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

September 15, 2008

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

RE: **EM-VER-164-080808** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 480-482 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 condition that the coax cables are reconfigured as specified on drawing C-1 of the structural analysis report dated July 23, 2008 and sealed by Carlo Centore, P.E.

The proposed modifications are to be implemented as specified here and in your notice dated August 8, 2008, 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

S. Derek Phelps
Executive Director

SDP/MP/jb

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

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ROBINSON & C(

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

EM-VER-164-080808

ORIGINAL

August 8, 2008

Via Hand Delivery

RECEIVED
AUG - 8 2008
CONNECTICUT
SITING COUNCIL

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

Re: **Notice of Exempt Modification – Antenna Swap**
480-482 Pigeon Hill Road, Windsor, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility at the above referenced location. The Council approved Cellco's shared use of this facility in Docket No. 58 on July 11, 1986. Cellco intends to modify its installation by replacing six (6) of its existing antennas with six (6) LPA-80063/4CF antennas at the same 155-foot level on the 160-foot 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 of 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 replacement antennas will be located at the same height and location as the existing antennas.

2. The proposed modifications will not require the extension of the site compound.

Law Offices
BOSTON
HARTFORD
NEW LONDON
STAMFORD
WHITE PLAINS
NEW YORK CITY
SARASOTA
www.rc.com

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

4. The operation of the replacement 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 facility is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that the tower, with the reconfiguration of Cellco and AT&T coax cables, 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

Vertically Polarized, Log Periodic 63° / 13 dBd

LPA-80063/4CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1205 mm	47.4 in
Width	386 mm	15.2 in
Depth	335 mm	13.2 in
Depth with z-bracket	375 mm	14.8 in
4) Weight	9.1 kg	20.0 lbs
Wind Area		
Fore/Aft	0.47 m^2	5.0 ft^2
Side	0.40 m^2	4.4 ft^2
Rated Wind Velocity (Safety factor 2.0)	>351 km/hr	>218 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	665 N	149.5 lbs
Side	577 N	129.6 lbs

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiberglass radome.

Mounting and Downtilting

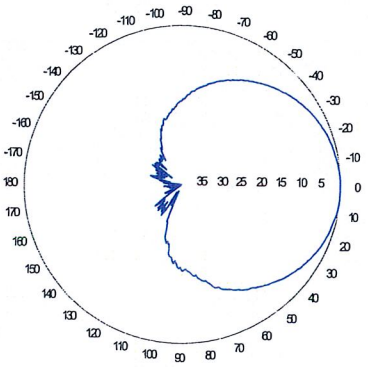
Mounting brackets attach to a pipe diameter of Ø50-102 mm (2.0-4.0 in). If the lock-down brace is used, the maximum diameter is Ø88.9 mm (3.5 in)

Mounting Bracket and Downtilt Bracket Kit #21699999

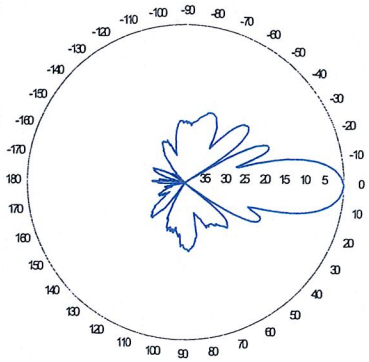
Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
3) Connector(s)	NE or E-DIN 1 port / center
1) VSWR	≤ 1.4:1
Polarization	Vertical
1) Gain	13 dBd
2) Power Rating	500 W
1) Half Power Angle	
H-Plane	63°
E-Plane	15°
1) Electrical Downtilt	0°
1) Null Fill	10%
Lightning Protection	Direct Ground

Radiation pattern[1)]



Horizontal

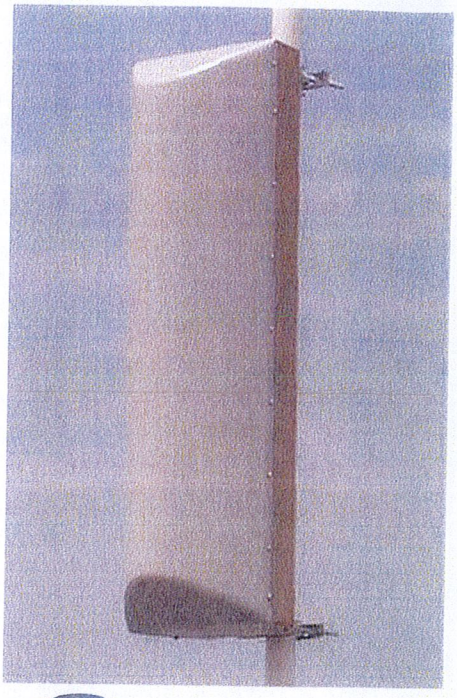


Vertical

Featuring upper side lobe suppression.

Radiation patterns for all antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back ratio.



Amphenol Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- True log-periodic design allows for superior front-to-side characteristics to minimize sector overlap.
- 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.

This Amphenol Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.

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) The antenna weight listed above does not include the bracket weight.

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

CF Denotes a Center-Fed Connector.

806-960 MHz

Amphenol Antel, Inc. 1300 Capital Drive Rockford, Illinois 61109 USA Tel. (815) 399-0001
Toll-Free (888) 417-9562 Fax. (815) 399-0156 antel@antelinc.com www.antelinc.com

Amphenol Antel, Inc. The Antenna Technology Company

Revision Date: 7/5/07

NATCOMM INC
CONSULTING ENGINEERS

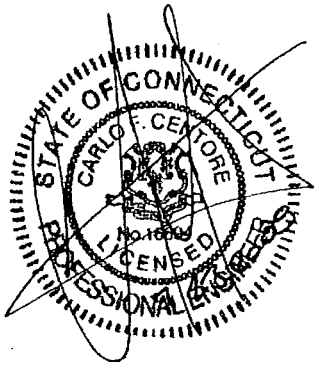
Tower Modification Design and Report

160' Existing Lattice Tower

480 – 482 Pigeon Hill Road
Windsor, CT

Natcomm Project No. 08007.CO9

Date: July 23, 2008



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

Introduction

This report was prompted, at the request of Verizon Wireless, by a structural analysis, prepared by Natcomm, Inc. (project no. 08007.CO9, dated May 27, 2008), in which the structural capacity of the existing 160-ft lattice tower was found to exceed its original design capacity. The subject tower is located in Windsor, Connecticut. The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the existing tower considering the proposed reconfiguration of AT&T and Verizon's coax cables.

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 H.E. Bergeron Engineers, P.A. (HEB); project no. 2000-110-005, dated April 16, 2001. 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 HEB structural analysis report and site assessment information obtained by Natcomm personnel on February 7, 2008. The reports prepared by HEB and FDH are available for reference in Section 5 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 is proposing the replacement of six (6) existing Cellular antennas on their three (3) existing 12' T-Frame mounts. Refer to the Antenna and Appurtenance Summary below and "Antenna Replacement Details" drawing "ANT-1" in Section 5 of this report for a detailed description and layout of the existing and 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:

- T-MOBILE (Existing):
  Antennas: Three (3) RS90-12-00NA-2 panel antennas and six (6) 10" by 8" by 3" TMA's mounted on a 10' by 4" ∅ pipe with a RAD center elevation of ±169-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) 14' by 3" ∅ omnidirectional (whip) antenna mounted with an elevation of ±167-ft above the tower base.
  Coax Cable: One (1) 5/8" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.

- UNKNOWN (Existing):
  Antenna: One (1) 10' ∅ dish antenna on a 6'-8" by 4" ∅ pipe mount with an elevation of ±71-ft above the tower base.
  Coax Cable: One (1) EW52 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' side mount standoff ±47-ft above the tower base.
  Coax Cables: Not applicable.
- UNKNOWN (Existing):
  Antenna: One (1) 8' by 3" ∅ omnidirectional (whip) antenna on a 4' side mount standoff with an elevation of ±37-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.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All coax cables to be routed as specified in Section 3 of this report.
- **AT&T and Verizon's coax cables will be reconfigured as shown (prior to Verizon's proposed antenna installation) as delineated on drawing C-1 in Section 4 of this report.**

Tower Capacity

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

Calculated stresses **were** found to be within allowable limits **considering the proposed reconfiguration of AT&T and Verizon's coax cables**. In Load Case 2, per RISATower "Section Capacity Table", this tower was found to be at **96.8%** of its total capacity.

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.

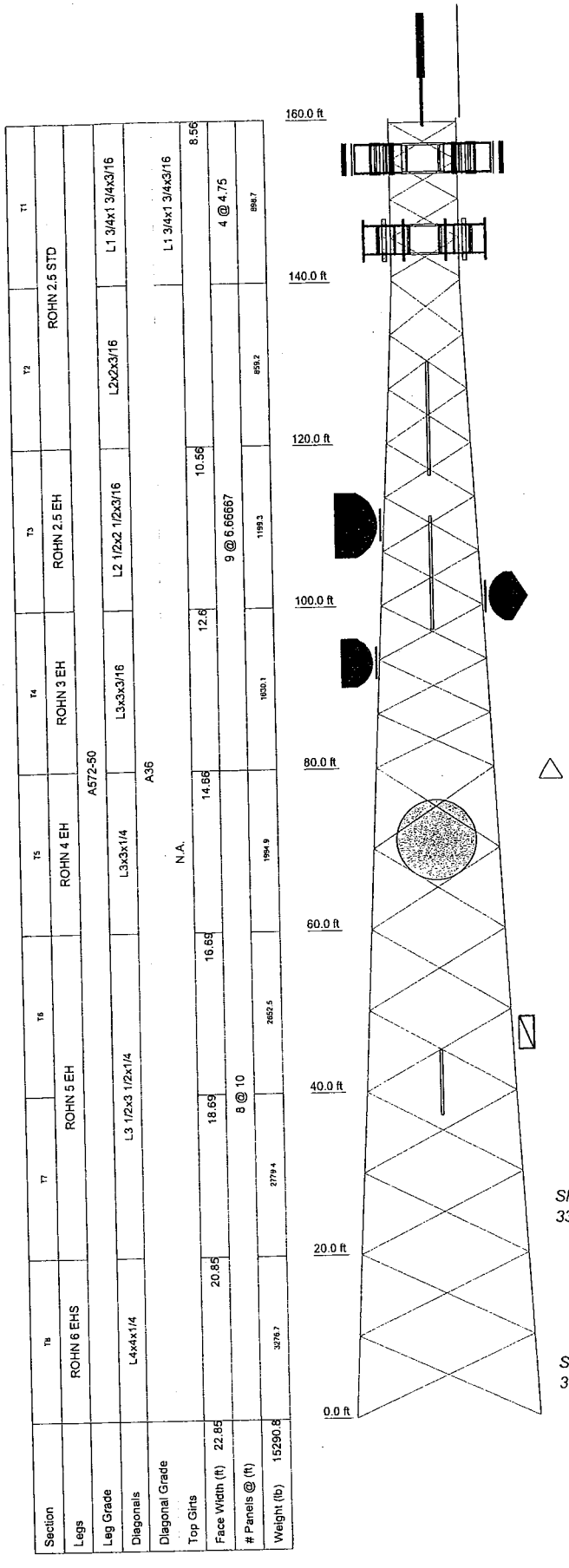
Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

- The tower base reactions developed from the governing Load Case 2 were used in the verification of the foundation and its anchors:
  - Uplift @ top of pier = **135.3** kips
  - Shear @ top of pier = **19.3** kips
  - Compression @ top of pier = **167.2** kips
- Base plates, anchor bolts and the foundation were found to be within allowable limits.
- Foundation resists two times the calculated wind load per the requirements of section 3108.4.2 of the 2005 CT State Building Code Supplement to the 2003 International Building Code (IBC).

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.



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
RS90-12-00NA-2 (T-Mobile)	169	12' Frame (ATT)	145
RS90-12-00NA-2 (T-Mobile)	169	(2) 7250.03 (ATT)	145
RS90-12-00NA-2 (T-Mobile)	169	(2) 7250.03 (ATT)	145
(2) TMA 10"x8"x3" (T-Mobile)	169	(2) 7250.03 (ATT)	145
(2) TMA 10"x8"x3" (T-Mobile)	169	(2) TMA 10"x8"x3" (ATT)	145
(2) TMA 10"x8"x3" (T-Mobile)	169	(2) TMA 10"x8"x3" (ATT)	145
14' x 3" Dia Omni (Unknown)	167	(2) TMA 10"x8"x3" (ATT)	145
10'0"x4" Pipe Mount (T-Mobile)	164	12' Frame (ATT)	145
12' T-Frame (Verizon)	155	14' x 3" Dia Omni (Unknown)	130 - 116
12' T-Frame (Verizon)	155	4' Side Mount Standoff (Unknown)	116
LPA-80063-4CF (Verizon)	155	14' x 3" Dia Omni (Unknown)	111 - 97
DB948F85T2E-M (Verizon)	155	4'x4" Pipe Mount (Unknown)	110
DB948F85T2E-M (Verizon)	155	8 FT DISH (Unknown)	110
LPA-80063-4CF (Verizon)	155	4'x4" Pipe Mount (Unknown)	101
LPA-80063-4CF (Verizon)	155	6 FT DISH (Unknown)	101
DB948F85T2E-M (Verizon)	155	4' Side Mount Standoff (Unknown)	97
DB948F85T2E-M (Verizon)	155	4'x4" Pipe Mount (Unknown)	93
LPA-80063-4CF (Verizon)	155	6 FT DISH (Unknown)	93
LPA-80063-4CF (Verizon)	155	10 FT DISH (Unknown)	71
DB948F85T2E-M (Verizon)	155	6'8"x4" Pipe Mount (Unknown)	71
DB948F85T2E-M (Verizon)	155	4' Side Mount Standoff (Unknown)	47
LPA-80063-4CF (Verizon)	155	8' x 3" Dia Omni (Unknown)	45 - 37
12' T-Frame (Verizon)	155	4' Side Mount Standoff (Unknown)	37
12' Frame (ATT)	145		

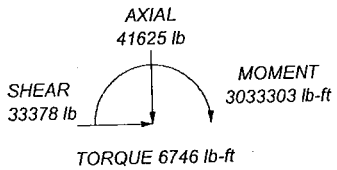
MATERIAL STRENGTH

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

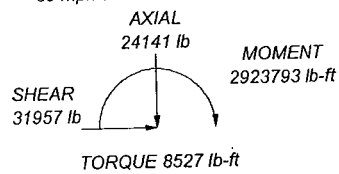
TOWER DESIGN NOTES

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: 96.8%

MAX. CORNER REACTIONS AT BASE:
DOWN: 167150 lb
UPLIFT: -135290 lb
SHEAR: 19342 lb



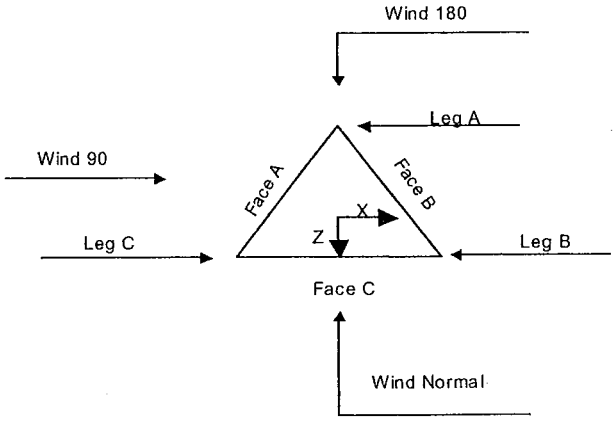
TORQUE 6746 lb-ft
69 mph WIND - 0.5000 in ICE



TORQUE 8527 lb-ft
REACTIONS - 80 mph WIND

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

Job: 160' ROHN SSV Self-Support Lattice		
Project: 08007.CO9 - 480-482 Pigeon Hill Road, Windsor		
Client: Verizon	Drawn by: Staff	App'd:
Code: TIA/EIA-222-F	Date: 06/02/08	Scale: NT
Path: C:\Users\jkerman\Documents\Natcomm\08007.CO9 Windsor\Rev 1 Rainf 6 2 2008\ERI Feet\160 Lattice Windsor.eri		Dwg No. E



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 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	K Factors[1] Legs	X Brace Diags X	X Brace Diags Y	K Single Diags X	K Single Diags Y	Girts X	Girts Y	Horiz. X	Horiz. Y	Sec. Horiz. X	Sec. Horiz. Y	Inner Brace X	Inner Brace Y
ft															
T1 160.00-140.00	Yes	Yes	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
T3 120.00-100.00	Yes	Yes	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
T5 80.00-60.00	Yes	Yes	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
T7 40.00-20.00	Yes	Yes	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]*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

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
EW52 (Unknown)	C	Yes	Af (CfAe)	93.00 - 3.00	0.0000	0.37	1	1	1.7426	1.7426	5.5505	0.59
7/8 (Unknown)	C	Yes	Ar (CfAe)	116.00 - 3.00	0.0000	0.36	1	1	1.1100	1.1100		0.54
7/8 (Unknown)	C	Yes	Ar (CfAe)	97.00 - 3.00	0.0000	0.35	1	1	1.1100	1.1100		0.54
EW52 (Unknown)	C	Yes	Af (CfAe)	71.00 - 3.00	0.0000	0.34	1	1	1.7426	1.7426	5.5505	0.59
5/8 (Unknown)	C	Yes	Ar (CfAe)	37.00 - 3.00	0.0000	0.33	1	1	0.8800	0.8800		0.40

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	160.00-140.00	A	14.850	0.000	0.000	0.000	187.20
		B	31.425	0.000	0.000	0.000	309.00
		C	1.467	0.000	0.000	0.000	8.00
T2	140.00-120.00	A	19.800	0.000	0.000	0.000	249.60
		B	43.050	0.000	0.000	0.000	368.40
		C	1.467	0.000	0.000	0.000	8.00
T3	120.00-100.00	A	19.800	0.000	0.000	0.000	249.60
		B	43.050	0.000	0.000	0.000	368.40
		C	3.039	1.452	0.000	0.000	23.08
T4	100.00-80.00	A	19.800	0.000	0.000	0.000	249.60
		B	43.050	0.000	0.000	0.000	368.40
		C	6.739	4.792	0.000	0.000	58.25
T5	80.00-60.00	A	19.800	0.000	0.000	0.000	249.60
		B	43.050	0.000	0.000	0.000	368.40
		C	7.017	7.406	0.000	0.000	70.49
T6	60.00-40.00	A	19.800	0.000	0.000	0.000	249.60
		B	43.050	0.000	0.000	0.000	368.40
		C	7.017	8.713	0.000	0.000	75.80
T7	40.00-20.00	A	19.800	0.000	0.000	0.000	249.60
		B	43.050	0.000	0.000	0.000	368.40
		C	8.263	8.713	0.000	0.000	82.60
T8	20.00-0.00	A	16.830	0.000	0.000	0.000	212.16
		B	36.593	0.000	0.000	0.000	313.14
		C	7.211	7.406	0.000	0.000	71.23

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	160.00-140.00	A	0.500	3.725	15.500	0.000	0.000	450.40
		B		7.092	34.333	0.000	0.000	776.39
		C		3.133	0.000	0.000	0.000	24.86
T2	140.00-120.00	A	0.500	4.967	20.667	0.000	0.000	600.53
		B		9.217	48.000	0.000	0.000	952.24
		C		3.133	0.000	0.000	0.000	24.86
T3	120.00-100.00	A	0.500	4.967	20.667	0.000	0.000	600.53
		B		9.217	48.000	0.000	0.000	952.24

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	160.00-140.00	-0.7607	-3.7711	-0.4749	-2.1310
T2	140.00-120.00	1.8276	-0.9191	1.8259	0.0304
T3	120.00-100.00	0.8365	-0.0543	0.6790	1.0791
T4	100.00-80.00	-1.5099	1.8000	-2.1089	3.2650
T5	80.00-60.00	-2.8070	2.9954	-3.6213	4.8027
T6	60.00-40.00	-3.1658	3.3057	-4.0599	5.1899
T7	40.00-20.00	-3.8667	3.9797	-5.0965	6.2313
T8	20.00-0.00	-3.3714	3.4702	-4.5717	5.5646

Discrete Tower Loads

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 lb
10'0"x4" Pipe Mount (T-Mobile)	C	None			0.0000	164.00	No Ice	4.50	4.50	110.00
							1/2" Ice	5.24	5.24	141.31
RS90-12-00NA-2 (T-Mobile)	A	None			0.0000	169.00	No Ice	11.47	7.58	36.00
							1/2" Ice	12.08	8.17	101.59
RS90-12-00NA-2 (T-Mobile)	B	None			0.0000	169.00	No Ice	11.47	7.58	36.00
							1/2" Ice	12.08	8.17	101.59
RS90-12-00NA-2 (T-Mobile)	C	None			0.0000	169.00	No Ice	11.47	7.58	36.00
							1/2" Ice	12.08	8.17	101.59
(2) TMA 10"x8"x3" (T-Mobile)	A	None			0.0000	169.00	No Ice	0.78	0.29	15.00
							1/2" Ice	0.90	0.38	20.06
(2) TMA 10"x8"x3" (T-Mobile)	B	None			0.0000	169.00	No Ice	0.78	0.29	15.00
							1/2" Ice	0.90	0.38	20.06
(2) TMA 10"x8"x3" (T-Mobile)	C	None			0.0000	169.00	No Ice	0.78	0.29	15.00
							1/2" Ice	0.90	0.38	20.06
12' T-Frame (Verizon)	A	From Leg	1.50	0.00	0.0000	155.00	No Ice	10.20	5.00	300.00
							1/2" Ice	16.20	7.00	400.00
12' T-Frame (Verizon)	B	From Leg	1.50	0.00	0.0000	155.00	No Ice	10.20	5.00	300.00
							1/2" Ice	16.20	7.00	400.00
12' T-Frame (Verizon)	C	From Leg	1.50	0.00	0.0000	155.00	No Ice	10.20	5.00	300.00
							1/2" Ice	16.20	7.00	400.00
LPA-80063-4CF (Verizon)	A	From Leg	3.00	0.00	0.0000	155.00	No Ice	7.00	6.08	20.00
				-6.00			1/2" Ice	7.41	6.48	72.62
DB948F85T2E-M (Verizon)	A	From Leg	3.00	0.00	0.0000	155.00	No Ice	1.92	3.26	8.50
				-4.00			1/2" Ice	2.22	3.62	27.57
DB948F85T2E-M (Verizon)	A	From Leg	3.00	0.00	0.0000	155.00	No Ice	1.92	3.26	8.50
				4.00			1/2" Ice	2.22	3.62	27.57
LPA-80063-4CF (Verizon)	A	From Leg	3.00	0.00	0.0000	155.00	No Ice	7.00	6.08	20.00
				6.00			1/2" Ice	7.41	6.48	72.62
LPA-80063-4CF (Verizon)	B	From Leg	3.00	0.00	0.0000	155.00	No Ice	7.00	6.08	20.00
				-6.00			1/2" Ice	7.41	6.48	72.62
				0.00						

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 lb
14' x 3" Dia Omni (Unknown)	A	From Leg	4.00 0.00 0.00	0.0000	111.00 - 97.00	No Ice 1/2" Ice	4.20 5.63	4.20 5.63	40.00 70.34
6'8"x4" Pipe Mount (Unknown)	A	From Leg	0.50 0.00 0.00	0.0000	71.00	No Ice 1/2" Ice	2.60 3.01	2.60 3.01	72.00 93.13
4' Side Mount Standoff (Unknown)	A	From Leg	2.00 0.00 0.00	0.0000	37.00	No Ice 1/2" Ice	2.72 4.91	2.72 4.91	50.00 89.00
8' x 3" Dia Omni (Unknown)	A	From Leg	4.00 0.00 0.00	0.0000	45.00 - 37.00	No Ice 1/2" Ice	2.40 3.19	2.40 3.19	25.00 42.51
14' x 3" Dia Omni (Unknown)	B	From Leg	0.50 0.00 0.00	0.0000	167.00	No Ice 1/2" Ice	4.20 5.63	4.20 5.63	40.00 70.34
4'x4" Pipe Mount (Unknown)	B	From Leg	0.50 0.00 0.00	0.0000	101.00	No Ice 1/2" Ice	1.32 1.58	1.32 1.58	44.00 56.99
4' Side Mount Standoff (Unknown)	B	From Leg	2.00 0.00 0.00	0.0000	47.00	No Ice 1/2" Ice	2.72 4.91	2.72 4.91	50.00 89.00
4'x4" Pipe Mount (Unknown)	C	From Leg	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.32 1.58	1.32 1.58	44.00 56.99
4'x4" Pipe Mount (Unknown)	C	From Leg	0.50 0.00 0.00	0.0000	93.00	No Ice 1/2" Ice	1.32 1.58	1.32 1.58	44.00 56.99

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight lb
10 FT DISH (Unknown)	A	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	0.0000		71.00	10.00	No Ice 1/2" Ice	78.54 79.81	317.00 726.71
6 FT DISH (Unknown)	B	Paraboloid w/Radome	From Leg	1.00 0.00 0.00	0.0000		101.00	6.00	No Ice 1/2" Ice	28.27 29.05	143.00 292.13
8 FT DISH (Unknown)	C	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	0.0000		110.00	8.00	No Ice 1/2" Ice	50.30 51.29	251.00 514.30
6 FT DISH (Unknown)	C	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 0.00	0.0000		93.00	6.00	No Ice 1/2" Ice	28.27 29.05	143.00 292.13

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
T7 40.00-20.00	30.00	1	12	0.5000	406.354	A	44.236	33.620	21.919	28.15	0.000	0.000
						B	69.505	37.280		20.53	0.000	0.000
						C	35.326	44.917		27.32	0.000	0.000
T8 20.00-0.00	10.00	1	12	0.5000	449.724	A	47.235	37.098	25.459	30.19	0.000	0.000
						B	68.500	40.218		23.42	0.000	0.000
						C	39.602	47.094		29.37	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	11.216	24.433	9.583	26.88	0.000	0.000
					B	9.989	41.008		18.79	0.000	0.000
					C	12.206	11.050		41.21	0.000	0.000
T2 140.00-120.00	130.00	1.48	9	195.998	A	10.160	29.399	9.599	24.27	0.000	0.000
					B	8.740	52.649		15.64	0.000	0.000
					C	11.279	11.066		42.96	0.000	0.000
T3 120.00-100.00	110.00	1.411	9	236.398	A	14.933	29.400	9.600	21.65	0.000	0.000
					B	13.255	52.650		14.57	0.000	0.000
					C	17.490	12.639		31.86	0.000	0.000
T4 100.00-80.00	90.00	1.332	9	278.441	A	20.638	31.487	11.687	22.42	0.000	0.000
					B	18.696	54.737		15.92	0.000	0.000
					C	26.121	18.426		26.24	0.000	0.000
T5 80.00-60.00	70.00	1.24	8	321.010	A	17.003	34.826	15.026	28.99	0.000	0.000
					B	15.623	58.076		20.39	0.000	0.000
					C	24.728	22.042		32.13	0.000	0.000
T6 60.00-40.00	50.00	1.126	7	363.083	A	21.793	38.374	18.574	30.87	0.000	0.000
					B	20.235	61.624		22.69	0.000	0.000
					C	30.779	25.591		32.95	0.000	0.000
T7 40.00-20.00	30.00	1	6	404.685	A	23.951	38.379	18.579	29.81	0.000	0.000
					B	22.431	61.629		22.10	0.000	0.000
					C	32.849	26.843		31.13	0.000	0.000
T8 20.00-0.00	10.00	1	6	448.055	A	30.032	38.950	22.120	32.07	0.000	0.000
					B	28.583	58.713		25.34	0.000	0.000
					C	37.600	29.331		33.05	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	504.20	898.74	A	0.203	2.587	0.591	1	1	25.654	2326.21	116.31	B
			B	0.29	2.324	0.613	1	1	35.120			
			C	0.132	2.838	0.579	1	1	18.603			
T2 140.00-120.00	626.00	859.16	A	0.202	2.59	0.591	1	1	27.528	2560.99	128.05	B
			B	0.313	2.261	0.62	1	1	41.385			
			C	0.114	2.908	0.577	1	1	17.660			

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	504.20	898.74	A	0.203	2.587	0.591	0.85	1	23.972	2226.97	111.35	B
			B	0.29	2.324	0.613	0.85	1	33.622			
			C	0.132	2.838	0.579	0.85	1	16.772			
T2 140.00-120.00	626.00	859.16	A	0.202	2.59	0.591	0.85	1	26.004	2479.86	123.99	B
			B	0.313	2.261	0.62	0.85	1	40.074			
			C	0.114	2.908	0.577	0.85	1	15.968			
T3 120.00-100.00	641.08	1199.35	A	0.188	2.638	0.588	0.85	1	29.978	2663.07	133.15	B
			B	0.279	2.354	0.61	0.85	1	43.364			
			C	0.127	2.856	0.578	0.85	1	22.175			
T4 100.00-80.00	676.25	1630.05	A	0.187	2.639	0.588	0.85	1	36.053	2895.38	144.77	B
			B	0.264	2.397	0.605	0.85	1	49.034			
			C	0.16	2.735	0.583	0.85	1	32.946			
T5 80.00-60.00	688.49	1994.93	A	0.161	2.73	0.583	0.85	1	34.766	2748.36	137.42	B
			B	0.23	2.5	0.597	0.85	1	47.944			
			C	0.146	2.787	0.581	0.85	1	33.821			
T6 60.00-40.00	693.80	2652.49	A	0.166	2.715	0.584	0.85	1	40.935	2822.38	141.12	B
			B	0.225	2.513	0.596	0.85	1	53.923			
			C	0.155	2.752	0.582	0.85	1	41.063			
T7 40.00-20.00	700.60	2779.43	A	0.154	2.757	0.582	0.85	1	42.699	2640.93	132.05	B
			B	0.208	2.57	0.592	0.85	1	55.551			
			C	0.148	2.781	0.581	0.85	1	43.519			
T8 20.00-0.00	596.53	3276.67	A	0.154	2.757	0.582	0.85	1	48.200	2846.82	142.34	B
			B	0.195	2.613	0.589	0.85	1	58.898			
			C	0.149	2.774	0.581	0.85	1	49.013			
Sum Weight:	5126.95	15290.82						OTM	1651148.63 lb-ft	21323.76		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	1251.65	1476.69	A	0.277	2.358	0.609	1	1	40.322	2676.85	133.84	B
			B	0.388	2.089	0.647	1	1	59.939			
			C	0.197	2.605	0.59	1	1	25.623			
T2 140.00-120.00	1577.63	1389.70	A	0.27	2.38	0.607	1	1	44.315	3051.35	152.57	B
			B	0.415	2.036	0.658	1	1	73.037			
			C	0.166	2.713	0.584	1	1	23.828			
T3 120.00-100.00	1623.90	1882.94	A	0.247	2.445	0.601	1	1	49.434	3236.01	161.80	B
			B	0.367	2.134	0.639	1	1	77.505			
			C	0.181	2.66	0.587	1	1	32.645			
T4 100.00-80.00	1731.70	2518.62	A	0.241	2.465	0.6	1	1	56.834	3420.06	171.00	B
			B	0.341	2.192	0.629	1	1	84.446			
			C	0.222	2.524	0.595	1	1	48.041			
T5 80.00-60.00	1772.94	2784.44	A	0.205	2.579	0.591	1	1	54.407	3285.35	164.27	B
			B	0.295	2.309	0.614	1	1	82.759			
			C	0.2	2.596	0.59	1	1	49.116			
T6 60.00-40.00	1791.28	3632.13	A	0.206	2.577	0.592	1	1	61.588	3273.76	163.69	B
			B	0.285	2.337	0.611	1	1	89.687			
			C	0.206	2.577	0.592	1	1	57.985			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T2 140.00-120.00	1577.63	1389.70	A	0.27	2.38	0.607	0.85	1	39.744	2701.19	135.06	B
			B	0.415	2.036	0.658	0.85	1	64.656			
			C	0.166	2.713	0.584	0.85	1	22.151			
T3 120.00-100.00	1623.90	1882.94	A	0.247	2.445	0.601	0.85	1	44.157	2858.78	142.94	B
			B	0.367	2.134	0.639	0.85	1	68.470			
			C	0.181	2.66	0.587	0.85	1	29.980			
T4 100.00-80.00	1731.70	2518.62	A	0.241	2.465	0.6	0.85	1	50.711	3022.07	151.10	B
			B	0.341	2.192	0.629	0.85	1	74.619			
			C	0.222	2.524	0.595	0.85	1	43.963			
T5 80.00-60.00	1772.94	2784.44	A	0.205	2.579	0.591	0.85	1	48.809	2911.50	145.57	B
			B	0.295	2.309	0.614	0.85	1	73.341			
			C	0.2	2.596	0.59	0.85	1	45.079			
T6 60.00-40.00	1791.28	3632.13	A	0.206	2.577	0.592	0.85	1	55.278	2905.35	145.27	B
			B	0.285	2.337	0.611	0.85	1	79.594			
			C	0.206	2.577	0.592	0.85	1	52.986			
T7 40.00-20.00	1812.41	3827.45	A	0.192	2.624	0.589	0.85	1	57.394	2717.61	135.88	B
			B	0.263	2.4	0.605	0.85	1	81.642			
			C	0.197	2.604	0.59	0.85	1	56.524			
T8 20.00-0.00	1543.72	4545.56	A	0.188	2.638	0.588	0.85	1	61.961	2812.87	140.64	B
			B	0.242	2.463	0.6	0.85	1	82.348			
			C	0.193	2.62	0.589	0.85	1	61.398			
Sum Weight:	13105.24	22057.53						OTM	1754069.1 6 lb-ft	22314.25		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1 160.00-140.00	504.20	898.74	A	0.203	2.587	0.591	1	1	25.654	908.68	45.43	B
			B	0.29	2.324	0.613	1	1	35.120			
			C	0.132	2.838	0.579	1	1	18.603			
T2 140.00-120.00	626.00	859.16	A	0.202	2.59	0.591	1	1	27.528	1000.39	50.02	B
			B	0.313	2.261	0.62	1	1	41.385			
			C	0.114	2.908	0.577	1	1	17.660			
T3 120.00-100.00	641.08	1199.35	A	0.188	2.638	0.588	1	1	32.218	1087.96	54.40	B
			B	0.279	2.354	0.61	1	1	45.352			
			C	0.127	2.856	0.578	1	1	24.799			
T4 100.00-80.00	676.25	1630.05	A	0.187	2.639	0.588	1	1	39.149	1195.70	59.78	B
			B	0.264	2.397	0.605	1	1	51.838			
			C	0.16	2.735	0.583	1	1	36.864			
T5 80.00-60.00	688.49	1994.93	A	0.161	2.73	0.583	1	1	37.316	1126.05	56.30	B
			B	0.23	2.5	0.597	1	1	50.288			
			C	0.146	2.787	0.581	1	1	37.530			
T6 60.00-40.00	693.80	2652.49	A	0.166	2.715	0.584	1	1	44.204	1164.55	58.23	B
			B	0.225	2.513	0.596	1	1	56.958			
			C	0.155	2.752	0.582	1	1	45.680			
T7 40.00-20.00	700.60	2779.43	A	0.154	2.757	0.582	1	1	46.292	1094.10	54.70	B
			B	0.208	2.57	0.592	1	1	58.916			
			C	0.148	2.781	0.581	1	1	48.447			
T8 20.00-0.00	596.53	3276.67	A	0.154	2.757	0.582	1	1	52.704	1192.99	59.65	B
			B	0.195	2.613	0.589	1	1	63.186			
			C	0.149	2.774	0.581	1	1	54.653			
Sum Weight:	5126.95	15290.82						OTM	675443.75	8770.41		

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
80.00			B	0.264	2.397	0.605	0.85	1	49.034			
			C	0.16	2.735	0.583	0.85	1	32.946			
T5 80.00-60.00	688.49	1994.93	A	0.161	2.73	0.583	0.85	1	34.766	1073.58	53.68	B
			B	0.23	2.5	0.597	0.85	1	47.944			
			C	0.146	2.787	0.581	0.85	1	33.821			
T6 60.00-40.00	693.80	2652.49	A	0.166	2.715	0.584	0.85	1	40.935	1102.49	55.12	B
			B	0.225	2.513	0.596	0.85	1	53.923			
			C	0.155	2.752	0.582	0.85	1	41.063			
T7 40.00-20.00	700.60	2779.43	A	0.154	2.757	0.582	0.85	1	42.699	1031.61	51.58	B
			B	0.208	2.57	0.592	0.85	1	55.551			
			C	0.148	2.781	0.581	0.85	1	43.519			
T8 20.00-0.00	596.53	3276.67	A	0.154	2.757	0.582	0.85	1	48.200	1112.04	55.60	B
			B	0.195	2.613	0.589	0.85	1	58.898			
			C	0.149	2.774	0.581	0.85	1	49.013			
Sum Weight:	5126.95	15290.82						OTM	644979.93 lb-ft	8329.60		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	6548.69					
Bracing Weight	8742.14					
Total Member Self-Weight	15290.82			-7621.19	9082.43	
Total Weight	24141.17			-7621.19	9082.43	
Wind 0 deg - No Ice		1199.24	-31892.66	-2902286.52	-115969.24	-5193.64
Wind 30 deg - No Ice		15694.68	-26932.82	-2472814.77	-1452155.49	-7164.06
Wind 60 deg - No Ice		26166.87	-15962.56	-1471024.89	-2419077.65	-8481.60
Wind 90 deg - No Ice		30774.26	-992.36	-104406.80	-2832123.47	-7805.64
Wind 120 deg - No Ice		27364.15	15646.79	1382323.98	-2501702.50	-926.12
Wind 150 deg - No Ice		14524.29	27020.07	2451297.58	-1326351.55	5336.98
Wind 180 deg - No Ice		-822.78	30533.20	2784026.58	94639.25	7061.64
Wind 210 deg - No Ice		-15582.11	26938.21	2443244.76	1454592.70	7241.76
Wind 240 deg - No Ice		-27126.38	16894.26	1512417.66	2495092.88	6119.76
Wind 270 deg - No Ice		-30472.26	441.32	44903.64	2818243.94	7864.21
Wind 300 deg - No Ice		-25957.18	-14891.43	-1359082.46	2414466.18	1419.96
Wind 330 deg - No Ice		-14901.88	-26512.95	-2428416.29	1387003.61	-5473.25
Member Ice	6766.71					
Total Weight Ice	41624.72			-14164.49	19888.09	
Wind 0 deg - Ice		919.30	-33330.15	-3012470.80	-75944.53	-5745.92
Wind 30 deg - Ice		15478.15	-26611.53	-2435550.92	-1407370.11	-5592.63
Wind 60 deg - Ice		25453.19	-15347.34	-1415254.93	-2325643.23	-5389.77
Wind 90 deg - Ice		30483.44	-759.98	-88291.53	-2772290.42	-3757.70
Wind 120 deg - Ice		28673.16	16431.73	1440750.39	-2580042.62	2611.55
Wind 150 deg - Ice		14580.78	26676.50	2402288.73	-1310960.66	6397.78
Wind 180 deg - Ice		-631.02	29628.52	2684477.53	85486.21	6674.78
Wind 210 deg - Ice		-15391.96	26613.14	2396052.68	1435123.86	5647.83
Wind 240 deg - Ice		-28490.86	17387.99	1540445.38	2600830.35	3134.37
Wind 270 deg - Ice		-30252.62	339.28	26156.89	2787583.58	3799.92
Wind 300 deg - Ice		-25293.59	-14526.55	-1329501.86	2348086.97	-1285.01
Wind 330 deg - Ice		-14871.22	-26290.44	-2401608.94	1383383.61	-6495.20
Total Weight	24141.17			-7621.19	9082.43	
Wind 0 deg - Service		468.45	-12458.07	-1134224.45	-47551.76	-2028.77
Wind 30 deg - Service		6130.74	-10520.63	-966462.05	-569499.51	-2798.46

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
T1	160 - 140	Leg	Max Tension	12	12368.26	-825.29	-487.02
			Max. Compression	15	-15174.37	8.80	879.75
			Max. Mx	10	-12406.14	-883.61	511.77
			Max. My	2	-14975.08	-7.60	-1021.38
			Max. Vy	23	-3293.14	763.07	-437.53
			Max. Vx	15	-3799.52	8.80	879.75
		Diagonal	Max Tension	7	2846.17	0.00	0.00
			Max. Compression	13	-2856.09	0.00	0.00
			Max. Mx	26	1387.53	15.83	0.06
			Max. My	7	-2848.72	2.92	3.00
			Max. Vy	26	11.51	15.83	0.06
			Max. Vx	7	0.61	0.00	0.00
		Top Girt	Max Tension	21	33.43	0.00	0.00
			Max. Compression	19	-141.35	0.00	0.00
			Max. Mx	14	-50.12	-35.32	0.00
			Max. My	24	-36.67	0.00	0.00
			Max. Vy	14	16.51	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
T2	140 - 120	Leg	Max Tension	12	25229.94	-128.06	-1.71
			Max. Compression	15	-30092.84	-10.60	-50.19
			Max. Mx	15	-17954.09	879.75	-8.79
			Max. My	5	-1329.73	15.68	299.54
			Max. Vy	19	188.12	879.61	6.17
			Max. Vx	16	-68.75	37.22	-291.93
		Diagonal	Max Tension	20	2852.68	0.00	0.00
			Max. Compression	20	-2919.20	0.00	0.00
			Max. Mx	15	2477.89	26.43	2.09
			Max. My	26	-2732.12	6.18	-5.66
			Max. Vy	25	15.61	25.38	2.10
			Max. Vx	26	1.39	0.00	0.00
T3	120 - 100	Leg	Max Tension	12	40904.42	-254.18	201.88
			Max. Compression	23	-49447.40	160.78	51.03
			Max. Mx	4	35181.27	641.41	22.27
			Max. My	7	-2386.89	6.98	687.20
			Max. Vy	4	321.81	-380.39	-3.41
			Max. Vx	13	-349.80	10.52	445.86
		Diagonal	Max Tension	3	3957.79	0.00	0.00
			Max. Compression	3	-4046.80	0.00	0.00
			Max. Mx	15	3507.24	53.14	-3.53
			Max. My	22	-3421.79	9.10	-7.24
			Max. Vy	15	-23.96	53.14	-3.53
			Max. Vx	25	1.64	0.00	0.00
T4	100 - 80	Leg	Max Tension	4	59422.83	-69.74	-42.40
			Max. Compression	23	-71956.75	87.10	-87.62
			Max. Mx	21	52782.93	-340.21	-0.64
			Max. My	7	-3912.18	18.01	-277.99
			Max. Vy	4	-346.26	-172.34	40.94
			Max. Vx	7	-380.08	-4.10	-214.54
		Diagonal	Max Tension	18	4659.47	0.00	0.00
			Max. Compression	5	-4743.46	0.00	0.00
			Max. Mx	19	4052.87	77.24	4.50
			Max. My	21	-3727.14	26.39	-10.05
			Max. Vy	19	-31.83	77.24	4.50
			Max. Vx	20	2.05	0.00	0.00
T5	80 - 60	Leg	Max Tension	4	76801.85	-396.22	187.00
			Max. Compression	23	-92832.16	-77.85	23.55
			Max. Mx	8	64322.36	-555.55	-24.64
			Max. My	5	-6773.78	0.95	571.44

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg A	Max. H_x	25	-122953.54	15906.51	9152.00
	Max. H_z	26	-107769.84	13749.86	9172.43
	Min. Vert	12	-132254.06	14542.36	8446.92
	Min. H_x	6	152760.46	-16504.35	-9569.98
	Min. H_z	6	152760.46	-16504.35	-9569.98
	Max. Vert	15	166635.81	-232.03	18298.06
	Max. H_x	11	5774.16	2688.53	431.54
	Max. H_z	2	155017.49	-226.69	19308.02
	Min. Vert	8	-132935.32	231.96	-17142.91
	Min. H_x	5	13333.53	-2726.57	1282.57
	Min. H_z	21	-122251.42	196.54	-18574.43

Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear$_x$ lb	Shear$_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	24141.17	-0.00	-0.00	-7620.75	9082.18	-0.00
Dead+Wind 0 deg - No Ice	24141.17	1199.24	-31892.66	-2908350.91	-116175.13	-5238.12
Dead+Wind 30 deg - No Ice	24141.17	15694.68	-26932.82	-2477996.90	-1455203.04	-7216.01
Dead+Wind 60 deg - No Ice	24141.17	26166.87	-15962.56	-1474099.70	-2424176.26	-8526.96
Dead+Wind 90 deg - No Ice	24141.17	30774.27	-992.36	-104612.33	-2838080.59	-7833.85
Dead+Wind 120 deg - No Ice	24141.17	27364.15	15646.79	1385188.36	-2506962.47	-928.42
Dead+Wind 150 deg - No Ice	24141.17	14524.29	27020.07	2456413.99	-1329156.76	5354.61
Dead+Wind 180 deg - No Ice	24141.17	-822.78	30533.20	2789855.32	94833.97	7095.27
Dead+Wind 210 deg - No Ice	24141.17	-15582.11	26938.21	2448338.15	1457665.22	7285.50
Dead+Wind 240 deg - No Ice	24141.17	-27126.38	16894.26	1515519.99	2500353.07	6164.64
Dead+Wind 270 deg - No Ice	24141.48	-30472.41	440.81	44979.78	2824181.88	7891.16
Dead+Wind 300 deg - No Ice	24141.17	-25957.18	-14891.43	-1361933.62	2419567.70	1431.99
Dead+Wind 330 deg - No Ice	24141.49	-14902.41	-26512.82	-2433501.36	1389950.22	-5481.78
Dead+Ice+Temp	41624.72	0.00	0.00	-14219.87	19961.54	0.25
Dead+Wind 0 deg+Ice+Temp	41624.72	919.30	-33330.15	-3022936.68	-76116.87	-5833.10
Dead+Wind 30 deg+Ice+Temp	41624.72	15478.15	-26611.53	-2443971.37	-1412239.30	-5679.25
Dead+Wind 60 deg+Ice+Temp	41624.72	25453.19	-15347.34	-1420143.29	-2333740.94	-5476.60
Dead+Wind 90 deg+Ice+Temp	41624.71	30483.43	-759.94	-88579.19	-2781899.84	-3815.57
Dead+Wind 120 deg+Ice+Temp	41624.72	28673.16	16431.73	1445727.00	-2589044.68	2601.30
Dead+Wind 150 deg+Ice+Temp	41624.71	14580.82	26676.47	2410555.46	-1315523.08	6435.27
Dead+Wind 180 deg+Ice+Temp	41624.72	-631.02	29628.51	2693760.39	85774.35	6746.31
Dead+Wind 210 deg+Ice+Temp	41624.72	-15391.96	26613.13	2404289.82	1440117.19	5728.32
Dead+Wind 240 deg+Ice+Temp	41624.72	-28490.86	17387.99	1545682.98	2609940.57	3229.02
Dead+Wind 270 deg+Ice+Temp	41624.71	-30252.62	339.32	26225.66	2797264.30	3859.80
Dead+Wind 300 deg+Ice+Temp	41624.72	-25293.59	-14526.55	-1334112.51	2356279.73	-1269.15
Dead+Wind 330 deg+Ice+Temp	41624.71	-14871.18	-26290.46	-2409910.94	1388219.71	-6529.36
Dead+Wind 0 deg - Service	24141.17	468.45	-12458.07	-1140738.91	-39835.36	-2045.30
Dead+Wind 30 deg - Service	24141.17	6130.74	-10520.63	-972628.86	-562897.52	-2816.28
Dead+Wind 60 deg - Service	24141.17	10221.43	-6235.38	-580476.34	-941406.83	-3330.62
Dead+Wind 90 deg - Service	24141.17	12021.20	-387.64	-45516.80	-1103087.56	-3060.10
Dead+Wind 120 deg - Service	24141.17	10689.12	6112.03	536440.01	-973742.87	-364.18
Dead+Wind 150 deg - Service	24141.17	5673.55	10554.72	954889.55	-513659.73	2091.01
Dead+Wind 180 deg - Service	24141.17	-321.40	11927.03	1085141.96	42589.14	2772.35
Dead+Wind 210 deg - Service	24141.17	-6086.76	10522.74	951736.54	574949.72	2846.83
Dead+Wind 240 deg - Service	24141.17	-10596.24	6599.32	587352.92	982255.04	2408.60
Dead+Wind 270 deg - Service	24141.17	-11903.23	172.39	12918.52	1108752.78	3083.81
Dead+Wind 300 deg - Service	24141.17	-10139.52	-5816.97	-536663.66	950699.46	558.41
Dead+Wind 330 deg - Service	24141.17	-5821.05	-10356.62	-955249.70	548500.01	-2143.87

10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000181
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000200
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000201
16	Yes	4	0.00000001	0.00000259
17	Yes	4	0.00000001	0.00000340
18	Yes	4	0.00000001	0.00000424
19	Yes	4	0.00000001	0.00000225
20	Yes	4	0.00000001	0.00000490
21	Yes	4	0.00000001	0.00000419
22	Yes	4	0.00000001	0.00000366
23	Yes	4	0.00000001	0.00000228
24	Yes	4	0.00000001	0.00000465
25	Yes	4	0.00000001	0.00000405
26	Yes	4	0.00000001	0.00000454
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 140	3.997	35	0.2238	0.0053
T2	140 - 120	3.042	35	0.2124	0.0060
T3	120 - 100	2.191	35	0.1779	0.0057
T4	100 - 80	1.496	35	0.1397	0.0048
T5	80 - 60	0.952	35	0.1033	0.0045
T6	60 - 40	0.552	35	0.0740	0.0034
T7	40 - 20	0.265	35	0.0502	0.0020
T8	20 - 0	0.080	35	0.0246	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
169.00	RS90-12-00NA-2	35	3.997	0.2238	0.0053	169117
167.00	14' x 3" Dia Omni	35	3.997	0.2238	0.0053	169117
164.00	10'0"x4" Pipe Mount	35	3.997	0.2238	0.0053	169117
155.00	12' T-Frame	35	3.754	0.2224	0.0055	169117
145.00	12' Frame	35	3.275	0.2172	0.0059	56372
130.00	14' x 3" Dia Omni	35	2.599	0.1971	0.0060	33365
123.00	14' x 3" Dia Omni	35	2.309	0.1838	0.0059	29118

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325N	0.6250	4	3092.07	13372.70	0.231 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2856.09	4123.34	0.693 ✔	1.333	Bolt Shear
T2	140	Leg	A325N	0.6250	4	6307.48	13499.00	0.467 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2919.20	4123.34	0.708 ✔	1.333	Bolt Shear
T3	120	Leg	A325N	0.7500	4	10226.10	19438.30	0.526 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4046.80	4123.34	0.981 ✔	1.333	Bolt Shear
T4	100	Leg	A325N	0.8750	4	14855.70	26458.10	0.561 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	4743.46	4123.34	1.150 ✔	1.333	Bolt Shear
T5	80	Leg	A325N	1.0000	4	19200.50	34557.50	0.556 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	6354.69	6442.72	0.986 ✔	1.333	Bolt Shear
T6	60	Leg	A325N	1.0000	4	24029.60	34557.50	0.695 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	6700.53	6442.72	1.040 ✔	1.333	Bolt Shear
T7	40	Leg	A325N	1.0000	6	18988.60	34557.50	0.549 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	7127.00	6442.72	1.106 ✔	1.333	Bolt Shear
T8	20	Leg	A354-BC	0.8750	6	21839.10	24804.50	0.880 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	8310.35	6442.72	1.290 ✔	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	160 - 140	ROHN 2.5 STD	20.00	4.75	60.2 K=1.00	22.690	1.7040	-15174.40	38664.10	0.392 ✔
T2	140 - 120	ROHN 2.5 STD	20.03	6.68	84.6 K=1.00	18.081	1.7040	-30092.80	30810.90	0.977 ✔
T3	120 - 100	ROHN 2.5 EH	20.03	6.68	86.7 K=1.00	17.634	2.2535	-49447.40	39739.10	1.244 ✔
T4	100 - 80	ROHN 3 EH	20.04	6.68	70.5 K=1.00	20.840	3.0159	-71956.80	62852.20	1.145 ✔
T5	80 - 60	ROHN 4 EH	20.03	10.02	81.4 K=1.00	18.730	4.4074	-92832.20	82552.50	1.125 ✔
T6	60 - 40	ROHN 5 EH	20.03	10.02	65.4 K=1.00	21.782	6.1120	-116765.00	133128.00	0.877 ✔

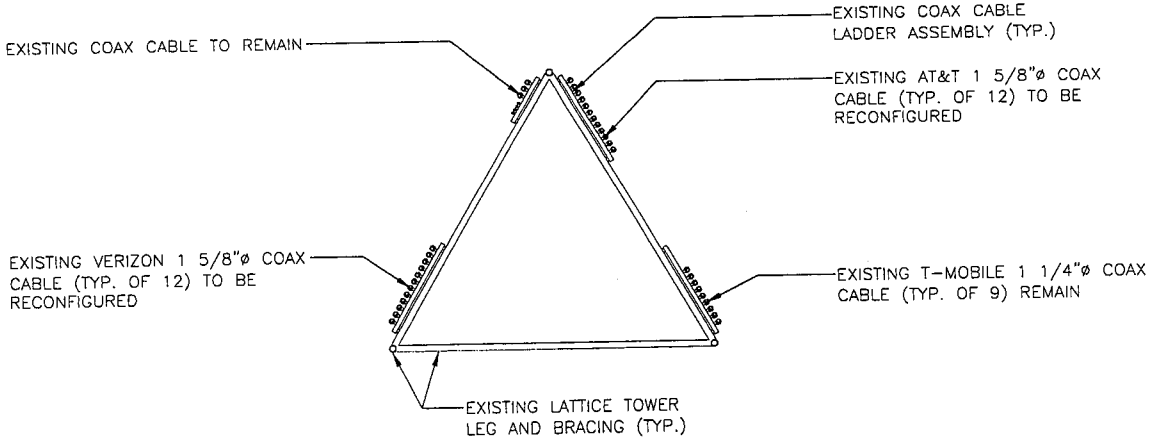
Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	160 - 140	ROHN 2.5 STD	20.00	4.75	60.2	30.000	1.7040	12368.30	51121.50	0.242 ✓
T2	140 - 120	ROHN 2.5 STD	20.03	6.68	84.6	30.000	1.7040	25229.90	51121.50	0.494 ✓
T3	120 - 100	ROHN 2.5 EH	20.03	6.68	86.7	30.000	2.2535	40904.40	67606.20	0.605 ✓
T4	100 - 80	ROHN 3 EH	20.04	6.68	70.5	30.000	3.0159	59422.80	90477.90	0.657 ✓
T5	80 - 60	ROHN 4 EH	20.03	10.02	81.4	30.000	4.4074	76801.80	132223.00	0.581 ✓
T6	60 - 40	ROHN 5 EH	20.03	10.02	65.4	30.000	6.1120	96118.20	183359.00	0.524 ✓
T7	40 - 20	ROHN 5 EH	20.04	10.02	65.4	30.000	6.1120	113932.00	183359.00	0.621 ✓
T8	20 - 0	ROHN 6 EHS	20.03	10.02	54.0	30.000	6.7133	131034.00	201398.00	0.651 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	160 - 140	L1 3/4x1 3/4x3/16	9.79	4.59	106.3	21.600	0.6211	2846.17	13415.60	0.212 ✓
T2	140 - 120	L2x2x3/16	12.21	5.99	119.8	21.600	0.7150	2852.68	15444.00	0.185 ✓
T3	120 - 100	L2 1/2x2 1/2x3/16	13.96	6.87	108.5	21.600	0.9020	3957.79	19483.20	0.203 ✓
T4	100 - 80	L3x3x3/16	15.79	7.76	101.3	21.600	1.0900	4659.47	23544.00	0.198 ✓
T5	80 - 60	L3x3x1/4	19.03	9.42	123.7	21.600	1.4400	6301.21	31104.00	0.203 ✓
T6	60 - 40	L3 1/2x3 1/2x1/4	20.76	10.23	114.5	21.600	1.6900	6700.53	36504.00	0.184 ✓
T7	40 - 20	L3 1/2x3 1/2x1/4	22.64	11.20	125.1	21.600	1.6900	7127.00	36504.00	0.195 ✓
T8	20 - 0	L4x4x1/4	24.49	12.05	117.3	21.600	1.9400	8310.35	41904.00	0.198 ✓

Top Girt Design Data (Tension)

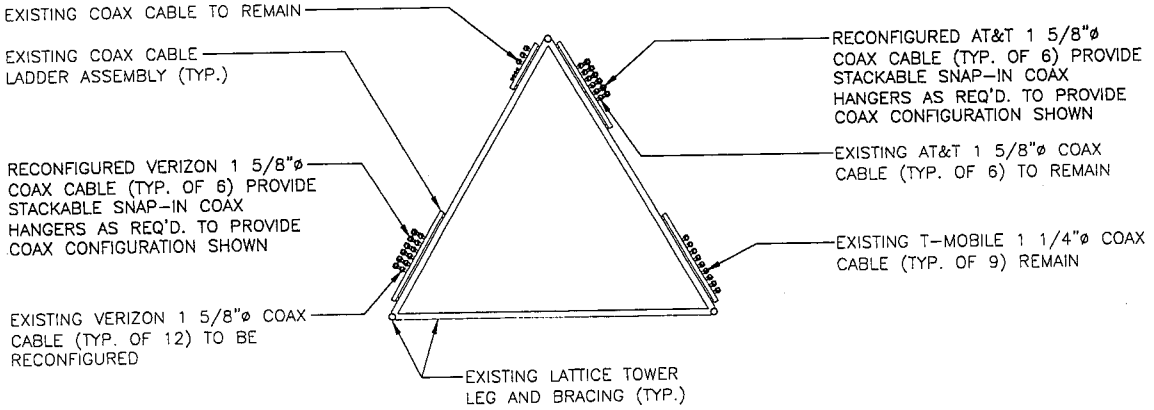
Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P / P_a
T1	160 - 140	L1 3/4x1 3/4x3/16	8.56	8.32	186.0	21.600	0.6211	33.43	13415.60	0.002 ✓



1 / C-1 **EXISTING COAX LAYOUT**

NOT TO SCALE

PROJECT NORTH



2 / C-1 **RECONFIGURED COAX LAYOUT**

NOT TO SCALE

PROJECT NORTH

REVISIONS

NO	07/30/08	CONSTRUCTION

Cellco Partnership

d.b.a. verizonwireless

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CONSULTING ENGINEERS

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Branford, CT 06405

WINDSOR

480-482 PIGEON HILL RD
WINDSOR, CT

PROJECT NO:	080
DRAWN BY:	
CHECKED BY:	
SCALE:	AS
DATE:	0

COAX RECONFIGURATION DETAILS

C-1

DWG. 1 OF

NATCOMM

Job	160' Self Support - Windsor, CT	Project No.	08007.CO9	Page ___ of ___	
Description	Spread Footing w/ Pier Stability Check	Computed by	JEK	Sheet 1 of 2	
		Checked by		Date 06/02/08	Date

FOUNDATION STABILITY CHECK

TOWER FORCES:

Shear at Base of Tower	$S_t := 19.4\,kip$
Max Compressive Force	$C_t := 168\,kip$
Max Uplift Force	$U_t := 136\,kip$
Height of Tower	$H_t := 160\,ft$

FOOTING DIMENSIONS:

Overall Depth of Footing	$D_f := 11.0\,ft$
Length of Pier	$L_p := 9.5\,ft$
Extension of Pier Above Grade	$L_{pag} := 2.0\,ft$
Diameter of Pier	$d_p := 3.0\,ft$
Thickness of Footing	$T_f := 3.5\,ft$
Width of Footing:	$W_f := 8.0\,ft$

PROPERTIES:

Internal Friction Angle of Soil	$\phi_s := 30\,deg$
Allowable Bearing Capacity	$q_s := 4500\,psf$
Unit Weight of Soil	$\gamma_s := 100\,pcf$
Unit Weight of Concrete	$\gamma_c := 150\,pcf$
Depth to Neglect	$n := 1ft$
Cohesion of Clay Type Soil Note: Use 0 for Sandy Soil	$c := 0\,ksf$
Seismic Zone Factor: UBC Fig 23-2	$Z := 2$
Coefficient of Friction between Concrete:	$\mu := 0.45$

Coefficient of Lateral Soil Pressure:

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

	General	Power	Density					
Site Name: Windsor								
Tower Height: Verizon @ 155ft								
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%	
*VoiceStream	8	242	145	0.0331	1930	1.0000	3.31%	
*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	**9**	**285**	**155**	**0.0348**	**1970**	**0.5866**	**5.93%**	
Verizon	**3**	**207**	**155**	**0.0093**	**875**	**1.0000**	**0.93%**	
								17.70%
* Source: Siting Council								

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HEB

STRUCTURAL ANALYSIS REPORT
OF
160' ROHN SELF-SUPPORTING TOWER
WINDSOR, CONNECTICUT

Prepared for Verizon Wireless

April 16, 2001

Prepared by: H. E. Bergeron Engineers, P.A.
P.O. Box 440, 2605 White Mountain Highway
North Conway, NH 03860
HEB Project No. 2000-110-005

HEB

- (1) 14' whip antenna with 7/8" waveguides cable on a 4-foot sidearm at 116'.
- *(6) EMS RR90-17 panel antennas, each with (2) 1-5/8" waveguide cables, on 15' gate boom mounts at 145' (proposed).*
- (1) 12-foot section of 4" tube steel at 151'.
- (15) ALP7130.16 panel antennas with 7/8" waveguide cables on 15-foot gate boom mounts at 155'.
- (1) 14' whip antenna with 5/8" waveguide cable at 160'.
- *(3) RS90-12 panel antennas, each with 1-5/8" waveguide cables, on pole mounts at 169' (proposed).*

STRUCTURAL ANALYSIS:

Methodology:

The structural analysis was done in accordance with TIA/EIA-222-F, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures (EIA), and the American Institute of Steel Construction (AISC), Manual of Steel Construction, Allowable Stress Design, Ninth Edition.

The analysis was conducted using a wind speed of 80 miles per hour and one-half inch of radial ice over the entire structure and all appurtenances. The EIA/TIA Standard requires a minimum of 80 miles per hour for Hartford County, Connecticut. The tower was analyzed by calculating the resultant wind loading and associated maximum bending moments and axial loads. The moments and forces were used to calculate compressive and shear stresses in leg members, which were compared to allowable stresses according to AISC.

Two loading conditions were evaluated in accordance with EIA/TIA-222-F to determine the tower's capacity. The more demanding of the two cases is used to calculate the tower capacity:

- Case 1 = Wind Load (without ice) + Tower Dead Load
- Case 2 = 0.75 Wind Load (with ice) + Ice Load + Tower Dead Load

In addition, the EIA/TIA standard permits a one-third increase in allowable stresses for towers less than 700-feet tall. Allowable stresses of tower members were increased by one-third when computing the load capacity values shown below.

HEB

tall concrete piers. The width of the mat was assumed to be 34.8-feet and the thickness of the mat was assumed to be 2-feet. The existing foundation should be partially excavated to determine if these assumptions are accurate. The overturning moment resisted by the existing foundation is sufficient to resist the overturning moment produced by the proposed loading as shown in Appendix B and using an assumed soil bearing capacity of 4000 psf and a soil overburden depth of 10 feet.

Base reactions imposed by the proposed antennas were calculated to be as follows:

Tension:	160.3 kips
Compression:	186 kips
Total Shear:	38.2 kips
Overturning Moment:	3517.3 ft-kips

CONCLUSIONS AND SUGGESTIONS:

As detailed above, our analysis indicates that Verizon Wireless' 160-foot ROHN self-supporting tower structure located on Pigeon Hill Road in Windsor, Connecticut is capable of supporting the additional antenna loading proposed. The foundation is capable of supporting the proposed loading. The depth and dimensions of the existing foundation were assumed and not taken from a drawing or from actual measurements. Further investigation of the foundation should be done to determine the accuracy of the assumptions.

LIMITATIONS:

This report is based on the following:

1. Tower is properly installed and maintained.
2. All members are in new condition.
3. All required members are in place.
4. All bolts are in place and are properly tightened.
5. Weep holes on tube and pipe members are open.
6. Tower is in plumb condition.
7. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
8. Foundation dimensions and depths are assumed and should be verified.

Appendix A

Drawings

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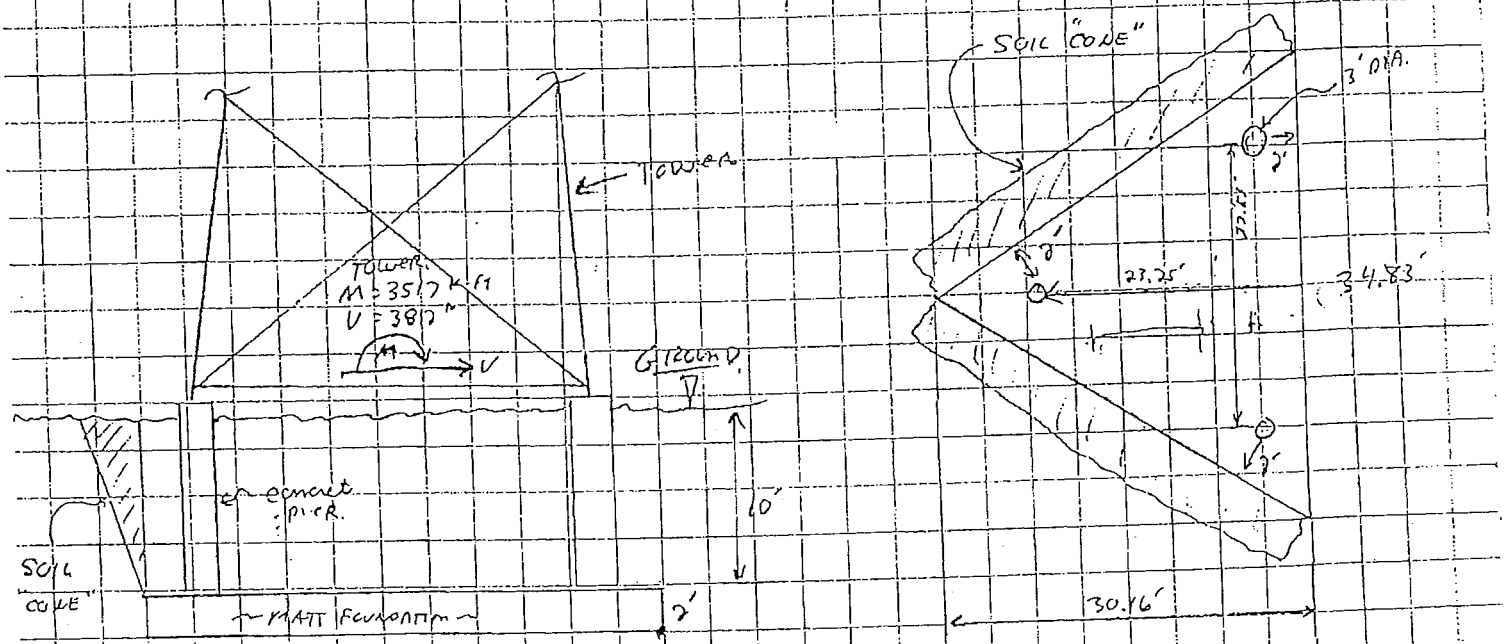
HEB

JOB Windsor, CT. JOB NO 2000-110-003
CALCULATED BY JK. DATE 5-1-01
CHECKED BY DATE
SCALE

- DETERMINE ACTUAL SOIL PRESSURE UNDER FOOTING & F.S. OVERTURNING AND SLIDING.

- ASSUMPTIONS—
  - FOOTING DEPTH 10'
  - FOOTING THICKNESS - 2'
  - FOOTING WIDTH = 2' BEYOND OUTSIDE LEG DIMS.



"CONE" NOT USED IN CALCS

HEB
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FAX (603) 356-7715

JOB _____ JOB NO. _____
CALCULATED BY JK DATE 5-1-01
CHECKED BY _____ DATE _____
SCALE _____

DETERMINE q_{ACT}

$$q = \frac{V}{L}\left(1 \pm \frac{6e}{L}\right) = \frac{LOAD}{AREA}\left(1 \pm \frac{6e}{L}\right)$$

$$q = \frac{1416}{(34.83 \times 30.16)/2}\left(1 \pm \frac{6e}{L}\right) = 1.36\left(1 \pm \frac{6(14.32)}{30.16}\right) = 4.16 \text{ KSF}$$

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Client: Verizon Wireless
Job: Windsor, CT

Job No.: 2000-110-005

Calculated By: J. Klementovich
Checked By:

Date: 16-Apr-01
Date:

General Information

Tower Manufacturer	ROHN
Tower Type	Self-supporting Tower
Total Height of Tower	160 ft.
Wind Speed Hartford County	80 mph.
Radial Ice	0.5 in.
75% Reduction for ice	yes (yes or no)
1/3 Increase for allowable loads	yes (yes or no)
Number of faces	3 faces

Antenna Force Calculations based on EIA/TIA-222-F, using the following formulas:

Force on discrete appurtenance: F=Qz*Gh*Ca*A

Force on microwave antennae: F=Cr*A*Gh*Kz*V^2, where Cr=((Ca^2)+(Cs^2))^(1/2)

Gh=.65+.60/(h/33)^(1/7) = Gh= 1.13

V as specified EIA-222-F

Fy	50 ksi
E (Modulus of Elasticity)	29000 ksi
Fb	0.6
K	1

Section No.	Section Length	Leg Spread @ Base of section	Leg Size (Description)		Width of Leg to Wind	Leg Properties: Area	Leg Properties: r_z	Leg Properties: Unbraced Lengths	Shape (round =R, flat =F, none =X)
1	20	22.85	6" EHS	33.00	6 63	6.71	2.23	120.00	R
2	20	20.85	5" X-Str.	31.00	5 56	6.11	1.84	120.00	R
3	20	18.69	5" X-Str.	31.00	5 56	6.11	1.84	120.00	R
4	20	16.69	4" X-Str.	27.00	4 50	4.41	1.48	120.00	R
5	20	14.66	3" X-Str.	19.00	3 50	3.02	1.14	80.00	R
6	20	12.60	2 1/2" X-Str.	15.00	2 88	2.25	0.92	40.00	R
7	20	10.56	2 1/2" Std.	14.00	2 88	1.70	0.95	80.00	R
8	20	8.56	2 1/2" Std.	14.00	2 88	1.70	0.95	60.00	R
top		8.56		#N/A	#N/A	#N/A	#N/A		X
				#N/A	#N/A	#N/A	#N/A		X
									X
									X

160

Information

Section 4 — type 12

Ag = 321 sf — z = 70 ft

	Quantity Per Face	Length (ft.)	Width (in.)	Area (sf)	Area w/ ice	Wt. Per ft.	Wt. (lbs.) Tower	Wt. (lbs.) Ice
Round Members								
Leg	2	20.0	4.5	15.0	18.3	15.0	900.4	183.2
				0.0	0.0		0.0	0.0
				0.0	0.0		0.0	0.0
Flat Members								
Leg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diagonal	4	18.2	3.0	18.2	24.3	4.9	1071.2	595.1
				0.0	0.0		0.0	0.0

Section 5 — type 11

Ag = 278 sf — z = 90 ft

	Quantity Per Face	Length (ft.)	Width (in.)	Area (sf)	Area w/ ice	Wt. Per ft.	Wt. (lbs.) Tower	Wt. (lbs.) Ice
Round Members								
Leg	2	20.0	3.5	11.7	15.0	10.3	616.6	146.5
	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0		0.0	0.0
Flat Members								
Leg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diagonal	6	14.9	3.0	22.3	29.8	3.7	993.8	729.2
				0.0	0.0		0.0	0.0

Section 6 — type 10

Ag = 236 sf — z = 110 ft

	Quantity Per Face	Length (ft.)	Width (in.)	Area (sf)	Area w/ ice	Wt. Per ft.	Wt. (lbs.) Tower	Wt. (lbs.) Ice
Round Members								
Leg	2	20.0	2.9	9.6	12.9	7.7	459.4	123.6
	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0		0.0	0.0
Flat Members								
Leg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diagonal	12	11.8	2.5	29.5	41.3	3.1	1305.3	992.1
				0.0	0.0		0.0	0.0

Section 7 — type 9

Ag = 196 sf — z = 130 ft

	Quantity Per Face	Length (ft.)	Width (in.)	Area (sf)	Area w/ ice	Wt. Per ft.	Wt. (lbs.) Tower	Wt. (lbs.) Ice
Round Members								
Leg	2	20.0	2.9	9.6	12.9	5.8	347.1	123.6
	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0		0.0	0.0
Flat Members								
Leg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diagonal	6	11.4	2.0	11.4	17.1	2.4	501.4	399.5
Horizontal	1	8.3	2.5	1.7	2.4	3.1	76.6	58.2

Section 8 — type 8

Ag = 176 sf — z = 150 ft

	Quantity Per Face	Length (ft.)	Width (in.)	Area (sf)	Area w/ ice	Wt. Per ft.	Wt. (lbs.) Tower	Wt. (lbs.) Ice
Round Members								
Leg	2	20.0	2.9	9.6	12.9	5.8	347.1	123.6
	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0		0.0	0.0
Flat Members								
Leg	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diagonal	8	9.7	1.75	11.3	17.7	2.1	492.2	406.3
Horizontal	1	8.3	2.0	1.4	2.1	1.7	41.2	48.5

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Client: Verizon Wireless
Job: Windsor, CT
Job No.: 2000-110-005

Calculated By: J. Klementovich
Date: 16-Apr-01
Checked By:
Date:

Antennas

Type	Elev. (z)	Coeff. (C)	Kz	Qz	Area (no Ice)	Area (Ice)	Force (no Ice)	Force (Ice)	Weight (no Ice)	Weight (w/ Ice)
Whip 8'	37	1.2	1.03	16.93	2.6	4.1	61	95	60	115
GPS	47	1.2	1.11	18.13	2.1	3.0	52	74	45	90
Mount for 10' HP	71	2.0	1.24	20.39	6.0	7.5	276	345	220	440
Mount for 6' HP	93	2.0	1.34	22.03	5.3	6.2	265	306	195	390
Whip 14'	97	1.2	1.36	22.30	4.6	6.9	137	208	125	200
Mount for 6' Dish	101	2.0	1.38	22.55	5.0	6.3	255	318	171	340
Whip 14'	116	1.2	1.43	23.46	4.6	6.9	145	219	125	200
Tube Steel	151	2.0	1.54	25.30	4.0	5.0	228	286	147	300
(15) ALP 7130.16	155	1.4	1.56	25.49	61.8	67.2	2488	2706	300	450
on 15' Gate Booms	155	1.2	1.56	25.49	27.2	37.5	938	1295	1500	2250
Whip 14'	160	1.2	1.57	25.72	2.3	3.5	81	122	60	115
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		
			1.00	16.38			0	0		

Dishes

											Orient	Ca	Cs
		0.00000	1.00	16.38			0	0					
10' HP	71	0.00252	1.24	20.39	85.2	86.6	1930	2517	550	1250	160	0.0025	0.0004
6' HP	93	0.00323	1.34	22.03	28.3	29.5	888	926	250	500	20	0.0032	0.0005
6' Dish w/ Radome	101	0.00100	1.38	22.55	28.3	29.5	282	294	250	500	100	0.0001	0.0010
8' HP	110	0.00323	1.41	23.11	55.6	57.0	1830	1876	450	975	0	0.0032	0.0000
		0.00000	1.00	16.38			0	0					
		0.00000	1.00	16.38			0	0					

Proposed Antennae

(3) RS90-12	169	1.4	1.59	26.13	18.9	21.1	781	871	175	250
(6) EMS RR90-17	145	1.4	1.53	25.01	45.6	58.9	1811	2327	1606	2358
		0.00000	1.00	16.38			0	0		

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Client: Verizon Wireless
Job: Windsor, CT
Calculated By: J. Klementovich
Checked By:

Job No.: 2000-110-005
Date: 16-Apr-01
Date:

Proposed Wind Load Without Ice

Section	Midpoint Height	Areas					Factors			Rr	Kz	Qz	Gh	e	Cf	Wind Load	Section Length	Uniform Load
		Gross	Flats	Rounds	Ae	Aa	Df	Dr	Ca									
1	10	448.0	31.3	22.1	44.1	54.42	1	1	1.2	0.58	1.00	16.38	1.13	0.12	2.89	3561 lbs.	20	178 lbs/ft.
2	30	404.7	25.3	18.5	36.0	54.26	1	1	1.2	0.58	1.00	16.38	1.13	0.11	2.93	3155 lbs.	20	158 lbs/ft.
3	50	363.1	23.2	18.5	33.9	52.89	1	1	1.2	0.58	1.13	18.45	1.13	0.11	2.90	3371 lbs.	20	169 lbs/ft.
4	70	321.0	18.2	15.0	26.9	50.95	1	1	1.2	0.58	1.24	20.31	1.13	0.10	2.95	3218 lbs.	20	161 lbs/ft.
5	90	278.4	22.3	11.7	29.1	47.30	1	1	1.2	0.58	1.33	21.82	1.13	0.12	2.88	3458 lbs.	20	173 lbs/ft.
6	110	236.4	29.5	9.6	35.1	39.85	1	1	1.2	0.58	1.41	23.11	1.13	0.17	2.72	3736 lbs.	20	187 lbs/ft.
7	130	196.0	13.1	9.6	18.7	37.24	1	1	1.2	0.58	1.48	24.24	1.13	0.12	2.90	2705 lbs.	20	135 lbs/ft.
8	150	176.0	12.7	9.6	18.2	23.33	1	1	1.2	0.58	1.54	25.25	1.13	0.13	2.86	2283 lbs.	20	114 lbs/ft.
top	160	0.0	0.0	0.0	0.0	4.46	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	155 lbs.	0	#DIV/0! lbs/ft.
0	160	0.0	0.0	0.0	0.0	0.00	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	0 lbs.	0	#DIV/0! lbs/ft.
0	160	0.0	0.0	0.0	0.0	4.46	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	155 lbs.	0	#DIV/0! lbs/ft.
	160	0.0	0.0	0.0	0.0	0.00	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	0 lbs.	0	#DIV/0! lbs/ft.

Proposed Wind Load With Ice

Section	Midpoint Height	Areas					Factors			Rr	Kz	Qz	Gh	e	Cf	Wind Load	Section Length	Uniform Load
		Gross	Flats	Rounds	Ae	Ai	Df	Dr	Ca									
1	10	448.0	39.1	25.4	53.9	81.09	1	1	1.2	0.58	1.00	16.38	1.13	0.14	2.79	4584 lbs.	20	229 lbs/ft.
2	30	404.7	32.5	21.9	45.2	80.68	1	1	1.2	0.58	1.00	16.38	1.13	0.13	2.83	4157 lbs.	20	208 lbs/ft.
3	50	363.1	29.8	21.9	42.5	76.81	1	1	1.2	0.58	1.13	18.45	1.13	0.14	2.80	4397 lbs.	20	220 lbs/ft.
4	70	321.0	24.3	18.3	34.9	73.53	1	1	1.2	0.58	1.24	20.31	1.13	0.13	2.84	4293 lbs.	20	215 lbs/ft.
5	90	278.4	29.8	15.0	38.5	68.13	1	1	1.2	0.58	1.33	21.82	1.13	0.16	2.73	4606 lbs.	20	230 lbs/ft.
6	110	236.4	41.3	12.9	49.0	55.72	1	1	1.2	0.60	1.41	23.11	1.13	0.23	2.50	4944 lbs.	20	247 lbs/ft.
7	130	196.0	19.5	12.9	27.1	51.40	1	1	1.2	0.58	1.48	24.24	1.13	0.17	2.71	3701 lbs.	20	185 lbs/ft.
8	150	176.0	19.8	12.9	27.4	34.05	1	1	1.2	0.59	1.54	25.25	1.13	0.19	2.64	3230 lbs.	20	162 lbs/ft.
top	160	0.0	0.0	0.0	0.0	5.21	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	181 lbs.	0	#DIV/0! lbs/ft.
0	160	0.0	0.0	0.0	0.0	0.00	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	0 lbs.	0	#DIV/0! lbs/ft.
0	160	0.0	0.0	0.0	0.0	5.21	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	181 lbs.	0	#DIV/0! lbs/ft.
	160	0.0	0.0	0.0	0.0	0.00	1	1	1.2	0.57	1.57	25.72	1.13	0.00	3.40	0 lbs.	0	#DIV/0! lbs/ft.

H. E. BERGERON ENGINEERS, P.A.
2605 White Mountain Highway, PO Box 440
North Conway, NH 03860
(603) 356-6936

Client: Verizon Wireless
Job: Windsor, CT Job No.: 000-110-005

Calculated By: J. Klementovich Date: 16-Apr-01
Checked By: Date:

Evaluation of Bracing Members

Center Bolted? Yes
Yield Strength (F_Y): 36 ksi C_C = 126.1

Section	Member	K Value	Length (ft.)	r_x (in.)	r_z (in.)	Area (in.^{2})	kL/r_x	kL/r_z	All. Tens. (k)	F_a (ksi)	All. Comp. (k)
1	L4 x 4 x 1/4	1.0	23.44	1.250	0.795	1.94	168.8	176.9	41.90	4.77	9.26
2	L3.5 x 3.5 x 1/4	1.0	21.62	1.090	0.694	1.69	178.5	187.0	36.50	4.27	7.22
3	L3.5 x 3.5 x 1/4	1.0	19.70	1.090	0.694	1.69	162.6	170.3	36.50	5.15	8.70
4	L3 x 3 x 1/4	1.0	17.96	0.930	0.592	1.44	173.8	182.0	31.10	4.51	6.49
5	L3 x 3 x 3/16	1.0	14.60	0.939	0.596	1.09	140.0	147.0	23.54	6.91	7.53
6	L2.5 x 2.5 x 3/16	1.0	11.53	0.778	0.495	0.902	133.4	139.8	19.48	7.64	6.89
7	L2 x 2 x 3/16	1.0	10.99	0.617	0.394	0.715	160.3	167.3	15.44	5.33	3.81
8	L1.75 x 1.75 x 3/16	1.0	8.41	0.537	0.343	0.621	141.0	147.2	13.41	6.89	4.28
9			0.00				#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!
10			0.00				#DIV/0!	#DIV/0!	0.00	#DIV/0!	#DIV/0!

H. E. BERGERON ENGINEERS, P.A.

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December 7, 2000

Exhibit "A"

Proposed Scope of Services for
160' ROHN SSV Tower Reinforcement
Windsor, Connecticut

The scope of services for inspection of the above listed site is as follows:

Scope of Work:

Assumptions:

1. Reinforcement shall be as per HEB's previous structural analysis, with the following additional antenna configuration:
   - (3) EMS Wireless RS90-12 panel antennas pole mounted at the top of the tower (rad center at 169'); (6) 1-5/8" waveguide cables
   - (12) EMS Wireless RR90-17 panel antennas on 15' gate boom mounts at 145'; (12) 1-5/8" waveguide cables
2. Qualified and experienced personnel will perform the actual reinforcement work.

HEB will provide these services:

1. Re-analysis of the tower with additional reinforcing to support the proposed panel antennas and mounts.
2. Design of reinforcing members.
3. Drafting of reinforcement drawing

Deliverables: Deliverables will consist of drawings with specifications in the form of drawing notes.

Schedule: We are prepared to begin work upon your authorization and complete the work within two weeks of receipt of authorization. Please keep in mind that we can't be responsible for delays that are caused by others and that reasonable time is needed to conduct thorough and professional work.

Fee: Our fee for this work is a lump sum of $1650.

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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.

Appendix