHOR RODS---ASTM F 1554
   - I. WELDING ELECTRODE---ASTM E 70XX
2. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
3. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
4. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
5. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
6. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
7. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
8. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
9. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".
10. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING E70XX ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.
11. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
12. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
13. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
14. CONNECTIONS SHALL CONFORM TO ALL REQUIREMENTS OF THE "AISC SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR SHELTERS", LATEST EDITION, AND THE "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS", LATEST EDITION.
15. LOCK WASHER ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES.
16. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
17. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
18. FABRICATE BEAMS WITH MILL CAMBER UP.
19. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
20. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.
21. INSPECTION AND TESTING OF ALL WELDING AND HIGH STRENGTH BOLTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY.
22. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

PAINT NOTES

PAINTING SCHEDULE:

1. FERROUS METAL :
   - A. CLEAN SURFACE IN CONFORMANCE TO SSPC-SP-3 STANDARDS, POWER TOOL CLEANING.

   PRIMER: APPLY ONE SPOT COAT OF TENEMEC SERIES 1 PRIMER @ 2.5-3.0 MILS DRY.

   FINISH COAT: APPLY TWO SPOT COATS OF TENEMEC SERIES 1029 (COLOR) AT 2.5 MILS PER COAT.

   COLOR TO MATCH EXISTING BUILDING COLOR. OWNER TO APPROVE COLOR MATCH.
2. ZINC COATED METAL: PROVIDE THE FOLLOWING FINISH SYSTEM OVER ZINC COATED METAL:
   - A. SEMIGLOSS ACYLIC-ENAMEL FINISH: 2 FINISH COATS OVER A PRIMER.

   PRIMER: GALVANIZED METAL PRIMER APPLIED AT SPREADING RATE RECOMMENDED BY THE MANUFACTURER TO ACHIEVE A TOTAL DRY FILM THICKNESS OF NOT LESS THAN 1.2 MILS. BENJAMIN MOOR IRON CLAD GALVANIZED METAL LATEX PRIMER #155 OR APPROVED EQUAL.

   FIRST AND SECOND COAT: SEMIGLOSS, ACYLIC EXTRIOR ENAMEL APPLIED AT SPREADING RATE RECOMMENDED BY THE MANUFACTURER TO ACHIEVE A TOTAL DRY FILM THICKNESS OF NOT LESS THAN 2.6 MILS. BENJAMIN MOORE REGAL AQUAGLO VINYL-ACYLIC LATEX ENAMEL #333 OR APPROVED EQUAL.
3. COAXIAL CABLES:
   - A. ONE COAT OF DTM BONDING PRIMER (2-5 MILS. DRY FINISH)
   - B. TWO COATS OF DTM ACRYLIC PRIMER/FINISH (2.5-5 MILS. DRY FINISH)
   - C. COLOR TO BE FIELD MATCHED WITH EXISTING STRUCTURE.

EXAMINATION AND PREPARATION:

1. DO NOT APPLY PAINT IN SNOW, RAIN, FOG OR MIST OR WHEN RELATIVE HUMIDITY EXCEEDS 85%. DO NOT APPLY PAINT TO DAMP OR WET SURFACES.
2. VERIFY THAT SUBSTRATE CONDITIONS ARE READY TO RECEIVE WORK. EXAMINE SURFACE SCHEDULED TO BE FINISHED PRIOR TO COMMENCEMENT OF WORK. REPORT ANY CONDITION THAT MAY POTENTIALLY AFFECT PROPER APPLICATION.
3. TEST SHOP APPLIED PRIMER FOR COMPATIBILITY WITH SUBSEQUENT COVER MATERIALS.
4. PERFORM PREPARATION AND CLEANING PROCEDURE IN STRICT ACCORDANCE WITH COATING MANUFACTURER'S INSTRUCTIONS FOR EACH SUBSTRATE CONDITION.
5. CORRECT DEFECTS AND CLEAN SURFACES WHICH AFFECT WORK OF THIS SECTION. REMOVE EXISTING COATINGS THAT EXHIBIT LOOSE SURFACE DEFECTS.
6. IMPERVIOUS SURFACE: REMOVE MILDEW BY SCRUBBING WITH SOLUTION OF TRI-SODIUM PHOSPHATE AND BLEACH. RINSE WITH CLEAN WATER AND ALLOW SURFACE TO DRY.
7. ALUMINUM SURFACE SCHEDULED FOR PAINT FINISH: REMOVE SURFACE CONTAMINATION BY STEAM OR HIGH-PRESSURE WATER. REMOVE OXIDATION WITH ACID ETCH AND SOLVENT WASHING. APPLY ETCHING PRIMER IMMEDIATELY FOLLOWING CLEANING.
8. FERROUS METALS: CLEAN UNGALVANIZED FERROUS METAL SURFACES THAT HAVE NOT BEEN SHOP COATED; REMOVE OIL, GREASE, DIRT, LOOSE MILL SCALE, AND OTHER FOREIGN SUBSTANCES. USE SOLVENT OR MECHANICAL CLEANING METHODS THAT COMPLY WITH THE STEEL STRUCTURES PAINTING COUNCIL'S (SSPC) RECOMMENDATIONS. TOUCH UP BARE AREAS AND SHOP APPLIED PRIME COATS THAT HAVE BEEN DAMAGED. WIRE BRUSH, CLEAN WITH SOLVENTS RECOMMENDED BY PAINT MANUFACTURER, AND TOUCH UP WITH THE SAME PRIMER AS THE SHOP COAT.
9. GALVANIZED SURFACES: CLEAN GALVANIZED SURFACES WITH NON-PETROLEUM-BASED SOLVENTS SO SURFACE IS FREE OF OIL AND SURFACE CONTAMINANTS. REMOVE PRETREATMENT FROM GALVANIZED SHEET METAL FABRICATED FROM COIL STOCK BY MECHANICAL METHODS.
10. ANTENNA PANELS: REMOVE ALL OIL, DUST, GREASE, DIRT, AND OTHER FOREIGN MATERIAL TO ENSURE ADEQUATE ADHESION. PANELS MUST BE WIPED WITH METHYL ETHYL KETONE (MEK).
11. COAXIAL CABLES: REMOVE ALL OIL, DUST, GREASE, DIRT, AND OTHER FOREIGN MATERIAL TO ENSURE ADEQUATE ADHESION.

CLEANING:

1. COLLECT WASTE MATERIAL, WHICH MAY CONSTITUTE A FIRE HAZARD, PLACE IN CLOSED METAL CONTAINERS AND REMOVE DAILY FROM SITE.

APPLICATION:

1. APPLY PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. DO NOT APPLY FINISHES TO SURFACES THAT ARE NOT DRY.
3. APPLY EACH COAT TO UNIFORM FINISH.
4. APPLY EACH COAT OF PAINT SLIGHTLY DARKER THAN PRECEDING COAT UNLESS OTHERWISE APPROVED.
5. SAND METAL LIGHTLY BETWEEN COATS TO ACHIEVE REQUIRED FINISH.
6. VACUUM CLEAN SURFACES FREE OF LOOSE PARTICLES. USE TACK CLOTH JUST PRIOR TO APPLYING NEXT COAT.
7. ALLOW APPLIED COAT TO DRY BEFORE NEXT COAT IS APPLIED.

COMPLETED WORK:

1. SAMPLES: PREPARE 24" X 24" SAMPLE AREA FOR REVIEW.
2. MATCH APPROVED SAMPLES FOR COLOR, TEXTURE AND COVERAGE. REMOVE REFINISH OR REPAINT WORK NOT IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.

DESIGNED BY: TJL
DRAWN BY: TJL
CHK'D BY: CFC

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	02/03/10	TJL	CFC	REVISED PER TOWER MAPPING REPORT DATED 01.22.10.
0	1/5/10	TJL	CFC	ISSUED FOR REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. verizon wireless

NATCOMM

VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
STRATFORD NORTH
110' 88V ROHN LATTICE TOWER
630 JAMES FARM ROAD
STRATFORD, CT

DATE: 1/5/10
SCALE: AS NOTED
JOB NO. 10001.C06

STRUCTURAL NOTES

S-3

Sheet No. 3 of 3

CSB
Communications, LLC
63-9 North Branford Road - Branford, CT 06405
Ph: 203-488-9748 Fax: 203-488-4804

Self-Supporter
Tower Mapping Cover Sheet
General Information

Site Name:		Windsor Switch
Site Number:		
FCC Number:		
Manufacturer ID #		
Street Address:		482 Pigeon Hill Road
City/State/Zip Code:		Windsor, CT
County:		Hartford
Lat:	N/S	
Long:	E/W	
Performed By:		Jason Coates
Date:		1/22/2010

Manufacture: (Circle One)

Rohn	Summit	EEI	Pirod	Sabre	Fort Worth	Valmont	Nudd	Other

Foundation:

A		B		C			
Reveal:	17" - 22"	Reveal:	13" - 22"	Reveal:	16" - 22"	Reveal:	
Grout:	3"	Grout:	3 1/4"	Grout:	3 3/4"	Grout:	
Size/Diam:	3'	Size/Diam:	3'	Size/Diam:	3'	Size/Diam:	

Anchor Bolts:

Flange Plate Grouted: **Yes** No

Number of Anchor Bolts: 6 per leg

Anchor Bolt Spacing: 5 1/4"

Diameter of Anchor Bolts: 1"

Diameter of Anchor Bolt Placement: 10 1/2"

Safety Climb:

Start Elevation: N/A

End Elevation: N/A

Location: N/A

Climbing Components:

Step Bolts Climbing Ladder Internal **External**

A Leg
Start Elevation: 1' End Elevation: 80'

B Leg
Start Elevation: 1' End Elevation: Top

C Leg
Start Elevation: 1' End Elevation: 80'

____ Leg
Start Elevation: End Elevation:

Lighting System Information:

1st OB:	N/A	1st Beacon:	N/A
2nd OB:	N/A	2nd Beacon:	N/A
3rd OB:	N/A	3rd Beacon:	N/A
4th OB:	N/A	4th Beacon:	N/A

Top of Tower Steel (Top of Concrete)	161'-9"
Top of Beacon	N/A
Top of Lightning Rod	
Top of Highest Appurtenance	175'

Antenna Information:

CARRIER: UNKNOWN — PIC

MOUNT

Type:	Side Arm			Manufacture:	N/A				
Elevation:	Bottom	35'-7"		Center	37'-7"		Top	39'-7"	Location: C
Face Width	2 1/2"	Height	4'	Projection	3'	Azimuth/s	210		

ANTENNA

Type:	Whip	Dim: (HxWxD)	12' x 1 1/2"	Azimuth/s:	210		
Make	None Found	Model	None Found	Location	C	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 39'-5" Center 45'-5" Top 51'-5"

TMA'S

Make		Model		Location	Quantity
Make		Model		Location	Quantity

COAX

Quantity: 1 Size: 1/2" Jumper: N/A Color: N/A

CARRIER: UNKNOWN — PIC

MOUNT

Type:	Z Brackets w 4 1/2" Pipe			Manufacture:	N/A				
Elevation:	Bottom	69'-7"		Center	72'-1"		Top	74'-7"	Location: C
Face Width	4 1/2"	Height	5'	Projection	9"	Azimuth/s	220		

ANTENNA

Type:	Dish	Dim: (HxWxD)	10'	Azimuth/s:	220		
Make	Andrew	Model	UHX10-107H	Location	C	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 67' Center 72' Top 77'

TMA'S

Make		Model		Location	Quantity
Make		Model		Location	Quantity

COAX

Quantity: 1 Size: Elliptical 63 Jumper: N/A Color: 2 Brown

CARRIER UNKNOWN PIC

MOUNT

Type: Z Brackets w 4 1/2" Pipe | Manufacture: N/A

Elevation: Bottom 91'-4" | Center 93'-10" | Top 96'-4" | Location B

Face Width 4 1/2" | Height 5' | Projection 9" | Azimuth/s 90

ANTENNA

Type: Dish | Dim: (HxWxD) 6' | Azimuth/s: 90

Make	Comstat	Model	HP60A72DL-2	Location	B	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 91' | Center 94' | Top 97'

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity: 1 | Size: Elliptical 63 | Jumper: N/A | Color: 2 Red

CARRIER UNKNOWN PIC

MOUNT

Type: Z Brackets w 4 1/2" Pipe | Manufacture: N/A

Elevation: Bottom 108'-10" | Center 111'-4" | Top 113'-10" | Location B

Face Width 4 1/2" | Height 5' | Projection 9" | Azimuth/s 90

ANTENNA

Type: Dish | Dim: (HxWxD) 8' | Azimuth/s: 60

Make	Andrew	Model	UHX8-59H	Location	B	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 107'-4" | Center 111'-4" | Top 115'-4"

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity: 1 | Size: Elliptical 63 | Jumper: N/A | Color: 2 Orange

CARRIER: T-MOBILE — PIC

MOUNT

Type:	Gate Booms			Manufacture:	N/A				
Elevation:	Bottom	145'	Center	147'	Top	149'	Location	All 3	
Face Width	15'	Height	4'	Projection	4'	Azimuth/s	70,195,320		

ANTENNA

Type:	Panels			Dim: (HxWxD)	5'x6 1/2"x3"/5'x13x3"			Azimuth/s:	70, 195, 320
Make	RFS			Model	APX16DWZ-16DWZS	Location	All 3	Quantity	3
Make	RFS			Model	APXZ18-209014	Location	All 3	Quantity	6
Make				Model		Location		Quantity	
Make				Model		Location		Quantity	
Make				Model		Location		Quantity	
Make				Model		Location		Quantity	
Elevation:		Bottom	145'	Center	147'-6"	Top	150'		

TMA'S

Make	Ericsson			Model	17-21-M	Location	ABC	Quantity	3
Make	Powerwave			Model	G3SSFL1850.060.01A	Location	ABC	Quantity	6

COAX

Quantity:	18	Size:	1 5/8"	Jumper:	6'	Color:	Red-White-Blue

CARRIER: VERIZON — PIC

MOUNT

Type:	Gate Boom			Manufacture:	Rohn				
Elevation:	Bottom	154'	Center	156'	Top	158'	Location	All 3	
Face Width	20'	Height	4'	Projection	5'	Azimuth/s	30,160,300		

ANTENNA

Type:	Panels			Dim: (HxWxD)	4'x3 1/2"x7"/4'x15"x16"			Azimuth/s:	30,160,300
Make	Amphonol - Cellular			Model	LPA80063-4CFE-DIN	Location	All 3	Quantity	6
Make	Andrew - PCS			Model	948F85T2E-M	Location	All 3	Quantity	6
Make				Model		Location		Quantity	
Make				Model		Location		Quantity	
Make				Model		Location		Quantity	
Make				Model		Location		Quantity	
Elevation:		Bottom	154'-6"	Center	156'-6"	Top	158'-6"		

TMA'S

Make				Model		Location		Quantity	
Make				Model		Location		Quantity	

COAX

Quantity:	12	Size:	1 5/8"	Jumper:	6'	Color:	Red-Blue-Green

CARRIER: AT&T — PIC

MOUNT

Type:	5" x 2" Leg to Leg			Manufacture:	N/A				
Elevation:	Bottom	153'	Center	162'-4"	Top	171'-9"	Location	Face B&C	
Face Width	4 1/2"	Height	18'-9"	Projection	9 1/2"	Azimuth/s	150		

ANTENNA

Type:	Panels	Dim: (HxWxD)	8' x 12" x 6 1/2"	Azimuth/s:	35, 155, 275		
Make	EMS	Model	MB96RR90020DPBL	Location	Face B&C	Quantity	3
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation:	Bottom	163'-9"	Center	167'-9"	Top	171'-9"

TMA'S

Make	ADC	Model	1226494	Location	Pipe	Quantity	6
Make		Model		Location		Quantity	

COAX

Quantity:	9	Size:	1 1/4"	Jumper:	3',6',10'	Color:	Yellow-Red-Orange

CARRIER: UNKNOWN — PIC

MOUNT

Type:	Pipe to Pipe Kit			Manufacture:	N/A				
Elevation:	Bottom		Center	161'	Top		Location	A	
Face Width	N/A	Height	N/A	Projection	9"	Azimuth/s	330		

ANTENNA

Type:	Whip	Dim: (HxWxD)	15' x 2"	Azimuth/s:	N/A		
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation:	Bottom	160'	Center	167'-6"	Top	175'

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity:	1	Size:	7/8"	Jumper:	6'	Color:	None

CARRIER UNKNOWN PIC

MOUNT

Type: Z Brackets w 4 1/2" Pipe | Manufacture: N/A

Elevation: Bottom 99'-8" | Center 102'-2" | Top 104'-8" | Location A

Face Width 4 1/2" | Height 5' | Projection 11" | Azimuth/s 330

ANTENNA

Type: Dish | Dim: (HxWxD) 6' | Azimuth/s: 280

Make	RSI	Model	P-105A72DL-2	Location	A	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 99' | Center 102' | Top 105'

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity: 1 | Size: Elliptical 90 | Jumper: N/A | Color: 2 Blue

CARRIER UNKNOWN PIC

MOUNT

Type: Alum. Side Arm | Manufacture: N/A

Elevation: Bottom 98' | Center 99' | Top 100' | Location C

Face Width 2 1/2" | Height 2' | Projection 3'-6" | Azimuth/s 210

ANTENNA

Type: Whip | Dim: (HxWxD) 16' x 2 1/2" | Azimuth/s: N/A

Make	None Found	Model	None Found	Location	C	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 100' | Center 108' | Top 116'

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity: 1 | Size: 7/8" | Jumper: 6' | Color: Brown

CARRIER UNKNOWN PIC

MOUNT

Type: Alum. Side Arm | Manufacture: N/A

Elevation: Bottom 116' | Center 117'-9" | Top 119'-6" | Location C

Face Width 2 1/2" | Height 3'-6" | Projection 4'-6" | Azimuth/s 210

ANTENNA

Type: Whip | Dim: (HxWxD) 16' x 2 1/2" | Azimuth/s: N/A

Make	None Found	Model	None Found	Location	C	Quantity	1
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom 119'-6" | Center 127'-6" | Top 135'-6"

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity: 1 | Size: 7/8" | Jumper: 6' | Color: None

CARRIER PIC

MOUNT

Type: | Manufacture:

Elevation: Bottom | Center | Top | Location

Face Width | Height | Projection | Azimuth/s

ANTENNA

Type: | Dim: (HxWxD) | Azimuth/s:

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

Elevation: Bottom | Center | Top

TMA'S

Make		Model		Location		Quantity	
Make		Model		Location		Quantity	

COAX

Quantity: | Size: | Jumper: | Color:

Dispersive Wave Propagation Testing of an Existing Tower Foundation

Report Prepared for
Natcomm, Inc.

Site Name: Windsor, CT
Site ID: 08007.CO9
480-482 Pigeon Hill Rd. – Windsor, CT
Lat: 41-51-59.85
Lon: 72-40-29.13

FDH Project Number 08-04006E N1

Prepared By:

Brian Peele

Brian Peele
NDT Signal Analyst

Reviewed By:

Corbin Hardy

Corbin Hardy
Director of NDT Technology

FDH Engineering, Inc.
PO Box 99556
Raleigh, NC 27615
(919)-755-1012
info@fdh-inc.com

4/18/2008

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Report Submitted by: Brian Peele, BSMSE
NDT Signal Analyst
FDH Engineering, Inc.
2730 Rowland Road, Suite 100 – Raleigh, NC 27615
Tel: (919) 755-1012 Fax: (919) 755-1031

Client: Natcomm, Inc.
Attn: Mr. Dan Bolan
63-2 North Branford Road - Branford, CT 06405-
Tel: (203) 488-0580 Fax: (203) 488-8587

Project Location: 480-482 Pigeon Hill Rd. - Windsor, CT

Foundation Type: Concrete Pad and Pier

Number of Foundations Tested: Three (3)

Scope of Work

Field crews from FDH Engineering, Inc. performed a nondestructive *Dispersive Wave* investigation of a concrete tower foundation in Connecticut. These tests were conducted to collect data used for determining the foundations' overall, in-situ sizes. The data acquired was transmitted to FDH's offices in Raleigh, NC where it was post-processed and analyzed. Contained herein are the results from this analysis.

The FDH Testing Methodology

FDH's method of dispersive wave testing is conducted by temporarily mounting accelerometers (gages) on the foundation's top, and then striking the foundation with a hand-held hammer. The waves created by the blow propagate up and down the foundation's length with the reflections being recorded and stored on a digital storage oscilloscope each time they pass the gages. The data then is analyzed by digital signal processing techniques using special software designed by FDH. This analysis permits computation of the time needed for a select group of frequencies to travel from the gages to the bottom of the concrete and back. The foundation's vertical dimension is then computed from the product of frequency velocity and the corresponding time required for travel. FDH's method of rebar determinations is conducted using FDH's proprietary software and field capabilities to obtain a three-dimensional view of the reinforcing steel within the concrete.

DISCUSSION

The concrete lengths shown in *Appendix – Drawing No. S-1* are considered to be from the foundation's top surface to its bottom surface. If there is a break or other significant fracture in the concrete, or a major void, a strong return would be found on the record at the approximate location of the apparent damage. The computed length then would be the distance from the foundation's top to the location of such a material anomaly.

GENERAL COMMENTS/LIMITATIONS

Professional judgments are incorporated into this report. These are based on our evaluations of field information gathered, on our understanding of the characteristics of the project, and on our experience and capabilities using dispersive wave propagation methods. We do not guarantee performance of this project in any respect, only that our work and judgments rendered meet the standard of care of our profession.

Several factors are mentioned below that could potentially affect the results of our investigation, either the wave propagation testing or the manual probing/digging operations that may have been used.

If any portion of the foundations have been modified in the past by pouring additional concrete above the original (old) concrete, then there exists the possibility of not being able to identify the dimensions of the original foundation located beneath the new pour. Such modifications could create cold joints through which wave energy may not pass, and the dimensions of any original block may be obscured by the new pour, or completely encompassed by it. The presence of "toes" at the bottom of anchor blocks, if applicable for this project, might not be detected.

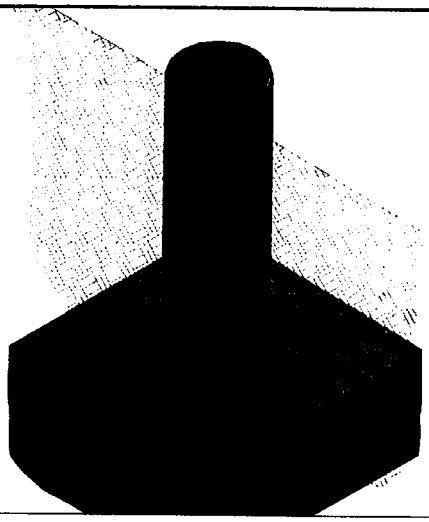
If foundations are embedded into rock the computed concrete thicknesses (depths) could be affected by the underlying rock. Multiple wave reflections could be present in the data due to uneven concrete surfaces that may exist between concrete and rock. Some wave energy could extend into the rock that could induce a slight error in the thickness (depth) calculations.

The presence of overspill concrete near the top of foundations can cause an error in the lateral dimensions determined for a foundations. Overspill concrete can encompass a larger area above the actual installed foundation size. Also, uneven concrete surfaces below grade, if they exist, make determination of foundation concrete sizes difficult. In these cases, average concrete dimensions are reported.

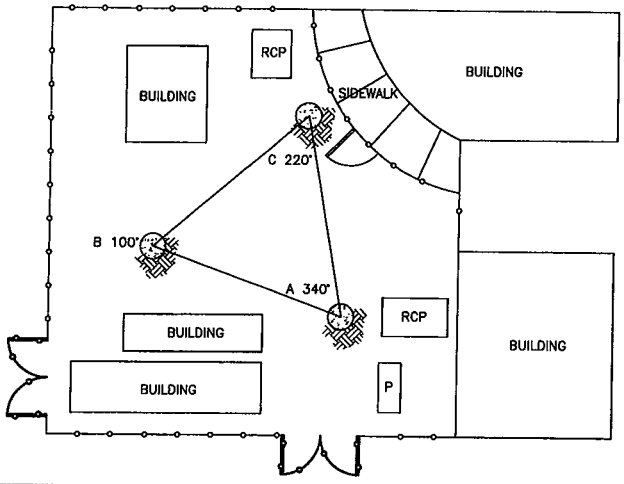
Every attempt is made to identify whether driven or cast-in-place piles exist beneath a foundation. Where piles are identified they are reported. If not reported, we do not guarantee they do not exist, only that they were not located. The client should be aware of this possibility and know that FDH has made every attempt to locate any suspected piles. Locating piles is a difficult operation without excavations, shoring, and dewatering operations where water table is high.

Wave propagation testing uses the fact that wave energy is mechanically generated and allowed to travel up and down a foundation's vertical length. Wave reflections, used for thickness or depth computations, are caused by energy encountering either the bottom of the concrete, voids, fractures, breaks, cold joints, soil intrusion, or varying material properties. If such areas are present, a strong return would be found on the record at the approximate location of the apparent interface. The computed length (thickness) then would be the distance from the foundation's top to the location of such a material anomaly.

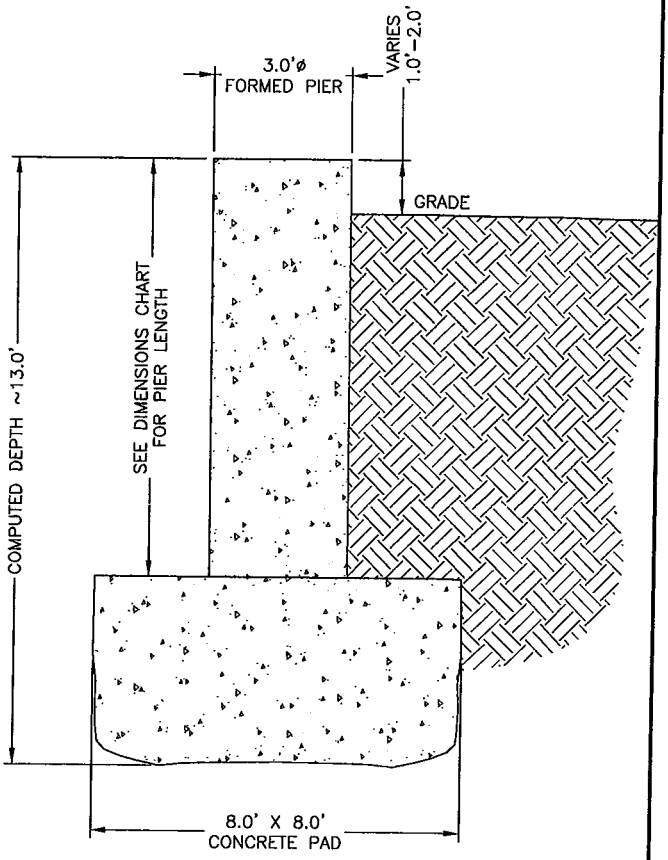
Appendix

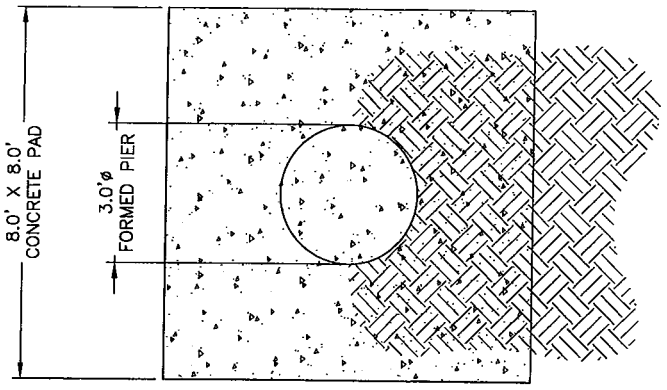


ISOMETRIC CLOSE-UP SCALE: NTS



SITE PLAN SCALE: NTS





PLAN VIEW SCALE: NTS

FOUNDATION PROFILE SCALE: NTS

FOUNDATION DIMENSIONS

AZIMUTH	PIER LENGTH
A 340°	9.0'
B 100°	9.5'
C 220°	9.5'

SITE NOTES: FACE WIDTH: 23.5'

PREPARED BY:
FDH ENGINEERING
2730 ROWLAND RD. STE. 100
RALEIGH, NC 27615
PHONE: (919) 755-1012
FAX: (919) 755-1031

PREPARED BY:
NATCOMM
63-2 NORTH BRANFORD RD.
BRANFORD, CT 06405
PHONE: (203) 488-0580
FAX: (203) 488-8587

DRAWING TITLE:
DISPERSIVE WAVE
FOUNDATION RESULTS

PROJECT NO:	DRAWN:	PC:	APPV'D:	DATE:
08-04006N	BLS	EBP	CCH	04/18/08

PROJECT NAME:
WINDSOR
08007.CO9

ADDRESS:
480-482 PIGEON HILL RD.
WINDSOR, CT 06095

LAT: 41° 51' 59.85"
LONG: 72° 40' 29.13"

REV. NO:	DATE:
A	04/18/08

DRAWING NO:
S-1

SITE NAME	WINDSOR CT	ECP - CELL #	8	143
LATITUDE	41-51-59.90 N	LONGITUDE	72-40-29.20 W	
		SAVE BUTTON		
Additional Comments: Add 3 700 antennas and 6 cables.		STRUCTURE TYPE	LATTICE	

700 Mhz - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	eNodeB	eNodeB	eNodeB
ANTENNA TYPE	BXA-70040-6CF-2-750MHZ	BXA-70040-6CF-2-750MHZ	BXA-70063-6CF-4-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	40	230	310
DOWN TILT (MECH/DEG)	4	4	4
RAD CTR (FT AGL)	155	155	155
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
MCPA BRICKS (QTY)			
850 Celluar - Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	Modcell 4.0 HD	Modcell 4.0 HD	Modcell 4.0 HD
ANTENNA TYPE	LPA-80063/4CF	LPA-80063/4CF	LPA-80063/4CF
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	40	230	310
DOWN TILT (MECH/DEG)	5	5	4
RAD CTR (FT AGL)	155	155	155
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
MCPA BRICKS (QTY)			
850 Celluar - Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	Modcell 4.0 HD	Modcell 4.0 HD	Modcell 4.0 HD
ANTENNA TYPE	LPA-80063/4CF	LPA-80063/4CF	LPA-80063/4CF
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	40	230	310
DOWN TILT (MECH/DEG)	5	5	4
RAD CTR (FT AGL)	155	155	155
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
MCPA BRICKS (QTY)			
1900 Cellular - Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS Modcell 4.0	PCS Modcell 4.0	PCS Modcell 4.0
ANTENNA TYPE	948F85T2E-M_2	948F85T2E-M_2	948F85T2E-M_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	40	230	310
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	155	155	155
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
MCPA BRICKS (QTY)			
1900 Cellular - Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS Modcell 4.0	PCS Modcell 4.0	PCS Modcell 4.0
ANTENNA TYPE	948F85T2E-M_2	948F85T2E-M_2	948F85T2E-M_2
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	40	230	310
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	155	155	155
TMA - QTY / MODEL			

DIPLEXER - QTY / MODEL						
MCPA BRICKS (QTY)						

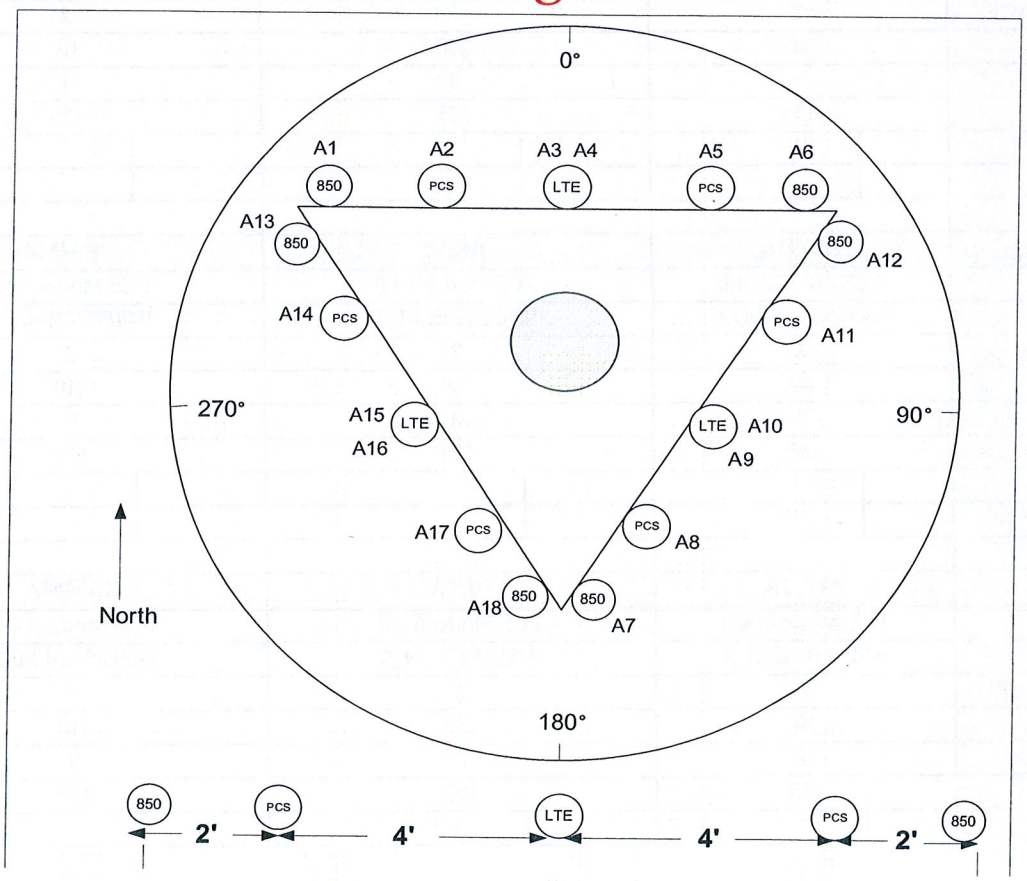
NUMBER OF CABLE'S NEEDED				ESTIMATED CABLE LENGTH	
MAINLINE SIZE	1 5/8"	TOTAL # OF MAINLINES	18	MAINLINE (FT)	150
JUMPER SIZE	1/2 "	TOTAL # OF TOP JUMPERS	18	TOP JUMPER (FT)	10

TX/ RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	PCS F-Band	700 Mhz C - Bloc	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895	RX - 776-787	LTE (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/ WHITE	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared By : Alex Restrepo	Steve Weatherbee	AR	11/13/2009

Site Configuration



Slant ±45° Dual Polarized Panel 40° / 16.0 dBd
696-900 MHz

Mechanical specifications

Length	1804	mm	71.1	in
Width	600	mm	23.6	in
Depth	200	mm	7.9	in
Depth with z-bracket	240	mm	9.4	in
Weight [4]	17	kg	37.5	lbs
Wind Area Fore/Aft	1.08	m^2	11.7	ft^2
Wind Area Side	0.36	m^2	3.9	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	1543	N	347	lbf
Side	545	N	123	lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in.

Mounting Bracket Kit	36210003
Downtilt Bracket Kit	36210004

Electrical specifications

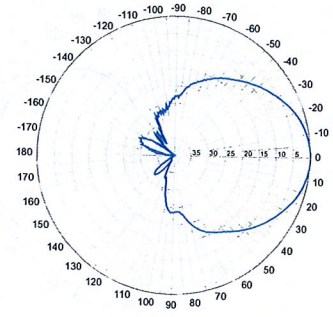
Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -27 dB
Gain [1]	16.0 dBd 18.0 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	40°
Vertical Beamwidth	10°
Electrical downtilt [5]	2°
Null fill [1]	5%
Lightning protection	Direct ground

Patented Dipole Design: U.S. Patent No. 6,608,600 B2

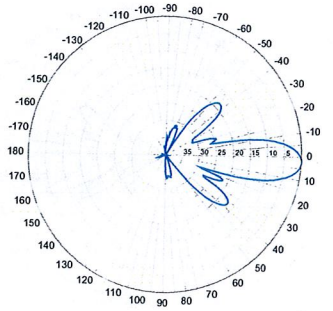
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector.
E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

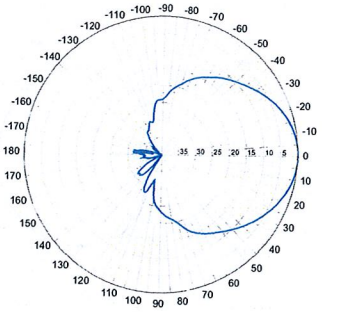
Radiation-pattern[1]
750 MHz



Horizontal



850 MHz



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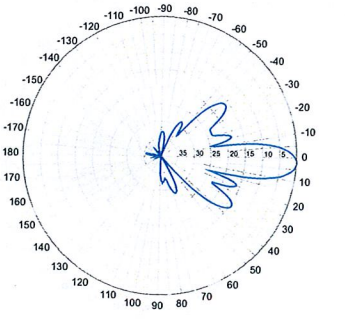
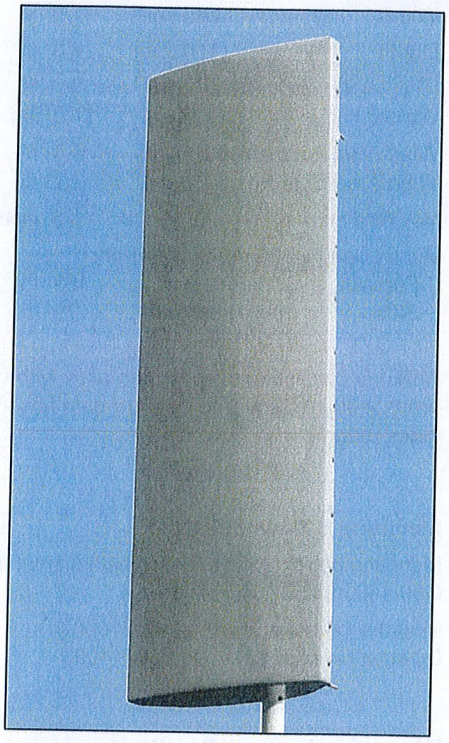


Vertical

696-900 MHz

BXA-70040/6CF __ 2°

When ordering replace "__" with connector type.



Featuring our Exclusive 3T Technology™ Antenna Design:

- Watercut brass feedline assembly for consistent performance.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad band-width and superior performance.
- Air as insulation for virtually no internal signal loss.

Warranty:
This antenna is under a five-year limited warranty for repair or replacement.

Revision Date: 5/13/09

815.399.0001 • antel@antelinc.com • www.antelinc.com

Amphenol Antel, Inc.
The Antenna Technology Company

Slant ±45° Dual Polarized FET Panel 63° / 14.5 dBd
696-900 MHz

Mechanical specifications

Length	1804	mm	71.0	in
Width	285	mm	11.2	in
Depth	114	mm	4.5	in
Depth with z-bracket	154	mm	6.1	in
Weight [4]	7.9	kg	17.0	lbs
Wind Area Fore/Aft	0.51	m^2	5.5	ft^2
Wind Area Side	0.21	m^2	2.2	ft^2
Max Wind Survivability	>201	km/hr	>125	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	753	N	169	lbf
Side	351	N	79	lbf

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiber-glass radome.

Mounting & Downtilting

Mounting hardware attaches to pipe diameter Ø50-160 mm; Ø2.0-6.3 in

Mounting Bracket Kit	36210002
Downtilt Bracket Kit	36114003

Electrical specifications

Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -25 dB
Gain [1]	14.5 dBd 16.5 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	63°
Vertical Beamwidth	11°
Electrical downtilt [5]	2°
Null fill [1]	5%
Lightning protection	Direct ground

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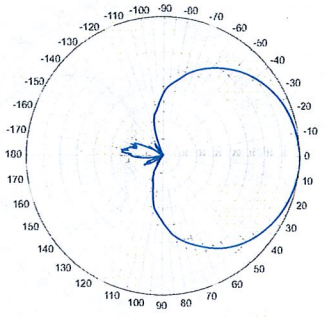
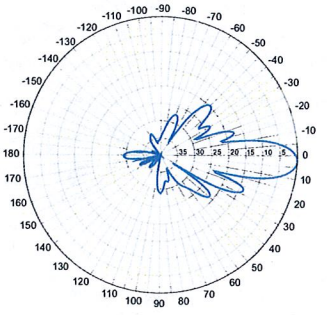
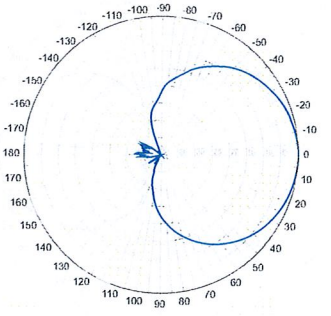


Horizontal

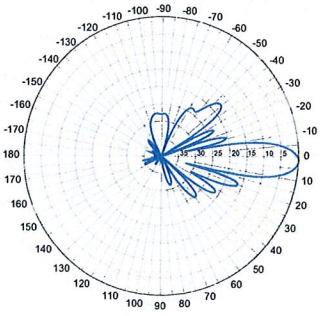


Vertical

850 MHz



Horizontal

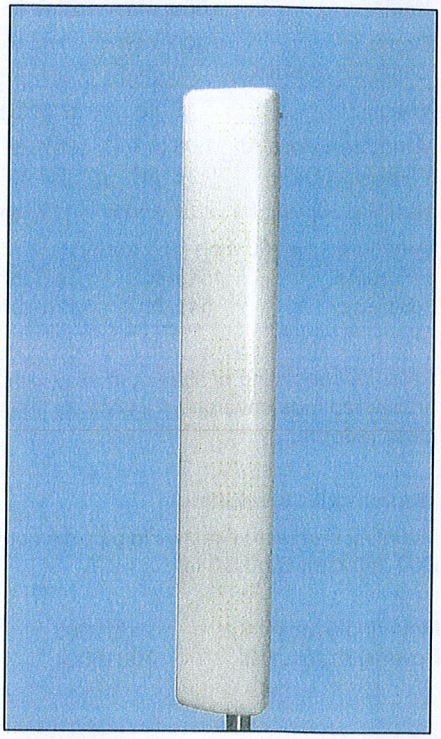


Vertical

696-900 MHz

BXA-70063/6CF __ 2°

When ordering replace "__" with connector type.



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