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@po.state.ct.us
www.ct.gov/csc

June 9, 2005

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

RE: **EM-VER-166-050428** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at Wolcott Road, Wolcott, Connecticut

Dear Attorney Baldwin:

At a public meeting held on June 8, 2005, the Connecticut Siting Council (Council) acknowledged your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies.

The proposed modifications are to be implemented as specified here and in your notice dated April 28, 2005, 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,

Pamela B. Katz, P.E.
Chairman

PBK/jkl

c: The Honorable Thomas G. Dunn, Mayor, Town of Wolcott
George Leggio, Zoning Enforcement Officer, Town of Wolcott
Christine Farrell, T-Mobile Inc.

ROBINSON & COLE LLP

NETH C. BALDWIN

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

EM-VER-166-050428

April 28, 2005

Via Hand Delivery

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

Re: **Notice of Exempt Modification – Antenna Swap**
Wolcott Road
Wolcott, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility on an existing tower owned Graziano Brothers, Wolcott Road in Wolcott. This facility consists of four (4) panel-type cellular antennas at the 135-foot level of the 180-foot tower. Equipment associated with the antennas is located in a shelter near the base of the tower.

The Connecticut Siting Council ("the Council") approved Cellco's shared use of the Wolcott Road facility on March 28, 1996. Cellco now intends to modify its facility by removing the existing antenna platform; installing a new mounting frame; re-installing the four (4) cellular antennas; and adding eight (8) PCS antennas, for a total of twelve (12) antennas, at the same level on the tower. Attached behind Tab 1 are specifications for the existing cellular antennas and the proposed PCS antennas for the Wolcott Road facility.

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 Wolcott Mayor, Thomas G. Dunn.

The planned modifications to the Wolcott Road facility fall 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 mounted at the same level on the tower.

2. The proposed modifications will not affect ground-mounted equipment and will not require the extension of the site boundaries.

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

4. The proposed modifications will not result in radio frequency (RF) power density levels at the facility that exceed the Federal Communications Commission (FCC) adopted safety standard. Attached behind Tab 2 is a new General Power Density Calculation Table.

Also, attached behind Tab 3 is a structural analysis confirming that the tower can support the existing and proposed antennas and related equipment.

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

Sincerely,

Kenneth C. Baldwin

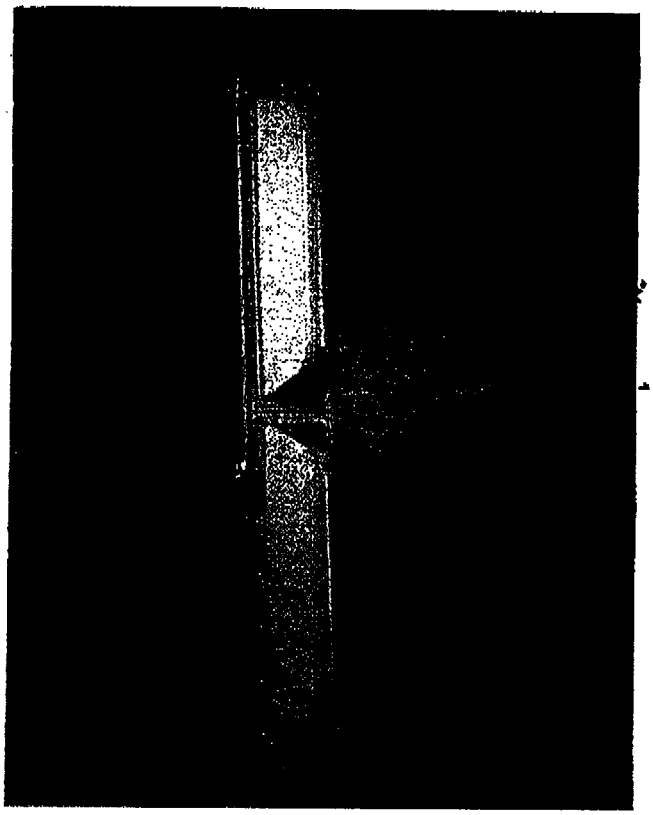
Enclosures
cc: Thomas G. Dunn, Town of Wolcott Mayor
Sandy M. Carter

Swedcom Corporation

ALP 110 11-N

Log-Periodic Reflector Antenna

110 Degrees 11 dBd



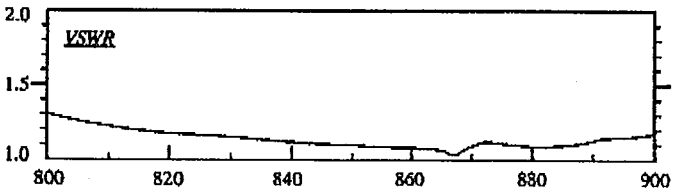
Features:

- ❑ **Broadbanded. (800-900 MHz)**
- ❑ **Low backlobe radiation. Front-to-back ratio better than 26 dB**
- ❑ **Low Intermodulation Products.**
- ❑ **Low Wind-load.**
- ❑ **Low weight.**
- ❑ **Small size.**
- ❑ **Rugged design.**

Please see the following pages including radiation patterns/tables for *ALP 110 11-N.*

Electrical Specifications:

Frequency range:	806-896 MHz
Impedance:	50 ohm
Connector:	N-female or 7/8" EIA
VSWR:	Typ. 1.3:1 max 1.5:1
Polarization:	Vertical
Gain:	11 dBd
Front to back ratio:	>26 dB
Side-lobe supression:	>17 dB
Intermodulation: (2x25W):	IM3 >146 dB
	IM5 >153 dB
	IM7 & IM9 >163 dB
Power Rating:	500 W
H-Plane: -3 dB	110 °
E-Plane: -3 dB	15 °
Lightning Protection:	DC Grounded



Mechanical Specifications:

Overall Height:	52 in	(1320 mm)
Width:	8.3 in	(210 mm)
Depth:	11.4 in	(290 mm)
Weight including brackets:	24.5 lbs	(11 Kg)
Rated wind velocity:	113 mph	(180 Km/h)
Wind Area (CxA/Front):	3.7 sq.ft	(0.34 sq.m)
Lateral thrust at rated wind		
Worst case:	530 N	

Materials:

Radiating elements:	Aluminum
Element housing:	Grey PVC
Back-plate:	Aluminum
Mounting hardware	
clamps:	Hot dip galvanized steel
bolts:	Stainless steel

*Manufactured by: **Allgon System AB***

EMS Wireless

FV65-12-XXDAL4

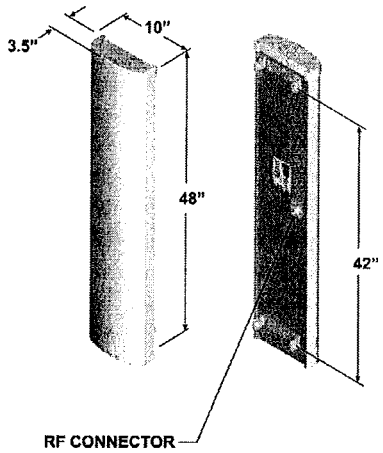
Vertical Polarization

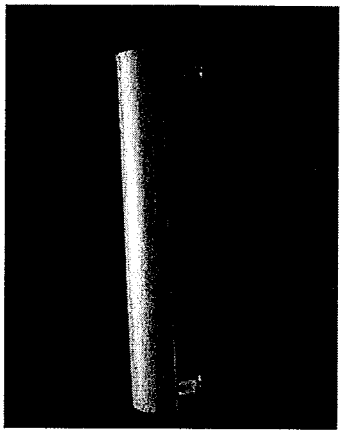
806 MHz - 896 MHz

SlimGEM™
OptiFill™
Suppressor™

Electrical Specifications

Azimuth Beamwidth	65°
Elevation Beamwidth	14.5°
Elevation Sidelobes (Upper)	≥ 18 dB
Gain	11.9 dBd (14.0 dBi)
Polarization	Linear, Vertical
Front-to-Back Ratio	≥ 23 dB
Electrical Downtilt Options	0°, 5°
VSWR	1.35:1 Max
Connectors	1; Type 7-16 DIN (female)
Power Handling	500 Watts CW
Passive Intermodulation	≤ -150 dBc [2 x 20W (+ 43 dBm)]
Lightning Protection	Chassis Ground





Mechanical Specifications

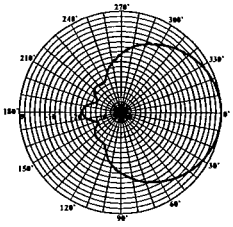
Dimensions (L x W x D)	48 in x 10 in x 3.50 in (122 cm x 25 cm x 9 cm)
Rated Wind Velocity	150 mph (241 km/hr)
Equivalent Flat Plate Area	3.33 ft² (0.3 m²)
Front Wind Load @ 100 mph (161 kph)	98 lbs (435 N)
Side Wind Load @ 100 mph (161 kph)	34 lbs (150 N)
Weight (Without Mounting Kit)	14.2 lbs (6.4 kg)

Mounting Options

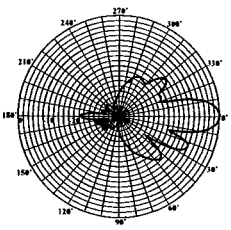
MTG-P00-10, MTG-S02-10, MTG-DXX-20*, MTG-CXX-10*, MTG-C02-10, MTG-TXX-10*

*Note: *Model number shown represents a series of products. See Mounting Options section for specific model number.*

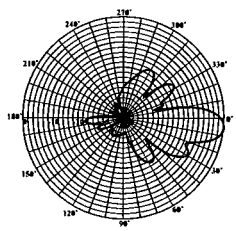
Patterns



Azimuth



Elevation
0° Downtilt



Elevation
5° Downtilt

Revised 06/21/04

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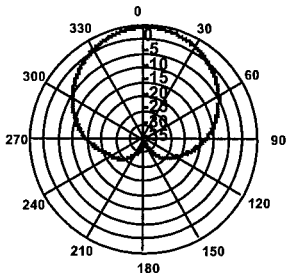
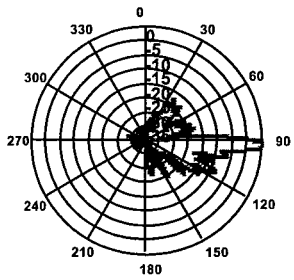
DECIBEL® Base Station Antennas	950F65T2ZE-M 18 dBi, Directed Dipole, No Screen Antenna 1850-1990 MHz	1850-1990 MHz dB Director® ZoneMaster™

- Exceptional azimuth roll-off reducing soft hand-offs and improving capacity
- Excellent upper side lobe suppression
- Deep null filling below the horizon assures improved signal intensity
- Low profile appearance and low wind loading profile for easier zoning approvals

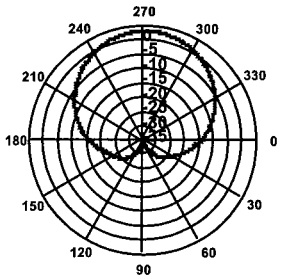
65°



Azimuth 1960 MHz (Tilt=2)



Vertical 1960 MHz (Tilt=2)



Horizontal 1960 MHz (Tilt=2)

ELECTRICAL		MECHANICAL	
Frequency (MHz):	1850-1990	**Weight:**	9.5 lbs (4.3 kg)
Polarization:	Vertical	**Dimensions (LxWxD):**	60 X 6.5 X 4 in (1524 X 165 X 102 mm)
Gain (dBd/dBi):	15.9/18	**Max. Wind Area:**	1.61 ft² (0.15 m²)
Azimuth BW:	65°	**Max. Wind Load (@ 100mph):**	87 lbf (387 N)
Elevation BW:	6.5°	**Max. Wind Speed:**	125 mph (201 km/h)
Beam Tilt:	2°	**Radiator Material:**	Low Loss Circuit Board
USLS* (dB):	>20	**Reflector Material:**	Aluminum
Null Fill* (dB):	15	**Radome Material:**	ABS, UV Resistant
Front-to-Back Ratio* (dB):	40	**Mounting Hardware Material:**	Galvanized Steel
VSWR:	<1.33:1	**Connector Type:**	7-16 DIN - Female (Bottom)
IM Suppression - Two 20 Watt Carriers:	-150 dBc	**Color:**	Light Gray
Impedance:	50 Ohms	**Standard Mounting Hardware:**	DB390 Pipe Mount Kit, included
Max Input Power:	250 Watts	**Downtilt Mounting Hardware:**	DB5098, optional
Lightning Protection:	DC Ground	**Opt. Mounting Hardware:**	DB5094-AZ Azimuth Wall Mount

Andrew Corporation
8635 Stemmons Freeway
Dallas, Texas U.S.A 75247-3701
Tel: 214.631.0310

Fax: 214.631.4706
Toll Free Tel: 1.800.676.5342
Fax: 1.800.229.4706
www.andrew.com

dbtech@andrew.com

Date: 4/8/2004
* - Indicates Typical Values

DECIBEL
Base Station Antennas

948F85T2E-M

16.1 dBi, Directed Dipole Antenna
1850-1990 MHz

1850-1990 MHz

MaxFill™

dB Director®

85°

- Exceptional azimuth roll-off reducing soft hand-offs and improving capacity
- Excellent upper side lobe suppression
- Deep null filling below the horizon assures improved signal intensity
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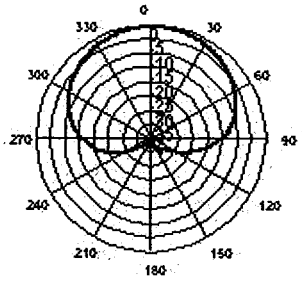
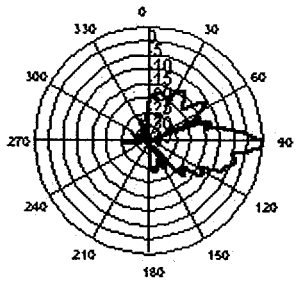
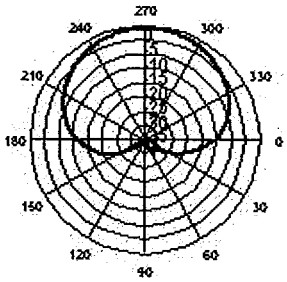


Azimuth 1850 MHz (Tilt=2)



Vertical 1850 MHz (Tilt=2)



Horizontal 1850 MHz (Tilt=2)

ELECTRICAL	
Frequency (MHz):	1850-1990
Polarization:	Vertical
Gain (dBd/dBi):	14/16.1
Azimuth BW:	85°
Elevation BW:	8°
Beam Tilt:	2°
USLS* (dB):	>18
Null Fill* (dB):	15
Front-to-Back Ratio* (dB):	40
VSWR:	<1.33:1
IM Suppression - Two 20 Watt Carriers:	-150 dBc
Impedance:	50 Ohms
Max Input Power:	250 Watts
Lightning Protection:	DC Ground
Opt Electrical Tilt:	0°,4°,6°

MECHANICAL	
Weight:	8.5 lbs (3.9 kg)
Dimensions (LxWxD):	48 X 3.5 X 7 in (1219 X 89 X 178 mm)
Max. Wind Area:	1.18 ft² (0.11 m²)
Max. Wind Load (@ 100mph):	65 lbf (289 N)
Max. Wind Speed:	125 mph (201 km/h)
Radiator Material:	Low Loss Circuit Board
Reflector Material:	Aluminum
Radome Material:	ABS, UV Resistant
Mounting Hardware Material:	Galvanized Steel
Connector Type:	7-16 DIN - Female (Bottom)
Color:	Light Gray
Standard Mounting Hardware:	DB390 Pipe Mount Kit, included
Downtilt Mounting Hardware:	DB5098, optional
Opt. Mounting Hardware:	DB5094-AZ Azimuth Wall Mount

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Fax: 1.800.229.4706
www.andrew.com

dbtech@andrew.com

Date: 4/29/2004
* - Indicates Typical Values

General Power Density

Site Name: Wolcott N, CT
Tower Height: 135 FT

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissable Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
Verizon	880	9	200	1800	135	0.0355	0.586	6.06%
Verizon	1900	3	200	600	135	0.0118	1	1.18%
Total Percentage of Maximum Permissible Exposure								**7.25%**

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

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

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF 180' SELF SUPPORTING LATTICE TOWER FOR NEW ANTENNA ARRANGEMENT

1192 Wolcott Road
Wolcott, Connecticut

prepared for

verizon wireless

Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

prepared by

URS

URS CORPORATION
500 ENTERPRISE DRIVE, SUITE 3B
ROCKY HILL, CT 06067
TEL. 860-529-8882

36930768.00000
VZ1-142

April 21, 2005

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 180' steel self-supporting lattice tower located at 1192 Wolcott Road in Wolcott, Connecticut. The analysis was conducted in accordance with the TIA/EIA-222-F standard for wind velocity of 85 mph and 74 mph concurrent with ½" ice. The antenna loading considered in the analysis consists of all existing and proposed antennas, transmission lines, and ancillary items as outlined in the Introduction portion of this report. The proposed Verizon Wireless additions/modifications are listed below:

Remove (2) Stand-off Frames and Replace with (3) Valmont 13' KD Sector Mounts (P/N 802644)	Verizon (proposed)	@ 135' elevation (centerline)
Install (2) FV65-12, (2) ALP 11011, (2) DB950F65T2ZE-M and (6) DB948F85T2E-M antennas on new Sector Mounts listed above with (12) 1 5/8" coax cables	Verizon (proposed)	@ 135' elevation (centerline)
Replace all L1 1/2x1 1/2x1/8 diagonal braces from 120' elevation to 140' elevation with L2x2x3/16 diagonal braces	Verizon (proposed)	@ 120'-140' elevation

With the above additions/modifications the steel self-supporting lattice tower is in compliance with the proposed loading conditions. The steel self-supporting lattice tower is structurally adequate under the TIA/EIA-222-F wind load classification specified above and the existing and proposed antenna loadings.

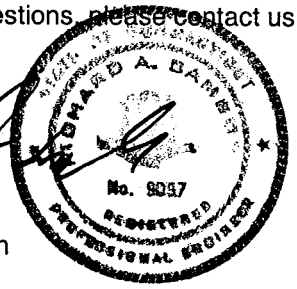
This analysis was based on:

1. The tower structure's capacity not including any assessment of the condition of the tower.
2. Tower geometry and structural member sizes taken from original construction drawings (engineering file no. 23963DB, drawing no. B881302) prepared by ROHN, signed and sealed November 28, 1988.
3. Antenna inventory as specified in section 2 of this report.

This report is only valid per the assumptions and data utilized in this report for antenna inventory, mounts and associated cables. The user of this report shall field verify the assumptions of the antenna and mount configurations. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

Should you have any questions, please contact us.

Sincerely,
URS Corporation AES



Richard A. Sambor, P.E.
Manager Facilities Design

RAS/jek

cc: Doug Roberts – URS
CF/Book

2. INTRODUCTION

The subject tower is located at 1192 Wolcott Road in Wolcott, Connecticut. The structure is a 180' steel self-supporting lattice tower manufactured by ROHN.

The tower geometry and structure member sizes were taken from the original construction drawings (engineering file no. 23963DB, drawing no. B881302) prepared by ROHN, signed and sealed November 28, 1988.

The existing structure supports several communication antennas. URS conducted a field visit to verify the antenna arrangement and to record the transmission line sizes and locations. The inventory is summarized below:

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(1) 2 Bay Dipole	(existing)	3' Stand-off	185'	(1) 1 5/8" coax cable
(2) 2" Dia 10' Omni	(existing)	3' Stand-off	185'	(2) 1 1/4" coax cables
(1) 2" Dia 10' Omni	(existing)	Tower Leg	185'	(1) 1 1/4" coax cable
(1) 2" Dia 10' Omni	(existing)	3' Stand-off	155'	(1) 1 1/4" coax cable
(1) 2" Dia 8' Omni	(existing)	2' Stand-off	144'	(1) 1 1/4" coax cable
(2) ALP-11011, (2) FV65-12, (2) DB950F65T2ZE-M and (6) DB948F85T2E-M antennas	**Verizon (proposed)**	**(3) Valmont 13' KD Sector Mounts (P/N 802644)**	**135'**	**(12) 1 5/8" coax cables**
(1) 2" Dia 8' Omni	(existing)	2' Stand-off	104'	(1) 7/8" coax cable

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

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

The analysis was conducted using ERI Tower 3.0. Two load conditions were evaluated as shown below which were compared to allowable stresses according to AISC and TIA/EIA.

Load Condition 1 = 85 mph Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 74 mph Wind Load (with ice) + Ice Load + Tower Dead Load

Please note that wind pressure is a function of velocity squared. Under Load Condition 2, a 25 percent reduction in wind pressure is allowed by code to account for the unlikelihood of the full wind pressure and ice load occurring at the same time. The same results may be achieved by utilizing a lower wind pressure without taking the 25 percent reduction, as shown above.

The TIA/EIA standard permits a one-third increase in allowable stresses for towers and monopoles less than 700 feet tall. For the purposes of this analysis, in computing the load capacity the allowable stresses of the monopole members were increased by one-third.

4. FINDINGS AND EVALUATION

Combined axial and bending stresses on the steel monopole structure were evaluated to compare with allowable stresses in accordance with AISC. The calculated stresses under the proposed loading were below the allowable stresses. Detailed analysis and calculations for the proposed antenna arrangement and load condition are provided in section 6 of this report. Additionally, the anchor bolts and foundation were found to be structurally adequate.

5. CONCLUSIONS

The results of the analysis indicate the steel self-supporting lattice tower with the proposed modifications is in compliance with the proposed loading conditions. **The steel self-supporting lattice tower is structurally adequate with the proposed modifications under the TIA/EIA-222-F wind load classification specified above and the existing and proposed antenna loadings.**

Limitations/Assumptions:

This report is based on the following:

1. Tower inventory as listed in this report.
2. Tower is properly installed and maintained.
3. All members are as specified in the original design documents and are in good condition.
4. All required members are in place.
5. All bolts are in place and are properly tightened.
6. Tower is in plumb condition.
7. All member protective coatings are in good condition.
8. All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9. Foundations were properly constructed to support original design loads as specified in the original design documents.
10. All coaxial cable is installed within the monopole.

URS is not responsible for any modifications completed prior to or hereafter in which URS is not or was not directly involved. Modifications include but are not limited to:

A. Adding antennas
B. Removing/replacing antennas
C. Adding coaxial cables

URS hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact URS. URS disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

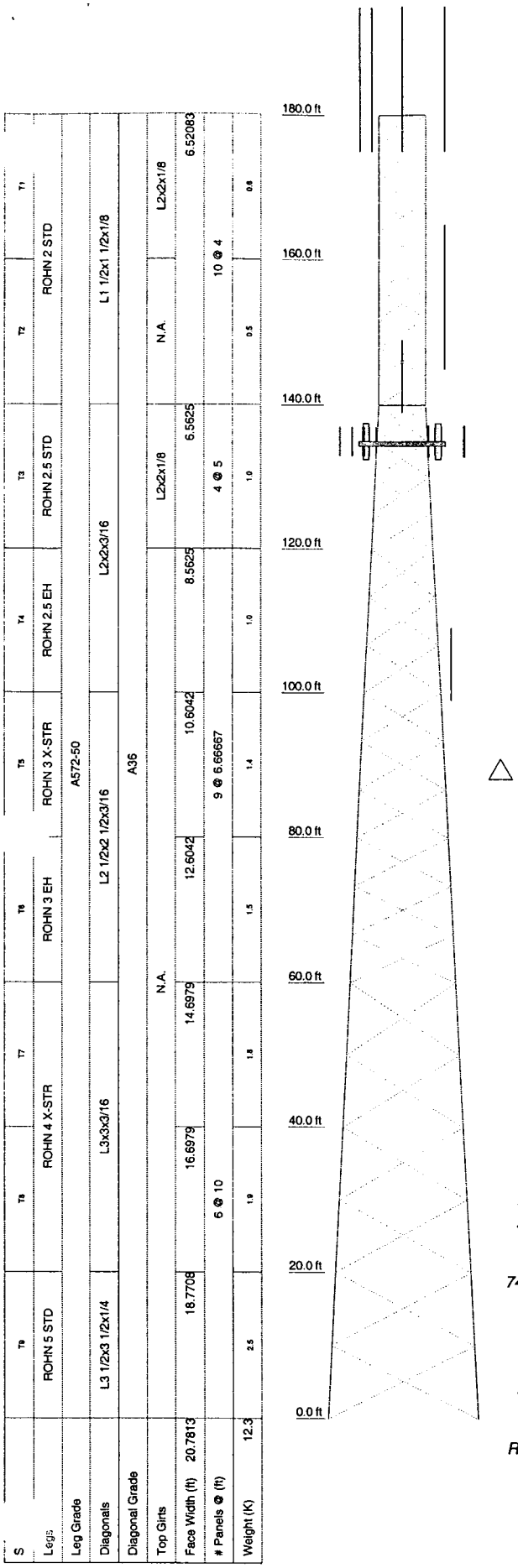
Ongoing and Periodic Inspection and Maintenance:

After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire tower structural system be performed at least yearly and more frequently as conditions warrant. According to TIA/EIA-222-F section 14.1, Note 1: It is recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading conditions.

6. DRAWINGS AND DATA

ERI TOWER INPUT/OUTPUT SUMMARY



S		T9	T8	T7	T6	T5	T4	T3	T2	T1
	Legs	ROHN 5 STD	ROHN 4 X-STR		ROHN 3 EH	ROHN 3 X-STR	ROHN 2.5 EH	ROHN 2.5 STD	ROHN 2 STD	
	Leg Grade	A572-50								
	Diagonals	L3 1/2x3 1/2x1/4	L3x3x3/16		L2 1/2x2 1/2x3/16		L2x2x3/16		L1 1/2x1 1/2x1/8	
	Diagonal Grade	A36								
	Top Girts				N.A.			L2x2x1/8	N.A.	L2x2x1/8
	Face Width (ft)	20.7813	18.7708	16.6979	14.6979	12.6042	10.6042	8.5625	6.5625	6.52083
	# Panels @ (ft)		6 @ 10			9 @ 6.66667		4 @ 5	10 @ 4	
	Weight (K)	12.3	2.5	1.9	1.8	1.5	1.4	1.0	0.5	0.8

APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
2 Bay Dipole	185	2' Side Mount Standoff (1)	140
2" Dia 10' Omni	185	(2) FV65-12-05DAL2 (Verizon)	135
2" Dia 10' Omni	185	(2) ALP 11011-N (Verizon)	135
2" Dia 10' Omni	185	(4) DB948F85T2E-M (Verizon)	135
3' Side Mount Standoff (1)	180	(2) DB950F65T2E-M (Verizon)	135
3' Side Mount Standoff (1)	180	(2) DB948F85T2E-M (Verizon)	135
3' Side Mount Standoff (1)	180	PiROD KD 13' T-Frame (Verizon)	135
2" Dia 10' Omni	155	PiROD KD 13' T-Frame (Verizon)	135
3' Side Mount Standoff (1)	150	PiROD KD 13' T-Frame (Verizon)	135
3' Side Mount Standoff (1)	150	2" Dia 8' Omni	104
3' Side Mount Standoff (1)	150	2' Side Mount Standoff (1)	100
2" Dia 8' Omni	144		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 98.8%

MAX PIER FORCES:
DOWN: 127 K
UPLIFT: -109 K
SHEAR: 14 K

AXIAL
27 K
SHEAR
22 K
MOMENT
2117 kip-ft

TORQUE 8 kip-ft
74 mph WIND - 0.5000 in ICE

AXIAL
16 K
SHEAR
24 K
MOMENT
2193 kip-ft

TORQUE 7 kip-ft
REACTIONS - 85 mph WIND

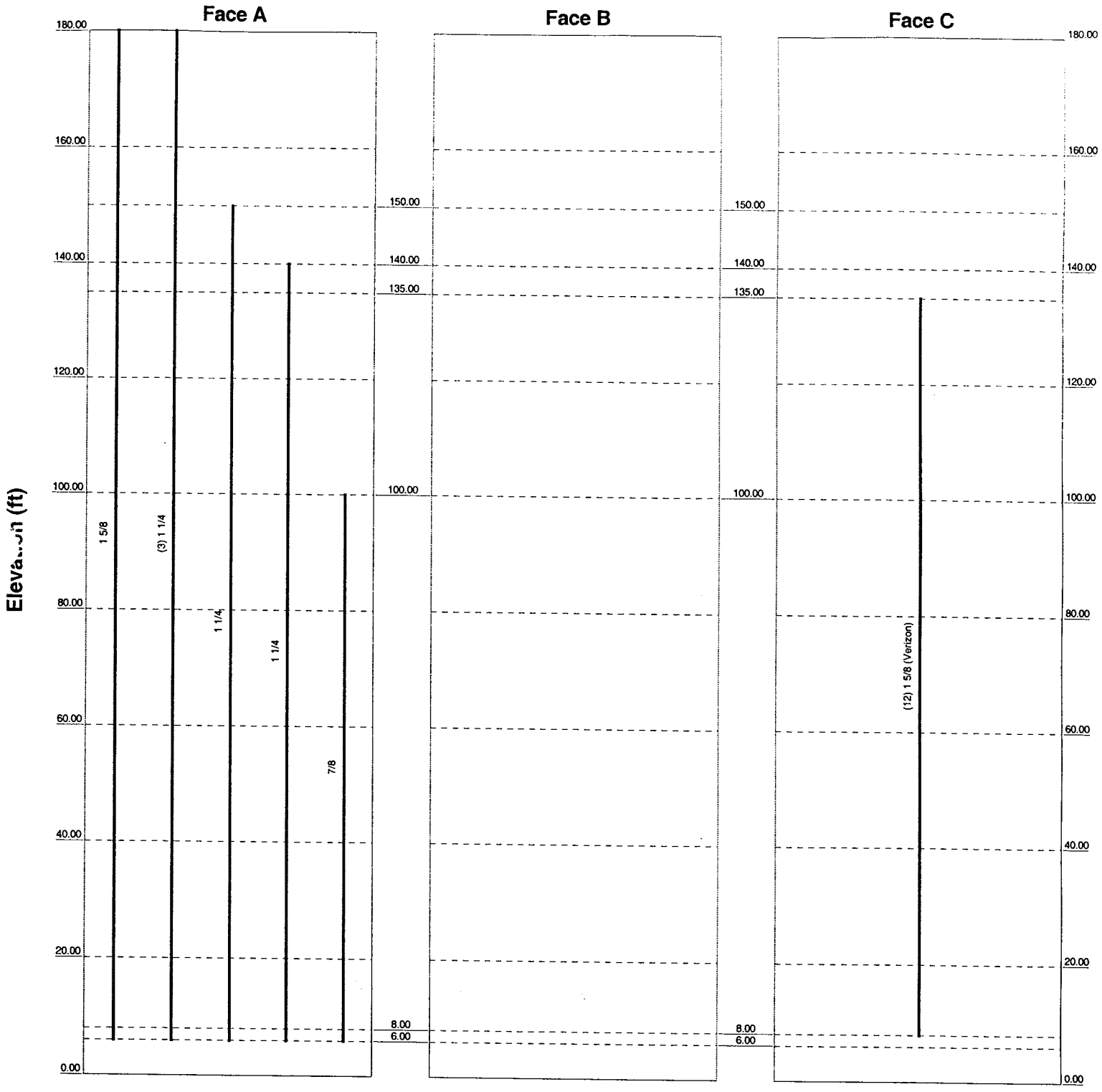
URS Corp. AES
500 Enterprise Dr, Suite 3B
Rocky Hill, CT 06067
Phone: (860) 529-8882
FAX: (860) 529-5566

Job: *180' ROHN*			
Project: *Wolcott, CT*			
Client: Verizon Wireless	Drawn by: Jed Kiernan	App'd:	
Code: TIA/EIA-222-F	Date: 04/21/05	Scale: N	
Path: P:\F08\ERI Files\180' RohnReinforced.eri		Dwg No.	

ERI TOWER FEEDLINE DISTRIBUTION CHART

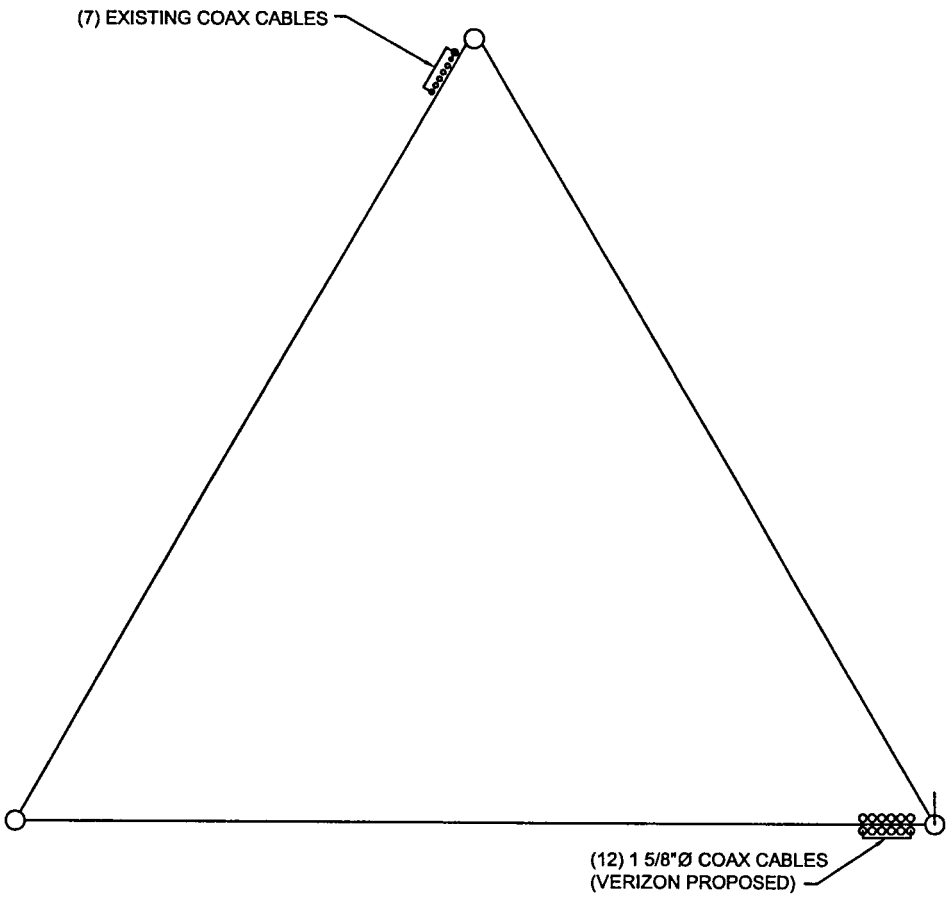
Feedline Distribution Chart
0' - 180'

Round Flat App In Face App Out Face Truss Leg



URS Corp. AES	Job: ***180' ROHN***		
500 Enterprise Dr, Suite 3B	Project: ***Wolcott, CT***		
Rocky Hill, CT 06067	Client: Verizon Wireless	Drawn by: Jed Kiernan	App'd:
Phone: (860) 529-8882	Code: TIA/EIA-222-F	Date: 04/21/05	Scale: NT
FAX: (860) 529-5566	Path: P:\F08\ERI Files\180' RohnReinforced.eri		Dwg No. E

FEEDLINE PLAN VIEW



FEEDLINE PLAN VIEW

ERI TOWER DETAILED OUTPUT

ERITower	Job	Page
	180' ROHN	1 of 26
URS Corp. AES 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project Wolcott, CT	Date 08:24:45 04/21/05
	Client Verizon Wireless	Designed by Jed Kiernan

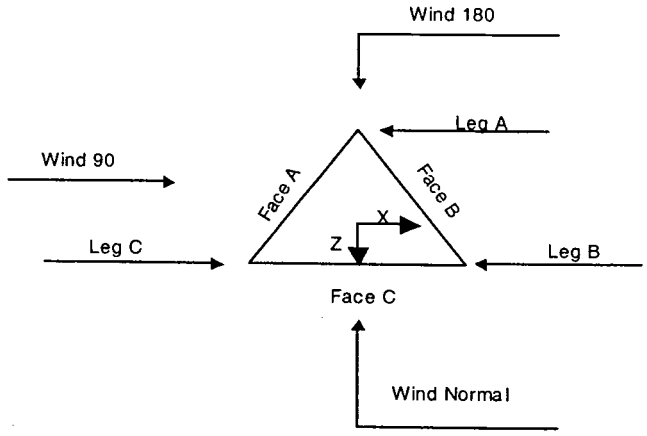
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 6.52 ft at the top and 20.78 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
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	180.00-160.00		SSV 7N490 (1986)	6.52	1	20.00
T2	160.00-140.00		SSV 7N404 (1990)	6.52	1	20.00
T3	140.00-120.00		SSV 8N340 (1990)	6.56	1	20.00
T4	120.00-100.00		SSV 9N334 (1993)	8.56	1	20.00
T5	100.00-80.00		SSV 10N266 (1995)	10.60	1	20.00
T6	80.00-60.00		SSV 11N224 (1993)	12.60	1	20.00
T7	60.00-40.00		SSV 12N95 (1993)	14.70	1	20.00
T8	40.00-20.00		SSV 13N88 (1991)	16.70	1	20.00
T9	20.00-0.00		SSV 14N72 (1991)	18.77	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	180.00-160.00	4.00	X Brace	No	No	0.0000	0.0000
T2	160.00-140.00	4.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	5.00	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T5	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	6.67	X Brace	No	No	0.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T7	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	20.00-0.00	10.00	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 180.00-160.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T2 160.00-140.00	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 1/2x1 1/2x1/8	A36 (36 ksi)
T3 140.00-120.00	Pipe	ROHN 2.5 STD	A572-50 (50 ksi)	Single Angle	L2x2x3/16	A36 (36 ksi)
T4 120.00-100.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L2x2x3/16	A36 (36 ksi)
T5 100.00-80.00	Pipe	ROHN 3 X-STR	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 80.00-60.00	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 60.00-40.00	Pipe	ROHN 4 X-STR	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T8 40.00-20.00	Pipe	ROHN 4 X-STR	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T9 20.00-0.00	Pipe	ROHN 5 STD	A572-50 (50 ksi)	Single Angle	L3 1/2x3 1/2x1/4	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 180.00-160.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T3 140.00-120.00	Single Angle	L2x2x1/8	A36 (36 ksi)	Single Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1.04	1	1.05	30.0000	30.0000
T4 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000
T5 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000
T6 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000
T7 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000
T8 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000
T9 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1.05	1	1.05	30.0000	30.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 180.00-160.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T2 160.00-140.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T3 140.00-120.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T4 120.00-100.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T5 100.00-80.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T6 80.00-60.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T7 60.00-40.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T8 40.00-20.00	No	No	1	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T9 20.00-0.00	No	No	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)*

ERITower	Job	Page
	180' ROHN	5 of 26
URS Corp. AES 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project Wolcott, CT	Date 08:24:45 04/21/05
	Client Verizon Wireless	Designed by Jed Kiernan

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 180.00-160.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 180.00-160.00	Flange	0.8750 A325X	4	0.6250 A325X	1	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0	0.6250 A325X	0
T2 160.00-140.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-80.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 80.00-60.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 60.00-40.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 40.00-20.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 20.00-0.00	Flange	1.0000 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8	A	Yes	Ar (CfAe)	180.00 - 6.00	1	1	1.9800	1.9800		1.04
1 1/4	A	Yes	Ar (CfAe)	180.00 - 6.00	3	3	1.5500	1.5500		0.66

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 1/4	A	Yes	Ar (CfAe)	150.00 - 6.00	1	1	1.5500	1.5500		0.66
1 1/4	A	Yes	Ar (CfAe)	140.00 - 6.00	1	1	1.5500	1.5500		0.66
7/8	A	Yes	Ar (CfAe)	100.00 - 6.00	1	1	1.1100	1.1100		0.54
1 5/8 (Verizon)	C	Yes	Ar (CfAe)	135.00 - 8.00	12	6	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	180.00-160.00	A	11.050	0.000	0.000	0.000	0.06
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	12.342	0.000	0.000	0.000	0.07
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T3	140.00-120.00	A	16.217	0.000	0.000	0.000	0.09
		B	0.000	0.000	0.000	0.000	0.00
		C	14.850	0.000	0.000	0.000	0.19
T4	120.00-100.00	A	16.217	0.000	0.000	0.000	0.09
		B	0.000	0.000	0.000	0.000	0.00
		C	19.800	0.000	0.000	0.000	0.25
T5	100.00-80.00	A	18.067	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	19.800	0.000	0.000	0.000	0.25
T6	80.00-60.00	A	18.067	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	19.800	0.000	0.000	0.000	0.25
T7	60.00-40.00	A	18.067	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	19.800	0.000	0.000	0.000	0.25
T8	40.00-20.00	A	18.067	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	19.800	0.000	0.000	0.000	0.25
T9	20.00-0.00	A	12.647	0.000	0.000	0.000	0.07
		B	0.000	0.000	0.000	0.000	0.00
		C	11.880	0.000	0.000	0.000	0.15

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	180.00-160.00	A	0.500	17.717	0.000	0.000	0.000	0.17
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.500	19.842	0.000	0.000	0.000	0.18
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	140.00-120.00	A	0.500	26.217	0.000	0.000	0.000	0.24
		B		0.000	0.000	0.000	0.000	0.00
		C		22.350	0.000	0.000	0.000	0.46
T4	120.00-100.00	A	0.500	26.217	0.000	0.000	0.000	0.24
		B		0.000	0.000	0.000	0.000	0.00

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
		C		29.800	0.000	0.000	0.000	0.61
T5	100.00-80.00	A	0.500	29.733	0.000	0.000	0.000	0.27
		B		0.000	0.000	0.000	0.000	0.00
		C		29.800	0.000	0.000	0.000	0.61
T6	80.00-60.00	A	0.500	29.733	0.000	0.000	0.000	0.27
		B		0.000	0.000	0.000	0.000	0.00
		C		29.800	0.000	0.000	0.000	0.61
T7	60.00-40.00	A	0.500	29.733	0.000	0.000	0.000	0.27
		B		0.000	0.000	0.000	0.000	0.00
		C		29.800	0.000	0.000	0.000	0.61
T8	40.00-20.00	A	0.500	29.733	0.000	0.000	0.000	0.27
		B		0.000	0.000	0.000	0.000	0.00
		C		29.800	0.000	0.000	0.000	0.61
T9	20.00-0.00	A	0.500	20.813	0.000	0.000	0.000	0.19
		B		0.000	0.000	0.000	0.000	0.00
		C		17.880	0.000	0.000	0.000	0.37

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	180.00-160.00	A	0.000	0.000	0.902	2.073
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T2	160.00-140.00	A	0.000	0.000	0.904	2.100
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	140.00-120.00	A	0.000	0.000	1.434	3.091
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	1.313	2.635
T4	120.00-100.00	A	0.000	0.000	0.989	2.132
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	1.208	2.423
T5	100.00-80.00	A	0.000	0.000	1.303	2.717
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	1.428	2.723
T6	80.00-60.00	A	0.000	0.000	1.257	2.621
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	1.378	2.627
T7	60.00-40.00	A	0.000	0.000	1.071	2.155
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	1.174	2.160
T8	40.00-20.00	A	0.000	0.000	1.037	2.087
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	1.137	2.091
T9	20.00-0.00	A	0.000	0.000	0.827	1.620
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.777	1.392

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	180.00-160.00	-3.0996	-1.7896	-3.3054	-1.9084
T2	160.00-140.00	-3.6104	-2.0844	-3.8491	-2.2223
T3	140.00-120.00	-3.5657	2.1328	-4.0125	2.0749
T4	120.00-100.00	-4.5546	4.1978	-5.1369	4.2036
T5	100.00-80.00	-4.8929	3.6960	-5.8359	3.7445
T6	80.00-60.00	-5.4322	4.0495	-6.5046	4.1144
T7	60.00-40.00	-5.8835	4.3426	-7.3046	4.5711
T8	40.00-20.00	-6.3924	4.6820	-7.9580	4.9386
T9	20.00-0.00	-4.4141	2.3679	-5.7811	2.5513

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft ft ft	°	ft		ft^2	ft^2	K
(2) DB950F65T2E-M (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.13 6.59	4.24 4.62	0.02 0.05
(2) FV65-12-05DAL2 (Verizon)	A	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	5.60 5.99	3.27 3.63	0.02 0.06
(2) ALP 11011-N (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	3.28 3.61	4.95 5.36	0.02 0.05
(2) DB948F85T2E-M (Verizon)	B	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
(4) DB948F85T2E-M (Verizon)	C	From Leg	3.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	0.01 0.03
3' Side Mount Standoff (1)	A	None		0.0000	180.00	No Ice 1/2" Ice	2.64 3.69	2.64 3.69	0.04 0.05
3' Side Mount Standoff (1)	B	None		0.0000	180.00	No Ice 1/2" Ice	2.64 3.69	2.64 3.69	0.04 0.05
3' Side Mount Standoff (1)	C	None		0.0000	180.00	No Ice 1/2" Ice	2.64 3.69	2.64 3.69	0.04 0.05
2 Bay Dipole	A	From Face	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	2.66 4.44	2.66 4.44	0.02 0.03
2" Dia 10' Omni	A	None		0.0000	185.00	No Ice 1/2" Ice	1.06 2.26	1.06 2.26	0.01 0.02
2" Dia 10' Omni	B	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	1.06 2.26	1.06 2.26	0.01 0.02
2" Dia 10' Omni	C	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	1.06 2.26	1.06 2.26	0.01 0.02
3' Side Mount Standoff (1)	A	None		0.0000	150.00	No Ice 1/2" Ice	2.64 3.69	2.64 3.69	0.04 0.05
3' Side Mount Standoff (1)	B	None		0.0000	150.00	No Ice 1/2" Ice	2.64 3.69	2.64 3.69	0.04 0.05
3' Side Mount Standoff (1)	C	None		0.0000	150.00	No Ice	2.64	2.64	0.04

ERITower	Job	Page
	180' ROHN	9 of 26
URS Corp. AES 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project Wolcott, CT	Date 08:24:45 04/21/05
	Client Verizon Wireless	Designed by Jed Kiernan

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft / ft / ft	°	ft		ft^2	ft^2	K
						1/2" Ice	3.69	3.69	0.05
2" Dia 10' Omni	B	From Leg	3.00 / 0.00 / 0.00	0.0000	155.00	No Ice	1.06	1.06	0.01
						1/2" Ice	2.26	2.26	0.02
2' Side Mount Standoff (1)	A	None		0.0000	140.00	No Ice	2.10	2.10	0.05
						1/2" Ice	4.30	4.30	0.09
2" Dia 8' Omni	A	From Leg	2.00 / 0.00 / 0.00	0.0000	144.00	No Ice	2.00	2.00	0.01
						1/2" Ice	3.03	3.03	0.02
2" Dia 8' Omni	B	From Leg	2.00 / 0.00 / 0.00	0.0000	104.00	No Ice	2.00	2.00	0.01
						1/2" Ice	3.03	3.03	0.02
2' Side Mount Standoff (1)	B	None		0.0000	100.00	No Ice	2.10	2.10	0.05
						1/2" Ice	4.30	4.30	0.09
PiROD KD 13' T-Frame (Verizon)	A	None		0.0000	135.00	No Ice	11.07	11.07	0.24
						1/2" Ice	15.53	15.53	0.35
PiROD KD 13' T-Frame (Verizon)	B	None		0.0000	135.00	No Ice	11.07	11.07	0.24
						1/2" Ice	15.53	15.53	0.35
PiROD KD 13' T-Frame (Verizon)	C	None		0.0000	135.00	No Ice	11.07	11.07	0.24
						1/2" Ice	15.53	15.53	0.35

Tower Pressures - No Ice

$G_H = 1.121$

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	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
T1 180.00-160.00	170.00	1.597	30	134.375	A	9.940	18.967	7.917	27.39	0.000	0.000
					B	10.842	7.917		42.20		
					C	10.842	7.917		42.20		
T2 160.00-140.00	150.00	1.541	29	134.792	A	8.855	20.258	7.917	27.19	0.000	0.000
					B	9.759	7.917		44.79		
					C	9.759	7.917		44.79		
T3 140.00-120.00	130.00	1.48	27	156.048	A	11.859	25.816	9.599	25.48	0.000	0.000
					B	13.293	9.599		41.93		
					C	11.980	24.449		26.35		
T4 120.00-100.00	110.00	1.411	26	196.465	A	10.968	25.817	9.600	26.10	0.000	0.000
					B	11.957	9.600		44.53		
					C	10.750	29.400		23.91		
T5 100.00-80.00	90.00	1.332	25	237.924	A	15.839	29.753	11.686	25.63	0.000	0.000
					B	17.142	11.686		40.54		
					C	15.714	31.486		24.76		
T6 80.00-60.00	70.00	1.24	23	278.862	A	18.260	29.755	11.688	24.34	0.000	0.000
					B	19.518	11.688		37.45		
					C	18.140	31.488		23.55		
T7 60.00-40.00	50.00	1.126	21	321.468	A	18.035	33.092	15.025	29.39	0.000	0.000
					B	19.107	15.025		44.02		
					C	17.932	34.825		28.48		

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	180' ROHN	10 of 26
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	Client Verizon Wireless	Designed by Jed Kiernan

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
T8 40.00-20.00	30.00	1	18	362.198	A	19.892	33.093	15.027	28.36	0.000	0.000
					B	20.929	15.027		41.79		
					C	19.792	34.827		27.51		
T9 20.00-0.00	10.00	1	18	404.804	A	25.718	31.221	18.575	32.62	0.000	0.000
					B	26.545	18.575		41.17		
					C	25.768	30.455		33.04		

Tower Pressure - With Ice

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-160.00	170.00	1.597	22	0.5000	136.042	A	13.465	28.967	11.250	26.51	0.000	0.000
						B	15.538	11.250		42.00		
						C	15.538	11.250		42.00		
T2 160.00-140.00	150.00	1.541	21	0.5000	136.458	A	11.997	31.092	11.250	26.11	0.000	0.000
						B	14.097	11.250		44.38		
						C	14.097	11.250		44.38		
T3 140.00-120.00	130.00	1.48	21	0.5000	157.716	A	14.633	39.155	12.938	24.05	0.000	0.000
						B	17.724	12.938		42.20		
						C	15.089	35.288		25.68		
T4 120.00-100.00	110.00	1.411	20	0.5000	198.133	A	13.811	39.156	12.939	24.43	0.000	0.000
						B	15.943	12.939		44.80		
						C	13.519	42.739		23.00		
T5 100.00-80.00	90.00	1.332	18	0.5000	239.593	A	18.997	44.758	15.025	23.57	0.000	0.000
						B	21.713	15.025		40.90		
						C	18.990	44.825		23.54		
T6 80.00-60.00	70.00	1.24	17	0.5000	280.531	A	22.102	44.761	15.027	22.48	0.000	0.000
						B	24.722	15.027		37.80		
						C	22.096	44.827		22.45		
T7 60.00-40.00	50.00	1.126	16	0.5000	323.137	A	21.197	48.097	18.364	26.50	0.000	0.000
						B	23.353	18.364		44.02		
						C	21.193	48.164		26.48		
T8 40.00-20.00	30.00	1	14	0.5000	363.866	A	23.494	48.099	18.366	25.65	0.000	0.000
						B	25.580	18.366		41.79		
						C	23.489	48.166		25.63		
T9 20.00-0.00	10.00	1	14	0.5000	406.473	A	29.981	42.727	21.913	30.14	0.000	0.000
						B	31.601	21.913		40.95		
						C	30.209	39.793		31.30		

Tower Pressure - Service

$G_H = 1.121$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 180.00-	170.00	1.597	10	134.375	A	9.940	18.967	7.917	27.39	0.000	0.000

ERITower	Job: 180' ROHN	Page: 11 of 26
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	Client: Verizon Wireless	Designed by: Jed Kiernan

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
160.00					B	10.842	7.917		42.20		
					C	10.842	7.917		42.20		
T2 160.00-140.00	150.00	1.541	10	134.792	A	8.855	20.258	7.917	27.19	0.000	0.000
					B	9.759	7.917		44.79		
					C	9.759	7.917		44.79		
T3 140.00-120.00	130.00	1.48	9	156.048	A	11.859	25.816	9.599	25.48	0.000	0.000
					B	13.293	9.599		41.93		
					C	11.980	24.449		26.35		
T4 120.00-100.00	110.00	1.411	9	196.465	A	10.968	25.817	9.600	26.10	0.000	0.000
					B	11.957	9.600		44.53		
					C	10.750	29.400		23.91		
T5 100.00-80.00	90.00	1.332	9	237.924	A	15.839	29.753	11.686	25.63	0.000	0.000
					B	17.142	11.686		40.54		
					C	15.714	31.486		24.76		
T6 80.00-60.00	70.00	1.24	8	278.862	A	18.260	29.755	11.688	24.34	0.000	0.000
					B	19.518	11.688		37.45		
					C	18.140	31.488		23.55		
T7 60.00-40.00	50.00	1.126	7	321.468	A	18.035	33.092	15.025	29.39	0.000	0.000
					B	19.107	15.025		44.02		
					C	17.932	34.825		28.48		
T8 40.00-20.00	30.00	1	6	362.198	A	19.892	33.093	15.027	28.36	0.000	0.000
					B	20.929	15.027		41.79		
					C	19.792	34.827		27.51		
T9 20.00-0.00	10.00	1	6	404.804	A	25.718	31.221	18.575	32.62	0.000	0.000
					B	26.545	18.575		41.17		
					C	25.768	30.455		33.04		

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 180.00-160.00	0.06	0.56	A	0.215	2.546	0.594	1	1	21.199	1.79	89.38	A
			B	0.14	2.81	0.58	1	1	15.433			
			C	0.14	2.81	0.58	1	1	15.433			
T2 160.00-140.00	0.07	0.53	A	0.216	2.543	0.594	1	1	20.884	1.70	84.87	A
			B	0.131	2.842	0.579	1	1	14.341			
			C	0.131	2.842	0.579	1	1	14.341			
T3 140.00-120.00	0.27	0.96	A	0.241	2.463	0.6	1	1	27.342	2.07	103.30	A
			B	0.147	2.784	0.581	1	1	18.870			
			C	0.233	2.488	0.598	1	1	26.596			
T4 120.00-100.00	0.34	1.02	A	0.187	2.639	0.588	1	1	26.145	2.12	106.19	C
			B	0.11	2.925	0.576	1	1	17.488			
			C	0.204	2.582	0.591	1	1	28.134			
T5 100.00-80.00	0.35	1.42	A	0.192	2.624	0.589	1	1	33.355	2.46	123.17	C
			B	0.121	2.88	0.577	1	1	23.891			
			C	0.198	2.601	0.59	1	1	34.293			
T6 80.00-60.00	0.35	1.53	A	0.172	2.692	0.585	1	1	35.671	2.51	125.62	C
			B	0.112	2.917	0.576	1	1	26.254			
			C	0.178	2.671	0.586	1	1	36.597			
T7 60.00-40.00	0.35	1.82	A	0.159	2.739	0.583	1	1	37.324	2.43	121.49	C
			B	0.106	2.939	0.576	1	1	27.757			
			C	0.164	2.72	0.584	1	1	38.261			
T8 40.00-20.00	0.35	1.90	A	0.146	2.785	0.581	1	1	39.116	2.30	114.93	C
			B	0.099	2.967	0.575	1	1	29.570			
			C	0.151	2.769	0.582	1	1	40.048			

ERITower	Job	Page
	180' ROHN	12 of 26
URS Corp. AES 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project Wolcott, CT	Date 08:24:45 04/21/05
	Client Verizon Wireless	Designed by Jed Kiernan

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T9 20.00-0.00	0.22	2.53	A	0.141	2.806	0.58	1	1	43.829	2.55	127.49	A
			B	0.111	2.918	0.576	1	1	37.250			
			C	0.139	2.813	0.58	1	1	43.427			
Sum Weight:	2.34	12.26						OTM	1674.20 kip-ft	19.93		

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 ft^2	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.06	0.56	A	0.215	2.546	0.594	0.8	1	19.211	1.62	81.00	A
			B	0.14	2.81	0.58	0.8	1	13.265			
			C	0.14	2.81	0.58	0.8	1	13.265			
T2 160.00-140.00	0.07	0.53	A	0.216	2.543	0.594	0.8	1	19.113	1.55	77.67	A
			B	0.131	2.842	0.579	0.8	1	12.389			
			C	0.131	2.842	0.579	0.8	1	12.389			
T3 140.00-120.00	0.27	0.96	A	0.241	2.463	0.6	0.8	1	24.970	1.89	94.34	A
			B	0.147	2.784	0.581	0.8	1	16.212			
			C	0.233	2.488	0.598	0.8	1	24.200			
T4 120.00-100.00	0.34	1.02	A	0.187	2.639	0.588	0.8	1	23.952	1.96	98.08	C
			B	0.11	2.925	0.576	0.8	1	15.097			
			C	0.204	2.582	0.591	0.8	1	25.984			
T5 100.00-80.00	0.35	1.42	A	0.192	2.624	0.589	0.8	1	30.187	2.24	111.88	C
			B	0.121	2.88	0.577	0.8	1	20.462			
			C	0.198	2.601	0.59	0.8	1	31.150			
T6 80.00-60.00	0.35	1.53	A	0.172	2.692	0.585	0.8	1	32.018	2.26	113.17	C
			B	0.112	2.917	0.576	0.8	1	22.351			
			C	0.178	2.671	0.586	0.8	1	32.969			
T7 60.00-40.00	0.35	1.82	A	0.159	2.739	0.583	0.8	1	33.717	2.20	110.10	C
			B	0.106	2.939	0.576	0.8	1	23.936			
			C	0.164	2.72	0.584	0.8	1	34.675			
T8 40.00-20.00	0.35	1.90	A	0.146	2.785	0.581	0.8	1	35.138	2.07	103.57	C
			B	0.099	2.967	0.575	0.8	1	25.384			
			C	0.151	2.769	0.582	0.8	1	36.089			
T9 20.00-0.00	0.22	2.53	A	0.141	2.806	0.58	0.8	1	38.685	2.25	112.53	A
			B	0.111	2.918	0.576	0.8	1	31.941			
			C	0.139	2.813	0.58	0.8	1	38.273			
Sum Weight:	2.34	12.26						OTM	1524.01 kip-ft	18.05		

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 ft^2	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.06	0.56	A	0.215	2.546	0.594	0.85	1	19.708	1.66	83.09	A
			B	0.14	2.81	0.58	0.85	1	13.807			
			C	0.14	2.81	0.58	0.85	1	13.807			

ERITower	Job: 180' ROHN	Page: 13 of 26
URS Corp. AES 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project: Wolcott, CT	Date: 08:24:45 04/21/05
	Client: Verizon Wireless	Designed by: Jed Kiernan

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T2 160.00-140.00	0.07	0.53	A	0.216	2.543	0.594	0.85	1	19.556	1.59	79.47	A
			B	0.131	2.842	0.579	0.85	1	12.877			
			C	0.131	2.842	0.579	0.85	1	12.877			
T3 140.00-120.00	0.27	0.96	A	0.241	2.463	0.6	0.85	1	25.563	1.93	96.58	A
			B	0.147	2.784	0.581	0.85	1	16.876			
			C	0.233	2.488	0.598	0.85	1	24.799			
T4 120.00-100.00	0.34	1.02	A	0.187	2.639	0.588	0.85	1	24.500	2.00	100.11	C
			B	0.11	2.925	0.576	0.85	1	15.695			
			C	0.204	2.582	0.591	0.85	1	26.521			
T5 100.00-80.00	0.35	1.42	A	0.192	2.624	0.589	0.85	1	30.979	2.29	114.71	C
			B	0.121	2.88	0.577	0.85	1	21.319			
			C	0.198	2.601	0.59	0.85	1	31.936			
T6 80.00-60.00	0.35	1.53	A	0.172	2.692	0.585	0.85	1	32.931	2.33	116.28	C
			B	0.112	2.917	0.576	0.85	1	23.327			
			C	0.178	2.671	0.586	0.85	1	33.876			
T7 60.00-40.00	0.35	1.82	A	0.159	2.739	0.583	0.85	1	34.619	2.26	112.94	C
			B	0.106	2.939	0.576	0.85	1	24.891			
			C	0.164	2.72	0.584	0.85	1	35.571			
T8 40.00-20.00	0.35	1.90	A	0.146	2.785	0.581	0.85	1	36.133	2.13	106.41	C
			B	0.099	2.967	0.575	0.85	1	26.431			
			C	0.151	2.769	0.582	0.85	1	37.079			
T9 20.00-0.00	0.22	2.53	A	0.141	2.806	0.58	0.85	1	39.971	2.33	116.27	A
			B	0.111	2.918	0.576	0.85	1	33.268			
			C	0.139	2.813	0.58	0.85	1	39.561			
Sum Weight:	2.34	12.26						OTM	1561.56 kip-ft	18.52		

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 ft^2	F K	w plf	Ctrl. Face
T1 180.00-160.00	0.17	1.06	A	0.312	2.265	0.62	1	1	31.413	1.77	88.35	A
			B	0.197	2.606	0.59	1	1	22.173			
			C	0.197	2.606	0.59	1	1	22.173			
T2 160.00-140.00	0.18	0.99	A	0.316	2.255	0.621	1	1	31.301	1.69	84.57	A
			B	0.186	2.644	0.588	1	1	20.707			
			C	0.186	2.644	0.588	1	1	20.707			
T3 140.00-120.00	0.70	1.54	A	0.341	2.193	0.629	1	1	39.274	1.98	99.05	A
			B	0.194	2.615	0.589	1	1	25.349			
			C	0.319	2.246	0.622	1	1	37.040			
T4 120.00-100.00	0.86	1.55	A	0.267	2.387	0.606	1	1	37.557	2.03	101.70	C
			B	0.146	2.787	0.581	1	1	23.458			
			C	0.284	2.34	0.611	1	1	39.638			
T5 100.00-80.00	0.89	2.13	A	0.266	2.39	0.606	1	1	46.125	2.28	114.22	C
			B	0.153	2.759	0.582	1	1	30.458			
			C	0.266	2.389	0.606	1	1	46.162			
T6 80.00-60.00	0.89	2.31	A	0.238	2.473	0.599	1	1	48.912	2.33	116.63	C
			B	0.142	2.802	0.58	1	1	33.442			
			C	0.239	2.472	0.599	1	1	48.948			
T7 60.00-40.00	0.89	2.61	A	0.214	2.548	0.593	1	1	49.741	2.22	111.03	C
			B	0.129	2.85	0.578	1	1	33.976			
			C	0.215	2.548	0.593	1	1	49.778			
T8 40.00-20.00	0.89	2.75	A	0.197	2.607	0.59	1	1	51.860	2.10	105.15	C
			B	0.121	2.882	0.577	1	1	36.186			

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
			C	0.197	2.606	0.59	1	1	51.896			
T9 20.00-0.00	0.56	3.58	A	0.179	2.668	0.586	1	1	55.032	2.28	114.15	A
			B	0.132	2.84	0.579	1	1	44.285			
			C	0.172	2.691	0.585	1	1	53.493			
Sum Weight:	6.01	18.51						OTM	1601.19 kip-ft	18.70		

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 180.00-160.00	0.17	1.06	A	0.312	2.265	0.62	0.8	1	28.720	1.62	80.78	A
			B	0.197	2.606	0.59	0.8	1	19.065			
			C	0.197	2.606	0.59	0.8	1	19.065			
T2 160.00-140.00	0.18	0.99	A	0.316	2.255	0.621	0.8	1	28.901	1.56	78.09	A
			B	0.186	2.644	0.588	0.8	1	17.888			
			C	0.186	2.644	0.588	0.8	1	17.888			
T3 140.00-120.00	0.70	1.54	A	0.341	2.193	0.629	0.8	1	36.348	1.83	91.67	A
			B	0.194	2.615	0.589	0.8	1	21.804			
			C	0.319	2.246	0.622	0.8	1	34.022			
T4 120.00-100.00	0.86	1.55	A	0.267	2.387	0.606	0.8	1	34.795	1.90	94.76	C
			B	0.146	2.787	0.581	0.8	1	20.270			
			C	0.284	2.34	0.611	0.8	1	36.934			
T5 100.00-80.00	0.89	2.13	A	0.266	2.39	0.606	0.8	1	42.326	2.10	104.82	C
			B	0.153	2.759	0.582	0.8	1	26.115			
			C	0.266	2.389	0.606	0.8	1	42.364			
T6 80.00-60.00	0.89	2.31	A	0.238	2.473	0.599	0.8	1	44.492	2.12	106.10	C
			B	0.142	2.802	0.58	0.8	1	28.497			
			C	0.239	2.472	0.599	0.8	1	44.529			
T7 60.00-40.00	0.89	2.61	A	0.214	2.548	0.593	0.8	1	45.501	2.03	101.57	C
			B	0.129	2.85	0.578	0.8	1	29.306			
			C	0.215	2.548	0.593	0.8	1	45.539			
T8 40.00-20.00	0.89	2.75	A	0.197	2.607	0.59	0.8	1	47.161	1.91	95.63	C
			B	0.121	2.882	0.577	0.8	1	31.070			
			C	0.197	2.606	0.59	0.8	1	47.199			
T9 20.00-0.00	0.56	3.58	A	0.179	2.668	0.586	0.8	1	49.036	2.03	101.71	A
			B	0.132	2.84	0.579	0.8	1	37.965			
			C	0.172	2.691	0.585	0.8	1	47.451			
Sum Weight:	6.01	18.51						OTM	1472.23 kip-ft	17.10		

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 180.00-160.00	0.17	1.06	A	0.312	2.265	0.62	0.85	1	29.393	1.65	82.67	A
			B	0.197	2.606	0.59	0.85	1	19.842			

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
			C	0.197	2.606	0.59	0.85	1	19.842			
T2 160.00-140.00	0.18	0.99	A	0.316	2.255	0.621	0.85	1	29.501	1.59	79.71	A
			B	0.186	2.644	0.588	0.85	1	18.593			
			C	0.186	2.644	0.588	0.85	1	18.593			
T3 140.00-120.00	0.70	1.54	A	0.341	2.193	0.629	0.85	1	37.079	1.87	93.51	A
			B	0.194	2.615	0.589	0.85	1	22.690			
			C	0.319	2.246	0.622	0.85	1	34.776			
T4 120.00-100.00	0.86	1.55	A	0.267	2.387	0.606	0.85	1	35.485	1.93	96.49	C
			B	0.146	2.787	0.581	0.85	1	21.067			
			C	0.284	2.34	0.611	0.85	1	37.610			
T5 100.00-80.00	0.89	2.13	A	0.266	2.39	0.606	0.85	1	43.276	2.14	107.17	C
			B	0.153	2.759	0.582	0.85	1	27.201			
			C	0.266	2.389	0.606	0.85	1	43.314			
T6 80.00-60.00	0.89	2.31	A	0.238	2.473	0.599	0.85	1	45.597	2.17	108.73	C
			B	0.142	2.802	0.58	0.85	1	29.734			
			C	0.239	2.472	0.599	0.85	1	45.634			
T7 60.00-40.00	0.89	2.61	A	0.214	2.548	0.593	0.85	1	46.561	2.08	103.94	C
			B	0.129	2.85	0.578	0.85	1	30.473			
			C	0.215	2.548	0.593	0.85	1	46.599			
T8 40.00-20.00	0.89	2.75	A	0.197	2.607	0.59	0.85	1	48.336	1.96	98.01	C
			B	0.121	2.882	0.577	0.85	1	32.349			
			C	0.197	2.606	0.59	0.85	1	48.373			
T9 20.00-0.00	0.56	3.58	A	0.179	2.668	0.586	0.85	1	50.535	2.10	104.82	A
			B	0.132	2.84	0.579	0.85	1	39.545			
			C	0.172	2.691	0.585	0.85	1	48.962			
Sum Weight:	6.01	18.51						OTM	1504.47 kip-ft	17.50		

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 180.00-160.00	0.06	0.56	A	0.215	2.546	0.594	1	1	21.199	0.62	30.93	A
			B	0.14	2.81	0.58	1	1	15.433			
			C	0.14	2.81	0.58	1	1	15.433			
T2 160.00-140.00	0.07	0.53	A	0.216	2.543	0.594	1	1	20.884	0.59	29.37	A
			B	0.131	2.842	0.579	1	1	14.341			
			C	0.131	2.842	0.579	1	1	14.341			
T3 140.00-120.00	0.27	0.96	A	0.241	2.463	0.6	1	1	27.342	0.71	35.74	A
			B	0.147	2.784	0.581	1	1	18.870			
			C	0.233	2.488	0.598	1	1	26.596			
T4 120.00-100.00	0.34	1.02	A	0.187	2.639	0.588	1	1	26.145	0.73	36.74	C
			B	0.11	2.925	0.576	1	1	17.488			
			C	0.204	2.582	0.591	1	1	28.134			
T5 100.00-80.00	0.35	1.42	A	0.192	2.624	0.589	1	1	33.355	0.85	42.62	C
			B	0.121	2.88	0.577	1	1	23.891			
			C	0.198	2.601	0.59	1	1	34.293			
T6 80.00-60.00	0.35	1.53	A	0.172	2.692	0.585	1	1	35.671	0.87	43.47	C
			B	0.112	2.917	0.576	1	1	26.254			
			C	0.178	2.671	0.586	1	1	36.597			
T7 60.00-40.00	0.35	1.82	A	0.159	2.739	0.583	1	1	37.324	0.84	42.04	C
			B	0.106	2.939	0.576	1	1	27.757			
			C	0.164	2.72	0.584	1	1	38.261			
T8 40.00-	0.35	1.90	A	0.146	2.785	0.581	1	1	39.116	0.80	39.77	C

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
20.00			B	0.099	2.967	0.575	1	1	29.570			
			C	0.151	2.769	0.582	1	1	40.048			
T9 20.00-0.00	0.22	2.53	A	0.141	2.806	0.58	1	1	43.829	0.88	44.11	A
			B	0.111	2.918	0.576	1	1	37.250			
			C	0.139	2.813	0.58	1	1	43.427			
Sum Weight:	2.34	12.26						OTM	579.31 kip-ft	6.90		

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 180.00-160.00	0.06	0.56	A	0.215	2.546	0.594	0.8	1	19.211	0.56	28.03	A
			B	0.14	2.81	0.58	0.8	1	13.265			
			C	0.14	2.81	0.58	0.8	1	13.265			
T2 160.00-140.00	0.07	0.53	A	0.216	2.543	0.594	0.8	1	19.113	0.54	26.87	A
			B	0.131	2.842	0.579	0.8	1	12.389			
			C	0.131	2.842	0.579	0.8	1	12.389			
T3 140.00-120.00	0.27	0.96	A	0.241	2.463	0.6	0.8	1	24.970	0.65	32.64	A
			B	0.147	2.784	0.581	0.8	1	16.212			
			C	0.233	2.488	0.598	0.8	1	24.200			
T4 120.00-100.00	0.34	1.02	A	0.187	2.639	0.588	0.8	1	23.952	0.68	33.94	C
			B	0.11	2.925	0.576	0.8	1	15.097			
			C	0.204	2.582	0.591	0.8	1	25.984			
T5 100.00-80.00	0.35	1.42	A	0.192	2.624	0.589	0.8	1	30.187	0.77	38.71	C
			B	0.121	2.88	0.577	0.8	1	20.462			
			C	0.198	2.601	0.59	0.8	1	31.150			
T6 80.00-60.00	0.35	1.53	A	0.172	2.692	0.585	0.8	1	32.018	0.78	39.16	C
			B	0.112	2.917	0.576	0.8	1	22.351			
			C	0.178	2.671	0.586	0.8	1	32.969			
T7 60.00-40.00	0.35	1.82	A	0.159	2.739	0.583	0.8	1	33.717	0.76	38.10	C
			B	0.106	2.939	0.576	0.8	1	23.936			
			C	0.164	2.72	0.584	0.8	1	34.675			
T8 40.00-20.00	0.35	1.90	A	0.146	2.785	0.581	0.8	1	35.138	0.72	35.84	C
			B	0.099	2.967	0.575	0.8	1	25.384			
			C	0.151	2.769	0.582	0.8	1	36.089			
T9 20.00-0.00	0.22	2.53	A	0.141	2.806	0.58	0.8	1	38.685	0.78	38.94	A
			B	0.111	2.918	0.576	0.8	1	31.941			
			C	0.139	2.813	0.58	0.8	1	38.273			
Sum Weight:	2.34	12.26						OTM	527.34 kip-ft	6.24		

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 180.00-	0.06	0.56	A	0.215	2.546	0.594	0.85	1	19.708	0.58	28.75	A

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
160.00			B	0.14	2.81	0.58	0.85	1	13.807			
			C	0.14	2.81	0.58	0.85	1	13.807			
T2 160.00-140.00	0.07	0.53	A	0.216	2.543	0.594	0.85	1	19.556	0.55	27.50	A
			B	0.131	2.842	0.579	0.85	1	12.877			
			C	0.131	2.842	0.579	0.85	1	12.877			
T3 140.00-120.00	0.27	0.96	A	0.241	2.463	0.6	0.85	1	25.563	0.67	33.42	A
			B	0.147	2.784	0.581	0.85	1	16.876			
			C	0.233	2.488	0.598	0.85	1	24.799			
T4 120.00-100.00	0.34	1.02	A	0.187	2.639	0.588	0.85	1	24.500	0.69	34.64	C
			B	0.11	2.925	0.576	0.85	1	15.695			
			C	0.204	2.582	0.591	0.85	1	26.521			
T5 100.00-80.00	0.35	1.42	A	0.192	2.624	0.589	0.85	1	30.979	0.79	39.69	C
			B	0.121	2.88	0.577	0.85	1	21.319			
			C	0.198	2.601	0.59	0.85	1	31.936			
T6 80.00-60.00	0.35	1.53	A	0.172	2.692	0.585	0.85	1	32.931	0.80	40.24	C
			B	0.112	2.917	0.576	0.85	1	23.327			
			C	0.178	2.671	0.586	0.85	1	33.876			
T7 60.00-40.00	0.35	1.82	A	0.159	2.739	0.583	0.85	1	34.619	0.78	39.08	C
			B	0.106	2.939	0.576	0.85	1	24.891			
			C	0.164	2.72	0.584	0.85	1	35.571			
T8 40.00-20.00	0.35	1.90	A	0.146	2.785	0.581	0.85	1	36.133	0.74	36.82	C
			B	0.099	2.967	0.575	0.85	1	26.431			
			C	0.151	2.769	0.582	0.85	1	37.079			
T9 20.00-0.00	0.22	2.53	A	0.141	2.806	0.58	0.85	1	39.971	0.80	40.23	A
			B	0.111	2.918	0.576	0.85	1	33.268			
			C	0.139	2.813	0.58	0.85	1	39.561			
Sum Weight:	2.34	12.26						OTM	540.33 kip-ft	6.41		

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	5.42					
Bracing Weight	6.84					
Total Member Self-Weight	12.26			4.97	2.25	
Total Weight	15.91			4.97	2.25	
Wind 0 deg - No Ice		0.00	-23.60	-2187.86	2.25	-7.03
Wind 90 deg - No Ice		22.19	0.00	4.97	-2077.93	2.20
Wind 180 deg - No Ice		0.00	21.71	2047.61	2.25	6.28
Member Ice	6.25					
Total Weight Ice	26.68			11.73	6.34	
Wind 0 deg - Ice		0.00	-22.33	-2108.29	6.34	-8.00
Wind 90 deg - Ice		21.14	0.00	11.73	-2016.96	2.57
Wind 180 deg - Ice		0.00	20.74	2002.79	6.34	7.24
Total Weight	15.91			4.97	2.25	
Wind 0 deg - Service		0.00	-8.17	-758.98	-0.14	-2.43
Wind 90 deg - Service		7.68	0.00	-0.22	-719.92	0.76
Wind 180 deg - Service		0.00	7.51	706.57	-0.14	2.17

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 90 deg - No Ice
4	Dead+Wind 180 deg - No Ice
5	Dead+Ice+Temp
6	Dead+Wind 0 deg+Ice+Temp
7	Dead+Wind 90 deg+Ice+Temp
8	Dead+Wind 180 deg+Ice+Temp
9	Dead+Wind 0 deg - Service
10	Dead+Wind 90 deg - Service
11	Dead+Wind 180 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	180 - 160	Leg	Max Tension	8	3.96	0.00	-0.01
			Max. Compression	6	-5.11	-0.00	0.01
			Max. Mx	7	-0.48	-0.02	-0.00
			Max. My	6	1.81	0.00	0.02
			Max. Vy	7	-0.21	0.00	0.00
			Max. Vx	8	-0.24	0.00	0.00
		Diagonal	Max Tension	6	0.83	0.00	0.00
			Max. Compression	6	-0.86	0.00	0.00
			Max. Mx	7	0.44	0.01	-0.00
			Max. My	6	-0.07	0.01	0.00
			Max. Vy	7	0.01	0.01	-0.00
			Max. Vx	6	0.00	0.00	0.00
		Top Girt	Max Tension	6	0.09	0.00	0.00
			Max. Compression	8	-0.12	0.00	0.00
			Max. Mx	5	-0.01	-0.02	0.00
			Max. My	6	-0.06	0.00	-0.00
			Max. Vy	5	0.01	0.00	0.00
			Max. Vx	6	0.00	0.00	0.00
T2	160 - 140	Leg	Max Tension	8	13.93	-0.00	-0.00
			Max. Compression	6	-16.70	0.07	0.01
			Max. Mx	6	-16.70	0.07	0.01
			Max. My	7	-0.69	-0.00	-0.06
			Max. Vy	6	-0.06	0.06	0.00
			Max. Vx	7	0.08	-0.00	0.03
		Diagonal	Max Tension	8	1.51	0.00	0.00
			Max. Compression	6	-1.64	0.00	0.00
			Max. Mx	6	1.48	0.01	0.00
			Max. My	6	-1.38	0.00	0.00
			Max. Vy	6	-0.01	0.01	0.00
			Max. Vx	6	-0.00	0.00	0.00
T3	140 - 120	Leg	Max Tension	4	27.55	-0.06	-0.00
			Max. Compression	6	-33.23	0.07	0.01
			Max. Mx	6	-19.38	0.07	0.01
			Max. My	2	14.07	-0.03	0.07
			Max. Vy	4	-0.93	-0.03	-0.01
			Max. Vx	3	1.06	-0.00	0.02
		Diagonal	Max Tension	2	2.17	0.00	0.00
			Max. Compression	2	-2.23	0.00	0.00
			Max. Mx	8	1.82	0.02	-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. My	8	-2.07	0.01	-0.00
			Max. Vy	8	0.01	0.02	-0.00
			Max. Vx	7	-0.00	0.00	0.00
		Top Girt	Max Tension	4	0.32	0.00	0.00
			Max. Compression	2	-0.32	0.00	0.00
			Max. Mx	5	-0.01	-0.02	0.00
			Max. My	8	-0.16	0.00	0.00
			Max. Vy	5	0.01	0.00	0.00
			Max. Vx	8	-0.00	0.00	0.00
T4	120 - 100	Leg	Max Tension	4	41.90	-0.08	0.00
			Max. Compression	6	-48.88	0.07	-0.00
			Max. Mx	8	40.99	-0.12	0.01
			Max. My	6	20.19	-0.08	-0.10
			Max. Vy	6	0.04	0.10	-0.00
			Max. Vx	6	0.04	-0.08	-0.10
		Diagonal	Max Tension	7	2.51	0.00	0.00
			Max. Compression	2	-2.58	0.00	0.00
			Max. Mx	8	1.96	0.03	-0.00
			Max. My	6	0.03	0.02	0.00
			Max. Vy	8	0.02	0.03	-0.00
			Max. Vx	6	0.00	0.00	0.00
T5	100 - 80	Leg	Max Tension	4	55.91	-0.09	-0.01
			Max. Compression	6	-64.60	0.21	0.01
			Max. Mx	6	-64.60	0.21	0.01
			Max. My	7	-3.39	-0.07	0.14
			Max. Vy	8	-0.07	-0.12	0.01
			Max. Vx	6	0.07	-0.08	0.09
		Diagonal	Max Tension	3	2.90	0.00	0.00
			Max. Compression	7	-3.01	0.00	0.00
			Max. Mx	6	2.31	0.05	0.00
			Max. My	8	-2.40	0.02	-0.01
			Max. Vy	8	0.02	0.05	-0.01
			Max. Vx	8	0.00	0.00	0.00
T6	80 - 60	Leg	Max Tension	4	69.10	-0.10	-0.01
			Max. Compression	6	-79.96	-0.03	0.02
			Max. Mx	8	66.47	-0.35	-0.01
			Max. My	6	32.04	-0.28	0.17
			Max. Vy	8	0.09	-0.35	-0.01
			Max. Vx	6	-0.05	-0.28	0.17
		Diagonal	Max Tension	7	3.26	0.00	0.00
			Max. Compression	7	-3.20	0.00	0.00
			Max. Mx	6	2.33	0.06	0.00
			Max. My	8	-2.53	0.02	-0.01
			Max. Vy	8	0.03	0.06	-0.01
			Max. Vx	8	0.00	0.00	0.00
T7	60 - 40	Leg	Max Tension	4	81.02	-0.21	-0.02
			Max. Compression	6	-93.89	-0.10	0.02
			Max. Mx	8	77.28	-0.61	-0.02
			Max. My	3	-2.97	-0.02	0.31
			Max. Vy	8	0.12	-0.61	-0.02
			Max. Vx	2	0.08	-0.13	0.31
		Diagonal	Max Tension	7	4.07	0.00	0.00
			Max. Compression	3	-3.98	0.00	0.00
			Max. Mx	8	2.51	0.10	-0.01
			Max. My	8	-3.49	0.06	-0.01
			Max. Vy	8	0.04	0.10	-0.01
			Max. Vx	8	0.00	0.00	0.00
T8	40 - 20	Leg	Max Tension	4	93.57	-0.15	-0.01
			Max. Compression	6	-108.68	-0.28	0.02
			Max. Mx	8	88.60	-0.99	-0.02
			Max. My	3	-3.66	-0.03	0.38

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	8	0.18	-0.99	-0.02
			Max. Vx	2	0.09	-0.10	0.36
		Diagonal	Max Tension	7	4.37	0.00	0.00
			Max. Compression	7	-4.29	0.00	0.00
			Max. Mx	8	2.41	0.12	-0.01
			Max. My	8	-3.79	0.08	-0.02
			Max. Vy	8	0.04	0.12	-0.01
			Max. Vx	8	0.00	0.00	0.00
T9	20 - 0	Leg	Max Tension	4	105.69	-0.34	-0.01
			Max. Compression	6	-123.45	-0.00	-0.00
			Max. Mx	6	-115.12	1.03	0.01
			Max. My	3	-4.39	-0.04	0.75
			Max. Vy	8	-0.20	-0.99	-0.02
			Max. Vx	2	0.14	-0.21	0.69
		Diagonal	Max Tension	7	5.07	0.00	0.00
			Max. Compression	7	-4.95	0.00	0.00
			Max. Mx	8	2.21	0.23	-0.01
			Max. My	8	-4.53	0.16	-0.03
			Max. Vy	8	0.07	0.23	-0.01
			Max. Vx	8	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	8	65.08	4.19	-4.07
	Max. H_x	4	62.44	5.16	-4.80
	Max. H_z	7	-88.24	-10.32	5.07
	Min. Vert	3	-94.80	-9.90	4.73
	Min. H_x	7	-88.24	-10.32	5.07
	Min. H_z	4	62.44	5.16	-4.80
Leg B	Max. Vert	7	106.69	-9.44	-4.50
	Max. H_x	6	-50.23	5.71	4.57
	Max. H_z	6	-50.23	5.71	4.57
	Min. Vert	2	-55.74	5.03	4.42
	Min. H_x	3	105.68	-10.71	-5.14
	Min. H_z	3	105.68	-10.71	-5.14
Leg A	Max. Vert	2	127.17	-0.20	14.43
	Max. H_x	8	-102.86	0.20	-12.95
	Max. H_z	2	127.17	-0.20	14.43
	Min. Vert	4	-108.76	0.17	-12.43
	Min. H_x	3	5.03	-1.58	0.41
	Min. H_z	8	-102.86	0.20	-12.95

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	15.91	0.00	0.00	4.97	2.25	0.00
Dead+Wind 0 deg - No Ice	15.91	-0.00	-23.60	-2193.31	2.28	-7.04
Dead+Wind 90 deg - No Ice	15.91	22.19	-0.00	4.98	-2083.13	2.23

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 180 deg - No Ice	15.91	0.00	21.71	2052.74	2.27	6.29
Dead+Ice+Temp	26.68	0.00	0.00	11.76	6.36	-0.00
Dead+Wind 0 deg+Ice+Temp	26.68	0.00	-22.33	-2117.17	6.42	-8.03
Dead+Wind 90 deg+Ice+Temp	26.68	21.14	0.00	11.77	-2025.46	2.61
Dead+Wind 180 deg+Ice+Temp	26.68	0.00	20.74	2011.23	6.39	7.27
Dead+Wind 0 deg - Service	15.91	0.00	-8.17	-755.69	2.26	-2.44
Dead+Wind 90 deg - Service	15.91	7.68	-0.00	4.98	-719.34	0.77
Dead+Wind 180 deg - Service	15.91	0.00	7.51	713.56	2.26	2.18

Solution Summary

Load Comb.	Sum of Applied Forces PX	PY	PZ	Sum of Reactions PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-15.91	0.00	0.00	15.91	0.00	0.000%
2	0.00	-15.91	-23.60	0.00	15.91	23.60	0.000%
3	22.19	-15.91	0.00	-22.19	15.91	0.00	0.002%
4	0.00	-15.91	21.71	-0.00	15.91	-21.71	0.000%
5	0.00	-26.68	0.00	0.00	26.68	0.00	0.000%
6	-0.00	-26.68	-22.33	0.00	26.68	22.33	0.000%
7	21.14	-26.68	0.00	-21.14	26.68	-0.00	0.000%
8	0.00	-26.68	20.74	-0.00	26.68	-20.74	0.000%
9	0.00	-15.91	-8.17	0.00	15.91	8.17	0.000%
10	7.68	-15.91	0.00	-7.68	15.91	0.00	0.000%
11	0.00	-15.91	7.51	0.00	15.91	-7.51	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000227
4	Yes	4	0.00000001	0.00000257
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000453
7	Yes	4	0.00000001	0.00000412
8	Yes	4	0.00000001	0.00000370
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
T1	180 - 160	5.986	9	0.2944	0.0163
T2	160 - 140	4.752	9	0.2874	0.0134

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T3	140 - 120	3.584	9	0.2532	0.0090
T4	120 - 100	2.587	9	0.2105	0.0073
T5	100 - 80	1.772	9	0.1670	0.0057
T6	80 - 60	1.128	9	0.1299	0.0045
T7	60 - 40	0.641	9	0.0898	0.0031
T8	40 - 20	0.302	9	0.0611	0.0019
T9	20 - 0	0.084	9	0.0314	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	2 Bay Dipole	9	5.986	0.2944	0.0163	390758
180.00	3' Side Mount Standoff (1)	9	5.986	0.2944	0.0163	390758
155.00	2" Dia 10' Omni	9	4.450	0.2811	0.0123	55468
150.00	3' Side Mount Standoff (1)	9	4.153	0.2729	0.0111	38729
144.00	2" Dia 8' Omni	9	3.807	0.2614	0.0097	28442
140.00	2' Side Mount Standoff (1)	9	3.584	0.2532	0.0090	25040
135.00	(2) DB950F65T2E-M	9	3.317	0.2428	0.0083	24763
104.00	2" Dia 8' Omni	9	1.921	0.1752	0.0060	27352
100.00	2' Side Mount Standoff (1)	9	1.772	0.1670	0.0057	27610

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	17.349	2	0.8568	0.0534
T2	160 - 140	13.777	2	0.8341	0.0435
T3	140 - 120	10.395	2	0.7336	0.0300
T4	120 - 100	7.505	2	0.6105	0.0241
T5	100 - 80	5.139	2	0.4846	0.0188
T6	80 - 60	3.271	2	0.3769	0.0148
T7	60 - 40	1.858	2	0.2606	0.0101
T8	40 - 20	0.876	2	0.1774	0.0064
T9	20 - 0	0.242	2	0.0912	0.0025

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	2 Bay Dipole	2	17.349	0.8568	0.0534	120899
180.00	3' Side Mount Standoff (1)	2	17.349	0.8568	0.0534	120899
155.00	2" Dia 10' Omni	2	12.901	0.8148	0.0401	17715
150.00	3' Side Mount Standoff (1)	2	12.041	0.7904	0.0364	12529
144.00	2" Dia 8' Omni	2	11.039	0.7573	0.0323	9275
140.00	2' Side Mount Standoff (1)	2	10.395	0.7336	0.0300	8201

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
135.00	(2) DB950F65T2E-M	2	9.621	0.7036	0.0279	8179
104.00	2" Dia 8' Omni	2	5.571	0.5083	0.0198	9428
100.00	2' Side Mount Standoff (1)	2	5.139	0.4846	0.0188	9531

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	180	Leg	A325X	0.8750	4	0.08	26.46	0.003 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.6250	1	0.83	4.53	0.183 ✔	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 P / P_a
T1	180 - 160	ROHN 2 STD	20.00	4.00	61.0 K=1.00	22.549	1.0745	-5.11	24.23	0.211 ✔
T2	160 - 140	ROHN 2 STD	20.00	4.00	61.0 K=1.00	22.549	1.0745	-16.70	24.23	0.689 ✔
T3	140 - 120	ROHN 2.5 STD	20.03	5.01	63.4 K=1.00	22.122	1.7040	-33.23	37.70	0.881 ✔
T4	120 - 100	ROHN 2.5 EH	20.03	6.68	86.7 K=1.00	17.634	2.2535	-48.88	39.74	1.230 ✔
T5	100 - 80	ROHN 3 X-STR	20.03	6.68	70.5 K=1.00	20.841	3.0159	-64.60	62.86	1.028 ✔
T6	80 - 60	ROHN 3 EH	20.04	6.68	70.5 K=1.00	20.839	3.0159	-79.96	62.85	1.272 ✔
T7	60 - 40	ROHN 4 X-STR	20.03	10.02	81.4 K=1.00	18.731	4.4074	-93.89	82.56	1.137 ✔
T8	40 - 20	ROHN 4 X-STR	20.04	10.02	81.4 K=1.00	18.729	4.4074	-108.68	82.55	1.317 ✔
T9	20 - 0	ROHN 5 STD	20.03	10.02	64.0 K=1.00	22.021	4.2999	-123.45	94.69	1.304 ✔

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	180 - 160	L1 1/2x1 1/2x1/8	7.65	3.71	150.3 K=1.00	6.614	0.3594	-0.86	2.38	0.362 ✓
T2	160 - 140	L1 1/2x1 1/2x1/8	7.68	3.73	151.0 K=1.00	6.548	0.3594	-1.64	2.35	0.698 ✓
T3	140 - 120	L2x2x3/16	9.70	4.86	147.9 K=1.00	6.825	0.7150	-2.22	4.88	0.455 ✓
T4	120 - 100	L2x2x3/16	12.24	6.18	188.2 K=1.00	4.215	0.7150	-2.58	3.01	0.856 ✓
T5	100 - 80	L2 1/2x2 1/2x3/16	13.97	7.01	169.9 K=1.00	5.176	0.9020	-3.01	4.67	0.645 ✓
T6	80 - 60	L2 1/2x2 1/2x3/16	15.82	7.94	192.6 K=1.00	4.027	0.9020	-3.19	3.63	0.879 ✓
T7	60 - 40	L3x3x3/16	19.04	9.59	193.1 K=1.00	4.003	1.0900	-3.98	4.36	0.913 ✓
T8	40 - 20	L3x3x3/16	20.81	10.49	211.2 K=1.00	3.348	1.0900	-4.17	3.65	1.143 ✓
T9	20 - 0	KL/R > 200 (C) - 182 L3 1/2x3 1/2x1/4	22.61	11.33	195.9 K=1.00	3.892	1.6900	-4.83	6.58	0.734 ✓

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	180 - 160	L2x2x1/8	6.52	6.32	190.9 K=1.00	4.099	0.4844	-0.12	1.99	0.058 ✓
T3	140 - 120	L2x2x1/8	6.56	6.36	192.1 K=1.00	4.046	0.4844	-0.32	1.96	0.165 ✓

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	180 - 160	ROHN 2 STD	20.00	4.00	61.0	30.000	1.0745	3.96	32.24	0.123 ✓
T2	160 - 140	ROHN 2 STD	20.00	4.00	61.0	30.000	1.0745	13.90	32.24	0.431 ✓
T3	140 - 120	ROHN 2.5 STD	20.03	5.01	63.4	30.000	1.7040	27.55	51.12	0.539 ✓
T4	120 - 100	ROHN 2.5 EH	20.03	6.68	86.7	30.000	2.2535	41.90	67.61	0.620 ✓
T5	100 - 80	ROHN 3 X-STR	20.03	6.68	70.5	30.000	3.0159	55.91	90.48	0.618 ✓

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	80 - 60	ROHN 3 EH	20.04	6.68	70.5	30.000	3.0159	69.10	90.48	0.764 ✓
T7	60 - 40	ROHN 4 X-STR	20.03	10.02	81.4	30.000	4.4074	81.02	132.22	0.613 ✓
T8	40 - 20	ROHN 4 X-STR	20.04	10.02	81.4	30.000	4.4074	93.56	132.22	0.708 ✓
T9	20 - 0	ROHN 5 STD	20.03	10.02	64.0	30.000	4.2999	105.69	129.00	0.819 ✓

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	180 - 160	L1 1/2x1 1/2x1/8	7.65	3.71	95.7	29.000	0.1992	0.83	5.78	0.144 ✓
T2	160 - 140	L1 1/2x1 1/2x1/8	7.68	3.73	96.2	21.600	0.3594	1.51	7.76	0.194 ✓
T3	140 - 120	L2x2x3/16	9.70	4.86	94.5	21.600	0.7150	2.17	15.44	0.141 ✓
T4	120 - 100	L2x2x3/16	12.24	6.18	120.2	21.600	0.7150	2.51	15.44	0.163 ✓
T5	100 - 80	L2 1/2x2 1/2x3/16	13.97	7.01	108.1	21.600	0.9020	2.90	19.48	0.149 ✓
T6	80 - 60	L2 1/2x2 1/2x3/16	15.82	7.94	122.5	21.600	0.9020	3.26	19.48	0.167 ✓
T7	60 - 40	L3x3x3/16	19.04	9.59	122.6	21.600	1.0900	4.07	23.54	0.173 ✓
T8	40 - 20	L3x3x3/16	20.81	10.49	134.0	21.600	1.0900	4.37	23.54	0.185 ✓
T9	20 - 0	L3 1/2x3 1/2x1/4	22.61	11.33	124.7	21.600	1.6900	5.07	36.50	0.139 ✓

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	180 - 160	L2x2x1/8	6.52	6.32	121.2	21.600	0.4844	0.09	10.46	0.009 ✓
T3	140 - 120	L2x2x1/8	6.56	6.36	122.0	21.600	0.4844	0.32	10.46	0.031 ✓

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	180' ROHN	26 of 26
URS Corp. AES 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project Wolcott, CT	Date 08:24:45 04/21/05
	Client Verizon Wireless	Designed by Jed Kiernan

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	180 - 160	Leg	ROHN 2 STD	3	-5.11	32.30	15.8	Pass
T2	160 - 140	Leg	ROHN 2 STD	39	-16.70	32.30	51.7	Pass
T3	140 - 120	Leg	ROHN 2.5 STD	72	-33.23	50.25	66.1	Pass
T4	120 - 100	Leg	ROHN 2.5 EH	102	-48.88	52.97	92.3	Pass
T5	100 - 80	Leg	ROHN 3 X-STR	123	-64.60	83.79	77.1	Pass
T6	80 - 60	Leg	ROHN 3 EH	144	-79.96	83.78	95.4	Pass
T7	60 - 40	Leg	ROHN 4 X-STR	165	-93.89	110.05	85.3	Pass
T8	40 - 20	Leg	ROHN 4 X-STR	180	-108.68	110.04	98.8	Pass
T9	20 - 0	Leg	ROHN 5 STD	195	-123.45	126.22	97.8	Pass
T1	180 - 160	Diagonal	L1 1/2x1 1/2x1/8	11	-0.86	3.17	27.1	Pass
T2	160 - 140	Diagonal	L1 1/2x1 1/2x1/8	44	-1.64	3.14	52.4	Pass
T3	140 - 120	Diagonal	L2x2x3/16	80	-2.22	6.50	34.1	Pass
T4	120 - 100	Diagonal	L2x2x3/16	107	-2.58	4.02	64.2	Pass
T5	100 - 80	Diagonal	L2 1/2x2 1/2x3/16	125	-3.01	6.22	48.4	Pass
T6	80 - 60	Diagonal	L2 1/2x2 1/2x3/16	146	-3.19	4.84	66.0	Pass
T7	60 - 40	Diagonal	L3x3x3/16	167	-3.98	5.82	68.5	Pass
T8	40 - 20	Diagonal	L3x3x3/16	182	-4.17	4.86	85.8	Pass
T9	20 - 0	Diagonal	L3 1/2x3 1/2x1/4	200	-4.83	8.77	55.1	Pass
T1	180 - 160	Top Girt	L2x2x1/8	4	-0.12	2.65	4.4	Pass
T3	140 - 120	Top Girt	L2x2x1/8	73	-0.32	2.61	12.4	Pass
							Summary	
						Leg (T8)	98.8	Pass
						Diagonal (T8)	85.8	Pass
						Top Girt (T3)	12.4	Pass
						Bolt Checks	13.7	Pass
						RATING =	**98.8**	**Pass**

ANCHOR BOLT ANALYSIS

URS

Job	180' Self-Supporting Tower, Wolcott, CT	Project No.	VZ1-142	Page / of	/
Description	Anchor Bolt Analysis	Computed by	JEK	Sheet	1 of 1
		Checked by		Date	04/21/05

ANCHOR BOLT ANALYSIS

Input Data

Tower Reactions:

Uplift Force: $Uplift := 110kips$ *user input*

Shear Force: $Shear := 25.0 \cdot kips$ *user input*

Anchor Bolt Data (use ASTM A449 Bolts):

Bolt Allowable Tension Stress: $F_t := 34.7 \cdot \frac{kips}{in^2}$ *user input*

Number of Anchor Bolts = N $NumberOfBolts := 4$ *user input*

Diameter Of Anchor Bolts $BoltDiameter := 1 \cdot in$ *user input*

Analysis

Notes 1. Analysis is based on AISC ASD section J3.4: *Combined Tension and Shear in Bearing-type Connections*
2. 1.33 allowable stress increase per TIA / EIA

Check Stress:

Bolt Shear Stress: $f_v := \frac{Shear}{\frac{\pi \cdot BoltDiameter^2 \cdot NumberOfBolts}{4}}$ $f_v = 7.96 \frac{kips}{in^2}$

Adjusted Allow. Tension Stress: $F_{adj} := \sqrt{(1.33 \cdot F_t)^2 - 4.39 \cdot f_v^2}$

$F_{adj} = 43.03 \frac{kips}{in^2}$

Bolt Tension Stress: $f_t := \frac{Uplift}{\frac{\pi \cdot BoltDiameter^2 \cdot NumberOfBolts}{4}}$ $f_t = 35.01 \frac{kips}{in^2}$

Stress Ratio: $StressRatio := \frac{f_t}{F_{adj}}$ $StressRatio = 0.81$

$AnchorBoltStress := if(StressRatio \leq 1.0, "Not Overstressed", "Overstressed")$

$AnchorBoltStress = "Not Overstressed"$

FOUNDATION ANALYSIS

URS

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Job	180' Self-Supporting Tower, Wolcott, CT	Project No.	VZ1-142	Sheet 1	of 7
Description	Foundation Analysis	Computed by	JEK	Date	04/21/05
		Checked by		Date	

PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower	$M_t := 2500 \cdot kip \cdot ft$
Shear at Base of Tower	$S_t := 25 \cdot kip$
Max Compressive Force	$C_t := 130 \cdot kip$
Max Uplift	$U_t := 110 \cdot kip$
Height of Tower	$H_t := 180 \cdot ft$
Width of Tower at Base	$W_t := 20.78125 \cdot ft$
Weight of Tower	$WT_t := 1 \cdot kip$

NOTE: Weight of Tower is incorporated into the other loads listed above and is therefore set equal to one for programming.

FOOTING DIMENSIONS:

Width of Footing	$W_f := 28.5 \cdot ft$
Overall Depth of Footing	$D_f := 4ft$
Length of Pier	$L_p := 0 \cdot ft$
Extension of Pier Above Grade	$L_{pag} := 0 \cdot ft$
Diameter of Pier	$d_p := 0 \cdot ft$
Thickness of Footing	$T_f := 4 \cdot ft$
Reinforement Cover:	$Cvr := 3in$

MATERIAL PROPERTIES:

Compressive Strength of Concrete	$f'c := 3000 \cdot psi$	Unit Weight of Soil	$\gamma_s := 60 \cdot pcf$
Yield Strength of Steel Reinforcement	$fy := 60000 \cdot psi$	Unit Weight of Concrete	$\gamma_c := 150 \cdot pcf$
Internal Friction Angle of Soil	$\phi_s := 34 \cdot deg$	Depth to Neglect	$n := 0 \cdot ft$
Allowable Bearing Capacity	$q_s := 3000 \cdot psf$	Cohesion of Clay Type Soil Note: Use 0 for Sandy Soil	$c := 0 \cdot ksf$
Coefficient of Lateral Soil Pressure	$K_p := \frac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$	$K_p = 3.5371$	

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

STEEL REINFORCING:

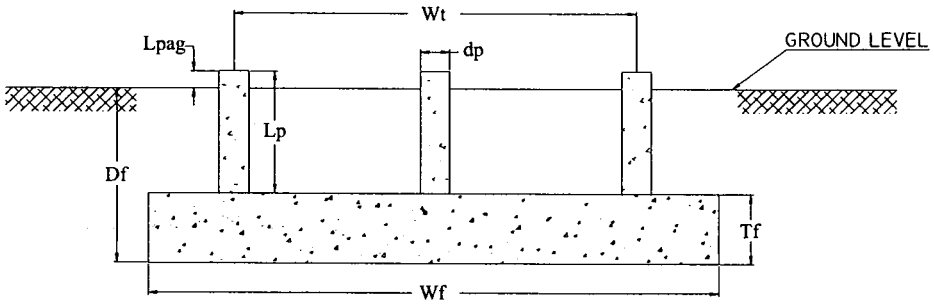
PIER REINFORCEMENT:

Bar Size	$BSpier := 7$	Bar Diameter	$d_{bpier} := 0.875 \cdot in$
Number of Bars	$NBpier := 29$	Bar Area	$A_{bpier} := 0.6 \cdot in^2$

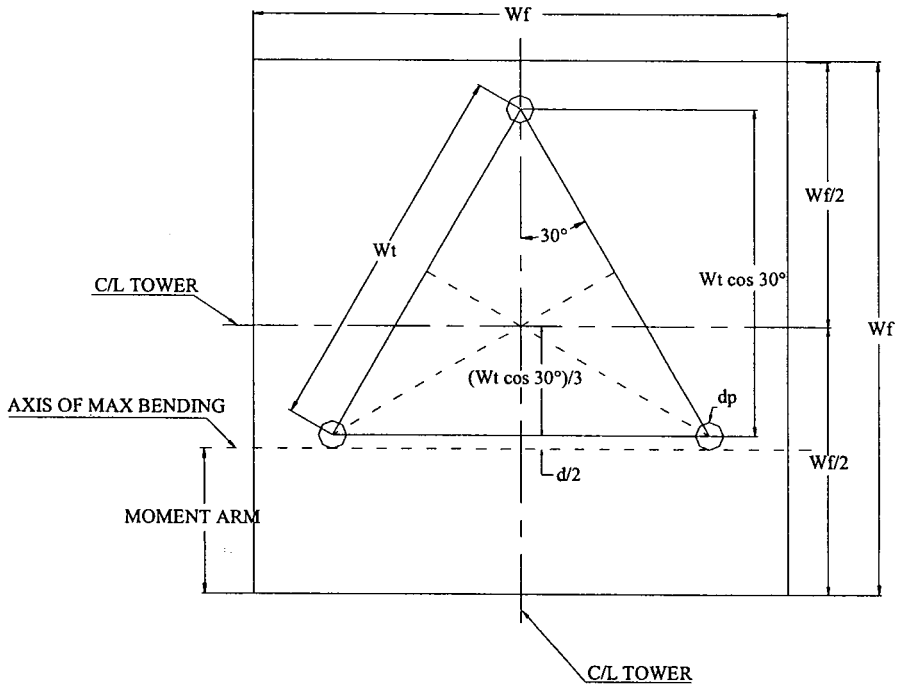
PAD REINFORCEMENT:

Bar Size	$BS_{pad} := 7$	Bar Diameter	$d_{bpad} := 0.875 \cdot in$
Number of Bars	$NB_{pad} := 29$	Bar Area	$A_{bpad} := 0.6 \cdot in^2$

FOUNDATION OVERVIEW



ELEVATION



PLAN

STABILITY OF FOOTING

Factor of Safety Req'd: $FS_{req} := 2$

Passive Pressure:

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pt} = 0\,ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}]$ $\quad P_{top} = 0\,ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{bot} = 0.8489\,ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $\quad P_{ave} = 0.4245\,ksf$

Shear:

$T_{pp} := if[n < (D_f - T_f), T_f, (D_f - n)]$ $\quad T_{pp} = 4\,ft$

$A_{pp} := W_f T_{pp}$ $\quad A_{pp} = 114\,ft^2$

Ultimate Shear: $S_u := P_{ave} \cdot A_{pp}$ $\quad S_u = 48.388\,kip$

Weight of Concrete Pad: $WT_c := (W_f^2 \cdot T_f) \cdot \gamma_c$ $\quad WT_c = 487.35\,kip$

Weight of Soil: above Footing: $WT_{s1} := W_f^2 (|D_f - T_f|) \cdot \gamma_s$ $\quad WT_{s1} = 0\,kip$

Weight of Soil Wedge at back face: $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f\right] \cdot \gamma_s$ $\quad WT_{s2} = 9.2273\,kip$

Distance to center of Tower Leg from Edge of Footing:

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

$X_t := if(Pos_{tower} = 1, X_{t1}, X_{t2})$ $\quad X_t = 8.251\,ft$

Additional Offset of Footing:

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

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

Resisting Moment:

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

$M_r = 7294.7807\,kip \cdot ft$

Overturning Moment: $M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off}$ $\quad M_{ot} = 2600\,kip \cdot ft$

Factor of Safety: $FS := \frac{M_r}{M_{ot}}$ $\quad FS = 2.8057$

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

BEARING PRESSURE CHECK:

Pressure Applied:

$LOAD_{tot} := WT_c + WT_{s1} + WT_t$ $\quad LOAD_{tot} = 488.35\,kip$

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

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

$P_{max} := \frac{LOAD_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$ $\quad P_{max} = 1.2751\,ksf$

$P_{min} := \frac{LOAD_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$ $\quad P_{min} = -0.0727\,ksf$

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

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

Distance to Resultant of Pressure Distribution:

$$X_p := \frac{P_{max}}{\frac{P_{max}-P_{min}}{W_f}} \cdot \frac{1}{3}$$ $\quad X_p = 8.9878\,ft$

Distance to Kern:

$X_k := \frac{W_f}{3}$ $\quad X_k = 9.5\,ft$

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

Eccentricity:

$e := \frac{M_{ot}}{LOAD_{tot}}$ $\quad e = 5.3241$

Adjusted Soil Pressure:

$$q_a := \frac{2\cdot LOAD_{tot}}{3\cdot W_f\left(\frac{W_f}{2} - e\right)}$$ $\quad q_a = 1.2798\,ksf$

Revised Maximum:

$q_{max} := if(X_p < X_k, q_a, P_{max})$ $\quad q_{max} = 1.2798\,kip$

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

CHECK PUNCHING AND BEAM SHEAR:

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

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

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

$d := T_f - Cvr - .5\cdot in$ $d = 44.5\ in$

Factored load: $FL := LF\cdot\frac{C_t}{W_f^2}$ $FL = 0.2081\ ksf$

$V_{req} := \frac{FL\cdot\left(X_t - 0.5\cdot d_p - d\right)\cdot W_f}{\phi_c}$ $V_{req} = 31.6906\ kip$

ACI 11.3.1.1 $V_{Avail} := 2\cdot\sqrt{f'c\cdot psi}\cdot W_f\, d$ $V_{Avail} = 1667.1579\ kip$

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

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

$b_o := \left(d_p + d\right)\cdot\pi$ $b_o = 11.6501\ ft$

$V_{req} := FL\cdot\frac{W_f^2 - \left(d_p + d\right)^2\cdot\frac{\pi}{4}}{\phi_c}$ $V_{req} = 196.1797\ kip$

$V_{Avail} := 4\cdot\sqrt{f'c\cdot psi}\cdot b_o\cdot d$ $V_{Avail} = 1362.9832\ kip$

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

TENSILE REINFORCEMENT IN PAD:

$\phi_m := .90$ per ACI 9.3.2.2

Applied Moments:

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

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

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

Design Moment: $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m}$ $M_n = -71.5483\ kips\cdot ft$

Required Reinforcement:

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

Effective Width: $b_{eff} := W_t\cdot\cos(30\cdot deg) + d_p$ $b_{eff} = 215.9651\ in$

$A_s := \dfrac{M_n}{\phi_m\cdot fy\cdot d}$ $A_s = -0.3573\ in^2$

$a := \dfrac{A_s\cdot fy}{\beta\cdot f'c\cdot b_{eff}}$ $a = -0.0389\ in$

$A_s := \dfrac{M_n}{fy\cdot\left(d - \frac{a}{2}\right)}$ $A_s = -0.3214\ in^2$

$\rho := \dfrac{A_s}{b_{eff}\cdot d}$ $\rho = -0$

Temperature and Shrinkage: (ACI 7.12.2.1b)

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

Area Required:

$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$ $As = 8.6494\,in^2$

Area Provided:

$As_{prov} := A_{bpad} \cdot NB_{pad}$ $As_{prov} = 17.4\,in^2$

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

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 12.2.3)

Bar Spacing:

$B_{sPad} := \frac{W_f - 2 \cdot Cvr - NB_{pad} \cdot d_{bpad}}{NB_{pad} - 1}$ $B_{sPad} = 11.0938\,in$

Development Length Factors:

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

Spacing or Cover Dimension:

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

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

Development Length:

$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{fc \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpad}}} \cdot d_{bpad}$ $L_{dbt} = 20.9675\,in$

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

Minimum Development Length: (ACI 12.2.1)

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

Available Length in Pad:

$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr$ $L_{Pad} = 43.3125\,in$

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