ROBINSON & COLE LLP

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

March 4, 2014

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

Re: **Notice of Exempt Modification – Antenna Swap**
78 Route 81, Killingworth, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 128-foot level of the existing 150-foot tower at 78 Route 81 in Killingworth, Connecticut (the "Property"). The tower is owned by Crown Castle. The Council approved Cellco's use of the tower in 2009. Cellco now intends to replace six (6) of its existing antennas with three (3) model 742-213V01, 1900 MHz antennas and three (3) model 742-213V01, 2100 MHz antennas, all at the same 128-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable, attached to the outside of the monopole. Included in Attachment 1 are specifications for Cellco's replacement antennas, 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 Catherine Iino, First Selectwoman of the Town of Killingworth. A copy of this letter is also being sent to Sherwood and Diane Anderson, Trustees, the owners of the Property.

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

ROBINSON & COLE LLP

1. The proposed modifications will not result in an increase in the height of the existing tower. The replaced antennas and RRHs will be located on Cellco's antenna platform at the 128-foot level on the 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 worst-case cumulative RF emissions calculation for Cellco's modified facility is included in 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 foundation can support Cellco's proposed facility modifications. (*See* Structural Analysis Report included in Attachment 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Catherine Iino, Killingworth First Selectwoman
Sherwood and Diane Anderson, Trustees
Sandy M. Carter

ATTACHMENT 1

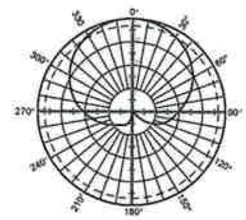
KATHREIN
SCALA DIVISION

742 213V01

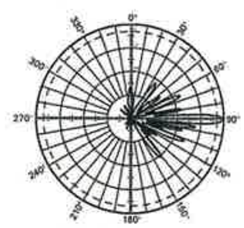
65° Panel Antenna

Kathrein's X-polarized adjustable electrical downtilt antennas offer the wireless carrier the ability to tailor polarization diversity sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

- 0-6° downtilt range.
- UV resistant pulltruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accomodate future 3G / UMTS applications.



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–6° electrical downtilt

General specifications:

Frequency range	1710–2200 MHz
VSWR	< 1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)
Maximum input power	300 watts per input (at 50°C)
Electrical downtilt continuously adjustable	0–6 degrees
Connector	2 x 7-16 DIN female
Isolation	>30 dB
Cross polar ratio Main direction 0° Sector ±60°	 25 dB (typical) >10 dB
Tracking, average	0.5 dB
Squint	±2.0°
Weight	19.8 lb (9 kg) 24.3 lb (11 kg) clamps included
Dimensions	76.9 x 6.1 x 2.8 inches (1954 x 155 x 70 mm)
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N) M (Medium)
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	88 x 6.8 x 3.6 inches (2235 x 172 x 92 mm)
Shipping weight	28.7 lb (13 kg)
Mounting	Fixed mounts for 2 to 4.6 inch (50 to 115 mm) OD masts are included and tilt options are available.

See reverse for order information.

Specifications:	**1710–1880 MHz**	**1850–1990 MHz**	**1920–2200 MHz**
Gain	19 dBi	19.2 dBi	19.5 dBi
+45° and -45° polarization horizontal beamwidth	67° (half-power)	65° (half-power)	63° (half-power)
+45° and -45° polarization vertical beamwidth	4.7° (half-power)	4.5° (half-power)	4.3° (half-power)
Sidelobe suppression for first sidelobe above main beam	0° 2° 4° 6° T 18 18 16 15 dB	0° 2° 4° 6° T 18 18 17 16 dB	0° 2° 4° 6° T 18 18 18 18 dB

RoHS Lead-Free

11271-B
936.3740/b

*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Alcatel·Lucent

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

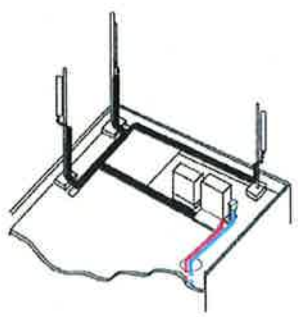
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.

Features

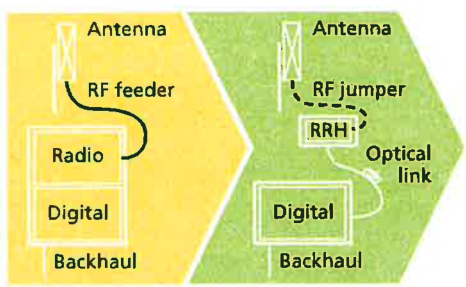
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

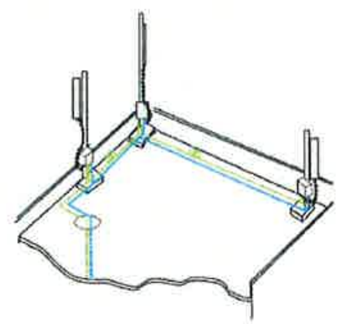
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - With solar load: -40°C to +50°C (-40°F to +122°F)
  - Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
  - One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - Single mode dual fiber (SM/DF)
- Multi-mode variant
  - Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

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.

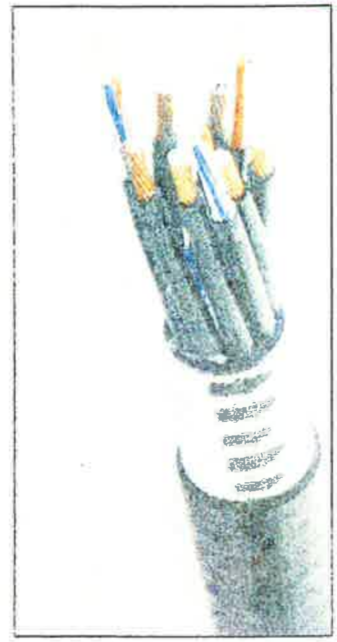


Figure 1: HYBRIFLEX Series

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)		[mm (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm (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)

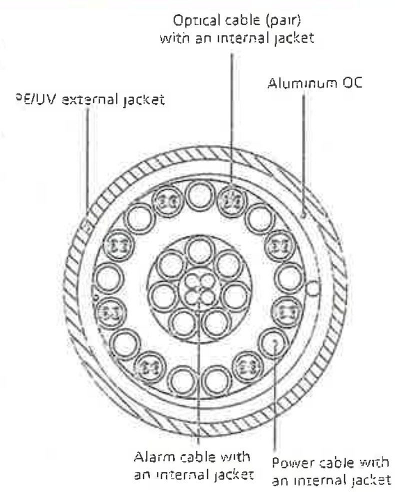


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Clinton N (Killingworth)								
Tower Height: Verizon @1280ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint	11	250	150	0.0439	1950	1.0000	4.39%	
*AT&T UMTS	2	565	143	0.0199	880	0.5867	3.39%	
*AT&T UMTS	2	875	143	0.0308	1900	1.0000	3.08%	
*AT&T GSM	1	283	143	0.0050	880	0.5867	0.85%	
*AT&T GSM	4	525	143	0.0369	1900	1.0000	3.69%	
*AT&T LTE	1	1615	143	0.0284	734	0.4893	5.80%	
Verizon	**11**	**534**	**128**	**0.1289**	**1970**	**1.0000**	**12.89%**	
Verizon	**9**	**397**	**128**	**0.0784**	**869**	**0.5793**	**13.54%**	
Verizon	**1**	**2198**	**128**	**0.0482**	**2145**	**1.0000**	**4.82%**	
Verizon	**1**	**824**	**128**	**0.0181**	**698**	**0.4653**	**3.89%**	
								56.34%
* Source: Siting Council								

ATTACHMENT 3

AW Solutions Inc
300 Crown Oak Centre Drive
Longwood, FL 32750
(407) 260-0231

Date: **January 16, 2014**

Cathy Garziano
Crown Castle
5350 North 48th Street Suite 305
Chandler, AZ 85226

Subject: Structural Analysis Report

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Name:	Clinton North, CT
Crown Castle Designation:	**Crown Castle BU Number:**	876383
	Crown Castle Site Name:	CLINTON / ANDERSON'S PROPERTY
	Crown Castle JDE Job Number:	256452
	Crown Castle Work Order Number:	699777
	Crown Castle Application Number:	211234 Rev. 1
Engineering Firm Designation:	**AW Solutions Inc Project Number:**	876383
Site Data:	**7 Sherwood Forest Lane, KILLINGWORTH, Middlesex County, CT**	
	Latitude *41° 20' 17.24"*, Longitude *-72° 33' 23.44"*	
	150 Foot - Monopole Tower	

Dear Cathy Garziano,

AW Solutions Inc is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 609259, in accordance with application 211234, revision 1.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC5: Existing + Proposed Equipment **Sufficient Capacity**

Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code based upon a wind speed of 85 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at *AW Solutions Inc* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Jennifer Flores, E.I.

Respectfully submitted by:

STATE OF CONNECTICUT EMMANUEL POULIN No. 22947 LICENSED PROFESSIONAL ENGINEER

Emmanuel Poulin, P.E.
VP of Engineering

1/16/14

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in April of 2000. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F. The tower was modified to include (12) base plate stiffeners and (4) anchor rod brackets by Paul J. Ford and Company in 2009.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
128.0	128.0	3	alcatel lucent	RRH2x40-AWS	1	1-5/8	1
		6	kathrein	742 213 w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Notes:
1) Proposed Equipment

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
150.0	152.0	6	decibel	DB980H90A-M w/ Mount Pipe	6	1-5/8	1
	150.0	1	tower mounts	Platform Mount [LP 303-1]			
143.0	143.0	3	ericsson	RRUS-11	-	-	1
		1	tower mounts	Side Arm Mount [SO 102-3]			
140.0	143.0	1	andrew	SBNH-1D6565C w/ Mount Pipe	12 1 2	1-5/8 3/8 7/16	1
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		1	kmw communications	AM-X-CD-17-65-00T-RET w/ Mount Pipe			
		6	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21903			
		1	raycap	DC6-48-60-18-8F			
	140.0	1	tower mounts	Platform Mount [LP 303-1]			
128.0	128.0	6	andrew	DB846F65ZAXY w/ Mount Pipe	18	1-5/8	1
		3	antel	BXA-70063/6CF w/ Mount Pipe			
		6	antel	LPA-185063/8CF w/ Mount Pipe	-	-	2
		1	tower mounts	T-Arm Mount [TA 602-3]	-	-	1
50.0	51.0	1	lucent	KS24019-L112A	1	1/2	1
	50.0	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Equipment To Be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
150	150	12	decibel	DB980H90	-	-
140	140	12	css	DUO1417-8686	-	-
130	130	6	allgon	7250.02	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	GOODKIND AND ODEA	2122536	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	EEI	1440547	CCISITES
4-TOWER MANUFACTURER DRAWINGS	EEI	1613582	CCISITES
4-TOWER STRUCTURAL ANALYSIS REPORTS	AWS	3295128	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	SEMANN	1595940	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	Paul J. Ford and Company	2418226	CCISITES

3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

This analysis may be affected if any assumptions are not valid or have been made in error. AW Solutions Inc should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 112.08	Pole	TP26.59x18x0.1875	1	-6.26	790.02	74.1	Pass
L2	112.08 - 76.58	Pole	TP34.14x25.3474x0.3125	2	-11.14	1688.62	75.8	Pass
L3	76.58 - 43.16	Pole	TP40.97x32.4352x0.3125	3	-17.13	2031.25	89.5	Pass
L4	43.16 - 0	Pole	TP50x39.0798x0.375	4	-28.86	3070.67	81.1	Pass
							Summary	
						Pole (L3)	89.5	Pass
						Rating =	89.5	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	86.1	Pass
1	Base Plate	0	89.8	Pass
1	Base Foundation	0	70.4	Pass

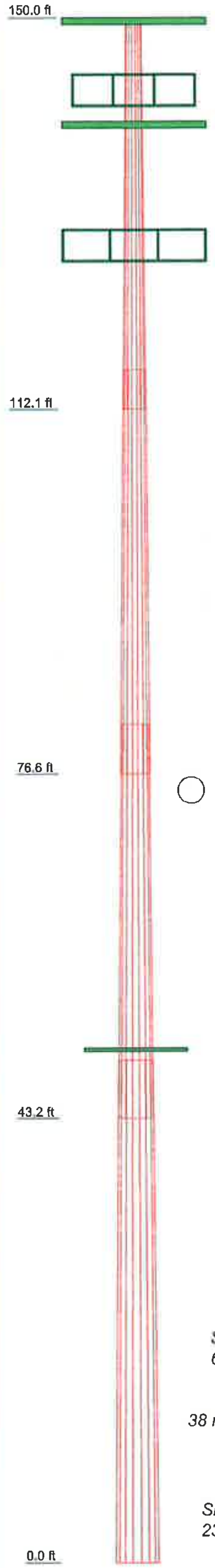
Structure Rating (max from all components) =	89.8%

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	37.92	18	0.1875	3.83	18.0000	26.5900	A572-65	1.7
2	39.33	18	0.3125	4.83	25.3474	34.1400		3.9
3	38.25	18	0.3125	5.67	32.4352	40.9700		4.7
4	48.83	18	0.3750		39.0798	50.0000		8.7
								19.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Platform Mount [LP 303-1]	150	(2) LGP21401	140
6'x2 1/2" Pipe mount	150	(2) LGP21903	140
6'x2 1/2" Pipe mount	150	(2) LGP21903	140
6'x2 1/2" Pipe mount	150	(2) LGP21903	140
(2) DB980H90A-M w/ Mount Pipe	150	DC6-48-60-18-8F	140
(2) DB980H90A-M w/ Mount Pipe	150	T-Arm Mount [TA 602-3]	128
(2) DB980H90A-M w/ Mount Pipe	150	(2) DB846F65ZAXY w/ Mount Pipe	128
Side Arm Mount [SO 102-3]	143	(2) DB846F65ZAXY w/ Mount Pipe	128
RRUS-11	143	(2) DB846F65ZAXY w/ Mount Pipe	128
RRUS-11	143	BXA-70063/6CF w/ Mount Pipe	128
RRUS-11	143	BXA-70063/6CF w/ Mount Pipe	128
Platform Mount [LP 303-1]	140	BXA-70063/6CF w/ Mount Pipe	128
(2) 7770.00 w/ Mount Pipe	140	(2) 742 213 w/ Mount Pipe	128
(2) 7770.00 w/ Mount Pipe	140	(2) 742 213 w/ Mount Pipe	128
(2) 7770.00 w/ Mount Pipe	140	(2) 742 213 w/ Mount Pipe	128
AM-X-CD-16-65-00T-RET w/ Mount Pipe	140	RRH2x40-AWS	128
		RRH2x40-AWS	128
AM-X-CD-17-65-00T-RET w/ Mount Pipe	140	RRH2x40-AWS	128
		DB-T1-6Z-8AB-0Z	128
SBNH-1D6565C w/ Mount Pipe	140	Side Arm Mount [SO 701-1]	50
(2) LGP21401	140	KS24019-L112A	50
(2) LGP21401	140		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 89.5%

AXIAL 40 K
SHEAR 6 K
MOMENT 624 kip-ft
TORQUE 0 kip-ft
38 mph WIND - 0.7500 in ICE

AXIAL 29 K
SHEAR 23 K
MOMENT 2512 kip-ft
TORQUE 1 kip-ft
REACTIONS - 85 mph WIND

AW Solutions Inc 300 Crown Oak Centre Drive Longwood, FL 32750 Phone: (407) 260-0231 FAX: (407) 260-0749	Job: BU 879383		
	Project: WO 699777		
	Client: Crown Castle	Drawn by: jennifer.flores	App'd:
	Code: TIA/EIA-222-F	Date: 01/16/14	Scale: NTS
	Path:		Dwg No. E-1

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

2) Tower is located in Middlesex County, Connecticut.
3) Basic wind speed of 85 mph.
4) Nominal ice thickness of 0.7500 in.
5) Ice thickness is considered to increase with height.
6) Ice density of 56 pcf.
7) A wind speed of 38 mph is used in combination with ice.
8) Temperature drop of 50 °F.
9) Deflections calculated using a wind speed of 50 mph.
10) A non-linear (P-delta) analysis was used.
11) Pressures are calculated at each section.
12) Stress ratio used in pole design is 1.333.
13) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
√ Escalate Ice
Always Use Max Kz
Use Special Wind Profile
Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
Add IBC .6D+W Combination

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
Use Clear Spans For KL/r
Retension Guys To Initial Tension
√ Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
Autocalc Torque Arm Areas
SR Members Have Cut Ends
Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing
Use TIA-222-G Tension Splice Capacity Exemption

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	150.00-112.08	37.92	3.83	18	18.0000	26.5900	0.1875	0.7500	A572-65 (65 ksi)
L2	112.08-76.58	39.33	4.83	18	25.3474	34.1400	0.3125	1.2500	A572-65 (65 ksi)
L3	76.58-43.16	38.25	5.67	18	32.4352	40.9700	0.3125	1.2500	A572-65 (65 ksi)
L4	43.16-0.00	48.83		18	39.0798	50.0000	0.3750	1.5000	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

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	18.2777	10.6007	424.9328	6.3234	9.1440	46.4712	850.4248	5.3013	2.8380	15.136
	27.0002	15.7128	1383.8238	9.3729	13.5077	102.4469	2769.4685	7.8579	4.3498	23.199
L2	26.6079	24.8315	1966.2175	8.8874	12.8765	152.6984	3935.0222	12.4181	3.9111	12.516
	34.6667	33.5527	4850.6965	12.0088	17.3431	279.6900	9707.7757	16.7795	5.4586	17.468
L3	34.0299	31.8617	4153.6583	11.4036	16.4771	252.0870	8312.7820	15.9339	5.1586	16.508
	41.6020	40.3272	8422.0227	14.4334	20.8128	404.6567	16855.127 3	20.1674	6.6607	21.314
L4	40.9703	46.0684	8719.0978	13.7402	19.8526	439.1926	17449.668 3	23.0386	6.2181	16.581
	50.7713	59.0662	18377.109 4	17.6169	25.4000	723.5082	36778.399 8	29.5387	8.1400	21.707

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150.00-112.08				1	1	1		
L2 112.08-76.58				1	1	1		
L3 76.58-43.16				1	1	1		
L4 43.16-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#		C_AA_A ft^2/ft	Weight plf
LDF7-50A(1-5/8")	C	No	Inside Pole	150.00 - 0.00	0.0000	0	6	No Ice	0.00	0.82
								1/2" Ice	0.00	0.82
								1" Ice	0.00	0.82
								2" Ice	0.00	0.82
								4" Ice	0.00	0.82
LDF7-50A(1-5/8")	C	No	Inside Pole	140.00 - 0.00	0.0000	0	9	No Ice	0.00	0.82
								1/2" Ice	0.00	0.82
								1" Ice	0.00	0.82
								2" Ice	0.00	0.82
								4" Ice	0.00	0.82
LCF158-50A(1-5/8")	C	No	Inside Pole	140.00 - 0.00	0.0000	0	3	No Ice	0.00	0.80
								1/2" Ice	0.00	0.80
								1" Ice	0.00	0.80
								2" Ice	0.00	0.80
								4" Ice	0.00	0.80
FB-L98B-002-75000(3/8")	A	No	Inside Pole	140.00 - 0.00	0.0000	0	1	No Ice	0.00	0.06
								1/2" Ice	0.00	0.06
								1" Ice	0.00	0.06
								2" Ice	0.00	0.06
								4" Ice	0.00	0.06
WR-VG122ST-BRDA(7/16)	A	No	Inside Pole	140.00 - 0.00	0.0000	0	2	No Ice	0.00	0.14
								1/2" Ice	0.00	0.14
								1" Ice	0.00	0.14
								2" Ice	0.00	0.14
								4" Ice	0.00	0.14
AVA7-50(1-5/8)	B	No	Inside Pole	128.00 - 0.00	0.0000	0	18	No Ice	0.00	0.70
								1/2" Ice	0.00	0.70
								1" Ice	0.00	0.70
								2" Ice	0.00	0.70
								4" Ice	0.00	0.70
HB158-1-08U8-S8J18(1-5/8)	B	No	CaAa (Out Of Face)	128.00 - 0.00	0.0000	0.2	1	No Ice	0.20	1.30
								1/2" Ice	0.30	2.81
								1" Ice	0.40	4.94
								2" Ice	0.60	11.02
								4" Ice	1.00	30.52
LDF4-	C	No	Inside Pole	50.00 - 0.00	0.0000	0	1	No Ice	0.00	0.15

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#		C_AA_A ft²/ft	Weight plf
50A(1/2")								1/2" Ice	0.00	0.15
								1" Ice	0.00	0.15
								2" Ice	0.00	0.15
								4" Ice	0.00	0.15
2" Rigid Conduit	A	No	Inside Pole	140.00 - 0.00	0.0000	0	1	No Ice	0.00	2.80
								1/2" Ice	0.00	2.80
								1" Ice	0.00	2.80
								2" Ice	0.00	2.80
								4" Ice	0.00	2.80

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150.00-112.08	A	0.000	0.000	0.000	0.000	0.09
		B	0.000	0.000	0.000	3.152	0.22
		C	0.000	0.000	0.000	0.000	0.46
L2	112.08-76.58	A	0.000	0.000	0.000	0.000	0.11
		B	0.000	0.000	0.000	7.029	0.49
		C	0.000	0.000	0.000	0.000	0.52
L3	76.58-43.16	A	0.000	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	6.617	0.46
		C	0.000	0.000	0.000	0.000	0.49
L4	43.16-0.00	A	0.000	0.000	0.000	0.000	0.14
		B	0.000	0.000	0.000	8.546	0.60
		C	0.000	0.000	0.000	0.000	0.64

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150.00-112.08	A	0.884	0.000	0.000	0.000	0.000	0.09
		B		0.000	0.000	0.000	5.967	0.27
		C		0.000	0.000	0.000	0.000	0.46
L2	112.08-76.58	A	0.850	0.000	0.000	0.000	0.000	0.11
		B		0.000	0.000	0.000	13.306	0.61
		C		0.000	0.000	0.000	0.000	0.52
L3	76.58-43.16	A	0.805	0.000	0.000	0.000	0.000	0.10
		B		0.000	0.000	0.000	12.300	0.56
		C		0.000	0.000	0.000	0.000	0.49
L4	43.16-0.00	A	0.750	0.000	0.000	0.000	0.000	0.14
		B		0.000	0.000	0.000	15.496	0.72
		C		0.000	0.000	0.000	0.000	0.64

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	150.00-112.08	0.1609	0.0929	0.2733	0.1578
L2	112.08-76.58	0.3338	0.1927	0.5645	0.3259
L3	76.58-43.16	0.3385	0.1954	0.5749	0.3319
L4	43.16-0.00	0.3421	0.1975	0.5773	0.3333

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
**									
**									
**									
Platform Mount [LP 303-1]	C	None		0.0000	150.00	No Ice	14.66	14.66	1.25
						1/2" Ice	18.87	18.87	1.48
						1" Ice	23.08	23.08	1.71
						2" Ice	31.50	31.50	2.18
						4" Ice	48.34	48.34	3.10
Side Arm Mount [SO 102-3]	C	None		0.0000	143.00	No Ice	3.00	3.00	0.08
						1/2" Ice	3.48	3.48	0.11
						1" Ice	3.96	3.96	0.14
						2" Ice	4.92	4.92	0.20
						4" Ice	6.84	6.84	0.32
Platform Mount [LP 303-1]	C	None		0.0000	140.00	No Ice	14.66	14.66	1.25
						1/2" Ice	18.87	18.87	1.48
						1" Ice	23.08	23.08	1.71
						2" Ice	31.50	31.50	2.18
						4" Ice	48.34	48.34	3.10
T-Arm Mount [TA 602-3]	C	None		0.0000	128.00	No Ice	11.59	11.59	0.77
						1/2" Ice	15.44	15.44	0.99
						1" Ice	19.29	19.29	1.21
						2" Ice	26.99	26.99	1.64
						4" Ice	42.39	42.39	2.50
Side Arm Mount [SO 701-1]	C	None		0.0000	50.00	No Ice	0.85	1.67	0.07
						1/2" Ice	1.14	2.34	0.08
						1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
						4" Ice	3.17	7.03	0.18
*									
6'x2 1/2" Pipe mount	A	From Leg	4.00	0.0000	150.00	No Ice	1.73	1.73	0.04
			0.00			1/2" Ice	2.09	2.09	0.05
			0.00			1" Ice	2.46	2.46	0.07
						2" Ice	3.23	3.23	0.12
						4" Ice	4.88	4.88	0.27
6'x2 1/2" Pipe mount	B	From Leg	4.00	0.0000	150.00	No Ice	1.73	1.73	0.04
			0.00			1/2" Ice	2.09	2.09	0.05
			0.00			1" Ice	2.46	2.46	0.07
						2" Ice	3.23	3.23	0.12
						4" Ice	4.88	4.88	0.27
6'x2 1/2" Pipe mount	C	From Leg	4.00	0.0000	150.00	No Ice	1.73	1.73	0.04
			0.00			1/2" Ice	2.09	2.09	0.05
			0.00			1" Ice	2.46	2.46	0.07
						2" Ice	3.23	3.23	0.12
						4" Ice	4.88	4.88	0.27
LEVEL 150									
(2) DB980H90A-M w/ Mount Pipe	A	From Leg	4.00	0.0000	150.00	No Ice	4.04	3.62	0.03
			0.00			1/2" Ice	4.50	4.48	0.07
			2.00			1" Ice	4.95	5.22	0.11
						2" Ice	5.87	6.74	0.22
						4" Ice	8.05	10.00	0.55
(2) DB980H90A-M w/ Mount Pipe	B	From Leg	4.00	0.0000	150.00	No Ice	4.04	3.62	0.03
			0.00			1/2" Ice	4.50	4.48	0.07
			2.00			1" Ice	4.95	5.22	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
						1" Ice	5.87	6.74	0.22
						2" Ice	8.05	10.00	0.55
						4" Ice			
(2) DB980H90A-M w/ Mount Pipe	C	From Leg	4.00	0.0000	150.00	No Ice	4.04	3.62	0.03
			0.00			1/2"	4.50	4.48	0.07
			2.00			Ice	4.95	5.22	0.11
						1" Ice	5.87	6.74	0.22
						2" Ice	8.05	10.00	0.55
						4" Ice			
LEVEL 143									
RRUS-11	A	From Leg	4.00	0.0000	143.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			0.00			Ice	3.74	1.74	0.09
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
RRUS-11	B	From Leg	4.00	0.0000	143.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			0.00			Ice	3.74	1.74	0.09
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
RRUS-11	C	From Leg	4.00	0.0000	143.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			0.00			Ice	3.74	1.74	0.09
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
LEVEL 140									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00	0.0000	140.00	No Ice	6.35	4.43	0.06
			0.00			1/2"	6.95	5.37	0.11
			3.00			Ice	7.51	6.12	0.17
						1" Ice	8.65	7.66	0.30
						2" Ice	11.06	11.10	0.70
						4" Ice			
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00	0.0000	140.00	No Ice	6.35	4.43	0.06
			0.00			1/2"	6.95	5.37	0.11
			3.00			Ice	7.51	6.12	0.17
						1" Ice	8.65	7.66	0.30
						2" Ice	11.06	11.10	0.70
						4" Ice			
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00	0.0000	140.00	No Ice	6.35	4.43	0.06
			0.00			1/2"	6.95	5.37	0.11
			3.00			Ice	7.51	6.12	0.17
						1" Ice	8.65	7.66	0.30
						2" Ice	11.06	11.10	0.70
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00	0.0000	140.00	No Ice	8.50	6.30	0.07
			0.00			1/2"	9.15	7.48	0.14
			3.00			Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
AM-X-CD-17-65-00T-RET w/ Mount Pipe	C	From Leg	4.00	0.0000	140.00	No Ice	11.55	8.94	0.09
			0.00			1/2"	12.27	10.45	0.18
			3.00			Ice	13.00	11.99	0.27
						1" Ice	14.45	14.31	0.50
						2" Ice	17.71	19.14	1.12
						4" Ice			
SBNH-1D6565C w/ Mount Pipe	B	From Leg	4.00	0.0000	140.00	No Ice	11.67	9.83	0.09
			0.00			1/2"	12.39	11.35	0.18
			3.00			Ice	13.12	12.90	0.28
						1" Ice	14.58	15.24	0.52
						2" Ice	17.85	20.11	1.16
						4" Ice			

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		C_AA_A *Front* *ft²*	C_AA_A *Side* *ft²*	*Weight* *K*
(2) LGP21401	A	From Leg	4.00	0.0000	140.00	No Ice	1.29	0.23	0.01
			0.00			1/2"	1.45	0.31	0.02
			3.00			Ice	1.61	0.40	0.03
						1" Ice	1.97	0.61	0.05
						2" Ice	2.79	1.12	0.14
						4" Ice			
(2) LGP21401	B	From Leg	4.00	0.0000	140.00	No Ice	1.29	0.23	0.01
			0.00			1/2"	1.45	0.31	0.02
			3.00			Ice	1.61	0.40	0.03
						1" Ice	1.97	0.61	0.05
						2" Ice	2.79	1.12	0.14
						4" Ice			
(2) LGP21401	C	From Leg	4.00	0.0000	140.00	No Ice	1.29	0.23	0.01
			0.00			1/2"	1.45	0.31	0.02
			3.00			Ice	1.61	0.40	0.03
						1" Ice	1.97	0.61	0.05
						2" Ice	2.79	1.12	0.14
						4" Ice			
(2) LGP21903	A	From Leg	4.00	0.0000	140.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			3.00			Ice	0.43	0.32	0.02
						1" Ice	0.62	0.49	0.03
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) LGP21903	B	From Leg	4.00	0.0000	140.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			3.00			Ice	0.43	0.32	0.02
						1" Ice	0.62	0.49	0.03
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) LGP21903	C	From Leg	4.00	0.0000	140.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			3.00			Ice	0.43	0.32	0.02
						1" Ice	0.62	0.49	0.03
						2" Ice	1.10	0.94	0.07
						4" Ice			
DC6-48-60-18-8F	B	From Leg	4.00	0.0000	140.00	No Ice	1.27	1.27	0.02
			0.00			1/2"	1.46	1.46	0.04
			3.00			Ice	1.66	1.66	0.05
						1" Ice	2.09	2.09	0.10
						2" Ice	3.10	3.10	0.21
						4" Ice			
LEVEL 128									
(2) DB846F65ZAXY w/ Mount Pipe	A	From Leg	4.00	0.0000	128.00	No Ice	7.27	7.82	0.05
			0.00			1/2"	7.88	9.01	0.11
			0.00			Ice	8.48	9.91	0.19
						1" Ice	9.72	11.81	0.37
						2" Ice	12.33	15.98	0.87
						4" Ice			
(2) DB846F65ZAXY w/ Mount Pipe	B	From Leg	4.00	0.0000	128.00	No Ice	7.27	7.82	0.05
			0.00			1/2"	7.88	9.01	0.11
			0.00			Ice	8.48	9.91	0.19
						1" Ice	9.72	11.81	0.37
						2" Ice	12.33	15.98	0.87
						4" Ice			
(2) DB846F65ZAXY w/ Mount Pipe	C	From Leg	4.00	0.0000	128.00	No Ice	7.27	7.82	0.05
			0.00			1/2"	7.88	9.01	0.11
			0.00			Ice	8.48	9.91	0.19
						1" Ice	9.72	11.81	0.37
						2" Ice	12.33	15.98	0.87
						4" Ice			
BXA-70063/6CF w/ Mount Pipe	A	From Leg	4.00	0.0000	128.00	No Ice	7.98	5.41	0.04
			0.00			1/2"	8.62	6.56	0.10
			0.00			Ice	9.23	7.42	0.17

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
						1" Ice 2" Ice 4" Ice	10.47 13.08	9.20 12.95	0.33 0.79
BXA-70063/6CF w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.98 8.62 9.23 10.47 13.08	5.41 6.56 7.42 9.20 12.95	0.04 0.10 0.17 0.33 0.79
BXA-70063/6CF w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.98 8.62 9.23 10.47 13.08	5.41 6.56 7.42 9.20 12.95	0.04 0.10 0.17 0.33 0.79
(2) 742 213 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.37 5.95 6.50 7.61 9.93	4.62 6.00 6.98 8.85 12.79	0.05 0.09 0.15 0.28 0.68
(2) 742 213 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.37 5.95 6.50 7.61 9.93	4.62 6.00 6.98 8.85 12.79	0.05 0.09 0.15 0.28 0.68
(2) 742 213 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.37 5.95 6.50 7.61 9.93	4.62 6.00 6.98 8.85 12.79	0.05 0.09 0.15 0.28 0.68
RRH2x40-AWS	A	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.52 2.75 2.99 3.50 4.61	1.59 1.80 2.01 2.46 3.48	0.04 0.06 0.08 0.13 0.28
RRH2x40-AWS	B	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.52 2.75 2.99 3.50 4.61	1.59 1.80 2.01 2.46 3.48	0.04 0.06 0.08 0.13 0.28
RRH2x40-AWS	C	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.52 2.75 2.99 3.50 4.61	1.59 1.80 2.01 2.46 3.48	0.04 0.06 0.08 0.13 0.28
DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0.00 0.00	0.0000	128.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.60 5.92 6.24 6.91 8.37	2.33 2.56 2.79 3.28 4.37	0.04 0.08 0.12 0.21 0.45
LEVEL 50 KS24019-L112A	A	From Leg	4.00 0.00 1.00	0.0000	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.16 0.22 0.30 0.48 0.95	0.16 0.22 0.30 0.48 0.95	0.01 0.01 0.01 0.02 0.06

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	150 - 112.08	Pole	Max Tension	14	0.00	0.00	0.00
			Max. Compression	14	-13.37	-0.33	0.09
			Max. Mx	5	-6.28	-301.87	0.51
			Max. My	2	-6.26	-0.53	303.67
			Max. Vy	5	14.43	-301.87	0.51
			Max. Vx	8	14.59	0.36	-303.60
			Max. Torque	4			-0.96
L2	112.08 - 76.58	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-19.31	-0.54	-0.03
			Max. Mx	5	-11.16	-845.78	1.03
			Max. My	2	-11.14	-1.19	852.79
			Max. Vy	5	17.13	-845.78	1.03
			Max. Vx	8	17.28	0.85	-852.79
			Max. Torque	9			0.63

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L3	76.58 - 43.16	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-26.40	-0.80	-0.14
			Max. Mx	5	-17.14	-1445.79	1.55
			Max. My	8	-17.13	1.31	-1457.77
			Max. Vy	5	19.70	-1445.79	1.55
			Max. Vx	8	19.86	1.31	-1457.77
			Max. Torque	9			0.71
L4	43.16 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-39.88	-1.25	-0.40
			Max. Mx	5	-28.86	-2492.68	2.26
			Max. My	8	-28.86	1.95	-2512.01
			Max. Vy	5	23.16	-2492.68	2.26
			Max. Vx	8	23.31	1.95	-2512.01
			Max. Torque	9			0.83

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	21	39.88	0.00	-5.51
	Max. H_x	11	28.88	23.14	-0.02
	Max. H_z	2	28.88	-0.02	23.28
	Max. M_x	2	2511.81	-0.02	23.28
	Max. M_z	5	2492.68	-23.14	0.02
	Max. Torsion	9	0.83	11.58	-20.17
	Min. Vert	1	28.88	0.00	0.00
	Min. H_x	5	28.88	-23.14	0.02
	Min. H_z	8	28.88	0.02	-23.28
	Min. M_x	8	-2512.01	0.02	-23.28
	Min. M_z	11	-2491.87	23.14	-0.02
	Min. Torsion	3	-0.83	-11.58	20.17

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	28.88	0.00	0.00	0.10	-0.39	0.00
Dead+Wind 0 deg - No Ice	28.88	0.02	-23.28	-2511.81	-2.75	0.70
Dead+Wind 30 deg - No Ice	28.88	11.58	-20.17	-2176.47	-1248.55	0.83
Dead+Wind 60 deg - No Ice	28.88	20.04	-11.66	-1257.93	-2159.93	0.74
Dead+Wind 90 deg - No Ice	28.88	23.14	-0.02	-2.26	-2492.68	0.45
Dead+Wind 120 deg - No Ice	28.88	20.03	11.63	1254.05	-2157.60	0.03
Dead+Wind 150 deg - No Ice	28.88	11.55	20.16	2174.33	-1244.48	-0.39
Dead+Wind 180 deg - No Ice	28.88	-0.02	23.28	2512.01	1.95	-0.71
Dead+Wind 210 deg - No Ice	28.88	-11.58	20.17	2176.66	1247.75	-0.83
Dead+Wind 240 deg - No Ice	28.88	-20.04	11.66	1258.11	2159.13	-0.74
Dead+Wind 270 deg - No Ice	28.88	-23.14	0.02	2.45	2491.87	-0.44
Dead+Wind 300 deg - No Ice	28.88	-20.03	-11.63	-1253.85	2156.79	-0.03
Dead+Wind 330 deg - No Ice	28.88	-11.55	-20.16	-2174.13	1243.68	0.39
Dead+Ice+Temp	39.88	0.00	0.00	0.40	-1.25	-0.00
Dead+Wind 0 deg+Ice+Temp	39.88	0.00	-5.51	-623.66	-1.82	0.20
Dead+Wind 30 deg+Ice+Temp	39.88	2.74	-4.77	-540.29	-311.22	0.24
Dead+Wind 60 deg+Ice+Temp	39.88	4.74	-2.76	-312.04	-537.59	0.22
Dead+Wind 90 deg+Ice+Temp	39.88	5.47	-0.00	-0.07	-620.27	0.14

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 120 deg+Ice+Temp	39.88	4.73	2.75	312.03	-537.10	0.02
Dead+Wind 150 deg+Ice+Temp	39.88	2.73	4.77	540.63	-310.38	-0.10
Dead+Wind 180 deg+Ice+Temp	39.88	-0.00	5.51	624.48	-0.85	-0.20
Dead+Wind 210 deg+Ice+Temp	39.88	-2.74	4.77	541.12	308.55	-0.24
Dead+Wind 240 deg+Ice+Temp	39.88	-4.74	2.76	312.87	534.91	-0.22
Dead+Wind 270 deg+Ice+Temp	39.88	-5.47	0.00	0.90	617.59	-0.14
Dead+Wind 300 deg+Ice+Temp	39.88	-4.73	-2.75	-311.21	534.43	-0.02
Dead+Wind 330 deg+Ice+Temp	39.88	-2.73	-4.77	-539.81	307.71	0.10
Dead+Wind 0 deg - Service	28.88	0.01	-8.06	-870.48	-1.22	0.25
Dead+Wind 30 deg - Service	28.88	4.01	-6.98	-754.25	-432.99	0.29
Dead+Wind 60 deg - Service	28.88	6.94	-4.03	-435.90	-748.84	0.26
Dead+Wind 90 deg - Service	28.88	8.01	-0.01	-0.72	-864.15	0.16
Dead+Wind 120 deg - Service	28.88	6.93	4.02	434.68	-748.03	0.01
Dead+Wind 150 deg - Service	28.88	4.00	6.97	753.63	-431.57	-0.14
Dead+Wind 180 deg - Service	28.88	-0.01	8.06	870.67	0.41	-0.25
Dead+Wind 210 deg - Service	28.88	-4.01	6.98	754.45	432.17	-0.29
Dead+Wind 240 deg - Service	28.88	-6.94	4.03	436.09	748.03	-0.26
Dead+Wind 270 deg - Service	28.88	-8.01	0.01	0.91	863.34	-0.16
Dead+Wind 300 deg - Service	28.88	-6.93	-4.02	-434.49	747.21	-0.01
Dead+Wind 330 deg - Service	28.88	-4.00	-6.97	-753.44	430.76	0.13

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	-28.88	0.00	0.00	28.88	0.00	0.000%
2	0.02	-28.88	-23.28	-0.02	28.88	23.28	0.000%
3	11.58	-28.88	-20.17	-11.58	28.88	20.17	0.000%
4	20.04	-28.88	-11.66	-20.04	28.88	11.66	0.000%
5	23.14	-28.88	-0.02	-23.14	28.88	0.02	0.000%
6	20.03	-28.88	11.63	-20.03	28.88	-11.63	0.000%
7	11.55	-28.88	20.16	-11.55	28.88	-20.16	0.000%
8	-0.02	-28.88	23.28	0.02	28.88	-23.28	0.000%
9	-11.58	-28.88	20.17	11.58	28.88	-20.17	0.000%
10	-20.04	-28.88	11.66	20.04	28.88	-11.66	0.000%
11	-23.14	-28.88	0.02	23.14	28.88	-0.02	0.000%
12	-20.03	-28.88	-11.63	20.03	28.88	11.63	0.000%
13	-11.55	-28.88	-20.16	11.55	28.88	20.16	0.000%
14	0.00	-39.88	0.00	0.00	39.88	0.00	0.000%
15	0.00	-39.88	-5.51	-0.00	39.88	5.51	0.000%
16	2.74	-39.88	-4.77	-2.74	39.88	4.77	0.000%
17	4.74	-39.88	-2.76	-4.74	39.88	2.76	0.000%
18	5.47	-39.88	-0.00	-5.47	39.88	0.00	0.000%
19	4.73	-39.88	2.75	-4.73	39.88	-2.75	0.000%
20	2.73	-39.88	4.77	-2.73	39.88	-4.77	0.000%
21	-0.00	-39.88	5.51	0.00	39.88	-5.51	0.000%
22	-2.74	-39.88	4.77	2.74	39.88	-4.77	0.000%
23	-4.74	-39.88	2.76	4.74	39.88	-2.76	0.000%
24	-5.47	-39.88	0.00	5.47	39.88	-0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
25	-4.73	-39.88	-2.75	4.73	39.88	2.75	0.000%
26	-2.73	-39.88	-4.77	2.73	39.88	4.77	0.000%
27	0.01	-28.88	-8.06	-0.01	28.88	8.06	0.000%
28	4.01	-28.88	-6.98	-4.01	28.88	6.98	0.000%
29	6.94	-28.88	-4.03	-6.94	28.88	4.03	0.000%
30	8.01	-28.88	-0.01	-8.01	28.88	0.01	0.000%
31	6.93	-28.88	4.02	-6.93	28.88	-4.02	0.000%
32	4.00	-28.88	6.97	-4.00	28.88	-6.97	0.000%
33	-0.01	-28.88	8.06	0.01	28.88	-8.06	0.000%
34	-4.01	-28.88	6.98	4.01	28.88	-6.98	0.000%
35	-6.94	-28.88	4.03	6.94	28.88	-4.03	0.000%
36	-8.01	-28.88	0.01	8.01	28.88	-0.01	0.000%
37	-6.93	-28.88	-4.02	6.93	28.88	4.02	0.000%
38	-4.00	-28.88	-6.97	4.00	28.88	6.97	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00062153
3	Yes	5	0.00000001	0.00094029
4	Yes	5	0.00000001	0.00091205
5	Yes	4	0.00000001	0.00040272
6	Yes	5	0.00000001	0.00092299
7	Yes	5	0.00000001	0.00092792
8	Yes	4	0.00000001	0.00051229
9	Yes	5	0.00000001	0.00091074
10	Yes	5	0.00000001	0.00093779
11	Yes	4	0.00000001	0.00050056
12	Yes	5	0.00000001	0.00091938
13	Yes	5	0.00000001	0.00091564
14	Yes	4	0.00000001	0.00000001
15	Yes	5	0.00000001	0.00023639
16	Yes	5	0.00000001	0.00031012
17	Yes	5	0.00000001	0.00030660
18	Yes	5	0.00000001	0.00023511
19	Yes	5	0.00000001	0.00030744
20	Yes	5	0.00000001	0.00030858
21	Yes	5	0.00000001	0.00023657
22	Yes	5	0.00000001	0.00030588
23	Yes	5	0.00000001	0.00030770
24	Yes	5	0.00000001	0.00023390
25	Yes	5	0.00000001	0.00030501
26	Yes	5	0.00000001	0.00030555
27	Yes	4	0.00000001	0.00013429
28	Yes	5	0.00000001	0.00008235
29	Yes	5	0.00000001	0.00007699
30	Yes	4	0.00000001	0.00011081
31	Yes	5	0.00000001	0.00007907
32	Yes	5	0.00000001	0.00008014
33	Yes	4	0.00000001	0.00012838
34	Yes	5	0.00000001	0.00007680
35	Yes	5	0.00000001	0.00008163
36	Yes	4	0.00000001	0.00011553
37	Yes	5	0.00000001	0.00007829
38	Yes	5	0.00000001	0.00007775

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	150 - 112.08 (1)	TP26.59x18x0.1875	37.92	0.00	0.0	39.000	15.1965	-6.26	592.66	0.011
L2	112.08 - 76.58 (2)	TP34.14x25.3474x0.3125	39.33	0.00	0.0	39.000	32.4816	-11.14	1266.78	0.009
L3	76.58 - 43.16 (3)	TP40.97x32.4352x0.3125	38.25	0.00	0.0	39.000	39.0723	-17.13	1523.82	0.011
L4	43.16 - 0 (4)	TP50x39.0798x0.375	48.83	0.00	0.0	39.000	59.0662	-28.86	2303.58	0.013

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 112.08 (1)	TP26.59x18x0.1875	303.68	38.038	39.000	0.975	0.00	0.000	39.000	0.000
L2	112.08 - 76.58 (2)	TP34.14x25.3474x0.3125	852.79	39.053	39.000	1.001	0.00	0.000	39.000	0.000
L3	76.58 - 43.16 (3)	TP40.97x32.4352x0.3125	1457.77	46.063	39.000	1.181	0.00	0.000	39.000	0.000
L4	43.16 - 0 (4)	TP50x39.0798x0.375	2512.01	41.664	39.000	1.068	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	150 - 112.08 (1)	TP26.59x18x0.1875	14.59	0.960	26.000	0.074	0.45	0.027	26.000	0.001
L2	112.08 - 76.58 (2)	TP34.14x25.3474x0.3125	17.28	0.532	26.000	0.041	0.51	0.011	26.000	0.000
L3	76.58 - 43.16 (3)	TP40.97x32.4352x0.3125	19.86	0.508	26.000	0.039	0.59	0.009	26.000	0.000
L4	43.16 - 0 (4)	TP50x39.0798x0.375	23.31	0.395	26.000	0.030	0.71	0.006	26.000	0.000

Pole Interaction Design Data

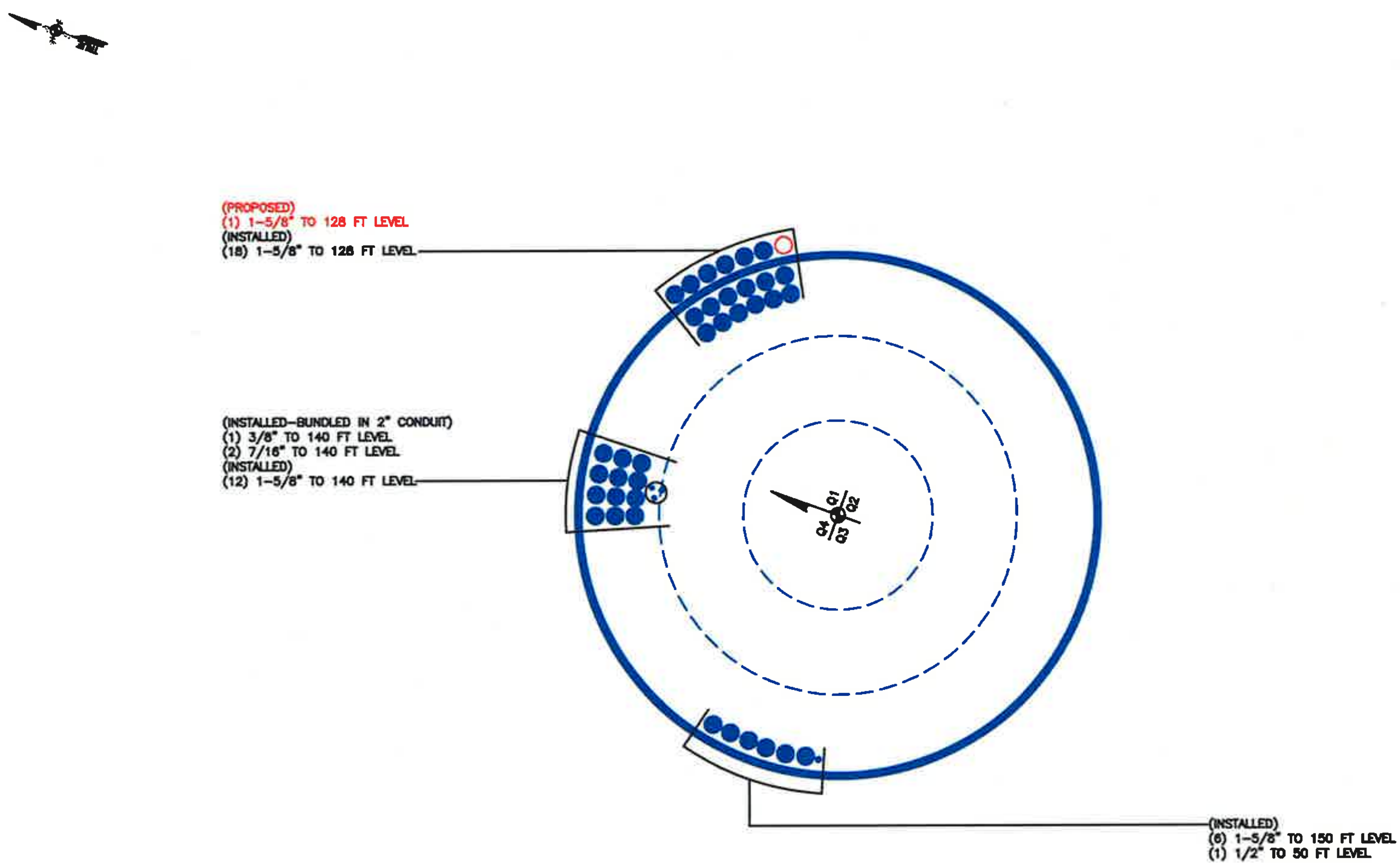
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 112.08 (1)	0.011	0.975	0.000	0.074	0.001	0.987 ✔	1.333	H1-3+VT ✔
L2	112.08 - 76.58 (2)	0.009	1.001	0.000	0.041	0.000	1.011 ✔	1.333	H1-3+VT ✔
L3	76.58 - 43.16 (3)	0.011	1.181	0.000	0.039	0.000	1.193 ✔	1.333	H1-3+VT ✔
L4	43.16 - 0 (4)	0.013	1.068	0.000	0.030	0.000	1.081 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	150 - 112.08	Pole	TP26.59x18x0.1875	1	-6.26	790.02	74.1	Pass
L2	112.08 - 76.58	Pole	TP34.14x25.3474x0.3125	2	-11.14	1688.62	75.8	Pass
L3	76.58 - 43.16	Pole	TP40.97x32.4352x0.3125	3	-17.13	2031.25	89.5	Pass
L4	43.16 - 0	Pole	TP50x39.0798x0.375	4	-28.86	3070.67	81.1	Pass
							Summary	
						Pole (L3)	89.5	Pass
						RATING =	**89.5**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 876363 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev F

Site Data

BU#:	*876383*
Site Name:	*Clinton/Anderson's Property*
App #:	*211234 Rev#1*
Pole Manufacturer:	*Other*

Reactions		
Moment:	2512	ft-kips
Axial:	29	kips
Shear:	23	kips

If No stiffeners, Criteria:	AISC ASD	<-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	59	in

Anchor Rod Results

Maximum Rod Tension:	167.9 Kips		Stiffened
Allowable Tension:	195.0 Kips		Service, ASD
Anchor Rod Stress Ratio:	86.1%	Pass	Fty*ASIF

Plate Data		
Diam:	65	in
Thick:	1.75	in
Grade:	60	ksi
Single-Rod B-eff:	13.22	in

Base Plate Results

	Flexural Check		
Base Plate Stress:	53.8 ksi		Stiffened
Allowable Plate Stress:	60.0 ksi		Service, ASD
Base Plate Stress Ratio:	89.8%	Pass	0.75*Fy*ASIF
			Y.L. Length: N/A, Roark

Stiffener Data (Welding at both sides)		
Config:	3	*
Weld Type:	Both	
Groove Depth:	0.5	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.5	in
Fillet V. Weld:	0.375	in
Width:	6	in
Height:	18	in
Thick:	1.25	in
Notch:	0.75	in
Grade:	50	ksi
Weld str.:	70	ksi
Clear Space between Stiffeners (b):	6	in

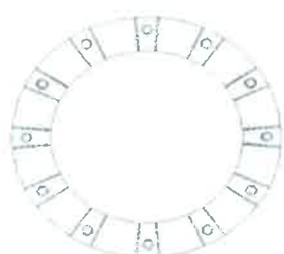
Stiffener Results

Horizontal Weld :	46.2%	Pass
Vertical Weld:	30.8%	Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	5.8%	Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	27.7%	Pass
Plate Comp. (AISC Bracket):	29.3%	Pass

Pole Results

Pole Punching Shear Check:	8.3%	Pass

Pole Data		
Diam:	50	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None



Stress Increase Factor		
ASIF:	1.333	

* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** <u>Note:</u> for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Version 2.1
Rev. Date: 10.01.2013

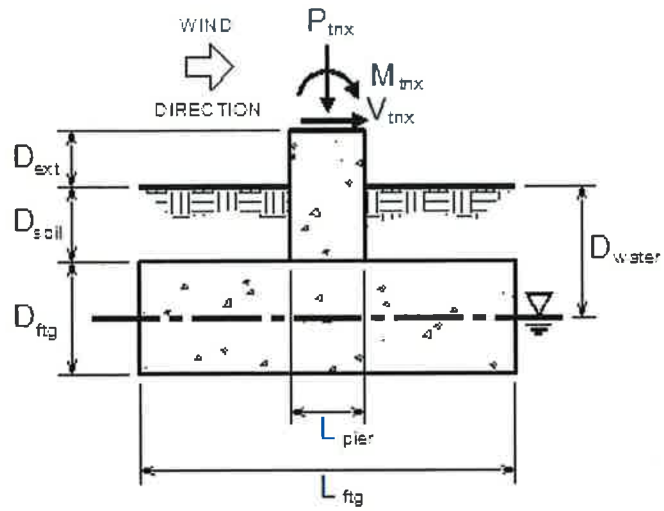
Project: BU876383
Site: Clinton/Anderson's Property

MP - SQUARE PIER AND PAD - INDIVIDUAL FOUNDATION ANALYSIS TIA-222-F

Designed by: JF
Checked by : EP
Date: 1.16.14

1.0 FOUNDATION GEOMETRY & MATERIALS:

L_{ftg}= Length of footing (parallel to wind direction)
L_{pier}= Length/Diameter of pier
D_{ftg}= Depth of footing
D_{soil}= Depth of soil above footing
D_{ext}= Height of pier above soil grade line
B_{ftg}= Width of footing (perpendicular to wind direction)
ρ_{conc}= Concrete density
A_{ftg} = Bearing area of spread footing
V_{ftg} = Volume of spread footing (does not include piers)
D_{pier} = Depth (height) of pier
A_{pier} = Cross-sectional area of pier



SECTION

$L_{ftg} := 24.5ft$ $\quad B_{ftg} := L_{ftg} = 24.5\ ft$ $\quad L_{pier} := 6.5ft$

$D_{ext} := 0.5ft$

(•) Square Pier
( ) Round Pier

$D_{soil} := 2ft$

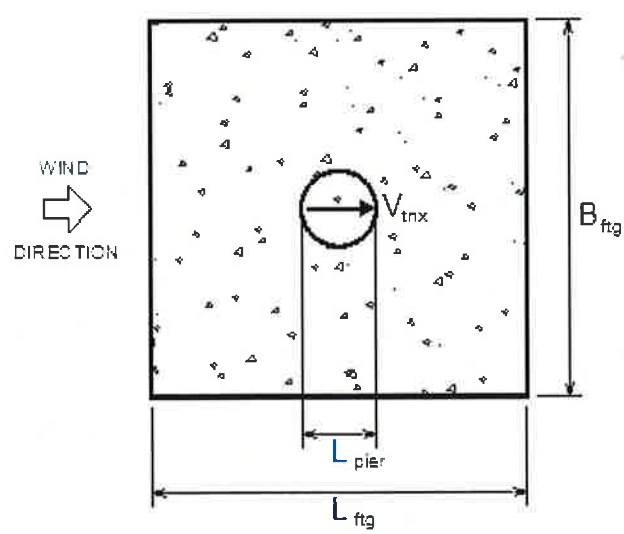
$D_{ftg} := 3ft$ $\quad \rho_{conc} := 150 \cdot pcf$

$$A_{ftg} := L_{ftg} \cdot B_{ftg} = 600.25\ ft^2$$

$$V_{ftg} := A_{ftg} \cdot D_{ftg} = 1800.75\ ft^3$$

$$D_{pier} := D_{soil} + D_{ext} = 2.5\ ft$$

$$A_{pier} := \begin{cases} (L_{pier})^2 & \text{if } R = 1 \\ \dfrac{\pi \cdot (L_{pier})^2}{4} & \text{otherwise} \end{cases} = 42.25\ ft^2$$



PLAN

2.0 SOIL PARAMETERS:

Data obtained from Geotechnical report:

D_{water}= Depth of water table below soil grade line
$D_{neglect}$= Depth of soil below grade line that is neglected
γ_{soil}= Moist density of soil
ϕ= Angle of friction of soil
K_p = Passive earth pressure coefficient
q_{brg_allow}= Allowable gross bearing capacity of soil
FOS_{coh}= Factor of Safety for cohesion
FOS_{lat}= Factor of Safety for lateral bearing
μ= Coefficient of friction - concrete & soil (sand)
c= Cohesion (clay)

$D_{water} := 0ft$ $\quad$ [✓] Check here if Groundwater is not present $\quad D_{neglect} := 3.25ft$

$\phi := 30deg$

$$K_p := \left(\tan\left(45 \cdot deg + \frac{\phi}{2}\right)\right)^2 = 3.00$$

$FOS_{lat} := 2.0$ $\quad \mu := 0.35$

$\gamma_{soil} := 120pcf$ $\quad c := 0 \cdot psf$ If c is unknown, use 0

$q_{brg\_allow} := 10000psf$ $\quad FOS_{coh} := 1.0$

3.0 LOADS:

Load combinations based on TIA-222-F (1.0D + 1.0W):

P = Unactored downward load from tnxTower (1.0D + 1.0W)
V = Unfactored shear from tnxTower (1.0W)
M = Unfactored tower moment from tnxTower (1.0D)

$P := 29 \cdot kip$

$V := 23 \cdot kip$

$M := 2512 \cdot kip \cdot ft$

ρ'_{conc_pier} = Density of concrete pier considering ground water depth
ρ'_{conc_ftg} = Density of concrete footing considering ground water depth
WT_{ftg} = Weight of footing, including piers

$$\rho'_{conc\_pier} = 150 \cdot pcf$$

$$\rho'_{conc\_ftg} = 150 \cdot pcf$$

$$WT_{ftg} := \rho_{conc} \cdot A_{pier} \cdot D_{ext} + \rho'_{conc\_pier} \cdot A_{pier} \cdot D_{soil} + \rho'_{conc\_ftg} \cdot V_{ftg} = 285.96 \cdot kip$$

4.0 ANALYSIS

4.1 BEARING CHECK:

Considering 1.0D+1.0W TIA-222-F Load Combination:

M_{over} = Overturning moment due to wind
P_{tot} = Axial dead load, self-weight of footing, and weight of soil directly above footing
e_{brg} = Eccentricity in the direction of the wind (L_{ftg})
q_{min} = Minimum bearing pressure due to applied loads
q_{max} = Maximum bearing pressure due to applied loads

$$M_{over} := M + V \cdot (D_{pier} + D_{ftg}) = 2638.5 \cdot kip \cdot ft$$

$$P_{tot} := P + \left[WT_{ftg} + \gamma'_{soil} \cdot (A_{ftg} - A_{pier}) D_{soil}\right] = 448.88 \cdot kip$$

$$e_{brg} := \frac{M_{over}}{P_{tot}} = 5.88\,ft \qquad \frac{L_{ftg}}{6} = 4.08\,ft \qquad \frac{L_{ftg}}{2} = 12.25\,ft$$

$$q_{min} := if\left(e_{brg} \le \frac{L_{ftg}}{6}, \frac{P_{tot}}{L_{ftg} \cdot B_{ftg}} - \frac{6 \cdot M_{over}}{B_{ftg} \cdot L_{ftg}^2}, if\left(e_{brg} \ge \frac{L_{ftg}}{2}, \text{"NO GOOD"}, 0 \cdot psf\right)\right) = 0 \cdot psf$$

$$q_{max} := if\left[e_{brg} \le \frac{L_{ftg}}{6}, \frac{P_{tot}}{L_{ftg} \cdot B_{ftg}} + \frac{6 \cdot M_{over}}{B_{ftg} \cdot L_{ftg}^2}, if\left[e_{brg} \ge \frac{L_{ftg}}{2}, \text{"NO GOOD"}, \frac{2 \cdot P_{tot}}{3 \cdot B_{ftg} \cdot \left(\frac{L_{ftg}}{2} - e_{brg}\right)}\right]\right] = 1917 \cdot psf$$

$$q_{brg\_allow} = 10000 \cdot psf$$

$$if(1.10 \cdot q_{brg\_allow} > q_{max}, \text{"OK"}, \text{"NO GOOD"}) = \text{"OK"}$$

$$\frac{q_{max}}{q_{brg\_allow}} = 19.2 \cdot \%$$

4.2 OVERTURNING CHECK:

Considering 1.0D+1.0W Load Combination with Factor of Safety (FS) = 1.5 per TIA-222-F, Sect. 7.2.4.5:

L_{brg} = Length of soil bearing area due to applied factored loads

γ'_{soil} = Density of soil above top of footing considering ground water depth

WT_{soil1} = Weight of soil centered over centroid of footing (A)

WT_{soil2} = Weight of soil extending beyond sides of the half of the footing in uplift "tension" (B)

WT_{soil3} = Weight of soil extending beyond back edge of footing (C + D)

V_{coh} = Vertical shear resistance due to soil cohesion above "non-bearing" portion of footing

M_{resist} = Resisting moment due to axial dead load, footing self-weight and weight of soil above footing and extending beyond top of footing at $\phi°$

$e_{OT} := e_{brg} = 5.88\,ft$

$L_{ftg} = 24.5\,ft$

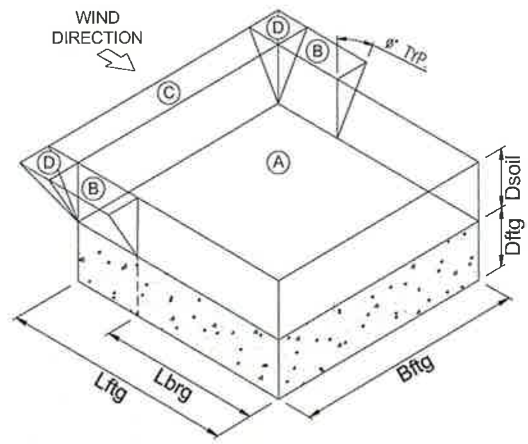
$\frac{L_{ftg}}{6} = 4.08\,ft$

$$L_{brg} := \begin{cases} L_{ftg} & \text{if } e_{OT} < \frac{L_{ftg}}{6} \\ 3\cdot\left(\frac{L_{ftg}}{2} - e_{OT}\right) & \text{otherwise} \end{cases} = 19.12\cdot ft$$

$q_{min} = 0\cdot psf$

$q_{max} = 1917\cdot psf$

$\gamma'_{soil} = 120\cdot pcf$

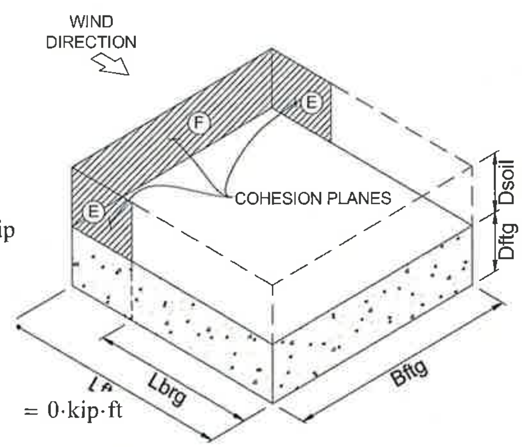


$$WT_{soil_1} := \gamma'_{soil}\cdot\left(A_{ftg} - A_{pier}\right)D_{soil} = 133.92\cdot kip$$

A

$$WT_{soil_2} := \begin{cases} 0\cdot kip & \text{if } \left(L_{ftg} - L_{brg}\right) \le 0\cdot ft \\ \gamma'_{soil}\cdot\left[\left(L_{ftg} - L_{brg}\right)\cdot D_{soil}^{2}\cdot\tan(\phi)\right] & \text{otherwise} \end{cases} = 1.49\cdot kip$$

B x 2



$$WT_{soil_3} := \begin{cases} 0\cdot kip & \text{if } \left(L_{ftg} - L_{brg}\right) \le 0\cdot ft \\ \gamma'_{soil}\cdot\left(\frac{B_{ftg}}{2}\cdot D_{soil}^{2}\cdot\tan(\phi) + \frac{2}{3}\cdot D_{soil}^{3}\cdot\tan(\phi)^{2}\right) & \text{otherwise} \end{cases} = 3.61\cdot kip$$

C D x 2

$$V_{coh} := \begin{cases} 0\cdot kip\cdot ft & \text{if } \left(L_{ftg} - L_{brg}\right) \le 0\cdot ft \\ \left(\frac{c}{2\cdot FOS_{coh}}\right)\cdot\left[2\cdot\left(L_{ftg} - L_{brg}\right)\cdot\left(L_{ftg} - \frac{L_{brg}}{2}\right) + B_{ftg}\cdot L_{ftg}\right]\cdot D_{soil} & \text{otherwise} \end{cases} = 0\cdot kip\cdot ft$$

E x 2 F

$$M_{resist} := \left[P + \left(WT_{soil_1} + WT_{ftg}\right)\right]\cdot\frac{L_{ftg}}{2} + \left(WT_{soil_2}\right)\cdot\left(\frac{L_{ftg} + L_{brg}}{2}\right) + \left(WT_{soil_3}\right)\cdot\left(L_{ftg} + \frac{D_{soil}\cdot\tan(\phi)}{3}\right) + V_{coh} = 5621\cdot kip\cdot ft$$

$M_{over} = 2638.5\cdot kip\cdot ft$

$\frac{M_{resist}}{M_{over}} = 2.13$

$$\text{if}\left(1.10\cdot\frac{M_{resist}}{M_{over}} > 1.5, \text{"OK"}, \text{"NO GOOD"}\right) = \text{"OK"}$$

$$\frac{1.5\cdot M_{over}}{M_{resist}} = 70.4\cdot\%$$

4.3 SLIDING RESISTANCE CHECK:

Considering 1.0D+1.0W Load Combination with Factor of Safety (FS) = 1.5 per TIA-222-F:

q_{lat_allow} = Allowable lateral bearing capacity of soil

$R_{s\_lat\_brg}$= Nominal soil resistance to bearing

$R_{s\_lat\_sliding}$= Nominal soil resistance to sliding

R_s= Total nominal soil resistance to resist sliding (bearing + sliding)

R_{s_allow}= Allowable strength of soil to resist sliding

$$q_{lat\_allow\_pier} := \frac{K_p \cdot \gamma'_{soil\_pier}}{FOS_{lat}} = 180 \cdot \frac{psf}{ft}$$

$$q_{lat\_allow\_ftg} := \frac{K_p \cdot \gamma'_{soil\_ftg}}{FOS_{lat}} = 180 \cdot \frac{psf}{ft}$$

$$R_{s\_lat\_brg} := q_{lat\_allow\_pier} \cdot \left(\frac{D_{soil}^{2} \cdot L_{pier}}{2}\right) + q_{lat\_allow\_ftg} \cdot \left[\left(D_{soil} + \frac{D_{ftg}}{2}\right) \cdot D_{ftg} \cdot B_{ftg}\right] + \left(2 \cdot c \cdot \sqrt{K_p}\right) \cdot \left(D_{soil} \cdot L_{pier} + D_{ftg} \cdot B_{ftg}\right) = 48.6 \cdot kip$$

Lateral Bearing - Soil Pressure (sand) | Lateral Bearing - Cohesion (clay)

$$R_{s\_lat\_sliding} := (\mu) \cdot \left(P + WT_{soil_1}\right) + c \cdot \left[A_{ftg} + 2 \cdot \left(D_{ftg} \cdot L_{ftg}\right)\right] = 57 \cdot kip$$

Lateral Sliding Friction (sand) | Lateral Sliding Cohesion (clay)

$$R_{s\_allow} := R_{s\_lat\_brg} + R_{s\_lat\_sliding} = 105.67 \cdot kip$$

$$V = 23 \cdot kip$$

$$\frac{R_{s\_allow}}{V} = 4.59$$

$$\text{if}\left(1.10 \cdot \frac{R_{s\_allow}}{V} > 1.5, \text{"OK"}, \text{"NO GOOD"}\right) = \text{"OK"}$$

$$\frac{1.5 \cdot V}{R_{s\_allow}} = 32.6 \cdot \%$$

5.0 CONCRETE DESIGN (ACI 318-05):

Load Combinations from TIA-222-F (1.0D + 1.0W) factored to meet ACI 318-05 load combination (1.2D + 1.6W):

d = Distance from extreme compression fiber to center of longitudinal reinforcement
No_rebar = Number of longitudinal reinforcement at steel depth "d" in direction of wind
Size_rebar = (#) size of longitudinal reinforcement at steel depth "d" in direction of wind
dia_s = Diameter of single longitudinal reinforcement (in^2) at steel depth "d" in direction of wind
A_s = Total area of longitudinal reinforcement at steel depth "d" in direction of wind
f_y = Specified yield strength of reinforcement (psi)
f_c = Specified compressive strength of concrete (psi)
M_{over}= Overturning moment due to wind
P_{tot}= Axial dead load, self-weight of footing, and weight of soil directly above footing
e_{ult}= Eccentricity in the direction of the wind (L_{ftg}) caused by ultimate loads
L_{brg_ult} = Length of soil bearing area due to applied factored loads
q_{u_min}= Minimum bearing pressure due to factored loads
q_{u_max}= Maximum bearing pressure due to factored loads

$d := 33 \cdot in$

$No\_rebar := 40$

$Size\_rebar := 8$

$dia_s = 1.000 \cdot in \qquad A_s := No\_rebar\left(dia_s\right)^2 \cdot \frac{\pi}{4} = 31.42 \cdot in^2$

$f_y := 60000 \cdot psi$

$f_c := 4000 \cdot psi$

$M_{u\_over} := 1.6 \cdot M + 1.6 \cdot V \cdot \left(D_{pier} + D_{ftg}\right) = 4222 \cdot kip \cdot ft \qquad 1.6 \cdot M_{over} = 4222 \cdot kip \cdot ft$

$P_{u\_tot} := 1.2 \cdot P + 1.2 \cdot \left[WT_{ftg} + \gamma'_{soil} \cdot \left(A_{ftg} - A_{pier}\right) D_{soil}\right] = 539 \cdot kip \qquad 1.2 \cdot P_{tot} = 539 \cdot kip$

$P_{ult} := 1.2 \cdot P = 35 \cdot kip$

$e_{ult} := \frac{M_{u\_over}}{P_{u\_tot}} = 7.84\,ft \qquad \frac{L_{ftg}}{6} = 4.08\,ft \qquad \frac{L_{ftg}}{2} = 12.25\,ft$

$$L_{brg\_ult} := \begin{cases} L_{ftg} & \text{if } e_{ult} < \frac{L_{ftg}}{6} \\ 3 \cdot \left(\frac{L_{ftg}}{2} - e_{ult}\right) & \text{otherwise} \end{cases} = 13.24\,ft$$

$$q_{u\_min} := if\left(e_{ult} \le \frac{L_{ftg}}{6}, \frac{P_{u\_tot}}{L_{ftg} \cdot B_{ftg}} - \frac{6 \cdot M_{u\_over}}{B_{ftg} \cdot L_{ftg}^2}, if\left(e_{ult} \ge \frac{L_{ftg}}{2}, \text{"NO GOOD"}, 0 \cdot psf\right)\right) = 0 \cdot psf$$

$$q_{u\_max} := if\left[e_{ult} \le \frac{L_{ftg}}{6}, \frac{P_{u\_tot}}{L_{ftg} \cdot B_{ftg}} + \frac{6 \cdot M_{u\_over}}{B_{ftg} \cdot L_{ftg}^2}, if\left[e_{ult} \ge \frac{L_{ftg}}{2}, \text{"NO GOOD"}, \frac{2 \cdot P_{u\_tot}}{3 \cdot B_{ftg} \cdot \left(\frac{L_{ftg}}{2} - e_{ult}\right)}\right]\right] = 3322 \cdot psf$$

5.1 DESIGN FOR FLEXURAL (ONE-WAY) SHEAR:

Load Combinations from TIA-222-F (1.0D + 1.0W) factored to meet ACI 318-05 load combination (1.2D + 1.6W):

ϕ_v= Shear resistance factor (ACI 318-05, Sect. 9.3.1)
x_1= Distance from the edge of the footing to the critical section for flexural shear
q_{x1}= Bearing pressure at critical section for flexural shear due to factored loads
V_{u1}= Ultimate factored flexural (one-way) shear force due to factored loads
V_{c1}= Nominal strength of concrete to resist flexural (one-way) shear (ACI 318-05, Section 11.3.1.1)
$\phi_v V_{c1}$= Design strength of concrete to resist flexural (one-way) shear

$$\phi_v := \mathbf{0.75}$$

$$x_1 := \frac{L_{ftg}}{2} - \frac{L_{pier}}{2} - d = 6.25\cdot ft$$

$$q_{x1} := \frac{(q_{u\_max} - q_{u\_min})\cdot(L_{brg\_ult} - x_1)}{L_{brg\_ult}} + q_{u\_min} = 1753\cdot psf$$

$$V_{u1} := \begin{cases} \frac{q_{u\_max}\cdot B_{ftg}\cdot L_{brg\_ult}}{2} & \text{if } L_{brg\_ult} < x_1 \\ \left(\frac{q_{u\_max} + q_{x1}}{2}\right)\cdot B_{ftg}\cdot x_1 & \text{otherwise} \end{cases} = 389\cdot kip$$

$$V_{c1} := 2\cdot d\cdot B_{ftg}\cdot\sqrt{f_c\cdot psi} = 1227\cdot kip$$

$$\phi_v\cdot V_{c1} = 920\cdot kip$$

if$(1.10\cdot\phi_v\cdot V_{c1} > V_{u1}$,"OK" ,"NO GOOD"$)$ = "OK"

$$\frac{V_{u1}}{\phi_v\cdot V_{c1}} = 42.2\cdot\%$$

5.2 DESIGN FOR PUNCHING (TWO-WAY) SHEAR:

Load Combinations from TIA-222-F (1.0D + 1.0W) factored to meet ACI 318-05 load combination (1.2D + 1.6W):

ϕ_v= Shear resistance factor (ACI 318-05, Sect. 9.3.2.3 -see flexural (one-way) shear section above for value)
x_{2A}= Distance from the edge of the footing to the critical section for punching shear corresponding to the smaller bearing pressure
x_{2B}= Distance from the edge of the footing to the critical section for punching shear corresponding to the larger bearing pressure
q_{x2A}= Smaller bearing pressure at critical section for punching shear due to factored loads
q_{x2B}= Larger bearing pressure at critical section for punching shear due to factored loads
V_{u2}= Ultimate factored punching (two-way) shear force due to factored loads
b_0 = Perimeter of critical section for punching shear
V_{c2}= Nominal strength of concrete to resist punching (two-way) shear (ACI 318-05, Section 11.12.2)
$\phi_v V_{c2}$= Design strength of concrete to resist punching (two-way) shear

$$x_{2A} := \frac{L_{ftg}}{2} + \frac{L_{pier} + d}{2} = 16.87\cdot ft$$

$$L_{brg\_ult} = 13.24\cdot ft$$

$$x_{2B} := \frac{L_{ftg}}{2} - \frac{L_{pier} + d}{2} = 7.63\cdot ft$$

$$q_{x2A} := \left(\frac{q_{max}}{L_{brg\_ult}}\right)\cdot(L_{brg\_ult} - x_{2A}) = -527\cdot psf$$

$$q_{x2B} := \left(\frac{q_{max}}{L_{brg\_ult}}\right)\cdot(L_{brg\_ult} - x_{2B}) = 813\cdot psf$$

$$V_{u2} := \begin{cases} \text{if } R = 1 \\ \quad \begin{cases} P_{ult} - \left(\dfrac{q_{x2A} + q_{x2B}}{2}\right)\cdot(L_{pier} + d)^2 & \text{if } L_{brg\_ult} \ge x_{2A} \\ P_{ult} & \text{otherwise} \end{cases} \\ \text{if } R \ne 1 \\ \quad \begin{cases} P_{ult} - \left(\dfrac{q_{x2A} + q_{x2B}}{2}\right)\cdot(L_{pier} + d)^2\cdot\left(\dfrac{\pi}{4}\right) & \text{if } L_{brg\_ult} \ge x_{2A} \\ P_{ult} & \text{otherwise} \end{cases} \end{cases} = 35\cdot kip$$

$$b_0 := \begin{cases} 4\cdot(L_{pier} + d) & \text{if } R = 1 \\ \pi\cdot(L_{pier} + d) & \text{otherwise} \end{cases} = 37\,ft$$

$$V_{c2} := 4\cdot d\cdot b_0\cdot\sqrt{f_c\cdot psi} = 3707\cdot kip$$

$$\phi_v\cdot V_{c2} = 2780\cdot kip$$

if$(1.10\cdot\phi_v\cdot V_{c2} > V_{u2}$, "OK" , "NO GOOD" $)$ = "OK"

$$\frac{V_{u2}}{\phi_v\cdot V_{c2}} = 1.3\cdot\%$$

5.3 DESIGN FOR FLEXURE:

Load Combinations from TIA-222-F (1.0D + 1.0W) factored to meet ACI 318-05 load combination (1.2D + 1.6W):

x_f=	Distance from the edge of the footing to the critical section for flexure corresponding to the smaller bearing pressure
q_f=	Smaller bearing pressure at critical section for flexure due to factored loads
M_u=	Ultimate factored moment on footing pad due to factored loads
ρ =	Ratio of A_s to bd
β_1 =	Factor relating depth of equivalent rectangular compressive stress block to neutral axis depth (ACI 318-05, Sect. 10.2.7.3)
ϕ_f=	Flexural resistance factor (ACI 318-05, Sect. 9.3.2.3)
M_n=	Nominal strength of concrete footing pad to resist flexure
$\phi_f M_n$=	Design strength of concrete footing pad to resist flexure
A_s =	Total area of longitudinal reinforcement at steel depth "d" in direction of wind
A_{st} =	Total area of longitudinal reinforcement in direction of wind (assumes A_s at top and bottom of footing pad)
A_{st_min} =	Minimum area of longitudinal reinforcement required in direction of wind (ACI 318-05, Sect. 7.12.2.1)

$$x_f := \frac{L_{ftg}}{2} - \frac{L_{pier}}{2} = 9\,ft$$

$$q_f := \frac{(q_{u\_max} - q_{u\_min})\cdot(L_{brg\_ult} - x_f)}{L_{brg\_ult}} + q_{min} = 1063\cdot psf$$

$$M_u := \begin{cases} \left(\frac{q_{u\_max}\cdot B_{ftg}\cdot L_{brg\_ult}}{2}\right)\cdot\left(x_f - \frac{L_{brg\_ult}}{3}\right) & \text{if } L_{brg\_ult} < x_f \\ \frac{(q_f\cdot B_{ftg})\cdot x_f^2}{2} + \frac{(q_{u\_max}\cdot B_{ftg} - q_f\cdot B_{ftg})\cdot(x_f)^2}{3} & \text{otherwise} \end{cases} = 2549\cdot kip\cdot ft$$

$$\rho := \frac{A_s}{B_{ftg}\cdot d} = 0.0032$$

$$\beta_1 = 0.85$$

$$\phi_f = 0.9$$

$$a := \frac{A_s\cdot f_y}{0.85 f_c\cdot B_{ftg}} = 1.89\cdot in$$

$$M_n := A_s\cdot f_y\cdot\left(d - \frac{a}{2}\right) = 5036\cdot kip\cdot ft$$

$$\phi_f\cdot M_n = 4532\cdot kip\cdot ft$$

$$\text{if}(1.10\cdot\phi_f\cdot M_n > M_u, \text{"OK"}, \text{"NO GOOD"}) = \text{"OK"}$$

$$\frac{M_u}{\phi_f\cdot M_n} = 56.2\cdot\%$$

5.3.1 FLEXURAL MINIMUM STEEL CHECK:

$$A_s = 31.42\cdot in^2$$

$$A_{s\_min} := \begin{cases} 0\cdot in^2 & \text{if } \phi_f\cdot M_n \ge \frac{4}{3}\cdot M_u \\ \text{otherwise} & \begin{cases} \frac{200\cdot B_{ftg}\cdot d}{\left(\frac{f_y}{psi}\right)} & \text{if } f_c \le 4444\cdot psi \\ \frac{3\cdot\sqrt{f_c\cdot psi}\cdot B_{ftg}\cdot d}{(f_y)} & \text{if } f_c > 4444\cdot psi \end{cases} \end{cases} = 0.00\cdot in^2$$

$$\text{if}(A_s > A_{s\_min}, \text{"OK"}, \text{"NO GOOD"}) = \text{"OK"}$$

5.3.2 TEMPERATURE MINIMUM STEEL CHECK:

$$A_{st} := 2\cdot A_s = 62.83\cdot in^2$$

$$A_{st\_min} := 0.0018\cdot B_{ftg}\cdot D_{ftg} = 19.05\cdot in^2$$

$$\text{if}(A_{st} > A_{st\_min}, \text{"OK"}, \text{"NO GOOD"}) = \text{"OK"}$$

Project: BU876383
Site: Clinton/Anderson's Property

MP - SQUARE PIER AND PAD - INDIVIDUAL FOUNDATION ANALYSIS
TIA-222-F

Version 2.1
Rev. Date: 10.01.2013

Designed by: JF
Checked by :EP
Date: 1.16.14

1.0 FOUNDATION GEOMETRY & MATERIALS:

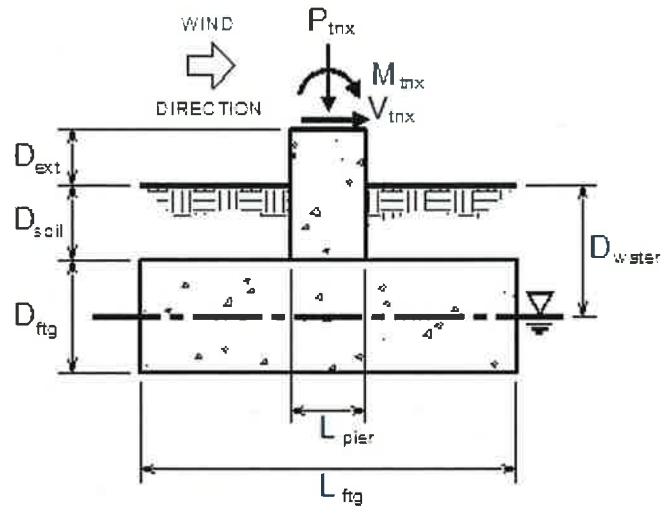
$L_{ftg} = 24.5\ ft$ $B_{ftg} = 24.5\ ft$ $L_{pier} = 6.5\ ft$

$D_{ftg} = 3\ ft$ $D_{soil} = 2\ ft$ $D_{ext} = 0.5\ ft$

Pier = "Square"

$d = 33 \cdot in$ No_rebar = 40 Size_rebar = 8

$f_y = 60000 \cdot psi$ $f_c = 4000 \cdot psi$



SECTION

2.0 SOIL PARAMETERS:

$\phi = 30 \cdot deg$ $K_p = 3.00$

$\gamma_{soil} = 120 \cdot pcf$ $\mu = 0.35$ $c = 0 \cdot psf$

Groundwater = "Not Present"

$q_{brg\_allow} = 10000 \cdot psf$

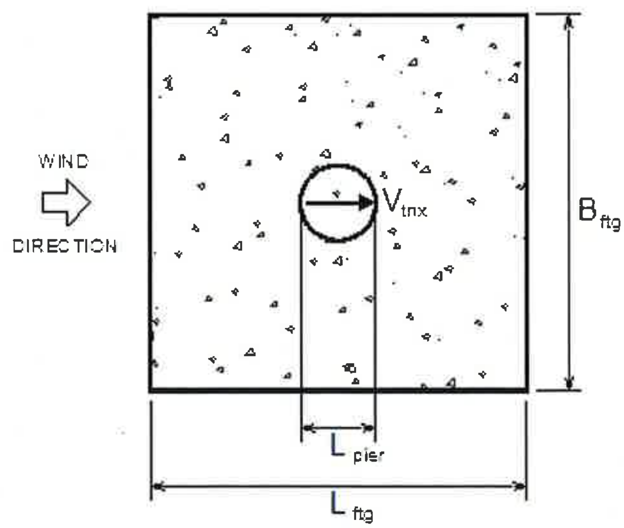
3.0 LOADS:

Load combinations based on TIA-222-F (1.0D + 1.0W):

$P = 29 \cdot kip$

$V = 23 \cdot kip$

$M = 2512 \cdot kip \cdot ft$



PLAN

4.0 ANALYSIS RESULTS:

		APPLIED	ALLOWABLE	CHECK
4.1	BEARING:	$B_{app} = 1917 \cdot psf$	$B_{cap} = 10000 \cdot psf$	$B\% = 19.2 \cdot \%$
4.2	OVERTURNING:	$M_{app} = 2639 \cdot kip \cdot ft$	$M_{cap} = 3747 \cdot kip \cdot ft$	$M\% = 70.4 \cdot \%$
4.3	SLIDING:	$V_{app} = 23 \cdot kip$	$V_{cap} = 70 \cdot kip$	$V\% = 32.6 \cdot \%$
5.1	FLEXURAL (ONE-WAY) SHEAR:	$V1_{app} = 389 \cdot kip$	$V1_{cap} = 920 \cdot kip$	$V1\% = 42.2 \cdot \%$
5.2	PUNCHING (TWO-WAY) SHEAR:	$V2_{app} = 35 \cdot kip$	$V2_{cap} = 2780 \cdot kip$	$V2\% = 1.3 \cdot \%$
5.3	PAD FLEXURE:	$F_{app} = 2549 \cdot kip \cdot ft$	$F_{cap} = 4532 \cdot kip \cdot ft$	$F\% = 56.2 \cdot \%$