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 12, 2006

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

RE: **EM-VER-057-138-165-060517** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify existing telecommunications facilities located at 363 Riversville Road, Greenwich; 627 Honeyspot Road, Stratford; and 1000 Old County Circle, Windsor Locks, Connecticut.

Dear Attorney Baldwin:

At a public meeting held on June 7, 2006, the Connecticut Siting Council (Council) acknowledged your notice to modify these existing telecommunications facilities, 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 May 17, 2006, including the placement of all necessary equipment and shelters within the tower compounds. 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 existing facility sites that would not increase tower heights, extend the boundaries of the tower sites, increase noise levels at the tower site boundaries by six decibels, and increase the total radio frequencies electromagnetic radiation power densities measured at the tower site boundaries to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. These facilities have also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on these towers.

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 any of these facilities 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/laf

c: See Attached List.

I:\siting\forms\exmod\emdcltr.doc

CSC
CONNECTICUT SITING COUNCIL

List Attachment.

The Honorable James A. Lash, First Selectman, Town of Greenwich
Diane Fox, Planning & Zoning Director, Town of Greenwich
The Honorable James R. Miron, Town Manager, Town of Stratford
Gary Lorentson, Planning & Zoning Administrator, Town of Stratford
The Honorable Steven N. Wawruck, Jr., First Selectman, Town of Windsor Locks
Alan Gannuscio, Planning and Zoning Chairman, Town of Windsor Locks
Com-tronics Communications and Electronics
Christopher B. Fisher, Esq., Cuddy & Feder LLP
Michele G. Briggs, New Cingular Wireless PCS, LLC
Thomas F. Flynn III, Esq., Sprint-Nextel Communications
Christine Farrell, T-Mobile
Thomas J. Regan, Esq., Brown Rudnick Berlack Israels, LLP

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May 31, 2006

The Honorable James A. Lash
First Selectman
Town of Greenwich
Town Hall
101 Field Point Road
P. O. Box 2540
Greenwich, CT 06836-2540

RE: **EM-VER-057-138-165-060517** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify existing telecommunications facilities located at 363 Riversville Road, Greenwich; 627 Honeyspot Road, Stratford; and 1000 Old County Circle, Windsor Locks, Connecticut.

Dear Mr. Lash:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

The Council will consider this item at the next meeting scheduled for June 7, 2006 at 1:30 p.m. in Hearing Room One, Ten Franklin Square, New Britain, Connecticut.

If you have any questions or comments regarding this proposal, please call me or inform the council by June 6, 2006.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/ap

Enclosure: Notice of Intent

c: Diane Fox, Planning & Zoning Director, Town of Greenwich

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@po.state.ct.us
www.ct.gov/csc

May 31, 2006

The Honorable Steven N. Wawruck, Jr.
First Selectman
Town of Windsor Locks
Town Office Building
50 Church Street
Windsor Locks, CT 06096

RE: **EM-VER-057-138-165-060517** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify existing telecommunications facilities located at 363 Riversville Road, Greenwich; 627 Honeyspot Road, Stratford; and 1000 Old County Circle, Windsor Locks, Connecticut.

Dear Mr. Wawruck:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

The Council will consider this item at the next meeting scheduled for June 7, 2006 at 1:30 p.m. in Hearing Room One, Ten Franklin Square, New Britain, Connecticut.

If you have any questions or comments regarding this proposal, please call me or inform the council by June 6, 2006.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/ap

Enclosure: Notice of Intent

c: Alan Gannuscio, Planning & Zoning Chairman, Town of Windsor Locks

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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E-Mail: siting.council@po.state.ct.us
www.ct.gov/csc

May 31, 2006

The Honorable James R. Miron
Town Manager
Town of Stratford
Town Hall, Room 101
2725 Main Street
Stratford, CT 06497

RE: **EM-VER-057-138-165-060517** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify existing telecommunications facilities located at 363 Riversville Road, Greenwich; 627 Honeyspot Road, Stratford; and 1000 Old County Circle, Windsor Locks, Connecticut.

Dear Mr. Miron:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

The Council will consider this item at the next meeting scheduled for June 7, 2006 at 1:30 p.m. in Hearing Room One, Ten Franklin Square, New Britain, Connecticut.

If you have any questions or comments regarding this proposal, please call me or inform the council by June 6, 2006.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/ap

Enclosure: Notice of Intent

c: Gary Lorentson, Planning & Zoning Administrator, Town of Stratford

ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

ORIGINAL

EM-VER-057-138-165-060517

May 17, 2006

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**
363 Riversville Road, Greenwich, CT
627 Honeyspot Road, Stratford, CT
1000 Old County Circle, Windsor Locks, CT

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility at each of the above referenced locations. In its continuing effort to improve the quality and reliability of its wireless service, Cellco intends to replace and upgrade antennas at each of these existing facility locations.

Greenwich

The Council originally approved Cellco's use of the Riversville Road facility on January 11, 1995. Cellco intends to modify this facility by replacing six existing antennas with six newer model antennas at the same location on the tower. Attached behind Tab 1 are specifications for the existing and proposed replacement antennas as well as a structural analysis for the Riversville Road facility.

Stratford

The Council originally approved Cellco's use of the Honeyspot Road facility on June 16, 1999. On March 4, 2004, the Council approved Cellco's request to replace six of its cellular antennas. Cellco now intends to modify this facility further by replacing the remaining six cellular antennas with six newer model antennas at the same location on the tower. Attached behind Tab 2 are specifications for the existing and proposed replacement antennas as well as a structural analysis for the Honeyspot Road facility.

Windsor Locks

The Old County Circle facility was originally approved by the Town of Windsor Locks. On November 17, 2004, the Council approved Cellco's request to replace six of it cellular antennas. Cellco now intends to modify this facility by replacing the remaining six cellular antennas with six newer model cellular antennas at the same location on the tower. Attached behind Tab 3 are specifications for the existing and proposed replacement antennas as well as a structural analysis for the Old County Circle 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 the chief elected official of each affected municipality.

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

1. The proposed modifications will not result in any increase in the overall height of the existing structures. Cellco's replacement antennas will be located at the same heights and locations as the existing antennas.

2. The proposed modifications will not affect associated equipment areas 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 changes to radio frequency (RF) power density levels at any of the above-described facilities. Therefore, no new Power Density Calculation Tables are provided.

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

Sincerely,

Kenneth C. Baldwin

Enclosures

cc: James Lash, First Selectman, Town of Greenwich
James R. Miron, Mayor, Town of Stratford
Steven N. Wawruck, Jr., First Selectman, Town of Windsor Locks
Sandy M. Carter
Michelle Kababik

DECIBEL
Base Station Antennas

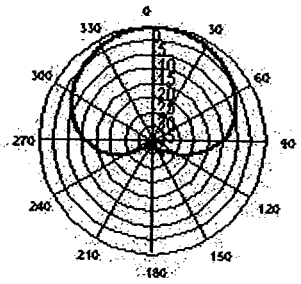
948F85T2E-M

16.1 dBi, Directed Dipole Antenna
1850-1990 MHz

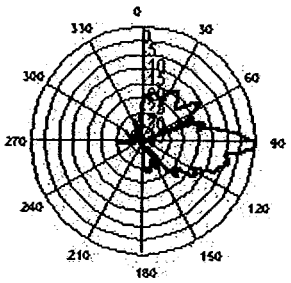
1850-1990 MHz
MaxFill™
dB Director®

- 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

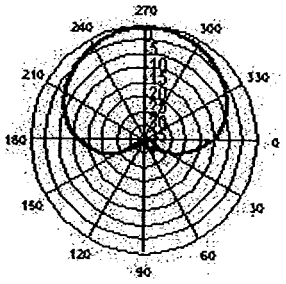
85°



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

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: 4/29/2004
* - Indicates Typical Values

Vertically Polarized, Log Periodic 80° / 17.5 dBi

LPA-185080/12CF ___

When ordering, replace "___" with connector type.

Mechanical specifications

Length	1806 mm	71.1 in
Width	104 mm	4.1 in
Depth	150 mm	5.9 in
[4] Weight	4.8 kg	10.5 lbs
Wind Area		
Front	0.188 m^2	2.02 ft^2
Side	0.271 m^2	2.92 ft^2
Rated Wind Velocity (Safety factor 2.0)		
	>270 km/hr	>168 mph
Wind load @ 100 mph (161 km/hr)		
Front	325 N	73.1 lbs
Side	440 N	98.9 lbs

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

Mounting & Downtilting:

Wall mounted or pole tower mount with mounting brackets.

Mounting bracket kit #26799997

Downtilt bracket kit #26799999

The downtilt bracket kit includes the mounting bracket kit.

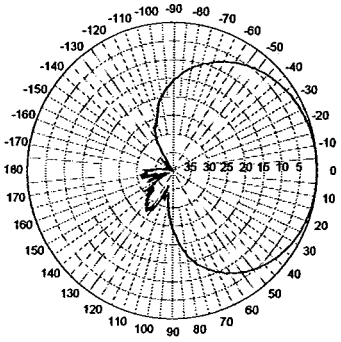
Electrical specifications

Frequency Range	1850-1990 MHz
Impedance	50Ω
[3] Connector	NE, E-DIN
[1] VSWR	≤1.4:1
Polarization	Vertical
[1] Gain	17.5 dBi
[2] Power Rating	250 W
[1] Half Power Angle	
H-Plane	80°
E-Plane	5°
[1] Electrical Downtilt	0°
[1] Null Fill	10%
Lightning Protection	Direct Ground

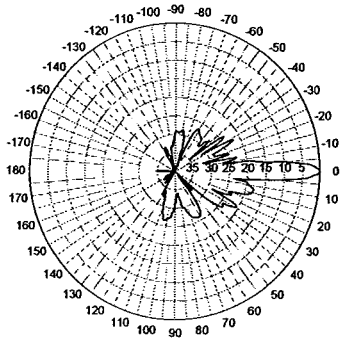
[1] Typical Values
[2] Power Rating limited by connector only
[3] NE indicates an elongated N Connector
E-DIN indicates an elongated DIN Connector
[4] The antenna weight listed above does not include the bracket weight.

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

Radiation-pattern[1]



Horizontal



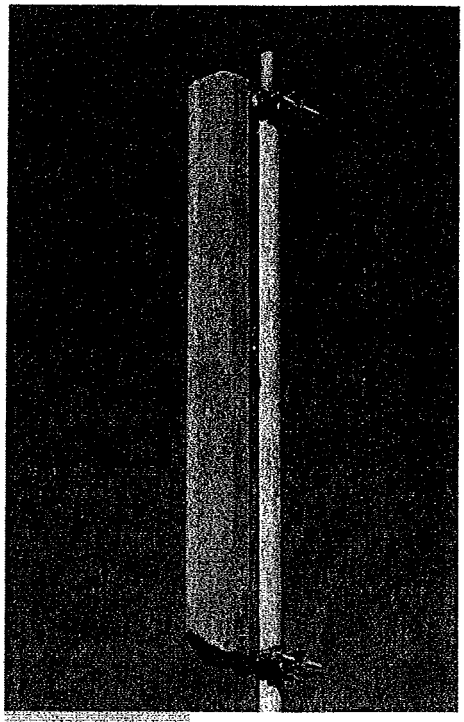
Vertical

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

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

CF Denotes a Center-Fed Connector.

1850-1990 MHz



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

- True log-periodic design allows for superior front-to-side characteristics to minimize sector overlap.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

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

Antenna available with center-fed connector only.

Amphenol Antel, Inc.
The Antenna Technology Company

1300 Capital Drive · Rockford, IL 61109 · Toll-Free (888) 417-9562 Tel. (815) 399-0001
Fax (815) 399-0156 · Email antel@antelinc.com www.antelinc.com

Revision Date: 1/27/05

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF EXISTING 160' MONOPOLE FOR NEW ANTENNA ARRANGEMENT

363 Riversville Road
Greenwich, Connecticut

prepared for

verizonwireless

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

36931017.00008
VZ1-192

May 12, 2006

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 160' steel monopole structure located at 363 Riversville Road in Greenwich, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code and the TIA/EIA-222-F standard for wind velocity of 85 mph (fastest mile) and 74 mph (fastest mile) 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 Section of this report. The proposed Verizon Wireless modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove (6) existing DB948F85T2E-M antennas **Install (6) Antel LPA-185080/12CF on the existing Low Profile Platform with the existing (12) 1 5/8" coax cables.**	**Verizon Wireless (Proposed)**	**@ 140'**

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the TIA/EIA-222-F wind load classification specified above and all the existing and proposed antenna loading.**

This analysis is based on:

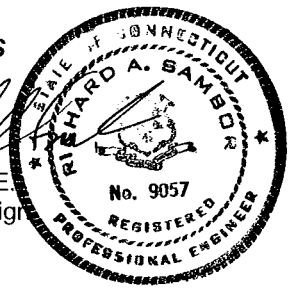
1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry and structural member sizes taken from original construction drawings (EEI Job #: 5590) prepared by Engineered Endeavors, Inc., signed and sealed June 27, 2001.
3) Antenna and mount configuration as specified on the following page of this report.

This report is only valid as 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 assumption of the antenna and mount configuration as well as the physical condition of the tower. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

URS Corporation AES



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

RAS/jek

cc: AA, DR, IA – URS
CF/Book

2. INTRODUCTION

The subject tower is located at 363 Riversville Road in Greenwich, Connecticut. The structure is a 160' steel monopole designed by EEI, Inc.

The tower geometry and structure member sizes were taken from the original construction drawings (EEI Job #: 5590) prepared by Engineered Endeavors, Inc., signed and sealed June 27, 2001.

The inventory is summarized in the table below:

Antenna Type	Carrier	Mount	Antenna Centerline Elevation	Cable
(12) DR65-18-02DPL2Q antennas and (12) TMA's	T-Mobile (existing and future)	Low-Profile Platform	160'	(24) 1 5/8" coax cables (within monopole)
(6) Powerwave 7770.00 antennas, (6) LGP13519 diplexers, and (6) LGP21401 TMA's	Cingular (existing)	Low-Profile Platform	150'	(12) 1 5/8" coax cables (within monopole)
(6) DB844H90 antennas	Verizon (existing)	Low-Profile Platform	140'	(6) 1 5/8" coax cables (within monopole)
(6) Antel LPA-185080/12CF antennas	**Verizon (proposed)**	Low-Profile Platform (listed above)	**140'**	(6) 1 5/8" coax cables (within monopole)
(12) DB844H90 antennas	Nextel (existing)	Low-Profile Platform	130'	(12) 1 1/4" coax cables (within monopole)
(2) GPS antennas	Nextel (existing)	Low-Profile Platform (listed above)	130'	(3) 1/2" coax cables (within monopole)
(9) DB980F90 antennas	Sprint (existing and future)	Low-Profile Platform	120'	(9) 1 1/4" coax cables (within monopole)
(12) 7250.03 antennas and (6) TMA's	Cingular Blue (existing and future)	Low-Profile Platform	110'	(12) 1 5/8" coax cables (within monopole)
(1) GPS antenna	Sprint (existing)	Stand Off Mount	75'	(1) 1/2" coax cable (within monopole)

This structural analysis of the communications tower was performed by URS Corporation (URS) for Verizon Wireless. The purpose of this analysis was to investigate the structural integrity of the existing tower with its existing and proposed antenna loads. This analysis was conducted to evaluate stress on the tower and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

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 tower members were increased by one-third.

4. FINDINGS AND EVALUATION

Combined axial and bending stresses on the 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 load condition are provided in section 6 of this report. Additionally, the anchor bolts, base plate, and foundation were found to be structurally adequate.

5. CONCLUSIONS

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are structurally adequate under the TIA/EIA-222-F wind load classification specified above and the 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 unless specified otherwise.

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.

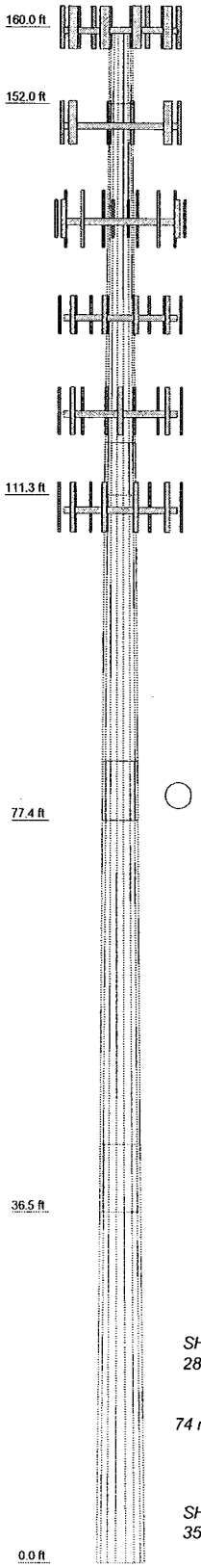
The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire 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.

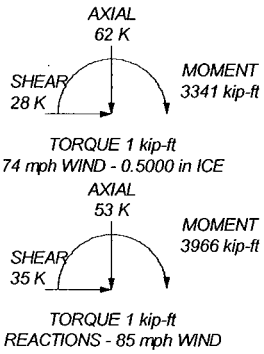
6. DRAWINGS AND DATA

ERI TOWER INPUT/OUTPUT SUMMARY

Section	1	2	3	4	5
Length (ft)	8.00	40.71	39.29	47.13	43.54
Number of Sides	18	18	18	18	18
Thickness (in)	0.1875	0.2500	0.3125	0.4375	0.5000
Lap Splice (ft)		5.42	6.17	7.08	
Top Dia (in)	29.0000	30.6200	37.2630	43.2359	50.3353
Bot Dia (in)	30.6200	38.8600	45.0900	52.6200	59.0000
Grade	A572-65				
Weight (K)	0.5	3.8	5.4	10.6	12.7

33.0





APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
(4) DR65-18-02DPL2Q (T-Mobile)	160	LPA-185080/12CF (Verizon)	140
(4) DR65-18-02DPL2Q (T-Mobile)	160	DB844H90 (Verizon)	140
(4) DR65-18-02DPL2Q (T-Mobile)	160	DB844H90 (Verizon)	140
(4) TMA (T-Mobile)	160	LPA-185080/12CF (Verizon)	140
(4) TMA (T-Mobile)	160	LPA-185080/12CF (Verizon)	140
(4) TMA (T-Mobile)	160	Low Profile Platform (Verizon)	140
Low Profile Platform (T-Mobile)	160	(4) DB844H90 (Nextel)	130
(2) 7770.00 (Cingular)	150	(4) DB844H90 (Nextel)	130
(2) LPG13519 Diplexer (Cingular)	150	(4) DB844H90 (Nextel)	130
(2) LPG21401 TMA (Cingular)	150	(2) GPS (Nextel)	130
(2) 7770.00 (Cingular)	150	Low Profile Platform (Nextel)	130
(2) LPG13519 Diplexer (Cingular)	150	(3) DB980F90E-M (Sprint)	120
(2) LPG21401 TMA (Cingular)	150	(3) DB980F90E-M (Sprint)	120
(2) 7770.00 (Cingular)	150	(3) DB980F90E-M (Sprint)	120
(2) LPG13519 Diplexer (Cingular)	150	Low Profile Platform (Sprint)	120
(2) LPG21401 TMA (Cingular)	150	(4) 7250.03 (Cingular Blue)	110
Low Profile Platform (Cingular)	150	(4) 7250.03 (Cingular Blue)	110
DB844H90 (Verizon)	140	(4) 7250.03 (Cingular Blue)	110
DB844H90 (Verizon)	140	(2) TMA (Cingular Blue)	110
LPA-185080/12CF (Verizon)	140	(2) TMA (Cingular Blue)	110
LPA-185080/12CF (Verizon)	140	(2) TMA (Cingular Blue)	110
DB844H90 (Verizon)	140	Low Profile Platform (Cingular Blue)	110
DB844H90 (Verizon)	140	GPS (Sprint)	75
LPA-185080/12CF (Verizon)	140	3' Side Mount Standoff (Sprint)	75

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Fairfield 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: 71.4%

URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Phone: (860) 529-8882
FAX: (860) 529-3991

Job: *160' EEI Monopole*			
Project: *Greenwich, CT*			
Client: Verizon Wireless	Drawn by: JEK	App'd:	
Code: TIA/EIA-222-F	Date: 05/12/06	Scale: NTS	
Path: N:\jkiernan\VZ1-Boy Scouts\ERI Files\160' Monopole - Greenwich.eri		Dwg No. E-1	

ERI TOWER DETAILED OUTPUT

ERITower	Job	Page
	160' EEI Monopole	1 of 22
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project Greenwich, CT	Date 07:28:11 05/12/06
	Client Verizon Wireless	Designed by JEK

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Fairfield 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 pole 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		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	160.00-152.00	8.00	0.00	18	29.0000	30.6200	0.1875	0.7500	A572-65 (65 ksi)
L2	152.00-111.29	40.71	5.42	18	30.6200	38.8600	0.2500	1.0000	A572-65 (65 ksi)
L3	111.29-77.42	39.29	6.17	18	37.2630	45.0900	0.3125	1.2500	A572-65 (65 ksi)
L4	77.42-36.46	47.13	7.08	18	43.2359	52.6200	0.4375	1.7500	A572-65 (65 ksi)
L5	36.46-0.00	43.54		18	50.3353	59.0000	0.5000	2.0000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	29.4474	17.1470	1798.4090	10.2284	14.7320	122.0750	3599.1844	8.5751	4.7740	25.461
	31.0924	18.1111	2119.1346	10.8035	15.5550	136.2353	4241.0576	9.0573	5.0591	26.982
L2	31.0924	24.0986	2808.1400	10.7814	15.5550	180.5302	5619.9750	12.0516	4.9491	19.796
	39.4595	30.6370	5770.1059	13.7066	19.7409	292.2922	11547.8043	15.3214	6.3994	25.597
L3	38.9342	36.6502	6321.9884	13.1174	18.9296	333.9740	12652.2955	18.3286	6.0083	19.226
	45.7856	44.4137	11250.5543	15.8960	22.9057	491.1679	22515.9125	22.2111	7.3858	23.635
L4	45.1503	59.4309	13753.2027	15.1934	21.9638	626.1754	27524.5022	29.7211	6.8395	15.633
	53.4317	72.4619	24928.5533	18.5248	26.7310	932.5723	49889.9082	36.2378	8.4911	19.408
L5	52.5425	79.0886	24815.6294	17.6915	25.5703	970.4854	49663.9118	39.5518	7.9790	15.958
	59.9102	92.8395	40140.4258	20.7675	29.9720	1339.2642	80333.6694	46.4286	9.5040	19.008

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
L1 160.00-152.00				1	1.02	1		
L2 152.00-111.29				1	1.02	1		
L3 111.29-77.42				1	1.02	1		
L4 77.42-36.46				1	1.02	1		
L5 36.46-0.00				1	1.02	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (T-Mobile)	C	No	Inside Pole	160.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Cingular)	C	No	Inside Pole	150.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Verizon)	C	No	Inside Pole	140.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 1/4 (Nextel)	C	No	Inside Pole	130.00 - 0.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
1 1/4 (Sprint future)	C	No	Inside Pole	120.00 - 0.00	9	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
1 5/8 (Cingular Blue)	C	No	Inside Pole	110.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
7/8 (Verizon)	C	No	Inside Pole	140.00 - 0.00	1	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1/2 (Sprint)	C	No	Inside Pole	75.00 - 0.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2 (Nextel)	C	No	Inside Pole	130.00 - 0.00	3	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1 5/8 (T-Mobile future)	C	No	Inside Pole	160.00 - 0.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 1/4 (Sprint future)	C	No	Inside Pole	120.00 - 0.00	3	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66

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
L1	160.00-152.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.20
L2	152.00-111.29	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	2.10
L3	111.29-77.42	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	2.68
L4	77.42-36.46	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	3.27
L5	36.46-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	2.91

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
L1	160.00-152.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.20
L2	152.00-111.29	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	2.10
L3	111.29-77.42	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	2.68
L4	77.42-36.46	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	3.27
L5	36.46-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	2.91

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(4) DR65-18-02DPL2Q	A	From Face	3.00	0.0000	160.00	No Ice	6.30	2.42	0.02
(T-Mobile)			0.00			1/2" Ice	6.73	2.76	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
				0.00						
(4) DR65-18-02DPL2Q	B	From Face	3.00	0.0000		160.00	No Ice	6.30	2.42	0.02
(T-Mobile)			0.00				1/2" Ice	6.73	2.76	0.06
				0.00						
(4) DR65-18-02DPL2Q	C	From Face	3.00	0.0000		160.00	No Ice	6.30	2.42	0.02
(T-Mobile)			0.00				1/2" Ice	6.73	2.76	0.06
				0.00						
(4) TMA	A	From Face	3.00	0.0000		160.00	No Ice	1.00	1.00	0.01
(T-Mobile)			0.00				1/2" Ice	1.50	1.50	0.01
				0.00						
(4) TMA	B	From Face	3.00	0.0000		160.00	No Ice	1.00	1.00	0.01
(T-Mobile)			0.00				1/2" Ice	1.50	1.50	0.01
				0.00						
(4) TMA	C	From Face	3.00	0.0000		160.00	No Ice	1.00	1.00	0.01
(T-Mobile)			0.00				1/2" Ice	1.50	1.50	0.01
				0.00						
Low Profile Platform	C	None			0.0000	160.00	No Ice	15.70	15.70	1.30
(T-Mobile)							1/2" Ice	20.10	20.10	1.76
(2) 7770.00	A	From Face	3.00	0.0000		150.00	No Ice	5.88	2.93	0.04
(Cingular)			0.00				1/2" Ice	6.31	3.27	0.07
				0.00						
(2) LPG13519 Diplexer	A	From Face	3.00	0.0000		150.00	No Ice	0.27	0.18	0.01
(Cingular)			0.00				1/2" Ice	0.34	0.25	0.01
				0.00						
(2) LPG21401 TMA	A	From Face	3.00	0.0000		150.00	No Ice	0.95	0.37	0.02
(Cingular)			0.00				1/2" Ice	1.09	0.48	0.02
				0.00						
(2) 7770.00	B	From Face	3.00	0.0000		150.00	No Ice	5.88	2.93	0.04
(Cingular)			0.00				1/2" Ice	6.31	3.27	0.07
				0.00						
(2) LPG13519 Diplexer	B	From Face	3.00	0.0000		150.00	No Ice	0.27	0.18	0.01
(Cingular)			0.00				1/2" Ice	0.34	0.25	0.01
				0.00						
(2) LPG21401 TMA	B	From Face	3.00	0.0000		150.00	No Ice	0.95	0.37	0.02
(Cingular)			0.00				1/2" Ice	1.09	0.48	0.02
				0.00						
(2) 7770.00	C	From Face	3.00	0.0000		150.00	No Ice	5.88	2.93	0.04
(Cingular)			0.00				1/2" Ice	6.31	3.27	0.07
				0.00						
(2) LPG13519 Diplexer	C	From Face	3.00	0.0000		150.00	No Ice	0.27	0.18	0.01
(Cingular)			0.00				1/2" Ice	0.34	0.25	0.01
				0.00						
(2) LPG21401 TMA	C	From Face	3.00	0.0000		150.00	No Ice	0.95	0.37	0.02
(Cingular)			0.00				1/2" Ice	1.09	0.48	0.02
				0.00						
Low Profile Platform	C	None			0.0000	150.00	No Ice	15.70	15.70	1.30
(Cingular)							1/2" Ice	20.10	20.10	1.76
DB844H90	A	From Face	3.00	0.0000		140.00	No Ice	2.87	3.97	0.01
(Verizon)			-6.00				1/2" Ice	3.18	4.34	0.04
				0.00						
DB844H90	A	From Face	3.00	0.0000		140.00	No Ice	2.87	3.97	0.01
(Verizon)			6.00				1/2" Ice	3.18	4.34	0.04
				0.00						
LPA-185080/12CF	A	From Face	3.00	0.0000		140.00	No Ice	3.53	4.57	0.01
(Verizon)			-4.00				1/2" Ice	3.96	5.01	0.04
				0.00						
LPA-185080/12CF	A	From Face	3.00	0.0000		140.00	No Ice	3.53	4.57	0.01

ERITower	Job: 160' EEI Monopole	Page: 5 of 22
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project: Greenwich, CT	Date: 07:28:11 05/12/06
	Client: Verizon Wireless	Designed by: JEK

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon)			4.00 0.00			1/2" Ice	3.96	5.01	0.04
DB844H90 (Verizon)	B	From Face	3.00 -6.00 0.00	0.0000	140.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
DB844H90 (Verizon)	B	From Face	3.00 6.00 0.00	0.0000	140.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
LPA-185080/12CF (Verizon)	B	From Face	3.00 -4.00 0.00	0.0000	140.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	0.01 0.04
LPA-185080/12CF (Verizon)	B	From Face	3.00 4.00 0.00	0.0000	140.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	0.01 0.04
DB844H90 (Verizon)	C	From Face	3.00 -6.00 0.00	0.0000	140.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
DB844H90 (Verizon)	C	From Face	3.00 6.00 0.00	0.0000	140.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
LPA-185080/12CF (Verizon)	C	From Face	3.00 -4.00 0.00	0.0000	140.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	0.01 0.04
LPA-185080/12CF (Verizon)	C	From Face	3.00 4.00 0.00	0.0000	140.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	0.01 0.04
Low Profile Platform (Verizon)	C	None		0.0000	140.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1.30 1.76
(4) DB844H90 (Nextel)	A	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
(4) DB844H90 (Nextel)	B	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
(4) DB844H90 (Nextel)	C	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 1/2" Ice	2.87 3.18	3.97 4.34	0.01 0.04
(2) GPS (Nextel)	C	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	0.01 0.01
Low Profile Platform (Nextel)	C	None		0.0000	130.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1.30 1.76
(3) DB980F90E-M (Sprint)	A	From Face	3.00 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice	3.90 4.28	2.29 2.65	0.01 0.03
(3) DB980F90E-M (Sprint)	B	From Face	3.00 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice	3.90 4.28	2.29 2.65	0.01 0.03
(3) DB980F90E-M (Sprint)	C	From Face	3.00 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice	3.90 4.28	2.29 2.65	0.01 0.03
Low Profile Platform (Sprint)	C	None		0.0000	120.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1.30 1.76
(4) 7250.03 (Cingular Blue)	A	From Face	3.00 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	4.00 4.39	1.87 2.33	0.02 0.04
(4) 7250.03	B	From Face	3.00	0.0000	110.00	No Ice	4.00	1.87	0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Cingular Blue)			0.00 0.00			1/2" Ice	4.39	2.33	0.04
(4) 7250.03	C	From Face	3.00	0.0000	110.00	No Ice	4.00	1.87	0.02
(Cingular Blue)			0.00 0.00			1/2" Ice	4.39	2.33	0.04
(2) TMA	B	From Face	3.00	0.0000	110.00	No Ice	1.00	1.00	0.01
(Cingular Blue)			0.00 0.00			1/2" Ice	1.50	1.50	0.01
(2) TMA	C	From Face	3.00	0.0000	110.00	No Ice	1.00	1.00	0.01
(Cingular Blue)			0.00 0.00			1/2" Ice	1.50	1.50	0.01
(2) TMA	A	From Face	3.00	0.0000	110.00	No Ice	1.00	1.00	0.01
(Cingular Blue)			0.00 0.00			1/2" Ice	1.50	1.50	0.01
Low Profile Platform	C	None		0.0000	110.00	No Ice	15.70	15.70	1.30
(Cingular Blue)						1/2" Ice	20.10	20.10	1.76
GPS	C	From Face	3.00	0.0000	75.00	No Ice	1.00	1.00	0.01
(Sprint)			0.00 0.00			1/2" Ice	1.50	1.50	0.01
3' Side Mount Standoff	C	From Face	1.50	0.0000	75.00	No Ice	2.72	2.72	0.05
(Sprint)			0.00 0.00			1/2" Ice	4.91	4.91	0.09

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 160.00-152.00	155.96	1.559	29	19.873	A	0.000	20.271	20.271	100.00	0.000	0.000
					B	0.000	20.271		100.00		
					C	0.000	20.271		100.00		
L2 152.00-111.29	131.06	1.483	27	117.855	A	0.000	120.213	120.213	100.00	0.000	0.000
					B	0.000	120.213		100.00		
					C	0.000	120.213		100.00		
L3 111.29-77.42	94.12	1.349	25	117.744	A	0.000	120.099	120.099	100.00	0.000	0.000
					B	0.000	120.099		100.00		
					C	0.000	120.099		100.00		
L4 77.42-36.46	56.90	1.168	21	165.691	A	0.000	169.004	169.004	100.00	0.000	0.000
					B	0.000	169.004		100.00		
					C	0.000	169.004		100.00		
L5 36.46-0.00	17.83	1	18	168.239	A	0.000	171.604	171.604	100.00	0.000	0.000
					B	0.000	171.604		100.00		
					C	0.000	171.604		100.00		

Tower Pressure - With Ice

$G_H = 1.690$

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
L1 160.00-152.00	155.96	1.559	22	0.5000	20.540	A	0.000	20.951	20.951	100.00	0.000	0.000
						B	0.000	20.951		100.00		
						C	0.000	20.951		100.00		
L2 152.00-111.29	131.06	1.483	21	0.5000	121.248	A	0.000	123.673	123.673	100.00	0.000	0.000
						B	0.000	123.673		100.00		
						C	0.000	123.673		100.00		
L3 111.29-77.42	94.12	1.349	19	0.5000	120.567	A	0.000	122.978	122.978	100.00	0.000	0.000
						B	0.000	122.978		100.00		
						C	0.000	122.978		100.00		
L4 77.42-36.46	56.90	1.168	16	0.5000	169.104	A	0.000	172.486	172.486	100.00	0.000	0.000
						B	0.000	172.486		100.00		
						C	0.000	172.486		100.00		
L5 36.46-0.00	17.83	1	14	0.5000	171.277	A	0.000	174.703	174.703	100.00	0.000	0.000
						B	0.000	174.703		100.00		
						C	0.000	174.703		100.00		

Tower Pressure - Service

$G_H = 1.690$

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
L1 160.00-152.00	155.96	1.559	10	19.873	A	0.000	20.271	20.271	100.00	0.000	0.000
					B	0.000	20.271		100.00		
					C	0.000	20.271		100.00		
L2 152.00-111.29	131.06	1.483	9	117.855	A	0.000	120.213	120.213	100.00	0.000	0.000
					B	0.000	120.213		100.00		
					C	0.000	120.213		100.00		
L3 111.29-77.42	94.12	1.349	9	117.744	A	0.000	120.099	120.099	100.00	0.000	0.000
					B	0.000	120.099		100.00		
					C	0.000	120.099		100.00		
L4 77.42-36.46	56.90	1.168	7	165.691	A	0.000	169.004	169.004	100.00	0.000	0.000
					B	0.000	169.004		100.00		
					C	0.000	169.004		100.00		
L5 36.46-0.00	17.83	1	6	168.239	A	0.000	171.604	171.604	100.00	0.000	0.000
					B	0.000	171.604		100.00		
					C	0.000	171.604		100.00		

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
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.64	80.24	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			

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
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	3.62	88.88	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	3.29	97.05	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	3.99	97.36	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	3.49	95.63	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	1172.77 kip-ft	15.02		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.64	80.24	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	3.62	88.88	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	3.29	97.05	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	3.99	97.36	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	3.49	95.63	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	1172.77 kip-ft	15.02		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.64	80.24	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	3.62	88.88	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			

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
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	3.29	97.05	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	3.99	97.36	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	3.49	95.63	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	1172.77 kip-ft	15.02		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.64	80.24	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	3.62	88.88	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	3.29	97.05	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	3.99	97.36	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	3.49	95.63	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	1172.77 kip-ft	15.02		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.63	A	1	0.65	1	1	1	20.951	0.50	62.20	C
			B	1	0.65	1	1	1	20.951			
			C	1	0.65	1	1	1	20.951			
L2 152.00-111.29	2.10	4.68	A	1	0.65	1	1	1	123.673	2.79	68.58	C
			B	1	0.65	1	1	1	123.673			
			C	1	0.65	1	1	1	123.673			
L3 111.29-77.42	2.68	6.30	A	1	0.65	1	1	1	122.978	2.52	74.53	C
			B	1	0.65	1	1	1	122.978			
			C	1	0.65	1	1	1	122.978			

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
L4 77.42-36.46	3.27	11.82	A	1	0.65	1	1	1	172.486	3.05	74.52	C
			B	1	0.65	1	1	1	172.486			
			C	1	0.65	1	1	1	172.486			
L5 36.46-0.00	2.91	13.99	A	1	0.65	1	1	1	174.703	2.66	73.02	C
			B	1	0.65	1	1	1	174.703			
			C	1	0.65	1	1	1	174.703			
Sum Weight:	11.16	37.42						OTM	902.25 kip-ft	11.53		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.63	A	1	0.65	1	1	1	20.951	0.50	62.20	C
			B	1	0.65	1	1	1	20.951			
			C	1	0.65	1	1	1	20.951			
L2 152.00-111.29	2.10	4.68	A	1	0.65	1	1	1	123.673	2.79	68.58	C
			B	1	0.65	1	1	1	123.673			
			C	1	0.65	1	1	1	123.673			
L3 111.29-77.42	2.68	6.30	A	1	0.65	1	1	1	122.978	2.52	74.53	C
			B	1	0.65	1	1	1	122.978			
			C	1	0.65	1	1	1	122.978			
L4 77.42-36.46	3.27	11.82	A	1	0.65	1	1	1	172.486	3.05	74.52	C
			B	1	0.65	1	1	1	172.486			
			C	1	0.65	1	1	1	172.486			
L5 36.46-0.00	2.91	13.99	A	1	0.65	1	1	1	174.703	2.66	73.02	C
			B	1	0.65	1	1	1	174.703			
			C	1	0.65	1	1	1	174.703			
Sum Weight:	11.16	37.42						OTM	902.25 kip-ft	11.53		

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
L1 160.00-152.00	0.20	0.63	A	1	0.65	1	1	1	20.951	0.50	62.20	C
			B	1	0.65	1	1	1	20.951			
			C	1	0.65	1	1	1	20.951			
L2 152.00-111.29	2.10	4.68	A	1	0.65	1	1	1	123.673	2.79	68.58	C
			B	1	0.65	1	1	1	123.673			
			C	1	0.65	1	1	1	123.673			
L3 111.29-77.42	2.68	6.30	A	1	0.65	1	1	1	122.978	2.52	74.53	C
			B	1	0.65	1	1	1	122.978			
			C	1	0.65	1	1	1	122.978			
L4 77.42-36.46	3.27	11.82	A	1	0.65	1	1	1	172.486	3.05	74.52	C
			B	1	0.65	1	1	1	172.486			
			C	1	0.65	1	1	1	172.486			

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
L5 36.46-0.00	2.91	13.99	A	1	0.65	1	1	1	174.703	2.66	73.02	C
			B	1	0.65	1	1	1	174.703			
			C	1	0.65	1	1	1	174.703			
Sum Weight:	11.16	37.42						OTM	902.25 kip-ft	11.53		

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
L1 160.00-152.00	0.20	0.63	A	1	0.65	1	1	1	20.951	0.50	62.20	C
			B	1	0.65	1	1	1	20.951			
			C	1	0.65	1	1	1	20.951			
L2 152.00-111.29	2.10	4.68	A	1	0.65	1	1	1	123.673	2.79	68.58	C
			B	1	0.65	1	1	1	123.673			
			C	1	0.65	1	1	1	123.673			
L3 111.29-77.42	2.68	6.30	A	1	0.65	1	1	1	122.978	2.52	74.53	C
			B	1	0.65	1	1	1	122.978			
			C	1	0.65	1	1	1	122.978			
L4 77.42-36.46	3.27	11.82	A	1	0.65	1	1	1	172.486	3.05	74.52	C
			B	1	0.65	1	1	1	172.486			
			C	1	0.65	1	1	1	172.486			
L5 36.46-0.00	2.91	13.99	A	1	0.65	1	1	1	174.703	2.66	73.02	C
			B	1	0.65	1	1	1	174.703			
			C	1	0.65	1	1	1	174.703			
Sum Weight:	11.16	37.42						OTM	902.25 kip-ft	11.53		

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
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.22	27.76	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	1.25	30.75	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	1.14	33.58	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	1.38	33.69	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	1.21	33.09	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			

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
Sum Weight:	11.16	33.00						OTM	405.80 kip-ft	5.20		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.22	27.76	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	1.25	30.75	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	1.14	33.58	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	1.38	33.69	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	1.21	33.09	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	405.80 kip-ft	5.20		

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 ft^2	F K	w plf	Ctrl. Face
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.22	27.76	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	1.25	30.75	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	1.14	33.58	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	1.38	33.69	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	1.21	33.09	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	405.80 kip-ft	5.20		

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
L1 160.00-152.00	0.20	0.48	A	1	0.65	1	1	1	20.271	0.22	27.76	C
			B	1	0.65	1	1	1	20.271			
			C	1	0.65	1	1	1	20.271			
L2 152.00-111.29	2.10	3.79	A	1	0.65	1	1	1	120.213	1.25	30.75	C
			B	1	0.65	1	1	1	120.213			
			C	1	0.65	1	1	1	120.213			
L3 111.29-77.42	2.68	5.42	A	1	0.65	1	1	1	120.099	1.14	33.58	C
			B	1	0.65	1	1	1	120.099			
			C	1	0.65	1	1	1	120.099			
L4 77.42-36.46	3.27	10.58	A	1	0.65	1	1	1	169.004	1.38	33.69	C
			B	1	0.65	1	1	1	169.004			
			C	1	0.65	1	1	1	169.004			
L5 36.46-0.00	2.91	12.74	A	1	0.65	1	1	1	171.604	1.21	33.09	C
			B	1	0.65	1	1	1	171.604			
			C	1	0.65	1	1	1	171.604			
Sum Weight:	11.16	33.00						OTM	405.80 kip-ft	5.20		

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	33.00					
Bracing Weight	0.00					
Total Member Self-Weight	33.00			0.31	0.00	
Total Weight	53.41			0.31	0.00	
Wind 0 deg - No Ice		0.00	-34.60	-3864.51	0.00	0.00
Wind 30 deg - No Ice		17.30	-29.96	-3346.72	-1932.41	0.48
Wind 45 deg - No Ice		24.46	-24.46	-2732.53	-2732.84	0.68
Wind 60 deg - No Ice		29.96	-17.30	-1932.10	-3347.03	0.84
Wind 90 deg - No Ice		34.60	0.00	0.31	-3864.81	0.97
Wind 120 deg - No Ice		29.96	17.30	1932.71	-3347.03	0.84
Wind 135 deg - No Ice		24.46	24.46	2733.14	-2732.84	0.68
Wind 150 deg - No Ice		17.30	29.96	3347.33	-1932.41	0.48
Wind 180 deg - No Ice		0.00	34.60	3865.12	0.00	0.00
Wind 210 deg - No Ice		-17.30	29.96	3347.33	1932.41	-0.48
Wind 225 deg - No Ice		-24.46	24.46	2733.14	2732.84	-0.68
Wind 240 deg - No Ice		-29.96	17.30	1932.71	3347.03	-0.84
Wind 270 deg - No Ice		-34.60	0.00	0.31	3864.81	-0.97
Wind 300 deg - No Ice		-29.96	-17.30	-1932.10	3347.03	-0.84
Wind 315 deg - No Ice		-24.46	-24.46	-2732.53	2732.84	-0.68
Wind 330 deg - No Ice		-17.30	-29.96	-3346.72	1932.41	-0.48
Member Ice	4.41					
Total Weight Ice	62.39			0.51	0.00	
Wind 0 deg - Ice		0.00	-28.50	-3229.45	0.00	0.00
Wind 30 deg - Ice		14.25	-24.68	-2796.72	-1614.98	0.59
Wind 45 deg - Ice		20.15	-20.15	-2283.42	-2283.93	0.83
Wind 60 deg - Ice		24.68	-14.25	-1614.47	-2797.23	1.01

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 90 deg - Ice		28.50	0.00	0.51	-3229.96	1.17
Wind 120 deg - Ice		24.68	14.25	1615.49	-2797.23	1.01
Wind 135 deg - Ice		20.15	20.15	2284.43	-2283.93	0.83
Wind 150 deg - Ice		14.25	24.68	2797.73	-1614.98	0.59
Wind 180 deg - Ice		0.00	28.50	3230.47	0.00	0.00
Wind 210 deg - Ice		-14.25	24.68	2797.73	1614.98	-0.59
Wind 225 deg - Ice		-20.15	20.15	2284.43	2283.93	-0.83
Wind 240 deg - Ice		-24.68	14.25	1615.49	2797.23	-1.01
Wind 270 deg - Ice		-28.50	0.00	0.51	3229.96	-1.17
Wind 300 deg - Ice		-24.68	-14.25	-1614.47	2797.23	-1.01
Wind 315 deg - Ice		-20.15	-20.15	-2283.42	2283.93	-0.83
Wind 330 deg - Ice		-14.25	-24.68	-2796.72	1614.98	-0.59
Total Weight	53.41			0.31	0.00	
Wind 0 deg - Service		0.00	-11.97	-1337.00	0.00	0.00
Wind 30 deg - Service		5.99	-10.37	-1157.83	-668.65	0.17
Wind 45 deg - Service		8.46	-8.46	-945.31	-945.62	0.24
Wind 60 deg - Service		10.37	-5.99	-668.35	-1158.14	0.29
Wind 90 deg - Service		11.97	0.00	0.31	-1337.31	0.33
Wind 120 deg - Service		10.37	5.99	668.96	-1158.14	0.29
Wind 135 deg - Service		8.46	8.46	945.92	-945.62	0.24
Wind 150 deg - Service		5.99	10.37	1158.45	-668.65	0.17
Wind 180 deg - Service		0.00	11.97	1337.61	0.00	0.00
Wind 210 deg - Service		-5.99	10.37	1158.45	668.65	-0.17
Wind 225 deg - Service		-8.46	8.46	945.92	945.62	-0.24
Wind 240 deg - Service		-10.37	5.99	668.96	1158.14	-0.29
Wind 270 deg - Service		-11.97	0.00	0.31	1337.31	-0.33
Wind 300 deg - Service		-10.37	-5.99	-668.35	1158.14	-0.29
Wind 315 deg - Service		-8.46	-8.46	-945.31	945.62	-0.24
Wind 330 deg - Service		-5.99	-10.37	-1157.83	668.65	-0.17

Load Combinations

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	160 - 152	Pole	Max Tension	18	0.00	0.00	0.00
			Max. Compression	18	-3.44	0.00	0.00
			Max. Mx	6	-1.95	-44.08	-0.00
			Max. My	10	-1.95	0.00	-44.08
			Max. Vy	6	5.86	-44.08	-0.00
			Max. Vx	10	5.86	0.00	-44.08
			Max. Torque	5			0.00
L2	152 - 111.29	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-18.08	0.00	-0.13
			Max. Mx	6	-12.15	-530.50	-0.08
			Max. My	10	-12.15	0.00	-530.60
			Max. Vy	6	20.83	-530.50	-0.08
			Max. Vx	10	20.83	0.00	-530.60
			Max. Torque	23			-0.47
L3	111.29 - 77.42	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-28.73	0.00	-0.13
			Max. Mx	6	-21.37	-1358.46	-0.10
			Max. My	10	-21.37	0.00	-1358.55
			Max. Vy	6	27.24	-1358.46	-0.10
			Max. Vx	10	27.24	0.00	-1358.55
			Max. Torque	23			-0.46
L4	77.42 - 36.46	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-42.98	0.00	-0.51
			Max. Mx	6	-34.84	-2531.84	-0.31
			Max. My	10	-34.84	0.00	-2532.16

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L5	36.46 - 0	Pole	Max. Vy	6	31.14	-2531.84	-0.31
			Max. Vx	10	31.14	0.00	-2532.16
			Max. Torque	23			-1.17
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-62.39	0.00	-0.51
			Max. Mx	6	-53.39	-3965.67	-0.32
			Max. My	10	-53.39	0.00	-3965.99
			Max. Vy	6	34.62	-3965.67	-0.32
			Max. Vx	10	34.62	0.00	-3965.99
			Max. Torque	23			-1.17

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	27	62.39	0.00	-28.50
	Max. H_x	14	53.41	34.60	-0.00
	Max. H_z	2	53.41	0.00	34.60
	Max. M_x	2	3965.35	0.00	34.60
	Max. M_z	6	3965.67	-34.60	-0.00
	Max. Torsion	31	1.17	28.50	0.00
	Min. Vert	1	53.41	0.00	0.00
	Min. H_x	6	53.41	-34.60	-0.00
	Min. H_z	10	53.41	0.00	-34.60
	Min. M_x	10	-3965.99	0.00	-34.60
	Min. M_z	14	-3965.67	34.60	-0.00
	Min. Torsion	23	-1.17	-28.50	0.00

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	53.41	0.00	0.00	0.31	0.00	0.00
Dead+Wind 0 deg - No Ice	53.41	0.00	-34.60	-3965.35	0.00	0.00
Dead+Wind 30 deg - No Ice	53.41	17.30	-29.96	-3434.06	-1982.84	0.48
Dead+Wind 45 deg - No Ice	53.41	24.46	-24.46	-2803.84	-2804.15	0.68
Dead+Wind 60 deg - No Ice	53.41	29.96	-17.30	-1982.52	-3434.37	0.83
Dead+Wind 90 deg - No Ice	53.41	34.60	0.00	0.31	-3965.67	0.96
Dead+Wind 120 deg - No Ice	53.41	29.96	17.30	1983.15	-3434.37	0.83
Dead+Wind 135 deg - No Ice	53.41	24.46	24.46	2804.47	-2804.16	0.68
Dead+Wind 150 deg - No Ice	53.41	17.30	29.96	3434.69	-1982.84	0.48
Dead+Wind 180 deg - No Ice	53.41	0.00	34.60	3965.99	0.00	0.00
Dead+Wind 210 deg - No Ice	53.41	-17.30	29.96	3434.69	1982.84	-0.48
Dead+Wind 225 deg - No Ice	53.41	-24.46	24.46	2804.47	2804.16	-0.68
Dead+Wind 240 deg - No Ice	53.41	-29.96	17.30	1983.15	3434.37	-0.83
Dead+Wind 270 deg - No Ice	53.41	-34.60	0.00	0.31	3965.67	-0.96
Dead+Wind 300 deg - No Ice	53.41	-29.96	-17.30	-1982.52	3434.37	-0.83
Dead+Wind 315 deg - No Ice	53.41	-24.46	-24.46	-2803.84	2804.15	-0.68
Dead+Wind 330 deg - No Ice	53.41	-17.30	-29.96	-3434.06	1982.84	-0.48
Dead+Ice+Temp	62.39	0.00	0.00	0.51	0.00	0.00
Dead+Wind 0 deg+Ice+Temp	62.39	0.00	-28.50	-3339.88	0.00	0.00

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 30 deg+Ice+Temp	62.39	14.25	-24.68	-2892.35	-1670.21	0.58
Dead+Wind 45 deg+Ice+Temp	62.39	20.15	-20.15	-2361.50	-2362.03	0.83
Dead+Wind 60 deg+Ice+Temp	62.39	24.68	-14.25	-1669.68	-2892.88	1.01
Dead+Wind 90 deg+Ice+Temp	62.39	28.50	0.00	0.53	-3340.41	1.17
Dead+Wind 120 deg+Ice+Temp	62.39	24.68	14.25	1670.73	-2892.88	1.01
Dead+Wind 135 deg+Ice+Temp	62.39	20.15	20.15	2362.56	-2362.03	0.83
Dead+Wind 150 deg+Ice+Temp	62.39	14.25	24.68	2893.41	-1670.21	0.58
Dead+Wind 180 deg+Ice+Temp	62.39	0.00	28.50	3340.94	0.00	0.00
Dead+Wind 210 deg+Ice+Temp	62.39	-14.25	24.68	2893.41	1670.21	-0.58
Dead+Wind 225 deg+Ice+Temp	62.39	-20.15	20.15	2362.56	2362.03	-0.83
Dead+Wind 240 deg+Ice+Temp	62.39	-24.68	14.25	1670.73	2892.88	-1.01
Dead+Wind 270 deg+Ice+Temp	62.39	-28.50	0.00	0.53	3340.41	-1.17
Dead+Wind 300 deg+Ice+Temp	62.39	-24.68	-14.25	-1669.68	2892.88	-1.01
Dead+Wind 315 deg+Ice+Temp	62.39	-20.15	-20.15	-2361.50	2362.03	-0.83
Dead+Wind 330 deg+Ice+Temp	62.39	-14.25	-24.68	-2892.35	1670.21	-0.58
Dead+Wind 0 deg - Service	53.41	0.00	-11.97	-1372.74	0.00	0.00
Dead+Wind 30 deg - Service	53.41	5.99	-10.37	-1188.78	-686.53	0.17
Dead+Wind 45 deg - Service	53.41	8.46	-8.46	-970.58	-970.90	0.24
Dead+Wind 60 deg - Service	53.41	10.37	-5.99	-686.21	-1189.10	0.29
Dead+Wind 90 deg - Service	53.41	11.97	0.00	0.32	-1373.05	0.33
Dead+Wind 120 deg - Service	53.41	10.37	5.99	686.85	-1189.10	0.29
Dead+Wind 135 deg - Service	53.41	8.46	8.46	971.21	-970.90	0.24
Dead+Wind 150 deg - Service	53.41	5.99	10.37	1189.42	-686.53	0.17
Dead+Wind 180 deg - Service	53.41	0.00	11.97	1373.37	0.00	0.00
Dead+Wind 210 deg - Service	53.41	-5.99	10.37	1189.42	686.53	-0.17
Dead+Wind 225 deg - Service	53.41	-8.46	8.46	971.21	970.90	-0.24
Dead+Wind 240 deg - Service	53.41	-10.37	5.99	686.85	1189.10	-0.29
Dead+Wind 270 deg - Service	53.41	-11.97	0.00	0.32	1373.05	-0.33
Dead+Wind 300 deg - Service	53.41	-10.37	-5.99	-686.21	1189.10	-0.29
Dead+Wind 315 deg - Service	53.41	-8.46	-8.46	-970.58	970.90	-0.24
Dead+Wind 330 deg - Service	53.41	-5.99	-10.37	-1188.78	686.53	-0.17

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-53.41	0.00	0.00	53.41	0.00	0.000%
2	0.00	-53.41	-34.60	0.00	53.41	34.60	0.000%
3	17.30	-53.41	-29.96	-17.30	53.41	29.96	0.000%
4	24.46	-53.41	-24.46	-24.46	53.41	24.46	0.000%
5	29.96	-53.41	-17.30	-29.96	53.41	17.30	0.000%
6	34.60	-53.41	0.00	-34.60	53.41	-0.00	0.000%
7	29.96	-53.41	17.30	-29.96	53.41	-17.30	0.000%
8	24.46	-53.41	24.46	-24.46	53.41	-24.46	0.000%
9	17.30	-53.41	29.96	-17.30	53.41	-29.96	0.000%
10	0.00	-53.41	34.60	0.00	53.41	-34.60	0.000%
11	-17.30	-53.41	29.96	17.30	53.41	-29.96	0.000%
12	-24.46	-53.41	24.46	24.46	53.41	-24.46	0.000%
13	-29.96	-53.41	17.30	29.96	53.41	-17.30	0.000%
14	-34.60	-53.41	0.00	34.60	53.41	-0.00	0.000%
15	-29.96	-53.41	-17.30	29.96	53.41	17.30	0.000%
16	-24.46	-53.41	-24.46	24.46	53.41	24.46	0.000%
17	-17.30	-53.41	-29.96	17.30	53.41	29.96	0.000%
18	0.00	-62.39	0.00	0.00	62.39	0.00	0.000%
19	0.00	-62.39	-28.50	0.00	62.39	28.50	0.000%
20	14.25	-62.39	-24.68	-14.25	62.39	24.68	0.000%
21	20.15	-62.39	-20.15	-20.15	62.39	20.15	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
22	24.68	-62.39	-14.25	-24.68	62.39	14.25	0.000%
23	28.50	-62.39	0.00	-28.50	62.39	0.00	0.000%
24	24.68	-62.39	14.25	-24.68	62.39	-14.25	0.000%
25	20.15	-62.39	20.15	-20.15	62.39	-20.15	0.000%
26	14.25	-62.39	24.68	-14.25	62.39	-24.68	0.000%
27	0.00	-62.39	28.50	0.00	62.39	-28.50	0.000%
28	-14.25	-62.39	24.68	14.25	62.39	-24.68	0.000%
29	-20.15	-62.39	20.15	20.15	62.39	-20.15	0.000%
30	-24.68	-62.39	14.25	24.68	62.39	-14.25	0.000%
31	-28.50	-62.39	0.00	28.50	62.39	0.00	0.000%
32	-24.68	-62.39	-14.25	24.68	62.39	14.25	0.000%
33	-20.15	-62.39	-20.15	20.15	62.39	20.15	0.000%
34	-14.25	-62.39	-24.68	14.25	62.39	24.68	0.000%
35	0.00	-53.41	-11.97	0.00	53.41	11.97	0.000%
36	5.99	-53.41	-10.37	-5.99	53.41	10.37	0.000%
37	8.46	-53.41	-8.46	-8.46	53.41	8.46	0.000%
38	10.37	-53.41	-5.99	-10.37	53.41	5.99	0.000%
39	11.97	-53.41	0.00	-11.97	53.41	0.00	0.000%
40	10.37	-53.41	5.99	-10.37	53.41	-5.99	0.000%
41	8.46	-53.41	8.46	-8.46	53.41	-8.46	0.000%
42	5.99	-53.41	10.37	-5.99	53.41	-10.37	0.000%
43	0.00	-53.41	11.97	0.00	53.41	-11.97	0.000%
44	-5.99	-53.41	10.37	5.99	53.41	-10.37	0.000%
45	-8.46	-53.41	8.46	8.46	53.41	-8.46	0.000%
46	-10.37	-53.41	5.99	10.37	53.41	-5.99	0.000%
47	-11.97	-53.41	0.00	11.97	53.41	0.00	0.000%
48	-10.37	-53.41	-5.99	10.37	53.41	5.99	0.000%
49	-8.46	-53.41	-8.46	8.46	53.41	8.46	0.000%
50	-5.99	-53.41	-10.37	5.99	53.41	10.37	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	0.00008972
3	Yes	5	0.00000001	0.00022381
4	Yes	5	0.00000001	0.00024950
5	Yes	5	0.00000001	0.00022011
6	Yes	4	0.00000001	0.00019330
7	Yes	5	0.00000001	0.00022493
8	Yes	5	0.00000001	0.00024960
9	Yes	5	0.00000001	0.00022117
10	Yes	4	0.00000001	0.00008973
11	Yes	5	0.00000001	0.00022117
12	Yes	5	0.00000001	0.00024960
13	Yes	5	0.00000001	0.00022493
14	Yes	4	0.00000001	0.00019330
15	Yes	5	0.00000001	0.00022011
16	Yes	5	0.00000001	0.00024950
17	Yes	5	0.00000001	0.00022381
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00013742
20	Yes	5	0.00000001	0.00041802
21	Yes	5	0.00000001	0.00046968
22	Yes	5	0.00000001	0.00041236

23	Yes	5	0.00000001	0.00013792
24	Yes	5	0.00000001	0.00041993
25	Yes	5	0.00000001	0.00047001
26	Yes	5	0.00000001	0.00041412
27	Yes	5	0.00000001	0.00013747
28	Yes	5	0.00000001	0.00041412
29	Yes	5	0.00000001	0.00047001
30	Yes	5	0.00000001	0.00041993
31	Yes	5	0.00000001	0.00013792
32	Yes	5	0.00000001	0.00041236
33	Yes	5	0.00000001	0.00046968
34	Yes	5	0.00000001	0.00041802
35	Yes	4	0.00000001	0.00004371
36	Yes	4	0.00000001	0.00048167
37	Yes	4	0.00000001	0.00054733
38	Yes	4	0.00000001	0.00046414
39	Yes	4	0.00000001	0.00005201
40	Yes	4	0.00000001	0.00048743
41	Yes	4	0.00000001	0.00054806
42	Yes	4	0.00000001	0.00046925
43	Yes	4	0.00000001	0.00004374
44	Yes	4	0.00000001	0.00046925
45	Yes	4	0.00000001	0.00054806
46	Yes	4	0.00000001	0.00048743
47	Yes	4	0.00000001	0.00005201
48	Yes	4	0.00000001	0.00046414
49	Yes	4	0.00000001	0.00054733
50	Yes	4	0.00000001	0.00048167

Maximum Tower Deflections - Service Wind

Section No.	*Elevation* ft	*Horz. Deflection* in	*Gov. Load Comb.*	*Tilt* °	*Twist* °
L1	160 - 152	25.439	43	1.3416	0.0007
L2	152 - 111.29	23.196	43	1.3331	0.0007
L3	116.71 - 77.42	13.898	43	1.1330	0.0006
L4	83.59 - 36.46	7.065	43	0.7929	0.0004
L5	43.54 - 0	1.941	43	0.3994	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	*Appurtenance*	*Gov. Load Comb.*	*Deflection* in	*Tilt* °	*Twist* °	*Radius of Curvature* ft
160.00	(4) DR65-18-02DPL2Q	43	25.439	1.3416	0.0007	48436
150.00	(2) 7770.00	43	22.638	1.3290	0.0007	24977
140.00	DB844H90	43	19.886	1.2934	0.0007	13248
130.00	(4) DB844H90	43	17.223	1.2359	0.0007	9022
120.00	(3) DB980F90E-M	43	14.694	1.1608	0.0006	6844
110.00	(4) 7250.03	43	12.339	1.0724	0.0005	6197
75.00	GPS	43	5.661	0.6929	0.0003	5492

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 152	73.396	10	3.8715	0.0024
L2	152 - 111.29	66.928	10	3.8470	0.0024
L3	116.71 - 77.42	40.111	10	3.2701	0.0020
L4	83.59 - 36.46	20.396	10	2.2888	0.0013
L5	43.54 - 0	5.604	10	1.1531	0.0005

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.00	(4) DR65-18-02DPL2Q	10	73.396	3.8715	0.0024	16944
150.00	(2) 7770.00	10	65.320	3.8353	0.0024	8733
140.00	DB844H90	10	57.380	3.7343	0.0024	4627
130.00	(4) DB844H90	10	49.702	3.5696	0.0022	3149
120.00	(3) DB980F90E-M	10	42.407	3.3517	0.0020	2388
110.00	(4) 7250.03	10	35.612	3.0910	0.0018	2160
75.00	GPS	10	16.343	2.0211	0.0011	1908

Compression Checks

Pole Design Data

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 $\frac{P}{P_a}$
L1	160 - 152 (1)	TP30.62x29x0.1875	8.00	160.00	177.7	4.728	18.1111	-3.16	85.63	0.037
L2	152 - 111.29 (2)	TP38.86x30.62x0.25	40.71	160.00	144.2	7.184	29.7665	-12.15	213.84	0.057
L3	111.29 - 77.42 (3)	TP45.09x37.263x0.3125	39.29	160.00	124.2	9.682	43.1945	-21.37	418.19	0.051
L4	77.42 - 36.46 (4)	TP52.62x43.2359x0.4375	47.13	160.00	106.5	13.160	70.5044	-34.84	927.86	0.038
L5	36.46 - 0 (5)	TP59x50.3353x0.5	43.54	160.00	92.5	17.457	92.8395	-53.39	1620.66	0.033

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	160 - 152 (1)	TP30.62x29x0.1875	38.31	3.374	37.630	0.090	0.00	0.000	37.630	0.000
L2	152 - 111.29 (2)	TP38.86x30.62x0.25	530.60	23.081	39.000	0.592	0.00	0.000	39.000	0.000
L3	111.29 - 77.42	TP45.09x37.263x0.3125	1358.55	35.099	39.000	0.900	0.00	0.000	39.000	0.000

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L4	77.42 - 36.46 (3)	TP52.62x43.2359x0.4375	2532.16	34.425	39.000	0.883	0.00	0.000	39.000	0.000
L5	36.46 - 0 (4)	TP59x50.3353x0.5	3965.99	35.536	39.000	0.911	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	160 - 152 (1)	TP30.62x29x0.1875	5.06	0.280	26.000	0.022	0.00	0.000	26.000	0.000
L2	152 - 111.29 (2)	TP38.86x30.62x0.25	20.83	0.700	26.000	0.054	0.00	0.000	26.000	0.000
L3	111.29 - 77.42 (3)	TP45.09x37.263x0.3125	27.24	0.631	26.000	0.049	0.00	0.000	26.000	0.000
L4	77.42 - 36.46 (4)	TP52.62x43.2359x0.4375	31.14	0.442	26.000	0.034	0.00	0.000	26.000	0.000
L5	36.46 - 0 (5)	TP59x50.3353x0.5	34.62	0.373	26.000	0.029	0.00	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	160 - 152 (1)	0.037	0.090	0.000	0.022	0.000	0.127 ✓	1.333	H1-3+VT ✓
L2	152 - 111.29 (2)	0.057	0.592	0.000	0.054	0.000	0.649 ✓	1.333	H1-3+VT ✓
L3	111.29 - 77.42 (3)	0.051	0.900	0.000	0.049	0.000	0.952 ✓	1.333	H1-3+VT ✓
L4	77.42 - 36.46 (4)	0.038	0.883	0.000	0.034	0.000	0.921 ✓	1.333	H1-3+VT ✓
L5	36.46 - 0 (5)	0.033	0.911	0.000	0.029	0.000	0.944 ✓	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	160 - 152	Pole	TP30.62x29x0.1875	1	-3.16	114.14	9.5	Pass
L2	152 - 111.29	Pole	TP38.86x30.62x0.25	2	-12.15	285.05	48.7	Pass
L3	111.29 - 77.42	Pole	TP45.09x37.263x0.3125	3	-21.37	557.45	71.4	Pass
L4	77.42 - 36.46	Pole	TP52.62x43.2359x0.4375	4	-34.84	1236.84	69.1	Pass
L5	36.46 - 0	Pole	TP59x50.3353x0.5	5	-53.39	2160.34	70.8	Pass
							Summary	
						Pole (L3)	71.4	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
						RATING =	**71.4**	**Pass**

Program Version 3.0.0.17 - 7/15/2004 File:N:/jkiernan/VZ1-Boy Scouts/ERI Files/160' Monopole - Greenwich.eri

ANCHOR BOLT AND BASE PLATE ANALYSIS

URS

Job	160' Monopole - Greenwich, CT	Project No.	VZ1-192	Page ___ of ___	
Description	Anchor Bolt and Base Plate Analysis	Computed by	JEK	Sheet 1 of 6	
		Checked by		Date 05/12/06	

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	OM := 5136.9·ft·kips	*user input*	
Shear Force:	Shear := 47·kips	*user input*	Original Design Reactions - Conservative
Axial Force:	Axial := 55·kips	*user input*	

Anchor Bolt Data:

Use ASTM 615 Grade 75

Number of Anchor Bolts = N	N := 24	*user input*
Diameter of Bolt Circle:	D_{bc} := 67in	*user input*
Bolt "Column" Distance:	l := 3in	*user input*
Bolt Ultimate Strength:	F_u := 100·ksi	*user input*
Bolt Yield Strength:	Fy := 75·ksi	*user input*
Bolt Modulus:	E := 29000·ksi	*user input*
Thickness Of Anchor Bolts	D := 2.25in	*user input*
Threads per Inch:	n := 4.5	*user input*

Base Plate Data:

Plate Yield Strength:	Fy_{bp} := 60·ksi	*user input*
Base Plate Thickness:	PlateThickness := 2.25·in	*user input*
Base Plate Diameter:	D_{bp} := 73·in	*user input*
Outer Pole Diameter:	D_{pole} := 59in	*user input*

Geometric Layout Data:

Distance from the center of gravity of the group to bolt in question = d(i)

Radius of Bolt Circle: $R_{bc} := \frac{D_{bc}}{2}$

Distance to Bolts: $i := 1 .. N$

$$d_i := \left| \begin{array}{l} \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N}\right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{array} \right.$$

$d_1 = 8.67\,in$ $d_7 = 32.36\,in$

$d_2 = 16.75\,in$ $d_8 = 29.01\,in$

$d_3 = 23.69\,in$ $d_9 = 23.69\,in$

$d_4 = 29.01\,in$ $d_{10} = 16.75\,in$

$d_5 = 32.36\,in$ $d_{11} = 8.67\,in$

$d_6 = 33.50\,in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 29.50\,in$

Moment Arms of Bolts about Neutral Axis: $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00\,in$ $MA_7 = 2.86\,in$

$MA_2 = 0.00\,in$ $MA_8 = 0.00\,in$

$MA_3 = 0.00\,in$ $MA_9 = 0.00\,in$

$MA_4 = 0.00\,in$ $MA_{10} = 0.00\,in$

$MA_5 = 2.86\,in$ $MA_{11} = 0.00\,in$

$MA_6 = 4.00\,in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := .75 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $EffectiveWidth = 32.24\,in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 1.347 \times 10^4\,in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 3.976\,in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 3.248\,in^2$$

Net Diameter:

$$D_n := \frac{2\cdot\sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 2.03\,in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.51\,in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi\cdot D_n^{\,3}}{32} \qquad S_x = 0.826\,in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right)\cdot l \qquad M_x = 0.490\,ft\cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 7.1\,ksi$$

Allowable Bending

$$F_{bx} := 1.33\cdot 0.60\cdot Fy \qquad F_{bx} = 59.8\,ksi$$

Note: 1.33 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$AllowableTension := 1.33 \cdot (0.33 \cdot A_g \cdot F_u)$ $\quad AllowableTension = 174.5\ kips$

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N} \qquad MaxTension = 151.0\ kips$$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.87$$

$$Condition := if\left(\frac{MaxTension}{AllowableTension} \le 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

Check Compression & Combined Stresses (if required):

Check to see if a complete combined stress analysis is required:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

Set the clear space between the plate and bolt to zero and remove bending stresses if a combined stress analysis is not required:

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0.00\,\text{in} & \text{otherwise} \end{cases} \qquad l = 0.00\,\text{in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0.0\,\text{ksi} & \text{otherwise} \end{cases} \qquad f_{bx} = 0.0\,\text{ksi}$$

Allowable Compressive Force:

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{Fy}} \qquad C_c = 87.36$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot Fy}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} \qquad F_a = 45.0\,\text{ksi}$$

$$F_{ax} := 1.33 \cdot F_a \quad \text{Note: 1.33 increase allowed per TIA/EIA} \qquad F_a = 59.9\,\text{ksi}$$

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 155.6\,\text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 47.9\,\text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.80$$

$$\text{Condition} := \text{if}\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right) \qquad \boxed{\text{Condition} = \text{"OK"}}$$

Base Plate Analysis:

Force from Bolt(s):

$$C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$$

$C_1 = 42.0\,kips$ $C_7 = 150.4\,kips$

$C_2 = 79.0\,kips$ $C_8 = 135.1\,kips$

$C_3 = 110.7\,kips$ $C_9 = 110.7\,kips$

$C_4 = 135.1\,kips$ $C_{10} = 79.0\,kips$

$C_5 = 150.4\,kips$ $C_{11} = 42.0\,kips$

$C_6 = 155.6\,kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2} \qquad f_{bp} = 54.5\,ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.33 \cdot 0.75 Fy_{bp}} = 0.91$$

$$Condition := if\left(\frac{f_{bp}}{1.33 \cdot 0.75 Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

FOUNDATION ANALYSIS

URS

Job	160' Monopole - Greenwich, CT	Project No.	VZ1-192	Page	of
Description	Spread Footing w/ Pier Analysis	Computed by	JEK	Sheet 1	of 9
		Checked by		Date 05/12/06	Date

MONOPOLE FOUNDATION ANALYSIS

TOWER FORCES:

Moment Caused by Tower	$M_t := 3966 \cdot ft \cdot kips$
Shear at Base of Tower	$S_t := 35kip$
Max Compressive Force	$C_t := 53 \cdot kip$
Height of Tower	$H_t := 160 \cdot ft$
Base Plate Bolt Circle	$MP := 67in$

FOOTING DIMENSIONS:

Overall Depth of Footing	$D_f := 7.5ft$
Length of Pier	$L_p := 5.5 \cdot ft$
Extension of Pier Above Grade	$L_{pag} := 1.0 \cdot ft$
Diameter of Pier	$d_p := 7 \cdot ft$
Thickness of Footing	$T_f := 3.0 \cdot ft$
Width of Footing:	$W_f := 28ft$
Length of Anchor Bolts:	$L_{st} := 96in$
Projection of anchor bolts above pier	$A_{BP} := 12 \cdot in$
Anchor bolts area	$A_{anchor} := 3.97 \cdot in^2$

PROPERTIES:

Compressive Strength of Concrete	$fc := 4000psi$
Yield Strength of Steel Reinforcement	$fy := 60000 \cdot psi$
Yield Strength of Anchor Bolt	$fya := 75000 \cdot psi$
Internal Friction Angle of Soil	$\phi_s := 10 \cdot deg$
Allowable Bearing Capacity	$q_s := 6000 \cdot psf$
Unit Weight of Soil	$\gamma_s := 110 \cdot pcf$
Unit Weight of Concrete	$\gamma_c := 150 \cdot pcf$
Depth to Neglect	$n := 0ft$
Cohesion of Clay Type Soil Note: Use 0 for Sandy Soil	$c := 0 \cdot ksf$
Seismic Zone Factor: UBC Fig 23-2	$Z := 2$
Coefficient of Friction between soil and Concrete:	$\mu := 0.35$
Clear Cover of Reinforcement Pier:	$Cvr_{pier} := 3 \cdot in$
Clear Cover of Reinforcement Pad:	$Cvr_{pad} := 3 \cdot in$
Anchor Bolt Diameter	$d_{anchor} := 2.25in$

PIER REINFORCEMENT:

Bar Size	$BSpier := 9$	Bar Diameter	$d_{bpier} := 1.128 \cdot in$
Number of Bars	$NBpier := 44$	Bar Area	$A_{bpier} := 1.00 \cdot in^2$

PAD REINFORCEMENT:

TOP:	Bar Size	$BS_{top} := 11$	Bar Diameter	$d_{btop} := 1.410 \cdot in$
	Number of Bars	$NB_{top} := 25$	Bar Area	$A_{btop} := 1.56 \cdot in^2$
BOTTOM:	Bar Size	$BS_{bot} := 11$	Bar Diameter	$d_{bbot} := 1.410 \cdot in$
	Number of Bars	$NB_{bot} := 50$	Bar Area	$A_{bot} := 1.56 \cdot in^2$

Coefficient of Lateral Soil Pressure: $K_p := \dfrac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$ $K_p = 1.4203$

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

URS

Job	160' Monopole - Greenwich, CT	Project No.	VZ1-192	Page	of
Description	Spread Footing w/ Pier Analysis	Computed by	JEK	Sheet 2	of 9
		Checked by		Date	05/12/06

CHECK ANCHOR STEEL EMBEDMENT

Depth:

$D_{ab} := L_{st} - A_{BP}$ $D_{ab} = 7\,ft$

$L_{anchor} := \frac{(0.11 \cdot fy) \cdot in}{\sqrt{f'c \cdot psi}}$ $L_{anchor} = 8.6963\,ft$

$DepthCheck := if(D_{ab} \geq L_{anchor}, "Okay", "No Good")$

$DepthCheck = "No Good"$ **Note:** anchor plate is provided

STABILITY OF FOOTING

Passive Pressure:

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $P_{pt} = 0.703\,ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}]$ $P_{top} = 0.703\,ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $P_{bot} = 1.1717\,ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $P_{ave} = 0.9374\,ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)]$ $T_p = 3\,ft$

$A_p := W_f T_p$ $A_p = 84\,ft^2$

Ultimate Shear:

$S_u := P_{ave} \cdot A_p$ $S_u = 78.7401\,kip$

Weight of Concrete Pad:

$WT_c := [(W_f^2 \cdot T_f) + d_p^2 L_p] \cdot \gamma_c$ $WT_c = 393.225\,kip$

Weight of Soil: above Footing:

$WT_{s1} := \left[W_f^2 \cdot (|L_p - L_{pag}|) - \frac{d_p^2 \cdot \pi}{4} \cdot (|L_p - L_{pag}|)\right] \cdot \gamma_s$ $WT_{s1} = 369.0302\,kip$

Weight of Soil Wedge at back face:

$WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\phi_s)}{2} \cdot W_f\right) \cdot \gamma_s$ $WT_{s2} = 15.2743\,kip$

Total Weight:

$WT_{tot} := WT_c + WT_{s1} + C_t$ $WT_{tot} = 815.2552\,kip$

Resisting Moment:

$M_r := (WT_{tot}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + WT_{s2} \cdot \left(W_f + \frac{D_f \tan(\phi_s)}{3}\right)$ $M_r = 11926.7268\,kip \cdot ft$

Overturning Moment:

$M_{ot} := M_t + S_t \cdot (L_p + T_f)$ $M_{ot} = 4263.5\,kip \cdot ft$

Factor of Safety:

$FS := \frac{M_r}{M_{ot}}$ $FS_{req} := 2$ $FS = 2.8$

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

URS

Job	160' Monopole - Greenwich, CT	Project No.	VZ1-192	Page ___ of ___	
Description	Spread Footing w/ Pier Analysis	Computed by	JEK	Sheet 3 of 9	
		Checked by		Date 05/12/06	

SHEAR CAPACITY IN PIER

$FS := 2$

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS}$$

$S_p = 182.0397\,\text{kips}$

$ShearCheck := if(S_p > S_t, \text{"Okay"}, \text{"No Good"})$

ShearCheck = "Okay"

BEARING PRESSURE CAUSED BY FOOTING

$$A_{mat} := W_f^2$$

$A_{mat} = 784\,ft^2$

$$S := \frac{W_f^3}{6}$$

$S = 3658.6667\,ft^3$

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$$

$P_{max} = 2.2052\,ksf$

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$$

$P_{min} = -0.1254\,ksf$

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

MaxPressure = "Okay"

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

MinPressure = "No Good"

Distance to Resultant of Pressure Distribution:

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

$X_p = 8.831\,ft$

Distance to Kern:

$$X_k := \frac{W_f}{6}$$

$X_k = 4.6667\,ft$

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

Eccentricity:

$$e := \frac{M_{ot}}{WT_{tot}}$$

$e = 5.2297$

Adjusted Soil Pressure:

$$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e \right)}$$

$P_a = 2.2132\,ksf$

$$q_{adj} := if\left(P_{min} < 0, P_a, \frac{P_{max}}{ft^2} \right)$$

$q_{adj} = 2.2132\,ksf$

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

PressureCheck = "Okay"

CONCRETE BEARING CAPACITY (ACI 10.17)

$\phi_c := 0.75$ (ACI 9.3.2.2)

$P_b := \phi_c \cdot 0.85 \cdot f'c \cdot \frac{d_p^2 \cdot \pi}{4}$ $P_b = 14131.5121$ kip

BearingCheck := if($P_b > LF \cdot C_t$, "Okay", "No Good") BearingCheck = "Okay"

SHEAR STRENGTH OF CONCRETE

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

$\phi_{vv} := .85$ (ACI 9.3.2.3)

$d := T_f - Cvr_{pad} - d_{bbot}$ $d = 31.59$ in

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$ $d_1 = 10.5$ ft

$d_2 := d_1 - d$ $d_2 = 7.8675$ ft

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$ $L = 26.311$ ft

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$ $Slope = 0.0841$ kcf

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \, d_1$ $V_{req} = 677.1111$ kip

ACI 11.3.1.1 $V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f'c \cdot psi} \cdot W_f \, d$ $V_{Avail} = 1141.2159$ kip

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

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

$b_o := \left(d_p + d\right) \cdot \pi$ $b_o = 30.2614$ ft

Area included inside bo: $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4}$ $A_{bo} = 72.8732$ ft^2

Area outside of bo: $A_{out} := A_{mat} - A_{bo}$ $A_{out} = 711.1268$ ft^2

Guess Value: $v_u := 1\,ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := \text{Find}(v_u)$ $v_u = 10.2338\,ksf$

$V_u := v_u \cdot d \cdot W_f$ $V_u = 754.3339\,kips$

$V_{req} := LF \cdot V_u$ $V_{req} = 980.6341\,kips$

$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f'c \cdot psi} \cdot b_o \cdot d$ $V_{Avail} = 2466.7701\,kips$

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

STEEL REINFORCEMENT IN THE PAD $\phi_m := .90$ ACI 9.3.2.2

Take Maximum Bending at face of Pier:

$q_b := q_{adj} - d_1 \cdot Slope$ $q_b = 1.33\,ksf$

$M_n := \frac{LF}{\phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f$ $M_n = 4278.0116\,kip \cdot ft$

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

$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2}$ $R_u = 24496.5\,lbf$

$\rho := \frac{0.85 \cdot f'c}{fy} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f'c}} \right)$ $\rho = 0.0029$

$\rho_{min} := 1.333 \cdot \rho$ $\rho_{min} = 0.00388$

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

(ACI 7.12.2.1b)

FOR BOTTOM BARS: $As := \max(\rho, \rho_{min}, \rho_{sh}) \cdot W_f d$ $As = 41.1724\ in^2$

$As_{prov} := A_{bot} \cdot NB_{bot}$ $As_{prov} = 78\ in^2$

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

FOR TOP BARS: $As := \rho_{sh} \cdot (W_f d)$ $As = 19.1056\ in^2$

$As_{prov} := A_{btop} \cdot NB_{top}$ $As_{prov} = 39\ in^2$

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

TENSION (ACI 12.2.3) **DEVELOPMENT LENGTH OF PAD REINFORCEMENT**

Bar Spacing: $B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1}$ $B_{sPad} = 5.2959\ in$

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: $c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right)$ $c = 2.648\ in$

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} \qquad L_{dbt} = 53.4207\ in$$

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

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: $L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad}$ $L_{Pad} = 123\ in$

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

REINFORCEMENT IN PIER

Pier Area: $A_{pv} := \frac{\pi \cdot d_p^2}{4}$ $A_p = 5541.7694\ in^2$

(ACI 10.8.4 and 10.9.1) $A_{smin} := 0.01 \cdot 0.05 \cdot A_p$ $A_{smin} = 2.7709\ in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $A_{sprov} = 44\ in^2$

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

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

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $B_{sPier} = 4.8696\ in$

Diamter of Reinforcement Cage: $Diam_{cage} := d_p - 2 \cdot Cvr_{pier}$ $Diam_{cage} = 78\ in$

Maximum Moment in Pier: $M_p := \left[M_t + S_t \cdot \left(L_p + \frac{A_{BP}}{4} \right) \right] \cdot LF$ $M_p = 65009.1\ in \cdot kips$

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

(defined variables) $(f_c\ \ f_y\ \ cl\ \ Spiral) = (4\ \ 60\ \ 3\ \ 0)$

The required input is column diameter in inches, number of reinforcing bars, bar size number, factored axial load in kips and moment in kip inches: $(D\ \ N\ \ n\ \ P_u\ \ M_{xu}) := (84\ \ 44\ \ 9\ \ 53\ \ 65009)$

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

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

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio: $(\phi P_n\ \ \phi M_{xn}\ \ f_{sp}\ \ \rho) = (69.1441\ \ 84811.0599\ \ -60\ \ 0.0079)$

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

$AxialLoadCheck := if(\phi P_n \geq P_u, "Okay", "No Good")$ $AxialLoadCheck = "Okay"$

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

URS

Job	160' Monopole - Greenwich, CT	Project No.	VZ1-192	Page	of
Description	Spread Footing w/ Pier Analysis	Computed by	JEK	Sheet 8	of 9
		Checked by		Date 05/12/06	

DEVELOPMENT LENGTH OF PIER REINFORCEMENT

TENSION (ACI 12.2.3)

Factors for development:

Reinforcement Location Factor $\alpha := 1.0$

Coating Factor $\beta := 1.0$

Concrete strength Factor $\lambda := 1.0$

Reinforcement Size Factor $\gamma := 1.0$

Spacing or Cover Dimension: $c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right)$ $c = 2.4348\ in$

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpier}}} \cdot d_{bpier} \qquad L_{dbt} = 37.1825\ in$$

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

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f'c}{psi}}} \cdot .7 \qquad L_{dh} = 14.9816\ in$$

$$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right) \qquad L_{db} = 37.1825\ in$$

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot fy}{\sqrt{f'c \cdot psi}} \qquad L_{dbc1} = 21.4023\ in$$

$$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot fy\right) \qquad L_{dbmin} = 20.304\ in$$

$$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) \qquad L_{dbc} = 21.4023\ in$$

Available Length in Pier: $L_{pier} := L_p - 3 \cdot in$ $L_{pier} = 63\ in$

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

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

NOTE: Anchor bolts and plate provided, OK

Available Length in Pad: $L_{pad} := T_f - 3 \cdot in$ $L_{pad} = 33\ in$

$L_{padtension} := if\left(L_{pad} > L_{dh}, "Okay", "No\ Good"\right)$ $L_{padtension} = "Okay"$

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

TIE SIZE AND SPACING IN COLUMN

Minimum Tie Size:

$Tie_{min} := if(BSpier \le 10, 3, 4)$ $\quad Tie_{min} = 3$

Used #4 Ties $\quad d_{Tie} := 4$

Seismic factor:
(ACI 21.10.5)

$z := if(Z \le 2, 1, 0.5)$ $\quad z = 1$

$s_{lim1} := 16 \cdot d_{bpier} \cdot z$ $\quad s_{lim1} = 18.048\,in$

$s_{lim2} := \frac{48 \cdot d_{Tie} \cdot in}{8} \cdot z$ $\quad s_{lim2} = 24\,in$

$s_{lim3} := D_f z$ $\quad s_{lim3} = 90\,in$

$s_{lim4} := 18in$ $\quad s_{lim4} = 18\,in$

Maximum Spacing:

$$s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) \quad s_{tie} = 18\,in$$

Number of Ties Required:

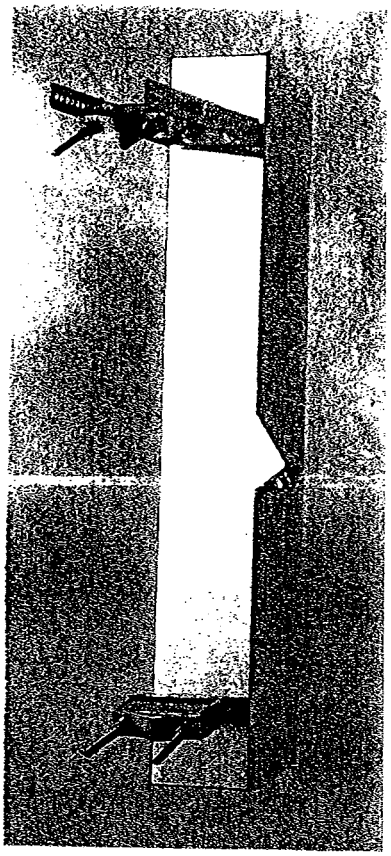
$$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 \quad n_{tie} = 4.3333$$

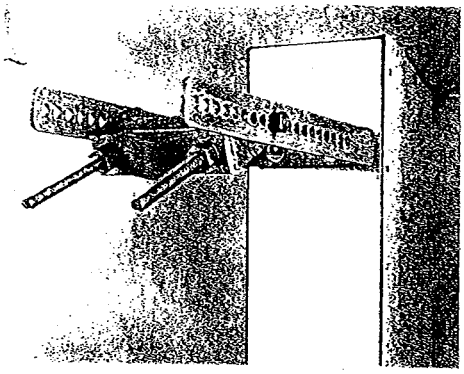
ALP-E 9011-Din

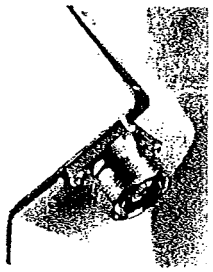
Enhanced Log-Periodic Antenna

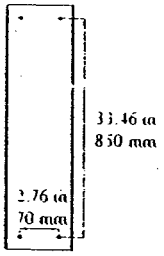
Features:

- ❑ Small Size
- ❑ Aesthetically Pleasing
- ❑ Suitable For TDMA/CDMA
- ❑ High Return Loss
- ❑ Low Intermodulation
- ❑ High FTB
- ❑ Broadbanded
- ❑ Side-lobe Suppression
- ❑ Sturdy Design
- ❑ Down-Tilt Brackets Incl.









The distance between the center of the bolts (on the back of the antenna) are shown in the drawing above.

Bolt diameter is: **3/8-16** [comes with lock nut].

Frequency Range:	800-900 MHz
Impedance:	50 ohm
Connector Type:	7/16 Din
Return Loss:	20 dB
Polarization:	Vertical
Gain:	> 11 dBd
Front To Back Ratio:	> 30 dB
Side-Lobe Suppression:	18 dB
Intermodulation (2x25W):	IM3 > 146 dB
	IM5 > 153 dB
	IM7/9 > 163 dB
Power Rating:	500 W
H-Plane (-3 dB point):	85 - 92°
V-Plane (-3 dB point):	16 - 18°
Lightning Protection:	DC Grounded

Overall Height:	43 in	[1092 mm]
Width:	6.5 in	[165 mm]
Depth:	8 in	[203 mm]
Weight Including Tilt-Brackets:	20 lbs	[9.1 Kg]
Rated Wind Velocity:	113 mph	[180 Km/h]
Wind Area (CxA/Side):	2.3 sq. ft.	[0.22 sq.m]
Lateral Thrust At Rated Wind Worst Case:	112 lbs	[500 N]

Radiating Elements:	Aluminum
Extrusion:	Aluminum
Radome:	Grey PVC
Tilt-Bracket:	Hot Dip Galvanized Steel
Antenna Bolts:	Stainless Steel

The ALP-E 9011-Din is made in U.S.A.

Vertically Polarized, Panel 90° / 11.5 dBd

WPA-80090/4CF ____

When ordering, replace "___" with connector type.

Mechanical specifications

	Length	1205 mm	47.4	in
	Width	205 mm	8.1	in
	Depth	145 mm	5.7	in
4)	Weight	5.4 kg	12.0	lbs
	Wind Area			
	Front	0.25 m^2	2.66	ft^2
	Side	0.17 m^2	1.88	ft^2
	Rated Wind Velocity (Safety factor 2.0)			
		>679 km/hr	>422	mph
	Wind load @ 100 mph (161 km/hr)			
	Front	362 N	81.4	lbs
	Side	264 N	59.4	lbs

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

Mounting & Downtilting:

Mounting brackets attach to a pipe diameter of Ø50-127 mm (2.0-5.0 in).

Mounting bracket kit #36210002

Downtilt bracket kit #36114003

Electrical specifications

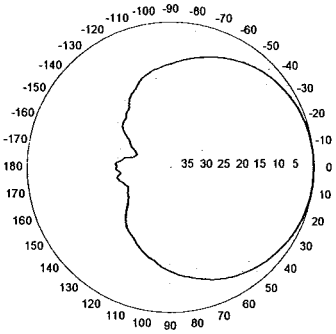
	Frequency Range	806-960 MHz
	Impedance	50Ω
3)	Connector	NE, E-DIN
1)	VSWR	≤1.4:1
	Polarization	Vertical
1)	Gain	11.5 dBd
2)	Power Rating	500 W
1)	Half Power Angle	
	H-Plane	90°
	E-Plane	15°
1)	Electrical Downtilt	0°
1)	Null Fill	10%
	Lightning Protection	Direct Ground

Patented Dipole Design: U.S. Patent No. 6,229,496 B1

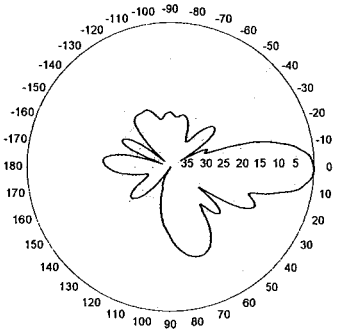
1) Typical Values
2) Power Rating limited by connector only.
3) NE indicates an elongated N Connector.
E-DIN indicates an elongated DIN Connector.
4) The antenna weight listed above does not include the bracket weight.

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

Radiation-pattern[1)]



Horizontal



Vertical

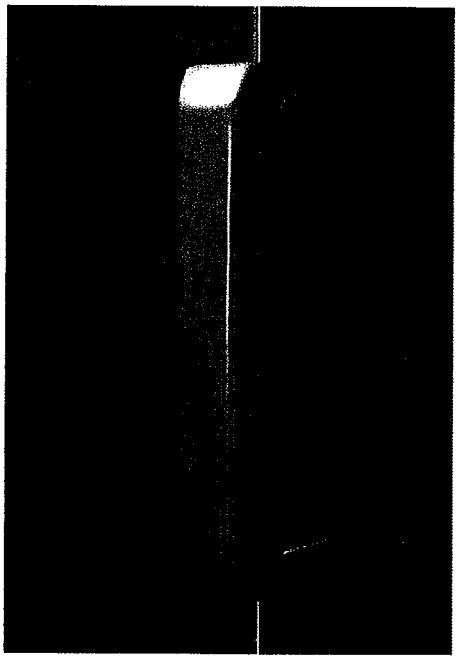
Featuring upper side lobe suppression.

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

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

CF Denotes a Center-Fed Connector.

806-960 MHz



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

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

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

Antenna available with center-fed connector only.

1300 Capital Drive Rockford, IL 61109 Toll-Free (888) 417-9562 Tel. (815) 399-0001
Fax. (815) 399-0156 Email: antel@antelinc.com www.antelinc.com

Amphenol Antel, Inc.
The Antenna Technology Company

Revision Date: 6/3/04

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF EXISTING 102' MONOPOLE FOR NEW ANTENNA ARRANGEMENT

627 Honeyspot Road
Stratford, Connecticut

prepared for

Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

prepared by

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

36931015.00008
VZ1-190

May 15, 2006

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 102' steel monopole structure located at 627 Honeyspot Road in Stratford, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code and the TIA/EIA-222-F standard for wind velocity of 90 mph and 78 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 Section of this report. The proposed Verizon Wireless modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove: **(6) Swedcom ALP-E-9011 antennas** **Install:** **(6) Antel WPA-80090/4CF antennas on the existing platform with the existing (6) 7/8" coax cables within the monopole.**	**Verizon (Proposed)**	**@ 82'**

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the wind load classification specified above and all the existing and proposed antenna loading.**

This analysis is based on:

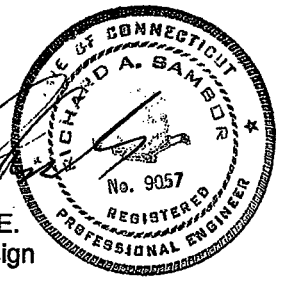
1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry and structural member sizes taken from original construction drawings (EEI Job #: 5553) prepared by Engineered Endeavors, Inc., signed and sealed September 10, 1999.
3) Antenna and mount configuration as specified on the following page of this report.

This report is only valid as 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 assumption of the antenna and mount configuration as well as the physical condition of the tower. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

URS Corporation



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

RAS/jek

cc: AA, DR, IA, CF/Book – URS

2. INTRODUCTION

The subject tower is located at 627 Honeyspot Road in Stratford, Connecticut. The structure is a 102' steel monopole designed by EEI, Inc.

The tower geometry and structure member sizes were taken from the original construction drawings (EEI Job #: 5553) prepared by Engineered Endeavors, Inc., signed and sealed September 10, 1999.

The inventory is summarized in the table below:

Antenna Type	Carrier	Mount	Antenna Centerline Elevation	Cable
(3) Decibel 978QNB120E-M antennas	Cingular Blue (existing)	Flush Mounts	102'	(12) 7/8" coax cables (within monopole)
(6) Powerwave 7770.00 antennas, (3) DB844 antennas, and (12) LGP21401 TMA's	Cingular (existing)	Platform w/handrails	92'	(12) 1 1/4" coax cables (within monopole)
(6) Decibel DB948F85T2E-M antennas	Verizon (existing)	Platform w/handrails	82'	(6) 7/8" coax cables (within monopole)
(6) Antel WPA-80090/4CF antennas	**Verizon (proposed)**	Platform w/handrails (listed above)	**82'**	(6) 7/8" coax cables (within monopole)
(9) Decibel 950G85VTZE-M antennas	Sprint (existing and future)	(3) T-Arm Mounts	72'	(9) 7/8" coax cables (outside monopole)
(3) EMS FQ65-11-XXXA2 antennas	Nextel (existing)	Flush Mounts	54'	(12) 7/8" coax cables (within monopole)
(1) 20' x 3" diameter antenna	(existing)	T-Arm Mount	43'	---
(2) 12' x 3" diameter antennas	(existing)	T-Arm Mount (listed above)	39'	---
(3) 10' x 3" diameter antennas	(existing)	T-Arm Mount (listed above)	38'	---
(1) GPS antenna	(existing)	T-Arm Mount (listed above)	33'	---

This structural analysis of the communications tower was performed by URS Corporation (URS) for Verizon. The purpose of this analysis was to investigate the structural integrity of the existing tower with its existing and proposed antenna loads. This analysis was conducted to evaluate stress on the tower and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

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 = 90 mph Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 78 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 tower members were increased by one-third.

4. FINDINGS AND EVALUATION

Combined axial and bending stresses on the 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 load condition are provided in section 6 of this report. The anchor bolts and base plate were found to be within allowable limits. No further analysis was conducted on the foundation since the shear and the moment at the top of the foundation were below the original design.

5. CONCLUSIONS

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are structurally adequate under the TIA/EIA-222-F wind load classification specified above and the 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 unless specified otherwise.

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.

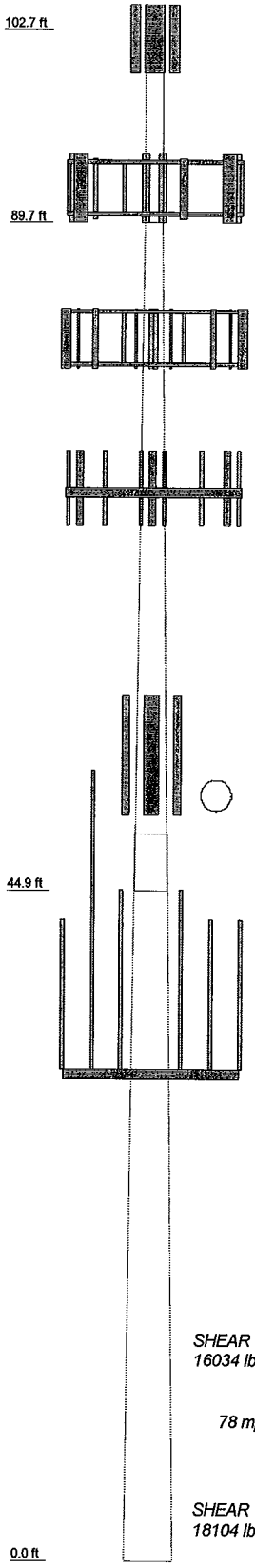
The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire 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

Section	1	2	3
Length (ft)	12.92	44.80	48.78
Number of Sides	1	18	18
Thickness (in)	0.2500	0.2500	0.3125
Lap Splice (ft)		3.85	
Top Dia (in)	13.0000	13.0000	25.1072
Bot Dia (in)	13.0000	26.7925	40.0000
Grade	A53-B-35		A572-65
Weight (lb)	440.0	2376.5	5308.1

Total Weight: 8124.7



AXIAL
21409 lb
SHEAR
16034 lb
MOMENT
1123666 lb-ft
TORQUE 4798 lb-ft
78 mph WIND - 0.5000 in ICE

AXIAL
16623 lb
SHEAR
18104 lb
MOMENT
1244292 lb-ft
TORQUE 4563 lb-ft
REACTIONS - 90 mph WIND

APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
978QNB120E-M w/Mount Pipe (Cingular Blue)	102	DB948F85T2E-M (Verizon)	82
978QNB120E-M w/Mount Pipe (Cingular Blue)	102	WPA-80090/4CF (Verizon)	82
978QNB120E-M w/Mount Pipe (Cingular Blue)	102	WPA-80090/4CF (Verizon)	82
12' Platform w / handrails (Cingular)	92	DB948F85T2E-M (Verizon)	82
(2) 7770.00 (Cingular)	92	DB948F85T2E-M (Verizon)	82
(4) LPG21401 TMA (Cingular)	92	WPA-80090/4CF (Verizon)	82
DB844 without screen (Cingular)	92	12' T-Frame (Sprint)	72
(2) 7770.00 (Cingular)	92	12' T-Frame (Sprint)	72
(4) LPG21401 TMA (Cingular)	92	12' T-Frame (Sprint)	72
DB844 without screen (Cingular)	92	(3) 950G65VTZE-M (Sprint)	72
(2) 7770.00 (Cingular)	92	(3) 950G65VTZE-M (Sprint)	72
(4) LPG21401 TMA (Cingular)	92	(3) 950G65VTZE-M (Sprint)	72
DB844 without screen (Cingular)	92	FQ65-11-XXXA2 w/ mount pipe (Nextel)	54
12' Platform w / handrails (Verizon)	82	FQ65-11-XXXA2 w/ mount pipe (Nextel)	54
WPA-80090/4CF (Verizon)	82	FQ65-11-XXXA2 w/ mount pipe (Nextel)	54
DB948F85T2E-M (Verizon)	82	3" Dia 20' Omni	53 - 33
DB948F85T2E-M (Verizon)	82	12' x 3" Dia Omni	45 - 33
WPA-80090/4CF (Verizon)	82	12' x 3" Dia Omni	45 - 33
WPA-80090/4CF (Verizon)	82	10' x 3" Dia Omni	43 - 33
DB948F85T2E-M (Verizon)	82	10' x 3" Dia Omni	43 - 33
		10' x 3" Dia Omni	43 - 33
		12' T-Frame	33
		GPS	33

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A572-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 78 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 85.4%

URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Phone: (860) 529-8882
FAX: (860) 529-3991

Job:	***102' EEI Monopole, Stratford, CT***		
Project:	***627 Honeyspot Road***		
Client: Verizon Wireless	Drawn by: JEK	App'd:	
Code: TIA/EIA-222-F	Date: 05/15/06	Scale: NTS	
Path: P:\08\ERI Files\102'.EEI.monopole.eri		Dwg No. E-1	

ERI TOWER DETAILED OUTPUT

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 90 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 78 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 pole 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				

Tapered Pole Section Geometry

Section	*Elevation*	*Section Length*	*Splice Length*	*Number of Sides*	*Top Diameter*	*Bottom Diameter*	*Wall Thickness*	*Bend Radius*	*Pole Grade*
	ft	*ft*	*ft*		*in*	*in*	*in*	*in*	
L1	102.65-89.73	12.92	0.00	Round	13.0000	13.0000	0.2500		A53-B-35 (35 ksi)
L2	89.73-44.93	44.80	3.85	18	13.0000	26.7925	0.2500	1.0000	A572-65 (65 ksi)
L3	44.93-0.00	48.78		18	25.1072	40.0000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	13.0000	10.0087	203.6400	4.5135	6.5000	31.3292	406.7253	5.0039	0.0000	0
	13.0000	10.0087	203.6400	4.5135	6.5000	31.3292	406.7253	5.0039	0.0000	0
L2	13.2005	10.1171	207.7854	4.5263	6.6040	31.4636	415.8441	5.0595	1.8480	7.392
	27.2058	21.0615	1874.6054	9.4226	13.6106	137.7314	3751.6774	10.5327	4.2755	17.102
L3	26.6881	24.5933	1910.1670	8.8021	12.7545	149.7646	3822.8474	12.2990	3.8689	12.38
	40.6171	39.3650	7833.4959	14.0891	20.3200	385.5067	15677.2994	19.6863	6.4900	20.768

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
L1 102.65-89.73				1	1	1		
L2 89.73-44.93				1	1	1		
L3 44.93-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
7/8 (Cingular Blue)	C	No	Inside Pole	102.00 - 30.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1 1/4 (Cingular)	C	No	Inside Pole	92.00 - 6.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
7/8 (Verizon)	C	No	Inside Pole	82.00 - 30.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
7/8 (Sprint)	C	No	CaAa (Out Of Face)	72.00 - 30.00	1	No Ice	0.11	0.54
						1/2" Ice	0.21	1.52
7/8 (Sprint)	C	No	CaAa (Out Of Face)	72.00 - 30.00	8	No Ice	0.00	0.54
						1/2" Ice	0.00	1.52
7/8 (Nextel)	C	No	Inside Pole	54.00 - 30.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	102.65-89.73	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	97.49
L2	89.73-44.93	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	3.005	1075.67
L3	44.93-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.657	671.12

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	102.65-89.73	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	97.49
L2	89.73-44.93	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	5.712	1314.42
L3	44.93-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	3.150	802.81

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
978QNB120E-M w/Mount Pipe	A	From Face	1.00 0.00	0.0000	102.00	No Ice 1/2" Ice	9.13 9.85	5.48 6.57	65.55 128.40
(Cingular Blue)			0.00						
978QNB120E-M w/Mount Pipe	B	From Face	1.00 0.00	0.0000	102.00	No Ice 1/2" Ice	9.13 9.85	5.48 6.57	65.55 128.40
(Cingular Blue)			0.00						
978QNB120E-M w/Mount Pipe	C	From Face	1.00 0.00	0.0000	102.00	No Ice 1/2" Ice	9.13 9.85	5.48 6.57	65.55 128.40
(Cingular Blue)			0.00						
12' Platform w / handrails (Cingular)	C	None		0.0000	92.00	No Ice 1/2" Ice	26.30 35.60	26.30 35.60	1920.00 2340.00
(2) 7770.00 (Cingular)	A	From Face	3.00 0.00	0.0000	92.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	35.00 67.63
			0.00						
(4) LPG21401 TMA (Cingular)	A	From Face	3.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	17.50 23.31
			0.00						
DB844 without screen (Cingular)	A	From Face	3.00 -2.00	0.0000	92.00	No Ice 1/2" Ice	3.06 3.39	3.73 4.10	20.00 46.30
			0.00						
(2) 7770.00 (Cingular)	B	From Face	3.00 0.00	0.0000	92.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	35.00 67.63
			0.00						
(4) LPG21401 TMA (Cingular)	B	From Face	3.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	17.50 23.31
			0.00						
DB844 without screen (Cingular)	B	From Face	3.00 -2.00	0.0000	92.00	No Ice 1/2" Ice	3.06 3.39	3.73 4.10	20.00 46.30
			0.00						
(2) 7770.00 (Cingular)	C	From Face	3.00 0.00	0.0000	92.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	35.00 67.63
			0.00						
(4) LPG21401 TMA (Cingular)	C	From Face	3.00 0.00	0.0000	92.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	17.50 23.31
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
DB844 without screen (Cingular)	C	From Face	3.00 -2.00 0.00	0.0000	92.00	No Ice 1/2" Ice	3.06 3.39	3.73 4.10	20.00 46.30
12' Platform w / handrails (Verizon)	C	None		0.0000	82.00	No Ice 1/2" Ice	26.30 35.60	26.30 35.60	1920.00 2340.00
WPA-80090/4CF (Verizon)	A	From Face	3.00 -6.00 0.00	0.0000	82.00	No Ice 1/2" Ice	3.73 4.10	2.71 3.01	12.00 36.71
DB948F85T2E-M (Verizon)	A	From Face	3.00 -4.00 0.00	0.0000	82.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	8.50 27.57
DB948F85T2E-M (Verizon)	A	From Face	3.00 4.00 0.00	0.0000	82.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	8.50 27.57
WPA-80090/4CF (Verizon)	A	From Face	3.00 6.00 0.00	0.0000	82.00	No Ice 1/2" Ice	3.73 4.10	2.71 3.01	12.00 36.71
WPA-80090/4CF (Verizon)	B	From Face	3.00 -6.00 0.00	0.0000	82.00	No Ice 1/2" Ice	3.73 4.10	2.71 3.01	12.00 36.71
DB948F85T2E-M (Verizon)	B	From Face	3.00 -4.00 0.00	0.0000	82.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	8.50 27.57
DB948F85T2E-M (Verizon)	B	From Face	3.00 4.00 0.00	0.0000	82.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	8.50 27.57
WPA-80090/4CF (Verizon)	B	From Face	3.00 6.00 0.00	0.0000	82.00	No Ice 1/2" Ice	3.73 4.10	2.71 3.01	12.00 36.71
WPA-80090/4CF (Verizon)	C	From Face	3.00 -6.00 0.00	0.0000	82.00	No Ice 1/2" Ice	3.73 4.10	2.71 3.01	12.00 36.71
DB948F85T2E-M (Verizon)	C	From Face	3.00 -4.00 0.00	0.0000	82.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	8.50 27.57
DB948F85T2E-M (Verizon)	C	From Face	3.00 4.00 0.00	0.0000	82.00	No Ice 1/2" Ice	1.92 2.22	3.26 3.62	8.50 27.57
WPA-80090/4CF (Verizon)	C	From Face	3.00 6.00 0.00	0.0000	82.00	No Ice 1/2" Ice	3.73 4.10	2.71 3.01	12.00 36.71
12' T-Frame (Sprint)	A	None		0.0000	72.00	No Ice 1/2" Ice	12.20 17.60	12.20 17.60	360.00 490.00
12' T-Frame (Sprint)	B	None		0.0000	72.00	No Ice 1/2" Ice	12.20 17.60	12.20 17.60	360.00 490.00
12' T-Frame (Sprint)	C	None		0.0000	72.00	No Ice 1/2" Ice	12.20 17.60	12.20 17.60	360.00 490.00
(3) 950G65VTZE-M (Sprint)	A	From Face	3.00 0.00 0.00	0.0000	72.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	10.00 33.58
(3) 950G65VTZE-M (Sprint)	B	From Face	3.00 0.00 0.00	0.0000	72.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	10.00 33.58
(3) 950G65VTZE-M (Sprint)	C	From Face	3.00 0.00 0.00	0.0000	72.00	No Ice 1/2" Ice	3.99 4.37	2.78 3.15	10.00 33.58
FQ65-11-XXXA2 w/ mount	A	From Face	1.00	0.0000	54.00	No Ice	11.61	10.02	82.72

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
pipe			0.00			1/2" Ice	12.28	11.49	172.00
(Nextel)			0.00						
FQ65-11-XXXA2 w/ mount	B	From Face	1.00	0.0000	54.00	No Ice	11.61	10.02	82.72
pipe			0.00			1/2" Ice	12.28	11.49	172.00
(Nextel)			0.00						
FQ65-11-XXXA2 w/ mount	C	From Face	1.00	0.0000	54.00	No Ice	11.61	10.02	82.72
pipe			0.00			1/2" Ice	12.28	11.49	172.00
(Nextel)			0.00						
12' T-Frame	C	From Face	1.50	0.0000	33.00	No Ice	12.20	12.20	360.00
			0.00			1/2" Ice	17.60	17.60	490.00
			0.00						
10' x 3" Dia Omni	C	From Face	3.00	0.0000	43.00 - 33.00	No Ice	3.00	3.00	30.00
			6.00			1/2" Ice	4.03	4.03	51.79
			0.00						
10' x 3" Dia Omni	C	From Face	3.00	0.0000	43.00 - 33.00	No Ice	3.00	3.00	30.00
			-6.00			1/2" Ice	4.03	4.03	51.79
			0.00						
10' x 3" Dia Omni	C	From Face	3.00	0.0000	43.00 - 33.00	No Ice	3.00	3.00	30.00
			-4.00			1/2" Ice	4.03	4.03	51.79
			0.00						
12' x 3" Dia Omni	C	From Face	3.00	0.0000	45.00 - 33.00	No Ice	3.60	3.60	35.00
			-2.00			1/2" Ice	4.83	4.83	61.06
			0.00						
12' x 3" Dia Omni	C	From Face	3.00	0.0000	45.00 - 33.00	No Ice	3.60	3.60	35.00
			2.00			1/2" Ice	4.83	4.83	61.06
			0.00						
3" Dia 20' Omni	C	From Face	3.00	0.0000	53.00 - 33.00	No Ice	4.00	4.00	55.00
			4.00			1/2" Ice	6.00	6.00	100.00
			0.00						
GPS	C	From Face	3.00	0.0000	33.00	No Ice	1.00	1.00	10.00
			0.00			1/2" Ice	1.50	1.50	15.00
			0.00						

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 102.65-89.73	96.19	1.358	28	13.997	A	0.000	13.997	13.997	100.00	0.000	0.000
					B	0.000	13.997		100.00		
					C	0.000	13.997		100.00		
L2 89.73-44.93	65.26	1.215	25	74.279	A	0.000	74.279	74.279	100.00	0.000	3.005
					B	0.000	74.279		100.00		
					C	0.000	74.279		100.00		
L3 44.93-0.00	20.93	1	21	124.087	A	0.000	124.087	124.087	100.00	0.000	1.657
					B	0.000	124.087		100.00		
					C	0.000	124.087		100.00		

Tower Pressure - With Ice

$G_H = 1.690$

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
L1 102.65-89.73	96.19	1.358	21	0.5000	15.073	A	0.000	15.073	15.073	100.00	0.000	0.000
						B	0.000	15.073		100.00		
						C	0.000	15.073		100.00		
L2 89.73-44.93	65.26	1.215	19	0.5000	78.013	A	0.000	78 013	78.013	100.00	0.000	5.712
						B	0.000	78.013		100.00		
						C	0.000	78.013		100.00		
L3 44.93-0.00	20.93	1	16	0.5000	127.831	A	0.000	127.831	127.831	100.00	0.000	3.150
						B	0.000	127.831		100.00		
						C	0.000	127.831		100.00		

Tower Pressure - Service

$G_H = 1.690$

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
L1 102.65-89.73	96.19	1.358	9	13.997	A	0.000	13.997	13.997	100.00	0.000	0.000
					B	0.000	13.997		100.00		
					C	0.000	13.997		100.00		
L2 89.73-44.93	65.26	1.215	8	74.279	A	0.000	74.279	74.279	100.00	0.000	3.005
					B	0.000	74.279		100.00		
					C	0.000	74.279		100.00		
L3 44.93-0.00	20.93	1	6	124.087	A	0.000	124.087	124.087	100.00	0.000	1.657
					B	0.000	124.087		100.00		
					C	0.000	124.087		100.00		

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.59	1	1	1	13.997	392.86	30.41	C
			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	2172.70	48.50	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	2887.54	64.27	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	240013.12	5453.11		

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

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.59	1	1	1	13.997	392.86	30.41	C
			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	2172.70	48.50	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	2887.54	64.27	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	240013.12 lb-ft	5453.11		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.59	1	1	1	13.997	392.86	30.41	C
			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	2172.70	48.50	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	2887.54	64.27	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	240013.12 lb-ft	5453.11		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.59	1	1	1	13.997	392.86	30.41	C
			B	1	0.59	1	1	1	13.997			
			C	1	0.59	1	1	1	13.997			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	2172.70	48.50	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	2887.54	64.27	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	240013.12 lb-ft	5453.11		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	546.52	A	1	0.59	1	1	1	15.073	317.31	24.56	C
			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2 89.73-44.93	1314.42	2940.44	A	1	0.65	1	1	1	78.013	1792.64	40.01	C
			B	1	0.65	1	1	1	78.013			
			C	1	0.65	1	1	1	78.013			
L3 44.93-0.00	802.81	6240.99	A	1	0.65	1	1	1	127.831	2268.97	50.50	C
			B	1	0.65	1	1	1	127.831			
			C	1	0.65	1	1	1	127.831			
Sum Weight:	2214.72	9727.94						OTM	194996.84 lb-ft	4378.91		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	546.52	A	1	0.59	1	1	1	15.073	317.31	24.56	C
			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2 89.73-44.93	1314.42	2940.44	A	1	0.65	1	1	1	78.013	1792.64	40.01	C
			B	1	0.65	1	1	1	78.013			
			C	1	0.65	1	1	1	78.013			
L3 44.93-0.00	802.81	6240.99	A	1	0.65	1	1	1	127.831	2268.97	50.50	C
			B	1	0.65	1	1	1	127.831			
			C	1	0.65	1	1	1	127.831			
Sum Weight:	2214.72	9727.94						OTM	194996.84 lb-ft	4378.91		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	546.52	A	1	0.59	1	1	1	15.073	317.31	24.56	C
			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2 89.73-44.93	1314.42	2940.44	A	1	0.65	1	1	1	78.013	1792.64	40.01	C
			B	1	0.65	1	1	1	78.013			
			C	1	0.65	1	1	1	78.013			
L3 44.93-0.00	802.81	6240.99	A	1	0.65	1	1	1	127.831	2268.97	50.50	C
			B	1	0.65	1	1	1	127.831			
			C	1	0.65	1	1	1	127.831			
Sum Weight:	2214.72	9727.94						OTM	194996.84 lb-ft	4378.91		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	546.52	A	1	0.59	1	1	1	15.073	317.31	24.56	C
			B	1	0.59	1	1	1	15.073			
			C	1	0.59	1	1	1	15.073			
L2 89.73-44.93	1314.42	2940.44	A	1	0.65	1	1	1	78.013	1792.64	40.01	C
			B	1	0.65	1	1	1	78.013			
			C	1	0.65	1	1	1	78.013			
L3 44.93-0.00	802.81	6240.99	A	1	0.65	1	1	1	127.831	2268.97	50.50	C
			B	1	0.65	1	1	1	127.831			
			C	1	0.65	1	1	1	127.831			
Sum Weight:	2214.72	9727.94						OTM	194996.84 lb-ft	4378.91		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.594	1	1	1	13.997	122.08	9.45	C
			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	670.59	14.97	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	891.22	19.84	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	74157.72 lb-ft	1683.88		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.594	1	1	1	13.997	122.08	9.45	C
			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	670.59	14.97	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	891.22	19.84	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	74157.72 lb-ft	1683.88		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.594	1	1	1	13.997	122.08	9.45	C
			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	670.59	14.97	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	891.22	19.84	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	74157.72 lb-ft	1683.88		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 102.65-89.73	97.49	440.02	A	1	0.594	1	1	1	13.997	122.08	9.45	C
			B	1	0.594	1	1	1	13.997			
			C	1	0.594	1	1	1	13.997			
L2 89.73-44.93	1075.67	2376.50	A	1	0.65	1	1	1	74.279	670.59	14.97	C
			B	1	0.65	1	1	1	74.279			
			C	1	0.65	1	1	1	74.279			
L3 44.93-0.00	671.12	5308.14	A	1	0.65	1	1	1	124.087	891.22	19.84	C
			B	1	0.65	1	1	1	124.087			
			C	1	0.65	1	1	1	124.087			
Sum Weight:	1844.28	8124.66						OTM	74157.72 lb-ft	1683.88		

ERITower	Job: 102' EEI Monopole, Stratford, CT	Page: 11 of 18
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project: 627 Honeyspot Road	Date: 11:19:55 05/15/06
	Client: Verizon Wireless	Designed by: JEK

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	8124.66					
Bracing Weight	0.00					
Total Member Self-Weight	8124.66			1972.79	142.35	
Total Weight	16611.75			1972.79	142.35	
Wind 0 deg - No Ice		0.00	-18104.07	-1208287.79	142.35	-283.34
Wind 30 deg - No Ice		9052.04	-15678.59	-1046143.61	-604987.94	2031.41
Wind 45 deg - No Ice		12801.51	-12801.51	-853810.67	-855641.11	3019.52
Wind 60 deg - No Ice		15678.59	-9052.04	-603157.50	-1047974.05	3801.85
Wind 90 deg - No Ice		18104.07	0.00	1972.79	-1210118.23	4553.58
Wind 120 deg - No Ice		15678.59	9052.04	607103.08	-1047974.05	4085.19
Wind 135 deg - No Ice		12801.51	12801.51	857756.25	-855641.11	3420.22
Wind 150 deg - No Ice		9052.04	15678.59	1050089.20	-604987.94	2522.17
Wind 180 deg - No Ice		0.00	18104.07	1212233.37	142.35	283.34
Wind 210 deg - No Ice		-9052.04	15678.59	1050089.20	605272.64	-2031.41
Wind 225 deg - No Ice		-12801.51	12801.51	857756.25	855925.81	-3019.52
Wind 240 deg - No Ice		-15678.59	9052.04	607103.08	1048258.75	-3801.85
Wind 270 deg - No Ice		-18104.07	0.00	1972.79	1210402.93	-4553.58
Wind 300 deg - No Ice		-15678.59	-9052.04	-603157.50	1048258.75	-4085.19
Wind 315 deg - No Ice		-12801.51	-12801.51	-853810.67	855925.81	-3420.22
Wind 330 deg - No Ice		-9052.04	-15678.59	-1046143.61	605272.64	-2522.17
Member Ice	1603.28					
Total Weight Ice	21388.69			3065.15	269.85	
Wind 0 deg - Ice		0.00	-16034.04	-1078205.60	269.85	-369.84
Wind 30 deg - Ice		8017.02	-13885.89	-933342.79	-540365.52	2070.01
Wind 45 deg - Ice		11337.78	-11337.78	-761508.73	-764304.03	3118.88
Wind 60 deg - Ice		13885.89	-8017.02	-537570.23	-936138.09	3955.20
Wind 90 deg - Ice		16034.04	0.00	3065.15	-1081000.90	4780.60
Wind 120 deg - Ice		13885.89	8017.02	543700.52	-936138.09	4325.04
Wind 135 deg - Ice		11337.78	11337.78	767639.03	-764304.03	3641.91
Wind 150 deg - Ice		8017.02	13885.89	939473.08	-540365.52	2710.59
Wind 180 deg - Ice		0.00	16034.04	1084335.90	269.85	369.84
Wind 210 deg - Ice		-8017.02	13885.89	939473.08	540905.22	-2070.01
Wind 225 deg - Ice		-11337.78	11337.78	767639.03	764843.73	-3118.88
Wind 240 deg - Ice		-13885.89	8017.02	543700.52	936677.79	-3955.20
Wind 270 deg - Ice		-16034.04	0.00	3065.15	1081540.60	-4780.60
Wind 300 deg - Ice		-13885.89	-8017.02	-537570.23	936677.79	-4325.04
Wind 315 deg - Ice		-11337.78	-11337.78	-761508.73	764843.73	-3641.91
Wind 330 deg - Ice		-8017.02	-13885.89	-933342.79	540905.22	-2710.59
Total Weight	16611.75			1972.79	142.35	
Wind 0 deg - Service		0.00	-5588.50	-371644.02	142.35	-87.45
Wind 30 deg - Service		2794.25	-4839.79	-321588.86	-186666.06	626.98
Wind 45 deg - Service		3951.67	-3951.67	-262214.19	-264044.63	931.95
Wind 60 deg - Service		4839.79	-2794.25	-184835.61	-323419.30	1173.41
Wind 90 deg - Service		5588.50	0.00	1972.79	-373474.46	1405.43
Wind 120 deg - Service		4839.79	2794.25	188781.20	-323419.30	1260.86
Wind 135 deg - Service		3951.67	3951.67	266159.77	-264044.63	1055.62
Wind 150 deg - Service		2794.25	4839.79	325534.44	-186666.06	778.45
Wind 180 deg - Service		0.00	5588.50	375589.60	142.35	87.45
Wind 210 deg - Service		-2794.25	4839.79	325534.44	186950.76	-626.98
Wind 225 deg - Service		-3951.67	3951.67	266159.77	264329.33	-931.95
Wind 240 deg - Service		-4839.79	2794.25	188781.20	323704.00	-1173.41
Wind 270 deg - Service		-5588.50	0.00	1972.79	373759.16	-1405.43
Wind 300 deg - Service		-4839.79	-2794.25	-184835.61	323704.00	-1260.86
Wind 315 deg - Service		-3951.67	-3951.67	-262214.19	264329.33	-1055.62

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Wind 330 deg - Service		-2794.25	-4839.79	-321588.86	186950.76	-778.45

Load Combinations

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

Comb. No.	Description
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	102.65 - 89.73	Pole	Max Tension	10	0.00	-0.03	0.00
			Max. Compression	18	-4193.68	0.28	-2.10
			Max. Mx	14	-2671.01	24072.11	-6.67
			Max. My	10	-2670.65	0.70	-24072.75
			Max. Vy	14	-5054.18	24072.11	-6.67
			Max. Vx	10	5054.36	0.70	-24072.75
			Max. Torque	23			0.04
L2	89.73 - 44.93	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-13037.34	91.15	-136.15
			Max. Mx	14	-9043.62	441829.16	-164.08
			Max. My	10	-9042.64	53.08	-441848.50
			Max. Vy	14	-14214.40	441829.16	-164.08
			Max. Vx	10	14215.03	53.08	-441848.50
			Max. Torque	33			277.23
L3	44.93 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-21408.65	279.52	-3142.05
			Max. Mx	14	-16605.62	1242421.20	-2011.56
			Max. My	10	-16605.59	146.04	-1244291.92
			Max. Vy	14	-18119.79	1242421.20	-2011.56
			Max. Vx	10	18119.81	146.04	-1244291.92
			Max. Torque	31			4801.19

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	27	21408.65	-0.00	-16034.05
	Max. H_x	14	16622.75	18104.07	-0.00
	Max. H_z	2	16622.75	0.00	18104.07
	Max. M_x	2	1240257.31	0.00	18104.07
	Max. M_z	6	1242128.06	-18104.07	-0.00
	Max. Torsion	31	4797.54	16034.05	-0.00
	Min. Vert	1	16622.75	0.00	0.00
	Min. H_x	6	16622.75	-18104.07	-0.00
	Min. H_z	10	16622.75	0.00	-18104.07
	Min. M_x	10	-1244291.92	0.00	-18104.07
	Min. M_z	14	-1242421.20	18104.07	-0.00
	Min. Torsion	23	-4797.54	-16034.05	-0.00

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Dead Only	16622.75	0.00	0.00	1972.79	142.35	0.00
Dead+Wind 0 deg - No Ice	16622.75	-0.00	-18104.07	-1240257.31	145.96	-281.81
Dead+Wind 30 deg - No Ice	16622.75	9052.04	-15678.59	-1073826.83	-620988.85	2037.30
Dead+Wind 45 deg - No Ice	16622.75	12801.51	-12801.51	-876407.77	-878272.02	3027.03
Dead+Wind 60 deg - No Ice	16622.75	15678.59	-9052.04	-619125.79	-1075693.14	3810.48
Dead+Wind 90 deg - No Ice	16622.75	18104.07	0.00	2010.23	-1242128.06	4562.69
Dead+Wind 120 deg - No Ice	16622.75	15678.59	9052.04	623149.75	-1075699.30	4092.27
Dead+Wind 135 deg - No Ice	16622.75	12801.51	12801.51	880435.28	-878279.14	3425.53
Dead+Wind 150 deg - No Ice	16622.75	9052.04	15678.59	1077857.89	-620995.02	2525.35
Dead+Wind 180 deg - No Ice	16622.75	-0.00	18104.07	1244291.92	145.96	281.80
Dead+Wind 210 deg - No Ice	16622.75	-9052.04	15678.59	1077858.43	621287.23	-2037.26
Dead+Wind 225 deg - No Ice	16622.75	-12801.51	12801.51	880435.89	878571.66	-3027.01
Dead+Wind 240 deg - No Ice	16622.75	-15678.59	9052.04	623150.28	1075992.14	-3810.47
Dead+Wind 270 deg - No Ice	16622.75	-18104.07	0.00	2010.22	1242421.20	-4562.69
Dead+Wind 300 deg - No Ice	16622.75	-15678.59	-9052.04	-619126.33	1075985.98	-4092.28
Dead+Wind 315 deg - No Ice	16622.75	-12801.51	-12801.51	-876408.39	878564.55	-3425.57
Dead+Wind 330 deg - No Ice	16622.75	-9052.04	-15678.59	-1073827.36	621281.08	-2525.40
Dead+Ice+Temp	21408.65	-0.00	0.00	3142.05	279.52	-0.01
Dead+Wind 0 deg+Ice+Temp	21408.65	0.00	-16034.05	-1117340.76	280.13	-368.19
Dead+Wind 30 deg+Ice+Temp	21408.65	8017.02	-13885.89	-967223.63	-559967.51	2079.94
Dead+Wind 45 deg+Ice+Temp	21408.65	11337.78	-11337.78	-789156.97	-792030.56	3132.05
Dead+Wind 60 deg+Ice+Temp	21408.65	13885.89	-8017.02	-557095.43	-970099.81	3970.71
Dead+Wind 90 deg+Ice+Temp	21408.65	16034.05	0.00	3153.68	-1120222.52	4797.54
Dead+Wind 120 deg+Ice+Temp	21408.65	13885.89	8017.02	563407.34	-970107.69	4338.86
Dead+Wind 135 deg+Ice+Temp	21408.65	11337.78	11337.78	795473.43	-792039.66	3652.68
Dead+Wind 150 deg+Ice+Temp	21408.65	8017.02	13885.89	973544.64	-559975.40	2717.57
Dead+Wind 180 deg+Ice+Temp	21408.65	0.00	16034.05	1123666.31	280.12	368.16
Dead+Wind 210 deg+Ice+Temp	21408.65	-8017.02	13885.89	973545.44	560536.10	-2079.90
Dead+Wind 225 deg+Ice+Temp	21408.65	-11337.78	11337.78	795474.36	792600.83	-3132.02
Dead+Wind 240 deg+Ice+Temp	21408.65	-13885.89	8017.02	563408.14	970669.33	-3970.70
Dead+Wind 270 deg+Ice+Temp	21408.65	-16034.05	0.00	3153.67	1120784.62	-4797.54
Dead+Wind 300 deg+Ice+Temp	21408.65	-13885.89	-8017.02	-557096.24	970661.45	-4338.90
Dead+Wind 315 deg+Ice+Temp	21408.65	-11337.78	-11337.78	-789157.91	792591.73	-3652.75
Dead+Wind 330 deg+Ice+Temp	21408.65	-8017.02	-13885.89	-967224.44	560528.23	-2717.67
Dead+Wind 0 deg - Service	16622.75	-0.00	-5588.50	-381866.62	146.99	-87.37
Dead+Wind 30 deg - Service	16622.75	2794.25	-4839.79	-330435.56	-191796.61	630.52
Dead+Wind 45 deg - Service	16622.75	3951.67	-3951.67	-269428.81	-271302.31	936.92
Dead+Wind 60 deg - Service	16622.75	4839.79	-2794.25	-189923.21	-332309.26	1179.46
Dead+Wind 90 deg - Service	16622.75	5588.50	0.00	2020.49	-383740.75	1412.36
Dead+Wind 120 deg - Service	16622.75	4839.79	2794.25	193964.54	-332309.85	1266.82
Dead+Wind 135 deg - Service	16622.75	3951.67	3951.67	273470.47	-271302.99	1060.46
Dead+Wind 150 deg - Service	16622.75	2794.25	4839.79	334477.56	-191797.20	781.83
Dead+Wind 180 deg - Service	16622.75	-0.00	5588.50	385908.97	146.99	87.36
Dead+Wind 210 deg - Service	16622.75	-2794.25	4839.79	334477.62	192091.20	-630.53
Dead+Wind 225 deg - Service	16622.75	-3951.67	3951.67	273470.53	271597.03	-936.92
Dead+Wind 240 deg - Service	16622.75	-4839.79	2794.25	193964.59	332603.92	-1179.47
Dead+Wind 270 deg - Service	16622.75	-5588.50	0.00	2020.49	384034.85	-1412.37
Dead+Wind 300 deg - Service	16622.75	-4839.79	-2794.25	-189923.27	332603.33	-1266.83
Dead+Wind 315 deg - Service	16622.75	-3951.67	-3951.67	-269428.86	271596.35	-1060.47
Dead+Wind 330 deg - Service	16622.75	-2794.25	-4839.79	-330435.61	192090.62	-781.85

Solution Summary

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
1	0.00	-16622.75	0.00	0.00	16622.75	0.00	0.000%
2	0.00	-16622.75	-18104.07	0.00	16622.75	18104.07	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
3	9052.04	-16622.75	-15678.59	-9052.04	16622.75	15678.59	0.000%
4	12801.51	-16622.75	-12801.51	-12801.51	16622.75	12801.51	0.000%
5	15678.59	-16622.75	-9052.04	-15678.59	16622.75	9052.04	0.000%
6	18104.07	-16622.75	0.00	-18104.07	16622.75	-0.00	0.000%
7	15678.59	-16622.75	9052.04	-15678.59	16622.75	-9052.04	0.000%
8	12801.51	-16622.75	12801.51	-12801.51	16622.75	-12801.51	0.000%
9	9052.04	-16622.75	15678.59	-9052.04	16622.75	-15678.59	0.000%
10	0.00	-16622.75	18104.07	0.00	16622.75	-18104.07	0.000%
11	-9052.04	-16622.75	15678.59	9052.04	16622.75	-15678.59	0.000%
12	-12801.51	-16622.75	12801.51	12801.51	16622.75	-12801.51	0.000%
13	-15678.59	-16622.75	9052.04	15678.59	16622.75	-9052.04	0.000%
14	-18104.07	-16622.75	0.00	18104.07	16622.75	-0.00	0.000%
15	-15678.59	-16622.75	-9052.04	15678.59	16622.75	9052.04	0.000%
16	-12801.51	-16622.75	-12801.51	12801.51	16622.75	12801.51	0.000%
17	-9052.04	-16622.75	-15678.59	9052.04	16622.75	15678.59	0.000%
18	0.00	-21408.65	0.00	0.00	21408.65	-0.00	0.000%
19	0.00	-21408.65	-16034.04	-0.00	21408.65	16034.05	0.000%
20	8017.02	-21408.65	-13885.89	-8017.02	21408.65	13885.89	0.000%
21	11337.78	-21408.65	-11337.78	-11337.78	21408.65	11337.78	0.000%
22	13885.89	-21408.65	-8017.02	-13885.89	21408.65	8017.02	0.000%
23	16034.04	-21408.65	0.00	-16034.05	21408.65	-0.00	0.000%
24	13885.89	-21408.65	8017.02	-13885.89	21408.65	-8017.02	0.000%
25	11337.78	-21408.65	11337.78	-11337.78	21408.65	-11337.78	0.000%
26	8017.02	-21408.65	13885.89	-8017.02	21408.65	-13885.89	0.000%
27	0.00	-21408.65	16034.04	-0.00	21408.65	-16034.05	0.000%
28	-8017.02	-21408.65	13885.89	8017.02	21408.65	-13885.89	0.000%
29	-11337.78	-21408.65	11337.78	11337.78	21408.65	-11337.78	0.000%
30	-13885.89	-21408.65	8017.02	13885.89	21408.65	-8017.02	0.000%
31	-16034.04	-21408.65	0.00	16034.05	21408.65	-0.00	0.000%
32	-13885.89	-21408.65	-8017.02	13885.89	21408.65	8017.02	0.000%
33	-11337.78	-21408.65	-11337.78	11337.78	21408.65	11337.78	0.000%
34	-8017.02	-21408.65	-13885.89	8017.02	21408.65	13885.89	0.000%
35	0.00	-16622.75	-5588.50	0.00	16622.75	5588.50	0.000%
36	2794.25	-16622.75	-4839.79	-2794.25	16622.75	4839.79	0.000%
37	3951.67	-16622.75	-3951.67	-3951.67	16622.75	3951.67	0.000%
38	4839.79	-16622.75	-2794.25	-4839.79	16622.75	2794.25	0.000%
39	5588.50	-16622.75	0.00	-5588.50	16622.75	-0.00	0.000%
40	4839.79	-16622.75	2794.25	-4839.79	16622.75	-2794.25	0.000%
41	3951.67	-16622.75	3951.67	-3951.67	16622.75	-3951.67	0.000%
42	2794.25	-16622.75	4839.79	-2794.25	16622.75	-4839.79	0.000%
43	0.00	-16622.75	5588.50	0.00	16622.75	-5588.50	0.000%
44	-2794.25	-16622.75	4839.79	2794.25	16622.75	-4839.79	0.000%
45	-3951.67	-16622.75	3951.67	3951.67	16622.75	-3951.67	0.000%
46	-4839.79	-16622.75	2794.25	4839.79	16622.75	-2794.25	0.000%
47	-5588.50	-16622.75	0.00	5588.50	16622.75	-0.00	0.000%
48	-4839.79	-16622.75	-2794.25	4839.79	16622.75	2794.25	0.000%
49	-3951.67	-16622.75	-3951.67	3951.67	16622.75	3951.67	0.000%
50	-2794.25	-16622.75	-4839.79	2794.25	16622.75	4839.79	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	0.00013126
3	Yes	5	0.00000001	0.00026397

4	Yes	5	0.00000001	0.00028118
5	Yes	5	0.00000001	0.00024900
6	Yes	4	0.00000001	0.00067250
7	Yes	5	0.00000001	0.00027204
8	Yes	5	0.00000001	0.00028238
9	Yes	5	0.00000001	0.00025239
10	Yes	4	0.00000001	0.00013179
11	Yes	5	0.00000001	0.00025453
12	Yes	5	0.00000001	0.00028219
13	Yes	5	0.00000001	0.00027067
14	Yes	4	0.00000001	0.00067265
15	Yes	5	0.00000001	0.00024801
16	Yes	5	0.00000001	0.00028156
17	Yes	5	0.00000001	0.00026649
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00007133
20	Yes	5	0.00000001	0.00053672
21	Yes	5	0.00000001	0.00059242
22	Yes	5	0.00000001	0.00051014
23	Yes	5	0.00000001	0.00008967
24	Yes	5	0.00000001	0.00055433
25	Yes	5	0.00000001	0.00059675
26	Yes	5	0.00000001	0.00051741
27	Yes	5	0.00000001	0.00007160
28	Yes	5	0.00000001	0.00052215
29	Yes	5	0.00000001	0.00059653
30	Yes	5	0.00000001	0.00055148
31	Yes	5	0.00000001	0.00008971
32	Yes	5	0.00000001	0.00050834
33	Yes	5	0.00000001	0.00059357
34	Yes	5	0.00000001	0.00054251
35	Yes	4	0.00000001	0.00002414
36	Yes	4	0.00000001	0.00042440
37	Yes	4	0.00000001	0.00046896
38	Yes	4	0.00000001	0.00037250
39	Yes	4	0.00000001	0.00010852
40	Yes	4	0.00000001	0.00046012
41	Yes	4	0.00000001	0.00047742
42	Yes	4	0.00000001	0.00038486
43	Yes	4	0.00000001	0.00002449
44	Yes	4	0.00000001	0.00039199
45	Yes	4	0.00000001	0.00047595
46	Yes	4	0.00000001	0.00045448
47	Yes	4	0.00000001	0.00010862
48	Yes	4	0.00000001	0.00037027
49	Yes	4	0.00000001	0.00047182
50	Yes	4	0.00000001	0.00043494

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
L1	102.65 - 89.73	19.585	43	1.7126	0.0044
L2	89.73 - 44.93	14.986	43	1.6682	0.0044
L3	48.78 - 0	4.013	43	0.8051	0.0043

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
102.00	978QNB120E-M w/Mount Pipe	43	19.349	1.7122	0.0044	11111
92.00	12' Platform w / handrails	43	15.773	1.6861	0.0044	5262
82.00	12' Platform w / handrails	43	12.415	1.5597	0.0044	3626
72.00	12' T-Frame	43	9.388	1.3417	0.0043	3009
54.00	FQ65-11-XXXA2 w/ mount pipe	43	4.990	0.9039	0.0043	2301
53.00	3" Dia 20' Omni	43	4.791	0.8832	0.0043	2272
48.00	3" Dia 20' Omni	43	3.880	0.7925	0.0043	2226
45.00	12' x 3" Dia Omni	43	3.398	0.7497	0.0043	2336
43.00	10' x 3" Dia Omni	43	3.103	0.7258	0.0043	2443
39.00	12' x 3" Dia Omni	43	2.571	0.6887	0.0043	2694
38.00	10' x 3" Dia Omni	43	2.449	0.6816	0.0043	2765
33.00	12' T-Frame	43	1.904	0.6571	0.0043	3183

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	102.65 - 89.73	63.083	10	5.5229	0.0149
L2	89.73 - 44.93	48.272	10	5.3800	0.0149
L3	48.78 - 0	12.923	10	2.5938	0.0146

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
102.00	978QNB120E-M w/Mount Pipe	10	62.326	5.5212	0.0149	3511
92.00	12' Platform w / handrails	10	50.808	5.4338	0.0148	1662
82.00	12' Platform w / handrails	10	39.992	5.0584	0.0150	1139
72.00	12' T-Frame	10	30.239	4.4033	0.0152	942
54.00	FQ65-11-XXXA2 w/ mount pipe	10	16.070	2.9730	0.0149	717
53.00	3" Dia 20' Omni	10	15.431	2.8972	0.0149	708
48.00	3" Dia 20' Omni	10	12.494	2.5412	0.0145	693
45.00	12' x 3" Dia Omni	10	10.943	2.3494	0.0142	726
43.00	10' x 3" Dia Omni	10	9.992	2.2306	0.0139	760
39.00	12' x 3" Dia Omni	10	8.277	2.0131	0.0133	837
38.00	10' x 3" Dia Omni	10	7.885	1.9628	0.0132	859
33.00	12' T-Frame	10	6.129	1.7327	0.0123	989

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	12.92	102.65	272.9	2.005	10.0087	-3820.48	20066.80	0.190
L2	89.73 - 44.93 (2)	TP26.7925x13x0.25	44.80	102.65	136.8	7.975	20.1209	-9042.69	160464.00	0.056
L3	44.93 - 0 (3)	TP40x25.1072x0.3125	48.78	102.65	102.3	14.264	33.6362	-13735.80	479773.00	0.029

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	102.65 - 89.73 (1)	TP13x13x0.25	21116.67	-8.088	23.100	0.350	0.00	0.000	23.100	0.000
L2	89.73 - 44.93 (2)	TP26.7925x13x0.25	441865.00	-42.200	39.000	1.082	0.00	0.000	39.000	0.000
L3	44.93 - 0 (3)	TP40x25.1072x0.3125	912800.00	-38.968	39.000	0.999	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	102.65 - 89.73 (1)	TP13x13x0.25	0.190	0.350	0.000	0.541 ✔	1.333	H1-3 ✔
L2	89.73 - 44.93 (2)	TP26.7925x13x0.25	0.056	1.082	0.000	1.138 ✔	1.333	H1-3 ✔
L3	44.93 - 0 (3)	TP40x25.1072x0.3125	0.029	0.999	0.000	1.028 ✔	1.333	H1-3 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L1	102.65 - 89.73	Pole	TP13x13x0.25	1	-3820.48	26749.04	40.5	Pass
L2	89.73 - 44.93	Pole	TP26.7925x13x0.25	2	-9042.69	213898.50	85.4	Pass
L3	44.93 - 0	Pole	TP40x25.1072x0.3125	3	-13735.80	639537.38	77.1	Pass
							Summary	
						Pole (L2)	85.4	Pass
						RATING =	**85.4**	**Pass**

ANCHOR BOLT AND BASE PLATE ANALYSIS

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 1244 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 18.1 \cdot kips$	*user input*
Axial Force:	$Axial := 16.6 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM 615 Grade 75

Number of Anchor Bolts = N	$N := 10$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 48in$	*user input*
Bolt "Column" Distance:	$l := 3in$	*user input*
Bolt Ultimate Strength:	$F_u := 100 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 75 \cdot ksi$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*
Thickness Of Anchor Bolts	$D := 2.25in$	*user input*
Threads per Inch:	$n := 4.5$	*user input*

Base Plate Data:

Plate Yield Strength:	$Fy_{bp} := 60 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 1.75 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 54 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 40in$	*user input*

Geometric Layout Data:

Distance from the center of gravity of the group to bolt in question = d(i)

Radius of Bolt Circle: $R_{bc} := \frac{D_{bc}}{2}$

Distance to Bolts: $i := 1..N$

$$d_i := \left| \begin{array}{l} \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N}\right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{array} \right.$$

$d_1 = 14.11\,in$ $d_7 = -22.83\,in$

$d_2 = 22.83\,in$ $d_8 = -22.83\,in$

$d_3 = 22.83\,in$ $d_9 = -14.11\,in$

$d_4 = 14.11\,in$ $d_{10} = -0.00\,in$

$d_5 = 0.00\,in$ $d_{11} =$ in

$d_6 = -14.11\,in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 20.00\,in$

Moment Arms of Bolts about Neutral Axis: $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00\,in$ $MA_7 = 0.00\,in$

$MA_2 = 2.83\,in$ $MA_8 = 0.00\,in$

$MA_3 = 2.83\,in$ $MA_9 = 0.00\,in$

$MA_4 = 0.00\,in$ $MA_{10} = 0.00\,in$

$MA_5 = 0.00\,in$ $MA_{11} =$ in

$MA_6 = 0.00\,in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := .75 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $EffectiveWidth = 27.21\,in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 2.880 \times 10^3\,\text{in}^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 3.976\,\text{in}^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot\text{in}}{n}\right)^2 \qquad A_n = 3.248\,\text{in}^2$$

Net Diameter:

$$D_n := \frac{2\cdot\sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 2.03\,\text{in}$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.51\,\text{in}$$

Section Modulus of Bolt:

$$S_x := \frac{\pi\cdot D_n^{\,3}}{32} \qquad S_x = 0.826\,\text{in}^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{\text{Shear}}{N}\right)\cdot 1 \qquad M_x = 0.453\,\text{ft}\cdot\text{kips}$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 6.6\,\text{ksi}$$

Allowable Bending

$$F_{bx} := 1.33\cdot 0.60\cdot Fy \qquad F_{bx} = 59.8\,\text{ksi}$$

Note: 1.33 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$AllowableTension := 1.33 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 174.5\,kips$

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N}$ $MaxTension = 122.7\,kips$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.70$$

$$Condition := if\left(\frac{MaxTension}{AllowableTension} \le 1.00, "OK", "Overstressed"\right)$$

$Condition = "OK"$

Check Compression & Combined Stresses (if required):

Check to see if a complete combined stress analysis is required:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

Set the clear space between the plate and bolt to zero and remove bending stresses if a combined stress analysis is not required:

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0.00\,\text{in} & \text{otherwise} \end{cases} \qquad l = 0.00\,\text{in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0.0\,\text{ksi} & \text{otherwise} \end{cases} \qquad f_{bx} = 0.0\,\text{ksi}$$

Allowable Compressive Force:

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{Fy}} \qquad C_c = 87.36$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot Fy}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} \qquad F_a = 45.0\,\text{ksi}$$

$$F_a := 1.33 \cdot F_a \quad \text{Note: 1.33 increase allowed per TIA/EIA} \qquad F_a = 59.9\,\text{ksi}$$

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 126.1\,\text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 38.8\,\text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.65$$

$$\text{Condition} := \text{if}\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right) \qquad \boxed{\text{Condition} = \text{"OK"}}$$

Base Plate Analysis:

Force from Bolt(s):

$$C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$$

$C_1 = 74.8\,kips$ $C_7 = -116.7\,kips$

$C_2 = 120.0\,kips$ $C_8 = -116.7\,kips$

$C_3 = 120.0\,kips$ $C_9 = -71.5\,kips$

$C_4 = 74.8\,kips$ $C_{10} = 1.7\,kips$

$C_5 = 1.7\,kips$ $C_{11} =$ kips

$C_6 = -71.5\,kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2} \qquad f_{bp} = 48.8\,ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.33 \cdot 0.75Fy_{bp}} = 0.82$$

$$Condition := if\left(\frac{f_{bp}}{1.33 \cdot 0.75Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

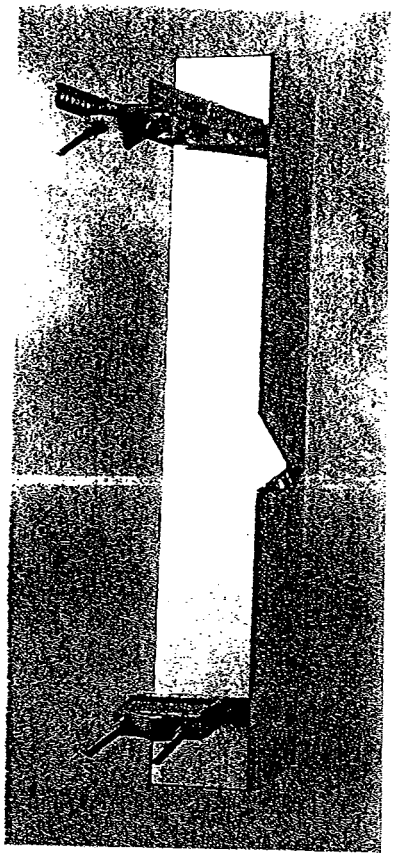
Condition = "OK"

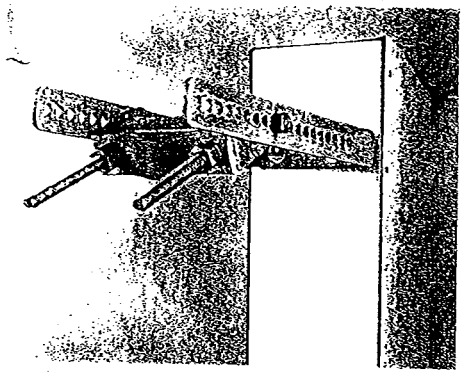
ALP-E 9011-Din

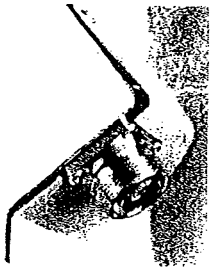
Enhanced Log-Periodic Antenna

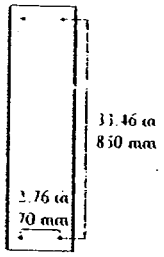
Features:

- ❑ Small Size
- ❑ Aesthetically Pleasing
- ❑ Suitable For TDMA/CDMA
- ❑ High Return Loss
- ❑ Low Intermodulation
- ❑ High FTB
- ❑ Broadbanded
- ❑ Side-lobe Suppression
- ❑ Sturdy Design
- ❑ Down-Tilt Brackets Incl.









The distance between the center of the bolts (on the back of the antenna) are shown in the drawing above.

Bolt diameter is: 3/8-16 [comes with lock nut].

Frequency Range:	800-900 MHz
Impedance:	50 ohm
Connector Type:	7/16 Din
Return Loss:	20 dB
Polarization:	Vertical
Gain:	> 11 dBd
Front To Back Ratio:	> 30 dB
Side-Lobe Suppression:	18 dB
Intermodulation (2x25W):	IM3 > 146 dB
	IM5 > 153 dB
	IM7/9 > 163 dB
Power Rating:	500 W
H-Plane (-3 dB point):	85 - 92°
V-Plane (-3 dB point):	16 - 18°
Lightning Protection:	DC Grounded

Overall Height:	43 in	[1092 mm]
Width:	6.5 in	[165 mm]
Depth:	8 in	[203 mm]
Weight Including Tilt-Brackets:	20 lbs	[9.1 Kg]
Rated Wind Velocity:	113 mph	[180 Km/h]
Wind Area (CxA/Side):	2.3 sq. ft.	[0.22 sq.m]
Lateral Thrust At Rated Wind Worst Case:	112 lbs	[500 N]

Radiating Elements:	Aluminum
Extrusion:	Aluminum
Radome:	Grey PVC
Tilt-Bracket:	Hot Dip Galvanized Steel
Antenna Bolts:	Stainless Steel

The ALP-E 9011-Din is made in U.S.A.

Vertically Polarized, Panel 90° / 11.5 dBd

WPA-80090/4CF ___

When ordering, replace "___" with connector type.

Mechanical specifications

Length	1205 mm	47.4 in
Width	205 mm	8.1 in
Depth	145 mm	5.7 in
[4] Weight	5.4 kg	12.0 lbs
Wind Area		
Front	0.25 m^2	2.66 ft^2
Side	0.17 m^2	1.88 ft^2
Rated Wind Velocity (Safety factor 2.0)		
	>679 km/hr	>422 mph
Wind load @ 100 mph (161 km/hr)		
Front	362 N	81.4 lbs
Side	264 N	59.4 lbs

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

Mounting & Downtilting:

Mounting brackets attach to a pipe diameter of Ø50-127 mm (2.0-5.0 in)

Mounting bracket kit #36210002

Downtilt bracket kit #36114003

Electrical specifications

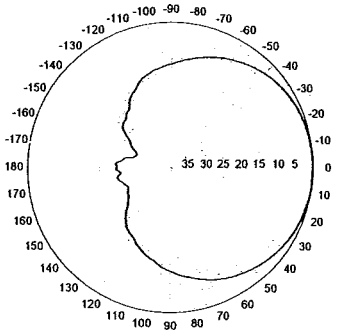
Frequency Range	806-960 MHz
Impedance	50Ω
[3] Connector	NE, E-DIN
[1] VSWR	≤1.4:1
Polarization	Vertical
[1] Gain	11.5 dBd
[2] Power Rating	500 W
[1] Half Power Angle	
H-Plane	90°
E-Plane	15°
[1] Electrical Downtilt	0°
[1] Null Fill	10%
Lightning Protection	Direct Ground

Patented Dipole Design: U.S. Patent No. 6,229,496 B1

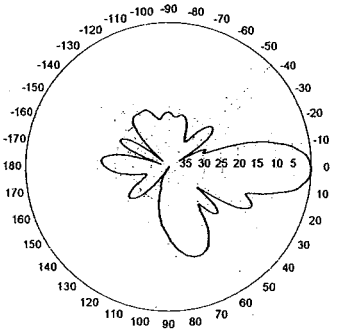
[1] Typical Values
[2] Power Rating limited by connector only.
[3] NE indicates an elongated N Connector.
E-DIN indicates an elongated DIN Connector.
[4] The antenna weight listed above does not include the bracket weight.

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

Radiation-pattern[1]



Horizontal



Vertical

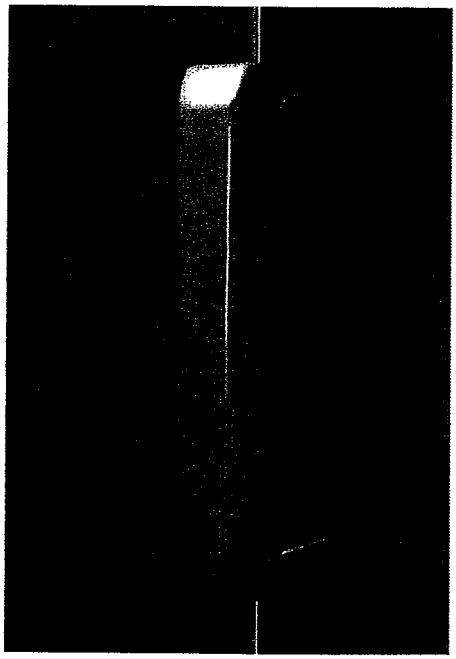
Featuring upper side lobe suppression.

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

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

CF Denotes a Center-Fed Connector.

806-960 MHz



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

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

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

Antenna available with center-fed connector only.

1300 Capital Drive Rockford, IL 61109 Toll-Free (888) 417-9562 Tel. (815) 399-0001
Fax. (815) 399-0156 Email: antel@antelinc.com www.antelinc.com

Amphenol Antel, Inc.
The Antenna Technology Company

Revision Date: 6/3/04

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF EXISTING 96' MONOPOLE FOR NEW ANTENNA ARRANGEMENT

1000 Old County Circle
Windsor Locks, Connecticut

prepared for

verizonwireless

Verizon Wireless
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East Hartford, Connecticut 06108

prepared by

URS

URS CORPORATION
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ROCKY HILL, CT 06067
TEL. 860-529-8882

36931016.00008
VZ1-191

May 5, 2006

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 96' steel monopole structure located at 1000 Old County Circle in Windsor Locks, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code and the TIA/EIA-222-F standard for wind velocity of 80 mph and 69 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 Section of this report. The proposed T-Mobile modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove: **(6) Swedcom ALP-E-9011 antennas** **Install:** **(6) Antel WPA-80090/4CF antennas on the existing low-profile platform with the existing (6) 1 5/8" coax cables within the monopole.**	**Verizon (Proposed)**	**@ 85'-9"**

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the wind load classification specified above and all the existing and proposed antenna loading.**

This analysis is based on:

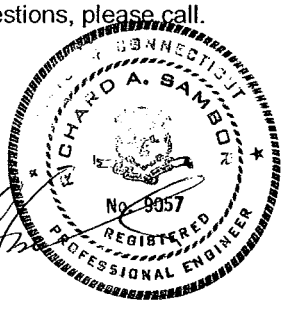
1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry and structural member sizes taken from original construction drawings (EEI Job #: 7485) prepared by Engineered Endeavors, Inc., signed and sealed September 22, 2000.
3) Antenna and mount configuration as specified on the following page of this report.

This report is only valid as 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 assumption of the antenna and mount configuration as well as the physical condition of the tower. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

URS Corporation



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

RAS/jek

cc: AA, DR, IA, CF/Book – URS

2. INTRODUCTION

The subject tower is located at 1000 Old County Circle in Windsor Locks, Connecticut. The structure is a 96' steel monopole designed by EEI, Inc.

The tower geometry and structure member sizes were taken from the original construction drawings (EEI Job #: 7485) prepared by Engineered Endeavors, Inc., signed and sealed September 22, 2000.

The inventory is summarized in the table below:

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(12) Allgon 7184 antennas	Cingular (existing)	Low-Profile Platform	95'-9"	(12) 1 5/8" coax cables (within monopole)
(6) Antel WPA-80090/4CF antennas	**Verizon (proposed)**	Low-Profile Platform	**85'-9"**	(6) 1 5/8" coax cables (within monopole)
(6) Decibel DB948F85T2E-M antennas	Verizon (existing)	Low-Profile Platform (listed above)	85'-9"	(6) 1 5/8" coax cables (within monopole)
(12) Decibel 844H90T6E-XY antennas	Nextel (existing)	Low-Profile Platform	75'-9"	(12) 1 5/8" coax cables (within monopole)
(9) EMS DR65-19-00DPQ antennas and (6) Decibel PCS 1900 TMA's	T-Mobile (existing)	Low-Profile Platform	65'	(24) 7/8" coax cables (within monopole)

This structural analysis of the communications tower was performed by URS Corporation (URS) for Verizon. The purpose of this analysis was to investigate the structural integrity of the existing tower with its existing and proposed antenna loads. This analysis was conducted to evaluate stress on the tower and the effect of forces to the foundation of the tower resulting from existing and proposed antenna arrangements.

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 = 80 mph Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 69 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 tower members were increased by one-third.

4. FINDINGS AND EVALUATION

Combined axial and bending stresses on the 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 load condition are provided in section 6 of this report. The anchor bolts and base plate were found to be within allowable limits. No further analysis was conducted on the foundation since the shear and the moment at the top of the foundation were below the original design.

5. CONCLUSIONS

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are structurally adequate under the TIA/EIA-222-F wind load classification specified above and the 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 unless specified otherwise.

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:

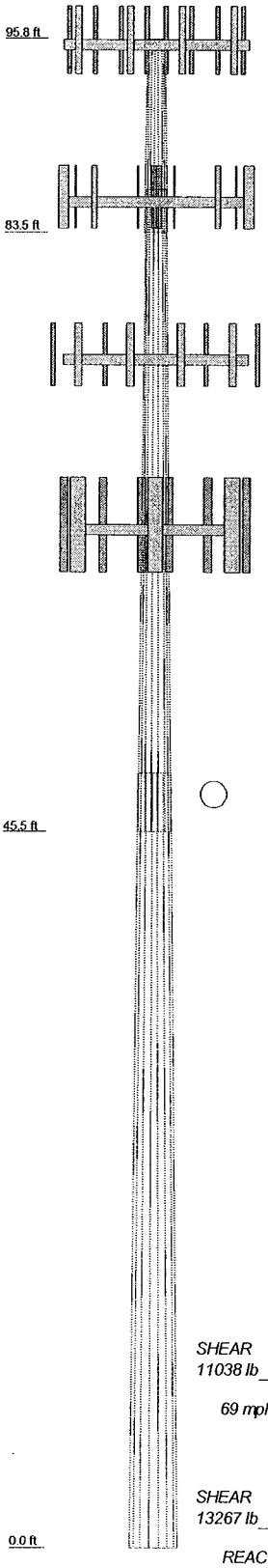
After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

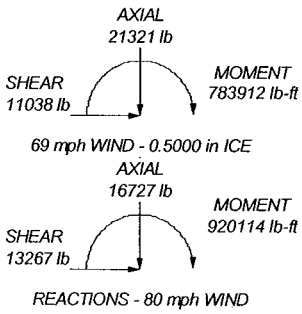
The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire 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

Section	3	2	1
Length (ft)	49.29	40.75	12.28
Number of Sides	18	18	18
Thickness (in)	0.3125	0.2500	0.1875
Lap Splice (ft)		3.82	2.67
Top Dia (in)	25.1121	16.3335	14.2500
Bot Dia (in)	37.5000	26.5722	17.3929
Grade	A572-65		
Weight (lbs)	5155.8	2332.8	388.8
7877.3			





APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
12' Low Profile Platform (Cingular)	95.75	DB948F85T2E-M (Verizon)	85.75
(4) 7184 (Cingular)	95.75	WPA-80090/4CF (Verizon)	85.75
(4) 7184 (Cingular)	95.75	PiROD 13' Low Profile Platform (Nextel)	75.75
(4) 7184 (Cingular)	95.75		
12' Low Profile Platform (Verizon)	85.75	(4) 844H90T6E-XY (Nextel)	75.75
WPA-80090/4CF (Verizon)	85.75	(4) 844H90T6E-XY (Nextel)	75.75
DB948F85T2E-M (Verizon)	85.75	(4) 844H90T6E-XY (Nextel)	75.75
DB948F85T2E-M (Verizon)	85.75	10' Low Profile Platform (T-Mobile)	65
WPA-80090/4CF (Verizon)	85.75	(3) DR65-19-00DPQ (T-Mobile)	65
WPA-80090/4CF (Verizon)	85.75	(3) DR65-19-00DPQ (T-Mobile)	65
DB948F85T2E-M (Verizon)	85.75	(3) DR65-19-00DPQ (T-Mobile)	65
DB948F85T2E-M (Verizon)	85.75	(2) Decibel PCS 1900 TMA (T-Mobile)	65
WPA-80090/4CF (Verizon)	85.75	(2) Decibel PCS 1900 TMA (T-Mobile)	65
WPA-80090/4CF (Verizon)	85.75	(2) Decibel PCS 1900 TMA (T-Mobile)	65
DB948F85T2E-M (Verizon)	85.75		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 64.5%

URS Corporation
500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
Phone: (860) 529-8882
FAX: (860) 529-3991

Job: *96' EEI Monopole, Windsor Locks, CT*			
Project: *1000 Old County Circle*			
Client: Verizon	Drawn by: JEK	App'd:	
Code: TIA/EIA-222-F	Date: 05/05/06	Scale: NTS	
Path: P:\06\ERI Files\96' EEI monopole.eri		Dwg No. E-1	

ERI TOWER DETAILED OUTPUT

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole 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		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	95.82-83.54	12.28	2.67	18	14.2500	17.3929	0.1875	0.7500	A572-65 (65 ksi)
L2	83.54-45.47	40.75	3.82	18	16.3335	26.5722	0.2500	1.0000	A572-65 (65 ksi)
L3	45.47-0.00	49.29		18	25.1121	37.5000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	14.4698	8.3689	209.0900	4.9922	7.2390	28.8838	418.4551	4.1853	2.1780	11.616
	17.6612	10.2394	382.9481	6.1079	8.8356	43.3415	766.4002	5.1207	2.7312	14.566
L2	17.2677	12.7622	417.0841	5.7096	8.2974	50.2668	834.7170	6.3823	2.4347	9.739
	26.9821	20.8867	1828.3146	9.3444	13.4987	135.4440	3659.0350	10.4453	4.2367	16.947
L3	26.4747	24.5981	1911.2924	8.8038	12.7569	149.8238	3825.0998	12.3014	3.8697	12.383
	38.0785	36.8854	6444.4424	13.2016	19.0500	338.2909	12897.3645	18.4462	6.0500	19.36

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
L1 95.82-83.54				1	1	1		
L2 83.54-45.47				1	1	1		
L3 45.47-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
7/8 (Cingular)	C	No	Inside Pole	95.75 - 6.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1 5/8 (Verizon)	C	No	Inside Pole	85.75 - 3.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
7/8 (Nextel)	C	No	Inside Pole	75.75 - 6.00	12	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
7/8 (T-Mobile)	C	No	Inside Pole	65.00 - 6.00	24	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	95.82-83.54	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	106.72
L2	83.54-45.47	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1171.27
L3	45.47-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1552.93

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	95.82-83.54	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	106.72
L2	83.54-45.47	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1171.27
L3	45.47-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1552.93

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
12' Low Profile Platform	C	None		0.0000	95.75	No Ice	15.70	15.70	1300.00
(Cingular)						1/2" Ice	20.10	20.10	1765.00
(4) 7184	A	From Face	3.00	0.0000	95.75	No Ice	2.68	1.89	11.20
(Cingular)			0.00			1/2" Ice	3.00	2.21	27.10
			0.00						
(4) 7184	B	From Face	3.00	0.0000	95.75	No Ice	2.68	1.89	11.20
(Cingular)			0.00			1/2" Ice	3.00	2.21	27.10
			0.00						
(4) 7184	C	From Face	3.00	0.0000	95.75	No Ice	2.68	1.89	11.20
(Cingular)			0.00			1/2" Ice	3.00	2.21	27.10
			0.00						
12' Low Profile Platform	C	None		0.0000	85.75	No Ice	15.70	15.70	1300.00
(Verizon)						1/2" Ice	20.10	20.10	1765.00
WPA-80090/4CF	A	From Face	3.00	0.0000	85.75	No Ice	3.73	2.71	12.00
(Verizon)			-6.00			1/2" Ice	4.10	3.01	36.71
			0.00						
DB948F85T2E-M	A	From Face	3.00	0.0000	85.75	No Ice	1.92	3.26	8.50
(Verizon)			-4.00			1/2" Ice	2.22	3.62	27.57
			0.00						
DB948F85T2E-M	A	From Face	3.00	0.0000	85.75	No Ice	1.92	3.26	8.50
(Verizon)			4.00			1/2" Ice	2.22	3.62	27.57
			0.00						
WPA-80090/4CF	A	From Face	3.00	0.0000	85.75	No Ice	3.73	2.71	12.00
(Verizon)			6.00			1/2" Ice	4.10	3.01	36.71
			0.00						
WPA-80090/4CF	B	From Face	3.00	0.0000	85.75	No Ice	3.73	2.71	12.00
(Verizon)			-6.00			1/2" Ice	4.10	3.01	36.71
			0.00						
DB948F85T2E-M	B	From Face	3.00	0.0000	85.75	No Ice	1.92	3.26	8.50
(Verizon)			-4.00			1/2" Ice	2.22	3.62	27.57
			0.00						
DB948F85T2E-M	B	From Face	3.00	0.0000	85.75	No Ice	1.92	3.26	8.50
(Verizon)			4.00			1/2" Ice	2.22	3.62	27.57
			0.00						
WPA-80090/4CF	B	From Face	3.00	0.0000	85.75	No Ice	3.73	2.71	12.00
(Verizon)			6.00			1/2" Ice	4.10	3.01	36.71
			0.00						
WPA-80090/4CF	C	From Face	3.00	0.0000	85.75	No Ice	3.73	2.71	12.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
(Verizon)			-6.00 0.00			1/2" Ice	4.10	3.01	36.71
DB948F85T2E-M	C	From Face	3.00	0.0000	85.75	No Ice	1.92	3.26	8.50
(Verizon)			-4.00 0.00			1/2" Ice	2.22	3.62	27.57
DB948F85T2E-M	C	From Face	3.00	0.0000	85.75	No Ice	1.92	3.26	8.50
(Verizon)			4.00 0.00			1/2" Ice	2.22	3.62	27.57
WPA-80090/4CF	C	From Face	3.00	0.0000	85.75	No Ice	3.73	2.71	12.00
(Verizon)			6.00 0.00			1/2" Ice	4.10	3.01	36.71
PiROD 13' Low Profile Platform	C	None		0.0000	75.75	No Ice	15.70	15.70	1300.00
(Nextel)						1/2" Ice	20.10	20.10	1765.00
(4) 844H90T6E-XY	A	From Face	4.00	0.0000	75.75	No Ice	3.06	3.73	14.00
(Nextel)			0.00 0.00			1/2" Ice	3.39	4.10	40.30
(4) 844H90T6E-XY	B	From Face	4.00	0.0000	75.75	No Ice	3.06	3.73	14.00
(Nextel)			0.00 0.00			1/2" Ice	3.39	4.10	40.30
(4) 844H90T6E-XY	C	From Face	4.00	0.0000	75.75	No Ice	3.06	3.73	14.00
(Nextel)			0.00 0.00			1/2" Ice	3.39	4.10	40.30
10' Low Profile Platform	C	None		0.0000	65.00	No Ice	15.70	15.70	1300.00
(T-Mobile)						1/2" Ice	20.10	20.10	1765.00
(3) DR65-19-00DPQ	A	From Face	3.00	0.0000	65.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00 0.00			1/2" Ice	8.95	3.97	73.77
(3) DR65-19-00DPQ	B	From Face	3.00	0.0000	65.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00 0.00			1/2" Ice	8.95	3.97	73.77
(3) DR65-19-00DPQ	C	From Face	3.00	0.0000	65.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00 0.00			1/2" Ice	8.95	3.97	73.77
(2) Decibel PCS 1900 TMA	A	From Face	3.00	0.0000	65.00	No Ice	0.00	0.63	17.60
(T-Mobile)			0.00 0.00			1/2" Ice	0.00	0.81	23.50
(2) Decibel PCS 1900 TMA	B	From Face	3.00	0.0000	65.00	No Ice	0.00	0.63	17.60
(T-Mobile)			0.00 0.00			1/2" Ice	0.00	0.81	23.50
(2) Decibel PCS 1900 TMA	C	From Face	3.00	0.0000	65.00	No Ice	0.00	0.63	17.60
(T-Mobile)			0.00 0.00			1/2" Ice	0.00	0.81	23.50

Tower Pressures - No Ice

$G_H = 1.690$

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
L1 95.82-83.54	89.48	1.33	22	16.189	A	0.000	16.189	16.189	100.00	0.000	0.000
					B	0.000	16.189		100.00		
					C	0.000	16.189		100.00		
L2 83.54-45.47	63.51	1.206	20	69.130	A	0.000	69.130	69.130	100.00	0.000	0.000
					B	0.000	69.130		100.00		
					C	0.000	69.130		100.00		
L3 45.47-0.00	21.41	1	16	120.433	A	0.000	120.433	120.433	100.00	0.000	0.000
					B	0.000	120.433		100.00		
					C	0.000	120.433		100.00		

Tower Pressure - With Ice

$G_H = 1.690$

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
L1 95.82-83.54	89.48	1.33	16	0.5000	17.213	A	0.000	17.213	17.213	100.00	0.000	0.000
						B	0.000	17.213		100.00		
						C	0.000	17.213		100.00		
L2 83.54-45.47	63.51	1.206	15	0.5000	72.303	A	0.000	72.303	72.303	100.00	0.000	0.000
						B	0.000	72.303		100.00		
						C	0.000	72.303		100.00		
L3 45.47-0.00	21.41	1	12	0.5000	124.222	A	0.000	124.222	124.222	100.00	0.000	0.000
						B	0.000	124.222		100.00		
						C	0.000	124.222		100.00		

Tower Pressure - Service

$G_H = 1.690$

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
L1 95.82-83.54	89.48	1.33	9	16.189	A	0.000	16.189	16.189	100.00	0.000	0.000
					B	0.000	16.189		100.00		
					C	0.000	16.189		100.00		
L2 83.54-45.47	63.51	1.206	8	69.130	A	0.000	69.130	69.130	100.00	0.000	0.000
					B	0.000	69.130		100.00		
					C	0.000	69.130		100.00		
L3 45.47-0.00	21.41	1	6	120.433	A	0.000	120.433	120.433	100.00	0.000	0.000
					B	0.000	120.433		100.00		
					C	0.000	120.433		100.00		

Tower Forces - No Ice - Wind Normal To Face

ERITower	Job: 96' EEI Monopole, Windsor Locks, CT	Page: 6 of 18
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project: 1000 Old County Circle	Date: 08:55:28 05/05/06
	Client: Verizon	Designed by: JEK

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	387.45	31.55	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	1494.04	39.24	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	2173.67	47.81	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	176081.87 lb-ft	4055.16		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	387.45	31.55	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	1494.04	39.24	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	2173.67	47.81	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	176081.87 lb-ft	4055.16		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	387.45	31.55	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	1494.04	39.24	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	2173.67	47.81	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	176081.87 lb-ft	4055.16		

ERITower	Job: 96' EEI Monopole, Windsor Locks, CT	Page: 7 of 18
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project: 1000 Old County Circle	Date: 08:55:28 05/05/06
	Client: Verizon	Designed by: JEK

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	387.45	31.55	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	1494.04	39.24	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	2173.67	47.81	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	176081.87 lb-ft	4055.16		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	512.44	A	1	0.65	1	1	1	17.213	308.95	25.16	C
			B	1	0.65	1	1	1	17.213			
			C	1	0.65	1	1	1	17.213			
L2 83.54-45.47	1171.27	2856.49	A	1	0.65	1	1	1	72.303	1171.95	30.78	C
			B	1	0.65	1	1	1	72.303			
			C	1	0.65	1	1	1	72.303			
L3 45.47-0.00	1552.93	6061.73	A	1	0.65	1	1	1	124.222	1681.54	36.98	C
			B	1	0.65	1	1	1	124.222			
			C	1	0.65	1	1	1	124.222			
Sum Weight:	2830.92	9430.66						OTM	138068.59 lb-ft	3162.45		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	512.44	A	1	0.65	1	1	1	17.213	308.95	25.16	C
			B	1	0.65	1	1	1	17.213			
			C	1	0.65	1	1	1	17.213			
L2 83.54-45.47	1171.27	2856.49	A	1	0.65	1	1	1	72.303	1171.95	30.78	C
			B	1	0.65	1	1	1	72.303			
			C	1	0.65	1	1	1	72.303			
L3 45.47-0.00	1552.93	6061.73	A	1	0.65	1	1	1	124.222	1681.54	36.98	C
			B	1	0.65	1	1	1	124.222			
			C	1	0.65	1	1	1	124.222			
Sum Weight:	2830.92	9430.66						OTM	138068.59 lb-ft	3162.45		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	512.44	A	1	0.65	1	1	1	17.213	308.95	25.16	C
			B	1	0.65	1	1	1	17.213			
			C	1	0.65	1	1	1	17.213			
L2 83.54-45.47	1171.27	2856.49	A	1	0.65	1	1	1	72.303	1171.95	30.78	C
			B	1	0.65	1	1	1	72.303			
			C	1	0.65	1	1	1	72.303			
L3 45.47-0.00	1552.93	6061.73	A	1	0.65	1	1	1	124.222	1681.54	36.98	C
			B	1	0.65	1	1	1	124.222			
			C	1	0.65	1	1	1	124.222			
Sum Weight:	2830.92	9430.66						OTM	138068.59 lb-ft	3162.45		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	512.44	A	1	0.65	1	1	1	17.213	308.95	25.16	C
			B	1	0.65	1	1	1	17.213			
			C	1	0.65	1	1	1	17.213			
L2 83.54-45.47	1171.27	2856.49	A	1	0.65	1	1	1	72.303	1171.95	30.78	C
			B	1	0.65	1	1	1	72.303			
			C	1	0.65	1	1	1	72.303			
L3 45.47-0.00	1552.93	6061.73	A	1	0.65	1	1	1	124.222	1681.54	36.98	C
			B	1	0.65	1	1	1	124.222			
			C	1	0.65	1	1	1	124.222			
Sum Weight:	2830.92	9430.66						OTM	138068.59 lb-ft	3162.45		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	151.35	12.33	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	583.61	15.33	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	849.09	18.68	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	68781.98	1584.05		

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

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	151.35	12.33	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	583.61	15.33	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	849.09	18.68	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	68781.98 lb-ft	1584.05		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	151.35	12.33	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	583.61	15.33	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	849.09	18.68	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	68781.98 lb-ft	1584.05		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 95.82-83.54	106.72	388.75	A	1	0.65	1	1	1	16.189	151.35	12.33	C
			B	1	0.65	1	1	1	16.189			
			C	1	0.65	1	1	1	16.189			

ERITower	Job: 96' EEI Monopole, Windsor Locks, CT	Page: 10 of 18
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project: 1000 Old County Circle	Date: 08:55:28 05/05/06
	Client: Verizon	Designed by: JEK

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L2 83.54-45.47	1171.27	2332.76	A	1	0.65	1	1	1	69.130	583.61	15.33	C
			B	1	0.65	1	1	1	69.130			
			C	1	0.65	1	1	1	69.130			
L3 45.47-0.00	1552.93	5155.78	A	1	0.65	1	1	1	120.433	849.09	18.68	C
			B	1	0.65	1	1	1	120.433			
			C	1	0.65	1	1	1	120.433			
Sum Weight:	2830.92	7877.29						OTM	68781.98 lb-ft	1584.05		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	7877.29					
Bracing Weight	0.00					
Total Member Self-Weight	7877.29			0.00	0.00	
Total Weight	16727.21			0.00	0.00	
Wind 0 deg - No Ice		0.00	-13267.45	-896471.21	0.00	0.00
Wind 30 deg - No Ice		6633.72	-11489.95	-776366.85	-448235.61	0.00
Wind 45 deg - No Ice		9381.50	-9381.50	-633900.88	-633900.88	0.00
Wind 60 deg - No Ice		11489.95	-6633.72	-448235.61	-776366.85	0.00
Wind 90 deg - No Ice		13267.45	0.00	0.00	-896471.21	0.00
Wind 120 deg - No Ice		11489.95	6633.72	448235.61	-776366.85	0.00
Wind 135 deg - No Ice		9381.50	9381.50	633900.88	-633900.88	0.00
Wind 150 deg - No Ice		6633.72	11489.95	776366.85	-448235.61	0.00
Wind 180 deg - No Ice		0.00	13267.45	896471.21	0.00	0.00
Wind 210 deg - No Ice		-6633.72	11489.95	776366.85	448235.61	0.00
Wind 225 deg - No Ice		-9381.50	9381.50	633900.88	633900.88	0.00
Wind 240 deg - No Ice		-11489.95	6633.72	448235.61	776366.85	0.00
Wind 270 deg - No Ice		-13267.45	0.00	0.00	896471.21	0.00
Wind 300 deg - No Ice		-11489.95	-6633.72	-448235.61	776366.85	0.00
Wind 315 deg - No Ice		-9381.50	-9381.50	-633900.88	633900.88	0.00
Wind 330 deg - No Ice		-6633.72	-11489.95	-776366.85	448235.61	0.00
Member Ice	1553.37					
Total Weight Ice	21320.96			0.00	0.00	
Wind 0 deg - Ice		0.00	-11037.64	-755760.99	0.00	0.00
Wind 30 deg - Ice		5518.82	-9558.87	-654508.22	-377880.50	0.00
Wind 45 deg - Ice		7804.79	-7804.79	-534403.72	-534403.72	0.00
Wind 60 deg - Ice		9558.87	-5518.82	-377880.50	-654508.22	0.00
Wind 90 deg - Ice		11037.64	0.00	0.00	-755760.99	0.00
Wind 120 deg - Ice		9558.87	5518.82	377880.50	-654508.22	0.00
Wind 135 deg - Ice		7804.79	7804.79	534403.72	-534403.72	0.00
Wind 150 deg - Ice		5518.82	9558.87	654508.22	-377880.50	0.00
Wind 180 deg - Ice		0.00	11037.64	755760.99	0.00	0.00
Wind 210 deg - Ice		-5518.82	9558.87	654508.22	377880.50	0.00
Wind 225 deg - Ice		-7804.79	7804.79	534403.72	534403.72	0.00
Wind 240 deg - Ice		-9558.87	5518.82	377880.50	654508.22	0.00
Wind 270 deg - Ice		-11037.64	0.00	0.00	755760.99	0.00
Wind 300 deg - Ice		-9558.87	-5518.82	-377880.50	654508.22	0.00
Wind 315 deg - Ice		-7804.79	-7804.79	-534403.72	534403.72	0.00
Wind 330 deg - Ice		-5518.82	-9558.87	-654508.22	377880.50	0.00
Total Weight	16727.21			0.00	0.00	
Wind 0 deg - Service		0.00	-5182.60	-350184.07	0.00	0.00
Wind 30 deg - Service		2591.30	-4488.26	-303268.30	-175092.03	0.00

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Wind 45 deg - Service		3664.65	-3664.65	-247617.53	-247617.53	0.00
Wind 60 deg - Service		4488.26	-2591.30	-175092.03	-303268.30	0.00
Wind 90 deg - Service		5182.60	0.00	0.00	-350184.07	0.00
Wind 120 deg - Service		4488.26	2591.30	175092.03	-303268.30	0.00
Wind 135 deg - Service		3664.65	3664.65	247617.53	-247617.53	0.00
Wind 150 deg - Service		2591.30	4488.26	303268.30	-175092.03	0.00
Wind 180 deg - Service		0.00	5182.60	350184.07	0.00	0.00
Wind 210 deg - Service		-2591.30	4488.26	303268.30	175092.03	0.00
Wind 225 deg - Service		-3664.65	3664.65	247617.53	247617.53	0.00
Wind 240 deg - Service		-4488.26	2591.30	175092.03	303268.30	0.00
Wind 270 deg - Service		-5182.60	0.00	0.00	350184.07	0.00
Wind 300 deg - Service		-4488.26	-2591.30	-175092.03	303268.30	0.00
Wind 315 deg - Service		-3664.65	-3664.65	-247617.53	247617.53	0.00
Wind 330 deg - Service		-2591.30	-4488.26	-303268.30	175092.03	0.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service

Comb. No.	Description
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	95.818 - 83.539	Pole	Max Tension	18	0.00	0.00	-0.00
			Max. Compression	18	-2565.80	0.00	0.00
			Max. Mx	6	-1682.14	-19458.93	0.00
			Max. My	10	-1682.14	0.00	-19458.93
			Max. Vy	6	2202.00	-19458.93	0.00
			Max. Vx	10	2202.00	0.00	-19458.93
			Max. Torque	26			0.00
L2	83.539 - 45.466	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-13259.42	0.00	0.00
			Max. Mx	6	-9205.71	-316103.28	0.00
			Max. My	10	-9205.71	0.00	-316103.28
			Max. Vy	6	11286.35	-316103.28	0.00
			Max. Vx	10	11286.35	0.00	-316103.28
			Max. Torque	22			0.00
L3	45.466 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-21320.96	0.00	0.00
			Max. Mx	6	-16715.81	-920112.89	0.00
			Max. My	2	-16715.81	0.00	920112.89
			Max. Vy	6	13281.81	-920112.89	0.00
			Max. Vx	2	-13281.81	0.00	920112.89
			Max. Torque	22			0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	27	21320.96	0.00	-11037.64
	Max. H_x	14	16727.21	13267.45	0.00
	Max. H_z	2	16727.21	0.00	13267.45
	Max. M_x	2	920112.89	0.00	13267.45
	Max. M_z	6	920112.89	-13267.45	0.00
	Max. Torsion	22	0.00	-9558.87	5518.82
	Min. Vert	1	16727.21	0.00	0.00

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
	Min. H_x	6	16727.21	-13267.45	0.00
	Min. H_z	10	16727.21	0.00	-13267.45
	Min. M_x	10	-920112.89	0.00	-13267.45
	Min. M_z	14	-920112.89	13267.45	0.00
	Min. Torsion	32	-0.00	9558.87	5518.82

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	16727.21	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg - No Ice	16727.21	0.00	-13267.45	-920112.89	0.00	0.00
Dead+Wind 30 deg - No Ice	16727.21	6633.72	-11489.95	-796841.89	-460056.88	0.00
Dead+Wind 45 deg - No Ice	16727.21	9381.50	-9381.50	-650618.68	-650618.68	0.00
Dead+Wind 60 deg - No Ice	16727.21	11489.95	-6633.72	-460056.88	-796841.89	-0.00
Dead+Wind 90 deg - No Ice	16727.21	13267.45	0.00	0.00	-920112.89	0.00
Dead+Wind 120 deg - No Ice	16727.21	11489.95	6633.72	460056.88	-796841.89	0.00
Dead+Wind 135 deg - No Ice	16727.21	9381.50	9381.50	650618.68	-650618.68	0.00
Dead+Wind 150 deg - No Ice	16727.21	6633.72	11489.95	796841.89	-460056.88	-0.00
Dead+Wind 180 deg - No Ice	16727.21	0.00	13267.45	920112.89	0.00	0.00
Dead+Wind 210 deg - No Ice	16727.21	-6633.72	11489.95	796841.89	460056.88	0.00
Dead+Wind 225 deg - No Ice	16727.21	-9381.50	9381.50	650618.68	650618.68	0.00
Dead+Wind 240 deg - No Ice	16727.21	-11489.95	6633.72	460056.88	796841.89	-0.00
Dead+Wind 270 deg - No Ice	16727.21	-13267.45	0.00	0.00	920112.89	0.00
Dead+Wind 300 deg - No Ice	16727.21	-11489.95	-6633.72	-460056.88	796841.89	0.00
Dead+Wind 315 deg - No Ice	16727.21	-9381.50	-9381.50	-650618.68	650618.68	0.00
Dead+Wind 330 deg - No Ice	16727.21	-6633.72	-11489.95	-796841.89	460056.88	-0.00
Dead+Ice+Temp	21320.96	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg+Ice+Temp	21320.96	0.00	-11037.64	-783912.17	0.00	0.00
Dead+Wind 30 deg+Ice+Temp	21320.96	5518.82	-9558.87	-678887.86	-391956.09	0.00
Dead+Wind 45 deg+Ice+Temp	21320.96	7804.79	-7804.79	-554309.62	-554309.62	0.00
Dead+Wind 60 deg+Ice+Temp	21320.96	9558.87	-5518.82	-391956.09	-678887.86	-0.00
Dead+Wind 90 deg+Ice+Temp	21320.96	11037.64	0.00	0.00	-783912.17	0.00
Dead+Wind 120 deg+Ice+Temp	21320.96	9558.87	5518.82	391956.09	-678887.86	0.00
Dead+Wind 135 deg+Ice+Temp	21320.96	7804.79	7804.79	554309.62	-554309.62	0.00
Dead+Wind 150 deg+Ice+Temp	21320.96	5518.82	9558.87	678887.86	-391956.09	-0.00
Dead+Wind 180 deg+Ice+Temp	21320.96	0.00	11037.64	783912.17	0.00	0.00
Dead+Wind 210 deg+Ice+Temp	21320.96	-5518.82	9558.87	678887.86	391956.09	0.00
Dead+Wind 225 deg+Ice+Temp	21320.96	-7804.79	7804.79	554309.62	554309.62	0.00
Dead+Wind 240 deg+Ice+Temp	21320.96	-9558.87	5518.82	391956.09	678887.86	-0.00
Dead+Wind 270 deg+Ice+Temp	21320.96	-11037.64	0.00	0.00	783912.17	0.00
Dead+Wind 300 deg+Ice+Temp	21320.96	-9558.87	-5518.82	-391956.09	678887.86	0.00
Dead+Wind 315 deg+Ice+Temp	21320.96	-7804.79	-7804.79	-554309.62	554309.62	0.00
Dead+Wind 330 deg+Ice+Temp	21320.96	-5518.82	-9558.87	-678887.86	391956.09	-0.00
Dead+Wind 0 deg - Service	16727.21	0.00	-5182.60	-359606.28	0.00	0.00
Dead+Wind 30 deg - Service	16727.21	2591.30	-4488.26	-311428.18	-179803.15	0.00
Dead+Wind 45 deg - Service	16727.21	3664.65	-3664.65	-254280.05	-254280.05	0.00
Dead+Wind 60 deg - Service	16727.21	4488.26	-2591.30	-179803.15	-311428.18	-0.00
Dead+Wind 90 deg - Service	16727.21	5182.60	0.00	0.00	-359606.28	0.00
Dead+Wind 120 deg - Service	16727.21	4488.26	2591.30	179803.15	-311428.18	0.00
Dead+Wind 135 deg - Service	16727.21	3664.65	3664.65	254280.05	-254280.05	0.00
Dead+Wind 150 deg - Service	16727.21	2591.30	4488.26	311428.18	-179803.15	-0.00
Dead+Wind 180 deg - Service	16727.21	0.00	5182.60	359606.28	0.00	0.00
Dead+Wind 210 deg - Service	16727.21	-2591.30	4488.26	311428.18	179803.15	0.00
Dead+Wind 225 deg - Service	16727.21	-3664.65	3664.65	254280.05	254280.05	0.00
Dead+Wind 240 deg - Service	16727.21	-4488.26	2591.30	179803.15	311428.18	-0.00

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Dead+Wind 270 deg - Service	16727.21	-5182.60	0.00	0.00	359606.28	0.00
Dead+Wind 300 deg - Service	16727.21	-4488.26	-2591.30	-179803.15	311428.18	0.00
Dead+Wind 315 deg - Service	16727.21	-3664.65	-3664.65	-254280.05	254280.05	0.00
Dead+Wind 330 deg - Service	16727.21	-2591.30	-4488.26	-311428.18	179803.15	-0.00

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-16727.21	0.00	0.00	16727.21	0.00	0.000%
2	0.00	-16727.21	-13267.45	0.00	16727.21	13267.45	0.000%
3	6633.72	-16727.21	-11489.95	-6633.72	16727.21	11489.95	0.000%
4	9381.50	-16727.21	-9381.50	-9381.50	16727.21	9381.50	0.000%
5	11489.95	-16727.21	-6633.72	-11489.95	16727.21	6633.72	0.000%
6	13267.45	-16727.21	0.00	-13267.45	16727.21	0.00	0.000%
7	11489.95	-16727.21	6633.72	-11489.95	16727.21	-6633.72	0.000%
8	9381.50	-16727.21	9381.50	-9381.50	16727.21	-9381.50	0.000%
9	6633.72	-16727.21	11489.95	-6633.72	16727.21	-11489.95	0.000%
10	0.00	-16727.21	13267.45	0.00	16727.21	-13267.45	0.000%
11	-6633.72	-16727.21	11489.95	6633.72	16727.21	-11489.95	0.000%
12	-9381.50	-16727.21	9381.50	9381.50	16727.21	-9381.50	0.000%
13	-11489.95	-16727.21	6633.72	11489.95	16727.21	-6633.72	0.000%
14	-13267.45	-16727.21	0.00	13267.45	16727.21	0.00	0.000%
15	-11489.95	-16727.21	-6633.72	11489.95	16727.21	6633.72	0.000%
16	-9381.50	-16727.21	-9381.50	9381.50	16727.21	9381.50	0.000%
17	-6633.72	-16727.21	-11489.95	6633.72	16727.21	11489.95	0.000%
18	0.00	-21320.96	0.00	0.00	21320.96	0.00	0.000%
19	0.00	-21320.96	-11037.64	0.00	21320.96	11037.64	0.000%
20	5518.82	-21320.96	-9558.87	-5518.82	21320.96	9558.87	0.000%
21	7804.79	-21320.96	-7804.79	-7804.79	21320.96	7804.79	0.000%
22	9558.87	-21320.96	-5518.82	-9558.87	21320.96	5518.82	0.000%
23	11037.64	-21320.96	0.00	-11037.64	21320.96	0.00	0.000%
24	9558.87	-21320.96	5518.82	-9558.87	21320.96	-5518.82	0.000%
25	7804.79	-21320.96	7804.79	-7804.79	21320.96	-7804.79	0.000%
26	5518.82	-21320.96	9558.87	-5518.82	21320.96	-9558.87	0.000%
27	0.00	-21320.96	11037.64	0.00	21320.96	-11037.64	0.000%
28	-5518.82	-21320.96	9558.87	5518.82	21320.96	-9558.87	0.000%
29	-7804.79	-21320.96	7804.79	7804.79	21320.96	-7804.79	0.000%
30	-9558.87	-21320.96	5518.82	9558.87	21320.96	-5518.82	0.000%
31	-11037.64	-21320.96	0.00	11037.64	21320.96	0.00	0.000%
32	-9558.87	-21320.96	-5518.82	9558.87	21320.96	5518.82	0.000%
33	-7804.79	-21320.96	-7804.79	7804.79	21320.96	7804.79	0.000%
34	-5518.82	-21320.96	-9558.87	5518.82	21320.96	9558.87	0.000%
35	0.00	-16727.21	-5182.60	0.00	16727.21	5182.60	0.000%
36	2591.30	-16727.21	-4488.26	-2591.30	16727.21	4488.26	0.000%
37	3664.65	-16727.21	-3664.65	-3664.65	16727.21	3664.65	0.000%
38	4488.26	-16727.21	-2591.30	-4488.26	16727.21	2591.30	0.000%
39	5182.60	-16727.21	0.00	-5182.60	16727.21	0.00	0.000%
40	4488.26	-16727.21	2591.30	-4488.26	16727.21	-2591.30	0.000%
41	3664.65	-16727.21	3664.65	-3664.65	16727.21	-3664.65	0.000%
42	2591.30	-16727.21	4488.26	-2591.30	16727.21	-4488.26	0.000%
43	0.00	-16727.21	5182.60	0.00	16727.21	-5182.60	0.000%
44	-2591.30	-16727.21	4488.26	2591.30	16727.21	-4488.26	0.000%
45	-3664.65	-16727.21	3664.65	3664.65	16727.21	-3664.65	0.000%
46	-4488.26	-16727.21	2591.30	4488.26	16727.21	-2591.30	0.000%
47	-5182.60	-16727.21	0.00	5182.60	16727.21	0.00	0.000%
48	-4488.26	-16727.21	-2591.30	4488.26	16727.21	2591.30	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
49	-3664.65	-16727.21	-3664.65	3664.65	16727.21	3664.65	0.000%
50	-2591.30	-16727.21	-4488.26	2591.30	16727.21	4488.26	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	0.00003714
3	Yes	5	0.00000001	0.00009993
4	Yes	5	0.00000001	0.00011247
5	Yes	5	0.00000001	0.00009993
6	Yes	4	0.00000001	0.00003714
7	Yes	5	0.00000001	0.00009993
8	Yes	5	0.00000001	0.00011247
9	Yes	5	0.00000001	0.00009993
10	Yes	4	0.00000001	0.00003714
11	Yes	5	0.00000001	0.00009993
12	Yes	5	0.00000001	0.00011247
13	Yes	5	0.00000001	0.00009993
14	Yes	4	0.00000001	0.00003714
15	Yes	5	0.00000001	0.00009993
16	Yes	5	0.00000001	0.00011247
17	Yes	5	0.00000001	0.00009993
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00005987
20	Yes	5	0.00000001	0.00021070
21	Yes	5	0.00000001	0.00023899
22	Yes	5	0.00000001	0.00021070
23	Yes	5	0.00000001	0.00005987
24	Yes	5	0.00000001	0.00021070
25	Yes	5	0.00000001	0.00023899
26	Yes	5	0.00000001	0.00021070
27	Yes	5	0.00000001	0.00005987
28	Yes	5	0.00000001	0.00021070
29	Yes	5	0.00000001	0.00023899
30	Yes	5	0.00000001	0.00021070
31	Yes	5	0.00000001	0.00005987
32	Yes	5	0.00000001	0.00021070
33	Yes	5	0.00000001	0.00023899
34	Yes	5	0.00000001	0.00021070
35	Yes	4	0.00000001	0.00001006
36	Yes	4	0.00000001	0.00026020
37	Yes	4	0.00000001	0.00029978
38	Yes	4	0.00000001	0.00026020
39	Yes	4	0.00000001	0.00001006
40	Yes	4	0.00000001	0.00026020
41	Yes	4	0.00000001	0.00029978
42	Yes	4	0.00000001	0.00026020
43	Yes	4	0.00000001	0.00001006
44	Yes	4	0.00000001	0.00026020
45	Yes	4	0.00000001	0.00029978
46	Yes	4	0.00000001	0.00026020
47	Yes	4	0.00000001	0.00001006
48	Yes	4	0.00000001	0.00026020
49	Yes	4	0.00000001	0.00029978

50	Yes	4	0.00000001	0.00026020

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	95.818 - 83.539	16.257	43	1.4203	0.0000
L2	86.213 - 45.466	13.425	39	1.3855	0.0000
L3	49.287 - 0	4.385	39	0.8439	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
95.75	12' Low Profile Platform	43	16.237	1.4202	0.0000	19628
85.75	12' Low Profile Platform	39	13.291	1.3822	0.0000	9871
75.75	PiROD 13' Low Profile Platform	39	10.464	1.2683	0.0000	5204
65.00	10' Low Profile Platform	39	7.687	1.0902	0.0000	3460

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	95.818 - 83.539	41.568	6	3.6322	0.0000
L2	86.213 - 45.466	34.329	6	3.5433	0.0000
L3	49.287 - 0	11.218	6	2.1588	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
95.75	12' Low Profile Platform	6	41.516	3.6318	0.0000	7745
85.75	12' Low Profile Platform	6	33.985	3.5356	0.0000	3893
75.75	PiROD 13' Low Profile Platform	6	26.760	3.2720	0.0000	2047
65.00	10' Low Profile Platform	6	19.659	2.8452	0.0000	1359

Compression Checks

ERITower	Job: 96' EEI Monopole, Windsor Locks, CT	Page: 17 of 18
URS Corporation 500 Enterprise Drive, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-3991	Project: 1000 Old County Circle	Date: 08:55:28 05/05/06
	Client: Verizon	Designed by: JEK

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
L1	95.818 - 83.539 (1)	TP17.3929x14.25x0.1875	12.28	95.82	196.0	3.885	9.8320	-2464.54	38200.20	0.065
L2	83.539 - 45.466 (2)	TP26.5722x16.3335x0.25	40.75	95.82	127.7	9.156	20.1248	-9205.70	184269.00	0.050
L3	45.466 - 0 (3)	TP37.5x25.1121x0.3125	49.29	95.82	87.1	19.326	36.8854	-16715.80	712854.00	0.023

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	95.818 - 83.539 (1)	TP17.3929x14.25x0.1875	17363.92	-5.216	39.000	0.134	0.00	0.000	39.000	0.000
L2	83.539 - 45.466 (2)	TP26.5722x16.3335x0.25	316104.17	-30.177	39.000	0.774	0.00	0.000	39.000	0.000
L3	45.466 - 0 (3)	TP37.5x25.1121x0.3125	920116.67	-32.639	39.000	0.837	0.00	0.000	39.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	95.818 - 83.539 (1)	TP17.3929x14.25x0.1875	0.065	0.134	0.000	0.198 ✓	1.333	H1-3 ✓
L2	83.539 - 45.466 (2)	TP26.5722x16.3335x0.25	0.050	0.774	0.000	0.824 ✓	1.333	H1-3 ✓
L3	45.466 - 0 (3)	TP37.5x25.1121x0.3125	0.023	0.837	0.000	0.860 ✓	1.333	H1-3 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L1	95.818 - 83.539	Pole	TP17.3929x14.25x0.1875	1	-2464.54	50920.86	14.9	Pass
L2	83.539 - 45.466	Pole	TP26.5722x16.3335x0.25	2	-9205.70	245630.57	61.8	Pass
L3	45.466 - 0	Pole	TP37.5x25.1121x0.3125	3	-16715.80	950234.34	64.5	Pass
							Summary	
						Pole (L3)	64.5	Pass
						RATING =	**64.5**	**Pass**

ERITower *URS Corporation* *500 Enterprise Drive, Suite 3B* *Rocky Hill, CT 06067* *Phone: (860) 529-8882* *FAX: (860) 529-3991*	**Job** 96' EEI Monopole, Windsor Locks, CT	**Page** 18 of 18
	Project 1000 Old County Circle	**Date** 08:55:28 05/05/06
	Client Verizon	**Designed by** JEK

Program Version 3.0.0.17 - 7/15/2004 File: P:\ERI Files/96'.EEI.monopole.eri

ANCHOR BOLT AND BASE PLATE ANALYSIS

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 921 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 13.3 \cdot kips$	*user input*
Axial Force:	$Axial := 16.7 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM 615 Grade 75

Number of Anchor Bolts = N	$N := 10$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 46in$	*user input*
Bolt "Column" Distance:	$l := 3in$	*user input*
Bolt Ultimate Strength:	$F_u := 100 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 75 \cdot ksi$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*
Thickness Of Anchor Bolts	$D := 2.25in$	*user input*
Threads per Inch:	$n := 4.5$	*user input*

Base Plate Data:

Plate Yield Strength:	$Fy_{bp} := 60 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 1.5 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 52 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 37.5in$	*user input*

Geometric Layout Data:

Distance from the center of gravity of the group to bolt in question = d(i)

Radius of Bolt Circle: $R_{bc} := \frac{D_{bc}}{2}$

Distance to Bolts: $i := 1 .. N$

$$d_i := \left| \begin{array}{l} \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N}\right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{array} \right.$$

$d_1 = 13.52\,in$ $d_7 = -21.87\,in$

$d_2 = 21.87\,in$ $d_8 = -21.87\,in$

$d_3 = 21.87\,in$ $d_9 = -13.52\,in$

$d_4 = 13.52\,in$ $d_{10} = -0.00\,in$

$d_5 = 0.00\,in$ $d_{11} =$ in

$d_6 = -13.52\,in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 18.75\,in$

Moment Arms of Bolts about Neutral Axis: $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00\,in$ $MA_7 = 0.00\,in$

$MA_2 = 3.12\,in$ $MA_8 = 0.00\,in$

$MA_3 = 3.12\,in$ $MA_9 = 0.00\,in$

$MA_4 = 0.00\,in$ $MA_{10} = 0.00\,in$

$MA_5 = 0.00\,in$ $MA_{11} =$ in

$MA_6 = 0.00\,in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $EffectiveWidth = 36.02\,in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 2.645 \times 10^3\ in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 3.976\ in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 3.248\ in^2$$

Net Diameter:

$$D_n := \frac{2\cdot\sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 2.03\ in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.51\ in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi\cdot D_n^{\ 3}}{32} \qquad S_x = 0.826\ in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right)\cdot l \qquad M_x = 0.332\ ft\cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 4.8\ ksi$$

Allowable Bending

$$F_{bx} := 1.33\cdot 0.60\cdot Fy \qquad F_{bx} = 59.8\ ksi$$

Note: 1.33 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$$AllowableTension := 1.33 \cdot (0.33 \cdot A_g \cdot F_u) \qquad AllowableTension = 174.5 \text{ kips}$$

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N} \qquad MaxTension = 94.4 \text{ kips}$$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.54$$

$$Condition := if\left(\frac{MaxTension}{AllowableTension} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Condition = "OK"

Check Compression & Combined Stresses (if required):

Check to see if a complete combined stress analysis is required:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

Set the clear space between the plate and bolt to zero and remove bending stresses if a combined stress analysis is not required:

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0.00\,\text{in} & \text{otherwise} \end{cases} \qquad l = 0.00\,\text{in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0.0\,\text{ksi} & \text{otherwise} \end{cases} \qquad f_{bx} = 0.0\,\text{ksi}$$

Allowable Compressive Force:

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{Fy}} \qquad C_c = 87.36$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot Fy}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} \qquad F_a = 45.0\,\text{ksi}$$

$$F_a := 1.33 \cdot F_a \quad \text{Note: 1.33 increase allowed per TIA/EIA} \qquad F_a = 59.9\,\text{ksi}$$

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 97.8\,\text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 30.1\,\text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.50$$

$$\text{Condition} := \text{if}\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right) \qquad \boxed{\text{Condition} = \text{"OK"}}$$

Base Plate Analysis:

Force from Bolt(s):

$$C_{wi} := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$$

$C_1 = 58.2\,kips$ $C_7 = -89.7\,kips$

$C_2 = 93.1\,kips$ $C_8 = -89.7\,kips$

$C_3 = 93.1\,kips$ $C_9 = -54.8\,kips$

$C_4 = 58.2\,kips$ $C_{10} = 1.7\,kips$

$C_5 = 1.7\,kips$ $C_{11} =$ kips

$C_6 = -54.8\,kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2} \qquad f_{bp} = 43.0\,ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.33 \cdot 0.75 Fy_{bp}} = 0.72$$

$$Condition := if\left(\frac{f_{bp}}{1.33 \cdot 0.75 Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 96' steel monopole structure located at 1000 Old County Circle in Windsor Locks, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code and the TIA/EIA-222-F standard for wind velocity of 80 mph and 69 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 Section of this report. The proposed T-Mobile modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove: **(6) Swedcom ALP-E-9011 antennas** **Install:** **(6) Antel WPA-80090/4CF antennas on the existing low-profile platform with the existing (6) 1 5/8" coax cables within the monopole.**	**Verizon (Proposed)**	**@ 85'-9"**

The results of the analysis indicate that the tower structure is in compliance with the proposed loading conditions. **The tower and its foundation are considered structurally adequate with the wind load classification specified above and all the existing and proposed antenna loading.**

This analysis is based on:

1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry and structural member sizes taken from original construction drawings (EEI Job #: 7485) prepared by Engineered Endeavors, Inc., signed and sealed September 22, 2000.
3) Antenna and mount configuration as specified on the following page of this report.

This report is only valid as 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 assumption of the antenna and mount configuration as well as the physical condition of the tower. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

URS Corporation

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

RAS/jek

cc: AA, DR, IA, CF/Book – URS