Robinson+Cole

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July 24, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
117 Washington Street, North Haven, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 117-foot level of the existing 120-foot tower at 117 Washington Street, North Haven, Connecticut (the "Property"). The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 1990. Cellco now intends to replace three (3) of its existing antennas with three (3) BXA-70063-6CF, 700 MHz antennas; and add three (3) model BXA-171063-12CF, 2100 MHz antennas, for a total of fifteen (15) antennas, all at the same 117-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Michael J. Freda, First Selectman of the Town of North Haven. A copy of this letter is also being sent to Luciani Realty Limited Partnership, 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 new antennas and RRHs will be installed at the 117-foot level on the existing 120-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:
Michael J. Freda, North Haven First Selectman
Luciani Realty Limited Partnership
Sandy M. Carter

ATTACHMENT 1

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

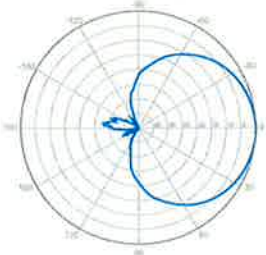
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	**50Ω**	
VSWR	**≤1.35:1**	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
IM3 (2x20W carriers)	< -153 dBc	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

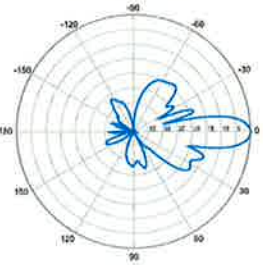
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



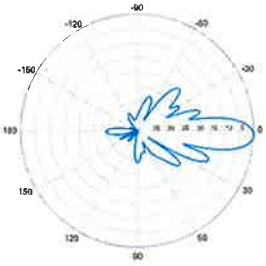
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0



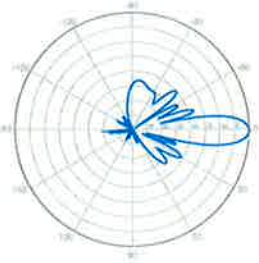
0° | Vertical | 750 MHz

BXA-70063-6CF-EDIN-2

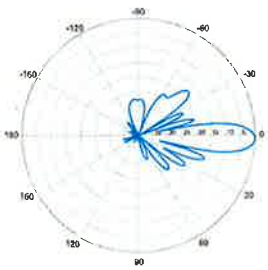


2° | Vertical | 750 MHz

Horizontal | 850 MHz



0° | Vertical | 850 MHz

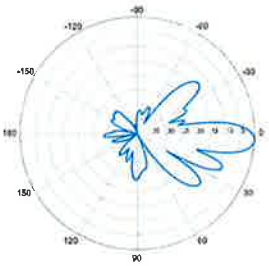


2° | Vertical | 850 MHz

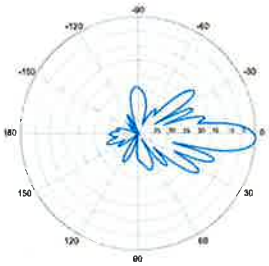
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

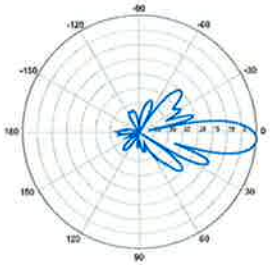


3° | Vertical | 750 MHz

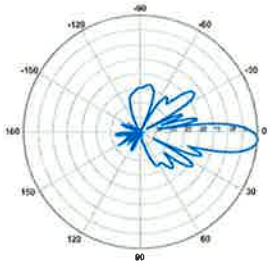


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

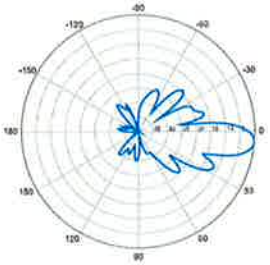


4° | Vertical | 750 MHz

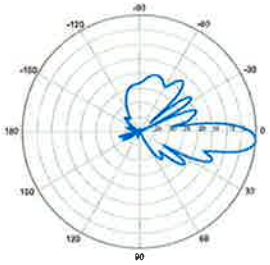


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

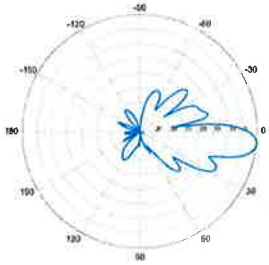


5° | Vertical | 750 MHz

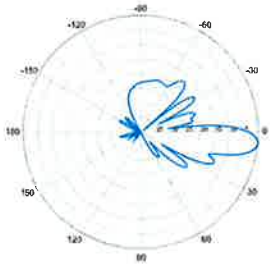


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

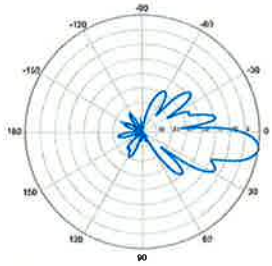


6° | Vertical | 750 MHz

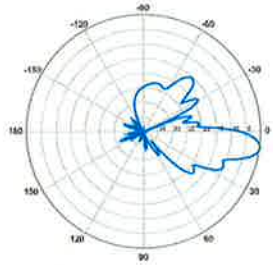


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

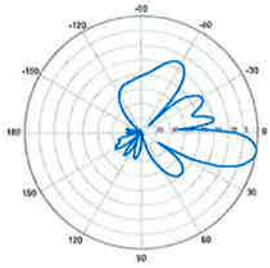


8° | Vertical | 750 MHz

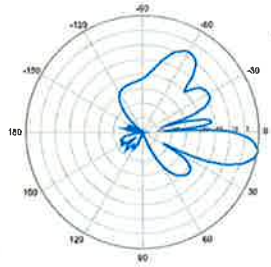


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

BXA-171063-12CF-EDIN-X

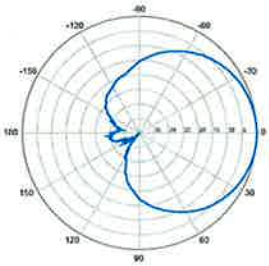
X-Pol | FET Panel | 63° | 19.0 dBi

Replace "X" with desired electrical downtilt

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering

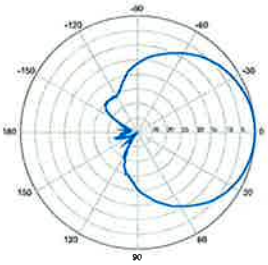
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	< -25 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)		
Operating temperature	-40° to +60° C / -40° to +140° F		
Mechanical Characteristics			
Dimensions Length x Width x Depth	1842 x 154 x 105 mm		72.5 x 6.1 x 4.1 in
Depth with z-brackets	133 mm		5.2 in
Weight without mounting brackets	5.8 kg		12.8 lbs
Survival wind speed	> 201 km/hr		> 125 mph
Wind area	Front: 0.28 m² Side: 0.19 m²		Front: 3.1 ft² Side: 2.1 ft²
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N		Front: 103 lbf Side: 68 lbf
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12CF-EDIN-X-FP		

BXA-171063-12CF-EDIN-X



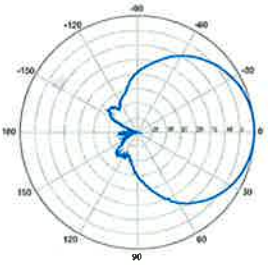
Horizontal | 1710-1880 MHz

BXA-171063-12CF-EDIN-X



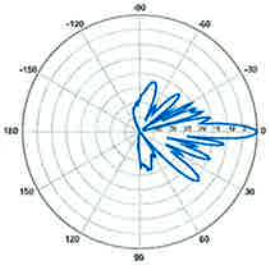
Horizontal | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



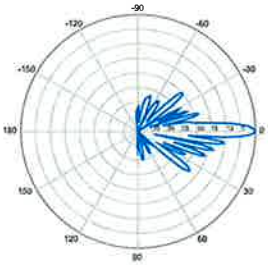
Horizontal | 1920-2170 MHz

BXA-171063-12CF-EDIN-0



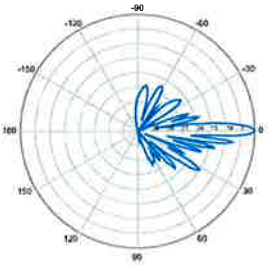
0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-0

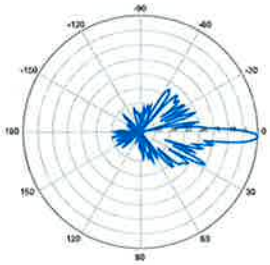


0° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-X

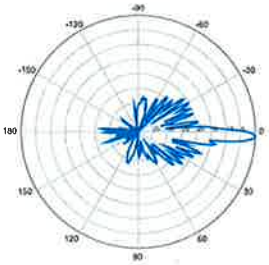
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2



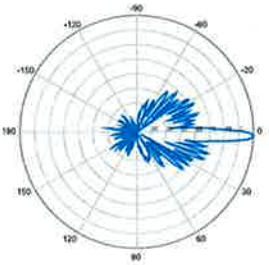
2° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2



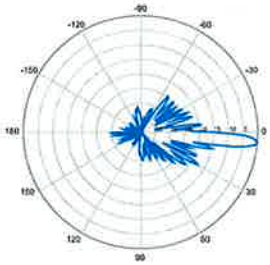
2° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



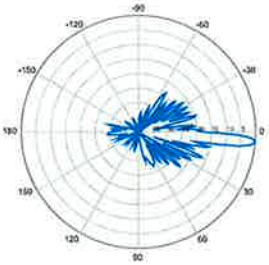
2° | Vertical | 1920-2170 MHz

BXA-171063-12CF-EDIN-5



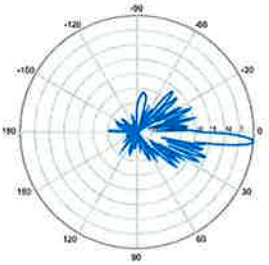
5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-5



5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-5



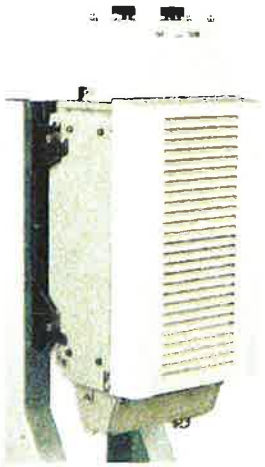
5° | Vertical | 1920-2170 MHz

Alcatel·Lucent

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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



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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

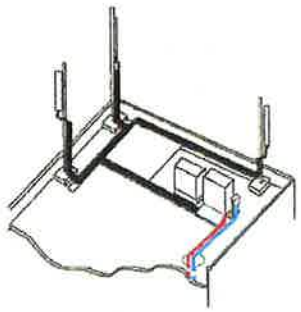
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

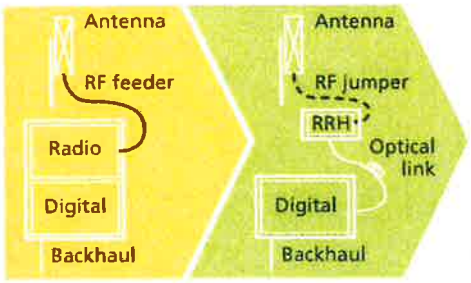
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

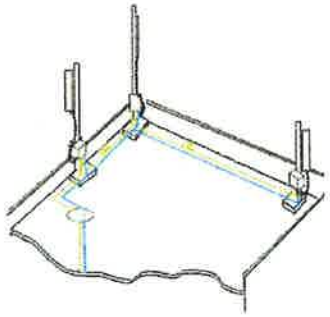
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

Alcatel·Lucent

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
Mechanical Properties			
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)
Electrical Properties			
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)
Fiber Optic Properties			
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
DC Power and Alarm Properties			
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
Environmental			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

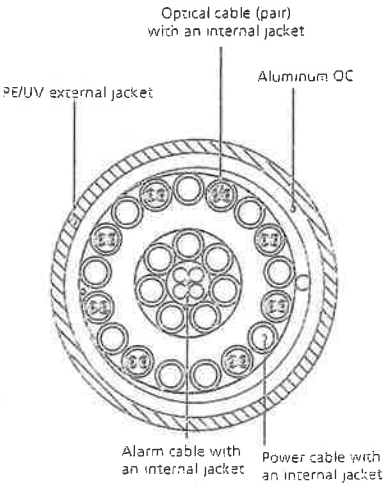


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: North Haven								
Tower Height: 120'								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint WiMAX	3	562	107	0.0530	2657	1.0000	5.30%	
*Sprint microwave	2	4.42	107	0.0003	22500	1.0000	0.03%	
*Sprint microwave	2	4.42	107	0.0003	22500	1.0000	0.03%	
*Sprint CDMA/LTE	3	778	104.3	0.0771	1900	1.0000	7.71%	
*Sprint CDMA/LTE	1	438	104.3	0.0145	850	0.5667	2.55%	
*Clearwire	2	153	105	0.0100	2496	1.0000	1.00%	
*Clearwire	1	211	105	0.0069	11 GHz	1.0000	0.69%	
Verizon	**7**	**446**	**117**	**0.0820**	**1970**	**1.0000**	**8.20%**	
Verizon	**9**	**324**	**117**	**0.0766**	**869**	**0.5793**	**13.22%**	
Verizon	**1**	**1828**	**117**	**0.0480**	**2145**	**1.0000**	**4.80%**	
Verizon	**1**	**654**	**117**	**0.0172**	**698**	**0.4973**	**3.45%**	
								47.0%
* Source: Siting Council								

ATTACHMENT 3

Date: **May 22, 2014**

Charles McGuirt
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

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

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	North Haven
Crown Castle Designation:	**Crown Castle BU Number:**	806454
	Crown Castle Site Name:	NHV 112 948129
	Crown Castle JDE Job Number:	280746
	Crown Castle Work Order Number:	766652
	Crown Castle Application Number:	237028 Rev. 6
Engineering Firm Designation:	**AW Solutions Inc Project Number:**	806454
Site Data:	**117 WASHINGTON STREET, NORTH HAVEN, New Haven County, CT**	
	Latitude 41° 23' 46.93", Longitude -72° 51' 27.67"	
	120 Foot - Monopole Tower	

Dear Charles McGuirt,

AW Solutions Inc is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 649162, in accordance with application 237028, revision 6.

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

LC5: Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

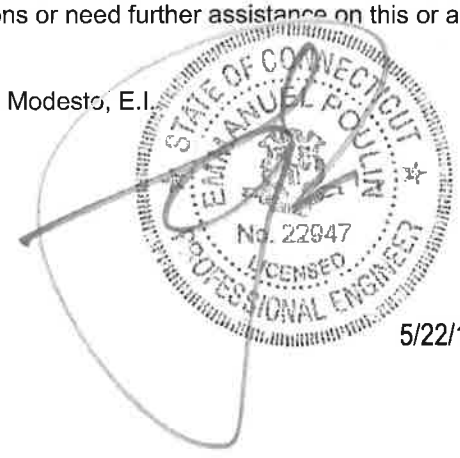
The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2005 CT Building Code based upon a wind speed of 85 mph fastest mile.

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

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

Structural analysis prepared by: Arturo Modesto, E.I.

Respectfully submitted by:



Emmanuel Poulin, P.E
VP of Engineering

5/22/14

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 120 ft Monopole tower designed by VALMONT in March of 1990. The tower was originally designed for a wind speed of 90 mph per EIA-222-D.

2) ANALYSIS CRITERIA

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

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
115.0	117.0	3	alcatel lucent	RRH2X40-AWS	1	1-5/8	1
		3	antel	BXA-171063-12CF-EDIN-2 w/ Mount Pipe			
		2	antel	BXA-70063-6CF-2 w/ Mount Pipe			
		1	antel	BXA-70063-6CF-EDIN-4 w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Notes:
1) Proposed Equipment

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
115.0	117.0	6	decibel	DB844G65ZAXY w/ Mount Pipe	12	1-5/8	1
		3	powerwave technologies	P65.16.XL.2 w/ Mount Pipe	-	-	2
		6	rfs celwave	FD9R6004/2C-3L			1
		3	rymsa wireless	MG D3-800TV w/ Mount Pipe			
	115.0	1	tower mounts	Platform Mount [LP 602-1]			
108.0	109.0	3	alcatel lucent	800MHZ RRH	-	-	1
	108.0	1	tower mounts	Pipe Mount [PM 601-3]			
	107.0	3	alcatel lucent	1900MHz RRH (65MHz)			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
105.0	109.0	1	dragonwave	A-ANT-23G-2-C	4 6 3	1/2 5/16 1-1/4	1
		1	andrew	VHLP2-18			
		1	andrew	VHLP800-11			
	106.0	3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		9	rfs celwave	ACU-A20-N			
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
	105.0	3	argus technologies	LLPX310R w/ Mount Pipe			
		3	samsung telecommunications	FDD_R6_RRH			
		1	tower mounts	Platform Mount [LP 602-1]			
90.0	90.0	3	rfs celwave	APXV18-206517S-C w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Pipe Mount [PM 601-3]			

Notes:
1) Existing Equipment
2) Equipment To Be Removed, Not Considered In 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)
117	118	4	RFS Celwave	PD10017		
111	111	12	RFS Celwave	PD1132		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH Engineering	2294635	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	SAC Engineering	2294635	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont	253972	CCISITES

3.1) Analysis Method

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

3.2) Assumptions

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

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	120 - 77.3333	Pole	TP30.45x21.91x0.2188	1	-7.27	1013.90	66.5	Pass
L2	77.3333 - 34.3333	Pole	TP38.61x29.0784x0.3125	2	-14.19	1944.14	80.6	Pass
L3	34.3333 - 0	Pole	TP44.85x36.8519x0.375	3	-23.69	2791.89	84.9	Pass
							Summary	
						Pole (L3)	84.9	Pass
						Rating =	84.9	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	84.2	Pass
1	Base Plate	0	39.9	Pass
1	Base Foundation	0	45.8	Pass

Structure Rating (max from all components) =	84.9%

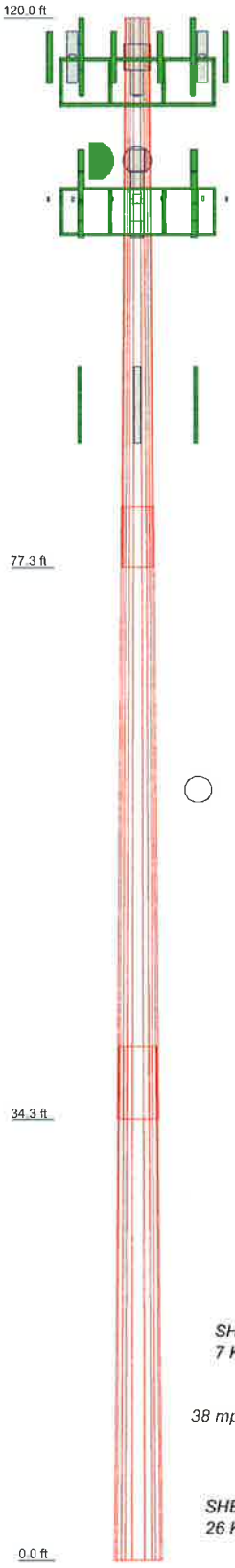
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

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

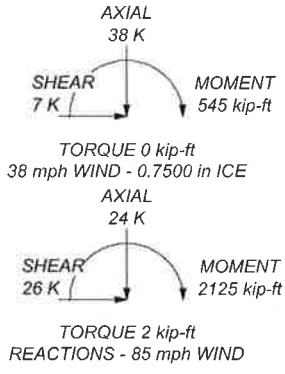
APPENDIX A

TNXTOWER OUTPUT



Section	1	2	3
Length (ft)	42.67	47.67	40.00
Number of Sides	12	12	12
Thickness (in)	0.2188	0.3125	0.3750
Socket Length (ft)	4.67	5.67	
Top Dia (in)	21.9100	29.0784	36.8519
Bot Dia (in)	30.4500	38.6100	44.8500
Grade		A572-65	
Weight (K)	2.7	5.5	6.7

Total Weight (K) 14.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) DB844G65ZAXY w/ Mount Pipe	115	1900MHz RRH (65MHz)	108
(2) DB844G65ZAXY w/ Mount Pipe	115	800MHZ RRH	108
(2) DB844G65ZAXY w/ Mount Pipe	115	1900MHz RRH (65MHz)	108
MG D3-800TV w/ Mount Pipe	115	Pipe Mount [PM 601-3]	108
MG D3-800TV w/ Mount Pipe	115	FDD_R6_RRH	105
MG D3-800TV w/ Mount Pipe	115	FDD_R6_RRH	105
(2) FD9R6004/2C-3L	115	800 EXTERNAL NOTCH FILTER	105
(2) FD9R6004/2C-3L	115	800 EXTERNAL NOTCH FILTER	105
(2) FD9R6004/2C-3L	115	800 EXTERNAL NOTCH FILTER	105
BXA-171063-12CF-EDIN-2 w/ Mount Pipe	115	(3) ACU-A20-N	105
		(3) ACU-A20-N	105
BXA-171063-12CF-EDIN-2 w/ Mount Pipe	115	(3) ACU-A20-N	105
BXA-171063-12CF-EDIN-2 w/ Mount Pipe	115	Platform Mount [LP 602-1]	105
		APXVSPP18-C-A20 w/ Mount Pipe	105
BXA-70063-6CF-2 w/ Mount Pipe	115	APXVSPP18-C-A20 w/ Mount Pipe	105
BXA-70063-6CF-2 w/ Mount Pipe	115	APXVSPP18-C-A20 w/ Mount Pipe	105
BXA-70063-6CF-EDIN-4 w/ Mount Pipe	115	LLPX310R w/ Mount Pipe	105
		LLPX310R w/ Mount Pipe	105
RRH2X40-AWS	115	LLPX310R w/ Mount Pipe	105
DB-T1-6Z-8AB-0Z	115	FDD_R6_RRH	105
RRH2X40-AWS	115	VHLP800-11	105
RRH2X40-AWS	115	VHLP2-18	105
Platform Mount [LP 602-1]	115	A-ANT-23G-2-C	105
800MHZ RRH	108	APXV18-206517S-C w/ Mount Pipe	90
1900MHz RRH (65MHz)	108	Pipe Mount [PM 601-3]	90
800MHZ RRH	108	APXV18-206517S-C w/ Mount Pipe	90
		APXV18-206517S-C w/ Mount Pipe	90

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 84.9%

AW Solutions Inc
300 Crown Oak Centre
Longwood, Fl 32750
Phone: (407) 260-0231
FAX: (407) 260-0749

Job: BU 806454			
Project: WO 766652			
Client: Crown Castle	Drawn by: arturo.modesto		App'd:
Code: TIA/EIA-222-F	Date: 05/22/14		Scale: NTS
Path:			Dwg No. E-1

Tower Input Data

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

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

Options

Consider Moments - Legs	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	120.00-77.33	42.67	4.67	12	21.9100	30.4500	0.2188	0.8750	A572-65 (65 ksi)
L2	77.33-34.33	47.67	5.67	12	29.0784	38.6100	0.3125	1.2500	A572-65 (65 ksi)
L3	34.33-0.00	40.00		12	36.8519	44.8500	0.3750	1.5000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	22.6829	15.2788	917.5793	7.7655	11.3494	80.8484	1859.2645	7.5197	5.2856	24.163
	31.5242	21.2941	2484.0378	10.8228	15.7731	157.4857	5033.3340	10.4803	7.5743	34.626
L2	31.0703	28.9457	3057.2251	10.2982	15.0626	202.9675	6194.7669	14.2462	6.9555	22.258
	39.9720	38.5369	7214.4482	13.7105	20.0000	360.7228	14618.4279	18.9667	9.5100	30.432
L3	39.3249	44.0458	7480.4209	13.0587	19.0893	391.8652	15157.3608	21.6780	8.8713	23.657
	46.4321	53.7036	13558.7908	15.9221	23.2323	583.6181	27473.7861	26.4313	11.0148	29.373

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 120.00-77.33				1	1	1		
L2 77.33-34.33				1	1	1		
L3 34.33-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
561(1-5/8")	B	No	Inside Pole	115.00 - 0.00	12	No Ice	0.00	1.35
						1/2" Ice	0.00	1.35
						1" Ice	0.00	1.35
						2" Ice	0.00	1.35
						4" Ice	0.00	1.35
561(1-5/8")	B	No	Inside Pole	115.00 - 0.00	1	No Ice	0.00	1.35
						1/2" Ice	0.00	1.35
						1" Ice	0.00	1.35
						2" Ice	0.00	1.35
						4" Ice	0.00	1.35
7983A(1/2")	A	No	CaAa (Out Of Face)	105.00 - 0.00	1	No Ice	0.06	0.08
						1/2" Ice	0.16	0.74
						1" Ice	0.26	2.01
						2" Ice	0.46	6.39
						4" Ice	0.86	22.47
7983A(1/2")	A	No	CaAa (Out Of Face)	105.00 - 0.00	2	No Ice	0.00	0.08
						1/2" Ice	0.00	0.74
						1" Ice	0.00	2.01
						2" Ice	0.00	6.39
						4" Ice	0.00	22.47
9207(5/16")	A	No	CaAa (Out Of Face)	105.00 - 0.00	6	No Ice	0.00	0.60
						1/2" Ice	0.00	1.11
						1" Ice	0.00	2.22
						2" Ice	0.00	6.29
						4" Ice	0.00	21.76
HB114-1-0813U4-M5J(1 1/4")	A	No	CaAa (Out Of Face)	105.00 - 0.00	1	No Ice	0.15	1.20
						1/2" Ice	0.25	2.45
						1" Ice	0.35	4.30
						2" Ice	0.55	9.85
						4" Ice	0.95	28.27
HB114-1-0813U4-M5J(1 1/4")	A	No	CaAa (Out Of Face)	105.00 - 0.00	2	No Ice	0.00	1.20
						1/2" Ice	0.00	2.45
						1" Ice	0.00	4.30
						2" Ice	0.00	9.85
						4" Ice	0.00	28.27
7983A(1/2")	A	No	CaAa (Out Of	105.00 - 0.00	1	No Ice	0.00	0.08

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
			Face)			1/2" Ice	0.00	0.74
						1" Ice	0.00	2.01
						2" Ice	0.00	6.39
						4" Ice	0.00	22.47
*								
3" Rigid Conduit	A	No	CaAa (Out Of Face)	105.00 - 0.00	1	No Ice	0.30	3.00
						1/2" Ice	0.40	5.14
						1" Ice	0.50	7.89
						2" Ice	0.70	15.22
						4" Ice	1.10	37.21
3" Rigid Conduit	A	No	CaAa (Out Of Face)	105.00 - 0.00	1	No Ice	0.00	3.00
						1/2" Ice	0.00	5.14
						1" Ice	0.00	7.89
						2" Ice	0.00	15.22
						4" Ice	0.00	37.21
*								
5/8" Step Bolts	C	No	CaAa (Out Of Face)	120.00 - 0.00	1	No Ice	0.04	0.49
						1/2" Ice	0.14	0.97
						1" Ice	0.24	1.46
						2" Ice	0.44	2.42
						4" Ice	0.84	4.36
Safety Line 3/8	C	No	CaAa (Out Of Face)	120.00 - 0.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46
*								
LCF158-50J(1-5/8")	C	No	CaAa (Out Of Face)	90.00 - 0.00	5	No Ice	0.00	0.92
						1/2" Ice	0.00	2.45
						1" Ice	0.00	4.60
						2" Ice	0.00	10.72
						4" Ice	0.00	30.29
LCF158-50J(1-5/8")	C	No	CaAa (Out Of Face)	90.00 - 0.00	1	No Ice	0.20	0.92
						1/2" Ice	0.30	2.45
						1" Ice	0.40	4.60
						2" Ice	0.60	10.72
						4" Ice	1.00	30.29

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	120.00-77.33	A	0.000	0.000	0.000	14.165	0.37
		B	0.000	0.000	0.000	0.000	0.66
		C	0.000	0.000	0.000	5.924	0.10
L2	77.33-34.33	A	0.000	0.000	0.000	22.016	0.58
		B	0.000	0.000	0.000	0.000	0.75
		C	0.000	0.000	0.000	12.047	0.27
L3	34.33-0.00	A	0.000	0.000	0.000	17.579	0.46
		B	0.000	0.000	0.000	0.000	0.60
		C	0.000	0.000	0.000	9.619	0.21

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	120.00-77.33	A	0.854	0.000	0.000	0.000	28.350	1.20
		B		0.000	0.000	0.000	0.000	0.66
		C		0.000	0.000	0.000	22.672	0.41
L2	77.33-34.33	A	0.798	0.000	0.000	0.000	44.062	1.87
		B		0.000	0.000	0.000	0.000	0.75

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
		C		0.000	0.000	0.000	34.093	1.13
L3	34.33-0.00	A	0.750	0.000	0.000	0.000	34.025	1.40
		B		0.000	0.000	0.000	0.000	0.60
		C		0.000	0.000	0.000	26.065	0.85

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	120.00-77.33	-0.1557	-0.3432	-0.4380	-0.4003
L2	77.33-34.33	-0.2850	-0.4368	-0.6111	-0.5591
L3	34.33-0.00	-0.2960	-0.4537	-0.6381	-0.5934

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
115'E									
(2) DB844G65ZAXY w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.90 5.35 5.80 6.73 8.73	4.92 5.60 6.28 7.71 10.83	0.03 0.08 0.13 0.26 0.62
(2) DB844G65ZAXY w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.90 5.35 5.80 6.73 8.73	4.92 5.60 6.28 7.71 10.83	0.03 0.08 0.13 0.26 0.62
(2) DB844G65ZAXY w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.90 5.35 5.80 6.73 8.73	4.92 5.60 6.28 7.71 10.83	0.03 0.08 0.13 0.26 0.62
MG D3-800TV w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.57 3.98 4.39 5.33 7.34	3.42 4.12 4.78 6.16 9.18	0.04 0.07 0.11 0.21 0.52
MG D3-800TV w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.57 3.98 4.39 5.33 7.34	3.42 4.12 4.78 6.16 9.18	0.04 0.07 0.11 0.21 0.52
MG D3-800TV w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.57 3.98 4.39 5.33 7.34	3.42 4.12 4.78 6.16 9.18	0.04 0.07 0.11 0.21 0.52
(2) FD9R6004/2C-3L	A	From Leg	4.00	0.0000	115.00	No Ice	0.37	0.08	0.00

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		1/2"	0.45	0.14	0.01
			2.00		Ice	0.54	0.20	0.01
					1" Ice	0.75	0.34	0.02
					2" Ice	1.28	0.74	0.06
					4" Ice			
(2) FD9R6004/2C-3L	B	From Leg	4.00	0.0000	115.00	No Ice	0.37	0.08	0.00
			0.00			1/2"	0.45	0.14	0.01
			2.00			Ice	0.54	0.20	0.01
						1" Ice	0.75	0.34	0.02
						2" Ice	1.28	0.74	0.06
						4" Ice			
(2) FD9R6004/2C-3L	C	From Leg	4.00	0.0000	115.00	No Ice	0.37	0.08	0.00
			0.00			1/2"	0.45	0.14	0.01
			2.00			Ice	0.54	0.20	0.01
						1" Ice	0.75	0.34	0.02
						2" Ice	1.28	0.74	0.06
						4" Ice			
115'P									
BXA-171063-12CF-EDIN-2 w/ Mount Pipe	A	From Leg	4.00	0.0000	115.00	No Ice	5.03	5.29	0.04
			0.00			1/2"	5.58	6.46	0.09
			2.00			Ice	6.10	7.35	0.14
						1" Ice	7.17	9.15	0.27
						2" Ice	9.44	12.95	0.68
						4" Ice			
BXA-171063-12CF-EDIN-2 w/ Mount Pipe	B	From Leg	4.00	0.0000	115.00	No Ice	5.03	5.29	0.04
			0.00			1/2"	5.58	6.46	0.09
			2.00			Ice	6.10	7.35	0.14
						1" Ice	7.17	9.15	0.27
						2" Ice	9.44	12.95	0.68
						4" Ice			
BXA-171063-12CF-EDIN-2 w/ Mount Pipe	C	From Leg	4.00	0.0000	115.00	No Ice	5.03	5.29	0.04
			0.00			1/2"	5.58	6.46	0.09
			2.00			Ice	6.10	7.35	0.14
						1" Ice	7.17	9.15	0.27
						2" Ice	9.44	12.95	0.68
						4" Ice			
BXA-70063-6CF-2 w/ Mount Pipe	B	From Leg	4.00	0.0000	115.00	No Ice	7.97	5.80	0.04
			0.00			1/2"	8.61	6.95	0.10
			2.00			Ice	9.22	7.82	0.17
						1" Ice	10.46	9.60	0.34
						2" Ice	13.07	13.37	0.80
						4" Ice			
BXA-70063-6CF-2 w/ Mount Pipe	C	From Leg	4.00	0.0000	115.00	No Ice	7.97	5.80	0.04
			0.00			1/2"	8.61	6.95	0.10
			2.00			Ice	9.22	7.82	0.17
						1" Ice	10.46	9.60	0.34
						2" Ice	13.07	13.37	0.80
						4" Ice			
BXA-70063-6CF-EDIN-4 w/ Mount Pipe	A	From Leg	4.00	0.0000	115.00	No Ice	7.97	5.80	0.04
			0.00			1/2"	8.61	6.95	0.10
			2.00			Ice	9.22	7.82	0.17
						1" Ice	10.46	9.60	0.34
						2" Ice	13.07	13.37	0.80
						4" Ice			
RRH2X40-AWS	A	From Leg	4.00	0.0000	115.00	No Ice	2.52	1.59	0.04
			0.00			1/2"	2.75	1.80	0.06
			2.00			Ice	2.99	2.01	0.08
						1" Ice	3.50	2.46	0.13
						2" Ice	4.61	3.48	0.28
						4" Ice			
DB-T1-6Z-8AB-0Z	A	From Leg	4.00	0.0000	115.00	No Ice	5.60	2.33	0.04
			0.00			1/2"	5.92	2.56	0.08
			2.00			Ice	6.24	2.79	0.12
						1" Ice	6.91	3.28	0.21
						2" Ice	8.37	4.37	0.45

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
						4" Ice			
RRH2X40-AWS	B	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.52 2.75 2.99 3.50 4.61	1.59 1.80 2.01 2.46 3.48	0.04 0.06 0.08 0.13 0.28
RRH2X40-AWS	C	From Leg	4.00 0.00 2.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.52 2.75 2.99 3.50 4.61	1.59 1.80 2.01 2.46 3.48	0.04 0.06 0.08 0.13 0.28
Platform Mount [LP 602-1]	C	None		0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
105'E APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	105.00	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 1.00	0.0000	105.00	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 1.00	0.0000	105.00	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
LLPX310R w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.07 5.48 5.91 6.79 8.70	2.98 3.53 4.09 5.31 8.13	0.05 0.08 0.13 0.23 0.54
LLPX310R w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.07 5.48 5.91 6.79 8.70	2.98 3.53 4.09 5.31 8.13	0.05 0.08 0.13 0.23 0.54
LLPX310R w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.07 5.48 5.91 6.79 8.70	2.98 3.53 4.09 5.31 8.13	0.05 0.08 0.13 0.23 0.54
* FDD_R6_RRH	A	From Leg	4.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.79 1.97 2.16 2.57 3.49	0.78 0.92 1.07 1.39 2.14	0.03 0.04 0.06 0.09 0.20
FDD_R6_RRH	B	From Leg	4.00 0.00	0.0000	105.00	No Ice 1/2"	1.79 1.97	0.78 0.92	0.03 0.04

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				Ice	2.16	1.07	0.06
							1" Ice	2.57	1.39	0.09
							2" Ice	3.49	2.14	0.20
							4" Ice			
FDD_R6_RRH	C	From Leg	4.00		0.0000	105.00	No Ice	1.79	0.78	0.03
			0.00				1/2"	1.97	0.92	0.04
			0.00				Ice	2.16	1.07	0.06
							1" Ice	2.57	1.39	0.09
							2" Ice	3.49	2.14	0.20
							4" Ice			
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00		0.0000	105.00	No Ice	0.77	0.37	0.01
			0.00				1/2"	0.89	0.46	0.02
			1.00				Ice	1.02	0.56	0.02
							1" Ice	1.30	0.79	0.04
							2" Ice	1.97	1.34	0.11
							4" Ice			
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00		0.0000	105.00	No Ice	0.77	0.37	0.01
			0.00				1/2"	0.89	0.46	0.02
			1.00				Ice	1.02	0.56	0.02
							1" Ice	1.30	0.79	0.04
							2" Ice	1.97	1.34	0.11
							4" Ice			
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00		0.0000	105.00	No Ice	0.77	0.37	0.01
			0.00				1/2"	0.89	0.46	0.02
			1.00				Ice	1.02	0.56	0.02
							1" Ice	1.30	0.79	0.04
							2" Ice	1.97	1.34	0.11
							4" Ice			
(3) ACU-A20-N	A	From Leg	4.00		0.0000	105.00	No Ice	0.08	0.14	0.00
			0.00				1/2"	0.12	0.19	0.00
			1.00				Ice	0.17	0.25	0.00
							1" Ice	0.30	0.40	0.01
							2" Ice	0.67	0.80	0.04
							4" Ice			
(3) ACU-A20-N	B	From Leg	4.00		0.0000	105.00	No Ice	0.08	0.14	0.00
			0.00				1/2"	0.12	0.19	0.00
			1.00				Ice	0.17	0.25	0.00
							1" Ice	0.30	0.40	0.01
							2" Ice	0.67	0.80	0.04
							4" Ice			
(3) ACU-A20-N	C	From Leg	4.00		0.0000	105.00	No Ice	0.08	0.14	0.00
			0.00				1/2"	0.12	0.19	0.00
			1.00				Ice	0.17	0.25	0.00
							1" Ice	0.30	0.40	0.01
							2" Ice	0.67	0.80	0.04
							4" Ice			
Platform Mount [LP 602-1]	C	None			0.0000	105.00	No Ice	32.03	32.03	1.34
							1/2"	38.71	38.71	1.80
							Ice	45.39	45.39	2.26
							1" Ice	58.75	58.75	3.17
							2" Ice	85.47	85.47	5.00
							4" Ice			
90'E APXV18-206517S-C w/ Mount Pipe	A	From Leg	4.00		0.0000	90.00	No Ice	5.40	4.70	0.05
			0.00				1/2"	5.96	5.86	0.10
			0.00				Ice	6.48	6.73	0.15
							1" Ice	7.55	8.51	0.28
							2" Ice	9.92	12.28	0.68
							4" Ice			
APXV18-206517S-C w/ Mount Pipe	B	From Leg	4.00		0.0000	90.00	No Ice	5.40	4.70	0.05
			0.00				1/2"	5.96	5.86	0.10
			0.00				Ice	6.48	6.73	0.15
							1" Ice	7.55	8.51	0.28
							2" Ice	9.92	12.28	0.68
							4" Ice			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APXV18-206517S-C w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.96 6.48 7.55 9.92	4.70 5.86 6.73 8.51 12.28	0.05 0.10 0.15 0.28 0.68
Pipe Mount [PM 601-3]	C	None		0.0000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.39 5.48 6.57 8.75 13.11	4.39 5.48 6.57 8.75 13.11	0.20 0.24 0.28 0.36 0.53
108'E 800MHZ RRH	A	From Leg	4.00 0.00 1.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
1900MHz RRH (65MHz)	A	From Leg	4.00 0.00 -1.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
800MHZ RRH	B	From Leg	4.00 0.00 1.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
1900MHz RRH (65MHz)	B	From Leg	4.00 0.00 -1.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
800MHZ RRH	C	From Leg	4.00 0.00 1.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
1900MHz RRH (65MHz)	C	From Leg	4.00 0.00 -1.00	0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
Pipe Mount [PM 601-3]	C	None		0.0000	108.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.39 5.48 6.57 8.75 13.11	4.39 5.48 6.57 8.75 13.11	0.20 0.24 0.28 0.36 0.53

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
VHLP800-11	C	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 4.00	20.0000		105.00	2.80	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.16 6.53 6.90 7.65 9.13	0.05 0.08 0.12 0.18 0.32
VHLP2-18	A	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 4.00	60.0000		105.00	2.17	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.01 4.30 4.88 6.04	0.03 0.05 0.07 0.11 0.20
A-ANT-23G-2-C	A	Paraboloid w/Shroud (HP)	From Leg	1.00 0.00 4.00	20.0000		105.00	2.17	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.01 4.30 4.88 6.04	0.03 0.05 0.07 0.11 0.19

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	120 - 77.3333	Pole	Max Tension	21	0.00	-0.00	0.00
			Max. Compression	14	-14.94	0.60	1.81
			Max. Mx	5	-7.29	-393.92	4.47
			Max. My	8	-7.28	6.00	-396.10
			Max. Vy	5	15.59	-393.92	4.47
			Max. Vx	8	15.64	6.00	-396.10
			Max. Torque	10			-1.06
L2	77.3333 - 34.3333	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-25.13	1.92	3.66
			Max. Mx	5	-14.20	-1164.97	11.16
			Max. My	8	-14.20	15.42	-1169.09
			Max. Vy	5	21.14	-1164.97	11.16
			Max. Vx	8	21.19	15.42	-1169.09
			Max. Torque	10			-1.29
L3	34.3333 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-37.64	3.37	5.59
			Max. Mx	5	-23.69	-2110.97	17.55
			Max. My	8	-23.69	24.32	-2116.84
			Max. Vy	5	26.17	-2110.97	17.55
			Max. Vx	8	26.23	24.32	-2116.84
			Max. Torque	10			-1.53

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	15	37.64	-0.03	6.56
	Max. H_x	11	23.71	26.13	-0.16
	Max. H_z	2	23.71	-0.14	26.15
	Max. M_x	2	2113.83	-0.14	26.15
	Max. M_z	5	2110.97	-26.16	0.14
	Max. Torsion	4	1.36	-22.69	13.17
	Min. Vert	1	23.71	0.00	0.00
	Min. H_x	5	23.71	-26.16	0.14
	Min. H_z	8	23.71	0.21	-26.21
	Min. M_x	8	-2116.84	0.21	-26.21
	Min. M_z	11	-2109.22	26.13	-0.16
	Min. Torsion	10	-1.53	22.67	-13.20

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	23.71	0.00	0.00	-1.90	0.84	-0.00
Dead+Wind 0 deg - No Ice	23.71	0.14	-26.15	-2113.83	-15.01	-0.75
Dead+Wind 30 deg - No Ice	23.71	13.24	-22.64	-1830.53	-1073.55	-1.08
Dead+Wind 60 deg - No Ice	23.71	22.69	-13.17	-1068.63	-1831.88	-1.36
Dead+Wind 90 deg - No Ice	23.71	26.16	-0.14	-17.55	-2110.97	-1.36
Dead+Wind 120 deg - No Ice	23.71	22.66	12.95	1040.17	-1829.18	-0.91
Dead+Wind 150 deg - No Ice	23.71	13.03	22.62	1823.98	-1049.80	0.01
Dead+Wind 180 deg - No Ice	23.71	-0.21	26.21	2116.84	24.32	0.95
Dead+Wind 210 deg - No Ice	23.71	-13.23	22.70	1833.48	1073.61	1.34
Dead+Wind 240 deg - No Ice	23.71	-22.67	13.20	1068.23	1831.63	1.53
Dead+Wind 270 deg - No Ice	23.71	-26.13	0.16	16.28	2109.22	1.37

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 - No Ice	23.71	-22.63	-12.93	-1041.80	1826.97	0.89
Dead+Wind 330 deg - No Ice	23.71	-12.98	-22.62	-1828.36	1045.94	-0.07
Dead+Ice+Temp	37.64	-0.00	-0.00	-5.59	3.37	-0.00
Dead+Wind 0 deg+Ice+Temp	37.64	0.03	-6.56	-544.76	-0.16	-0.28
Dead+Wind 30 deg+Ice+Temp	37.64	3.32	-5.68	-472.47	-270.36	-0.36
Dead+Wind 60 deg+Ice+Temp	37.64	5.69	-3.30	-277.63	-464.47	-0.40
Dead+Wind 90 deg+Ice+Temp	37.64	6.56	-0.03	-9.17	-535.87	-0.35
Dead+Wind 120 deg+Ice+Temp	37.64	5.68	3.25	260.81	-463.86	-0.19
Dead+Wind 150 deg+Ice+Temp	37.64	3.27	5.67	460.58	-265.02	0.07
Dead+Wind 180 deg+Ice+Temp	37.64	-0.05	6.57	535.02	8.68	0.32
Dead+Wind 210 deg+Ice+Temp	37.64	-3.31	5.69	462.72	276.84	0.42
Dead+Wind 240 deg+Ice+Temp	37.64	-5.69	3.31	267.13	470.89	0.44
Dead+Wind 270 deg+Ice+Temp	37.64	-6.55	0.04	-1.53	541.95	0.36
Dead+Wind 300 deg+Ice+Temp	37.64	-5.68	-3.25	-271.60	469.82	0.19
Dead+Wind 330 deg+Ice+Temp	37.64	-3.26	-5.67	-471.98	270.59	-0.08
Dead+Wind 0 deg - Service	23.71	0.05	-9.05	-733.32	-4.63	-0.26
Dead+Wind 30 deg - Service	23.71	4.58	-7.83	-635.22	-371.23	-0.38
Dead+Wind 60 deg - Service	23.71	7.85	-4.56	-371.36	-633.84	-0.47
Dead+Wind 90 deg - Service	23.71	9.05	-0.05	-7.35	-730.49	-0.47
Dead+Wind 120 deg - Service	23.71	7.84	4.48	358.94	-632.90	-0.31
Dead+Wind 150 deg - Service	23.71	4.51	7.83	630.39	-362.99	0.00
Dead+Wind 180 deg - Service	23.71	-0.07	9.07	731.82	8.99	0.33
Dead+Wind 210 deg - Service	23.71	-4.58	7.86	633.69	372.37	0.47
Dead+Wind 240 deg - Service	23.71	-7.84	4.57	368.67	634.88	0.53
Dead+Wind 270 deg - Service	23.71	-9.04	0.06	4.36	731.01	0.48
Dead+Wind 300 deg - Service	23.71	-7.83	-4.47	-362.06	633.26	0.31
Dead+Wind 330 deg - Service	23.71	-4.49	-7.83	-634.45	362.78	-0.03

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	-23.71	0.00	0.00	23.71	0.00	0.000%
2	0.14	-23.71	-26.15	-0.14	23.71	26.15	0.000%
3	13.24	-23.71	-22.64	-13.24	23.71	22.64	0.000%
4	22.69	-23.71	-13.17	-22.69	23.71	13.17	0.000%
5	26.16	-23.71	-0.14	-26.16	23.71	0.14	0.000%
6	22.66	-23.71	12.95	-22.66	23.71	-12.95	0.000%
7	13.03	-23.71	22.62	-13.03	23.71	-22.62	0.000%
8	-0.21	-23.71	26.21	0.21	23.71	-26.21	0.000%
9	-13.23	-23.71	22.70	13.23	23.71	-22.70	0.000%
10	-22.67	-23.71	13.20	22.67	23.71	-13.20	0.000%
11	-26.13	-23.71	0.16	26.13	23.71	-0.16	0.000%
12	-22.63	-23.71	-12.93	22.63	23.71	12.93	0.000%
13	-12.98	-23.71	-22.62	12.98	23.71	22.62	0.000%
14	0.00	-37.64	0.00	0.00	37.64	0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
15	0.03	-37.64	-6.56	-0.03	37.64	6.56	0.000%
16	3.32	-37.64	-5.68	-3.32	37.64	5.68	0.000%
17	5.69	-37.64	-3.30	-5.69	37.64	3.30	0.000%
18	6.56	-37.64	-0.03	-6.56	37.64	0.03	0.000%
19	5.68	-37.64	3.25	-5.68	37.64	-3.25	0.000%
20	3.27	-37.64	5.67	-3.27	37.64	-5.67	0.000%
21	-0.05	-37.64	6.57	0.05	37.64	-6.57	0.000%
22	-3.31	-37.64	5.69	3.31	37.64	-5.69	0.000%
23	-5.69	-37.64	3.31	5.69	37.64	-3.31	0.000%
24	-6.55	-37.64	0.04	6.55	37.64	-0.04	0.000%
25	-5.68	-37.64	-3.25	5.68	37.64	3.25	0.000%
26	-3.26	-37.64	-5.67	3.26	37.64	5.67	0.000%
27	0.05	-23.71	-9.05	-0.05	23.71	9.05	0.000%
28	4.58	-23.71	-7.83	-4.58	23.71	7.83	0.000%
29	7.85	-23.71	-4.56	-7.85	23.71	4.56	0.000%
30	9.05	-23.71	-0.05	-9.05	23.71	0.05	0.000%
31	7.84	-23.71	4.48	-7.84	23.71	-4.48	0.000%
32	4.51	-23.71	7.83	-4.51	23.71	-7.83	0.000%
33	-0.07	-23.71	9.07	0.07	23.71	-9.07	0.000%
34	-4.58	-23.71	7.86	4.58	23.71	-7.86	0.000%
35	-7.84	-23.71	4.57	7.84	23.71	-4.57	0.000%
36	-9.04	-23.71	0.06	9.04	23.71	-0.06	0.000%
37	-7.83	-23.71	-4.47	7.83	23.71	4.47	0.000%
38	-4.49	-23.71	-7.83	4.49	23.71	7.83	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	0.00005318
3	Yes	5	0.00000001	0.00007510
4	Yes	5	0.00000001	0.00007970
5	Yes	4	0.00000001	0.00027530
6	Yes	5	0.00000001	0.00007277
7	Yes	5	0.00000001	0.00007530
8	Yes	4	0.00000001	0.00024366
9	Yes	5	0.00000001	0.00008015
10	Yes	5	0.00000001	0.00007368
11	Yes	4	0.00000001	0.00014514
12	Yes	5	0.00000001	0.00007706
13	Yes	5	0.00000001	0.00007544
14	Yes	4	0.00000001	0.00000989
15	Yes	4	0.00000001	0.00081598
16	Yes	4	0.00000001	0.00095098
17	Yes	4	0.00000001	0.00095701
18	Yes	4	0.00000001	0.00080193
19	Yes	4	0.00000001	0.00091625
20	Yes	4	0.00000001	0.00091931
21	Yes	4	0.00000001	0.00079886
22	Yes	4	0.00000001	0.00094923
23	Yes	4	0.00000001	0.00093793
24	Yes	4	0.00000001	0.00081021
25	Yes	4	0.00000001	0.00095279
26	Yes	4	0.00000001	0.00095315
27	Yes	4	0.00000001	0.00002265
28	Yes	4	0.00000001	0.00023008
29	Yes	4	0.00000001	0.00026292
30	Yes	4	0.00000001	0.00004938
31	Yes	4	0.00000001	0.00021711
32	Yes	4	0.00000001	0.00023222
33	Yes	4	0.00000001	0.00003924
34	Yes	4	0.00000001	0.00026371
35	Yes	4	0.00000001	0.00022143
36	Yes	4	0.00000001	0.00004104
37	Yes	4	0.00000001	0.00024877
38	Yes	4	0.00000001	0.00023596

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	120 - 77.3333 (1)	TP30.45x21.91x0.2188	42.67	0.00	0.0	36.858	20.6362	-7.27	760.62	0.010
L2	77.3333 - 34.3333 (2)	TP38.61x29.0784x0.3125	47.67	0.00	0.0	39.000	37.3967	-14.19	1458.47	0.010
L3	34.3333 - 0 (3)	TP44.85x36.8519x0.375	40.00	0.00	0.0	39.000	53.7036	-23.69	2094.44	0.011

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	120 - 77.3333 (1)	TP30.45x21.91x0.2188	397.83	32.285	36.858	0.876	0.00	0.000	36.858	0.000
L2	77.3333 - 34.3333 (2)	TP38.61x29.0784x0.3125	1173.94	41.481	39.000	1.064	0.00	0.000	39.000	0.000
L3	34.3333 - 0 (3)	TP44.85x36.8519x0.375	2124.69	43.687	39.000	1.120	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	120 - 77.3333 (1)	TP30.45x21.91x0.2188	15.71	0.761	26.000	0.059	0.92	0.035	26.000	0.001
L2	77.3333 - 34.3333 (2)	TP38.61x29.0784x0.3125	21.26	0.568	26.000	0.044	1.13	0.019	26.000	0.001
L3	34.3333 - 0 (3)	TP44.85x36.8519x0.375	26.29	0.490	26.000	0.038	1.34	0.013	26.000	0.001

Pole Interaction Design Data

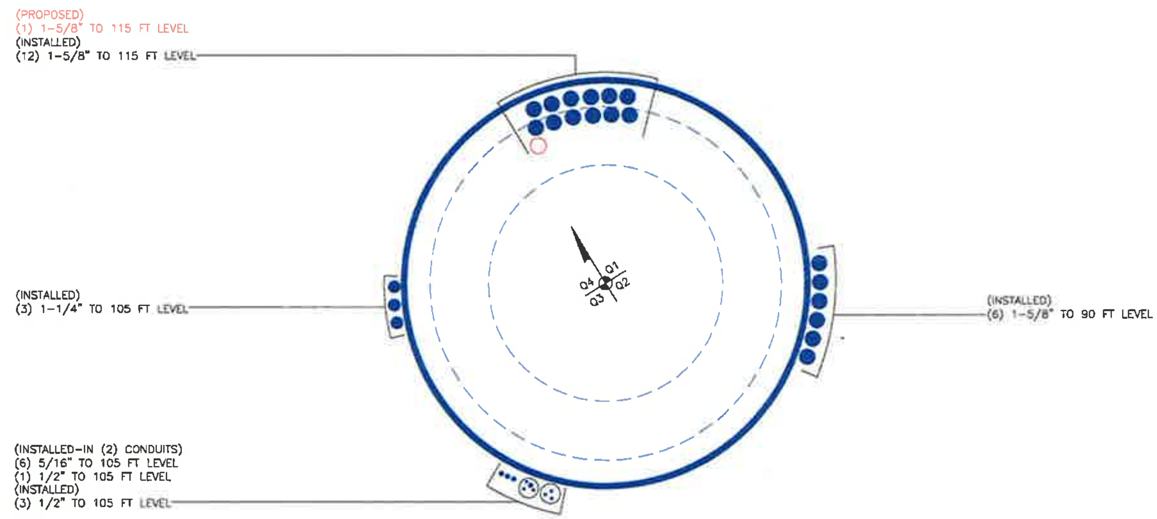
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	120 - 77.3333 (1)	0.010	0.876	0.000	0.059	0.001	0.886 ✔	1.333	H1-3+VT ✔
L2	77.3333 - 34.3333 (2)	0.010	1.064	0.000	0.044	0.001	1.074 ✔	1.333	H1-3+VT ✔
L3	34.3333 - 0 (3)	0.011	1.120	0.000	0.038	0.001	1.132 ✔	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	120 - 77.3333	Pole	TP30.45x21.91x0.2188	1	-7.27	1013.90	66.5	Pass
L2	77.3333 - 34.3333	Pole	TP38.61x29.0784x0.3125	2	-14.19	1944.14	80.6	Pass
L3	34.3333 - 0	Pole	TP44.85x36.8519x0.375	3	-23.69	2791.89	84.9	Pass
							Summary	
						Pole (L3)	84.9	Pass
						RATING =	**84.9**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 806454 TOWER ID: C_BASELEVEL

BASE LEVEL DRAWING

PLOT DATE: 5/15/2014 FILE NAME: 806454_BASELEVEL.dwg
Xref R:\TEMPLATES\TYPICAL BLOCKS FOR TEMPLATES\TITLE BLOCK STD-VER 5.T.dwg

CROWN REGION ADDRESS
USA

Date	Description	By
18/09/08	APPLICATION ADDED PER WORK ORDER # 230547	AM
06/02/09	UPDATED PER WORK ORDER # 232228	LAN
26/08/09	APPLICATION ADDED PER WORK ORDER # 281220	AMM
17/08/10	AS-BUILT INFORMATION ADDED PER WORK ORDER # 333360	ESC
08/03/11	AS-BUILT INFORMATION ADDED PER WORK ORDER # 363936, # 389570	ADJ
12/01/12	UPDATED PER WORK ORDER # 454061	JDC
16/10/12	APPLICATION ADDED PER WORK ORDER # 542383	ATT
16/11/12	UPDATED PER WORK ORDER # 552537	BRW
14/05/14	UPDATED PER WORK ORDER # 766645	SB

DRAWN BY: KDI/BH
CHECKED BY:
DRAWING DATE: 28/08/07

SITE NUMBER:
SITE NAME:

SITE NAME
NHV 112 948129

BUSINESS UNIT NUMBER
806454

SITE ADDRESS
117 WASHINGTON STREET
NORTH HAVEN, CT 06473
NEW HAVEN COUNTY
USA

SHEET TITLE
BASE LEVEL

SHEET NUMBER
A1-0

APPENDIX C

ADDITIONAL CALCULATIONS

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

TIA Rev F

Site Data

BU#: *806454*
Site Name: *NHV 112 948129*
App #:

Pole Manufacturer:	*Other*

Reactions		
Moment:	2125	ft-kips
Axial:	24	kips
Shear:	26	kips

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	51.16	in

Plate Data		
Diam:	57.16	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	12.02	in

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	44.85	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

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

Anchor Rod Results

		Rigid
Maximum Rod Tension:	164.1 Kips	Service, ASD
Allowable Tension:	195.0 Kips	Fty*ASIF
Anchor Rod Stress Ratio:	84.2% Pass	

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	23.9 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	39.9% Pass	Y.L. Length: 24.61

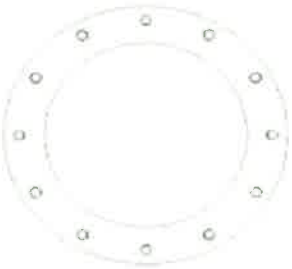
n/a

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

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AW Solutions Inc

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**********************************************************************************************
*                                                                                            *
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*                                                                                            *
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Project Title: BU806454
Project Notes: WO766652

Calculation Method: Full 8CD

******* I N P U T D A T A

Pier Properties

Diameter (ft)	Distance of Top of Pier above Ground (ft)	Concrete Strength (ksi)	Steel Yield Strength (ksi)
6.00	0.50	3.00	60.00

Soil Properties

Layer	Type	Thickness (ft)	Depth at Top of Layer (ft)	Density (lbs/ft^3)	CU (psf)	KP	PHI (deg)
1	Clay	3.00	0.00	105.0			
2	Sand	9.00	3.00	105.0		2.464	25.00
3	Clay	1.00	12.00	110.0	1250.0		
4	Clay	29.00	13.00	47.6	1250.0		
5	Clay	18.00	42.00	52.6	1500.0		

Design (Factored) Loads at Top of Pier

Moment (ft-k)	Axial Load (kips)	Shear Load (kips)	Additional Safety Factor Against Soil Failure
2125.0	24.0	26.00	14.50 ===> 2/14.5 = 13.8 %

******* R E S U L T S

Calculated Pier Properties

Length (ft)	Weight (kips)	End Bearing Pressure (psf)
59.500	252.348	848.8

Ultimate Resisting Forces Along Pier

Type	Distance of Top of Layer to Top of Pier (ft)	Thickness (ft)	Density (lbs/ft^3)	CU (psf)	KP	Force (kips)	Arm (ft)
Clay	0.50	3.00	105.0			0.00	2.00
Sand	3.50	9.00	105.0		2.464	314.33	8.90
Clay	12.50	1.00	110.0	1250.0		60.00	13.00
Clay	13.50	24.73	47.6	1250.0		1483.65	25.86
Clay	38.23	4.27	47.6	1250.0		-256.34	40.36
Clay	42.50	17.00	52.6	1500.0		-1224.00	51.00

Shear and Moments Along Pier

Distance below Top of Pier (ft)	Shear (with Safety Factor) (kips)	Moment (with Safety Factor) (ft-k)	Shear (without Safety Factor) (kips)	Moment (without Safety Factor) (ft-k)
0.00	377.6	30820.5	26.0	2125.5
5.95	329.4	33014.1	22.7	2276.8
11.90	96.0	34361.5	6.6	2369.8
17.85	-257.7	33889.5	-17.8	2337.2
23.80	-614.7	31294.1	-42.4	2158.2
29.75	-971.7	26574.7	-67.0	1832.7
35.70	-1328.7	19731.0	-91.6	1360.8
41.65	-1275.0	11466.1	-87.9	790.8
47.60	-856.8	5098.0	-59.1	351.6
53.55	-428.4	1274.5	-29.5	87.9
59.50	0.0	-0.0	0.0	-0.0

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

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

Site Data

BU#: *806454*
Site Name: *NHV 112 948129*
App #:

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

Pier Properties

Concrete:

Pier Diameter =	6.0	ft
Concrete Area =	4071.5	in^2

Reinforcement:

Clear Cover to **Tie**=	4.00	in
Horiz. **Tie** Bar Size=	4	
Vert. Cage Diameter =	5.13	ft
Vert. Cage Diameter =	61.59	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	36	
As Total=	56.16	in^2
A s/ Aconc, Rho:	0.0138	1.38%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	1.38%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	7076.54	kips
at Mu=(ϕ=0.65)Mn=	3563.73	ft-kips
Max Tu, (φ=0.9) Tn =	3032.64	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces

TIA Revision:	F	
Max. Service Shaft M:	2369.8	ft-kips **(* Note)**
Max. Service Shaft P:	24	kips
Max Axial Force Type:	Comp.	

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

Load Factor	Shaft Factored Loads		
1.30	Mu:	3080.74	ft-kips
1.30	Pu:	31.2	kips

Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	

ACI 318 Code

Select Analysis ACI Code= 2008

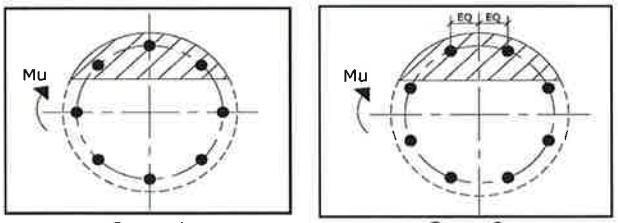
Seismic Properties

Seismic Design Category = C
Seismic Risk = **Moderate**

Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1 Case 2

Dist. From Edge to Neutral Axis: **17.49** in
Extreme Steel Strain, εt: **0.0084**
εt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	31.20	kips
Drilled Shaft Moment Capacity, φMn:	**6723.20**	ft-kips
Drilled Shaft Superimposed Mu:	**3080.74**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**45.8%**