STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Internet: ct.gov/csc

Daniel F. Caruso
Chairman

May 7, 2008

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

RE: **EM-VER-007-080305** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 1657 Wilbur Cross Parkway a/k/a Berlin Turnpike, Berlin, Connecticut.

Dear Attorney Baldwin:

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

The proposed modifications are to be implemented as specified here and in your notice dated March 5, 2008, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP

c: Honorable Adam P. Salina, Mayor, Town of Berlin
Roger L. Kemp, Interim Town Manager, Town of Berlin
Hellyn Riggins, Town Planner, Town of Berlin
Berlin Volunteer Fire Department

STATE OF CONNECTICUT

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Daniel F. Caruso
Chairman

March 7, 2008

The Honorable Adam P. Salina
Mayor
Town of Berlin
240 Kensington Road
Kensington, CT 06037

RE: **EM-VER-007-080305** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunication facility located at 1657 Wilbur Cross Parkway, Berlin, Connecticut.

Dear Mayor Salina:

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.

If you have any questions or comments regarding this proposal, please call me or inform the Council by March 24, 2008.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/jb

Enclosure: Notice of Intent

c: Hellyn Riggins, Town Planner, Town of Berlin
Roger L. Kemp

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

EM-VER-007-080305

March 5, 2008

Via Hand Delivery

ORIGINAL

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

Re: **Notice of Exempt Modification – Antenna Swap**
1657 Wilbur Cross Parkway (a/k/a Berlin Turnpike), Berlin, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility at the above referenced location. The Council approved Cellco's shared use of this facility on March 22, 2006. Cellco intends to modify its installation by replacing four (4) RWA-80013 antennas with four (4) LPA-80063/6CF antennas at the 117-foot level on the 175-foot tower. The tower is owned by the Berlin Volunteer Fire Department. Attached behind Tab 1 are the specifications for the proposed replacement antennas.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Roger Kemp, Town Manager of the Town of Berlin. Pursuant to a Council directive, a copy of this letter is being sent to the Berlin Volunteer Fire Department, the owner of the property on which the facility is located.

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

1. The proposed modifications will not result in any increase in the overall height of the existing structure. Cellco's replacement antennas will be located at the 117-foot level of the 175-foot tower.

2. The proposed modifications will not involve any ground-mounted equipment and, therefore, 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 operation of the replacement antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for the facility is included behind Tab 2.

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Roger Kemp, Berlin Town Manager
Berlin Volunteer Fire Department
Sandy M. Carter

Vertically Polarized, Log Periodic 63° / 14.5 dBd

LPA-80063/6CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1800 mm	70.9 in
Width	380 mm	15.0 in
Depth	332 mm	13.1 in
Depth with z-bracket	372 mm	14.6 in
4) Weight	12.3 kg	27.0 lbs
Wind Area		
Fore/Aft	0.68 m^2	7.4 ft^2
Side	0.60 m^2	6.5 ft^2
Rated Wind Velocity (Safety factor 2.0)	>235 km/hr	>146 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	993 N	223.3 lbs
Side	872 N	196.1 lbs

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

Mounting and Downtilting

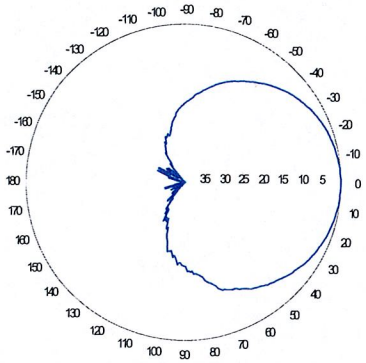
Mounting brackets attach to a pipe diameter of Ø50-102 mm (2.0-4.0 in). If the lock-down brace is used, the maximum diameter is Ø88.9 mm (3.5 in)

Mounting Bracket & Downtilt Bracket Kit #21699999

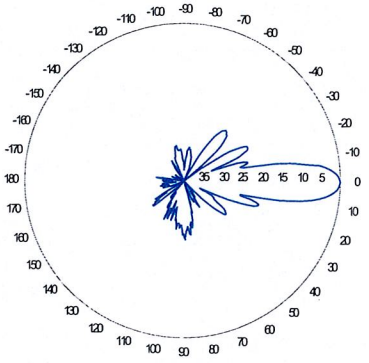
Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
3) Connector(s)	NE or E-DIN 1 port / center
1) VSWR	≤ 1.4:1
Polarization	Vertical
1) Gain	14.5 dBd
2) Power Rating	500 W
1) Half Power Angle	
H-Plane	63°
E-Plane	10°
1) Electrical Downtilt	0°
1) Null Fill	10%
Lightning Protection	Direct Ground

Radiation pattern1)



Horizontal

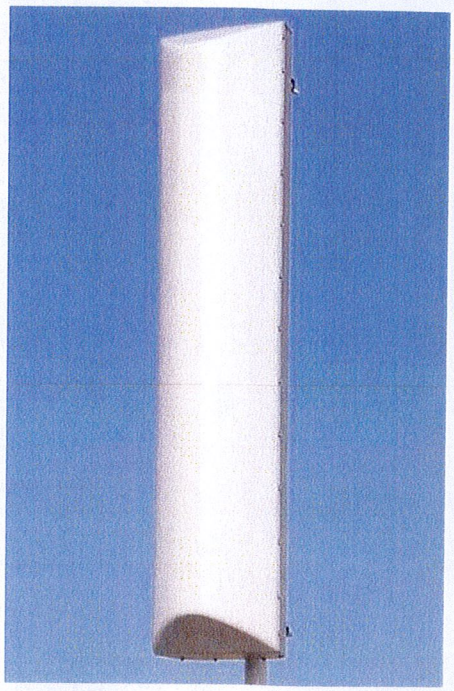


Vertical

Featuring upper side lobe suppression.

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

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



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

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

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

Antenna available with center-fed connector only.

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

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

CF Denotes a Center-Fed Connector.

806-960 MHz

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

Revision Date: 7/5/07

	General	Power	Density					
Site Name: Berlin 4								
Tower Height: Verizon @ 117Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint	11	477.09	147.5	0.0867	1962.5	1.0000	8.67%	
*Police Channel	1	200	180	0.0022	809	0.5393	0.41%	
*Fire Main	1	100	180	0.0011	154	0.2	0.55%	
*Fire Intercity	1	30	100	0.0011	154	0.2	0.54%	
*Highway	1	50	160	0.0007	156	0.2	0.35%	
*Fire Ground	1	5	130	0.0001	156	0.2	0.05%	
*SP Hotline	1	80.77	180	0.0009	45	0.2	0.45%	
*RAFS	1	30	180	0.0003	465	0.3100	0.11%	
*960 Link	1	20.5	100	0.0007	960	0.6400	0.12%	
*Cingular GSM	4	787	170	0.0392	1900	1.0000	3.92%	
*Cingular UMTS	1	500	170	0.0062	880	0.5867	1.06%	
*T-Mobile	8	161	160	0.0181	1930	1.0000	1.81%	
Verizon	**9**	**397**	**117**	**0.0939**	**880**	**0.5866**	**16.00%**	
Verizon	**3**	**233**	**117**	**0.0184**	**1900**	**1.0000**	**1.84%**	35.88%
* Source: Siting Council								

NATCOMM ENG
CONSULTING ENGINEERS

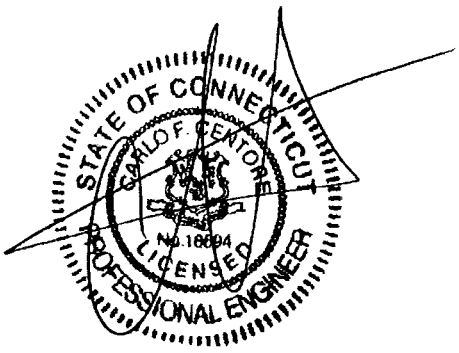
Structural Analysis Report

175' Existing Monopole

1657 Wilbur Cross Parkway
Berlin, CT

Natcomm Project No. 08007.CO5

Date: February 14, 2008



Prepared for:

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

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

Natcomm, Inc.
Structural Monopole Analysis
175' Existing EEI Monopole
Berlin, CT
February 14, 2008

Table of Contents

Natcomm, Inc.
Structural Monopole Analysis
175' Existing EEI Monopole
Berlin, CT
February 14, 2008

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna exchange proposed by Verizon Wireless on the existing monopole (tower) located in Berlin, Connecticut. The host tower is a 175-ft, three section, eighteen sided, tapered monopole originally designed and manufactured by Engineered Endeavors Incorporated (EEI); job no. 11129 dated September 16, 2002. The manufacturer's drawings and calculations were unavailable for use in this report. The tower geometry and section sizes were taken from a previous structural analysis report prepared by URS Corporation; job no. 36922118.0000, dated September 29, 2005. URS's structural analysis report is available for reference in Section 4 of this report.

Verizon Wireless is proposing the replacement of four (4) existing Cellular antennas on their low profile platform. Refer to the Antenna and Appurtenance Summary below and "Antenna Replacement Details" drawing "ANT-1" available for reference in Section 4 of this report for a detailed description and layout of the Verizon Wireless existing and proposed antenna configuration.

Antenna and Appurtenance Summary

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

- TOWN (Existing):
  Antennas: One (1) 4-Bay Dipole, one (2) Omnidirectional (whip), one (1) Grid Dish and one (1) 8-Bay Dipole antenna mounted on a low profile platform with a RAD center elevation of 175-ft above the existing tower base plate.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- TOWN (Reserved):
  Antennas: One (1) 4-Bay Dipole antenna mounted on a low profile platform with a RAD center elevation of 175-ft above the existing tower base plate.
  Coax Cables: One (1) 1-5/8" ∅ coax cable running on the inside of the existing tower.
- CINGULAR (Existing):
  Antennas: Three (3) Powerwave 7770.00 panel antennas and six (6) Powerwave LPG21401 TMA's flush-mounted with a RAD center elevation of 169-ft above the existing tower base plate.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- T-MOBILE (Existing):
  Antennas: Nine (9) DR65-19-00DPQ (3 existing/6 reserved) panel antennas and twelve (12) 10" by 8" by 3" TMA's mounted on three (3) Valmont T-Arms with a RAD center elevation of 159-ft above the existing tower base plate.
  Coax Cables: Twenty-four (24) 1-5/8" ∅ coax cables running on the inside of the existing tower.

- TOWN (Existing):
  Antennas: One (1) 2-Bay Dipole and one (1) Grid Dish antenna mounted to T-Mobile's T-Arms with a RAD center elevation of 159-ft above the existing tower base plate.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- SPRINT (Existing):
  Antennas: Twelve (12) 48000 (6 existing/6 reserved) panel antennas and six (6) 10" by 8" by 3" TMA's mounted on a platform with rails with a RAD center elevation of 149-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) 2-Bay Dipole antenna on a 6' Extension Arm Mount with a RAD center elevation of 129-ft above the existing tower base plate.
  Coax Cables: One (1) 1-5/8" ∅ coax cable running on the inside of the existing tower.
- VERIZON (Existing Removed/Reconfigured):
  Antennas: Six (6) Antel RWA-80013 and six (6) Antel LPA-185080/8CF_2 panel antennas mounted on a low profile platform with a RAD center elevation of 117-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **VERIZON (Proposed/Reconfigured):**
  Antennas: Four (4) Antel LPA-80063/6CF (proposed), two (2) Antel RWA-80013 (existing to remain) and six (6) Antel LPA-185080/8CF_2 (existing to remain) panel antennas mounted on a low profile platform with a RAD center elevation of 117-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) 4-Bay Dipole and one (1) Grid Dish antenna on a 6' Extension Arm Mount with a RAD center elevation of 99-ft above the existing tower base plate.
  Coax Cables: Two (2) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- SPRINT (Existing):
  Antennas: One (1) GPS antenna a 3' GPS Stand-off mount with a RAD center elevation of 74-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.
- T-MOBILE (Reserved):
  Antennas: One (1) GPS antenna a 3' GPS Stand-off mount with a RAD center elevation of 59-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.

- TOWN (Reserved):
  Antennas: One (1) Scanner antenna mounted with a RAD center elevation of 59-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the inside of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

Tower Loading

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

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Berlin; v = 100 mph (3 second gust) equivalent to v = 80 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	Equivalent wind speeds	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1610.1.3 of State Bldg. Code 1999] does not control in the design of this structure type*

Natcomm, Inc.
Structural Monopole Analysis
175' Existing EEI Monopole
Berlin, CT
February 14, 2008

Tower Capacity

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

Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **69.1%** of its total capacity.

Foundation and Anchors

The existing foundation consists of an 8-ft ∅ reinforced concrete caisson bearing directly on existing sub grade. The monopole tower is connected to the pedestal by means of eighteen (18) 2" diameter, A615-GR75 anchor bolts embedded into the concrete foundation structure.

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

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:
  - Shear Force @ top of pedestal = **28.0** kips
  - Moment @ top of pedestal = **3,400.0** ft-kips
  - Axial Force @ top of pedestal = **48.0** kips
- The base plate, anchor bolts and the foundation are within allowable limits.

Conclusions

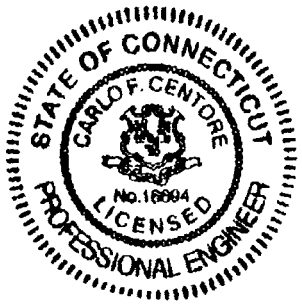
This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration.

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer



Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

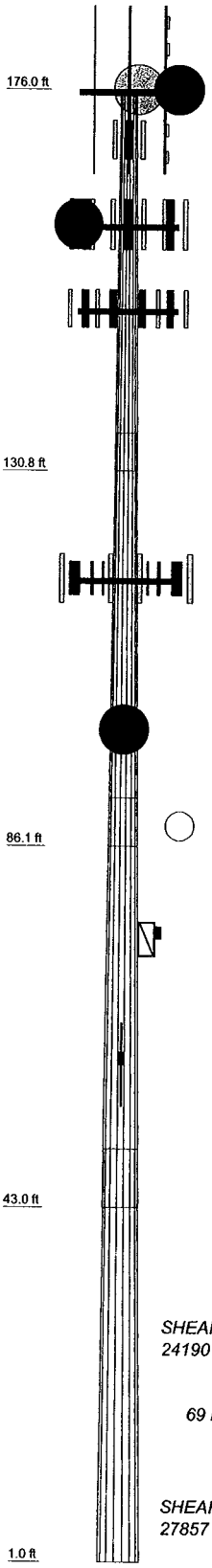
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

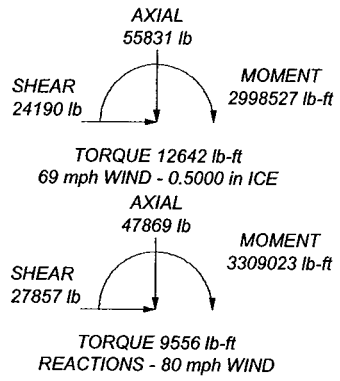
RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

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

Section	1	2	3	4
Length (ft)	45.25	49.13	48.87	49.00
Number of Sides	18	18	18	18
Thickness (in)	0.2500	0.3125	0.3750	0.4375
Lap Splice (ft)	4.50	5.75	7.00	
Top Dia (in)	21.0000	30.2260	39.8381	48.9596
Bot Dia (in)	31.8000	41.8200	51.3600	60.5000
Grade	A572-65			
Weight (lb) 30638.3	3195.0	5921.5	8951.2	12570.5





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Low Profile Platform (Town)	176	Grid Dish (Town)	160
4-Bay Dipole (Town)	176	Low Profile Platform (Sprint)	150
Omni (Town)	176	(4) 48000 (Sprint)	150
Grid Dish (Town)	176	(4) 48000 (Sprint)	150
8-Bay Dipole (Town)	176	(4) 48000 (Sprint)	150
Grid Dish (Town)	176	6' Extension Arm Mount (Town)	130
Omni (Town)	176	2-Bay Dipole (Town)	130
4-Bay Dipole (Town Reserved)	176	LPA-185080/8CF_2 (Verizon)	118
7770.00 w/ mount pipe (Cingular)	170	LPA-185080/8CF_2 (Verizon)	118
(2) LPG21401 TMA (Cingular)	170	LPA-80063-6CF (Verizon)	118
7770.00 w/ mount pipe (Cingular)	170	LPA-80063-6CF (Verizon)	118
(2) LPG21401 TMA (Cingular)	170	LPA-185080/8CF_2 (Verizon)	118
7770.00 w/ mount pipe (Cingular)	170	LPA-185080/8CF_2 (Verizon)	118
(2) LPG21401 TMA (Cingular)	170	LPA-80063-6CF (Verizon)	118
Valmont T-Arm (1) (T-Mobile)	160	RWA-80013 (Verizon)	118
Valmont T-Arm (1) (T-Mobile)	160	LPA-185080/8CF_2 (Verizon)	118
Valmont T-Arm (1) (T-Mobile)	160	LPA-185080/8CF_2 (Verizon)	118
DR65-19-00DPQ (T-Mobile)	160	RWA-80013 (Verizon)	118
(2) DR65-19-00DPQ (T-Mobile future)	160	Low Profile Platform (Verizon)	118
DR65-19-00DPQ (T-Mobile)	160	LPA-80063-6CF (Verizon)	118
(2) DR65-19-00DPQ (T-Mobile future)	160	6' Extension Arm Mount (Town)	100
DR65-19-00DPQ (T-Mobile)	160	4-Bay Dipole (Town)	100
(2) DR65-19-00DPQ (T-Mobile future)	160	Grid Dish (Town)	100
(2) TMA 10"x8"x3" (T-Mobile)	160	3' GPS Stand-off Mount (Sprint)	75
(2) TMA 10"x8"x3" (T-Mobile future)	160	GPS (Sprint)	75
(2) TMA 10"x8"x3" (T-Mobile)	160	3' GPS Stand-off Mount (T-Mobile Reserved)	60
(2) TMA 10"x8"x3" (T-Mobile future)	160		
(2) TMA 10"x8"x3" (T-Mobile)	160	GPS (T-Mobile Reserved)	60
(2) TMA 10"x8"x3" (T-Mobile future)	160	Scanner Antenna (Town Reserved)	60
2-Bay Dipole (Town)	160		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 69.1%

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

Job: 175' EEI Monopole		
Project: 08007.CO5 - 1657 Wilbur Cross Pkwy, Berlin, CT		
Client: Verizon	Drawn by: Staff	App'd:
Code: TIA/EIA-222-F	Date: 02/08/08	Scale: NTS
Path: C:\Users\klorman214\Documents\Natcomm\08007.CO5 Berlin 4\ERI Files\175 EEI Berlin FD.dl		Dwg No. E-1

RISATower	Job	Page
	175' EEI Monopole	1 of 19
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 08007.CO5 - 1657 Wilbur Cross Pkwy, Berlin, CT	Date 21:40:43 02/08/08
	Client Verizon	Designed by Staff

Tower Input Data

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

Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in 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	176.00-130.75	45.25	4.50	18	21.0000	31.8000	0.2500	1.0000	A572-65 (65 ksi)
L2	130.75-86.12	49.13	5.75	18	30.2260	41.8200	0.3125	1.2500	A572-65 (65 ksi)
L3	86.12-43.00	48.87	7.00	18	39.8381	51.3600	0.3750	1.5000	A572-65 (65 ksi)
L4	43.00-1.00	49.00		18	48.9596	60.5000	0.4375	1.7500	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	21.3240	16.4651	895.6507	7.3663	10.6680	83.9568	1792.4800	8.2341	3.2560	13.024
	32.2906	25.0349	3148.3461	11.2003	16.1544	194.8909	6300.8349	12.5198	5.1568	20.627
L2	31.7706	29.6704	3354.2439	10.6193	15.3548	218.4493	6712.9014	14.8380	4.7698	15.263
	42.4651	41.1703	8961.3641	14.7352	21.2446	421.8192	17934.5198	20.5890	6.8103	21.793
L3	41.8292	46.9709	9241.6269	14.0094	20.2377	456.6531	18495.4142	23.4899	6.3515	16.937
	52.1523	60.6849	19929.7987	18.0997	26.0909	763.8607	39885.8215	30.3482	8.3794	22.345
L4	51.3890	67.3790	20042.0464	17.2254	24.8715	805.8240	40110.4646	33.6959	7.8469	17.936
	61.4333	83.4043	38013.0437	21.3222	30.7340	1236.8401	76076.1060	41.7101	9.8780	22.578

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 176.00-130.75				1	1	1		
L2 130.75-86.12				1	1	1		
L3 86.12-43.00				1	1	1		
L4 43.00-1.00				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
1 5/8 (Town)	A	No	Inside Pole	176.00 - 4.00	7	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Cingular)	B	No	Inside Pole	170.00 - 4.00	6	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (T-Mobile)	C	No	Inside Pole	160.00 - 4.00	24	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Town)	C	No	Inside Pole	160.00 - 4.00	2	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Sprint)	A	No	Inside Pole	150.00 - 4.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Town)	A	No	Inside Pole	130.00 - 4.00	1	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Verizon)	B	No	Inside Pole	118.00 - 4.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Town)	C	No	Inside Pole	100.00 - 4.00	2	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1/2 (Sprint)	C	No	Inside Pole	75.00 - 4.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2 (T-Mobile)	C	No	Inside Pole	60.00 - 4.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2 (Town)	C	No	Inside Pole	60.00 - 4.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25

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	176.00-130.75	A	0.000	0.000	0.000	0.000	569.66
		B	0.000	0.000	0.000	0.000	244.92
		C	0.000	0.000	0.000	0.000	790.92
L2	130.75-86.12	A	0.000	0.000	0.000	0.000	927.52
		B	0.000	0.000	0.000	0.000	676.35
		C	0.000	0.000	0.000	0.000	1235.67
L3	86.12-43.00	A	0.000	0.000	0.000	0.000	896.90
		B	0.000	0.000	0.000	0.000	807.21
		C	0.000	0.000	0.000	0.000	1272.15
L4	43.00-1.00	A	0.000	0.000	0.000	0.000	811.20
		B	0.000	0.000	0.000	0.000	730.08
		C	0.000	0.000	0.000	0.000	1164.93

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	176.00-130.75	A	0.500	0.000	0.000	0.000	0.000	569.66
		B		0.000	0.000	0.000	0.000	244.92
		C		0.000	0.000	0.000	0.000	790.92
L2	130.75-86.12	A	0.500	0.000	0.000	0.000	0.000	927.52
		B		0.000	0.000	0.000	0.000	676.35
		C		0.000	0.000	0.000	0.000	1235.67
L3	86.12-43.00	A	0.500	0.000	0.000	0.000	0.000	896.90
		B		0.000	0.000	0.000	0.000	807.21
		C		0.000	0.000	0.000	0.000	1272.15
L4	43.00-1.00	A	0.500	0.000	0.000	0.000	0.000	811.20
		B		0.000	0.000	0.000	0.000	730.08
		C		0.000	0.000	0.000	0.000	1164.93

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	176.00-130.75	0.0000	0.0000	0.0000	0.0000
L2	130.75-86.12	0.0000	0.0000	0.0000	0.0000
L3	86.12-43.00	0.0000	0.0000	0.0000	0.0000
L4	43.00-1.00	0.0000	0.0000	0.0000	0.0000

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
Low Profile Platform	C	None		0.0000	176.00	No Ice	15.70	15.70	1300.00
(Town)						1/2" Ice	20.10	20.10	1765.00
4-Bay Dipole	C	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			6.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Omni	C	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Grid Dish	C	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			-6.00			1/2" Ice	9.00	9.00	80.00
			0.00						
8-Bay Dipole	B	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Grid Dish	B	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			-6.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Omni	A	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
4-Bay Dipole	C	From Face	4.00	0.0000	176.00	No Ice	5.40	5.40	50.00
(Town Reserved)			6.00			1/2" Ice	9.00	9.00	80.00
			0.00						
7770.00 w/ mount pipe	A	From Face	1.00	0.0000	170.00	No Ice	5.99	4.26	63.95
(Cingular)			0.00			1/2" Ice	6.45	4.91	110.64
			0.00						
(2) LPG21401 TMA	A	From Face	1.00	0.0000	170.00	No Ice	0.95	0.37	17.50
(Cingular)			0.00			1/2" Ice	1.09	0.48	23.31
			0.00						
7770.00 w/ mount pipe	B	From Face	1.00	0.0000	170.00	No Ice	5.99	4.26	63.95
(Cingular)			0.00			1/2" Ice	6.45	4.91	110.64
			0.00						
(2) LPG21401 TMA	B	From Face	1.00	0.0000	170.00	No Ice	0.95	0.37	17.50
(Cingular)			0.00			1/2" Ice	1.09	0.48	23.31
			0.00						
7770.00 w/ mount pipe	C	From Face	1.00	0.0000	170.00	No Ice	5.99	4.26	63.95
(Cingular)			0.00			1/2" Ice	6.45	4.91	110.64
			0.00						
(2) LPG21401 TMA	C	From Face	1.00	0.0000	170.00	No Ice	0.95	0.37	17.50
(Cingular)			0.00			1/2" Ice	1.09	0.48	23.31
			0.00						
Valmont T-Arm (1)	A	From Face	2.00	0.0000	160.00	No Ice	10.54	10.54	336.00
(T-Mobile)			0.00			1/2" Ice	14.45	14.45	412.00
			0.00						
Valmont T-Arm (1)	B	From Face	2.00	0.0000	160.00	No Ice	10.54	10.54	336.00
(T-Mobile)			0.00			1/2" Ice	14.45	14.45	412.00
			0.00						
Valmont T-Arm (1)	C	From Face	2.00	0.0000	160.00	No Ice	10.54	10.54	336.00
(T-Mobile)			0.00			1/2" Ice	14.45	14.45	412.00
			0.00						
DR65-19-00DPQ	A	From Face	4.00	0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00			1/2" Ice	8.95	3.97	73.77
			0.00						
(2) DR65-19-00DPQ	A	From Face	4.00	0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile future)			0.00			1/2" Ice	8.95	3.97	73.77
			0.00						
DR65-19-00DPQ	B	From Face	4.00	0.0000	160.00	No Ice	8.40	3.53	32.00

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
(T-Mobile)			0.00			1/2" Ice	8.95	3.97	73.77
			0.00						
(2) DR65-19-00DPQ	B	From Face	4.00	0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile future)			0.00			1/2" Ice	8.95	3.97	73.77
			0.00						
DR65-19-00DPQ	C	From Face	4.00	0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00			1/2" Ice	8.95	3.97	73.77
			0.00						
(2) DR65-19-00DPQ	C	From Face	4.00	0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile future)			0.00			1/2" Ice	8.95	3.97	73.77
			0.00						
(2) TMA 10"x8"x3"	A	From Face	4.00	0.0000	160.00	No Ice	0.78	0.29	15.00
(T-Mobile)			0.00			1/2" Ice	0.90	0.38	20.06
			0.00						
(2) TMA 10"x8"x3"	A	From Face	4.00	0.0000	160.00	No Ice	0.78	0.29	15.00
(T-Mobile future)			0.00			1/2" Ice	0.90	0.38	20.06
			0.00						
(2) TMA 10"x8"x3"	B	From Face	4.00	0.0000	160.00	No Ice	0.78	0.29	15.00
(T-Mobile)			0.00			1/2" Ice	0.90	0.38	20.06
			0.00						
(2) TMA 10"x8"x3"	B	From Face	4.00	0.0000	160.00	No Ice	0.78	0.29	15.00
(T-Mobile future)			0.00			1/2" Ice	0.90	0.38	20.06
			0.00						
(2) TMA 10"x8"x3"	C	From Face	4.00	0.0000	160.00	No Ice	0.78	0.29	15.00
(T-Mobile)			0.00			1/2" Ice	0.90	0.38	20.06
			0.00						
(2) TMA 10"x8"x3"	C	From Face	4.00	0.0000	160.00	No Ice	0.78	0.29	15.00
(T-Mobile future)			0.00			1/2" Ice	0.90	0.38	20.06
			0.00						
2-Bay Dipole	C	From Face	4.00	0.0000	160.00	No Ice	5.40	5.40	50.00
(Town)			6.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Grid Dish	C	From Face	4.00	0.0000	160.00	No Ice	5.40	5.40	50.00
(Town)			6.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Low Profile Platform	C	None		0.0000	150.00	No Ice	15.70	15.70	1300.00
(Sprint)						1/2" Ice	20.10	20.10	1765.00
(4) 48000	A	From Face	4.00	0.0000	150.00	No Ice	4.51	1.82	18.30
(Sprint)			0.00			1/2" Ice	4.91	2.15	40.88
			0.00						
(4) 48000	B	From Face	4.00	0.0000	150.00	No Ice	4.51	1.82	18.30
(Sprint)			0.00			1/2" Ice	4.91	2.15	40.88
			0.00						
(4) 48000	C	From Face	4.00	0.0000	150.00	No Ice	4.51	1.82	18.30
(Sprint)			0.00			1/2" Ice	4.91	2.15	40.88
			0.00						
Low Profile Platform	C	None		0.0000	118.00	No Ice	15.70	15.70	1300.00
(Verizon)						1/2" Ice	20.10	20.10	1765.00
LPA-80063-6CF	A	From Face	4.00	0.0000	118.00	No Ice	10.31	9.01	27.00
(Verizon)			-6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
LPA-185080/8CF_2	A	From Face	4.00	0.0000	118.00	No Ice	2.09	2.79	7.00
(Verizon)			-4.00			1/2" Ice	2.39	3.09	25.04
			0.00						
LPA-185080/8CF_2	A	From Face	4.00	0.0000	118.00	No Ice	2.09	2.79	7.00
(Verizon)			4.00			1/2" Ice	2.39	3.09	25.04
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
LPA-80063-6CF	A	From Face	4.00	0.0000	118.00	No Ice	10.31	9.01	27.00
(Verizon)			6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
LPA-80063-6CF	B	From Face	4.00	0.0000	118.00	No Ice	10.31	9.01	27.00
(Verizon)			-6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
LPA-185080/8CF_2	B	From Face	4.00	0.0000	118.00	No Ice	2.09	2.79	7.00
(Verizon)			-4.00			1/2" Ice	2.39	3.09	25.04
			0.00						
LPA-185080/8CF_2	B	From Face	4.00	0.0000	118.00	No Ice	2.09	2.79	7.00
(Verizon)			4.00			1/2" Ice	2.39	3.09	25.04
			0.00						
LPA-80063-6CF	B	From Face	4.00	0.0000	118.00	No Ice	10.31	9.01	27.00
(Verizon)			6.00			1/2" Ice	10.87	9.55	100.95
			0.00						
RWA-80013	C	From Face	4.00	0.0000	118.00	No Ice	5.44	3.00	14.30
(Verizon)			-6.00			1/2" Ice	5.83	3.31	46.80
			0.00						
LPA-185080/8CF_2	C	From Face	4.00	0.0000	118.00	No Ice	2.09	2.79	7.00
(Verizon)			-4.00			1/2" Ice	2.39	3.09	25.04
			0.00						
LPA-185080/8CF_2	C	From Face	4.00	0.0000	118.00	No Ice	2.09	2.79	7.00
(Verizon)			4.00			1/2" Ice	2.39	3.09	25.04
			0.00						
RWA-80013	C	From Face	4.00	0.0000	118.00	No Ice	5.44	3.00	14.30
(Verizon)			6.00			1/2" Ice	5.83	3.31	46.80
			0.00						
6' Extension Arm Mount	C	From Face	3.00	0.0000	130.00	No Ice	5.01	5.01	130.00
(Town)			0.00			1/2" Ice	6.77	6.77	165.00
			0.00						
2-Bay Dipole	C	From Face	6.00	0.0000	130.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
6' Extension Arm Mount	C	From Face	3.00	0.0000	100.00	No Ice	5.01	5.01	130.00
(Town)			0.00			1/2" Ice	6.77	6.77	165.00
			0.00						
4-Bay Dipole	C	From Face	6.00	0.0000	100.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Grid Dish	C	From Face	6.00	0.0000	100.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
3' GPS Stand-off Mount	B	From Face	1.50	0.0000	75.00	No Ice	2.45	2.45	51.00
(Sprint)			0.00			1/2" Ice	3.98	3.98	75.00
			0.00						
GPS	B	From Face	3.00	0.0000	75.00	No Ice	1.00	1.00	10.00
(Sprint)			0.00			1/2" Ice	1.50	1.50	15.00
			0.00						
3' GPS Stand-off Mount	C	From Face	1.50	0.0000	60.00	No Ice	2.45	2.45	51.00
(T-Mobile Reserved)			0.00			1/2" Ice	3.98	3.98	75.00
			0.00						
GPS	C	From Face	3.00	0.0000	60.00	No Ice	1.00	1.00	10.00
(T-Mobile Reserved)			0.00			1/2" Ice	1.50	1.50	15.00
			0.00						
Scanner Antenna	C	From Face	3.00	0.0000	60.00	No Ice	5.40	5.40	50.00
(Town Reserved)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						

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 176.00-130.75	152.07	1.547	25	99.550	A	0.000	99.550	99.550	100.00	0.000	0.000
					B	0.000	99.550		100.00		
					C	0.000	99.550		100.00		
L2 130.75-86.12	107.69	1.402	23	135.950	A	0.000	135.950	135.950	100.00	0.000	0.000
					B	0.000	135.950		100.00		
					C	0.000	135.950		100.00		
L3 86.12-43.00	64.29	1.21	20	166.288	A	0.000	166.288	166.288	100.00	0.000	0.000
					B	0.000	166.288		100.00		
					C	0.000	166.288		100.00		
L4 43.00-1.00	21.38	1	16	194.439	A	0.000	194.439	194.439	100.00	0.000	0.000
					B	0.000	194.439		100.00		
					C	0.000	194.439		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 176.00-130.75	152.07	1.547	19	0.5000	103.321	A	0.000	103.321	103.321	100.00	0.000	0.000
						B	0.000	103.321		100.00		
						C	0.000	103.321		100.00		
L2 130.75-86.12	107.69	1.402	17	0.5000	139.669	A	0.000	139.669	139.669	100.00	0.000	0.000
						B	0.000	139.669		100.00		
						C	0.000	139.669		100.00		
L3 86.12-43.00	64.29	1.21	15	0.5000	169.882	A	0.000	169.882	169.882	100.00	0.000	0.000
						B	0.000	169.882		100.00		
						C	0.000	169.882		100.00		
L4 43.00-1.00	21.38	1	12	0.5000	197.939	A	0.000	197.939	197.939	100.00	0.000	0.000
						B	0.000	197.939		100.00		
						C	0.000	197.939		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 176.00-130.75	152.07	1.547	10	99.550	A	0.000	99.550	99.550	100.00	0.000	0.000
					B	0.000	99.550		100.00		
					C	0.000	99.550		100.00		
L2 130.75-86.12	107.69	1.402	9	135.950	A	0.000	135.950	135.950	100.00	0.000	0.000
					B	0.000	135.950		100.00		
					C	0.000	135.950		100.00		
L3 86.12-43.00	64.29	1.21	8	166.288	A	0.000	166.288	166.288	100.00	0.000	0.000
					B	0.000	166.288		100.00		
					C	0.000	166.288		100.00		
L4 43.00-1.00	21.38	1	6	194.439	A	0.000	194.439	194.439	100.00	0.000	0.000
					B	0.000	194.439		100.00		
					C	0.000	194.439		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 176.00-130.75	1605.50	3195.00	A	1	0.65	1	1	1	99.550	2769.54	61.21	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.75-86.12	2839.54	5921.52	A	1	0.65	1	1	1	135.950	3423.82	76.72	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.12-43.00	2976.26	8951.25	A	1	0.65	1	1	1	166.288	3602.17	83.54	C
			B	1	0.65	1	1	1	166.288			
			C	1	0.65	1	1	1	166.288			
L4 43.00-1.00	2706.21	12570.51	A	1	0.65	1	1	1	194.439	3499.49	83.32	C
			B	1	0.65	1	1	1	194.439			
			C	1	0.65	1	1	1	194.439			
Sum Weight:	10127.51	30638.28						OTM	1082968.3 4 lb-ft	13295.01		

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 176.00-130.75	1605.50	3195.00	A	1	0.65	1	1	1	99.550	2769.54	61.21	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.75-86.12	2839.54	5921.52	A	1	0.65	1	1	1	135.950	3423.82	76.72	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.12-43.00	2976.26	8951.25	A	1	0.65	1	1	1	166.288	3602.17	83.54	C
			B	1	0.65	1	1	1	166.288			
			C	1	0.65	1	1	1	166.288			
L4 43.00-1.00	2706.21	12570.51	A	1	0.65	1	1	1	194.439	3499.49	83.32	C
			B	1	0.65	1	1	1	194.439			
			C	1	0.65	1	1	1	194.439			
Sum Weight:	10127.51	30638.28						OTM	1082968.3	13295.01		

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

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 176.00-130.75	1605.50	3195.00	A	1	0.65	1	1	1	99.550	2769.54	61.21	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.75-86.12	2839.54	5921.52	A	1	0.65	1	1	1	135.950	3423.82	76.72	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.12-43.00	2976.26	8951.25	A	1	0.65	1	1	1	166.288	3602.17	83.54	C
			B	1	0.65	1	1	1	166.288			
			C	1	0.65	1	1	1	166.288			
L4 43.00-1.00	2706.21	12570.51	A	1	0.65	1	1	1	194.439	3499.49	83.32	C
			B	1	0.65	1	1	1	194.439			
			C	1	0.65	1	1	1	194.439			
Sum Weight:	10127.51	30638.28						OTM	1082968.3 4 lb-ft	13295.01		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face e	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 176.00-130.75	1605.50	3946.23	A	1	0.65	1	1	1	103.321	2155.83	47.64	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.75-86.12	2839.54	6942.14	A	1	0.65	1	1	1	139.669	2638.11	59.11	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			
L3 86.12-43.00	2976.26	10196.08	A	1	0.65	1	1	1	169.882	2760.00	64.01	C
			B	1	0.65	1	1	1	169.882			
			C	1	0.65	1	1	1	169.882			
L4 43.00-1.00	2706.21	14023.49	A	1	0.65	1	1	1	197.939	2671.86	63.62	C
			B	1	0.65	1	1	1	197.939			
			C	1	0.65	1	1	1	197.939			
Sum Weight:	10127.51	35107.94						OTM	836263.93 lb-ft	10225.80		

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 176.00-130.75	1605.50	3946.23	A	1	0.65	1	1	1	103.321	2155.83	47.64	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.75-86.12	2839.54	6942.14	A	1	0.65	1	1	1	139.669	2638.11	59.11	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			
L3 86.12-43.00	2976.26	10196.08	A	1	0.65	1	1	1	169.882	2760.00	64.01	C
			B	1	0.65	1	1	1	169.882			
			C	1	0.65	1	1	1	169.882			
L4 43.00-1.00	2706.21	14023.49	A	1	0.65	1	1	1	197.939	2671.86	63.62	C
			B	1	0.65	1	1	1	197.939			
			C	1	0.65	1	1	1	197.939			
Sum Weight:	10127.51	35107.94						OTM	836263.93 lb-ft	10225.80		

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 176.00-130.75	1605.50	3946.23	A	1	0.65	1	1	1	103.321	2155.83	47.64	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.75-86.12	2839.54	6942.14	A	1	0.65	1	1	1	139.669	2638.11	59.11	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			
L3 86.12-43.00	2976.26	10196.08	A	1	0.65	1	1	1	169.882	2760.00	64.01	C
			B	1	0.65	1	1	1	169.882			
			C	1	0.65	1	1	1	169.882			
L4 43.00-1.00	2706.21	14023.49	A	1	0.65	1	1	1	197.939	2671.86	63.62	C
			B	1	0.65	1	1	1	197.939			
			C	1	0.65	1	1	1	197.939			
Sum Weight:	10127.51	35107.94						OTM	836263.93 lb-ft	10225.80		

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 176.00-130.75	1605.50	3195.00	A	1	0.65	1	1	1	99.550	1081.85	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.75-86.12	2839.54	5921.52	A	1	0.65	1	1	1	135.950	1337.43	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.12-43.00	2976.26	8951.25	A	1	0.65	1	1	1	166.288	1407.10	32.63	C
			B	1	0.65	1	1	1	166.288			
			C	1	0.65	1	1	1	166.288			

RISATower	Job: 175' EEI Monopole	Page: 11 of 19
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 08007.CO5 - 1657 Wilbur Cross Pkwy, Berlin, CT	Date: 21:40:43 02/08/08
	Client: Verizon	Designed by: Staff

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
L4 43.00-1.00	2706.21	12570.51	A	1	0.65	1	1	1	194.439	1366.99	32.55	C
			B	1	0.65	1	1	1	194.439			
			C	1	0.65	1	1	1	194.439			
Sum Weight:	10127.51	30638.28						OTM	423034.51 lb-ft	5193.36		

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 176.00-130.75	1605.50	3195.00	A	1	0.65	1	1	1	99.550	1081.85	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.75-86.12	2839.54	5921.52	A	1	0.65	1	1	1	135.950	1337.43	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.12-43.00	2976.26	8951.25	A	1	0.65	1	1	1	166.288	1407.10	32.63	C
			B	1	0.65	1	1	1	166.288			
			C	1	0.65	1	1	1	166.288			
L4 43.00-1.00	2706.21	12570.51	A	1	0.65	1	1	1	194.439	1366.99	32.55	C
			B	1	0.65	1	1	1	194.439			
			C	1	0.65	1	1	1	194.439			
Sum Weight:	10127.51	30638.28						OTM	423034.51 lb-ft	5193.36		

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 176.00-130.75	1605.50	3195.00	A	1	0.65	1	1	1	99.550	1081.85	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.75-86.12	2839.54	5921.52	A	1	0.65	1	1	1	135.950	1337.43	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.12-43.00	2976.26	8951.25	A	1	0.65	1	1	1	166.288	1407.10	32.63	C
			B	1	0.65	1	1	1	166.288			
			C	1	0.65	1	1	1	166.288			
L4 43.00-1.00	2706.21	12570.51	A	1	0.65	1	1	1	194.439	1366.99	32.55	C
			B	1	0.65	1	1	1	194.439			
			C	1	0.65	1	1	1	194.439			
Sum Weight:	10127.51	30638.28						OTM	423034.51 lb-ft	5193.36		

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	30638.28					
Bracing Weight	0.00					
Total Member Self-Weight	30638.28			3367.02	650.23	
Total Weight	47868.84			3367.02	650.23	
Wind 0 deg - No Ice		0.00	-27857.06	-3199216.92	650.23	-3576.13
Wind 30 deg - No Ice		13883.27	-24124.92	-2770152.03	-1595347.00	1427.88
Wind 60 deg - No Ice		24046.54	-13928.53	-1597924.95	-2763698.06	6049.29
Wind 90 deg - No Ice		27766.55	0.00	3367.02	-3191344.22	9049.80
Wind 120 deg - No Ice		24046.54	13928.53	1604659.00	-2763698.06	9625.42
Wind 150 deg - No Ice		13883.27	24124.92	2776886.08	-1595347.00	7621.92
Wind 180 deg - No Ice		0.00	27857.06	3205950.97	650.23	3576.13
Wind 210 deg - No Ice		-13883.27	24124.92	2776886.08	1596647.46	-1427.88
Wind 240 deg - No Ice		-24046.54	13928.53	1604659.00	2764998.52	-6049.29
Wind 270 deg - No Ice		-27766.55	0.00	3367.02	3192644.68	-9049.80
Wind 300 deg - No Ice		-24046.54	-13928.53	-1597924.95	2764998.52	-9625.42
Wind 330 deg - No Ice		-13883.27	-24124.92	-2770152.03	1596647.46	-7621.92
Member Ice	4469.67					
Total Weight Ice	55831.09			4622.00	1063.56	
Wind 0 deg - Ice		0.00	-24189.73	-2868745.99	1063.56	-4496.26
Wind 30 deg - Ice		12058.93	-20948.92	-2483787.67	-1431416.10	2158.40
Wind 60 deg - Ice		20886.68	-12094.87	-1432062.00	-2480063.98	8234.72
Wind 90 deg - Ice		24117.87	0.00	4622.00	-2863895.75	12104.55
Wind 120 deg - Ice		20886.68	12094.87	1441305.99	-2480063.98	12730.98
Wind 150 deg - Ice		12058.93	20948.92	2493031.66	-1431416.10	9946.15
Wind 180 deg - Ice		0.00	24189.73	2877989.98	1063.56	4496.26
Wind 210 deg - Ice		-12058.93	20948.92	2493031.66	1433543.21	-2158.40
Wind 240 deg - Ice		-20886.68	12094.87	1441305.99	2482191.10	-8234.72
Wind 270 deg - Ice		-24117.87	0.00	4622.00	2866022.86	-12104.55
Wind 300 deg - Ice		-20886.68	-12094.87	-1432062.00	2482191.10	-12730.98
Wind 330 deg - Ice		-12058.93	-20948.92	-2483787.67	1433543.21	-9946.15
Total Weight	47868.84			3367.02	650.23	
Wind 0 deg - Service		0.00	-10881.66	-1247642.33	650.23	-1396.93
Wind 30 deg - Service		5423.15	-9423.80	-1080038.86	-622786.19	557.77
Wind 60 deg - Service		9393.18	-5440.83	-622137.65	-1079173.32	2363.00
Wind 90 deg - Service		10846.31	0.00	3367.02	-1246222.60	3535.08
Wind 120 deg - Service		9393.18	5440.83	628871.70	-1079173.32	3759.93
Wind 150 deg - Service		5423.15	9423.80	1086772.91	-622786.19	2977.31
Wind 180 deg - Service		0.00	10881.66	1254376.38	650.23	1396.93
Wind 210 deg - Service		-5423.15	9423.80	1086772.91	624086.65	-557.77
Wind 240 deg - Service		-9393.18	5440.83	628871.70	1080473.78	-2363.00
Wind 270 deg - Service		-10846.31	0.00	3367.02	1247523.06	-3535.08
Wind 300 deg - Service		-9393.18	-5440.83	-622137.65	1080473.78	-3759.93
Wind 330 deg - Service		-5423.15	-9423.80	-1080038.86	624086.65	-2977.31

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	176 - 130.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-12280.03	1379.73	-1439.11
			Max. Mx	11	-8424.72	335098.67	-771.68
			Max. My	8	-8421.39	675.55	-335163.81
			Max. Vy	11	-13057.81	335098.67	-771.68
			Max. Vx	8	13059.96	675.55	-335163.81
			Max. Torque	25			6853.91
L2	130.75 - 86.12	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-24363.06	1419.60	-4243.07
			Max. Mx	11	-18438.86	1077862.20	-2991.74
			Max. My	8	-18430.82	797.75	-1082566.54
			Max. Vy	11	-20611.51	1077862.20	-2991.74
			Max. Vx	8	20705.52	797.75	-1082566.54
			Max. Torque	19			-11705.26
L3	86.12 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-36975.66	1144.84	-4829.66
			Max. Mx	11	-30165.19	2017188.90	-3477.51
			Max. My	8	-30160.91	670.97	-

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
							2026380.03
			Max. Vy	11	-24325.39	2017188.90	-3477.51
			Max. Vx	8	24418.73	670.97	-
							2026380.03
			Max. Torque	19			-12650.68
L4	43 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-55831.09	1144.84	-4829.64
			Max. Mx	11	-47855.53	3295312.40	-3500.85
			Max. My	8	-47855.43	675.22	-
							3309022.59
			Max. Vy	11	-27789.48	3295312.40	-3500.85
			Max. Vx	8	27880.08	675.22	-
							3309022.59
			Max. Torque	19			-12646.84

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	21	55831.09	-0.00	-24189.75
	Max. H_x	11	47868.84	27766.55	-0.00
	Max. H_z	2	47868.84	0.00	27857.06
	Max. M_x	2	3301956.06	0.00	27857.06
	Max. M_z	5	3293920.54	-27766.55	-0.00
	Max. Torsion	25	12641.98	20886.70	12094.87
	Min. Vert	1	47868.84	0.00	-0.00
	Min. H_x	5	47868.84	-27766.55	-0.00
	Min. H_z	8	47868.84	0.00	-27857.06
	Min. M_x	8	-3309022.59	0.00	-27857.06
	Min. M_z	11	-3295312.41	27766.55	-0.00
	Min. Torsion	19	-12642.45	-20886.70	-12094.87

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	47868.84	-0.00	0.00	3452.81	681.54	-0.05
Dead+Wind 0 deg - No Ice	47868.84	-0.00	-27857.06	-3301956.06	674.83	-3545.01
Dead+Wind 30 deg - No Ice	47868.84	13883.27	-24124.92	-2859106.88	-1646608.08	1423.53
Dead+Wind 60 deg - No Ice	47868.84	24046.54	-13928.53	-1649232.93	-2852513.13	6010.91
Dead+Wind 90 deg - No Ice	47868.84	27766.55	0.00	3499.64	-3293920.54	8987.87
Dead+Wind 120 deg - No Ice	47868.84	24046.54	13928.53	1656249.02	-2852542.48	9556.33
Dead+Wind 150 deg - No Ice	47868.84	13883.27	24124.92	2866156.59	-1646637.49	7563.87
Dead+Wind 180 deg - No Ice	47868.84	-0.00	27857.06	3309022.59	674.70	3544.69
Dead+Wind 210 deg - No Ice	47868.84	-13883.27	24124.92	2866174.84	1647997.51	-1424.14
Dead+Wind 240 deg - No Ice	47868.84	-24046.54	13928.53	1656267.22	2853923.72	-6011.29
Dead+Wind 270 deg - No Ice	47868.84	-27766.55	0.00	3499.55	3295312.41	-8987.63
Dead+Wind 300 deg - No Ice	47868.84	-24046.54	-13928.53	-1649251.26	2853894.46	-9555.75
Dead+Wind 330 deg - No Ice	47868.84	-13883.27	-24124.92	-2859125.16	1647968.30	-7563.63
Dead+Ice+Temp	55831.09	-0.00	0.00	4829.64	1144.84	-0.03
Dead+Wind 0 deg+Ice+Temp	55831.09	0.00	-24189.75	-2988678.97	1131.03	-4460.80

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 30 deg+Ice+Temp	55831.09	12058.94	-20948.94	-2587615.05	-1491283.32	2148.09
Dead+Wind 60 deg+Ice+Temp	55831.09	20886.70	-12094.87	-1491911.63	-2583819.26	8181.60
Dead+Wind 90 deg+Ice+Temp	55831.09	24117.88	-0.00	4864.62	-2983740.42	12022.93
Dead+Wind 120 deg+Ice+Temp	55831.09	20886.70	12094.87	1501670.53	-2583871.05	12642.45
Dead+Wind 150 deg+Ice+Temp	55831.09	12058.94	20948.94	2597433.31	-1491335.24	9874.14
Dead+Wind 180 deg+Ice+Temp	55831.09	0.00	24189.75	2998526.88	1130.73	4460.26
Dead+Wind 210 deg+Ice+Temp	55831.09	-12058.94	20948.94	2597461.66	1493613.22	-2148.51
Dead+Wind 240 deg+Ice+Temp	55831.09	-20886.70	12094.87	1501698.78	2586182.09	-8181.60
Dead+Wind 270 deg+Ice+Temp	55831.09	-24117.88	-0.00	4864.38	2986068.01	-12022.45
Dead+Wind 300 deg+Ice+Temp	55831.09	-20886.70	-12094.87	-1491940.23	2586130.50	-12641.98
Dead+Wind 330 deg+Ice+Temp	55831.09	-12058.94	-20948.94	-2587643.54	1493561.77	-9874.29
Dead+Wind 0 deg - Service	47868.84	-0.00	-10881.67	-1288593.30	698.31	-1394.87
Dead+Wind 30 deg - Service	47868.84	5423.16	-9423.80	-1115479.16	-643242.41	556.21
Dead+Wind 60 deg - Service	47868.84	9393.18	-5440.83	-642525.01	-1114640.70	2358.27
Dead+Wind 90 deg - Service	47868.84	10846.31	0.00	3543.75	-1287186.61	3528.49
Dead+Wind 120 deg - Service	47868.84	9393.18	5440.83	649615.08	-1114645.20	3753.22
Dead+Wind 150 deg - Service	47868.84	5423.16	9423.80	1122574.36	-643246.93	2972.22
Dead+Wind 180 deg - Service	47868.84	-0.00	10881.67	1295691.05	698.26	1394.82
Dead+Wind 210 deg - Service	47868.84	-5423.16	9423.80	1122577.13	644645.07	-556.31
Dead+Wind 240 deg - Service	47868.84	-9393.18	5440.83	649617.84	1116046.60	-2358.36
Dead+Wind 270 deg - Service	47868.84	-10846.31	0.00	3543.71	1288589.65	-3528.45
Dead+Wind 300 deg - Service	47868.84	-9393.18	-5440.83	-642527.83	1116042.15	-3753.11
Dead+Wind 330 deg - Service	47868.84	-5423.16	-9423.80	-1115481.97	644640.64	-2972.18

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	-47868.84	0.00	0.00	47868.84	-0.00	0.000%
2	0.00	-47868.84	-27857.06	0.00	47868.84	27857.06	0.000%
3	13883.27	-47868.84	-24124.92	-13883.27	47868.84	24124.92	0.000%
4	24046.54	-47868.84	-13928.53	-24046.54	47868.84	13928.53	0.000%
5	27766.55	-47868.84	0.00	-27766.55	47868.84	-0.00	0.000%
6	24046.54	-47868.84	13928.53	-24046.54	47868.84	-13928.53	0.000%
7	13883.27	-47868.84	24124.92	-13883.27	47868.84	-24124.92	0.000%
8	0.00	-47868.84	27857.06	0.00	47868.84	-27857.06	0.000%
9	-13883.27	-47868.84	24124.92	13883.27	47868.84	-24124.92	0.000%
10	-24046.54	-47868.84	13928.53	24046.54	47868.84	-13928.53	0.000%
11	-27766.55	-47868.84	0.00	27766.55	47868.84	-0.00	0.000%
12	-24046.54	-47868.84	-13928.53	24046.54	47868.84	13928.53	0.000%
13	-13883.27	-47868.84	-24124.92	13883.27	47868.84	24124.92	0.000%
14	0.00	-55831.09	0.00	0.00	55831.09	-0.00	0.000%
15	0.00	-55831.09	-24189.73	-0.00	55831.09	24189.75	0.000%
16	12058.93	-55831.09	-20948.92	-12058.94	55831.09	20948.94	0.000%
17	20886.68	-55831.09	-12094.87	-20886.70	55831.09	12094.87	0.000%
18	24117.87	-55831.09	0.00	-24117.88	55831.09	0.00	0.000%
19	20886.68	-55831.09	12094.87	-20886.70	55831.09	-12094.87	0.000%
20	12058.93	-55831.09	20948.92	-12058.94	55831.09	-20948.94	0.000%
21	0.00	-55831.09	24189.73	-0.00	55831.09	-24189.75	0.000%
22	-12058.93	-55831.09	20948.92	12058.94	55831.09	-20948.94	0.000%
23	-20886.68	-55831.09	12094.87	20886.70	55831.09	-12094.87	0.000%
24	-24117.87	-55831.09	0.00	24117.88	55831.09	0.00	0.000%
25	-20886.68	-55831.09	-12094.87	20886.70	55831.09	12094.87	0.000%
26	-12058.93	-55831.09	-20948.92	12058.94	55831.09	20948.94	0.000%
27	0.00	-47868.84	-10881.66	0.00	47868.84	10881.67	0.000%
28	5423.15	-47868.84	-9423.80	-5423.16	47868.84	9423.80	0.000%
29	9393.18	-47868.84	-5440.83	-9393.18	47868.84	5440.83	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
30	10846.31	-47868.84	0.00	-10846.31	47868.84	-0.00	0.000%
31	9393.18	-47868.84	5440.83	-9393.18	47868.84	-5440.83	0.000%
32	5423.15	-47868.84	9423.80	-5423.16	47868.84	-9423.80	0.000%
33	0.00	-47868.84	10881.66	0.00	47868.84	-10881.67	0.000%
34	-5423.15	-47868.84	9423.80	5423.16	47868.84	-9423.80	0.000%
35	-9393.18	-47868.84	5440.83	9393.18	47868.84	-5440.83	0.000%
36	-10846.31	-47868.84	0.00	10846.31	47868.84	-0.00	0.000%
37	-9393.18	-47868.84	-5440.83	9393.18	47868.84	5440.83	0.000%
38	-5423.15	-47868.84	-9423.80	5423.16	47868.84	9423.80	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	5	0.00000001	0.00004748
3	Yes	5	0.00000001	0.00027143
4	Yes	5	0.00000001	0.00024954
5	Yes	5	0.00000001	0.00008307
6	Yes	5	0.00000001	0.00033479
7	Yes	5	0.00000001	0.00024182
8	Yes	5	0.00000001	0.00004758
9	Yes	5	0.00000001	0.00027308
10	Yes	5	0.00000001	0.00030219
11	Yes	5	0.00000001	0.00008311
12	Yes	5	0.00000001	0.00023847
13	Yes	5	0.00000001	0.00032401
14	Yes	4	0.00000001	0.00001877
15	Yes	5	0.00000001	0.00020796
16	Yes	5	0.00000001	0.00056249
17	Yes	5	0.00000001	0.00052552
18	Yes	5	0.00000001	0.00026859
19	Yes	5	0.00000001	0.00068928
20	Yes	5	0.00000001	0.00052351
21	Yes	5	0.00000001	0.00020884
22	Yes	5	0.00000001	0.00056354
23	Yes	5	0.00000001	0.00062446
24	Yes	5	0.00000001	0.00026897
25	Yes	5	0.00000001	0.00052153
26	Yes	5	0.00000001	0.00066359
27	Yes	4	0.00000001	0.00024141
28	Yes	4	0.00000001	0.00058133
29	Yes	4	0.00000001	0.00050930
30	Yes	4	0.00000001	0.00041683
31	Yes	4	0.00000001	0.00091425
32	Yes	4	0.00000001	0.00053364
33	Yes	4	0.00000001	0.00024379
34	Yes	4	0.00000001	0.00059463
35	Yes	4	0.00000001	0.00073978
36	Yes	4	0.00000001	0.00041816
37	Yes	4	0.00000001	0.00054610
38	Yes	4	0.00000001	0.00085468

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	35.538	33	1.8165	0.0271
L2	135.25 - 86.12	20.787	33	1.5461	0.0135
L3	91.87 - 43	9.073	33	0.9845	0.0060
L4	50 - 1	2.548	33	0.4775	0.0022

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	Low Profile Platform	33	35.538	1.8165	0.0271	37702
170.00	7770.00 w/ mount pipe	33	33.263	1.7854	0.0249	31418
160.00	Valmont T-Arm (1)	33	29.508	1.7305	0.0213	11781
150.00	Low Profile Platform	33	25.855	1.6670	0.0179	7249
130.00	6' Extension Arm Mount	33	19.107	1.4926	0.0122	4609
118.00	Low Profile Platform	33	15.537	1.3509	0.0098	4575
100.00	6' Extension Arm Mount	33	10.890	1.1035	0.0071	4524
75.00	3' GPS Stand-off Mount	33	5.866	0.7419	0.0041	4402
60.00	3' GPS Stand-off Mount	33	3.667	0.5618	0.0028	4319

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	90.518	8	4.6206	0.0887
L2	135.25 - 86.12	52.989	8	3.9391	0.0453
L3	91.87 - 43	23.146	8	2.5106	0.0204
L4	50 - 1	6.503	8	1.2188	0.0076

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	Low Profile Platform	8	90.518	4.6206	0.0887	15055
170.00	7770.00 w/ mount pipe	8	84.731	4.5444	0.0817	12545
160.00	Valmont T-Arm (1)	8	75.180	4.4086	0.0702	4703
150.00	Low Profile Platform	8	65.887	4.2491	0.0593	2892
130.00	6' Extension Arm Mount	8	48.712	3.8002	0.0411	1834
118.00	Low Profile Platform	8	39.620	3.4328	0.0330	1814
100.00	6' Extension Arm Mount	8	27.779	2.8035	0.0238	1785
75.00	3' GPS Stand-off Mount	8	14.971	1.9295	0.0143	1731
60.00	3' GPS Stand-off Mount	8	9.360	1.4741	0.0099	1696

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	176 - 130.75 (1)	TP31.8x21x0.25	45.25	175.00	194.1	3.964	24.1827	-11504.40	95849.20	0.120
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	49.13	175.00	147.3	6.879	39.8244	-18430.80	273969.00	0.067
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	48.87	175.00	119.9	10.387	58.7205	-30160.90	609906.00	0.049
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	49.00	175.00	98.5	15.395	83.4043	-47855.40	1284000.00	0.037

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	176 - 130.75 (1)	TP31.8x21x0.25	329550.00	-21.753	39.000	0.558	0.00	0.000	39.000	0.000
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	1082566.67	-32.922	39.000	0.844	0.00	0.000	39.000	0.000
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	2026383.33	-34.008	39.000	0.872	0.00	0.000	39.000	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	3309025.00	-32.105	39.000	0.823	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	176 - 130.75 (1)	TP31.8x21x0.25	0.120	0.558	0.000	0.678 ✔	1.333	H1-3 ✔
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	0.067	0.844	0.000	0.911 ✔	1.333	H1-3 ✔
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	0.049	0.872	0.000	0.921 ✔	1.333	H1-3 ✔
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	0.037	0.823	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	176 - 130.75	Pole	TP31.8x21x0.25	1	-11504.40	127766.98	50.8	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P_{allow} lb	% Capacity	Pass Fail
L2	130.75 - 86.12	Pole	TP41.82x30.226x0.3125	2	-18430.80	365200.66	68.4	Pass
L3	86.12 - 43	Pole	TP51.36x39.8381x0.375	3	-30160.90	813004.66	69.1	Pass
L4	43 - 1	Pole	TP60.5x48.9596x0.4375	4	-47855.40	1711571.93	64.6	Pass
							Summary	
						Pole (L3)	69.1	Pass
						RATING =	**69.1**	**Pass**

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 3400 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 28 \cdot kips$	*user input*
Axial Force:	$Axial := 48 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts = N	$N := 18$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 70in$	*user input*
Bolt "Column" Distance:	$l := 3.0in$	*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*
Anchor Bolt Diameter	$D := 2.25in$	*user input*
Threads per Inch:	$n := 4.5$	*user input*

Base Plate Data:

Use ASTM A871 (60 ksi)		*user input*
Plate Yield Strength:	$Fy_{bp} := 60 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 2 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 76 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 60.5in$	*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: $i := 1..N$

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

$d_1 = 11.97 \cdot in$ $d_7 = 22.50 \cdot in$

$d_2 = 22.50 \cdot in$ $d_8 = 11.97 \cdot in$

$d_3 = 30.31 \cdot in$ $d_9 = 0.00 \cdot in$

$d_4 = 34.47 \cdot in$ $d_{10} = -11.97 \cdot in$

$d_5 = 34.47 \cdot in$ $d_{11} = -22.50 \cdot in$

$d_6 = 30.31 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 30.25 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 0.06 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 4.22 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 4.22 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 0.06 \cdot in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $EffectiveWidth = 36.80 \cdot in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 1.103 \times 10^4 \cdot in^2$$

Gross Area of Bolt:

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

Net Area of Bolt:

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

Net Diameter:

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

Radius of Gyration of Bolt:

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

Section Modulus of Bolt:

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

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.389 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 5.7 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 60.0 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

$$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) \qquad AllowableTension = 174.9 \cdot kips$$

Note: 1.333 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$$F_{net.area} := 1.333 \cdot (0.60 \cdot A_n \cdot Fy) \qquad F_{net.area} = 194.8 \cdot kips$$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N} \qquad MaxTension = 126.9 \cdot kips$$

Check Stresses:

Note: Bolts supplied are "upset bolts." Use net area for checking per AISC

$$\frac{MaxTension}{F_{net.area}} = 0.65$$

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

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:

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

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

Allowable Compressive Force:

$$K := 0.65$$

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

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

$$F_a := 1.333 \cdot F_a \quad \text{Note: 1.333 increase allowed per TIA/EIA} \qquad F_a = 60.0 \cdot ksi$$

Applied Compressive Force:

$$MaxCompression := \frac{OM \cdot R_{bc}}{I_p} + \frac{Axial}{N} \qquad MaxCompression = 132.2 \cdot kips$$

$$f_a := \frac{MaxCompression}{A_n} \qquad f_a = 40.7 \cdot ksi$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.68$$

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

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 47.0 \cdot kips$ $C_7 = 85.9 \cdot kips$

$C_2 = 85.9 \cdot kips$ $C_8 = 47.0 \cdot kips$

$C_3 = 114.8 \cdot kips$ $C_9 = 2.7 \cdot kips$

$C_4 = 130.2 \cdot kips$ $C_{10} = -41.6 \cdot kips$

$C_5 = 130.2 \cdot kips$ $C_{11} = -80.6 \cdot kips$

$C_6 = 114.8 \cdot kips$ etc.

Bending Stress in Plate:

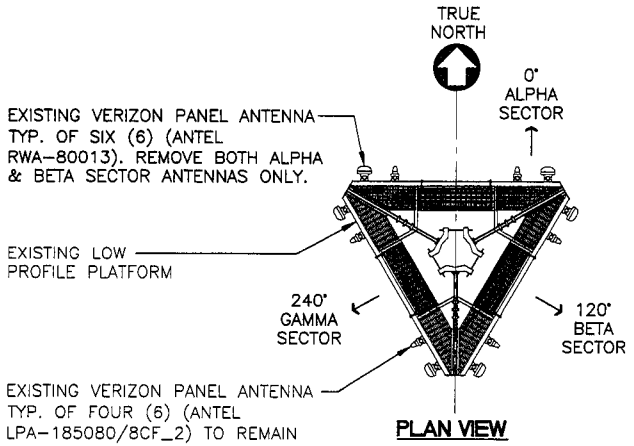
$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2} \qquad f_{bp} = 45.4 \cdot ksi$$

Check Stresses:

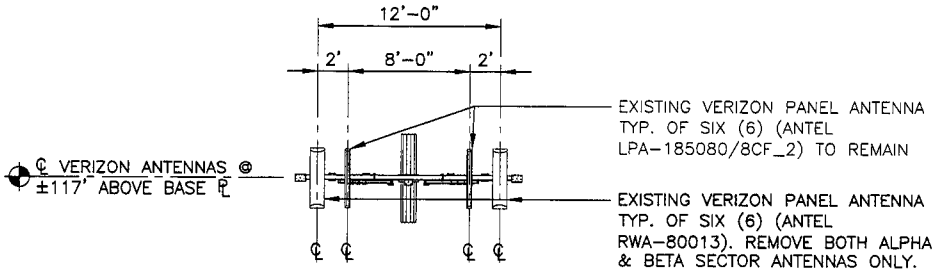
$$\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} = 0.76$$

$$Condition := if\left(\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition = "OK"



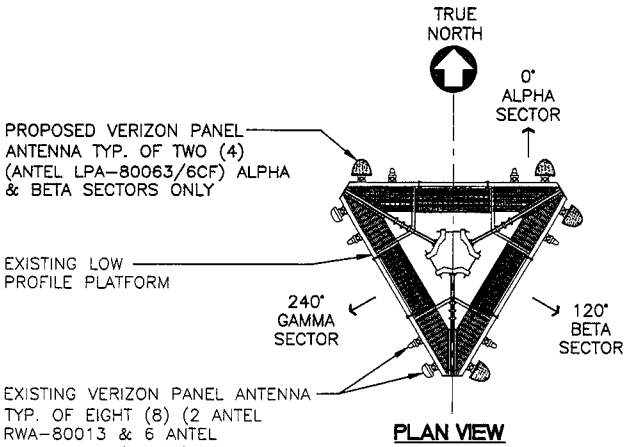
PLAN VIEW



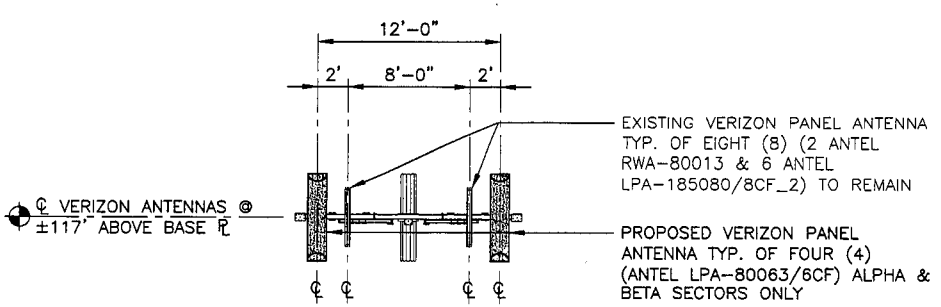
TYPICAL SECTOR ELEVATION

1 ANT-1 EXISTING ANTENNA MOUNTING CONFIGURATION

NOT TO SCALE



PLAN VIEW



ALPHA/BETA SECTOR ELEVATION

2 ANT-1 PROPOSED ANTENNA MOUNTING CONFIGURATION

NOT TO SCALE

REVISIONS		
00	02/13/08	ANTENNA LAYOUT

Celico Partnership
d.b.a. verizon wireless

NATCOMM
CONSULTING ENGINEERS
P: 203.488.0580
F: 203.488.8587
w: natcomm.com
e: info@nat-eng.com
63-2 N. Branford Rd.
Branford, CT 06405

PROFESSIONAL ENGINEER SEAL

BERLIN 4

1657 WILBUR CROSS PARKWAY
BERLIN, CT

PROJECT NO:	06007.C05
DRAWN BY:	DEB
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	02/13/08

ANTENNA REPLACEMENT DETAILS

ANT-1

DWG. 1 OF 1

DETAILED STRUCTURAL ANALYSIS AND EVALUATION OF 176' EXISTING MONOPOLE FOR NEW ANTENNA ARRANGEMENT

Berlin Fire Department
1657 Wilbur Cross Parkway
Berlin, Connecticut
T-Mobile Site No.: CTHA231A

prepared for

T · ·Mobile·

100 FILLEY STREET
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TEL. 860-692-7100

prepared by

URS

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

36922118.00000
VS1-034

September 29, 2005

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the existing 176' steel monopole structure located at 1657 Wilbur Cross Parkway in Berlin, Connecticut. The analysis was conducted in accordance with the TIA/EIA-222-F standard for wind velocity of 85 mph and 74 mph concurrent with ½" ice. The antenna loading considered in the analysis consists of all existing and proposed antennas, transmission lines, and ancillary items as outlined in the Introduction Section of this report. The proposed T-Mobile modification is as follows:

Proposed Antenna and Mount	Carrier	Antenna Center Elevation
Remove (1) Standoff Mount and relocate (1) Dipole antenna and (1) Grid Dish to new 10' low-profile platform	(Proposed)	@ 160'
Install (9) EMS DR65-19-00DPQ antennas and (12) Decibel PCS 1900 TMA's on a new 10' low-profile platform with (24) 1 5/8" coax cables within the monopole.	T-Mobile (Proposed)	@ 160'
Install (1) VIC-100 GPS antenna on (1) side arm mount with (1) 1/2" coax cable within the monopole	T-Mobile (Proposed)	@ 60'

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:

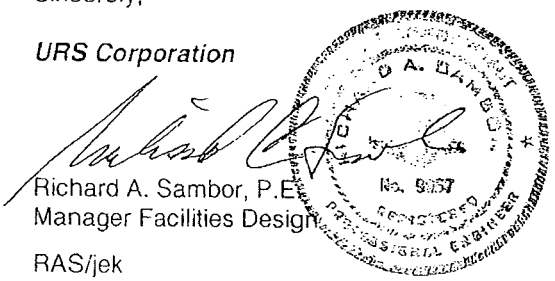
1) The tower structure's theoretical capacity, not including any assessment of the condition of the tower.
2) Tower geometry and structural member sizes taken from original construction drawings (EEI Job #: 11129) prepared by Engineered Endeavors, Inc., signed and sealed September 16, 2002.
3) Antenna 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. 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 – URS
CF/Book

2. INTRODUCTION

The subject tower is located at 1657 Wilbur Cross Parkway in Berlin, Connecticut. The structure is a 176' steel monopole designed by EEI, Inc.

The tower geometry and structure member sizes were taken from the original construction drawings (EEI Job #: 11129) prepared by Engineered Endeavors, Inc., signed and sealed September 16, 2002.

The inventory is summarized in the table below:

Antenna Type	*Carrier*	*Mount*	*Antenna Centerline Elevation*	*Cable*
(2) Dipole antennas	Town (existing)	Low-Profile Platform	176'	(2) 1 5/8" coax cables (within monopole)
(2) Grid Dishes	Town (existing)	Low-Profile Platform (listed above)	176'	(2) 1 5/8" coax cables (within monopole)
(2) Omni antennas	Town (existing)	Low-Profile Platform (listed above)	176'	(2) 1 5/8" coax cables (within monopole)
(1) Dipole antenna	Town (future)	Low-Profile Platform (listed above)	176'	(1) 1 5/8" coax cable (within monopole)
(3) Allgon 7184 antennas	Cingular (existing)	(3) Flush Mounts	168'	(6) 1 5/8" coax cables (within monopole)
(9) EMS DR65-19-00DPQ antennas and (12) Decibel PCS 1900 TMA's	**T-Mobile (proposed)**	**Low-Profile Platform**	160'	**(24) 1 5/8" coax cables (within monopole)**
(12) Dapa 48000 antennas	Sprint (existing and future)	Low-Profile Platform	150'	(12) 1 5/8" coax cables (within monopole)
(1) Dipole antenna	Town (existing)	Standoff Mount	130'	(1) 1 5/8" coax cable (within monopole)
(1) Dipole antenna	Town (existing)	Standoff Mount	100'	(1) 1 5/8" coax cable (within monopole)
(1) Grid Dish	Town (existing)	Standoff Mount (listed above)	100'	(1) 1 5/8" coax cable (within monopole)
(1) GPS antenna	Sprint (existing)	Standoff Mount	75'	(1) 1/2" coax cable (within monopole)
(1) VIC-100 GPS antenna	**T-Mobile (proposed)**	**Standoff Mount**	60'	**(1) 1/2" coax cable (within monopole)**
(1) Scanner antenna	Town (existing)	Standoff Mount	60'	(1) 1/2" coax cable (within monopole)

This structural analysis of the communications tower was performed by URS Corporation (URS) for T-Mobile. 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. 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.

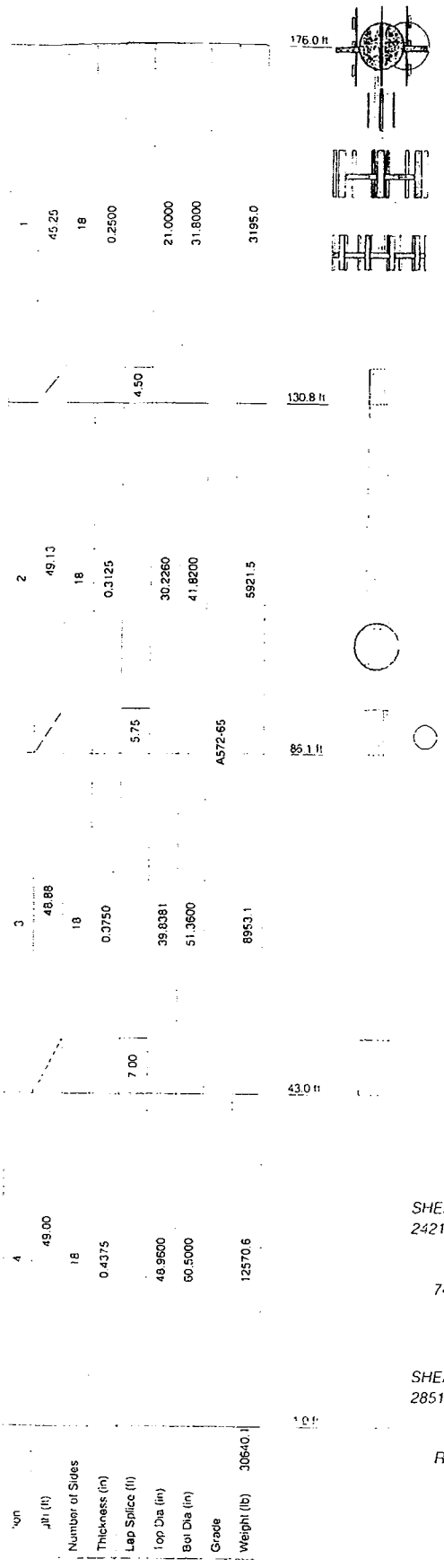
Ongoing and Periodic Inspection and Maintenance:

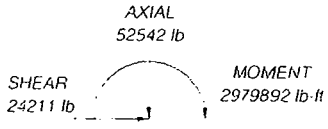
After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

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





APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
12' Low Profile Platform (Town)	176	(4) Decibel PCS 1900 TMA (T-Mobile)	160
4 Bay Dipole (Town)	176	(4) Decibel PCS 1900 TMA (T-Mobile)	160
Omni (Town)	176	(4) Decibel PCS 1900 TMA (T-Mobile)	160
Grid Dish (Town)	176	Low Profile Platform (Sprint)	150
Dipole (Town)	176	(4) 48000 (Sprint)	150
Grid Dish (Town)	176	(4) 48000 (Sprint)	150
Omni (Town)	176	(4) 48000 (Sprint)	150
Dipole (future) (Town)	176	2 Bay Dipole (Town)	130
5'3"x4" Pipe Mount (Cingular)	168	5' Side Mount Standoff (Town)	130
5'3"x4" Pipe Mount (Cingular)	168	6' Side Mount Standoff (Town)	100
5'3"x4" Pipe Mount (Cingular)	168	4 Bay Dipole (Town)	100
7184 (Cingular)	168	Grid Dish (Town)	100
7184 (Cingular)	168	Side Mount Standoff (Sprint)	75
7184 (Cingular)	168	GPS (Sprint)	75
10' Low Profile Platform (T-Mobile)	160	Side Mount Standoff (T-Mobile)	60
(3) DR65-19-00DPQ (T-Mobile)	160	GPS (T-Mobile)	60
(3) DR65-19-00DPQ (T-Mobile)	160	Side Mount Standoff (Town)	60
(3) DR65-19-00DPQ (T-Mobile)	160	Scanner Antenna (Town)	60

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 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: 71.1%

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

Job:	176' EEI Monopole, Berlin, CT
Project:	T-Mobile Site No: CTHA231A
Client: T-Mobile	Drawn by: Jed Kiernan App'd
Code: TIA/EIA-222-F	Date: 09/29/05 Scale: NT
Path: P:\0347\08\EER Files\176' EEI monopole.en	Dwg No. E

ERI TOWER DETAILED OUTPUT

ERITower	Job	Page
URS Corporation 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	176' EEI Monopole, Berlin, CT	1 of 20
	Project T-Mobile Site No: CTHA231A	Date 10:24:20 09/29/05
	Client T-Mobile	Designed by Jed Kiernan

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 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	176.01-130.76	45.25	4.50	18	21.0000	31.8000	0.2500	1.0000	A572-65 (65 ksi)
L2	130.76-86.13	49.13	5.75	18	30.2260	41.8200	0.3125	1.2500	A572-65 (65 ksi)
L3	86.13-43.00	48.88	7.00	18	39.8381	51.3600	0.3750	1.5000	A572-65 (65 ksi)
L4	43.00-1.00	49.00		18	48.9600	60.5000	0.4375	1.7500	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	21.3240	16.4651	895.6507	7.3663	10.6680	83.9568	1792.4800	8.2341	5.2560	13.024
	32.2906	25.0349	3148.3461	11.2003	16.1544	194.8909	6300.8349	12.5198	5.1568	20.627
L2	31.7706	29.6704	3354.2439	10.6193	15.3548	218.4493	6712.9014	14.8380	4.7698	15.263
	42.4651	41.1703	8961.3641	14.7352	21.2446	421.8192	17934.5198	20.5890	6.8103	21.793
L3	41.8289	46.9709	9241.6269	14.0094	20.2377	456.6531	18495.4142	23.4899	6.3515	16.937
	52.1523	60.6849	19929.7987	18.0997	26.0909	763.8607	39885.8215	30.3482	8.3794	22.345
L4	51.3893	67.3795	20042.4648	17.2255	24.8717	805.8353	40111.3019	33.6962	7.8470	17.936
	61.4333	83.4043	38013.0437	21.3222	30.7340	1236.8401	76076.1060	41.7101	9.8780	22.578

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 176.01-130.76				1	1	1		
L2 130.76-86.13				1	1	1		
L3 86.13-43.00				1	1	1		
L4 43.00-1.00				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
1 5/8	C	No	Inside Pole	176.00 - 4.00	7	No Ice	0.00	1.04
(Town)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	169.00 - 7.00	6	No Ice	0.00	1.04
(Cingular)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	161.00 - 7.00	24	No Ice	0.00	1.04
(T-Mobile)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	161.00 - 7.00	2	No Ice	0.00	1.04
(Town)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	151.00 - 7.00	12	No Ice	0.00	1.04
(Sprint)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	131.00 - 7.00	1	No Ice	0.00	1.04
(Town)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	101.00 - 7.00	2	No Ice	0.00	1.04
(Town)						1/2" Ice	0.00	1.04
1/2	C	No	Inside Pole	76.00 - 7.00	1	No Ice	0.00	0.25
(Sprint)						1/2" Ice	0.00	0.25
1/2	C	No	Inside Pole	61.00 - 7.00	1	No Ice	0.00	0.25
(Town)						1/2" Ice	0.00	0.25
1/2	C	No	Inside Pole	61.00 - 7.00	1	No Ice	0.00	0.25
(T-Mobile)						1/2" Ice	0.00	0.25

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	176.01-130.76	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	1638.50
L2	130.76-86.13	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	2444.52
L3	86.13-43.00	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	2439.43
L4	43.00-1.00	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	2070.60

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	176.01-130.76	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	1638.50
L2	130.76-86.13	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	2444.52
L3	86.13-43.00	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	2439.43
L4	43.00-1.00	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	2070.60

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 lb
12' Low Profile Platform	C	None			0.0000	176.00	No Ice	15.70	15.70	1300.00
(Town)							1/2" Ice	20.10	20.10	1765.00
4 Bay Dipole	C	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							
Omni	C	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							
Grid Dish	C	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							
Dipole	B	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							

ERITower	Job: 176' EEI Monopole, Berlin, CT	Page: 4 of 20
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	Client: T-Mobile	Designed by: Jed Kiernan

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
Grid Dish	B	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							
Omni	A	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							
Dipole (future)	A	From Face	3.00		0.0000	176.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00
			0.00							
5'3"x4" Pipe Mount	A	None			0.0000	168.00	No Ice	1.88	1.88	57.00
(Cingular)							1/2" Ice	2.21	2.21	73.81
5'3"x4" Pipe Mount	B	None			0.0000	168.00	No Ice	1.88	1.88	57.00
(Cingular)							1/2" Ice	2.21	2.21	73.81
5'3"x4" Pipe Mount	C	None			0.0000	168.00	No Ice	1.88	1.88	57.00
(Cingular)							1/2" Ice	2.21	2.21	73.81
7184	A	From Face	1.00		0.0000	168.00	No Ice	2.68	1.89	11.20
(Cingular)			0.00				1/2" Ice	3.00	2.21	27.10
			0.00							
7184	B	From Face	1.00		0.0000	168.00	No Ice	2.68	1.89	11.20
(Cingular)			0.00				1/2" Ice	3.00	2.21	27.10
			0.00							
7184	C	From Face	1.00		0.0000	168.00	No Ice	2.68	1.89	11.20
(Cingular)			0.00				1/2" Ice	3.00	2.21	27.10
			0.00							
10' Low Profile Platform	C	None			0.0000	160.00	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	160.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00				1/2" Ice	8.95	3.97	73.77
			0.00							
(3) DR65-19-00DPQ	B	From Face	3.00		0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00				1/2" Ice	8.95	3.97	73.77
			0.00							
(3) DR65-19-00DPQ	C	From Face	3.00		0.0000	160.00	No Ice	8.40	3.53	32.00
(T-Mobile)			0.00				1/2" Ice	8.95	3.97	73.77
			0.00							
(4) Decibel PCS 1900 TMA	A	From Face	3.00		0.0000	160.00	No Ice	0.00	0.63	17.60
(T-Mobile)			0.00				1/2" Ice	0.00	0.81	23.50
			0.00							
(4) Decibel PCS 1900 TMA	B	From Face	3.00		0.0000	160.00	No Ice	0.00	0.63	17.60
(T-Mobile)			0.00				1/2" Ice	0.00	0.81	23.50
			0.00							
(4) Decibel PCS 1900 TMA	C	From Face	3.00		0.0000	160.00	No Ice	0.00	0.63	17.60
(T-Mobile)			0.00				1/2" Ice	0.00	0.81	23.50
			0.00							
Low Profile Platform	C	None			0.0000	150.00	No Ice	17.30	17.30	1500.00
(Sprint)							1/2" Ice	22.10	22.10	2030.00
(4) 48000	A	From Face	3.00		0.0000	150.00	No Ice	4.51	1.82	18.30
(Sprint)			0.00				1/2" Ice	4.91	2.15	40.88
			0.00							
(4) 48000	B	From Face	3.00		0.0000	150.00	No Ice	4.51	1.82	18.30
(Sprint)			0.00				1/2" Ice	4.91	2.15	40.88
			0.00							
(4) 48000	C	From Face	3.00		0.0000	150.00	No Ice	4.51	1.82	18.30
(Sprint)			0.00				1/2" Ice	4.91	2.15	40.88
			0.00							
2 Bay Dipole	C	From Face	6.00		0.0000	130.00	No Ice	5.40	5.40	50.00
(Town)			0.00				1/2" Ice	9.00	9.00	80.00

ERITower	Job: 176' EEI Monopole, Berlin, CT	Page: 5 of 20
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	Client: T-Mobile	Designed by: Jed Kiernan

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.00						
6' Side Mount Standoff	C	From Face	3.00	0.0000	130.00	No Ice	4.97	4.97	70.00
(Town)			0.00			1/2" Ice	6.12	6.12	130.00
			0.00						
6' Side Mount Standoff	C	From Face	3.00	0.0000	100.00	No Ice	4.97	4.97	70.00
(Town)			0.00			1/2" Ice	6.12	6.12	130.00
			0.00						
4 Bay Dipole	C	From Face	6.00	0.0000	100.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Grid Dish	C	From Face	6.00	0.0000	100.00	No Ice	5.40	5.40	50.00
(Town)			0.00			1/2" Ice	9.00	9.00	80.00
			0.00						
Side Mount Standoff	C	From Face	1.50	0.0000	75.00	No Ice	4.97	4.97	70.00
(Sprint)			0.00			1/2" Ice	6.12	6.12	130.00
			0.00						
GPS	C	From Face	3.00	0.0000	75.00	No Ice	1.00	1.00	15.00
(Sprint)			0.00			1/2" Ice	1.50	1.50	30.00
			0.00						
Side Mount Standoff	C	From Face	1.50	0.0000	60.00	No Ice	4.97	4.97	70.00
(T-Mobile)			0.00			1/2" Ice	6.12	6.12	130.00
			0.00						
GPS	C	From Face	3.00	0.0000	60.00	No Ice	1.00	1.00	15.00
(T-Mobile)			0.00			1/2" Ice	1.50	1.50	30.00
			0.00						
Side Mount Standoff	C	From Face	1.50	0.0000	60.00	No Ice	4.97	4.97	70.00
(Town)			0.00			1/2" Ice	6.12	6.12	130.00
			0.00						
Scanner Antenna	C	From Face	3.00	0.0000	60.00	No Ice	1.00	1.00	15.00
(Town)			0.00			1/2" Ice	1.50	1.50	30.00
			0.00						

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_{Ice} ft²	Leg % %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 176.01-130.76	152.08	1.547	29	99.550	A	0.000	99.550	99.550	100.00	0.000	0.000
					B	0.000	99.550		100.00		
					C	0.000	99.550		100.00		
L2 130.76-86.13	107.70	1.402	26	135.950	A	0.000	135.950	135.950	100.00	0.000	0.000
					B	0.000	135.950		100.00		
					C	0.000	135.950		100.00		
L3 86.13-43.00	64.29	1.21	22	166.326	A	0.000	166.326	166.326	100.00	0.000	0.000
					B	0.000	166.326		100.00		
					C	0.000	166.326		100.00		
L4 43.00-1.00	21.38	1	18	194.440	A	0.000	194.440	194.440	100.00	0.000	0.000

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Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{Leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft²		ft²	ft²	ft²		ft²	ft²
					B	0.000	194.440		100.00		
					C	0.000	194.440		100.00		

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation	z	K_Z	q_z	t_Z	A_G	Face	A_F	A_R	A_{Leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	in	ft²		ft²	ft²	ft²		ft²	ft²
L1 176.01-130.76	152.08	1.547	21	0.5000	103.321	A	0.000	103.321	103.321	100.00	0.000	0.000
						B	0.000	103.321		100.00		
						C	0.000	103.321		100.00		
L2 130.76-86.13	107.70	1.402	19	0.5000	139.669	A	0.000	139.669	139.669	100.00	0.000	0.000
						B	0.000	139.669		100.00		
						C	0.000	139.669		100.00		
L3 86.13-43.00	64.29	1.21	17	0.5000	169.920	A	0.000	169.920	169.920	100.00	0.000	0.000
						B	0.000	169.920		100.00		
						C	0.000	169.920		100.00		
L4 43.00-1.00	21.38	1	14	0.5000	197.940	A	0.000	197.940	197.940	100.00	0.000	0.000
						B	0.000	197.940		100.00		
						C	0.000	197.940		100.00		

Tower Pressure - Service

$G_H = 1.690$

Section Elevation	z	K_Z	q_z	A_G	Face	A_F	A_R	A_{Leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft²		ft²	ft²	ft²		ft²	ft²
L1 176.01-130.76	152.08	1.547	10	99.550	A	0.000	99.550	99.550	100.00	0.000	0.000
					B	0.000	99.550		100.00		
					C	0.000	99.550		100.00		
L2 130.76-86.13	107.70	1.402	9	135.950	A	0.000	135.950	135.950	100.00	0.000	0.000
					B	0.000	135.950		100.00		
					C	0.000	135.950		100.00		
L3 86.13-43.00	64.29	1.21	8	166.326	A	0.000	166.326	166.326	100.00	0.000	0.000
					B	0.000	166.326		100.00		
					C	0.000	166.326		100.00		
L4 43.00-1.00	21.38	1	6	194.440	A	0.000	194.440	194.440	100.00	0.000	0.000
					B	0.000	194.440		100.00		
					C	0.000	194.440		100.00		

Tower Forces - No Ice - Wind Normal To Face

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	176' EEI Monopole, Berlin, CT	7 of 20
URS Corporation 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project T-Mobile Site No: CTHA231A	Date 10:24:20 09/29/05
	Client T-Mobile	Designed by Jed Kiernan

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L1 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	3126.60	69.10	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	3865.28	86.61	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	4067.52	94.31	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	3950.60	94.06	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	1222744.2 7 lb-ft	15010.01		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L1 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	3126.60	69.10	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	3865.28	86.61	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	4067.52	94.31	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	3950.60	94.06	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	1222744.2 7 lb-ft	15010.01		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L1 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	3126.60	69.10	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	3865.28	86.61	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	4067.52	94.31	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			

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
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	3950.60	94.06	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	1222744.27 lb-ft	15010.01		

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 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	3126.60	69.10	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	3865.28	86.61	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	4067.52	94.31	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	3950.60	94.06	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	1222744.27 lb-ft	15010.01		

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 176.01-130.76	1638.50	3946.23	A	1	0.65	1	1	1	103.321	2433.78	53.79	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.76-86.13	2444.52	6942.14	A	1	0.65	1	1	1	139.669	2978.27	66.73	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			
L3 86.13-43.00	2439.43	10198.20	A	1	0.65	1	1	1	169.920	3116.57	72.26	C
			B	1	0.65	1	1	1	169.920			
			C	1	0.65	1	1	1	169.920			
L4 43.00-1.00	2070.60	14023.54	A	1	0.65	1	1	1	197.940	3016.29	71.82	C
			B	1	0.65	1	1	1	197.940			
			C	1	0.65	1	1	1	197.940			
Sum Weight:	8593.05	35110.10						OTM	944199.96 lb-ft	11544.90		

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 176.01-130.76	1638.50	3946.23	A	1	0.65	1	1	1	103.321	2433.78	53.79	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.76-86.13	2444.52	6942.14	A	1	0.65	1	1	1	139.669	2978.27	66.73	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			
L3 86.13-43.00	2439.43	10198.20	A	1	0.65	1	1	1	169.920	3116.57	72.26	C
			B	1	0.65	1	1	1	169.920			
			C	1	0.65	1	1	1	169.920			
L4 43.00-1.00	2070.60	14023.54	A	1	0.65	1	1	1	197.940	3016.29	71.82	C
			B	1	0.65	1	1	1	197.940			
			C	1	0.65	1	1	1	197.940			
Sum Weight:	8593.05	35110.10						OTM	944199.96 lb-ft	11544.90		

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 176.01-130.76	1638.50	3946.23	A	1	0.65	1	1	1	103.321	2433.78	53.79	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.76-86.13	2444.52	6942.14	A	1	0.65	1	1	1	139.669	2978.27	66.73	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			
L3 86.13-43.00	2439.43	10198.20	A	1	0.65	1	1	1	169.920	3116.57	72.26	C
			B	1	0.65	1	1	1	169.920			
			C	1	0.65	1	1	1	169.920			
L4 43.00-1.00	2070.60	14023.54	A	1	0.65	1	1	1	197.940	3016.29	71.82	C
			B	1	0.65	1	1	1	197.940			
			C	1	0.65	1	1	1	197.940			
Sum Weight:	8593.05	35110.10						OTM	944199.96 lb-ft	11544.90		

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 176.01-130.76	1638.50	3946.23	A	1	0.65	1	1	1	103.321	2433.78	53.79	C
			B	1	0.65	1	1	1	103.321			
			C	1	0.65	1	1	1	103.321			
L2 130.76-86.13	2444.52	6942.14	A	1	0.65	1	1	1	139.669	2978.27	66.73	C
			B	1	0.65	1	1	1	139.669			
			C	1	0.65	1	1	1	139.669			

ERITower	Job	Page
	176' EEI Monopole, Berlin, CT	10 of 20
URS Corporation 500 Enterprise Dr. Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project T-Mobile Site No: CTHA231A	Date 10:24:20 09/29/05
	Client T-Mobile	Designed by Jed Kiernan

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L3 86.13-43.00	2439.43	10198.20	A	1	0.65	1	1	1	169.920	3116.57	72.26	C
			B	1	0.65	1	1	1	169.920			
			C	1	0.65	1	1	1	169.920			
L4 43.00-1.00	2070.60	14023.54	A	1	0.65	1	1	1	197.940	3016.29	71.82	C
			B	1	0.65	1	1	1	197.940			
			C	1	0.65	1	1	1	197.940			
Sum Weight:	8593.05	35110.10						OTM	944199.96 lb-ft	11544.90		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L1 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	1081.87	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	1337.47	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	1407.45	32.63	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	1366.99	32.55	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	423094.90 lb-ft	5193.77		

Tower Forces - Service - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft^2	lb	plf	
L1 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	1081.87	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	1337.47	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	1407.45	32.63	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	1366.99	32.55	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	423094.90 lb-ft	5193.77		

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 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	1081.87	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	1337.47	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	1407.45	32.63	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	1366.99	32.55	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	423094.90 lb-ft	5193.77		

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 176.01-130.76	1638.50	3195.00	A	1	0.65	1	1	1	99.550	1081.87	23.91	C
			B	1	0.65	1	1	1	99.550			
			C	1	0.65	1	1	1	99.550			
L2 130.76-86.13	2444.52	5921.52	A	1	0.65	1	1	1	135.950	1337.47	29.97	C
			B	1	0.65	1	1	1	135.950			
			C	1	0.65	1	1	1	135.950			
L3 86.13-43.00	2439.43	8953.08	A	1	0.65	1	1	1	166.326	1407.45	32.63	C
			B	1	0.65	1	1	1	166.326			
			C	1	0.65	1	1	1	166.326			
L4 43.00-1.00	2070.60	12570.55	A	1	0.65	1	1	1	194.440	1366.99	32.55	C
			B	1	0.65	1	1	1	194.440			
			C	1	0.65	1	1	1	194.440			
Sum Weight:	8593.05	30640.15						OTM	423094.90 lb-ft	5193.77		

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	30640.15					
Bracing Weight	0.00					
Total Member Self-Weight	30640.15			2884.73	0.00	
Total Weight	45151.60			2884.73	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 0 deg - No Ice		0.00	-28514.07	-3261907.27	0.00	0.00
Wind 30 deg - No Ice		14257.04	-24693.91	-2824508.08	-1632396.00	5435.90
Wind 45 deg - No Ice		20162.49	-20162.49	-2305671.83	-2308556.56	7687.53
Wind 60 deg - No Ice		24693.91	-14257.04	-1629511.27	-2827392.81	9415.26
Wind 90 deg - No Ice		28514.07	0.00	2884.73	-3264792.00	10871.81
Wind 120 deg - No Ice		24693.91	14257.04	1635280.73	-2827392.81	9415.26
Wind 135 deg - No Ice		20162.49	20162.49	2311441.29	-2308556.56	7687.53
Wind 150 deg - No Ice		14257.04	24693.91	2830277.54	-1632396.00	5435.90
Wind 180 deg - No Ice		0.00	28514.07	3267676.73	0.00	0.00
Wind 210 deg - No Ice		-14257.04	24693.91	2830277.54	1632396.00	-5435.90
Wind 225 deg - No Ice		-20162.49	20162.49	2311441.29	2308556.56	-7687.53
Wind 240 deg - No Ice		-24693.91	14257.04	1635280.73	2827392.81	-9415.26
Wind 270 deg - No Ice		-28514.07	0.00	2884.73	3264792.00	-10871.81
Wind 300 deg - No Ice		-24693.91	-14257.04	-1629511.27	2827392.81	-9415.26
Wind 315 deg - No Ice		-20162.49	-20162.49	-2305671.83	2308556.56	-7687.53
Wind 330 deg - No Ice		-14257.04	-24693.91	-2824508.08	1632396.00	-5435.90
Member Ice	4469.95					
Total Weight Ice	52542.40			5049.60	0.00	
Wind 0 deg - Ice		0.00	-24211.22	-2854868.34	0.00	0.00
Wind 30 deg - Ice		12105.61	-20967.53	-2471711.98	-1429958.97	6122.26
Wind 45 deg - Ice		17119.92	-17119.92	-2017217.76	-2022267.37	8658.18
Wind 60 deg - Ice		20967.53	-12105.61	-1424909.37	-2476761.59	10604.06
Wind 90 deg - Ice		24211.22	0.00	5049.60	-2859917.94	12244.52
Wind 120 deg - Ice		20967.53	12105.61	1435008.58	-2476761.59	10604.06
Wind 135 deg - Ice		17119.92	17119.92	2027316.97	-2022267.37	8658.18
Wind 150 deg - Ice		12105.61	20967.53	2481811.19	-1429958.97	6122.26
Wind 180 deg - Ice		0.00	24211.22	2864967.55	0.00	0.00
Wind 210 deg - Ice		-12105.61	20967.53	2481811.19	1429958.97	-6122.26
Wind 225 deg - Ice		-17119.92	17119.92	2027316.97	2022267.37	-8658.18
Wind 240 deg - Ice		-20967.53	12105.61	1435008.58	2476761.59	-10604.06
Wind 270 deg - Ice		-24211.22	0.00	5049.60	2859917.94	-12244.52
Wind 300 deg - Ice		-20967.53	-12105.61	-1424909.37	2476761.59	-10604.06
Wind 315 deg - Ice		-17119.92	-17119.92	-2017217.76	2022267.37	-8658.18
Wind 330 deg - Ice		-12105.61	-20967.53	-2471711.98	1429958.97	-6122.26
Total Weight	45151.60			2884.73	0.00	
Wind 0 deg - Service		0.00	-9866.46	-1126801.08	0.00	0.00
Wind 30 deg - Service		4933.23	-8544.61	-975451.88	-564842.91	1880.94
Wind 45 deg - Service		6976.64	-6976.64	-795923.77	-798808.50	2660.04
Wind 60 deg - Service		8544.61	-4933.23	-561958.17	-978336.61	3257.88
Wind 90 deg - Service		9866.46	0.00	2884.73	-1129685.81	3761.87
Wind 120 deg - Service		8544.61	4933.23	567727.64	-978336.61	3257.88
Wind 135 deg - Service		6976.64	6976.64	801693.23	-798808.50	2660.04
Wind 150 deg - Service		4933.23	8544.61	981221.34	-564842.91	1880.94
Wind 180 deg - Service		0.00	9866.46	1132570.55	0.00	0.00
Wind 210 deg - Service		-4933.23	8544.61	981221.34	564842.91	-1880.94
Wind 225 deg - Service		-6976.64	6976.64	801693.23	798808.50	-2660.04
Wind 240 deg - Service		-8544.61	4933.23	567727.64	978336.61	-3257.88
Wind 270 deg - Service		-9866.46	0.00	2884.73	1129685.81	-3761.87
Wind 300 deg - Service		-8544.61	-4933.23	-561958.17	978336.61	-3257.88
Wind 315 deg - Service		-6976.64	-6976.64	-795923.77	798808.50	-2660.04
Wind 330 deg - Service		-4933.23	-8544.61	-975451.88	564842.91	-1880.94

Load Combinations

Comb. No.	Description

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
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	176.01 - 130.76	Pole	Max Tension	18	0.00	0.00	0.00
			Max. Compression	18	-12815.99	0.00	-364.43

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Mx	6	-8591.86	-373169.79	-312.00
			Max. My	10	-8590.46	0.00	-373383.27
			Max. Vy	6	15101.00	-373169.79	-312.00
			Max. Vx	10	15101.86	0.00	-373383.27
			Max. Torque	23			-1338.60
L2	130.76 - 86.13	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-22075.54	0.00	-3427.32
			Max. Mx	6	-16859.12	-1133940.54	-1932.35
			Max. My	10	-16857.96	0.00	-1135941.80
			Max. Vy	6	20064.70	-1133940.54	-1932.35
			Max. Vx	10	20065.82	0.00	-1135941.80
			Max. Torque	23			-9787.97
L3	86.13 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-34409.77	0.00	-5205.80
			Max. Mx	6	-28155.01	-2064857.49	-2948.65
			Max. My	10	-28154.42	0.00	-2067835.86
			Max. Vy	6	24513.80	-2064857.49	-2948.65
			Max. Vx	10	24514.66	0.00	-2067835.86
			Max. Torque	23			-12203.92
L4	43 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-52542.40	0.00	-5205.79
			Max. Mx	6	-45137.64	-3365615.31	-2966.36
			Max. My	10	-45137.63	0.00	-3368612.13
			Max. Vy	6	28536.16	-3365615.31	-2966.36
			Max. Vx	10	28536.18	0.00	-3368612.13
			Max. Torque	23			-12200.25

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	27	52542.40	0.00	-24211.23
	Max. H_x	14	45151.60	28514.07	-0.00
	Max. H_z	2	45151.60	0.00	28514.08
	Max. M_x	2	3362607.82	0.00	28514.08
	Max. M_z	6	3365615.32	-28514.07	-0.00
	Max. Torsion	31	12196.05	24211.23	0.00
	Min. Vert	1	45151.60	0.00	-0.00
	Min. H_x	6	45151.60	-28514.07	-0.00
	Min. H_z	10	45151.60	0.00	-28514.08
	Min. M_x	10	-3368612.13	0.00	-28514.08
	Min. M_z	14	-3365615.32	28514.07	-0.00
	Min. Torsion	23	-12196.05	-24211.23	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	45151.60	0.00	0.00	2894.92	0.00	0.00
Dead+Wind 0 deg - No Ice	45151.60	0.00	-28514.08	-3362607.82	0.00	0.00
Dead+Wind 30 deg - No Ice	45151.60	14257.04	-24693.91	-2911715.52	-1682791.49	5409.28
Dead+Wind 45 deg - No Ice	45151.60	20162.49	-20162.49	-2376865.93	-2379830.74	7649.84
Dead+Wind 60 deg - No Ice	45151.60	24693.91	-14257.04	-1679833.54	-2914692.18	9369.06
Dead+Wind 90 deg - No Ice	45151.60	28514.07	0.00	2964.75	-3365615.32	10818.39
Dead+Wind 120 deg - No Ice	45151.60	24693.91	14257.04	1685781.75	-2914724.58	9368.95
Dead+Wind 135 deg - No Ice	45151.60	20162.49	20162.49	2382832.85	-2379868.14	7649.68
Dead+Wind 150 deg - No Ice	45151.60	14257.04	24693.91	2917701.14	-1682823.88	5409.11
Dead+Wind 180 deg - No Ice	45151.60	0.00	28514.08	3368612.13	0.00	0.00
Dead+Wind 210 deg - No Ice	45151.60	-14257.04	24693.91	2917701.14	1682823.88	-5409.11
Dead+Wind 225 deg - No Ice	45151.60	-20162.49	20162.49	2382832.85	2379868.14	-7649.68
Dead+Wind 240 deg - No Ice	45151.60	-24693.91	14257.04	1685781.75	2914724.58	-9368.95
Dead+Wind 270 deg - No Ice	45151.60	-28514.07	0.00	2964.75	3365615.32	-10818.39
Dead+Wind 300 deg - No Ice	45151.60	-24693.91	-14257.04	-1679833.54	2914692.18	-9369.06
Dead+Wind 315 deg - No Ice	45151.60	-20162.49	-20162.49	-2376865.93	2379830.74	-7649.84
Dead+Wind 330 deg - No Ice	45151.60	-14257.04	-24693.91	-2911715.52	1682791.49	-5409.28
Dead+Ice+Temp	52542.40	0.00	0.00	5205.79	0.00	0.00
Dead+Wind 0 deg+Ice+Temp	52542.40	0.00	-24211.23	-2969259.17	0.00	0.00
Dead+Wind 30 deg+Ice+Temp	52542.40	12105.61	-20967.54	-2570754.13	-1487266.21	6098.17
Dead+Wind 45 deg+Ice+Temp	52542.40	17119.92	-17119.92	-2098051.19	-2103317.63	8624.05
Dead+Wind 60 deg+Ice+Temp	52542.40	20967.54	-12105.61	-1482008.94	-2576036.39	10562.19
Dead+Wind 90 deg+Ice+Temp	52542.40	24211.23	-0.00	5266.30	-2974575.51	12196.05
Dead+Wind 120 deg+Ice+Temp	52542.40	20967.54	12105.61	1492566.49	-2576079.59	10561.99
Dead+Wind 135 deg+Ice+Temp	52542.40	17119.92	17119.92	2108633.68	-2103367.51	8623.77
Dead+Wind 150 deg+Ice+Temp	52542.40	12105.61	20967.54	2581361.56	-1487309.42	6097.88
Dead+Wind 180 deg+Ice+Temp	52542.40	0.00	24211.23	2979891.55	0.00	0.00
Dead+Wind 210 deg+Ice+Temp	52542.40	-12105.61	20967.54	2581361.56	1487309.42	-6097.88
Dead+Wind 225 deg+Ice+Temp	52542.40	-17119.92	17119.92	2108633.68	2103367.51	-8623.77
Dead+Wind 240 deg+Ice+Temp	52542.40	-20967.54	12105.61	1492566.49	2576079.59	-10561.99
Dead+Wind 270 deg+Ice+Temp	52542.40	-24211.23	-0.00	5266.30	2974575.51	-12196.05
Dead+Wind 300 deg+Ice+Temp	52542.40	-20967.54	-12105.61	-1482008.94	2576036.39	-10562.19
Dead+Wind 315 deg+Ice+Temp	52542.40	-17119.92	-17119.92	-2098051.19	2103317.63	-8624.05
Dead+Wind 330 deg+Ice+Temp	52542.40	-12105.61	-20967.54	-2570754.13	1487266.21	-6098.17
Dead+Wind 0 deg - Service	45151.60	0.00	-9866.46	-1162542.10	0.00	0.00
Dead+Wind 30 deg - Service	45151.60	4933.23	-8544.61	-1006388.40	-582775.83	1880.50
Dead+Wind 45 deg - Service	45151.60	6976.64	-6976.64	-821161.06	-824169.98	2659.42
Dead+Wind 60 deg - Service	45151.60	8544.61	-4933.23	-579767.74	-1009398.75	3257.10
Dead+Wind 90 deg - Service	45151.60	9866.46	0.00	3008.90	-1165555.52	3760.98
Dead+Wind 120 deg - Service	45151.60	8544.61	4933.23	585787.79	-1009402.64	3257.10
Dead+Wind 135 deg - Service	45151.60	6976.64	6976.64	827183.36	-824174.47	2659.40
Dead+Wind 150 deg - Service	45151.60	4933.23	8544.61	1012412.95	-582779.72	1880.47
Dead+Wind 180 deg - Service	45151.60	0.00	9866.46	1168568.88	0.00	0.00
Dead+Wind 210 deg - Service	45151.60	-4933.23	8544.61	1012412.95	582779.72	-1880.47
Dead+Wind 225 deg - Service	45151.60	-6976.64	6976.64	827183.36	824174.47	-2659.40
Dead+Wind 240 deg - Service	45151.60	-8544.61	4933.23	585787.79	1009402.64	-3257.10
Dead+Wind 270 deg - Service	45151.60	-9866.46	0.00	3008.90	1165555.52	-3760.98
Dead+Wind 300 deg - Service	45151.60	-8544.61	-4933.23	-579767.74	1009398.75	-3257.10
Dead+Wind 315 deg - Service	45151.60	-6976.64	-6976.64	-821161.06	824169.98	-2659.42
Dead+Wind 330 deg - Service	45151.60	-4933.23	-8544.61	-1006388.40	582775.83	-1880.50

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	-45151.60	0.00	0.00	45151.60	-0.00	0.000%
2	0.00	-45151.60	-28514.07	0.00	45151.60	28514.08	0.000%
3	14257.04	-45151.60	-24693.91	-14257.04	45151.60	24693.91	0.000%
4	20162.49	-45151.60	-20162.49	-20162.49	45151.60	20162.49	0.000%
5	24693.91	-45151.60	-14257.04	-24693.91	45151.60	14257.04	0.000%
6	28514.07	-45151.60	0.00	-28514.07	45151.60	-0.00	0.000%
7	24693.91	-45151.60	14257.04	-24693.91	45151.60	-14257.04	0.000%
8	20162.49	-45151.60	20162.49	-20162.49	45151.60	-20162.49	0.000%
9	14257.04	-45151.60	24693.91	-14257.04	45151.60	-24693.91	0.000%
10	0.00	-45151.60	28514.07	0.00	45151.60	-28514.08	0.000%
11	-14257.04	-45151.60	24693.91	14257.04	45151.60	-24693.91	0.000%
12	-20162.49	-45151.60	20162.49	20162.49	45151.60	-20162.49	0.000%
13	-24693.91	-45151.60	14257.04	24693.91	45151.60	-14257.04	0.000%
14	-28514.07	-45151.60	0.00	28514.07	45151.60	-0.00	0.000%
15	-24693.91	-45151.60	-14257.04	24693.91	45151.60	14257.04	0.000%
16	-20162.49	-45151.60	-20162.49	20162.49	45151.60	20162.49	0.000%
17	-14257.04	-45151.60	-24693.91	14257.04	45151.60	24693.91	0.000%
18	0.00	-52542.40	0.00	0.00	52542.40	-0.00	0.000%
19	0.00	-52542.40	-24211.22	0.00	52542.40	24211.23	0.000%
20	12105.61	-52542.40	-20967.53	-12105.61	52542.40	20967.54	0.000%
21	17119.92	-52542.40	-17119.92	-17119.92	52542.40	17119.92	0.000%
22	20967.53	-52542.40	-12105.61	-20967.54	52542.40	12105.61	0.000%
23	24211.22	-52542.40	0.00	-24211.23	52542.40	0.00	0.000%
24	20967.53	-52542.40	12105.61	-20967.54	52542.40	-12105.61	0.000%
25	17119.92	-52542.40	17119.92	-17119.92	52542.40	-17119.92	0.000%
26	12105.61	-52542.40	20967.53	-12105.61	52542.40	-20967.54	0.000%
27	0.00	-52542.40	24211.22	0.00	52542.40	-24211.23	0.000%
28	-12105.61	-52542.40	20967.53	12105.61	52542.40	-20967.54	0.000%
29	-17119.92	-52542.40	17119.92	17119.92	52542.40	-17119.92	0.000%
30	-20967.53	-52542.40	12105.61	20967.54	52542.40	-12105.61	0.000%
31	-24211.22	-52542.40	0.00	24211.23	52542.40	0.00	0.000%
32	-20967.53	-52542.40	-12105.61	20967.54	52542.40	12105.61	0.000%
33	-17119.92	-52542.40	-17119.92	17119.92	52542.40	17119.92	0.000%
34	-12105.61	-52542.40	-20967.53	12105.61	52542.40	20967.54	0.000%
35	0.00	-45151.60	-9866.46	0.00	45151.60	9866.46	0.000%
36	4933.23	-45151.60	-8544.61	-4933.23	45151.60	8544.61	0.000%
37	6976.64	-45151.60	-6976.64	-6976.64	45151.60	6976.64	0.000%
38	8544.61	-45151.60	-4933.23	-8544.61	45151.60	4933.23	0.000%
39	9866.46	-45151.60	0.00	-9866.46	45151.60	-0.00	0.000%
40	8544.61	-45151.60	4933.23	-8544.61	45151.60	-4933.23	0.000%
41	6976.64	-45151.60	6976.64	-6976.64	45151.60	-6976.64	0.000%
42	4933.23	-45151.60	8544.61	-4933.23	45151.60	-8544.61	0.000%
43	0.00	-45151.60	9866.46	0.00	45151.60	-9866.46	0.000%
44	-4933.23	-45151.60	8544.61	4933.23	45151.60	-8544.61	0.000%
45	-6976.64	-45151.60	6976.64	6976.64	45151.60	-6976.64	0.000%
46	-8544.61	-45151.60	4933.23	8544.61	45151.60	-4933.23	0.000%
47	-9866.46	-45151.60	0.00	9866.46	45151.60	-0.00	0.000%
48	-8544.61	-45151.60	-4933.23	8544.61	45151.60	4933.23	0.000%
49	-6976.64	-45151.60	-6976.64	6976.64	45151.60	6976.64	0.000%
50	-4933.23	-45151.60	-8544.61	4933.23	45151.60	8544.61	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	0.00011101
3	Yes	5	0.00000001	0.00030514
4	Yes	5	0.00000001	0.00032118
5	Yes	5	0.00000001	0.00025361
6	Yes	5	0.00000001	0.00008063
7	Yes	5	0.00000001	0.00032625
8	Yes	5	0.00000001	0.00032255
9	Yes	5	0.00000001	0.00026452
10	Yes	4	0.00000001	0.00011132
11	Yes	5	0.00000001	0.00026452
12	Yes	5	0.00000001	0.00032255
13	Yes	5	0.00000001	0.00032625
14	Yes	5	0.00000001	0.00008063
15	Yes	5	0.00000001	0.00025361
16	Yes	5	0.00000001	0.00032118
17	Yes	5	0.00000001	0.00030514
18	Yes	4	0.00000001	0.00000958
19	Yes	5	0.00000001	0.00016859
20	Yes	5	0.00000001	0.00058924
21	Yes	5	0.00000001	0.00063377
22	Yes	5	0.00000001	0.00051403
23	Yes	5	0.00000001	0.00023891
24	Yes	5	0.00000001	0.00062829
25	Yes	5	0.00000001	0.00063859
26	Yes	5	0.00000001	0.00052888
27	Yes	5	0.00000001	0.00016925
28	Yes	5	0.00000001	0.00052888
29	Yes	5	0.00000001	0.00063859
30	Yes	5	0.00000001	0.00062829
31	Yes	5	0.00000001	0.00023891
32	Yes	5	0.00000001	0.00051403
33	Yes	5	0.00000001	0.00063377
34	Yes	5	0.00000001	0.00058924
35	Yes	4	0.00000001	0.00004092
36	Yes	4	0.00000001	0.00056637
37	Yes	4	0.00000001	0.00058888
38	Yes	4	0.00000001	0.00041978
39	Yes	4	0.00000001	0.00034702
40	Yes	4	0.00000001	0.00066610
41	Yes	4	0.00000001	0.00059704
42	Yes	4	0.00000001	0.00042221
43	Yes	4	0.00000001	0.00004126
44	Yes	4	0.00000001	0.00042221
45	Yes	4	0.00000001	0.00059704
46	Yes	4	0.00000001	0.00066610
47	Yes	4	0.00000001	0.00034702
48	Yes	4	0.00000001	0.00041978
49	Yes	4	0.00000001	0.00058888
50	Yes	4	0.00000001	0.00056637

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176.01 - 130.76	32.720	43	1.6932	0.0134
L2	135.26 - 86.13	18.966	43	1.4370	0.0099
L3	91.88 - 43	8.200	43	0.8930	0.0057
L4	50 - 1	2.297	43	0.4308	0.0023

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

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	12' Low Profile Platform	43	32.716	1.6932	0.0134	38540
168.00	5'3"x4" Pipe Mount	43	29.883	1.6548	0.0127	24057
160.00	10' Low Profile Platform	43	27.082	1.6136	0.0121	12036
150.00	Low Profile Platform	43	23.675	1.5536	0.0112	7408
130.00	2 Bay Dipole	43	17.407	1.3846	0.0094	4735
100.00	6' Side Mount Standoff	43	9.855	1.0058	0.0065	4780
75.00	Side Mount Standoff	43	5.290	0.6687	0.0041	4774
60.00	Side Mount Standoff	43	3.305	0.5060	0.0028	4758

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176.01 - 130.76	94.121	10	4.8707	0.0456
L2	135.26 - 86.13	54.582	10	4.1353	0.0329
L3	91.88 - 43	23.615	10	2.5710	0.0189
L4	50 - 1	6.620	10	1.2410	0.0073

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	12' Low Profile Platform	10	94.111	4.8706	0.0456	13564
168.00	5'3"x4" Pipe Mount	10	85.968	4.7627	0.0431	8466
160.00	10' Low Profile Platform	10	77.917	4.6460	0.0407	4234
150.00	Low Profile Platform	10	68.121	4.4744	0.0375	2604
130.00	2 Bay Dipole	10	50.100	3.9813	0.0312	1661
100.00	6' Side Mount Standoff	10	28.376	2.8846	0.0215	1670
75.00	Side Mount Standoff	10	15.238	1.9658	0.0136	1663
60.00	Side Mount Standoff	10	9.523	1.5019	0.0095	1655

Compression Checks

Pole Design Data

ERITower	Job: 176' EEI Monopole, Berlin, CT	Page: 19 of 20
URS Corporation 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project: T-Mobile Site No: CTHA231A	Date: 10:24:20 09/29/05
	Client: T-Mobile	Designed by: Jed Kiernan

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_n lb	Ratio $\frac{P}{P_n}$
L1	176.01 - 130.76 (1)	TP31.8x21x0.25	45.25	175.01	194.1	3.963	24.1827	-11934.50	95838.30	0.125
L2	130.76 - 86.13 (2)	TP41.82x30.226x0.3125	49.13	175.01	147.3	6.879	39.8244	-16858.00	273938.00	0.062
L3	86.13 - 43 (3)	TP51.36x39.8381x0.375	48.88	175.01	119.9	10.386	58.7209	-28154.40	609849.00	0.046
L4	43 - 1 (4)	TP60.5x48.96x0.4375	49.00	175.01	98.5	15.393	83.4043	-45137.60	1283850.00	0.035

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	176.01 - 130.76 (1)	TP31.8x21x0.25	353891.67	23.360	39.000	0.599	0.00	0.000	39.000	0.000
L2	130.76 - 86.13 (2)	TP41.82x30.226x0.3125	1135941.67	34.545	39.000	0.886	0.00	0.000	39.000	0.000
L3	86.13 - 43 (3)	TP51.36x39.8381x0.375	2067833.33	34.703	39.000	0.890	0.00	0.000	39.000	0.000
L4	43 - 1 (4)	TP60.5x48.96x0.4375	3368608.33	32.683	39.000	0.838	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V lb	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T lb-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	176.01 - 130.76 (1)	TP31.8x21x0.25	13691.60	0.566	26.000	0.044	0.00	0.000	26.000	0.000
L2	130.76 - 86.13 (2)	TP41.82x30.226x0.3125	20065.80	0.504	26.000	0.039	0.00	0.000	26.000	0.000
L3	86.13 - 43 (3)	TP51.36x39.8381x0.375	24514.70	0.417	26.000	0.032	0.00	0.000	26.000	0.000
L4	43 - 1 (4)	TP60.5x48.96x0.4375	28536.20	0.342	26.000	0.026	0.00	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_n}$	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	176.01 - 130.76 (1)	0.125	0.599	0.000	0.044	0.000	0.724 ✓	1.333	H1-3+VT ✓
L2	130.76 - 86.13 (2)	0.062	0.886	0.000	0.039	0.000	0.948 ✓	1.333	H1-3+VT ✓
L3	86.13 - 43 (3)	0.046	0.890	0.000	0.032	0.000	0.936 ✓	1.333	H1-3+VT ✓

ERITower	Job	Page
	176' EEI Monopole, Berlin, CT	20 of 20
URS Corporation 500 Enterprise Dr, Suite 3B Rocky Hill, CT 06067 Phone: (860) 529-8882 FAX: (860) 529-5566	Project T-Mobile Site No: CTHA231A	Date 10:24:20 09/29/05
	Client T-Mobile	Designed by Jed Kiernan

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
L4	43 - 1 (4)	0.035	0.838	0.000	0.026	0.000	0.873 ✓	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L1	176.01 - 130.76	Pole	TP31.8x21x0.25	1	-11934.50	127752.44	54.3	Pass
L2	130.76 - 86.13	Pole	TP41.82x30.226x0.3125	2	-16858.00	365159.34	71.1	Pass
L3	86.13 - 43	Pole	TP51.36x39.8381x0.375	3	-28154.40	812928.68	70.2	Pass
L4	43 - 1	Pole	TP60.5x48.96x0.4375	4	-45137.60	1711371.98	65.5	Pass
							Summary	
						Pole (L2)	71.1	Pass
						RATING =	71.1	Pass

ANCHOR BOLT AND BASE PLATE ANALYSIS

URS

Job	176' Monopole- Berlin, CT	Project No.	VS1-034	Page	of
Description	Anchor Bolt and Base Plate Analysis	Computed by	JEK	Sheet 1	of 6
	T-Mobile CTHA231A	Checked by		Date 09/29/05	

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	OM := 4306.5·ft·kips	*user input*	
Shear Force:	Shear := 34.94·kips	*user input*	Original Design Loads - Conservative
Axial Force:	Axial := 49.6·kips	*user input*	

Anchor Bolt Data:

Use ASTM 615 Grade 75

Number of Anchor Bolts = N	N := 18	*user input*
Diameter of Bolt Circle:	D_{bc} := 70in	*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·in	*user input*
Base Plate Diameter:	D_{bp} := 76·in	*user input*
Outer Pole Diameter:	D_{pole} := 60.5in	*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: $i := 1 .. N$

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

$d_1 = 11.97\,in$ $d_7 = 22.50\,in$

$d_2 = 22.50\,in$ $d_8 = 11.97\,in$

$d_3 = 30.31\,in$ $d_9 = 0.00\,in$

$d_4 = 34.47\,in$ $d_{10} = -11.97\,in$

$d_5 = 34.47\,in$ $d_{11} = -22.50\,in$

$d_6 = 30.31\,in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 30.25\,in$

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

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

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

$MA_3 = 0.06\,in$ $MA_9 = 0.00\,in$

$MA_4 = 4.22\,in$ $MA_{10} = 0.00\,in$

$MA_5 = 4.22\,in$ $MA_{11} = 0.00\,in$

$MA_6 = 0.06\,in$ etc.

Effective Width of Baseplate for Bending: $EffectiveWidth := 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $EffectiveWidth = 46.00\,in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 1.103 \times 10^4\,in^2$$

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:

$$M_x := \left(\frac{Shear}{N}\right)\cdot l \qquad M_x = 0.485\,ft\cdot kips$$

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

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:

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

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N} \qquad MaxTension = 161.3\,kips$$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.92$$

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

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:

$$K := 0.65$$

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

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

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

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 166.8\,\text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 51.4\,\text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.86$$

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

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 58.9\,kips$ $C_7 = 108.2\,kips$

$C_2 = 108.2\,kips$ $C_8 = 58.9\,kips$

$C_3 = 144.8\,kips$ $C_9 = 2.8\,kips$

$C_4 = 164.3\,kips$ $C_{10} = -53.4\,kips$

$C_5 = 164.3\,kips$ $C_{11} = -102.7\,kips$

$C_6 = 144.8\,kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{EffectiveWidth \cdot PlateThickness^2} \qquad f_{bp} = 45.8\,ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.33 \cdot 0.75 Fy_{bp}} = 0.76$$

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

Condition = "OK"