

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

February 27, 2014

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

Re: **Notice of Exempt Modification – Facility Modification
691 Oxford Road, Oxford, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the 147-foot level of the existing 150-foot tower at 691 Oxford Road in Oxford, Connecticut (the “Property”). The tower is owned by Crown Castle. The Council approved Cellco’s use of the existing tower in 2007. Cellco now intends to modify its facility by adding three (3) model 742 213V01, 2100 MHz antennas, at the same 147-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 located inside the monopole tower. Included in Attachment 1 are specifications for Cellco’s additional 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 George R. Temple, First Selectman of the Town of Oxford. A copy of this letter is also being sent to Don and Dave Farm Realty LLC, the owner 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).



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February 27, 2014
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1. The proposed modifications will not result in an increase in the height of the existing tower. The new antennas and RRHs will be located at the 147-foot level on the 150-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 worst-case 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 its foundation can support Cellco's proposed 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:

George R. Temple, Oxford First Selectman
Don and Dave Farm Realty LLC
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.

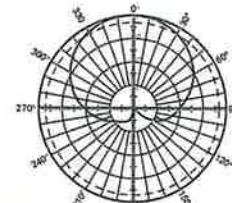
- 0-6° downtilt range.
- UV resistant pulltruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accommodate future 3G / UMTS applications.

General specifications:

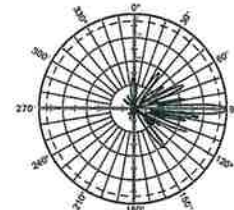
Frequency range	1710–2200 MHz	
VSWR	< 1.5:1	
Impedance	50 ohms	
Intermodulation (2x20w)	IM3: <-150 dBc	
Polarization	+45° and -45°	
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)	
Maximum input power	300 watts per input (at 50°C)	
Electrical downtilt continuously adjustable	0–6 degrees	
Connector	2 x 7-16 DIN female	
Isolation	>30 dB	
Cross polar ratio		
Main direction 0°	25 dB (typical)	
Sector ±60°	>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	at 93 mph (150kph)	
Front/Side/Rear	115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N)	
Mounting category	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



Horizontal pattern
±45°- polarization



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



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.

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

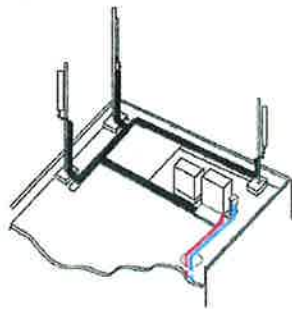
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent 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

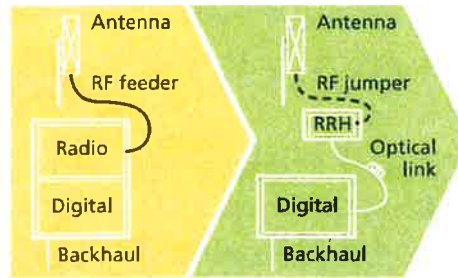
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation 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.



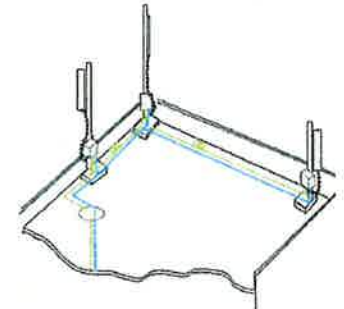
Macro

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



RRH for space-constrained cell sites



Distributed

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

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170 mm (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

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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.

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

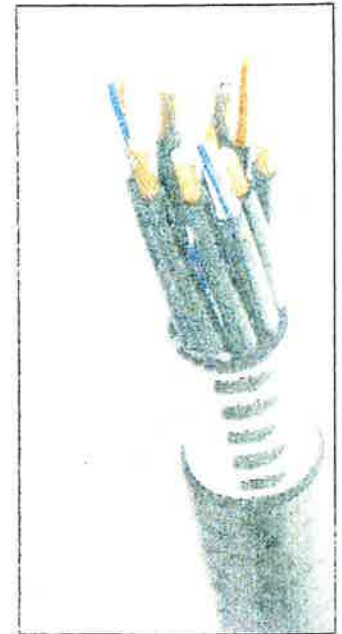


Figure 1: HYBRIFLEX Series

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 (0.265)
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-95-652, UL Type XHHV-2, UL 44, UL-LS Limited Smoke, UL VW-1, IEEE-383 (1974), IEEE 1202/FT4, RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to 149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to 149)

* This data is provisional and subject to change

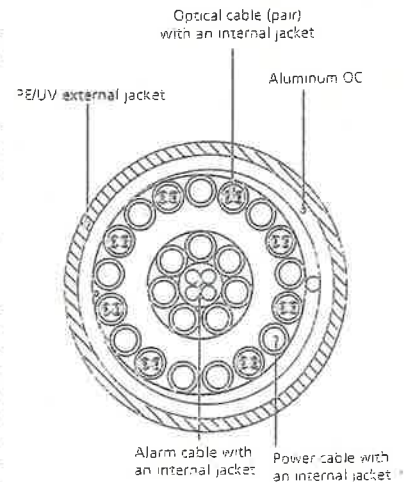


Figure 3: Construction Detail

All information contained in the present datasheet is subject to confirmation at time of ordering

ATTACHMENT 2

Site Name: Oxford N		General	Power	Density				
Tower Height: Verizon @147ft								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*AT&T UMTS	2	565	137	0.0216	880	0.5867	3.69%	
*AT&T UMTS	2	875	137	0.0335	1900	1.0000	3.35%	
*AT&T GSM	1	538	137	0.0103	880	0.5867	1.76%	
*AT&T GSM	4	934	137	0.0716	1900	1.0000	7.16%	
*AT&T LTE	1	1375	137	0.0263	734	0.4893	5.38%	
Verizon	7	411	147	0.0479	1970	1.0000	4.79%	
Verizon	9	388	147	0.0581	869	0.5793	10.03%	
Verizon	1	2196	147	0.0365	2145	1.0000	3.65%	
Verizon	1	806	147	0.0134	698	0.4653	2.88%	42.69%
* Source: Siting Council								

ATTACHMENT 3

Date: **January 13, 2014**

Veronica Harris
Crown Castle
1200 McArthur Blvd
Mahwah, NJ 07430



Aero Solutions, LLC
5500 Flatirons Parkway, Suite 100
Boulder, CO 80301
(720) 304-6882

Subject: Structural Analysis Report

Carrier Designation: Verizon Wireless Co-Locate
Carrier Site Number: NG72772
Carrier Site Name: Oxford

Crown Castle Designation: Crown Castle BU Number: 873645
Crown Castle Site Name: Oxford
Crown Castle JDE Job Number: 255809
Crown Castle Work Order Number: 697709
Crown Castle Application Number: 210922 Rev. 4

Engineering Firm Designation: Aero Solutions, LLC Project Number: 003-14-0037

Site Data: 691 Oxford RD, OXFORD, New Haven County, CT
Latitude 41° 26' 49.51", Longitude -73° 9' 8.316"
150 Foot - Monopole Tower

Dear Veronica Harris,

Aero Solutions, LLC 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 608191, in accordance with application 210922, revision 4.

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:

LC7: Existing + Reserved + 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 with 2009 amendment 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 Aero Solutions, LLC 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: Joseph R. Sullivan, E.I.

Respectfully submitted by:

Shraddha Dharia, P.E.
Structural Engineer
CT PE#: PEN0028187
Expires: 1/31/2014



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1) INTRODUCTION

This tower is a 150 ft Monopole tower designed by SUMMIT in August of 2001. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

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
149.0	149.0	3	alcatel lucent	RRH2X40-AWS			
		1	tower mounts	Side Arm Mount [SO 102-3)			
147.0	147.0	3	kathrein	742 213 w/ Mount Pipe	1	1-5/8"	
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

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
147.0	147.0	3	antel	BXA-171063-12BF w/ Mount Pipe	12	1-5/8"	1
		3	antel	BXA-70063-6CF-EDIN-0 w/ Mount Pipe			
		6	antel	LPA-80063/6CF w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
		1	tower mounts	Platform Mount [LP 304-1]			
136.0	137.0	4	andrew	SBNH-1D6565C w/ Mount Pipe	12	1-5/8"	1
		3	communication components inc.	DTMABP7819VG12A	2	3/4"	
		3	ericsson	RRUS-11	1	3/8"	
		3	ericsson	RRUS-11			2
		2	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			1
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP21901			
	1	raycap	DC6-48-60-18-8F				
136.0	1	tower mounts	Platform Mount [LP-1201]				

- Notes:
 1) Existing Equipment
 2) Reserved Equipment

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)
147	147	12	DAPA	48000		
137	137	12	DAPA	48000		
127	127	12	DAPA	48000		
117	117	12	DAPA	48000		
107	107	12	DAPA	48000		
97	97	12	DAPA	48000		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Criscuolo Shepard Associates	2134249	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Summit/PJF	1339630	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit/PJF	1339644	CCISITES
4-TOWER STRUCTURAL ANALYSIS REPORTS	PJF	3152876	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. Aero Solutions, LLC 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 - 110.75	Pole	TP31.38x24x0.2188	1	-6.97	1097.87	60.6	Pass
L2	110.75 - 74.75	Pole	TP37.711x30.1903x0.25	2	-11.32	1508.49	90.1	Pass
L3	74.75 - 39.5	Pole	TP43.839x36.3179x0.3125	3	-17.37	2191.11	89.4	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L4	39.5 - 0	Pole	TP50.64x42.1799x0.375	4	-27.83	3110.28	85.3	Pass
							Summary	
						Pole (L2)	90.1	Pass
						Rating =	90.1	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	71.1	Pass
1	Base Plate	0	65.4	Pass
1	Base Foundation	0	54.6	Pass
1	Base Foundation Soil Interaction	0	64.7	Pass

Structure Rating (max from all components) =	90.1%
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Notes:

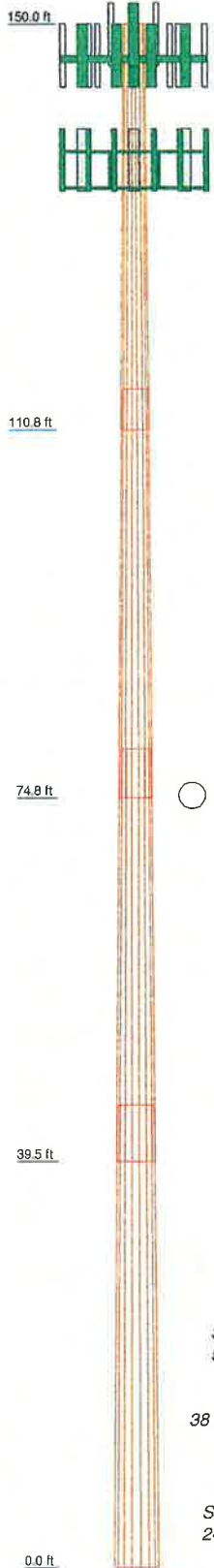
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

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

APPENDIX A
TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	39.2500	18	0.2188	4.0000	24.0000	31.3800	A607-65	2.5
2	40.0000	18	0.2500	4.7500	30.1903	37.7110	A607-65	3.6
3	40.0000	18	0.3125	5.5000	36.3179	43.8390	A607-65	5.4
4	45.0000	18	0.3750	42.1799	50.6400		A607-65	8.4
								19.9



DESIGNED APPURTENANCE LOADING

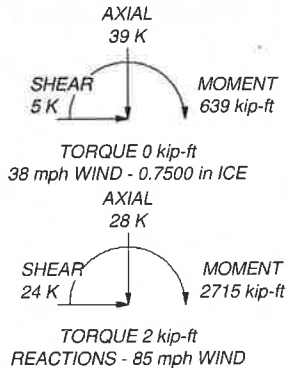
TYPE	ELEVATION	TYPE	ELEVATION
RRH2X40-AWS	149	742 213 w/ Mount Pipe	147
RRH2X40-AWS	149	DB-T1-6Z-8AB-0Z	147
RRH2X40-AWS	149	Platform Mount [LP 304-1]	147
Pipe Mount 2 x 4'	149	(2) SBNH-1D6565C w/ Mount Pipe	136
Pipe Mount 2 x 4'	149	DTMABP7819VG12A	136
Pipe Mount 2 x 4'	149	RRUS-11	136
Side Arm Mount [SO 102-3]	149	7770.00 w/ Mount Pipe	136
BXA-171063-12BF w/ Mount Pipe	147	(2) LGP21901	136
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	147	DC6-48-60-18-8F	136
(2) LPA-80063/6CF w/ Mount Pipe	147	(2) SBNH-1D6565C w/ Mount Pipe	136
(2) FD9R6004/2C-3L	147	DTMABP7819VG12A	136
BXA-171063-12BF w/ Mount Pipe	147	RRUS-11	136
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	147	7770.00 w/ Mount Pipe	136
(2) LPA-80063/6CF w/ Mount Pipe	147	(2) LGP21901	136
(2) FD9R6004/2C-3L	147	DTMABP7819VG12A	136
BXA-171063-12BF w/ Mount Pipe	147	RRUS-11	136
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	147	(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	136
(2) LPA-80063/6CF w/ Mount Pipe	147	7770.00 w/ Mount Pipe	136
(2) FD9R6004/2C-3L	147	(2) LGP21901	136
742 213 w/ Mount Pipe	147	RRUS-11	136
742 213 w/ Mount Pipe	147	RRUS-11	136
		Platform Mount [LP-1201]	136

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in New Haven 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: 90.1%



Aero Solutions, LLC		Job: BU# 873645	
5500 Flatirons Parkway, Suite 100		Project: Existing 150' Monopole	
Boulder, CO 80301		Client: CCI	Drawn by: JRS
Phone: (720) 304-6882		Code: TIA/EIA-222-F	Date: 01/13/14
FAX: (720) 304-6883		Scale: NTS	Dwg No. E-1

Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

- 3) Tower is located in New Haven County, Connecticut.
- 4) Basic wind speed of 85 mph.
- 5) Nominal ice thickness of 0.7500 in.
- 6) Ice thickness is considered to increase with height.
- 7) Ice density of 56.00 pcf.
- 8) A wind speed of 38 mph is used in combination with ice.
- 9) Temperature drop of 50 °F.
- 10) Deflections calculated using a wind speed of 50 mph.
- 11) A non-linear (P-delta) analysis was used.
- 12) Pressures are calculated at each section.
- 13) Stress ratio used in pole design is 1.333.
- 14) 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	150.0000- 110.7500	39.2500	4.00	18	24.0000	31.3800	0.2188	0.8752	A607-65 (65 ksi)
L2	110.7500- 74.7500	40.0000	4.75	18	30.1903	37.7110	0.2500	1.0000	A607-65 (65 ksi)
L3	74.7500- 39.5000	40.0000	5.50	18	36.3179	43.8390	0.3125	1.2500	A607-65 (65 ksi)
L4	39.5000- 0.0000	45.0000		18	42.1799	50.6400	0.3750	1.5000	A607-65 (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	I/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	I/Q in ²	w in	w/t
L1	24.3702	16.5154	1180.0298	8.4423	12.1920	96.7872	2361.6124	8.2592	3.8389	17.545
	31.8641	21.6406	2654.8147	11.0622	15.9410	166.5396	5313.1226	10.8223	5.1378	23.482
L2	31.4197	23.7576	2690.6223	10.6288	15.3367	175.4372	5384.7850	11.8811	4.8735	19.494
	38.2928	29.7253	5270.1440	13.2987	19.1572	275.1001	10547.2226	14.8655	6.1971	24.789
L3	37.7851	35.7129	5849.2196	12.7819	18.4495	317.0394	11706.1358	17.8598	5.8420	18.694
	44.5153	43.1728	10333.6949	15.4519	22.2702	464.0142	20680.9871	21.5905	7.1657	22.93
L4	43.8805	49.7582	10986.4069	14.8407	21.4274	512.7279	21987.2700	24.8838	6.7637	18.036
	51.4212	59.8279	19097.3321	17.8441	25.7251	742.3612	38219.7930	29.9196	8.2526	22.007

Tower Elevation ft	Gusset Area (per face) ft ²	Gusset Thickness in	Gusset Grade	Adjust. Factor A _r	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150.0000- 110.7500				1	1	1		
L2 110.7500- 74.7500				1	1	1		
L3 74.7500- 39.5000				1	1	1		
L4 39.5000- 0.0000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight klf
AVA7-50(1-5/8)	A	No	Inside Pole	147.0000 - 8.0000	6	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
HJ7-50A(1-5/8")	A	No	Inside Pole	147.0000 - 8.0000	6	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
LCF158-50JA-A0(1 5/8")	B	No	Inside Pole	136.0000 - 8.0000	12	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
FB-L98B-002-75000(3/8")	B	No	Inside Pole	136.0000 - 8.0000	1	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
WR-VG86ST-BRD(3/4)	B	No	Inside Pole	136.0000 - 8.0000	2	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
2" Rigid Conduit	B	No	Inside Pole	136.0000 - 8.0000	1	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
HB158-1-08U8-S8J18(1-5/8)	A	No	Inside Pole	147.0000 - 8.0000	1	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00

Description	Face or Shield Leg	Allow Shield	Component Type	Placement ft	Total Number	C _{AA} A ft ² /ft	Weight klf
					1" Ice	0.0000	0.00
					2" Ice	0.0000	0.00
					4" Ice	0.0000	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section n	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	150.0000- 110.7500	A	0.000	0.000	0.000	0.000	0.43
		B	0.000	0.000	0.000	0.000	0.13
		C	0.000	0.000	0.000	0.000	0.00
L2	110.7500- 74.7500	A	0.000	0.000	0.000	0.000	0.42
		B	0.000	0.000	0.000	0.000	0.18
		C	0.000	0.000	0.000	0.000	0.00
L3	74.7500-39.5000	A	0.000	0.000	0.000	0.000	0.41
		B	0.000	0.000	0.000	0.000	0.18
		C	0.000	0.000	0.000	0.000	0.00
L4	39.5000-0.0000	A	0.000	0.000	0.000	0.000	0.37
		B	0.000	0.000	0.000	0.000	0.16
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section n	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	150.0000- 110.7500	A	0.884	0.000	0.000	0.000	0.000	0.43
		B		0.000	0.000	0.000	0.000	0.13
		C		0.000	0.000	0.000	0.000	0.00
L2	110.7500- 74.7500	A	0.849	0.000	0.000	0.000	0.000	0.42
		B		0.000	0.000	0.000	0.000	0.18
		C		0.000	0.000	0.000	0.000	0.00
L3	74.7500-39.5000	A	0.801	0.000	0.000	0.000	0.000	0.41
		B		0.000	0.000	0.000	0.000	0.18
		C		0.000	0.000	0.000	0.000	0.00
L4	39.5000-0.0000	A	0.750	0.000	0.000	0.000	0.000	0.37
		B		0.000	0.000	0.000	0.000	0.16
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP _x in	CP _z in	CP _x Ice in	CP _z Ice in
L1	150.0000- 110.7500	0.0000	0.0000	0.0000	0.0000
L2	110.7500-74.7500	0.0000	0.0000	0.0000	0.0000
L3	74.7500-39.5000	0.0000	0.0000	0.0000	0.0000
L4	39.5000-0.0000	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement		C_{AA}	C_{AA}	Weight
			Horz	Lateral				Front	Side	
			ft	ft		ft	ft ²	ft ²	K	

RRH2X40-AWS	A	From Face	1.5000	0.00	0.00	149.0000	No Ice	2.6033	2.0229	0.04
			0.00	0.00			1/2"	2.8398	2.2440	0.06
			0.00	0.00			Ice	3.0849	2.4738	0.08
							1" Ice	3.6011	2.9593	0.14
							2" Ice	4.7372	4.0339	0.30
						4" Ice				
RRH2X40-AWS	B	From Face	1.5000	0.00	0.00	149.0000	No Ice	2.6033	2.0229	0.04
			0.00	0.00			1/2"	2.8398	2.2440	0.06
			0.00	0.00			Ice	3.0849	2.4738	0.08
							1" Ice	3.6011	2.9593	0.14
							2" Ice	4.7372	4.0339	0.30
						4" Ice				
RRH2X40-AWS	C	From Face	1.5000	0.00	0.00	149.0000	No Ice	2.6033	2.0229	0.04
			0.00	0.00			1/2"	2.8398	2.2440	0.06
			0.00	0.00			Ice	3.0849	2.4738	0.08
							1" Ice	3.6011	2.9593	0.14
							2" Ice	4.7372	4.0339	0.30
						4" Ice				
Pipe Mount 2 x 4'	A	From Face	1.5000	0.00	0.00	149.0000	No Ice	0.8657	0.8657	0.01
			0.00	0.00			1/2"	1.1106	1.1106	0.02
			0.00	0.00			Ice	1.3648	1.3648	0.03
							1" Ice	1.9008	1.9008	0.06
							2" Ice	3.2278	3.2278	0.16
						4" Ice				
Pipe Mount 2 x 4'	B	From Face	1.5000	0.00	0.00	149.0000	No Ice	0.8657	0.8657	0.01
			0.00	0.00			1/2"	1.1106	1.1106	0.02
			0.00	0.00			Ice	1.3648	1.3648	0.03
							1" Ice	1.9008	1.9008	0.06
							2" Ice	3.2278	3.2278	0.16
						4" Ice				
Pipe Mount 2 x 4'	C	From Face	1.5000	0.00	0.00	149.0000	No Ice	0.8657	0.8657	0.01
			0.00	0.00			1/2"	1.1106	1.1106	0.02
			0.00	0.00			Ice	1.3648	1.3648	0.03
							1" Ice	1.9008	1.9008	0.06
							2" Ice	3.2278	3.2278	0.16
						4" Ice				
Side Arm Mount [SO 102-3)	C	None			0.00	149.0000	No Ice	3.0000	3.0000	0.08
							1/2"	3.4800	3.4800	0.11
							Ice	3.9600	3.9600	0.14
							1" Ice	4.9200	4.9200	0.20
							2" Ice	6.8400	6.8400	0.32
						4" Ice				
**										
BXA-171063-12BF w/ Mount Pipe	A	From Face	4.0000	0.00	0.00	147.0000	No Ice	4.9710	5.2283	0.04
			0.00	0.00			1/2"	5.5211	6.3892	0.09
			0.00	0.00			Ice	6.0361	7.2610	0.14
							1" Ice	7.0911	9.0462	0.27
							2" Ice	9.3593	12.8165	0.67
						4" Ice				
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	A	From Face	4.0000	0.00	0.00	147.0000	No Ice	7.9686	5.8008	0.04
			0.00	0.00			1/2"	8.6091	6.9529	0.10
			0.00	0.00			Ice	9.2158	7.8191	0.17
							1" Ice	10.4591	9.6015	0.34
							2" Ice	13.0655	13.3662	0.80
						4" Ice				
(2) LPA-80063/6CF w/ Mount Pipe	A	From Face	4.0000	0.00	0.00	147.0000	No Ice	10.3300	10.4304	0.05
			0.00	0.00			1/2"	10.8985	11.4788	0.14
			0.00	0.00			Ice	11.4735	12.4047	0.24
							1" Ice	12.6500	14.3104	0.46
							2" Ice	15.1084	18.3366	1.05
						4" Ice				
(2) FD9R6004/2C-3L	A	From Face	4.0000	0.00	0.00	147.0000	No Ice	0.3665	0.0846	0.00
			0.00	0.00			1/2"	0.4506	0.1362	0.01
			0.00	0.00			Ice	0.5433	0.1965	0.01

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} A _{Front}	C _{AA} A _{Side}	Weight	
			Horz	Lateral						Vert
			ft	ft						
BXA-171063-12BF w/ Mount Pipe	B	From Face	4.0000	0.00	0.00	147.0000	1" Ice	0.7546	0.3430	0.02
							2" Ice	1.2808	0.7396	0.06
							4" Ice			
							No Ice	4.9710	5.2283	0.04
							1/2" Ice	5.5211	6.3892	0.09
							Ice	6.0361	7.2610	0.14
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	B	From Face	4.0000	0.00	0.00	147.0000	1" Ice	7.0911	9.0462	0.27
							2" Ice	9.3593	12.8165	0.67
							4" Ice			
							No Ice	7.9686	5.8008	0.04
							1/2" Ice	8.6091	6.9529	0.10
							Ice	9.2158	7.8191	0.17
(2) LPA-80063/6CF w/ Mount Pipe	B	From Face	4.0000	0.00	0.00	147.0000	1" Ice	10.4591	9.6015	0.34
							2" Ice	13.0655	13.3662	0.80
							4" Ice			
							No Ice	10.3300	10.4304	0.05
							1/2" Ice	10.8985	11.4788	0.14
							Ice	11.4735	12.4047	0.24
(2) FD9R6004/2C-3L	B	From Face	4.0000	0.00	0.00	147.0000	1" Ice	12.6500	14.3104	0.46
							2" Ice	15.1084	18.3366	1.05
							4" Ice			
							No Ice	0.3665	0.0846	0.00
							1/2" Ice	0.4506	0.1362	0.01
							Ice	0.5433	0.1965	0.01
BXA-171063-12BF w/ Mount Pipe	C	From Face	4.0000	0.00	0.00	147.0000	1" Ice	0.7546	0.3430	0.02
							2" Ice	1.2808	0.7396	0.06
							4" Ice			
							No Ice	4.9710	5.2283	0.04
							1/2" Ice	5.5211	6.3892	0.09
							Ice	6.0361	7.2610	0.14
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	C	From Face	4.0000	0.00	0.00	147.0000	1" Ice	7.0911	9.0462	0.27
							2" Ice	9.3593	12.8165	0.67
							4" Ice			
							No Ice	7.9686	5.8008	0.04
							1/2" Ice	8.6091	6.9529	0.10
							Ice	9.2158	7.8191	0.17
(2) LPA-80063/6CF w/ Mount Pipe	C	From Face	4.0000	0.00	0.00	147.0000	1" Ice	10.4591	9.6015	0.34
							2" Ice	13.0655	13.3662	0.80
							4" Ice			
							No Ice	10.3300	10.4304	0.05
							1/2" Ice	10.8985	11.4788	0.14
							Ice	11.4735	12.4047	0.24
(2) FD9R6004/2C-3L	C	From Face	4.0000	0.00	0.00	147.0000	1" Ice	12.6500	14.3104	0.46
							2" Ice	15.1084	18.3366	1.05
							4" Ice			
							No Ice	0.3665	0.0846	0.00
							1/2" Ice	0.4506	0.1362	0.01
							Ice	0.5433	0.1965	0.01
742 213 w/ Mount Pipe	A	From Face	4.0000	0.00	0.00	147.0000	1" Ice	0.7546	0.3430	0.02
							2" Ice	1.2808	0.7396	0.06
							4" Ice			
							No Ice	5.3729	4.6203	0.05
							1/2" Ice	5.9502	6.0004	0.09
							Ice	6.5014	6.9816	0.15
742 213 w/ Mount Pipe	B	From Face	4.0000	0.00	0.00	147.0000	1" Ice	7.6106	8.8524	0.28
							2" Ice	9.9329	12.7940	0.68
							4" Ice			
							No Ice	5.3729	4.6203	0.05
							1/2" Ice	5.9502	6.0004	0.09
							Ice	6.5014	6.9816	0.15
742 213 w/ Mount Pipe	C	From Face	4.0000	0.00	0.00	147.0000	1" Ice	7.6106	8.8524	0.28
							2" Ice	9.9329	12.7940	0.68
							4" Ice			
							No Ice	5.3729	4.6203	0.05
							1/2" Ice	5.9502	6.0004	0.09
							Ice	6.5014	6.9816	0.15

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight
			Horz	Lateral					
			Vert			ft ²	ft ²	K	
			ft						
			0.00						
						Ice	6.5014	6.9816	0.15
						1" Ice	7.6106	8.8524	0.28
						2" Ice	9.9329	12.7940	0.68
						4" Ice			
DB-T1-6Z-8AB-0Z	A	From Face	4.0000	0.00	147.0000	No Ice	5.6000	2.3333	0.04
			0.00			1/2"	5.9154	2.5580	0.08
			0.00			Ice	6.2395	2.7914	0.12
						1" Ice	6.9136	3.2840	0.21
						2" Ice	8.3654	4.3728	0.45
						4" Ice			
Platform Mount [LP 304-1]	C	None		0.00	147.0000	No Ice	17.4600	17.4600	1.35
						1/2"	22.4400	22.4400	1.62
						Ice	27.4200	27.4200	1.90
						1" Ice	37.3800	37.3800	2.45
						2" Ice	57.3000	57.3000	3.55
						4" Ice			
**									
(2) SBNH-1D6565C w/ Mount Pipe	A	From Leg	4.0000	23.00	136.0000	No Ice	11.6828	9.8418	0.10
			0.00			1/2"	12.4043	11.3657	0.19
			1.00			Ice	13.1351	12.9138	0.29
						1" Ice	14.6007	15.2672	0.52
						2" Ice	17.8748	20.1392	1.17
						4" Ice			
DTMABP7819VG12A	A	From Leg	4.0000	23.00	136.0000	No Ice	1.1389	0.3907	0.02
			0.00			1/2"	1.2835	0.4884	0.03
			1.00			Ice	1.4368	0.5947	0.04
						1" Ice	1.7693	0.8334	0.06
						2" Ice	2.5380	1.4144	0.14
						4" Ice			
RRUS-11	A	From Leg	4.0000	23.00	136.0000	No Ice	2.9419	1.2460	0.06
			0.00			1/2"	3.1718	1.4124	0.07
			1.00			Ice	3.4103	1.5874	0.10
						1" Ice	3.9133	1.9633	0.15
						2" Ice	5.0229	2.8188	0.30
						4" Ice			
7770.00 w/ Mount Pipe	A	From Leg	4.0000	23.00	136.0000	No Ice	6.1194	4.2543	0.06
			0.00			1/2"	6.6258	5.0137	0.10
			1.00			Ice	7.1283	5.7109	0.16
						1" Ice	8.1643	7.1553	0.29
						2" Ice	10.3599	10.4117	0.66
						4" Ice			
(2) LGP21901	A	From Leg	4.0000	23.00	136.0000	No Ice	0.2695	0.1838	0.01
			0.00			1/2"	0.3432	0.2483	0.01
			1.00			Ice	0.4255	0.3216	0.01
						1" Ice	0.6160	0.4940	0.02
						2" Ice	1.1009	0.9425	0.07
						4" Ice			
DC6-48-60-18-8F	A	From Leg	4.0000	23.00	136.0000	No Ice	2.5667	2.5667	0.03
			0.00			1/2"	2.7978	2.7978	0.06
			1.00			Ice	3.0377	3.0377	0.08
						1" Ice	3.5432	3.5432	0.14
						2" Ice	4.6580	4.6580	0.31
						4" Ice			
(2) SBNH-1D6565C w/ Mount Pipe	B	From Leg	4.0000	23.00	136.0000	No Ice	11.6828	9.8418	0.10
			0.00			1/2"	12.4043	11.3657	0.19
			1.00			Ice	13.1351	12.9138	0.29
						1" Ice	14.6007	15.2672	0.52
						2" Ice	17.8748	20.1392	1.17
						4" Ice			
DTMABP7819VG12A	B	From Leg	4.0000	23.00	136.0000	No Ice	1.1389	0.3907	0.02
			0.00			1/2"	1.2835	0.4884	0.03
			1.00			Ice	1.4368	0.5947	0.04
						1" Ice	1.7693	0.8334	0.06
						2" Ice	2.5380	1.4144	0.14
						4" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA}	C _{AA}	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft ²	ft ²	K
RRUS-11	B	From Leg	4.0000	23.00	136.0000	No Ice	2.9419	1.2460	0.06
			0.00			1/2"	3.1718	1.4124	0.07
			1.00			Ice	3.4103	1.5874	0.10
						1" Ice	3.9133	1.9633	0.15
						2" Ice	5.0229	2.8188	0.30
7770.00 w/ Mount Pipe	B	From Leg	4.0000	23.00	136.0000	No Ice	6.1194	4.2543	0.06
			0.00			1/2"	6.6258	5.0137	0.10
			1.00			Ice	7.1283	5.7109	0.16
						1" Ice	8.1643	7.1553	0.29
						2" Ice	10.3599	10.4117	0.66
(2) LGP21901	B	From Leg	4.0000	23.00	136.0000	No Ice	0.2695	0.1838	0.01
			0.00			1/2"	0.3432	0.2483	0.01
			1.00			Ice	0.4255	0.3216	0.01
						1" Ice	0.6160	0.4940	0.02
						2" Ice	1.1009	0.9425	0.07
DTMABP7819VG12A	C	From Leg	4.0000	23.00	136.0000	No Ice	1.1389	0.3907	0.02
			0.00			1/2"	1.2835	0.4884	0.03
			1.00			Ice	1.4368	0.5947	0.04
						1" Ice	1.7693	0.8334	0.06
						2" Ice	2.5380	1.4144	0.14
RRUS-11	C	From Leg	4.0000	23.00	136.0000	No Ice	2.9419	1.2460	0.06
			0.00			1/2"	3.1718	1.4124	0.07
			1.00			Ice	3.4103	1.5874	0.10
						1" Ice	3.9133	1.9633	0.15
						2" Ice	5.0229	2.8188	0.30
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.0000	23.00	136.0000	No Ice	8.4975	6.3042	0.07
			0.00			1/2"	9.1490	7.4790	0.14
			1.00			Ice	9.7672	8.3676	0.21
						1" Ice	11.0311	10.1785	0.38
						2" Ice	13.6786	14.0237	0.87
7770.00 w/ Mount Pipe	C	From Leg	4.0000	23.00	136.0000	No Ice	6.1194	4.2543	0.06
			0.00			1/2"	6.6258	5.0137	0.10
			1.00			Ice	7.1283	5.7109	0.16
						1" Ice	8.1643	7.1553	0.29
						2" Ice	10.3599	10.4117	0.66
(2) LGP21901	C	From Leg	4.0000	23.00	136.0000	No Ice	0.2695	0.1838	0.01
			0.00			1/2"	0.3432	0.2483	0.01
			1.00			Ice	0.4255	0.3216	0.01
						1" Ice	0.6160	0.4940	0.02
						2" Ice	1.1009	0.9425	0.07
RRUS-11	A	From Leg	4.0000	23.00	136.0000	No Ice	2.9419	1.2460	0.06
			0.00			1/2"	3.1718	1.4124	0.07
			1.00			Ice	3.4103	1.5874	0.10
						1" Ice	3.9133	1.9633	0.15
						2" Ice	5.0229	2.8188	0.30
RRUS-11	B	From Leg	4.0000	23.00	136.0000	No Ice	2.9419	1.2460	0.06
			0.00			1/2"	3.1718	1.4124	0.07
			1.00			Ice	3.4103	1.5874	0.10
						1" Ice	3.9133	1.9633	0.15
						2" Ice	5.0229	2.8188	0.30
RRUS-11	C	From Leg	4.0000	23.00	136.0000	No Ice	2.9419	1.2460	0.06
			0.00			1/2"	3.1718	1.4124	0.07
			1.00			Ice	3.4103	1.5874	0.10
						1" Ice	3.9133	1.9633	0.15
						2" Ice	5.0229	2.8188	0.30

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustmen t	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K	
			Horz ft	Lateral Vert ft						
Platform Mount [LP-1201]	C	None			0.00	136.0000	4" Ice			
							No Ice	23.1000	23.1000	2.10
							1/2" Ice	26.8000	26.8000	2.50
							Ice	30.5000	30.5000	2.90
							1" Ice	37.9000	37.9000	3.70
2" Ice	52.7000	52.7000	5.30							
							4" Ice			

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K _Z	q _z ksf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L1 150.0000-110.7500	129.7137	1.479	0.03	90.569	A	0.000	90.569	90.569	100.00	0.000	0.000
					B	0.000	90.569	100.00	0.000	0.000	
					C	0.000	90.569	100.00	0.000	0.000	
L2 110.7500-74.7500	92.4084	1.342	0.02	102.980	A	0.000	102.980	102.980	100.00	0.000	0.000
					B	0.000	102.980	100.00	0.000	0.000	
					C	0.000	102.980	100.00	0.000	0.000	
L3 74.7500-39.5000	57.0363	1.169	0.02	119.042	A	0.000	119.042	119.042	100.00	0.000	0.000
					B	0.000	119.042	100.00	0.000	0.000	
					C	0.000	119.042	100.00	0.000	0.000	
L4 39.5000-0.0000	19.2291	1	0.02	154.468	A	0.000	154.468	154.468	100.00	0.000	0.000
					B	0.000	154.468	100.00	0.000	0.000	
					C	0.000	154.468	100.00	0.000	0.000	

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K _Z	q _z ksf	t _z in	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L1 150.0000-110.7500	129.7137	1.479	0.01	0.8839	96.351	A	0.000	96.351	96.351	100.00	0.000	0.000
						B	0.000	96.351	100.00	0.000	0.000	
						C	0.000	96.351	100.00	0.000	0.000	
L2 110.7500-74.7500	92.4084	1.342	0.00	0.8486	108.283	A	0.000	108.283	108.283	100.00	0.000	0.000
						B	0.000	108.283	100.00	0.000	0.000	
						C	0.000	108.283	100.00	0.000	0.000	
L3 74.7500-39.5000	57.0363	1.169	0.00	0.8009	124.028	A	0.000	124.028	124.028	100.00	0.000	0.000
						B	0.000	124.028	100.00	0.000	0.000	
						C	0.000	124.028	100.00	0.000	0.000	
L4 39.5000-0.0000	19.2291	1	0.00	0.7500	159.740	A	0.000	159.740	159.740	100.00	0.000	0.000
						B	0.000	159.740	100.00	0.000	0.000	
						C	0.000	159.740	100.00	0.000	0.000	

Tower Pressure - Service

$G_H = 1.690$

Section Elevation	z	K_z	q_z	A_G	F a c e	A_F	A_R	A_{leg}	Leg %	C_{AA} In Face ft ²	C_{AA} Out Face ft ²
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²			
L1 150.0000- 110.7500	129.7137	1.479	0.01	90.569	A	0.000	90.569	90.569	100.00	0.000	0.000
					B	0.000	90.569	100.00	0.000	0.000	
					C	0.000	90.569	100.00	0.000	0.000	
L2 110.7500- 74.7500	92.4084	1.342	0.01	102.98 0	A	0.000	102.980	102.980	100.00	0.000	0.000
					B	0.000	102.980	100.00	0.000	0.000	
					C	0.000	102.980	100.00	0.000	0.000	
L3 74.7500- 39.5000	57.0363	1.169	0.01	119.04 2	A	0.000	119.042	119.042	100.00	0.000	0.000
					B	0.000	119.042	100.00	0.000	0.000	
					C	0.000	119.042	100.00	0.000	0.000	
L4 39.5000- 0.0000	19.2291	1	0.01	154.46 8	A	0.000	154.468	154.468	100.00	0.000	0.000
					B	0.000	154.468	100.00	0.000	0.000	
					C	0.000	154.468	100.00	0.000	0.000	

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 - 110.75	Pole	Max Tension	2	0.00	0.00	-0.00
			Max. Compression	14	-14.37	-0.14	1.06
			Max. Mx	5	-6.98	-410.09	-1.84
			Max. My	2	-7.00	2.13	407.08
			Max. Vy	5	15.70	-410.09	-1.84
			Max. Vx	2	-15.59	2.13	407.08
			Max. Torque	12			-1.92
L2	110.75 - 74.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-19.83	-0.14	1.06
			Max. Mx	5	-11.33	-1012.15	-4.14
			Max. My	2	-11.34	4.45	1005.09
			Max. Vy	5	18.43	-1012.15	-4.14
			Max. Vx	2	-18.32	4.45	1005.09
			Max. Torque	12			-1.92
L3	74.75 - 39.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-27.04	-0.14	1.06
			Max. Mx	5	-17.38	-1694.29	-6.40
			Max. My	2	-17.38	6.73	1683.30
			Max. Vy	5	21.04	-1694.29	-6.40
			Max. Vx	2	-20.93	6.73	1683.30
			Max. Torque	12			-1.91
L4	39.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-39.06	-0.14	1.06
			Max. Mx	5	-27.83	-2710.46	-9.33
			Max. My	2	-27.83	9.65	2694.41
			Max. Vy	5	24.08	-2710.46	-9.33
			Max. Vx	2	-23.97	9.65	2694.41
			Max. Torque	12			-1.91

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	39.06	-5.38	-0.01
	Max. H _x	11	27.85	24.06	0.06
	Max. H _z	2	27.85	0.06	23.95
	Max. M _x	2	2694.41	0.06	23.95
	Max. M _z	5	2710.46	-24.06	-0.06
	Max. Torsion	6	1.90	-20.87	-12.03
	Min. Vert	1	27.85	0.00	0.00
	Min. H _x	5	27.85	-24.06	-0.06
	Min. H _z	8	27.85	-0.06	-23.95
	Min. M _x	8	-2693.55	-0.06	-23.95
	Min. M _z	11	-2710.27	24.06	0.06
	Min. Torsion	12	-1.90	20.87	12.03

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	27.85	0.00	0.00	-0.41	-0.09	0.00
Dead+Wind 0 deg - No Ice	27.85	-0.06	-23.95	-2694.41	9.66	0.97
Dead+Wind 30 deg - No Ice	27.85	11.97	-20.71	-2328.63	-1346.88	0.02
Dead+Wind 60 deg - No Ice	27.85	20.80	-11.92	-1338.97	-2342.52	-0.93
Dead+Wind 90 deg - No Ice	27.85	24.06	0.06	9.33	-2710.46	-1.63
Dead+Wind 120 deg - No Ice	27.85	20.87	12.03	1354.97	-2352.19	-1.90
Dead+Wind 150 deg - No Ice	27.85	12.08	20.77	2337.46	-1363.72	-1.66
Dead+Wind 180 deg - No Ice	27.85	0.06	23.95	2693.55	-9.83	-0.97

Load Combination	Vertical	Shear _x	Shear _z	Overturning Moment, M _x	Overturning Moment, M _z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 210 deg - No Ice	27.85	-11.97	20.71	2327.78	1346.69	-0.02
Dead+Wind 240 deg - No Ice	27.85	-20.80	11.92	1338.12	2342.32	0.93
Dead+Wind 270 deg - No Ice	27.85	-24.06	-0.06	-10.16	2710.27	1.64
Dead+Wind 300 deg - No Ice	27.85	-20.87	-12.03	-1355.80	2352.01	1.90
Dead+Wind 330 deg - No Ice	27.85	-12.08	-20.77	-2338.31	1363.54	1.66
Dead+Ice+Temp	39.06	0.00	-0.00	-1.06	-0.14	-0.00
Dead+Wind 0 deg+Ice+Temp	39.06	-0.01	-5.35	-633.78	1.68	0.25
Dead+Wind 30 deg+Ice+Temp	39.06	2.68	-4.63	-548.10	-317.50	0.03
Dead+Wind 60 deg+Ice+Temp	39.06	4.66	-2.66	-315.87	-551.66	-0.19
Dead+Wind 90 deg+Ice+Temp	39.06	5.38	0.01	0.69	-638.03	-0.36
Dead+Wind 120 deg+Ice+Temp	39.06	4.67	2.68	316.77	-553.49	-0.44
Dead+Wind 150 deg+Ice+Temp	39.06	2.70	4.64	547.66	-320.68	-0.39
Dead+Wind 180 deg+Ice+Temp	39.06	0.01	5.35	631.50	-1.98	-0.25
Dead+Wind 210 deg+Ice+Temp	39.06	-2.68	4.63	545.83	317.20	-0.03
Dead+Wind 240 deg+Ice+Temp	39.06	-4.66	2.66	313.59	551.35	0.19
Dead+Wind 270 deg+Ice+Temp	39.06	-5.38	-0.01	-2.97	637.73	0.36
Dead+Wind 300 deg+Ice+Temp	39.06	-4.67	-2.68	-319.04	553.19	0.44
Dead+Wind 330 deg+Ice+Temp	39.06	-2.70	-4.64	-549.94	320.38	0.39
Dead+Wind 0 deg - Service	27.85	-0.02	-8.29	-934.05	3.28	0.34
Dead+Wind 30 deg - Service	27.85	4.14	-7.17	-807.28	-466.83	0.01
Dead+Wind 60 deg - Service	27.85	7.20	-4.12	-464.31	-811.88	-0.33
Dead+Wind 90 deg - Service	27.85	8.32	0.02	2.95	-939.41	-0.57
Dead+Wind 120 deg - Service	27.85	7.22	4.16	469.30	-815.26	-0.67
Dead+Wind 150 deg - Service	27.85	4.18	7.19	809.79	-472.68	-0.58
Dead+Wind 180 deg - Service	27.85	0.02	8.29	933.18	-3.47	-0.34
Dead+Wind 210 deg - Service	27.85	-4.14	7.17	806.41	466.64	-0.01
Dead+Wind 240 deg - Service	27.85	-7.20	4.12	463.45	811.69	0.33
Dead+Wind 270 deg - Service	27.85	-8.32	-0.02	-3.81	939.22	0.57
Dead+Wind 300 deg - Service	27.85	-7.22	-4.16	-470.16	815.06	0.67
Dead+Wind 330 deg - Service	27.85	-4.18	-7.19	-810.65	472.49	0.58

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-27.85	0.00	0.00	27.85	0.00	0.000%
2	-0.06	-27.85	-23.95	0.06	27.85	23.95	0.000%
3	11.97	-27.85	-20.71	-11.97	27.85	20.71	0.000%
4	20.80	-27.85	-11.92	-20.80	27.85	11.92	0.000%
5	24.06	-27.85	0.06	-24.06	27.85	-0.06	0.000%
6	20.87	-27.85	12.03	-20.87	27.85	-12.03	0.000%
7	12.08	-27.85	20.77	-12.08	27.85	-20.77	0.000%
8	0.06	-27.85	23.95	-0.06	27.85	-23.95	0.000%
9	-11.97	-27.85	20.71	11.97	27.85	-20.71	0.000%
10	-20.80	-27.85	11.92	20.80	27.85	-11.92	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
11	-24.06	-27.85	-0.06	24.06	27.85	0.06	0.000%
12	-20.87	-27.85	-12.03	20.87	27.85	12.03	0.000%
13	-12.08	-27.85	-20.77	12.08	27.85	20.77	0.000%
14	0.00	-39.06	0.00	-0.00	39.06	0.00	0.000%
15	-0.01	-39.06	-5.35	0.01	39.06	5.35	0.000%
16	2.68	-39.06	-4.63	-2.68	39.06	4.63	0.000%
17	4.66	-39.06	-2.66	-4.66	39.06	2.66	0.000%
18	5.38	-39.06	0.01	-5.38	39.06	-0.01	0.000%
19	4.67	-39.06	2.68	-4.67	39.06	-2.68	0.000%
20	2.70	-39.06	4.64	-2.70	39.06	-4.64	0.000%
21	0.01	-39.06	5.35	-0.01	39.06	-5.35	0.000%
22	-2.68	-39.06	4.63	2.68	39.06	-4.63	0.000%
23	-4.66	-39.06	2.66	4.66	39.06	-2.66	0.000%
24	-5.38	-39.06	-0.01	5.38	39.06	0.01	0.000%
25	-4.67	-39.06	-2.68	4.67	39.06	2.68	0.000%
26	-2.70	-39.06	-4.64	2.70	39.06	4.64	0.000%
27	-0.02	-27.85	-8.29	0.02	27.85	8.29	0.000%
28	4.14	-27.85	-7.17	-4.14	27.85	7.17	0.000%
29	7.20	-27.85	-4.12	-7.20	27.85	4.12	0.000%
30	8.32	-27.85	0.02	-8.32	27.85	-0.02	0.000%
31	7.22	-27.85	4.16	-7.22	27.85	-4.16	0.000%
32	4.18	-27.85	7.19	-4.18	27.85	-7.19	0.000%
33	0.02	-27.85	8.29	-0.02	27.85	-8.29	0.000%
34	-4.14	-27.85	7.17	4.14	27.85	-7.17	0.000%
35	-7.20	-27.85	4.12	7.20	27.85	-4.12	0.000%
36	-8.32	-27.85	-0.02	8.32	27.85	0.02	0.000%
37	-7.22	-27.85	-4.16	7.22	27.85	4.16	0.000%
38	-4.18	-27.85	-7.19	4.18	27.85	7.19	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.0000001	0.0000001
2	Yes	4	0.0000001	0.00052837
3	Yes	5	0.0000001	0.00072107
4	Yes	5	0.0000001	0.00073699
5	Yes	5	0.0000001	0.00003678
6	Yes	5	0.0000001	0.00070266
7	Yes	5	0.0000001	0.00075704
8	Yes	4	0.0000001	0.00094854
9	Yes	5	0.0000001	0.00072013
10	Yes	5	0.0000001	0.00070633
11	Yes	5	0.0000001	0.00005221
12	Yes	5	0.0000001	0.00076291
13	Yes	5	0.0000001	0.00070643
14	Yes	4	0.0000001	0.00000625
15	Yes	5	0.0000001	0.00019256
16	Yes	5	0.0000001	0.00024642
17	Yes	5	0.0000001	0.00024817
18	Yes	5	0.0000001	0.00019389
19	Yes	5	0.0000001	0.00024548
20	Yes	5	0.0000001	0.00024921
21	Yes	5	0.0000001	0.00019116
22	Yes	5	0.0000001	0.00024386
23	Yes	5	0.0000001	0.00024376
24	Yes	5	0.0000001	0.00019381
25	Yes	5	0.0000001	0.00025215
26	Yes	5	0.0000001	0.00024672
27	Yes	4	0.0000001	0.00014642
28	Yes	5	0.0000001	0.00006560
29	Yes	5	0.0000001	0.00006884
30	Yes	4	0.0000001	0.00024391
31	Yes	5	0.0000001	0.00006221
32	Yes	5	0.0000001	0.00007233

33	Yes	4	0.00000001	0.00017250
34	Yes	5	0.00000001	0.00006520
35	Yes	5	0.00000001	0.00006275
36	Yes	4	0.00000001	0.00027248
37	Yes	5	0.00000001	0.00007381
38	Yes	5	0.00000001	0.00006290

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 110.75	35.76	37	2.09	0.01
L2	114.75 - 74.75	20.97	37	1.81	0.00
L3	79.5 - 39.5	9.71	37	1.19	0.00
L4	45 - 0	3.05	37	0.62	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.0000	RRH2X40-AWS	37	35.32	2.09	0.01	25232
147.0000	BXA-171063-12BF w/ Mount Pipe	37	34.44	2.08	0.01	25232
136.0000	(2) SBNH-1D6565C w/ Mount Pipe	37	29.65	2.01	0.01	9011

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 110.75	102.87	12	6.03	0.02
L2	114.75 - 74.75	60.37	12	5.21	0.01
L3	79.5 - 39.5	27.98	12	3.42	0.01
L4	45 - 0	8.80	12	1.79	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.0000	RRH2X40-AWS	12	101.61	6.01	0.02	8962
147.0000	BXA-171063-12BF w/ Mount Pipe	12	99.09	5.98	0.02	8962
136.0000	(2) SBNH-1D6565C w/ Mount Pipe	12	85.33	5.79	0.02	3199

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _v ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
L1	150 - 110.75 (1)	TP31.38x24x0.2188	39.2500	0.0000	0.0	39.00	21.1182	-6.97	823.61	0.008
L2	110.75 - 74.75 (2)	TP37.711x30.1903x0.25	40.0000	0.0000	0.0	39.00	29.0166	-11.32	1131.65	0.010
L3	74.75 - 39.5 (3)	TP43.839x36.3179x0.3125	40.0000	0.0000	0.0	39.00	42.1471	-17.37	1643.74	0.011
L4	39.5 - 0 (4)	TP50.64x42.1799x0.375	45.0000	0.0000	0.0	39.00	59.8279	-27.83	2333.29	0.012

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio f _{bx} F _{bx}	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio f _{by} F _{by}
L1	150 - 110.75 (1)	TP31.38x24x0.2188	411.16	31.11	39.00	0.798	0.00	0.00	39.00	0.000
L2	110.75 - 74.75 (2)	TP37.711x30.1903x0.25	1014.2 3	46.44	39.00	1.191	0.00	0.00	39.00	0.000
L3	74.75 - 39.5 (3)	TP43.839x36.3179x0.3125	1697.3 5	46.07	39.00	1.181	0.00	0.00	39.00	0.000
L4	39.5 - 0 (4)	TP50.64x42.1799x0.375	2714.8 1	43.88	39.00	1.125	0.00	0.00	39.00	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f _v ksi	Allow. F _v ksi	Ratio f _v F _v	Actual T kip-ft	Actual f _{vt} ksi	Allow. F _{vt} ksi	Ratio f _{vt} F _{vt}
L1	150 - 110.75 (1)	TP31.38x24x0.2188	15.73	0.74	26.00	0.057	1.92	0.07	26.00	0.003
L2	110.75 - 74.75 (2)	TP37.711x30.1903x0.25	18.46	0.64	26.00	0.049	1.91	0.04	26.00	0.002
L3	74.75 - 39.5 (3)	TP43.839x36.3179x0.3125	21.07	0.50	26.00	0.038	1.91	0.03	26.00	0.001
L4	39.5 - 0 (4)	TP50.64x42.1799x0.375	24.11	0.40	26.00	0.031	1.90	0.02	26.00	0.001

Pole Interaction Design Data

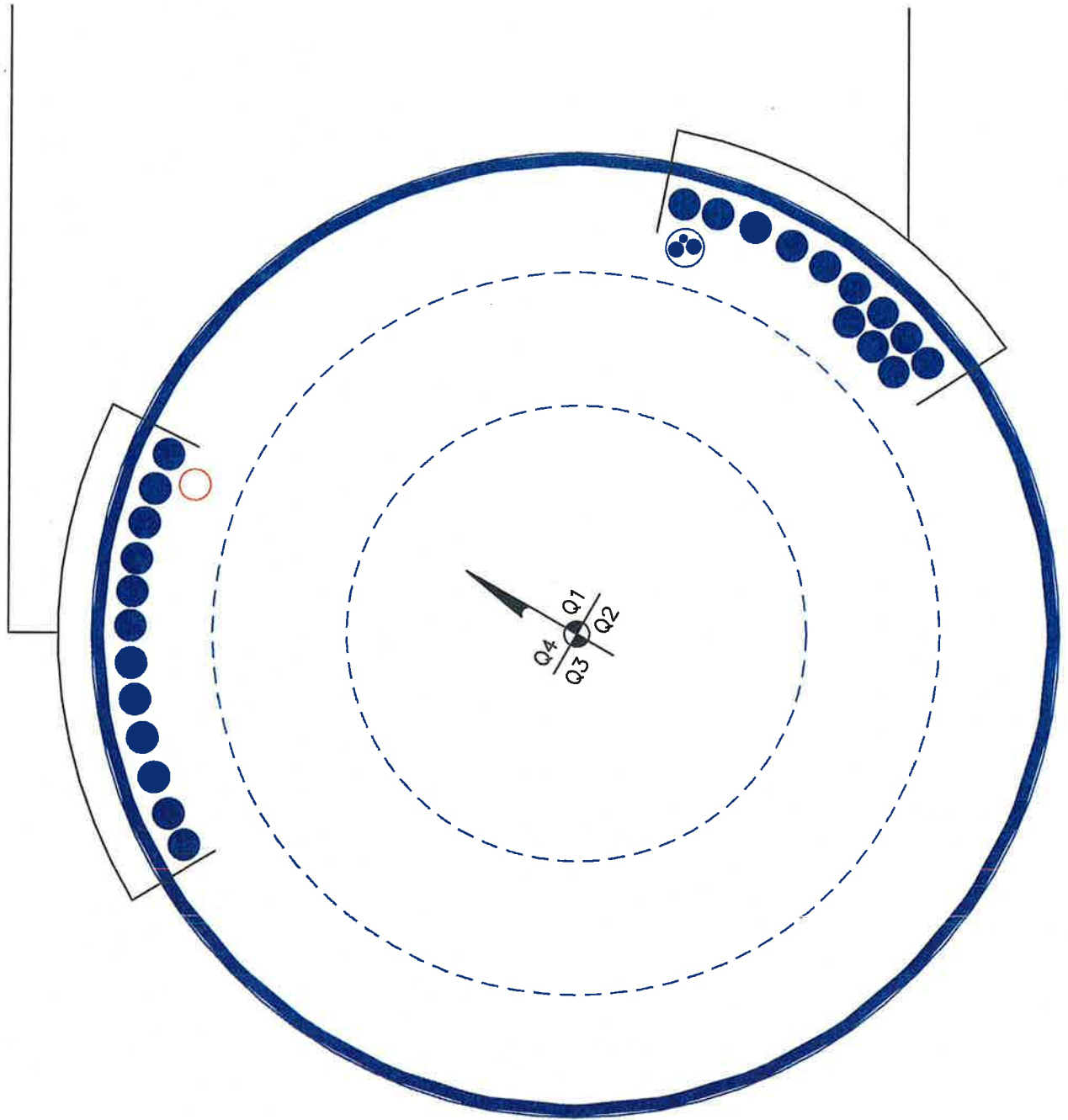
Section No.	Elevation ft	Ratio P P _a	Ratio f _{bx} F _{bx}	Ratio f _{by} F _{by}	Ratio f _v F _v	Ratio f _{vt} F _{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 110.75 (1)	0.008	0.798	0.000	0.057	0.003	0.807 ✓	1.333	H1-3+VT ✓
L2	110.75 - 74.75 (2)	0.010	1.191	0.000	0.049	0.002	1.201 ✓	1.333	H1-3+VT ✓
L3	74.75 - 39.5 (3)	0.011	1.181	0.000	0.038	0.001	1.192 ✓	1.333	H1-3+VT ✓
L4	39.5 - 0 (4)	0.012	1.125	0.000	0.031	0.001	1.137 ✓	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 - 110.75	Pole	TP31.38x24x0.2188	1	-6.97	1097.87	60.6	Pass	
L2	110.75 - 74.75	Pole	TP37.711x30.1903x0.25	2	-11.32	1508.49	90.1	Pass	
L3	74.75 - 39.5	Pole	TP43.839x36.3179x0.3125	3	-17.37	2191.11	89.4	Pass	
L4	39.5 - 0	Pole	TP50.64x42.1799x0.375	4	-27.83	3110.28	85.3	Pass	
							Summary		
							Pole (L2)	90.1	Pass
							RATING =	90.1	Pass

APPENDIX B
BASE LEVEL DRAWING

(PROPOSED)
(1) 1-5/8" TO 147 FT LEVEL
(INSTALLED)
(12) 1-5/8" TO 147 FT LEVEL



(INSTALLED-IN CONDUIT)
(1) 3/8" TO 136 FT LEVEL
(2) 3/4" TO 136 FT LEVEL
(INSTALLED)
(12) 1-5/8" TO 136 FT LEVEL

APPENDIX C
ADDITIONAL CALCULATIONS

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F / C

- Assumptions:**
- 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
 - 2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
 - 3) Clear space between bottom of leveling nut and top of concrete **not exceeding** (1)*(Rod Diameter)

Site Data

BU#:	873645	
Site Name:	Oxford	
App #:	210992 R4	
Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	58	in
Anchor Spacing:	6	in

Plate Data

W=Side:	57	in
Thick:	3	in
Grade:	55	ksi
Clip Distance:	6	in

Stiffener Data (Welding at both sides)

Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data

Diam:	50.64	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor

ASD ASIF:	1.333	
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Base Reactions

TIA Revision:	F	
Unfactored Moment, M:	2714.80526	ft-kips
Unfactored Axial, P:	27.8307	kips
Unfactored Shear, V:	24.106249	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension	138.7 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	71.1% Pass

Base Plate Results

	Flexural Check
Base Plate Stress:	36.0 ksi
Allowable PL Bending Stress:	55.0 ksi
Base Plate Stress Ratio:	65.4% Pass

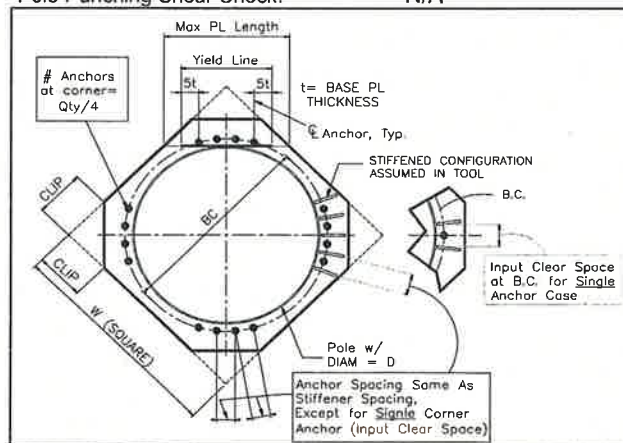
N/A - Unstiffened

Stiffener Results

Horizontal Weld :	N/A
Vertical Weld:	N/A
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$:	N/A
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$:	N/A
Plate Comp. (AISC Bracket):	N/A

Pole Results

Pole Punching Shear Check:	N/A
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** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

BU#: 873645
Site Name: Oxford
App #: 210992 R4

Enter Load Factors Below:		
For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Pier Properties	
Concrete:	
Pier Diameter =	7.0 ft
Concrete Area =	5541.8 in ²
Reinforcement:	
Clear Cover to Tie=	3.00 in
Horiz. Tie Bar Size=	4
Vert. Cage Diameter =	6.30 ft
Vert. Cage Diameter =	75.59 in
Vertical Bar Size =	11
Bar Diameter =	1.41 in
Bar Area =	1.56 in ²
Number of Bars =	28
As Total=	43.68 in ²
A s/ Aconc, Rho:	0.0079 0.79%

ACI 10.5, ACI 21.10.4, and IBC 1810.
 Min As for Flexural, Tension Controlled, Shafts:
 $(3) \cdot (\sqrt{f_c}) / F_y = 0.0027$
 $200 / F_y = 0.0033$

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.79%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = ($\phi=0.65$) Pn.		
Pn per ACI 318 (10-2)	8653.28	kips
at Mu=($\phi=0.65$)Mn=	5267.46	ft-kips
Max Tu, ($\phi=0.9$) Tn =	2358.72	kips
at Mu= $\phi=(0.90)$ Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	2823.283	ft-kips (* Note)
Max. Service Shaft P:	27.8307	kips
Max Axial Force Type:	Comp.	

(* Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

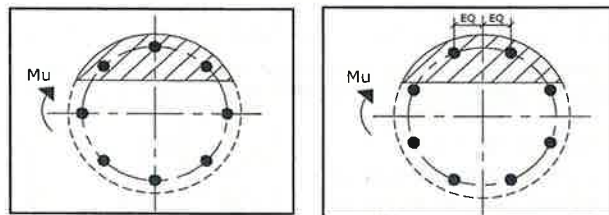
Load Factor	Shaft Factored Loads	
1.30	Mu:	3670.268 ft-kips
1.30	Pu:	36.17991 kips

Material Properties		
Concrete Comp. strength, f_c =	3000	psi
Reinforcement yield strength, F_y =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	High	

Solve (Run) ← Press Upon Completing All Input

Results:

Governing Orientation Case: 2



Case 1 Case 2

Dist. From Edge to Neutral Axis: **15.47** in

Extreme Steel Strain, ϵ_t : **0.0124**

$\epsilon_t > 0.0050$, Tension Controlled

Reduction Factor, ϕ : **0.900**

Output Note: Negative Pu=Tension
 For Axial Compression, ϕ Pn = Pu: 36.18 kips
 Drilled Shaft Moment Capacity, ϕ Mn: **6722.80** ft-kips
 Drilled Shaft Superimposed Mu: **3670.27** ft-kips

(Mu/ ϕ Mn, Drilled Shaft Flexure CSR): 54.6%

(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)

Site Data

BU#: 873645
Site Name: Oxford
App #: ????

Enter Load Factors Below:		
For P (DL)	1.2	<---- Enter Factor
For P,V, and M (WL)	1.35	<---- Enter Factor

Pad & Pier Data		
Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	6	in
Pad Bearing Depth, D:	7	ft
Pad Thickness, T:	3	ft
Pad Width=Length, L:	23.5	ft
Pier Cross Section Shape:	Square	<--Pull Down
Enter Pier Side Width:	7	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	49.00	ft^2
Pier Height:	4.50	ft
Soil (above pad) Height:	4.00	ft

Soil Parameters		
Unit Weight, γ :	125.0	pcf
Ultimate Bearing Capacity, q_n :	12.00	ksf
Strength Reduct. factor, ϕ :	0.75	
Angle of Friction, Φ :	30.0	degrees
Undrained Shear Strength, C_u :	0.00	ksf
Allowable Bearing: $\phi * q_n$:	9.00	ksf
Passive Pres. Coeff., K_p :	3.00	

Forces/Moments due to Wind and Lateral Soil		
Minimum of ($\phi * \text{Ultimate Pad Passive Force, } V_u$):	32.5	kips
Pad Force Location Above D:	1.36	ft
ϕ (Passive Pressure Moment):	44.38	ft-kips
Factored O.T. M(WL), "1.6W":	3909.1	ft-kips
Factored OT (MW-Msoil), M1	3864.69	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	2.31	ft
Sum of Soil Wedges Wt:	31.04	kips
Soil Wedges ecc, K1:	8.70	ft
Ftg+Soil above Pad wt:	533.2	kips
Unfactored (Total ftg-soil Wt):	564.25	kips
1.2D. No Soil Wedges.	673.25	kips
0.9D. With Soil Wedges	532.88	kips

Resistance due to Cohesion (Vertical)		
$\phi * (1/2 * C_u) (\text{Total Vert. Planes})$	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Monopole Base Reaction Forces		
TIA Revision:	F	<--Pull Down
Unfactored DL Axial, PD:	27.8307	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	24.10625	kips
Unfactored WL Moment, M:	2714.805	ft-kips

Load Factor	Shaft Factored Loads	
1.20	1.2D+1.6W, Pu:	33.39684 kips
0.90	0.9D+1.6W, Pu:	25.04763 kips
1.35	Vu:	32.54344 kips
	Mu:	3664.987 ft-kips

1.2D+1.6W Load Combination. Bearing Results:

(No Soil Wedges) [Reaction+Conc+Soil]	673.25	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	3864.69	ft-kips

Orthogonal Direction:

$ecc1 = M1/P1 = 5.74 \text{ ft}$
 $Orthogonal qu = 2.41 \text{ ksf}$
 $qu/\phi * q_n \text{ Ratio} = 26.78\% \text{ Pass}$

Diagonal Direction:

$ecc2 = (0.707M1)/P1 = 4.06 \text{ ft}$
 $Diagonal qu = 2.85 \text{ ksf}$
 $qu/\phi * q_n \text{ Ratio} = 31.61\% \text{ Pass}$

<- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination. Bearing Results:

(w/ Soil Wedges) [Reaction+Conc+Soil]	532.88	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	3621.65	ft-kips

$Orthogonal ecc3 = M2/P2 = 6.80 \text{ ft}$
 $Ortho Non Bearing Length, NBL = 13.59 \text{ ft}$
 $Orthogonal qu = 2.29 \text{ ksf}$
 $Diagonal qu = 2.76 \text{ ksf}$

Max Reaction Moment (ft-kips) so that $qu = \phi * q_n = 100\%$ Capacity Rating

Actual M:	2714.81		
M Orthogonal:	4193.75	64.73%	Pass
M Diagonal:	4193.75	64.73%	Pass