Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

January 27, 2017

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification**
37 Bacon Road, Enfield, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas at the 150-foot level of the existing 180-foot tower at 37 Bacon Road in Enfield, Connecticut (the "Property"). The tower is owned by SAI. The Council approved Cellco's use of this tower in 2005. Cellco also intends to replace three (3) remote radio heads ("RRHs") with three (3) newer model RRHs and install one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement RRHs and HYBRIFLEX™ cable.

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 Scott R. Kaupin, Mayor for the Town of Enfield. A copy of this letter is also being sent to Roger J. O'Brien, Director of the Enfield Planning and Zoning Department. A copy of this letter is also being sent to Shaker Pines Fire Department, the owner of the Property and SAI, the tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement RRHs will be located at the 150-foot level on the 180-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included behind Attachment 2.

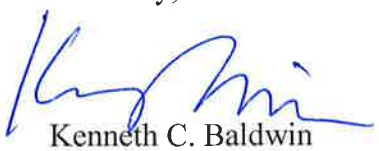
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report[1] included in Attachment 3).

A copy of the Town Assessor's Parcel Map and property owner information is included in Attachment 4.

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

Sincerely,



Kenneth C. Baldwin

Enclosures
Copy to:
Scott R. Kaupin, Mayor, Town of Enfield
Roger J. O'Brien, Director, Enfield Planning and Zoning Department
Shaker Pines Fire Department
SAI
Tim Parks

[1] The attached Structural Analysis Report reflects work previously approved by the Council in EM-VER-049-151007, but not yet completed and the new RRH replacement described above.

ATTACHMENT 1

ALCATEL-LUCENT B25 RRH4X30

Alcatel-Lucent Band 25 Remote Radio Head 4x30W is the new addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B25 RRH4x30 allows operators to have a compact radio solution to deploy LTE in the PCS band (1.9 GHz, 3GPP band 25), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B25 RRH4x30 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity, LTE carriers from 3 MHz up to 20 MHz and up to 65 MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30 is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

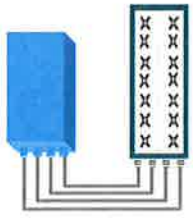
Its compactness and slim design makes the Alcatel-Lucent B25 RRH4x30 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 1.9 GHz band (PCS, 3GPP band 2 & 25)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- Ready for 3, 5, 10, 15 or 20MHz LTE carrier operation with 4Rx Diversity
- Ready to support up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- Convection-cooled (fan-less)
- Supports AISG 2.0 devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in PCS band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Full flexibility for multiple carriers operation over entire PCS spectrum
- Improves downlink spectral efficiency and cell edge throughput through MIMO4
- Increases LTE coverage thanks to 4-way Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options (Pole or Wall)



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

Alcatel·Lucent

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	3GPP bands 2 & 25 (PCS-G) DL: 1930 - 1995 MHz UL: 1850 - 1915 MHz
Instantaneous bandwidth - #carriers	65MHz – Up to 4 LTE carriers (in 40MHz occupied bandwidth)
LTE carrier bandwidth	3, 5, 10, 15 or 20 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure (3GPP band 2) **RX Diversity scheme**	2.0 dB typ. (<2.5 dB max) 2 or 4 way Rx diversity
Sizes (HxWxD)(w/ solar shield) in mm (in.) **Volume (w/ solar shield) in L** **Weight (w/ solar shield) in kg (lb)**	538 x 304 x 182 (21.2" x 12.0" x 7.2") 30 24 (53)
DC voltage range **DC power consumption**	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 580W typical @100% RF load
Environmental conditions **Wind load (@150km/h or 93mph)**	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5 (> 14dB)
CPRI ports	2 CPRI ports (HW ready for Rate7 / 9.8 Gbps)
AISG interfaces	1 AISG2.0 output (RS485), +24V/2A DC power Integrated Smart Bias Tees (x2)
Misc. Interfaces	1 external alarms connector (4 alarms) 4 RF Tx & 4 RF Rx monitor ports 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

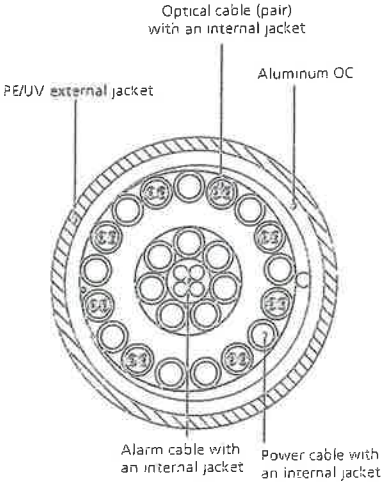


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Somers W (Enfield)								
Tower Height: 180'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Omnipoint	8	199	160	0.0241	1950	1.0000	0.24%	
*Town - UHF	2	250	180	0.0059	450	0.3000	0.20%	
*Town - VHF	1	60	180	0.0007	34	0.2000	0.04%	
*AT&T UMTS	2	565	168	0.0155	880	0.5867	0.26%	
*AT&T UMTS	2	1077	168	0.0295	1900	1.0000	0.30%	
*AT&T GSM	1	647	168	0.0089	880	0.5867	0.15%	
*AT&T GSM	4	934	168	0.0512	1900	1.0000	0.51%	
*AT&T LTE	1	1615	168	0.0221	734	0.4893	0.45%	
Verizon	**1**	**2240**	**150**	**0.0358**	**1970**	**1.0000**	**3.58%**	
Verizon	**9**	**317**	**150**	**0.0456**	**869**	**0.5793**	**7.87%**	
Verizon	**1**	**3542**	**150**	**0.0566**	**2145**	**1.0000**	**5.66%**	
Verizon	**1**	**975**	**150**	**0.0156**	**746**	**0.4973**	**3.13%**	
								22.4%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Existing Sabre Monopole

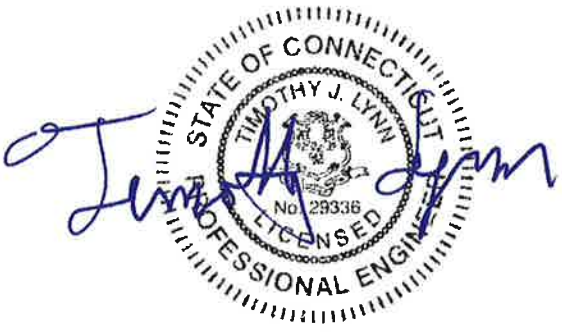
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Somers West

37 Bacon Road
Enfield, CT

Centek Project No. 16001.44

Date: October 5, 2016



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

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon on the existing monopole (tower) located in Enfield, CT.

The host tower is a 180-ft tall, four-section, eighteen sided, tapered monopole, originally designed and manufactured by Sabre Communications Corp. job no; 04-07104, dated July 23, 2003. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned Sabre design documents. The tower was previously reinforced by Hudson Design Group job no. 1103 dated May 29, 2013 and Centek Engineering job no. 15001.066 dated September 24, 2015.

Antenna and appurtenance information were obtained from the aforementioned Centek structural report and a Verizon RF data sheet.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 14.40-in at the top and 53.23-in at the base.

Verizon proposes the installation of three (3) remote radio heads and one (1) main distribution box mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- UNKNOWN (EXISTING):
  Antennas: One (1) 10-ft Omni-directional whip, one (1) 1'x1' panel antenna and one (1) 2-ft dish mounted on two (2) existing 4-ft Dual Standoff Mounts with an elevation of 177-ft above grade.
  Coax Cables: Two (2) 1-1/4" ∅ and two (2) 1/2" ∅ coax cables running on the inside of the existing tower.
- AT&T (EXISTING):
  Antennas: Two (2) KMW AM-X-CD-16-65-00T panel antennas, two (2) Andrew SBNH-1D656C panel antennas, two (2) Powerwave P65-17-XLH-RR panel antennas, three (3) Kathrein 800-10121 panel antennas, six (6) Kathrein 860-10025 remote control units, six (6) Powerwave LGP21401 TMA's, twelve (12) Powerwave LGP21901 diplexers and three (3) DTMABP7819VG12A TMA's mounted on three (3) existing T-Arms with a RAD center elevation of 168-ft above grade.
  Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- AT&T (EXISTING/RESERVED):
  Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor flush mounted with an elevation of 168-ft above grade.
  Cables: One (1) fiber cable and two (2) dc control cables running on the inside of the existing tower.

- T-MOBILE (EXISTING):
  Antennas: Three (3) EMS RR90-17-02DP panel antennas and six (6) 10"x8"x3" TMA's mounted on three (3) existing T-Arms w/ work support platforms with a RAD center elevation of 160-ft above grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- VERIZON WIRELESS (Existing to Remain):
  Antennas: Six (6) Andrew SBNHH-1D65B panel antennas, three (3) Antel BXA-70063-6CF panel antennas, six (6) Antel LPA-80080-4CF panel antennas, three (3) Nokia RRH4x30-B13 remote radio heads, three (3) Nokia RRH4x45-AWS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a low profile platform with a RAD center elevation of 150-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" ∅ fiber cable running on the inside of the existing tower.
- **VERIZON (Proposed):**
  Antennas:, Three (3) Nokia RRH4x30-B25 remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on a low profile platform with a RAD center elevation of 150-ft above grade.
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running on the inside of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

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

The existing tower was analyzed for the controlling basic wind speed (3-second gust) with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-G-2005 entitled "Structural Standard for Antenna Support Structures and Antennas", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix N of the CSBC[1] and the wind speed data available in the TIA-222-G-2005 Standard.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 1.0" radial ice on the tower structure and its components.

Basic Wind Speed:	Hartford; v = 90-105 mph (3-second gust)	*[Annex B of TIA-222-G-2005]*
	Enfield; v = 97 mph (3 second gust)	*[Appendix N of the 2016 CT Building Code]*
Load Cases:	Load Case 1; 97 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2016 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.0" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

[1] The 2012 International Building Code as amended by the 2016 Connecticut State Building Code (CSBC).

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. 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.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L5)	21.00'-48.75'	90.9%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7-ft square x 4.5-ft long reinforced concrete pier on a 23.0-ft square x 2.0-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned design documents prepared by Sabre Communications Corp. job no; 04-07104, dated July 23, 2003. The base of the tower is connected to the foundation by means of (16) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 6-ft into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	30 kips
	Compression	41 kips
	Moment	3707 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	TIA-222-G Section 9.4 FS[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad and Pier	OTM[2]	1.0	1.36	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	63.0%	**PASS**
Base Plate	Bending	71.5%	**PASS**

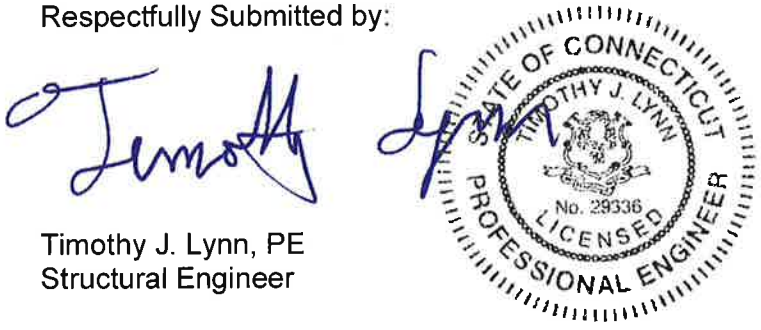
Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of CENTEK engineering, 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 CENTEK engineering, 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. CENTEK engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

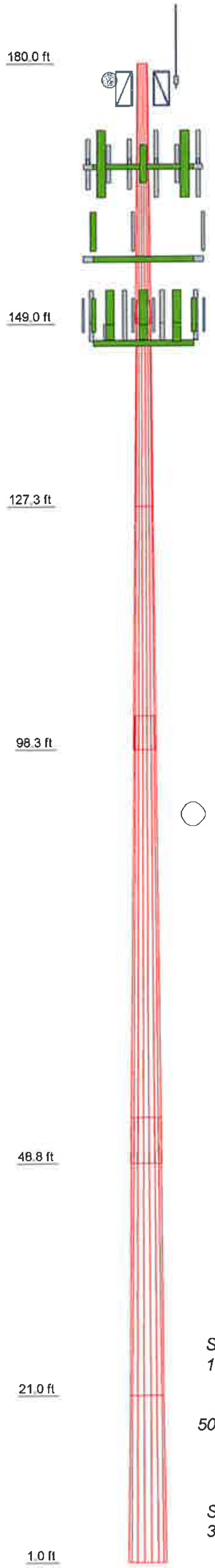
General Description of Structural Analysis Program

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

tnxTower Features:

- tnxTower 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.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	1	2	3	4	5	6
Length (ft)	31.00	24.50	29.00	53.50	33.25	20.00
Number of Sides	18	18	18	18	18	18
Thickness (in)	0.1875	0.2500	0.3000	0.3400	0.3400	0.3500
Socket Length (ft)	2.75		4.00	5.50		
Top Dia (in)	14.4000	20.3858	25.9100	30.9393	41.1698	48.9500
Bot Dia (in)	21.3800	25.9100	32.4400	43.1000	48.9500	53.2300
Grade	A572-65					
Weight (K) 21.8	1.1	1.5	2.7	7.2	5.5	3.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
HP2-4.7	178	12-ft T-arm w/ Work Support Platform (T-Mobile - Existing)	157
4-ft Dual Mount Standoff	177	12-ft T-arm w/ Work Support Platform (T-Mobile - Existing)	157
10' x 1" Dia Omni	177	12-ft T-arm w/ Work Support Platform (T-Mobile - Existing)	157
1' x 1' Panel	177	(2) TMA 10"x8"x3" (T-Mobile - Existing)	157
4-ft Dual Mount Standoff	177	SBNHH-1D65B (Verizon - Existing)	150
Valmont T-Arm (1) (ATT - Existing)	168	BXA-70063/6CF (Verizon - Existing)	150
Valmont T-Arm (1) (ATT - Existing)	168	SBNHH-1D65B (Verizon - Existing)	150
(2) AM-X-CD-16-65-00T-RET(72") (ATT - Existing)	168	LPA-80080-4CF (Verizon - Existing)	150
(2) SBNH-1D6565C (ATT - Existing)	168	LPA-80080-4CF (Verizon - Existing)	150
(2) P65-17-XLH-RR (ATT - Existing)	168	SBNHH-1D65B (Verizon - Existing)	150
(2) RRUS-11 (ATT - Existing)	168	BXA-70063/6CF (Verizon - Existing)	150
(2) RRUS-11 (ATT - Existing)	168	SBNHH-1D65B (Verizon - Existing)	150
(2) RRUS-11 (ATT - Existing)	168	LPA-80080-4CF (Verizon - Existing)	150
DC6-48-60-18-8F Surge Arrestor (ATT - Existing)	168	LPA-80080-4CF (Verizon - Existing)	150
800 10121 (ATT - Existing)	168	SBNHH-1D65B (Verizon - Existing)	150
800 10121 (ATT - Existing)	168	BXA-70063/6CF (Verizon - Existing)	150
800 10121 (ATT - Existing)	168	SBNHH-1D65B (Verizon - Existing)	150
(2) 860 10025 RCU (ATT - Existing)	168	LPA-80080-4CF (Verizon - Existing)	150
(2) 860 10025 RCU (ATT - Existing)	168	LPA-80080-4CF (Verizon - Existing)	150
(2) 860 10025 RCU (ATT - Existing)	168	RRH4x30-B13 (Verizon - Existing)	148
(2) LGP21401 TMA (ATT - Existing)	168	RRH4x30-B13 (Verizon - Existing)	148
(2) LGP21401 TMA (ATT - Existing)	168	RRH4x45/2x90-AWS (Verizon - Existing)	148
(2) LGP21401 TMA (ATT - Existing)	168	RRH4x45/2x90-AWS (Verizon - Existing)	148
(4) LGP21901 Diplexer (ATT - Existing)	168	RRH4x45/2x90-AWS (Verizon - Existing)	148
(4) LGP21901 Diplexer (ATT - Existing)	168	RRH4x30-B25 (Verizon - Proposed)	148
(4) LGP21901 Diplexer (ATT - Existing)	168	RRH4x30-B25 (Verizon - Proposed)	148
DTMABP7819VG12A TMA (ATT - Existing)	168	RRH4x30-B25 (Verizon - Proposed)	148
DTMABP7819VG12A TMA (ATT - Existing)	168	DB-T1-6Z-8AB-0Z (Verizon - Existing)	148
DTMABP7819VG12A TMA (ATT - Existing)	168	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	148
Valmont T-Arm (1) (ATT - Existing)	168	RRH4x30-B13 (Verizon - Existing)	148
RR90-17-02DP (T-Mobile - Existing)	160	Andrew 12'-6" Low Profile Platform (Verizon - Existing)	147
RR90-17-02DP (T-Mobile - Existing)	160		
RR90-17-02DP (T-Mobile - Existing)	160		
(2) TMA 10"x8"x3" (T-Mobile - Existing)	157		
(2) TMA 10"x8"x3" (T-Mobile - Existing)	157		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 90.9%

ALL REACTIONS ARE FACTORED

AXIAL 74 K
SHEAR 10 K
MOMENT 1354 kip-ft
TORQUE 0 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 41 K
SHEAR 30 K
MOMENT 3707 kip-ft
TORQUE 1 kip-ft
REACTIONS - 97 mph WIND

Centek Engineering Inc.	Job: 16001.44 - Somers West		
63-2 North Branford Rd.	Project: 180' Sabre Monopole - 37 Bacon Rd., Enfield,		
Branford, CT 06405	Client: Verizon Wireless	Drawn by: TJL	App'd:
Phone: (203) 488-0580	Code: TIA-222-G	Date: 10/05/16	Scale: NTS
FAX: (203) 488-8587	Path:		Dwg No. E-1

Tower Input Data

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

Basic wind speed of 97 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56.0 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 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.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Horizontals	Assume Legs Pinned	Calculate Redundant Bracing Forces
Consider Moments - Diagonals	√ Assume Rigid Index Plate	Ignore Redundant Members in FEA
Use Moment Magnification	Use Clear Spans For Wind Area	SR Leg Bolts Resist Compression
√ Use Code Stress Ratios	Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	Offset Girt At Foundation
Escalate Ice	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Always Use Max Kz	Use Azimuth Dish Coefficients	Include Angle Block Shear Check
Use Special Wind Profile	√ Project Wind Area of Appurt.	Use TIA-222-G Bracing Resist. Exemption
Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Use TIA-222-G Tension Splice Exemption
Leg Bolts Are At Top Of Section	Add IBC .6D+W Combinations	Poles
Secondary Horizontal Braces Leg	√ Sort Capacity Reports By Component	√ Include Shear-Torsion Interaction
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Always Use Sub-Critical Flow
SR Members Have Cut Ends	Treat Feed Line Bundles As Cylinder	Use Top Mounted Sockets
SR Members Are Concentric		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	180.00-149.00	31.00	2.75	18	14.4000	21.3800	0.1875	0.7500	A572-65 (65 ksi)
L2	149.00-127.25	24.50	0.00	18	20.3858	25.9100	0.2500	1.0000	A572-65

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L3	127.25-98.25	29.00	4.00	18	25.9100	32.4400	0.3000	1.2000	(65 ksi) A572-65 (65 ksi)
L4	98.25-48.75	53.50	5.50	18	30.9393	43.1000	0.3400	1.3600	A572-65 (65 ksi)
L5	48.75-21.00	33.25	0.00	18	41.1698	48.9500	0.3400	1.3600	A572-65 (65 ksi)
L6	21.00-1.00	20.00		18	48.9500	53.2300	0.3500	1.4000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	14.6221	8.4582	215.8525	5.0454	7.3152	29.5074	431.9890	4.2299	2.2044	11.757
	21.7098	12.6122	715.6361	7.5233	10.8610	65.8902	1432.2138	6.3073	3.4329	18.309
L2	21.3299	15.9778	818.4486	7.1482	10.3560	79.0314	1637.9742	7.9904	3.1479	12.592
	26.3097	20.3612	1693.7696	9.1093	13.1623	128.6836	3389.7679	10.1825	4.1202	16.481
L3	26.3097	24.3858	2020.6652	9.0915	13.1623	153.5194	4043.9892	12.1952	4.0322	13.441
	32.9404	30.6037	3993.9557	11.4097	16.4795	242.3587	7993.1668	15.3048	5.1814	17.271
L4	32.3398	33.0216	3906.2334	10.8628	15.7172	248.5329	7817.6067	16.5139	4.8469	14.256
	43.7649	46.1449	10659.4888	15.1798	21.8948	486.8502	21333.0037	23.0768	6.9872	20.551
L5	43.1117	44.0619	9280.1756	14.4946	20.9143	443.7244	18572.5624	22.0351	6.6475	19.551
	49.7051	52.4580	15660.3027	17.2566	24.8666	629.7726	31341.2117	26.2340	8.0168	23.579
L6	49.7051	53.9897	16110.9528	17.2530	24.8666	647.8953	32243.1048	27.0000	7.9992	22.855
	54.0512	58.7444	20753.2805	18.7724	27.0408	767.4791	41533.8687	29.3778	8.7525	25.007

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 180.00-149.00				1	1	1			
L2 149.00-127.25				1	1	1			
L3 127.25-98.25				1	1	1			
L4 98.25-48.75				1	1	1			
L5 48.75-21.00				1	1	1			
L6 21.00-1.00				1	1	1			

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	√
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	16
Embedment length	60.0000 in
f'_c	4.000 ksi

Base Plate Data	
Grout space	3.0000 in
Base plate grade	A572-60
Base plate thickness	2.2500 in
Bolt circle diameter	60.0000 in
Outer diameter	66.0000 in
Inner diameter	40.0000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 1/4	C	No	Inside Pole	180.00 - 1.00	2	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
1/2	C	No	Inside Pole	180.00 - 1.00	2	No Ice	0.00	0.25
						1/2" Ice	0.00	0.25
						1" Ice	0.00	0.25
1 5/8 (AT&T - Existing)	C	No	Inside Pole	171.00 - 1.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
1 5/8 (T-Mobile - Existing)	C	No	Inside Pole	161.00 - 1.00	6	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
1 5/8 (Verizon - Existing)	C	No	Inside Pole	151.00 - 1.00	12	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
						1" Ice	0.00	1.04
#8 AWG Copper WIre (AT&T - Existing)	C	No	Inside Pole	171.00 - 1.00	2	No Ice	0.00	0.05
						1/2" Ice	0.00	0.05
						1" Ice	0.00	0.05
RG6-Fiber (AT&T - Existing)	C	No	Inside Pole	171.00 - 1.00	1	No Ice	0.00	1.00
						1/2" Ice	0.00	1.00
						1" Ice	0.00	1.00
HYBRIFLEX 1-5/8" (Verizon - Existing)	C	No	Inside Pole	151.00 - 1.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
						1" Ice	0.00	1.90
HYBRIFLEX 1-5/8" (Verizon - Proposed)	C	No	Inside Pole	151.00 - 1.00	1	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
						1" Ice	0.00	1.90

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	180.00-149.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.46
L2	149.00-127.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.82
L3	127.25-98.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.10
L4	98.25-48.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C	0.000	0.000	0.000	0.000	1.88
L5	48.75-21.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.05
L6	21.00-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.76

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	180.00-149.00	A	2.347	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.46
L2	149.00-127.25	A	2.307	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.82
L3	127.25-98.25	A	2.260	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.10
L4	98.25-48.75	A	2.164	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.88
L5	48.75-21.00	A	2.009	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.05
L6	21.00-1.00	A	1.790	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.76

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	180.00-149.00	0.0000	0.0000	0.0000	0.0000
L2	149.00-127.25	0.0000	0.0000	0.0000	0.0000
L3	127.25-98.25	0.0000	0.0000	0.0000	0.0000
L4	98.25-48.75	0.0000	0.0000	0.0000	0.0000
L5	48.75-21.00	0.0000	0.0000	0.0000	0.0000
L6	21.00-1.00	0.0000	0.0000	0.0000	0.0000

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
4-ft Dual Mount Standoff	A	From Face	2.00	0.00	0.0000	177.00	No Ice	5.20	5.20	0.05
							1/2" Ice	6.30	6.30	0.06
							1" Ice	7.40	7.40	0.07
4-ft Dual Mount Standoff	B	From Face	2.00	0.00	0.0000	177.00	No Ice	5.20	5.20	0.05
							1/2" Ice	6.30	6.30	0.06
							1" Ice	7.40	7.40	0.07
10' x 1" Dia Omni	B	From Face	4.00	0.00	0.0000	177.00	No Ice	1.00	1.00	0.03
							1/2" Ice	2.02	2.02	0.04
							1" Ice	3.05	3.05	0.05
1' x 1' Panel	B	From Face	4.00	0.00	0.0000	177.00	No Ice	1.20	0.32	0.02
							1/2" Ice	1.34	0.40	0.03
							1" Ice	1.48	0.49	0.04
Valmont T-Arm (1) (AT&T - Existing)	A	From Face	4.00	0.00	0.0000	168.00	No Ice	10.54	10.54	0.34
							1/2" Ice	14.45	14.45	0.41
							1" Ice	18.36	18.36	0.49
Valmont T-Arm (1) (AT&T - Existing)	B	From Face	4.00	0.00	0.0000	168.00	No Ice	10.54	10.54	0.34
							1/2" Ice	14.45	14.45	0.41
							1" Ice	18.36	18.36	0.49
Valmont T-Arm (1) (AT&T - Existing)	C	From Face	4.00	0.00	0.0000	168.00	No Ice	10.54	10.54	0.34
							1/2" Ice	14.45	14.45	0.41
							1" Ice	18.36	18.36	0.49
(2) AM-X-CD-16-65-00T-RET(72") (AT&T - Existing)	A	From Face	4.00	0.00	0.0000	168.00	No Ice	8.02	4.64	0.05
							1/2" Ice	8.48	5.09	0.10
							1" Ice	8.94	5.54	0.15
(2) SBNH-1D6565C (AT&T - Existing)	B	From Face	4.00	0.00	0.0000	168.00	No Ice	11.41	7.70	0.06
							1/2" Ice	12.03	8.29	0.13
							1" Ice	12.65	8.89	0.20
(2) P65-17-XLH-RR (AT&T - Existing)	C	From Face	4.00	0.00	0.0000	168.00	No Ice	11.47	6.80	0.06
							1/2" Ice	12.08	7.38	0.12
							1" Ice	12.71	7.98	0.19
(2) RRUS-11 (AT&T - Existing)	A	From Face	0.50	0.00	0.0000	168.00	No Ice	0.00	1.25	0.05
							1/2" Ice	0.00	1.41	0.07
							1" Ice	0.00	1.59	0.09
(2) RRUS-11 (AT&T - Existing)	B	From Face	0.50	0.00	0.0000	168.00	No Ice	0.00	1.25	0.05
							1/2" Ice	0.00	1.41	0.07
							1" Ice	0.00	1.59	0.09
(2) RRUS-11 (AT&T - Existing)	C	From Face	0.50	0.00	0.0000	168.00	No Ice	0.00	1.25	0.05
							1/2" Ice	0.00	1.41	0.07
							1" Ice	0.00	1.59	0.09
DC6-48-60-18-8F Surge Arrestor (AT&T - Existing)	C	From Face	0.50	0.00	0.0000	168.00	No Ice	1.91	1.91	0.02
							1/2" Ice	2.10	2.10	0.04
							1" Ice	2.29	2.29	0.06
800 10121 (AT&T - Existing)	A	From Face	4.00	0.00	0.0000	168.00	No Ice	5.16	3.29	0.05
							1/2" Ice	5.51	3.64	0.08
							1" Ice	5.87	3.99	0.12
800 10121 (AT&T - Existing)	B	From Face	4.00	0.00	0.0000	168.00	No Ice	5.16	3.29	0.05
							1/2" Ice	5.51	3.64	0.08
							1" Ice	5.87	3.99	0.12
800 10121 (AT&T - Existing)	C	From Face	4.00	0.00	0.0000	168.00	No Ice	5.16	3.29	0.05
							1/2" Ice	5.51	3.64	0.08
							1" Ice	5.87	3.99	0.12

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert (ft ft ft)	Azimuth Adjustment (°)	Placement (ft)		C_AA_A Front (ft^2)	C_AA_A Side (ft^2)	Weight (K)
(2) 860 10025 RCU	A	From Face	4.00	0.0000	168.00	No Ice	0.00	0.00	0.00
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.00	0.00
			0.00			1" Ice	0.00	0.00	0.01
(2) 860 10025 RCU	B	From Face	4.00	0.0000	168.00	No Ice	0.00	0.00	0.00
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.00	0.00
			0.00			1" Ice	0.00	0.00	0.01
(2) 860 10025 RCU	C	From Face	4.00	0.0000	168.00	No Ice	0.00	0.00	0.00
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.00	0.00
			0.00			1" Ice	0.00	0.00	0.01
(2) LGP21401 TMA	A	From Face	4.00	0.0000	168.00	No Ice	0.82	0.35	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	B	From Face	4.00	0.0000	168.00	No Ice	0.82	0.35	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(2) LGP21401 TMA	C	From Face	4.00	0.0000	168.00	No Ice	0.82	0.35	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.94	0.44	0.02
			0.00			1" Ice	1.06	0.54	0.03
(4) LGP21901 Diplexer	A	From Face	4.00	0.0000	168.00	No Ice	0.00	0.12	0.01
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.17	0.01
			0.00			1" Ice	0.00	0.22	0.01
(4) LGP21901 Diplexer	B	From Face	4.00	0.0000	168.00	No Ice	0.00	0.12	0.01
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.17	0.01
			0.00			1" Ice	0.00	0.22	0.01
(4) LGP21901 Diplexer	C	From Face	4.00	0.0000	168.00	No Ice	0.00	0.12	0.01
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.17	0.01
			0.00			1" Ice	0.00	0.22	0.01
DTMABP7819VG12A TMA	A	From Face	4.00	0.0000	168.00	No Ice	0.00	0.58	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.70	0.03
			0.00			1" Ice	0.00	0.83	0.04
DTMABP7819VG12A TMA	B	From Face	4.00	0.0000	168.00	No Ice	0.00	0.58	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.70	0.03
			0.00			1" Ice	0.00	0.83	0.04
DTMABP7819VG12A TMA	C	From Face	4.00	0.0000	168.00	No Ice	0.00	0.58	0.02
(AT&T - Existing)			0.00			1/2" Ice	0.00	0.70	0.03
			0.00			1" Ice	0.00	0.83	0.04
RR90-17-02DP	A	From Face	4.00	0.0000	160.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			6.00			1/2" Ice	4.70	2.31	0.04
			0.00			1" Ice	5.06	2.66	0.07
RR90-17-02DP	B	From Face	4.00	0.0000	160.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			6.00			1/2" Ice	4.70	2.31	0.04
			0.00			1" Ice	5.06	2.66	0.07
RR90-17-02DP	C	From Face	4.00	0.0000	160.00	No Ice	4.36	1.97	0.02
(T-Mobile - Existing)			6.00			1/2" Ice	4.70	2.31	0.04
			0.00			1" Ice	5.06	2.66	0.07
(2) TMA 10"x8"x3"	A	From Face	4.00	0.0000	157.00	No Ice	0.00	0.00	0.02
(T-Mobile - Existing)			5.00			1/2" Ice	0.00	0.00	0.02
			0.00			1" Ice	0.00	0.00	0.03
(2) TMA 10"x8"x3"	A	From Face	4.00	0.0000	157.00	No Ice	0.00	0.00	0.02
(T-Mobile - Existing)			5.00			1/2" Ice	0.00	0.00	0.02
			0.00			1" Ice	0.00	0.00	0.03
(2) TMA 10"x8"x3"	A	From Face	4.00	0.0000	157.00	No Ice	0.00	0.00	0.02
(T-Mobile - Existing)			5.00			1/2" Ice	0.00	0.00	0.02
			0.00			1" Ice	0.00	0.00	0.03
12-ft T-arm w/ Work Support Platform	A	From Face	4.00	0.0000	157.00	No Ice	14.20	14.20	0.49
(T-Mobile - Existing)			0.00			1/2" Ice	19.70	19.70	0.57
			0.00			1" Ice	25.20	25.20	0.66

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
12-ft T-arm w/ Work Support Platform	B	From Face	4.00 0.00	0.0000	157.00	No Ice 1/2" Ice	14.20 19.70	14.20 19.70	0.49 0.57
(T-Mobile - Existing)			0.00			1" Ice	25.20	25.20	0.66
12-ft T-arm w/ Work Support Platform	C	From Face	4.00 0.00	0.0000	157.00	No Ice 1/2" Ice	14.20 19.70	14.20 19.70	0.49 0.57
(T-Mobile - Existing)			0.00			1" Ice	25.20	25.20	0.66
LPA-80080-4CF	A	From Face	4.00	0.0000	150.00	No Ice	2.62	5.40	0.01
(Verizon - Existing)			6.00 0.00			1/2" Ice 1" Ice	2.92 3.23	5.73 6.06	0.05 0.08
SBNHH-1D65B	A	From Face	4.00	0.0000	150.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			4.00 0.00			1/2" Ice 1" Ice	8.53 9.00	5.79 6.26	0.09 0.15
BXA-70063/6CF	A	From Face	4.00	0.0000	150.00	No Ice	7.57	4.16	0.01
(Verizon - Existing)			0.00 0.00			1/2" Ice 1" Ice	8.02 8.47	4.60 5.04	0.05 0.10
SBNHH-1D65B	A	From Face	4.00	0.0000	150.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			-4.00 0.00			1/2" Ice 1" Ice	8.53 9.00	5.79 6.26	0.09 0.15
LPA-80080-4CF	A	From Face	4.00	0.0000	150.00	No Ice	2.62	5.40	0.01
(Verizon - Existing)			-6.00 0.00			1/2" Ice 1" Ice	2.92 3.23	5.73 6.06	0.05 0.08
LPA-80080-4CF	B	From Face	4.00	0.0000	150.00	No Ice	2.62	5.40	0.01
(Verizon - Existing)			6.00 0.00			1/2" Ice 1" Ice	2.92 3.23	5.73 6.06	0.05 0.08
SBNHH-1D65B	B	From Face	4.00	0.0000	150.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			4.00 0.00			1/2" Ice 1" Ice	8.53 9.00	5.79 6.26	0.09 0.15
BXA-70063/6CF	B	From Face	4.00	0.0000	150.00	No Ice	7.57	4.16	0.01
(Verizon - Existing)			0.00 0.00			1/2" Ice 1" Ice	8.02 8.47	4.60 5.04	0.05 0.10
SBNHH-1D65B	B	From Face	4.00	0.0000	150.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			-4.00 0.00			1/2" Ice 1" Ice	8.53 9.00	5.79 6.26	0.09 0.15
LPA-80080-4CF	B	From Face	4.00	0.0000	150.00	No Ice	2.62	5.40	0.01
(Verizon - Existing)			-6.00 0.00			1/2" Ice 1" Ice	2.92 3.23	5.73 6.06	0.05 0.08
LPA-80080-4CF	C	From Face	4.00	0.0000	150.00	No Ice	2.62	5.40	0.01
(Verizon - Existing)			6.00 0.00			1/2" Ice 1" Ice	2.92 3.23	5.73 6.06	0.05 0.08
SBNHH-1D65B	C	From Face	4.00	0.0000	150.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			4.00 0.00			1/2" Ice 1" Ice	8.53 9.00	5.79 6.26	0.09 0.15
BXA-70063/6CF	C	From Face	4.00	0.0000	150.00	No Ice	7.57	4.16	0.01
(Verizon - Existing)			0.00 0.00			1/2" Ice 1" Ice	8.02 8.47	4.60 5.04	0.05 0.10
SBNHH-1D65B	C	From Face	4.00	0.0000	150.00	No Ice	8.08	5.34	0.04
(Verizon - Existing)			-4.00 0.00			1/2" Ice 1" Ice	8.53 9.00	5.79 6.26	0.09 0.15
LPA-80080-4CF	C	From Face	4.00	0.0000	150.00	No Ice	2.62	5.40	0.01
(Verizon - Existing)			-6.00 0.00			1/2" Ice 1" Ice	2.92 3.23	5.73 6.06	0.05 0.08
RRH4x30-B13	A	From Face	4.00	0.0000	148.00	No Ice	2.16	1.62	0.06
(Verizon - Existing)			0.00 0.00			1/2" Ice 1" Ice	2.35 2.55	1.79 1.97	0.08 0.10
RRH4x30-B13	B	From Face	4.00	0.0000	148.00	No Ice	2.16	1.62	0.06
(Verizon - Existing)			0.00 0.00			1/2" Ice 1" Ice	2.35 2.55	1.79 1.97	0.08 0.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert (ft / ft / ft)	Azimuth Adjustment (°)	Placement (ft)		C_AA_A Front (ft^2)	C_AA_A Side (ft^2)	Weight (K)
RRH4x30-B13 (Verizon - Existing)	C	From Face	4.00 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.16 2.35 2.55	1.62 1.79 1.97	0.06 0.08 0.10
RRH4x45/2x90-AWS (Verizon - Existing)	A	From Face	4.00 -4.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.58 2.79 3.01	1.69 1.87 2.06	0.08 0.10 0.12
RRH4x45/2x90-AWS (Verizon - Existing)	B	From Face	4.00 -4.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.58 2.79 3.01	1.69 1.87 2.06	0.08 0.10 0.12
RRH4x45/2x90-AWS (Verizon - Existing)	C	From Face	4.00 -4.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.58 2.79 3.01	1.69 1.87 2.06	0.08 0.10 0.12
RRH4x30-B25 (Verizon - Proposed)	A	From Face	4.00 4.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.12 2.31 2.50	1.29 1.45 1.61	0.05 0.07 0.09
RRH4x30-B25 (Verizon - Proposed)	B	From Face	4.00 4.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.12 2.31 2.50	1.29 1.45 1.61	0.05 0.07 0.09
RRH4x30-B25 (Verizon - Proposed)	C	From Face	4.00 4.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	2.12 2.31 2.50	1.29 1.45 1.61	0.05 0.07 0.09
DB-T1-6Z-8AB-0Z (Verizon - Existing)	A	From Face	4.00 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	0.04 0.08 0.12
DB-T1-6Z-8AB-0Z (Verizon - Proposed)	C	From Face	4.00 0.00 0.00	0.0000	148.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	2.33 2.56 2.79	0.04 0.08 0.12
Andrew 12'-6" Low Profile Platform (Verizon - Existing)	C	None		0.0000	147.00	No Ice 1/2" Ice 1" Ice	14.45 19.00 23.55	14.45 19.00 23.55	1.30 1.69 2.08

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 (ft^2)	Weight (K)
HP2-4.7	A	Paraboloid w/Shroud (HP)	From Face	4.00 0.00 0.00	Worst		178.00	2.00	No Ice 1/2" Ice 1" Ice	3.14 3.41 3.68	0.03 0.04 0.06

Tower Pressures - No Ice

$G_H = 1.100$

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 180.00-149.00	163.57	1.404	32.11	46.929	A	0.000	46.929	46.929	100.00	0.000	0.000
					B	0.000	46.929		100.00	0.000	0.000
					C	0.000	46.929		100.00	0.000	0.000
L2 149.00-127.25	137.75	1.354	30.98	43.173	A	0.000	43.173	43.173	100.00	0.000	0.000
					B	0.000	43.173		100.00	0.000	0.000
					C	0.000	43.173		100.00	0.000	0.000
L3 127.25-98.25	112.21	1.297	29.67	71.594	A	0.000	71.594	71.594	100.00	0.000	0.000
					B	0.000	71.594		100.00	0.000	0.000
					C	0.000	71.594		100.00	0.000	0.000
L4 98.25-48.75	72.70	1.183	26.98	156.966	A	0.000	156.966	156.966	100.00	0.000	0.000
					B	0.000	156.966		100.00	0.000	0.000
					C	0.000	156.966		100.00	0.000	0.000
L5 48.75-21.00	34.55	1.012	23.15	107.320	A	0.000	107.320	107.320	100.00	0.000	0.000
					B	0.000	107.320		100.00	0.000	0.000
					C	0.000	107.320		100.00	0.000	0.000
L6 21.00-1.00	10.86	0.85	19.45	86.464	A	0.000	86.464	86.464	100.00	0.000	0.000
					B	0.000	86.464		100.00	0.000	0.000
					C	0.000	86.464		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.100$

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 180.00-149.00	163.57	1.404	8.53	2.3472	59.056	A	0.000	59.056	59.056	100.00	0.000	0.000
						B	0.000	59.056		100.00	0.000	0.000
						C	0.000	59.056		100.00	0.000	0.000
L2 149.00-127.25	137.75	1.354	8.23	2.3072	51.682	A	0.000	51.682	51.682	100.00	0.000	0.000
						B	0.000	51.682		100.00	0.000	0.000
						C	0.000	51.682		100.00	0.000	0.000
L3 127.25-98.25	112.21	1.297	7.88	2.2604	82.519	A	0.000	82.519	82.519	100.00	0.000	0.000
						B	0.000	82.519		100.00	0.000	0.000
						C	0.000	82.519		100.00	0.000	0.000
L4 98.25-48.75	72.70	1.183	7.17	2.1644	175.614	A	0.000	175.614	175.614	100.00	0.000	0.000
						B	0.000	175.614		100.00	0.000	0.000
						C	0.000	175.614		100.00	0.000	0.000
L5 48.75-21.00	34.55	1.012	6.15	2.0092	117.330	A	0.000	117.330	117.330	100.00	0.000	0.000
						B	0.000	117.330		100.00	0.000	0.000
						C	0.000	117.330		100.00	0.000	0.000
L6 21.00-1.00	10.86	0.85	5.17	1.7896	92.429	A	0.000	92.429	92.429	100.00	0.000	0.000
						B	0.000	92.429		100.00	0.000	0.000
						C	0.000	92.429		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.100$

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 180.00-149.00	163.57	1.404	10.99	46.929	A	0.000	46.929	46.929	100.00	0.000	0.000
					B	0.000	46.929		100.00	0.000	0.000
					C	0.000	46.929		100.00	0.000	0.000
L2 149.00-127.25	137.75	1.354	10.61	43.173	A	0.000	43.173	43.173	100.00	0.000	0.000
					B	0.000	43.173		100.00	0.000	0.000
					C	0.000	43.173		100.00	0.000	0.000
L3 127.25-98.25	112.21	1.297	10.16	71.594	A	0.000	71.594	71.594	100.00	0.000	0.000
					B	0.000	71.594		100.00	0.000	0.000
					C	0.000	71.594		100.00	0.000	0.000
L4 98.25-48.75	72.70	1.183	9.24	156.966	A	0.000	156.966	156.966	100.00	0.000	0.000
					B	0.000	156.966		100.00	0.000	0.000
					C	0.000	156.966		100.00	0.000	0.000
L5 48.75-21.00	34.55	1.012	7.93	107.320	A	0.000	107.320	107.320	100.00	0.000	0.000
					B	0.000	107.320		100.00	0.000	0.000
					C	0.000	107.320		100.00	0.000	0.000
L6 21.00-1.00	10.86	0.85	6.66	86.464	A	0.000	86.464	86.464	100.00	0.000	0.000
					B	0.000	86.464		100.00	0.000	0.000
					C	0.000	86.464		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 180.00-149.00	0.46	1.11	A	1	0.65	32.11	1	1	46.929	1.08	34.76	C
			B	1	0.65		1	1	46.929			
			C	1	0.65		1	1	46.929			
L2 149.00-127.25	0.82	1.51	A	1	0.65	30.98	1	1	43.173	0.96	43.97	C
			B	1	0.65		1	1	43.173			
			C	1	0.65		1	1	43.173			
L3 127.25-98.25	1.10	2.71	A	1	0.65	29.67	1	1	71.594	1.52	52.38	C
			B	1	0.65		1	1	71.594			
			C	1	0.65		1	1	71.594			
L4 98.25-48.75	1.88	7.21	A	1	0.65	26.98	1	1	156.966	3.03	61.17	C
			B	1	0.65		1	1	156.966			
			C	1	0.65		1	1	156.966			
L5 48.75-21.00	1.05	5.46	A	1	0.65	23.15	1	1	107.320	1.78	64.03	C
			B	1	0.65		1	1	107.320			
			C	1	0.65		1	1	107.320			
L6 21.00-1.00	0.76	3.84	A	1	0.65	19.45	1	1	86.464	1.20	60.12	C
			B	1	0.65		1	1	86.464			
			C	1	0.65		1	1	86.464			
Sum Weight:	6.07	21.84						OTM	763.44 kip-ft	9.56		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.46	1.11	A	1	0.65	32.11	1	1	46.929	1.08	34.76	C
180.00-149.00			B	1	0.65		1	1	46.929			
			C	1	0.65		1	1	46.929			
L2	0.82	1.51	A	1	0.65	30.98	1	1	43.173	0.96	43.97	C
149.00-127.25			B	1	0.65		1	1	43.173			
			C	1	0.65		1	1	43.173			
L3	1.10	2.71	A	1	0.65	29.67	1	1	71.594	1.52	52.38	C
127.25-98.25			B	1	0.65		1	1	71.594			
			C	1	0.65		1	1	71.594			
L4	1.88	7.21	A	1	0.65	26.98	1	1	156.966	3.03	61.17	C
98.25-48.75			B	1	0.65		1	1	156.966			
			C	1	0.65		1	1	156.966			
L5	1.05	5.46	A	1	0.65	23.15	1	1	107.320	1.78	64.03	C
48.75-21.00			B	1	0.65		1	1	107.320			
			C	1	0.65		1	1	107.320			
L6 21.00-1.00	0.76	3.84	A	1	0.65	19.45	1	1	86.464	1.20	60.12	C
			B	1	0.65		1	1	86.464			
			C	1	0.65		1	1	86.464			
Sum Weight:	6.07	21.84						OTM	763.44 kip-ft	9.56		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.46	1.11	A	1	0.65	32.11	1	1	46.929	1.08	34.76	C
180.00-149.00			B	1	0.65		1	1	46.929			
			C	1	0.65		1	1	46.929			
L2	0.82	1.51	A	1	0.65	30.98	1	1	43.173	0.96	43.97	C
149.00-127.25			B	1	0.65		1	1	43.173			
			C	1	0.65		1	1	43.173			
L3	1.10	2.71	A	1	0.65	29.67	1	1	71.594	1.52	52.38	C
127.25-98.25			B	1	0.65		1	1	71.594			
			C	1	0.65		1	1	71.594			
L4	1.88	7.21	A	1	0.65	26.98	1	1	156.966	3.03	61.17	C
98.25-48.75			B	1	0.65		1	1	156.966			
			C	1	0.65		1	1	156.966			
L5	1.05	5.46	A	1	0.65	23.15	1	1	107.320	1.78	64.03	C
48.75-21.00			B	1	0.65		1	1	107.320			
			C	1	0.65		1	1	107.320			
L6 21.00-1.00	0.76	3.84	A	1	0.65	19.45	1	1	86.464	1.20	60.12	C
			B	1	0.65		1	1	86.464			
			C	1	0.65		1	1	86.464			
Sum Weight:	6.07	21.84						OTM	763.44 kip-ft	9.56		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.46	2.93	A	1	1.2	8.53	1	1	59.056	0.67	21.46	C
180.00-149.00			B	1	1.2		1	1	59.056			
			C	1	1.2		1	1	59.056			
L2	0.82	3.11	A	1	1.2	8.23	1	1	51.682	0.56	25.82	C
149.00-127.25			B	1	1.2		1	1	51.682			
			C	1	1.2		1	1	51.682			
L3	1.10	5.26	A	1	1.2	7.88	1	1	82.519	0.86	29.61	C
127.25-98.25			B	1	1.2		1	1	82.519			
			C	1	1.2		1	1	82.519			
L4	1.88	12.45	A	1	1.2	7.17	1	1	175.614	1.66	33.57	C
98.25-48.75			B	1	1.2		1	1	175.614			
			C	1	1.2		1	1	175.614			
L5	1.05	8.74	A	1	1.2	6.15	1	1	117.330	0.95	34.34	C
48.75-21.00			B	1	1.2		1	1	117.330			
			C	1	1.2		1	1	117.330			
L6 21.00-1.00	0.76	6.17	A	1	1.2	5.17	1	1	92.429	0.63	31.53	C
			B	1	1.2		1	1	92.429			
			C	1	1.2		1	1	92.429			
Sum Weight:	6.07	38.66						OTM	437.76 kip-ft	5.33		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.46	2.93	A	1	1.2	8.53	1	1	59.056	0.67	21.46	C
180.00-149.00			B	1	1.2		1	1	59.056			
			C	1	1.2		1	1	59.056			
L2	0.82	3.11	A	1	1.2	8.23	1	1	51.682	0.56	25.82	C
149.00-127.25			B	1	1.2		1	1	51.682			
			C	1	1.2		1	1	51.682			
L3	1.10	5.26	A	1	1.2	7.88	1	1	82.519	0.86	29.61	C
127.25-98.25			B	1	1.2		1	1	82.519			
			C	1	1.2		1	1	82.519			
L4	1.88	12.45	A	1	1.2	7.17	1	1	175.614	1.66	33.57	C
98.25-48.75			B	1	1.2		1	1	175.614			
			C	1	1.2		1	1	175.614			
L5	1.05	8.74	A	1	1.2	6.15	1	1	117.330	0.95	34.34	C
48.75-21.00			B	1	1.2		1	1	117.330			
			C	1	1.2		1	1	117.330			
L6 21.00-1.00	0.76	6.17	A	1	1.2	5.17	1	1	92.429	0.63	31.53	C
			B	1	1.2		1	1	92.429			
			C	1	1.2		1	1	92.429			
Sum Weight:	6.07	38.66						OTM	437.76 kip-ft	5.33		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.46	2.93	A	1	1.2	8.53	1	1	59.056	0.67	21.46	C
180.00-149.00			B	1	1.2		1	1	59.056			
			C	1	1.2		1	1	59.056			
L2	0.82	3.11	A	1	1.2	8.23	1	1	51.682	0.56	25.82	C
149.00-127.25			B	1	1.2		1	1	51.682			
			C	1	1.2		1	1	51.682			
L3	1.10	5.26	A	1	1.2	7.88	1	1	82.519	0.86	29.61	C
127.25-98.25			B	1	1.2		1	1	82.519			
			C	1	1.2		1	1	82.519			
L4	1.88	12.45	A	1	1.2	7.17	1	1	175.614	1.66	33.57	C
98.25-48.75			B	1	1.2		1	1	175.614			
			C	1	1.2		1	1	175.614			
L5	1.05	8.74	A	1	1.2	6.15	1	1	117.330	0.95	34.34	C
48.75-21.00			B	1	1.2		1	1	117.330			
			C	1	1.2		1	1	117.330			
L6 21.00-1.00	0.76	6.17	A	1	1.2	5.17	1	1	92.429	0.63	31.53	C
			B	1	1.2		1	1	92.429			
			C	1	1.2		1	1	92.429			
Sum Weight:	6.07	38.66						OTM	437.76 kip-ft	5.33		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	0.46	1.11	A	1	0.65	10.99	1	1	46.929	0.37	11.90	C
180.00-149.00			B	1	0.65		1	1	46.929			
			C	1	0.65		1	1	46.929			
L2	0.82	1.51	A	1	0.65	10.61	1	1	43.173	0.33	15.05	C
149.00-127.25			B	1	0.65		1	1	43.173			
			C	1	0.65		1	1	43.173			
L3	1.10	2.71	A	1	0.65	10.16	1	1	71.594	0.52	17.93	C
127.25-98.25			B	1	0.65		1	1	71.594			
			C	1	0.65		1	1	71.594			
L4	1.88	7.21	A	1	0.65	9.24	1	1	156.966	1.04	20.94	C
98.25-48.75			B	1	0.65		1	1	156.966			
			C	1	0.65		1	1	156.966			
L5	1.05	5.46	A	1	0.65	7.93	1	1	107.320	0.61	21.92	C
48.75-21.00			B	1	0.65		1	1	107.320			
			C	1	0.65		1	1	107.320			
L6 21.00-1.00	0.76	3.84	A	1	0.65	6.66	1	1	86.464	0.41	20.58	C
			B	1	0.65		1	1	86.464			
			C	1	0.65		1	1	86.464			
Sum Weight:	6.07	21.84						OTM	261.35 kip-ft	3.27		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 180.00-149.00	0.46	1.11	A	1	0.65	10.99	1	1	46.929	0.37	11.90	C
			B	1	0.65		1	1	46.929			
			C	1	0.65		1	1	46.929			
L2 149.00-127.25	0.82	1.51	A	1	0.65	10.61	1	1	43.173	0.33	15.05	C
			B	1	0.65		1	1	43.173			
			C	1	0.65		1	1	43.173			
L3 127.25-98.25	1.10	2.71	A	1	0.65	10.16	1	1	71.594	0.52	17.93	C
			B	1	0.65		1	1	71.594			
			C	1	0.65		1	1	71.594			
L4 98.25-48.75	1.88	7.21	A	1	0.65	9.24	1	1	156.966	1.04	20.94	C
			B	1	0.65		1	1	156.966			
			C	1	0.65		1	1	156.966			
L5 48.75-21.00	1.05	5.46	A	1	0.65	7.93	1	1	107.320	0.61	21.92	C
			B	1	0.65		1	1	107.320			
			C	1	0.65		1	1	107.320			
L6 21.00-1.00	0.76	3.84	A	1	0.65	6.66	1	1	86.464	0.41	20.58	C
			B	1	0.65		1	1	86.464			
			C	1	0.65		1	1	86.464			
Sum Weight:	6.07	21.84						OTM	261.35 kip-ft	3.27		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 180.00-149.00	0.46	1.11	A	1	0.65	10.99	1	1	46.929	0.37	11.90	C
			B	1	0.65		1	1	46.929			
			C	1	0.65		1	1	46.929			
L2 149.00-127.25	0.82	1.51	A	1	0.65	10.61	1	1	43.173	0.33	15.05	C
			B	1	0.65		1	1	43.173			
			C	1	0.65		1	1	43.173			
L3 127.25-98.25	1.10	2.71	A	1	0.65	10.16	1	1	71.594	0.52	17.93	C
			B	1	0.65		1	1	71.594			
			C	1	0.65		1	1	71.594			
L4 98.25-48.75	1.88	7.21	A	1	0.65	9.24	1	1	156.966	1.04	20.94	C
			B	1	0.65		1	1	156.966			
			C	1	0.65		1	1	156.966			
L5 48.75-21.00	1.05	5.46	A	1	0.65	7.93	1	1	107.320	0.61	21.92	C
			B	1	0.65		1	1	107.320			
			C	1	0.65		1	1	107.320			
L6 21.00-1.00	0.76	3.84	A	1	0.65	6.66	1	1	86.464	0.41	20.58	C
			B	1	0.65		1	1	86.464			
			C	1	0.65		1	1	86.464			
Sum Weight:	6.07	21.84						OTM	261.35 kip-ft	3.27		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	21.84					
Bracing Weight	0.00					
Total Member Self-Weight	21.84			-0.96	0.21	
Total Weight	34.10			-0.96	0.21	
Wind 0 deg - No Ice		-0.02	-18.48	-2177.43	2.59	0.04
Wind 30 deg - No Ice		9.26	-15.99	-1884.65	-1091.55	-0.20
Wind 60 deg - No Ice		16.06	-9.22	-1087.13	-1893.15	-0.39
Wind 90 deg - No Ice		18.56	0.02	1.43	-2187.43	-0.47
Wind 120 deg - No Ice		16.08	9.26	1089.35	-1895.54	-0.43
Wind 150 deg - No Ice		9.30	16.01	1885.12	-1095.68	-0.27
Wind 180 deg - No Ice		0.02	18.48	2175.52	-2.18	-0.04
Wind 210 deg - No Ice		-9.26	15.99	1882.74	1091.96	0.20
Wind 240 deg - No Ice		-16.06	9.22	1085.22	1893.57	0.39
Wind 270 deg - No Ice		-18.56	-0.02	-3.34	2187.85	0.47
Wind 300 deg - No Ice		-16.08	-9.26	-1091.26	1895.95	0.43
Wind 330 deg - No Ice		-9.30	-16.01	-1887.03	1096.09	0.27
Member Ice	16.82					
Total Weight Ice	65.73			-2.11	0.25	
Wind 0 deg - Ice		-0.01	-9.85	-1158.76	0.87	0.15
Wind 30 deg - Ice		4.94	-8.53	-1003.49	-579.97	-0.04
Wind 60 deg - Ice		8.56	-4.92	-579.90	-1005.33	-0.22
Wind 90 deg - Ice		9.88	0.01	-1.49	-1161.25	-0.34
Wind 120 deg - Ice		8.56	4.93	576.76	-1005.95	-0.37
Wind 150 deg - Ice		4.95	8.53	999.89	-581.03	-0.30
Wind 180 deg - Ice		0.01	9.85	1154.55	-0.37	-0.15
Wind 210 deg - Ice		-4.94	8.53	999.28	580.47	0.04
Wind 240 deg - Ice		-8.56	4.92	575.69	1005.83	0.22
Wind 270 deg - Ice		-9.88	-0.01	-2.72	1161.75	0.34
Wind 300 deg - Ice		-8.56	-4.93	-580.97	1006.45	0.37
Wind 330 deg - Ice		-4.95	-8.53	-1004.11	581.53	0.30
Total Weight	34.10			-0.96	0.21	
Wind 0 deg - Service		-0.01	-6.32	-746.05	1.02	0.01
Wind 30 deg - Service		3.17	-5.47	-645.81	-373.54	-0.07
Wind 60 deg - Service		5.50	-3.16	-372.79	-647.96	-0.13
Wind 90 deg - Service		6.35	0.01	-0.14	-748.70	-0.16
Wind 120 deg - Service		5.51	3.17	372.30	-648.78	-0.15
Wind 150 deg - Service		3.18	5.48	644.72	-374.95	-0.09
Wind 180 deg - Service		0.01	6.32	744.13	-0.61	-0.01
Wind 210 deg - Service		-3.17	5.47	643.90	373.96	0.07
Wind 240 deg - Service		-5.50	3.16	370.88	648.38	0.13
Wind 270 deg - Service		-6.35	-0.01	-1.77	749.12	0.16
Wind 300 deg - Service		-5.51	-3.17	-374.21	649.19	0.15
Wind 330 deg - Service		-3.18	-5.48	-646.63	375.37	0.09

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice

Comb. No.	Description
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	180 - 149	Pole	Max Tension	27	0.00	0.00	-0.00
			Max. Compression	26	-15.79	-0.82	3.08
			Max. Mx	20	-4.40	155.97	0.33
			Max. My	2	-4.40	-0.64	158.12
			Max. Vy	20	-11.37	155.97	0.33

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	2	-11.44	-0.64	158.12
			Max. Torque	18			-1.58
L2	149 - 127.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-30.54	0.31	2.71
			Max. Mx	20	-9.38	587.85	0.91
			Max. My	2	-9.41	0.04	587.19
			Max. Vy	20	-19.24	587.85	0.91
			Max. Vx	2	-19.10	0.04	587.19
			Max. Torque	11			1.20
L3	127.25 - 98.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-36.64	0.33	2.89
			Max. Mx	20	-13.74	1094.68	1.80
			Max. My	2	-13.77	0.88	1090.63
			Max. Vy	20	-21.36	1094.68	1.80
			Max. Vx	2	-21.22	0.88	1090.63
			Max. Torque	9			0.69
L4	98.25 - 48.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-52.37	0.35	3.01
			Max. Mx	20	-25.00	2224.80	3.48
			Max. My	2	-25.01	2.51	2214.18
			Max. Vy	20	-25.69	2224.80	3.48
			Max. Vx	2	-25.56	2.51	2214.18
			Max. Torque	9			0.69
L5	48.75 - 21	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-65.98	0.35	3.01
			Max. Mx	20	-34.86	3126.10	4.60
			Max. My	2	-34.87	3.62	3110.98
			Max. Vy	20	-28.44	3126.10	4.60
			Max. Vx	2	-28.31	3.62	3110.98
			Max. Torque	9			0.68
L6	21 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-73.83	0.35	3.01
			Max. Mx	20	-40.90	3707.16	5.25
			Max. My	2	-40.90	4.27	3689.41
			Max. Vy	20	-29.71	3707.16	5.25
			Max. Vx	2	-29.58	4.27	3689.41
			Max. Torque	9			0.68

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	36	73.83	9.89	0.01
	Max. H_x	20	40.92	29.69	0.03
	Max. H_z	2	40.92	0.03	29.56
	Max. M_x	2	3689.41	0.03	29.56
	Max. M_z	8	3706.64	-29.69	-0.03
	Max. Torsion	9	0.68	-29.69	-0.03
	Min. Vert	25	30.69	14.87	25.62
	Min. H_x	8	40.92	-29.69	-0.03
	Min. H_z	14	40.92	-0.03	-29.56
	Min. M_x	14	-3686.92	-0.03	-29.56
	Min. M_z	20	-3707.16	29.69	0.03
	Min. Torsion	21	-0.67	29.69	0.03

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	34.10	0.00	-0.00	-1.00	0.22	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	40.92	-0.03	-29.56	-3689.41	4.27	0.13
0.9 Dead+1.6 Wind 0 deg - No Ice	30.69	-0.03	-29.56	-3631.02	4.14	0.11
1.2 Dead+1.6 Wind 30 deg - No Ice	40.92	14.82	-25.58	-3193.29	-1849.79	-0.22
0.9 Dead+1.6 Wind 30 deg - No Ice	30.69	14.82	-25.58	-3142.69	-1820.73	-0.24
1.2 Dead+1.6 Wind 60 deg - No Ice	40.92	25.70	-14.75	-1841.84	-3208.06	-0.51
0.9 Dead+1.6 Wind 60 deg - No Ice	30.69	25.70	-14.75	-1812.51	-3157.63	-0.53
1.2 Dead+1.6 Wind 90 deg - No Ice	40.92	29.69	0.03	2.74	-3706.64	-0.66
0.9 Dead+1.6 Wind 90 deg - No Ice	30.69	29.69	0.03	3.03	-3648.38	-0.68
1.2 Dead+1.6 Wind 120 deg - No Ice	40.92	25.73	14.81	1846.23	-3212.03	-0.64
0.9 Dead+1.6 Wind 120 deg - No Ice	30.69	25.73	14.81	1817.50	-3161.55	-0.64
1.2 Dead+1.6 Wind 150 deg - No Ice	40.92	14.87	25.62	3194.75	-1856.69	-0.44
0.9 Dead+1.6 Wind 150 deg - No Ice	30.69	14.87	25.62	3144.79	-1827.55	-0.43
1.2 Dead+1.6 Wind 180 deg - No Ice	40.92	0.03	29.56	3686.92	-3.72	-0.12
0.9 Dead+1.6 Wind 180 deg - No Ice	30.69	0.03	29.56	3629.21	-3.75	-0.10
1.2 Dead+1.6 Wind 210 deg - No Ice	40.92	-14.82	25.58	3190.78	1850.34	0.23
0.9 Dead+1.6 Wind 210 deg - No Ice	30.69	-14.82	25.58	3140.87	1821.13	0.25
1.2 Dead+1.6 Wind 240 deg - No Ice	40.92	-25.70	14.75	1839.32	3208.60	0.51
0.9 Dead+1.6 Wind 240 deg - No Ice	30.69	-25.70	14.75	1810.68	3158.03	0.53
1.2 Dead+1.6 Wind 270 deg - No Ice	40.92	-29.69	-0.03	-5.25	3707.16	0.66
0.9 Dead+1.6 Wind 270 deg - No Ice	30.69	-29.69	-0.03	-4.86	3648.76	0.67
1.2 Dead+1.6 Wind 300 deg - No Ice	40.92	-25.73	-14.81	-1848.72	3212.55	0.63
0.9 Dead+1.6 Wind 300 deg - No Ice	30.69	-25.73	-14.81	-1819.32	3161.93	0.63
1.2 Dead+1.6 Wind 330 deg - No Ice	40.92	-14.87	-25.62	-3197.24	1857.23	0.44
0.9 Dead+1.6 Wind 330 deg - No Ice	30.69	-14.87	-25.62	-3146.60	1827.94	0.43
1.2 Dead+1.0 Ice+1.0 Temp	73.83	-0.00	-0.00	-3.01	0.35	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	73.83	-0.01	-9.85	-1350.13	1.06	0.26
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	73.83	4.94	-8.53	-1169.37	-675.35	0.10
1.2 Dead+1.0 Wind 60 deg+1.0	73.83	8.56	-4.92	-676.09	-1170.70	-0.09

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Ice+1.0 Temp 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	73.83	9.89	0.01	-2.50	-1352.22	-0.26
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	73.83	8.56	4.93	670.91	-1171.38	-0.36
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	73.83	4.95	8.53	1163.70	-676.53	-0.36
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	73.83	0.01	9.85	1343.78	-0.31	-0.26
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	73.83	-4.94	8.53	1163.01	676.10	-0.09
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	73.83	-8.56	4.92	669.72	1171.43	0.10
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	73.83	-9.89	-0.01	-3.86	1352.94	0.26
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	73.83	-8.56	-4.93	-677.26	1172.11	0.36
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	73.83	-4.95	-8.53	-1170.04	677.27	0.36
Dead+Wind 0 deg - Service	34.10	-0.01	-6.32	-785.30	1.08	0.03
Dead+Wind 30 deg - Service	34.10	3.17	-5.47	-679.81	-393.16	-0.05
Dead+Wind 60 deg - Service	34.10	5.50	-3.16	-392.45	-682.00	-0.12
Dead+Wind 90 deg - Service	34.10	6.35	0.01	-0.22	-788.02	-0.15
Dead+Wind 120 deg - Service	34.10	5.51	3.17	391.79	-682.85	-0.14
Dead+Wind 150 deg - Service	34.10	3.18	5.48	678.54	-394.63	-0.10
Dead+Wind 180 deg - Service	34.10	0.01	6.32	783.17	-0.62	-0.03
Dead+Wind 210 deg - Service	34.10	-3.17	5.47	677.69	393.62	0.05
Dead+Wind 240 deg - Service	34.10	-5.50	3.16	390.32	682.46	0.12
Dead+Wind 270 deg - Service	34.10	-6.35	-0.01	-1.91	788.48	0.15
Dead+Wind 300 deg - Service	34.10	-5.51	-3.17	-393.92	683.31	0.14
Dead+Wind 330 deg - Service	34.10	-3.18	-5.48	-680.66	395.09	0.10

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-34.10	0.00	0.00	34.10	0.00	0.000%
2	-0.03	-40.92	-29.56	0.03	40.92	29.56	0.000%
3	-0.03	-30.69	-29.56	0.03	30.69	29.56	0.000%
4	14.82	-40.92	-25.58	-14.82	40.92	25.58	0.000%
5	14.82	-30.69	-25.58	-14.82	30.69	25.58	0.000%
6	25.70	-40.92	-14.75	-25.70	40.92	14.75	0.000%
7	25.70	-30.69	-14.75	-25.70	30.69	14.75	0.000%
8	29.69	-40.92	0.03	-29.69	40.92	-0.03	0.000%
9	29.69	-30.69	0.03	-29.69	30.69	-0.03	0.000%
10	25.73	-40.92	14.81	-25.73	40.92	-14.81	0.000%
11	25.73	-30.69	14.81	-25.73	30.69	-14.81	0.000%
12	14.87	-40.92	25.62	-14.87	40.92	-25.62	0.000%
13	14.87	-30.69	25.62	-14.87	30.69	-25.62	0.000%
14	0.03	-40.92	29.56	-0.03	40.92	-29.56	0.000%
15	0.03	-30.69	29.56	-0.03	30.69	-29.56	0.000%
16	-14.82	-40.92	25.58	14.82	40.92	-25.58	0.000%
17	-14.82	-30.69	25.58	14.82	30.69	-25.58	0.000%
18	-25.70	-40.92	14.75	25.70	40.92	-14.75	0.000%
19	-25.70	-30.69	14.75	25.70	30.69	-14.75	0.000%
20	-29.69	-40.92	-0.03	29.69	40.92	0.03	0.000%
21	-29.69	-30.69	-0.03	29.69	30.69	0.03	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
22	-25.73	-40.92	-14.81	25.73	40.92	14.81	0.000%
23	-25.73	-30.69	-14.81	25.73	30.69	14.81	0.000%
24	-14.87	-40.92	-25.62	14.87	40.92	25.62	0.000%
25	-14.87	-30.69	-25.62	14.87	30.69	25.62	0.000%
26	0.00	-73.83	0.00	0.00	73.83	0.00	0.000%
27	-0.01	-73.83	-9.85	0.01	73.83	9.85	0.001%
28	4.94	-73.83	-8.53	-4.94	73.83	8.53	0.000%
29	8.56	-73.83	-4.92	-8.56	73.83	4.92	0.000%
30	9.88	-73.83	0.01	-9.89	73.83	-0.01	0.001%
31	8.56	-73.83	4.93	-8.56	73.83	-4.93	0.000%
32	4.95	-73.83	8.53	-4.95	73.83	-8.53	0.000%
33	0.01	-73.83	9.85	-0.01	73.83	-9.85	0.001%
34	-4.94	-73.83	8.53	4.94	73.83	-8.53	0.000%
35	-8.56	-73.83	4.92	8.56	73.83	-4.92	0.000%
36	-9.88	-73.83	-0.01	9.89	73.83	0.01	0.001%
37	-8.56	-73.83	-4.93	8.56	73.83	4.93	0.000%
38	-4.95	-73.83	-8.53	4.95	73.83	8.53	0.000%
39	-0.01	-34.10	-6.32	0.01	34.10	6.32	0.000%
40	3.17	-34.10	-5.47	-3.17	34.10	5.47	0.000%
41	5.50	-34.10	-3.16	-5.50	34.10	3.16	0.000%
42	6.35	-34.10	0.01	-6.35	34.10	-0.01	0.000%
43	5.51	-34.10	3.17	-5.51	34.10	-3.17	0.000%
44	3.18	-34.10	5.48	-3.18	34.10	-5.48	0.000%
45	0.01	-34.10	6.32	-0.01	34.10	-6.32	0.000%
46	-3.17	-34.10	5.47	3.17	34.10	-5.47	0.000%
47	-5.50	-34.10	3.16	5.50	34.10	-3.16	0.000%
48	-6.35	-34.10	-0.01	6.35	34.10	0.01	0.000%
49	-5.51	-34.10	-3.17	5.51	34.10	3.17	0.000%
50	-3.18	-34.10	-5.48	3.18	34.10	5.48	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	0.00005610
3	Yes	5	0.00000001	0.00001954
4	Yes	7	0.00000001	0.00006202
5	Yes	6	0.00000001	0.00026279
6	Yes	7	0.00000001	0.00006284
7	Yes	6	0.00000001	0.00026706
8	Yes	5	0.00000001	0.00022771
9	Yes	5	0.00000001	0.00009260
10	Yes	7	0.00000001	0.00006174
11	Yes	6	0.00000001	0.00026124
12	Yes	7	0.00000001	0.00006300
13	Yes	6	0.00000001	0.00026732
14	Yes	5	0.00000001	0.00009788
15	Yes	5	0.00000001	0.00003653
16	Yes	7	0.00000001	0.00006253
17	Yes	6	0.00000001	0.00026554
18	Yes	7	0.00000001	0.00006173
19	Yes	6	0.00000001	0.00026135
20	Yes	5	0.00000001	0.00030892
21	Yes	5	0.00000001	0.00012529
22	Yes	7	0.00000001	0.00006304

23	Yes	6	0.00000001	0.00026784
24	Yes	7	0.00000001	0.00006177
25	Yes	6	0.00000001	0.00026170
26	Yes	4	0.00000001	0.00013117
27	Yes	6	0.00004409	0.00093494
28	Yes	7	0.00000001	0.00068268
29	Yes	7	0.00000001	0.00068465
30	Yes	6	0.00004412	0.00093699
31	Yes	7	0.00000001	0.00066034
32	Yes	7	0.00000001	0.00067724
33	Yes	6	0.00004415	0.00092605
34	Yes	7	0.00000001	0.00066678
35	Yes	7	0.00000001	0.00066599
36	Yes	6	0.00004408	0.00093794
37	Yes	7	0.00000001	0.00069277
38	Yes	7	0.00000001	0.00067426
39	Yes	4	0.00000001	0.00027663
40	Yes	5	0.00000001	0.00030534
41	Yes	5	0.00000001	0.00031474
42	Yes	4	0.00000001	0.00038233
43	Yes	5	0.00000001	0.00029785
44	Yes	5	0.00000001	0.00030984
45	Yes	4	0.00000001	0.00027640
46	Yes	5	0.00000001	0.00030697
47	Yes	5	0.00000001	0.00029876
48	Yes	4	0.00000001	0.00039567
49	Yes	5	0.00000001	0.00031852
50	Yes	5	0.00000001	0.00030526

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 149	45.659	49	2.3647	0.0087
L2	151.75 - 127.25	31.934	49	2.2043	0.0021
L3	127.25 - 98.25	21.553	49	1.7903	0.0011
L4	102.25 - 48.75	13.370	49	1.3348	0.0006
L5	54.25 - 21	3.498	49	0.6254	0.0002
L6	21 - 1	0.466	49	0.2254	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178.00	HP2-4.7	49	44.663	2.3592	0.0081	26258
177.00	4-ft Dual Mount Standoff	49	44.166	2.3564	0.0078	26258
168.00	Valmont T-Arm (1)	49	39.712	2.3262	0.0054	10940
160.00	RR90-17-02DP	49	35.824	2.2811	0.0035	6563
157.00	(2) TMA 10"x8"x3"	49	34.393	2.2575	0.0029	5707
150.00	LPA-80080-4CF	49	31.129	2.1828	0.0019	4438
148.00	RRH4x30-B13	49	30.220	2.1559	0.0017	4207
147.00	Andrew 12'-6" Low Profile Platform	49	29.769	2.1416	0.0016	4103

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 149	213.565	20	11.0597	0.0416
L2	151.75 - 127.25	149.639	20	10.3307	0.0105
L3	127.25 - 98.25	101.154	20	8.4051	0.0050
L4	102.25 - 48.75	62.813	20	6.2737	0.0027
L5	54.25 - 21	16.448	20	2.9412	0.0009
L6	21 - 1	2.189	20	1.0596	0.0003

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
178.00	HP2-4.7	20	208.932	11.0359	0.0389	6160
177.00	4-ft Dual Mount Standoff	20	206.616	11.0237	0.0375	6160
168.00	Valmont T-Arm (1)	20	185.880	10.8902	0.0260	2564
160.00	RR90-17-02DP	20	167.769	10.6865	0.0172	1535
157.00	(2) TMA 10"x8"x3"	20	161.101	10.5774	0.0145	1333
150.00	LPA-80080-4CF	20	145.886	10.2307	0.0095	1029
148.00	RRH4x30-B13	20	141.642	10.1059	0.0086	972
147.00	Andrew 12'-6" Low Profile Platform	20	139.539	10.0396	0.0081	946

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Concrete Stress ksi	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Critical Ratio
2.2500	16	2.2500	140.44 223.65 0.63	2.397 4.080 0.59	38.606 54.000 0.71		Plate	0.71 ✔

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
L1	180 - 178.513	TP21.38x14.4x0.1875	31.00	0.00	0.0	8.6574	-0.06	643.21	0.000
	178.513 - 177.026					8.8567	-0.44	658.01	0.001
	177.026 - 175.539					9.0559	-0.23	672.81	0.000
	175.539 - 174.053					9.2552	-0.29	687.61	0.000
	174.053 - 172.566					9.4544	-0.36	702.41	0.001
	172.566 - 171.079					9.6536	-0.43	717.22	0.001
	171.079 - 169.592					9.8529	-0.50	732.02	0.001
	169.592 - 168.105					10.0521	-0.57	746.82	0.001
	168.105 - 166.618					10.2513	-2.12	761.62	0.003
	166.618 - 165.132					10.4506	-2.19	776.42	0.003
	165.132 - 163.645					10.6498	-2.26	791.23	0.003
	163.645 - 162.158					10.8490	-2.34	806.03	0.003
	162.158 - 160.671					11.0483	-2.43	820.83	0.003
	160.671 - 159.184					11.2475	-2.50	834.09	0.003
	159.184 - 157.697					11.4467	-2.59	845.06	0.003
	157.697 - 156.211					11.6460	-4.10	855.90	0.005
	156.211 - 154.724					11.8452	-4.19	866.60	0.005
	154.724 - 153.237					12.0445	-4.29	877.17	0.005
	153.237 - 151.75					12.2437	-4.39	887.61	0.005
	151.75 - 149					12.6122	-1.83	906.56	0.002
L2	151.75 - 149	TP25.91x20.3858x0.25	24.50	0.00	0.0	16.4698	-2.65	1223.62	0.002
	149 - 147.855					16.6746	-5.23	1238.84	0.004
	147.855 - 146.711					16.8794	-6.76	1254.06	0.005
	146.711 - 145.566					17.0842	-6.90	1269.27	0.005
	145.566 - 144.421					17.2890	-7.05	1284.49	0.005
	144.421 - 143.276					17.4938	-7.19	1299.71	0.006
	143.276 - 142.132					17.6987	-7.34	1314.92	0.006
	142.132 - 140.987					17.9035	-7.49	1330.14	0.006
	140.987 - 139.842					18.1083	-7.64	1345.35	0.006
	139.842 - 138.697					18.3131	-7.79	1360.57	0.006
	138.697 - 137.553					18.5179	-7.94	1375.79	0.006
	137.553 - 136.408					18.7227	-8.10	1391.00	0.006

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	136.408 - 135.263					18.9275	-8.26	1406.22	0.006
	135.263 - 134.118					19.1323	-8.42	1421.44	0.006
	134.118 - 132.974					19.3372	-8.58	1436.65	0.006
	132.974 - 131.829					19.5420	-8.74	1451.87	0.006
	131.829 - 130.684					19.7468	-8.89	1467.09	0.006
	130.684 - 129.539					19.9516	-9.06	1480.40	0.006
	129.539 - 128.395					20.1564	-9.21	1491.72	0.006
	128.395 - 127.25					20.3612	-9.38	1502.96	0.006
L3	127.25 - 125.934	TP32.44x25.91x0.3	29.00	0.00	0.0	24.6680	-9.60	1832.71	0.005
	125.934 - 124.618					24.9501	-9.81	1853.67	0.005
	124.618 - 123.303					25.2322	-10.03	1874.63	0.005
	123.303 - 121.987					25.5143	-10.24	1895.59	0.005
	121.987 - 120.671					25.7964	-10.46	1916.55	0.005
	120.671 - 119.355					26.0785	-10.69	1937.51	0.006
	119.355 - 118.039					26.3607	-10.91	1958.47	0.006
	118.039 - 116.724					26.6428	-11.14	1979.43	0.006
	116.724 - 115.408					26.9249	-11.36	2000.39	0.006
	115.408 - 114.092					27.2070	-11.59	2021.35	0.006
	114.092 - 112.776					27.4891	-11.82	2042.31	0.006
	112.776 - 111.461					27.7712	-12.06	2063.27	0.006
	111.461 - 110.145					28.0534	-12.29	2084.22	0.006
	110.145 - 108.829					28.3355	-12.53	2105.18	0.006
	108.829 - 107.513					28.6176	-12.77	2125.51	0.006
	107.513 - 106.197					28.8997	-13.01	2141.15	0.006
	106.197 - 104.882					29.1818	-13.25	2156.68	0.006
	104.882 - 103.566					29.4640	-13.50	2172.11	0.006
	103.566 - 102.25					29.7461	-13.74	2187.43	0.006
	102.25 - 98.25					30.6037	-7.13	2233.38	0.003
L4	102.25 - 98.25	TP43.1x30.9393x0.34	53.50	0.00	0.0	34.0027	-7.84	2526.23	0.003
	98.25 - 95.8056					34.6023	-15.46	2570.78	0.006
	95.8056 - 93.3611					35.2020	-15.97	2615.33	0.006

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
	93.3611 - 90.9167					35.8016	-16.49	2659.88	0.006
	90.9167 - 88.4722					36.4012	-17.01	2704.43	0.006
	88.4722 - 86.0278					37.0008	-17.54	2743.59	0.006
	86.0278 - 83.5833					37.6004	-18.07	2776.60	0.007
	83.5833 - 81.1389					38.2000	-18.61	2809.25	0.007
	81.1389 - 78.6944					38.7996	-19.16	2841.53	0.007
	78.6944 - 76.25					39.3992	-19.72	2873.45	0.007
	76.25 - 73.8056					39.9989	-20.28	2905.00	0.007
	73.8056 - 71.3611					40.5985	-20.84	2936.19	0.007
	71.3611 - 68.9167					41.1981	-21.42	2967.02	0.007
	68.9167 - 66.4722					41.7977	-22.00	2997.47	0.007
	66.4722 - 64.0278					42.3973	-22.59	3027.57	0.007
	64.0278 - 61.5833					42.9969	-23.18	3057.29	0.008
	61.5833 - 59.1389					43.5965	-23.78	3086.65	0.008
	59.1389 - 56.6944					44.1961	-24.38	3115.65	0.008
	56.6944 - 54.25					44.7958	-25.00	3144.28	0.008
	54.25 - 48.75					46.1449	-13.82	3207.37	0.004
L5	54.25 - 48.75	TP48.95x41.1698x0.34	33.25	0.00	0.0	45.4507	-13.50	3175.14	0.004
	48.75 - 47.2895					45.8195	-27.71	3192.33	0.009
	47.2895 - 45.8289					46.1883	-28.09	3209.37	0.009
	45.8289 - 44.3684					46.5571	-28.47	3226.28	0.009
	44.3684 - 42.9079					46.9259	-28.85	3243.05	0.009
	42.9079 - 41.4474					47.2948	-29.24	3259.68	0.009
	41.4474 - 39.9868					47.6636	-29.63	3276.17	0.009
	39.9868 - 38.5263					48.0324	-30.01	3292.53	0.009
	38.5263 - 37.0658					48.4012	-30.41	3308.75	0.009
	37.0658 - 35.6053					48.7700	-30.80	3324.83	0.009
	35.6053 - 34.1447					49.1388	-31.20	3340.77	0.009
	34.1447 - 32.6842					49.5076	-31.59	3356.57	0.009
	32.6842 - 31.2237					49.8764	-32.00	3372.23	0.009
	31.2237 - 29.7632					50.2452	-32.40	3387.76	0.010

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	29.7632 - 28.3026					50.6140	-32.80	3403.15	0.010
	28.3026 - 26.8421					50.9828	-33.21	3418.40	0.010
	26.8421 - 25.3816					51.3516	-33.62	3433.51	0.010
	25.3816 - 23.9211					51.7204	-34.03	3448.48	0.010
	23.9211 - 22.4605					52.0892	-34.45	3463.32	0.010
	22.4605 - 21					52.4580	-34.86	3478.02	0.010
L6	21 - 20	TP53.23x48.95x0.35	20.00	0.00	0.0	54.2275	-35.16	3630.72	0.010
	20 - 19					54.4652	-35.45	3640.43	0.010
	19 - 18					54.7029	-35.75	3650.09	0.010
	18 - 17					54.9407	-36.04	3659.69	0.010
	17 - 16					55.1784	-36.34	3669.24	0.010
	16 - 15					55.4161	-36.64	3678.74	0.010
	15 - 14					55.6539	-36.94	3688.18	0.010
	14 - 13					55.8916	-37.23	3697.57	0.010
	13 - 12					56.1293	-37.53	3706.90	0.010
	12 - 11					56.3671	-37.84	3716.18	0.010
	11 - 10					56.6048	-38.14	3725.41	0.010
	10 - 9					56.8425	-38.44	3734.58	0.010
	9 - 8					57.0803	-38.75	3743.70	0.010
	8 - 7					57.3180	-39.05	3752.76	0.010
	7 - 6					57.5557	-39.36	3761.77	0.010
	6 - 5					57.7935	-39.66	3770.72	0.011
	5 - 4					58.0312	-39.97	3779.62	0.011
	4 - 3					58.2689	-40.28	3788.47	0.011
	3 - 2					58.5067	-40.59	3797.26	0.011
	2 - 1					58.7444	-40.90	3806.00	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	180 - 178.513	TP21.38x14.4x0.1875	0.06	191.45	0.000	0.00	191.45	0.000
	178.513 - 177.026		0.72	200.42	0.004	0.00	200.42	0.000
	177.026 - 175.539		2.92	209.60	0.014	0.00	209.60	0.000
	175.539 - 174.053		4.79	218.98	0.022	0.00	218.98	0.000
	174.053 - 172.566		6.79	228.57	0.030	0.00	228.57	0.000
	172.566 - 171.079		8.93	238.36	0.037	0.00	238.36	0.000
	171.079 - 169.592		11.20	248.36	0.045	0.00	248.36	0.000
	169.592 - 168.105		13.63	258.56	0.053	0.00	258.56	0.000
	168.105 - 166.618		23.84	268.97	0.089	0.00	268.97	0.000
	166.618 - 165.132		34.75	279.58	0.124	0.00	279.58	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	165.132 - 163.645		45.84	290.40	0.158	0.00	290.40	0.000
	163.645 - 162.158		57.08	301.43	0.189	0.00	301.43	0.000
	162.158 - 160.671		68.47	312.66	0.219	0.00	312.66	0.000
	160.671 - 159.184		80.36	323.50	0.248	0.00	323.50	0.000
	159.184 - 157.697		92.68	333.61	0.278	0.00	333.61	0.000
	157.697 - 156.211		107.99	343.83	0.314	0.00	343.83	0.000
	156.211 - 154.724		124.63	354.14	0.352	0.00	354.14	0.000
	154.724 - 153.237		141.42	364.54	0.388	0.00	364.54	0.000
	153.237 - 151.75		158.37	375.04	0.422	0.00	375.04	0.000
	151.75 - 149		86.93	394.68	0.220	0.00	394.68	0.000
L2	151.75 - 149	TP25.91x20.3858x0.25	106.89	520.09	0.206	0.00	520.09	0.000
	149 - 147.855		211.38	533.19	0.396	0.00	533.19	0.000
	147.855 - 146.711		230.57	546.44	0.422	0.00	546.44	0.000
	146.711 - 145.566		250.76	559.86	0.448	0.00	559.86	0.000
	145.566 - 144.421		271.05	573.45	0.473	0.00	573.45	0.000
	144.421 - 143.276		291.44	587.19	0.496	0.00	587.19	0.000
	143.276 - 142.132		311.93	601.10	0.519	0.00	601.10	0.000
	142.132 - 140.987		332.52	615.17	0.541	0.00	615.17	0.000
	140.987 - 139.842		353.21	629.40	0.561	0.00	629.40	0.000
	139.842 - 138.697		374.00	643.80	0.581	0.00	643.80	0.000
	138.697 - 137.553		394.89	658.36	0.600	0.00	658.36	0.000
	137.553 - 136.408		415.88	673.08	0.618	0.00	673.08	0.000
	136.408 - 135.263		436.98	687.96	0.635	0.00	687.96	0.000
	135.263 - 134.118		458.17	703.01	0.652	0.00	703.01	0.000
	134.118 - 132.974		479.47	718.22	0.668	0.00	718.22	0.000
	132.974 - 131.829		500.87	733.59	0.683	0.00	733.59	0.000
	131.829 - 130.684		522.41	749.13	0.697	0.00	749.13	0.000
	130.684 - 129.539		544.10	763.84	0.712	0.00	763.84	0.000
	129.539 - 128.395		565.89	777.66	0.728	0.00	777.66	0.000
	128.395 - 127.25		587.85	791.56	0.743	0.00	791.56	0.000
L3	127.25 - 125.934	TP32.44x25.91x0.3	613.22	972.73	0.630	0.00	972.73	0.000
	125.934 -		638.74	995.23	0.642	0.00	995.23	0.000

Section No.	Elevation	Size	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft		kip-ft	kip-ft		kip-ft	kip-ft	
	124.618							
	124.618 - 123.303		664.39	1017.99	0.653	0.00	1017.99	0.000
	123.303 - 121.987		690.19	1041.02	0.663	0.00	1041.02	0.000
	121.987 - 120.671		716.13	1064.29	0.673	0.00	1064.29	0.000
	120.671 - 119.355		742.22	1087.83	0.682	0.00	1087.83	0.000
	119.355 - 118.039		768.45	1111.62	0.691	0.00	1111.62	0.000
	118.039 - 116.724		794.82	1135.67	0.700	0.00	1135.67	0.000
	116.724 - 115.408		821.34	1159.97	0.708	0.00	1159.97	0.000
	115.408 - 114.092		848.01	1184.54	0.716	0.00	1184.54	0.000
	114.092 - 112.776		874.83	1209.36	0.723	0.00	1209.36	0.000
	112.776 - 111.461		901.78	1234.44	0.731	0.00	1234.44	0.000
	111.461 - 110.145		928.89	1259.78	0.737	0.00	1259.78	0.000
	110.145 - 108.829		956.15	1285.38	0.744	0.00	1285.38	0.000
	108.829 - 107.513		983.55	1310.83	0.750	0.00	1310.83	0.000
	107.513 - 106.197		1011.11	1333.63	0.758	0.00	1333.63	0.000
	106.197 - 104.882		1038.82	1356.54	0.766	0.00	1356.54	0.000
	104.882 - 103.566		1066.67	1379.58	0.773	0.00	1379.58	0.000
	103.566 - 102.25		1094.68	1402.74	0.780	0.00	1402.74	0.000
	102.25 - 98.25		571.54	1473.90	0.388	0.00	1473.90	0.000
L4	102.25 - 98.25	TP43.1x30.9393x0.34	609.43	1632.05	0.373	0.00	1632.05	0.000
	98.25 - 95.8056		1234.52	1690.43	0.730	0.00	1690.43	0.000
	95.8056 - 93.3611		1288.58	1749.83	0.736	0.00	1749.83	0.000
	93.3611 - 90.9167		1343.18	1810.27	0.742	0.00	1810.27	0.000
	90.9167 - 88.4722		1398.28	1871.72	0.747	0.00	1871.72	0.000
	88.4722 - 86.0278		1453.92	1930.42	0.753	0.00	1930.42	0.000
	86.0278 - 83.5833		1510.07	1985.62	0.761	0.00	1985.62	0.000
	83.5833 - 81.1389		1566.74	2041.31	0.768	0.00	2041.31	0.000
	81.1389 - 78.6944		1623.94	2097.49	0.774	0.00	2097.49	0.000
	78.6944 - 76.25		1681.67	2154.13	0.781	0.00	2154.13	0.000
	76.25 - 73.8056		1739.91	2211.24	0.787	0.00	2211.24	0.000
	73.8056 - 71.3611		1798.68	2268.78	0.793	0.00	2268.78	0.000
	71.3611 -		1857.97	2326.77	0.799	0.00	2326.77	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	68.9167							
	68.9167 - 66.4722		1917.80	2385.17	0.804	0.00	2385.17	0.000
	66.4722 - 64.0278		1978.14	2443.97	0.809	0.00	2443.97	0.000
	64.0278 - 61.5833		2039.02	2503.18	0.815	0.00	2503.18	0.000
	61.5833 - 59.1389		2100.42	2562.75	0.820	0.00	2562.75	0.000
	59.1389 - 56.6944		2162.35	2622.71	0.824	0.00	2622.71	0.000
	56.6944 - 54.25		2224.80	2683.01	0.829	0.00	2683.01	0.000
	54.25 - 48.75		1212.00	2819.94	0.430	0.00	2819.94	0.000
L5	54.25 - 48.75	TP48.95x41.1698x0.34	1155.62	2749.28	0.420	0.00	2749.28	0.000
	48.75 - 47.2895		2406.07	2786.77	0.863	0.00	2786.77	0.000
	47.2895 - 45.8289		2444.68	2824.38	0.866	0.00	2824.38	0.000
	45.8289 - 44.3684		2483.45	2862.11	0.868	0.00	2862.11	0.000
	44.3684 - 42.9079		2522.38	2899.95	0.870	0.00	2899.95	0.000
	42.9079 - 41.4474		2561.48	2937.91	0.872	0.00	2937.91	0.000
	41.4474 - 39.9868		2600.73	2975.97	0.874	0.00	2975.97	0.000
	39.9868 - 38.5263		2640.16	3014.15	0.876	0.00	3014.15	0.000
	38.5263 - 37.0658		2679.74	3052.43	0.878	0.00	3052.43	0.000
	37.0658 - 35.6053		2719.48	3090.82	0.880	0.00	3090.82	0.000
	35.6053 - 34.1447		2759.40	3129.29	0.882	0.00	3129.29	0.000
	34.1447 - 32.6842		2799.47	3167.87	0.884	0.00	3167.87	0.000
	32.6842 - 31.2237		2839.72	3206.53	0.886	0.00	3206.53	0.000
	31.2237 - 29.7632		2880.13	3245.29	0.887	0.00	3245.29	0.000
	29.7632 - 28.3026		2920.70	3284.13	0.889	0.00	3284.13	0.000
	28.3026 - 26.8421		2961.44	3323.06	0.891	0.00	3323.06	0.000
	26.8421 - 25.3816		3002.35	3362.07	0.893	0.00	3362.07	0.000
	25.3816 - 23.9211		3043.43	3401.16	0.895	0.00	3401.16	0.000
	23.9211 - 22.4605		3084.68	3440.32	0.897	0.00	3440.32	0.000
	22.4605 - 21		3126.10	3479.55	0.898	0.00	3479.55	0.000
L6	21 - 20	TP53.23x48.95x0.35	3154.55	3646.93	0.865	0.00	3646.93	0.000
	20 - 19		3183.06	3672.82	0.867	0.00	3672.82	0.000
	19 - 18		3211.64	3698.76	0.868	0.00	3698.76	0.000
	18 - 17		3240.28	3724.72	0.870	0.00	3724.72	0.000
	17 - 16		3268.98	3750.72	0.872	0.00	3750.72	0.000
	16 - 15		3297.75	3776.73	0.873	0.00	3776.73	0.000
	15 - 14		3326.57	3802.78	0.875	0.00	3802.78	0.000
	14 - 13		3355.47	3828.87	0.876	0.00	3828.87	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	13 - 12		3384.43	3854.97	0.878	0.00	3854.97	0.000
	12 - 11		3413.45	3881.10	0.880	0.00	3881.10	0.000
	11 - 10		3442.53	3907.26	0.881	0.00	3907.26	0.000
	10 - 9		3471.68	3933.43	0.883	0.00	3933.43	0.000
	9 - 8		3500.89	3959.64	0.884	0.00	3959.64	0.000
	8 - 7		3530.17	3985.88	0.886	0.00	3985.88	0.000
	7 - 6		3559.51	4012.13	0.887	0.00	4012.13	0.000
	6 - 5		3588.92	4038.40	0.889	0.00	4038.40	0.000
	5 - 4		3618.38	4064.69	0.890	0.00	4064.69	0.000
	4 - 3		3647.92	4091.01	0.892	0.00	4091.01	0.000
	3 - 2		3677.51	4117.34	0.893	0.00	4117.34	0.000
	2 - 1		3707.17	4143.69	0.895	0.00	4143.69	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	180 - 178.513	TP21.38x14.4x0.1875	0.08	321.60	0.000	0.00	383.37	0.000
	178.513 - 177.026		0.14	329.00	0.000	0.00	401.34	0.000
	177.026 - 175.539		1.22	336.40	0.004	1.22	419.71	0.003
	175.539 - 174.053		1.30	343.81	0.004	1.22	438.50	0.003
	174.053 - 172.566		1.39	351.21	0.004	1.22	457.69	0.003
	172.566 - 171.079		1.48	358.61	0.004	1.22	477.30	0.003
	171.079 - 169.592		1.59	366.01	0.004	1.58	497.32	0.003
	169.592 - 168.105		1.68	373.41	0.004	1.58	517.75	0.003
	168.105 - 166.618		7.28	380.81	0.019	1.58	538.60	0.003
	166.618 - 165.132		7.41	388.21	0.019	0.06	559.85	0.000
	165.132 - 163.645		7.51	395.61	0.019	0.06	581.52	0.000
	163.645 - 162.158		7.61	403.01	0.019	0.06	603.59	0.000
	162.158 - 160.671		7.71	410.42	0.019	0.06	626.08	0.000
	160.671 - 159.184		8.24	417.05	0.020	0.06	647.78	0.000
	159.184 - 157.697		8.34	422.53	0.020	0.06	668.04	0.000
	157.697 - 156.211		11.14	427.95	0.026	0.06	688.50	0.000
	156.211 - 154.724		11.24	433.30	0.026	0.01	709.14	0.000
	154.724 - 153.237		11.35	438.58	0.026	0.01	729.98	0.000
	153.237 - 151.75		11.45	443.80	0.026	0.01	751.00	0.000
	151.75 - 149		8.28	453.28	0.018	0.00	790.33	0.000

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L2	151.75 - 149	TP25.91x20.3858x0.25	7.06	611.81	0.012	0.00	1041.46	0.000
	149 - 147.855		16.45	619.42	0.027	0.22	1067.68	0.000
	147.855 - 146.711		17.60	627.03	0.028	0.22	1094.22	0.000
	146.711 - 145.566		17.69	634.64	0.028	0.22	1121.09	0.000
	145.566 - 144.421		17.77	642.24	0.028	0.22	1148.29	0.000
	144.421 - 143.276		17.86	649.85	0.027	0.22	1175.82	0.000
	143.276 - 142.132		17.95	657.46	0.027	0.22	1203.67	0.000
	142.132 - 140.987		18.04	665.07	0.027	0.22	1231.84	0.000
	140.987 - 139.842		18.12	672.68	0.027	0.22	1260.34	0.000
	139.842 - 138.697		18.21	680.29	0.027	0.22	1289.17	0.000
	138.697 - 137.553		18.30	687.89	0.027	0.22	1318.33	0.000
	137.553 - 136.408		18.39	695.50	0.026	0.22	1347.80	0.000
	136.408 - 135.263		18.48	703.11	0.026	0.22	1377.61	0.000
	135.263 - 134.118		18.57	710.72	0.026	0.22	1407.74	0.000
	134.118 - 132.974		18.66	718.33	0.026	0.22	1438.20	0.000
	132.974 - 131.829		18.75	725.93	0.026	0.22	1468.98	0.000
	131.829 - 130.684		18.91	733.54	0.026	0.52	1500.09	0.000
	130.684 - 129.539		19.00	740.20	0.026	0.52	1529.55	0.000
	129.539 - 128.395		19.15	745.86	0.026	0.67	1557.22	0.000
	128.395 - 127.25		19.24	751.48	0.026	0.67	1585.06	0.000
L3	127.25 - 125.934	TP32.44x25.91x0.3	19.35	916.35	0.021	0.67	1947.83	0.000
	125.934 - 124.618		19.45	926.83	0.021	0.67	1992.89	0.000
	124.618 - 123.303		19.56	937.31	0.021	0.67	2038.47	0.000
	123.303 - 121.987		19.67	947.79	0.021	0.67	2084.57	0.000
	121.987 - 120.671		19.78	958.27	0.021	0.67	2131.18	0.000
	120.671 - 119.355		19.89	968.75	0.021	0.67	2178.31	0.000
	119.355 - 118.039		20.00	979.23	0.020	0.67	2225.96	0.000
	118.039 - 116.724		20.11	989.71	0.020	0.67	2274.12	0.000
	116.724 - 115.408		20.22	1000.19	0.020	0.67	2322.78	0.000
	115.408 - 114.092		20.33	1010.67	0.020	0.67	2371.97	0.000
	114.092 - 112.776		20.45	1021.15	0.020	0.67	2421.68	0.000

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
	112.776 - 111.461		20.56	1031.63	0.020	0.66	2471.90	0.000
	111.461 - 110.145		20.67	1042.11	0.020	0.66	2522.63	0.000
	110.145 - 108.829		20.78	1052.59	0.020	0.66	2573.89	0.000
	108.829 - 107.513		20.90	1062.76	0.020	0.66	2624.88	0.000
	107.513 - 106.197		21.01	1070.57	0.020	0.66	2670.51	0.000
	106.197 - 104.882		21.13	1078.34	0.020	0.66	2716.39	0.000
	104.882 - 103.566		21.24	1086.05	0.020	0.66	2762.53	0.000
	103.566 - 102.25		21.36	1093.72	0.020	0.66	2808.92	0.000
	102.25 - 98.25		10.66	1116.69	0.010	0.32	2951.40	0.000
L4	102.25 - 98.25	TP43.1x30.9393x0.34	11.16	1263.12	0.009	0.34	3268.08	0.000
	98.25 - 95.8056		22.04	1285.39	0.017	0.66	3384.99	0.000
	95.8056 - 93.3611		22.25	1307.66	0.017	0.66	3503.95	0.000
	93.3611 - 90.9167		22.47	1329.94	0.017	0.66	3624.96	0.000
	90.9167 - 88.4722		22.68	1352.21	0.017	0.66	3748.03	0.000
	88.4722 - 86.0278		22.89	1371.79	0.017	0.66	3865.56	0.000
	86.0278 - 83.5833		23.11	1388.30	0.017	0.66	3976.09	0.000
	83.5833 - 81.1389		23.32	1404.63	0.017	0.66	4087.62	0.000
	81.1389 - 78.6944		23.54	1420.77	0.017	0.66	4200.11	0.000
	78.6944 - 76.25		23.75	1436.73	0.017	0.66	4313.53	0.000
	76.25 - 73.8056		23.97	1452.50	0.016	0.66	4427.88	0.000
	73.8056 - 71.3611		24.18	1468.10	0.016	0.66	4543.12	0.000
	71.3611 - 68.9167		24.40	1483.51	0.016	0.66	4659.23	0.000
	68.9167 - 66.4722		24.61	1498.74	0.016	0.66	4776.17	0.000
	66.4722 - 64.0278		24.83	1513.78	0.016	0.66	4893.92	0.000
	64.0278 - 61.5833		25.04	1528.65	0.016	0.66	5012.47	0.000
	61.5833 - 59.1389		25.26	1543.33	0.016	0.66	5131.77	0.000
	59.1389 - 56.6944		25.48	1557.83	0.016	0.66	5251.82	0.000
	56.6944 - 54.25		25.69	1572.14	0.016	0.66	5372.58	0.000
	54.25 - 48.75		13.62	1603.69	0.008	0.34	5646.77	0.000
L5	54.25 - 48.75	TP48.95x41.1698x0.34	12.70	1587.57	0.008	0.32	5505.28	0.000
	48.75 - 47.2895		26.41	1596.16	0.017	0.66	5580.35	0.000
	47.2895 - 45.8289		26.52	1604.69	0.017	0.66	5655.67	0.000

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
	45.8289 - 44.3684		26.63	1613.14	0.017	0.66	5731.22	0.000
	44.3684 - 42.9079		26.74	1621.52	0.016	0.66	5807.00	0.000
	42.9079 - 41.4474		26.85	1629.84	0.016	0.66	5883.01	0.000
	41.4474 - 39.9868		26.96	1638.09	0.016	0.66	5959.23	0.000
	39.9868 - 38.5263		27.07	1646.26	0.016	0.66	6035.67	0.000
	38.5263 - 37.0658		27.18	1654.37	0.016	0.66	6112.33	0.000
	37.0658 - 35.6053		27.29	1662.41	0.016	0.66	6189.18	0.000
	35.6053 - 34.1447		27.41	1670.38	0.016	0.66	6266.24	0.000
	34.1447 - 32.6842		27.52	1678.28	0.016	0.66	6343.48	0.000
	32.6842 - 31.2237		27.63	1686.12	0.016	0.66	6420.91	0.000
	31.2237 - 29.7632		27.75	1693.88	0.016	0.66	6498.52	0.000
	29.7632 - 28.3026		27.86	1701.57	0.016	0.66	6576.30	0.000
	28.3026 - 26.8421		27.98	1709.20	0.016	0.66	6654.25	0.000
	26.8421 - 25.3816		28.09	1716.76	0.016	0.66	6732.36	0.000
	25.3816 - 23.9211		28.21	1724.24	0.016	0.66	6810.63	0.000
	23.9211 - 22.4605		28.33	1731.66	0.016	0.66	6889.05	0.000
	22.4605 - 21		28.44	1739.01	0.016	0.66	6967.61	0.000
L6	21 - 20	TP53.23x48.95x0.35	28.50	1815.36	0.016	0.66	7302.77	0.000
	20 - 19		28.56	1820.22	0.016	0.66	7354.63	0.000
	19 - 18		28.62	1825.04	0.016	0.66	7406.56	0.000
	18 - 17		28.69	1829.85	0.016	0.66	7458.55	0.000
	17 - 16		28.75	1834.62	0.016	0.66	7510.60	0.000
	16 - 15		28.82	1839.37	0.016	0.66	7562.71	0.000
	15 - 14		28.88	1844.09	0.016	0.66	7614.87	0.000
	14 - 13		28.94	1848.79	0.016	0.66	7667.09	0.000
	13 - 12		29.01	1853.45	0.016	0.66	7719.37	0.000
	12 - 11		29.07	1858.09	0.016	0.66	7771.69	0.000
	11 - 10		29.13	1862.70	0.016	0.66	7824.07	0.000
	10 - 9		29.20	1867.29	0.016	0.66	7876.50	0.000
	9 - 8		29.26	1871.85	0.016	0.66	7928.97	0.000
	8 - 7		29.33	1876.38	0.016	0.66	7981.49	0.000
	7 - 6		29.39	1880.88	0.016	0.66	8034.06	0.000
	6 - 5		29.45	1885.36	0.016	0.66	8086.67	0.000
	5 - 4		29.52	1889.81	0.016	0.66	8139.32	0.000
	4 - 3		29.58	1894.24	0.016	0.66	8192.02	0.000
	3 - 2		29.65	1898.63	0.016	0.66	8244.75	0.000
	2 - 1		29.71	1903.00	0.016	0.66	8297.52	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	180 - 178.513	0.000	0.000	0.000	0.000	0.000	0.000 ✔	1.000	4.8.2 ✔
	178.513 - 177.026	0.001	0.004	0.000	0.000	0.000	0.004 ✔	1.000	4.8.2 ✔
	177.026 - 175.539	0.000	0.014	0.000	0.004	0.003	0.014 ✔	1.000	4.8.2 ✔
	175.539 - 174.053	0.000	0.022	0.000	0.004	0.003	0.022 ✔	1.000	4.8.2 ✔
	174.053 - 172.566	0.001	0.030	0.000	0.004	0.003	0.030 ✔	1.000	4.8.2 ✔
	172.566 - 171.079	0.001	0.037	0.000	0.004	0.003	0.038 ✔	1.000	4.8.2 ✔
	171.079 - 169.592	0.001	0.045	0.000	0.004	0.003	0.046 ✔	1.000	4.8.2 ✔
	169.592 - 168.105	0.001	0.053	0.000	0.004	0.003	0.054 ✔	1.000	4.8.2 ✔
	168.105 - 166.618	0.003	0.089	0.000	0.019	0.003	0.092 ✔	1.000	4.8.2 ✔
	166.618 - 165.132	0.003	0.124	0.000	0.019	0.000	0.127 ✔	1.000	4.8.2 ✔
	165.132 - 163.645	0.003	0.158	0.000	0.019	0.000	0.161 ✔	1.000	4.8.2 ✔
	163.645 - 162.158	0.003	0.189	0.000	0.019	0.000	0.193 ✔	1.000	4.8.2 ✔
	162.158 - 160.671	0.003	0.219	0.000	0.019	0.000	0.222 ✔	1.000	4.8.2 ✔
	160.671 - 159.184	0.003	0.248	0.000	0.020	0.000	0.252 ✔	1.000	4.8.2 ✔
	159.184 - 157.697	0.003	0.278	0.000	0.020	0.000	0.281 ✔	1.000	4.8.2 ✔
	157.697 - 156.211	0.005	0.314	0.000	0.026	0.000	0.320 ✔	1.000	4.8.2 ✔
	156.211 - 154.724	0.005	0.352	0.000	0.026	0.000	0.357 ✔	1.000	4.8.2 ✔
	154.724 - 153.237	0.005	0.388	0.000	0.026	0.000	0.394 ✔	1.000	4.8.2 ✔
	153.237 - 151.75	0.005	0.422	0.000	0.026	0.000	0.428 ✔	1.000	4.8.2 ✔
	151.75 - 149	0.002	0.220	0.000	0.018	0.000	0.223 ✔	1.000	4.8.2 ✔
L2	151.75 - 149	0.002	0.206	0.000	0.012	0.000	0.208 ✔	1.000	4.8.2 ✔
	149 - 147.855	0.004	0.396	0.000	0.027	0.000	0.401 ✔	1.000	4.8.2 ✔
	147.855 - 146.711	0.005	0.422	0.000	0.028	0.000	0.428 ✔	1.000	4.8.2 ✔
	146.711 - 145.566	0.005	0.448	0.000	0.028	0.000	0.454 ✔	1.000	4.8.2 ✔
	145.566 - 144.421	0.005	0.473	0.000	0.028	0.000	0.479 ✔	1.000	4.8.2 ✔
	144.421 - 143.276	0.006	0.496	0.000	0.027	0.000	0.503 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $P_u/\phi P_n$	Ratio $M_{ux}/\phi M_{nx}$	Ratio $M_{uy}/\phi M_{ny}$	Ratio $V_u/\phi V_n$	Ratio $T_u/\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	143.276 - 142.132	0.006	0.519	0.000	0.027	0.000	0.525	1.000	4.8.2
	142.132 - 140.987	0.006	0.541	0.000	0.027	0.000	0.547	1.000	4.8.2
	140.987 - 139.842	0.006	0.561	0.000	0.027	0.000	0.568	1.000	4.8.2
	139.842 - 138.697	0.006	0.581	0.000	0.027	0.000	0.587	1.000	4.8.2
	138.697 - 137.553	0.006	0.600	0.000	0.027	0.000	0.606	1.000	4.8.2
	137.553 - 136.408	0.006	0.618	0.000	0.026	0.000	0.624	1.000	4.8.2
	136.408 - 135.263	0.006	0.635	0.000	0.026	0.000	0.642	1.000	4.8.2
	135.263 - 134.118	0.006	0.652	0.000	0.026	0.000	0.658	1.000	4.8.2
	134.118 - 132.974	0.006	0.668	0.000	0.026	0.000	0.674	1.000	4.8.2
	132.974 - 131.829	0.006	0.683	0.000	0.026	0.000	0.689	1.000	4.8.2
	131.829 - 130.684	0.006	0.697	0.000	0.026	0.000	0.704	1.000	4.8.2
	130.684 - 129.539	0.006	0.712	0.000	0.026	0.000	0.719	1.000	4.8.2
	129.539 - 128.395	0.006	0.728	0.000	0.026	0.000	0.735	1.000	4.8.2
	128.395 - 127.25	0.006	0.743	0.000	0.026	0.000	0.750	1.000	4.8.2
L3	127.25 - 125.934	0.005	0.630	0.000	0.021	0.000	0.636	1.000	4.8.2
	125.934 - 124.618	0.005	0.642	0.000	0.021	0.000	0.648	1.000	4.8.2
	124.618 - 123.303	0.005	0.653	0.000	0.021	0.000	0.658	1.000	4.8.2
	123.303 - 121.987	0.005	0.663	0.000	0.021	0.000	0.669	1.000	4.8.2
	121.987 - 120.671	0.005	0.673	0.000	0.021	0.000	0.679	1.000	4.8.2
	120.671 - 119.355	0.006	0.682	0.000	0.021	0.000	0.688	1.000	4.8.2
	119.355 - 118.039	0.006	0.691	0.000	0.020	0.000	0.697	1.000	4.8.2
	118.039 - 116.724	0.006	0.700	0.000	0.020	0.000	0.706	1.000	4.8.2
	116.724 - 115.408	0.006	0.708	0.000	0.020	0.000	0.714	1.000	4.8.2
	115.408 - 114.092	0.006	0.716	0.000	0.020	0.000	0.722	1.000	4.8.2
	114.092 - 112.776	0.006	0.723	0.000	0.020	0.000	0.730	1.000	4.8.2
	112.776 -	0.006	0.731	0.000	0.020	0.000	0.737	1.000	4.8.2

tnxTower	Job	Page
	16001.44 - Somers West	36 of 39
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 180' Sabre Monopole - 37 Bacon Rd., Enfield, CT	**Date** 14:40:40 10/05/16
	Client Verizon Wireless	**Designed by** TJL

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	111.461						✔		
	111.461 - 110.145	0.006	0.737	0.000	0.020	0.000	0.744 ✔	1.000	4.8.2 ✔
	110.145 - 108.829	0.006	0.744	0.000	0.020	0.000	0.750 ✔	1.000	4.8.2 ✔
	108.829 - 107.513	0.006	0.750	0.000	0.020	0.000	0.757 ✔	1.000	4.8.2 ✔
	107.513 - 106.197	0.006	0.758	0.000	0.020	0.000	0.765 ✔	1.000	4.8.2 ✔
	106.197 - 104.882	0.006	0.766	0.000	0.020	0.000	0.772 ✔	1.000	4.8.2 ✔
	104.882 - 103.566	0.006	0.773	0.000	0.020	0.000	0.780 ✔	1.000	4.8.2 ✔
	103.566 - 102.25	0.006	0.780	0.000	0.020	0.000	0.787 ✔	1.000	4.8.2 ✔
	102.25 - 98.25	0.003	0.388	0.000	0.010	0.000	0.391 ✔	1.000	4.8.2 ✔
L4	102.25 - 98.25	0.003	0.373	0.000	0.009	0.000	0.377 ✔	1.000	4.8.2 ✔
	98.25 - 95.8056	0.006	0.730	0.000	0.017	0.000	0.737 ✔	1.000	4.8.2 ✔
	95.8056 - 93.3611	0.006	0.736	0.000	0.017	0.000	0.743 ✔	1.000	4.8.2 ✔
	93.3611 - 90.9167	0.006	0.742	0.000	0.017	0.000	0.748 ✔	1.000	4.8.2 ✔
	90.9167 - 88.4722	0.006	0.747	0.000	0.017	0.000	0.754 ✔	1.000	4.8.2 ✔
	88.4722 - 86.0278	0.006	0.753	0.000	0.017	0.000	0.760 ✔	1.000	4.8.2 ✔
	86.0278 - 83.5833	0.007	0.761	0.000	0.017	0.000	0.767 ✔	1.000	4.8.2 ✔
	83.5833 - 81.1389	0.007	0.768	0.000	0.017	0.000	0.774 ✔	1.000	4.8.2 ✔
	81.1389 - 78.6944	0.007	0.774	0.000	0.017	0.000	0.781 ✔	1.000	4.8.2 ✔
	78.6944 - 76.25	0.007	0.781	0.000	0.017	0.000	0.788 ✔	1.000	4.8.2 ✔
	76.25 - 73.8056	0.007	0.787	0.000	0.016	0.000	0.794 ✔	1.000	4.8.2 ✔
	73.8056 - 71.3611	0.007	0.793	0.000	0.016	0.000	0.800 ✔	1.000	4.8.2 ✔
	71.3611 - 68.9167	0.007	0.799	0.000	0.016	0.000	0.806 ✔	1.000	4.8.2 ✔
	68.9167 - 66.4722	0.007	0.804	0.000	0.016	0.000	0.812 ✔	1.000	4.8.2 ✔
	66.4722 - 64.0278	0.007	0.809	0.000	0.016	0.000	0.817 ✔	1.000	4.8.2 ✔
	64.0278 - 61.5833	0.008	0.815	0.000	0.016	0.000	0.822 ✔	1.000	4.8.2 ✔
	61.5833 - 59.1389	0.008	0.820	0.000	0.016	0.000	0.828 ✔	1.000	4.8.2 ✔
	59.1389 -	0.008	0.824	0.000	0.016	0.000	0.833	1.000	4.8.2 ✔

tnxTower	Job	Page
	16001.44 - Somers West	37 of 39
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 180' Sabre Monopole - 37 Bacon Rd., Enfield, CT	**Date** 14:40:40 10/05/16
	Client Verizon Wireless	**Designed by** TJL

Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	56.6944						✔		
	56.6944 - 54.25	0.008	0.829	0.000	0.016	0.000	0.837 ✔	1.000	4.8.2 ✔
	54.25 - 48.75	0.004	0.430	0.000	0.008	0.000	0.434 ✔	1.000	4.8.2 ✔
L5	54.25 - 48.75	0.004	0.420	0.000	0.008	0.000	0.425 ✔	1.000	4.8.2 ✔
	48.75 - 47.2895	0.009	0.863	0.000	0.017	0.000	0.872 ✔	1.000	4.8.2 ✔
	47.2895 - 45.8289	0.009	0.866	0.000	0.017	0.000	0.875 ✔	1.000	4.8.2 ✔
	45.8289 - 44.3684	0.009	0.868	0.000	0.017	0.000	0.877 ✔	1.000	4.8.2 ✔
	44.3684 - 42.9079	0.009	0.870	0.000	0.016	0.000	0.879 ✔	1.000	4.8.2 ✔
	42.9079 - 41.4474	0.009	0.872	0.000	0.016	0.000	0.881 ✔	1.000	4.8.2 ✔
	41.4474 - 39.9868	0.009	0.874	0.000	0.016	0.000	0.883 ✔	1.000	4.8.2 ✔
	39.9868 - 38.5263	0.009	0.876	0.000	0.016	0.000	0.885 ✔	1.000	4.8.2 ✔
	38.5263 - 37.0658	0.009	0.878	0.000	0.016	0.000	0.887 ✔	1.000	4.8.2 ✔
	37.0658 - 35.6053	0.009	0.880	0.000	0.016	0.000	0.889 ✔	1.000	4.8.2 ✔
	35.6053 - 34.1447	0.009	0.882	0.000	0.016	0.000	0.891 ✔	1.000	4.8.2 ✔
	34.1447 - 32.6842	0.009	0.884	0.000	0.016	0.000	0.893 ✔	1.000	4.8.2 ✔
	32.6842 - 31.2237	0.009	0.886	0.000	0.016	0.000	0.895 ✔	1.000	4.8.2 ✔
	31.2237 - 29.7632	0.010	0.887	0.000	0.016	0.000	0.897 ✔	1.000	4.8.2 ✔
	29.7632 - 28.3026	0.010	0.889	0.000	0.016	0.000	0.899 ✔	1.000	4.8.2 ✔
	28.3026 - 26.8421	0.010	0.891	0.000	0.016	0.000	0.901 ✔	1.000	4.8.2 ✔
	26.8421 - 25.3816	0.010	0.893	0.000	0.016	0.000	0.903 ✔	1.000	4.8.2 ✔
	25.3816 - 23.9211	0.010	0.895	0.000	0.016	0.000	0.905 ✔	1.000	4.8.2 ✔
	23.9211 - 22.4605	0.010	0.897	0.000	0.016	0.000	0.907 ✔	1.000	4.8.2 ✔
	22.4605 - 21	0.010	0.898	0.000	0.016	0.000	0.909 ✔	1.000	4.8.2 ✔
L6	21 - 20	0.010	0.865	0.000	0.016	0.000	0.875 ✔	1.000	4.8.2 ✔
	20 - 19	0.010	0.867	0.000	0.016	0.000	0.877 ✔	1.000	4.8.2 ✔
	19 - 18	0.010	0.868	0.000	0.016	0.000	0.878 ✔	1.000	4.8.2 ✔
	18 - 17	0.010	0.870	0.000	0.016	0.000	0.880	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	17 - 16	0.010	0.872	0.000	0.016	0.000	0.882	1.000	4.8.2
	16 - 15	0.010	0.873	0.000	0.016	0.000	0.883	1.000	4.8.2
	15 - 14	0.010	0.875	0.000	0.016	0.000	0.885	1.000	4.8.2
	14 - 13	0.010	0.876	0.000	0.016	0.000	0.887	1.000	4.8.2
	13 - 12	0.010	0.878	0.000	0.016	0.000	0.888	1.000	4.8.2
	12 - 11	0.010	0.880	0.000	0.016	0.000	0.890	1.000	4.8.2
	11 - 10	0.010	0.881	0.000	0.016	0.000	0.892	1.000	4.8.2
	10 - 9	0.010	0.883	0.000	0.016	0.000	0.893	1.000	4.8.2
	9 - 8	0.010	0.884	0.000	0.016	0.000	0.895	1.000	4.8.2
	8 - 7	0.010	0.886	0.000	0.016	0.000	0.896	1.000	4.8.2
	7 - 6	0.010	0.887	0.000	0.016	0.000	0.898	1.000	4.8.2
	6 - 5	0.011	0.889	0.000	0.016	0.000	0.899	1.000	4.8.2
	5 - 4	0.011	0.890	0.000	0.016	0.000	0.901	1.000	4.8.2
	4 - 3	0.011	0.892	0.000	0.016	0.000	0.903	1.000	4.8.2
	3 - 2	0.011	0.893	0.000	0.016	0.000	0.904	1.000	4.8.2
	2 - 1	0.011	0.895	0.000	0.016	0.000	0.906	1.000	4.8.2

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	180 - 149	Pole	TP21.38x14.4x0.1875	1	-4.39	887.61	42.8	Pass
L2	149 - 127.25	Pole	TP25.91x20.3858x0.25	2	-9.38	1502.96	75.0	Pass
L3	127.25 - 98.25	Pole	TP32.44x25.91x0.3	3	-13.74	2187.43	78.7	Pass
L4	98.25 - 48.75	Pole	TP43.1x30.9393x0.34	4	-25.00	3144.28	83.7	Pass
L5	48.75 - 21	Pole	TP48.95x41.1698x0.34	5	-34.86	3478.02	90.9	Pass
L6	21 - 1	Pole	TP53.23x48.95x0.35	6	-40.90	3806.00	90.6	Pass
						Summary		
						Pole (L5)	90.9	Pass
						Base Plate	71.5	Pass
						RATING =	**90.9**	**Pass**

CENTEK engineering
Centered on Solutions
63-2 North Branford Road
Branford, CT 06405
www.centekeng.com
P: (203) 488-0580
F: (203) 488-8587

Subject: FOUNDATION ANALYSIS

Location: 180-ft Monopole
Enfield, CT

Rev. 0: 10/5/16

Prepared by: T.J.L Checked by: C.F.C.
Job no. 16001.44

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 3707 \cdot ft \cdot kips$	(User Input)	
Shear Force =	$Shear := 30 \cdot kip$	(User Input)	
Axial Force =	$Axial := 41 \cdot kip$	(User Input)	
Tower Height =	$H_t := 180 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 6 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 4.5 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 7.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 2.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 23.0 \cdot ft$	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts =	$L_{st} := 84 \cdot in$	(User Input)	
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12.0 \cdot in$	(User Input)	
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)	
Base Plate Bolt Circle =	$MP := 60 \cdot in$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 34 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_u := 6000 \cdot psf$	(User Input)	
Allowable Soil Bearing Capacity =	$q_a := \frac{q_u}{2} = 3000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 125 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 8$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.00 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 36$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 3 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 8$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.00 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 36$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.00 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 36$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.785 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.785 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785 \cdot in^2$

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3.537$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := if(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}) = 150 \cdot pcf$

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 125 \cdot pcf$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 1.769 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 1.769 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.653 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 2.211 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 2$

$A_p := W_f \cdot T_p = 46$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 101.693 \cdot kip$

Weight of Concrete Pad = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + d_p^2 L_p\right] \cdot \gamma_c = 191.775 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left(W_f^2 - d_p^2\right) \cdot \left(\left|L_p - L_{pag} - n\right|\right)\right] \cdot \gamma_s = 240 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right) \cdot \gamma_s = 34.906 \cdot kip$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[(D_f)^3 \cdot \frac{\tan(\Phi_s)}{3}\right] \cdot \gamma_s = 12.141 \cdot kips$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + Axial = 472.775 \cdot kip$

Resisting Weight = $WT_R := 0.9 \cdot WT_c + 0.75 \cdot WT_{s1} + 0.75 \cdot Axial = 383.348 \cdot kip$

Resisting Moment = $M_r := (WT_R) \cdot \frac{W_f}{2} + 0.75 \cdot S_u \cdot \frac{T_f}{3} + 0.75 \cdot \left[(WT_{s2} + WT_{s3}) \cdot \left(W_f + \frac{D_f \tan(\Phi_s)}{3}\right)\right] = 5319 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + Shear \cdot (L_p + T_f) = 3902 \cdot kip \cdot ft$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 1.36$

Factor of Safety Required = $FS_{req} := 1$

$OverTurning\_Moment\_Check := if(FS \geq FS_{req}, "Okay", "No Good")$

$OverTurning\_Moment\_Check = "Okay"$

Shear Capacity in Pier:

Shear Resistance of Pier =

$$S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 314.441 \cdot kips$$

$$Shear\_Check := if\left(S_p > Shear, "Okay", "No Good"\right)$$

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat =

$$A_{mat} := W_f^2 = 529$$

Section Modulus of Mat =

$$S := \frac{W_f^3}{6} = 2027.83 \cdot ft^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 2.818 \cdot ksf$$

$$Max\_Pressure\_Check := if\left(P_{max} < .75 \cdot q_u, "Okay", "No Good"\right)$$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat =

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -1.031 \cdot ksf$$

$$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < .75 \cdot q_u\right), "Okay", "No Good"\right]$$

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution =

$$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 5.614$$

Distance to Kern =

$$X_k := \frac{W_f}{6} = 3.833$$

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

Eccentricity =

$$e := \frac{M_{ot}}{WT_{tot}} = 8.253$$

Adjusted Soil Pressure =

$$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e\right)} = 4.221 \cdot ksf$$

$$q_{adj} := if\left(P_{min} < 0, P_a, P_{max}\right) = 4.221 \cdot ksf$$

$$Pressure\_Check := if\left(q_{adj} < .75 \cdot q_u, "Okay", "No Good"\right)$$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 1.225 \times 10^4 \cdot \text{kips}$ (ACI-2008 10.14)

$\text{Bearing\_Check} := \text{if}(P_b > \text{Axial}, \text{"Okay"}, \text{"No Good"})$

Bearing_Check = "Okay"

Shear Strength of Concrete:

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

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 1.667$

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

$d_2 := d_1 - d$

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

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

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

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot \text{psi}} \cdot W_f \cdot d$ (ACI-2008 11.2.1.1)

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

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := (d_p + d) \cdot \pi = 27.2$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 59$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 470$

Guess Value = $v_u := 1ksf$

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

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

$v_u := Find(v_u) = 10.4 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 399.4 \cdot kips$

Required Shear Strength = $V_{req} := V_u = 399.4 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1405.1 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

$Punching\_Shear\_Check = "Okay"$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 0.754 \cdot ksf$

Maximum Bending at Face of Pier = $M_n := \frac{1}{\phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 2506.7 \cdot kip \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$R_n := \frac{M_n}{W_f \cdot d^2} = 272.5 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0047$

$\rho_{min} := \rho = 0.00474$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases}$$ (ACI -2008 7.12.2.1)

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 26.161 \cdot in^2$$

$As_{prov} := A_{bbot} \cdot NB_{bot} = 28.3 \cdot in^2$

$Pad\_Reinforcement\_Bot := if(As_{prov} > As, "Okay", "No Good")$

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 5 \cdot in^2$$

$As_{prov} := A_{btop} \cdot NB_{top} = 28.3 \cdot in^2$

$Pad\_Reinforcement\_Top := if(As_{prov} > As, "Okay", "No Good")$

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 6.69 \cdot in$$

Spacing or Cover Dimension =

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

Transverse Reinforcement Index =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 23.7 \cdot in$$

Minimum Development Length =

$L_{dbmin} := 12 \cdot in$ (ACI-2008 12.2.1)

$L_{dbtCheck} := if(L_{dbt} \geq L_{dbmin}, "Use L.dbt", "Use L.dbmin")$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 93 \cdot in$$

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

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier =

$A_p := d_p^2 = 7056 \cdot in^2$

$A_{smin} := .0033 \cdot A_p = 23.28 \cdot in^2$

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 28.27 \cdot in^2$

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

Steel_Area_Check = "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 =

$B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 6.33 \cdot in$

Diameter of Reinforcement Cage =

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

Maximum Moment in Pier =

$M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2} \right) \right] = 46284 \cdot in \cdot kips$

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

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{Axial \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) = (84 \;\; 36 \;\; 8 \;\; 54.7 \;\; 46284)$

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$

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

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = (66.3 \;\; 56185.2 \;\; -60 \;\; 0)$

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

Axial_Load_Check = "Okay"

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

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 51 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 21 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

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

Transverse Reinforcement =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 23.72 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 13.282 \cdot in$ (ACI 12.2.1)

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

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

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

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 18.974 \cdot in$

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

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 18.974 \cdot in$

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

$L_{compression\_Check} = "Okay"$

Tie Size and Spacing in Column:

Minimum Tie Size = $Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 3$

Used #3 Ties

Seismic Factor = $z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

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

$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 18 \cdot in$

$s_{lim3} := D_f \cdot z = 72 \cdot in$

$s_{lim4} := 18in$

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

Number of Ties Required = $n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 4$

Check Anchor Steel Embedment:

Depth Available = $D_{ab} := L_{st} - A_{BP} = 6 \cdot ft$

Length of Anchor Bolt = $L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 10.87 \cdot ft$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

SITE NAME	SOMERS WEST CT	Additional Comments: 2017 PCS carrier add.		FOR LEASING ONLY DO NOT ORDER
SITE NO.	8-0016			
LATITUDE	42-0-57.37 N			
LONGITUDE	72-31-43.46 W			
700 MHz (LTE-700U) - BEFORE	**ALPHA**	**BETA**	**GAMMA**	
EQUIPMENT TYPE	700 MHz BBU + RRH	700 MHz BBU + RRH	700 MHz BBU + RRH	
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B	
ANTENNA QUANTITY	Same as AWS	Same as AWS	Same as AWS	
ORIENTATION (°)	30	150	270	
TILT (MDT°|EDT°)	0 | 5	0 | 3	0 | 4	
RAD CENTER (ft)	150.0	150.0	150.0	
TMA (QTY)				
DIPLEXER (QTY/MODEL)				
RRH MODEL	Nokia RH_4X30-B13	Nokia RH_4X30-B13	Nokia RH_4X30-B13	
700 MHz (LTE-700U) - AFTER	**ALPHA**	**BETA**	**GAMMA**	
EQUIPMENT TYPE	700 MHz BBU + RRH	700 MHz BBU + RRH	700 MHz BBU + RRH	☐
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B	☐
ANTENNA QUANTITY	Same as AWS	Same as AWS	Same as AWS	
ORIENTATION (°)	30	150	270	
TILT (MDT°|EDT°)	0 | 5	0 | 3	0 | 4	
RAD CENTER (ft)	150.0	150.0	150.0	
TMA (QTY)				☐
DIPLEXER (QTY/MODEL)				☐
RRH MODEL	Nokia RH_4X30-B13	Nokia RH_4X30-B13	Nokia RH_4X30-B13	☐
850 MHz (Cellular) - BEFORE	**ALPHA**	**BETA**	**GAMMA**	
EQUIPMENT TYPE	Cellular Mod 4.0B	Cellular Mod 4.0B	Cellular Mod 4.0B	
ANTENNA TYPE	LPA-80080-4CF	LPA-80080-4CF	LPA-80080-4CF	
ANTENNA QUANTITY	2	2	2	
ORIENTATION (°)	30	150	270	
TILT (MDT°|EDT°)	0 | 0	0 | 5	0 | 5	
RAD CENTER (ft)	150.0	150.0	150.0	
TMA (QTY)				
DIPLEXER (QTY/MODEL)				
RRH (QTY/MODEL)				
850 MHz (Cellular) - AFTER	**ALPHA**	**BETA**	**GAMMA**	
EQUIPMENT TYPE	Cellular Mod 4.0B	Cellular Mod 4.0B	Cellular Mod 4.0B	☐
ANTENNA TYPE	LPA-80080-4CF	LPA-80080-4CF	LPA-80080-4CF	☐
ANTENNA QUANTITY	2	2	2	
ORIENTATION (°)	30	150	270	
TILT (MDT°|EDT°)	0 | 0	0 | 5	0 | 5	
RAD CENTER (ft)	150.0	150.0	150.0	
TMA (QTY)				☐
DIPLEXER (QTY/MODEL)				☐
RRH (QTY/MODEL)				☐
1900 MHz (PCS) - BEFORE	**ALPHA**	**BETA**	**GAMMA**	
EQUIPMENT TYPE	N/A	N/A	N/A	
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B	
ANTENNA QUANTITY	1	1	1	
ORIENTATION (°)	30	150	270	
TILT (MDT°|EDT°)	0 | 2	0 | 2	0 | 2	
RAD CENTER (ft)	150.0	150.0	150.0	
TMA (QTY)				
DIPLEXER (QTY/MODEL)				
RRH (QTY/MODEL)				
1900 MHz (PCS) - AFTER	**ALPHA**	**BETA**	**GAMMA**	
EQUIPMENT TYPE	**1900 MHz BBU + RRH**	**1900 MHz BBU + RRH**	**1900 MHz BBU + RRH**	☐
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B	☐
ANTENNA QUANTITY	1	1	1	
ORIENTATION (°)	30	150	270	
TILT (MDT°|EDT°)	0 | **5**	0 | **3**	0 | **3**	
RAD CENTER (ft)	150.0	150.0	150.0	
TMA (QTY)				☐
DIPLEXER (QTY/MODEL)				☐
RRH (QTY/MODEL)	**Nokia RH_4X30-B25**	**Nokia RH_4X30-B25**	**Nokia RH_4X30-B25**	☐

2100 MHz (AWS) - BEFORE	ALPHA		BETA		GAMMA	
EQUIPMENT TYPE	2100 MHz BBU + RRH		1900 MHz BBU + RRH		1900 MHz BBU + RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
ANTENNA QUANTITY	1		1		1	
ORIENTATION (°)	30		150		270	
TILT (MDT°|EDT°)	0	3	0	3	0	5
RAD CENTER (ft)	150.0		150.0		150.0	
TMA (QTY)						
DIPLEXER (QTY/MODEL)						
RRH (QTY/MODEL)	Nokia RH_4X45-AWS		Nokia RH_4X45-AWS		Nokia RH_4X45-AWS	
2100 MHz (AWS) - AFTER	**ALPHA**		**BETA**		**GAMMA**	
EQUIPMENT TYPE	2100 MHz BBU + RRH		1900 MHz BBU + RRH		1900 MHz BBU + RRH	
ANTENNA TYPE	SBNHH-1D65B		SBNHH-1D65B		SBNHH-1D65B	
ANTENNA QUANTITY	1		1		1	
ORIENTATION (°)	30		150		270	
TILT (MDT°|EDT°)	0	3	0	3	0	5
RAD CENTER (ft)	150.0		150.0		150.0	
TMA (QTY)						
DIPLEXER (QTY/MODEL)						
RRH (QTY/MODEL)	Nokia RH_4X45-AWS		Nokia RH_4X45-AWS		Nokia RH_4X45-AWS	

COAX CABLE	QUANTITY	SIZE	FIBER CABLE	QTY	TYPE/MODEL
MAIN LINE	18	1 5/8 "	FIBER LINE	2	H+S 85016661
TOP COAX JUMPER	42	1/2"	OVP	2	RC2DC-3315-PF-48
RET CONNECTIVITY REQUIRED	☑ LTE-700U	☑ PCS	OTHER RET RELATED INFO	☐ HOMERUN	☐ DAISY CHAIN
	☐ 850	☑ AWS	RET KIT	☐ BIAS-T	Other:

Special Instructions:

RF ENGINEER	RF MANAGER	RF INITIALS	DATE
Kelly Lemay	ALEX RESTREPO	KML	8/25/2016

Weights and dimensions

Overview

This topic provides the Alcatel-Lucent B25 RRH4x30 weights and dimensions.

Alcatel-Lucent B25 RRH4x30 weights and dimensions

The following table provides the weight and dimensions for the Alcatel-Lucent B25 RRH4x30.

Description/Parameter	Specification[1, 2]
Height	538.5 mm (21.2 inches)
Width	304 mm (11.97 inches)
Depth	182.4 mm (7.18 inches)
Weight (without mounting hardware)	24 kg (52.9 lbs)

Notes:

1. All specifications provided are with the solar shield installed.
2. Dimensions do not include connectors or other small protrusions.

Miscellaneous hardware weights

The following table provides approximate weights for other miscellaneous hardware.

Item	Weight – kg (lbs)
Shipping box and packaging	3.6 (8)
Carrying handle	0.1 (0.3)
Mounting bracket (used for wall and pole mounting)	2.3 (5.1)
Wall mounting kit	2.2 (4.8)
Pole mounting brackets: • Small pole mount kit • Large pole mount kit	 • 3.9 (8.6) • 2.4 (5.3)
User alarm cable	15 m (50 ft) = 1.29 (2.85) 30 m (100 ft) = 2.59 (5.7)
RF antenna cable	1.22 m (4 ft) = 0.38 (0.84) 3.66 m (12 ft) = 0.93 (2.04) 9.8 m (32 ft) = 2.29 (5.04)

Item	Weight – kg (lbs)
AISG cable	1 m (3.28 ft) = 0.09 (0.19) 5 m (16.4 ft) = 0.43 (0.95) 10 m (32.81 ft) = 0.86 (1.9) 25 m (82.02 ft) = 2.15 (4.75) 40 m (131.23 ft) = 3.45 (7.6) 50 m (164.04 ft) = 4.31 (9.5) 80 m (262.47 ft) = 6.89 (15.2)
Single mode dual fiber (SMDF) optical cable	5 m (16.4 ft) = 0.12 (0.27) 10 m (32.8 ft) = 0.24 (0.53) 15 m (50 ft) = 0.36 (0.80) 30 m (100 ft) = 0.73 (1.6) 50 m (164.04 ft) = 1.2 (2.65) 70 m (229.66 ft) = 1.68 (3.71) 85 m (278.87 ft) = 2.05 (4.51) 100 m (328.08 ft) = 2.40 (5.3) 150 m (492.12 ft) = 3.63 (8) 200 m (656.17 ft) = 4.81 (10.6) 250 m (820.21 ft) = 6.01 (13.25) 300 m (984.25 ft) = 7.26 (16)

ATTACHMENT 4

Enfield, CT

N
W E
S

0 150300 600 900 1,2001,500 Feet

1 inch = 969 feet

37 BACON RD

Location	37 BACON RD	**Mblu**	094/ / 0062/ /
Acct#	052900010040E	**Owner**	SHAKER PINES FIRE DISTRICT #5
Assessment	$957,470	**Appraisal**	$1,367,790
PID	30306	**Building Count**	1
Fire District	5		

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2016	$1,236,370	$131,420	$1,367,790

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2016	$865,470	$92,000	$957,470

Owner of Record

Owner	SHAKER PINES FIRE DISTRICT #5	**Sale Price**	$0
Co-Owner		**Certificate**	
Address	37 BACON RD ENFIELD, CT 06082	**Book & Page**	617/ 455
		Sale Date	10/01/2015
		Instrument	15

Ownership History

Ownership History					
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Instrument**	**Sale Date**
SHAKER PINES FIRE DISTRICT #5	$0		617/ 455	15	10/01/2015

Building Information

Building 1 : Section 1

Year Built:	2001
Living Area:	10,620
Replacement Cost:	$1,486,946
Building Percent Good:	81

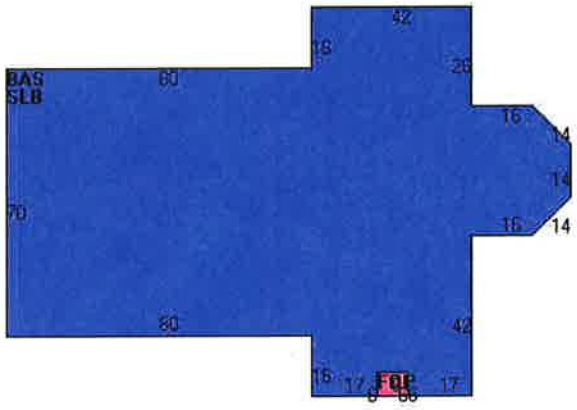
Replacement Cost
Less Depreciation: $1,204,430

Building Attributes	
Field	**Description**
STYLE	Fire Station
MODEL	Comm/Ind
Grade	Average +10
Stories:	1
Occupancy	1
Exterior Wall 1	Brick
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asph/F Gls/Cmp
Interior Wall 1	Minim/Masonry
Interior Wall 2	
Interior Floor 1	Vinyl/Asphalt
Interior Floor 2	
Heating Fuel	Gas
Heating Type	Hot Air-no Duc
AC Type	Partial
Bldg Use	Exempt Comm
Total Rooms	
Total Bedrms	
Total Baths	
Total H Bths	
Extra Fixtures	
1st Floor Use:	
Heat/AC	None
Frame Type	Masonry
Baths/Plumbing	Average
Ceiling/Wall	Sus Ceil Wall
Rooms/Prtns	Average
Wall Height	18
% Comn Wall	

Building Photo

(http://images.vgsi.com/photos2/EnfieldCTPhotos//default.jpg)

Building Layout



Building Sub-Areas (sq ft)			Legend
Code	**Description**	**Gross Area**	**Living Area**
BAS	First Floor	10,620	10,620
FOP	Open Porch	48	0
SLB	Slab	10,620	0
		21,288	10,620

Extra Features

Extra Features				Legend
Code	**Description**	**Size**	**Value**	**Bldg #**
SPR1	SPRINKLERS-WET	10620 SF	$8,600	1

Land

Land Use

Use Code	925
Description	Exempt Comm
Zone	I1
Neighborhood	C500
Alt Land Appr	No
Category	

Land Line Valuation

Size (Acres)	6.5
Frontage	
Depth	
Assessed Value	$92,000
Appraised Value	$131,420

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
FGR1	Garage	FR	Frame	400 S.F.	$5,000	1
PAV1	Paving	AS	Asphalt	3420 S.F.	$3,680	1
SHD1	Shed	MS	Masonry	360 S.F.	$2,930	1
SHD1	Shed	MS	Masonry	348 S.F.	$2,840	1
FN2	FENCE-6' CHAIN			280 L.F.	$2,380	1
SHD1	Shed	FR	Frame	288 S.F.	$1,760	1
FOP	Porch			792 S.F.	$4,750	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2015	$1,122,660	$131,420	$1,254,080

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2015	$785,880	$92,000	$877,880