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

October 29, 2009

Michael Perrone
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

ORIGINAL

Re: **Cellco Partnership d/b/a Verizon Wireless**
Exempt Modification Approval

Dear Mr. Perrone:

Enclosed you will find a structural letter confirming that the Verizon Wireless antenna installation was completed in accordance with the requirements of the Structural Analysis submitted as a part of the referenced exempt modification filings. The attached letter relates specifically to the following Siting Council filing.

1. EM-VER-132-090514
South Windsor 2 – 300 Governor's Highway, South Windsor, CT

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

Sincerely,

Kenneth C. Baldwin

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

10068084-v1

NATCOMM INC.
CONSULTING ENGINEERS

October 28, 2009

Mr. Brian Ragozzine
Verizon Wireless
99 East River Drive
East Harford, CT 06108

Project:	**Tower Reinforcement – Verizon South Windsor 2** 300 Governors Highway South Windsor, Connecticut
Tower Owner:	T-Mobile
Engineer:	Natcomm, Inc. 63-2 North Branford Road, Branford, CT 06405
Contractor:	CSB Communications, LLC 63-3 North Branford Road, Branford, CT 06405
Project No:	06139.000

Dear Mr. Ragozzine,

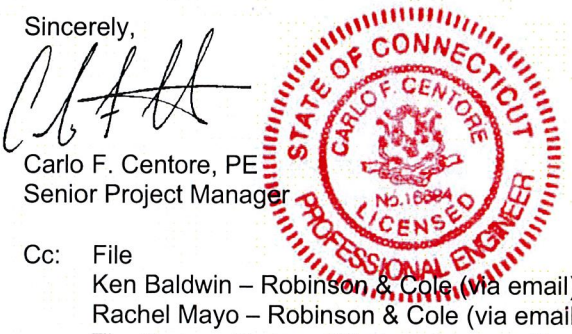
We are providing this "Post Construction Letter" with regard to the structural components at the above referenced project.

The following are the basis for substantiating compliance with the contract documents prepared by Natcomm, Inc.:

- Visual inspection of the base plate reinforcement, including stiffener size and welded connection, conducted by Natcomm personnel on 9/15/09. The work as installed was found to be acceptable. (Refer to attached field visit report)
- Welder's certificate for Richard Mitchell of CSB attached.

The tower reinforcement work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in compliance with the "Structural Analysis Report ~ 169' Existing Monopole, T-Mobile Site Reference: CCT-11-279", Natcomm Project No. 09009-CO2, dated March 19, 2009. The tower as currently loaded and reinforced does not exceed the maximum post construction rating of 100%.

Sincerely,



Carlo F. Centore, PE
Senior Project Manager

Cc: File
Ken Baldwin – Robinson & Cole (via email)
Rachel Mayo – Robinson & Cole (via email)
Tim Parks – Verizon Wireless (via email)

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

NATCOMM INC.
CONSULTING ENGINEERS

63-2 North Branford Road
Branford, Connecticut 06405
(203) 488-0580
Fax (203) 488-8587

FIELD VISIT REPORT

DATE: 9/15/09 **TIME:** 4:00 PM

TO: South Windsor Building Dept. **PHONE:** (860) 644-2511 Ext. 230
ATTN: Christopher Dougan **FAX:** (860) 644-3781

FROM: Timothy J. Lynn; E.I.T. **PHONE:** (203) 488-0580 Ext. 149
FAX: (203) 488-8587

PROJECT NO.: 06139

PROJECT NAME: Verizon Wireless - South Windsor 2

CC: Brian Ragozzine; Adrien Paradis, Aaron Chandler

The following was observed, discussed, reviewed and/or resolved at the site, which requires action by the Contractor unless noted otherwise. Items shall remain on this ongoing report until resolved to the satisfaction of this office.

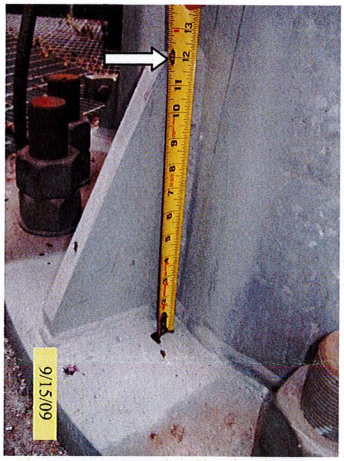
090109.1 Contractor for project is Adrien Paradis of Construction Services of Branford Communications, LLC. Welding done by Richard Mitchell of CSB.

090109.2 1"x5"x1'-0" stiffener plate (typ. of 6). Welds were made with A5.20; E71T-11 electrodes and all areas disturbed by the work were painted with ZRC Galvanizing Compound per Adrien Paradis.

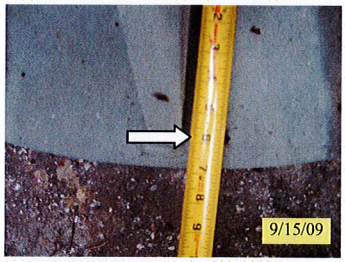
NATCOMM INC.
CONSULTING ENGINEERS

63-2 North Branford Road
Branford, Connecticut 06405
(203) 488-0580
Fax (203) 488-8587

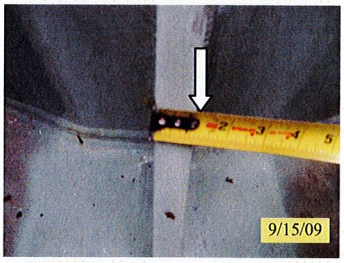
090109.3 Stiffener plate height verified as 12".



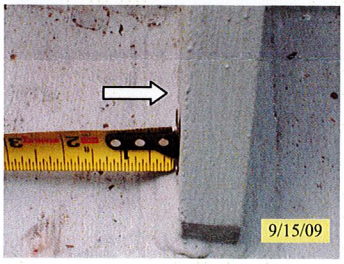
090109.4 Stiffener plate depth at base verified as 6".



090109.5 Stiffener plate thickness verified as 1".



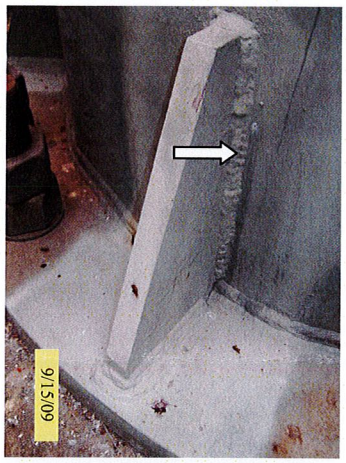
090109.6 Stiffener plate to base plate horizontal weld each side and front of plate verified a 3/4" fillet weld.



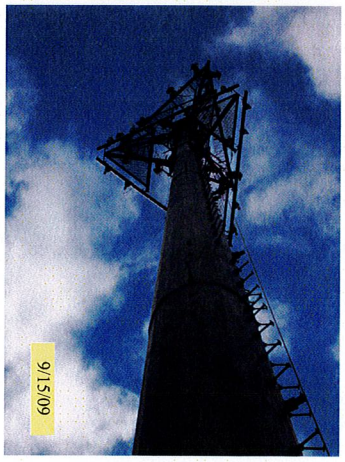
NATCOMM INC.
CONSULTING ENGINEERS

63-2 North Branford Road
Branford, Connecticut 06405
(203) 488-0580
Fax (203) 488-8587

090109.7 Stiffener plate to monopole vertical weld each side and top of plate verified as 5/16" fillet weld.



090109.8 View looking up monopole to installed lightweight platform by Andrew Corp.



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

October 29, 2009

ORIGINAL

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

Re: **EM-VER-132-090514**
300 Governor's Highway, South Windsor, Connecticut
Completion of Construction Activity

Dear Mr. Phelps:

The purpose of this letter is to notify you and the Connecticut Siting Council that the above-referenced Cellco Partnership d/b/a Verizon Wireless telecommunications facility has now been activated.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Copy to:
Sandy M. Carter

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
www.ct.gov/csc

June 17, 2009

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

RE: **EM-VER-132-090514**– Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 300 Governor's Highway, South Windsor, Connecticut.

Dear Attorney Baldwin:

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

- The tower shall be reinforced per drawings S-1 and S-2 of the structural analysis report dated March 19, 2009 and sealed by Carlo F. Centore, P.E. prior to the antenna installation;
- The tower shall not exceed 100 percent of its post-construction structural rating; and
- A signed letter from a Professional Engineer duly licensed in the State of Connecticut shall be submitted to the Council to certify that the reinforcements were properly completed and the tower does not exceed 100 percent of its post-construction structural rating.

The proposed modifications are to be implemented as specified here and in your notice dated May 14, 2009, 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.

CSC
CONNECTICUT SITING COUNCIL

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

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps

S. Derek Phelps
Executive Director

SDP/MP/laf

c: The Honorable Matthew Streeter, Mayor, Town of South Windsor
Matthew B. Galligan, Town Manager, Town of South Windsor
Marcia Banach, Director of Planning, Town of South Windsor
Hans Fiedler, T-Mobile USA, Inc.

ROBINSON & COLE

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-132-090514

ORIGINAL

May 14, 2009

Via Hand Delivery

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

Re: **Notice of Exempt Modification**
300 Governor's Highway, South Windsor, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to install antennas on an existing monopole tower, owned by T-Mobile , at 300 Governors Highway in South Windsor, Connecticut. Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, of 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 Matthew B. Galligan, Town Manager for the Town of South Windsor. A copy of this letter is also being sent to Electron Technologies Corporation, the owner of the property on which the tower is located.

The existing facility consists of a 169-foot monopole tower capable of supporting multiple wireless carriers. The tower is currently shared by T-Mobile with antennas at the 169-foot level; AT&T with antennas at the 162-foot level; Sprint with antennas at the 152-foot level; and Pocket Wireless with antennas at the 142-foot level.

Cellco intends to install twelve (12) antennas (three (3) BXA 70080/6CF_2 antennas; three (3) BXA80080/6CF antennas and six (6) LPA-185085/12CF_2 antennas) at the 112-foot level on the tower. Due to space limitations, Cellco will install a 12' x 20' equipment shelter in the northeast corner of the compound and a free-standing natural gas-fueled backup generator on a 4' x 10' concrete pad in the southwest corner of the compound. Attached behind Tab 1 are Project Plans for the proposed Cellco facility.

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

1. The proposed modification will not increase the overall height of the existing tower. Cellco's antennas will be mounted with their centerline at the 112-foot level on the 169-foot tower.

2. The proposed installation of Cellco's equipment shelter and free-standing generator will not require an extension of the fenced compound or the lease area.

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

4. The operation of the 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. The cumulative RF power density emissions for all existing antennas and Cellco's proposed antennas would be 38.40% of the FCC standard. A worst-case power density calculations table is included behind Tab 2.

Included behind Tab 3 is a Structural Analysis Report prepared by Natcomm Inc. confirming that the tower, with base plate modifications, and the foundation can support all existing and proposed antennas and associated equipment.

For the foregoing reasons, Cellco respectfully submits that the proposed antenna installation at the facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Attachments
Copy to:
Matthew B. Galligan, South Windsor Town Manager
Electron Technologies Corporation
Sandy M. Carter
Michelle Kababik

Cellco Partnership

d.b.a. verizon wireless

WIRELESS COMMUNICATIONS FACILITY

SOUTH WINDSOR II
300 GOVERNORS HIGHWAY
SOUTH WINDSOR, CT 06074

SITE DIRECTIONS

FROM:	99 EAST RIVER DRIVE EAST HARTFORD, CONNECTICUT	TO:	300 GOVERNORS HIGHWAY SOUTH WINDSOR, CONNECTICUT

1. Start out going EAST on E RIVER DR toward DARLIN STREET.	0.3 MI.
2. Stay STRAIGHT to go onto ASH STREET.	0.2 MI.
3. Turn RIGHT onto CONNECTICUT BLVD/US-44.	0.5 MI.
4. Turn LEFT onto MAIN STREET/US-44/US-5. Continue to follow US-5 N.	4.9 MI.
5. End at 300 Governors Highway South Windsor, CT 06074-2422.	

GENERAL NOTES

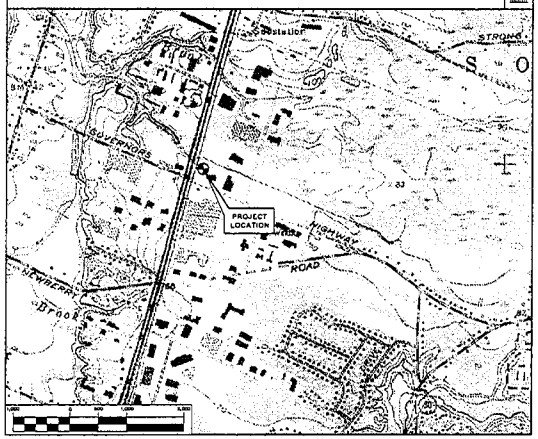
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF A 12'x20' PREFABRICATED WIRELESS EQUIPMENT SHELTER ON A CONCRETE FOUNDATION AND A PAD MOUNTED, NATURAL GAS FUELED EMERGENCY POWER GENERATOR, ALL LOCATED WITHIN THE EXISTING WIRELESS COMMUNICATIONS LEASE AREA.
2. A TOTAL OF TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED ON AN EXISTING 169' TALL MONOPOLE TOWER AT A RAD CENTER ELEVATION OF 112' ABOVE FINISHED GRADE.
3. ELECTRIC AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND TO THE PROPOSED EQUIPMENT SHELTER FROM AN EXISTING UTILITY DEMARCS LOCATED ADJACENT TO EXISTING FENCED COMPOUND.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	SOUTH WINDSOR II
SITE ADDRESS:	300 GOVERNORS HIGHWAY SOUTH WINDSOR, CT 06074
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON:	SANDY CARTER CELLCO PARTNERSHIP (860) 803-6219
TOWER COORDINATES:	LATITUDE 41°-49'-48" LONGITUDE 72°-36'-0"
	COORDINATES ARE BASED ON CONNECTICUT SITING COUNCIL DATABASE.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	A
C-1	COMPOUND PLAN AND ELEVATION	A

DESIGNED BY: CFC
DRAWN BY: TSP
CHK'D BY: DMD

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
A	05/13/09	TSP	DMD	ISSUED FOR CSC-CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. Verizon Wireless

NATCOM

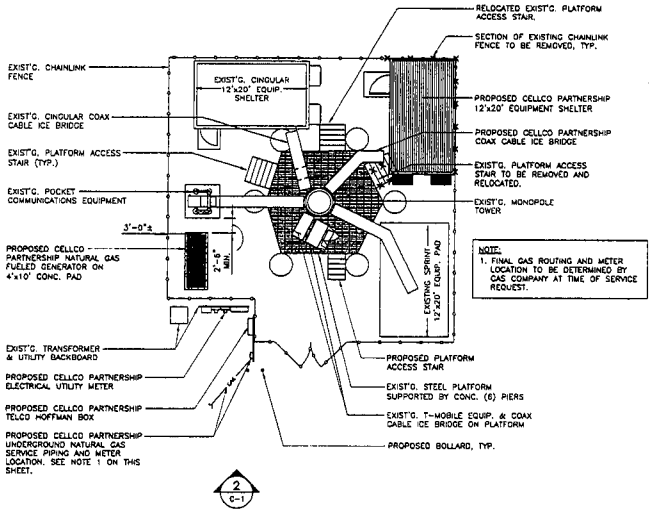
VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
SOUTH WINDSOR II
300 GOVERNORS HIGHWAY
SOUTH WINDSOR, CT 06074

DATE: 05/13/09
SCALE: AS NOTED
JOB NO. 06139

TITLE SHEET

T-1

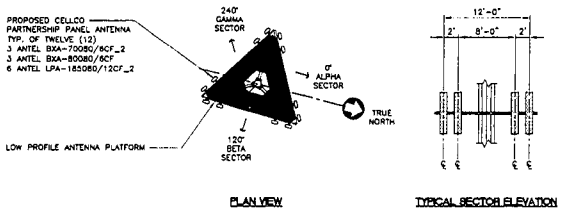
Sheet No. 1 of 2



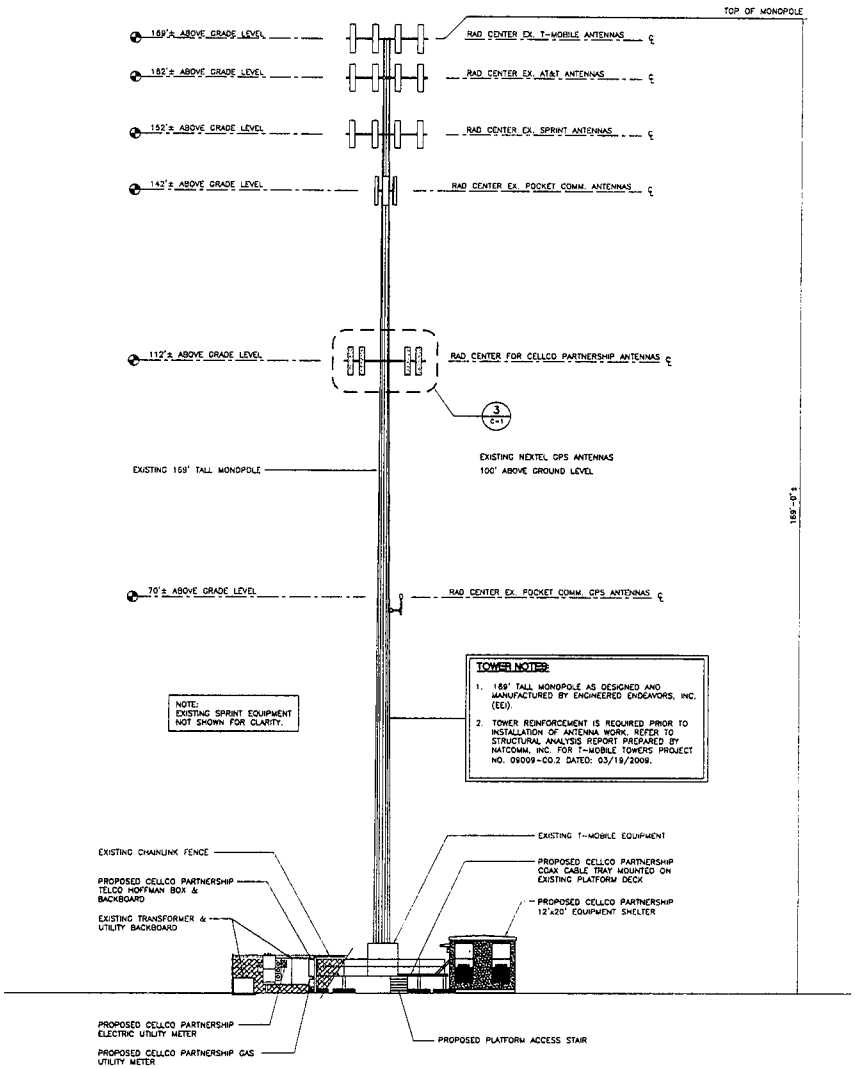
1 / C-1 **COMPOUND PLAN**
SCALE: 1" = 10'- 0"

TRUE NORTH

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.



3 / C-1 **ANTENNA MOUNTING CONFIGURATION**
NOT TO SCALE



2 / C-1 **EAST ELEVATION**
SCALE: 1" = 10'

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.

DESIGNED BY:	CFC
DRAWN BY:	TSP
CHK'D BY:	DMD

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
A	05/13/09	TSP	DMD	ISSUED FOR ESC-CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

Cellco Partnership d.b.a. Verizon Wireless

NATCOMM

VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
SOUTH WINDSOR II
300 GOVERNORS HIGHWAY
SOUTH WINDSOR, CT 06074

DATE	05/13/09
SCALE:	AS NOTED
JOB NO.	06139

COMPOUND PLAN AND ELEVATION

C-1

Sheet No. 2 of 2

	General	Power	Density					
Site Name: South Windsor 2								
Tower Height: Verizon @ 112ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*T-Mobile	8	116	172	0.0113	1930	1.0000	1.13%	
*Pocket	3	631	142	0.0338	2130	1.0000	3.38%	
*Sprint/Nextel iDEN	12	100	152	0.0187	851	0.5673	3.29%	
*Sprint/Nextel CDMA	11	301	152	0.0515	1962.5	1.0000	5.15%	
*Cingular UMTS	1	500	162	0.0069	880	0.5867	1.17%	
*Cingular GSM	2	296	162	0.0081	880	0.5867	1.38%	
*Cingular GSM	1	427	162	0.0059	1900	1.0000	0.59%	
Verizon	**3**	**377.03**	**112**	**0.0324**	**1970**	**1.0000**	**3.24%**	
Verizon	**9**	**340.695**	**112**	**0.0879**	**875**	**0.5830**	**15.08%**	
Verizon	**1**	**693.74**	**112**	**0.0199**	**746**	**0.4973**	**4.00%**	
								38.40%
* Source: Siting Council								

NATCOMM INC.
CONSULTING ENGINEERS

Structural Analysis Report

169' Existing Monopole

T-Mobile Site Ref: CT-11-279

Verizon Wireless – S. Windsor 2

300 Governors Highway
South Windsor, CT 06074

Natcomm Project No. 09009-CO.2

Date: March 19, 2009

Prepared for:

T-Mobile Towers
4 Sylvan Way
Parsippany, NJ 07054

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
169' Existing EEI Monopole
South Windsor, CT
March 19, 2009

Table of Contents

Natcomm, Inc.
Structural Monopole Analysis
169' Existing EEI Monopole
South Windsor, CT
March 19, 2009

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by Verizon Wireless on an existing monopole (tower) owned and operated by T-Mobile, located in South Windsor, Connecticut.

The host tower is a 169-ft, four-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Inc (EEI)—job no: 6255, dated June 2, 2000. The tower geometry, structure member sizes and foundation system information were obtained from the EEI design drawings. Antenna and appurtenance information were obtained from a Structural Analysis Worksheet (SAW) provided by T-Mobile.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 16.25-in at the top and 45.50-in at the base.

The aforementioned EEI design drawings and T-Mobile SAW data sheet are available for reference in Section 4 of this report.

Verizon Wireless proposes the installation of twelve (12) panel antennas on a 13' low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance 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:

- CARRIER T-Mobile (Existing/Reserved):
  Antennas: Twelve (12) EMS RR65-19-02DP panel antennas, twelve (12) 10"x8"x3" TMA's, mounted a low profile platform with a RAD center elevation of 169-ft above finished grade.
  Coax Cables: Twenty-five (25) 1 5/8" ∅ coax cables (interior of monopole).

- AT&T (Existing):
  Antennas: Six (6) Powerwave 7770 and three (3) CSS DUO1417-8686 panel antennas, six (6) ADC CG1900W850 TMA's and three (3) LGP13519 Diplexers mounted on a 14' low profile platform with a RAD center elevation of 162-ft above finished grade.
  Coax Cables: Twelve (12) 1 5/8" ∅ coax cables (interior of monopole).

- Sprint (Existing):
  Antennas: Three (3) Andrew 932LG65VTE-B panel antennas flush mounted with a RAD center elevation of 152-ft above finished grade.
  Coax Cables: Six (6) 1 5/8" ∅ coax cables (interior of monopole).

- Pocket (Existing):
  Antennas: Three (3) Kathrein Scala 742-213 panel antennas flush mounted with a RAD center elevation of 142-ft above finished grade.
  Coax Cables: Six (6) 1 5/8" ∅ coax cables running on the outside of the pole.

- Pocket (Existing):
  Antennas: One (1) GPS mounted on one (1) 2' mount with a RAD center elevation of 70-ft above finished grade.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the outside of the pole.

- **Verizon (Proposed):**
  Antennas: Three (3) Antel BXA-70080/6CF_2, three (3) Antel BXA-800-80/6CF and six (6) Antel LPA-185080-12CF_2 panel antennas mounted on one (1) 13' low profile platform with a RAD center elevation of 112-ft above finished grade.
  Coax Cables: Eighteen (18) 1 5/8" ∅ coax cables running on the outside of the pole stacked in two rows of nine.

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 existing coax cables to be installed through engineered port holes unless otherwise indicated.

Natcomm, Inc.
Structural Monopole Analysis
169' Existing EEI Monopole
South Windsor, CT
March 19, 2009

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]*
	South Windsor; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed criteria controls.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design. This load case typically controls the design of monopole towers.	*[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. This load case typically controls the design of lattice towers.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software RISA Tower. 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 **99.8%** of its total capacity.

Tower Section	Component	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	4.00'-43.39'	**99.8%**	**PASS**

Foundation and Anchors

The existing foundation system consists of a 25.0-ft ∅ structural steel 'Star Mount' frame together with helical soil anchors. The sub-grade conditions used in the analysis of the existing foundation were obtained from a geotechnical report prepared by French & Parello, dated October 20, 1999. Verification of the 'Star Mount' steel frame member sizes was conducted by NATCOMM during March, 2009. The base of the monopole tower is connected to the 'Star Mount' base frame by means of (12) 2.25" ∅, ASTM A193-Gr.B anchor bolts embedded into the concrete foundation structure.

Review of the foundation system 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 system and its anchors:

Base Reactions	Vector	Proposed Load (kips/ft-kips)
Base	Shear	**22**
	Axial	**36**
	Moment	**2544**

- The foundation/base frame support system was found to be structurally adequate.

Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Helical Anchors	Compression	54.0%	**PASS**
'Star Mount'			
Girder Bending	Bending	74.0%	**PASS**
Girder Web Shear	Web Shear	50.0%	**PASS**
Girder Bolt Connection	Tension	65.0%	**PASS**
End Plate	Bending	84.0%	**PASS**

- The anchor bolts were found to be structurally adequate. However, the tower base plate was **NOT** found to be within the allowable limits. With the reinforcements outlined in drawings S-1 and S-2 within Section 3 of this report the base plate shall be considered structurally adequate for the proposed loading.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Compression	76.7%	**PASS**
Base Plate (un-reinforced)	Bending	Overstressed	**FAIL**
Base Plate (reinforced)	Bending	45.0%	**PASS**

Conclusion

This analysis shows that with the base plate reinforcements outlined above 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:

3/20/09

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

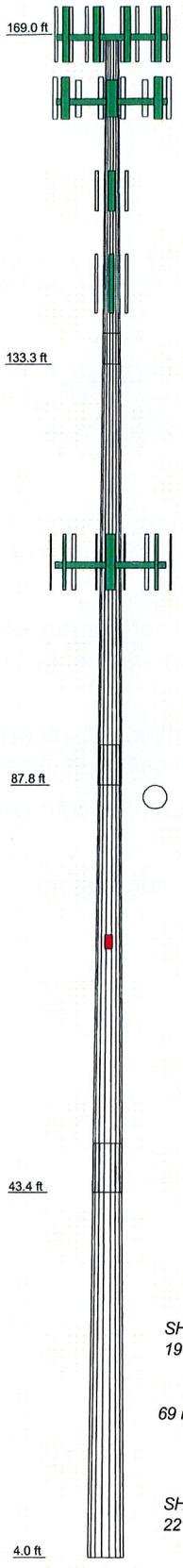
RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

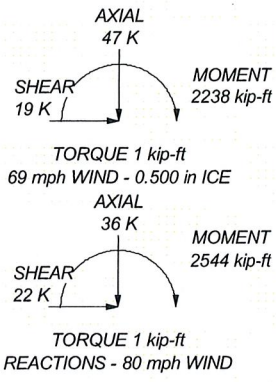
RISATower Features:

- 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)	35.670	48.830	48.780	44.719
Number of Sides	18	18	18	18
Thickness (in)	0.250	0.313	0.375	0.375
Lap Splice (ft)	3.333	4.333	5.333	
Top Dia (in)	16.250	21.233	28.935	36.370
Bot Dia (in)	22.298	30.371	38.125	45.500
Grade	A572-65			
Weight (K)	1.8	4.2	6.6	7.3

Total Weight (K) 19.9





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(4) RR65-19-02DP (T-Mobile - existing/reserved)	169	932LG65VTE-B (Sprint - existing)	152
(4) RR65-19-02DP (T-Mobile - existing/reserved)	169	932LG65VTE-B (Sprint - existing)	152
(4) RR65-19-02DP (T-Mobile - existing/reserved)	169	932LG65VTE-B (Sprint - existing)	152
(4) TMA 10"x8"x3" (T-Mobile - existing/reserved)	169	Uni-Tri Bracket (Sprint - existing)	152
(4) TMA 10"x8"x3" (T-Mobile - existing/reserved)	169	742-213 (Pocket - existing)	142
(4) TMA 10"x8"x3" (T-Mobile - existing/reserved)	169	742-213 (Pocket - existing)	142
EEI Low Profile Platform (T-Mobile - existing)	169	742-213 (Pocket - existing)	142
DUO1417-8686 (ATI - existing)	162	Uni-Tri Bracket (Pocket - existing)	142
DUO1417-8686 (ATI - existing)	162	BXA-70080/6CF_2 (Verizon - proposed)	112
DUO1417-8686 (ATI - existing)	162	BXA-70080/6CF_2 (Verizon - proposed)	112
(2) 7770.00 (ATI - existing)	162	BXA-70080/6CF_2 (Verizon - proposed)	112
(2) 7770.00 (ATI - existing)	162	BXA-80080/6CF (Verizon - proposed)	112
(2) 7770.00 (ATI - existing)	162	BXA-80080/6CF (Verizon - proposed)	112
(2) CG1900W850 TMA (ATI - existing)	162	BXA-80080/6CF (Verizon - proposed)	112
(2) CG1900W850 TMA (ATI - existing)	162	(2) LPA-185080-12CF_2 (Verizon - proposed)	112
(2) CG1900W850 TMA (ATI - existing)	162	(2) LPA-185080-12CF_2 (Verizon - proposed)	112
LPG13519 Diplexer (ATI - existing)	162	(2) LPA-185080-12CF_2 (Verizon - proposed)	112
LPG13519 Diplexer (ATI - existing)	162	Valmont 13' Low Profile Platform (Verizon - existing)	112
LPG13519 Diplexer (ATI - existing)	162	GPS (Pocket - existing)	70
14' Low Profile Platform (ATI - existing)	162	2' GPS Mount (Pocket - existing)	70

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 99.8%

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

Job: 169-ft EEI Monopole - 09009.CO2			
Project: 300 Governors Highway., South Windsor, CT			
Client: T-Mobile/Verizon	Drawn by: Staff	App'd:	
Code: TIA/EIA-222-F	Date: 03/19/09	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

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

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in 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	169.000-133.330	35.670	3.333	18	16.250	22.298	0.250	1.000	A572-65 (65 ksi)
L2	133.330-87.833	48.830	4.333	18	21.233	30.371	0.313	1.250	A572-65 (65 ksi)
L3	87.833-43.386	48.780	5.333	18	28.935	38.125	0.375	1.500	A572-65

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
L4	43.386-4.000	44.719		18	36.370	45.500	0.375	1.500	(65 ksi) 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	16.501	12.696	410.624	5.680	8.255	49.742	821.788	6.349	2.420	9.68
	22.642	17.495	1074.406	7.827	11.327	94.852	2150.225	8.749	3.484	13.938
L2	22.193	20.750	1147.309	7.427	10.786	106.369	2296.127	10.377	3.187	10.198
	30.840	29.814	3403.337	10.671	15.429	220.587	6811.153	14.910	4.795	15.345
L3	30.211	33.994	3503.179	10.139	14.699	238.326	7010.968	17.000	4.433	11.82
	38.713	44.932	8089.461	13.401	19.367	417.684	16189.567	22.470	6.050	16.133
L4	38.037	42.843	7013.049	12.778	18.476	379.576	14035.326	21.426	5.741	15.31
	46.202	53.710	13817.430	16.019	23.114	597.795	27653.042	26.860	7.348	19.595

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 169.000-133.330				1	1	1		
L2 133.330-87.833				1	1	1		
L3 87.833-43.386				1	1	1		
L4 43.386-4.000				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 klf
1 5/8 (T-Mobile - existing)	C	No	Inside Pole	169.000 - 4.000	24	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (AT&T- existing)	C	No	Inside Pole	162.000 - 4.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (Sprint - existing)	C	No	Inside Pole	152.000 - 4.000	6	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (Pocket - existing)	C	No	CaAa (Out Of Face)	142.000 - 4.000	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (Pocket - existing)	C	No	CaAa (Out Of Face)	142.000 - 4.000	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003
1 5/8 (Verizon - proposed)	C	No	CaAa (Out Of Face)	112.000 - 4.000	2	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (Verizon - proposed)	C	No	CaAa (Out Of Face)	112.000 - 4.000	16	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003
1/2 (Pocket - existing)	C	No	CaAa (Out Of Face)	74.000 - 4.000	1	No Ice	0.058	0.000
						1/2" Ice	0.158	0.001

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	169.000-133.330	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.717	1.419
L2	133.330-87.833	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	18.579	2.724
L3	87.833-43.386	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	28.177	3.058
L4	43.386-4.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	25.680	2.713

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	169.000-133.330	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	2.584	1.497
L2	133.330-87.833	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	27.962	3.793
L3	87.833-43.386	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	44.573	4.689
L4	43.386-4.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	41.434	4.167

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	169.000-133.330	-0.068	0.039	-0.096	0.055
L2	133.330-87.833	-0.464	0.268	-0.628	0.363
L3	87.833-43.386	-0.674	0.389	-0.945	0.546
L4	43.386-4.000	-0.713	0.411	-1.029	0.594

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(4) RR65-19-02DP	A	From Face	3.500	0.000	169.000	No Ice	5.867	2.750	0.023
(T-Mobile -			0.000			1/2" Ice	6.325	3.234	0.052
existing/reserved)			0.000						
(4) RR65-19-02DP	B	From Face	3.500	0.000	169.000	No Ice	5.867	2.750	0.023
(T-Mobile -			0.000			1/2" Ice	6.325	3.234	0.052
existing/reserved)			0.000						
(4) RR65-19-02DP	C	From Face	3.500	0.000	169.000	No Ice	5.867	2.750	0.023
(T-Mobile -			0.000			1/2" Ice	6.325	3.234	0.052
existing/reserved)			0.000						
(4) TMA 10"x8"x3"	A	From Face	3.000	0.000	169.000	No Ice	0.778	0.292	0.015
(T-Mobile -			0.000			1/2" Ice	0.899	0.380	0.020
existing/reserved)			0.000						
(4) TMA 10"x8"x3"	B	From Face	3.000	0.000	169.000	No Ice	0.778	0.292	0.015
(T-Mobile -			0.000			1/2" Ice	0.899	0.380	0.020
existing/reserved)			0.000						
(4) TMA 10"x8"x3"	C	From Face	3.000	0.000	169.000	No Ice	0.778	0.292	0.015
(T-Mobile -			0.000			1/2" Ice	0.899	0.380	0.020
existing/reserved)			0.000						
EEI Low Profile Platform	C	None		0.000	169.000	No Ice	22.500	22.500	1.500
(T-Mobile - existing)						1/2" Ice	28.200	28.200	2.250
DUO1417-8686	A	From Face	3.500	0.000	162.000	No Ice	6.533	4.200	0.020
(AT&T - existing)			0.000			1/2" Ice	6.940	4.574	0.062
			0.000						
DUO1417-8686	B	From Face	3.500	0.000	162.000	No Ice	6.533	4.200	0.020
(AT&T - existing)			0.000			1/2" Ice	6.940	4.574	0.062
			0.000						
DUO1417-8686	C	From Face	3.500	0.000	162.000	No Ice	6.533	4.200	0.020
(AT&T - existing)			0.000			1/2" Ice	6.940	4.574	0.062
			0.000						
(2) 7770.00	A	From Face	3.500	0.000	162.000	No Ice	5.882	2.928	0.035
(AT&T - existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
(2) 7770.00	B	From Face	3.500	0.000	162.000	No Ice	5.882	2.928	0.035
(AT&T - existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
(2) 7770.00	C	From Face	3.500	0.000	162.000	No Ice	5.882	2.928	0.035
(AT&T - existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
(2) CG1900W850 TMA	A	From Face	3.500	0.000	162.000	No Ice	1.285	0.319	0.015
(AT&T - existing)			0.000			1/2" Ice	1.439	0.417	0.023
			0.000						
(2) CG1900W850 TMA	B	From Face	3.500	0.000	162.000	No Ice	1.285	0.319	0.015
(AT&T - existing)			0.000			1/2" Ice	1.439	0.417	0.023
			0.000						
(2) CG1900W850 TMA	C	From Face	3.500	0.000	162.000	No Ice	1.285	0.319	0.015
(AT&T - existing)			0.000			1/2" Ice	1.439	0.417	0.023
			0.000						
LPG13519 Diplexer	A	From Face	3.500	0.000	162.000	No Ice	0.270	0.184	0.005
(AT&T - existing)			0.000			1/2" Ice	0.343	0.248	0.008
			0.000						
LPG13519 Diplexer	B	From Face	3.500	0.000	162.000	No Ice	0.270	0.184	0.005
(AT&T - existing)			0.000			1/2" Ice	0.343	0.248	0.008
			0.000						
LPG13519 Diplexer	C	From Face	3.500	0.000	162.000	No Ice	0.270	0.184	0.005
(AT&T - existing)			0.000			1/2" Ice	0.343	0.248	0.008
			0.000						
14' Low Profile Platform	C	None		0.000	162.000	No Ice	17.300	17.300	1.500

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T - existing)						1/2" Ice	22.100	22.100	2.030
932LG65VTE-B	A	From Face	1.000	0.000	152.000	No Ice	4.256	3.535	0.020
(Sprint - existing)			0.000			1/2" Ice	4.649	3.888	0.050
			0.000						
932LG65VTE-B	B	From Face	1.000	0.000	152.000	No Ice	4.256	3.535	0.020
(Sprint - existing)			0.000			1/2" Ice	4.649	3.888	0.050
			0.000						
932LG65VTE-B	C	From Face	1.000	0.000	152.000	No Ice	4.256	3.535	0.020
(Sprint - existing)			0.000			1/2" Ice	4.649	3.888	0.050
			0.000						
Uni-Tri Bracket	C	None		0.000	152.000	No Ice	0.000	0.000	0.290
(Sprint - existing)						1/2" Ice	0.000	0.000	0.306
742-213	A	From Face	1.000	0.000	142.000	No Ice	5.135	2.869	0.022
(Pocket - existing)			0.000			1/2" Ice	5.609	3.483	0.047
			0.000						
742-213	B	From Face	1.000	0.000	142.000	No Ice	5.135	2.869	0.022
(Pocket - existing)			0.000			1/2" Ice	5.609	3.483	0.047
			0.000						
742-213	C	From Face	1.000	0.000	142.000	No Ice	5.135	2.869	0.022
(Pocket - existing)			0.000			1/2" Ice	5.609	3.483	0.047
			0.000						
Uni-Tri Bracket	C	None		0.000	142.000	No Ice	0.000	0.000	0.290
(Pocket - existing)						1/2" Ice	0.000	0.000	0.306
BXA-70080/6CF_2	A	From Face	3.500	0.000	112.000	No Ice	7.905	4.690	0.022
(Verizon - proposed)			0.000			1/2" Ice	8.453	5.141	0.067
			0.000						
BXA-70080/6CF_2	B	From Face	3.500	0.000	112.000	No Ice	7.905	4.690	0.022
(Verizon - proposed)			0.000			1/2" Ice	8.453	5.141	0.067
			0.000						
BXA-70080/6CF_2	C	From Face	3.500	0.000	112.000	No Ice	7.905	4.690	0.022
(Verizon - proposed)			0.000			1/2" Ice	8.453	5.141	0.067
			0.000						
BXA-80080/6CF	A	From Face	3.500	0.000	112.000	No Ice	7.905	3.926	0.022
(Verizon - proposed)			0.000			1/2" Ice	8.453	4.369	0.064
			0.000						
BXA-80080/6CF	B	From Face	3.500	0.000	112.000	No Ice	7.905	3.926	0.022
(Verizon - proposed)			0.000			1/2" Ice	8.453	4.369	0.064
			0.000						
BXA-80080/6CF	C	From Face	3.500	0.000	112.000	No Ice	7.905	3.926	0.022
(Verizon - proposed)			0.000			1/2" Ice	8.453	4.369	0.064
			0.000						
(2) LPA-185080-12CF_2	A	From Face	3.500	0.000	112.000	No Ice	3.532	4.569	0.011
(Verizon - proposed)			0.000			1/2" Ice	3.964	5.010	0.037
			0.000						
(2) LPA-185080-12CF_2	B	From Face	3.500	0.000	112.000	No Ice	3.532	4.569	0.011
(Verizon - proposed)			0.000			1/2" Ice	3.964	5.010	0.037
			0.000						
(2) LPA-185080-12CF_2	C	From Face	3.500	0.000	112.000	No Ice	3.532	4.569	0.011
(Verizon - proposed)			0.000			1/2" Ice	3.964	5.010	0.037
			0.000						
Valmont 13' Low Profile	C	None		0.000	112.000	No Ice	15.700	15.700	1.300
Platform						1/2" Ice	20.100	20.100	1.765
(Verizon - existing)									
GPS	C	From Face	2.000	0.000	70.000	No Ice	1.000	1.000	0.010
(Pocket - existing)			0.000			1/2" Ice	1.500	1.500	0.015
			0.000						
2' GPS Mount	C	From Face	1.000	0.000	70.000	No Ice	0.780	0.680	0.025

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Pocket - existing)			0.000 0.000			1/2" Ice	1.100	1.100	0.033

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 169.000-133.330	150.382	1.542	0.025	57.291	A	0.000	57.291	57.291	100.00	0.000	0.000
					B	0.000	57.291		100.00	0.000	0.000
					C	0.000	57.291		100.00	0.000	1.717
L2 133.330-87.833	109.679	1.409	0.023	99.008	A	0.000	99.008	99.008	100.00	0.000	0.000
					B	0.000	99.008		100.00	0.000	0.000
					C	0.000	99.008		100.00	0.000	18.579
L3 87.833-43.386	65.238	1.215	0.020	125.704	A	0.000	125.704	125.704	100.00	0.000	0.000
					B	0.000	125.704		100.00	0.000	0.000
					C	0.000	125.704		100.00	0.000	28.177
L4 43.386-4.000	23.072	1	0.016	136.143	A	0.000	136.143	136.143	100.00	0.000	0.000
					B	0.000	136.143		100.00	0.000	0.000
					C	0.000	136.143		100.00	0.000	25.680

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 169.000-133.330	150.382	1.542	0.019	0.500	60.264	A	0.000	60.264	60.264	100.00	0.000	0.000
						B	0.000	60.264		100.00	0.000	0.000
						C	0.000	60.264		100.00	0.000	2.584
L2 133.330-87.833	109.679	1.409	0.017	0.500	102.800	A	0.000	102.800	102.800	100.00	0.000	0.000
						B	0.000	102.800		100.00	0.000	0.000
						C	0.000	102.800		100.00	0.000	27.962
L3 87.833-43.386	65.238	1.215	0.015	0.500	129.408	A	0.000	129.408	129.408	100.00	0.000	0.000
						B	0.000	129.408		100.00	0.000	0.000
						C	0.000	129.408		100.00	0.000	44.573
L4 43.386-4.000	23.072	1	0.012	0.500	139.425	A	0.000	139.425	139.425	100.00	0.000	0.000
						B	0.000	139.425		100.00	0.000	0.000
						C	0.000	139.425		100.00	0.000	41.434

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	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 169.000-133.330	150.382	1.542	0.010	57.291	A	0.000	57.291	57.291	100.00	0.000	0.000
					B	0.000	57.291		100.00	0.000	0.000
					C	0.000	57.291		100.00	0.000	1.717
L2 133.330-87.833	109.679	1.409	0.009	99.008	A	0.000	99.008	99.008	100.00	0.000	0.000
					B	0.000	99.008		100.00	0.000	0.000
					C	0.000	99.008		100.00	0.000	18.579
L3 87.833-43.386	65.238	1.215	0.008	125.704	A	0.000	125.704	125.704	100.00	0.000	0.000
					B	0.000	125.704		100.00	0.000	0.000
					C	0.000	125.704		100.00	0.000	28.177
L4 43.386-4.000	23.072	1	0.006	136.143	A	0.000	136.143	136.143	100.00	0.000	0.000
					B	0.000	136.143		100.00	0.000	0.000
					C	0.000	136.143		100.00	0.000	25.680

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	1.663	0.047	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	3.230	0.071	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	3.677	0.083	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	3.166	0.080	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	870.286 kip-ft	11.736		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	1.663	0.047	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	3.230	0.071	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	3.677	0.083	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	3.166	0.080	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	870.286 kip-ft	11.736		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	1.663	0.047	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	3.230	0.071	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	3.677	0.083	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	3.166	0.080	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	870.286 kip-ft	11.736		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	1.663	0.047	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	3.230	0.071	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	3.677	0.083	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	3.166	0.080	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	870.286 kip-ft	11.736		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.497	2.268	A	1	0.65	1	1	1	60.264	1.337	0.037	C
			B	1	0.65	1	1	1	60.264			
			C	1	0.65	1	1	1	60.264			
L2 133.330-87.833	3.793	4.948	A	1	0.65	1	1	1	102.800	2.769	0.061	C
			B	1	0.65	1	1	1	102.800			
			C	1	0.65	1	1	1	102.800			
L3 87.833-43.386	4.689	7.495	A	1	0.65	1	1	1	129.408	3.230	0.073	C
			B	1	0.65	1	1	1	129.408			
			C	1	0.65	1	1	1	129.408			
L4 43.386-4.000	4.167	8.367	A	1	0.65	1	1	1	139.425	2.747	0.070	C
			B	1	0.65	1	1	1	139.425			
			C	1	0.65	1	1	1	139.425			
Sum Weight:	14.146	23.077						OTM	738.395 kip-ft	10.081		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.497	2.268	A	1	0.65	1	1	1	60.264	1.337	0.037	C
			B	1	0.65	1	1	1	60.264			
			C	1	0.65	1	1	1	60.264			
L2 133.330-87.833	3.793	4.948	A	1	0.65	1	1	1	102.800	2.769	0.061	C
			B	1	0.65	1	1	1	102.800			
			C	1	0.65	1	1	1	102.800			
L3 87.833-43.386	4.689	7.495	A	1	0.65	1	1	1	129.408	3.230	0.073	C
			B	1	0.65	1	1	1	129.408			
			C	1	0.65	1	1	1	129.408			
L4 43.386-4.000	4.167	8.367	A	1	0.65	1	1	1	139.425	2.747	0.070	C
			B	1	0.65	1	1	1	139.425			
			C	1	0.65	1	1	1	139.425			
Sum Weight:	14.146	23.077						OTM	738.395 kip-ft	10.081		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.497	2.268	A	1	0.65	1	1	1	60.264	1.337	0.037	C
			B	1	0.65	1	1	1	60.264			
			C	1	0.65	1	1	1	60.264			
L2 133.330-	3.793	4.948	A	1	0.65	1	1	1	102.800	2.769	0.061	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
87.833			B	1	0.65	1	1	1	102.800			
			C	1	0.65	1	1	1	102.800			
L3 87.833-43.386	4.689	7.495	A	1	0.65	1	1	1	129.408	3.230	0.073	C
			B	1	0.65	1	1	1	129.408			
			C	1	0.65	1	1	1	129.408			
L4 43.386-4.000	4.167	8.367	A	1	0.65	1	1	1	139.425	2.747	0.070	C
			B	1	0.65	1	1	1	139.425			
			C	1	0.65	1	1	1	139.425			
Sum Weight:	14.146	23.077						OTM	738.395 kip-ft	10.081		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.497	2.268	A	1	0.65	1	1	1	60.264	1.337	0.037	C
			B	1	0.65	1	1	1	60.264			
			C	1	0.65	1	1	1	60.264			
L2 133.330-87.833	3.793	4.948	A	1	0.65	1	1	1	102.800	2.769	0.061	C
			B	1	0.65	1	1	1	102.800			
			C	1	0.65	1	1	1	102.800			
L3 87.833-43.386	4.689	7.495	A	1	0.65	1	1	1	129.408	3.230	0.073	C
			B	1	0.65	1	1	1	129.408			
			C	1	0.65	1	1	1	129.408			
L4 43.386-4.000	4.167	8.367	A	1	0.65	1	1	1	139.425	2.747	0.070	C
			B	1	0.65	1	1	1	139.425			
			C	1	0.65	1	1	1	139.425			
Sum Weight:	14.146	23.077						OTM	738.395 kip-ft	10.081		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	0.649	0.018	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	1.262	0.028	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	1.436	0.032	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	1.237	0.031	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	339.955	4.584		

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

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	0.649	0.018	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	1.262	0.028	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	1.436	0.032	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	1.237	0.031	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	339.955 kip-ft	4.584		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	0.649	0.018	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	1.262	0.028	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	1.436	0.032	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	1.237	0.031	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	339.955 kip-ft	4.584		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1 169.000-133.330	1.419	1.832	A	1	0.65	1	1	1	57.291	0.649	0.018	C
			B	1	0.65	1	1	1	57.291			
			C	1	0.65	1	1	1	57.291			
L2 133.330-87.833	2.724	4.201	A	1	0.65	1	1	1	99.008	1.262	0.028	C
			B	1	0.65	1	1	1	99.008			
			C	1	0.65	1	1	1	99.008			
L3 87.833-43.386	3.058	6.550	A	1	0.65	1	1	1	125.704	1.436	0.032	C
			B	1	0.65	1	1	1	125.704			
			C	1	0.65	1	1	1	125.704			
L4 43.386-4.000	2.713	7.346	A	1	0.65	1	1	1	136.143	1.237	0.031	C
			B	1	0.65	1	1	1	136.143			
			C	1	0.65	1	1	1	136.143			
Sum Weight:	9.914	19.930						OTM	339.955 kip-ft	4.584		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	19.930					
Bracing Weight	0.000					
Total Member Self-Weight	19.930			2.185	3.623	
Total Weight	35.914			2.185	3.623	
Wind 0 deg - No Ice		0.000	-22.220	-2378.386	3.623	-0.529
Wind 30 deg - No Ice		11.108	-19.243	-2059.450	-1186.549	-0.220
Wind 45 deg - No Ice		15.710	-15.712	-1681.133	-1679.535	-0.037
Wind 60 deg - No Ice		19.240	-11.110	-1188.101	-2057.816	0.149
Wind 90 deg - No Ice		22.217	0.000	2.185	-2376.722	0.477
Wind 120 deg - No Ice		19.240	11.110	1192.471	-2057.816	0.678
Wind 135 deg - No Ice		15.710	15.712	1685.503	-1679.535	0.711
Wind 150 deg - No Ice		11.108	19.243	2063.820	-1186.549	0.697
Wind 180 deg - No Ice		0.000	22.220	2382.756	3.623	0.529
Wind 210 deg - No Ice		-11.108	19.243	2063.820	1193.795	0.220
Wind 225 deg - No Ice		-15.710	15.712	1685.503	1686.781	0.037
Wind 240 deg - No Ice		-19.240	11.110	1192.471	2065.062	-0.149
Wind 270 deg - No Ice		-22.217	0.000	2.185	2383.968	-0.477
Wind 300 deg - No Ice		-19.240	-11.110	-1188.101	2065.062	-0.678
Wind 315 deg - No Ice		-15.710	-15.712	-1681.133	1686.781	-0.711
Wind 330 deg - No Ice		-11.108	-19.243	-2059.450	1193.795	-0.697
Member Ice	3.148					
Total Weight Ice	46.446			5.274	8.912	
Wind 0 deg - Ice		0.000	-19.068	-2028.240	8.912	-0.645
Wind 30 deg - Ice		9.534	-16.514	-1755.800	-1007.844	-0.274
Wind 45 deg - Ice		13.483	-13.483	-1432.637	-1428.999	-0.053
Wind 60 deg - Ice		16.514	-9.534	-1011.483	-1752.162	0.171
Wind 90 deg - Ice		19.068	0.000	5.274	-2024.601	0.571
Wind 120 deg - Ice		16.514	9.534	1022.030	-1752.162	0.817
Wind 135 deg - Ice		13.483	13.483	1443.185	-1428.999	0.860
Wind 150 deg - Ice		9.534	16.514	1766.348	-1007.844	0.844
Wind 180 deg - Ice		0.000	19.068	2038.787	8.912	0.645
Wind 210 deg - Ice		-9.534	16.514	1766.348	1025.669	0.274
Wind 225 deg - Ice		-13.483	13.483	1443.185	1446.823	0.053
Wind 240 deg - Ice		-16.514	9.534	1022.030	1769.987	-0.171
Wind 270 deg - Ice		-19.068	0.000	5.274	2042.426	-0.571

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 300 deg - Ice		-16.514	-9.534	-1011.483	1769.987	-0.817
Wind 315 deg - Ice		-13.483	-13.483	-1432.637	1446.823	-0.860
Wind 330 deg - Ice		-9.534	-16.514	-1755.800	1025.669	-0.844
Total Weight	35.914			2.185	3.623	
Wind 0 deg - Service		0.000	-8.680	-929.817	0.000	-0.207
Wind 30 deg - Service		4.339	-7.517	-805.233	-464.911	-0.086
Wind 45 deg - Service		6.137	-6.137	-657.453	-657.484	-0.014
Wind 60 deg - Service		7.516	-4.340	-464.862	-805.250	0.058
Wind 90 deg - Service		8.678	0.000	0.093	-929.822	0.186
Wind 120 deg - Service		7.516	4.340	465.049	-805.250	0.265
Wind 135 deg - Service		6.137	6.137	657.639	-657.484	0.278
Wind 150 deg - Service		4.339	7.517	805.420	-464.911	0.272
Wind 180 deg - Service		0.000	8.680	930.004	0.000	0.207
Wind 210 deg - Service		-4.339	7.517	805.420	464.911	0.086
Wind 225 deg - Service		-6.137	6.137	657.639	657.484	0.014
Wind 240 deg - Service		-7.516	4.340	465.049	805.250	-0.058
Wind 270 deg - Service		-8.678	0.000	0.093	929.822	-0.186
Wind 300 deg - Service		-7.516	-4.340	-464.862	805.250	-0.265
Wind 315 deg - Service		-6.137	-6.137	-657.453	657.484	-0.278
Wind 330 deg - Service		-4.339	-7.517	-805.233	464.911	-0.272

Load Combinations

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	169 - 133.33	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-10.178	0.189	-0.111
			Max. Mx	14	-6.123	243.274	-0.041
			Max. My	10	-6.124	0.067	-243.250
			Max. Vy	14	-9.870	243.274	-0.041
			Max. Vx	10	9.870	0.067	-243.250
			Max. Torque	34			0.011
L2	133.33 - 87.833	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-20.804	2.048	-1.188
			Max. Mx	14	-14.099	818.243	-0.466
			Max. My	10	-14.100	0.793	-817.920
			Max. Vy	14	-16.317	818.243	-0.466
			Max. Vx	10	16.317	0.793	-817.920
			Max. Torque	34			0.159
L3	87.833 - 43.386	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-32.420	5.441	-3.280
			Max. Mx	14	-23.846	1602.442	-1.331
			Max. My	10	-23.847	2.137	-1601.723
			Max. Vy	14	-19.651	1602.442	-1.331
			Max. Vx	10	19.654	2.137	-1601.723
			Max. Torque	25			-0.556
L4	43.386 - 4	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-46.446	9.595	-5.680
			Max. Mx	14	-35.893	2542.889	-2.305
			Max. My	10	-35.893	3.823	-2541.613
			Max. Vy	14	-22.251	2542.889	-2.305
			Max. Vx	10	22.254	3.823	-2541.613
			Max. Torque	25			-0.853

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	31	46.446	19.068	-0.000
	Max. H_x	14	35.914	22.217	-0.000
	Max. H_z	2	35.914	0.000	22.220
	Max. M_x	2	2537.018	0.000	22.220
	Max. M_z	6	2535.274	-22.217	-0.000
	Max. Torsion	33	0.853	13.483	13.483
	Min. Vert	1	35.914	0.000	-0.000
	Min. H_x	6	35.914	-22.217	-0.000
	Min. H_z	10	35.914	0.000	-22.220
	Min. M_x	10	-2541.613	0.000	-22.220
	Min. M_z	14	-2542.889	22.217	-0.000
	Min. Torsion	25	-0.853	-13.483	-13.483

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	35.914	-0.000	0.000	2.272	3.766	0.000
Dead+Wind 0 deg - No Ice	35.914	-0.000	-22.220	-2537.018	3.823	-0.523
Dead+Wind 30 deg - No Ice	35.914	11.108	-19.243	-2196.824	-1265.727	-0.217
Dead+Wind 45 deg - No Ice	35.914	15.710	-15.712	-1793.278	-1791.594	-0.036
Dead+Wind 60 deg - No Ice	35.914	19.240	-11.110	-1267.364	-2195.106	0.147
Dead+Wind 90 deg - No Ice	35.914	22.217	0.000	2.305	-2535.274	0.472
Dead+Wind 120 deg - No Ice	35.914	19.240	11.110	1271.971	-2195.099	0.671
Dead+Wind 135 deg - No Ice	35.914	15.710	15.712	1797.880	-1791.586	0.704
Dead+Wind 150 deg - No Ice	35.914	11.108	19.243	2201.423	-1265.720	0.689
Dead+Wind 180 deg - No Ice	35.914	-0.000	22.220	2541.613	3.823	0.523
Dead+Wind 210 deg - No Ice	35.914	-11.108	19.243	2201.409	1273.359	0.217
Dead+Wind 225 deg - No Ice	35.914	-15.710	15.712	1797.865	1799.217	0.036
Dead+Wind 240 deg - No Ice	35.914	-19.240	11.110	1271.957	2202.721	-0.147
Dead+Wind 270 deg - No Ice	35.914	-22.217	0.000	2.305	2542.889	-0.472
Dead+Wind 300 deg - No Ice	35.914	-19.240	-11.110	-1267.350	2202.728	-0.671
Dead+Wind 315 deg - No Ice	35.914	-15.710	-15.712	-1793.262	1799.224	-0.704
Dead+Wind 330 deg - No Ice	35.914	-11.108	-19.243	-2196.810	1273.366	-0.689
Dead+Ice+Temp	46.446	-0.000	0.000	5.680	9.595	0.000
Dead+Wind 0 deg+Ice+Temp	46.446	-0.000	-19.068	-2220.093	9.615	-0.640
Dead+Wind 30 deg+Ice+Temp	46.446	9.534	-16.514	-1921.911	-1103.285	-0.271
Dead+Wind 45 deg+Ice+Temp	46.446	13.483	-13.483	-1568.192	-1564.267	-0.052
Dead+Wind 60 deg+Ice+Temp	46.446	16.514	-9.534	-1107.214	-1917.990	0.170
Dead+Wind 90 deg+Ice+Temp	46.446	19.068	0.000	5.689	-2216.184	0.566
Dead+Wind 120 deg+Ice+Temp	46.446	16.514	9.534	1118.583	-1917.974	0.810
Dead+Wind 135 deg+Ice+Temp	46.446	13.483	13.483	1579.552	-1564.249	0.853
Dead+Wind 150 deg+Ice+Temp	46.446	9.534	16.514	1933.261	-1103.270	0.837
Dead+Wind 180 deg+Ice+Temp	46.446	-0.000	19.068	2231.435	9.615	0.640
Dead+Wind 210 deg+Ice+Temp	46.446	-9.534	16.514	1933.231	1122.482	0.271
Dead+Wind 225 deg+Ice+Temp	46.446	-13.483	13.483	1579.517	1583.443	0.052
Dead+Wind 240 deg+Ice+Temp	46.446	-16.514	9.534	1118.553	1937.152	-0.170
Dead+Wind 270 deg+Ice+Temp	46.446	-19.068	0.000	5.689	2235.344	-0.566
Dead+Wind 300 deg+Ice+Temp	46.446	-16.514	-9.534	-1107.184	1937.167	-0.810
Dead+Wind 315 deg+Ice+Temp	46.446	-13.483	-13.483	-1568.158	1583.462	-0.853
Dead+Wind 330 deg+Ice+Temp	46.446	-9.534	-16.514	-1921.880	1122.498	-0.837
Dead+Wind 0 deg - Service	35.914	-0.000	-8.680	-992.647	3.836	-0.206
Dead+Wind 30 deg - Service	35.914	4.339	-7.517	-859.349	-493.600	-0.086

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 45 deg - Service	35.914	6.137	-6.137	-701.233	-699.646	-0.014
Dead+Wind 60 deg - Service	35.914	7.516	-4.340	-495.167	-857.748	0.058
Dead+Wind 90 deg - Service	35.914	8.678	0.000	2.314	-991.035	0.186
Dead+Wind 120 deg - Service	35.914	7.516	4.340	499.795	-857.747	0.264
Dead+Wind 135 deg - Service	35.914	6.137	6.137	705.860	-699.645	0.277
Dead+Wind 150 deg - Service	35.914	4.339	7.517	863.975	-493.598	0.272
Dead+Wind 180 deg - Service	35.914	-0.000	8.680	997.273	3.836	0.206
Dead+Wind 210 deg - Service	35.914	-4.339	7.517	863.973	501.269	0.086
Dead+Wind 225 deg - Service	35.914	-6.137	6.137	705.858	707.315	0.014
Dead+Wind 240 deg - Service	35.914	-7.516	4.340	499.793	865.415	-0.058
Dead+Wind 270 deg - Service	35.914	-8.678	0.000	2.314	998.702	-0.186
Dead+Wind 300 deg - Service	35.914	-7.516	-4.340	-495.165	865.416	-0.264
Dead+Wind 315 deg - Service	35.914	-6.137	-6.137	-701.230	707.316	-0.278
Dead+Wind 330 deg - Service	35.914	-4.339	-7.517	-859.346	501.270	-0.272

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.000	-35.914	0.000	0.000	35.914	-0.000	0.000%
2	0.000	-35.914	-22.220	0.000	35.914	22.220	0.000%
3	11.108	-35.914	-19.243	-11.108	35.914	19.243	0.000%
4	15.710	-35.914	-15.712	-15.710	35.914	15.712	0.000%
5	19.240	-35.914	-11.110	-19.240	35.914	11.110	0.000%
6	22.217	-35.914	0.000	-22.217	35.914	-0.000	0.000%
7	19.240	-35.914	11.110	-19.240	35.914	-11.110	0.000%
8	15.710	-35.914	15.712	-15.710	35.914	-15.712	0.000%
9	11.108	-35.914	19.243	-11.108	35.914	-19.243	0.000%
10	0.000	-35.914	22.220	0.000	35.914	-22.220	0.000%
11	-11.108	-35.914	19.243	11.108	35.914	-19.243	0.000%
12	-15.710	-35.914	15.712	15.710	35.914	-15.712	0.000%
13	-19.240	-35.914	11.110	19.240	35.914	-11.110	0.000%
14	-22.217	-35.914	0.000	22.217	35.914	-0.000	0.000%
15	-19.240	-35.914	-11.110	19.240	35.914	11.110	0.000%
16	-15.710	-35.914	-15.712	15.710	35.914	15.712	0.000%
17	-11.108	-35.914	-19.243	11.108	35.914	19.243	0.000%
18	0.000	-46.446	0.000	0.000	46.446	-0.000	0.000%
19	0.000	-46.446	-19.068	0.000	46.446	19.068	0.000%
20	9.534	-46.446	-16.514	-9.534	46.446	16.514	0.000%
21	13.483	-46.446	-13.483	-13.483	46.446	13.483	0.000%
22	16.514	-46.446	-9.534	-16.514	46.446	9.534	0.000%
23	19.068	-46.446	0.000	-19.068	46.446	-0.000	0.000%
24	16.514	-46.446	9.534	-16.514	46.446	-9.534	0.000%
25	13.483	-46.446	13.483	-13.483	46.446	-13.483	0.000%
26	9.534	-46.446	16.514	-9.534	46.446	-16.514	0.000%
27	0.000	-46.446	19.068	0.000	46.446	-19.068	0.000%
28	-9.534	-46.446	16.514	9.534	46.446	-16.514	0.000%
29	-13.483	-46.446	13.483	13.483	46.446	-13.483	0.000%
30	-16.514	-46.446	9.534	16.514	46.446	-9.534	0.000%
31	-19.068	-46.446	0.000	19.068	46.446	-0.000	0.000%
32	-16.514	-46.446	-9.534	16.514	46.446	9.534	0.000%
33	-13.483	-46.446	-13.483	13.483	46.446	13.483	0.000%
34	-9.534	-46.446	-16.514	9.534	46.446	16.514	0.000%
35	0.000	-35.914	-8.680	0.000	35.914	8.680	0.000%
36	4.339	-35.914	-7.517	-4.339	35.914	7.517	0.000%
37	6.137	-35.914	-6.137	-6.137	35.914	6.137	0.000%
38	7.516	-35.914	-4.340	-7.516	35.914	4.340	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
39	8.678	-35.914	0.000	-8.678	35.914	-0.000	0.000%
40	7.516	-35.914	4.340	-7.516	35.914	-4.340	0.000%
41	6.137	-35.914	6.137	-6.137	35.914	-6.137	0.000%
42	4.339	-35.914	7.517	-4.339	35.914	-7.517	0.000%
43	0.000	-35.914	8.680	0.000	35.914	-8.680	0.000%
44	-4.339	-35.914	7.517	4.339	35.914	-7.517	0.000%
45	-6.137	-35.914	6.137	6.137	35.914	-6.137	0.000%
46	-7.516	-35.914	4.340	7.516	35.914	-4.340	0.000%
47	-8.678	-35.914	0.000	8.678	35.914	-0.000	0.000%
48	-7.516	-35.914	-4.340	7.516	35.914	4.340	0.000%
49	-6.137	-35.914	-6.137	6.137	35.914	6.137	0.000%
50	-4.339	-35.914	-7.517	4.339	35.914	7.517	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	0.00007366
3	Yes	6	0.00000001	0.00062509
4	Yes	6	0.00000001	0.00065545
5	Yes	6	0.00000001	0.00062548
6	Yes	5	0.00000001	0.00006019
7	Yes	6	0.00000001	0.00062976
8	Yes	6	0.00000001	0.00065643
9	Yes	6	0.00000001	0.00062440
10	Yes	5	0.00000001	0.00007374
11	Yes	6	0.00000001	0.00062986
12	Yes	6	0.00000001	0.00065800
13	Yes	6	0.00000001	0.00062950
14	Yes	5	0.00000001	0.00006029
15	Yes	6	0.00000001	0.00062523
16	Yes	6	0.00000001	0.00065704
17	Yes	6	0.00000001	0.00063057
18	Yes	4	0.00000001	0.00005986
19	Yes	6	0.00000001	0.00015156
20	Yes	7	0.00000001	0.00018166
21	Yes	7	0.00000001	0.00019907
22	Yes	7	0.00000001	0.00018190
23	Yes	6	0.00000001	0.00015034
24	Yes	7	0.00000001	0.00018417
25	Yes	7	0.00000001	0.00020010
26	Yes	7	0.00000001	0.00018200
27	Yes	6	0.00000001	0.00015194
28	Yes	7	0.00000001	0.00018530
29	Yes	7	0.00000001	0.00020185
30	Yes	7	0.00000001	0.00018506
31	Yes	6	0.00000001	0.00015098
32	Yes	7	0.00000001	0.00018279
33	Yes	7	0.00000001	0.00020081
34	Yes	7	0.00000001	0.00018495
35	Yes	5	0.00000001	0.00002120
36	Yes	5	0.00000001	0.00093018
37	Yes	6	0.00000001	0.00009180
38	Yes	5	0.00000001	0.00093155
39	Yes	5	0.00000001	0.00001848

40	Yes	5	0.00000001	0.00094701
41	Yes	6	0.00000001	0.00009245
42	Yes	5	0.00000001	0.00093219
43	Yes	5	0.00000001	0.00002130
44	Yes	5	0.00000001	0.00095399
45	Yes	6	0.00000001	0.00009351
46	Yes	5	0.00000001	0.00095263
47	Yes	5	0.00000001	0.00001862
48	Yes	5	0.00000001	0.00093709
49	Yes	6	0.00000001	0.00009287
50	Yes	5	0.00000001	0.00095192

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	169 - 133.33	66.523	46	3.683	0.001
L2	136.663 - 87.833	42.767	46	3.185	0.001
L3	92.166 - 43.386	18.248	46	2.008	0.001
L4	48.719 - 4	4.603	46	0.959	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
169.000	(4) RR65-19-02DP	46	66.523	3.683	0.001	13765
162.000	DUO1417-8686	46	61.177	3.591	0.001	9832
152.000	932LG65VTE-B	46	53.659	3.449	0.001	4047
142.000	742-213	46	46.438	3.286	0.001	2547
112.000	BXA-70080/6CF_2	46	27.851	2.585	0.001	2226
70.000	GPS	46	9.978	1.377	0.000	2162

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	169 - 133.33	168.647	14	9.348	0.004
L2	136.663 - 87.833	108.532	14	8.086	0.003
L3	92.166 - 43.386	46.370	14	5.105	0.002
L4	48.719 - 4	11.709	13	2.439	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
169.000	(4) RR65-19-02DP	14	168.647	9.348	0.004	5663
162.000	DUO1417-8686	14	155.122	9.117	0.003	4044
152.000	932LG65VTE-B	14	136.100	8.762	0.003	1662
142.000	742-213	14	117.826	8.346	0.003	1043
112.000	BXA-70080/6CF_2	14	70.736	6.538	0.003	898
70.000	GPS	14	25.366	3.607	0.002	858

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	169 - 133.33 (1)	TP22.298x16.25x0.25	35.670	0.000	0.0	39.000	17.046	-6.123	664.809	0.009
L2	133.33 - 87.833 (2)	TP30.371x21.233x0.313	48.830	0.000	0.0	39.000	29.010	-14.099	1131.400	0.012
L3	87.833 - 43.386 (3)	TP38.125x28.935x0.375	48.780	0.000	0.0	39.000	43.736	-23.846	1705.700	0.014
L4	43.386 - 4 (4)	TP45.5x36.37x0.375	44.719	0.000	0.0	39.000	49.680	-31.543	1937.530	0.016

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	169 - 133.33 (1)	TP22.298x16.25x0.25	243.285	32.429	39.000	0.832	0.000	0.000	39.000	0.000
L2	133.33 - 87.833 (2)	TP30.371x21.233x0.313	818.367	47.036	39.000	1.206	0.000	0.000	39.000	0.000
L3	87.833 - 43.386 (3)	TP38.125x28.935x0.375	1602.842	48.615	39.000	1.247	0.000	0.000	39.000	0.000
L4	43.386 - 4 (4)	TP45.5x36.37x0.375	2181.950	51.228	39.000	1.314	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	169 - 133.33 (1)	TP22.298x16.25x0.25	9.872	0.579	26.000	0.045	0.000	0.000	26.000	0.000
L2	133.33 - 87.833 (2)	TP30.371x21.233x0.313	16.318	0.563	26.000	0.043	0.000	0.000	26.000	0.000
L3	87.833 - 43.386 (3)	TP38.125x28.935x0.375	19.653	0.449	26.000	0.035	0.147	0.002	26.000	0.000

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L4	43.386 - 4 (4)	TP45.5x36.37x0.375	21.457	0.432	26.000	0.033	0.147	0.002	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	169 - 133.33 (1)	0.009	0.832	0.000	0.045	0.000	0.841 ✔	1.333	H1-3+VT ✔
L2	133.33 - 87.833 (2)	0.012	1.206	0.000	0.043	0.000	1.219 ✔	1.333	H1-3+VT ✔
L3	87.833 - 43.386 (3)	0.014	1.247	0.000	0.035	0.000	1.261 ✔	1.333	H1-3+VT ✔
L4	43.386 - 4 (4)	0.016	1.314	0.000	0.033	0.000	1.330 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	169 - 133.33	Pole	TP22.298x16.25x0.25	1	-6.123	886.190	63.1	Pass
L2	133.33 - 87.833	Pole	TP30.371x21.233x0.313	2	-14.099	1508.156	91.4	Pass
L3	87.833 - 43.386	Pole	TP38.125x28.935x0.375	3	-23.846	2273.698	94.6	Pass
L4	43.386 - 4	Pole	TP45.5x36.37x0.375	4	-31.543	2582.727	99.8	Pass
							Summary	
						Pole (L4)	99.8	Pass
						RATING =	**99.8**	**Pass**

NATCOMM ENG. CONSULTING ENGINEERS p: 203.488.0580 f: 203.488.8587 www.natcomm.com 63-2 N. Branford Rd., Branford, CT 06405	Subject:	GROUPED ANCHOR BOLT AND BASE PLATE ANALYSIS
	Location:	169-ft Monopole South Windsor, CT
	Rev. 0: 03/19/09	Prepared by: Staff. Checked by: C.F.C.

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2544·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 22·kips	(Input From RisaTower)
Axial Force =	Axial := 36·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A193 Gr. B7	per EEI design documents	
Number of Anchor Bolts =	N := 12	(User Input)
Diameter of Bolt Circle =	D_{bc} := 54.0·in	(User Input)
Bolt "Column" Distance =	l := 0.125·in	(User Input)
Bolt Ultimate Strength =	F_u := 115·ksi	(User Input)
Bolt Yield Strength =	F_y := 95·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.0	(User Input)

Base Plate Data:

Use ASTM A572 Grade 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.50·in	(User Input)
Base Plate Diameter =	D_{bp} := 60.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 45.50·in	(User Input)

Note: Two possible bending conditions will be checked. Only geometry data will change while loading and material input will remain constant

Condition 1 Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 26.8328in$ (User Input)

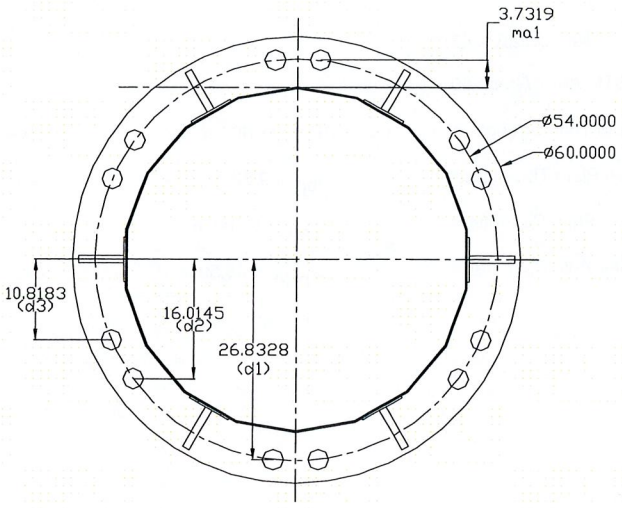
$d_2 := 16.0145in$ (User Input)

$d_3 := 10.8183in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3.7319in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 13.4637in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[\left(d_1\right)^2 \cdot 4 + \left(d_2\right)^2 \cdot 4 + \left(d_3\right)^2 \cdot 4\right] = 4.374 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.162 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.006 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.502 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.793 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 184.3 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 201.1 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.333 \cdot \left(0.60 \cdot A_n \cdot F_y\right) = 240.237 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 76.7$ Bolts are "upset bolts". Use net area per AISC

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, "OK", "Overstressed"\right)$

Condition1 = "OK" Note Shear stress is negligible

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.019 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 0.3 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 76 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

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.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Anchor Bolt Compression/Combined Stress:

Applied Compressive Force =

$$C_{Max} := OM \cdot \frac{d_1}{l_p} + \frac{Axial}{N} = 190.3 \cdot kips$$

Applied Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 60.2 \cdot ksi$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 77.625$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^2}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^3}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} = 57 \cdot ksi$$

Allowable Compressive Stress =

$$F_{av} := 1.333 \cdot F_a = 76 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 79.2$$

Condition 2 =

$$Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_1}{I_p} + \frac{Axial}{N} = 190.278 \cdot kips$

Section Modulus of Plate with stiffeners= $S_{x.Plate} := 52.7in^3$ (Calculated externally of program)

Applied Bending Stress in Plate = $f_{bp} := \frac{(2C_1 \cdot ma_1)}{S_{x.Plate}} = 26.95 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 45$

Condition3 = $Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

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	Location:	169-ft Monopole South Windsor, CT
	Rev. 0: 03/19/09	Prepared by: Staff. Checked by: C.F.C.

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2544·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 22·kips	(Input From RisaTower)
Axial Force =	Axial := 36·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A193 Gr. B7	per EEI design documents	
Number of Anchor Bolts =	N := 12	(User Input)
Diameter of Bolt Circle =	D_{bc} := 54.0·in	(User Input)
Bolt "Column" Distance =	l := 0.125·in	(User Input)
Bolt Ultimate Strength =	F_u := 115·ksi	(User Input)
Bolt Yield Strength =	F_y := 95·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.0	(User Input)

Base Plate Data:

Use ASTM A572 Grade 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.50·in	(User Input)
Base Plate Diameter =	D_{bp} := 60.00·in	(User Input)
Outer Pole Diameter =	D_{pole} := 45.50·in	(User Input)

Condition 2 Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 24.7379in$ (User Input)

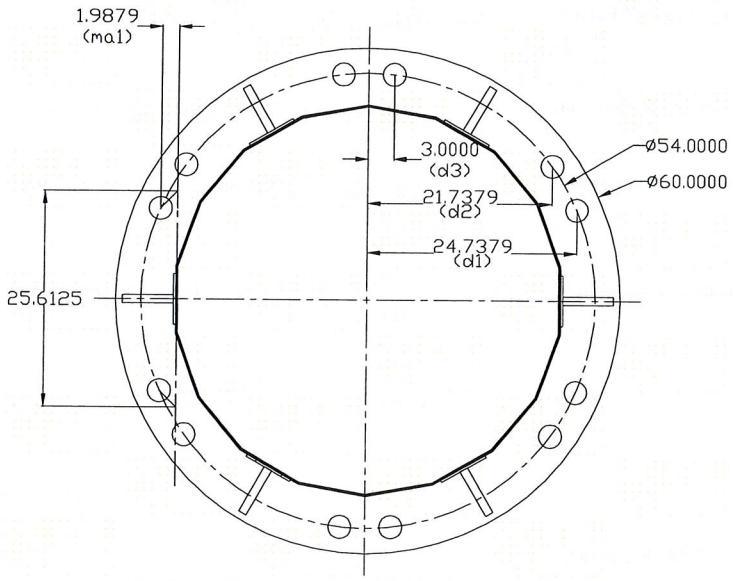
$d_2 := 21.7379in$ (User Input)

$d_3 := 3.000in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 1.9879in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 25.6125in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

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Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[\left(d_1\right)^2 \cdot 4 + \left(d_2\right)^2 \cdot 4 + \left(d_3\right)^2 \cdot 4\right] = 4.374 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.162 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.006 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.502 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.793 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 169.7 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 201.1 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.333 \cdot \left(0.60 \cdot A_n \cdot F_y\right) = 240.237 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 70.6$ Bolts are "upset bolts". Use net area per AISC

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, "OK", "Overstressed"\right)$

Condition1 = "OK"

Note Shear stress is negligible

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.019 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 0.3 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 76 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

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.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Anchor Bolt Compression/Combined Stress:

Applied Compressive Force =

$$C_{Max} := OM \cdot \frac{d_1}{I_p} + \frac{Axial}{N} = 175.7 \cdot kips$$

Applied Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 55.6 \cdot ksi$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 77.625$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} = 57 \cdot ksi$$

Allowable Compressive Stress =

$$F_{aa} := 1.333 \cdot F_a = 76 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 73.1$$

Condition 2 =

$$Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, "OK", "Overstressed"\right)$$

Condition2 = "OK"

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

Subject:	GROUPED ANCHOR BOLT AND BASE PLATE ANALYSIS
Location:	169-ft Monopole South Windsor, CT
Rev. 0: 03/19/09	Prepared by: Staff. Checked by: C.F.C.

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_1}{I_p} + \frac{Axial}{N} = 175.656 \cdot kips$

Section Modulus of Plate with stiffeners= $S_{x.Plate} := 58.5in^3$ (Calculated externally of program)

Applied Bending Stress in Plate = $f_{bp} := \frac{(2C_1 \cdot ma_1)}{S_{x.Plate}} = 11.94 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 19.9$

Condition3 = $Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

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p: 203.488.0580 f: 203.488.8587 www.natcomm.com
63-2 N. Branford Rd., Branford, CT 06405

Subject: Star Mount Anchor and Frame Analysis

Location: S.Windsor, CT

Rev. 0: 3/19/09

Prepared by: jrm
Checked by: cfc.
Job No. 09009.CO2

Tapered Beam Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 2544 \cdot ft \cdot kips$	(Input From RisaTower)
Axial Force =	$Axial := 36 \cdot kips$	(Input From RisaTower)
Star mount Frame Steel Yield Strength =	$F_y := 36ksi$	*(assumed for plate girder steel)*
Star mount Anchor Diameter =	$D := 300in$	(Ref EEI design drawing 6255, dated 06.02.00)
Total Number of Anchors =	$NA := 6$	(User Input)
Star mount Anchor Ultimate Tension Capacity x2=	$T_{All} := (2 \cdot 138)kips = 276 \cdot kips$	(User Input)
Star mount Anchor Ultimate Compression Capacity x2=	$C_{All} := (2 \cdot 138)kips = 276 \cdot kips$	(User Input)
Stramount Beam Span =	$Span := 100in$	User Input
Flange width =	$b_f := 12in$	User Input
Flange Thickness =	$t_f := 0.625in$	User Input
Web Thickness =	$t_w := 0.375in$	*(field verified)*
Depth of Tapered Beam Web at Monpole End =	$h_1 := 35.75in$	User Input
Depth of Tapered Beam Web at Helical Anchor End =	$h_2 := 12.25in$	User Input
Flange area (Af) x1 =	$A_f := (b_f \cdot t_f)$ $A_f = 7.5 \cdot in^2$	

Determine Compression and Tension Forces at Helical Anchor:

Geometric Layout Data:

Distance from Anchors to Centroid of Pole:

Radius of Anchor Circle =: $R_{bc} := \frac{D}{2} = 150 \cdot in$

Distance to Anchors = $i := 1 .. NA$

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

$d_1 = 129.90 \cdot in$
$d_2 = 129.90 \cdot in$
$d_3 = 0.00 \cdot in$
$d_4 = -129.90 \cdot in$
$d_5 = -129.90 \cdot in$
$d_6 = -0.00 \cdot in$

Polar Moment of Inertia = $I_p := \sum_i (d_i)^2 = 6.75 \times 10^4 \cdot in^2$

Check Anchor Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{NA} = 61.8 \cdot kips$

Check Anchor Compressive Force:

Maximum Compression Force = $C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{NA} = 73.8 \cdot kips$

Anchor Tension % of Capacity = $\frac{T_{Max}}{\frac{T_{All}}{2}} \cdot 100 = 45$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{All}} \le 1.00, "OK", "Overstressed"\right)$

Condition1 = "OK"

Anchor Compression % of Capacity = $\frac{C_{Max}}{\frac{C_{All}}{2}} \cdot 100 = 54$

Condition2 = $Condition2 := if\left(\frac{C_{Max}}{C_{All}} \le 1.00, "OK", "Overstressed"\right)$

Condition2 = "OK"

Check Tapered Girder Bending:

Allowable Bending Stress per AISC (Fb) $F_b := 0.6 \cdot 1.333 F_y$ $F_b = 28.793 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Max Bending Stress in Tapered Beam = $fb_{max} := 21.22ksi$

$Condition3 := if\left(\frac{fb_{max}}{F_b} < 1.00, "Ok", "Overstressed"\right)$ $\frac{fb_{max}}{F_b} = 0.74$ Condition3 = "Ok"

Check Web Shear Stress at Mid-Point:

$Condition4 := if\left(\frac{fv_{max}}{F_v} < 1.00, "Ok", "Overstressed"\right)$ $\frac{fv_{max}}{F_v} = 0.39$ Condition4 = "Ok" (1.333 increase allowed per TIA/EIA)

Check Web Shear Stress at End-Point:

$Condition5 := if\left(\frac{fv_{max}}{F_v} < 1.00, "Ok", "Overstressed"\right)$ $\frac{fv_{max2}}{F_{v2}} = 0.5$ Condition5 = "Ok" (1.333 increase allowed per TIA/EIA)

Girder Connection Check:

Reactions:

Overturning Moment = $M := 615.3ft \cdot kips$ *(Input from max moment obtained from above)*

Shear = $Shear := 3.0kips + C_{Max} = 76.8 \cdot kips$ *(Includes shear due to star mount end reaction and estimated dead weight of wireless equipment cabinet and steel)*

Bolt Data:

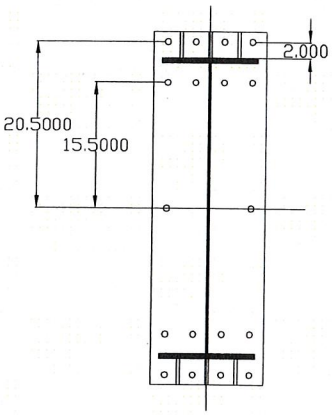
Use ASTM A325- U (Field Verified)

Number of Anchor Bolts = $N_{bolt} := 16$ (User Input)

Bolt Ultimate Strength = $F_u := 120 \cdot ksi$ (AISC 9th Ed Table I-A)

Bolt Modulus = $E := 29000 \cdot ksi$ (User Input)

Diameter of Anchor Bolts = $D_{bolt} := 1.000 \cdot in$ (Field Verified)



Girder End Connection:

Plate Data:

Use ASTM A36

Plate Yield Strength = $Fy_{bp} := 36 \cdot ksi$ (User Input)

Plate Thickness = $T_{pl} := 1.00 \cdot in$ (User Input)

Stiffener Data:

Stiffener Thickness = $t_{stiff} := 0.375 \cdot in$ (User Input)

Stiffener Height = $h_{stiff} := 5.00 \cdot in$ (User Input)

Number of Stiffeners Within Bend Line = $n_{stiff} := 3$ (User Input)

Distance from Bolts to Centroid of Plate: $d_1 := 15.50in$ (User Input)

$d_2 := 20.50in$ (User Input)

Bolt Force Moment Arm = $ma := 2.00in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 12in$ (User Input)

***Detemine Compression and Tension Force at Bolts*:**

Condition6 = $\text{Condition6} := \text{if}\left(\frac{f_t}{F_t} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$ (1.333 increase allowed per TIA/EIA)

Condition6 = "OK"

***Detemine Bending Stress in Plate Connection*:**

Total Force to Plate = $P := \left(f_{total} \cdot A_g\right) \cdot 4 = 133.8 \cdot kips$

Section Modulus of Plate with stiffeners = $S_x := 8.9in^3$ (Calculated externally of program)

Bending Stress in Plate = $f_{bp} := \frac{P \cdot ma}{S_x}$ $f_{bp} = 30.1 \cdot ksi$

Check Stresses = $\frac{f_{bp}}{1.333 \cdot 0.75Fy_{bp}} = 0.84$ (1.333 increase allowed per TIA/EIA)

$\text{Condition7} := \text{if}\left(\frac{f_{bp}}{1.333 \cdot 0.75Fy_{bp}} < 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

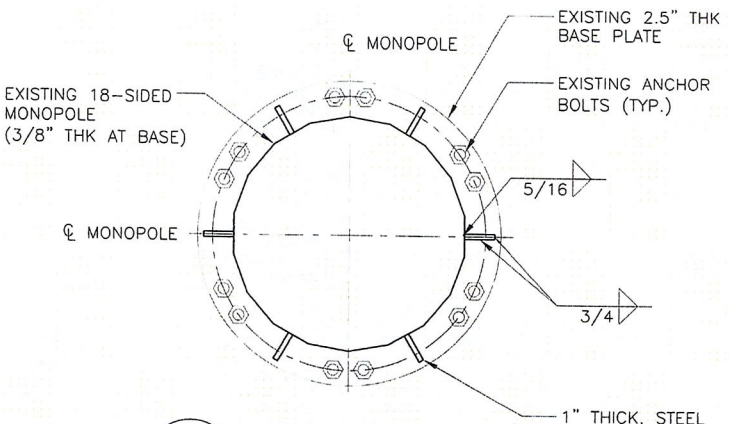
Condition7 = "OK"

INSTALLATION NOTES:

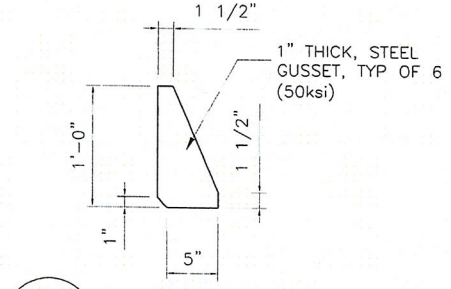
1. REFER TO DRAWING S-2 FOR INSPECTION REQUIREMENTS PRIOR TO COMMENCEMENT OF CONSTRUCTION RELATED ACTIVITIES.
2. GRIND EXISTING SURFACE TO REMOVE EXISTING GALVANIZING PRIOR TO WELDING.
3. PRE-HEAT/POST-HEAT WELD AREA PER AWS. D1.1 SPECIFICATIONS.
4. PROTECT/RELOCATE EXISTING COAXIAL CABLE TRANSMISSION LINES AND RELATED EQUIPMENT PRIOR TO COMMENCING WITH WELDING ACITIVITY.
5. GRIND STEEL EDGES AFTER COMPLETION OF FIELD CUTTING TO REMOVE BURRS.
6. CLEAN SURFACE AFTER WELDING AND TOUCH UP ABRASIONS AND NON-GALVANIZED SURFACES PER NOTE 7 ON SHEET S-2.

GENERAL DRAWING NOTES:

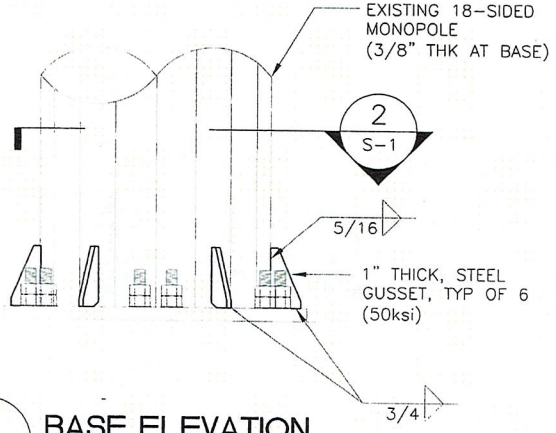
7. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED BY NATCOMM INC FOR T-MOBILE USA ON BEHALF OF VERIZON WIRELESS, DATED MARCH 19, 2008. DESIGN LOADS ARE BASED ON THE ABOVE REPORT.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR PROCURING ALL NECESSARY PERMITS, LICENSES, APPROVALS AND OTHER REQUIREMENTS FOR CONSTRUCTION.
9. ALL EXISTING MATERIAL MONOPOLE INFOMRATION TAKEN FROM EEI DESIGN DRAWING GS52237, DATED JUNE 6, 2000.
10. THE INSTALLATION OF TOWER REINFORCEMENT SHALL BE CONDUCTED ONLY ON DAYS WHEN THE EXPECTED WEATHER CONDTION INDICATES LESS THAN 15 MPH WIND SPEED. HANDHOLE INSTALLATION SHALL BE COMPLETED ON SAME WORKING DAY. CONTRACTOR SHALL ENSURE THE STABILITY OF THE SUBJECT TOWER DURING MODIFICATION WORK.



2 / S-1 **BASE PLATE PLAN**
SCALE: 1/2" = 1'-0"



3 / S-1 **GUSSET DETAIL**
SCALE: 1/2" = 1'-0"



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

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

T-MOBILE

CT-11-279

300 GOVERNORS HIGHWAY
SOUTH WINDSOR, CT 06074

PROJECT NO:	09009.CO2
DRAWN BY:	JRM
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	03/19/09

MONOPOLE REINFORCEMENT DETAILS

S-1

DWG. 1 OF 2

GENERAL NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES"

2. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY. MAINTAIN EXISTING SITE OPERATIONS, COORDINATE WORK WITH TOWER OWNER.

3. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WOPSRK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.

4. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.

5. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.

6. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.

7. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.

8. TOWER REINFORCING SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.

9. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER REINFORCEMENT.

STRUCTURAL STEEL NOTES:

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD)

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992, (FY = 50 KSI)
   B. STRUCTURAL STEEL (PLATE)---ASTM A50, (FY = 50 KSI)
   C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   C. CONNECTION BOLTS---ASTM A325-N
   D. ANCHOR RODS---ASTM F 1554
   E. WELDING ELECTRODE---ASTM E 70XX

2. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.

3. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.

4. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.

5. NOTIFY THE ENGINEER PRIOR TO FIELD CUTTING OR MODIFYING APPROVED FABRICATIONS.

6. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.

7. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".

8. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING E70XX ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.

9. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

10. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

11. INSPECTION AND TESTING OF ALL WELDING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY. THE INSPECTOR SHALL PROVIDE VISUAL AND ULTRASONIC INSPECTION OF ALL WELDS. NO WORK IS TO COMMENCE WITHOUT THE WELDING INSPECTOR PRESENT.

12. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

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

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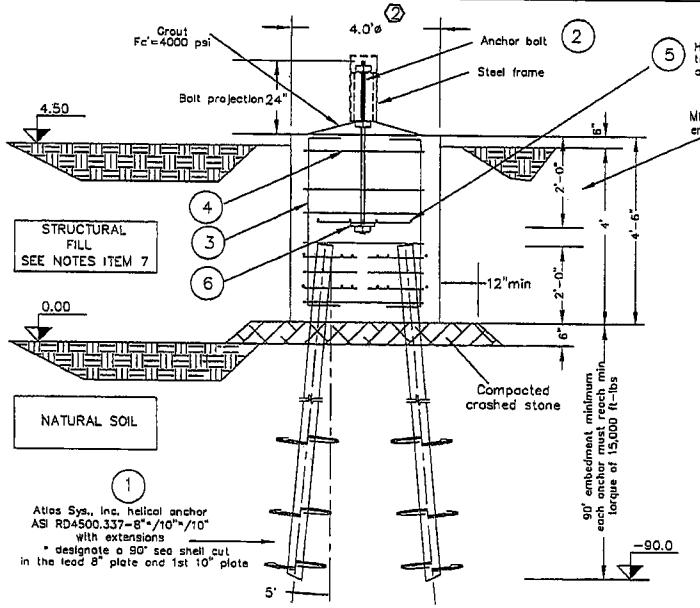
PROJECT NO:	09009.CO2
DRAWN BY:	JRM
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	03/19/09

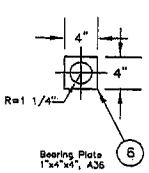
NOTES

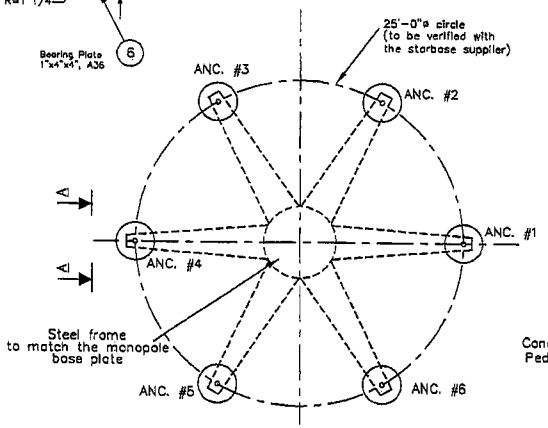
S-2

DWG. 2 OF 2

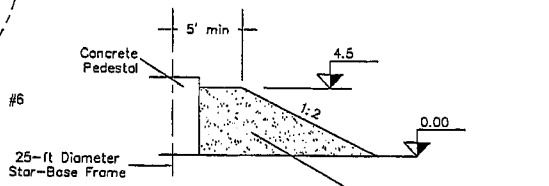


A – A
(TYP. EACH SUPPORT)





FOUNDATION LAYOUT



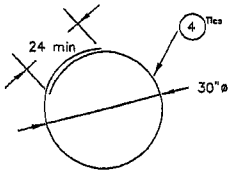
STRUCTURAL FILL PLACEMENT

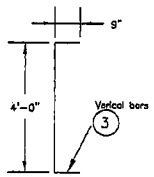
LOADING AT TOWER BASE

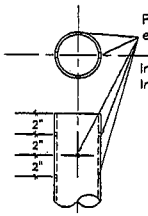
MOMENT, kip-ft	2577.6
SHEAR, kips	20.0
AXIAL, kips	27.6

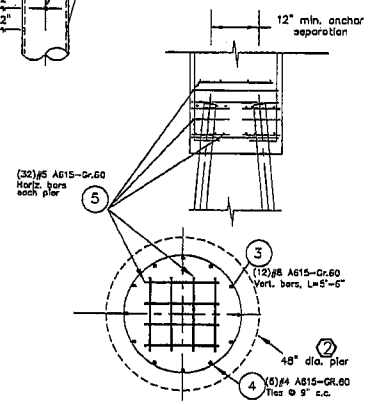
LOADING PER ONE LEG

MOMENT, kip-ft	-----
SHEAR, kips	6.0
COMPR., KIPS	82.0
UPLIFT, kips	70.0









ANCHOR CAP REINFORCEMENT

MATERIAL REQUIRED PER LEG/TOTAL

		ITEM	Q-TY One Leg	Q-TY Total	ITEM DESCRIPTION
*)	1	Helical Anchors	2	12	Atlas Systems, Inc. helical anchor w/extensions ASI RD4500.337-8"+/10"+/10"
	2	Anchor Bolts	1	6	2.25"ø, A615-GR.75, L=4'0" Anchor bolt w/(3) h.h. nuts & (2) fl. washers
1	3	Vertical Bars	12	72	#8 Gr.60 (ASTM A615), L=5'-6"
	4	Ties	6	36	#4 GR.60 (ASTM A615), L=10'-0"
	5	Horiz. Bars	32	192	#5 GR.60 (ASTM A615), L=2'-0"
	6	Steel Plate	1	6	Steel bearing plate 1"x4"x4" (A36) with a 2.5"dia. hole
		Concrete per one anch., cub.yd.	1.2		Concrete (total), cub.yd. 7.2

*) quantity and length of extensions to be field verified

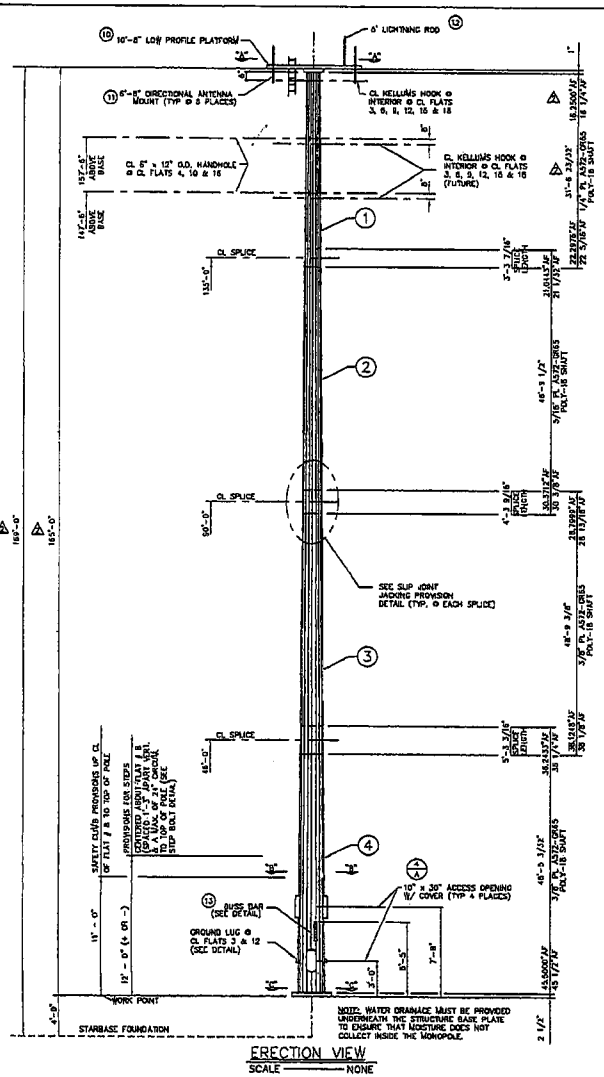
GENERAL NOTES:

1. FOUNDATION DESIGN IS BASED ON THE FOLLOWING INFORMATION:
   - MONOPOLE BASE REACTIONS PER EEI MONOPOLE DESIGN NO. 99-1371
     THE TOWER LOADING INCLUDES: (12) EMS-RR90-17 ANTENNAS @ 175', 165', 155' ON LOW PROFILE PLATFORMS.
     THE MONOPOLE DESIGNED PER TIA/EIA-222F, DESIGN WIND SPEED = 80 MPH.
   - HELICAL ANCHOR DESIGN AND RECOMMENDATIONS PROVIDED BY DR. DAVID KRAFT Ph.D, P.E. ON JANUARY 16, 2000.
   - SOIL REPORT PROVIDED BY FRENCH+PARRELLO ASSOCIATES, PA. REPORT NO. 99A076AR1 ON OCTOBER 20, 1999.
1 - FOUNDATION IS DESIGNED TO SUPPORT AN ADDITIONAL LOAD FROM THE EQUIPMENTCABINETS NOT EXCEEDING 12,000 lbs. NO MORE THAN ONE CABINET (UP TO 3,000 lbs) SHOULD BE INSTALLED OVER ONE LEG.
2. EACH ANCHOR SHALL BE INSTALLED TO THE ESTIMATED DEPTH OF 90 ft AS SHOWN ON THE DRAWING. THE INSTALLATION DEPTH IS MEASURED FROM THE GROUND SURFACE AS SHOWN IN THE SOIL REPORT.
   MINIMUM INSTALLATION TORQUE MOMENT SHALL NOT BE LESS THAN 15,000 LBS-FT.
   THE LAST 7 ft OF INSTALLATION SHOULD HAVE A MINIMUM TORQUE OF 4000 ft-lb.
   IF MAX TORQUE IS REACHED PRIOR TO MINIMUM RECOMMENDED ANCHOR EMBEDMENT, FOUNDATION ENGINEER SHALL BE NOTIFIED IN ORDER TO RE-EVALUATE THE DESIGN.
3. EACH ANCHOR SHALL BE INSTALLED AT A 5 DEGREE OUTWARD ANGLE WITH THE VERTICAL.
4. MINIMUM ANCHOR BOLT EMBEDMENT IN CONCRETE SHALL BE 24 in.
   MINIMUM HELICAL ANCHOR EMBEDMENT IN CONCRETE SHALL BE 24 in.
5. REINFORCEMENT FOR CONCRETE CAP SHALL CONFORM TO ASTM A615-87, Fy = 60 ksi.
   REBAR CAGE SHALL BE ASSEMBLED USING STEEL WIRE.
   CONCRETE MIX DESIGN AND CONSTRUCTION PROCEDURE SHALL BE IN COMPLIANCE WITH ACE 318-95.
   CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 psi AT 28 DAYS.
   CONCRETE PEDESTAL TO BEINSTALLED ON A 6" SUBBASE OF COMPACTED CRASHED STONE.
6. EIGHT (8) BARS (ITEM 5) TO BE INSTALLED IN TWO LAYERS IN PERPENDICULAR DIRECTION ABOVE THE ANCHOR BOLT ANCHORAGE PLATE.
   INSTALL ONE THROUGH BAR (ITEM 5) IN EACH PRE-DRILLED HOLE AND THEN INSTALL THREE BARS IN PERPENDICULAR DIRECTION ABOVE EACH THROUGH BARS.
   MINIMUM CONCRETE COVER = 3 in.
2 7. STRUCTURAL FILL SHALL BE MADE OF COHESIONLESS SOIL AND COMPACTED AT LEAST 95% OF MAXIMUM DRY DENSITY. THE GRADE OF THE STRUCTURAL FILL SHOULD EXTEND AT LEAST 5 FEET BEYOND THE PEDESTAL WITH A SLOPE 1:2.
8. ANCHOR BOLT LAYOUT REQUIRED PRIOR TO CONCRETE PLACEMENT.
   STARBASE ANCHOR BOLT PATTERN SHALL BE VERIFIED PRIOR TO INSTALLATION OF EARTH ANCHORS.
9. CAP BETWEEN FRAME AND CONCRETE SHALL BE FILLED WITH A NON-SHRINK GROUT WITH A MINIMUM STRENGTH OF 4000 PSI.

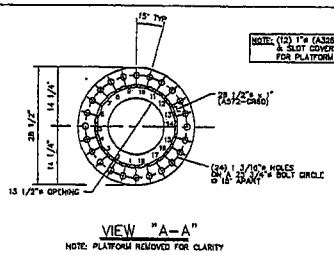
ENGINEERED ENDEAVORS INCORPORATED
7610 Jenther Drive
Mentor, Ohio 44060
(440)918-1101

NORTHERN TECHNOLOGIES, INC.
175-ft MONOPOLE
CT-11-279A CELLULAR SITE
SOUTH WINDSOR, CT

	REVISION	DESCRIPTION	DWN. BY	CHK. BY	DATE	PROJECT NO:
	RELEASE		B.S.F.		01/17/00	6255
1	REVISION	1. REVISED DESIGN NOTES 2. REVISED VERTICAL REINFORCEMENTDESIGN NOTES	B.S.F.		03/10/00	
2	REVISION	1. REVISED PIER DIAMETER TO 4'. 2. REVISED ELEVATION OF CONCRETE PEDESTALS	B.S.F.		05/02/00	DRAWING NO:
						6255-helical.DWG

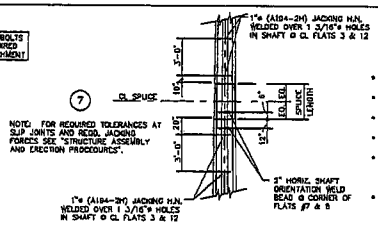


ERECTION VIEW
SCALE — NONE

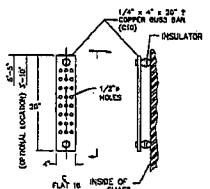


VIEW "A-A"
NOTE: PLATFORM REMOVED FOR CLARITY

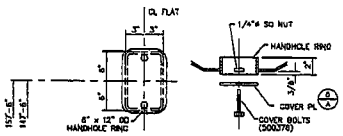
NOTE: (12) 1"ø (A325) HEX BOLTS & SLOT COVERS REQUIRED FOR PLATFORM ATTACHMENT



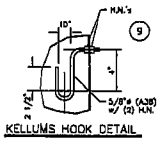
SLIP JOINT JACKING PROVISION DETAIL



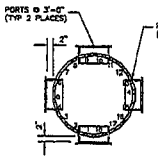
BUSS BAR DETAIL (13)



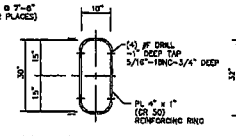
6" X 12" HANDHOLE DETAIL



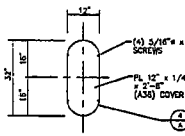
KELLUMS HOOK DETAIL



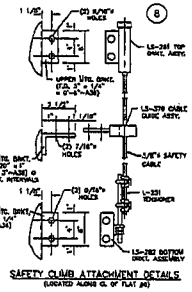
SECTION "B-B"



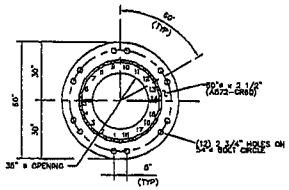
REIN. RING DETAIL @ 10" x 30" ACCESS OPENING



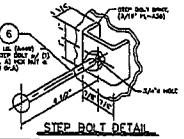
10" x 30" ACCESS PORT COVER PL DETAIL



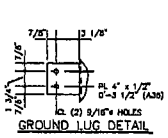
SAFETY CLIMB ATTACHMENT DETAILS
(LOCATED ALONG CL OF FLAT #6)



SECTION "C-C"



STEP BOLT DETAIL



GROUND LUG DETAIL

ASSEMBLY MARKING PROCEDURE
EACH INDIVIDUAL ASSEMBLY SHALL HAVE A METAL TAG WELDED TO IT WHICH WILL BE ENGRAVED WITH THE ASSEMBLY MARK NO. AS SHOWN IN THE MATERIAL BLOCK. (MINIMUM OF 5/8" HIGH LETTERS)

MATERIAL REQ'D. PER ASSEMBLY

	GALV. WT.	QTY.	ITEM	MK. NO.	DESCRIPTION
*	2092.08	1	1	GSC26207	SHAFT ASSY. (TOP SECTION)
*	4398.22	1	2	GSC26208	SHAFT ASSY. (UP. MID. SECTION)
*	6864.58	1	3	GSC26209	SHAFT ASSY. (LOW. MID. SECTION)
*	10065.56	1	4	GSC26210	SHAFT ASSY. (BOTTOM SECTION)
*	25.00	4	A/A	C12669	13" x 33" ACCESS PORT COVER PL w/ (4)BOLTS (500822) & (4)WASHERS (500234)
			5		HARDWARE AS FOLLOWS:
*	5.51	6	A/A	GS14842	6" x 12" HANDHOLE COVER PLATE w/ (2) BOLTS (500376).
	1.08	135	6	S10006	5/8"ø x 6 1/2" LG. BUTTON HEAD STEP BOLT w/ (1) HEX & (1) SQUARE NUT EACH.
		1	7		STRUCTURE ASSEMBLY AND ERECTION PROCEDURES
		1	8	DBI-170	170'-0" SAFETY CLIMB KIT
		1	B/A	L2010	SAFETY CLIMB HARNESS
	1.50	6	9	GS13625	5/8"ø KELLUMS HOOK ASSY.
	1235.15	1	10	K10008A	10'-8" LOW PROFILE ANTENNA PLATFORM
	32.63	6	11	K10009	6'-6" DIRECTIONAL ANTENNA MOUNT
	21.00	3	12	K10122	5' LIGHTNING ROD
	7.50	1	13	K10062	BUSS BAR KIT
		1	14		STRUCTURE I.D. TAG

TOTAL GALV. STR. & ACCES. WT. 25,134.67#

GENERAL NOTES
1) ALL WELDS SHALL BE IN ACCORDANCE WITH A.W.S. D.1.1.
2) LONGITUDINAL SEAM WELDS IN TELESCOPING SECTION OF THE SLIP JOINT SHALL BE FULL PENETRATION WELDS.
3) FOR PROPER SHAFT ALIGNMENT, A 3" HORIZONTAL WELD BEAD AND A MARK NUMBER ARE POSITIONED ON EACH SHAFT AT EACH SPLICE. THE 3" HORIZONTAL WELD BEADS ARE ON MATCHING CORNERS. THE MARK NUMBER IS ON AN ADJACENT FLAT. THE HORIZONTAL WELD BEAD CORNERS SHALL BE ALIGNED TOP TO BOTTOM OF THE POLE. MATCH NUMBERS SHALL BE MATCHED FOR EACH SPLICE.
4) FIELD ASSEMBLY NUTS (1" DIA) ARE LOCATED ON OPPOSING SECTION FLATS ABOVE AND BELOW SPLICES FOR JACKING SHAFTS TOGETHER.
5) THE BOTTOM OF THE UPPER SECTION SHALL BE TELESCOPED IN THE FIELD TO WITHIN 12" OF THE WELD ORIENTATION MARK ON THE LOWER SECTION.
6) A SLOT 1 1/2" x 4" IS REQUIRED AT THE TOP OF THE BOTTOM SECTION AND AT THE BOTTOM OF THE TOP SECTION FOR HANDLING DURING GALVANIZING.
7) GAP BETWEEN TOP OF FOOTING AND BOTTOM BASE PLATE SHALL BE FILLED WITH A NON-SHRINK GROUT.
8) POLES SHALL BE HOT DIP GALVANIZED AFTER FABRICATION.
9) POLE TAPER = 0.1913 IN./FT.

DESIGN NOTES
DESIGN IN ACCORDANCE WITH TIA/EIA 222-F
80 MPH DESIGN WIND SPEED

SITE: CT-11-279A
SO. WINDSOR, CT

REV.	DESCRIPTION	DATE	DR'N	CHK.	APP.
2	REMOVED 4'-0" FROM TOP OF POLE	5/6/00	M.A.S.		
1	COMPLETED DETAILING	5/2/00	M.A.S.		

6255

ENGINEERED ENDEAVORS INCORPORATED
7510 Panther Drive
Mentor, Ohio 44060
(440) 918-1101

170'-0" MONOPOLE
NORTHERN TECHNOLOGIES

DR'N	CHK'D	APP'D
M.A.S. 04-21-00		

SCALE: NONE
DWG. NO. GS52237

T-Mobile
Tower Asset Management

Existing	142'	3	Katrein 742 213	Flush Mount	6	1 5/8"	Outside	Pocket
Existing	70'	1	GPS antenna	GPS mount	1	½"	Outside	Pocket

*** See coax diagram below for SST and Guy towers**

Structural Loading Cont:

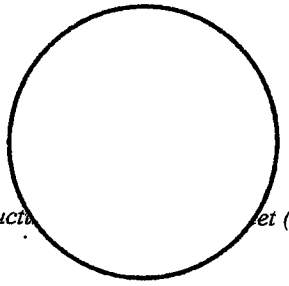
Existing/ Proposed	Elevation (Ft)	Qty	Antennas	Mount Type	Qty Coax	Coax Size	Coax Location*	Owner/Tenant
Proposed	**112'**	**12**	**(3) BXA 70080/6CF 2 (3) BXA 80080/6CF (6) LPA -185080/12CF 2**	**LP Platform**	**18**	**1 5/8"**	**Outside**	**Verizon**

*** See coax diagram below for SST and Guy towers**

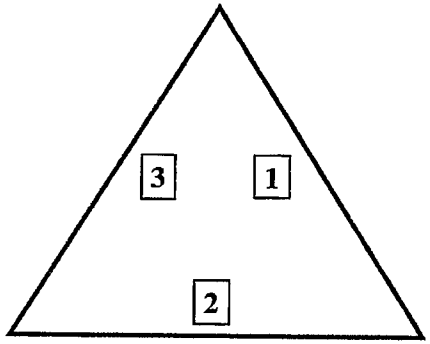
Additional Loading Notes:

Tower Diagrams for Coax stacking detail (North towards top of page)

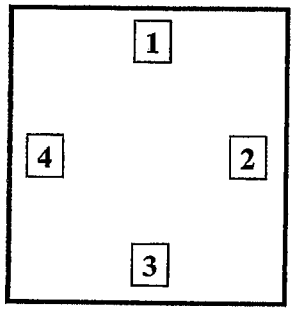
Monopole



3 Leg SST/Guy Tower



4 Leg SST



T-Mobile
Tower Asset Management

Structural Analysis Worksheet (SAW)

Date: 2/3/09	**TMO Site ID: CT11279**	**TMO Site Name: S. Windsor**
Applicant: Verizon	**TMO Project Manager: Jackie Donahue**	
Analysis Request: Initial	**Previous Analysis by: SEMAAN**	**Previous Analysis Date: 11/19/08**
Structure Type: MONOPOLE	**Structure Height: 169'**	**Tower Manufacturer: EEI**
Foundation Type:Steel Frame Starbase	**Manufacturer ID#:99-1371**	**FCC ID#:**

Additional Structure info:

Structural Loading:

Existing/ Proposed	Elevation (Ft)	Qty	Antenna Model (Provide cut-sheet if non-standard)	Mount Type	Qty Coax	Coax Size	Coax Location*	Owner/Tenant
Existing	169'	12	Standard T-Mobile loading including (12) LNAs and (1) 4' HP MW dish	12' LP platform	25	1-5/8"	Inside	T-Mobile
Existing`	162'	9	(6) Powerwavre 7770.00; (3) CSS DUO1417-8686	LOW PROFILE PLATFORM	12	1 5/8"	Inside	AT&T
Existing	162'		(6) ADC-850/1900 TMA; (3) LGP 13519 DIPLEXER	same	same	same	same	same
Existing	152'	3	932LG65VTE-B	Flush Mount	6	1 5/8"	Inside	Sprint

FRENCH & PARRELLO
ASSOCIATES, P.A.
CONSULTING ENGINEERS
Since 1974

670 NORTH BEERS STREET BLDG. #3
HOLMDEL, NEW JERSEY 07733
(732) 888-7700
http://www.fpawww.com
email: fpa@fpawww.com

October 20, 1999

Mr. Dave Weinpahl
ARCNET ARCHITECTS, INC.
670 North Beers Street
Building No. 2
Holmdel, New Jersey 07733

LAURENCE E. FRENCH, P.E.
ARGO T. PARRELLO, P.E.
JAMES B. HELLER, P.E.
JOSEPH M. EDWARDS, P.E.
SCOTT D. WATKINS, P.E.

Re: Report of Subsurface Exploration and
Geotechnical Evaluation
South Windsor/Rt. 5
Arcnet No. A99.506-823A
300 Governors Highway
South Windsor, CT
FPA No. 99A076AR1

Dear Mr. Weinpahl:

INTRODUCTION

Pursuant to your authorization, we have performed a subsurface exploration and geotechnical engineering evaluation in connection with the proposed 175 foot monopole at the above referenced site. The project is located in the rear of the property located at 300 Governors Highway, South Windsor, Connecticut and is adjacent to an existing Railroad Easement. A regional location plan is presented on Drawing No. 1.

The purpose for our participation on the project at this time was to explore the subsurface conditions in the vicinity of the proposed monopole and to develop geotechnical engineering recommendations towards the design and construction of the pole foundation. Our scope of work has been performed in accordance with the General Arcnet Specifications and included the advancement of one test boring, engineering evaluation, and the generation of our recommendations.

DESIGN CONSIDERATION

It is our understanding that the proposed steel monopole will be approximately 170 feet high. Based on preliminary planning, it is anticipated that the proposed monopole will be founded on a pile supported pier and pad. Design loads for the pole foundation were not available at the time this report was prepared.

FPA

SUBSURFACE EXPLORATION

French & Parrello Associates (FPA) performed one test boring on October 7, 1999, to characterize subsurface conditions in the vicinity of the proposed site. The as-drilled boring locations are presented on Drawing No. 2, "Test Boring Location Plan." The boring was advanced to a depth of approximately 91 feet at the proposed monopole location. The field work was accomplished by a test boring subcontractor while under the full-time technical observation by a representative of FPA. Test boring, B-1, was advanced to a depth of 91 feet below existing grade utilizing hollow stem auger and mud rotary drilling procedures. Soil samples were obtained utilizing a standard 2 inch outside diameter split spoon sampler advanced in accordance with ASTM Test Method D-1586, The Standard Penetration Test. The soil samples were classified in the field in accordance with the Burmister Soil Classification System and were returned to our laboratory for further review. The samples will be stored for a period of 30 days from the date of this report. Details of the drilling procedures, as well as the sample classifications, groundwater depths, and Standard Penetration Test results are presented on the attached boring logs.

SUBSURFACE CONDITIONS

Based upon the results of the test borings, it appears that the soil in the area of the proposed construction consists of stratified glacial deposits underlain by alluvium soils. From the ground surface to an approximate depth of 10 feet, the encountered soils consisted of a coarse to fine sand with varying fractions of silt and gravel. From a depth of 10 feet to an approximate depth of 83 feet, the encountered soils consisted of a clayey silt. From an approximate depth of 83 feet to the terminating depth of the boring, the soils consisted of coarse to fine sand with varying fractions of silt and gravel. Based upon the results of the Standard Penetration Tests, the upper soil is in a loose state of relative density, the clayey silt soils are in a very soft state of consistency, and the underlying sand formation is in a dense state of relative density.

Groundwater was encountered at an approximate depth of four feet below grade. For a more detailed description of the subsurface conditions encountered, please refer to the attached boring logs.

FOUNDATION RECOMMENDATIONS

The Alluvium soils are soft and compressible and are generally inadequate for providing support for the proposed monopole. As such, the loads from the monopole must be transferred down to the competent, dense sand below a depth of approximately 83 feet from the ground surface. Therefore, it is our recommendation that the monopole be supported by a pier and pad which will in turn be supported by piling. Based upon the required length to reach competent bearing soils and the estimated structural load requirements, it is our recommendation that a minimum of 10 inch diameter steel pipe piles be considered for supporting the required pier and pad. The pipe piles should be driven to a gross capacity of 40 tons, which will provide a net pile capacity of 35

tons for support of the pier and pad and will allow 5 tons for negative skin friction. We estimate that a 10 inch diameter steel pipe pile driven to an approximate depth of 85 feet below the existing ground surface will be capable of providing the gross 40 ton capacity. We estimate that the same pile could provide an allowable uplift resistance of 10 tons and a lateral capacity of 3 tons. The piles may achieve their capacities at shorter depth due to variation of the soil parameters. Therefore, it is our recommendation that the length of the pile be verified by a pile driving test prior to ordering the piles.

The piles should be driven and the estimated allowable compressive pile capacities field verified through the implementation of empirical pile driving criteria as determined by the Engineering News Record Formula.

Engineering News Record Formula:

Single Acting Hammers

$$Q_{all} = \frac{2\,WH}{S+0.1}$$

Double Acting Hammers

$$Q_{all} = \frac{2\,E}{S+0.1}$$

Where:

Q_{all}	=	Allowable pile load in pounds
W	=	Weight of striking parts of hammer in pounds
H	=	The effective height of fall in feet
E	=	The actual energy delivered by hammer per blow, in foot-pounds
S	=	Average net penetration in inches per blow, for the last 6 inches of driving

The equipment cabinet can be supported upon a mat foundation designed to tolerate long term settlement of the underlying alluvium soils. Utility connections should be of a flexible nature to accommodate the long term settlement of the mat foundation.

CLOSING

The recommendations contained herein are contingent upon subsurface conditions remaining consistent with those encountered during our subsurface exploration. They are also contingent upon the basis that all foundation related aspects of construction, including stripping, controlled fill placement, foundation excavation, pile driving and subgrade preparation, be observed by a representative of French & Parrello Associates, P.A. This is to observe compliance with the design concepts and specifications and to allow design changes in the event that subsurface conditions differ from those anticipated prior to construction.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site.

Services performed by French & Parrello Associates, P.A. during this project have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in the services provided.

Should you have any questions or comments or if we can be of service to you in the future, please feel free to contact us.

Very truly yours,

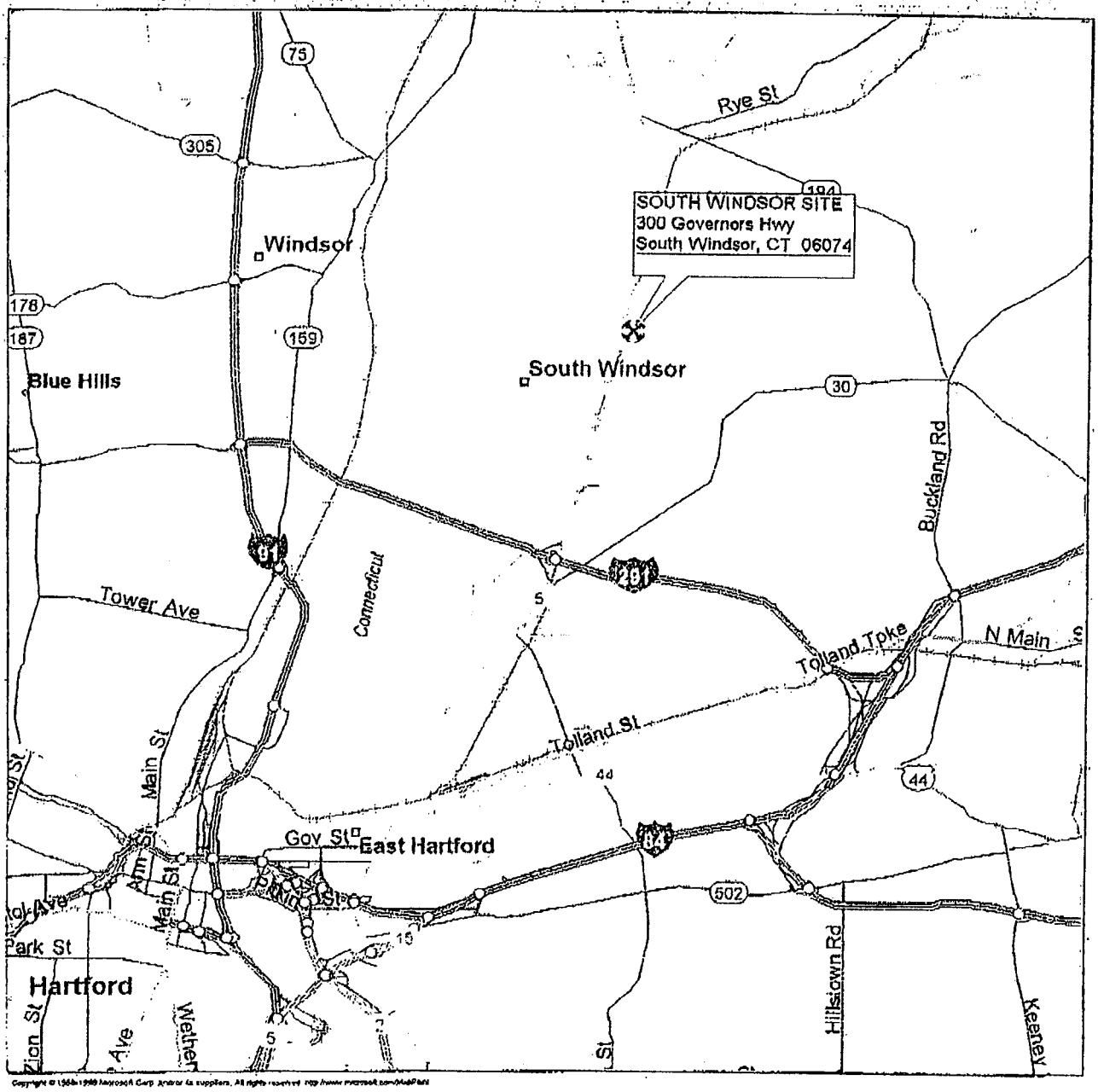
FRENCH & PARRELLO ASSOCIATES, P.A.

John W. Colagrande
Project Manager

R. Raymond Mankbadi
Senior Project Manager

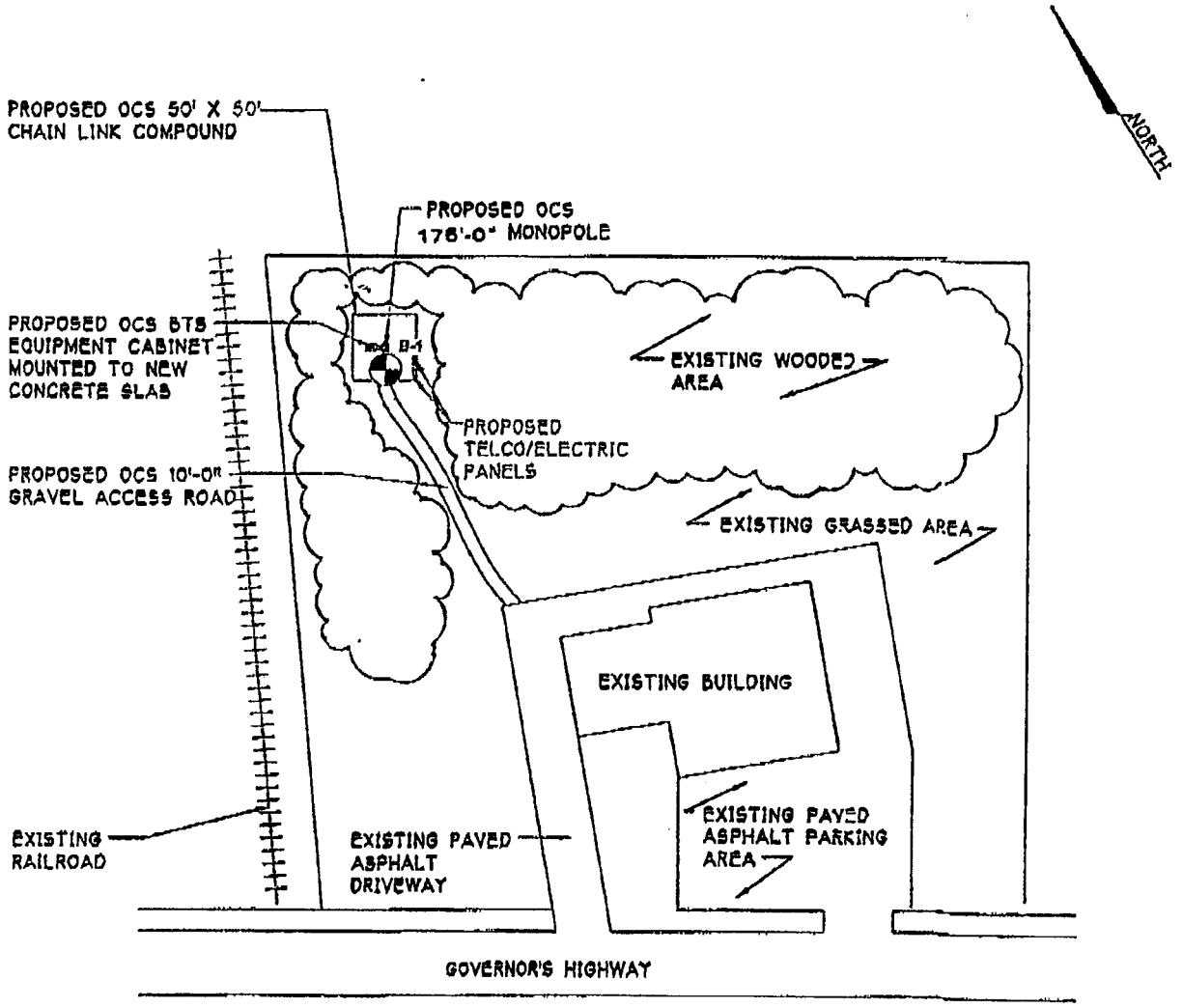
JWC/RRM/ebm

R. Raymond Mankbadi, P.E.
CT Professional License No. 16547



REGIONAL LOCATION PLAN

FRENCH & PARRELLO ASSOCIATES, P.A. CONSULTING ENGINEERS 670 NORTH BEERS STREET BLDG. #3 HOLMDEL, NEW JERSEY 07733 TEL: (732) 888-7100 FAX: (732) 888-7822			PROJECT: SOUTH WINDSOR SITE 300 GOVERNERS HIGHWAY SOUTH WINDSOR, CONNECTICUT		
DRAWN BY: JWC	CHECKED BY: JWC	SCALE: N.T.S.	DATE: 10/12/99	JOB NO.: 99A076A	DRAWING NO.: 1



KEY

APPROXIMATE BORING LOCATION

TEST BORING LOCATION PLAN

FRENCH & PARRELLO ASSOCIATES, P.A.
CONSULTING ENGINEERS
570 NORTH BEERS STREET BLDG. #3 HOLMDEL, NEW JERSEY 07733
TEL: (732) 888-7709 FAX: (732) 888-7822

PROJECT: SOUTH WINDSOR SITE
300 GOVERNERS HIGHWAY
SOUTH WINDSOR, CONNECTICUT

DRAWN BY:	CHECKED BY:	SCALE:	DATE:	JOB NO.:	DRAWING NO.:
JWC	JWC	N.T.S.	10/13/99	99A076A	2

FRENCH & PARRELLO ASSOCIATES, P.A.
670 North Beers Street, Building No. 3
Holmdel, New Jersey 07733

TEST BORING LOG

SOUTH WINDSOR
SOUTH WINDSOR, NJ (FPA NO. 99A076AB1)

BORING NO.: B-1
SHEET 1 OF 3

DATE STARTED: 10-07-99
DATE FINISHED: 10-07-99
DEPTH OF WATER: 4.0'
LOCATION: SEE PLAN
GROUND ELEVATION: N/A
GROUND WATER ELEV.: N/A

DRILLING TECHNIQUE: HOLLOW STEM AUGER AND MUD ROTARY

DEPTH FEET	SAMPLE DEPTH	SPT BLOW COUNTS (PER 6")	STRATA	DESCRIPTION OF SOIL
	S-1 0-2'	1 – 1 – 2 – 2		S-1 Topsoil over Gray & Brown cmf SAND, little
	S-2 2-4'	5 – 6 – 8 – 11		S-2 Gray mf SAND, trace Silt
--- 5'---	S-3 4-6'	4 – 5 – 5 – 5		S-3 Gray mf SAND, trace Silt
	S-4 6-8'	4 – 5 – 5 – 7		S-4 Same as S-3
	S-5 8-10'	4 – 5 – 4 – 5		S-5 Same as S-3
---10'---	S-6 10-12'	1 – 1 – 1 – 1		S-6 Gray Silty CLAY
---15'---	S-7 15-17'	1 – 1 – 1 – 2		S-7 Same as S-6
---20'---	S-8 20-22'	woh – woh – woh – woh		S-8 Same as S-6
---25'---	S-9 25-27'	woh – woh – woh – woh		S-9 Same as S-6
---30'---	S-10 30-32'	1 – 0 – 1 – 0		S-10 Same as S-6
---35'---	S-11 35-37'	1 – 0 – 0 – 1		S-11 Same as S-6
---40'---				

SOILS ENGINEER: R. MANKBADI, PE
TEST BORING OBSERVER: K. SHANNON
CONTRACTOR: NEW ENGLAND BORING CONTRACTORS
DRILLER: T. CARPENTER

The information shown hereon indicates the subsurface conditions encountered at the specific boring location on the date(s) of drilling. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.

FRENCH & PARRELLO ASSOCIATES, P.A.
670 North Beers Street, Building No. 3
Holmdel, New Jersey 07733

TEST BORING LOG

SOUTH WINDSOR
SOUTH WINDSOR, NJ (FPA NO. 99A076AB1)

BORING NO.: B-1
SHEET 2 OF 3

DATE STARTED: 10-07-99
DATE FINISHED: 10-07-99
DEPTH OF WATER: 4.0'
LOCATION: SEE PLAN
GROUND ELEVATION: N/A
GROUND WATER ELEV.: N/A

DRILLING TECHNIQUE: HOLLOW STEM AUGER AND MUD ROTARY

DEPTH FEET	SAMPLE DEPTH	SPT BLOW COUNTS (PER 6")	STRATA	DESCRIPTION OF SOIL
	S-12 40-42'	woh – woh – 1 – 1		S-12 Gray & Brown Silty CLAY
---45'---	S-13 45-47'	wor – wor – wor – wor		S-13 Same as S-12
---50'---	S-14 50-52'	2 – 2 – 2 – 3		S-14 Same as S-12
---55'---	S-15 55-57'	2 – 2 – 3 – 4		S-15 Brown Silty CLAY.
---60'---	S-16 60-62'	2 – 3 – 2 – 3		S-16 Same as S-15
---65'---	S-17 65-67'	1 – 1 – 1 – 2		S-17 Same as S-15
---70'---	S-18 70-72'	2 – 0 – 2 – 4		S-18 Same as S-15
---75'---	S-19 75-77'	2 – 2 – 1 – 3		S-19 Same as S-15
---80'---				Note Boring advanced by Hollow Stem Auger to 45', switch to Mud Rotary From 45' to terminating depth of boring.

SOILS ENGINEER: R. MANKBADI, PE
TEST BORING OBSERVER: K. SHANNON
CONTRACTOR: NEW ENGLAND BORING CONTRACTORS
DRILLER: T. CARPENTER

The information shown hereon indicates the subsurface conditions encountered at the specific boring location on the date(s) of drilling. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.

FRENCH & PARRELLO ASSOCIATES P.A.
670 North Beers Street, Building No. 3
Holmdel, New Jersey 07733

TEST BORING LOG

SOUTH WINDSOR
SOUTH WINDSOR, NJ (FPA NO. 99A076AB1)

BORING NO.: B-1
SHEET 3 OF 3

DATE STARTED: 10-07-99
DATE FINISHED: 10-07-99
DEPTH OF WATER: 4.0'
LOCATION: SEE PLAN
GROUND ELEVATION: N/A
GROUND WATER ELEV.: N/A

DRILLING TECHNIQUE: HOLLOW STEM AUGER AND MUD ROTARY

DEPTH FEET	SAMPLE DEPTH	SPT BLOW COUNTS (PER 6")	STRATA	DESCRIPTION OF SOIL
	S-20 80-82'	2 – 3 – 5 – 5		S-20 Brown Silty CLAY
---85'---	S-21 85-87'	34 – 37 – 40 – 42		S-21 Top: Gray Brown cmf **SAND**, Some mf Gravel, trace Silt. Bottom: Gray cmf Sand, little mf Gravel, trace Silt
---90'---	S-22 90-91'	81 – 136 – X – X		S-22 Gray Brown cmf **SAND** and mf Gravel, trace clayey Silt
---95'---				END OF BORING AT 91'
--100'---				Note: at 83' Driller noted a change in drilling pressure.
--105'---				
--110'---				
--115'---				
--120'---				

SOILS ENGINEER: R. MANKBADI, PE
TEST BORING OBSERVER: K. SHANNON
CONTRACTOR: NEW ENGLAND BORING CONTRACTORS
DRILLER: T. CARPENTER

The information shown hereon indicates the subsurface conditions encountered at the specific boring location on the date(s) of drilling. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.

F[illegible]MISTER SOIL CLASSIFICATION [illegible]STEM

A. Cohesionless Soils: Particle Size Definitions

Soil	Fraction	U.S. Standard Sieve	Actual Sizes
Gravel	coarse	3 in. to 1 in.	76 mm to 25 mm
	medium	1 in. to 3/8 in.	25 mm to 9.5 mm
	fine	3/8 in. to No. 10	9.5 mm to 2.0 mm
Sand	coarse	No. 10 to No. 30	2.0 mm to 0.6 mm
	medium	No. 30 to No. 60	0.6 mm to 0.25 mm
	fine	No. 60 to No. 200	0.25 mm to 0.75 mm
Silt		< No. 200	< 0.075 mm

B. Terms Describing Gradation of Cohesionless Soils

Written Description	Symbol/Designation	Defining Proportions
coarse, medium to fine	cmf	all fractions > 10%
coarse to medium	cm	< 10% fine
medium to fine	mf	< 10% coarse
coarse	c	< 10% medium and fine
medium	m	< 10% coarse and fine
fine	f	< 10% coarse and medium

Note: Use (+) for upper limit and (-) for lower limit.

C. Cohesive Soils: Terms Describing Plasticity

Soil	Plasticity Index	Workability	Plasticity Description
SILT	0	--	Non-Plastic
Clayey SILT	1 to 5	1/4 in. thread	Slightly Plastic
SILT & CLAY	5 to 10	1/8 in. thread	Low Plasticity
CLAY & SILT	10 to 20	1/16 in. thread	Medium Plasticity
Silty CLAY	20 to 40	1/32 in. thread	High Plasticity
CLAY	>40	1/64 in. thread	Very High Plasticity

D. Terms Describing Overall Composition of Soil

Written Proportion	Proportion Symbol	Proportion Percent by Weight
and	a	35 to 50
some	s	20 to 35
little	l	10 to 20
trace	t	1 to 10

Note: Use (+) for upper limit and (-) for lower limit.

Slant +/- 45° Dual Polarized, Panel 80° / 13.5 dBd

BXA-80080/6CF ___

When ordering replace "___" with connector type.

Mechanical specifications

Length	1844 mm	72.6 in
Width	285 mm	11.2 in
Depth	116 mm	4.6 in
Depth with z-bracket	156 mm	6.1 in
[4] Weight	10 kg	22.0 lbs
Wind Area		
Fore/Aft	0.53 m^2	5.7 ft^2
Side	0.21 m^2	2.3 ft^2
Rated Wind Velocity (Safety factor 2.0)	>277 km/hr	>172 mph
Wind Load @ 100 mph (161 km/hr)		
Fore/Aft	765 N	172 lbs
Side	366 N	82 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 Ø50-160 mm (2.0-6.3 in).

Mounting bracket kit #36210002
Downtilt bracket kit #36114003

Electrical specifications

	Frequency Range	806-900 MHz*
	Impedance	50Ω
[3]	Connector(s)	NE or E-DIN 2 ports / center
[1]	VSWR	≤ 1.4:1
	Polarization	Slant ± 45°
[1]	Isolation Between Ports	< -30 dB
[1]	Gain	13.5 dBd
[2]	Power Rating	500 W
[1]	Half Power Angle	
	H-Plane	80°
	E-Plane	11°
[1]	Electrical Downtilt	0°
[1]	Null Fill	5%
	Lightning Protection	Direct Ground

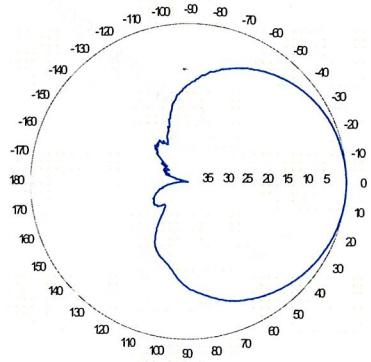
*Also available for 870-960 MHz. Consult your sales director for more information.

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

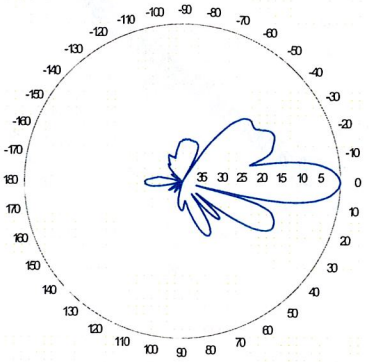
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector. E-DIN indicates an elongated DIN connector.
4) The antenna weight listed above does not include the bracket weight.

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

Radiation pattern[1]



Horizontal



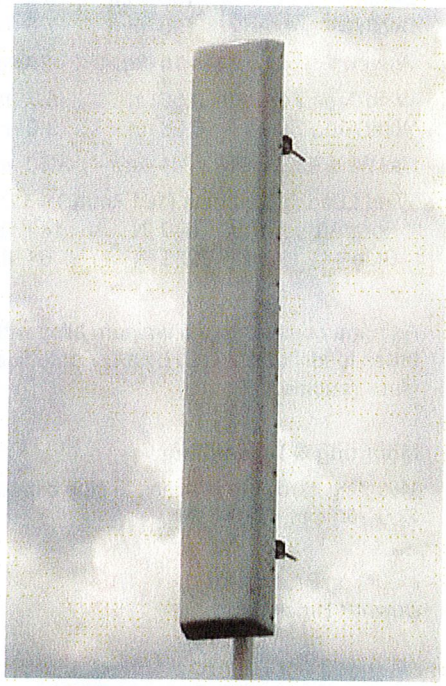
Vertical

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

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

CF Denotes a Center-Fed Connector.

806-900 MHz



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

- Watercut brass feedline assembly for consistent performance.
- Unique feedline design eliminates the need for conventional solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad 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 connectors only.

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

Amphenol Antel, Inc. The Antenna Technology Company

Revision Date: 7/3/07

Slant ±45° Dual Polarized Panel 80° / 13.5 dBd
696-900 MHz

BXA-70080/6CF __ 2°
When ordering replace "__" with connector type.

Mechanical specifications

Length	1844	mm	72.6	in
Width	285	mm	11.2	in
Depth	150	mm	5.9	in
Depth with z-bracket	190	mm	7.5	in
Weight [4]	10	kg	22	lbs
Wind Area Fore/Aft	0.52	m^2	5.7	ft^2
Wind Area Side	0.28	m^2	3.0	ft^2
Max Wind Survivability	>241	km/hr	>150	mph
Wind Load @ 100 mph (161 km/hr)				
Fore/Aft	640	N	144	lbf
Side	285	N	64	lbf

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

Mounting & Downtilting

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

Mounting Bracket Kit	TBD
Downtilt Bracket Kit	TBD

Electrical specifications

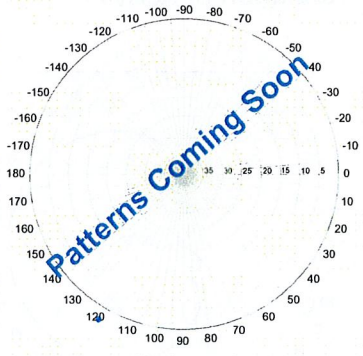
Frequency Range	696-900 MHz
Impedance	50Ω
Connector [3]	NE or E-DIN Female 2 ports / Center
VSWR [1]	≤ 1.35:1
Polarization	Slant ±45°
Isolation Between Ports [1]	< -30 dB
Gain [1]	13.5 dBd 15.5 dBi
Power Rating [2]	500 W
Half Power Angle [1]	
Horizontal Beamwidth	80°
Vertical Beamwidth	10°
Electrical downtilt [5]	2°
Null fill [1]	5%
Lightning protection	Direct ground

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

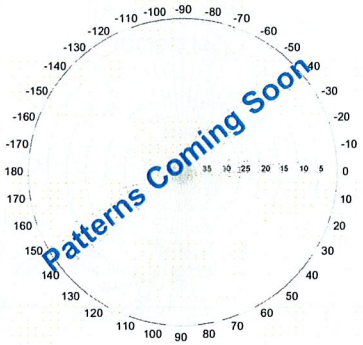
1) Typical values.
2) Power rating limited by connector only.
3) NE indicates an elongated N connector.
E-DIN indicates an elongated DIN connector.
4) Antenna weight does not include brackets.
5) Add'l downtilts may be available. Check website for details.

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

Radiation-pattern[1]



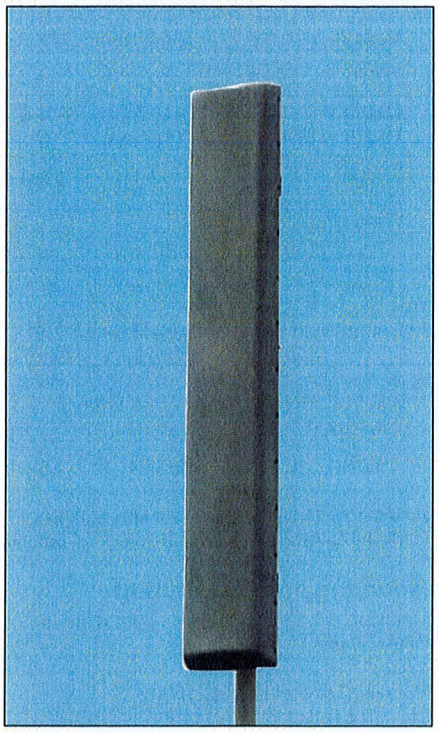
Horizontal



Vertical

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

Mounting on a metal pole will typically improve the front-to-back ratio.



PRELIMINARY

Featuring our Exclusive 3T Technology™ Antenna Design:

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

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

Revision Date: 1/20/09

696-900 MHz

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

Amphenol Antel, Inc. The Antenna Technology Company

Vertically Polarized, Log Periodic 80° / 17.5 dBi

LPA-185080/12CF ___ 2°

When ordering, replace "___" with connector type.

Mechanical specifications

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

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

Mounting & Downtilting:

Wall mounted or pole tower mount with mounting brackets.

Mounting bracket kit #26799997

Downtilt bracket kit #26799999
The downtilt bracket kit includes the mounting bracket kit.

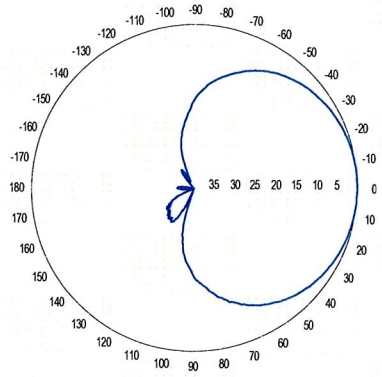
Electrical specifications

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

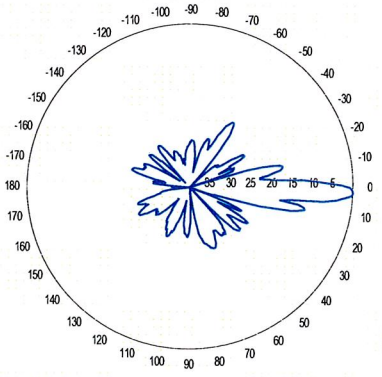
1) Typical Values
2) Power Rating limited by connector only.
3) NE indicates an elongated N Connector.
E-DIN indicates an elongated DIN Connector.
4) The antenna weight listed above does not include the bracket weight.

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

Radiation-pattern[1)]



Horizontal



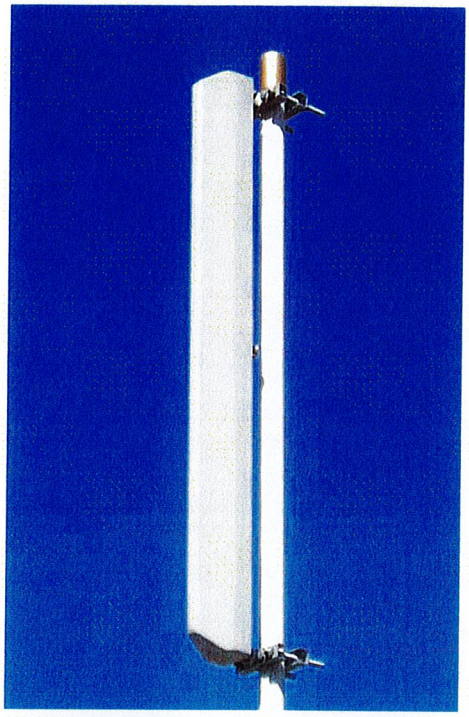
Vertical

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

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

CF Denotes a Center-Fed Connector.

1850-1990 MHz



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

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

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

Antenna available with center-fed connector only.

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

Revision Date: 8/25/05