ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

ORIGINAL

October 24, 2008

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

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

Dear Mr. Perrone:

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

1. EM-VER-007-080623
Berlin/Kensington – 240 Kensington Road, Berlin, CT

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

Sincerely,

Kenneth C. Baldwin

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

NATCOMM INC.
CONSULTING ENGINEERS

October 21, 2008

Mr. Tim Parks
Verizon Wireless
99 East River Drive
East Hartford, Connecticut 06108

Re:	**Tower Modification Certification Letter**
Project:	**Verizon ~ Berlin-Kensington** 240 Kensington Road Berlin, Connecticut
Tower Owner:	**T-Mobile** 10 Commerce Way Norton, Massachusetts 02766
Engineer:	**Natcomm, Inc.** 63-2 North Branford Road, Branford, CT 06405
Contractor:	**Construction Services of Branford (CSB)** 63-3 North Branford Road, Branford, CT 06405

Natcomm Project No.: 08001.000

Dear Mr. Parks,

We are providing this "Tower Modification Certification Letter" with regard to the reinforcement of the existing 190 ft. monopole by Verizon Wireless at the above referenced site.

The following are the basis for substantiating compliance with the reinforcement design drawings S-1 thru S-5 dated 3/06/2008 as prepared by Natcomm, Inc.:

- Review of the welder's certifications submitted by CSB prepared by IMTL and dated 9/14/06 for Richard Mitchell – found to be acceptable.
- Field observations by Natcomm personnel of tower reinforcement on 9/25/2008, 10/03/2008 and 10/10/2008 confirming compliance with the above referenced documents. Note that equivalent FCAW E71T-11 used in lieu of SMAW E70XX for welding filler metal.
- All exposed metal surfaces and welds protected with ZRC® Cold Galvanizing Compound in accordance with the manufacturers application requirements.

The work under this Contract has been reviewed and found, to the Engineer's best knowledge, information and belief, to be completed in general compliance with the documents referenced above.

Sincerely,

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16694
LICENSED
PROFESSIONAL ENGINEER

Carlo F. Centore, PE
Principal ~ Structural Engineer

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

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

July 25, 2008

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

RE: **EM-VER-007-080623** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 240 Kensington Road, Berlin, Connecticut.

Dear Attorney Baldwin:

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

- The proposed coax cables are installed in one row of 12 cables on the exterior of the tower.
- The modifications specified on drawings S1 through S5 of the structural analysis report dated March 18, 2008 and sealed by Carlo F. Centore, P.E. are completed prior to the antenna installation.
- A signed letter from a Professional Engineer is submitted to the Council to certify that the modifications have been properly completed.

The proposed modifications are to be implemented as specified here and in your notice dated June 23, 2008, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

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

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP/cm

c: The Honorable Adam P. Salina, Mayor, Town of Berlin
Hellyn Riggins, Town Planner, Town of Berlin

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

June 23, 2008

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

RE: **EM-VER-007-080623** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 240 Kensington Road, Berlin, Connecticut.

Dear Mayor Salina:

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

If you have any questions or comments regarding this proposal, please call me or inform the Council by July 7, 2008.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/jb

Enclosure: Notice of Intent

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

ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

EM-VER-007-080623

ORIGINAL

June 23, 2008

RECEIVED
JUN 23 2008
CONNECTICUT
SITING COUNCIL

Via Hand Delivery

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

Re: **Notice of Exempt Modification**
240 Kensington Road, Berlin, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to install antennas on the existing 190-foot self-supporting monopole owned by The Town of Berlin at 240 Kensington Road in Berlin, 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 Roger L. Kemp, Interim Town Manager of the Town of Berlin. The Town of Berlin is the owner of the property on which the tower is located.

The facility consists of a 190-foot self-supporting monopole tower capable of supporting multiple carriers within a fenced compound at 240 Kensington Road in Berlin. The tower is currently shared by the Town at various levels; T-Mobile with antennas at the 181-foot level; AT&T with antennas located at the 151-foot level; and Nextel with antennas located at the 118-foot level on the tower. Cellco intends to install six (6) LPA-80080/6CF antennas and six (6) LPA 185080/12CF antennas at the 160-foot level on the tower. Associated equipment, including a diesel fueled back-up generator, will be located within a 12' x 30' equipment shelter on the ground near the base of the tower. Attached behind Tab 1 are Project Plans for the proposed Cellco facility.

The planned modifications to the Berlin 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 160-foot level on the 190-foot tower.

2. The proposed installation of associated equipment within a shelter will not require an extension of the fenced compound or 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 existing and Cellco antennas would be 80.97 % of the FCC standard. A cumulative power density calculations table is included behind Tab 2.

Included behind Tab 3 is a Structural Analysis Report and Reinforcement Design confirming that, with modifications, the tower can support the existing and Cellco antennas, and associated equipment.

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

Sincerely,

Kenneth C. Baldwin

Attachments
Copy to:

Roger L. Kemp, Berlin Interim Town Manager
Sandy M. Carter
Michelle Kababik

CELLCO PARTNERSHIP
DBA
verizon wireless

BERLIN-KENSINGTON

240 KENSINGTON ROAD
BERLIN, CONNECTICUT 06037

GENERAL NOTES

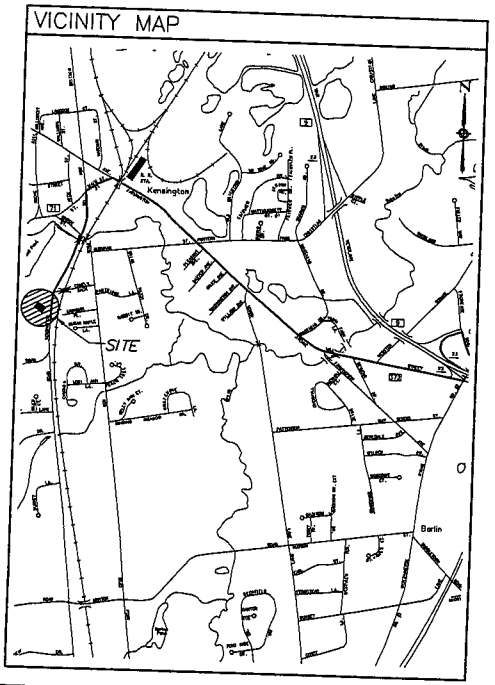
1. THE TYPE, DIMENSIONS, MOUNTING HARDWARE, AND POSITIONS OF ALL PROJECT OWNER'S EQUIPMENT ARE SHOWN IN ILLUSTRATIVE FASHION. THESE DRAWINGS ARE NOT INTENDED FOR CONSTRUCTION. ACTUAL HARDWARE DETAILS AND FINAL LOCATIONS MAY DIFFER SLIGHTLY FROM WHAT IS SHOWN.

2. THE PROJECT OWNER'S PCS FACILITY IS AN UNMANNED PRIVATE AND SECURED EQUIPMENT INSTALLATION. IT IS ONLY ACCESSED BY TRAINED TECHNICIANS FOR PERIODIC ROUTINE MAINTENANCE AND THEREFORE DOES NOT REQUIRE ANY WATER OR SANITARY SEWER SERVICE. THE FACILITY IS NOT GOVERNED BY REGULATIONS REQUIRING PUBLIC ACCESS PER ADA REQUIREMENTS.

3. THE DESIGN OF ANTENNA MOUNTING HARDWARE WILL MEET THE ANSI/EIA/TIA-222-F STANDARDS FOR STRUCTURAL STEEL ANTENNA SUPPORTING STRUCTURES AND STATE BUILDING CODE REQUIREMENTS. DETAILED CONSTRUCTION DRAWINGS AND STRUCTURAL CALCULATIONS WILL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED WITH A BUILDING PERMIT APPLICATION FOR REVIEW AND APPROVAL BY THE LOCAL BUILDING CODE ENFORCEMENT OFFICIAL.

4. ONCE THE FACILITY BECOMES FULLY OPERATIONAL, NORMAL AND ROUTINE MAINTENANCE BY PROJECT OWNER'S TECHNICIANS WILL BE PERFORMED ON A MONTHLY BASIS. THEREFORE, THE ESTIMATED VEHICLE TRIP GENERATION RATE IS 2 TRIPS PER MONTH. THE AVERAGE DAILY TRIP GENERATION RATE (ADT) IS 0.07.

VICINITY MAP



PROJECT SUMMARY

SITE NAME:	BERLIN-KENSINGTON
SITE ADDRESS:	240 KENSINGTON ROAD BERLIN, CONNECTICUT 06037
CONTACT PERSON	CELLCO PARTNERSHIP DBA VERIZON WIRELESS SANDY CARTER (860) 803-8219
PROPERTY OWNER:	TOWN OF BERLIN 240 KENSINGTON ROAD BERLIN, CONNECTICUT 06037
JURISDICTION:	CONNECTICUT SITING COUNCIL
ARCHITECT:	URS CORPORATION A.E.S. 500 ENTERPRISE DRIVE, SUITE 3B ROCKY HILL, CT 06067
M/E/P ENGINEER:	URS CORPORATION A.E.S. 500 ENTERPRISE DRIVE, SUITE 3B ROCKY HILL, CT 06067
LATITUDE:	41° 37' 37" NAD 83
LONGITUDE:	72° 46' 36" NAD 83

LEGEND

SYMBOL	DESCRIPTION
	SECTION OR DETAIL NUMBER SHEET WHERE DETAIL/SECTION OCCURS
	ELEVATION NUMBER SHEET WHERE ELEVATION OCCURS

ABBREVIATIONS

MIN.	MINIMUM
V.I.F.	VERIFY IN FIELD
O.C.	ON CENTER
PSF	POUND/SQUARE FOOT
TYP.	TYPICAL
TOC	TOP OF CONCRETE
TOW	TOP OF WALL
FT.	FEET
SQ.FT.	SQUARE FEET
N/A	NOT APPLICABLE

SHEET INDEX

SHT. NO.	DESCRIPTION
T-1	TITLE SHEET - GENERAL NOTES AND LEGENDS
SC-1	COMPOUND PLAN AND MONOPOLE ELEVATION

CELLCO PARTNERSHIP
DBA
verizon wireless

A&E FIRM
URS CORPORATION AES
500 ENTERPRISE DRIVE
SUITE 3B
ROCKY HILL, CONNECTICUT
1-(860)-529-8882

A&E SEAL

SITE NAME: BERLIN-KENSINGTON
PROJECT ID: 2007220515
PROJECT TYPE: PCSCA
LOCATION CODE: 178064
SITE ADDRESS:
240 KENSINGTON ROAD
BERLIN, CONNECTICUT
06037

PROJECT NO: 36931070
JOB NO: VZI-245
DRAWN BY: KAP/RRH
CHECKED BY: MJE

ISSUED FOR

A	06-20-08	REVIEW

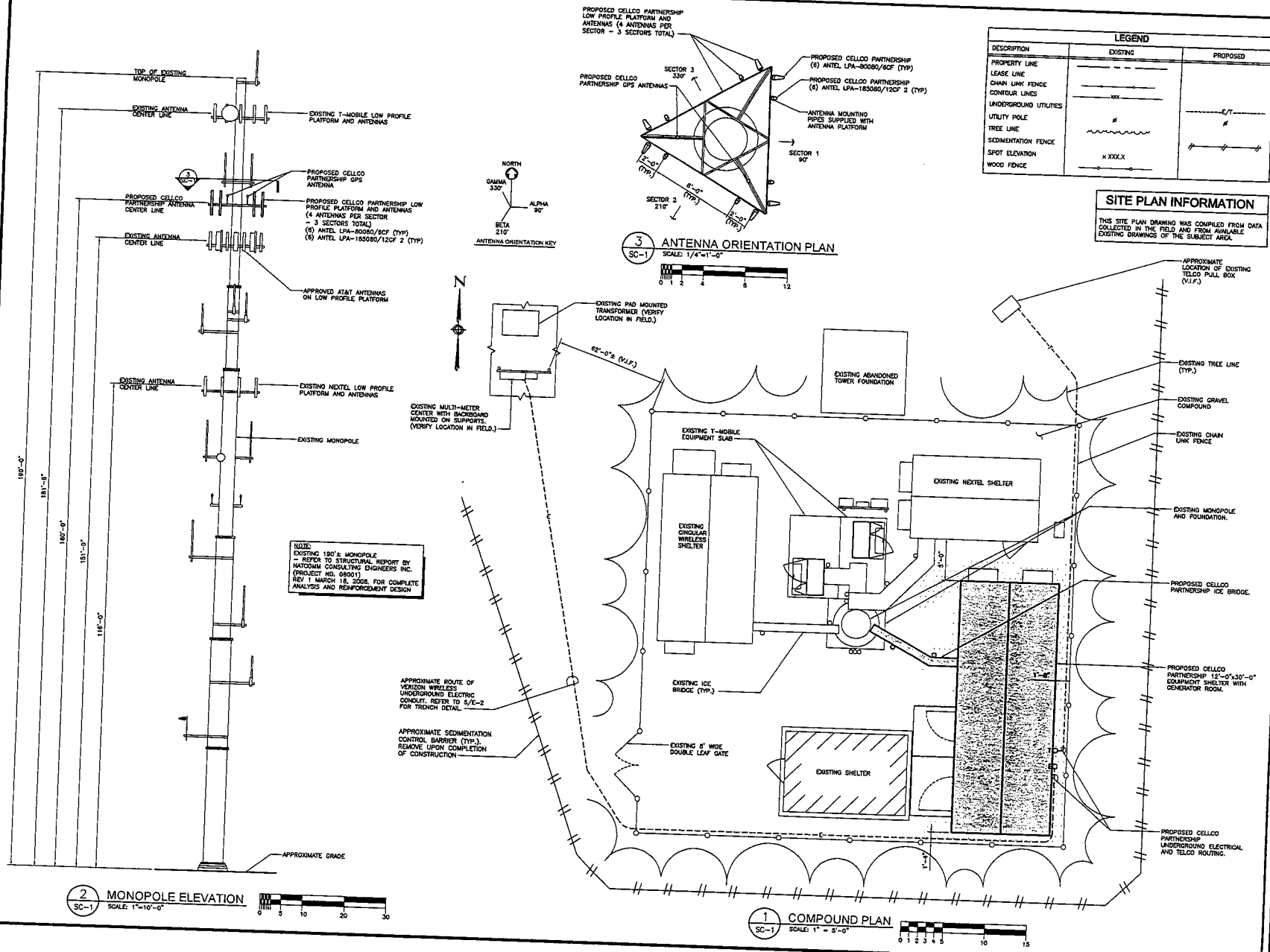
BERLIN-
KENSINGTON

240 KENSINGTON ROAD
BERLIN, CONNECTICUT 06037

SCALE: AS NOTED

TITLE SHEET -
GENERAL NOTES
AND LEGENDS

T-1



LEGEND		
DESCRIPTION	EXISTING	PROPOSED
PROPERTY LINE		
LEASE LINE		
CHAIN LINK FENCE		
CONTOUR LINES	XXX	
UNDERGROUND UTILITIES		E/T
UTILITY POLE		
TREE LINE		
SEDIMENTATION FENCE		
SPOT ELEVATION	x XXX.X	
WOOD FENCE		

SITE PLAN INFORMATION

THIS SITE PLAN DRAWING WAS COMPILED FROM DATA COLLECTED IN THE FIELD AND FROM AVAILABLE EXISTING DRAWINGS OF THE SUBJECT AREA.

CELLCO PARTNERSHIP
DBA
verizon wireless

A&E FIRM
BBS CONSULTANTS LLC
500 ENTERPRISE DRIVE
SUITE 3B
ROCKY HILL, CONNECTICUT
1-(860)-529-8882

A&E SEAL

SITE NAME: BERLIN-KENSINGTON
PROJECT ID: 2007220515
PROJECT TYPE: PCSCA
LOCATION CODE: 178064
SITE ADDRESS:
240 KENSINGTON ROAD
BERLIN, CONNECTICUT
06037

PROJECT NO: 36931070
JOB NO: VZ1-245
DRAWN BY: KAP/RRH
CHECKED BY: MJE

ISSUED FOR

A	06-20-08	REVIEW

BERLIN-
KENSINGTON

240 KENSINGTON ROAD
BERLIN, CONNECTICUT 06037

SCALE: AS NOTED

COMPOUND PLAN AND MONOPOLE ELEVATION

SC-1

	General	Power	Density					
Site Name: Berlin/Kensington								
Tower Height: Verizon @ 160Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Cingular UMTS	1	500	149	0.0081	880	0.5867	1.38%	
*Cingular GSM	8	296	149	0.0384	880	0.5867	6.54%	
*Cingular GSM	2	427	149	0.0138	1900	1.0000	1.38%	
*VoiceStream	8	241	182	0.0209	1930	1.0000	2.09%	
*Nextel	9	100	116	0.0240	851	0.5673	4.24%	
*Town of Berlin			194	0.0048	850	0.5667	0.84%	
*Town of Berlin			165	0.0013	45	0.2000	0.65%	
*Town of Berlin			165	0.0066	159	0.2000	3.30%	
*Town of Berlin			132	0.0021	45	0.2000	1.05%	
*Town of Berlin			136	0.0097	154	0.2000	4.85%	
*Town of Berlin			99	0.0073	45	0.2000	3.65%	
*Town of Berlin			75	0.0319	155	0.2000	15.95%	
*Town of Berlin			59	0.0516	850	0.5667	9.11%	
*Town of Berlin			45	0.0177	450	0.3000	5.90%	
Verizon	**3**	**410**	**160**	**0.0173**	**1970**	**1.0000**	**1.73%**	
Verizon	**9**	**348**	**160**	**0.0440**	**875**	**0.5830**	**7.55%**	
								80.97%
* Source: Siting Council								

Natcomm, Inc.
Structural Monopole Analysis
190' Existing PiROD Monopole
Berlin, Connecticut
Revision 1 ~ March 18, 2008

Table of Contents

NATCOMM INC.
CONSULTING ENGINEERS

Structural Analysis Report & Reinforcement Design

190' Existing Monopole

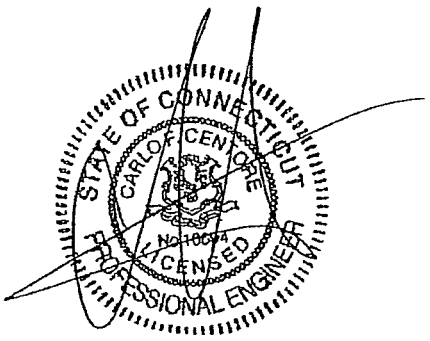
240 Kensington Road
Berlin, CT

APPROVED - 4/18/08
T-Mobile Tower Asset Mgt.

Natcomm Project No. 08001

~~Date: March 6, 2008~~

Rev. 1: March 18, 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

- **VERIZON (Proposed):**
  Antennas: Six (6) Amphenol Antel, Inc. (Antel) LPA-80080-6CF and six (6) Antel LPA-185080/12CF panel antennas mounted on a 13-ft Low Profile platform with a RAD center elevation of 160-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" Ø coax cables running on the outside of the existing tower.
- **AT&T (Proposed):**
  Antennas: Six (6) DUO1417-8686 and three (3) Powerwave 7770.00 panel antennas, six (6) TMA's and three (3) LPG13519 diplexers mounted on a PiROD 15-ft Low Profile Platform with a RAD center elevation of 151-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-1/4" Ø coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) DB224 antenna mounted to AT&T's Low Profile Platform with a RAD center elevation of 151-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) SRL233 antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 136-ft above the existing tower base plate.
  Coax Cables: One (1) 7/8" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) DB205-A antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 132-ft above the existing tower base plate.
  Coax Cables: One (1) 7/8" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) 10-ft x 3" Ø Omnidirectional (whip) antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 129-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" Ø coax cable running on the inside of the existing tower.
- SPRINT (Existing):
  Antennas: Twelve (12) 844G90VTA-SX panel antennas mounted on a PiROD 15-ft Low Profile Platform with a RAD center elevation of 116-ft above the existing tower base plate.
  Coax Cables: Twelve (12) 1-5/8" Ø coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: Two (2) DB205-A antennas and one (1) 2-ft Ø Grid Dish antenna mounted on a two (2) PiROD 5" Tube x 58" Standoffs with a RAD center mount elevation of 99-ft above the existing tower base plate.
  Coax Cables: Three (3) 7/8" Ø coax cables running on the inside of the existing tower.

Natcomm, Inc.
Structural Monopole Analysis
190' Existing PiROD Monopole
Berlin, Connecticut
Revision 1 ~ March 18, 2008

Introduction

This report was prompted, at the request of Verizon Wireless, by a structural analysis, prepared by GPD Associates, in which the structural capacity of the existing 190-ft monopole (tower) was found to exceed its original design capacity. The subject tower is located at 240 Kensington Road in Berlin, Connecticut. The tower is a 190-ft monopole originally designed and manufactured circa 1999 by PiROD Inc. The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the existing tower considering proposed structural reinforcement modifications required to adequately support the aforementioned antenna installation proposed by Verizon.

The existing tower is constructed of eleven (11) stacked pipe sections connected by bolted flange plate connections. The pipe sections vary in width with a base section of 60" Ø and a top section of 18" Ø. The tower geometry and structure member sizes were taken from PiROD's original design drawings; dated May 4, 1999, PiROD job no. A-115400. Antenna and appurtenance inventory information was taken from the aforementioned structural analysis prepared by GPD Associates; dated October 22, 2007, GPD project no. 2007293.67.

Both PiROD's original design drawings and GPD's structural analysis design documents are available for reference in Section 5 of this report.

Antenna and Appurtenance Summary

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

- TOWN (Existing):
  Antennas: One (1) DB589 antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 189-ft above the existing tower base plate.
  Coax Cables: One (1) 7/8" Ø coax cable running on the inside of the existing tower.
- T-MOBILE (Existing):
  Antennas: Twelve (12) DR65-19-00DP panel antennas and twelve TMA's mounted on a PiROD 15-ft Low Profile Platform with a RAD center elevation of 181.67-ft above the existing tower base plate.
  Coax Cables: Twenty-four (24) 1-5/8" Ø coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) 4' Ø dish antenna mounted to T-Mobile's Low Profile Platform with a RAD center elevation of 181.67-ft above the existing tower base plate.
  Coax Cables: One (1) 7/8" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing/Relocated):
  Antennas: One (1) DB205-A and one (1) SRL224 antennas mounted with a RAD center elevation of 168-ft above the existing tower base plate.
  Coax Cables: Two (2) 7/8" Ø coax cables running on the inside of the existing tower.

- UNKNOWN (Existing):
  Antennas: Two (2) GPS antennas mounted with a RAD center elevation of 90-ft above the existing tower base plate.
  Coax Cables: Two (2) 1/2" Ø coax cables running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) SRL233 antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 75-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) DB583 antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 59-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) 5-ft x 3" Ø Omnidirectional (whip) antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 45-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" Ø coax cable running on the inside of the existing tower.
- TOWN (Existing):
  Antennas: One (1) MYA4505 antenna mounted on a PiROD 5" Tube x 58" Standoff with a RAD center mount elevation of 32-ft above the existing tower base plate.
  Coax Cables: One (1) 1/2" Ø coax cable running on the inside of the existing tower.

Natcomm, Inc.
Structural Monopole Analysis
190' Existing PiROD Monopole
Berlin, Connecticut
Revision 1 ~ March 18, 2008

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed within tower.
- **Verizon's coax cables to be installed in one (1) row of twelve (12) cables on the exterior of the tower.**
- **The proposed reinforcing will be installed (prior to Verizon and Cingular proposed antenna installation) as shown in drawings S-1 thru S-5 in Section 4 of this report.**
- A new porthole will not be required.

Analysis

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

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

Natcomm, Inc.
Structural Monopole Analysis
190' Existing PiROD Monopole
Berlin, Connecticut
Revision 1 ~ March 18, 2008

Tower Loading

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

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

Tower Capacity

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

Calculated stresses **were** found to be within allowable limits **considering the installation of the proposed reinforcement**. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **99.8%** of its total capacity.

Foundation and Anchors

The existing foundation consists of a 7-ft Ø reinforced concrete pedestal with a 20.5-ft square reinforced concrete pad bearing directly on the existing sub grade. The sub grade conditions used in the foundation analysis were derived from the aforementioned PiROD structural design documents available for reference in Section 5 of this report. The monopole tower is connected to the pedestal by means of fifty-two (52) 1.25" Ø, A687 anchor bolts embedded approximately 6-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 = **30.3** kips
  - Moment @ top of pedestal = **3,715** ft-kips
  - Axial Force @ top of pedestal = **57.2** kips
- The base plate, anchor bolts and the foundation are within allowable limits.
- Considering the additional overburden weight of existing equipment support foundations in the vicinity of the tower, the tower 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 antenna configuration **as modified by the proposed tower reinforcement delineated on drawings S1 thru S5 located in Section 4 of this report**.

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

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 16694
LICENSED
PROFESSIONAL ENGINEER

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

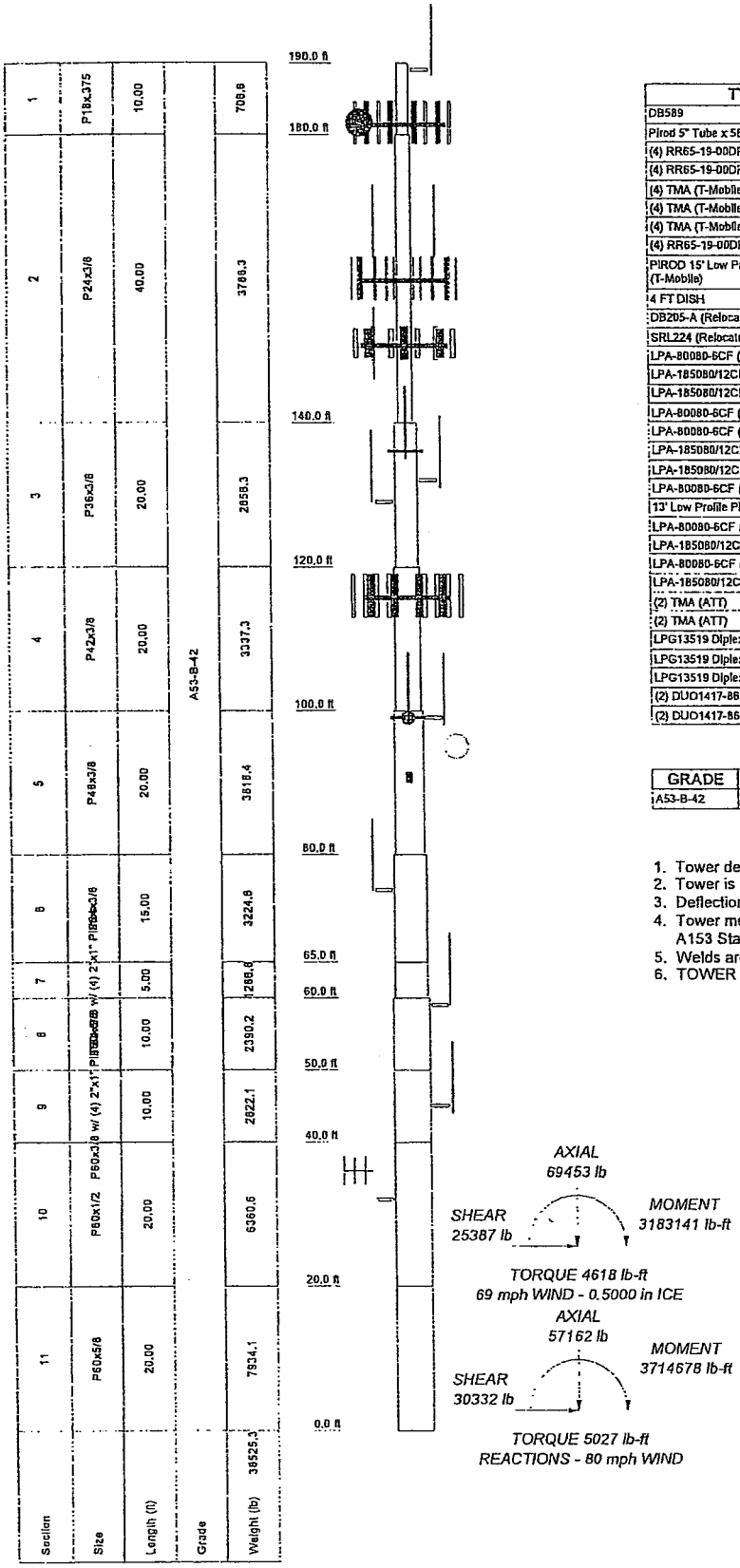
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Natcomm, Inc. or generated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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

RISATower Features:

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



AXIAL
69453 lb

SHEAR
25387 lb

MOMENT
3183141 lb-ft

TORQUE 4618 lb-ft
69 mph WIND - 0.5000 in ICE

AXIAL
57162 lb

SHEAR
30332 lb

MOMENT
3714678 lb-ft

TORQUE 5027 lb-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB589	193.25	(2) DUO1417-8686 (ATT)	151
Pirod 5" Tube x 58" Standoff	189	PIROD 15' Low Profile Platform (ATT)	151
(4) RR65-19-00DP (T-Mobile)	181.67	7770.00 (ATT)	151
(4) RR65-19-00DP (T-Mobile)	181.67	DB224	151
(4) TMA (T-Mobile)	181.67	7770.00 (ATT)	151
(4) TMA (T-Mobile)	181.67	7770.00 (ATT)	151
(4) TMA (T-Mobile)	181.67	(2) TMA (ATT)	151
(4) RR65-19-00DP (T-Mobile)	181.67	SRL233	140
PIROD 15' Low Profile Platform (T-Mobile)	181.67	Pirod 5" Tube x 58" Standoff	136
		DB205-A	136
4 FT DISH	181.67	10' x 3" Dia Omni	134
DB205-A (Relocated)	168	Pirod 5" Tube x 58" Standoff	132
SRL224 (Relocated)	168	Pirod 5" Tube x 58" Standoff	129
LPA-80080-6CF (Verizon)	160	(4) 844G90VTA-SX (Sprint)	116
LPA-185080/12CF (Verizon)	160	(4) 844G90VTA-SX (Sprint)	116
LPA-185080/12CF (Verizon)	160	PIROD 15' Low Profile Platform (Sprint)	116
LPA-80080-6CF (Verizon)	160		
LPA-80080-6CF (Verizon)	160	(4) 844G90VTA-SX (Sprint)	116
LPA-185080/12CF (Verizon)	160	DB205-A	103
LPA-185080/12CF (Verizon)	160	DB205-A	103
LPA-80080-6CF (Verizon)	160	Pirod 5" Tube x 58" Standoff	99
13' Low Profile Platform (Verizon)	160	Pirod 5" Tube x 58" Standoff	99
LPA-80080-6CF (Verizon)	160	2 FT Grid Dish	99
LPA-185080/12CF (Verizon)	160	(2) GPS	90
LPA-80080-6CF (Verizon)	160	SRL233	80
LPA-185080/12CF (Verizon)	160	Pirod 5" Tube x 58" Standoff	75
(2) TMA (ATT)	151	DB583	64
(2) TMA (ATT)	151	Pirod 5" Tube x 58" Standoff	59
LPG13519 Diplexer (ATT)	151	5' x 3" Dia Omni	49
LPG13519 Diplexer (ATT)	151	Pirod 5" Tube x 58" Standoff	45
LPG13519 Diplexer (ATT)	151	MYA4505	36
(2) DUO1417-8686 (ATT)	151	Pirod 5" Tube x 58" Standoff	32
(2) DUO1417-8686 (ATT)	151		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-42	42 ksi	63 ksi			

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 99.8%

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

Job: *190' Pirod Monopole*			
Project: *08001 - 240 Kensington Road, Berlin, CT*			
Client: Verizon	Drawn by: Staff	App'd:	
Code: TIA/EIA-222-F	Date: 03/03/08	Scale: NTS	
Path:		Dwg No. E-1	

RISATower	Job	Page
	190' Pirod Monopole	1 of 39
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 08001 - 240 Kensington Road, Berlin, CT	Date 20:03:08 03/03/08
	Client Verizon	Designed by Staff

Tower Input Data

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

Basic wind speed of 80 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Treat Feedline Bundles As Cylinder
Consider Moments - Horizontals	Assume Legs Pinned	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Diagonals	√ Assume Rigid Index Plate	Calculate Redundant Bracing Forces
Use Moment Magnification	Use Clear Spans For Wind Area	Ignore Redundant Members in FEA
√ Use Code Stress Ratios	Use Clear Spans For KL/r	SR Leg Bolts Resist Compression
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	All Leg Panels Have Same Allowable
Escalate Ice	Bypass Mast Stability Checks	Offset Girt At Foundation
Always Use Max Kz	√ Use Azimuth Dish Coefficients	√ Consider Feedline Torque
Use Special Wind Profile	√ Project Wind Area of Appurt.	Include Angle Block Shear Check
Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Poles
Leg Bolts Are At Top Of Section	SR Members Have Cut Ends	Include Shear-Torsion Interaction
Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	Always Use Sub-Critical Flow
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Use Top Mounted Sockets
Add IBC .6D+W Combination		

Pole Section Geometry

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	190.00-180.00	10.00	P18x.375	A53-B-42 (42 ksi)	
L2	180.00-140.00	40.00	P24x3/8	A53-B-42 (42 ksi)	
L3	140.00-120.00	20.00	P36x3/8	A53-B-42 (42 ksi)	
L4	120.00-100.00	20.00	P42x3/8	A53-B-42 (42 ksi)	
L5	100.00-80.00	20.00	P48x3/8	A53-B-42 (42 ksi)	

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L6	80.00-65.00	15.00	P54x3/8	A53-B-42 (42 ksi)	
L7	65.00-60.00	5.00	P54x3/8 w/ (4) 2"x1" Plates	A53-B-42 (42 ksi)	
L8	60.00-50.00	10.00	P60x3/8	A53-B-42 (42 ksi)	
L9	50.00-40.00	10.00	P60x3/8 w/ (4) 2"x1" Plates	A53-B-42 (42 ksi)	
L10	40.00-20.00	20.00	P60x1/2	A53-B-42 (42 ksi)	
L11	20.00-0.00	20.00	P60x5/8	A53-B-42 (42 ksi)	

Tower Elevation ft	Gusset Area (per face) ft²	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 190.00-180.00				1	1	1		
L2 180.00-140.00				1	1	1		
L3 140.00-120.00				1	1	1		
L4 120.00-100.00				1	1	1		
L5 100.00-80.00				1	1	1		
L6 80.00-65.00				1	1	1		
L7 65.00-60.00				1	1.074	1.05		
L8 60.00-50.00				1	1	1		
L9 50.00-40.00				1	1.067	1.05		
L10 40.00-20.00				1	1	1		
L11 20.00-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft²/ft	Weight plf
7/8	A	No	Inside Pole	190.00 - 3.00	1	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
7/8	B	No	Inside Pole	165.00 - 3.00	2	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1 5/8 (T-Mobile)	C	No	Inside Pole	182.00 - 3.00	24	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1 5/8 (Verizon)	A	No	CaAa (Out Of Face)	160.00 - 3.00	1	No Ice	0.20	1.04
						1/2" Ice	0.30	2.55
1 5/8 (Verizon)	A	No	CaAa (Out Of Face)	160.00 - 3.00	11	No Ice	0.00	1.04
						1/2" Ice	0.00	2.55
1 1/4 (ATT)	B	No	Inside Pole	151.00 - 3.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
1/2	C	No	Inside Pole	151.00 - 3.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
7/8	A	No	Inside Pole	136.00 - 3.00	1	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
7/8	B	No	Inside Pole	132.00 - 3.00	1	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1/2	C	No	Inside Pole	129.00 - 3.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1 5/8 (Sprint)	A	No	Inside Pole	116.00 - 3.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
1/2	B	No	Inside Pole	99.00 - 3.00	3	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2	C	No	Inside Pole	90.00 - 3.00	2	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2	A	No	Inside Pole	75.00 - 3.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2	B	No	Inside Pole	59.00 - 3.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2	C	No	Inside Pole	45.00 - 3.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
1/2	A	No	Inside Pole	32.00 - 3.00	1	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	190.00-180.00	A	0.000	0.000	0.000	0.000	5.40
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	49.92
L2	180.00-140.00	A	0.000	0.000	0.000	3.960	271.20
		B	0.000	0.000	0.000	0.000	114.12
		C	0.000	0.000	0.000	0.000	1001.15
L3	140.00-120.00	A	0.000	0.000	0.000	3.960	269.04
		B	0.000	0.000	0.000	0.000	186.48
		C	0.000	0.000	0.000	0.000	506.45
L4	120.00-100.00	A	0.000	0.000	0.000	3.960	470.88
		B	0.000	0.000	0.000	0.000	190.80
		C	0.000	0.000	0.000	0.000	509.20
L5	100.00-80.00	A	0.000	0.000	0.000	3.960	520.80
		B	0.000	0.000	0.000	0.000	205.05
		C	0.000	0.000	0.000	0.000	514.20
L6	80.00-65.00	A	0.000	0.000	0.000	2.970	393.10
		B	0.000	0.000	0.000	0.000	154.35
		C	0.000	0.000	0.000	0.000	389.40
L7	65.00-60.00	A	0.000	0.000	0.000	0.990	131.45
		B	0.000	0.000	0.000	0.000	51.45
		C	0.000	0.000	0.000	0.000	129.80
L8	60.00-50.00	A	0.000	0.000	0.000	1.980	262.90
		B	0.000	0.000	0.000	0.000	105.15
		C	0.000	0.000	0.000	0.000	259.60
L9	50.00-40.00	A	0.000	0.000	0.000	1.980	262.90
		B	0.000	0.000	0.000	0.000	105.40
		C	0.000	0.000	0.000	0.000	260.85
L10	40.00-20.00	A	0.000	0.000	0.000	3.960	528.80
		B	0.000	0.000	0.000	0.000	210.80
		C	0.000	0.000	0.000	0.000	524.20
L11	20.00-0.00	A	0.000	0.000	0.000	3.366	451.18
		B	0.000	0.000	0.000	0.000	179.18

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
		C	0.000	0.000	0.000	0.000	445.57

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	190.00-180.00	A	0.500	0.000	0.000	0.000	0.000	5.40
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	49.92
L2	180.00-140.00	A	0.500	0.000	0.000	0.000	5.960	633.60
		B		0.000	0.000	0.000	0.000	114.12
		C		0.000	0.000	0.000	0.000	1001.15
L3	140.00-120.00	A	0.500	0.000	0.000	0.000	5.960	631.44
		B		0.000	0.000	0.000	0.000	186.48
		C		0.000	0.000	0.000	0.000	506.45
L4	120.00-100.00	A	0.500	0.000	0.000	0.000	5.960	833.28
		B		0.000	0.000	0.000	0.000	190.80
		C		0.000	0.000	0.000	0.000	509.20
L5	100.00-80.00	A	0.500	0.000	0.000	0.000	5.960	883.20
		B		0.000	0.000	0.000	0.000	205.05
		C		0.000	0.000	0.000	0.000	514.20
L6	80.00-65.00	A	0.500	0.000	0.000	0.000	4.470	664.90
		B		0.000	0.000	0.000	0.000	154.35
		C		0.000	0.000	0.000	0.000	389.40
L7	65.00-60.00	A	0.500	0.000	0.000	0.000	1.490	222.05
		B		0.000	0.000	0.000	0.000	51.45
		C		0.000	0.000	0.000	0.000	129.80
L8	60.00-50.00	A	0.500	0.000	0.000	0.000	2.980	444.10
		B		0.000	0.000	0.000	0.000	105.15
		C		0.000	0.000	0.000	0.000	259.60
L9	50.00-40.00	A	0.500	0.000	0.000	0.000	2.980	444.10
		B		0.000	0.000	0.000	0.000	105.40
		C		0.000	0.000	0.000	0.000	260.85
L10	40.00-20.00	A	0.500	0.000	0.000	0.000	5.960	891.20
		B		0.000	0.000	0.000	0.000	210.80
		C		0.000	0.000	0.000	0.000	524.20
L11	20.00-0.00	A	0.500	0.000	0.000	0.000	5.066	759.22
		B		0.000	0.000	0.000	0.000	179.18
		C		0.000	0.000	0.000	0.000	445.57

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	190.00-180.00	0.0000	0.0000	0.0000	0.0000
L2	180.00-140.00	0.0000	-0.1415	0.0000	-0.2002
L3	140.00-120.00	0.0000	-0.2786	0.0000	-0.3966
L4	120.00-100.00	0.0000	-0.2811	0.0000	-0.4031
L5	100.00-80.00	0.0000	-0.2830	0.0000	-0.4081
L6	80.00-65.00	0.0000	-0.2845	0.0000	-0.4121
L7	65.00-60.00	0.0000	-0.2657	0.0000	-0.3853
L8	60.00-50.00	0.0000	-0.2857	0.0000	-0.4153

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L9	50.00-40.00	0.0000	-0.2684	0.0000	-0.3906
L10	40.00-20.00	0.0000	-0.2857	0.0000	-0.4153
L11	20.00-0.00	0.0000	-0.2442	0.0000	-0.3560

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
PiROD 15' Low Profile Platform (T-Mobile)	C	None			0.0000	181.67	No Ice	17.30	17.30	1500.00
							1/2" Ice	22.10	22.10	2030.00
(4) RR65-19-00DP (T-Mobile)	A	From Face	4.00	0.00	0.0000	181.67	No Ice	5.87	2.75	23.00
							1/2" Ice	6.32	3.23	51.51
(4) RR65-19-00DP (T-Mobile)	B	From Face	4.00	0.00	0.0000	181.67	No Ice	5.87	2.75	23.00
							1/2" Ice	6.32	3.23	51.51
(4) RR65-19-00DP (T-Mobile)	C	From Face	4.00	0.00	0.0000	181.67	No Ice	5.87	2.75	23.00
							1/2" Ice	6.32	3.23	51.51
(4) TMA (T-Mobile)	A	From Face	4.00	0.00	0.0000	181.67	No Ice	1.20	1.20	5.00
							1/2" Ice	1.40	1.40	20.20
(4) TMA (T-Mobile)	B	From Face	4.00	0.00	0.0000	181.67	No Ice	1.20	1.20	5.00
							1/2" Ice	1.40	1.40	20.20
(4) TMA (T-Mobile)	C	From Face	4.00	0.00	0.0000	181.67	No Ice	1.20	1.20	5.00
							1/2" Ice	1.40	1.40	20.20
13' Low Profile Platform (Verizon)	C	None			0.0000	160.00	No Ice	15.60	15.60	1300.00
							1/2" Ice	20.00	20.00	1765.00
LPA-80080-6CF (Verizon)	A	From Face	4.00	0.00	0.0000	160.00	No Ice	4.33	9.09	21.00
			-6.00				1/2" Ice	4.76	9.64	69.24
LPA-185080/12CF (Verizon)	A	From Face	4.00	0.00	0.0000	160.00	No Ice	3.53	4.57	11.00
			-4.00				1/2" Ice	3.96	5.01	37.49
LPA-185080/12CF (Verizon)	A	From Face	4.00	0.00	0.0000	160.00	No Ice	3.53	4.57	11.00
			4.00				1/2" Ice	3.96	5.01	37.49
LPA-80080-6CF (Verizon)	A	From Face	4.00	0.00	0.0000	160.00	No Ice	4.33	9.09	21.00
			6.00				1/2" Ice	4.76	9.64	69.24
LPA-80080-6CF (Verizon)	B	From Face	4.00	0.00	0.0000	160.00	No Ice	4.33	9.09	21.00
			-6.00				1/2" Ice	4.76	9.64	69.24
LPA-185080/12CF (Verizon)	B	From Face	4.00	0.00	0.0000	160.00	No Ice	3.53	4.57	11.00
			-4.00				1/2" Ice	3.96	5.01	37.49
LPA-185080/12CF (Verizon)	B	From Face	4.00	0.00	0.0000	160.00	No Ice	3.53	4.57	11.00
			4.00				1/2" Ice	3.96	5.01	37.49

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
LPA-80080-6CF (Verizon)	B	From Face	0.00 4.00 6.00	0.0000	160.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-80080-6CF (Verizon)	C	From Face	0.00 4.00 -6.00	0.0000	160.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
LPA-185080/12CF (Verizon)	C	From Face	0.00 4.00 -4.00	0.0000	160.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-185080/12CF (Verizon)	C	From Face	0.00 4.00 4.00	0.0000	160.00	No Ice 1/2" Ice	3.53 3.96	4.57 5.01	11.00 37.49
LPA-80080-6CF (Verizon)	C	From Face	0.00 4.00 6.00	0.0000	160.00	No Ice 1/2" Ice	4.33 4.76	9.09 9.64	21.00 69.24
PiROD 15' Low Profile Platform (ATT)	C	None	0.00	0.0000	151.00	No Ice 1/2" Ice	17.20 22.00	17.20 22.00	1500.00 2030.00
7770.00 (ATT)	A	From Face	4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	35.00 67.63
7770.00 (ATT)	B	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	35.00 67.63
7770.00 (ATT)	C	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	5.88 6.31	2.93 3.27	35.00 67.63
(2) TMA (ATT)	A	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	17.50 23.31
(2) TMA (ATT)	B	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	17.50 23.31
(2) TMA (ATT)	C	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	0.95 1.09	0.37 0.48	17.50 23.31
LPG13519 Diplexer (ATT)	A	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	5.30 7.71
LPG13519 Diplexer (ATT)	B	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	5.30 7.71
LPG13519 Diplexer (ATT)	C	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	0.27 0.34	0.18 0.25	5.30 7.71
(2) DUO1417-8686 (ATT)	A	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	6.53 6.94	4.20 4.57	20.30 62.49
(2) DUO1417-8686 (ATT)	B	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	6.53 6.94	4.20 4.57	20.30 62.49
(2) DUO1417-8686 (ATT)	C	From Face	0.00 4.00 0.00	0.0000	151.00	No Ice 1/2" Ice	6.53 6.94	4.20 4.57	20.30 62.49
PiROD 15' Low Profile Platform	C	None	0.00	0.0000	116.00	No Ice 1/2" Ice	17.20 22.00	17.20 22.00	1500.00 2030.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Offsets: ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
(Sprint) (4) 844G90VTA-SX (Sprint)	A	From Face	4.00 0.00 0.00			0.0000	116.00	No Ice 1/2" Ice	3.06 3.39	3.73 4.10	11.50 37.80
(4) 844G90VTA-SX (Sprint)	B	From Face	4.00 0.00 0.00			0.0000	116.00	No Ice 1/2" Ice	3.06 3.39	3.73 4.10	11.50 37.80
(4) 844G90VTA-SX (Sprint)	C	From Face	4.00 0.00 0.00			0.0000	116.00	No Ice 1/2" Ice	3.06 3.39	3.73 4.10	11.50 37.80
Pirod 5" Tube x 58" Standoff	B	From Face	2.00 0.00 0.00			0.0000	189.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
DB589	B	From Face	4.00 0.00 0.00			0.0000	193.25	No Ice 1/2" Ice	2.13 3.00	2.13 3.00	11.50 27.39
Pirod 5" Tube x 58" Standoff	C	From Face	2.00 0.00 0.00			0.0000	136.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
SRL233	C	From Face	4.00 0.00 0.00			0.0000	140.00	No Ice 1/2" Ice	1.26 2.27	1.26 2.27	2.00 13.00
Pirod 5" Tube x 58" Standoff	B	From Face	2.00 0.00 0.00			0.0000	132.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
DB205-A	B	From Face	4.00 0.00 0.00			0.0000	136.00	No Ice 1/2" Ice	1.20 2.16	1.20 2.16	38.00 49.40
Pirod 5" Tube x 58" Standoff	A	From Face	2.00 0.00 0.00			0.0000	129.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
10' x 3" Dia Omni	A	From Face	4.00 0.00 0.00			0.0000	134.00	No Ice 1/2" Ice	3.00 4.03	3.00 4.03	30.00 51.79
Pirod 5" Tube x 58" Standoff	C	From Face	2.00 0.00 0.00			0.0000	99.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
DB205-A	C	From Face	4.00 0.00 0.00			0.0000	103.00	No Ice 1/2" Ice	1.20 2.16	1.20 2.16	38.00 49.40
Pirod 5" Tube x 58" Standoff	B	From Face	2.00 0.00 0.00			0.0000	99.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
DB205-A	B	From Face	4.00 0.00 0.00			0.0000	103.00	No Ice 1/2" Ice	1.20 2.16	1.20 2.16	38.00 49.40
DB224	A	From Face	4.00 0.00 0.00			0.0000	151.00	No Ice 1/2" Ice	3.15 5.67	3.15 5.67	32.00 41.60
(2) GPS	C	None				0.0000	90.00	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	10.00 15.00
Pirod 5" Tube x 58" Standoff	A	From Face	2.00 0.00 0.00			0.0000	75.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
SRL233	A	From Face	4.00 0.00 0.00			0.0000	80.00	No Ice 1/2" Ice	1.26 2.27	1.26 2.27	2.00 13.00

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
Pirod 5" Tube x 58" Standoff	B	From Face	2.00 0.00 0.00	0.0000	59.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
DB583	B	From Face	4.00 0.00 0.00	0.0000	64.00	No Ice 1/2" Ice	0.54 0.71	0.54 0.71	6.25 11.60
Pirod 5" Tube x 58" Standoff	B	From Face	2.00 0.00 0.00	0.0000	45.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
5' x 3" Dia Omni	B	From Face	4.00 0.00 0.00	0.0000	49.00	No Ice 1/2" Ice	1.77 2.13	1.77 2.13	20.00 33.24
Pirod 5" Tube x 58" Standoff	A	From Face	2.00 0.00 0.00	0.0000	32.00	No Ice 1/2" Ice	3.25 3.80	0.81 1.05	165.44 194.55
MYA4505	A	From Face	4.00 0.00 0.00	0.0000	36.00	No Ice 1/2" Ice	0.23 0.41	0.23 0.41	2.00 2.60
DB205-A (Relocated)	B	From Face	4.00 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	1.20 2.16	1.20 2.16	38.00 49.40
SRL224 (Relocated)	A	From Face	4.00 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	5.22 7.02	5.22 7.02	35.00 72.00

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight lb
4 FT DISH	C	Paraboloid w/Shroud (HP)	From Face	4.00 6.00 0.00	0.0000		181.67	4.00	No Ice 1/2" Ice	12.56 13.09	170.00 237.19
2 FT Grid Dish	C	Grid	From Face	4.00 0.00 0.00	0.0000		99.00	2.00	No Ice 1/2" Ice	3.14 3.41	25.00 42.49

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

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 190.00-180.00	185.00	1.636	27	15.000	A	0.000	15.000	15.000	100.00	0.000	0.000
					B	0.000	15.000		100.00		
					C	0.000	15.000		100.00		
L2 180.00-140.00	160.18	1.57	26	80.000	A	0.000	80.000	80.000	100.00	0.000	3.960
					B	0.000	80.000		100.00		
					C	0.000	80.000		100.00		
L3 140.00-120.00	130.00	1.48	24	60.000	A	0.000	60.000	60.000	100.00	0.000	3.960
					B	0.000	60.000		100.00		
					C	0.000	60.000		100.00		
L4 120.00-100.00	110.00	1.411	23	70.000	A	0.000	70.000	70.000	100.00	0.000	3.960
					B	0.000	70.000		100.00		
					C	0.000	70.000		100.00		
L5 100.00-80.00	90.00	1.332	22	80.000	A	0.000	80.000	80.000	100.00	0.000	3.960
					B	0.000	80.000		100.00		
					C	0.000	80.000		100.00		
L6 80.00-65.00	72.50	1.252	21	67.500	A	0.000	67.500	67.500	100.00	0.000	2.970
					B	0.000	67.500		100.00		
					C	0.000	67.500		100.00		
L7 65.00-60.00	62.50	1.2	20	22.500	A	0.000	24.165	24.165	100.00	0.000	0.990
					B	0.000	24.165		100.00		
					C	0.000	24.165		100.00		
L8 60.00-50.00	55.00	1.157	19	50.000	A	0.000	50.000	50.000	100.00	0.000	1.980
					B	0.000	50.000		100.00		
					C	0.000	50.000		100.00		
L9 50.00-40.00	45.00	1.093	18	50.000	A	0.000	53.350	53.350	100.00	0.000	1.980
					B	0.000	53.350		100.00		
					C	0.000	53.350		100.00		
L10 40.00-20.00	30.00	1	16	100.000	A	0.000	100.000	100.000	100.00	0.000	3.960
					B	0.000	100.000		100.00		
					C	0.000	100.000		100.00		
L11 20.00-0.00	10.00	1	16	100.000	A	0.000	100.000	100.000	100.00	0.000	3.366
					B	0.000	100.000		100.00		
					C	0.000	100.000		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 190.00-180.00	185.00	1.636	20	0.5000	15.833	A	0.000	15.833	15.833	100.00	0.000	0.000
						B	0.000	15.833		100.00		
						C	0.000	15.833		100.00		
L2 180.00-140.00	160.18	1.57	19	0.5000	83.333	A	0.000	83.333	83.333	100.00	0.000	5.960
						B	0.000	83.333		100.00		
						C	0.000	83.333		100.00		
L3 140.00-120.00	130.00	1.48	18	0.5000	61.667	A	0.000	61.667	61.667	100.00	0.000	5.960
						B	0.000	61.667		100.00		
						C	0.000	61.667		100.00		
L4 120.00-100.00	110.00	1.411	17	0.5000	71.667	A	0.000	71.667	71.667	100.00	0.000	5.960
						B	0.000	71.667		100.00		
						C	0.000	71.667		100.00		
L5 100.00-80.00	90.00	1.332	16	0.5000	81.667	A	0.000	81.667	81.667	100.00	0.000	5.960
						B	0.000	81.667		100.00		

RISATower	Job	Page
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	190' Pirod Monopole	10 of 39
	Project 08001 - 240 Kensington Road, Berlin, CT	Date 20:03:08 03/03/08
	Client Verizon	Designed by Staff

Section Elevation	z	K_z	q_z	t_z	A_G	Face	A_F	A_R	A_{Leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	in	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
L6 80.00-65.00	72.50	1.252	15	0.5000	68.750	C	0.000	81.667		100.00		
						A	0.000	68.750	68.750	100.00	0.000	4.470
						B	0.000	68.750		100.00		
L7 65.00-60.00	62.50	1.2	15	0.5000	22.917	C	0.000	68.750		100.00		
						A	0.000	24.613	24.613	100.00	0.000	1.490
						B	0.000	24.613		100.00		
L8 60.00-50.00	55.00	1.157	14	0.5000	50.833	C	0.000	24.613		100.00		
						A	0.000	50.833	50.833	100.00	0.000	2.980
						B	0.000	50.833		100.00		
L9 50.00-40.00	45.00	1.093	13	0.5000	50.833	C	0.000	50.833		100.00		
						A	0.000	54.239	54.239	100.00	0.000	2.980
						B	0.000	54.239		100.00		
L10 40.00-20.00	30.00	1	12	0.5000	101.667	C	0.000	54.239		100.00		
						A	0.000	101.667	101.667	100.00	0.000	5.960
						B	0.000	101.667		100.00		
L11 20.00-0.00	10.00	1	12	0.5000	101.667	C	0.000	101.667		100.00		
						A	0.000	101.667	101.667	100.00	0.000	5.066
						B	0.000	101.667		100.00		
						C	0.000	101.667		100.00		

Tower Pressure - Service

$G_H = 1.690$

Section Elevation	z	K_z	q_z	A_G	Face	A_F	A_R	A_{Leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft^2		ft^2	ft^2	ft^2		ft^2	ft^2
L1 190.00-180.00	185.00	1.636	10	15.000	A	0.000	15.000	15.000	100.00	0.000	0.000
					B	0.000	15.000		100.00		
					C	0.000	15.000		100.00		
L2 180.00-140.00	160.18	1.57	10	80.000	A	0.000	80.000	80.000	100.00	0.000	3.960
					B	0.000	80.000		100.00		
					C	0.000	80.000		100.00		
L3 140.00-120.00	130.00	1.48	9	60.000	A	0.000	60.000	60.000	100.00	0.000	3.960
					B	0.000	60.000		100.00		
					C	0.000	60.000		100.00		
L4 120.00-100.00	110.00	1.411	9	70.000	A	0.000	70.000	70.000	100.00	0.000	3.960
					B	0.000	70.000		100.00		
					C	0.000	70.000		100.00		
L5 100.00-80.00	90.00	1.332	9	80.000	A	0.000	80.000	80.000	100.00	0.000	3.960
					B	0.000	80.000		100.00		
					C	0.000	80.000		100.00		
L6 80.00-65.00	72.50	1.252	8	67.500	A	0.000	67.500	67.500	100.00	0.000	2.970
					B	0.000	67.500		100.00		
					C	0.000	67.500		100.00		
L7 65.00-60.00	62.50	1.2	8	22.500	A	0.000	24.165	24.165	100.00	0.000	0.990
					B	0.000	24.165		100.00		
					C	0.000	24.165		100.00		
L8 60.00-50.00	55.00	1.157	7	50.000	A	0.000	50.000	50.000	100.00	0.000	1.980
					B	0.000	50.000		100.00		
					C	0.000	50.000		100.00		
L9 50.00-40.00	45.00	1.093	7	50.000	A	0.000	53.350	53.350	100.00	0.000	1.980
					B	0.000	53.350		100.00		
					C	0.000	53.350		100.00		

RISATower	Job: 190' Pirod Monopole	Page: 11 of 39
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 08001 - 240 Kensington Road, Berlin, CT	Date: 20:03:08 03/03/08
	Client: Verizon	Designed by: Staff

Section Elevation	z	K_z	q_z	A_G	Face	A_F	A_{lt}	A_{leg}	Leg %	C_AA_A In Face	C_AA_A Out Face
ft	ft		psf	ft²		ft²	ft²	ft²		ft²	ft²
L10 40.00-20.00	30.00	1	6	100.000	A	0.000	100.000	100.000	100.00	0.000	3.960
					B	0.000	100.000		100.00		
					C	0.000	100.000		100.00		
L11 20.00-0.00	10.00	1	6	100.000	A	0.000	100.000	100.000	100.00	0.000	3.366
					B	0.000	100.000		100.00		
					C	0.000	100.000		100.00		

Tower Forces - No Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	Face	e	C_F	R_R	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb							ft²	lb	plf	
L1 190.00-180.00	55.32	706.55	A	1	0.59	1	1	1	15.000	401.01	40.10	C
			B	1	0.59	1	1	1	15.000			
			C	1	0.59	1	1	1	15.000			
L2 180.00-140.00	1386.47	3788.32	A	1	0.59	1	1	1	80.000	2223.06	55.58	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L3 140.00-120.00	961.97	2856.27	A	1	0.59	1	1	1	60.000	1612.44	80.62	C
			B	1	0.59	1	1	1	60.000			
			C	1	0.59	1	1	1	60.000			
L4 120.00-100.00	1170.88	3337.33	A	1	0.59	1	1	1	70.000	1767.73	88.39	C
			B	1	0.59	1	1	1	70.000			
			C	1	0.59	1	1	1	70.000			
L5 100.00-80.00	1240.05	3818.38	A	1	0.59	1	1	1	80.000	1886.82	94.34	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L6 80.00-65.00	936.85	3224.58	A	1	0.59	1	1	1	67.500	1483.76	98.92	C
			B	1	0.59	1	1	1	67.500			
			C	1	0.59	1	1	1	67.500			
L7 65.00-60.00	312.70	1286.84	A	1	0.59	1	1	1	24.165	506.70	101.34	C
			B	1	0.59	1	1	1	24.165			
			C	1	0.59	1	1	1	24.165			
L8 60.00-50.00	627.65	2390.25	A	1	0.59	1	1	1	50.000	1008.62	100.86	C
			B	1	0.59	1	1	1	50.000			
			C	1	0.59	1	1	1	50.000			
L9 50.00-40.00	629.15	2822.09	A	1	0.59	1	1	1	53.350	1012.21	101.22	C
			B	1	0.59	1	1	1	53.350			
			C	1	0.59	1	1	1	53.350			
L10 40.00-20.00	1263.80	6360.63	A	1	0.59	1	1	1	100.000	1743.30	87.16	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
L11 20.00-0.00	1075.93	7934.09	A	1	0.59	1	1	1	100.000	1726.85	86.34	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
Sum Weight:	9660.77	38525.34						OTM	1313987.2 0 lb-ft	15372.50		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	706.55	A	1	0.59	1	1	1	15.000	401.01	40.10	C
			B	1	0.59	1	1	1	15.000			
			C	1	0.59	1	1	1	15.000			
L2 180.00-140.00	1386.47	3788.32	A	1	0.59	1	1	1	80.000	2223.06	55.58	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L3 140.00-120.00	961.97	2856.27	A	1	0.59	1	1	1	60.000	1612.44	80.62	C
			B	1	0.59	1	1	1	60.000			
			C	1	0.59	1	1	1	60.000			
L4 120.00-100.00	1170.88	3337.33	A	1	0.59	1	1	1	70.000	1767.73	88.39	C
			B	1	0.59	1	1	1	70.000			
			C	1	0.59	1	1	1	70.000			
L5 100.00-80.00	1240.05	3818.38	A	1	0.59	1	1	1	80.000	1886.82	94.34	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L6 80.00-65.00	936.85	3224.58	A	1	0.59	1	1	1	67.500	1483.76	98.92	C
			B	1	0.59	1	1	1	67.500			
			C	1	0.59	1	1	1	67.500			
L7 65.00-60.00	312.70	1286.84	A	1	0.59	1	1	1	24.165	506.70	101.34	C
			B	1	0.59	1	1	1	24.165			
			C	1	0.59	1	1	1	24.165			
L8 60.00-50.00	627.65	2390.25	A	1	0.59	1	1	1	50.000	1008.62	100.86	C
			B	1	0.59	1	1	1	50.000			
			C	1	0.59	1	1	1	50.000			
L9 50.00-40.00	629.15	2822.09	A	1	0.59	1	1	1	53.350	1012.21	101.22	C
			B	1	0.59	1	1	1	53.350			
			C	1	0.59	1	1	1	53.350			
L10 40.00-20.00	1263.80	6360.63	A	1	0.59	1	1	1	100.000	1743.30	87.16	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
L11 20.00-0.00	1075.93	7934.09	A	1	0.59	1	1	1	100.000	1726.85	86.34	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
Sum Weight:	9660.77	38525.34						OTM	1313987.2 0 lb-ft	15372.50		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	706.55	A	1	0.59	1	1	1	15.000	401.01	40.10	C
			B	1	0.59	1	1	1	15.000			
			C	1	0.59	1	1	1	15.000			
L2 180.00-140.00	1386.47	3788.32	A	1	0.59	1	1	1	80.000	2223.06	55.58	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L3 140.00-120.00	961.97	2856.27	A	1	0.59	1	1	1	60.000	1612.44	80.62	C
			B	1	0.59	1	1	1	60.000			
			C	1	0.59	1	1	1	60.000			
L4 120.00-100.00	1170.88	3337.33	A	1	0.59	1	1	1	70.000	1767.73	88.39	C
			B	1	0.59	1	1	1	70.000			
			C	1	0.59	1	1	1	70.000			
L5 100.00-80.00	1240.05	3818.38	A	1	0.59	1	1	1	80.000	1886.82	94.34	C
			B	1	0.59	1	1	1	80.000			

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
			C	1	0.59	1	1	1	80.000			
L6 80.00-65.00	936.85	3224.58	A	1	0.59	1	1	1	67.500	1483.76	98.92	C
			B	1	0.59	1	1	1	67.500			
			C	1	0.59	1	1	1	67.500			
L7 65.00-60.00	312.70	1286.84	A	1	0.59	1	1	1	24.165	506.70	101.34	C
			B	1	0.59	1	1	1	24.165			
			C	1	0.59	1	1	1	24.165			
L8 60.00-50.00	627.65	2390.25	A	1	0.59	1	1	1	50.000	1008.62	100.86	C
			B	1	0.59	1	1	1	50.000			
			C	1	0.59	1	1	1	50.000			
L9 50.00-40.00	629.15	2822.09	A	1	0.59	1	1	1	53.350	1012.21	101.22	C
			B	1	0.59	1	1	1	53.350			
			C	1	0.59	1	1	1	53.350			
L10 40.00-20.00	1263.80	6360.63	A	1	0.59	1	1	1	100.000	1743.30	87.16	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
L11 20.00-0.00	1075.93	7934.09	A	1	0.59	1	1	1	100.000	1726.85	86.34	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
Sum Weight:	9660.77	38525.34						OTM	1313987.20 lb-ft	15372.50		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	819.56	A	1	0.59	1	1	1	15.833	317.46	31.75	C
			B	1	0.59	1	1	1	15.833			
			C	1	0.59	1	1	1	15.833			
L2 180.00-140.00	1748.87	4386.97	A	1	0.59	1	1	1	83.333	1796.56	44.91	C
			B	1	0.59	1	1	1	83.333			
			C	1	0.59	1	1	1	83.333			
L3 140.00-120.00	1324.37	3302.20	A	1	0.59	1	1	1	61.667	1300.99	65.05	C
			B	1	0.59	1	1	1	61.667			
			C	1	0.59	1	1	1	61.667			
L4 120.00-100.00	1533.28	3856.56	A	1	0.59	1	1	1	71.667	1413.18	70.66	C
			B	1	0.59	1	1	1	71.667			
			C	1	0.59	1	1	1	71.667			
L5 100.00-80.00	1602.45	4410.92	A	1	0.59	1	1	1	81.667	1497.63	74.88	C
			B	1	0.59	1	1	1	81.667			
			C	1	0.59	1	1	1	81.667			
L6 80.00-65.00	1208.65	3723.96	A	1	0.59	1	1	1	68.750	1171.00	78.07	C
			B	1	0.59	1	1	1	68.750			
			C	1	0.59	1	1	1	68.750			
L7 65.00-60.00	403.30	1453.30	A	1	0.59	1	1	1	24.613	399.06	79.81	C
			B	1	0.59	1	1	1	24.613			
			C	1	0.59	1	1	1	24.613			
L8 60.00-50.00	808.85	2759.82	A	1	0.59	1	1	1	50.833	792.31	79.23	C
			B	1	0.59	1	1	1	50.833			
			C	1	0.59	1	1	1	50.833			
L9 50.00-40.00	810.35	3191.67	A	1	0.59	1	1	1	54.239	793.75	79.38	C
			B	1	0.59	1	1	1	54.239			
			C	1	0.59	1	1	1	54.239			
L10 40.00-	1626.20	7099.78	A	1	0.59	1	1	1	101.667	1369.42	68.47	C

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
20.00			B	1	0.59	1	1	1	101.667			
			C	1	0.59	1	1	1	101.667			
L11 20.00-0.00	1383.97	8673.24	A	1	0.59	1	1	1	101.667	1350.86	67.54	C
			B	1	0.59	1	1	1	101.667			
			C	1	0.59	1	1	1	101.667			
Sum Weight:	12505.61	43677.99						OTM	1049594.26 lb-ft	12202.24		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	819.56	A	1	0.59	1	1	1	15.833	317.46	31.75	C
			B	1	0.59	1	1	1	15.833			
			C	1	0.59	1	1	1	15.833			
L2 180.00-140.00	1748.87	4386.97	A	1	0.59	1	1	1	83.333	1796.56	44.91	C
			B	1	0.59	1	1	1	83.333			
			C	1	0.59	1	1	1	83.333			
L3 140.00-120.00	1324.37	3302.20	A	1	0.59	1	1	1	61.667	1300.99	65.05	C
			B	1	0.59	1	1	1	61.667			
			C	1	0.59	1	1	1	61.667			
L4 120.00-100.00	1533.28	3856.56	A	1	0.59	1	1	1	71.667	1413.18	70.66	C
			B	1	0.59	1	1	1	71.667			
			C	1	0.59	1	1	1	71.667			
L5 100.00-80.00	1602.45	4410.92	A	1	0.59	1	1	1	81.667	1497.63	74.88	C
			B	1	0.59	1	1	1	81.667			
			C	1	0.59	1	1	1	81.667			
L6 80.00-65.00	1208.65	3723.96	A	1	0.59	1	1	1	68.750	1171.00	78.07	C
			B	1	0.59	1	1	1	68.750			
			C	1	0.59	1	1	1	68.750			
L7 65.00-60.00	403.30	1453.30	A	1	0.59	1	1	1	24.613	399.06	79.81	C
			B	1	0.59	1	1	1	24.613			
			C	1	0.59	1	1	1	24.613			
L8 60.00-50.00	808.85	2759.82	A	1	0.59	1	1	1	50.833	792.31	79.23	C
			B	1	0.59	1	1	1	50.833			
			C	1	0.59	1	1	1	50.833			
L9 50.00-40.00	810.35	3191.67	A	1	0.59	1	1	1	54.239	793.75	79.38	C
			B	1	0.59	1	1	1	54.239			
			C	1	0.59	1	1	1	54.239			
L10 40.00-20.00	1626.20	7099.78	A	1	0.59	1	1	1	101.667	1369.42	68.47	C
			B	1	0.59	1	1	1	101.667			
			C	1	0.59	1	1	1	101.667			
L11 20.00-0.00	1383.97	8673.24	A	1	0.59	1	1	1	101.667	1350.86	67.54	C
			B	1	0.59	1	1	1	101.667			
			C	1	0.59	1	1	1	101.667			
Sum Weight:	12505.61	43677.99						OTM	1049594.26 lb-ft	12202.24		

Tower Forces - With Ice - Wind 90 To Face

RISATower	Job: 190' Pirod Monopole	Page: 15 of 39
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 08001 - 240 Kensington Road, Berlin, CT	Date: 20:03:08 03/03/08
	Client: Verizon	Designed by: Staff

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	819.56	A	1	0.59	1	1	1	15.833	317.46	31.75	C
			B	1	0.59	1	1	1	15.833			
			C	1	0.59	1	1	1	15.833			
L2 180.00-140.00	1748.87	4386.97	A	1	0.59	1	1	1	83.333	1796.56	44.91	C
			B	1	0.59	1	1	1	83.333			
			C	1	0.59	1	1	1	83.333			
L3 140.00-120.00	1324.37	3302.20	A	1	0.59	1	1	1	61.667	1300.99	65.05	C
			B	1	0.59	1	1	1	61.667			
			C	1	0.59	1	1	1	61.667			
L4 120.00-100.00	1533.28	3856.56	A	1	0.59	1	1	1	71.667	1413.18	70.66	C
			B	1	0.59	1	1	1	71.667			
			C	1	0.59	1	1	1	71.667			
L5 100.00-80.00	1602.45	4410.92	A	1	0.59	1	1	1	81.667	1497.63	74.88	C
			B	1	0.59	1	1	1	81.667			
			C	1	0.59	1	1	1	81.667			
L6 80.00-65.00	1208.65	3723.96	A	1	0.59	1	1	1	68.750	1171.00	78.07	C
			B	1	0.59	1	1	1	68.750			
			C	1	0.59	1	1	1	68.750			
L7 65.00-60.00	403.30	1453.30	A	1	0.59	1	1	1	24.613	399.06	79.81	C
			B	1	0.59	1	1	1	24.613			
			C	1	0.59	1	1	1	24.613			
L8 60.00-50.00	808.85	2759.82	A	1	0.59	1	1	1	50.833	792.31	79.23	C
			B	1	0.59	1	1	1	50.833			
			C	1	0.59	1	1	1	50.833			
L9 50.00-40.00	810.35	3191.67	A	1	0.59	1	1	1	54.239	793.75	79.38	C
			B	1	0.59	1	1	1	54.239			
			C	1	0.59	1	1	1	54.239			
L10 40.00-20.00	1626.20	7099.78	A	1	0.59	1	1	1	101.667	1369.42	68.47	C
			B	1	0.59	1	1	1	101.667			
			C	1	0.59	1	1	1	101.667			
L11 20.00-0.00	1383.97	8673.24	A	1	0.59	1	1	1	101.667	1350.86	67.54	C
			B	1	0.59	1	1	1	101.667			
			C	1	0.59	1	1	1	101.667			
Sum Weight:	12505.61	43677.99						OTM	1049594.26 lb-ft	12202.24		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	706.55	A	1	0.59	1	1	1	15.000	156.64	15.66	C
			B	1	0.59	1	1	1	15.000			
			C	1	0.59	1	1	1	15.000			
L2 180.00-140.00	1386.47	3788.32	A	1	0.59	1	1	1	80.000	868.38	21.71	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L3 140.00-120.00	961.97	2856.27	A	1	0.59	1	1	1	60.000	629.86	31.49	C
			B	1	0.59	1	1	1	60.000			
			C	1	0.59	1	1	1	60.000			
L4 120.00-100.00	1170.88	3337.33	A	1	0.59	1	1	1	70.000	690.52	34.53	C
			B	1	0.59	1	1	1	70.000			
			C	1	0.59	1	1	1	70.000			
L5 100.00-80.00	1240.05	3818.38	A	1	0.59	1	1	1	80.000	737.04	36.85	C
			B	1	0.59	1	1	1	80.000			

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
			C	1	0.59	1	1	1	80.000			
L6 80.00-65.00	936.85	3224.58	A	1	0.59	1	1	1	67.500	579.59	38.64	C
			B	1	0.59	1	1	1	67.500			
			C	1	0.59	1	1	1	67.500			
L7 65.00-60.00	312.70	1286.84	A	1	0.59	1	1	1	24.165	197.93	39.59	C
			B	1	0.59	1	1	1	24.165			
			C	1	0.59	1	1	1	24.165			
L8 60.00-50.00	627.65	2390.25	A	1	0.59	1	1	1	50.000	393.99	39.40	C
			B	1	0.59	1	1	1	50.000			
			C	1	0.59	1	1	1	50.000			
L9 50.00-40.00	629.15	2822.09	A	1	0.59	1	1	1	53.350	395.40	39.54	C
			B	1	0.59	1	1	1	53.350			
			C	1	0.59	1	1	1	53.350			
L10 40.00-20.00	1263.80	6360.63	A	1	0.59	1	1	1	100.000	680.98	34.05	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
L11 20.00-0.00	1075.93	7934.09	A	1	0.59	1	1	1	100.000	674.55	33.73	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
Sum Weight:	9660.77	38525.34						OTM	513276.25 lb-ft	6004.88		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	706.55	A	1	0.59	1	1	1	15.000	156.64	15.66	C
			B	1	0.59	1	1	1	15.000			
			C	1	0.59	1	1	1	15.000			
L2 180.00-140.00	1386.47	3788.32	A	1	0.59	1	1	1	80.000	868.38	21.71	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L3 140.00-120.00	961.97	2856.27	A	1	0.59	1	1	1	60.000	629.86	31.49	C
			B	1	0.59	1	1	1	60.000			
			C	1	0.59	1	1	1	60.000			
L4 120.00-100.00	1170.88	3337.33	A	1	0.59	1	1	1	70.000	690.52	34.53	C
			B	1	0.59	1	1	1	70.000			
			C	1	0.59	1	1	1	70.000			
L5 100.00-80.00	1240.05	3818.38	A	1	0.59	1	1	1	80.000	737.04	36.85	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L6 80.00-65.00	936.85	3224.58	A	1	0.59	1	1	1	67.500	579.59	38.64	C
			B	1	0.59	1	1	1	67.500			
			C	1	0.59	1	1	1	67.500			
L7 65.00-60.00	312.70	1286.84	A	1	0.59	1	1	1	24.165	197.93	39.59	C
			B	1	0.59	1	1	1	24.165			
			C	1	0.59	1	1	1	24.165			
L8 60.00-50.00	627.65	2390.25	A	1	0.59	1	1	1	50.000	393.99	39.40	C
			B	1	0.59	1	1	1	50.000			
			C	1	0.59	1	1	1	50.000			
L9 50.00-40.00	629.15	2822.09	A	1	0.59	1	1	1	53.350	395.40	39.54	C
			B	1	0.59	1	1	1	53.350			
			C	1	0.59	1	1	1	53.350			
L10 40.00-	1263.80	6360.63	A	1	0.59	1	1	1	100.000	680.98	34.05	C

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
20.00			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
L11 20.00-0.00	1075.93	7934.09	A	1	0.59	1	1	1	100.000	674.55	33.73	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
Sum Weight:	9660.77	38525.34						OTM	513276.25 lb-ft	6004.88		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1 190.00-180.00	55.32	706.55	A	1	0.59	1	1	1	15.000	156.64	15.66	C
			B	1	0.59	1	1	1	15.000			
			C	1	0.59	1	1	1	15.000			
L2 180.00-140.00	1386.47	3788.32	A	1	0.59	1	1	1	80.000	868.38	21.71	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L3 140.00-120.00	961.97	2856.27	A	1	0.59	1	1	1	60.000	629.86	31.49	C
			B	1	0.59	1	1	1	60.000			
			C	1	0.59	1	1	1	60.000			
L4 120.00-100.00	1170.88	3337.33	A	1	0.59	1	1	1	70.000	690.52	34.53	C
			B	1	0.59	1	1	1	70.000			
			C	1	0.59	1	1	1	70.000			
L5 100.00-80.00	1240.05	3818.38	A	1	0.59	1	1	1	80.000	737.04	36.85	C
			B	1	0.59	1	1	1	80.000			
			C	1	0.59	1	1	1	80.000			
L6 80.00-65.00	936.85	3224.58	A	1	0.59	1	1	1	67.500	579.59	38.64	C
			B	1	0.59	1	1	1	67.500			
			C	1	0.59	1	1	1	67.500			
L7 65.00-60.00	312.70	1286.84	A	1	0.59	1	1	1	24.165	197.93	39.59	C
			B	1	0.59	1	1	1	24.165			
			C	1	0.59	1	1	1	24.165			
L8 60.00-50.00	627.65	2390.25	A	1	0.59	1	1	1	50.000	393.99	39.40	C
			B	1	0.59	1	1	1	50.000			
			C	1	0.59	1	1	1	50.000			
L9 50.00-40.00	629.15	2822.09	A	1	0.59	1	1	1	53.350	395.40	39.54	C
			B	1	0.59	1	1	1	53.350			
			C	1	0.59	1	1	1	53.350			
L10 40.00-20.00	1263.80	6360.63	A	1	0.59	1	1	1	100.000	680.98	34.05	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
L11 20.00-0.00	1075.93	7934.09	A	1	0.59	1	1	1	100.000	674.55	33.73	C
			B	1	0.59	1	1	1	100.000			
			C	1	0.59	1	1	1	100.000			
Sum Weight:	9660.77	38525.34						OTM	513276.25 lb-ft	6004.88		

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	38525.34					
Bracing Weight	0.00					
Total Member Self-Weight	38525.34			-4761.97	-256.75	
Total Weight	57161.96			-4761.97	-256.75	
Wind 0 deg - No Ice		88.71	-30271.12	-3610296.87	-13250.95	-5021.84
Wind 30 deg - No Ice		15064.19	-26326.57	-3145877.57	-1779816.85	-5105.63
Wind 60 deg - No Ice		25967.25	-15386.47	-1850734.81	-3064174.78	-4367.12
Wind 90 deg - No Ice		30037.16	-20.74	-5908.07	-3550364.38	-36.72
Wind 120 deg - No Ice		25917.89	15103.84	1794965.65	-3058366.60	2202.44
Wind 150 deg - No Ice		14874.11	26095.97	3097427.84	-1750961.41	3377.71
Wind 180 deg - No Ice		-88.71	30138.77	3576151.12	12737.44	4185.86
Wind 210 deg - No Ice		-15027.76	26184.68	3110422.03	1772954.51	4398.78
Wind 240 deg - No Ice		-26006.60	15257.49	1817472.25	3070847.29	3363.45
Wind 270 deg - No Ice		-30037.16	156.68	20080.32	3549850.87	779.82
Wind 300 deg - No Ice		-25878.55	-15232.82	-1828228.21	3050667.08	-2791.12
Wind 330 deg - No Ice		-14910.54	-26237.86	-3132883.38	1756796.74	-4395.90
Member Ice	5152.65					
Total Weight Ice	69452.99			-10521.49	6.73	
Wind 0 deg - Ice		75.00	-25350.78	-3068303.77	-10979.25	-4167.12
Wind 30 deg - Ice		12554.92	-22064.77	-2675670.23	-1504495.05	-4683.32
Wind 60 deg - Ice		21682.33	-12964.12	-1582585.29	-2594607.82	-4133.08
Wind 90 deg - Ice		25088.46	-25.46	-12601.61	-3006428.82	-632.56
Wind 120 deg - Ice		21659.27	12615.02	1512238.65	-2591336.33	1374.68
Wind 150 deg - Ice		12439.98	21801.68	2615731.38	-1484804.23	2629.55
Wind 180 deg - Ice		-75.00	25193.79	3022715.26	10992.70	3513.68
Wind 210 deg - Ice		-12569.88	21876.68	2626717.35	1503845.94	3867.75
Wind 240 deg - Ice		-21734.27	12744.92	1531266.92	2602335.76	3217.70
Wind 270 deg - Ice		-25088.46	124.54	9370.33	3006442.27	1213.40
Wind 300 deg - Ice		-21607.33	-12834.22	-1563557.03	2583635.30	-1703.95
Wind 330 deg - Ice		-12425.02	-21989.77	-2664684.26	1485480.23	-3162.36
Total Weight	57161.96			-4761.97	-256.75	
Wind 0 deg - Service		34.65	-11824.66	-1409274.04	-5332.61	-1961.66
Wind 30 deg - Service		5884.45	-10283.82	-1227860.26	-695397.42	-1994.39
Wind 60 deg - Service		10143.46	-6010.34	-721945.11	-1197099.73	-1705.91
Wind 90 deg - Service		11733.27	-8.10	-1309.67	-1387017.55	-14.34
Wind 120 deg - Service		10124.18	5899.94	702156.63	-1194830.91	860.33
Wind 150 deg - Service		5810.20	10193.74	1210930.92	-684125.76	1319.42
Wind 180 deg - Service		-34.65	11772.96	1397932.20	4819.10	1635.10
Wind 210 deg - Service		-5870.22	10228.39	1216006.78	692403.90	1718.27
Wind 240 deg - Service		-10158.83	5959.96	710948.27	1199393.26	1313.85
Wind 270 deg - Service		-11733.27	61.20	8842.05	1386504.04	304.62
Wind 300 deg - Service		-10108.81	-5950.32	-713153.47	1191510.37	-1090.28
Wind 330 deg - Service		-5824.43	-10249.16	-1222784.40	686092.27	-1717.15

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
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice

Comb. No.	Description
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	190 - 180	Pole	Max Tension	11	0.00	-0.00	0.23
			Max. Compression	14	-4224.54	848.68	-793.01
			Max. Mx	11	-2621.83	12387.37	-1027.40
			Max. My	8	-2606.28	825.27	-12238.19
			Max. Vy	11	-4918.50	12387.37	-1027.40
			Max. Vx	2	-5227.30	-106.22	11374.92
			Max. Torque	13			4097.23
L2	180 - 140	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-15699.63	1153.87	271.19
			Max. Mx	11	-10833.02	373223.89	-5129.79
			Max. My	2	-10799.23	-1894.27	385152.79
			Max. Vy	11	-14316.55	373223.89	-5129.79
			Max. Vx	2	-14634.26	-1894.27	385152.79
			Max. Torque	2			5075.18
L3	140 - 120	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21024.05	1173.80	1445.11
			Max. Mx	11	-15243.53	683154.07	-7018.89
			Max. My	2	-15213.93	-3041.19	702614.23
			Max. Vy	11	-16502.97	683154.07	-7018.89
			Max. Vx	2	-16823.13	-3041.19	702614.23
			Max. Torque	2			5422.08
L4	120 - 100	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-28996.28	931.08	2401.64

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Mx	11	-21447.98	1069213.64	-9000.14
			Max. My	2	-21421.28	-4208.61	1095627.35
			Max. Vy	5	20754.22	-1068240.34	247.50
			Max. Vx	2	-21075.62	-4208.61	1095627.35
			Max. Torque	2			5418.77
L5	100 - 80	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-35471.25	257.12	2981.59
			Max. Mx	5	-26987.96	-1506525.71	664.79
			Max. My	2	-26964.35	-6539.46	1541332.25
			Max. Vy	5	22850.22	-1506525.71	664.79
			Max. Vx	2	-23251.59	-6539.46	1541332.25
			Max. Torque	2			5179.96
L6	80 - 65	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-40611.42	1040.75	4466.77
			Max. Mx	11	-31406.66	1862040.16	-13429.45
			Max. My	2	-31388.36	-6915.44	1902774.70
			Max. Vy	5	24415.96	-1860976.98	1389.06
			Max. Vx	2	-24773.07	-6915.44	1902774.70
			Max. Torque	2			5404.22
L7	65 - 60	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-42479.62	977.96	4847.27
			Max. Mx	11	-33046.98	1985326.78	-13888.55
			Max. My	2	-33030.13	-7214.71	2028043.12
			Max. Vy	5	24914.25	-1984332.05	1469.95
			Max. Vx	2	-25270.76	-7214.71	2028043.12
			Max. Torque	2			5403.26
L8	60 - 50	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-46242.85	219.76	6050.02
			Max. Mx	5	-36295.27	-2239617.65	2307.95
			Max. My	2	-36281.87	-8702.73	2286574.64
			Max. Vy	5	25950.76	-2239617.65	2307.95
			Max. Vx	2	-26265.99	-8702.73	2286574.64
			Max. Torque	2			5304.84
L9	50 - 40	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-50472.65	-725.53	7360.78
			Max. Mx	5	-40003.34	-2505424.96	3402.24
			Max. My	2	-39993.02	-10492.26	2555341.29
			Max. Vy	5	27023.81	-2505424.96	3402.24
			Max. Vx	2	-27300.70	-10492.26	2555341.29
			Max. Torque	2			5187.82
L10	40 - 20	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-59395.79	47.30	9336.97
			Max. Mx	5	-47962.24	-3061607.58	5066.83
			Max. My	2	-47957.26	-11878.18	3118289.03
			Max. Vy	5	28630.93	-3061607.58	5066.83
			Max. Vx	2	-28870.17	-11878.18	3118289.03
			Max. Torque	3			5009.42
L11	20 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-69452.99	47.30	10637.46
			Max. Mx	5	-57156.68	-	6017.48

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
						3648492.64	
			Max. My	2	-57156.55	-13671.27	3710443.31
			Max. Vy	5	30047.23	- 3648492.64	6017.48
			Max. Vx	2	-30281.34	-13671.27	3710443.31
			Max. Torque	3			5026.71

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	15	69452.99	-75.00	25350.80
	Max. H_x	11	57161.96	30037.18	-156.68
	Max. H_z	2	57161.96	-88.71	30271.12
	Max. M_x	2	3710443.31	-88.71	30271.12
	Max. M_z	5	3648492.64	-30037.18	20.74
	Max. Torsion	3	5026.71	-15064.19	26326.57
	Min. Vert	27	57161.96	-34.65	11824.66
	Min. H_x	5	57161.96	-30037.18	20.74
	Min. H_z	8	57161.96	88.71	-30138.77
	Min. M_x	8	-3675260.46	88.71	-30138.77
	Min. M_z	11	-3647989.58	30037.18	-156.68
	Min. Torsion	9	-4327.00	15027.76	-26184.68

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	57161.96	0.00	0.00	-4761.97	-256.75	0.00
Dead+Wind 0 deg - No Ice	57161.96	88.71	-30271.12	-3710443.31	-13671.54	-4902.17
Dead+Wind 30 deg - No Ice	57161.96	15064.19	-26326.57	-3233229.23	-1828950.40	-5026.71
Dead+Wind 60 deg - No Ice	57161.96	25967.25	-15386.47	-1902333.60	-3148730.78	-4347.56
Dead+Wind 90 deg - No Ice	57161.96	30037.18	-20.74	-6017.47	-3648492.64	-98.52
Dead+Wind 120 deg - No Ice	57161.96	25917.89	15103.84	1844849.27	-3142803.08	2091.44
Dead+Wind 150 deg - No Ice	57161.96	14874.11	26095.97	3183325.60	-1799213.91	3250.52
Dead+Wind 180 deg - No Ice	57161.96	-88.71	30138.77	3675260.46	13123.76	4072.92
Dead+Wind 210 deg - No Ice	57161.96	-15027.76	26184.68	3196714.63	1821866.08	4327.00
Dead+Wind 240 deg - No Ice	57161.96	-26006.60	15257.49	1868059.47	3155657.56	3352.65
Dead+Wind 270 deg - No Ice	57161.96	-30037.18	156.68	20777.50	3647989.58	836.70
Dead+Wind 300 deg - No Ice	57161.96	-25878.55	-15232.82	-1879176.58	3134838.50	-2677.72
Dead+Wind 330 deg - No Ice	57161.96	-14910.54	-26237.86	-3219881.86	1805219.12	-4262.31
Dead+Ice+Temp	69452.99	-0.00	-0.00	-10637.46	47.30	0.32
Dead+Wind 0 deg+Ice+Temp	69452.99	75.00	-25350.80	-3181776.75	-11415.23	-4057.42
Dead+Wind 30 deg+Ice+Temp	69452.99	12554.92	-22064.77	-2774694.34	-1559953.57	-4617.77
Dead+Wind 60 deg+Ice+Temp	69452.99	21682.33	-12964.12	-1641274.29	-2690171.36	-4127.95
Dead+Wind 90 deg+Ice+Temp	69452.99	25088.48	-25.46	-12984.12	-3117303.41	-700.60
Dead+Wind 120 deg+Ice+Temp	69452.99	21659.27	12615.02	1568315.36	-2686784.87	1262.41
Dead+Wind 150 deg+Ice+Temp	69452.99	12439.98	21801.68	2712530.23	-1539382.77	2505.46
Dead+Wind 180 deg+Ice+Temp	69452.99	-75.00	25193.81	3134501.34	11466.32	3408.86
Dead+Wind 210 deg+Ice+Temp	69452.99	-12569.88	21876.68	2723970.12	1559248.77	3808.20
Dead+Wind 240 deg+Ice+Temp	69452.99	-21734.27	12744.92	1588139.91	2698288.13	3219.64

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Dead+Wind 270 deg+Ice+Temp	69452.99	-25088.48	124.54	9896.85	3117396.38	1278.80
Dead+Wind 300 deg+Ice+Temp	69452.99	-21607.33	-12834.22	-1621499.20	2678824.45	-1590.13
Dead+Wind 330 deg+Ice+Temp	69452.99	-12425.02	-21989.77	-2763293.23	1540205.13	-3034.34
Dead+Wind 0 deg - Service	57161.96	34.65	-11824.66	-1453003.86	-5486.82	-1924.58
Dead+Wind 30 deg - Service	57161.96	5884.45	-10283.82	-1266515.96	-714894.35	-1973.03
Dead+Wind 60 deg - Service	57161.96	10143.46	-6010.34	-746396.79	-1230649.19	-1705.65
Dead+Wind 90 deg - Service	57161.96	11733.27	-8.10	-5317.19	-1425943.84	-37.37
Dead+Wind 120 deg - Service	57161.96	10124.18	5899.94	717987.58	-1228322.22	822.07
Dead+Wind 150 deg - Service	57161.96	5810.20	10193.74	1241056.13	-703261.66	1276.64
Dead+Wind 180 deg - Service	57161.96	-34.65	11772.96	1433304.81	4984.95	1598.93
Dead+Wind 210 deg - Service	57161.96	-5870.22	10228.39	1246293.00	711829.06	1698.01
Dead+Wind 240 deg - Service	57161.96	-10158.83	5959.96	727058.47	1233059.21	1314.96
Dead+Wind 270 deg - Service	57161.96	-11733.27	61.20	5154.47	1425448.83	327.25
Dead+Wind 300 deg - Service	57161.96	-10108.81	-5950.32	-737334.00	1224917.30	-1051.74
Dead+Wind 330 deg - Service	57161.96	-5824.43	-10249.16	-1261285.41	705325.68	-1673.63

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	lb	lb	lb	lb	lb	lb	
1	0.00	-57161.96	0.00	0.00	57161.96	0.00	0.000%
2	88.71	-57161.96	-30271.12	-88.71	57161.96	30271.12	0.000%
3	15064.19	-57161.96	-26326.57	-15064.19	57161.96	26326.57	0.000%
4	25967.25	-57161.96	-15386.47	-25967.25	57161.96	15386.47	0.000%
5	30037.16	-57161.96	-20.74	-30037.18	57161.96	20.74	0.000%
6	25917.89	-57161.96	15103.84	-25917.89	57161.96	-15103.84	0.000%
7	14874.11	-57161.96	26095.97	-14874.11	57161.96	-26095.97	0.000%
8	-88.71	-57161.96	30138.77	88.71	57161.96	-30138.77	0.000%
9	-15027.76	-57161.96	26184.68	15027.76	57161.96	-26184.68	0.000%
10	-26006.60	-57161.96	15257.49	26006.60	57161.96	-15257.49	0.000%
11	-30037.16	-57161.96	156.68	30037.18	57161.96	-156.68	0.000%
12	-25878.55	-57161.96	-15232.82	25878.55	57161.96	15232.82	0.000%
13	-14910.54	-57161.96	-26237.86	14910.54	57161.96	26237.86	0.000%
14	0.00	-69452.99	0.00	0.00	69452.99	0.00	0.000%
15	75.00	-69452.99	-25350.78	-75.00	69452.99	25350.80	0.000%
16	12554.92	-69452.99	-22064.77	-12554.92	69452.99	22064.77	0.000%
17	21682.33	-69452.99	-12964.12	-21682.33	69452.99	12964.12	0.000%
18	25088.46	-69452.99	-25.46	-25088.48	69452.99	25.46	0.000%
19	21659.27	-69452.99	12615.02	-21659.27	69452.99	-12615.02	0.000%
20	12439.98	-69452.99	21801.68	-12439.98	69452.99	-21801.68	0.000%
21	-75.00	-69452.99	25193.79	75.00	69452.99	-25193.81	0.000%
22	-12569.88	-69452.99	21876.68	12569.88	69452.99	-21876.68	0.000%
23	-21734.27	-69452.99	12744.92	21734.27	69452.99	-12744.92	0.000%
24	-25088.46	-69452.99	124.54	25088.48	69452.99	-124.54	0.000%
25	-21607.33	-69452.99	-12834.22	21607.33	69452.99	12834.22	0.000%
26	-12425.02	-69452.99	-21989.77	12425.02	69452.99	21989.77	0.000%
27	34.65	-57161.96	-11824.66	-34.65	57161.96	11824.66	0.000%
28	5884.45	-57161.96	-10283.82	-5884.45	57161.96	10283.82	0.000%
29	10143.46	-57161.96	-6010.34	-10143.46	57161.96	6010.34	0.000%
30	11733.27	-57161.96	-8.10	-11733.27	57161.96	8.10	0.000%
31	10124.18	-57161.96	5899.94	-10124.18	57161.96	-5899.94	0.000%
32	5810.20	-57161.96	10193.74	-5810.20	57161.96	-10193.74	0.000%
33	-34.65	-57161.96	11772.96	34.65	57161.96	-11772.96	0.000%
34	-5870.22	-57161.96	10228.39	5870.22	57161.96	-10228.39	0.000%
35	-10158.83	-57161.96	5959.96	10158.83	57161.96	-5959.96	0.000%
36	-11733.27	-57161.96	61.20	11733.27	57161.96	-61.20	0.000%
37	-10108.81	-57161.96	-5950.32	10108.81	57161.96	5950.32	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	-5824.43	-57161.96	-10249.16	5824.43	57161.96	10249.16	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00011760
3	Yes	5	0.00000001	0.00045237
4	Yes	5	0.00000001	0.00055398
5	Yes	4	0.00000001	0.00050834
6	Yes	5	0.00000001	0.00051720
7	Yes	5	0.00000001	0.00044130
8	Yes	5	0.00000001	0.00010622
9	Yes	5	0.00000001	0.00055058
10	Yes	5	0.00000001	0.00046529
11	Yes	4	0.00000001	0.00042632
12	Yes	5	0.00000001	0.00046388
13	Yes	5	0.00000001	0.00056021
14	Yes	4	0.00000001	0.00004067
15	Yes	5	0.00000001	0.00063667
16	Yes	6	0.00000001	0.00005290
17	Yes	6	0.00000001	0.00005763
18	Yes	5	0.00000001	0.00060141
19	Yes	6	0.00000001	0.00005431
20	Yes	6	0.00000001	0.00005159
21	Yes	5	0.00000001	0.00062463
22	Yes	6	0.00000001	0.00005631
23	Yes	6	0.00000001	0.00005293
24	Yes	5	0.00000001	0.00060222
25	Yes	6	0.00000001	0.00005362
26	Yes	6	0.00000001	0.00005645
27	Yes	4	0.00000001	0.00066965
28	Yes	5	0.00000001	0.00003961
29	Yes	5	0.00000001	0.00005479
30	Yes	4	0.00000001	0.00020479
31	Yes	5	0.00000001	0.00004882
32	Yes	5	0.00000001	0.00003751
33	Yes	4	0.00000001	0.00057922
34	Yes	5	0.00000001	0.00005510
35	Yes	5	0.00000001	0.00003981
36	Yes	4	0.00000001	0.00019991
37	Yes	5	0.00000001	0.00004020
38	Yes	5	0.00000001	0.00005720

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	190 - 180	31.706	28	1.5424	0.0160
L2	180 - 140	28.479	28	1.5381	0.0159

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L3	140 - 120	16.532	28	1.1756	0.0053
L4	120 - 100	11.949	28	0.9951	0.0034
L5	100 - 80	8.144	28	0.8080	0.0022
L6	80 - 65	5.123	28	0.6238	0.0015
L7	65 - 60	3.355	28	0.4973	0.0010
L8	60 - 50	2.856	28	0.4549	0.0009
L9	50 - 40	1.983	28	0.3779	0.0007
L10	40 - 20	1.270	28	0.3009	0.0005
L11	20 - 0	0.319	28	0.1481	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
193.25	DB589	28	31.706	1.5424	0.0199	119369
189.00	Pirod 5" Tube x 58" Standoff	28	31.383	1.5429	0.0199	119369
181.67	4 FT DISH	28	29.017	1.5413	0.0197	66502
168.00	DB205-A	28	24.649	1.4713	0.0165	11170
160.00	13' Low Profile Platform	28	22.173	1.3957	0.0135	7218
151.00	PiROD 15' Low Profile Platform	28	19.516	1.2963	0.0099	5144
140.00	SRL233	28	16.532	1.1756	0.0064	3966
136.00	Pirod 5" Tube x 58" Standoff	28	15.534	1.1364	0.0056	4221
134.00	10' x 3" Dia Omni	28	15.052	1.1178	0.0053	4461
132.00	Pirod 5" Tube x 58" Standoff	28	14.582	1.0997	0.0050	4732
129.00	Pirod 5" Tube x 58" Standoff	28	13.894	1.0732	0.0047	5207
116.00	PiROD 15' Low Profile Platform	28	11.130	0.9591	0.0038	7041
103.00	DB205-A	28	8.666	0.8366	0.0028	5991
99.00	2 FT Grid Dish	28	7.973	0.7984	0.0026	5856
90.00	(2) GPS	28	6.535	0.7137	0.0021	6100
80.00	SRL233	28	5.123	0.6238	0.0017	6428
75.00	Pirod 5" Tube x 58" Standoff	28	4.488	0.5812	0.0015	6503
64.00	DB583	28	3.252	0.4887	0.0012	6813
59.00	Pirod 5" Tube x 58" Standoff	28	2.762	0.4468	0.0010	7305
49.00	5' x 3" Dia Omni	28	1.904	0.3705	0.0008	7389
45.00	Pirod 5" Tube x 58" Standoff	28	1.607	0.3406	0.0007	7791
36.00	MYA4505	28	1.027	0.2663	0.0005	7794
32.00	Pirod 5" Tube x 58" Standoff	28	0.808	0.2311	0.0005	7237

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	190 - 180	80.974	3	3.9448	0.0408
L2	180 - 140	72.730	3	3.9345	0.0404
L3	140 - 120	42.214	3	3.0037	0.0137
L4	120 - 100	30.512	3	2.5421	0.0089
L5	100 - 80	20.796	3	2.0640	0.0057
L6	80 - 65	13.082	3	1.5934	0.0037
L7	65 - 60	8.568	3	1.2700	0.0027
L8	60 - 50	7.294	3	1.1618	0.0023

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L9	50 - 40	5.063	3	0.9651	0.0018
L10	40 - 20	3.244	3	0.7685	0.0014
L11	20 - 0	0.815	3	0.3783	0.0006

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
193.25	DB589	3	80.974	3.9448	0.0510	49914
189.00	Pirod 5" Tube x 58" Standoff	3	80.149	3.9464	0.0510	49914
181.67	4 FT DISH	3	74.104	3.9429	0.0504	27638
168.00	DB205-A	3	62.944	3.7627	0.0423	4399
160.00	13' Low Profile Platform	3	56.620	3.5687	0.0346	2834
151.00	PiROD 15' Low Profile Platform	3	49.836	3.3137	0.0253	2023
140.00	SRL233	3	42.214	3.0037	0.0163	1559
136.00	Pirod 5" Tube x 58" Standoff	3	39.667	2.9033	0.0143	1659
134.00	10' x 3" Dia Omni	3	38.437	2.8557	0.0135	1753
132.00	Pirod 5" Tube x 58" Standoff	3	37.235	2.8094	0.0128	1860
129.00	Pirod 5" Tube x 58" Standoff	3	35.481	2.7417	0.0121	2046
116.00	PiROD 15' Low Profile Platform	3	28.422	2.4501	0.0097	2766
103.00	DB205-A	3	22.130	2.1372	0.0072	2351
99.00	2 FT Grid Dish	3	20.362	2.0396	0.0066	2298
90.00	(2) GPS	3	16.688	1.8231	0.0054	2392
80.00	SRL233	3	13.082	1.5934	0.0044	2519
75.00	Pirod 5" Tube x 58" Standoff	3	11.460	1.4845	0.0039	2548
64.00	DB583	3	8.304	1.2482	0.0030	2669
59.00	Pirod 5" Tube x 58" Standoff	3	7.052	1.1410	0.0026	2862
49.00	5' x 3" Dia Omni	3	4.863	0.9459	0.0021	2895
45.00	Pirod 5" Tube x 58" Standoff	3	4.104	0.8684	0.0018	3053
36.00	MYA4505	3	2.623	0.6858	0.0014	3054
32.00	Pirod 5" Tube x 58" Standoff	3	2.064	0.6028	0.0012	2835

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	190 - 189	P18x.375	10.00	190.00	365.8	1.116	20.7640	-106.76	23171.60	0.005
	189 - 188					1.116	20.7640	-396.92	23171.60	0.017
	188 - 187					1.116	20.7640	-484.41	23171.60	0.021
	187 - 186					1.116	20.7640	-571.90	23171.60	0.025
	186 - 185					1.116	20.7640	-659.38	23171.60	0.028
	185 - 184					1.116	20.7640	-746.87	23171.60	0.032
	184 - 183					1.116	20.7640	-834.36	23171.60	0.036
	183 - 182					1.116	20.7640	-891.74	23171.60	0.038
	182 - 181					1.116	20.7640	-4137.05	23171.60	0.179
	181 - 180					1.116	20.7640	-4224.54	23171.60	0.182

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 $\frac{P}{P_a}$
L2	180 - 178	P24x3/8	40.00	190.00	272.9	2.005	27.8325	-4277.03	55795.30	0.077
	178 - 176					2.005	27.8325	-4573.99	55795.30	0.082
	176 - 174					2.005	27.8325	-4875.62	55795.30	0.087
	174 - 172					2.005	27.8325	-5177.53	55795.30	0.093
	172 - 170					2.005	27.8325	-5479.74	55795.30	0.098
	170 - 168					2.005	27.8325	-5782.28	55795.30	0.104
	168 - 166					2.005	27.8325	-4408.18	55795.30	0.079
	166 - 164					2.005	27.8325	-4661.92	55795.30	0.084
	164 - 162					2.005	27.8325	-4916.24	55795.30	0.088
	162 - 160					2.005	27.8325	-5171.18	55795.30	0.093
	160 - 158					2.005	27.8325	-6690.11	55795.30	0.120
	158 - 156					2.005	27.8325	-6949.43	55795.30	0.125
	156 - 154					2.005	27.8325	-7210.12	55795.30	0.129
	154 - 152					2.005	27.8325	-7472.23	55795.30	0.134
	152 - 150					2.005	27.8325	-9428.46	55795.30	0.169
	150 - 148					2.005	27.8325	-9697.62	55795.30	0.174
	148 - 146					2.005	27.8325	-9969.15	55795.30	0.179
	146 - 144					2.005	27.8325	-10243.10	55795.30	0.184
	144 - 142					2.005	27.8325	-10519.60	55795.30	0.189
	142 - 140					2.005	27.8325	-10798.70	55795.30	0.194
L3	140 - 139	P36x3/8	20.00	190.00	181.0	4.558	41.9697	-11000.50	191287.00	0.058
	139 - 138					4.558	41.9697	-11191.40	191287.00	0.059
	138 - 137					4.558	41.9697	-11382.50	191287.00	0.060
	137 - 136					4.558	41.9697	-11573.80	191287.00	0.061
	136 - 135					4.558	41.9697	-11960.30	191287.00	0.063
	135 - 134					4.558	41.9697	-12152.20	191287.00	0.064
	134 - 133					4.558	41.9697	-12367.90	191287.00	0.065
	133 - 132					4.558	41.9697	-12560.30	191287.00	0.066
	132 - 131					4.558	41.9697	-12912.80	191287.00	0.068
	131 - 130					4.558	41.9697	-13105.70	191287.00	0.069
	130 - 129					4.558	41.9697	-13298.80	191287.00	0.070
	129 - 128					4.558	41.9697	-13655.90	191287.00	0.071
	128 - 127					4.558	41.9697	-13849.60	191287.00	0.072
	127 - 126					4.558	41.9697	-14043.60	191287.00	0.073
	126 - 125					4.558	41.9697	-14237.80	191287.00	0.074
	125 - 124					4.558	41.9697	-14432.40	191287.00	0.075
	124 - 123					4.558	41.9697	-14627.20	191287.00	0.076
	123 - 122					4.558	41.9697	-14822.30	191287.00	0.077
	122 - 121					4.558	41.9697	-15017.70	191287.00	0.079
	121 - 120					4.558	41.9697	-15213.40	191287.00	0.080
L4	120 - 119	P42x3/8	20.00	190.00	154.9	6.222	49.0383	-15441.80	305120.00	0.051
	119 - 118					6.222	49.0383	-15668.80	305120.00	0.051
	118 - 117					6.222	49.0383	-15896.00	305120.00	0.052
	117 - 116					6.222	49.0383	-16123.40	305120.00	0.053
	116 - 115					6.222	49.0383	-17889.20	305120.00	0.059
	115 - 114					6.222	49.0383	-18118.00	305120.00	0.059
	114 - 113					6.222	49.0383	-18346.90	305120.00	0.060
	113 - 112					6.222	49.0383	-18576.20	305120.00	0.061
	112 - 111					6.222	49.0383	-18805.70	305120.00	0.062
	111 - 110					6.222	49.0383	-19035.40	305120.00	0.062
	110 - 109					6.222	49.0383	-19265.40	305120.00	0.063
	109 - 108					6.222	49.0383	-19495.70	305120.00	0.064
	108 - 107					6.222	49.0383	-19726.30	305120.00	0.065
	107 - 106					6.222	49.0383	-19957.10	305120.00	0.065
	106 - 105					6.222	49.0383	-20188.20	305120.00	0.066
	105 - 104					6.222	49.0383	-20419.60	305120.00	0.067
	104 - 103					6.222	49.0383	-20651.30	305120.00	0.068
	103 - 102					6.222	49.0383	-20955.80	305120.00	0.069
	102 - 101					6.222	49.0383	-21188.10	305120.00	0.069
	101 - 100					6.222	49.0383	-21420.70	305120.00	0.070

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 P / P_a
L5	100 - 99	P48x3/8	20.00	190.00	135.4	8.145	56.1069	-21679.00	456988.00	0.047
	99 - 98					8.145	56.1069	-22282.20	456988.00	0.049
	98 - 97					8.145	56.1069	-22539.30	456988.00	0.049
	97 - 96					8.145	56.1069	-22796.60	456988.00	0.050
	96 - 95					8.145	56.1069	-23054.20	456988.00	0.050
	95 - 94					8.145	56.1069	-23311.90	456988.00	0.051
	94 - 93					8.145	56.1069	-23569.90	456988.00	0.052
	93 - 92					8.145	56.1069	-23828.10	456988.00	0.052
	92 - 91					8.145	56.1069	-24086.60	456988.00	0.053
	91 - 90					8.145	56.1069	-24345.30	456988.00	0.053
	90 - 89					8.145	56.1069	-24621.80	456988.00	0.054
	89 - 88					8.145	56.1069	-24881.00	456988.00	0.054
	88 - 87					8.145	56.1069	-25140.40	456988.00	0.055
	87 - 86					8.145	56.1069	-25400.00	456988.00	0.056
	86 - 85					8.145	56.1069	-25659.90	456988.00	0.056
	85 - 84					8.145	56.1069	-25920.10	456988.00	0.057
	84 - 83					8.145	56.1069	-26180.50	456988.00	0.057
	83 - 82					8.145	56.1069	-26441.20	456988.00	0.058
	82 - 81					8.145	56.1069	-26702.10	456988.00	0.058
	81 - 80					8.145	56.1069	-26963.20	456988.00	0.059
L6	80 - 79	P54x3/8	15.00	190.00	120.3	10.326	63.1755	-27248.10	652373.00	0.042
	79 - 78					10.326	63.1755	-27530.70	652373.00	0.042
	78 - 77					10.326	63.1755	-27813.60	652373.00	0.043
	77 - 76					10.326	63.1755	-28096.60	652373.00	0.043
	76 - 75					10.326	63.1755	-28379.80	652373.00	0.044
	75 - 74					10.326	63.1755	-28827.90	652373.00	0.044
	74 - 73					10.326	63.1755	-29111.50	652373.00	0.045
	73 - 72					10.326	63.1755	-29395.30	652373.00	0.045
	72 - 71					10.326	63.1755	-29679.40	652373.00	0.045
	71 - 70					10.326	63.1755	-29963.60	652373.00	0.046
	70 - 69					10.326	63.1755	-30248.00	652373.00	0.046
	69 - 68					10.326	63.1755	-30532.70	652373.00	0.047
	68 - 67					10.326	63.1755	-30817.50	652373.00	0.047
	67 - 66					10.326	63.1755	-31102.60	652373.00	0.048
	66 - 65					10.326	63.1755	-31387.90	652373.00	0.048
L7	65 - 64	P54x3/8 w/ (4) 2"x1" Plates	5.00	190.00	120.4	10.306	72.0330	-31715.20	742380.00	0.043
	64 - 63					10.306	72.0330	-32047.90	742380.00	0.043
	63 - 62					10.306	72.0330	-32374.90	742380.00	0.044
	62 - 61					10.306	72.0330	-32702.20	742380.00	0.044
	61 - 60					10.306	72.0330	-33029.70	742380.00	0.044
L8	60 - 59	P60x3/8	10.00	190.00	108.2	12.523	70.2440	-33338.40	879645.00	0.038
	59 - 58					12.523	70.2440	-33810.10	879645.00	0.038
	58 - 57					12.523	70.2440	-34118.30	879645.00	0.039
	57 - 56					12.523	70.2440	-34426.70	879645.00	0.039
	56 - 55					12.523	70.2440	-34735.30	879645.00	0.039
	55 - 54					12.523	70.2440	-35044.00	879645.00	0.040
	54 - 53					12.523	70.2440	-35352.90	879645.00	0.040
	53 - 52					12.523	70.2440	-35662.00	879645.00	0.041
	52 - 51					12.523	70.2440	-35971.30	879645.00	0.041
	51 - 50					12.523	70.2440	-36280.80	879645.00	0.041
L9	50 - 49	P60x3/8 w/ (4) 2"x1" Plates	10.00	190.00	108.2	12.508	78.9857	-36633.20	987928.00	0.037
	49 - 48					12.508	78.9857	-37004.40	987928.00	0.037
	48 - 47					12.508	78.9857	-37356.60	987928.00	0.038
	47 - 46					12.508	78.9857	-37709.10	987928.00	0.038
	46 - 45					12.508	78.9857	-38061.70	987928.00	0.039
	45 - 44					12.508	78.9857	-38578.70	987928.00	0.039
	44 - 43					12.508	78.9857	-38931.60	987928.00	0.039
	43 - 42					12.508	78.9857	-39284.80	987928.00	0.040
	42 - 41					12.508	78.9857	-39638.10	987928.00	0.040
	41 - 40					12.508	78.9857	-39991.60	987928.00	0.040

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 $\frac{P}{P_a}$
L10	40 - 39	P60x1/2	20.00	190.00	108.4	12.483	93.4624	-40380.80	1166670.00	0.035
	39 - 38					12.483	93.4624	-40769.40	1166670.00	0.035
	38 - 37					12.483	93.4624	-41158.10	1166670.00	0.035
	37 - 36					12.483	93.4624	-41547.00	1166670.00	0.036
	36 - 35					12.483	93.4624	-41937.90	1166670.00	0.036
	35 - 34					12.483	93.4624	-42327.10	1166670.00	0.036
	34 - 33					12.483	93.4624	-42716.40	1166670.00	0.037
	33 - 32					12.483	93.4624	-43105.80	1166670.00	0.037
	32 - 31					12.483	93.4624	-43660.60	1166670.00	0.037
	31 - 30					12.483	93.4624	-44050.40	1166670.00	0.038
	30 - 29					12.483	93.4624	-44440.30	1166670.00	0.038
	29 - 28					12.483	93.4624	-44830.40	1166670.00	0.038
	28 - 27					12.483	93.4624	-45220.70	1166670.00	0.039
	27 - 26					12.483	93.4624	-45611.00	1166670.00	0.039
	26 - 25					12.483	93.4624	-46001.60	1166670.00	0.039
	25 - 24					12.483	93.4624	-46392.30	1166670.00	0.040
	24 - 23					12.483	93.4624	-46783.10	1166670.00	0.040
	23 - 22					12.483	93.4624	-47174.10	1166670.00	0.040
	22 - 21					12.483	93.4624	-47565.30	1166670.00	0.041
	21 - 20					12.483	93.4624	-47956.60	1166670.00	0.041
L11	20 - 19	P60x5/8	20.00	190.00	108.6	12.443	116.5830	-48416.40	1450590.00	0.033
	19 - 18					12.443	116.5830	-48875.10	1450590.00	0.034
	18 - 17					12.443	116.5830	-49334.10	1450590.00	0.034
	17 - 16					12.443	116.5830	-49793.10	1450590.00	0.034
	16 - 15					12.443	116.5830	-50252.30	1450590.00	0.035
	15 - 14					12.443	116.5830	-50711.60	1450590.00	0.035
	14 - 13					12.443	116.5830	-51171.10	1450590.00	0.035
	13 - 12					12.443	116.5830	-51630.70	1450590.00	0.036
	12 - 11					12.443	116.5830	-52090.40	1450590.00	0.036
	11 - 10					12.443	116.5830	-52550.30	1450590.00	0.036
	10 - 9					12.443	116.5830	-53010.30	1450590.00	0.037
	9 - 8					12.443	116.5830	-53470.40	1450590.00	0.037
	8 - 7					12.443	116.5830	-53930.70	1450590.00	0.037
	7 - 6					12.443	116.5830	-54391.10	1450590.00	0.037
	6 - 5					12.443	116.5830	-54851.60	1450590.00	0.038
	5 - 4					12.443	116.5830	-55312.30	1450590.00	0.038
	4 - 3					12.443	116.5830	-55773.20	1450590.00	0.038
	3 - 2					12.443	116.5830	-56234.10	1450590.00	0.039
	2 - 1					12.443	116.5830	-56695.30	1450590.00	0.039
	1 - 0					12.443	116.5830	-57156.50	1450590.00	0.039

* DL controls

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	190 - 189	P18x.375	589.29	-0.079	27.720	0.003	0.00	0.000	27.720	0.000
	189 - 188		665.10	-0.089	27.720	0.003	0.00	0.000	27.720	0.000
	188 - 187		665.08	-0.089	27.720	0.003	0.00	0.000	27.720	0.000
	187 - 186		665.05	-0.089	27.720	0.003	0.00	0.000	27.720	0.000
	186 - 185		665.01	-0.089	27.720	0.003	0.00	0.000	27.720	0.000
	185 - 184		664.96	-0.089	27.720	0.003	0.00	0.000	27.720	0.000
	184 - 183		664.91	-0.089	27.720	0.003	0.00	0.000	27.720	0.000
	183 - 182		4005.77	-0.536	27.720	0.019	0.00	0.000	27.720	0.000

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 $\frac{f_{by}}{F_{by}}$
	182 - 181		1161.38	-0.155	27.720	0.006	0.00	0.000	27.720	0.000
	181 - 180		1161.52	-0.156	27.720	0.006	0.00	0.000	27.720	0.000
L2	180 - 178	P24x3/8	20747.42	-1.538	27.720	0.055	0.00	0.000	27.720	0.000
	178 - 176		29895.00	-2.216	27.720	0.080	0.00	0.000	27.720	0.000
	176 - 174		39270.67	-2.911	27.720	0.105	0.00	0.000	27.720	0.000
	174 - 172		48863.25	-3.623	27.720	0.131	0.00	0.000	27.720	0.000
	172 - 170		58671.42	-4.350	27.720	0.157	0.00	0.000	27.720	0.000
	170 - 168		68693.67	-5.093	27.720	0.184	0.00	0.000	27.720	0.000
	168 - 166		92006.67	-6.821	27.720	0.246	0.00	0.000	27.720	0.000
	166 - 164		104993.33	-7.784	27.720	0.281	0.00	0.000	27.720	0.000
	164 - 162		118233.33	-8.766	27.720	0.316	0.00	0.000	27.720	0.000
	162 - 160		131722.50	-9.766	27.720	0.352	0.00	0.000	27.720	0.000
	160 - 158		152604.17	-11.314	27.720	0.408	0.00	0.000	27.720	0.000
	158 - 156		173730.83	-12.880	27.720	0.465	0.00	0.000	27.720	0.000
	156 - 154		195098.33	-14.464	27.720	0.522	0.00	0.000	27.720	0.000
	154 - 152		216703.33	-16.066	27.720	0.580	0.00	0.000	27.720	0.000
	152 - 150		241665.83	-17.917	27.720	0.646	0.00	0.000	27.720	0.000
	150 - 148		269970.00	-20.015	27.720	0.722	0.00	0.000	27.720	0.000
	148 - 146		298497.50	-22.130	27.720	0.798	0.00	0.000	27.720	0.000
	146 - 144		327240.83	-24.261	27.720	0.875	0.00	0.000	27.720	0.000
	144 - 142		356196.67	-26.408	27.720	0.953	0.00	0.000	27.720	0.000
	142 - 140		385359.17	-28.570	27.720	1.031	0.00	0.000	27.720	0.000
L3	140 - 139	P36x3/8	400090.00	-12.978	23.696	0.548	0.00	0.000	23.696	0.000
	139 - 138		414916.67	-13.459	23.696	0.568	0.00	0.000	23.696	0.000
	138 - 137		429830.00	-13.943	23.696	0.588	0.00	0.000	23.696	0.000
	137 - 136		444830.00	-14.429	23.696	0.609	0.00	0.000	23.696	0.000
	136 - 135		459759.17	-14.914	23.696	0.629	0.00	0.000	23.696	0.000
	135 - 134		475101.67	-15.411	23.696	0.650	0.00	0.000	23.696	0.000
	134 - 133		490658.33	-15.916	23.696	0.672	0.00	0.000	23.696	0.000
	133 - 132		506298.33	-16.423	23.696	0.693	0.00	0.000	23.696	0.000
	132 - 131		522635.00	-16.953	23.696	0.715	0.00	0.000	23.696	0.000

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 $\frac{f_{by}}{F_{by}}$
	131 - 130		538560.83	-17.470	23.696	0.737	0.00	0.000	23.696	0.000
	130 - 129		554571.67	-17.989	23.696	0.759	0.00	0.000	23.696	0.000
	129 - 128		570717.50	-18.513	23.696	0.781	0.00	0.000	23.696	0.000
	128 - 127		586937.50	-19.039	23.696	0.803	0.00	0.000	23.696	0.000
	127 - 126		603240.83	-19.568	23.696	0.826	0.00	0.000	23.696	0.000
	126 - 125		619626.67	-20.099	23.696	0.848	0.00	0.000	23.696	0.000
	125 - 124		636096.67	-20.634	23.696	0.871	0.00	0.000	23.696	0.000
	124 - 123		652648.33	-21.170	23.696	0.893	0.00	0.000	23.696	0.000
	123 - 122		669282.50	-21.710	23.696	0.916	0.00	0.000	23.696	0.000
	122 - 121		685998.33	-22.252	23.696	0.939	0.00	0.000	23.696	0.000
	121 - 120		702795.83	-22.797	23.696	0.962	0.00	0.000	23.696	0.000
L4	120 - 119	P42x3/8	719683.33	-17.075	22.711	0.752	0.00	0.000	22.711	0.000
	119 - 118		736663.33	-17.477	22.711	0.770	0.00	0.000	22.711	0.000
	118 - 117		753736.67	-17.883	22.711	0.787	0.00	0.000	22.711	0.000
	117 - 116		770901.67	-18.290	22.711	0.805	0.00	0.000	22.711	0.000
	116 - 115		790525.00	-18.755	22.711	0.826	0.00	0.000	22.711	0.000
	115 - 114		810239.17	-19.223	22.711	0.846	0.00	0.000	22.711	0.000
	114 - 113		830044.17	-19.693	22.711	0.867	0.00	0.000	22.711	0.000
	113 - 112		849941.67	-20.165	22.711	0.888	0.00	0.000	22.711	0.000
	112 - 111		869925.00	-20.639	22.711	0.909	0.00	0.000	22.711	0.000
	111 - 110		890000.00	-21.116	22.711	0.930	0.00	0.000	22.711	0.000
	110 - 109		910166.67	-21.594	22.711	0.951	0.00	0.000	22.711	0.000
	109 - 108		930425.00	-22.075	22.711	0.972	0.00	0.000	22.711	0.000
	108 - 107		950766.67	-22.557	22.711	0.993	0.00	0.000	22.711	0.000
	107 - 106		971200.00	-23.042	22.711	1.015	0.00	0.000	22.711	0.000
	106 - 105		991716.67	-23.529	22.711	1.036	0.00	0.000	22.711	0.000
	105 - 104		1012325.00	-24.018	22.711	1.058	0.00	0.000	22.711	0.000
	104 - 103		1033016.67	-24.509	22.711	1.079	0.00	0.000	22.711	0.000
	103 - 102		1053891.67	-25.004	22.711	1.101	0.00	0.000	22.711	0.000
	102 - 101		1074858.33	-25.501	22.711	1.123	0.00	0.000	22.711	0.000

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 $\frac{f_{by}}{F_{by}}$
	101 - 100		1095908	-26.001	22.711	1.145	0.00	0.000	22.711	0.000
			.33							
L5	100 - 99	P48x3/8	1117050	-20.223	21.972	0.920	0.00	0.000	21.972	0.000
			.00							
	99 - 98		1138416	-20.610	21.972	0.938	0.00	0.000	21.972	0.000
			.67							
	98 - 97		1160025	-21.001	21.972	0.956	0.00	0.000	21.972	0.000
			.00							
	97 - 96		1181733	-21.394	21.972	0.974	0.00	0.000	21.972	0.000
			.33							
	96 - 95		1203525	-21.788	21.972	0.992	0.00	0.000	21.972	0.000
			.00							
	95 - 94		1225416	-22.185	21.972	1.010	0.00	0.000	21.972	0.000
			.67							
	94 - 93		1247400	-22.583	21.972	1.028	0.00	0.000	21.972	0.000
			.00							
	93 - 92		1269483	-22.982	21.972	1.046	0.00	0.000	21.972	0.000
			.33							
	92 - 91		1291650	-23.384	21.972	1.064	0.00	0.000	21.972	0.000
			.00							
	91 - 90		1313916	-23.787	21.972	1.083	0.00	0.000	21.972	0.000
			.67							
	90 - 89		1336350	-24.193	21.972	1.101	0.00	0.000	21.972	0.000
			.00							
	89 - 88		1358875	-24.601	21.972	1.120	0.00	0.000	21.972	0.000
			.00							
	88 - 87		1381491	-25.010	21.972	1.138	0.00	0.000	21.972	0.000
			.67							
	87 - 86		1404191	-25.421	21.972	1.157	0.00	0.000	21.972	0.000
			.67							
	86 - 85		1426991	-25.834	21.972	1.176	0.00	0.000	21.972	0.000
			.67							
	85 - 84		1449883	-26.248	21.972	1.195	0.00	0.000	21.972	0.000
			.33							
	84 - 83		1472858	-26.664	21.972	1.214	0.00	0.000	21.972	0.000
			.33							
	83 - 82		1495925	-27.082	21.972	1.233	0.00	0.000	21.972	0.000
			.00							
	82 - 81		1519083	-27.501	21.972	1.252	0.00	0.000	21.972	0.000
			.33							
	81 - 80		1542325	-27.922	21.972	1.271	0.00	0.000	21.972	0.000
			.00							
L6	80 - 79	P54x3/8	1565716	-22.338	21.397	1.044	0.00	0.000	21.397	0.000
			.67							
	79 - 78		1589200	-22.673	21.397	1.060	0.00	0.000	21.397	0.000
			.00							
	78 - 77		1612775	-23.009	21.397	1.075	0.00	0.000	21.397	0.000
			.00							
	77 - 76		1636458	-23.347	21.397	1.091	0.00	0.000	21.397	0.000
			.33							
	76 - 75		1660225	-23.686	21.397	1.107	0.00	0.000	21.397	0.000
			.00							
	75 - 74		1684141	-24.028	21.397	1.123	0.00	0.000	21.397	0.000
			.67							
	74 - 73		1708133	-24.370	21.397	1.139	0.00	0.000	21.397	0.000
			.33							
	73 - 72		1732225	-24.714	21.397	1.155	0.00	0.000	21.397	0.000
			.00							
	72 - 71		1756416	-25.059	21.397	1.171	0.00	0.000	21.397	0.000
			.67							

RISATower	Job: 190' Pirod Monopole	Page: 32 of 39
NATCOMM 63-2 N. Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project: 08001 - 240 Kensington Road, Berlin, CT	Date: 20:03:08 03/03/08
	Client: Verizon	Designed by: Staff

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 $\frac{f_{bv}}{F_{by}}$
	71 - 70		1780691.67	-25.405	21.397	1.187	0.00	0.000	21.397	0.000
	70 - 69		1805066.67	-25.753	21.397	1.204	0.00	0.000	21.397	0.000
	69 - 68		1829533.33	-26.102	21.397	1.220	0.00	0.000	21.397	0.000
	68 - 67		1854100.00	-26.452	21.397	1.236	0.00	0.000	21.397	0.000
	67 - 66		1878750.00	-26.804	21.397	1.253	0.00	0.000	21.397	0.000
	66 - 65		1903500.00	-27.157	21.397	1.269	0.00	0.000	21.397	0.000
L7	65 - 64	P54x3/8 w/ (4) 2"x1" Plates	1928341.67	-24.176	22.047	1.097	0.00	0.000	22.047	0.000
	64 - 63		1953333.33	-24.489	22.047	1.111	0.00	0.000	22.047	0.000
	63 - 62		1978383.33	-24.803	22.047	1.125	0.00	0.000	22.047	0.000
	62 - 61		2003525.00	-25.119	22.047	1.139	0.00	0.000	22.047	0.000
	61 - 60		2028775.00	-25.435	22.047	1.154	0.00	0.000	22.047	0.000
L8	60 - 59	P60x3/8	2054116.67	-23.688	20.938	1.131	0.00	0.000	20.938	0.000
	59 - 58		2080283.33	-23.990	20.938	1.146	0.00	0.000	20.938	0.000
	58 - 57		2105900.00	-24.285	20.938	1.160	0.00	0.000	20.938	0.000
	57 - 56		2131616.67	-24.582	20.938	1.174	0.00	0.000	20.938	0.000
	56 - 55		2157433.33	-24.880	20.938	1.188	0.00	0.000	20.938	0.000
	55 - 54		2183341.67	-25.179	20.938	1.203	0.00	0.000	20.938	0.000
	54 - 53		2209341.67	-25.478	20.938	1.217	0.00	0.000	20.938	0.000
	53 - 52		2235433.33	-25.779	20.938	1.231	0.00	0.000	20.938	0.000
	52 - 51		2261625.00	-26.081	20.938	1.246	0.00	0.000	20.938	0.000
	51 - 50		2287900.00	-26.384	20.938	1.260	0.00	0.000	20.938	0.000
L9	50 - 49	P60x3/8 w/ (4) 2"x1" Plates	2314275.00	-23.772	21.456	1.108	0.00	0.000	21.456	0.000
	49 - 48		2340916.67	-24.046	21.456	1.121	0.00	0.000	21.456	0.000
	48 - 47		2367533.33	-24.319	21.456	1.133	0.00	0.000	21.456	0.000
	47 - 46		2394250.00	-24.593	21.456	1.146	0.00	0.000	21.456	0.000
	46 - 45		2421058.33	-24.869	21.456	1.159	0.00	0.000	21.456	0.000
	45 - 44		2448683.33	-25.153	21.456	1.172	0.00	0.000	21.456	0.000
	44 - 43		2475758.33	-25.431	21.456	1.185	0.00	0.000	21.456	0.000
	43 - 42		2502925.00	-25.710	21.456	1.198	0.00	0.000	21.456	0.000
	42 - 41		2530183.33	-25.990	21.456	1.211	0.00	0.000	21.456	0.000

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 $\frac{f_{by}}{F_{by}}$
	41 - 40		2557541	-26.271	21.456	1.224	0.00	0.000	21.456	0.000
			.67							
L10	40 - 39	P60x1/2	2584975	-22.498	22.317	1.008	0.00	0.000	22.317	0.000
			.00							
	39 - 38		2612491	-22.738	22.317	1.019	0.00	0.000	22.317	0.000
			.67							
	38 - 37		2640091	-22.978	22.317	1.030	0.00	0.000	22.317	0.000
			.67							
	37 - 36		2667766	-23.219	22.317	1.040	0.00	0.000	22.317	0.000
			.67							
	36 - 35		2695525	-23.460	22.317	1.051	0.00	0.000	22.317	0.000
			.00							
	35 - 34		2723366	-23.703	22.317	1.062	0.00	0.000	22.317	0.000
			.67							
	34 - 33		2751283	-23.946	22.317	1.073	0.00	0.000	22.317	0.000
			.33							
	33 - 32		2779275	-24.189	22.317	1.084	0.00	0.000	22.317	0.000
			.00							
	32 - 31		2807383	-24.434	22.317	1.095	0.00	0.000	22.317	0.000
			.33							
	31 - 30		2835550	-24.679	22.317	1.106	0.00	0.000	22.317	0.000
			.00							
	30 - 29		2863800	-24.925	22.317	1.117	0.00	0.000	22.317	0.000
			.00							
	29 - 28		2892125	-25.171	22.317	1.128	0.00	0.000	22.317	0.000
			.00							
	28 - 27		2920525	-25.419	22.317	1.139	0.00	0.000	22.317	0.000
			.00							
	27 - 26		2948991	-25.666	22.317	1.150	0.00	0.000	22.317	0.000
			.67							
	26 - 25		2977541	-25.915	22.317	1.161	0.00	0.000	22.317	0.000
			.67							
	25 - 24		3006166	-26.164	22.317	1.172	0.00	0.000	22.317	0.000
			.67							
	24 - 23		3034858	-26.414	22.317	1.184	0.00	0.000	22.317	0.000
			.33							
	23 - 22		3063625	-26.664	22.317	1.195	0.00	0.000	22.317	0.000
			.00							
	22 - 21		3092466	-26.915	22.317	1.206	0.00	0.000	22.317	0.000
			.67							
	21 - 20		3121383	-27.167	22.317	1.217	0.00	0.000	22.317	0.000
			.33							
L11	20 - 19	P60x5/8	3150366	-22.073	23.696	0.932	0.00	0.000	23.696	0.000
			.67							
	19 - 18		3179425	-22.277	23.696	0.940	0.00	0.000	23.696	0.000
			.00							
	18 - 17		3208550	-22.481	23.696	0.949	0.00	0.000	23.696	0.000
			.00							
	17 - 16		3237758	-22.686	23.696	0.957	0.00	0.000	23.696	0.000
			.33							
	16 - 15		3267033	-22.891	23.696	0.966	0.00	0.000	23.696	0.000
			.33							
	15 - 14		3296383	-23.096	23.696	0.975	0.00	0.000	23.696	0.000
			.33							
	14 - 13		3325808	-23.302	23.696	0.983	0.00	0.000	23.696	0.000
			.33							
	13 - 12		3355300	-23.509	23.696	0.992	0.00	0.000	23.696	0.000
			.00							
	12 - 11		3384866	-23.716	23.696	1.001	0.00	0.000	23.696	0.000
			.67							

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 $\frac{f_{by}}{F_{by}}$
	11 - 10		3414508.33	-23.924	23.696	1.010	0.00	0.000	23.696	0.000
	10 - 9		3444208.33	-24.132	23.696	1.018	0.00	0.000	23.696	0.000
	9 - 8		3473991.67	-24.341	23.696	1.027	0.00	0.000	23.696	0.000
	8 - 7		3503833.33	-24.550	23.696	1.036	0.00	0.000	23.696	0.000
	7 - 6		3533750.00	-24.759	23.696	1.045	0.00	0.000	23.696	0.000
	6 - 5		3563741.67	-24.970	23.696	1.054	0.00	0.000	23.696	0.000
	5 - 4		3593791.67	-25.180	23.696	1.063	0.00	0.000	23.696	0.000
	4 - 3		3623916.67	-25.391	23.696	1.072	0.00	0.000	23.696	0.000
	3 - 2		3654100.00	-25.603	23.696	1.080	0.00	0.000	23.696	0.000
	2 - 1		3684358.33	-25.815	23.696	1.089	0.00	0.000	23.696	0.000
	1 - 0		3714675.00	-26.027	23.696	1.098	0.00	0.000	23.696	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	190 - 189	P18x.375	0.005	0.003	0.000	0.007 ✓	1.333	H1-3 ✓
	189 - 188		0.017	0.003	0.000	0.020 ✓	1.000	H1-3 ✓
	188 - 187		0.021	0.003	0.000	0.024 ✓	1.000	H1-3 ✓
	187 - 186		0.025	0.003	0.000	0.028 ✓	1.000	H1-3 ✓
	186 - 185		0.028	0.003	0.000	0.032 ✓	1.000	H1-3 ✓
	185 - 184		0.032	0.003	0.000	0.035 ✓	1.000	H1-3 ✓
	184 - 183		0.036	0.003	0.000	0.039 ✓	1.000	H1-3 ✓
	183 - 182		0.038	0.019	0.000	0.058 ✓	1.333	H1-3 ✓
	182 - 181		0.179	0.006	0.000	0.184 ✓	1.000	H1-3 ✓
	181 - 180		0.182	0.006	0.000	0.188 ✓	1.000	H1-3 ✓
L2	180 - 178	P24x3/8	0.077	0.055	0.000	0.132 ✓	1.333	H1-3 ✓
	178 - 176		0.082	0.080	0.000	0.162 ✓	1.333	H1-3 ✓
	176 - 174		0.087	0.105	0.000	0.192 ✓	1.333	H1-3 ✓
	174 - 172		0.093	0.131	0.000	0.223 ✓	1.333	H1-3 ✓
	172 - 170		0.098	0.157	0.000	0.255 ✓	1.333	H1-3 ✓
	170 - 168		0.104	0.184	0.000	0.287 ✓	1.333	H1-3 ✓
	168 - 166		0.079	0.246	0.000	0.325 ✓	1.333	H1-3 ✓
	166 - 164		0.084	0.281	0.000	0.364 ✓	1.333	H1-3 ✓
	164 - 162		0.088	0.316	0.000	0.404 ✓	1.333	H1-3 ✓

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	Client: Verizon	Designed by: Staff

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
	162 - 160		0.093	0.352	0.000	0.445 ✓	1.333	H1-3 ✓
	160 - 158		0.120	0.408	0.000	0.528 ✓	1.333	H1-3 ✓
	158 - 156		0.125	0.465	0.000	0.589 ✓	1.333	H1-3 ✓
	156 - 154		0.129	0.522	0.000	0.651 ✓	1.333	H1-3 ✓
	154 - 152		0.134	0.580	0.000	0.714 ✓	1.333	H1-3 ✓
	152 - 150		0.169	0.646	0.000	0.815 ✓	1.333	H1-3 ✓
	150 - 148		0.174	0.722	0.000	0.896 ✓	1.333	H1-3 ✓
	148 - 146		0.179	0.798	0.000	0.977 ✓	1.333	H1-3 ✓
	146 - 144		0.184	0.875	0.000	1.059 ✓	1.333	H1-3 ✓
	144 - 142		0.189	0.953	0.000	1.141 ✓	1.333	H1-3 ✓
	142 - 140		0.194	1.031	0.000	1.224 ✓	1.333	H1-3 ✓
L3	140 - 139	P36x3/8	0.058	0.548	0.000	0.605 ✓	1.333	H1-3 ✓
	139 - 138		0.059	0.568	0.000	0.626 ✓	1.333	H1-3 ✓
	138 - 137		0.060	0.588	0.000	0.648 ✓	1.333	H1-3 ✓
	137 - 136		0.061	0.609	0.000	0.669 ✓	1.333	H1-3 ✓
	136 - 135		0.063	0.629	0.000	0.692 ✓	1.333	H1-3 ✓
	135 - 134		0.064	0.650	0.000	0.714 ✓	1.333	H1-3 ✓
	134 - 133		0.065	0.672	0.000	0.736 ✓	1.333	H1-3 ✓
	133 - 132		0.066	0.693	0.000	0.759 ✓	1.333	H1-3 ✓
	132 - 131		0.068	0.715	0.000	0.783 ✓	1.333	H1-3 ✓
	131 - 130		0.069	0.737	0.000	0.806 ✓	1.333	H1-3 ✓
	130 - 129		0.070	0.759	0.000	0.829 ✓	1.333	H1-3 ✓
	129 - 128		0.071	0.781	0.000	0.853 ✓	1.333	H1-3 ✓
	128 - 127		0.072	0.803	0.000	0.876 ✓	1.333	H1-3 ✓
	127 - 126		0.073	0.826	0.000	0.899 ✓	1.333	H1-3 ✓
	126 - 125		0.074	0.848	0.000	0.923 ✓	1.333	H1-3 ✓
	125 - 124		0.075	0.871	0.000	0.946 ✓	1.333	H1-3 ✓
	124 - 123		0.076	0.893	0.000	0.970 ✓	1.333	H1-3 ✓
	123 - 122		0.077	0.916	0.000	0.994 ✓	1.333	H1-3 ✓
	122 - 121		0.079	0.939	0.000	1.018 ✓	1.333	H1-3 ✓
	121 - 120		0.080	0.962	0.000	1.042 ✓	1.333	H1-3 ✓
L4	120 - 119	P42x3/8	0.051	0.752	0.000	0.802 ✓	1.333	H1-3 ✓
	119 - 118		0.051	0.770	0.000	0.821 ✓	1.333	H1-3 ✓
	118 - 117		0.052	0.787	0.000	0.840 ✓	1.333	H1-3 ✓
	117 - 116		0.053	0.805	0.000	0.858 ✓	1.333	H1-3 ✓
	116 - 115		0.059	0.826	0.000	0.884 ✓	1.333	H1-3 ✓
	115 - 114		0.059	0.846	0.000	0.906 ✓	1.333	H1-3 ✓
	114 - 113		0.060	0.867	0.000	0.927 ✓	1.333	H1-3 ✓
	113 - 112		0.061	0.888	0.000	0.949 ✓	1.333	H1-3 ✓
	112 - 111		0.062	0.909	0.000	0.970 ✓	1.333	H1-3 ✓

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	Client: Verizon	Designed by: Staff

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
	111 - 110		0.062	0.930	0.000	0.992 ✓	1.333	H1-3 ✓
	110 - 109		0.063	0.951	0.000	1.014 ✓	1.333	H1-3 ✓
	109 - 108		0.064	0.972	0.000	1.036 ✓	1.333	H1-3 ✓
	108 - 107		0.065	0.993	0.000	1.058 ✓	1.333	H1-3 ✓
	107 - 106		0.065	1.015	0.000	1.080 ✓	1.333	H1-3 ✓
	106 - 105		0.066	1.036	0.000	1.102 ✓	1.333	H1-3 ✓
	105 - 104		0.067	1.058	0.000	1.124 ✓	1.333	H1-3 ✓
	104 - 103		0.068	1.079	0.000	1.147 ✓	1.333	H1-3 ✓
	103 - 102		0.069	1.101	0.000	1.170 ✓	1.333	H1-3 ✓
	102 - 101		0.069	1.123	0.000	1.192 ✓	1.333	H1-3 ✓
	101 - 100		0.070	1.145	0.000	1.215 ✓	1.333	H1-3 ✓
L5	100 - 99	P48x3/8	0.047	0.920	0.000	0.968 ✓	1.333	H1-3 ✓
	99 - 98		0.049	0.938	0.000	0.987 ✓	1.333	H1-3 ✓
	98 - 97		0.049	0.956	0.000	1.005 ✓	1.333	H1-3 ✓
	97 - 96		0.050	0.974	0.000	1.024 ✓	1.333	H1-3 ✓
	96 - 95		0.050	0.992	0.000	1.042 ✓	1.333	H1-3 ✓
	95 - 94		0.051	1.010	0.000	1.061 ✓	1.333	H1-3 ✓
	94 - 93		0.052	1.028	0.000	1.079 ✓	1.333	H1-3 ✓
	93 - 92		0.052	1.046	0.000	1.098 ✓	1.333	H1-3 ✓
	92 - 91		0.053	1.064	0.000	1.117 ✓	1.333	H1-3 ✓
	91 - 90		0.053	1.083	0.000	1.136 ✓	1.333	H1-3 ✓
	90 - 89		0.054	1.101	0.000	1.155 ✓	1.333	H1-3 ✓
	89 - 88		0.054	1.120	0.000	1.174 ✓	1.333	H1-3 ✓
	88 - 87		0.055	1.138	0.000	1.193 ✓	1.333	H1-3 ✓
	87 - 86		0.056	1.157	0.000	1.213 ✓	1.333	H1-3 ✓
	86 - 85		0.056	1.176	0.000	1.232 ✓	1.333	H1-3 ✓
	85 - 84		0.057	1.195	0.000	1.251 ✓	1.333	H1-3 ✓
	84 - 83		0.057	1.214	0.000	1.271 ✓	1.333	H1-3 ✓
	83 - 82		0.058	1.233	0.000	1.290 ✓	1.333	H1-3 ✓
	82 - 81		0.058	1.252	0.000	1.310 ✓	1.333	H1-3 ✓
	81 - 80		0.059	1.271	0.000	1.330 ✓	1.333	H1-3 ✓
L6	80 - 79	P54x3/8	0.042	1.044	0.000	1.086 ✓	1.333	H1-3 ✓
	79 - 78		0.042	1.060	0.000	1.102 ✓	1.333	H1-3 ✓
	78 - 77		0.043	1.075	0.000	1.118 ✓	1.333	H1-3 ✓
	77 - 76		0.043	1.091	0.000	1.134 ✓	1.333	H1-3 ✓
	76 - 75		0.044	1.107	0.000	1.150 ✓	1.333	H1-3 ✓
	75 - 74		0.044	1.123	0.000	1.167 ✓	1.333	H1-3 ✓
	74 - 73		0.045	1.139	0.000	1.184 ✓	1.333	H1-3 ✓
	73 - 72		0.045	1.155	0.000	1.200 ✓	1.333	H1-3 ✓
	72 - 71		0.045	1.171	0.000	1.217 ✓	1.333	H1-3 ✓

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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
	71 - 70		0.046	1.187	0.000	1.233 ✓	1.333	H1-3 ✓
	70 - 69		0.046	1.204	0.000	1.250 ✓	1.333	H1-3 ✓
	69 - 68		0.047	1.220	0.000	1.267 ✓	1.333	H1-3 ✓
	68 - 67		0.047	1.236	0.000	1.283 ✓	1.333	H1-3 ✓
	67 - 66		0.048	1.253	0.000	1.300 ✓	1.333	H1-3 ✓
	66 - 65		0.048	1.269	0.000	1.317 ✓	1.333	H1-3 ✓
L7	65 - 64	P54x3/8 w/ (4) 2"x1" Plates	0.043	1.097	0.000	1.139 ✓	1.333	H1-3 ✓
	64 - 63		0.043	1.111	0.000	1.154 ✓	1.333	H1-3 ✓
	63 - 62		0.044	1.125	0.000	1.169 ✓	1.333	H1-3 ✓
	62 - 61		0.044	1.139	0.000	1.183 ✓	1.333	H1-3 ✓
	61 - 60		0.044	1.154	0.000	1.198 ✓	1.333	H1-3 ✓
L8	60 - 59	P60x3/8	0.038	1.131	0.000	1.169 ✓	1.333	H1-3 ✓
	59 - 58		0.038	1.146	0.000	1.184 ✓	1.333	H1-3 ✓
	58 - 57		0.039	1.160	0.000	1.199 ✓	1.333	H1-3 ✓
	57 - 56		0.039	1.174	0.000	1.213 ✓	1.333	H1-3 ✓
	56 - 55		0.039	1.188	0.000	1.228 ✓	1.333	H1-3 ✓
	55 - 54		0.040	1.203	0.000	1.242 ✓	1.333	H1-3 ✓
	54 - 53		0.040	1.217	0.000	1.257 ✓	1.333	H1-3 ✓
	53 - 52		0.041	1.231	0.000	1.272 ✓	1.333	H1-3 ✓
	52 - 51		0.041	1.246	0.000	1.287 ✓	1.333	H1-3 ✓
	51 - 50		0.041	1.260	0.000	1.301 ✓	1.333	H1-3 ✓
L9	50 - 49	P60x3/8 w/ (4) 2"x1" Plates	0.037	1.108	0.000	1.145 ✓	1.333	H1-3 ✓
	49 - 48		0.037	1.121	0.000	1.158 ✓	1.333	H1-3 ✓
	48 - 47		0.038	1.133	0.000	1.171 ✓	1.333	H1-3 ✓
	47 - 46		0.038	1.146	0.000	1.184 ✓	1.333	H1-3 ✓
	46 - 45		0.039	1.159	0.000	1.198 ✓	1.333	H1-3 ✓
	45 - 44		0.039	1.172	0.000	1.211 ✓	1.333	H1-3 ✓
	44 - 43		0.039	1.185	0.000	1.225 ✓	1.333	H1-3 ✓
	43 - 42		0.040	1.198	0.000	1.238 ✓	1.333	H1-3 ✓
	42 - 41		0.040	1.211	0.000	1.251 ✓	1.333	H1-3 ✓
	41 - 40		0.040	1.224	0.000	1.265 ✓	1.333	H1-3 ✓
L10	40 - 39	P60x1/2	0.035	1.008	0.000	1.043 ✓	1.333	H1-3 ✓
	39 - 38		0.035	1.019	0.000	1.054 ✓	1.333	H1-3 ✓
	38 - 37		0.035	1.030	0.000	1.065 ✓	1.333	H1-3 ✓
	37 - 36		0.036	1.040	0.000	1.076 ✓	1.333	H1-3 ✓
	36 - 35		0.036	1.051	0.000	1.087 ✓	1.333	H1-3 ✓
	35 - 34		0.036	1.062	0.000	1.098 ✓	1.333	H1-3 ✓
	34 - 33		0.037	1.073	0.000	1.110 ✓	1.333	H1-3 ✓
	33 - 32		0.037	1.084	0.000	1.121 ✓	1.333	H1-3 ✓
	32 - 31		0.037	1.095	0.000	1.132 ✓	1.333	H1-3 ✓

RISATower	Job: 190' Pirod Monopole	Page: 38 of 39
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	Client: Verizon	Designed by: Staff

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
	31 - 30		0.038	1.106	0.000	1.144 ✓	1.333	H1-3 ✓
	30 - 29		0.038	1.117	0.000	1.155 ✓	1.333	H1-3 ✓
	29 - 28		0.038	1.128	0.000	1.166 ✓	1.333	H1-3 ✓
	28 - 27		0.039	1.139	0.000	1.178 ✓	1.333	H1-3 ✓
	27 - 26		0.039	1.150	0.000	1.189 ✓	1.333	H1-3 ✓
	26 - 25		0.039	1.161	0.000	1.201 ✓	1.333	H1-3 ✓
	25 - 24		0.040	1.172	0.000	1.212 ✓	1.333	H1-3 ✓
	24 - 23		0.040	1.184	0.000	1.224 ✓	1.333	H1-3 ✓
	23 - 22		0.040	1.195	0.000	1.235 ✓	1.333	H1-3 ✓
	22 - 21		0.041	1.206	0.000	1.247 ✓	1.333	H1-3 ✓
	21 - 20		0.041	1.217	0.000	1.258 ✓	1.333	H1-3 ✓
L11	20 - 19	P60x5/8	0.033	0.932	0.000	0.965 ✓	1.333	H1-3 ✓
	19 - 18		0.034	0.940	0.000	0.974 ✓	1.333	H1-3 ✓
	18 - 17		0.034	0.949	0.000	0.983 ✓	1.333	H1-3 ✓
	17 - 16		0.034	0.957	0.000	0.992 ✓	1.333	H1-3 ✓
	16 - 15		0.035	0.966	0.000	1.001 ✓	1.333	H1-3 ✓
	15 - 14		0.035	0.975	0.000	1.010 ✓	1.333	H1-3 ✓
	14 - 13		0.035	0.983	0.000	1.019 ✓	1.333	H1-3 ✓
	13 - 12		0.036	0.992	0.000	1.028 ✓	1.333	H1-3 ✓
	12 - 11		0.036	1.001	0.000	1.037 ✓	1.333	H1-3 ✓
	11 - 10		0.036	1.010	0.000	1.046 ✓	1.333	H1-3 ✓
	10 - 9		0.037	1.018	0.000	1.055 ✓	1.333	H1-3 ✓
	9 - 8		0.037	1.027	0.000	1.064 ✓	1.333	H1-3 ✓
	8 - 7		0.037	1.036	0.000	1.073 ✓	1.333	H1-3 ✓
	7 - 6		0.037	1.045	0.000	1.082 ✓	1.333	H1-3 ✓
	6 - 5		0.038	1.054	0.000	1.092 ✓	1.333	H1-3 ✓
	5 - 4		0.038	1.063	0.000	1.101 ✓	1.333	H1-3 ✓
	4 - 3		0.038	1.072	0.000	1.110 ✓	1.333	H1-3 ✓
	3 - 2		0.039	1.080	0.000	1.119 ✓	1.333	H1-3 ✓
	2 - 1		0.039	1.089	0.000	1.128 ✓	1.333	H1-3 ✓
	1 - 0		0.039	1.098	0.000	1.138 ✓	1.333	H1-3 ✓

* DL controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L1	190 - 180	Pole	P18x.375	1	-4224.54	23171.60	18.8	Pass
L2	180 - 140	Pole	P24x3/8	2	-10798.70	74375.13	91.8	Pass
L3	140 - 120	Pole	P36x3/8	3	-15213.40	254985.56	78.1	Pass

RISATower	Job: 190' Pirod Monopole	Page: 39 of 39
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	Client: Verizon	Designed by: Staff

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
L4	120 - 100	Pole	P42x3/8	4	-21420.70	406724.94	91.2	Pass
L5	100 - 80	Pole	P48x3/8	5	-26963.20	609164.98	99.8	Pass
L6	80 - 65	Pole	P54x3/8	6	-31387.90	869613.17	98.8	Pass
L7	65 - 60	Pole	P54x3/8 w/ (4) 2"x1" Plates	7	-33029.70	989592.50	89.9	Pass
L8	60 - 50	Pole	P60x3/8	8	-36280.80	1172566.74	97.6	Pass
L9	50 - 40	Pole	P60x3/8 w/ (4) 2"x1" Plates	9	-39991.60	1316907.97	94.9	Pass
L10	40 - 20	Pole	P60x1/2	10	-47956.60	1555171.05	94.4	Pass
L11	20 - 0	Pole	P60x5/8	11	-57156.50	1933636.39	85.4	Pass
							Summary	
							Pole (L5) 99.8	Pass
							RATING = 99.8	Pass

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Description	140' Flange Plate	Computed by	JEK	Sheet 1 of 5	
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FLANGE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	OM := 385.2 ft·kips	*user input*
Shear Force:	Shear := 14.6 kips	*user input*
Axial Force:	Axial := 15.7 kips	*user input*

Anchor Bolt Data:

Use ASTM A325

Number of Anchor Bolts = N	N := 24	*user input*
Diameter of Bolt Circle:	D_{bc} := 33in	*user input*
Bolt "Column" Distance:	l := 0.1in	*user input*
Bolt Ultimate Strength:	F_u := 120 ksi	*user input*
Bolt Yield Strength:	Fy := 74 ksi	*user input*
Bolt Modulus:	E := 29000 ksi	*user input*
Thickness Of Anchor Bolts	D := 1.0in	*user input*
Threads per Inch:	n := 8	*user input*

Base Plate Data:

Plate Yield Strength:	Fy_{bp} := 36 ksi	*user input*
Base Plate Thickness:	PlateThickness := 1.25 in	*user input*
Base Plate Diameter:	D_{bp} := 36 in	*user input*
Outer Pole Diameter:	D_{pole} := 24in	*user input*

Gusset Data:

Exist Gusset Thickness:	$t_{Gusset1}$:= 0.5 in	*user input*
Exist Gusset Height:	$H_{Gusset1}$:= 2 in	*user input*
New Gusset Thickness:	$t_{Gusset2}$:= .75 in	*user input*
New Gusset Height:	$H_{Gusset2}$:= 8 in	*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: $i := 1..N$

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

$d_1 = 4.27 \cdot in$ $d_7 = 15.94 \cdot in$

$d_2 = 8.25 \cdot in$ $d_8 = 14.29 \cdot in$

$d_3 = 11.67 \cdot in$ $d_9 = 11.67 \cdot in$

$d_4 = 14.29 \cdot in$ $d_{10} = 8.25 \cdot in$

$d_5 = 15.94 \cdot in$ $d_{11} = 4.27 \cdot in$

$d_6 = 16.50 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 12.00 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 3.94 \cdot in$

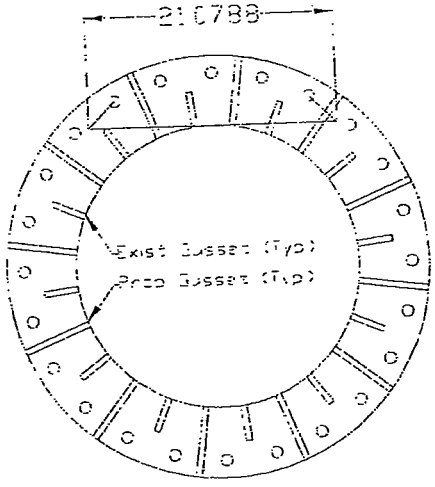
$MA_2 = 0.00 \cdot in$ $MA_8 = 2.29 \cdot in$

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

$MA_4 = 2.29 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 3.94 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 4.50 \cdot in$ etc.



EffectiveWidth := 21.07in

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 3.267 \times 10^3 \cdot in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 0.785 \cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 \qquad A_n = 0.606 \cdot in^2$$

Net Diameter:

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 0.88 \cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.22 \cdot in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi \cdot D_n^3}{32} \qquad S_x = 0.066 \cdot in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.005 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 0.9 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 59.2 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 41.5 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N}$ $MaxTension = 22.7 \cdot kips$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.55$$

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

Condition = "OK"

Check Combined Stresses:

$$\frac{MaxTension}{AllowableTension} + \frac{f_{bx}}{F_{bx}} = 0.56$$

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

Condition2 = "OK"

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Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 6.7 \cdot kips$ $C_7 = 23.2 \cdot kips$

$C_2 = 12.3 \cdot kips$ $C_8 = 20.9 \cdot kips$

$C_3 = 17.2 \cdot kips$ $C_9 = 17.2 \cdot kips$

$C_4 = 20.9 \cdot kips$ $C_{10} = 12.3 \cdot kips$

$C_5 = 23.2 \cdot kips$ $C_{11} = 6.7 \cdot kips$

$C_6 = 24.0 \cdot kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(EffectiveWidth \cdot PlateThickness^2\right) + 2\left(t_{Gusset1} \cdot H_{Gusset1}^2\right) + 2\left[t_{Gusset2} \cdot \left(.6H_{Gusset2}\right)^2\right]}$$

$f_{bp} = 32.4 \cdot ksi$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} = 0.90$$

$$Condition3 := if\left(\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition3 = "OK"

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FLANGE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 1096 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 21.1 \cdot kips$	*user input*
Axial Force:	$Axial := 29.0 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A325

Number of Anchor Bolts = N	$N := 32$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 45in$	*user input*
Bolt "Column" Distance:	$l := 0.1in$	*user input*
Bolt Ultimate Strength:	$F_u := 120 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 74 \cdot ksi$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*
Thickness Of Anchor Bolts	$D := 1.0in$	*user input*
Threads per Inch:	$n := 8$	*user input*

Base Plate Data:

Plate Yield Strength:	$Fy_{bp} := 36 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 1.25 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 48 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 42in$	*user input*

Gusset Data:

Exist Gusset Thickness:	$t_{Gusset1} := 0.5 \cdot in$	*user input*
Exist Gusset Height:	$H_{Gusset1} := 2 \cdot in$	*user input*
Proposed Gusset Thickness:	$t_{Gusset2} := 0.5 \cdot in$	*user input*
Proposed Gusset Height:	$H_{Gusset2} := 6 \cdot in$	*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: $i := 1 .. N$

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

$d_1 = 4.39 \cdot in$ $d_7 = 22.07 \cdot in$

$d_2 = 8.61 \cdot in$ $d_8 = 22.50 \cdot in$

$d_3 = 12.50 \cdot in$ $d_9 = 22.07 \cdot in$

$d_4 = 15.91 \cdot in$ $d_{10} = 20.79 \cdot in$

$d_5 = 18.71 \cdot in$ $d_{11} = 18.71 \cdot in$

$d_6 = 20.79 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 21.00 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 1.07 \cdot in$

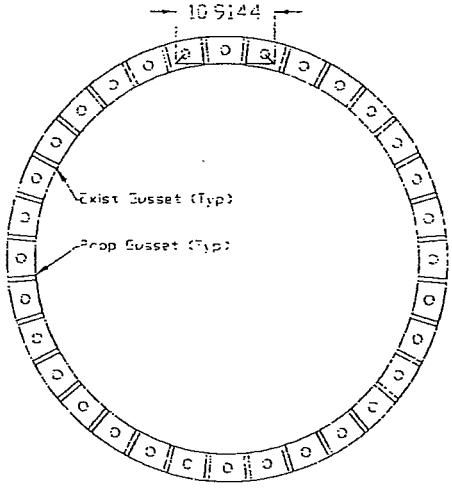
$MA_2 = 0.00 \cdot in$ $MA_8 = 1.50 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_9 = 1.07 \cdot in$

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

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

$MA_6 = 0.00 \cdot in$ etc.



$EffectiveWidth := 10.9144in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$I_p := \sum_i \left(d_i\right)^2$ $\quad I_p = 8.100 \times 10^3 \cdot in^2$

Gross Area of Bolt:

$A_g := \frac{\pi}{4} \cdot D^2$ $\quad A_g = 0.785 \cdot in^2$

Net Area of Bolt:

$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2$ $\quad A_n = 0.606 \cdot in^2$

Net Diameter:

$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}}$ $\quad D_n = 0.88 \cdot in$

Radius of Gyration of Bolt:

$r := \frac{D_n}{4}$ $\quad r = 0.22 \cdot in$

Section Modulus of Bolt:

$S_x := \frac{\pi \cdot D_n^3}{32}$ $\quad S_x = 0.066 \cdot in^3$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$M_x := \left(\frac{Shear}{N}\right) \cdot l$ $\quad M_x = 0.005 \cdot ft \cdot kips$

$f_{bx} := \frac{M_x}{S_x}$ $\quad f_{bx} = 1.0 \cdot ksi$

Allowable Bending

$F_{bx} := 1.333 \cdot 0.60 \cdot Fy$ $\quad F_{bx} = 59.2 \cdot ksi$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) \qquad AllowableTension = 41.5 \cdot kips$$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N} \qquad MaxTension = 35.6 \cdot kips$$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.86$$

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

Condition = "OK"

Check Combined Stresses:

$$\frac{MaxTension}{AllowableTension} + \frac{f_{bx}}{F_{bx}} = 0.88$$

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 8.0 \cdot kips$ $C_7 = 36.7 \cdot kips$

$C_2 = 14.9 \cdot kips$ $C_8 = 37.4 \cdot kips$

$C_3 = 21.2 \cdot kips$ $C_9 = 36.7 \cdot kips$

$C_4 = 26.7 \cdot kips$ $C_{10} = 34.7 \cdot kips$

$C_5 = 31.3 \cdot kips$ $C_{11} = 31.3 \cdot kips$

$C_6 = 34.7 \cdot kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(EffectiveWidth \cdot PlateThickness^2\right) + 1\left(t_{Gusset1} \cdot H_{Gusset1}^2\right) + 1\left[t_{Gusset2} \cdot \left(.5H_{Gusset2}\right)^2\right]} \qquad f_{bp} = 34.3 \cdot ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75Fy_{bp}} = 0.95$$

$$Condition3 := if\left(\frac{f_{bp}}{1.333 \cdot 0.75Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition3 = "OK"

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Description	80' Flange Plate	Computed by	JEK	Sheet	1 of 5
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				Date	

FLANGE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	$OM := 1541 \cdot ft \cdot kips$	*user input*
Shear Force:	$Shear := 23.3 \cdot kips$	*user input*
Axial Force:	$Axial := 35.5 \cdot kips$	*user input*

Anchor Bolt Data:

Use ASTM A325

Number of Anchor Bolts = N	$N := 36$	*user input*
Diameter of Bolt Circle:	$D_{bc} := 51in$	*user input*
Bolt "Column" Distance:	$l := 0.1in$	*user input*
Bolt Ultimate Strength:	$F_u := 120 \cdot ksi$	*user input*
Bolt Yield Strength:	$Fy := 74 \cdot ksi$	*user input*
Bolt Modulus:	$E := 29000 \cdot ksi$	*user input*
Thickness Of Anchor Bolts	$D := 1.0in$	*user input*
Threads per Inch:	$n := 8$	*user input*

Base Plate Data:

Plate Yield Strength:	$Fy_{bp} := 36 \cdot ksi$	*user input*
Base Plate Thickness:	$PlateThickness := 1.25 \cdot in$	*user input*
Base Plate Diameter:	$D_{bp} := 54 \cdot in$	*user input*
Outer Pole Diameter:	$D_{pole} := 48in$	*user input*

Gusset Data:

Exist Gusset Thickness:	$t_{Gusset1} := 0.5 \cdot in$	*user input*
Exist Gusset Height:	$H_{Gusset1} := 2 \cdot in$	*user input*
Proposed Gusset Thickness:	$t_{Gusset2} := 0.5 \cdot in$	*user input*
Proposed Gusset Height:	$H_{Gusset2} := 6 \cdot in$	*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: $i := 1..N$

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

$d_1 = 4.43 \cdot in$ $d_7 = 23.96 \cdot in$

$d_2 = 8.72 \cdot in$ $d_8 = 25.11 \cdot in$

$d_3 = 12.75 \cdot in$ $d_9 = 25.50 \cdot in$

$d_4 = 16.39 \cdot in$ $d_{10} = 25.11 \cdot in$

$d_5 = 19.53 \cdot in$ $d_{11} = 23.96 \cdot in$

$d_6 = 22.08 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 24.00 \cdot in$

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

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

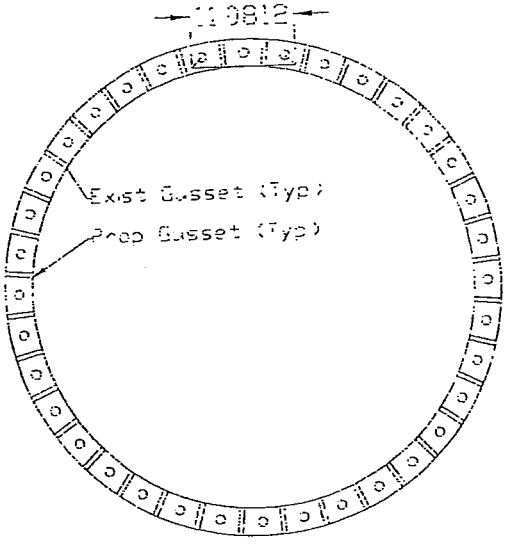
$MA_2 = 0.00 \cdot in$ $MA_8 = 1.11 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_9 = 1.50 \cdot in$

$MA_4 = 0.00 \cdot in$ $MA_{10} = 1.11 \cdot in$

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

$MA_6 = 0.00 \cdot in$ etc.



EffectiveWidth := 11.0812in

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 1.170 \times 10^4 \cdot in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 0.785 \cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 \qquad A_n = 0.606 \cdot in^2$$

Net Diameter:

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 0.88 \cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.22 \cdot in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi \cdot D_n^3}{32} \qquad S_x = 0.066 \cdot in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.005 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 1.0 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 59.2 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 41.5 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N}$ $MaxTension = 39.3 \cdot kips$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.95$$

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

Condition = "OK"

Check Combined Stresses:

$$\frac{MaxTension}{AllowableTension} + \frac{f_{bx}}{F_{bx}} = 0.96$$

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 8.0 \cdot kips$ $C_7 = 38.8 \cdot kips$

$C_2 = 14.8 \cdot kips$ $C_8 = 40.7 \cdot kips$

$C_3 = 21.1 \cdot kips$ $C_9 = 41.3 \cdot kips$

$C_4 = 26.9 \cdot kips$ $C_{10} = 40.7 \cdot kips$

$C_5 = 31.8 \cdot kips$ $C_{11} = 38.8 \cdot kips$

$C_6 = 35.9 \cdot kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(EffectiveWidth \cdot PlateThickness^2\right) + 1\left(t_{Gusset1} \cdot H_{Gusset1}^2\right) + 1\left[t_{Gusset2} \cdot \left(.6H_{Gusset2}\right)^2\right]} \qquad f_{bp} = 35.4 \cdot ksi$$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75Fy_{bp}} = 0.98$$

$$Condition3 := if\left(\frac{f_{bp}}{1.333 \cdot 0.75Fy_{bp}} < 1.00, "OK", "Overstressed"\right)$$

Condition3 = "OK"

ANCHOR BOLT AND BASE PLATE ANALYSIS

Input Data

Tower Reactions:

Overturning Moment:	OM := 3715·ft·kips	*user input*
Shear Force:	Shear := 30.4·kips	*user input*
Axial Force:	Axial := 57.2·kips	*user input*

Anchor Bolt Data:

Use ASTM A687

Number of Anchor Bolts = N	N := 52	*user input*
Diameter of Bolt Circle:	D_{bc} := 67in	*user input*
Bolt "Column" Distance:	l := 3in	*user input*
Bolt Ultimate Strength:	F_u := 150·ksi	*user input*
Bolt Yield Strength:	Fy := 105·ksi	*user input*
Bolt Modulus:	E := 29000·ksi	*user input*
Thickness Of Anchor Bolts	D := 1.25in	*user input*
Threads per Inch:	n := 7	*user input*

Base Plate Data:

Plate Yield Strength:	Fy_{bp} := 36·ksi	*user input*
Base Plate Thickness:	PlateThickness := 1.25·in	*user input*
Base Plate Diameter:	D_{bp} := 70·in	*user input*
Outer Pole Diameter:	D_{pole} := 60in	*user input*

Gusset Data:

Gusset Thickness:	t_{Gusset} := 0.625·in	*user input*
Gusset Height:	H_{Gusset} := 6·in	*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: $i := 1..N$

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

$d_1 = 4.04 \cdot in$ $d_7 = 25.08 \cdot in$

$d_2 = 8.02 \cdot in$ $d_8 = 27.57 \cdot in$

$d_3 = 11.88 \cdot in$ $d_9 = 29.66 \cdot in$

$d_4 = 15.57 \cdot in$ $d_{10} = 31.32 \cdot in$

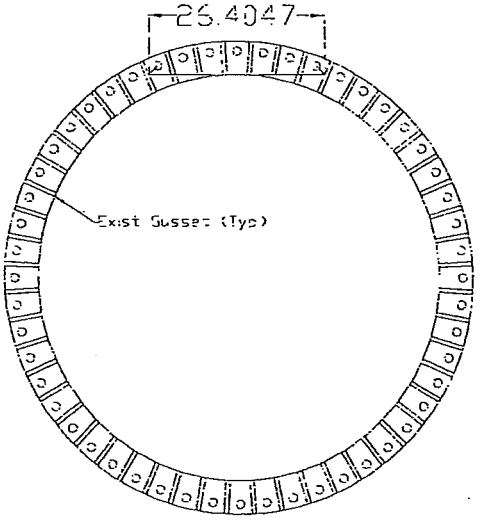
$d_5 = 19.03 \cdot in$ $d_{11} = 32.53 \cdot in$

$d_6 = 22.21 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius: $R_{pole} := \frac{D_{pole}}{2}$ $R_{pole} = 30.00 \cdot in$

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



$MA_1 = 0.00 \cdot in$ $MA_{10} = 1.32 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_{11} = 2.53 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_{12} = 3.26 \cdot in$

$MA_4 = 0.00 \cdot in$ $MA_{13} = 3.50 \cdot in$

$MA_5 = 0.00 \cdot in$ $MA_{14} = 3.26 \cdot in$

$MA_6 = 0.00 \cdot in$ $MA_{15} = 2.53 \cdot in$

$MA_7 = 0.00 \cdot in$ $MA_{16} = 1.32 \cdot in$

$MA_8 = 0.00 \cdot in$ $MA_{17} = 0.00 \cdot in$

$MA_9 = 0.00 \cdot in$ $MA_{18} = 0.00 \cdot in$

$EffectiveWidth := 26.4047in$

Anchor Bolt Analysis:

Polar Moment of Inertia I_p:

$$I_p := \sum_i \left(d_i\right)^2 \qquad I_p = 2.918 \times 10^4 \cdot in^2$$

Gross Area of Bolt:

$$A_g := \frac{\pi}{4} \cdot D^2 \qquad A_g = 1.227 \cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 \qquad A_n = 0.969 \cdot in^2$$

Net Diameter:

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} \qquad D_n = 1.11 \cdot in$$

Radius of Gyration of Bolt:

$$r := \frac{D_n}{4} \qquad r = 0.28 \cdot in$$

Section Modulus of Bolt:

$$S_x := \frac{\pi \cdot D_n^3}{32} \qquad S_x = 0.135 \cdot in^3$$

Anchor Bolt Bending Stress:

Maximum Applied Bending:

$$M_x := \left(\frac{Shear}{N}\right) \cdot l \qquad M_x = 0.146 \cdot ft \cdot kips$$

$$f_{bx} := \frac{M_x}{S_x} \qquad f_{bx} = 13.0 \cdot ksi$$

Allowable Bending

$$F_{bx} := 1.333 \cdot 0.60 \cdot Fy \qquad F_{bx} = 84.0 \cdot ksi$$

Note: 1.333 increase allowed per TIA/EIA

Check Tensile Forces:

Allowable Tensile Force:

$AllowableTension := 1.333 \cdot (0.33 \cdot A_g \cdot F_u)$ $AllowableTension = 81.0 \cdot kips$

Note: 1.333 increase allowed per TIA/EIA

Applied Tension:

$MaxTension := \frac{OM \cdot R_{bc}}{I_p} - \frac{Axial}{N}$ $MaxTension = 50.1 \cdot kips$

Check Stresses:

$$\frac{MaxTension}{AllowableTension} = 0.62$$

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

$Condition = "OK"$

Check Compression & Combined Stresses (if required):

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

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

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

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_h \\ 0.00\text{in} & \text{otherwise} \end{cases} \qquad l = 3.00 \cdot \text{in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_h \\ 0.0\text{ksi} & \text{otherwise} \end{cases} \qquad f_{bx} = 13.0 \cdot \text{ksi}$$

Allowable Compressive Force:

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{Fy}} \qquad C_c = 73.84$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^2}\right] \cdot Fy}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^3}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} \qquad F_a = 61.4 \cdot \text{ksi}$$

$$F_a := 1.333 \cdot F_a \quad \text{Note: 1.333 increase allowed per TIA/EIA} \qquad F_a = 81.9 \cdot \text{ksi}$$

Applied Compressive Force:

$$\text{MaxCompression} := \frac{OM \cdot R_{bc}}{I_p} + \frac{\text{Axial}}{N} \qquad \text{MaxCompression} = 52.3 \cdot \text{kips}$$

$$f_a := \frac{\text{MaxCompression}}{A_n} \qquad f_a = 53.9 \cdot \text{ksi}$$

Check Combined Stresses:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} = 0.81$$

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

Natcomm

Job	190' Monopole - Berlin, CT	Project No.	08001	Page ___ of ___	
Description	Anchor Bolt and Base Plate Analysis	Computed by	JEK	Sheet 6 of 6	
		Checked by		Date 03/03/08	
				Date	

Base Plate Analysis:

Force from Bolt(s):

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

$C_1 = 7.3 \cdot kips$ $C_7 = 39.4 \cdot kips$

$C_2 = 13.3 \cdot kips$ $C_8 = 43.2 \cdot kips$

$C_3 = 19.2 \cdot kips$ $C_9 = 46.4 \cdot kips$

$C_4 = 24.9 \cdot kips$ $C_{10} = 49.0 \cdot kips$

$C_5 = 30.2 \cdot kips$ $C_{11} = 50.8 \cdot kips$

$C_6 = 35.0 \cdot kips$ etc.

Bending Stress in Plate:

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(EffectiveWidth \cdot PlateThickness^2\right) + 6\left(t_{Gusset} \cdot H_{Gusset}^2\right)}$$

$f_{bp} = 30.9 \cdot ksi$

Check Stresses:

$$\frac{f_{bp}}{1.333 \cdot 0.75 Fy_{bp}} = 0.86$$

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

Condition = "OK"

NATCOMM

Job	190' Pirod Monopole – Berlin, CT	**Project No.**	08001	**Page**	1 of 9
Description	Foundation Analysis	**Computed by**	JEK	**Date**	3/3/2008

MONOPOLE FOUNDATION ANALYSIS

TOWER FORCES:

Moment Caused by Tower	$M_t := 3714.7 \cdot ft \cdot kips$
Shear at Base of Tower	$S_t := 30.4 kip$
Max Compressive Force	$C_t := 57.2 \cdot kip$
Height of Tower	$H_t := 190 \cdot ft$
Base Plate Bolt Circle	$MP := 67in$

FOOTING DIMENSIONS:

Overall Depth of Footing	$D_f := 9ft$
Length of Pier	$L_p := 7 \cdot ft$
Extension of Pier Above Grade	$L_{pag} := 0.5 \cdot ft$
Diameter of Pier	$d_p := 7 \cdot ft$
Thickness of Footing	$T_f := 2.5 \cdot ft$
Width of Footing:	$W_f := 20.5ft$
Length of Anchor Bolts:	$L_{st} := 80in$
Projection of anchor bolts above pier	$A_{BP} := 8 \cdot in$

ADDITIONAL OVERBURDEN:

4 Shelters around Tower	
Weight of 1 Shelter, Foundation, & Equipment	$Shelter_w := 35kips$
Tower to Center of Shelter Dist	$Shelter_d := 16ft$

PROPERTIES:

Compressive Strength of Concrete	$fc := 4000psi$
Yield Strength of Steel Reinforcement	$fy := 60000 \cdot psi$
Yield Strength of Anchor Bolt	$fya := 75000 \cdot psi$
Internal Friction Angle of Soil	$\phi_s := 34 \cdot deg$
Allowable Bearing Capacity	$q_s := 6000 \cdot psf$
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 Note: Use 0 for Sandy Soil	$c := 0 \cdot ksf$
Seismic Zone Factor: UBC Fig 23-2	$Z := 2$
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	$d_{anchor} := 1.25in$
Anchor bolt area	$A_{anchor} := 1.23 \cdot in^2$

PIER REINFORCEMENT:

Bar Size	$BSpier := 9$	Bar Diameter	$d_{bpier} := 1.128 \cdot in$
Number of Bars	$NBpier := 34$	Bar Area	$A_{bpier} := 1.00 \cdot in^2$

PAD REINFORCEMENT:

TOP:	Bar Size	$BS_{top} := 11$	Bar Diameter	$d_{btop} := 1.410 \cdot in$
	Number of Bars	$NB_{top} := 30$	Bar Area	$A_{btop} := 1.56 \cdot in^2$
BOTTOM:	Bar Size	$BS_{bot} := 11$	Bar Diameter	$d_{bbot} := 1.410 \cdot in$
	Number of Bars	$NB_{bot} := 30$	Bar Area	$A_{bot} := 1.56 \cdot in^2$

Coefficient of Lateral Soil Pressure: $K_p := \frac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$ $K_p = 3.5371$

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

NATCOMM

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CHECK ANCHOR STEEL EMBEDMENT

Depth:

$D_{ab} := L_{st} - A_{BP}$ $D_{ab} = 6 \cdot ft$ $L_{anchor} := \frac{(0.11 \cdot fy) \cdot in}{\sqrt{fc \cdot psi}}$ $L_{anchor} = 8.7 \cdot ft$

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

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

STABILITY OF FOOTING

Passive Pressure:

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $P_{pt} = 2.759 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}]$ $P_{top} = 2.759 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $P_{bot} = 3.8201 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $P_{ave} = 3.2895 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)]$ $T_p = 2.5 \cdot ft$

$A_p := W_f \cdot T_p$ $A_p = 51.25 \cdot ft^2$

Ultimate Shear:

$S_u := P_{ave} \cdot A_p$ $S_u = 168.59 \cdot kip$

Weight of Concrete Pad:

$WT_c := [(W_f^2 \cdot T_f) + d_p^2 \cdot L_p] \cdot \gamma_c$ $WT_c = 209.04 \cdot kip$

Weight of Soil: above Footing:

$WT_{s1} := [W_f^2 \cdot (|L_p - L_{pag}|) - d_p^2 \cdot (|L_p - L_{pag}|)] \cdot \gamma_s$ $WT_{s1} = 289.58 \cdot kip$

Weight of Soil Wedge at back face:

$WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\phi_s)}{2} \cdot W_f\right) \cdot \gamma_s$ $WT_{s2} = 67.2 \cdot kip$

Total Weight:

$WT_{tot} := WT_c + WT_{s1} + C_t$ $WT_{tot} = 555.82 \cdot kip$

Resisting Moment:

$M_r := (WT_{tot}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + WT_{s2} \cdot \left(W_f + \frac{D_f \cdot \tan(\phi_s)}{3}\right) + Shelter_w \cdot Shelter_d$ $M_r = 7911.24 \cdot kip \cdot ft$

Overturning Moment:

$M_{ot} := M_t + S_t \cdot (L_p + T_f)$ $M_{ot} = 4003.5 \cdot kip \cdot ft$

Factor of Safety:

$FS := \frac{M_r}{M_{ot}}$ $FS_{req} := 2$ $FS = 1.98$

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

Acceptable

SHEAR CAPACITY IN PIER

$FS := 2$

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS} \qquad S_p = 209.35 \cdot kips$$

$$ShearCheck := if\left(S_p > S_t, "Okay", "No\ Good"\right) \qquad ShearCheck = "Okay"$$

BEARING PRESSURE CAUSED BY FOOTING

$$A_{mat} := W_f^{\,2} \qquad A_{mat} = 420.25 \cdot ft^2$$

$$S := \frac{W_f^{\,3}}{6} \qquad S = 1435.85 \cdot ft^3$$

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} \qquad P_{max} = 4.11 \cdot ksf$$

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} \qquad P_{min} = -1.47 \cdot ksf$$

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

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

Distance to Resultant of Pressure Distribution:

$$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} \qquad X_p = 5.04 \cdot ft$$

Distance to Kern: $X_k := \frac{W_f}{6}$ $\qquad X_k = 3.42 \cdot ft$

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

Eccentricity: $e := \frac{M_{ot}}{WT_{tot}}$ $\qquad e = 7.2$

Adjusted Soil Pressure: $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$ $\qquad P_a = 5.93 \cdot ksf$

$$q_{adj} := if\left(P_{min} < 0, P_a, \frac{P_{max}}{ft^2}\right) \qquad q_{adj} = 5.93 \cdot ksf$$

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

CONCRETE BEARING CAPACITY (ACI 10.17)

$\phi_c := 0.75$ (ACI 9.3.2.2)

$P_b := \phi_c \cdot 0.85 \cdot f'c \cdot \frac{d_p^2 \cdot \pi}{4}$ $P_b = 14131.51 \cdot kip$

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

SHEAR STRENGTH OF CONCRETE

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

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

$d := T_f - Cvr_{pad} - d_{bbot}$ $d = 25.59 \cdot in$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$ $d_1 = 6.75 \cdot ft$

$d_2 := d_1 - d$ $d_2 = 4.62 \cdot ft$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$ $L = 9.14 \cdot ft$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$ $Slope = 0.6489 \cdot kcf$

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1$ $V_{req} = 673.12 \cdot kip$

ACI 11.3.1.1 $V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f'c \cdot psi} \cdot W_f \cdot d$ $V_{Avail} = 676.84 \cdot kip$

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

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

$b_o := \left(d_p + d\right) \cdot \pi$ $b_o = 28.69 \cdot ft$

Area included inside bo: $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4}$ $A_{bo} = 65.5 \cdot ft^2$

Area outside of bo: $A_{out} := A_{mat} - A_{bo}$ $A_{out} = 354.75 \cdot ft^2$

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

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

$v_u := \text{Find}(v_u)$ $v_u = 9.08 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f$ $V_u = 397.1 \cdot kips$

$V_{req} := LF \cdot V_u$ $V_{req} = 516.3 \cdot kips$

$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f'c \cdot psi} \cdot b_o \cdot d$ $V_{Avail} = 1894.5 \cdot kips$

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

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

Take Maximum Bending at face of Pier:

$q_b := q_{adj} - d_1 \cdot Slope$ $q_b = 1.55 \cdot ksf$

$M_n := \frac{LF}{\phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f$ $M_n = 3016.7 \cdot kip \cdot ft$

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

$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2}$ $R_u = 35954.3 \text{ lbf}$

$\rho := \frac{0.85 \cdot f'c}{fy} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f'c}} \right)$ $\rho = 0.0043$

$\rho_{min} := 1.333 \cdot \rho$ $\rho_{min} = 0.0058$

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

(ACI 7.12.2.1b)

FOR BOTTOM BARS: $As := \max(\rho, \rho_{min}, \rho_{sh}) \cdot W_f \cdot d$ $As = 36.31 \cdot in^2$

$As_{prov} := A_{bot} \cdot NB_{bot}$ $As_{prov} = 46.8 \cdot in^2$

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

FOR TOP BARS: $As := \rho_{sh} \cdot (W_f \cdot d)$ $As = 11.33 \cdot in^2$

$As_{prov} := A_{btop} \cdot NB_{top}$ $As_{prov} = 46.8 \cdot in^2$

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

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

Bar Spacing: $B_{sPad} := \dfrac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1}$ $B_{sPad} = 6.82 \cdot in$

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: $c := \text{if}\left(Cvr_{pad} < \dfrac{B_{sPad}}{2}, Cvr_{pad}, \dfrac{B_{sPad}}{2}\right)$ $c = 3 \cdot in$

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} \qquad L_{dbt} = 47.15 \cdot in$$

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

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

Available Length in Pad: $L_{Pad} := \dfrac{W_f}{2} - \dfrac{d_p}{2} - Cvr_{pad}$ $L_{Pad} = 78 \cdot in$

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

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Job	190' Pirod Monopole -- Berlin, CT	**Project No.**	08001	**Page**	7 of 9
Description	Foundation Analysis	**Computed by**	JEK	**Date**	3/3/2008

REINFORCEMENT IN PIER

Pier Area: $A_{pv} := \frac{\pi \cdot d_p^2}{4}$ $A_p = 5541.77 \cdot in^2$

(ACI 10.8.4 and 10.9.1) $A_{smin} := 0.01 \cdot 0.05 \cdot A_p$ $A_{smin} = 2.77 \cdot in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $A_{sprov} = 34 \cdot in^2$

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

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

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $B_{sPier} = 6.63 \cdot in$

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

Maximum Moment in Pier: $M_p := \left[M_t + S_t \cdot \left(L_p + \frac{A_{BP}}{2} \right) \right] \cdot LF$ $M_p = 61427.08 \cdot in \cdot kips$

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: $(D \ N \ n \ P_u \ M_{xu}) := (84 \ 34 \ 9 \ 57.1 \ 62000)$

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: $(\phi P_n \ \phi M_{xn} \ f_{sp} \ \rho) = (60.3908 \ 65573.1905 \ -60 \ 0.0061)$

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

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

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

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: $c := \text{if}\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right)$ $c = 3 \cdot in$

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

$$L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpier}}} \cdot d_{bpier} \qquad L_{dbt} = 30.18 \cdot in$$

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

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

$$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f'c}{psi}}} \cdot .7 \qquad L_{dh} = 14.98 \cdot in$$

$$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right) \qquad L_{db} = 30.18 \cdot in$$

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot fy}{\sqrt{f'c \cdot psi}} \qquad L_{dbc1} = 21.4 \cdot in$$

$$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot fy\right) \qquad L_{dbmin} = 20.3 \cdot in$$

$$L_{dbc} := \text{if}\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) \qquad L_{dbc} = 21.4 \cdot in$$

Available Length in Foundation:

$$L_{pier} := L_p - Cvr_{pier} \qquad L_{pier} = 81 \cdot in$$

$$L_{pad} := T_f - Cvr_{pad} \qquad L_{pad} = 27 \cdot in$$

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

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

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)

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

$s_{lim1} := 16 \cdot d_{bpier} \cdot z$ $\quad s_{lim1} = 18.05 \cdot in$

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

$s_{lim3} := D_f \cdot z$ $\quad s_{lim3} = 108 \cdot in$

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

Maximum Spacing:

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

Number of Ties Required:

$$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 \quad n_{tie} = 5.3$$

STRUCTURAL STEEL NOTES:

1. PERFORM ALL WORK IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL CODES.
2. VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS PRIOR TO FABRICATION.
3. PREPARE SURFACE FOR WELDING BY REMOVING EXISTING GALVANIZING.
4. CENTER GUSSET PLATES BETWEEN ADJACENT ANCHOR BOLTS.
5. STEEL FABRICATION SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION AND APPLICABLE BUILDING CODES.
6. STRUCTURAL STEEL PLATE TO BE ASTM A36 STEEL. MINIMUM YIELD STRESS TO BE 36,000 PSI.
7. WELD IN ACCORDANCE WITH AWS D1.1 USING CERTIFIED WELDERS AND E70XX ELECTRODES. CONTROL HEAT INPUT AND USE A BALANCED WELD SEQUENCE TO MINIMIZE BASE METAL DISTORTION.
8. PROVIDE TIGHT FIT BETWEEN GUSSET PLATE AND FLANGE PLATE SURFACE. GAP TO BE NO LARGER THAN 1/16".
9. APPLY A MINIMUM OF (3) COATS OF COLD GALVANIZING TO ANY FIELD CUT, WELDED OR HEATED SURFACES, IN STRICT ACCORDANCE WITH THE MANUFACTURERs RECOMMENDATIONS.

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00	03/03/08	CONSTRUCTION

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BERLIN-KENSINGTON
TOWER REINFORCEMENT

240 KENSINGTON ROAD
BERLIN, CT

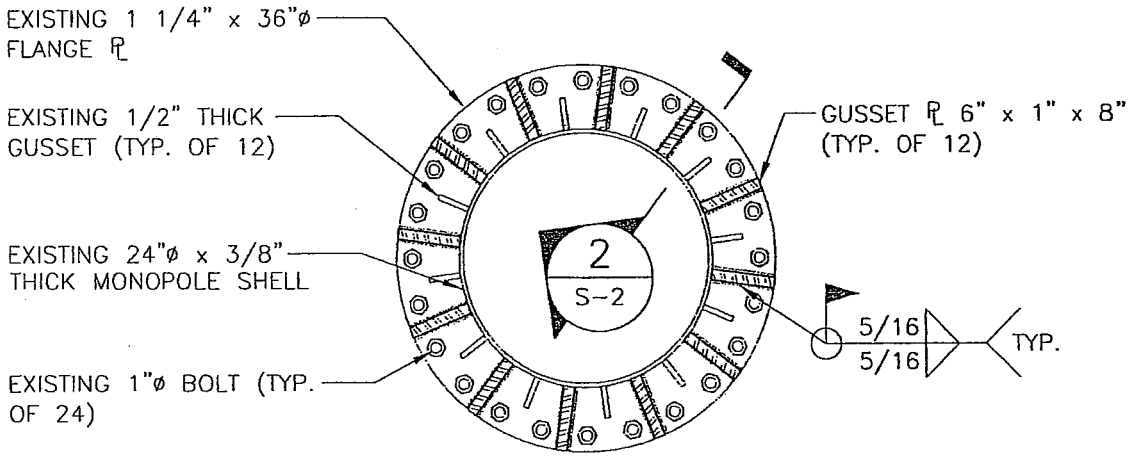
PROJECT NO:	08D01
DRAWN BY:	DEB
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	03/03/08

Cellco Partnership d.b.a. verizon wireless

STRUCTURAL SPECIFICATIONS

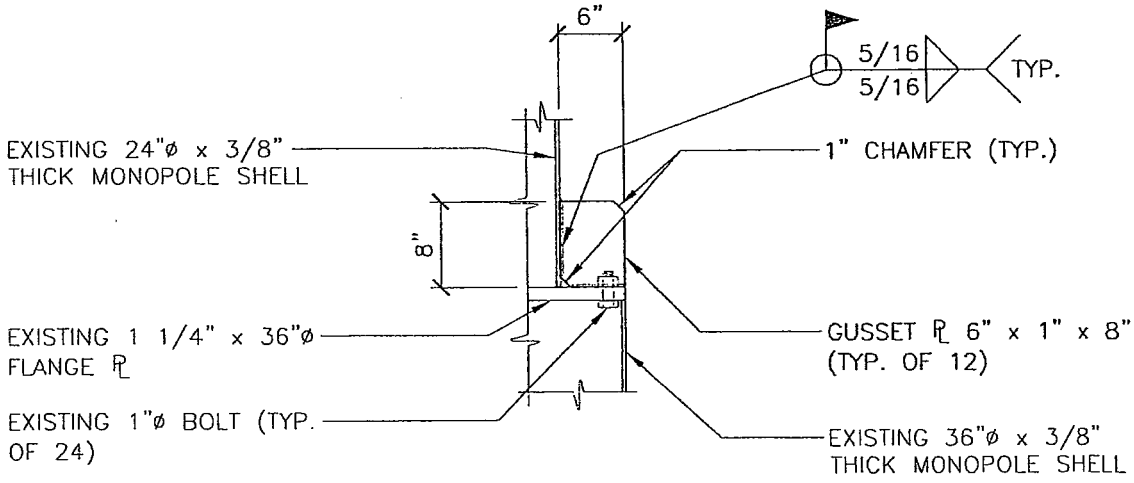
S-1

DWG. 1 OF 5



1/S-2 FLANGE PLATE @ 140'

SCALE: 3/4" = 1'-0"



2/S-2 SECTION

SCALE: 3/4" = 1'-0"

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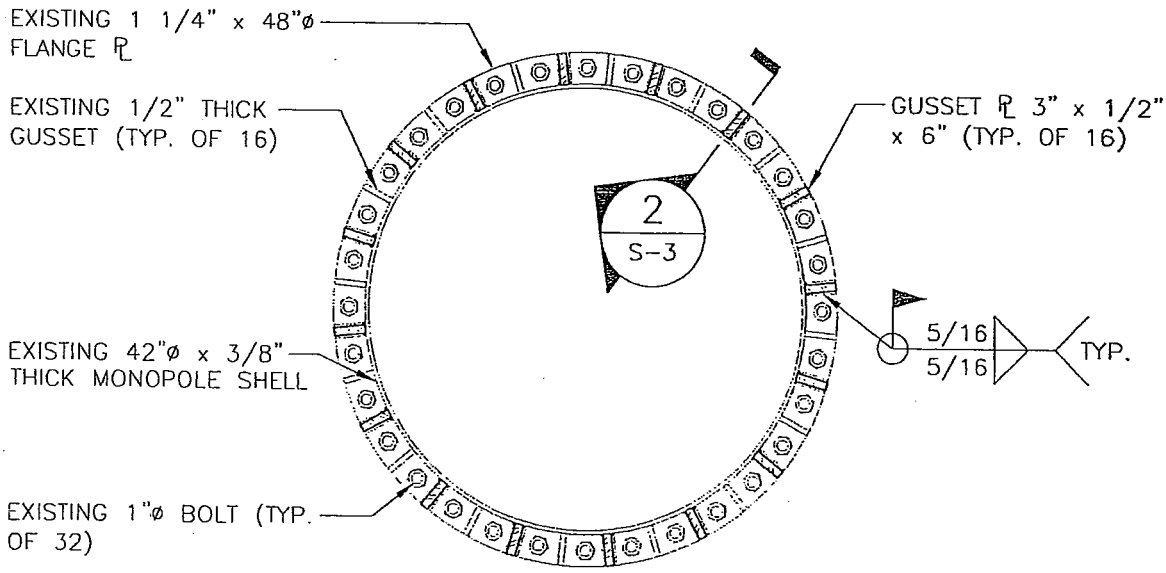
FLANGE PLATE REINF. DETAILS

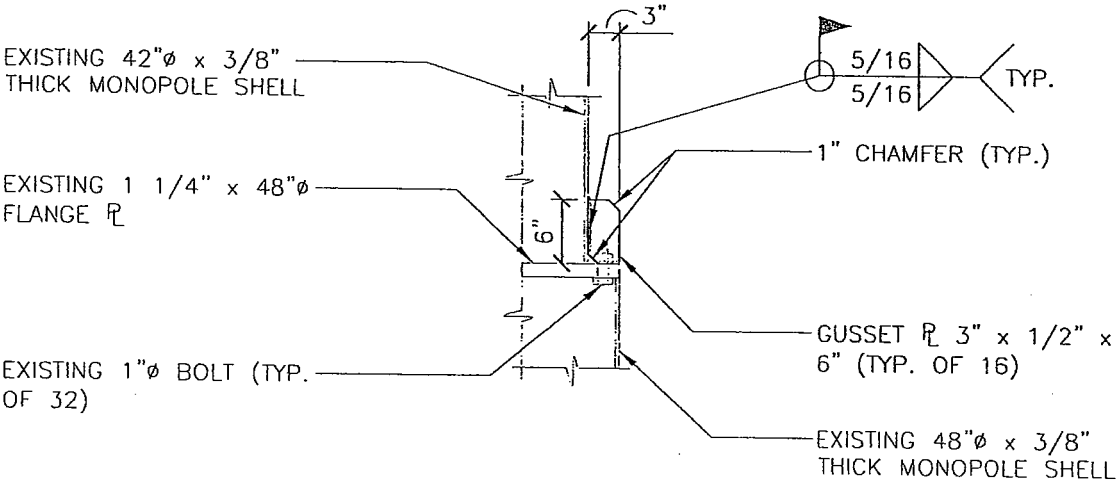
S-2

DWG. 2 OF 5



1 / S-3 **FLANGE PLATE @ 100'**

SCALE: 3/4" = 1'-0"



2 / S-3 **SECTION**

SCALE: 3/4" = 1'-0"

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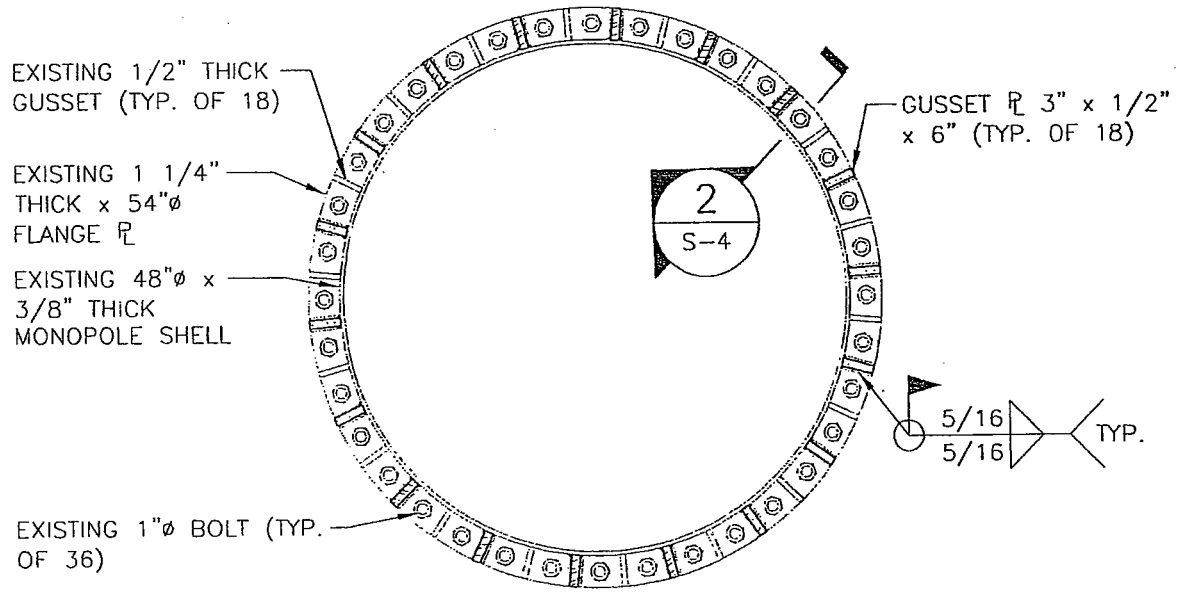
FLANGE PLATE REINF. DETAILS

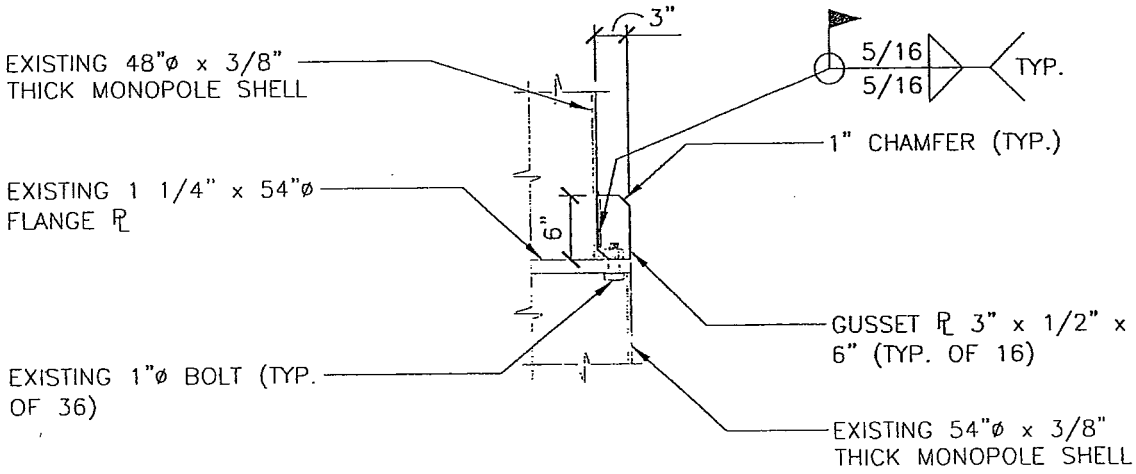
S-3

DWG. 3 OF 5



1 / S-4 FLANGE PLATE @ 80'

SCALE: 3/4" = 1'-0"



2 / S-4 SECTION

SCALE: 3/4" = 1'-0"

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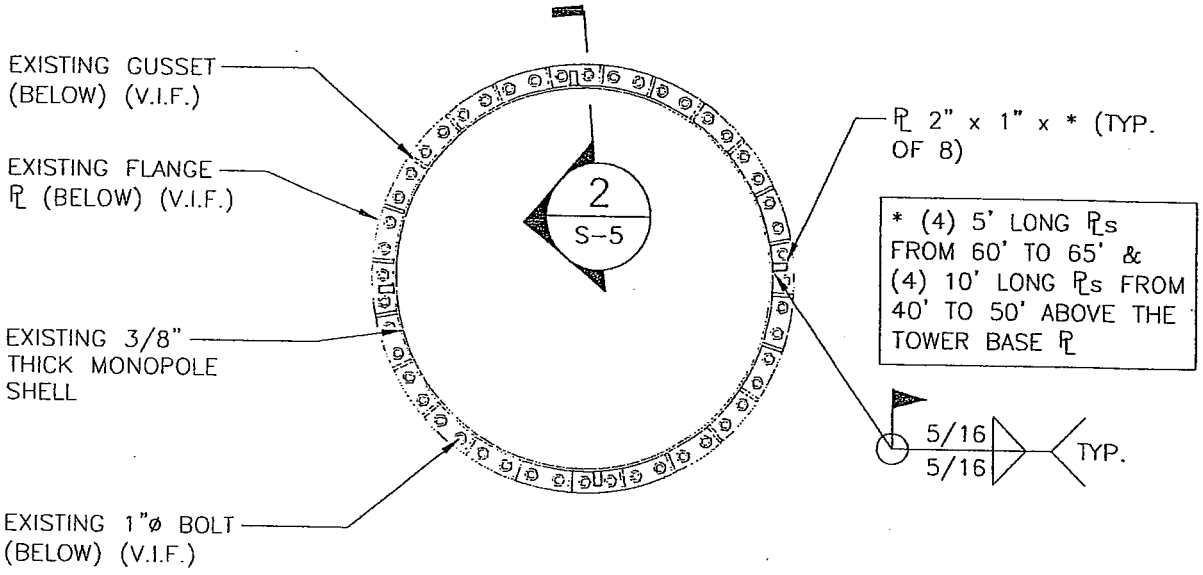
FLANGE PLATE REINF. DETAILS

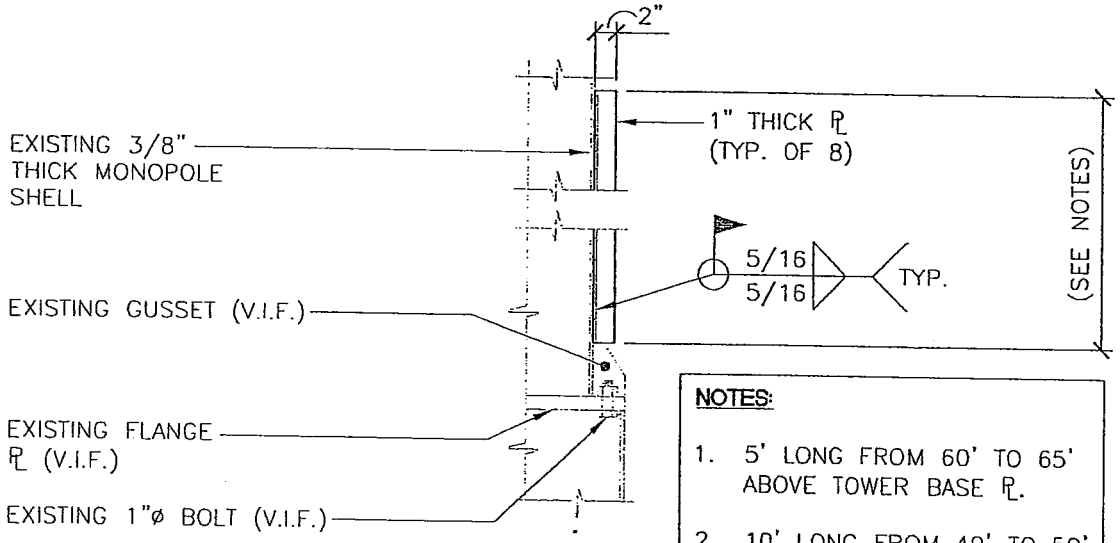
S-4

DWG. 4 OF 5



1 S-5 TOWER SHELL REINF. PLAN

SCALE: 1/2" = 1'-0"



NOTES:

1. 5' LONG FROM 60' TO 65' ABOVE TOWER BASE ℄.
2. 10' LONG FROM 40' TO 50' ABOVE TOWER BASE ℄.

2 S-5 SECTION

SCALE: 3/4" = 1'-0"

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TOWER SHELL REINF. DETAILS

S-5

DWG. 5 OF 5