STATE OF CONNECTICUT

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

Daniel F. Caruso
Chairman

September 15, 2008

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

RE: **EM-VER-142-080808** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 319 Peter Green Road, Tolland, Connecticut.

Dear Attorney Baldwin:

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

The proposed modifications are to be implemented as specified here and in your notice dated August 8, 2008, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

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

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps

S. Derek Phelps
Executive Director

SDP/MP/jb

c: The Honorable Frederick M. Daniels, Chairman Town Council, Town of Tolland
Steven R. Werbner, Town Manager, Town of Tolland
Linda Farmer, Town Planner, Town of Tolland
Christopher B. Fisher, Esq., Cuddy & Feder LLP

ROBINSON & C

KENNETH C. BALDWIN

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

EM-VER-142-080808

ORIGINAL

August 8, 2008

Via Hand Delivery

RECEIVED
AUG - 8 2008
CONNECTICUT
SITING COUNCIL

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

Re: **Notice of Exempt Modification**
319 Peter Green Road, Tolland, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to install antennas on the existing 120-foot monopole tower owned by AT&T at 319 Peter Green Road in Tolland, Connecticut. Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Steven R. Werbner, Town Manager of the Town of Tolland. Pursuant to a Council directive, a copy of this letter is also being sent to Mark Kreckho, the owner of the property on which the tower is located.

The facility consists of a 120-foot monopole tower capable of supporting multiple carriers at 319 Peter Green Road in Tolland. AT&T currently maintains antennas at the top level on the tower. Cellco intends to install six (6) LPA-80063/4CF antennas ; six (6) LPA-185063/12F antennas; and six tower mounted amplifiers (TMAs) at the 110-foot level on the tower. Equipment associated with the facility, including a diesel fueled back-up generator, will be located within a 12' x 30' shelter on the ground adjacent to the tower. Attached behind Tab 1 are Project Plans for Cellco's installation.

The planned modifications to the Tolland 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 110-

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foot level on the 120-foot tower. The TMAs will not extend above the height of Cellco's antennas.

2. The proposed installation 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 RF power density calculations for Cellco antennas would be 23.94% of the FCC standard. A power density calculations table is included behind Tab 2.

Included behind Tab 3 is a Structural Analysis Report confirming that the tower can support AT&T and Cellco antennas, TMAs, 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:
Steven R. Werbner, Tolland Town Manager
Mark Kreckho
Sandy M. Carter
Michelle Kababik

Site Plans

Issued for: **Final CSC**

Date Issued: August 6, 2008

Latest Issue: August 6, 2008

Index

SITE DIRECTIONS (taken from Mapquest)

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CT TO: 319 PETER GREEN ROAD, TOLLAND, CT

-START OUT GOING EAST ON EAST RIVER DRIVE	0.0 MI
-MERGE ONTO I-84E VIA THE RAMP ON THE LEFT TOWARD BOSTON	14.2 MI
-TAKE THE CT-31 EXIT, EXIT 67, TOWARD ROCKVILLE/COVENTRY	0.2 MI.
-TURN LEFT ONTO CT 31/MILE HILL ROAD/RESERVOIR RD	0.4 MI.
-TURN RIGHT ONTO HARTFORD TURNPIKE/CT-30 CONTINUE TO FOLLOW CT-30	1.7 MI
-TURN LEFT ONTO CRYSTAL LAKE RD/CT-30	2.0 MI.
-TURN RIGHT ONTO HUNTER ROAD.	0.2 MI
-TURN RIGHT ONTO PETER GREEN ROAD.	0.4 MI.
-END AT 319 PETER GREEN ROAD, TOLLAND, CT 06084	

NOTE: ADDRESS IS LISTED AS 319 PETER GREEN ROAD BUT ACCESS IS OFF OF CRYSTAL LAKE ROAD (ROUTE 30) TOWER ACCESS ROAD IS ON THE RIGHT, BEFORE HUNTER ROAD

TOTAL EST. DISTANCE: 19.08 MILES

GENERAL NOTES

1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP

SITE INFORMATION

THE SCOPE OF WORK SHALL INCLUDE:

1. THE CONSTRUCTION OF A 12'x30' EQUIPMENT SHELTER WITHIN AN EXISTING 60'x65'± FENCED WIRELESS COMMUNICATIONS COMPOUND LEASE AREA
2. A TOTAL OF TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED AT A RAD CENTER ELEVATION OF 110' AGL ON A EXISTING 120' MONOPOLE TOWER LOCATED IN THE CENTER OF THE COMPOUND
3. POWER AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND FROM AN EXISTING UTILITY BACKBOARD WITH MULTI-METER CENTER AND HOFFMAN BOX LOCATED ADJACENT TO THE EXISTING FENCED COMPOUND TO THE NORTH TO THE PROPOSED 12'x30' WIRELESS EQUIPMENT SHELTER.

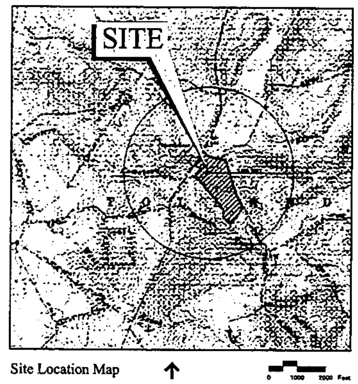
PROJECT SUMMARY

SITE NAME	ELLINGTON SOUTH
SITE ADDRESS	319 PETER GREEN ROAD TOLLAND, CT 06084
TOWER OWNER:	AT & T
LESSEE:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
APPLICANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON.	SANDY CARTER CELLCO PARTNERSHIP (860) 803-8219
PROJECT ID.	2008300568
LOCATION CODE:	189023
PROJECT TYPE	PCSCO
TOWER COORDINATES:	LATITUDE: 41°53'42.7" LONGITUDE: 72°23'37.5"

Cellco Partnership d.b.a. verizon wireless

Proposed Wireless Communications Facility

Ellington South
319 Peter Green Road
Tolland, Connecticut



Site Location Map

Property Information

Tower Owner:
AT & T

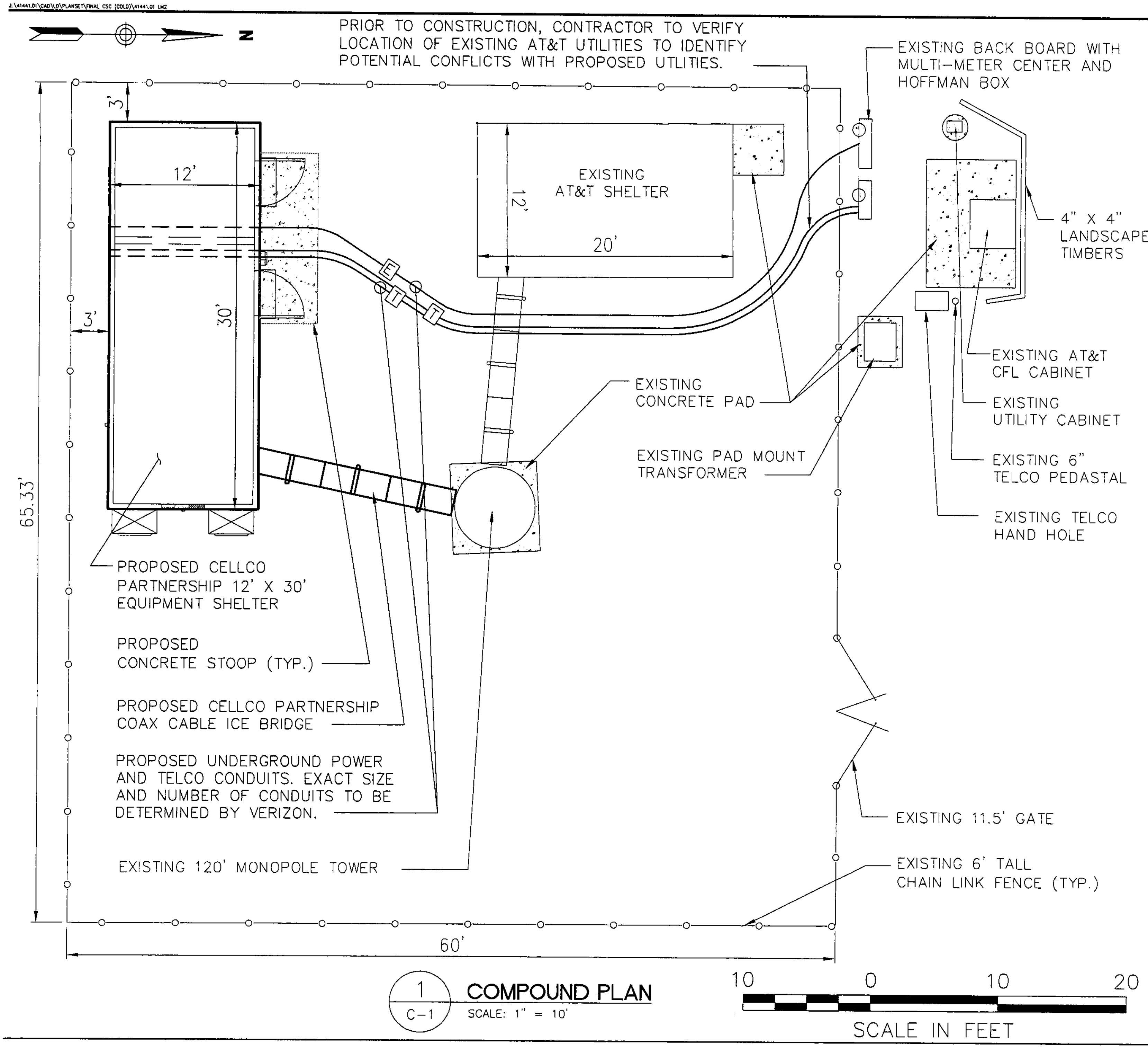
Applicant:
Cellco Partnership d.b.a. Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Assessor's Plat: Vol. 1042 / Page 294
Map: 009 Block: 0001 Lot: 0016

VHB

Vanasse Hangen Brustlin, Inc.
Transportation
Land Development
Environmental Services

54 Tuttle Place
Middletown, Connecticut 06457
860.632.1500 • FAX 860.632.7879



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

VHB
Vanasse Hangen Brustlin, Inc.
Transportation
Land Development
Environmental Services
54 Tuttle Place
Middletown, Connecticut 06457
860.632.1500 • FAX 860.632.7879

Cellco Partnership
d.b.a. verizon wireless

NATCOMM
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

Scale 1"=10'
Date August 6, 2008

Proposed Wireless Communication Facility

319 Peter Green Road
Tolland, Connecticut

Final CSC

Not Approved for Construction

Compound Plan

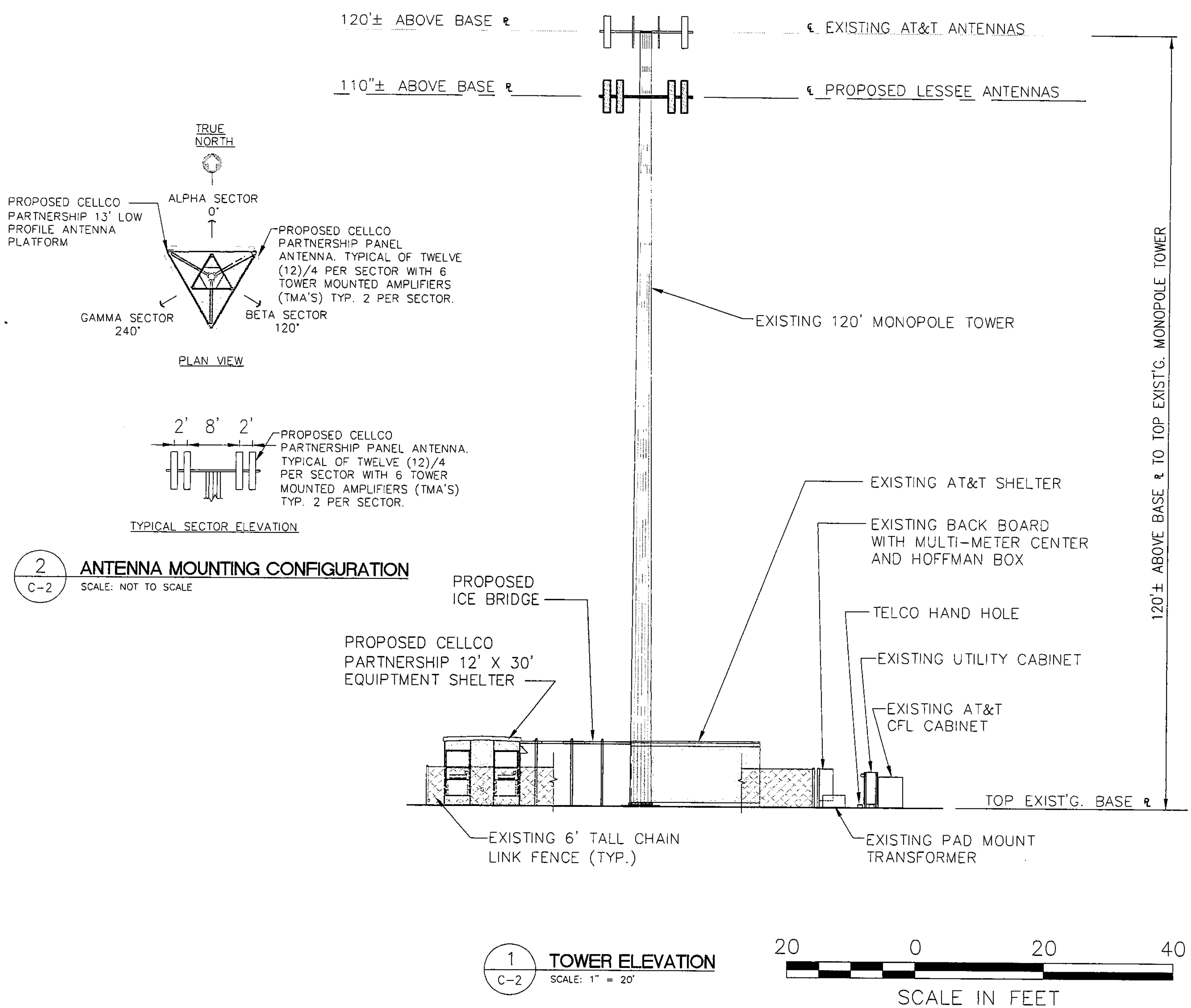
C-1

Sheet 1 of 2

Project Number 41441.01

41441.01 LM2.DWG

J:\41441.01\CAD\LD\PLANSET\FINAL CSC (COLO)\41441.01 LM2



2 / C-2 **ANTENNA MOUNTING CONFIGURATION**
SCALE: NOT TO SCALE

1 / C-2 **TOWER ELEVATION**
SCALE: 1" = 20'

VHB
Vanasse Hangen Brustlin, Inc.
Transportation
Land Development
Environmental Services
54 Tuttle Place
Middletown, Connecticut 06457
860.632.1500 • FAX 860.632.7879

Cellco Partnership
d.b.a. verizon wireless

Scale: As Shown
Date: August 6, 2008

Proposed Wireless Communication Facility
319 Peter Green Road
Tolland, Connecticut

Final CSC

Not Approved for Construction

Tower Elevation

C-2

Sheet 2 of 2

Project Number 41441.01

41441.01 TE.DWG

	General	Power	Density					
Site Name: Ellington South								
Tower Height: Verizon @ 110ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T	12	250	120	0.0749	1962.5	1.0000	7.49%	
Verizon	**3**	**435**	**110**	**0.0388**	**1970**	**1.0000**	**3.88%**	
Verizon	**9**	**274**	**110**	**0.0733**	**875**	**0.5830**	**12.57%**	
								23.94%
* Source: Siting Council								

NATCOMM INC.
CONSULTING ENGINEERS

Structural Analysis Report

119' Existing Monopole

319 Peter Green Road
Tolland, CT

Natcomm Project No. 08080.CO4

Date: July 7, 2008

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

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

Natcomm, Inc.
Structural Monopole Analysis
119' Existing EEI Monopole
Tolland, CT
July 7, 2008

Table of Contents

Natcomm, Inc.
Structural Monopole Analysis
119' Existing EEI Monopole
Tolland, CT
July 7, 2008

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna tma and platform installation proposed by Verizon Wireless on the existing monopole (tower) located in Tolland, Connecticut. The host tower is a 119-ft, three section, eighteen sided, tapered monopole originally designed and manufactured by Engineered Endeavors Incorporated (EEI); project no. 14003 dated March 9, 2006. EEI's structure and foundation design calculations and drawings are available for reference in Section 4 of this report.

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:

- AT&T (EXISTING):
  Antennas: Twelve (12) Powerwave 7770.00 panel antennas (6 existing/ 6 reserved), twelve (12) Powerwave LGP21401 TMAs and eighteen (18) LPG13519 Diplexers (9 existing/ 9 reserved), mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 122.33-ft above the existing tower base plate.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **VERIZON (Proposed):**
  Antennas: Six (6) Amphenol Antel, Inc. (Antel) LPA-80063-4CF, six (6) Antel LPA-185063/12CF_2 panel antennas and six (6) 14"x11.3"x6" TMA's mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 110-ft above the existing tower base plate .
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- FUTURE CARRIER:
  Antennas: Twelve (12) ALP 9212-N panel antennas mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 100-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.

- FUTURE CARRIER:
  Antennas: Twelve (12) ALP 9212-N panel antennas mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 90-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- FUTURE CARRIER:
  Antennas: Twelve (12) ALP 9212-N panel antennas mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 80-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- FUTURE CARRIER:
  Antennas: Twelve (12) ALP 9212-N panel antennas mounted on a PiROD 13-ft low profile platform with a RAD center elevation of 70-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

The existing tower was analyzed for 85mph 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:	Tolland; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Tolland; v = 100 mph (3 second gust) equivalent to v = 80 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed Controls	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation. This load case typically controls the design.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1610.1.3 of State Bldg. Code 2005] does not control in the design of this structure type*

Allowable Stresses

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

Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **86.5%** of its total capacity.

Foundation and Anchors

The existing foundation consists of a 7-ft square reinforced concrete pedestal with a 25-ft square reinforced concrete pad bearing directly on existing sub grade. The monopole tower is connected to the pedestal by means of sixteen (16) 2-1/4" diameter, A615-GR75 anchor bolts embedded 5-ft into the concrete foundation structure.

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

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:
  - Shear Force @ top of pedestal = **30.1** kips
  - Moment @ top of pedestal = **2565.0** ft-kips
  - Axial Force @ top of pedestal = **31.0** kips
- The base plate, anchor bolts and the foundation are within allowable limits.
- Foundation resists two times the calculated wind load per the requirements of Section 3108.4.2 of the 2005 CT State Building Code Supplement to the 2003 International Building Code (IBC).

Conclusions

This analysis shows that the subject tower **is adequate** to support the proposed antennas, tma's, platform and associated hardware.

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feedline 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 are performed, results obtained, and recommendations made 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.

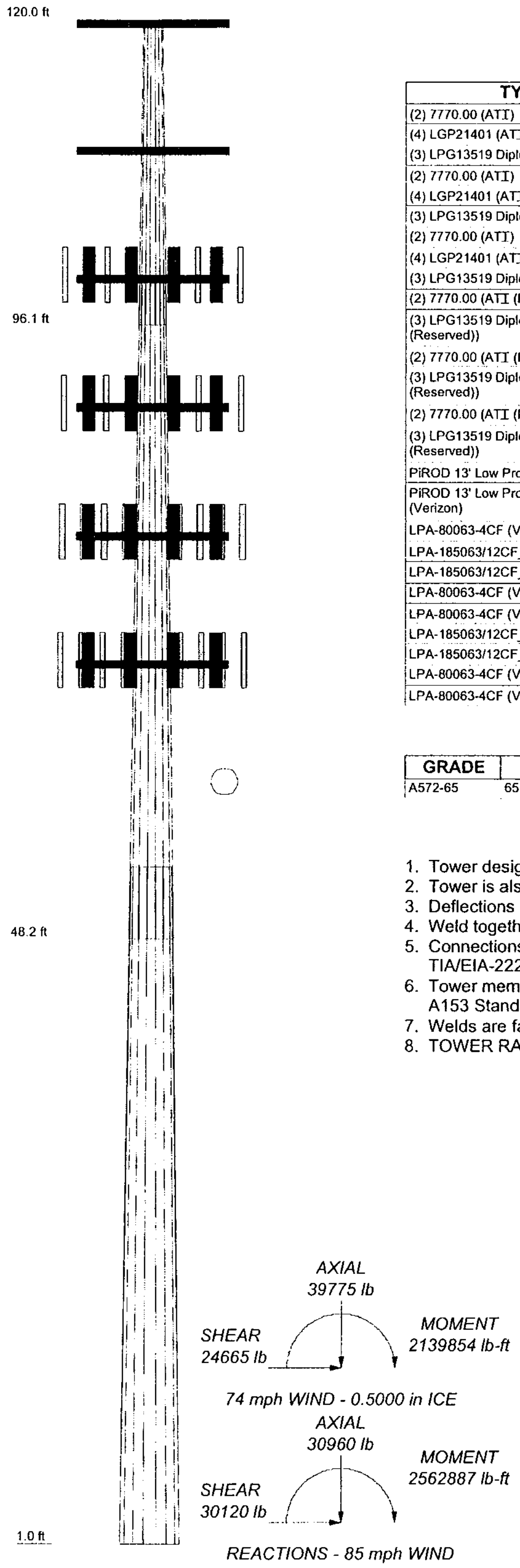
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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	Length (ft)	Number of Sides	Thickness (in)	Lap Splice (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (lb)
1	23.92	18	0.1875	3.83	18.5000	26.2600	A572-65	1075.0
2	51.75	18	0.2500	5.67	24.6425	41.3200	A572-65	4573.5
3	52.83	18	0.3125		38.9927	56.0000	A572-65	8413.3
								14061.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) 7770.00 (ATI)	122.33	LPA-185063/12CF_2 (Verizon)	110
(4) LGP21401 (ATI)	122.33	LPA-185063/12CF_2 (Verizon)	110
(3) LPG13519 Diplexer (ATI)	122.33	LPA-80063-4CF (Verizon)	110
(2) 7770.00 (ATI)	122.33	TMA 14" x 11.3" x 6" (Verizon)	110
(4) LGP21401 (ATI)	122.33	TMA 14" x 11.3" x 6" (Verizon)	110
(3) LPG13519 Diplexer (ATI)	122.33	TMA 14" x 11.3" x 6" (Verizon)	110
(2) 7770.00 (ATI)	122.33	TMA 14" x 11.3" x 6" (Verizon)	110
(4) LGP21401 (ATI)	122.33	TMA 14" x 11.3" x 6" (Verizon)	110
(3) LPG13519 Diplexer (ATI)	122.33	TMA 14" x 11.3" x 6" (Verizon)	110
(2) 7770.00 (ATI (Reserved))	122.33	PiROD 13' Low Profile Platform (Future Carrier)	100
(3) LPG13519 Diplexer (ATI (Reserved))	122.33	(4) ALP 9212-N (Future Carrier)	100
(2) 7770.00 (ATI (Reserved))	122.33	(4) ALP 9212-N (Future Carrier)	100
(3) LPG13519 Diplexer (ATI (Reserved))	122.33	(4) ALP 9212-N (Future Carrier)	100
(2) 7770.00 (ATI (Reserved))	122.33	(4) ALP 9212-N (Future Carrier)	90
(3) LPG13519 Diplexer (ATI (Reserved))	122.33	(4) ALP 9212-N (Future Carrier)	90
PiROD 13' Low Profile Platform (ATI)	120	PiROD 13' Low Profile Platform (Future Carrier)	90
PiROD 13' Low Profile Platform (Verizon)	110	(4) ALP 9212-N (Future Carrier)	90
LPA-80063-4CF (Verizon)	110	(4) ALP 9212-N (Future Carrier)	80
LPA-185063/12CF_2 (Verizon)	110	(4) ALP 9212-N (Future Carrier)	80
LPA-185063/12CF_2 (Verizon)	110	PiROD 13' Low Profile Platform (Future Carrier)	80
LPA-80063-4CF (Verizon)	110	(4) ALP 9212-N (Future Carrier)	80
LPA-80063-4CF (Verizon)	110	(4) ALP 9212-N (Future Carrier)	70
LPA-185063/12CF_2 (Verizon)	110	(4) ALP 9212-N (Future Carrier)	70
LPA-185063/12CF_2 (Verizon)	110	PiROD 13' Low Profile Platform (Future Carrier)	70
LPA-80063-4CF (Verizon)	110	(4) ALP 9212-N (Future Carrier)	70
LPA-80063-4CF (Verizon)	110		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 86.5%

NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: 119' EEI MONOPOLE		
	Project: 08080.CO4 - 319 PETER GREEN ROAD, TOLLAND, C		
	Client: VERIZON	Drawn by: Staff	App'd:
	Code: TIA/EIA-222-F	Date: 07/07/08	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:

- Basic wind speed of 85 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 74 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- 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
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
Add IBC .6D+W Combination

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
Use Clear Spans For Wind Area
Use Clear Spans For KL/r
Retension Guys To Initial Tension
Bypass Mast Stability Checks
Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
Autocalc Torque Arm Areas
SR Members Have Cut Ends
√ Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing

Treat Feedline Bundles As Cylinder
Use ASCE 10 X-Brace Ly Rules
Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
SR Leg Bolts Resist Compression
All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feedline Torque
Include Angle Block Shear Check
Poles
Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets

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	120.00-96.08	23.92	3.83	18	18.5000	26.2600	0.1875	0.7500	A572-65 (65 ksi)
L2	96.08-48.16	51.75	5.67	18	24.6425	41.3200	0.2500	2.0000	A572-65 (65 ksi)
L3	48.16-1.00	52.83		18	38.9927	56.0000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	18.7854	10.8982	461.7305	6.5009	9.3980	49.1307	924.0685	5.4501	2.9260	15.605
	26.6651	15.5164	1332.5812	9.2557	13.3401	99.8930	2666.9158	7.7597	4.2918	22.889
L2	26.2760	19.3554	1454.9662	8.6593	12.5184	116.2263	2911.8468	9.6796	3.8971	15.588
	41.9574	32.5890	6944.7800	14.5799	20.9906	330.8525	13898.6980	16.2976	6.8323	27.329
L3	41.4477	38.3659	7252.0597	13.7315	19.8083	366.1121	14513.6618	19.1866	6.3127	20.201
	56.8639	55.2350	21640.5133	19.7691	28.4480	760.7042	43309.5018	27.6228	9.3060	29.779

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 120.00-96.08				1	1	1		
L2 96.08-48.16				1	1	1		
L3 48.16-1.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8	A	No	Inside Pole	120.00 - 8.00	18	No Ice	0.00	1.04
(AT&T)						1/2" Ice	0.00	1.04
1 5/8	B	No	Inside Pole	110.00 - 8.00	12	No Ice	0.00	1.04
(Verizon)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	100.00 - 8.00	12	No Ice	0.00	1.04
(Future Carrier)						1/2" Ice	0.00	1.04
1 5/8	A	No	Inside Pole	90.00 - 8.00	12	No Ice	0.00	1.04
(Future Carrier)						1/2" Ice	0.00	1.04
1 5/8	B	No	Inside Pole	80.00 - 8.00	12	No Ice	0.00	1.04
(Future Carrier)						1/2" Ice	0.00	1.04
1 5/8	C	No	Inside Pole	70.00 - 8.00	12	No Ice	0.00	1.04
(Future Carrier)						1/2" Ice	0.00	1.04

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	120.00-96.08	A	0.000	0.000	0.000	0.000	447.78
		B	0.000	0.000	0.000	0.000	173.72
		C	0.000	0.000	0.000	0.000	48.92
L2	96.08-48.16	A	0.000	0.000	0.000	0.000	1419.23
		B	0.000	0.000	0.000	0.000	995.40
		C	0.000	0.000	0.000	0.000	870.60
L3	48.16-1.00	A	0.000	0.000	0.000	0.000	1252.99

Tower Section	*Tower Elevation ft*	*Face*	A_R ft^2	A_F ft^2	C_AA_A *In Face* ft^2	C_AA_A *Out Face* ft^2	*Weight lb*
		B	0.000	0.000	0.000	0.000	1002.39
		C	0.000	0.000	0.000	0.000	1002.39

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	*Tower Elevation ft*	*Face or Leg*	*Ice Thickness in*	A_R ft^2	A_F ft^2	C_AA_A *In Face* ft^2	C_AA_A *Out Face* ft^2	*Weight lb*
L1	120.00-96.08	A	0.500	0.000	0.000	0.000	0.000	447.78
		B		0.000	0.000	0.000	0.000	173.72
		C		0.000	0.000	0.000	0.000	48.92
L2	96.08-48.16	A	0.500	0.000	0.000	0.000	0.000	1419.23
		B		0.000	0.000	0.000	0.000	995.40
		C		0.000	0.000	0.000	0.000	870.60
L3	48.16-1.00	A	0.500	0.000	0.000	0.000	0.000	1252.99
		B		0.000	0.000	0.000	0.000	1002.39
		C		0.000	0.000	0.000	0.000	1002.39

Feed Line Center of Pressure

Section	*Elevation ft*	CP_X *in*	CP_Z *in*	CP_X *Ice in*	CP_Z *Ice in*
L1	120.00-96.08	0.0000	0.0000	0.0000	0.0000
L2	96.08-48.16	0.0000	0.0000	0.0000	0.0000
L3	48.16-1.00	0.0000	0.0000	0.0000	0.0000

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 lb*
PiROD 13' Low Profile Platform (AT&T)	C	None		0.0000	120.00	No Ice	15.70	15.70	1300.00
						1/2" Ice	20.10	20.10	1765.00
(2) 7770.00 (AT&T)	A	From Face	4.00 0.00 0.00	0.0000	122.33	No Ice	5.88	2.93	35.00
						1/2" Ice	6.31	3.27	67.63
(4) LGP21401 (AT&T)	A	From Face	4.00 0.00 0.00	0.0000	122.33	No Ice	0.95	0.37	17.50
						1/2" Ice	1.09	0.48	23.31
(3) LPG13519 Diplexer (AT&T)	A	From Face	4.00 0.00 0.00	0.0000	122.33	No Ice	0.27	0.18	5.30
						1/2" Ice	0.34	0.25	7.71
(2) 7770.00	B	From Face	4.00	0.0000	122.33	No Ice	5.88	2.93	35.00

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft²	C_AA_A *Side* ft²	*Weight* lb
(AT&T)			0.00			1/2" Ice	6.31	3.27	67.63
			0.00						
(4) LGP21401	B	From Face	4.00	0.0000	122.33	No Ice	0.95	0.37	17.50
(AT&T)			0.00			1/2" Ice	1.09	0.48	23.31
			0.00						
(3) LPG13519 Diplexer	B	From Face	4.00	0.0000	122.33	No Ice	0.27	0.18	5.30
(AT&T)			0.00			1/2" Ice	0.34	0.25	7.71
			0.00						
(2) 7770.00	C	From Face	4.00	0.0000	122.33	No Ice	5.88	2.93	35.00
(AT&T)			0.00			1/2" Ice	6.31	3.27	67.63
			0.00						
(4) LGP21401	C	From Face	4.00	0.0000	122.33	No Ice	0.95	0.37	17.50
(AT&T)			0.00			1/2" Ice	1.09	0.48	23.31
			0.00						
(3) LPG13519 Diplexer	C	From Face	4.00	0.0000	122.33	No Ice	0.27	0.18	5.30
(AT&T)			0.00			1/2" Ice	0.34	0.25	7.71
			0.00						
(2) 7770.00	A	From Face	4.00	0.0000	122.33	No Ice	5.88	2.93	35.00
(AT&T (Reserved))			0.00			1/2" Ice	6.31	3.27	67.63
			0.00						
(3) LPG13519 Diplexer	A	From Face	4.00	0.0000	122.33	No Ice	0.27	0.18	5.30
(AT&T (Reserved))			0.00			1/2" Ice	0.34	0.25	7.71
			0.00						
(2) 7770.00	B	From Face	4.00	0.0000	122.33	No Ice	5.88	2.93	35.00
(AT&T (Reserved))			0.00			1/2" Ice	6.31	3.27	67.63
			0.00						
(3) LPG13519 Diplexer	B	From Face	4.00	0.0000	122.33	No Ice	0.27	0.18	5.30
(AT&T (Reserved))			0.00			1/2" Ice	0.34	0.25	7.71
			0.00						
(2) 7770.00	C	From Face	4.00	0.0000	122.33	No Ice	5.88	2.93	35.00
(AT&T (Reserved))			0.00			1/2" Ice	6.31	3.27	67.63
			0.00						
(3) LPG13519 Diplexer	C	From Face	4.00	0.0000	122.33	No Ice	0.27	0.18	5.30
(AT&T (Reserved))			0.00			1/2" Ice	0.34	0.25	7.71
			0.00						
PiROD 13' Low Profile	C	None		0.0000	110.00	No Ice	15.70	15.70	1300.00
Platform						1/2" Ice	20.10	20.10	1765.00
(Verizon)									
LPA-80063-4CF	A	From Face	4.00	0.0000	110.00	No Ice	7.00	6.08	20.00
(Verizon)			-6.00			1/2" Ice	7.41	6.48	72.62
			0.00						
LPA-185063/12CF_2	A	From Face	4.00	0.0000	110.00	No Ice	4.97	4.51	13.50
(Verizon)			-4.00			1/2" Ice	5.42	4.95	46.05
			0.00						
LPA-185063/12CF_2	A	From Face	4.00	0.0000	110.00	No Ice	4.97	4.51	13.50
(Verizon)			4.00			1/2" Ice	5.42	4.95	46.05
			0.00						
LPA-80063-4CF	A	From Face	4.00	0.0000	110.00	No Ice	7.00	6.08	20.00
(Verizon)			6.00			1/2" Ice	7.41	6.48	72.62
			0.00						
LPA-80063-4CF	B	From Face	4.00	0.0000	110.00	No Ice	7.00	6.08	20.00
(Verizon)			-6.00			1/2" Ice	7.41	6.48	72.62
			0.00						
LPA-185063/12CF_2	B	From Face	4.00	0.0000	110.00	No Ice	4.97	4.51	13.50
(Verizon)			-4.00			1/2" Ice	5.42	4.95	46.05
			0.00						
LPA-185063/12CF_2	B	From Face	4.00	0.0000	110.00	No Ice	4.97	4.51	13.50

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* *lb*
(Verizon)			4.00 0.00			1/2" Ice	5.42	4.95	46.05
LPA-80063-4CF (Verizon)	B	From Face	4.00 6.00 0.00	0.0000	110.00	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	20.00 72.62
LPA-80063-4CF (Verizon)	C	From Face	4.00 -6.00 0.00	0.0000	110.00	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	20.00 72.62
LPA-185063/12CF_2 (Verizon)	C	From Face	4.00 -4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	4.97 5.42	4.51 4.95	13.50 46.05
LPA-185063/12CF_2 (Verizon)	C	From Face	4.00 4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	4.97 5.42	4.51 4.95	13.50 46.05
LPA-80063-4CF (Verizon)	C	From Face	4.00 6.00 0.00	0.0000	110.00	No Ice 1/2" Ice	7.00 7.41	6.08 6.48	20.00 72.62
PiROD 13' Low Profile Platform (Future Carrier)	C	None		0.0000	100.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1300.00 1765.00
(4) ALP 9212-N (Future Carrier)	A	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	B	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	C	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
PiROD 13' Low Profile Platform (Future Carrier)	C	None		0.0000	90.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1300.00 1765.00
(4) ALP 9212-N (Future Carrier)	A	From Face	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	B	From Face	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	C	From Face	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
PiROD 13' Low Profile Platform (Future Carrier)	C	None		0.0000	80.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1300.00 1765.00
(4) ALP 9212-N (Future Carrier)	A	From Face	4.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	B	From Face	4.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	C	From Face	4.00 0.00 0.00	0.0000	80.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
PiROD 13' Low Profile Platform (Future Carrier)	C	None		0.0000	70.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1300.00 1765.00
(4) ALP 9212-N	A	From Face	4.00	0.0000	70.00	No Ice	5.78	5.78	17.16

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
(Future Carrier)			0.00 0.00			1/2" Ice	6.20	6.20	62.42
(4) ALP 9212-N (Future Carrier)	B	From Face	4.00 0.00 0.00	0.0000	70.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
(4) ALP 9212-N (Future Carrier)	C	From Face	4.00 0.00 0.00	0.0000	70.00	No Ice 1/2" Ice	5.78 6.20	5.78 6.20	17.16 62.42
TMA 14" x 11.3" x 6" (Verizon)	A	From Face	4.00 -4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.54 1.71	0.82 0.95	22.50 33.59
TMA 14" x 11.3" x 6" (Verizon)	A	From Face	4.00 4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.54 1.71	0.82 0.95	22.50 33.59
TMA 14" x 11.3" x 6" (Verizon)	B	From Face	4.00 -4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.54 1.71	0.82 0.95	22.50 33.59
TMA 14" x 11.3" x 6" (Verizon)	B	From Face	4.00 4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.54 1.71	0.82 0.95	22.50 33.59
TMA 14" x 11.3" x 6" (Verizon)	C	From Face	4.00 -4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.54 1.71	0.82 0.95	22.50 33.59
TMA 14" x 11.3" x 6" (Verizon)	C	From Face	4.00 4.00 0.00	0.0000	110.00	No Ice 1/2" Ice	1.54 1.71	0.82 0.95	22.50 33.59

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 120.00-96.08	107.35	1.401	26	44.611	A	0.000	44.611	44.611	100.00	0.000	0.000
					B	0.000	44.611		100.00		
					C	0.000	44.611		100.00		
L2 96.08-48.16	70.85	1.244	23	134.170	A	0.000	134.170	134.170	100.00	0.000	0.000
					B	0.000	134.170		100.00		
					C	0.000	134.170		100.00		
L3 48.16-1.00	23.49	1	19	190.247	A	0.000	190.247	190.247	100.00	0.000	0.000
					B	0.000	190.247		100.00		
					C	0.000	190.247		100.00		

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 120.00-96.08	107.35	1.401	19	0.5000	46.604	A	0.000	46.604	46.604	100.00	0.000	0.000
						B	0.000	46.604		100.00		
						C	0.000	46.604		100.00		
L2 96.08-48.16	70.85	1.244	17	0.5000	138.163	A	0.000	138.163	138.163	100.00	0.000	0.000
						B	0.000	138.163		100.00		
						C	0.000	138.163		100.00		
L3 48.16-1.00	23.49	1	14	0.5000	194.177	A	0.000	194.177	194.177	100.00	0.000	0.000
						B	0.000	194.177		100.00		
						C	0.000	194.177		100.00		

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 120.00-96.08	107.35	1.401	9	44.611	A	0.000	44.611	44.611	100.00	0.000	0.000
					B	0.000	44.611		100.00		
					C	0.000	44.611		100.00		
L2 96.08-48.16	70.85	1.244	8	134.170	A	0.000	134.170	134.170	100.00	0.000	0.000
					B	0.000	134.170		100.00		
					C	0.000	134.170		100.00		
L3 48.16-1.00	23.49	1	6	190.247	A	0.000	190.247	190.247	100.00	0.000	0.000
					B	0.000	190.247		100.00		
					C	0.000	190.247		100.00		

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 120.00-96.08	670.43	1075.00	A	1	0.65	1	1	1	44.611	1269.65	53.08	C
			B	1	0.65	1	1	1	44.611			
			C	1	0.65	1	1	1	44.611			
L2 96.08-48.16	3285.24	4573.55	A	1	0.65	1	1	1	134.170	3373.63	70.40	C
			B	1	0.65	1	1	1	134.170			
			C	1	0.65	1	1	1	134.170			
L3 48.16-1.00	3257.78	8413.27	A	1	0.65	1	1	1	190.247	3910.77	82.93	C
			B	1	0.65	1	1	1	190.247			
			C	1	0.65	1	1	1	190.247			
Sum Weight:	7213.44	14061.82						OTM	458652.89 lb-ft	8554.06		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	*Add Weight* lb	*Self Weight* lb	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* lb	*w* plf	*Ctrl. Face*
L1 120.00-96.08	670.43	1075.00	A	1	0.65	1	1	1	44.611	1269.65	53.08	C
			B	1	0.65	1	1	1	44.611			
			C	1	0.65	1	1	1	44.611			
L2 96.08-48.16	3285.24	4573.55	A	1	0.65	1	1	1	134.170	3373.63	70.40	C
			B	1	0.65	1	1	1	134.170			
			C	1	0.65	1	1	1	134.170			
L3 48.16-1.00	3257.78	8413.27	A	1	0.65	1	1	1	190.247	3910.77	82.93	C
			B	1	0.65	1	1	1	190.247			
			C	1	0.65	1	1	1	190.247			
Sum Weight:	7213.44	14061.82						OTM	458652.89 lb-ft	8554.06		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	*Add Weight* lb	*Self Weight* lb	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* lb	*w* plf	*Ctrl. Face*
L1 120.00-96.08	670.43	1075.00	A	1	0.65	1	1	1	44.611	1269.65	53.08	C
			B	1	0.65	1	1	1	44.611			
			C	1	0.65	1	1	1	44.611			
L2 96.08-48.16	3285.24	4573.55	A	1	0.65	1	1	1	134.170	3373.63	70.40	C
			B	1	0.65	1	1	1	134.170			
			C	1	0.65	1	1	1	134.170			
L3 48.16-1.00	3257.78	8413.27	A	1	0.65	1	1	1	190.247	3910.77	82.93	C
			B	1	0.65	1	1	1	190.247			
			C	1	0.65	1	1	1	190.247			
Sum Weight:	7213.44	14061.82						OTM	458652.89 lb-ft	8554.06		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	*Add Weight* lb	*Self Weight* lb	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* lb	*w* plf	*Ctrl. Face*
L1 120.00-96.08	670.43	1412.77	A	1	0.65	1	1	1	46.604	994.79	41.59	C
			B	1	0.65	1	1	1	46.604			
			C	1	0.65	1	1	1	46.604			
L2 96.08-48.16	3285.24	5582.00	A	1	0.65	1	1	1	138.163	2605.54	54.37	C
			B	1	0.65	1	1	1	138.163			
			C	1	0.65	1	1	1	138.163			
L3 48.16-1.00	3257.78	9836.79	A	1	0.65	1	1	1	194.177	2993.67	63.48	C
			B	1	0.65	1	1	1	194.177			
			C	1	0.65	1	1	1	194.177			
Sum Weight:	7213.44	16831.56						OTM	355138.42	6594.00		

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

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120.00-96.08	670.43	1412.77	A	1	0.65	1	1	1	46.604	994.79	41.59	C
			B	1	0.65	1	1	1	46.604			
			C	1	0.65	1	1	1	46.604			
L2 96.08-48.16	3285.24	5582.00	A	1	0.65	1	1	1	138.163	2605.54	54.37	C
			B	1	0.65	1	1	1	138.163			
			C	1	0.65	1	1	1	138.163			
L3 48.16-1.00	3257.78	9836.79	A	1	0.65	1	1	1	194.177	2993.67	63.48	C
			B	1	0.65	1	1	1	194.177			
			C	1	0.65	1	1	1	194.177			
Sum Weight:	7213.44	16831.56						OTM	355138.42 lb-ft	6594.00		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120.00-96.08	670.43	1412.77	A	1	0.65	1	1	1	46.604	994.79	41.59	C
			B	1	0.65	1	1	1	46.604			
			C	1	0.65	1	1	1	46.604			
L2 96.08-48.16	3285.24	5582.00	A	1	0.65	1	1	1	138.163	2605.54	54.37	C
			B	1	0.65	1	1	1	138.163			
			C	1	0.65	1	1	1	138.163			
L3 48.16-1.00	3257.78	9836.79	A	1	0.65	1	1	1	194.177	2993.67	63.48	C
			B	1	0.65	1	1	1	194.177			
			C	1	0.65	1	1	1	194.177			
Sum Weight:	7213.44	16831.56						OTM	355138.42 lb-ft	6594.00		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120.00-96.08	670.43	1075.00	A	1	0.65	1	1	1	44.611	439.33	18.37	C
			B	1	0.65	1	1	1	44.611			
			C	1	0.65	1	1	1	44.611			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L2 96.08-48.16	3285.24	4573.55	A	1	0.65	1	1	1	134.170	1167.35	24.36	C
			B	1	0.65	1	1	1	134.170			
			C	1	0.65	1	1	1	134.170			
L3 48.16-1.00	3257.78	8413.27	A	1	0.65	1	1	1	190.247	1353.21	28.69	C
			B	1	0.65	1	1	1	190.247			
			C	1	0.65	1	1	1	190.247			
Sum Weight:	7213.44	14061.82						OTM	158703.42 lb-ft	2959.88		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120.00-96.08	670.43	1075.00	A	1	0.65	1	1	1	44.611	439.33	18.37	C
			B	1	0.65	1	1	1	44.611			
			C	1	0.65	1	1	1	44.611			
L2 96.08-48.16	3285.24	4573.55	A	1	0.65	1	1	1	134.170	1167.35	24.36	C
			B	1	0.65	1	1	1	134.170			
			C	1	0.65	1	1	1	134.170			
L3 48.16-1.00	3257.78	8413.27	A	1	0.65	1	1	1	190.247	1353.21	28.69	C
			B	1	0.65	1	1	1	190.247			
			C	1	0.65	1	1	1	190.247			
Sum Weight:	7213.44	14061.82						OTM	158703.42 lb-ft	2959.88		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1 120.00-96.08	670.43	1075.00	A	1	0.65	1	1	1	44.611	439.33	18.37	C
			B	1	0.65	1	1	1	44.611			
			C	1	0.65	1	1	1	44.611			
L2 96.08-48.16	3285.24	4573.55	A	1	0.65	1	1	1	134.170	1167.35	24.36	C
			B	1	0.65	1	1	1	134.170			
			C	1	0.65	1	1	1	134.170			
L3 48.16-1.00	3257.78	8413.27	A	1	0.65	1	1	1	190.247	1353.21	28.69	C
			B	1	0.65	1	1	1	190.247			
			C	1	0.65	1	1	1	190.247			
Sum Weight:	7213.44	14061.82						OTM	158703.42 lb-ft	2959.88		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	14061.82					
Bracing Weight	0.00					
Total Member Self-Weight	14061.82			0.00	0.00	
Total Weight	30960.34			0.00	0.00	
Wind 0 deg - No Ice		0.00	-30120.28	-2510746.69	0.00	0.00
Wind 30 deg - No Ice		15060.14	-26084.93	-2174370.41	-1255373.34	0.00
Wind 60 deg - No Ice		26084.93	-15060.14	-1255373.34	-2174370.41	0.00
Wind 90 deg - No Ice		30120.28	0.00	0.00	-2510746.69	0.00
Wind 120 deg - No Ice		26084.93	15060.14	1255373.34	-2174370.41	0.00
Wind 150 deg - No Ice		15060.14	26084.93	2174370.41	-1255373.34	0.00
Wind 180 deg - No Ice		0.00	30120.28	2510746.69	0.00	0.00
Wind 210 deg - No Ice		-15060.14	26084.93	2174370.41	1255373.34	0.00
Wind 240 deg - No Ice		-26084.93	15060.14	1255373.34	2174370.41	0.00
Wind 270 deg - No Ice		-30120.28	0.00	0.00	2510746.69	0.00
Wind 300 deg - No Ice		-26084.93	-15060.14	-1255373.34	2174370.41	0.00
Wind 330 deg - No Ice		-15060.14	-26084.93	-2174370.41	1255373.34	0.00
Member Ice	2769.74					
Total Weight Ice	39774.83			0.00	0.00	
Wind 0 deg - Ice		0.00	-24665.49	-2077279.01	0.00	0.00
Wind 30 deg - Ice		12332.74	-21360.94	-1798976.39	-1038639.50	0.00
Wind 60 deg - Ice		21360.94	-12332.74	-1038639.50	-1798976.39	0.00
Wind 90 deg - Ice		24665.49	0.00	0.00	-2077279.01	0.00
Wind 120 deg - Ice		21360.94	12332.74	1038639.50	-1798976.39	0.00
Wind 150 deg - Ice		12332.74	21360.94	1798976.39	-1038639.50	0.00
Wind 180 deg - Ice		0.00	24665.49	2077279.01	0.00	0.00
Wind 210 deg - Ice		-12332.74	21360.94	1798976.39	1038639.50	0.00
Wind 240 deg - Ice		-21360.94	12332.74	1038639.50	1798976.39	0.00
Wind 270 deg - Ice		-24665.49	0.00	0.00	2077279.01	0.00
Wind 300 deg - Ice		-21360.94	-12332.74	-1038639.50	1798976.39	0.00
Wind 330 deg - Ice		-12332.74	-21360.94	-1798976.39	1038639.50	0.00
Total Weight	30960.34			0.00	0.00	
Wind 0 deg - Service		0.00	-10422.24	-868770.48	0.00	0.00
Wind 30 deg - Service		5211.12	-9025.93	-752377.31	-434385.24	0.00
Wind 60 deg - Service		9025.93	-5211.12	-434385.24	-752377.31	0.00
Wind 90 deg - Service		10422.24	0.00	0.00	-868770.48	0.00
Wind 120 deg - Service		9025.93	5211.12	434385.24	-752377.31	0.00
Wind 150 deg - Service		5211.12	9025.93	752377.31	-434385.24	0.00
Wind 180 deg - Service		0.00	10422.24	868770.48	0.00	0.00
Wind 210 deg - Service		-5211.12	9025.93	752377.31	434385.24	0.00
Wind 240 deg - Service		-9025.93	5211.12	434385.24	752377.31	0.00
Wind 270 deg - Service		-10422.24	0.00	0.00	868770.48	0.00
Wind 300 deg - Service		-9025.93	-5211.12	-434385.24	752377.31	0.00
Wind 330 deg - Service		-5211.12	-9025.93	-752377.31	434385.24	0.00

Load Combinations

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

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	120 - 96.08	Pole	Max Tension	14	0.00	0.00	-0.00
			Max. Compression	14	-9904.46	0.00	0.00
			Max. Mx	5	-5763.01	-135564.50	0.00
			Max. My	2	-5763.01	0.00	135564.50
			Max. Vy	5	12752.68	-135564.50	0.00
			Max. Vx	2	-12752.68	0.00	135564.50
			Max. Torque	26			0.00
L2	96.08 - 48.16	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-25533.62	0.00	0.00
			Max. Mx	5	-17383.02	- 1071636.87	0.00
			Max. My	2	-17383.02	0.00	1071636.87
			Max. Vy	5	26372.24	- 1071636.87	0.00
			Max. Vx	2	-26372.24	0.00	1071636.87
			Max. Torque	26			0.00
L3	48.16 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-39774.83	0.00	0.00
			Max. Mx	5	-30938.09	- 2562886.36	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. My	8	-30938.09	0.00	-2562886.36
			Max. Vy	5	30143.13	-2562886.36	0.00
			Max. Vx	2	-30143.13	0.00	2562886.36
			Max. Torque	23			0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	21	39774.83	0.00	-24665.49
	Max. H_x	11	30960.34	30120.28	0.00
	Max. H_z	2	30960.34	0.00	30120.28
	Max. M_x	2	2562886.36	0.00	30120.28
	Max. M_z	5	2562886.36	-30120.28	0.00
	Max. Torsion	23	0.00	21360.94	-12332.75
	Min. Vert	1	30960.34	0.00	0.00
	Min. H_x	5	30960.34	-30120.28	0.00
	Min. H_z	8	30960.34	0.00	-30120.28
	Min. M_x	8	-2562886.36	0.00	-30120.28
	Min. M_z	11	-2562886.36	30120.28	0.00
	Min. Torsion	25	-0.00	21360.94	12332.75

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	30960.34	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg - No Ice	30960.34	0.00	-30120.28	-2562886.36	0.00	0.00
Dead+Wind 30 deg - No Ice	30960.34	15060.14	-26084.93	-2219525.49	-1281443.64	0.00
Dead+Wind 60 deg - No Ice	30960.34	26084.93	-15060.14	-1281443.64	-2219525.49	-0.00
Dead+Wind 90 deg - No Ice	30960.34	30120.28	0.00	0.00	-2562886.36	0.00
Dead+Wind 120 deg - No Ice	30960.34	26084.93	15060.14	1281443.64	-2219525.49	0.00
Dead+Wind 150 deg - No Ice	30960.34	15060.14	26084.93	2219525.49	-1281443.64	-0.00
Dead+Wind 180 deg - No Ice	30960.34	0.00	30120.28	2562886.36	0.00	0.00
Dead+Wind 210 deg - No Ice	30960.34	-15060.14	26084.93	2219525.49	1281443.64	0.00
Dead+Wind 240 deg - No Ice	30960.34	-26084.93	15060.14	1281443.64	2219525.49	-0.00
Dead+Wind 270 deg - No Ice	30960.34	-30120.28	0.00	0.00	2562886.36	0.00
Dead+Wind 300 deg - No Ice	30960.34	-26084.93	-15060.14	-1281443.64	2219525.49	0.00
Dead+Wind 330 deg - No Ice	30960.34	-15060.14	-26084.93	-2219525.49	1281443.64	-0.00
Dead+Ice+Temp	39774.83	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg+Ice+Temp	39774.83	0.00	-24665.49	-2139854.03	0.00	0.00
Dead+Wind 30 deg+Ice+Temp	39774.83	12332.75	-21360.94	-1853167.95	-1069927.02	0.00
Dead+Wind 60 deg+Ice+Temp	39774.83	21360.94	-12332.75	-1069927.02	-1853167.95	-0.00
Dead+Wind 90 deg+Ice+Temp	39774.83	24665.49	0.00	0.00	-2139854.03	0.00
Dead+Wind 120 deg+Ice+Temp	39774.83	21360.94	12332.75	1069927.02	-1853167.95	0.00
Dead+Wind 150 deg+Ice+Temp	39774.83	12332.75	21360.94	1853167.95	-1069927.02	-0.00
Dead+Wind 180 deg+Ice+Temp	39774.83	0.00	24665.49	2139854.03	0.00	0.00
Dead+Wind 210 deg+Ice+Temp	39774.83	-12332.75	21360.94	1853167.95	1069927.02	0.00
Dead+Wind 240 deg+Ice+Temp	39774.83	-21360.94	12332.75	1069927.02	1853167.95	-0.00

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead+Wind 270 deg+Ice+Temp	39774.83	-24665.49	0.00	0.00	2139854.03	0.00
Dead+Wind 300 deg+Ice+Temp	39774.83	-21360.94	-12332.75	-1069927.02	1853167.95	0.00
Dead+Wind 330 deg+Ice+Temp	39774.83	-12332.75	-21360.94	-1853167.95	1069927.02	-0.00
Dead+Wind 0 deg - Service	30960.34	0.00	-10422.24	-887371.43	0.00	0.00
Dead+Wind 30 deg - Service	30960.34	5211.12	-9025.93	-768486.20	-443685.72	0.00
Dead+Wind 60 deg - Service	30960.34	9025.93	-5211.12	-443685.72	-768486.20	-0.00
Dead+Wind 90 deg - Service	30960.34	10422.24	0.00	0.00	-887371.43	0.00
Dead+Wind 120 deg - Service	30960.34	9025.93	5211.12	443685.72	-768486.20	0.00
Dead+Wind 150 deg - Service	30960.34	5211.12	9025.93	768486.20	-443685.72	-0.00
Dead+Wind 180 deg - Service	30960.34	0.00	10422.24	887371.43	0.00	0.00
Dead+Wind 210 deg - Service	30960.34	-5211.12	9025.93	768486.20	443685.72	0.00
Dead+Wind 240 deg - Service	30960.34	-9025.93	5211.12	443685.72	768486.20	-0.00
Dead+Wind 270 deg - Service	30960.34	-10422.24	0.00	0.00	887371.43	0.00
Dead+Wind 300 deg - Service	30960.34	-9025.93	-5211.12	-443685.72	768486.20	0.00
Dead+Wind 330 deg - Service	30960.34	-5211.12	-9025.93	-768486.20	443685.72	-0.00

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-30960.34	0.00	0.00	30960.34	0.00	0.000%
2	0.00	-30960.34	-30120.28	0.00	30960.34	30120.28	0.000%
3	15060.14	-30960.34	-26084.93	-15060.14	30960.34	26084.93	0.000%
4	26084.93	-30960.34	-15060.14	-26084.93	30960.34	15060.14	0.000%
5	30120.28	-30960.34	0.00	-30120.28	30960.34	0.00	0.000%
6	26084.93	-30960.34	15060.14	-26084.93	30960.34	-15060.14	0.000%
7	15060.14	-30960.34	26084.93	-15060.14	30960.34	-26084.93	0.000%
8	0.00	-30960.34	30120.28	0.00	30960.34	-30120.28	0.000%
9	-15060.14	-30960.34	26084.93	15060.14	30960.34	-26084.93	0.000%
10	-26084.93	-30960.34	15060.14	26084.93	30960.34	-15060.14	0.000%
11	-30120.28	-30960.34	0.00	30120.28	30960.34	0.00	0.000%
12	-26084.93	-30960.34	-15060.14	26084.93	30960.34	15060.14	0.000%
13	-15060.14	-30960.34	-26084.93	15060.14	30960.34	26084.93	0.000%
14	0.00	-39774.83	0.00	0.00	39774.83	0.00	0.000%
15	0.00	-39774.83	-24665.49	0.00	39774.83	24665.49	0.000%
16	12332.74	-39774.83	-21360.94	-12332.75	39774.83	21360.94	0.000%
17	21360.94	-39774.83	-12332.74	-21360.94	39774.83	12332.75	0.000%
18	24665.49	-39774.83	0.00	-24665.49	39774.83	0.00	0.000%
19	21360.94	-39774.83	12332.74	-21360.94	39774.83	-12332.75	0.000%
20	12332.74	-39774.83	21360.94	-12332.75	39774.83	-21360.94	0.000%
21	0.00	-39774.83	24665.49	0.00	39774.83	-24665.49	0.000%
22	-12332.74	-39774.83	21360.94	12332.75	39774.83	-21360.94	0.000%
23	-21360.94	-39774.83	12332.74	21360.94	39774.83	-12332.75	0.000%
24	-24665.49	-39774.83	0.00	24665.49	39774.83	0.00	0.000%
25	-21360.94	-39774.83	-12332.74	21360.94	39774.83	12332.75	0.000%
26	-12332.74	-39774.83	-21360.94	12332.75	39774.83	21360.94	0.000%
27	0.00	-30960.34	-10422.24	0.00	30960.34	10422.24	0.000%
28	5211.12	-30960.34	-9025.93	-5211.12	30960.34	9025.93	0.000%
29	9025.93	-30960.34	-5211.12	-9025.93	30960.34	5211.12	0.000%
30	10422.24	-30960.34	0.00	-10422.24	30960.34	0.00	0.000%
31	9025.93	-30960.34	5211.12	-9025.93	30960.34	-5211.12	0.000%
32	5211.12	-30960.34	9025.93	-5211.12	30960.34	-9025.93	0.000%
33	0.00	-30960.34	10422.24	0.00	30960.34	-10422.24	0.000%
34	-5211.12	-30960.34	9025.93	5211.12	30960.34	-9025.93	0.000%
35	-9025.93	-30960.34	5211.12	9025.93	30960.34	-5211.12	0.000%
36	-10422.24	-30960.34	0.00	10422.24	30960.34	0.00	0.000%
37	-9025.93	-30960.34	-5211.12	9025.93	30960.34	5211.12	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
38	-5211.12	-30960.34	-9025.93	5211.12	30960.34	9025.93	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00002387
3	Yes	5	0.00000001	0.00010713
4	Yes	5	0.00000001	0.00010713
5	Yes	4	0.00000001	0.00002387
6	Yes	5	0.00000001	0.00010713
7	Yes	5	0.00000001	0.00010713
8	Yes	4	0.00000001	0.00002387
9	Yes	5	0.00000001	0.00010713
10	Yes	5	0.00000001	0.00010713
11	Yes	4	0.00000001	0.00002387
12	Yes	5	0.00000001	0.00010713
13	Yes	5	0.00000001	0.00010713
14	Yes	4	0.00000001	0.00000001
15	Yes	5	0.00000001	0.00005502
16	Yes	5	0.00000001	0.00024248
17	Yes	5	0.00000001	0.00024248
18	Yes	5	0.00000001	0.00005502
19	Yes	5	0.00000001	0.00024248
20	Yes	5	0.00000001	0.00024248
21	Yes	5	0.00000001	0.00005502
22	Yes	5	0.00000001	0.00024248
23	Yes	5	0.00000001	0.00024248
24	Yes	5	0.00000001	0.00005502
25	Yes	5	0.00000001	0.00024248
26	Yes	5	0.00000001	0.00024248
27	Yes	4	0.00000001	0.00001305
28	Yes	4	0.00000001	0.00030906
29	Yes	4	0.00000001	0.00030906
30	Yes	4	0.00000001	0.00001305
31	Yes	4	0.00000001	0.00030906
32	Yes	4	0.00000001	0.00030906
33	Yes	4	0.00000001	0.00001305
34	Yes	4	0.00000001	0.00030906
35	Yes	4	0.00000001	0.00030906
36	Yes	4	0.00000001	0.00001305
37	Yes	4	0.00000001	0.00030906
38	Yes	4	0.00000001	0.00030906

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 96.08	19.689	30	1.4666	0.0000
L2	99.91 - 48.16	13.733	30	1.3306	0.0000

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L3	53.83 - 1	3.724	30	0.6666	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
122.33	(2) 7770.00	30	19.689	1.4666	0.0000	21690
120.00	PiROD 13' Low Profile Platform	30	19.689	1.4666	0.0000	21690
110.00	PiROD 13' Low Profile Platform	30	16.668	1.4126	0.0000	10845
100.00	PiROD 13' Low Profile Platform	30	13.758	1.3315	0.0000	5568
90.00	PiROD 13' Low Profile Platform	30	11.058	1.2047	0.0000	4633
80.00	PiROD 13' Low Profile Platform	30	8.617	1.0475	0.0000	4053
70.00	PiROD 13' Low Profile Platform	30	6.472	0.8838	0.0000	3603

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 96.08	56.809	5	4.2329	0.0000
L2	99.91 - 48.16	39.632	5	3.8404	0.0000
L3	53.83 - 1	10.754	5	1.9248	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
122.33	(2) 7770.00	5	56.809	4.2329	0.0000	7592
120.00	PiROD 13' Low Profile Platform	5	56.809	4.2329	0.0000	7592
110.00	PiROD 13' Low Profile Platform	5	48.098	4.0701	0.0000	3795
100.00	PiROD 13' Low Profile Platform	5	39.705	3.8430	0.0000	1947
90.00	PiROD 13' Low Profile Platform	5	31.916	3.5052	0.0000	1617
80.00	PiROD 13' Low Profile Platform	5	24.873	3.0842	0.0000	1412
70.00	PiROD 13' Low Profile Platform	5	18.683	2.6261	0.0000	1253

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
L1	120 - 96.08 (1)	TP26.26x18.5x0.1875	23.92	119.00	162.0	5.690	14.7769	-5763.00	84079.40	0.069
L2	96.08 - 48.16 (2)	TP41.32x24.6425x0.25	51.75	119.00	102.5	14.213	31.1391	-17383.00	442564.00	0.039
L3	48.16 - 1 (3)	TP56x38.9927x0.3125	52.83	119.00	72.2	24.098	55.2350	-30938.10	1331030.00	0.023

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	120 - 96.08 (1)	TP26.26x18.5x0.1875	135565.00	-17.962	39.000	0.461	0.00	0.000	39.000	0.000
L2	96.08 - 48.16 (2)	TP41.32x24.6425x0.25	1071641.67	-42.584	38.228	1.114	0.00	0.000	38.228	0.000
L3	48.16 - 1 (3)	TP56x38.9927x0.3125	2562883.33	-40.429	35.851	1.128	0.00	0.000	35.851	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	120 - 96.08 (1)	TP26.26x18.5x0.1875	0.069	0.461	0.000	0.529 ✔	1.333	H1-3 ✔
L2	96.08 - 48.16 (2)	TP41.32x24.6425x0.25	0.039	1.114	0.000	1.153 ✔	1.333	H1-3 ✔
L3	48.16 - 1 (3)	TP56x38.9927x0.3125	0.023	1.128	0.000	1.151 ✔	1.333	H1-3 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF^*P_{allow} lb	% Capacity	Pass Fail
L1	120 - 96.08	Pole	TP26.26x18.5x0.1875	1	-5763.00	112077.83	39.7	Pass
L2	96.08 - 48.16	Pole	TP41.32x24.6425x0.25	2	-17383.00	589937.79	86.5	Pass
L3	48.16 - 1	Pole	TP56x38.9927x0.3125	3	-30938.10	1774262.92	86.3	Pass
							Summary	
						Pole (L2)	86.5	Pass
						RATING =	**86.5**	**Pass**

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 2565 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 30.1 \cdot kips$	*user input*
Axial Force:	$Axial := 31 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A615 Grade 75		*user input*
Number of Anchor Bolts = N	$N := 16$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 65in$	*user input*
Bolt "Column" Distance:	$l := 3.25in$	*user input*
Bolt Ultimate Strength:	$F_u := 100 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 75 \cdot ksi$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*
Anchor Bolt Diameter	$D := 2.25in$	*user input*
Threads per Inch:	$n := 4.5$	*user input*

Base Plate Data:

Use ASTM A572 Mod 60 (60 ksi)		*user input*
Plate Yield Strength:	$Fy_{bp} := 60 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 2.25 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 71 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 56in$	*user input*

Geometric Layout Data:

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

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

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

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

$d_1 = 12.44 \cdot in$ $\quad d_7 = 12.44 \cdot in$

$d_2 = 22.98 \cdot in$ $\quad d_8 = 0.00 \cdot in$

$d_3 = 30.03 \cdot in$ $\quad d_9 = -12.44 \cdot in$

$d_4 = 32.50 \cdot in$ $\quad d_{10} = -22.98 \cdot in$

$d_5 = 30.03 \cdot in$ $\quad d_{11} = -30.03 \cdot in$

$d_6 = 22.98 \cdot in$ $\quad$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $\quad R_{pole} = 28.00 \cdot in$

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

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

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

$MA_3 = 2.03 \cdot in$ $\quad MA_9 = 0.00 \cdot in$

$MA_4 = 4.50 \cdot in$ $\quad MA_{10} = 0.00 \cdot in$

$MA_5 = 2.03 \cdot in$ $\quad MA_{11} = 0.00 \cdot in$

$MA_6 = 0.00 \cdot in$ $\quad$ etc.

Effective Width of Baseplate for Bending: $\text{EffectiveWidth} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2}$ $\quad \text{EffectiveWidth} = 34.92 \cdot in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 8.450 \times 10^3 \cdot in^2$$

Gross Area of Bolt:

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

Net Area of Bolt:

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

Net Diameter:

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

Radius of Gyration of Bolt:

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

Section Modulus of Bolt:

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

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.510 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 7.4 \cdot ksi$$

Allowable Bending

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

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

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

Note: 1.333 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

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

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N}$ $\quad$ $MaxTension = 116.4 \cdot kips$

Check Stresses:

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

$\frac{MaxTension}{F_{net.area}} = 0.60$

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

$Condition = "OK"$

Check Compression & Combined Stresses (if required):

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

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

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

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

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

Allowable Compressive Force:

$$K := 0.65$$

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

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

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

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 120.3 \cdot \text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 37.0 \cdot \text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.62$$

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

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 47.2 \cdot kips$ $C_7 = 47.2 \cdot kips$

$C_2 = 85.6 \cdot kips$ $C_8 = 1.9 \cdot kips$

$C_3 = 111.3 \cdot kips$ $C_9 = -43.4 \cdot kips$

$C_4 = 120.3 \cdot kips$ $C_{10} = -81.8 \cdot kips$

$C_5 = 111.3 \cdot kips$ $C_{11} = -107.4 \cdot kips$

$C_6 = 85.6 \cdot kips$ etc.

Bending Stress in Plate:

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

$f_{bp} = 33.7 \cdot ksi$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} = 0.56$$

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

Condition = "OK"

MONOPOLE FOUNDATION ANALYSIS

TOWER FORCES:

Moment Caused by Tower $M_t := 2565 \cdot ft \cdot kips$

Shear at Base of Tower $S_t := 30.1 kip$

Max Compressive Force $C_t := 31 \cdot kip$

Height of Tower $H_t := 119 \cdot ft$

Base Plate Bolt Circle $MP := 65in$

FOOTING DIMENSIONS:

Overall Depth of Footing $D_f := 5ft$

Length of Pier $L_p := 3 \cdot ft$

Extension of Pier Above Grade $L_{pag} := 1.0 \cdot ft$

Diameter of Pier $d_p := 7.0 \cdot ft$

Thickness of Footing $T_f := 3.0 \cdot ft$

Width of Footing: $W_f := 25ft$

Length of Anchor Bolts: $L_{st} := 72in$

Projection of anchor bolts above pier $A_{BP} := 12 \cdot in$

PROPERTIES:

Compressive Strength of Concrete $f'c := 4000psi$

Yield Strength of Steel Reinforcement $fy := 60000 \cdot psi$

Yield Strength of Anchor Bolt $fya := 75000 \cdot psi$

Internal Friction Angle of Soil $\phi_s := 30 \cdot deg$

Allowable Bearing Capacity $q_s := 5000 \cdot psf$

Unit Weight of Soil $\gamma_s := 120 \cdot pcf$

Unit Weight of Concrete $\gamma_c := 150 \cdot pcf$

Depth to Neglect $n := 0ft$

Cohesion of Clay Type Soil $c := 0 \cdot ksf$
Note: Use 0 for Sandy Soil

Seismic Zone Factor: $Z := 2$
UBC Fig 23-2

Coefficient of Friction between Concrete: $\mu := 0.45$

Clear Cover of Reinforcement Pier: $Cvr_{pier} := 3 \cdot in$

Clear Cover of Reinforcement Pad: $Cvr_{pad} := 3 \cdot in$

Anchor Bolt Diameter $d_{anchor} := 2.25in$

Anchor bolt area $A_{anchor} := 3.97 \cdot in^2$

PIER REINFORCEMENT:

Bar Size $BSpier := 8$ Bar Diameter $d_{bpier} := 1.000 \cdot in$

Number of Bars $NBpier := 36$ Bar Area $A_{bpier} := 0.790 \cdot in^2$

PAD REINFORCEMENT:

TOP:

Bar Size $BS_{top} := 8$ Bar Diameter $d_{btop} := 1.000 \cdot in$

Number of Bars $NB_{top} := 32$ Bar Area $A_{btop} := 0.790 \cdot in^2$

BOTTOM:

Bar Size $BS_{bot} := 8$ Bar Diameter $d_{bbot} := 1.000 \cdot in$

Number of Bars $NB_{bot} := 32$ Bar Area $A_{bot} := 0.790 \cdot in^2$

Coefficient of Lateral Soil Pressure: $K_p := \dfrac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$ $K_p = 3$

Load Factor (EIA 3.1.1): $LF := if\left[H_t \le 700 \cdot ft, 1.333, if\left[H_t \ge 1200, 1.7, 1.333 + \left(\dfrac{H_t - 700}{1200 - 700}\right) \cdot 0.4\right]\right]$ $LF = 1.333$

CHECK ANCHOR STEEL EMBEDMENT

Depth:

$D_{ab} := L_{st} - A_{BP}$ $D_{ab} = 5 \cdot ft$ $L_{anchor} := \dfrac{(0.11 \cdot fy) \cdot in}{\sqrt{f'c \cdot psi}}$ $L_{anchor} = 8.6963 \cdot ft$

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

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

STABILITY OF FOOTING

Passive Pressure:

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

$P_{pt} := K_p \cdot \gamma_s \cdot \left(D_f - T_f\right) + c \cdot 2 \cdot \sqrt{K_p}$ $P_{pt} = 0.72 \cdot ksf$

$P_{top} := \text{if}\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right]$ $P_{top} = 0.72 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $P_{bot} = 1.8 \cdot ksf$

$P_{ave} := \dfrac{P_{top} + P_{bot}}{2}$ $P_{ave} = 1.26 \cdot ksf$

$T_p := \text{if}\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right]$ $T_p = 3 \cdot ft$

$A_p := W_f \cdot T_p$ $A_p = 75 \cdot ft^2$

Ultimate Shear: $S_u := P_{ave} \cdot A_p$ $S_u = 94.5 \cdot kip$

Weight of Concrete Pad: $WT_c := \left[\left(W_f^{\,2} \cdot T_f\right) + d_p^{\,2} L_p\right] \cdot \gamma_c$ $WT_c = 303.3 \cdot kip$

Weight of Soil: above Footing: $WT_{s1} := \left[W_f^{\,2} \cdot \left(\left|L_p - L_{pag}\right|\right) - \dfrac{d_p^{\,2} \cdot \pi}{4} \cdot \left(\left|L_p - L_{pag}\right|\right)\right] \cdot \gamma_s$ $WT_{s1} = 140.7637 \cdot kip$

Weight of Soil Wedge at back face: $WT_{s2} := \left(\dfrac{D_f^{\,2} \cdot \tan\left(\phi_s\right)}{2} \cdot W_f\right) \cdot \gamma_s$ $WT_{s2} = 21.6506 \cdot kip$

Total Weight: $WT_{tot} := WT_c + WT_{s1} + C_t$ $WT_{tot} = 475.0637 \cdot kip$

Resisting Moment: $M_r := \left(WT_{tot}\right) \cdot \dfrac{W_f}{2} + S_u \cdot \dfrac{T_f}{3} + WT_{s2} \cdot \left(W_f + \dfrac{D_f \cdot \tan\left(\phi_s\right)}{3}\right)$ $M_r = 6594.8957 \cdot kip \cdot ft$

Overturning Moment: $M_{ot} := M_t + S_t \cdot \left(L_p + T_f\right)$ $M_{ot} = 2745.6 \cdot kip \cdot ft$

Factor of Safety: $FS := \dfrac{M_r}{M_{ot}}$ $FS_{req} := 2$ $FS = 2.4$

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

SHEAR CAPACITY IN PIER

$FS := 2$

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

$S_p = 154.1393 \cdot kips$

ShearCheck := if($S_p > S_t$, "Okay", "No Good")

ShearCheck = "Okay"

BEARING PRESSURE CAUSED BY FOOTING

$A_{mat} := W_f^2$ $\qquad A_{mat} = 625 \cdot ft^2$

$$S := \frac{W_f^3}{6}$$ $S = 2604.1667 \cdot ft^3$

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$$ $P_{max} = 1.8144 \cdot ksf$

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$$ $P_{min} = -0.2942 \cdot ksf$

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

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

Distance to Resultant of Pressure Distribution:

$$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3}$$ $X_p = 7.1706 \cdot ft$

Distance to Kern: $$X_k := \frac{W_f}{6}$$ $X_k = 4.1667 \cdot ft$

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

Eccentricity: $$e := \frac{M_{ot}}{WT_{tot}}$$ $e = 5.7794$

Adjusted Soil Pressure: $$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$$ $P_a = 1.885 \cdot ksf$

$$q_{adj} := \text{if}\left(P_{min} < 0, P_a, \frac{P_{max}}{ft^2}\right)$$ $q_{adj} = 1.885 \cdot ksf$

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

CONCRETE BEARING CAPACITY (ACI 10.17)

$\phi_c := 0.75$ (ACI 9.3.2.2)

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

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

SHEAR STRENGTH OF CONCRETE

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

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

$d := T_f - Cvr_{pad} - d_{bbot}$ $d = 32 \cdot in$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$ $d_1 = 9 \cdot ft$

$d_2 := d_1 - d$ $d_2 = 6.3333 \cdot ft$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$ $L = 20.1617 \cdot ft$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$ $Slope = 0.0935 \cdot kcf$

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1$ $V_{req} = 439.1766 \cdot kip$

ACI 11.3.1.1 $V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f'c \cdot psi} \cdot W_f \cdot d$ $V_{Avail} = 1032.1674 \cdot kip$

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

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

$b_o := (d_p + d) \cdot \pi$ $b_o = 30.3687 \cdot ft$

Area included inside bo: $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4}$ $A_{bo} = 73.3911 \cdot ft^2$

Area outside of bo: $A_{out} := A_{mat} - A_{bo}$ $A_{out} = 551.6089 \cdot ft^2$

Guess Value: $v_u := 1\text{ksf}$

(From "Foundation Analysis and design",
By Joseph Bowles, Eq. 8-9)

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

$v_u := \text{Find}(v_u)$ $\qquad v_u = 5.8662 \cdot \text{ksf}$

$V_u := v_u \cdot d \cdot W_f$ $\qquad V_u = 391.0797 \cdot \text{kips}$

$V_{req} := LF \cdot V_u$ $\qquad V_{req} = 521.3092 \cdot \text{kips}$

$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f'c \cdot psi} \cdot b_o \cdot d$ $\qquad V_{Avail} = 2507.649 \cdot \text{kips}$

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

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

Take Maximum Bending at face of Pier:

$q_b := q_{adj} - d_l \cdot \text{Slope}$ $\qquad q_b = 1.0436 \cdot \text{ksf}$

$$M_n := \frac{1}{LF \cdot \phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_l^2}{3} + q_b \cdot \frac{d_l^2}{2} \right] \cdot W_f$$ $\qquad M_n = 1354.1611 \cdot \text{kip} \cdot \text{ft}$

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

$$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2}$$ $\qquad R_u = 8463.5 \, \text{lbf}$

$$\rho := \frac{0.85 \cdot f'c}{fy} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f'c}} \right)$$ $\qquad \rho = 0.001$

$\rho_{min} := 1.333 \cdot \rho$ $\qquad \rho_{min} = 0.00132$

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

(ACI 7.12.2.1b)

FOR BOTTOM BARS: $As := max(\rho, \rho_{min}, \rho_{sh}) \cdot W_f \cdot d$ $As = 17.28 \cdot in^2$

$As_{prov} := A_{bot} \cdot NB_{bot}$ $As_{prov} = 25.28 \cdot in^2$

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

FOR TOP BARS: $As := \rho_{sh} \cdot (W_f \cdot d)$ $As = 17.28 \cdot in^2$

$As_{prov} := A_{btop} \cdot NB_{top}$ $As_{prov} = 25.28 \cdot in^2$

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

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

Bar Spacing: $$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1}$$ $B_{sPad} = 8.4516 \cdot in$

Development Length Factors:

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

Spacing or Cover Dimension: $$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right)$$ $c = 3 \cdot in$

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot}$$ $L_{dbt} = 23.7171 \cdot in$

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

Minimum Development Length: (ACI 12.2.1) $L_{dbtCheck} := if(L_{dbt} \geq L_{dbmin}, \text{"Use L.dbt"}, \text{"Use L.dbmin"})$ $L_{dbtCheck}$ = "Use L.dbt"

Available Length in Pad: $$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad}$$ $L_{Pad} = 105 \cdot in$

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

REINFORCEMENT IN PIER

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

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

$A_{sprov} := NBpier \cdot A_{bpier}$ $\quad A_{sprov} = 28.44 \cdot in^2$

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

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

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $\quad B_{sPier} = 6.3304 \cdot in$

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

Maximum Moment in Pier: $M_p := \left[M_t + S_t \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF$ $\quad M_p = 42714.9186 \cdot in \cdot kips$

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

(defined variables) $(f'_c \ f_y \ cl \ Spiral) = (3 \ 60 \ 3 \ 0)$

The required input is column diameter in inches, number of reinforcing bars, bar size number, factored axial load in kips and moment in kip inches: $(D \ N \ n \ P_u \ M_{xu}) := (84 \ 36 \ 8 \ 31 \ 43000)$

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

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

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio: $(\phi P_n \ \phi M_{xn} \ f_{sp} \ \rho) = (40.0251 \ 55518.6353 \ -60 \ 0.0051)$

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

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

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

DEVELOPMENT LENGTH OF PIER REINFORCEMENT

TENSION (ACI 12.2.3)

Factors for development:

Reinforcement Location Factor $\alpha := 1.0$

Coating Factor $\beta := 1.0$

Concrete strength Factor $\lambda := 1.0$

Reinforcement Size Factor $\gamma := 1.0$

Spacing or Cover Dimension: $c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right)$ $\quad c = 3 \cdot in$

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpier}}} \cdot d_{bpier} \qquad L_{dbt} = 23.7171 \cdot in$$

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

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

$$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f'c}{psi}}} \cdot .7 \qquad L_{dh} = 13.2816 \cdot in$$

$$L_{db} := max(L_{dbt}, L_{dbmin}) \qquad L_{db} = 23.7171 \cdot in$$

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot fy}{\sqrt{f'c \cdot psi}} \qquad L_{dbc1} = 18.9737 \cdot in$$

$$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot (d_{bpier} \cdot fy) \qquad L_{dbmin} = 18 \cdot in$$

$$L_{dbc} := if(L_{dbc1} \ge L_{dbmin}, L_{dbc1}, L_{dbmin}) \qquad L_{dbc} = 18.9737 \cdot in$$

Available Length in Foundation:

$$L_{pier} := L_p - Cvr_{pier} \qquad L_{pier} = 33 \cdot in$$

$$L_{pad} := T_f - Cvr_{pad} \qquad L_{pad} = 33 \cdot in$$

$$L_{tension} := if(L_{pier} + L_{pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"}) = \text{"Okay"} \qquad L_{tension} = \text{"Okay"}$$

$$L_{compression} := if(L_{pier} + L_{pad} > L_{dbc}, \text{"Okay"}, \text{"No Good"}) \qquad L_{compression} = \text{"Okay"}$$

NOTE: Anchor bolts and plate provided, OK

TIE SIZE AND SPACING IN COLUMN

Minimum Tie Size:

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

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

Seismic factor:
(ACI 21.10.5)

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

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

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

$s_{lim3} := D_f \cdot z$ $\quad s_{lim3} = 60 \cdot in$

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

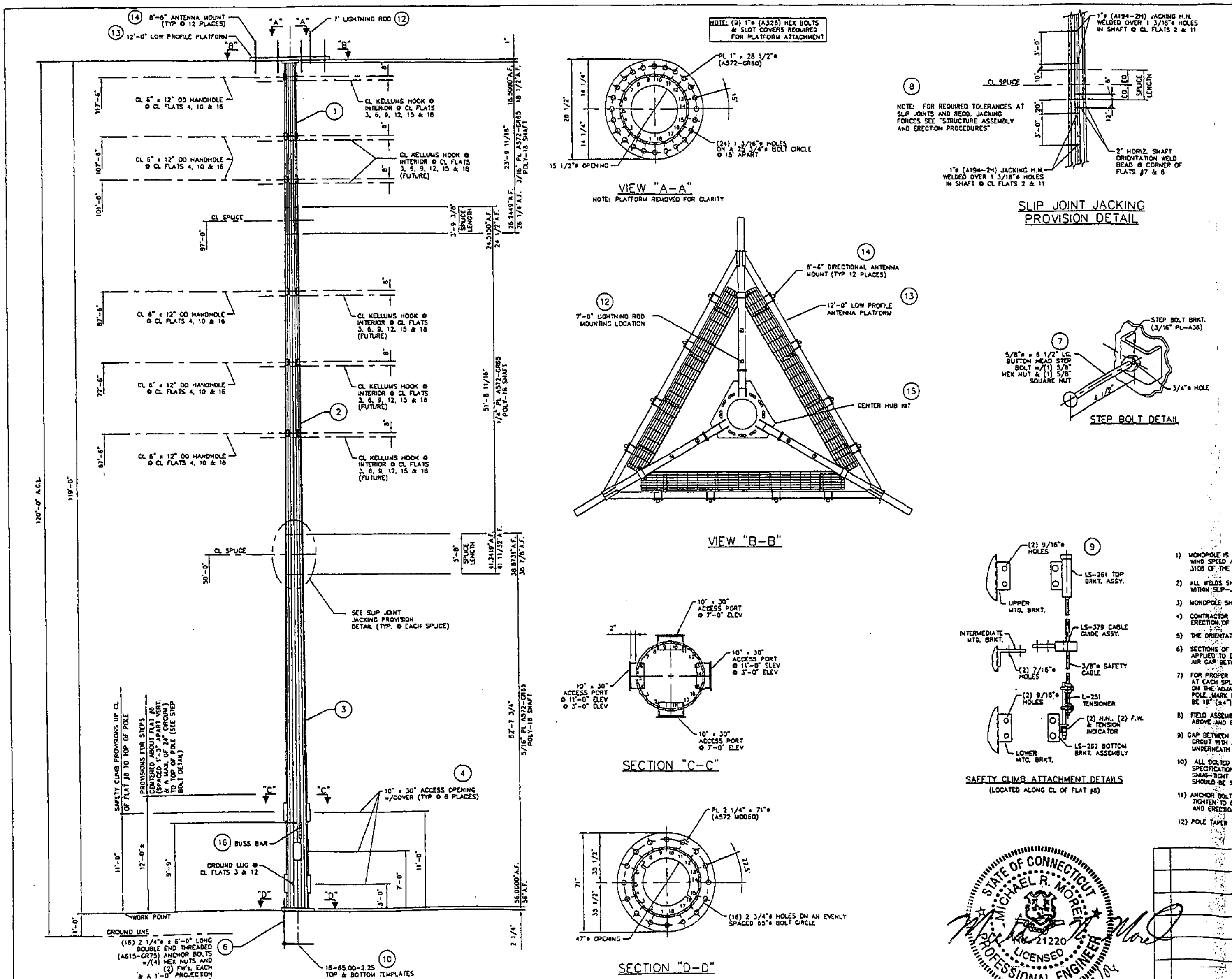
Maximum Spacing:

$$s_{tie} := min\left(\left(\begin{matrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{matrix}\right)\right) \qquad s_{tie} = 16 \cdot in$$

Number of Ties Required:

$$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 \qquad n_{tie} = 2.875$$

Tectonic
Structure & Foundation
Design Calculations
120' Monopole
Site: Tolland-Peter Green Rd./S1680
EEI Job #: 14003-E01



MATERIAL REQ'D. PER ASSEMBLY

GALV. WT.	QTY.	ITEM	MK. NO.	DESCRIPTION
--	1	1	---	SHAFT ASSY. (TOP) 23.89' LG.
--	1	2	---	SHAFT ASSY. (MIDDLE) 51.72' LG.
--	1	3	---	SHAFT ASSY. (BOTTOM) 52.83' LG.
31.41	6	4	K11497	10" x 30" ACCESS PORT COVER PL
		5		HARDWARE AS FOLLOWS:
6.87	18	5/A	K11097	6" x 12" HANDHOLE COVER PL
101.45	16	6	2.25-AB60DE-4	2 1/4"ø x 6'-0" LG. (A615-GR75) ANCHOR BOLTS w/ (4) HEX NUTS (A194-GR2H) & (2) FW's. EACH
1.08	--	7	S10006	5/8"ø x 8 1/2" LG. BUTTON HEAD STEP BOLT w/ (1) HEX & (1) SQUARE NUT EACH
	1	8		STRUCTURE ASSEMBLY AND ERECTION PROCEDURES
	1	9	DBI-120	120'-0" SAFETY CLIMB KIT
	1	9/A	L2010	SAFETY CLIMB HARNESS
122.76	2	10	16-65.00-2.25	SETTING TEMPLATE
0.40	6	11	GS13220	3/8"ø KELLUMS HOOK ASSY.
28.60	1	12	K10333	7' LIGHTNING ROD
1098.42	1	13	K10994A	12'-0" LOW PROFILE ANTENNA PLATFORM
40.91	12	14	K11014	8'-6" LOW PROFILE DIRECTIONAL ANTENNA MOUNTS
292.32	1	15	K11128	CENTER HUB KIT
7.50	1	16	K10062	BUSS BAR KIT

TOTAL GALV. STR. & ACCES. WT. __#__

TOTAL ANCHOR BOLT & TEMPLATE WT. 1868.66#

GENERAL NOTES

1) MONOPOLE IS DESIGNED IN ACCORDANCE WITH TIA/EIA-222F AND STATE OF CONNECTICUT FOR 88 MPH FASTEST MILE WIND SPEED AND 1/2" RADIAL ICE (NON-SIMULTANEOUS). DESIGN MEETS THE REQUIREMENTS OF SECTIONS 1609 & 3108 OF THE 2000 & 2003 IBC FOR 105 MPH 3-SECOND GUST WIND SPEED.
2) ALL WELDS SHALL BE IN ACCORDANCE WITH AWS D.1.1. (LATEST EDITION). LONGITUDINAL SEAM WELDS WITHIN SLIP-JOINT AREA IN FEMALE SECTION SHALL BE 100% PENETRATION.
3) MONOPOLE SHALL BE HOT DIP GALVANIZED PER ASTM A123.
4) CONTRACTOR SHALL THOROUGHLY REVIEW EEI'S ASSEMBLY & ERECTION PROCEDURE PRIOR TO INITIATING THE ERECTION OF THE MONOPOLE.
5) THE ORIENTATION OF THE MONOPOLE SHALL BE VERIFIED PRIOR TO ERECTION OF THE POLE.
6) SECTIONS OF THE MONOPOLE SHALL BE JACKED TOGETHER WITH A MINIMUM JACKING FORCE OF 10,000 lbf APPLIED TO EACH SIDE. FOR A MAXIMUM RECOMMENDED JACKING FORCE, SPLICE LENGTH TOLERANCE, AND AIR GAP BETWEEN SECTIONS REFER TO EEI ASSEMBLY & ERECTION PROCEDURE.
7) FOR PROPER SHAFT ALIGNMENT A 2" HORIZONTAL WELD BEAD AND A MARK ARE POSITIONED ON EACH SHAFT AT EACH SPLICE. THE 2" HORIZONTAL WELD BEADS ARE ON THE MATCHING CORNERS. THE MARK NUMBER IS ON THE ADJACENT FLAT. THE CORNERS WITH WELD BEADS SHALL BE ALIGNED FROM TOP TO BOTTOM OF THE POLE. MARK NUMBERS SHALL BE MATCHED FOR EACH SIDE & THE DISTANCE BETWEEN TWO WELD BEADS SHOULD BE 18" (±4").
8) FIELD ASSEMBLY NUTS (1"ø) FOR JACKING SECTIONS TOGETHER ARE LOCATED ON OPPOSING SECTION FLATS ABOVE AND BELOW SPLICES.
9) GAP BETWEEN TOP OF THE FOUNDATION AND BOTTOM OF THE BASE PLATE MAY BE FILLED WITH A NON-SHRINK GROUT WITH A MINIMUM COMPRESSIVE STRENGTH OF f'=2000 psi. WATER DRAINAGE MUST BE PROVIDED UNDERNEATH THE BASE PLATE TO ENSURE THAT MOISTURE DOES NOT COLLECT INSIDE THE MONOPOLE.
10) ALL BOLTED CONNECTIONS WITH A325 HIGH-STRENGTH BOLTS SHALL BE ASSEMBLED IN ACCORDANCE WITH SPECIFICATIONS FOR STRUCTURAL JOINTS USING A325 OR A490 BOLTS. BOLTS SHALL BE BROUGHT TO SNUG-TIGHT CONDITIONS AS RECOMMENDED BY THE FLANGE SPECIFICATIONS IN FLANGE-TYPE JOINTS AND SHOULD BE SHIMMED IF NECESSARY. THE SHIMS WILL BE SUPPLIED BY EEI.
11) ANCHOR BOLTS SHALL BE TIGHTENED AFTER THE STRUCTURE IS PLUMB. BOTH TOP & BOTTOM NUT SHALL BE TIGHTEN TO 600 ft-lbs MOMENT. FOR DETAIL ANCHOR BOLT INSTALLATION REFER TO EEI ASSEMBLY AND ERECTION PROCEDURE.
12) POLE TAPER = 0.3253in/ft.

NOTE: ALL ELEVATIONS SHOWN FROM BOTTOM OF BASE PLATE UNLESS OTHERWISE NOTED

ERECTION VIEW
SCALE — NONE

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)

STATE OF CONNECTICUT — MICHAEL R. MOREL — 21220 — LICENSED PROFESSIONAL ENGINEER — 3/9/04

ENGINEERED ENDEAVORS INCORPORATED
The Experienced Point of View
7610 Jenther Drive * Mentor, OH 44060-4872
Ph: (440) 918-1101 * Ph: (888) 270-3855
Fx: (440) 918-1108 * www.engend.com

120'-0" MONOPOLE
TECTONIC/CINGULAR
TOLLAND - PETER GREEN RD
S1680
TOLLAND COUNTY, CT

REV	DESCRIPTION	DATE	DRN.	APP.
0	COMPLETED APPROVAL DWG	3/8/2004	J.A.M.	

SCALE: NONE — PROJECT NO. 14003 — SHEET 1 of 1 — DRAWING NO. GS56166

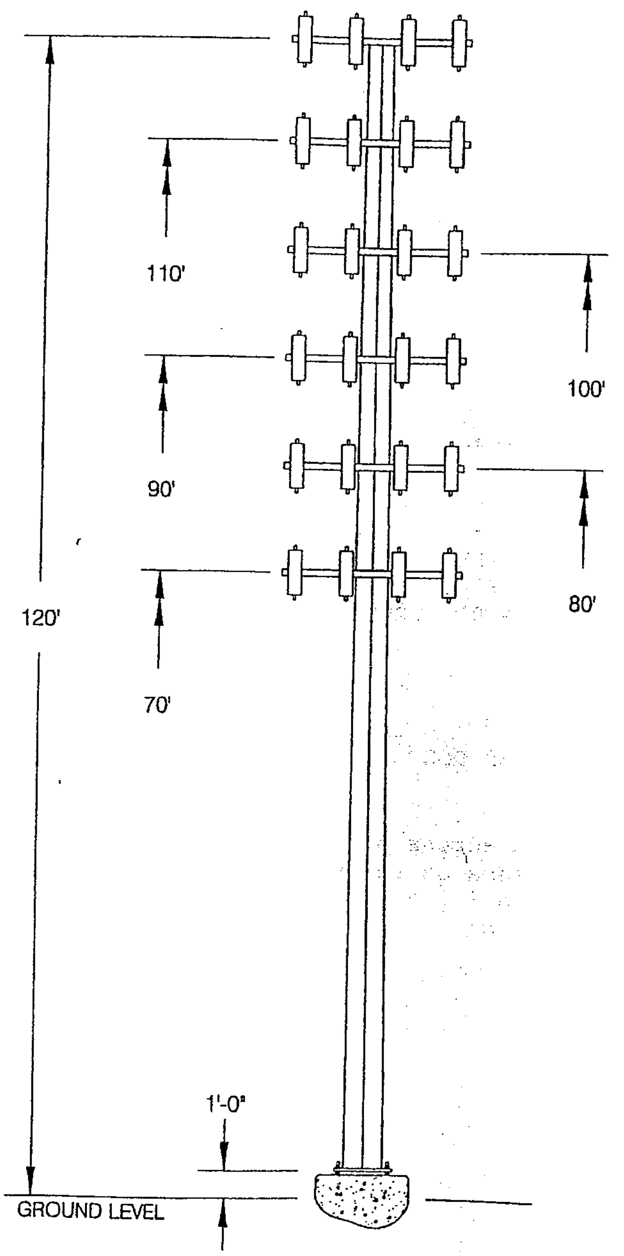
ENGINEERED ENDEAVORS INCORPORATED
The Experienced Point of View

Customer: TECTONIC / CINGULAR
Description: 120' MONOPOLE
EEI Job Number: 14003

EMERSON™ Network Power

SITE INFORMATION
Location: TOLLAND COUNTY, CT
Site Name: TOLLAND - PETER GREEN RD.
Site Number: S1680

DESIGN INFORMATION
Designed By: N. UNGER
Design Date: 3/8/2006
Status: REVISION 0



ANTENNA LOADING

(12) 7770 PANEL ANTENNAS, (6) LGP2140X TMAs, AND (18) LGP13519 DIPLEXERS MOUNTED ON A LOW PROFILE PLATFORM AT 120' (CINGULAR)

(12) ALP 9212 PANEL ANTENNAS MOUNTED ON A LOW PROFILE PLATFORM AT 110' (FUTURE)

(12) ALP 9212 PANEL ANTENNAS MOUNTED ON A LOW PROFILE PLATFORM AT 100' (FUTURE)

(12) ALP 9212 PANEL ANTENNAS MOUNTED ON A LOW PROFILE PLATFORM AT 90' (FUTURE)

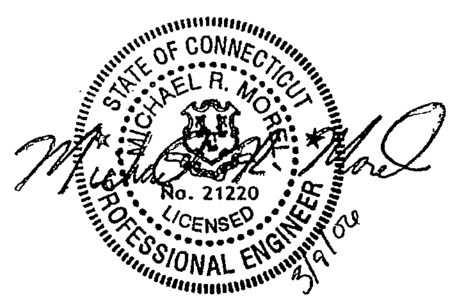
(12) ALP 9212 PANEL ANTENNAS MOUNTED ON A LOW PROFILE PLATFORM AT 80' (FUTURE)

(12) ALP 9212 PANEL ANTENNAS MOUNTED ON A LOW PROFILE PLATFORM AT 70' (FUTURE)

DESIGN CRITERIA

DESIGNED IN ACCORDANCE WITH THE TIA/EIA 222-F AND STATE OF CONNECTICUT FOR 88 MPH FASTEST MILE WIND SPEED AND 1/2" RADIAL ICE (NON-SIMULTANEOUS)

DESIGN MEETS THE REQUIREMENTS OF SECTIONS 1609 AND 3108 OF THE 2000 AND 2003 INTERNATIONAL BUILDING CODES FOR 105 MPH 3-SECOND GUST WIND SPEED



ENGINEERED ENDEAVORS, INC.
7610 Jenther Drive • Mentor, Ohio 44060-4872
Phone: (440) 918-1101 • Phone: (888) 270-3855
Fax: (440) 918-1108 • www.engend.com

IT IS THE RESPONSIBILITY OF THE PURCHASER TO VERIFY THAT THE WIND LOADS AND DESIGN CRITERIA SPECIFIED MEET THE REQUIREMENTS OF ALL LOCAL BUILDING CODES

Engineered Endeavors Inc.

7610 Jenther Drive
Mentor, Ohio 44060
Tel (440) 918-1101 Fax (440) 918-1108

Communications Structure Nonlinear Analysis and Design Program

08:07:22 03-09-2006
Revision 1.3 - 1/22/01
Engineer: NGU

Customer	TECTONIC / CINGULAR
Job Name	14003
Structure	120' MONOPOLE
Location	TOLLAND COUNTY, CT
Site	TOLLAND - PETER GREEN RD. / S1680

OD BOT	OD TOP	NUM. SIDES	THICK INCH	TAPER IN/FT	LENGTH FT	JOINT INCH	JOINT TYPE	YIELD KSI	WEIGHT LBS	JOINT HEIGHT
26.26	18.50	18	0.1875	0.325	23.92	46.00	SLIP	65.0	1062.	97.00
41.32	24.52	18	0.2500	0.325	51.75	68.00	SLIP	65.0	4509.	50.00
56.00	38.85	18	0.3125	0.325	52.83	0.00	BASEPL	65.0	8299.	0.00
			TOTAL TUBE WEIGHT				13870.	POUNDS		
			POLE SHAFT LENGTH				119.00	FEET		

E = 29600.0 KSI
UNIT WGT = 0.283 LBS/CU IN
AISC constants are used for stress reductions.
TUBE SECTIONS HAVE 18 SIDES AND ARE TREATED AS ROUND
Internal bend radius = 3 X T
Tube diameters are measured flat to flat.
Tube diameters are increased by 1.020 for wind across points.
Drag coefficients are increase by 1.300 for steps on the pole.
AISC Tube Shape Coefficient of 1.000 is applied.
REVISED DATA FILE NAME T:\ENG5\JOBS14\14003120

APPURTENANCES

DESCRIPTION	NUM.	ELEV.	Kz	AREA	WGT	Ca	AREA	WGT	Ca	FACTOR
				< WITHOUT ICE		>	< WITH ICE		>	
7770	12	119.	1.443	4.20	35.	1.4000	4.67	68.	1.4000	0.93
TMA	6	119.	1.443	0.68	18.	1.4000	0.83	24.	1.4000	0.91
DIPLEXER	18	119.	1.443	0.11	5.	1.4000	0.17	7.	1.4000	1.06
LOW PROF. PLATF.	1	119.	1.443	7.50	2100.	2.0000	9.00	3250.	2.0000	1.00
ALP 9212-N	12	109.	1.407	3.90	27.	1.4000	4.24	55.	1.4000	0.80
LOW PROF. PLATF.	1	109.	1.407	7.50	2100.	2.0000	9.00	3250.	2.0000	1.00
ALP 9212-N	12	99.	1.369	3.90	27.	1.4000	4.24	55.	1.4000	0.80
LOW PROF. PLATF.	1	99.	1.369	7.50	2100.	2.0000	9.00	3250.	2.0000	1.00
ALP 9212-N	12	89.	1.328	3.90	27.	1.4000	4.24	55.	1.4000	0.80
LOW PROF. PLATF.	1	89.	1.328	7.50	2100.	2.0000	9.00	3250.	2.0000	1.00
ALP 9212-N	12	79.	1.283	3.90	27.	1.4000	4.24	55.	1.4000	0.80
LOW PROF. PLATF.	1	79.	1.283	7.50	2100.	2.0000	9.00	3250.	2.0000	1.00
ALP 9212-N	12	69.	1.235	3.90	27.	1.4000	4.24	55.	1.4000	0.80
LOW PROF. PLATF.	1	69.	1.235	7.50	2100.	2.0000	9.00	3250.	2.0000	1.00

LOAD CASE 1

BASIC LOADING

DEAD LOAD FACTOR 1.00 WIND PSF REDUCTION 1.00 RADIAL ICE 0.00 IN.

WIND VELOCITY 88 BOTTOM 21.17 PSF TOP 30.17 PSF
MAX BASE ROTATION 0.00 DEG

APPLIED APPURTENANCE FORCES

	ELEVATION FT	WEIGHT KIPS	WIND KIPS
7770	119.00	0.420	3.359
TMA	119.00	0.108	0.266
DIPLEXER	119.00	0.095	0.150
LOW PROF. PLATF.	119.00	2.100	0.768
ALP 9212-N	109.00	0.324	2.617
LOW PROF. PLATF.	109.00	2.100	0.749
ALP 9212-N	99.00	0.324	2.546
LOW PROF. PLATF.	99.00	2.100	0.729
ALP 9212-N	89.00	0.324	2.470
LOW PROF. PLATF.	89.00	2.100	0.707
ALP 9212-N	79.00	0.324	2.387
LOW PROF. PLATF.	79.00	2.100	0.683
ALP 9212-N	69.00	0.324	2.296
LOW PROF. PLATF.	69.00	2.100	0.657

TUBE PROPERTIES			MEMBER FORCES			STRESSES			STRESS	TOTAL	
ELEV FT	DIAM IN	WALL IN	SHEAR K	BENDING K-FT	AXIAL K	AXIAL KSI	BEND. KSI	ALLOW KSI	RATIOS	DEFL IN	TILT DEG
119.00	18.50	0.1875	5.00	0.00	2.55	0.24	0.00	50.98	0.00	57.9	4.37
109.00	21.75	0.1875	5.00	49.89	2.55	0.20	8.82	48.80	0.18	48.9	4.26
99.00	24.99	0.1875	9.10	140.62	5.14	0.35	18.76	47.19	0.40	40.2	3.98
97.00	25.64	0.1875	12.87	166.29	7.63	0.51	21.07	46.92	0.46	38.6	3.91
TYPE OF JOINT: SLIP JOINT											
97.00	25.14	0.2500	13.23	166.31	8.22	0.42	16.57	50.71	0.33	38.6	3.91
89.00	27.74	0.2500	13.23	271.91	8.22	0.38	22.19	49.37	0.46	32.3	3.64
79.00	30.98	0.2500	17.13	442.85	11.16	0.46	28.89	48.01	0.61	25.1	3.24
69.00	34.23	0.2500	20.98	652.33	14.34	0.54	34.78	46.91	0.75	18.7	2.79
59.00	37.47	0.2500	24.71	899.14	17.67	0.60	39.92	45.99	0.88	13.4	2.31
50.00	40.40	0.2500	25.33	1127.00	18.79	0.60	43.00	45.30	0.96	9.4	1.87
TYPE OF JOINT: SLIP JOINT											
50.00	39.77	0.3125	26.01	1127.00	21.61	0.56	35.67	47.70	0.76	9.4	1.87
40.00	43.02	0.3125	26.01	1387.02	21.61	0.52	37.46	46.85	0.81	5.9	1.46
30.00	46.26	0.3125	27.39	1653.91	24.58	0.54	38.56	46.12	0.85	3.3	1.07
20.00	49.51	0.3125	27.39	1927.75	24.58	0.51	39.19	45.48	0.87	1.4	0.69
10.00	52.75	0.3125	28.12	2208.94	26.22	0.51	39.50	44.92	0.89	0.4	0.34
0.00	56.00	0.3125	29.38	2497.91	28.89	0.53	39.60	44.42	0.90	0.0	0.00

REACTION COMPONENTS (KIPS AND FT-KIPS)

TRANSVERSE SHEAR	VERTICAL FORCE	WIND SHEAR	MOMENT ABOUT TRANSVERSE	MOMENT ABOUT VERTICAL	MOMENT ABOUT WIND AXIS
0.000	28.889	-29.377	2497.907	0.000	0.000

LOAD CASE 2

BASIC LOADING PLUS ICE

DEAD LOAD FACTOR 1.00 WIND PSF REDUCTION 0.75 RADIAL ICE 0.50 IN.

WIND VELOCITY 88 BOTTOM 15.88 PSF TOP 22.63 PSF
MAX BASE ROTATION 0.00 DEG

APPLIED APPURTENANCE FORCES

	ELEVATION FT	WEIGHT KIPS	WIND KIPS
7770	119.00	0.811	2.801
TMA	119.00	0.144	0.244
DIPLEXER	119.00	0.126	0.174
LOW PROF. PLATF.	119.00	3.250	0.691
ALP 9212-N	109.00	0.660	2.134
LOW PROF. PLATF.	109.00	3.250	0.674
ALP 9212-N	99.00	0.660	2.076
LOW PROF. PLATF.	99.00	3.250	0.656
ALP 9212-N	89.00	0.660	2.014
LOW PROF. PLATF.	89.00	3.250	0.636
ALP 9212-N	79.00	0.660	1.946
LOW PROF. PLATF.	79.00	3.250	0.615
ALP 9212-N	69.00	0.660	1.872
LOW PROF. PLATF.	69.00	3.250	0.591

TUBE PROPERTIES			MEMBER FORCES			STRESSES			STRESS	TOTAL	
ELEV FT	DIAM IN	WALL IN	SHEAR K	BENDING K-FT	AXIAL K	AXIAL KSI	BEND. KSI	ALLOW KSI	RATIOS	DEFL IN	TILT DEG
119.00	18.50	0.1875	4.39	0.00	4.26	0.39	0.00	50.98	0.00	49.2	3.74
109.00	21.75	0.1875	4.39	43.84	4.26	0.34	7.75	48.80	0.16	41.5	3.64
99.00	24.99	0.1875	7.87	122.43	8.41	0.58	16.34	47.19	0.36	34.1	3.40
97.00	25.64	0.1875	11.06	144.55	12.44	0.83	18.31	46.92	0.41	32.7	3.33
TYPE OF JOINT: SLIP JOINT											
97.00	25.14	0.2500	11.35	144.62	13.04	0.67	14.41	50.71	0.29	32.7	3.33
89.00	27.74	0.2500	11.35	235.28	13.04	0.60	19.20	49.37	0.40	27.3	3.10
79.00	30.98	0.2500	14.63	381.34	17.51	0.73	24.87	48.01	0.53	21.2	2.75
69.00	34.23	0.2500	17.83	559.40	22.20	0.83	29.83	46.91	0.65	15.8	2.36
59.00	37.47	0.2500	20.89	768.13	27.03	0.92	34.10	45.99	0.76	11.3	1.95
50.00	40.40	0.2500	21.31	959.83	28.76	0.91	36.62	45.30	0.83	8.0	1.58
TYPE OF JOINT: SLIP JOINT											
50.00	39.77	0.3125	21.75	959.83	30.64	0.79	30.38	47.70	0.65	8.0	1.58
40.00	43.02	0.3125	21.75	1177.30	30.64	0.73	31.79	46.85	0.69	5.0	1.23
30.00	46.26	0.3125	22.68	1399.40	33.61	0.75	32.62	46.12	0.72	2.8	0.90
20.00	49.51	0.3125	23.18	1626.19	35.26	0.73	33.06	45.48	0.74	1.2	0.58
10.00	52.75	0.3125	23.72	1858.00	37.02	0.72	33.23	44.92	0.75	0.3	0.28
0.00	56.00	0.3125	24.09	2095.19	37.93	0.69	33.22	44.42	0.76	0.0	0.00

REACTION COMPONENTS (KIPS AND FT-KIPS)

TRANSVERSE SHEAR	VERTICAL FORCE	WIND SHEAR	MOMENT ABOUT TRANSVERSE	MOMENT ABOUT VERTICAL	MOMENT ABOUT WIND AXIS
0.000	37.927	-24.086	2095.186	0.000	0.000

SUMMARY TABLE

ELEV	STRESS RATIO	AXIAL	BENDING	LOADING
119.00	0.01	2.55	0.0	1 BASIC LOADING
109.00	0.18	2.55	49.9	1 BASIC LOADING
99.00	0.40	5.14	140.6	1 BASIC LOADING
97.00	0.46	7.63	166.3	1 BASIC LOADING
89.00	0.46	8.22	271.9	1 BASIC LOADING
79.00	0.61	11.16	442.8	1 BASIC LOADING
69.00	0.75	14.34	652.3	1 BASIC LOADING
59.00	0.88	17.67	899.1	1 BASIC LOADING
50.00	0.96	18.79	1127.0	1 BASIC LOADING
40.00	0.81	21.61	1387.0	1 BASIC LOADING
30.00	0.85	24.58	1653.9	1 BASIC LOADING
20.00	0.87	24.58	1927.8	1 BASIC LOADING
10.00	0.89	26.22	2208.9	1 BASIC LOADING
0.00	0.90	28.89	2497.9	1 BASIC LOADING

MAXIMUM SUPPORT MOMENT K-FT	2497.91
CORRESPONDING AXIAL FORCE KIPS	28.89
CORRESPONDING SHEAR FORCE KIPS	29.38

BASE PLATE AT ELEVATION 0.00 FEET

TUBE DIAMETER	56.00	INCHES
DESIGN MOMENT	2497.9	KIP FT

DESIGN MOMENT IS 0. DEGREES FROM THE WIND DIRECTION
BOLTS ARE ON THE KNUCKLES OF THE TUBE

APPLIED AXIAL FORCE	28.9	KIPS
APPLIED SHEAR	29.38	KIPS

BOLT DATA

BOLT TYPE	A615 GR75	
BOLTS ARE EVENLY SPACED		
DIAMETER	2.250	INCHES
EFFECTIVE AREA	3.250	SQ IN
TOTAL LENGTH	6.0	FEET
MINIMUM EMBEDMENT	5.0	FEET
NUMBER OF BOLTS	16	
BOLT CIRCLE DIAMETER	65.00	INCHES
ALLOWABLE STRESS	60.0	KSI
APPLIED AXIAL STRESS	36.0	KSI
MAX BOLT FORCE	117.1	KIPS
BOLT BENDING STRESS	2.7	KSI
COMBINED BOLT STRESS	38.7	KSI
CLEARANCE UNDER PLATE	3.25	INCHES
BOLT WEIGHT	1804.8	POUNDS

PLATE DATA

DIAMETER OF PLATE	71.00	INCHES
MATERIAL	A572 MOD60	
PROVIDED THICKNESS	2.250	INCHES
REQUIRED THICKNESS	1.487	INCHES
BOLT HOLE DIAMETER	2.625	INCHES
CENTER HOLE SIZE	47.00	INCHES
NET WEIGHT	1361.2	POUNDS
RAW STOCK WEIGHT	3209.9	POUNDS
SURFACE AREA	29.69	SQ FT
ALLOWABLE STRESS	59.99	KSI
MAX APPLIED STRESS	26.21	KSI
CONCRETE STRENGTH	3000.	PSI

Base Plate - use 71.00 inch ROUND x 2.250 inch A572 MOD60 with (16) 2.250 diameter x 6.00 foot caged A615 GR75 bolts on a 65 inch bolt circle

ENGINEERED
ENDEAVORS
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7610 Jenther Drive * Mentor, OH 44060-4872
Ph: (440) 918-1101 * Ph: (888) 270-3855
Fx: (440) 918-1108 * www.engend.com

DESIGN CALCULATIONS FOR A SPREAD FOOTER FOUNDATION

Tectonic / Cingular
120 ft Monopole

Tolland - Peter Green Rd. / S1680
Tolland County, CT

EEI Project Number 14003
March 9, 2006

FOUNDATION DESIGN CALCULATIONS
FOR
SPREAD FOOTING FOUNDATION

ENGINEERED ENDEAVORS INC.
*7610 Jentner Drive * Mentor, Ohio 44060*
*Tel:(216)918-1101 * Fax:(216)918-1108*

09-Mar-06
09:18 AM

CUSTOMER	TECTONIC / CINGULAR
STRUCTURE	120' MONOPOLE
EEI PROJECT	14003
LOCATION	TOLLAND COUNTY, CT
SITE NAME	TOLLAND - PETER GREEN RD. / S1680

SERVICE LOADS AT BASE OF THE MONOPOLE

	Design Loading
Moment, kip-ft	2497.9
Shear, kips	29.38
Axial Load, kips	28.9

Anchor Bolts	Quantity		16.0
	Length, ft		6.0
	Circle Dia., in		65.0
	Projection, in		12.0
Foundation Parameters			
Pedestal Min. Width, in			83.00
Pedestal Projection, in			12.0
Found. Min Height, ft			5.5
	Height, ft		Width, ft
Footing		3.00	25.00
Pedestal		3.00	7.00

Soil Unit Wt., pcf	120.00
Concrete Unit Wt., pcf	150.00
Slope of backfill, degrees	0.00

Foundation Weight, kips	303.30
Concrete, cub.yd.	74.89
Soil Weight, kips	138.24
Total Vertical Load, kips	470.44
Kern of Eccentricity, ft	4.17
Actual Eccentricity, ft	5.68
Overturning Moment, kip-ft	2674.18
Resisting Moment, kip-ft	5880.50
Allowable Gross Soil Pressure, ksf	0.0
Allowable Net Soil Pressure, ksf	5.0
Gross Soil Pressure, (Service Load), ksf	

H= 2.00
B= 25.00

	(gross)	(net)
max q=	1.84	1.13
min q=	0.00	

Safety Factor Sf= **2.20**

ULTIMATE STRENGTH DESIGN OF FOOTING

CONCRETE, psi	3000
STEEL, KSI	60

SHEAR IN FOOTING

1. CASE I -DEAD LOAD, TWO-WAY SHEAR — U= 1.4*D

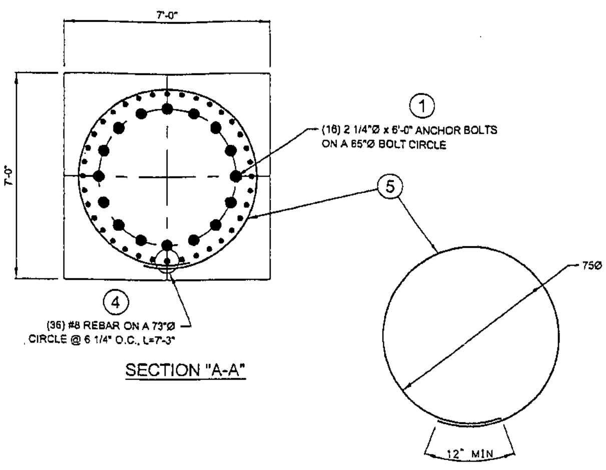
Ultimate Vertical Load, kips	658.62	
Ultimate Pressure, ksf	1.05	
Ultimate shear V, kips	**563.51**	
Design shear Vn, kips	**2547.57**	O.K.

2. CASE II - WIND LOAD, ONE-WAY SHEAR — U=0.9*D+1.6*W

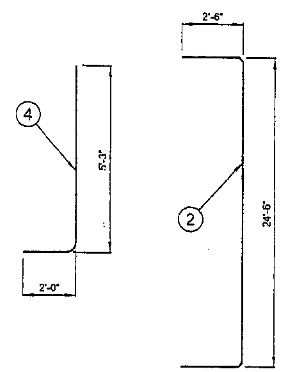
Ultimate Moment, kip-ft		4278.69	
Ultimate Vertical Load, kips		423.40	
Eccentricity, ft		10.11	
Ultimate Pressure, ksf	qult=	4.72	
Dist. from edge to critical sect., ft		6.50	
Pressure distance ft	c=	7.18	
Pressure @ critical section, ksf		0.45	
Ultimate Shear, kips		**419.57**	
Design Shear, kips		**838.02**	O.K.

FLEXURE STRENGTH DESIGN

Ultimate Moment, kip-ft		Case I	1066.96		
		Case II	2796.80	q1=	0.00
Coefficient of Resistance		Rn=	138.1		
Reinforcement Ratio		r=	0.00237		
Min. Reinforcement Ratio		r min	0.00180		
Min. Steel Area, sq.in.		A1	21.31		
Type of Bars		#	8		
		Ab,in^2=	0.79		
BOTTOM	Min. Number of Bars		26.98		
	Actual Number of Bars		32.00		
	Actual Steel Area, sq.in.		25.28		
	Steel Ratio Actual	ra=	0.00281		
	Revised Coef. of Resist	Rn=	168.52		
	Design Moment, kip-ft		**3412.52**		
	Horizontal Spacing, in	shor=	9.48		
TOP	Min. Steel Area, sq.in		16.20		
	Min. Number of Bars		20.51		
	Actual Number of Bars		32.00		
	Top Steel Area, sq.in		25.28		
	Horizontal Spacing, in	shor=	9.48		



SECTION "A-A"



FOUNDATION LOADING	
MOMENT	2497.9 kip-ft
SHEAR	29.4 kips
AXIAL	28.9 kips

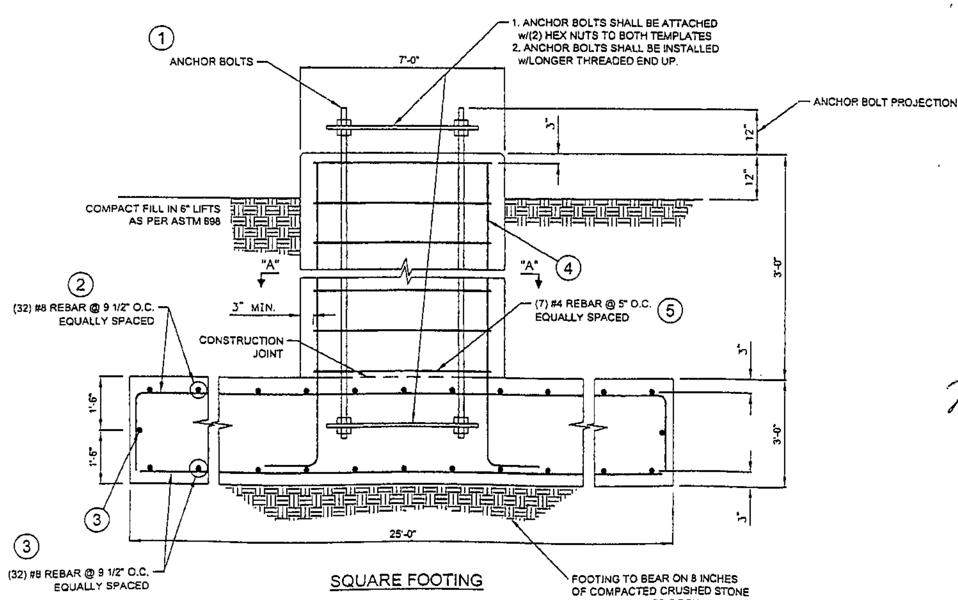
MATERIAL LIST

ITEM	QTY.	DESCRIPTION
1	16	2 1/4"Ø x 6'-0" (A615-GR.75) ANCHOR BOLTS
2	64	#8 REBAR x 29'-6" (ASTM A615-GR.60)
3	68	#8 REBAR x 24'-6" (ASTM A615-GR.60)
4	36	#8 REBAR x 7'-3" (ASTM A615-GR.60)
5	7	#4 REBAR x 21'-9" (ASTM A615-GR.60)

VOL. CONCRETE @ 4000 psi (TYPE II CEMENT)	74.9 yd^3
STEEL (ASTM A615-GR.60)	11634.6 lbs

GENERAL NOTES:

1. FOUNDATION DESIGN IS BASED ON THE FOLLOWING: EEI JOB# 14003, DRAWING# GS56166, SOIL REPORT BY TECTONIC ENGINEERING & SURVEYING CONSULTANTS, P.C., REPORT NO. W.O. 3917.TOLLAND - 03/03/06
2. FOUNDATION EMBEDMENT IS SHOWN FROM THE GROUND LEVEL AT THE TIME OF SOIL INVESTIGATION AS DEPICTED IN THE SOIL REPORT. SHOULD THE ACTUAL SOIL CONDITIONS DIFFER FROM THOSE IN THE REPORT, THE GEOTECHNICAL ENGINEER AND FOUNDATION DESIGNER SHOULD BE NOTIFIED IN ORDER TO RE-EVALUATE THE FOUNDATION DESIGN.
3. SOIL REPORT SHOULD BE CONSULTED PRIOR TO CONSTRUCTION. STEEL CASING OR SLURRY METHOD MAY BE REQUIRED TO PREVENT SOIL FROM CAVING DURING CONSTRUCTION. THE CASING SHOULD BE REMOVED AFTER COMPLETION OF CONCRETING OR, IF LEFT IN THE GROUND, ALL VOIDS AROUND THE CASING SHALL BE FILLED WITH PRESSURIZED GROUT. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES.
4. FOUNDATION EXCAVATION SHALL BE INSPECTED PRIOR TO PLACEMENT OF REINFORCEMENT AND ANCHOR BOLTS.
5. SPECIAL INSPECTION OF REINFORCEMENT, ANCHOR BOLT INSTALLATION, AND CONCRETE IS REQUIRED PER 2003 IBC AND STATE OF CONNECTICUT. FOUNDATION REINFORCEMENT AND ANCHOR BOLTS SHALL BE INSPECTED PRIOR TO PLACEMENT.
6. REINFORCING STEEL SHALL COMFORM TO ASTM A615-87, Fy=60 ksi. REINFORCEMENT SHALL BE ASSEMBLED USING STEEL WIRE. WELDING IS NOT PERMITTED. MINIMUM SPLICE LENGTH: FOR No. 6 BARS AND SMALLER - 44 x Øbar; FOR No. 7 BARS AND LARGER - 55 x Øbar. HORIZONTAL TIES SHALL BE STAGGERED WITH NO MORE THAN 50% OF SPLICES IN ONE PLACE.
7. CONCRETE MIX DESIGN AND CONSTRUCTION PROCEDURE SHALL BE IN COMPLIANCE WITH ACI 318-02, ACI 336.3R-93, AND ALL APPLICABLE STATE AND LOCAL CODES.
   a. MINIMUM COMPRESSIVE STRENGTH - 4000 psi AT 28 DAYS. USE TYPE II CEMENT UNLESS STATED OTHERWISE.
   b. CONCRETE MIX SHOULD HAVE A SLUMP OF 7" (±1") FOR DRILLED PIER AND 3" (±1") FOR MAT FOUNDATIONS.
   c. FOR DRILLED PIERS ONLY THE CONCRETE OVER THE ENTIRE LENGTH OF ANCHOR BOLTS SHALL BE VIBRATED. FOR MAT FOUNDATIONS ALL CONCRETE SHALL BE VIBRATED.
8. ANCHOR BOLT ORIENTATION REQUIRED PRIOR TO CONCRETE PLACEMENT. THE CONTRACTOR SHOULD CONSULT THE SITE PLAN AND MONOPOLE DRAWING FOR PROPER ACCESS PORT ORIENTATION.



SQUARE FOOTING

STATE OF CONNECTICUT
MICHAEL R. MOREY
No. 21220
LICENSED
PROFESSIONAL ENGINEER
3/9/06

REV	DESCRIPTION	DATE	DWN	CHK
0	COMPLETED DRAWING	03/09/06	N.U.	

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TECTONIC / CINGULAR
120'-0" MONOPOLE
TOLLAND - PETER GREEN RD. / S1680
TOLLAND COUNTY, CT

SCALE: N.T.S.	PROJECT NO.	14003
SHEET 1 of 1	DRAWING NO.	14003S-120.0

	Ellington South CT	Site #	
	41-53-47.7	Longitude	72-23-37.5
ch Owner		GEL (Feet)	689.8

ell Info			
MHz Cellular Site Info	ALPHA	BETA	GAMMA
UIPMENT TYPE	Modcell 4.0B	Modcell 4.0B	Modcell 4.0B
NTENNA TYPE	LPA 80063/4CF	LPA 80063/4CF	LPA 80063/4CF
QUANTITY PER FACE	2	2	2
ORIENTATION	0 DEG	120 DEG	240 DEG
DOWN TILT (DEG.)	0 Deg	0 Deg	0 Deg
RAD CTR (FT AGL)	110	110	110
TOWER MOUNTED AMPS (QTY)	NA	NA	NA

New Cell Info			
1900 MHz PCS Site Info	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	PCS Modcell 4.0	PCS Modcell 4.0	PCS Modcell 4.0
ANTENNA TYPE	LPA-185063/12CF_2	LPA-185063/12CF_2	LPA-185063/12CF_2
QUANTITY PER FACE	2	2	2
ORIENTATION	0 DEG	120 DEG	240 DEG
DOWN TILT (DEG.)	0 Deg Mec + 2 Deg Elec	0 Deg Mec + 2 Deg Elec	0 Deg Mec + 2 Deg Elec
RAD CTR (FT AGL)	110	110	110
TOWER MOUNTED AMPS (QTY)	2	2	2

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A5	800	Tx2/Rx0	BLUE	A9	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/WHITE	A6	1900	Tx2/Rx0	BLUE/WHITE	A10	1900	Tx3/Rx0	GREEN/WHITE
A3	1900	Tx4/Rx1	RED/RED/WHITE	A7	1900	Tx5/Rx1	BLUE/BLUE/WHITE	A11	1900	Tx6/Rx1	GREEN/GREEN/WHITE
A4	800	Tx4/Rx1	RED/RED	A8	800	Tx5/Rx1	BLUE/BLUE	A12	800	Tx6/Rx1	GREEN/GREEN

SITE ADDRESS	Tower Owner	o	

Work Requested:

Work Requested:

APPROVALS	INITIALS	DATE
Prepared By : Alex Restrepo > RF Engineer	AR	4/21/2008
Rachel Rea > RF Design Manager		
Mark Gauger > Construction Manager		
Sandy Carter > Regulatory Manager		