Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

December 11, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
Great Hollow Road, Woodbury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 129-foot level of the existing 138.5-foot tower off Great Hollow Road in Woodbury, Connecticut (the Property"). The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 2004. Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model HBXX-6517DS-VTM, 700 MHz antennas; three (3) model LNX-8513DS-VTM, 850 MHZ antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, at the same 129-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its new 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable attached to the outside of the monopole tower. Attached behind Tab 1 are the specifications for the 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 William J. Butterly, Jr., First Selectman of the Town of Woodbury. A copy of this letter is also being sent to O&G Industries, 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).

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on Cellco's existing antenna platform at the 129-foot level of the 138.5-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 replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included 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:
William J. Butterly, Jr., Woodbury First Selectman
O&G Industries
Sandy M. Carter

ATTACHMENT 1

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°

**Values calculated using NGMN Alliance N-P-BASTA v9.6*

Mechanical Specifications

Color | Radome Material	Light gray | PVC, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1903.0 mm x 305.0 mm x 166.0 mm | 74.9 in x 12.0 in x 6.5 in
Net Weight	19.5 kg | 43.0 lb
Model with factory installed AISG 2.0 RET	HBXX-6517DS-A2M

Product Specifications

COMMSCOPE®

LNX-8513DS-VTM

Andrew® Teletilt® Antenna, 698–896 MHz, 85° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	14.6	15.3
Beamwidth, Horizontal, degrees	85	85
Beamwidth, Vertical, degrees	12.2	11.0
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	17
Front-to-Back Ratio at 180°, dB	25	26
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	17.8 kg | 39.2 lb
Model with factory installed AISG 2.0 RET	LNX-8513DS-A1M

ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the 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 a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-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.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

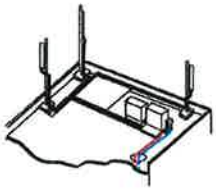
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

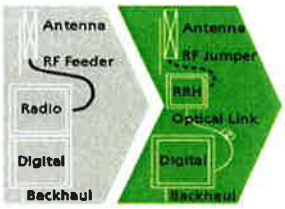
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

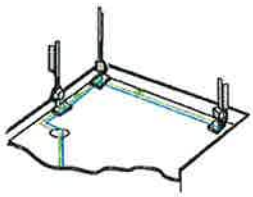
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

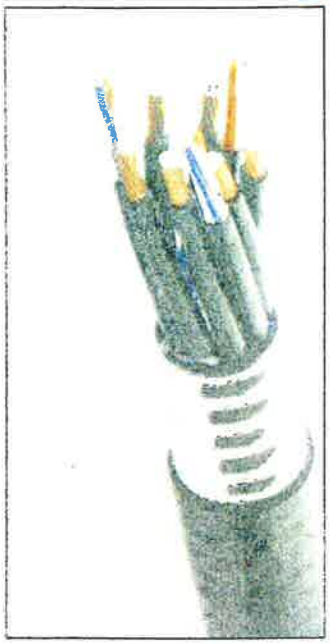


Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

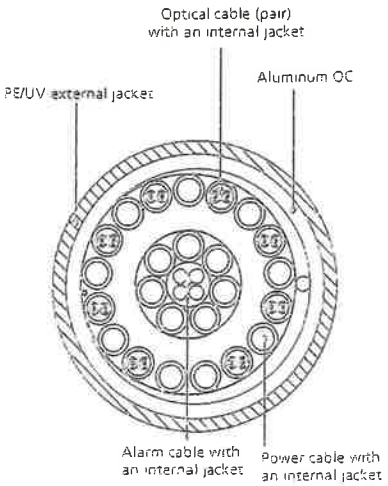


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Woodburyt S								
Tower Height: 138.5ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint CDMA/LTE	2	693	108	0.0427	1900	1.0000	4.27%	
*Sprint CDMA/LTE	1	390	108	0.0120	850	0.5667	2.12%	
*Sprint CDMA/LTE	2	693	108	0.0427	2500	1.0000	4.27%	
*AT&T UMTS	2	565	139	0.0210	880	0.5867	3.58%	
*AT&T UMTS	2	875	139	0.0326	1900	1.0000	3.26%	
*AT&T GSM	1	283	139	0.0053	880	0.5867	0.90%	
*AT&T GSM	4	525	139	0.0391	1900	1.0000	3.91%	
*AT&T LTE	1	1313	139	0.0244	734	0.4893	4.99%	
*Nextel	12	100	120	0.0300	851	0.5673	5.28%	
*T-Mobile	8	126	90	0.0447	1935	1.0000	4.47%	
*CL&P	2	240	148	0.0079	938	0.6253	1.26%	
Verizon PCS	**11**	**428**	**129**	**0.1017**	**1970**	**1.0000**	**10.17%**	
Verizon Cellular	**9**	**397**	**129**	**0.0772**	**869**	**0.5793**	**13.33%**	
Verizon AWS	**1**	**1750**	**129**	**0.0378**	**2145**	**1.0000**	**3.78%**	
Verizon 700	**1**	**1050**	**129**	**0.0227**	**746**	**0.4973**	**4.56%**	
								70.17%
* Source: Siting Council								

ATTACHMENT 3

Date: **November 6, 2014**

Timothy Howell
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
6521 Meridien Drive
Raleigh, NC 27616
(919) 755-1012

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate** **Carrier Site Name:**	 Woodbury South CT
Crown Castle Designation:	**Crown Castle BU Number:** **Crown Castle Site Name:** **Crown Castle JDE Job Number:** **Crown Castle Work Order Number:** **Crown Castle Application Number:**	876380 O&G WOODBURY 312305 961548 268887 Rev. 0
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number:**	146GGY1400
Site Data:	**Great Hollow Road, WOODBURY, Litchfield County, CT** **Latitude *41° 31' 19.2"*, Longitude *-73° 13' 15.6"*** **138.5 Foot - Monopole Tower**	

Dear Timothy Howell,

FDH Engineering, 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 726209, in accordance with application 268887, revision 0.

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 based upon a wind speed of 80 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 *FDH Engineering, 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.

Respectfully submitted by:

Jeffrey B. Ray, EI
Project Engineer

Reviewed by:

Dennis D. Abel PE
Director - Structural Engineering
CT PE License No. 23247

STATE OF CONNECTICUT
DENNIS D. ABEL
No. 23247
LICENSED
PROFESSIONAL ENGINEER

11-06-2014

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 138.5 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in April of 2003. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. The tower was originally designed to be 150-ft but was only constructed to a height of 139 ft. The tower has been modified multiple times in the past to accommodate additional loading. The tower was modified per reinforcement drawings prepared by Semaan Engineering Solutions, Inc. in November of 2005. Reinforcement consists of base plate stiffeners. The tower was modified again per reinforcement drawings prepared by GPD Group in December of 2011. Reinforcement consists of additional anchor rods.

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 80 mph with no ice, 28.1 mph with 1 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
129.0	129.0	3	alcatel lucent	RRH2X60-AWS	1	1-5/8	--
		6	andrew	HBXX-6517DS-A2M w/ Mount Pipe			
		3	andrew	LNX-8513DS-A1M w/ Mount Pipe			
		1	rfs celwave	DB-B1-6C-12AB-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
139.0	140.0	6	ericsson	RRUS-11	--	--	1
	139.0	1	crown mounts	Side Arm Mount [SO 102-3]			
138.0	148.0	1	dbspectra	DS9A09F36D-N	--	--	2
		1	bird technologies group	TTA-429-83H-08179	1 2	1/2 1-1/4	2
	139.0	6	powerwave technologies	LGP2140X	12 2 1	1-1/4 7/16 3/8	1
		6	css	XDUO1416-80 w/ Mount Pipe			
		1	kathrein	800 10764 w/ Mount Pipe			
		1	kmw communications	AM-X-CD-14-65-00T-RET w/ Mount Pipe			
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
	138.0	6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21901			
		1	crown mounts	Platform Mount [LP 303-1]			
		1	crown mounts	Side Arm Mount [SO 309-1]	--	--	2

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
137.0	147.0	1	telewave	ANT150F6	1	1/2	1
	137.0	1	crown mounts	Pipe Mount [PM 601-1]			
129.0	129.0	3	antel	BXA-171085-8BF-EDIN-2 w/ Mount Pipe	--	--	3
		6	antel	LPA-80080/6CF w/ Mount Pipe			
		3	antel	BXA-70063/6CF-2 W/Mount Pipe	18	1-5/8	1
		1	crown mounts	Platform Mount [LP 304-1]			
119.0	119.0	1	crown mounts	Platform Mount [LP 304-1]	12	1-5/8	3
		12	decibel	DB846G90A-XY w/ Mount Pipe			
105.0	105.0	3	alcatel lucent	1900MHz RRH (65MHz)	--	--	1
		1	crown mounts	Side Arm Mount [SO 102-3]			
104.0	108.0	3	alcatel lucent	TD-RRH8x20-25	1	1-1/4	2
		3	rfs celwave	APXVTM14-C-120 w/ Mount Pipe			
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe	3	1-1/4	1
	104.0	9	rfs celwave	ACU-A20-N			
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		1	crown mounts	Miscellaneous [NA 507-1]			
		1	crown mounts	Platform Mount [LP 712-1]			
87.0	87.0	12	airtech	KN-1870-15-4803	12	1-5/8	1
		1	crown mounts	Platform Mount [LP 305-1]			
		6	rfs celwave	APXV18-209014-C w/ Mount Pipe			
70.0	71.0	1	lucent	KS24019-L112A	1	1/2	1
	70.0	1	crown mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Existing Equipment to be removed; not considered in this analysis

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	DB980F90	-	-
140	140	12	decibel	DB980F90	-	-
130	130	12	decibel	DB980F90	-	-
120	120	12	decibel	DB980F90	-	-
109	109	12	decibel	DB980F90	-	-
100	100	12	decibel	DB980F90		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Clarence Welti Assoc, Inc.	1531967	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Engineered Endeavors, Inc.	2122534	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Engineered Endeavors, Inc.	1533002	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	Semaan Engineering Solutions	2055776	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	GPD Group	3030835	CCISITES
4-POST-INSTALLATION INSPECTION	GPD Group	3420974	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.
5) Tower dimensions for elevation 108.5' to 138.5' was taken from Crown Castle Structural Analysis Report dated March 19, 2013 (Project No. 587330).

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, 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	138.5 - 108.5	Pole	TP24.5x17.375x0.1875	1	-5.60	752.20	77.2	Pass
L2	108.5 - 83.75	Pole	TP31.88x24.5x0.25	2	-10.33	1249.44	80.3	Pass
L3	83.75 - 43	Pole	TP43.42x30.0382x0.3125	3	-18.97	2131.32	80.6	Pass
L4	43 - 0	Pole	TP55.5x41.0206x0.3125	4	-30.49	2629.01	89.7	Pass
							Summary	
						Pole (L4)	89.7	Pass
						RATING =	**89.7**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity - LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	62.8	Pass
1	Base Plate	0	92.4	Pass
1	Base Foundation	0	71.0	Pass
1	Flange Bolts	108.5	44.0	Pass
1	Flange Plate	108.5	30.6	Pass

Structure Rating (max from all components) =	92.4%

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

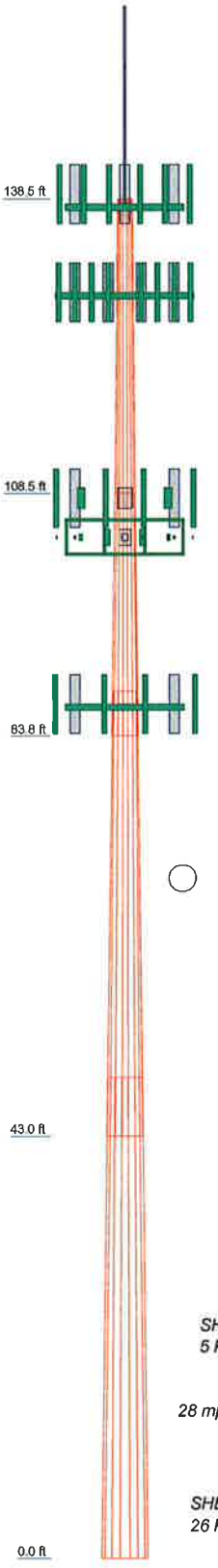
4.1) Recommendations

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	1	2	3	4	
Length (ft)	30.00	24.75	45.25	49.00	
Number of Sides	18	18	18	18	
Thickness (in)	0.1875	0.2500	0.3125	0.3125	
Socket Length (ft)		4.50	6.00		
Top Dia (in)	17.3750	24.5000	30.0382	41.0206	
Bot Dia (in)	24.5000	31.8800	43.4200	55.5000	
Grade	A572-65				
Weight (K)	1.3	1.9	5.6	7.9	16.6



AXIAL
53 K
SHEAR
5 K
MOMENT
504 kip-ft
TORQUE 0 kip-ft
28 mph WIND - 1.0000 in ICE

AXIAL
31 K
SHEAR
26 K
MOMENT
2646 kip-ft
TORQUE 2 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) RRUS-11	139	RRH2X60-AWS	129
(2) RRUS-11	139	RRH2X60-AWS	129
(2) RRUS-11	139	Platform Mount [LP 304-1]	129
Side Arm Mount [SO 102-3]	139	1900MHz RRH (65MHz)	105
(2) LGP21401	138	1900MHz RRH (65MHz)	105
(2) LGP21401	138	1900MHz RRH (65MHz)	105
(2) LGP2140X	138	Side Arm Mount [SO 102-3]	105
(2) LGP2140X	138	APXVTM14-C-120 w/ Mount Pipe	104
(2) LGP2140X	138	APXVTM14-C-120 w/ Mount Pipe	104
(2) LGP21901	138	APXVTM14-C-120 w/ Mount Pipe	104
(2) LGP21901	138	TD-RRH8x20-25	104
(2) LGP21901	138	TD-RRH8x20-25	104
(2) XDUO1416-80 w/ Mount Pipe	138	TD-RRH8x20-25	104
(2) XDUO1416-80 w/ Mount Pipe	138	APXVSPP18-C-A20 w/ Mount Pipe	104
(2) XDUO1416-80 w/ Mount Pipe	138	APXVSPP18-C-A20 w/ Mount Pipe	104
AM-X-CD-16-65-00T-RET w/ Mount Pipe	138	APXVSPP18-C-A20 w/ Mount Pipe	104
800 10764 w/ Mount Pipe	138	(3) ACU-A20-N	104
AM-X-CD-14-65-00T-RET w/ Mount Pipe	138	(3) ACU-A20-N	104
DC6-48-60-18-8F	138	(3) ACU-A20-N	104
Platform Mount [LP 303-1]	138	800 EXTERNAL NOTCH FILTER	104
TTA-429-63H-08179	138	800 EXTERNAL NOTCH FILTER	104
DS9A09F36D-N	138	800 EXTERNAL NOTCH FILTER	104
Side Arm Mount [SO 309-1]	138	800MHZ RRH	104
(2) LGP21401	138	800MHZ RRH	104
ANT150F6	137	800MHZ RRH	104
Pipe Mount [PM 601-1]	137	Platform Mount [LP 712-1]	104
BXA-70063/6CF-2 W/Mount Pipe	129	Miscellaneous [NA 507-1]	104
BXA-70063/6CF-2 W/Mount Pipe	129	(4) KN-1870-15-4803	87
BXA-70063/6CF-2 W/Mount Pipe	129	(4) KN-1870-15-4803	87
(2) HBXX-6517DS-A2M w/ Mount Pipe	129	(4) KN-1870-15-4803	87
(2) HBXX-6517DS-A2M w/ Mount Pipe	129	(2) APXV18-209014-C w/ Mount Pipe	87
(2) HBXX-6517DS-A2M w/ Mount Pipe	129	(2) APXV18-209014-C w/ Mount Pipe	87
LNX-8513DS-A1M w/ Mount Pipe	129	(2) APXV18-209014-C w/ Mount Pipe	87
LNX-8513DS-A1M w/ Mount Pipe	129	Empty Pipe Mount	87
LNX-8513DS-A1M w/ Mount Pipe	129	Empty Pipe Mount	87
DB-B1-6C-12AB-0Z	129	Empty Pipe Mount	87
RRH2X60-AWS	129	Platform Mount [LP 305-1]	87
		KS24019-L112A	70
		Side Arm Mount [SO 701-1]	70

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Litchfield County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 89.7%

FDH Engineering, Inc.
6521 Meridien Drive, Suite 107
Raleigh, North Carolina
Phone: 9197551012
FAX: 9197551031
Tower Analysis

Job: O&G Woodbury, BU# 876380			
Project: 146GGY1400			
Client: Crown Castle	Drawn by: Jeffrey B. Ray	App'd:	
Code: TIA/EIA-222-F	Date: 11/06/14	Scale: NTS	
Path:		Dwg No. E-1	

tnxTower	Job	Page
	O&G Woodbury, BU# 876380	1 of 28
FDH Engineering, Inc. 6521 Meridien Drive, Suite 107 Raleigh, North Carolina Phone: 9197551012 FAX: 9197551031	**Project** 146GGY1400	**Date** 14:50:35 11/06/14
	Client Crown Castle	**Designed by** Jeffrey B. Ray

Tower Input Data

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

Tower is located in Litchfield County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 28 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

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	138.50-108.50	30.00	0.00	18	17.3750	24.5000	0.1875	0.7500	A572-65 (65 ksi)
L2	108.50-83.75	24.75	4.50	18	24.5000	31.8800	0.2500	1.0000	A572-65 (65 ksi)
L3	83.75-43.00	45.25	6.00	18	30.0382	43.4200	0.3125	1.2500	A572-65 (65 ksi)
L4	43.00-0.00	49.00		18	41.0206	55.5000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	17.6430	10.2287	381.7542	6.1016	8.8265	43.2509	764.0106	5.1153	2.7280	14.549
	24.8780	14.4690	1080.5242	8.6309	12.4460	86.8170	2162.4702	7.2359	3.9820	21.237
L2	24.8780	19.2424	1429.6167	8.6088	12.4460	114.8656	2861.1145	9.6230	3.8720	15.488
	32.3718	25.0984	3172.3563	11.2287	16.1950	195.8844	6348.8868	12.5516	5.1709	20.684
L3	31.8529	29.4842	3291.4698	10.5526	15.2594	215.7012	6587.2706	14.7449	4.7367	15.158
	44.0898	42.7573	10038.1321	15.3032	22.0574	455.0922	20089.4726	21.3827	7.0919	22.694
L4	43.4538	40.3774	8453.5159	14.4514	20.8385	405.6687	16918.1551	20.1925	6.6696	21.343
	56.3562	54.7391	21062.8220	19.5916	28.1940	747.0675	42153.3590	27.3748	9.2180	29.498

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 138.50-108.50				1	1	1		
L2 108.50-83.75				1	1	1		
L3 83.75-43.00				1	1	1		
L4 43.00-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
Safety Line 3/8	C	Surface Ar (CaAa)	138.50 - 0.00	1	1	0.000 0.000	0.3750		0.22
LDF4-50A(1/2")	A	Surface Ar (CaAa)	138.00 - 0.00	1	1	-0.110 -0.100	0.0000		0.15
LDF6-50A(1-1/4")	A	Surface Ar (CaAa)	138.00 - 0.00	2	1	-0.100 -0.050	1.5500		0.66
LDF7-50A(1-5/8")	A	Surface Ar (CaAa)	129.00 - 0.00	7	1	0.000 0.250	1.9800		0.82
HB114-1-0813U4-M5J(1 1/4")	B	Surface Ar (CaAa)	104.00 - 0.00	1	1	-0.400 -0.380	1.5400		1.20
***									

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
***								
LDF6-50A(1-1/4")	A	No	Inside Pole	138.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LCF114-50J(1-1/4")	A	No	Inside Pole	138.00 - 0.00	6	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
FB-L98B-002-75000(3/8")	A	No	Inside Pole	138.00 - 0.00	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	138.00 - 0.00	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
***								
LDF4-50A(1/2")	A	No	Inside Pole	137.00 - 0.00	1	No Ice	0.00	0.15
						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
***								
LDF7-50A(1-5/8")	A	No	Inside Pole	129.00 - 0.00	12	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
***								
***								
HB114-1-0813U4-M5J(1 1/4")	B	No	Inside Pole	104.00 - 0.00	3	No Ice	0.00	1.20
						1/2" Ice	0.00	1.20
						1" Ice	0.00	1.20
						2" Ice	0.00	1.20
						4" Ice	0.00	1.20
***								
LDF7-50A(1-5/8")	B	No	Inside Pole	87.00 - 0.00	12	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
***								
LDF4-50A(1/2")	B	No	Inside Pole	70.00 - 0.00	1	No Ice	0.00	0.15
						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
***								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	138.50-108.50	A	0.000	0.000	8.632	0.000	0.62
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	1.125	0.000	0.01
L2	108.50-83.75	A	0.000	0.000	8.737	0.000	0.64
		B	0.000	0.000	3.119	0.000	0.13

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C	0.000	0.000	0.928	0.000	0.01
L3	83.75-43.00	A	0.000	0.000	14.385	0.000	1.05
		B	0.000	0.000	6.276	0.000	0.60
		C	0.000	0.000	1.528	0.000	0.01
L4	43.00-0.00	A	0.000	0.000	15.179	0.000	1.11
		B	0.000	0.000	6.622	0.000	0.64
		C	0.000	0.000	1.613	0.000	0.01

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	138.50-108.50	A	1.171	0.000	0.000	27.244	0.000	1.54
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	8.149	0.000	0.07
L2	108.50-83.75	A	1.136	0.000	0.000	25.608	0.000	1.61
		B		0.000	0.000	7.720	0.000	0.20
		C		0.000	0.000	6.552	0.000	0.06
L3	83.75-43.00	A	1.080	0.000	0.000	42.163	0.000	2.65
		B		0.000	0.000	15.535	0.000	0.75
		C		0.000	0.000	10.788	0.000	0.09
L4	43.00-0.00	A	1.000	0.000	0.000	43.047	0.000	2.68
		B		0.000	0.000	15.911	0.000	0.78
		C		0.000	0.000	10.902	0.000	0.09

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	138.50-108.50	-0.4146	-0.2388	-0.8303	-0.2589
L2	108.50-83.75	-0.4162	-0.4486	-0.8361	-0.6179
L3	83.75-43.00	-0.3984	-0.4728	-0.8669	-0.7007
L4	43.00-0.00	-0.3933	-0.4705	-0.8981	-0.7261

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
TTA-429-83H-08179	A	From Leg	1.00 0.00 10.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice	1.05 1.21 1.38 1.74	1.05 1.21 1.38 1.74	0.02 0.03 0.04 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	2.57	2.57	0.16
DS9A09F36D-N	A	From Leg	1.00 0.00 10.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.76 7.71 9.68 13.67 20.51	5.76 7.71 9.68 13.67 20.51	0.05 0.09 0.14 0.29 0.73
Side Arm Mount [SO 309-1]	A	From Leg	0.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.82 4.07 5.32 7.82 12.82	2.20 3.16 4.12 6.04 9.88	0.04 0.06 0.08 0.13 0.22
***									
(2) LGP21401	A	From Leg	4.00 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.23 0.31 0.40 0.61 1.12	0.01 0.02 0.03 0.05 0.14
(2) LGP21401	B	From Leg	4.00 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.23 0.31 0.40 0.61 1.12	0.01 0.02 0.03 0.05 0.14
(2) LGP21401	C	From Leg	4.00 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.23 0.31 0.40 0.61 1.12	0.01 0.02 0.03 0.05 0.14
(2) LGP2140X	A	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.26 1.42 1.58 1.94 2.75	0.38 0.49 0.62 0.89 1.54	0.01 0.02 0.03 0.05 0.13
(2) LGP2140X	B	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.26 1.42 1.58 1.94 2.75	0.38 0.49 0.62 0.89 1.54	0.01 0.02 0.03 0.05 0.13
(2) LGP2140X	C	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.26 1.42 1.58 1.94 2.75	0.38 0.49 0.62 0.89 1.54	0.01 0.02 0.03 0.05 0.13
(2) LGP21901	A	From Leg	4.00 6.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.01 0.02 0.07
(2) LGP21901	B	From Leg	4.00 6.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.01 0.02 0.07
(2) LGP21901	C	From Leg	4.00 6.00 0.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.01 0.02 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) XDUO1416-80 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.73 7.21 7.69 8.69 10.82	4.09 4.74 5.38 6.80 9.91	0.04 0.09 0.15 0.28 0.66
(2) XDUO1416-80 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.73 7.21 7.69 8.69 10.82	4.09 4.74 5.38 6.80 9.91	0.04 0.09 0.15 0.28 0.66
(2) XDUO1416-80 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.73 7.21 7.69 8.69 10.82	4.09 4.74 5.38 6.80 9.91	0.04 0.09 0.15 0.28 0.66
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
800 10764 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.20 6.69 7.18 8.19 10.33	4.29 4.99 5.66 7.10 10.30	0.06 0.11 0.17 0.30 0.67
AM-X-CD-14-65-00T-RET w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.74 6.20 6.66 7.62 9.67	4.02 4.63 5.28 6.68 9.74	0.03 0.08 0.13 0.25 0.61
DC6-48-60-18-8F	B	From Leg	4.00 0.00 1.00	0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.80 3.04 3.54 4.66	4.32 4.60 4.88 5.49 6.80	0.03 0.06 0.10 0.18 0.40
Platform Mount [LP 303-1]	C	None		0.0000	138.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	14.66 18.87 23.08 31.50 48.34	14.66 18.87 23.08 31.50 48.34	1.25 1.48 1.71 2.18 3.10
***									
(2) RRUS-11	A	From Leg	1.00 0.00 1.00	0.0000	139.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.25 1.41 1.59 1.96 2.82	0.06 0.07 0.10 0.15 0.30
(2) RRUS-11	B	From Leg	1.00 0.00 1.00	0.0000	139.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.25 1.41 1.59 1.96 2.82	0.06 0.07 0.10 0.15 0.30
(2) RRUS-11	C	From Leg	1.00 0.00 1.00	0.0000	139.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.25 1.41 1.59 1.96 2.82	0.06 0.07 0.10 0.15 0.30
Side Arm Mount [SO 102-3]	C	None		0.0000	139.00	No Ice	3.00	3.00	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						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
***									
ANT150F6	A	From Leg	1.00 0.00 10.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.80 6.83 8.87 13.01 21.03	4.80 6.83 8.87 13.01 21.03	0.03 0.07 0.11 0.25 0.68
Pipe Mount [PM 601-1]	A	From Leg	0.50 0.00 0.00	0.0000	137.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.00 3.74 4.48 5.96 8.92	0.90 1.12 1.34 1.78 2.66	0.07 0.08 0.09 0.12 0.18
***									
BXA-70063/6CF-2 W/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.75 8.29 8.85 9.97 12.34	5.18 6.11 6.92 8.59 12.13	0.04 0.10 0.16 0.31 0.75
BXA-70063/6CF-2 W/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.75 8.29 8.85 9.97 12.34	5.18 6.11 6.92 8.59 12.13	0.04 0.10 0.16 0.31 0.75
BXA-70063/6CF-2 W/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.75 8.29 8.85 9.97 12.34	5.18 6.11 6.92 8.59 12.13	0.04 0.10 0.16 0.31 0.75
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
LNX-8513DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
LNX-8513DS-A1M w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
LNX-8513DS-A1M w/	C	From Leg	4.00	0.0000	129.00	No Ice	8.65	7.08	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Mount Pipe			0.00 0.00			1/2" Ice	9.31	8.27	0.13
						1" Ice	9.93	9.18	0.21
						2" Ice	11.20	11.02	0.39
						4" Ice	13.87	15.06	0.90
DB-B1-6C-12AB-0Z	A	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice	3.92	2.56	0.02
						1/2" Ice	4.20	2.79	0.05
						1" Ice	4.48	3.04	0.08
						2" Ice	5.07	3.56	0.16
						4" Ice	6.35	4.70	0.36
RRH2X60-AWS	A	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice	3.96	1.82	0.06
						1/2" Ice	4.27	2.08	0.08
						1" Ice	4.60	2.36	0.11
						2" Ice	5.27	2.96	0.17
						4" Ice	6.72	4.25	0.35
RRH2X60-AWS	B	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice	3.96	1.82	0.06
						1/2" Ice	4.27	2.08	0.08
						1" Ice	4.60	2.36	0.11
						2" Ice	5.27	2.96	0.17
						4" Ice	6.72	4.25	0.35
RRH2X60-AWS	C	From Leg	4.00 0.00 0.00	0.0000	129.00	No Ice	3.96	1.82	0.06
						1/2" Ice	4.27	2.08	0.08
						1" Ice	4.60	2.36	0.11
						2" Ice	5.27	2.96	0.17
						4" Ice	6.72	4.25	0.35
Platform Mount [LP 304-1]	C	None		0.0000	129.00	No Ice	17.46	17.46	1.35
						1/2" Ice	22.44	22.44	1.62
						1" Ice	27.42	27.42	1.90
						2" Ice	37.38	37.38	2.45
						4" Ice	57.30	57.30	3.55
***									
***									
1900MHz RRH (65MHz)	A	From Leg	1.00 0.00 0.00	0.0000	105.00	No Ice	2.70	2.77	0.06
						1/2" Ice	2.94	3.01	0.08
						1" Ice	3.18	3.26	0.11
						2" Ice	3.70	3.78	0.18
						4" Ice	4.85	4.93	0.35
1900MHz RRH (65MHz)	B	From Leg	1.00 0.00 0.00	0.0000	105.00	No Ice	2.70	2.77	0.06
						1/2" Ice	2.94	3.01	0.08
						1" Ice	3.18	3.26	0.11
						2" Ice	3.70	3.78	0.18
						4" Ice	4.85	4.93	0.35
1900MHz RRH (65MHz)	C	From Leg	1.00 0.00 0.00	0.0000	105.00	No Ice	2.70	2.77	0.06
						1/2" Ice	2.94	3.01	0.08
						1" Ice	3.18	3.26	0.11
						2" Ice	3.70	3.78	0.18
						4" Ice	4.85	4.93	0.35
Side Arm Mount [SO 102-3]	C	None		0.0000	105.00	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
***									
APXVTM14-C-120 w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice	7.13	4.96	0.08
						1/2" Ice	7.66	5.75	0.13
						1" Ice	8.18	6.47	0.19
						2" Ice	9.26	8.01	0.34
						4" Ice	11.53	11.41	0.75

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APXVTM14-C-120 w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.13 7.66 8.18 9.26 11.53	4.96 5.75 6.47 8.01 11.41	0.08 0.13 0.19 0.34 0.75
APXVTM14-C-120 w/ Mount Pipe	C	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.13 7.66 8.18 9.26 11.53	4.96 5.75 6.47 8.01 11.41	0.08 0.13 0.19 0.34 0.75
TD-RRH8x20-25	A	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.14 2.62 3.68	0.07 0.10 0.13 0.20 0.40
TD-RRH8x20-25	B	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.14 2.62 3.68	0.07 0.10 0.13 0.20 0.40
TD-RRH8x20-25	C	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.14 2.62 3.68	0.07 0.10 0.13 0.20 0.40
APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.23 0.41 0.91
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.23 0.41 0.91
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.00 0.00 4.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.23 0.41 0.91
(3) ACU-A20-N	A	From Leg	4.00 0.00 0.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.08 0.12 0.17 0.30 0.67	0.14 0.19 0.25 0.40 0.80	0.00 0.00 0.00 0.01 0.04
(3) ACU-A20-N	B	From Leg	4.00 0.00 0.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.08 0.12 0.17 0.30 0.67	0.14 0.19 0.25 0.40 0.80	0.00 0.00 0.00 0.01 0.04
(3) ACU-A20-N	C	From Leg	4.00 0.00 0.00	0.0000	104.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.08 0.12 0.17 0.30 0.67	0.14 0.19 0.25 0.40 0.80	0.00 0.00 0.00 0.01 0.04
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00 0.00	0.0000	104.00	No Ice 1/2" Ice	0.77 0.89	0.37 0.46	0.01 0.02

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			1" Ice	1.02	0.56	0.02
						2" Ice	1.30	0.79	0.04
						4" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00	0.0000	104.00	No Ice	0.77	0.37	0.01
			0.00			1/2" Ice	0.89	0.46	0.02
			0.00			1" Ice	1.02	0.56	0.02
						2" Ice	1.30	0.79	0.04
						4" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00	0.0000	104.00	No Ice	0.77	0.37	0.01
			0.00			1/2" Ice	0.89	0.46	0.02
			0.00			1" Ice	1.02	0.56	0.02
						2" Ice	1.30	0.79	0.04
						4" Ice	1.97	1.34	0.11
800MHZ RRH	A	From Leg	1.00	0.0000	104.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			0.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
800MHZ RRH	B	From Leg	1.00	0.0000	104.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			0.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
800MHZ RRH	C	From Leg	1.00	0.0000	104.00	No Ice	2.49	2.07	0.05
			0.00			1/2" Ice	2.71	2.27	0.07
			0.00			1" Ice	2.93	2.48	0.10
						2" Ice	3.41	2.93	0.16
						4" Ice	4.46	3.93	0.32
Platform Mount [LP 712-1]	C	None		0.0000	104.00	No Ice	24.53	24.53	1.34
						1/2" Ice	29.94	29.94	1.65
						1" Ice	35.35	35.35	1.96
						2" Ice	46.17	46.17	2.58
						4" Ice	67.81	67.81	3.82
Miscellaneous [NA 507-1]	C	None		0.0000	104.00	No Ice	4.80	4.80	0.25
						1/2" Ice	6.70	6.70	0.29
						1" Ice	8.60	8.60	0.34
						2" Ice	12.40	12.40	0.44
						4" Ice	20.00	20.00	0.64
***									
(4) KN-1870-15-4803	A	From Leg	4.00	0.0000	87.00	No Ice	0.83	0.39	0.01
			0.00			1/2" Ice	0.97	0.50	0.02
			0.00			1" Ice	1.11	0.62	0.02
						2" Ice	1.42	0.89	0.04
						4" Ice	2.14	1.52	0.11
(4) KN-1870-15-4803	B	From Leg	4.00	0.0000	87.00	No Ice	0.83	0.39	0.01
			0.00			1/2" Ice	0.97	0.50	0.02
			0.00			1" Ice	1.11	0.62	0.02
						2" Ice	1.42	0.89	0.04
						4" Ice	2.14	1.52	0.11
(4) KN-1870-15-4803	C	From Leg	4.00	0.0000	87.00	No Ice	0.83	0.39	0.01
			0.00			1/2" Ice	0.97	0.50	0.02
			0.00			1" Ice	1.11	0.62	0.02
						2" Ice	1.42	0.89	0.04
						4" Ice	2.14	1.52	0.11
(2) APXV18-209014-C w/ Mount Pipe	A	From Leg	4.00	0.0000	87.00	No Ice	3.72	3.31	0.04
			0.00			1/2" Ice	4.13	4.02	0.07
			0.00			1" Ice	4.56	4.68	0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	5.51	6.07	0.21
						4" Ice	7.55	9.05	0.52
(2) APXV18-209014-C w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.13 4.56 5.51 7.55	3.31 4.02 4.68 6.07 9.05	0.04 0.07 0.11 0.21 0.52
(2) APXV18-209014-C w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.13 4.56 5.51 7.55	3.31 4.02 4.68 6.07 9.05	0.04 0.07 0.11 0.21 0.52
Empty Pipe Mount	A	From Leg	4.00 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.50 1.57 1.71 2.00	1.43 1.50 1.57 1.71 2.00	0.02 0.03 0.04 0.05 0.07
Empty Pipe Mount	B	From Leg	4.00 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.50 1.57 1.71 2.00	1.43 1.50 1.57 1.71 2.00	0.02 0.03 0.04 0.05 0.07
Empty Pipe Mount	C	From Leg	4.00 0.00 0.00	0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.50 1.57 1.71 2.00	1.43 1.50 1.57 1.71 2.00	0.02 0.03 0.04 0.05 0.07
Platform Mount [LP 305-1]	C	None		0.0000	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	18.01 23.33 28.65 39.29 60.57	18.01 23.33 28.65 39.29 60.57	1.12 1.35 1.58 2.05 2.97
***									
KS24019-L112A	A	From Leg	3.00 0.00 1.00	0.0000	70.00	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
Side Arm Mount [SO 701-1]	A	From Leg	1.50 0.00 0.00	0.0000	70.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.85 1.14 1.43 2.01 3.17	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18
***									

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	16.62					
Bracing Weight	0.00					
Total Member Self-Weight	16.62			-2.06	1.12	
Total Weight	30.51			-2.06	1.12	
Wind 0 deg - No Ice		0.03	-26.39	-2568.98	-2.82	0.42
Wind 30 deg - No Ice		13.12	-22.86	-2227.05	-1271.75	-0.69
Wind 60 deg - No Ice		22.70	-13.22	-1288.94	-2199.61	-1.61
Wind 90 deg - No Ice		26.19	-0.03	-6.00	-2537.79	-2.10
Wind 120 deg - No Ice		22.67	13.17	1277.99	-2195.66	-2.03
Wind 150 deg - No Ice		13.07	22.84	2218.99	-1264.91	-1.41
Wind 180 deg - No Ice		-0.03	26.39	2564.87	5.07	-0.42
Wind 210 deg - No Ice		-13.12	22.86	2222.94	1273.99	0.69
Wind 240 deg - No Ice		-22.70	13.22	1284.82	2201.85	1.61
Wind 270 deg - No Ice		-26.19	0.03	1.89	2540.03	2.10
Wind 300 deg - No Ice		-22.67	-13.17	-1282.10	2197.91	2.03
Wind 330 deg - No Ice		-13.07	-22.84	-2223.11	1267.16	1.41
Member Ice	6.73					
Total Weight Ice	52.59			-9.73	8.16	
Wind 0 deg - Ice		0.00	-4.73	-471.87	7.62	-0.04
Wind 30 deg - Ice		2.35	-4.10	-410.22	-221.21	-0.27
Wind 60 deg - Ice		4.07	-2.37	-241.26	-388.57	-0.43
Wind 90 deg - Ice		4.70	-0.00	-10.26	-449.64	-0.47
Wind 120 deg - Ice		4.07	2.36	220.88	-388.04	-0.39
Wind 150 deg - Ice		2.35	4.10	390.23	-220.28	-0.20
Wind 180 deg - Ice		-0.00	4.73	452.41	8.70	0.04
Wind 210 deg - Ice		-2.35	4.10	390.77	237.52	0.27
Wind 240 deg - Ice		-4.07	2.37	221.81	404.89	0.43
Wind 270 deg - Ice		-4.70	0.00	-9.19	465.96	0.47
Wind 300 deg - Ice		-4.07	-2.36	-240.33	404.36	0.39
Wind 330 deg - Ice		-2.35	-4.10	-409.69	236.59	0.20
Total Weight	30.51			-2.06	1.12	
Wind 0 deg - Service		0.01	-10.31	-1003.37	-1.79	0.16
Wind 30 deg - Service		5.13	-8.93	-869.80	-497.46	-0.27
Wind 60 deg - Service		8.87	-5.16	-503.35	-859.91	-0.63
Wind 90 deg - Service		10.23	-0.01	-2.20	-992.01	-0.82
Wind 120 deg - Service		8.86	5.14	499.36	-858.37	-0.79
Wind 150 deg - Service		5.11	8.92	866.94	-494.79	-0.55
Wind 180 deg - Service		-0.01	10.31	1002.04	1.30	-0.16
Wind 210 deg - Service		-5.13	8.93	868.48	496.97	0.27
Wind 240 deg - Service		-8.87	5.16	502.03	859.41	0.63
Wind 270 deg - Service		-10.23	0.01	0.88	991.52	0.82
Wind 300 deg - Service		-8.86	-5.14	-500.68	857.87	0.79
Wind 330 deg - Service		-5.11	-8.92	-868.26	494.30	0.55

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	138.5 - 108.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-14.43	0.58	2.43
			Max. Mx	5	-5.63	-280.65	1.42
			Max. My	2	-5.60	-0.93	287.31
			Max. Vy	11	-11.73	280.49	-0.37
			Max. Vx	2	-11.95	-0.93	287.31
			Max. Torque	6			1.69
L2	108.5 - 83.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-23.47	1.81	3.63
			Max. Mx	11	-10.36	605.86	-0.75
			Max. My	2	-10.33	-1.37	617.35
			Max. Vy	11	-17.33	605.86	-0.75
			Max. Vx	2	-17.56	-1.37	617.35
			Max. Torque	6			1.71
L3	83.75 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-36.99	4.66	6.71
			Max. Mx	11	-18.98	1423.36	-1.22
			Max. My	2	-18.97	-2.14	1443.55
			Max. Vy	11	-22.47	1423.36	-1.22
			Max. Vx	2	-22.68	-2.14	1443.55
			Max. Torque	6			1.93
L4	43 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-53.19	8.62	10.45

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	11	-30.49	2616.17	-1.97
			Max. My	2	-30.49	-2.93	2646.09
			Max. Vy	11	-26.21	2616.17	-1.97
			Max. Vx	2	-26.41	-2.93	2646.09
			Max. Torque	11			-2.09

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	53.19	2.35	4.10
	Max. H_x	11	30.51	26.19	-0.03
	Max. H_z	2	30.51	-0.03	26.39
	Max. M_x	2	2646.09	-0.03	26.39
	Max. M_z	5	2613.88	-26.19	0.03
	Max. Torsion	5	2.08	-26.19	0.03
	Min. Vert	1	30.51	0.00	0.00
	Min. H_x	5	30.51	-26.19	0.03
	Min. H_z	8	30.51	0.03	-26.39
	Min. M_x	8	-2641.83	0.03	-26.39
	Min. M_z	11	-2616.17	26.19	-0.03
	Min. Torsion	11	-2.09	26.19	-0.03

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	30.51	0.00	0.00	-2.08	1.12	-0.00
Dead+Wind 0 deg - No Ice	30.51	0.03	-26.39	-2646.09	-2.93	0.40
Dead+Wind 30 deg - No Ice	30.51	13.12	-22.86	-2293.92	-1309.86	-0.70
Dead+Wind 60 deg - No Ice	30.51	22.70	-13.22	-1327.68	-2265.54	-1.60
Dead+Wind 90 deg - No Ice	30.51	26.19	-0.03	-6.21	-2613.88	-2.08
Dead+Wind 120 deg - No Ice	30.51	22.67	13.17	1316.37	-2261.47	-2.01
Dead+Wind 150 deg - No Ice	30.51	13.07	22.84	2285.61	-1302.78	-1.39
Dead+Wind 180 deg - No Ice	30.51	-0.03	26.39	2641.83	5.24	-0.40
Dead+Wind 210 deg - No Ice	30.51	-13.12	22.86	2289.67	1312.16	0.70
Dead+Wind 240 deg - No Ice	30.51	-22.70	13.22	1323.43	2267.84	1.61
Dead+Wind 270 deg - No Ice	30.51	-26.19	0.03	1.97	2616.17	2.09
Dead+Wind 300 deg - No Ice	30.51	-22.67	-13.17	-1320.61	2263.78	2.01
Dead+Wind 330 deg - No Ice	30.51	-13.07	-22.84	-2289.85	1305.09	1.39
Dead+Ice+Temp	53.19	-0.00	-0.00	-10.45	8.62	-0.00
Dead+Wind 0 deg+Ice+Temp	53.19	0.00	-4.73	-502.80	8.08	-0.04
Dead+Wind 30 deg+Ice+Temp	53.19	2.35	-4.10	-437.14	-235.64	-0.27
Dead+Wind 60 deg+Ice+Temp	53.19	4.07	-2.37	-257.15	-413.90	-0.43
Dead+Wind 90 deg+Ice+Temp	53.19	4.70	-0.00	-11.08	-478.94	-0.47
Dead+Wind 120 deg+Ice+Temp	53.19	4.07	2.36	235.15	-413.32	-0.39
Dead+Wind 150 deg+Ice+Temp	53.19	2.35	4.10	415.56	-234.63	-0.20
Dead+Wind 180 deg+Ice+Temp	53.19	-0.00	4.73	481.80	9.24	0.04
Dead+Wind 210 deg+Ice+Temp	53.19	-2.35	4.10	416.14	252.96	0.27
Dead+Wind 240 deg+Ice+Temp	53.19	-4.07	2.37	236.15	431.23	0.43
Dead+Wind 270 deg+Ice+Temp	53.19	-4.70	0.00	-9.92	496.26	0.47

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 300 deg+Ice+Temp	53.19	-4.07	-2.36	-256.15	430.65	0.39
Dead+Wind 330 deg+Ice+Temp	53.19	-2.35	-4.10	-436.56	251.96	0.20
Dead+Wind 0 deg - Service	30.51	0.01	-10.31	-1036.20	-0.45	0.16
Dead+Wind 30 deg - Service	30.51	5.13	-8.93	-898.46	-511.59	-0.27
Dead+Wind 60 deg - Service	30.51	8.87	-5.16	-520.56	-885.34	-0.63
Dead+Wind 90 deg - Service	30.51	10.23	-0.01	-3.74	-1021.55	-0.82
Dead+Wind 120 deg - Service	30.51	8.86	5.14	513.51	-883.74	-0.79
Dead+Wind 150 deg - Service	30.51	5.11	8.92	892.59	-508.81	-0.55
Dead+Wind 180 deg - Service	30.51	-0.01	10.31	1031.92	2.75	-0.16
Dead+Wind 210 deg - Service	30.51	-5.13	8.93	894.19	513.88	0.27
Dead+Wind 240 deg - Service	30.51	-8.87	5.16	516.28	887.63	0.63
Dead+Wind 270 deg - Service	30.51	-10.23	0.01	-0.54	1023.85	0.82
Dead+Wind 300 deg - Service	30.51	-8.86	-5.14	-517.79	886.04	0.79
Dead+Wind 330 deg - Service	30.51	-5.11	-8.92	-896.86	511.11	0.55

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	-30.51	0.00	0.00	30.51	0.00	0.000%
2	0.03	-30.51	-26.39	-0.03	30.51	26.39	0.000%
3	13.12	-30.51	-22.86	-13.12	30.51	22.86	0.000%
4	22.70	-30.51	-13.22	-22.70	30.51	13.22	0.000%
5	26.19	-30.51	-0.03	-26.19	30.51	0.03	0.000%
6	22.67	-30.51	13.17	-22.67	30.51	-13.17	0.000%
7	13.07	-30.51	22.84	-13.07	30.51	-22.84	0.000%
8	-0.03	-30.51	26.39	0.03	30.51	-26.39	0.000%
9	-13.12	-30.51	22.86	13.12	30.51	-22.86	0.000%
10	-22.70	-30.51	13.22	22.70	30.51	-13.22	0.000%
11	-26.19	-30.51	0.03	26.19	30.51	-0.03	0.000%
12	-22.67	-30.51	-13.17	22.67	30.51	13.17	0.000%
13	-13.07	-30.51	-22.84	13.07	30.51	22.84	0.000%
14	0.00	-53.19	0.00	0.00	53.19	0.00	0.000%
15	0.00	-53.19	-4.73	-0.00	53.19	4.73	0.000%
16	2.35	-53.19	-4.10	-2.35	53.19	4.10	0.000%
17	4.07	-53.19	-2.37	-4.07	53.19	2.37	0.000%
18	4.70	-53.19	-0.00	-4.70	53.19	0.00	0.000%
19	4.07	-53.19	2.36	-4.07	53.19	-2.36	0.000%
20	2.35	-53.19	4.10	-2.35	53.19	-4.10	0.000%
21	-0.00	-53.19	4.73	0.00	53.19	-4.73	0.000%
22	-2.35	-53.19	4.10	2.35	53.19	-4.10	0.000%
23	-4.07	-53.19	2.37	4.07	53.19	-2.37	0.000%
24	-4.70	-53.19	0.00	4.70	53.19	-0.00	0.000%
25	-4.07	-53.19	-2.36	4.07	53.19	2.36	0.000%
26	-2.35	-53.19	-4.10	2.35	53.19	4.10	0.000%
27	0.01	-30.51	-10.31	-0.01	30.51	10.31	0.000%
28	5.13	-30.51	-8.93	-5.13	30.51	8.93	0.000%
29	8.87	-30.51	-5.16	-8.87	30.51	5.16	0.000%
30	10.23	-30.51	-0.01	-10.23	30.51	0.01	0.000%
31	8.86	-30.51	5.14	-8.86	30.51	-5.14	0.000%
32	5.11	-30.51	8.92	-5.11	30.51	-8.92	0.000%
33	-0.01	-30.51	10.31	0.01	30.51	-10.31	0.000%
34	-5.13	-30.51	8.93	5.13	30.51	-8.93	0.000%
35	-8.87	-30.51	5.16	8.87	30.51	-5.16	0.000%
36	-10.23	-30.51	0.01	10.23	30.51	-0.01	0.000%
37	-8.86	-30.51	-5.14	8.86	30.51	5.14	0.000%
38	-5.11	-30.51	-8.92	5.11	30.51	8.92	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	0.00076031
3	Yes	5	0.00000001	0.00084582
4	Yes	5	0.00000001	0.00087725
5	Yes	5	0.00000001	0.00007209
6	Yes	5	0.00000001	0.00080635
7	Yes	5	0.00000001	0.00087802
8	Yes	4	0.00000001	0.00055011
9	Yes	5	0.00000001	0.00085937
10	Yes	5	0.00000001	0.00082455
11	Yes	5	0.00000001	0.00006423
12	Yes	5	0.00000001	0.00088746
13	Yes	5	0.00000001	0.00081893
14	Yes	4	0.00000001	0.00008464
15	Yes	5	0.00000001	0.00022962
16	Yes	5	0.00000001	0.00027088
17	Yes	5	0.00000001	0.00027284
18	Yes	5	0.00000001	0.00021884
19	Yes	5	0.00000001	0.00025403
20	Yes	5	0.00000001	0.00025791
21	Yes	5	0.00000001	0.00021741
22	Yes	5	0.00000001	0.00026687
23	Yes	5	0.00000001	0.00026339
24	Yes	5	0.00000001	0.00022596
25	Yes	5	0.00000001	0.00028111
26	Yes	5	0.00000001	0.00027831
27	Yes	4	0.00000001	0.00018694
28	Yes	5	0.00000001	0.00010130
29	Yes	5	0.00000001	0.00010875
30	Yes	4	0.00000001	0.00046243
31	Yes	5	0.00000001	0.00009253
32	Yes	5	0.00000001	0.00010867
33	Yes	4	0.00000001	0.00016860
34	Yes	5	0.00000001	0.00010397
35	Yes	5	0.00000001	0.00009611
36	Yes	4	0.00000001	0.00044337
37	Yes	5	0.00000001	0.00011164
38	Yes	5	0.00000001	0.00009579

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	138.5 - 108.5	35.014	27	2.5081	0.0149
L2	108.5 - 83.75	20.473	27	1.9722	0.0052
L3	88.25 - 43	13.123	27	1.4854	0.0027
L4	49 - 0	3.874	27	0.7456	0.0010

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.00	(2) RRUS-11	27	35.014	2.5081	0.0151	11119
138.00	TTA-429-83H-08179	27	34.755	2.5002	0.0149	11119
137.00	ANT150F6	27	34.238	2.4845	0.0145	11119
129.00	BXA-70063/6CF-2 W/Mount Pipe	27	30.132	2.3569	0.0115	5852
105.00	1900MHz RRH (65MHz)	27	19.043	1.8921	0.0046	1994
104.00	APXVTM14-C-120 w/ Mount Pipe	27	18.648	1.8685	0.0044	2036
87.00	(4) KN-1870-15-4803	27	12.732	1.4565	0.0027	3070
70.00	KS24019-L112A	27	8.028	1.1053	0.0017	2905

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	138.5 - 108.5	89.177	2	6.3827	0.0375
L2	108.5 - 83.75	52.201	2	5.0269	0.0130
L3	88.25 - 43	33.476	2	3.7886	0.0068
L4	49 - 0	9.888	2	1.9031	0.0025

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.00	(2) RRUS-11	2	89.177	6.3827	0.0387	4465
138.00	TTA-429-83H-08179	2	88.520	6.3629	0.0382	4465
137.00	ANT150F6	2	87.206	6.3233	0.0372	4465
129.00	BXA-70063/6CF-2 W/Mount Pipe	2	76.767	6.0010	0.0294	2349
105.00	1900MHz RRH (65MHz)	2	48.560	4.8235	0.0118	796
104.00	APXVTM14-C-120 w/ Mount Pipe	2	47.554	4.7635	0.0114	812
87.00	(4) KN-1870-15-4803	2	32.480	3.7149	0.0068	1214
70.00	KS24019-L112A	2	20.484	2.8204	0.0043	1145

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	138.5 - 137	TP24.5x17.375x0.1875	30.00	0.00	0.0	39.000	10.4407	-1.96	407.19	0.005

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 $\frac{P}{P_a}$
	137 - 135.5					39.000	10.6527	-2.10	415.46	0.005
	135.5 - 134					39.000	10.8648	-2.18	423.73	0.005
	134 - 132.5					39.000	11.0768	-2.25	431.99	0.005
	132.5 - 131					39.000	11.2888	-2.33	440.26	0.005
	131 - 129.5					39.000	11.5008	-2.42	448.53	0.005
	129.5 - 128					39.000	11.7128	-4.22	456.80	0.009
	128 - 126.5					39.000	11.9248	-4.32	465.07	0.009
	126.5 - 125					39.000	12.1368	-4.41	473.34	0.009
	125 - 123.5					39.000	12.3488	-4.51	481.61	0.009
	123.5 - 122					39.000	12.5609	-4.61	489.87	0.009
	122 - 120.5					39.000	12.7729	-4.71	498.14	0.009
	120.5 - 119					39.000	12.9849	-4.81	506.41	0.009
	119 - 117.5					39.000	13.1969	-4.92	514.68	0.010
	117.5 - 116					39.000	13.4089	-5.02	522.95	0.010
	116 - 114.5					39.000	13.6209	-5.14	531.22	0.010
	114.5 - 113					39.000	13.8329	-5.25	539.49	0.010
	113 - 111.5					39.000	14.0449	-5.36	547.75	0.010
	111.5 - 110					39.000	14.2570	-5.48	556.02	0.010
	110 - 108.5					39.000	14.4690	-5.60	564.29	0.010
L2	108.5 - 107.434	TP31.88x24.5x0.25	24.75	0.00	0.0	39.000	19.4945	-5.71	760.29	0.008
	107.434 - 106.368					39.000	19.7467	-5.82	770.12	0.008
	106.368 - 105.303					39.000	19.9989	-5.93	779.96	0.008
	105.303 - 104.237					39.000	20.2511	-6.27	789.79	0.008
	104.237 - 103.171					39.000	20.5032	-8.55	799.63	0.011
	103.171 - 102.105					39.000	20.7554	-8.67	809.46	0.011
	102.105 - 101.039					39.000	21.0076	-8.79	819.30	0.011
	101.039 - 99.9737					39.000	21.2598	-8.91	829.13	0.011
	99.9737 - 98.9079					39.000	21.5119	-9.03	838.97	0.011
	98.9079 - 97.8421					39.000	21.7641	-9.16	848.80	0.011
	97.8421 - 96.7763					39.000	22.0163	-9.28	858.63	0.011
	96.7763 - 95.7105					39.000	22.2685	-9.41	868.47	0.011
	95.7105 - 94.6447					39.000	22.5206	-9.54	878.30	0.011
	94.6447 - 93.5789					39.000	22.7728	-9.67	888.14	0.011
	93.5789 - 92.5132					39.000	23.0250	-9.80	897.97	0.011
	92.5132 - 91.4474					39.000	23.2772	-9.93	907.81	0.011
	91.4474 - 90.3816					39.000	23.5293	-10.06	917.64	0.011
	90.3816 - 89.3158					39.000	23.7815	-10.19	927.48	0.011
	89.3158 - 88.25					39.000	24.0337	-10.33	937.31	0.011
	88.25 - 83.75					39.000	25.0984	-5.97	978.84	0.006
L3	88.25 - 83.75	TP43.42x30.0382x0.3125	45.25	0.00	0.0	39.000	30.8041	-6.76	1201.36	0.006
	83.75 - 81.8194					39.000	31.3704	-13.05	1223.45	0.011
	81.8194 - 79.8889					39.000	31.9367	-13.36	1245.53	0.011

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 $\frac{P}{P_a}$
	79.8889 - 77.9583					39.000	32.5030	-13.67	1267.62	0.011
	77.9583 - 76.0278					39.000	33.0693	-14.00	1289.70	0.011
	76.0278 - 74.0972					39.000	33.6356	-14.32	1311.79	0.011
	74.0972 - 72.1667					39.000	34.2019	-14.65	1333.87	0.011
	72.1667 - 70.2361					39.000	34.7681	-14.98	1355.96	0.011
	70.2361 - 68.3056					39.000	35.3344	-15.39	1378.04	0.011
	68.3056 - 66.375					39.000	35.9007	-15.73	1400.13	0.011
	66.375 - 64.4444					39.000	36.4670	-16.07	1422.21	0.011
	64.4444 - 62.5139					39.000	37.0333	-16.42	1444.30	0.011
	62.5139 - 60.5833					39.000	37.5996	-16.77	1466.38	0.011
	60.5833 - 58.6528					39.000	38.1659	-17.13	1488.47	0.012
	58.6528 - 56.7222					39.000	38.7321	-17.49	1510.55	0.012
	56.7222 - 54.7917					39.000	39.2984	-17.85	1532.64	0.012
	54.7917 - 52.8611					39.000	39.8647	-18.22	1554.72	0.012
	52.8611 - 50.9306					39.000	40.4310	-18.59	1576.81	0.012
	50.9306 - 49					39.000	40.9973	-18.97	1598.89	0.012
	49 - 43					39.000	42.7573	-10.60	1667.53	0.006
L4	49 - 43	TP55.5x41.0206x0.3125	49.00	0.00	0.0	39.000	42.1359	-10.33	1643.30	0.006
	43 - 40.7368					39.000	42.7993	-21.40	1669.17	0.013
	40.7368 - 38.4737					39.000	43.4626	-21.86	1695.04	0.013
	38.4737 - 36.2105					39.000	44.1259	-22.33	1720.91	0.013
	36.2105 - 33.9474					39.000	44.7892	-22.80	1746.78	0.013
	33.9474 - 31.6842					39.000	45.4526	-23.28	1772.65	0.013
	31.6842 - 29.4211					39.000	46.1159	-23.76	1798.52	0.013
	29.4211 - 27.1579					38.905	46.7792	-24.25	1819.96	0.013
	27.1579 - 24.8947					38.666	47.4425	-24.74	1834.40	0.013
	24.8947 - 22.6316					38.426	48.1059	-25.23	1848.52	0.014
	22.6316 - 20.3684					38.187	48.7692	-25.74	1862.32	0.014
	20.3684 - 18.1053					37.947	49.4325	-26.24	1875.81	0.014
	18.1053 - 15.8421					37.707	50.0958	-26.76	1888.98	0.014
	15.8421 - 13.5789					37.468	50.7592	-27.27	1901.83	0.014
	13.5789 - 11.3158					37.228	51.4225	-27.80	1914.36	0.015

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 $\frac{P}{P_a}$
	11.3158 - 9.05263					36.989	52.0858	-28.33	1926.58	0.015
	9.05263 - 6.78947					36.749	52.7491	-28.86	1938.47	0.015
	6.78947 - 4.52632					36.509	53.4125	-29.40	1950.05	0.015
	4.52632 - 2.26316					36.270	54.0758	-29.94	1961.31	0.015
	2.26316 - 0					36.030	54.7391	-30.49	1972.25	0.015

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	138.5 - 137	TP24.5x17.375x0.1875	11.52	3.066	39.000	0.079	0.00	0.000	39.000	0.000
	137 - 135.5		21.26	5.436	39.000	0.139	0.00	0.000	39.000	0.000
	135.5 - 134		28.98	7.122	39.000	0.183	0.00	0.000	39.000	0.000
	134 - 132.5		36.83	8.708	39.000	0.223	0.00	0.000	39.000	0.000
	132.5 - 131		44.84	10.205	39.000	0.262	0.00	0.000	39.000	0.000
	131 - 129.5		52.99	11.615	39.000	0.298	0.00	0.000	39.000	0.000
	129.5 - 128		66.51	14.054	39.000	0.360	0.00	0.000	39.000	0.000
	128 - 126.5		82.66	16.847	39.000	0.432	0.00	0.000	39.000	0.000
	126.5 - 125		98.94	19.464	39.000	0.499	0.00	0.000	39.000	0.000
	125 - 123.5		115.35	21.918	39.000	0.562	0.00	0.000	39.000	0.000
	123.5 - 122		131.91	24.221	39.000	0.621	0.00	0.000	39.000	0.000
	122 - 120.5		148.60	26.384	39.000	0.677	0.00	0.000	39.000	0.000
	120.5 - 119		165.43	28.417	39.000	0.729	0.00	0.000	39.000	0.000
	119 - 117.5		182.41	30.330	39.000	0.778	0.00	0.000	39.000	0.000
	117.5 - 116		199.53	32.132	39.000	0.824	0.00	0.000	39.000	0.000
	116 - 114.5		216.79	33.829	39.000	0.867	0.00	0.000	39.000	0.000
	114.5 - 113		234.20	35.429	39.000	0.908	0.00	0.000	39.000	0.000
	113 - 111.5		251.75	36.939	39.000	0.947	0.00	0.000	39.000	0.000
	111.5 - 110		269.46	38.365	39.000	0.984	0.00	0.000	39.000	0.000
	110 - 108.5		287.31	39.713	39.000	1.018	0.00	0.000	39.000	0.000
L2	108.5 - 107.434	TP31.88x24.5x0.25	300.09	30.541	39.000	0.783	0.00	0.000	39.000	0.000
	107.434 - 106.368		312.96	31.038	39.000	0.796	0.00	0.000	39.000	0.000
	106.368 - 105.303		325.90	31.508	39.000	0.808	0.00	0.000	39.000	0.000
	105.303 - 104.237		339.27	31.984	39.000	0.820	0.00	0.000	39.000	0.000
	104.237 - 103.171		363.78	33.453	39.000	0.858	0.00	0.000	39.000	0.000
	103.171 - 102.105		381.35	34.218	39.000	0.877	0.00	0.000	39.000	0.000
	102.105 - 101.039		399.00	34.943	39.000	0.896	0.00	0.000	39.000	0.000
	101.039 - 99.9737		416.74	35.631	39.000	0.914	0.00	0.000	39.000	0.000
	99.9737 - 98.9079		434.55	36.285	39.000	0.930	0.00	0.000	39.000	0.000
	98.9079 - 97.8421		452.45	36.905	39.000	0.946	0.00	0.000	39.000	0.000
	97.8421 -		470.43	37.493	39.000	0.961	0.00	0.000	39.000	0.000

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 $\frac{f_{by}}{F_{by}}$
	96.7763									
	96.7763 - 95.7105		488.49	38.053	39.000	0.976	0.00	0.000	39.000	0.000
	95.7105 - 94.6447		506.64	38.584	39.000	0.989	0.00	0.000	39.000	0.000
	94.6447 - 93.5789		524.88	39.088	39.000	1.002	0.00	0.000	39.000	0.000
	93.5789 - 92.5132		543.20	39.568	39.000	1.015	0.00	0.000	39.000	0.000
	92.5132 - 91.4474		561.60	40.023	39.000	1.026	0.00	0.000	39.000	0.000
	91.4474 - 90.3816		580.10	40.456	39.000	1.037	0.00	0.000	39.000	0.000
	90.3816 - 89.3158		598.68	40.868	39.000	1.048	0.00	0.000	39.000	0.000
	89.3158 - 88.25		617.35	41.259	39.000	1.058	0.00	0.000	39.000	0.000
	88.25 - 83.75		322.74	19.771	39.000	0.507	0.00	0.000	39.000	0.000
L3	88.25 - 83.75	TP43.42x30.0382x0.3125	380.91	19.405	39.000	0.498	0.00	0.000	39.000	0.000
	83.75 - 81.8194		742.27	36.455	39.000	0.935	0.00	0.000	39.000	0.000
	81.8194 - 79.8889		781.16	37.010	39.000	0.949	0.00	0.000	39.000	0.000
	79.8889 - 77.9583		820.34	37.517	39.000	0.962	0.00	0.000	39.000	0.000
	77.9583 - 76.0278		859.80	37.981	39.000	0.974	0.00	0.000	39.000	0.000
	76.0278 - 74.0972		899.54	38.404	39.000	0.985	0.00	0.000	39.000	0.000
	74.0972 - 72.1667		939.57	38.789	39.000	0.995	0.00	0.000	39.000	0.000
	72.1667 - 70.2361		979.88	39.141	39.000	1.004	0.00	0.000	39.000	0.000
	70.2361 - 68.3056		1020.76	39.472	39.000	1.012	0.00	0.000	39.000	0.000
	68.3056 - 66.375		1061.72	39.765	39.000	1.020	0.00	0.000	39.000	0.000
	66.375 - 64.4444		1102.97	40.032	39.000	1.026	0.00	0.000	39.000	0.000
	64.4444 - 62.5139		1144.51	40.273	39.000	1.033	0.00	0.000	39.000	0.000
	62.5139 - 60.5833		1186.34	40.492	39.000	1.038	0.00	0.000	39.000	0.000
	60.5833 - 58.6528		1228.47	40.690	39.000	1.043	0.00	0.000	39.000	0.000
	58.6528 - 56.7222		1270.89	40.869	39.000	1.048	0.00	0.000	39.000	0.000
	56.7222 - 54.7917		1313.61	41.029	39.000	1.052	0.00	0.000	39.000	0.000
	54.7917 - 52.8611		1356.63	41.173	39.000	1.056	0.00	0.000	39.000	0.000
	52.8611 - 50.9306		1399.94	41.301	39.000	1.059	0.00	0.000	39.000	0.000
	50.9306 - 49		1443.56	41.415	39.000	1.062	0.00	0.000	39.000	0.000
	49 - 43		808.46	21.318	39.000	0.547	0.00	0.000	39.000	0.000
L4	49 - 43	TP55.5x41.0206x0.3125	772.81	20.985	39.000	0.538	0.00	0.000	39.000	0.000
	43 - 40.7368		1634.03	43.002	39.000	1.103	0.00	0.000	39.000	0.000
	40.7368 - 38.4737		1687.13	43.050	39.000	1.104	0.00	0.000	39.000	0.000
	38.4737 -		1740.58	43.084	39.000	1.105	0.00	0.000	39.000	0.000

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 $\frac{f_{by}}{F_{by}}$
	36.2105									
	36.2105 - 33.9474		1794.38	43.105	39.000	1.105	0.00	0.000	39.000	0.000
	33.9474 - 31.6842		1848.53	43.115	39.000	1.105	0.00	0.000	39.000	0.000
	31.6842 - 29.4211		1903.03	43.114	39.000	1.105	0.00	0.000	39.000	0.000
	29.4211 - 27.1579		1957.90	43.104	38.905	1.108	0.00	0.000	38.905	0.000
	27.1579 - 24.8947		2013.14	43.085	38.666	1.114	0.00	0.000	38.666	0.000
	24.8947 - 22.6316		2068.74	43.059	38.426	1.121	0.00	0.000	38.426	0.000
	22.6316 - 20.3684		2124.72	43.026	38.187	1.127	0.00	0.000	38.187	0.000
	20.3684 - 18.1053		2181.08	42.986	37.947	1.133	0.00	0.000	37.947	0.000
	18.1053 - 15.8421		2237.82	42.940	37.707	1.139	0.00	0.000	37.707	0.000
	15.8421 - 13.5789		2294.95	42.890	37.468	1.145	0.00	0.000	37.468	0.000
	13.5789 - 11.3158		2352.47	42.834	37.228	1.151	0.00	0.000	37.228	0.000
	11.3158 - 9.05263		2410.39	42.775	36.989	1.156	0.00	0.000	36.989	0.000
	9.05263 - 6.78947		2468.71	42.712	36.749	1.162	0.00	0.000	36.749	0.000
	6.78947 - 4.52632		2527.43	42.645	36.509	1.168	0.00	0.000	36.509	0.000
	4.52632 - 2.26316		2586.55	42.576	36.270	1.174	0.00	0.000	36.270	0.000
	2.26316 - 0		2646.09	42.504	36.030	1.180	0.00	0.000	36.030	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	138.5 - 137	TP24.5x17.375x0.1875	4.70	0.451	26.000	0.035	0.37	0.047	26.000	0.002
	137 - 135.5		5.10	0.479	26.000	0.037	0.16	0.020	26.000	0.001
	135.5 - 134		5.19	0.478	26.000	0.037	0.16	0.019	26.000	0.001
	134 - 132.5		5.29	0.478	26.000	0.037	0.76	0.088	26.000	0.003
	132.5 - 131		5.38	0.477	26.000	0.037	0.76	0.084	26.000	0.003
	131 - 129.5		5.47	0.476	26.000	0.037	0.76	0.081	26.000	0.003
	129.5 - 128		10.72	0.915	26.000	0.070	0.75	0.078	26.000	0.003
	128 - 126.5		10.81	0.906	26.000	0.070	0.75	0.075	26.000	0.003
	126.5 - 125		10.90	0.898	26.000	0.069	0.75	0.072	26.000	0.003
	125 - 123.5		10.99	0.890	26.000	0.068	0.75	0.069	26.000	0.003
	123.5 - 122		11.08	0.882	26.000	0.068	0.74	0.066	26.000	0.003
	122 - 120.5		11.17	0.875	26.000	0.067	0.74	0.064	26.000	0.002
	120.5 - 119		11.27	0.868	26.000	0.067	0.74	0.062	26.000	0.002
	119 - 117.5		11.36	0.861	26.000	0.066	0.73	0.059	26.000	0.002
	117.5 - 116		11.46	0.855	26.000	0.066	0.73	0.057	26.000	0.002
	116 - 114.5		11.56	0.848	26.000	0.065	0.73	0.055	26.000	0.002
	114.5 - 113		11.65	0.843	26.000	0.065	0.72	0.053	26.000	0.002
	113 - 111.5		11.75	0.837	26.000	0.064	0.72	0.051	26.000	0.002

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 $\frac{f_{vt}}{F_{vt}}$
	111.5 - 110		11.85	0.831	26.000	0.064	0.72	0.050	26.000	0.002
	110 - 108.5		11.95	0.826	26.000	0.064	0.71	0.048	26.000	0.002
L2	108.5 - 107.434	TP31.88x24.5x0.25	12.03	0.617	26.000	0.047	0.71	0.035	26.000	0.001
	107.434 - 106.368		12.10	0.613	26.000	0.047	0.71	0.034	26.000	0.001
	106.368 - 105.303		12.18	0.609	26.000	0.047	0.70	0.033	26.000	0.001
	105.303 - 104.237		12.71	0.627	26.000	0.048	0.70	0.032	26.000	0.001
	104.237 - 103.171		16.45	0.802	26.000	0.062	0.70	0.031	26.000	0.001
	103.171 - 102.105		16.52	0.796	26.000	0.061	0.70	0.030	26.000	0.001
	102.105 - 101.039		16.60	0.790	26.000	0.061	0.69	0.030	26.000	0.001
	101.039 - 99.9737		16.67	0.784	26.000	0.060	0.69	0.029	26.000	0.001
	99.9737 - 98.9079		16.75	0.779	26.000	0.060	0.69	0.028	26.000	0.001
	98.9079 - 97.8421		16.83	0.773	26.000	0.059	0.68	0.027	26.000	0.001
	97.8421 - 96.7763		16.91	0.768	26.000	0.059	0.68	0.026	26.000	0.001
	96.7763 - 95.7105		16.99	0.763	26.000	0.059	0.68	0.026	26.000	0.001
	95.7105 - 94.6447		17.07	0.758	26.000	0.058	0.68	0.025	26.000	0.001
	94.6447 - 93.5789		17.15	0.753	26.000	0.058	0.67	0.024	26.000	0.001
	93.5789 - 92.5132		17.23	0.748	26.000	0.058	0.67	0.024	26.000	0.001
	92.5132 - 91.4474		17.31	0.744	26.000	0.057	0.67	0.023	26.000	0.001
	91.4474 - 90.3816		17.39	0.739	26.000	0.057	0.66	0.023	26.000	0.001
	90.3816 - 89.3158		17.47	0.735	26.000	0.057	0.66	0.022	26.000	0.001
	89.3158 - 88.25		17.56	0.731	26.000	0.056	0.66	0.021	26.000	0.001
	88.25 - 83.75		9.44	0.376	26.000	0.029	0.30	0.009	26.000	0.000
L3	88.25 - 83.75	TP43.42x30.0382x0.3125	10.50	0.341	26.000	0.026	0.35	0.009	26.000	0.000
	83.75 - 81.8194		20.08	0.640	26.000	0.049	0.64	0.015	26.000	0.001
	81.8194 - 79.8889		20.22	0.633	26.000	0.049	0.64	0.015	26.000	0.001
	79.8889 - 77.9583		20.37	0.627	26.000	0.048	0.63	0.014	26.000	0.001
	77.9583 - 76.0278		20.51	0.620	26.000	0.048	0.63	0.013	26.000	0.001
	76.0278 - 74.0972		20.66	0.614	26.000	0.047	0.62	0.013	26.000	0.000
	74.0972 - 72.1667		20.81	0.608	26.000	0.047	0.62	0.012	26.000	0.000
	72.1667 - 70.2361		20.96	0.603	26.000	0.046	0.61	0.012	26.000	0.000
	70.2361 - 68.3056		21.14	0.598	26.000	0.046	0.60	0.011	26.000	0.000
	68.3056 - 66.375		21.29	0.593	26.000	0.046	0.60	0.011	26.000	0.000

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 $\frac{f_{vt}}{F_{vt}}$
	66.375 - 64.4444		21.44	0.588	26.000	0.045	0.59	0.011	26.000	0.000
	64.4444 - 62.5139		21.60	0.583	26.000	0.045	0.59	0.010	26.000	0.000
	62.5139 - 60.5833		21.75	0.578	26.000	0.044	0.58	0.010	26.000	0.000
	60.5833 - 58.6528		21.90	0.574	26.000	0.044	0.58	0.009	26.000	0.000
	58.6528 - 56.7222		22.05	0.569	26.000	0.044	0.57	0.009	26.000	0.000
	56.7222 - 54.7917		22.21	0.565	26.000	0.043	0.57	0.009	26.000	0.000
	54.7917 - 52.8611		22.36	0.561	26.000	0.043	0.56	0.008	26.000	0.000
	52.8611 - 50.9306		22.52	0.557	26.000	0.043	0.55	0.008	26.000	0.000
	50.9306 - 49		22.68	0.553	26.000	0.043	0.55	0.008	26.000	0.000
	49 - 43		12.02	0.281	26.000	0.022	0.28	0.004	26.000	0.000
L4	49 - 43	TP55.5x41.0206x0.3125	11.23	0.267	26.000	0.021	0.26	0.003	26.000	0.000
	43 - 40.7368		23.39	0.547	26.000	0.042	0.52	0.007	26.000	0.000
	40.7368 - 38.4737		23.55	0.542	26.000	0.042	0.52	0.006	26.000	0.000
	38.4737 - 36.2105		23.70	0.537	26.000	0.041	0.51	0.006	26.000	0.000
	36.2105 - 33.9474		23.85	0.533	26.000	0.041	0.51	0.006	26.000	0.000
	33.9474 - 31.6842		24.01	0.528	26.000	0.041	0.50	0.006	26.000	0.000
	31.6842 - 29.4211		24.17	0.524	26.000	0.040	0.49	0.005	26.000	0.000
	29.4211 - 27.1579		24.33	0.520	26.000	0.040	0.49	0.005	26.000	0.000
	27.1579 - 24.8947		24.49	0.516	26.000	0.040	0.48	0.005	26.000	0.000
	24.8947 - 22.6316		24.66	0.513	26.000	0.039	0.48	0.005	26.000	0.000
	22.6316 - 20.3684		24.83	0.509	26.000	0.039	0.47	0.005	26.000	0.000
	20.3684 - 18.1053		24.99	0.506	26.000	0.039	0.46	0.004	26.000	0.000
	18.1053 - 15.8421		25.16	0.502	26.000	0.039	0.46	0.004	26.000	0.000
	15.8421 - 13.5789		25.34	0.499	26.000	0.038	0.45	0.004	26.000	0.000
	13.5789 - 11.3158		25.51	0.496	26.000	0.038	0.44	0.004	26.000	0.000
	11.3158 - 9.05263		25.69	0.493	26.000	0.038	0.44	0.004	26.000	0.000
	9.05263 - 6.78947		25.86	0.490	26.000	0.038	0.43	0.004	26.000	0.000
	6.78947 - 4.52632		26.04	0.488	26.000	0.037	0.42	0.003	26.000	0.000
	4.52632 - 2.26316		26.22	0.485	26.000	0.037	0.41	0.003	26.000	0.000
	2.26316 - 0		26.41	0.482	26.000	0.037	0.41	0.003	26.000	0.000

tnxTower	Job	Page
	O&G Woodbury, BU# 876380	25 of 28
FDH Engineering, Inc. 6521 Meridien Drive, Suite 107 Raleigh, North Carolina Phone: 9197551012 FAX: 9197551031	**Project** 146GGY1400	**Date** 14:50:35 11/06/14
	Client Crown Castle	**Designed by** Jeffrey B. Ray

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	138.5 - 137	0.005	0.079	0.000	0.035	0.002	0.084 ✔	1.333	H1-3+VT ✔
	137 - 135.5	0.005	0.139	0.000	0.037	0.001	0.145 ✔	1.333	H1-3+VT ✔
	135.5 - 134	0.005	0.183	0.000	0.037	0.001	0.188 ✔	1.333	H1-3+VT ✔
	134 - 132.5	0.005	0.223	0.000	0.037	0.003	0.229 ✔	1.333	H1-3+VT ✔
	132.5 - 131	0.005	0.262	0.000	0.037	0.003	0.267 ✔	1.333	H1-3+VT ✔
	131 - 129.5	0.005	0.298	0.000	0.037	0.003	0.304 ✔	1.333	H1-3+VT ✔
	129.5 - 128	0.009	0.360	0.000	0.070	0.003	0.371 ✔	1.333	H1-3+VT ✔
	128 - 126.5	0.009	0.432	0.000	0.070	0.003	0.443 ✔	1.333	H1-3+VT ✔
	126.5 - 125	0.009	0.499	0.000	0.069	0.003	0.510 ✔	1.333	H1-3+VT ✔
	125 - 123.5	0.009	0.562	0.000	0.068	0.003	0.573 ✔	1.333	H1-3+VT ✔
	123.5 - 122	0.009	0.621	0.000	0.068	0.003	0.632 ✔	1.333	H1-3+VT ✔
	122 - 120.5	0.009	0.677	0.000	0.067	0.002	0.687 ✔	1.333	H1-3+VT ✔
	120.5 - 119	0.009	0.729	0.000	0.067	0.002	0.739 ✔	1.333	H1-3+VT ✔
	119 - 117.5	0.010	0.778	0.000	0.066	0.002	0.789 ✔	1.333	H1-3+VT ✔
	117.5 - 116	0.010	0.824	0.000	0.066	0.002	0.835 ✔	1.333	H1-3+VT ✔
	116 - 114.5	0.010	0.867	0.000	0.065	0.002	0.878 ✔	1.333	H1-3+VT ✔
	114.5 - 113	0.010	0.908	0.000	0.065	0.002	0.919 ✔	1.333	H1-3+VT ✔
	113 - 111.5	0.010	0.947	0.000	0.064	0.002	0.958 ✔	1.333	H1-3+VT ✔
	111.5 - 110	0.010	0.984	0.000	0.064	0.002	0.995 ✔	1.333	H1-3+VT ✔
	110 - 108.5	0.010	1.018	0.000	0.064	0.002	1.029 ✔	1.333	H1-3+VT ✔
L2	108.5 - 107.434	0.008	0.783	0.000	0.047	0.001	0.791 ✔	1.333	H1-3+VT ✔
	107.434 - 106.368	0.008	0.796	0.000	0.047	0.001	0.804 ✔	1.333	H1-3+VT ✔
	106.368 - 105.303	0.008	0.808	0.000	0.047	0.001	0.816 ✔	1.333	H1-3+VT ✔
	105.303 - 104.237	0.008	0.820	0.000	0.048	0.001	0.829 ✔	1.333	H1-3+VT ✔
	104.237 - 103.171	0.011	0.858	0.000	0.062	0.001	0.869 ✔	1.333	H1-3+VT ✔

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
	103.171 - 102.105	0.011	0.877	0.000	0.061	0.001	0.889 ✔	1.333	H1-3+VT ✔
	102.105 - 101.039	0.011	0.896	0.000	0.061	0.001	0.908 ✔	1.333	H1-3+VT ✔
	101.039 - 99.9737	0.011	0.914	0.000	0.060	0.001	0.925 ✔	1.333	H1-3+VT ✔
	99.9737 - 98.9079	0.011	0.930	0.000	0.060	0.001	0.942 ✔	1.333	H1-3+VT ✔
	98.9079 - 97.8421	0.011	0.946	0.000	0.059	0.001	0.958 ✔	1.333	H1-3+VT ✔
	97.8421 - 96.7763	0.011	0.961	0.000	0.059	0.001	0.973 ✔	1.333	H1-3+VT ✔
	96.7763 - 95.7105	0.011	0.976	0.000	0.059	0.001	0.987 ✔	1.333	H1-3+VT ✔
	95.7105 - 94.6447	0.011	0.989	0.000	0.058	0.001	1.001 ✔	1.333	H1-3+VT ✔
	94.6447 - 93.5789	0.011	1.002	0.000	0.058	0.001	1.014 ✔	1.333	H1-3+VT ✔
	93.5789 - 92.5132	0.011	1.015	0.000	0.058	0.001	1.026 ✔	1.333	H1-3+VT ✔
	92.5132 - 91.4474	0.011	1.026	0.000	0.057	0.001	1.038 ✔	1.333	H1-3+VT ✔
	91.4474 - 90.3816	0.011	1.037	0.000	0.057	0.001	1.049 ✔	1.333	H1-3+VT ✔
	90.3816 - 89.3158	0.011	1.048	0.000	0.057	0.001	1.060 ✔	1.333	H1-3+VT ✔
	89.3158 - 88.25	0.011	1.058	0.000	0.056	0.001	1.070 ✔	1.333	H1-3+VT ✔
	88.25 - 83.75	0.006	0.507	0.000	0.029	0.000	0.513 ✔	1.333	H1-3+VT ✔
L3	88.25 - 83.75	0.006	0.498	0.000	0.026	0.000	0.503 ✔	1.333	H1-3+VT ✔
	83.75 - 81.8194	0.011	0.935	0.000	0.049	0.001	0.946 ✔	1.333	H1-3+VT ✔
	81.8194 - 79.8889	0.011	0.949	0.000	0.049	0.001	0.960 ✔	1.333	H1-3+VT ✔
	79.8889 - 77.9583	0.011	0.962	0.000	0.048	0.001	0.973 ✔	1.333	H1-3+VT ✔
	77.9583 - 76.0278	0.011	0.974	0.000	0.048	0.001	0.985 ✔	1.333	H1-3+VT ✔
	76.0278 - 74.0972	0.011	0.985	0.000	0.047	0.000	0.996 ✔	1.333	H1-3+VT ✔
	74.0972 - 72.1667	0.011	0.995	0.000	0.047	0.000	1.006 ✔	1.333	H1-3+VT ✔
	72.1667 - 70.2361	0.011	1.004	0.000	0.046	0.000	1.015 ✔	1.333	H1-3+VT ✔
	70.2361 - 68.3056	0.011	1.012	0.000	0.046	0.000	1.024 ✔	1.333	H1-3+VT ✔
	68.3056 - 66.375	0.011	1.020	0.000	0.046	0.000	1.031 ✔	1.333	H1-3+VT ✔
	66.375 - 64.4444	0.011	1.026	0.000	0.045	0.000	1.038 ✔	1.333	H1-3+VT ✔

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
	64.4444 - 62.5139	0.011	1.033	0.000	0.045	0.000	1.045 ✔	1.333	H1-3+VT ✔
	62.5139 - 60.5833	0.011	1.038	0.000	0.044	0.000	1.050 ✔	1.333	H1-3+VT ✔
	60.5833 - 58.6528	0.012	1.043	0.000	0.044	0.000	1.055 ✔	1.333	H1-3+VT ✔
	58.6528 - 56.7222	0.012	1.048	0.000	0.044	0.000	1.060 ✔	1.333	H1-3+VT ✔
	56.7222 - 54.7917	0.012	1.052	0.000	0.043	0.000	1.064 ✔	1.333	H1-3+VT ✔
	54.7917 - 52.8611	0.012	1.056	0.000	0.043	0.000	1.068 ✔	1.333	H1-3+VT ✔
	52.8611 - 50.9306	0.012	1.059	0.000	0.043	0.000	1.071 ✔	1.333	H1-3+VT ✔
	50.9306 - 49	0.012	1.062	0.000	0.043	0.000	1.074 ✔	1.333	H1-3+VT ✔
	49 - 43	0.006	0.547	0.000	0.022	0.000	0.553 ✔	1.333	H1-3+VT ✔
L4	49 - 43	0.006	0.538	0.000	0.021	0.000	0.544 ✔	1.333	H1-3+VT ✔
	43 - 40.7368	0.013	1.103	0.000	0.042	0.000	1.116 ✔	1.333	H1-3+VT ✔
	40.7368 - 38.4737	0.013	1.104	0.000	0.042	0.000	1.117 ✔	1.333	H1-3+VT ✔
	38.4737 - 36.2105	0.013	1.105	0.000	0.041	0.000	1.118 ✔	1.333	H1-3+VT ✔
	36.2105 - 33.9474	0.013	1.105	0.000	0.041	0.000	1.119 ✔	1.333	H1-3+VT ✔
	33.9474 - 31.6842	0.013	1.105	0.000	0.041	0.000	1.119 ✔	1.333	H1-3+VT ✔
	31.6842 - 29.4211	0.013	1.105	0.000	0.040	0.000	1.119 ✔	1.333	H1-3+VT ✔
	29.4211 - 27.1579	0.013	1.108	0.000	0.040	0.000	1.122 ✔	1.333	H1-3+VT ✔
	27.1579 - 24.8947	0.013	1.114	0.000	0.040	0.000	1.128 ✔	1.333	H1-3+VT ✔
	24.8947 - 22.6316	0.014	1.121	0.000	0.039	0.000	1.135 ✔	1.333	H1-3+VT ✔
	22.6316 - 20.3684	0.014	1.127	0.000	0.039	0.000	1.141 ✔	1.333	H1-3+VT ✔
	20.3684 - 18.1053	0.014	1.133	0.000	0.039	0.000	1.147 ✔	1.333	H1-3+VT ✔
	18.1053 - 15.8421	0.014	1.139	0.000	0.039	0.000	1.153 ✔	1.333	H1-3+VT ✔
	15.8421 - 13.5789	0.014	1.145	0.000	0.038	0.000	1.159 ✔	1.333	H1-3+VT ✔
	13.5789 - 11.3158	0.015	1.151	0.000	0.038	0.000	1.165 ✔	1.333	H1-3+VT ✔
	11.3158 - 9.05263	0.015	1.156	0.000	0.038	0.000	1.172 ✔	1.333	H1-3+VT ✔
	9.05263 - 6.78947	0.015	1.162	0.000	0.038	0.000	1.178 ✔	1.333	H1-3+VT ✔

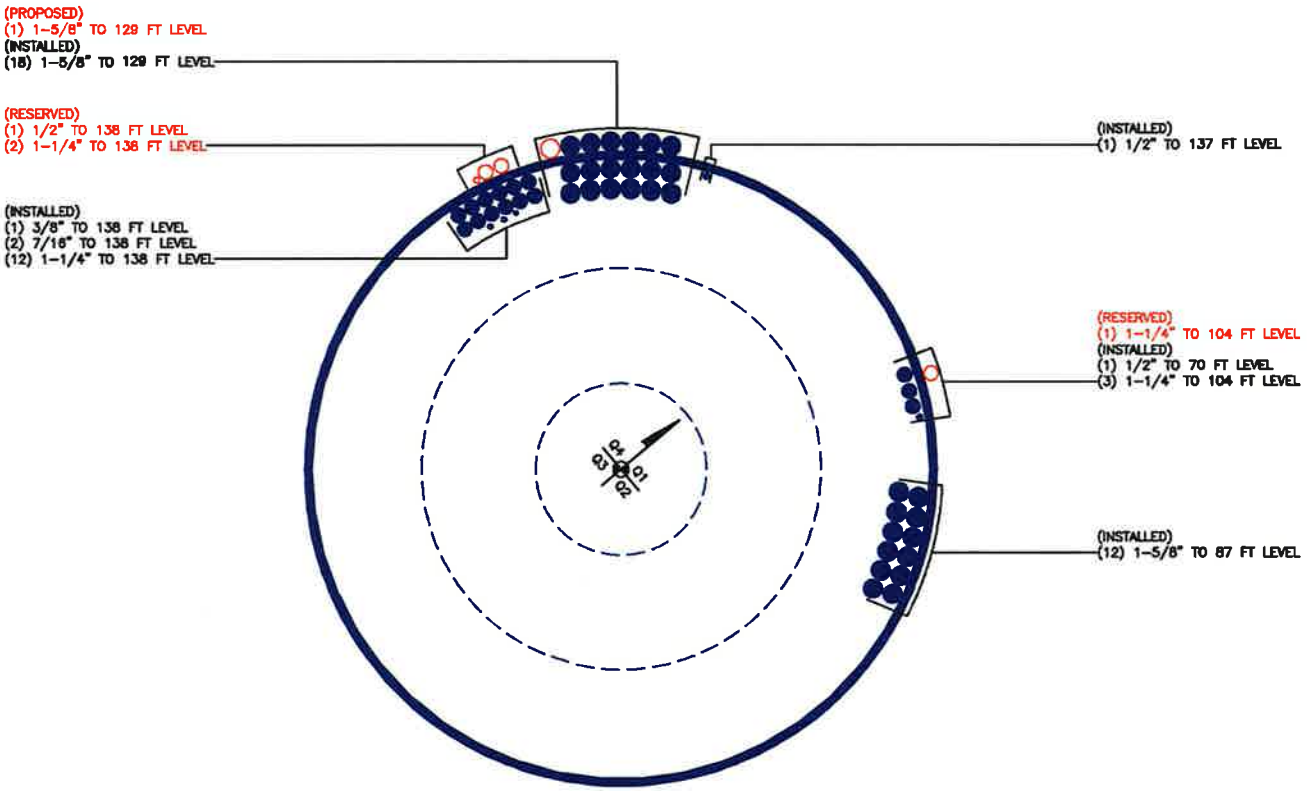
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	6.78947 - 4.52632	0.015	1.168	0.000	0.037	0.000	1.184 ✔	1.333	H1-3+VT ✔
	4.52632 - 2.26316	0.015	1.174	0.000	0.037	0.000	1.189 ✔	1.333	H1-3+VT ✔
	2.26316 - 0	0.015	1.180	0.000	0.037	0.000	1.195 ✔	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	138.5 - 108.5	Pole	TP24.5x17.375x0.1875	1	-5.60	752.20	77.2	Pass
L2	108.5 - 83.75	Pole	TP31.88x24.5x0.25	2	-10.33	1249.44	80.3	Pass
L3	83.75 - 43	Pole	TP43.42x30.0382x0.3125	3	-18.97	2131.32	80.6	Pass
L4	43 - 0	Pole	TP55.5x41.0206x0.3125	4	-30.49	2629.01	89.7	Pass
							Summary	
						Pole (L4)	89.7	Pass
						RATING =	**89.7**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 876380 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev F

Site Data

BU#: *876380*
Site Name: *O&G Woodbury*
App #:

Pole Manufacturer:	Other

Reactions		
Moment:	287.3	ft-kips
Axial:	5.6	kips
Shear:	11.59	kips
Elevation:	108.5	feet

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

Bolt Data			
Qty:	24		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	75	<-- Disregard	Bolt Fty:
N/A:	55	<-- Disregard	44.00
Circle (in.):	28		

Plate Data		
Diam:	31	in
Thick, t:	1.5	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	3.24	in

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.25	in
Fillet V. Weld:	0.25	in
Width:	3	in
Height:	8	in
Thick:	0.5	in
Notch:	0.375	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	24.5	in
Thick:	0.1875	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	

Flange Bolt Results

Bolt Tension Capacity, **B**:	46.07	kips	Rigid
Max Bolt directly applied T:	20.29	Kips	Service, ASD
Min. PL "tc" for **B** cap. **w/o** Pry:	1.340	in	Fty*ASIF
Min PL "treq" for actual **T w/ Pry**:	0.688	in	
Min PL "t1" for actual **T w/o Pry**:	0.889	in	
T allowable w/o Prying:	46.07	kips	α'<0 case
Prying Force, Q:	0.00	kips	
Total Bolt Tension=T+Q:	20.29	kips	
Non-Prying Bolt Stress Ratio, T/B:	44.0%	**Pass**	

Exterior Flange Plate Results Flexural Check

Compression Side Plate Stress:	18.4	ksi	Rigid
Allowable Plate Stress:	60.0	ksi	Service ASD
Compression Plate Stress Ratio:	30.6%	**Pass**	0.75*Fy*ASIF
No Prying			Comp. Y.L. Length:
Tension Side Stress Ratio, (treq/t)^2:	21.1%	**Pass**	13.56

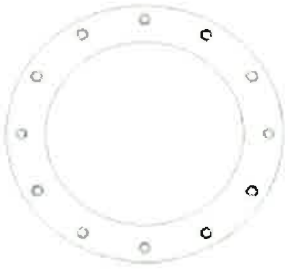
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a



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

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

FDH ENGINEERING INNOVATION
FDH Engineering, Inc., 6521 Meridien Dr. Raleigh, NC 27616, Ph. 919.755.1012, Fax 919.755.1031

Anchor Rod Design

Site Name:	O&G Woodbury
Job No. :	876380
Elevation:	0
	Input Cells in Yellow

*Note: Use Anchor Rod Transfer Plate Design Tab in Conjunction

Legend
Input
Output/ Notes

Code (F or G):	F	Pull Down
Anchor Bolts (Yes or No)	Yes	Pull Down
P (from RISA)	31	kips
V (from RISA)	26	kips
M (from RISA)	2646	ft-kips

Existing Rods		
y	32	in
No. Bolts	12	
BC	64	in
I	24453.12	in^4
Bolt Grade	A615-75	Pull Down
Thread Form	Non-Upset	-
d (in)	2.25	Pull Down
Ag	3.98	in^2
Ae	3.25	in^2
Fy	75	ksi
Fu	100	ksi

Itot	32604.16	in^4

T	122.094	kips
V	1.625	kips

New Rods		
y new	32	in
No. Bolts new	4	
BC new	64	in
Inew	8,151	in^4
Bolt Grade	A193 B7	Pull Down
Thread Form	Non-Upset	Pull Down
d new (in)	2.25	Pull Down
Ag new	3.98	in^2
Ae new	3.25	in^2
Fy new	105	ksi
Fu new	125	ksi

Tnew	122.094	kips
Vnew	1.625	kips

Req'd Embedment Length for New Rods		
f'c, caisson's concrete strength	4000	psi
fy, rebar yield strength	60000	psi
d_b, diameter of vertical rebar	1	in
vertical rebar cage BC ø	73	in
vertical rebar top cover distance	3	in
τ, Ultimate Hilti Bond Resistance	1.8	ksi

Note For New Anchor Rods:
Williams Bars (Upset)
A722 (Fy=127.7 ksi, Fu=150 ksi)
A615-75 (Fy=75 ksi, Fu=100 ksi)

l_d (vertical rebar dev. Length)	28.460	in
l_{dH} (Hilti dev. length)	76.630	in
G/1.5	3.000	in

Total Embed. Length of New Bolts	76.63	in
	6.39	ft

Capacity (%)					Pullout Test Value
Tn/Ω	194.5	kips	OK	62.77	218.90 kips
Tn/Ω, new	218.9	kips	OK	55.78	
øTn	260	kips			
øTn, new	325	kips			

Equations:

f = (M*y*Ag)/Itot-P*(Ag/Atotal)

Tn/Ω = 0.33*Fu*Ag*(4/3)

= 0.8*Fu*Ae (anchor bolts only) **øTn = 0.75*Fu*Ae (non anchor bolts)**

I = (No. Bolts/8)*BC^2*Ag

Notes:

***Ag and Ae are taken from AISC 13th Ed. Manual (pg. 7-83)**

***I calc. will only work for symmetric bolt group, otherwise use CAD**

Interaction Equation Checks (Rev. G: Section 4.9.9)			(works for Rev F also)
Detail Type (hover for detail)	c	Pull Down	
η	0.55		
l_{er}, for Detail Type d only	2.25	in	(top of concrete to bottom of leveling nut)
øRnt	194.5	kips	
øRnv	119.4	kips	
øRnm	94.922	kip-in	
Mu	2.3765625	kip-in	
(Pu+Vu/η)/øRnt < 1?	0.643	OK	
$(Vu/øRnv)^2$ + $((Pu/øRnt)+(Mu/øRnm))^2$	NA		(only applicable for Detail Type d)

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

TIA Rev F

Site Data

BU#: *876380*
Site Name: *O&G Woodbury*
App#:

Pole Manufacturer:	*Other*

Reactions		
*Moment:	3950	ft-kips
Axial:	31	kips
Shear:	26	kips

*Anchor Rod quantiy and Moment are modified due to consideration of modifications.

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

Anchor Rod Data		
*Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	64	in

Plate Data		
Diam:	70	in
Thick:	1.5	in
Grade:	60	ksi
Single-Rod B-eff:	7.34	in

Stiffener Data (Welding at both sides)		
Config:	1	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.375	in
Fillet V. Weld:	0.25	in
Width:	7	in
Height:	16	in
Thick:	0.5	in
Notch:	0.75	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	55.5	in
Thick:	0.3125	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	

Anchor Rod Results

		Stiffened
Maximum Rod Tension:	122.1 Kips	Service, ASD
Allowable Tension:	195.0 Kips	Fty*ASIF
Anchor Rod Stress Ratio:	62.7% **Pass**	

Base Plate Results

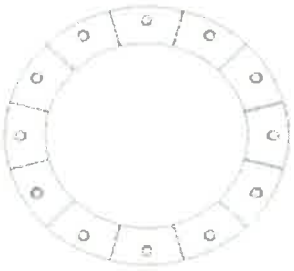
	Flexural Check	Stiffened
Base Plate Stress:	53.9 ksi	Service, ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	89.9% **Pass**	Y.L. Length: N/A, Roark

Stiffener Results

Horizontal Weld :	92.4% **Pass**
Vertical Weld:	64.9% **Pass**
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	34.0% **Pass**
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	76.8% **Pass**
Plate Comp. (AISC Bracket):	88.6% **Pass**

Pole Results

Pole Punching Shear Check:	16.9% **Pass**



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

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

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

Site Data

BU#: *876380*
Site Name: *O&G Woodbury*
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:	12	in
Pad Bearing Depth, D:	6.5	ft
Pad Thickness, T:	3	ft
Pad Width=Length, L:	23	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:	3.50	ft

Soil Parameters		
Unit Weight, γ:	125.0	pcf
Ultimate Bearing Capacity, qn:	12.00	ksf
Strength Reduct. factor, ϕ:	0.75	
Angle of Friction, Φ:	34.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: ϕ*qn:	9.00	ksf
Passive Pres. Coeff., Kp	3.54	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	35.1	kips
Pad Force Location Above D:	1.35	ft
ϕ(Passive Pressure Moment):	47.39	ft-kips
Factored O.T. M(WL), "1.6W":	3835.4	ft-kips
Factored OT (MW-Msoil), M1	3787.97	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	2.36	ft
Sum of Soil Wedges Wt:	28.70	kips
Soil Wedges ecc, K1:	7.98	ft
Ftg+Soil above Pad wt:	481.1	kips
Unfactored (Total ftg-soil Wt):	509.83	kips
1.2D. **No Soil Wedges.**	614.55	kips
0.9D. **With Soil Wedges**	486.75	kips

Resistance due to Cohesion (Vertical)		
ϕ*(1/2*Cu)(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:	31	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	26	kips
Unfactored WL Moment, M:	2646	ft-kips

Load Factor	Shaft Factored Loads		
1.20	1.2D+1.6W, Pu:	37.2	kips
0.90	0.9D+1.6W, Pu:	27.9	kips
1.35	Vu:	35.1	kips
	Mu:	3572.1	ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(**No Soil Wedges**) [Reaction+Conc+Soil]	614.55	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	3787.97	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 =	6.16	ft
Orthogonal qu=	2.50	ksf
qu/ϕ*qn Ratio=	**27.82%**	Pass

Diagonal Direction:

ecc2 = (0.707M1)/P1 =	4.36	ft
Diagonal qu=	3.01	ksf
qu/ϕ*qn Ratio=	**33.47%**	Pass

Run <-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(**w/ Soil Wedges**) [Reaction+Conc+Soil]	486.75	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	3581.84	ft-kips

Orthogonal ecc3 = M2/P2 =	7.36	ft
Ortho Non Bearing Length,NBL=	14.72	ft
Orthogonal qu=	2.56	ksf
Diagonal qu=	3.07	ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	2646.00		
M Orthogonal:	3727.29	**70.99%**	Pass
M Diagonal:	3727.29	**70.99%**	Pass