Robinson+Cole

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Also admitted in Massachusetts

October 14, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
557 Route 82, Montville, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 167-foot level of the existing 180-foot tower at 577 Route 82 in Montville, Connecticut (the "Property"). The tower is owned by Crown Castle ("Crown"). The Council approved Cellco's use of this tower in 2001. Cellco now intends to replace six (6) of its existing antennas with three (3) model LNX-6514DS, 700 MHz antennas and three (3) model HBXX-6516DS, 1900 MHz antennas, and add three (3) model HBXX-6516DS, 2100 MHz antennas, for a total of fifteen (15) antennas, all at the same 167-foot level on the tower. Cellco also intends to install nine (9) radio heads ("RRHs") and two (2) HYBRIFLEX™ fiber optic antenna cables. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cables.

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 Ronald K. McDaniel, Mayor for the Town of Montville. A copy of this letter is also being sent to Carolyn Besade, the owner of the Property and to Crown, the tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRH's will be located on its existing platform at the 167-foot level on the tower.

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

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

4. The operation of the 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 worst-case 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:
Ronald K. McDaniel, Montville Mayor
Carolyn Besade
Crown Castle
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.8	15.9
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	12.4	11.2
Beam Tilt, degrees	0–10	0–10
USLS, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	23	23
CPR at Sector, dB	12	10
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°
Impedance	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**
Gain by all Beam Tilts, average, dBi	15.6	15.7
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 15.7	0 ° | 15.9
	5 ° | 15.7	5 ° | 15.8
	10 ° | 15.3	10 ° | 15.3
Beamwidth, Horizontal Tolerance, degrees	±0.9	±1.4
Beamwidth, Vertical Tolerance, degrees	±0.8	±0.6
USLS, dB	18	20
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	25	24
CPR at Sector, dB	15	12

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®

Product Specifications

LNX-6514DS-VTM

Operating Frequency Band	698 – 896 MHz
Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	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

Dimensions

Depth	180.5 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight	14.2 kg | 31.3 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

Product Specifications

COMMSCOPE®

on the go

HBXX-6516DS-VTM

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

- Fully supports PCS 1900, GSM 1800, UMTS 2100, and AWS spectrum
- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain, dBi	17.7	18.0	18.0
Beamwidth, Horizontal, degrees	67	65	63
Beamwidth, Vertical, degrees	7.5	7.0	6.5
Beam Tilt, degrees	0–10	0–10	0–10
USLS, typical, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4:1 | 15.6	1.4:1 | 15.6	1.4:1 | 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°
Impedance	50 ohm	50 ohm	50 ohm
Lightning Protection	dc Ground	dc Ground	dc Ground

Mechanical Specifications

Color | Radome Material	Light gray | PVC, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	419.5 N @ 150 km/h 94.3 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1294.00 mm | 50.94 in
Width	305.00 mm | 12.01 in
Net Weight	13.90 kg | 30.64 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	HBXX-6516DS-R2M
Model with Factory Installed AISG 2.0 Actuator	HBXX-6516DS-A2M

Regulatory Compliance/Certifications

Agency	**Classification**
RoHS 2002/95/EC	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)

Product Specifications

HBXX-6516DS-VTM

ISO 9001:2008 Designed, manufactured and/or distributed under this quality management system

Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

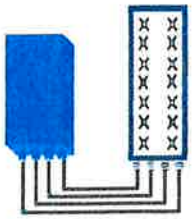
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.) Volume in L Weight in kg (lb) (w/o mounting HW)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield) 38 (with solar shield) 26 (57.2) (with solar shield)
DC voltage range DC power consumption	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions Wind load (@150km/h or 93mph)	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

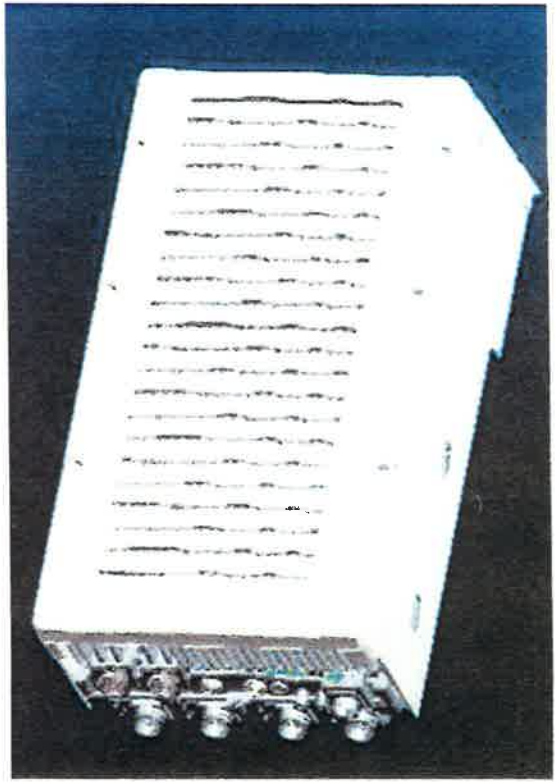
		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

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.

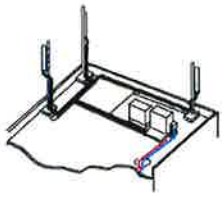
EASY INSTALLATION

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.

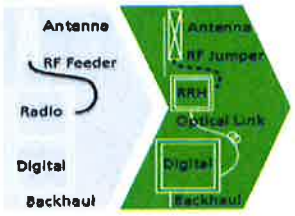
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

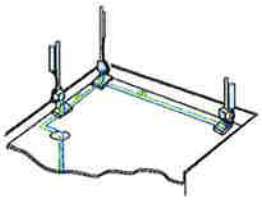
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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)		[mm (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

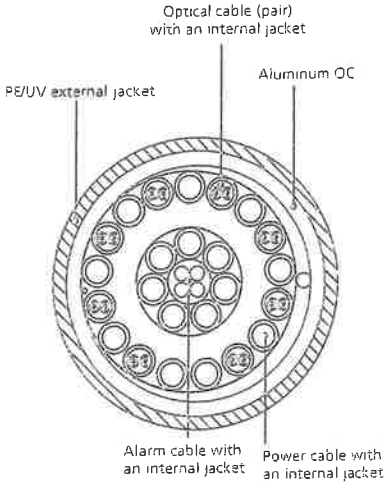


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Montville NW								
Tower Height: 180ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint	11	122	180	0.0159	1962.5	1.0000	0.16%	
*AT&T UMTS	2	565	147	0.0204	880	0.5867	0.35%	
*AT&T UMTS	2	875	147	0.0317	1900	1.0000	0.32%	
*AT&T GSM	1	283	147	0.0051	880	0.5867	0.09%	
*AT&T GSM	4	525	147	0.0380	1900	1.0000	0.38%	
*AT&T LTE	1	1615	147	0.0292	734	0.4893	0.60%	
Verizon PCS	**11**	**309**	**167**	**0.0438**	**1970**	**1.0000**	**4.38%**	
Verizon Cellular	**9**	**398**	**167**	**0.0462**	**869**	**0.5793**	**7.97%**	
Verizon AWS	**1**	**2173**	**167**	**0.0280**	**2145**	**1.0000**	**2.80%**	
Verizon 700	**1**	**1032**	**167**	**0.0133**	**746**	**0.4973**	**2.68%**	
								19.72%
* Source: Siting Council								

ATTACHMENT 3

PJF PAUL J. FORD & COMPANY

Date: **August 18, 2015**

Sean Dempsey
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
614.221.6679

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	117761
	Carrier Site Name:	Montville NW
Crown Castle Designation:	**Crown Castle BU Number:**	876371
	Crown Castle Site Name:	WALDEN / CAROLYN BESADE
	Crown Castle JDE Job Number:	342871
	Crown Castle Work Order Number:	1103409
	Crown Castle Application Number:	305574 Rev. 1
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37515-2492.001.7805
Site Data:	**557 Rte. 82, Oakdale, New London County, CT** **Latitude *41° 30' 20.3"*, Longitude *-72° 11' 51.1"*** **180 Foot - Monopole Tower**	

Dear Sean Dempsey,

Paul J Ford and Company 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 815572, in accordance with application 305574, revision 1.

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

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

The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2005 CT State Building Code based upon 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.

We at *Paul J Ford and Company* 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:

Joshua Frybarger, E.I.T.
Structural Designer

STATE OF CONNECTICUT
JUSTIN T. KLINE
No. 30301
LICENSED
PROFESSIONAL ENGINEER
8-18-15

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 180 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in November of 1999. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2005 CT State Building Code based upon 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
167.0	167.0	3	alcatel lucent	RRH2X60-PCS	2	1 5/8	-
		3	alcatel lucent	RRH2x60-700			
		3	alcatel lucent	RRH2x60-AWS			
		6	commscope	HBXX-6516DS-A2M w/ Mount Pipe			
		3	commscope	LNX-6514DS-A1M w/ Mount Pipe			
		2	rfs celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing 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
180.0	180.0	6	decibel	DB980H90E-M w/ Mount Pipe	6	1 5/8	1
		1	tower mounts	Platform Mount [LP 601-1]			
167.0	167.0	3	antel	BXA-171063-8BF-2 w/ Mount Pipe	-	-	2
		3	antel	BXA-70063/6CF-2 w/ Mount Pipe			
		4	antel	LPA-80063/6CF w/ Mount Pipe	12 1	1 5/8 1/2	1
		2	antel	LPA-80080-6CF-EDIN w/ Mount Pipe			
		1	gps	GPS_A			
		6	rfs celwave	FD9R6004/2C-3L			
		1	tower mounts	Platform Mount [LP 601-1]			
148.0	149.0	3	ericsson	TME-RRUS-11	-	-	1
	148.0	1	tower mounts	Side Arm Mount [SO 102-3]			
147.0	147.0	6	powerwave technologies	7770.00 w/ Mount Pipe	12 2 1	1 5/8 7/16 3/8	1
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21901			
		3	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		1	tower mounts	Platform Mount [LP 601-1]			
75.0	76.0	1	gps	GPS_A	1	1/2	1
	75.0	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Equipment to be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Dr. Clarence Welti, 10/29/99	2053524	CCISITES
4-POST-MODIFICATION INSPECTION	Vertical Structures, 2009-004-024, 6/12/09	2447495	CCISITES
4-POST-MODIFICATION INSPECTION	TEP, 131001.876371, 5/28/13	3868204	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	EEI, 6063, 11/23/99	1615419	CCISITES
4-TOWER MANUFACTURER DRAWINGS	EEI, 6063, 11/22/99	1615393	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) Monopole was reinforced in conformance with the referenced modification drawings.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	180 - 133	Pole	TP27.99x18x0.25	1	-7.34	1109.25	85.7	Pass
L2	133 - 131	Pole	TP27.8996x26.6398x0.3125	2	-8.37	1422.52	81.1	Pass
L3	131 - 104.5	Pole	TP33.4638x27.8996x0.4395	3	-13.24	2263.25	81.9	Pass
L4	104.5 - 87.42	Pole	TP37.05x33.4638x0.4591	4	-15.77	2689.87	78.9	Pass
L5	87.42 - 69	Pole	TP40.2846x35.0462x0.5053	5	-22.52	3316.77	79.9	Pass
L6	69 - 42.88	Pole	TP45.76x40.2846x0.5153	6	-28.05	3735.60	80.7	Pass
L7	42.88 - 34.5	Pole	TP46.767x43.4193x0.5712	7	-31.52	4173.16	76.6	Pass
L8	34.5 - 0	Pole	TP54x46.767x0.5342	8	-41.00	4458.14	81.9	Pass
							Summary	
						Pole (L1)	85.7	Pass
						Rating =	85.7	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	78.3	Pass
1	Base Plate	0	62.2	Pass
1	Base Foundation Structural	0	16.9	Pass
1	Base Foundation Soil Interaction	0	62.4	Pass

Structure Rating (max from all components) =	85.7%

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

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

1) Tower is located in New London County, Connecticut.
2) Basic wind speed of 85 mph.
3) Nominal ice thickness of 0.7500 in.
4) Ice thickness is considered to increase with height.
5) Ice density of 56.00 pcf.
6) A wind speed of 38 mph is used in combination with ice.
7) Deflections calculated using a wind speed of 50 mph.
8) A non-linear (P-delta) analysis was used.
9) Pressures are calculated at each section.
10) Stress ratio used in pole design is 1.333.
11) 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	180.00-133.00	47.00	4.00	18	18.0000	27.9900	0.2500	1.0000	A572-65 (65 ksi)
L2	133.00-131.00	6.00	0.00	18	26.6398	27.8996	0.3125	1.2500	A572-65 (65 ksi)
L3	131.00-104.50	26.50	0.00	18	27.8996	33.4637	0.4395	1.7579	Reinf 61.43 ksi (61 ksi)
L4	104.50-87.42	17.08	5.17	18	33.4637	37.0500	0.4591	1.8365	Reinf 65.00 ksi (65 ksi)
L5	87.42-69.00	23.59	0.00	18	35.0462	40.2846	0.5053	2.0212	Reinf 65.00 ksi (65 ksi)
L6	69.00-42.88	26.12	6.25	18	40.2846	45.7600	0.5153	2.0612	Reinf 65.00 ksi (65 ksi)
L7	42.88-34.50	14.63	0.00	18	43.4193	46.7670	0.5712	2.2847	Reinf 65.00 ksi (65 ksi)
L8	34.50-0.00	34.50		18	46.7670	54.0000	0.5342	2.1370	Reinf 65.00 ksi (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	18.2777	14.0846	560.6340	6.3012	9.1440	61.3117	1122.0058	7.0437	2.7280	10.912
	28.4218	22.0117	2139.9506	9.8477	14.2189	150.5002	4282.7170	11.0079	4.4862	17.945
L2	27.9036	26.1134	2286.7186	9.3462	13.5330	168.9734	4576.4461	13.0592	4.1386	13.244
	28.3300	27.3630	2630.9525	9.7934	14.1730	185.6313	5265.3670	13.6841	4.3603	13.953
L3	28.3300	38.3035	3649.0671	9.7483	14.1730	257.4661	7302.9357	19.1554	4.1369	9.413
	33.9800	46.0648	6347.0757	11.7236	16.9996	373.3665	12702.5031	23.0368	5.1162	11.642
L4	33.9800	48.0969	6619.1810	11.7166	16.9996	389.3731	13247.0716	24.0530	5.0816	11.068
	37.6216	53.3231	9019.8279	12.9898	18.8214	479.2326	18051.5243	26.6666	5.7127	12.443
L5	36.7526	55.3986	8350.3189	12.2620	17.8035	469.0275	16711.6254	27.7045	5.2788	10.447
	40.9060	63.8001	12754.7622	14.1216	20.4646	623.2610	25526.3074	31.9061	6.2007	12.271
L6	40.9060	65.0439	12996.8849	14.1181	20.4646	635.0923	26010.8714	32.5281	6.1832	11.999
	46.4659	73.9991	19138.1306	16.0619	23.2461	823.2842	38301.4436	37.0066	7.1468	13.87
L7	45.5413	77.6804	18018.2000	15.2111	22.0570	816.8932	36060.1087	38.8476	6.6365	11.619
	47.4885	83.7496	22580.0910	16.3995	23.7576	950.4349	45189.8935	41.8828	7.2257	12.651
L8	47.4885	78.3959	21170.4709	16.4126	23.7576	891.1016	42368.7984	39.2054	7.2907	13.647
	54.8330	90.6607	32742.2114	18.9803	27.4320	1193.5773	65527.5058	45.3390	8.5637	16.03

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
VXL7-50(1-5/8")	C	No	Inside Pole	180.00 - 0.00	6	No Ice	0.00	0.75
						1/2" Ice	0.00	0.75
						1" Ice	0.00	0.75
						2" Ice	0.00	0.75
						4" Ice	0.00	0.75
***								
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	167.00 - 0.00	2	No Ice	0.00	1.30
						1/2" Ice	0.00	1.30
						1" Ice	0.00	1.30
						2" Ice	0.00	1.30
						4" Ice	0.00	1.30
LDF4-50A(1/2")	C	No	Inside Pole	167.00 - 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")	C	No	Inside Pole	167.00 - 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
***								
LCF158-50A(1-5/8")	C	No	Inside Pole	147.00 - 0.00	12	No Ice	0.00	0.80
						1/2" Ice	0.00	0.80
						1" Ice	0.00	0.80
						2" Ice	0.00	0.80
						4" Ice	0.00	0.80
FB-L98B-002-75000(3/8")	C	No	Inside Pole	147.00 - 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

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						4" Ice	0.00	0.06
WR-VG122ST-BRDA(7/16)	C	No	Inside Pole	147.00 - 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
***								
LCF12-50J(1/2)	C	No	Inside Pole	75.00 - 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
***								
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	132.75 - 1.75	1	No Ice	0.17	0.00
						1/2" Ice	0.28	0.00
						1" Ice	0.39	0.00
						2" Ice	0.61	0.00
						4" Ice	1.06	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	180.00-133.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.78
L2	133.00-131.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.292	0.05
L3	131.00-104.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	4.417	0.72
L4	104.50-87.42	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.847	0.46
L5	87.42-69.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	3.070	0.50
L6	69.00-42.88	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	4.353	0.71
L7	42.88-34.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.397	0.23
L8	34.50-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	5.458	0.94

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	180.00-133.00	A	0.903	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.78
L2	133.00-131.00	A	0.886	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.643	0.05
L3	131.00-104.50	A	0.873	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	9.559	0.72
L4	104.50-87.42	A	0.852	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	6.082	0.46

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
L5	87.42-69.00	A	0.832	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	6.559	0.50
L6	69.00-42.88	A	0.799	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	8.988	0.71
L7	42.88-34.50	A	0.764	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	2.884	0.23
L8	34.50-0.00	A	0.750	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	10.917	0.94

Discrete Tower Loads

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) DB980H90E-M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
6' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	B	From Leg	4.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	C	From Leg	4.00 0.00 0.00	0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
Platform Mount [LP 601-1]	C	None		0.00	180.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	28.47 33.59 38.71 48.95 69.43	28.47 33.59 38.71 48.95 69.43	1.12 1.51 1.91 2.69 4.26
***									
(2) HBXX-6516DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00	0.00	167.00	No Ice 1/2"	6.18 6.65	4.53 5.20	0.05 0.10

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	7.14	5.90	0.15
							1" Ice	8.13	7.37	0.29
							2" Ice	10.26	10.56	0.67
							4" Ice			
(2) HBXX-6516DS-A2M w/ Mount Pipe	B	From Leg	4.00	0.00	0.00	167.00	No Ice	6.18	4.53	0.05
			0.00				1/2"	6.65	5.20	0.10
			0.00				Ice	7.14	5.90	0.15
							1" Ice	8.13	7.37	0.29
							2" Ice	10.26	10.56	0.67
							4" Ice			
(2) HBXX-6516DS-A2M w/ Mount Pipe	C	From Leg	4.00	0.00	0.00	167.00	No Ice	6.18	4.53	0.05
			0.00				1/2"	6.65	5.20	0.10
			0.00				Ice	7.14	5.90	0.15
							1" Ice	8.13	7.37	0.29
							2" Ice	10.26	10.56	0.67
							4" Ice			
LNX-6514DS-A1M w/ Mount Pipe	A	From Leg	4.00	0.00	0.00	167.00	No Ice	8.65	7.08	0.06
			0.00				1/2"	9.31	8.27	0.13
			0.00				Ice	9.93	9.18	0.21
							1" Ice	11.20	11.02	0.39
							2" Ice	13.87	15.06	0.90
							4" Ice			
LNX-6514DS-A1M w/ Mount Pipe	B	From Leg	4.00	0.00	0.00	167.00	No Ice	8.65	7.08	0.06
			0.00				1/2"	9.31	8.27	0.13
			0.00				Ice	9.93	9.18	0.21
							1" Ice	11.20	11.02	0.39
							2" Ice	13.87	15.06	0.90
							4" Ice			
LNX-6514DS-A1M w/ Mount Pipe	C	From Leg	4.00	0.00	0.00	167.00	No Ice	8.65	7.08	0.06
			0.00				1/2"	9.31	8.27	0.13
			0.00				Ice	9.93	9.18	0.21
							1" Ice	11.20	11.02	0.39
							2" Ice	13.87	15.06	0.90
							4" Ice			
RRH2x60-700	A	From Leg	4.00	0.00	0.00	167.00	No Ice	3.96	1.82	0.06
			0.00				1/2"	4.27	2.08	0.08
			0.00				Ice	4.60	2.36	0.11
							1" Ice	5.27	2.96	0.17
							2" Ice	6.72	4.25	0.35
							4" Ice			
RRH2x60-700	B	From Leg	4.00	0.00	0.00	167.00	No Ice	3.96	1.82	0.06
			0.00				1/2"	4.27	2.08	0.08
			0.00				Ice	4.60	2.36	0.11
							1" Ice	5.27	2.96	0.17
							2" Ice	6.72	4.25	0.35
							4" Ice			
RRH2x60-700	C	From Leg	4.00	0.00	0.00	167.00	No Ice	3.96	1.82	0.06
			0.00				1/2"	4.27	2.08	0.08
			0.00				Ice	4.60	2.36	0.11
							1" Ice	5.27	2.96	0.17
							2" Ice	6.72	4.25	0.35
							4" Ice			
RRH2X60-PCS	A	From Leg	4.00	0.00	0.00	167.00	No Ice	2.57	2.01	0.06
			0.00				1/2"	2.79	2.22	0.08
			0.00				Ice	3.02	2.43	0.10
							1" Ice	3.52	2.89	0.16
							2" Ice	4.61	3.92	0.31
							4" Ice			
RRH2X60-PCS	B	From Leg	4.00	0.00	0.00	167.00	No Ice	2.57	2.01	0.06
			0.00				1/2"	2.79	2.22	0.08
			0.00				Ice	3.02	2.43	0.10
							1" Ice	3.52	2.89	0.16
							2" Ice	4.61	3.92	0.31
							4" Ice			
RRH2X60-PCS	C	From Leg	4.00	0.00	0.00	167.00	No Ice	2.57	2.01	0.06

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
			0.00			1/2"	2.79	2.22	0.08
			0.00			Ice	3.02	2.43	0.10
						1" Ice	3.52	2.89	0.16
						2" Ice	4.61	3.92	0.31
						4" Ice			
RRH2x60-AWS	A	From Leg	4.00	0.00	167.00	No Ice	2.19	1.43	0.04
			0.00			1/2"	2.40	1.61	0.06
			0.00			Ice	2.61	1.80	0.08
						1" Ice	3.07	2.21	0.13
						2" Ice	4.09	3.13	0.26
						4" Ice			
RRH2x60-AWS	B	From Leg	4.00	0.00	167.00	No Ice	2.19	1.43	0.04
			0.00			1/2"	2.40	1.61	0.06
			0.00			Ice	2.61	1.80	0.08
						1" Ice	3.07	2.21	0.13
						2" Ice	4.09	3.13	0.26
						4" Ice			
RRH2x60-AWS	C	From Leg	4.00	0.00	167.00	No Ice	2.19	1.43	0.04
			0.00			1/2"	2.40	1.61	0.06
			0.00			Ice	2.61	1.80	0.08
						1" Ice	3.07	2.21	0.13
						2" Ice	4.09	3.13	0.26
						4" Ice			
DB-T1-6Z-8AB-0Z	A	From Leg	4.00	0.00	167.00	No Ice	5.60	2.33	0.04
			0.00			1/2"	5.92	2.56	0.08
			0.00			Ice	6.24	2.79	0.12
						1" Ice	6.91	3.28	0.21
						2" Ice	8.37	4.37	0.45
						4" Ice			
DB-T1-6Z-8AB-0Z	C	From Leg	4.00	0.00	167.00	No Ice	5.60	2.33	0.04
			0.00			1/2"	5.92	2.56	0.08
			0.00			Ice	6.24	2.79	0.12
						1" Ice	6.91	3.28	0.21
						2" Ice	8.37	4.37	0.45
						4" Ice			
(2) LPA-80080-6CF-EDIN w/ Mount Pipe	A	From Leg	4.00	0.00	167.00	No Ice	4.56	10.74	0.05
			0.00			1/2"	5.10	12.00	0.11
			0.00			Ice	5.61	12.98	0.19
						1" Ice	6.65	14.99	0.36
						2" Ice	8.83	19.23	0.86
						4" Ice			
(2) LPA-80063/6CF w/ Mount Pipe	B	From Leg	4.00	0.00	167.00	No Ice	10.58	10.67	0.05
			0.00			1/2"	11.24	11.93	0.14
			0.00			Ice	11.87	12.91	0.25
						1" Ice	13.16	14.92	0.48
						2" Ice	15.87	19.16	1.09
						4" Ice			
(2) LPA-80063/6CF w/ Mount Pipe	C	From Leg	4.00	0.00	167.00	No Ice	10.58	10.67	0.05
			0.00			1/2"	11.24	11.93	0.14
			0.00			Ice	11.87	12.91	0.25
						1" Ice	13.16	14.92	0.48
						2" Ice	15.87	19.16	1.09
						4" Ice			
(2) FD9R6004/2C-3L	A	From Leg	4.00	0.00	167.00	No Ice	0.37	0.08	0.00
			0.00			1/2"	0.45	0.14	0.01
			0.00			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	0.00	167.00	No Ice	0.37	0.08	0.00
			0.00			1/2"	0.45	0.14	0.01
			0.00			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			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) FD9R6004/2C-3L	C	From Leg	4.00 0.00 0.00	0.00	167.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
GPS_A	A	From Leg	4.00 0.00 0.00	0.00	167.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.30 0.37 0.46 0.65 1.15	0.30 0.37 0.46 0.65 1.15	0.00 0.00 0.01 0.02 0.08
Platform Mount [LP 601-1]	C	None		0.00	167.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	28.47 33.59 38.71 48.95 69.43	28.47 33.59 38.71 48.95 69.43	1.12 1.51 1.91 2.69 4.26
***									
TME-RRUS-11	A	From Leg	2.00 0.00 1.00	0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.25 3.49 3.74 4.27 5.43	1.37 1.55 1.74 2.14 3.04	0.05 0.07 0.09 0.15 0.31
TME-RRUS-11	B	From Leg	2.00 0.00 1.00	0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.25 3.49 3.74 4.27 5.43	1.37 1.55 1.74 2.14 3.04	0.05 0.07 0.09 0.15 0.31
TME-RRUS-11	C	From Leg	2.00 0.00 1.00	0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.25 3.49 3.74 4.27 5.43	1.37 1.55 1.74 2.14 3.04	0.05 0.07 0.09 0.15 0.31
6' x 2" Mount Pipe	A	From Leg	2.00 0.00 0.00	0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	B	From Leg	2.00 0.00 0.00	0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	C	From Leg	2.00 0.00 0.00	0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
Side Arm Mount [SO 102-3]	C	None		0.00	148.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.00 3.48 3.96 4.92 6.84	3.00 3.48 3.96 4.92 6.84	0.08 0.11 0.14 0.20 0.32
***									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.00	147.00	No Ice 1/2" Ice	6.22 6.71 7.22	4.82 5.51 6.21	0.09 0.14 0.21

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
						1" Ice	8.26	7.67	0.36
						2" Ice	10.48	11.06	0.76
						4" Ice			
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00	0.00	147.00	No Ice	6.22	4.82	0.09
			0.00			1/2"	6.71	5.51	0.14
			0.00			Ice	7.22	6.21	0.21
						1" Ice	8.26	7.67	0.36
						2" Ice	10.48	11.06	0.76
						4" Ice			
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00	0.00	147.00	No Ice	6.22	4.82	0.09
			0.00			1/2"	6.71	5.51	0.14
			0.00			Ice	7.22	6.21	0.21
						1" Ice	8.26	7.67	0.36
						2" Ice	10.48	11.06	0.76
						4" Ice			
P65-17-XLH-RR w/ Mount Pipe	A	From Leg	4.00	0.00	147.00	No Ice	11.82	9.06	0.09
			0.00			1/2"	12.59	10.62	0.18
			0.00			Ice	13.38	12.21	0.28
						1" Ice	14.94	14.70	0.51
						2" Ice	18.33	19.64	1.14
						4" Ice			
P65-17-XLH-RR w/ Mount Pipe	B	From Leg	4.00	0.00	147.00	No Ice	11.82	9.06	0.09
			0.00			1/2"	12.59	10.62	0.18
			0.00			Ice	13.38	12.21	0.28
						1" Ice	14.94	14.70	0.51
						2" Ice	18.33	19.64	1.14
						4" Ice			
P65-17-XLH-RR w/ Mount Pipe	C	From Leg	4.00	0.00	147.00	No Ice	11.82	9.06	0.09
			0.00			1/2"	12.59	10.62	0.18
			0.00			Ice	13.38	12.21	0.28
						1" Ice	14.94	14.70	0.51
						2" Ice	18.33	19.64	1.14
						4" Ice			
(2) LGP21401	A	From Leg	4.00	0.00	147.00	No Ice	1.29	0.36	0.01
			0.00			1/2"	1.45	0.48	0.02
			0.00			Ice	1.61	0.60	0.03
						1" Ice	1.97	0.87	0.05
						2" Ice	2.79	1.52	0.14
						4" Ice			
(2) LGP21401	B	From Leg	4.00	0.00	147.00	No Ice	1.29	0.36	0.01
			0.00			1/2"	1.45	0.48	0.02
			0.00			Ice	1.61	0.60	0.03
						1" Ice	1.97	0.87	0.05
						2" Ice	2.79	1.52	0.14
						4" Ice			
(2) LGP21401	C	From Leg	4.00	0.00	147.00	No Ice	1.29	0.36	0.01
			0.00			1/2"	1.45	0.48	0.02
			0.00			Ice	1.61	0.60	0.03
						1" Ice	1.97	0.87	0.05
						2" Ice	2.79	1.52	0.14
						4" Ice			
(2) LGP21901	A	From Leg	4.00	0.00	147.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			0.00			Ice	0.43	0.32	0.01
						1" Ice	0.62	0.49	0.02
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) LGP21901	B	From Leg	4.00	0.00	147.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			0.00			Ice	0.43	0.32	0.01
						1" Ice	0.62	0.49	0.02
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) LGP21901	C	From Leg	4.00	0.00	147.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01

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
			0.00			Ice	0.43	0.32	0.01
						1" Ice	0.62	0.49	0.02
						2" Ice	1.10	0.94	0.07
						4" Ice			
DC6-48-60-18-8F	B	From Leg	4.00	0.00	147.00	No Ice	1.47	1.47	0.02
			0.00			1/2"	1.67	1.67	0.04
			0.00			Ice	1.88	1.88	0.06
						1" Ice	2.33	2.33	0.11
						2" Ice	3.38	3.38	0.24
						4" Ice			
6' x 2" Mount Pipe	A	From Leg	4.00	0.00	147.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
6' x 2" Mount Pipe	B	From Leg	4.00	0.00	147.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
6' x 2" Mount Pipe	C	From Leg	4.00	0.00	147.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
Platform Mount [LP 601-1]	C	None		0.00	147.00	No Ice	28.47	28.47	1.12
						1/2"	33.59	33.59	1.51
						Ice	38.71	38.71	1.91
						1" Ice	48.95	48.95	2.69
						2" Ice	69.43	69.43	4.26
						4" Ice			
***									
GPS_A	A	From Leg	3.00	0.00	75.00	No Ice	0.30	0.30	0.00
			0.00			1/2"	0.37	0.37	0.00
			1.00			Ice	0.46	0.46	0.01
						1" Ice	0.65	0.65	0.02
						2" Ice	1.15	1.15	0.08
						4" Ice			
Side Arm Mount [SO 701-1]	A	From Leg	1.50	0.00	75.00	No Ice	0.85	1.67	0.07
			0.00			1/2"	1.14	2.34	0.08
			0.00			Ice	1.43	3.01	0.09
						1" Ice	2.01	4.35	0.12
						2" Ice	3.17	7.03	0.18
						4" Ice			

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 180.00-133.00	155.05	1.556	28.75	90.064	A	0.000	90.064	90.064	100.00	0.000	0.000
					B	0.000	90.064		100.00	0.000	0.000
					C	0.000	90.064		100.00	0.000	0.000
L2 133.00-131.00	132.00	1.486	27.48	4.615	A	0.000	4.615	4.615	100.00	0.000	0.000
					B	0.000	4.615		100.00	0.000	0.000
					C	0.000	4.615		100.00	0.000	0.292
L3 131.00-	117.35	1.437	26.58	67.755	A	0.000	67.755	67.755	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
104.50					B	0.000	67.755		100.00	0.000	0.000
					C	0.000	67.755		100.00	0.000	4.417
L4 104.50-87.42	95.82	1.356	25.08	50.182	A	0.000	50.182	50.182	100.00	0.000	0.000
					B	0.000	50.182		100.00	0.000	0.000
					C	0.000	50.182		100.00	0.000	2.847
L5 87.42-69.00	78.05	1.279	23.65	58.697	A	0.000	58.697	58.697	100.00	0.000	0.000
					B	0.000	58.697		100.00	0.000	0.000
					C	0.000	58.697		100.00	0.000	3.070
L6 69.00-42.88	55.66	1.161	21.48	93.645	A	0.000	93.645	93.645	100.00	0.000	0.000
					B	0.000	93.645		100.00	0.000	0.000
					C	0.000	93.645		100.00	0.000	4.353
L7 42.88-34.50	38.66	1.046	19.35	31.989	A	0.000	31.989	31.989	100.00	0.000	0.000
					B	0.000	31.989		100.00	0.000	0.000
					C	0.000	31.989		100.00	0.000	1.397
L8 34.50-0.00	16.84	1	18.50	144.853	A	0.000	144.853	144.853	100.00	0.000	0.000
					B	0.000	144.853		100.00	0.000	0.000
					C	0.000	144.853		100.00	0.000	5.458

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 180.00-133.00	155.05	1.556	5.63	0.9030	97.137	A	0.000	97.137	97.137	100.00	0.000	0.000
						B	0.000	97.137		100.00	0.000	0.000
						C	0.000	97.137		100.00	0.000	0.000
L2 133.00-131.00	132.00	1.486	5.38	0.8857	4.916	A	0.000	4.916	4.916	100.00	0.000	0.000
						B	0.000	4.916		100.00	0.000	0.000
						C	0.000	4.916		100.00	0.000	0.643
L3 131.00-104.50	117.35	1.437	5.20	0.8733	71.613	A	0.000	71.613	71.613	100.00	0.000	0.000
						B	0.000	71.613		100.00	0.000	0.000
						C	0.000	71.613		100.00	0.000	9.559
L4 104.50-87.42	95.82	1.356	4.91	0.8523	52.609	A	0.000	52.609	52.609	100.00	0.000	0.000
						B	0.000	52.609		100.00	0.000	0.000
						C	0.000	52.609		100.00	0.000	6.082
L5 87.42-69.00	78.05	1.279	4.63	0.8316	61.314	A	0.000	61.314	61.314	100.00	0.000	0.000
						B	0.000	61.314		100.00	0.000	0.000
						C	0.000	61.314		100.00	0.000	6.559
L6 69.00-42.88	55.66	1.161	4.20	0.7986	97.122	A	0.000	97.122	97.122	100.00	0.000	0.000
						B	0.000	97.122		100.00	0.000	0.000
						C	0.000	97.122		100.00	0.000	8.988
L7 42.88-34.50	38.66	1.046	3.79	0.7644	33.105	A	0.000	33.105	33.105	100.00	0.000	0.000
						B	0.000	33.105		100.00	0.000	0.000
						C	0.000	33.105		100.00	0.000	2.884
L8 34.50-0.00	16.84	1	3.62	0.7500	149.165	A	0.000	149.165	149.165	100.00	0.000	0.000
						B	0.000	149.165		100.00	0.000	0.000
						C	0.000	149.165		100.00	0.000	10.917

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 180.00-133.00	155.05	1.556	9.95	90.064	A	0.000	90.064	90.064	100.00	0.000	0.000
					B	0.000	90.064		100.00	0.000	0.000
					C	0.000	90.064		100.00	0.000	0.000
L2 133.00-131.00	132.00	1.486	9.51	4.615	A	0.000	4.615	4.615	100.00	0.000	0.000
					B	0.000	4.615		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	0.000	4.615		100.00	0.000	0.292
L3 131.00-104.50	117.35	1.437	9.20	67.755	A	0.000	67.755	67.755	100.00	0.000	0.000
					B	0.000	67.755		100.00	0.000	0.000
					C	0.000	67.755		100.00	0.000	4.417
L4 104.50-87.42	95.82	1.356	8.68	50.182	A	0.000	50.182	50.182	100.00	0.000	0.000
					B	0.000	50.182		100.00	0.000	0.000
					C	0.000	50.182		100.00	0.000	2.847
L5 87.42-69.00	78.05	1.279	8.18	58.697	A	0.000	58.697	58.697	100.00	0.000	0.000
					B	0.000	58.697		100.00	0.000	0.000
					C	0.000	58.697		100.00	0.000	3.070
L6 69.00-42.88	55.66	1.161	7.43	93.645	A	0.000	93.645	93.645	100.00	0.000	0.000
					B	0.000	93.645		100.00	0.000	0.000
					C	0.000	93.645		100.00	0.000	4.353
L7 42.88-34.50	38.66	1.046	6.70	31.989	A	0.000	31.989	31.989	100.00	0.000	0.000
					B	0.000	31.989		100.00	0.000	0.000
					C	0.000	31.989		100.00	0.000	1.397
L8 34.50-0.00	16.84	1	6.40	144.853	A	0.000	144.853	144.853	100.00	0.000	0.000
					B	0.000	144.853		100.00	0.000	0.000
					C	0.000	144.853		100.00	0.000	5.458

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
15	Dead+Wind 0 deg+Ice
16	Dead+Wind 30 deg+Ice
17	Dead+Wind 60 deg+Ice
18	Dead+Wind 90 deg+Ice
19	Dead+Wind 120 deg+Ice
20	Dead+Wind 150 deg+Ice
21	Dead+Wind 180 deg+Ice
22	Dead+Wind 210 deg+Ice
23	Dead+Wind 240 deg+Ice
24	Dead+Wind 270 deg+Ice
25	Dead+Wind 300 deg+Ice
26	Dead+Wind 330 deg+Ice
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	180 - 133	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-17.42	0.25	-0.34
			Max. Mx	11	-7.34	520.21	-2.15
			Max. My	2	-7.45	-2.12	504.06
			Max. Vy	11	-20.84	520.21	-2.15
			Max. Vx	2	-20.30	-2.12	504.06
			Max. Torque	9			-0.61
L2	133 - 131	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-18.67	0.25	-0.34
			Max. Mx	11	-8.37	646.71	-2.59
			Max. My	2	-8.48	-2.56	627.31
			Max. Vy	11	-21.33	646.71	-2.59
			Max. Vx	2	-20.79	-2.56	627.31
			Max. Torque	10			-0.27
L3	131 - 104.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-24.09	0.25	-0.34
			Max. Mx	11	-13.24	1241.92	-4.53
			Max. My	2	-13.32	-4.51	1208.07
			Max. Vy	11	-23.64	1241.92	-4.53
			Max. Vx	2	-23.09	-4.51	1208.07
			Max. Torque	10			-0.27
L4	104.5 - 87.42	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-26.89	0.25	-0.34
			Max. Mx	11	-15.77	1529.46	-5.40
			Max. My	2	-15.85	-5.39	1489.09
			Max. Vy	11	-24.67	1529.46	-5.40
			Max. Vx	2	-24.12	-5.39	1489.09
			Max. Torque	10			-0.27
L5	87.42 - 69	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-34.48	0.25	-0.02
			Max. Mx	11	-22.52	2137.84	-6.95
			Max. My	2	-22.58	-7.13	2084.53
			Max. Vy	11	-26.88	2137.84	-6.95
			Max. Vx	2	-26.30	-7.13	2084.53
			Max. Torque	10			-0.50
L6	69 - 42.88	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-40.50	0.25	-0.02
			Max. Mx	11	-28.05	2687.32	-8.40
			Max. My	2	-28.09	-8.58	2622.52
			Max. Vy	11	-28.46	2687.32	-8.40
			Max. Vx	2	-27.88	-8.58	2622.52
			Max. Torque	10			-0.50
L7	42.88 - 34.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-47.38	0.25	-0.02
			Max. Mx	11	-34.22	3113.26	-9.47
			Max. My	2	-34.25	-9.65	3040.03
			Max. Vy	11	-29.69	3113.26	-9.47
			Max. Vx	2	-29.12	-9.65	3040.03
			Max. Torque	10			-0.50
L8	34.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-59.88	0.25	-0.02
			Max. Mx	11	-45.76	4176.61	-11.94
			Max. My	2	-45.76	-12.12	4083.86
			Max. Vy	11	-32.00	4176.61	-11.94
			Max. Vx	2	-31.45	-12.12	4083.86
			Max. Torque	10			-0.50

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	24	59.88	7.41	-0.01
	Max. H_x	11	45.78	31.98	-0.07
	Max. H_z	2	45.78	-0.07	31.42
	Max. M_x	2	4083.86	-0.07	31.42
	Max. M_z	5	4176.45	-31.98	0.07
	Max. Torsion	4	0.49	-27.73	15.77
	Min. Vert	1	45.78	0.00	0.00
	Min. H_x	5	45.78	-31.98	0.07
	Min. H_z	8	45.78	0.07	-31.42
	Min. M_x	8	-4083.32	0.07	-31.42
	Min. M_z	11	-4176.61	31.98	-0.07
	Min. Torsion	10	-0.50	27.73	-15.77

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	45.78	0.00	0.00	-0.26	0.08	0.00
Dead+Wind 0 deg - No Ice	45.78	0.07	-31.42	-4083.86	-12.12	-0.18
Dead+Wind 30 deg - No Ice	45.78	16.05	-27.25	-3542.72	-2098.91	-0.38
Dead+Wind 60 deg - No Ice	45.78	27.73	-15.77	-2052.43	-3623.06	-0.49
Dead+Wind 90 deg - No Ice	45.78	31.98	-0.07	-12.47	-4176.45	-0.47
Dead+Wind 120 deg - No Ice	45.78	27.66	15.65	2030.81	-3610.95	-0.32
Dead+Wind 150 deg - No Ice	45.78	15.93	27.18	3530.08	-2077.82	-0.08
Dead+Wind 180 deg - No Ice	45.78	-0.07	31.42	4083.32	12.29	0.18
Dead+Wind 210 deg - No Ice	45.78	-16.05	27.25	3542.19	2099.08	0.39
Dead+Wind 240 deg - No Ice	45.78	-27.73	15.77	2051.90	3623.23	0.50
Dead+Wind 270 deg - No Ice	45.78	-31.98	0.07	11.94	4176.61	0.47
Dead+Wind 300 deg - No Ice	45.78	-27.66	-15.65	-2031.35	3611.12	0.31
Dead+Wind 330 deg - No Ice	45.78	-15.93	-27.18	-3530.61	2077.99	0.08
Dead+Ice	59.88	0.00	0.00	0.02	0.25	0.00
Dead+Wind 0 deg+Ice	59.88	0.01	-7.29	-991.26	-2.30	-0.04
Dead+Wind 30 deg+Ice	59.88	3.72	-6.32	-859.76	-507.53	-0.10
Dead+Wind 60 deg+Ice	59.88	6.42	-3.66	-497.85	-876.69	-0.14
Dead+Wind 90 deg+Ice	59.88	7.41	-0.01	-2.53	-1010.84	-0.14
Dead+Wind 120 deg+Ice	59.88	6.41	3.63	493.48	-874.11	-0.10
Dead+Wind 150 deg+Ice	59.88	3.69	6.31	857.28	-503.06	-0.03
Dead+Wind 180 deg+Ice	59.88	-0.01	7.29	991.36	2.87	0.04
Dead+Wind 210 deg+Ice	59.88	-3.72	6.32	859.86	508.10	0.10
Dead+Wind 240 deg+Ice	59.88	-6.42	3.66	497.95	877.26	0.14
Dead+Wind 270 deg+Ice	59.88	-7.41	0.01	2.63	1011.41	0.14
Dead+Wind 300 deg+Ice	59.88	-6.41	-3.63	-493.38	874.68	0.10
Dead+Wind 330 deg+Ice	59.88	-3.69	-6.31	-857.18	503.63	0.03
Dead+Wind 0 deg - Service	45.78	0.02	-10.87	-1415.99	-4.15	-0.06
Dead+Wind 30 deg - Service	45.78	5.55	-9.43	-1228.44	-727.64	-0.14
Dead+Wind 60 deg - Service	45.78	9.59	-5.46	-711.79	-1256.13	-0.17
Dead+Wind 90 deg - Service	45.78	11.07	-0.02	-4.50	-1448.01	-0.16
Dead+Wind 120 deg - Service	45.78	9.57	5.42	703.92	-1251.90	-0.11
Dead+Wind 150 deg - Service	45.78	5.51	9.40	1223.66	-720.31	-0.03
Dead+Wind 180 deg - Service	45.78	-0.02	10.87	1415.45	4.32	0.06
Dead+Wind 210 deg - Service	45.78	-5.55	9.43	1227.89	727.81	0.14
Dead+Wind 240 deg - Service	45.78	-9.59	5.46	711.25	1256.30	0.17
Dead+Wind 270 deg - Service	45.78	-11.07	0.02	3.96	1448.19	0.16
Dead+Wind 300 deg - Service	45.78	-9.57	-5.42	-704.46	1252.07	0.11
Dead+Wind 330 deg -	45.78	-5.51	-9.40	-1224.21	720.48	0.03

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Service						

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	-45.78	0.00	0.00	45.78	0.00	0.000%
2	0.07	-45.78	-31.42	-0.07	45.78	31.42	0.000%
3	16.05	-45.78	-27.25	-16.05	45.78	27.25	0.000%
4	27.73	-45.78	-15.77	-27.73	45.78	15.77	0.000%
5	31.98	-45.78	-0.07	-31.98	45.78	0.07	0.000%
6	27.66	-45.78	15.65	-27.66	45.78	-15.65	0.000%
7	15.93	-45.78	27.18	-15.93	45.78	-27.18	0.000%
8	-0.07	-45.78	31.42	0.07	45.78	-31.42	0.000%
9	-16.05	-45.78	27.25	16.05	45.78	-27.25	0.000%
10	-27.73	-45.78	15.77	27.73	45.78	-15.77	0.000%
11	-31.98	-45.78	0.07	31.98	45.78	-0.07	0.000%
12	-27.66	-45.78	-15.65	27.66	45.78	15.65	0.000%
13	-15.93	-45.78	-27.18	15.93	45.78	27.18	0.000%
14	0.00	-59.88	0.00	0.00	59.88	0.00	0.000%
15	0.01	-59.88	-7.29	-0.01	59.88	7.29	0.000%
16	3.72	-59.88	-6.32	-3.72	59.88	6.32	0.000%
17	6.42	-59.88	-3.66	-6.42	59.88	3.66	0.000%
18	7.41	-59.88	-0.01	-7.41	59.88	0.01	0.000%
19	6.41	-59.88	3.63	-6.41	59.88	-3.63	0.000%
20	3.69	-59.88	6.31	-3.69	59.88	-6.31	0.000%
21	-0.01	-59.88	7.29	0.01	59.88	-7.29	0.000%
22	-3.72	-59.88	6.32	3.72	59.88	-6.32	0.000%
23	-6.42	-59.88	3.66	6.42	59.88	-3.66	0.000%
24	-7.41	-59.88	0.01	7.41	59.88	-0.01	0.000%
25	-6.41	-59.88	-3.63	6.41	59.88	3.63	0.000%
26	-3.69	-59.88	-6.31	3.69	59.88	6.31	0.000%
27	0.02	-45.78	-10.87	-0.02	45.78	10.87	0.000%
28	5.55	-45.78	-9.43	-5.55	45.78	9.43	0.000%
29	9.59	-45.78	-5.46	-9.59	45.78	5.46	0.000%
30	11.07	-45.78	-0.02	-11.07	45.78	0.02	0.000%
31	9.57	-45.78	5.42	-9.57	45.78	-5.42	0.000%
32	5.51	-45.78	9.40	-5.51	45.78	-9.40	0.000%
33	-0.02	-45.78	10.87	0.02	45.78	-10.87	0.000%
34	-5.55	-45.78	9.43	5.55	45.78	-9.43	0.000%
35	-9.59	-45.78	5.46	9.59	45.78	-5.46	0.000%
36	-11.07	-45.78	0.02	11.07	45.78	-0.02	0.000%
37	-9.57	-45.78	-5.42	9.57	45.78	5.42	0.000%
38	-5.51	-45.78	-9.40	5.51	45.78	9.40	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	0.00056428
3	Yes	6	0.00000001	0.00008359
4	Yes	6	0.00000001	0.00008449
5	Yes	5	0.00000001	0.00004206
6	Yes	6	0.00000001	0.00008310
7	Yes	6	0.00000001	0.00008343
8	Yes	4	0.00000001	0.00087125
9	Yes	6	0.00000001	0.00008438
10	Yes	6	0.00000001	0.00008345
11	Yes	4	0.00000001	0.00052161
12	Yes	6	0.00000001	0.00008368
13	Yes	6	0.00000001	0.00008338
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00053809
16	Yes	5	0.00000001	0.00026924

17	Yes	5	0.00000001	0.00027825
18	Yes	4	0.00000001	0.00056308
19	Yes	5	0.00000001	0.00026794
20	Yes	5	0.00000001	0.00026842
21	Yes	4	0.00000001	0.00054169
22	Yes	5	0.00000001	0.00027588
23	Yes	5	0.00000001	0.00027192
24	Yes	4	0.00000001	0.00055722
25	Yes	5	0.00000001	0.00027294
26	Yes	5	0.00000001	0.00026750
27	Yes	4	0.00000001	0.00025953
28	Yes	5	0.00000001	0.00020221
29	Yes	5	0.00000001	0.00020839
30	Yes	4	0.00000001	0.00029277
31	Yes	5	0.00000001	0.00020070
32	Yes	5	0.00000001	0.00019993
33	Yes	4	0.00000001	0.00026965
34	Yes	5	0.00000001	0.00020555
35	Yes	5	0.00000001	0.00020380
36	Yes	4	0.00000001	0.00027214
37	Yes	5	0.00000001	0.00020353
38	Yes	5	0.00000001	0.00019996

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 133	50.82	36	2.68	0.00
L2	137 - 131	28.26	36	2.12	0.00
L3	131 - 104.5	25.64	36	2.02	0.00
L4	104.5 - 87.42	15.77	36	1.53	0.00
L5	92.59 - 69	12.24	36	1.30	0.00
L6	69 - 42.88	6.62	36	0.94	0.00
L7	49.13 - 34.5	3.36	36	0.63	0.00
L8	34.5 - 0	1.65	36	0.47	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	(2) DB980H90E-M w/ Mount Pipe	36	50.82	2.68	0.00	19863
167.00	(2) HBXX-6516DS-A2M w/ Mount Pipe	36	43.56	2.53	0.00	7639
148.00	TME-RRUS-11	36	33.49	2.29	0.00	3102
147.00	(2) 7770.00 w/ Mount Pipe	36	33.00	2.27	0.00	3007
75.00	GPS_A	36	7.87	1.03	0.00	3327

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	180 - 133	146.07	11	7.71	0.01
L2	137 - 131	81.33	11	6.11	0.00
L3	131 - 104.5	73.82	11	5.83	0.00
L4	104.5 - 87.42	45.43	11	4.39	0.00
L5	92.59 - 69	35.28	11	3.76	0.00
L6	69 - 42.88	19.08	11	2.71	0.00
L7	49.13 - 34.5	9.69	11	1.81	0.00
L8	34.5 - 0	4.75	11	1.35	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
180.00	(2) DB980H90E-M w/ Mount Pipe	11	146.07	7.71	0.01	7135
167.00	(2) HBXX-6516DS-A2M w/ Mount Pipe	11	125.24	7.28	0.00	2742
148.00	TME-RRUS-11	11	96.37	6.58	0.00	1109
147.00	(2) 7770.00 w/ Mount Pipe	11	94.94	6.54	0.00	1075
75.00	GPS_A	11	22.68	2.98	0.00	1161

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	180 - 133 (1)	TP27.99x18x0.25	47.00	0.00	0.0	39.00	21.3370	-7.34	832.14	0.009
L2	133 - 131 (2)	TP27.8996x26.6398x0.3125	6.00	0.00	0.0	39.00	27.3630	-8.37	1067.16	0.008
L3	131 - 104.5 (3)	TP33.4638x27.8996x0.4395	26.50	0.00	0.0	36.86	46.0648	-13.24	1697.86	0.008
L4	104.5 - 87.42 (4)	TP37.05x33.4638x0.4591	17.08	0.00	0.0	39.00	51.7412	-15.77	2017.91	0.008
L5	87.42 - 69 (5)	TP40.2846x35.0462x0.5053	23.59	0.00	0.0	39.00	63.8001	-22.52	2488.20	0.009
L6	69 - 42.88 (6)	TP45.76x40.2846x0.5153	26.12	0.00	0.0	39.00	71.8563	-28.05	2802.40	0.010
L7	42.88 - 34.5 (7)	TP46.767x43.4193x0.5712	14.63	0.00	0.0	39.00	80.2732	-31.52	3130.65	0.010
L8	34.5 - 0 (8)	TP54x46.767x0.5342	34.50	0.00	0.0	39.00	85.7548	-41.00	3344.44	0.012

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	180 - 133 (1)	TP27.99x18x0.25	520.21	44.16	39.00	1.132	0.00	0.00	39.00	0.000
L2	133 - 131 (2)	TP27.8996x26.6398x0.3125	646.72	41.81	39.00	1.072	0.00	0.00	39.00	0.000
L3	131 - 104.5 (3)	TP33.4638x27.8996x0.4395	1241.93	39.92	36.86	1.083	0.00	0.00	36.86	0.000
L4	104.5 - 87.42 (4)	TP37.05x33.4638x0.4591	1529.47	40.69	39.00	1.043	0.00	0.00	39.00	0.000
L5	87.42 - 69 (5)	TP40.2846x35.0462x0.5053	2137.86	41.16	39.00	1.055	0.00	0.00	39.00	0.000
L6	69 - 42.88 (6)	TP45.76x40.2846x0.5153	2687.34	41.56	39.00	1.066	0.00	0.00	39.00	0.000
L7	42.88 - 34.5 (7)	TP46.767x43.4193x0.5712	2867.11	39.42	39.00	1.011	0.00	0.00	39.00	0.000
L8	34.5 - 0 (8)	TP54x46.767x0.5342	3741.75	42.07	39.00	1.079	0.00	0.00	39.00	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	180 - 133 (1)	TP27.99x18x0.25	20.84	0.98	26.00	0.075	0.21	0.01	26.00	0.000
L2	133 - 131 (2)	TP27.8996x26.6398x0.3125	21.33	0.78	26.00	0.060	0.21	0.01	26.00	0.000
L3	131 - 104.5	TP33.4638x27.8996x0.43	23.64	0.51	24.57	0.042	0.21	0.00	24.57	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 $\frac{f_{vt}}{F_{vt}}$
	(3)	95								
L4	104.5 - 87.42	TP37.05x33.4638x0.4591	24.67	0.48	26.00	0.037	0.20	0.00	26.00	0.000
	(4)									
L5	87.42 - 69 (5)	TP40.2846x35.0462x0.50	26.88	0.42	26.00	0.032	0.47	0.00	26.00	0.000
		53								
L6	69 - 42.88 (6)	TP45.76x40.2846x0.5153	28.46	0.40	26.00	0.030	0.47	0.00	26.00	0.000
L7	42.88 - 34.5	TP46.767x43.4193x0.571	29.16	0.36	26.00	0.028	0.47	0.00	26.00	0.000
	(7)	2								
L8	34.5 - 0 (8)	TP54x46.767x0.5342	31.19	0.36	26.00	0.028	0.47	0.00	26.00	0.000

Pole Interaction Design Data

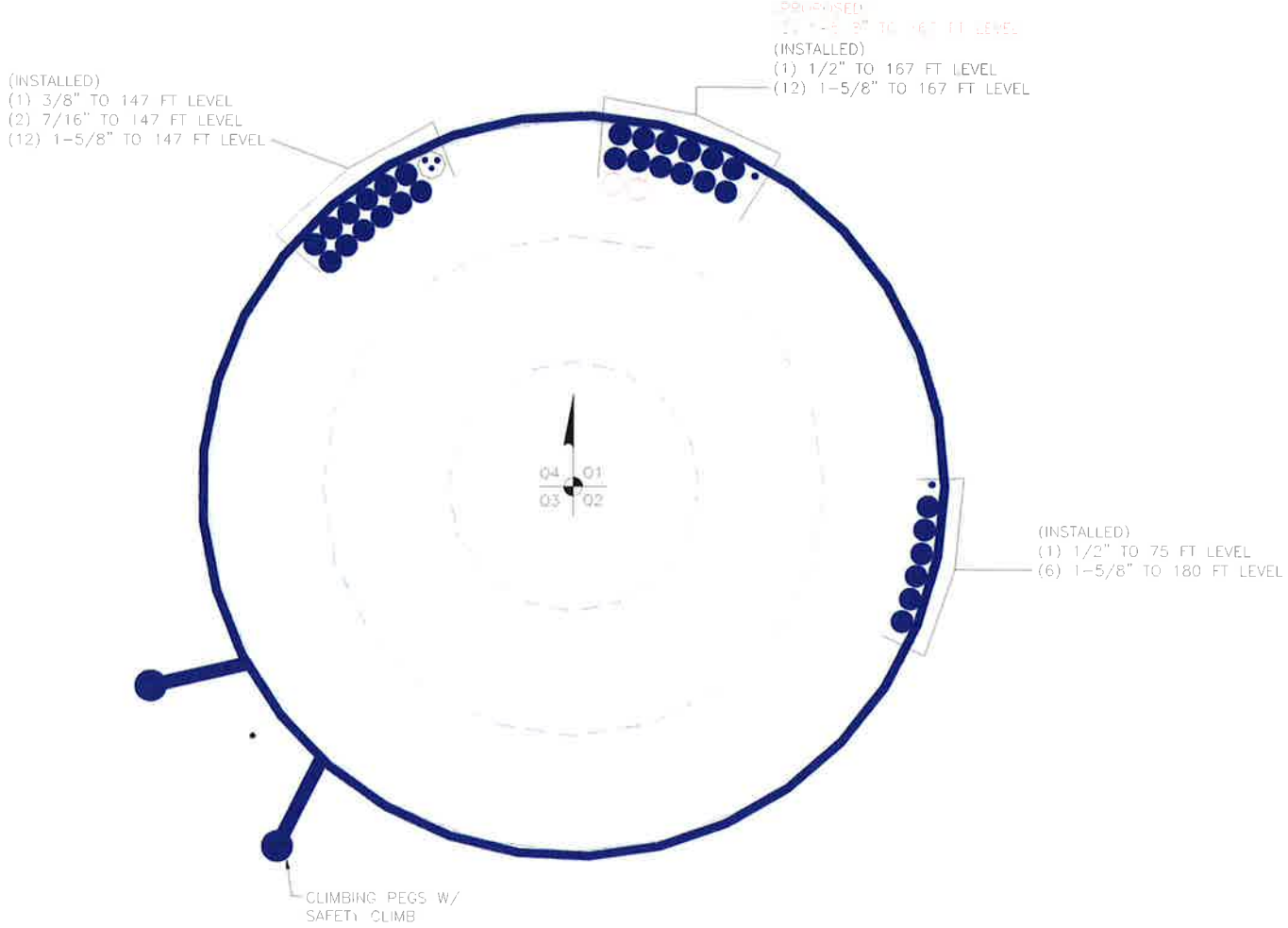
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	180 - 133 (1)	0.009	1.132	0.000	0.075	0.000	1.142 ✔	1.333	H1-3+VT ✔
L2	133 - 131 (2)	0.008	1.072	0.000	0.060	0.000	1.081 ✔	1.333	H1-3+VT ✔
L3	131 - 104.5 (3)	0.008	1.083	0.000	0.042	0.000	1.091 ✔	1.333	H1-3+VT ✔
L4	104.5 - 87.42 (4)	0.008	1.043	0.000	0.037	0.000	1.052 ✔	1.333	H1-3+VT ✔
L5	87.42 - 69 (5)	0.009	1.055	0.000	0.032	0.000	1.065 ✔	1.333	H1-3+VT ✔
L6	69 - 42.88 (6)	0.010	1.066	0.000	0.030	0.000	1.076 ✔	1.333	H1-3+VT ✔
L7	42.88 - 34.5 (7)	0.010	1.011	0.000	0.028	0.000	1.021 ✔	1.333	H1-3+VT ✔
L8	34.5 - 0 (8)	0.012	1.079	0.000	0.028	0.000	1.091 ✔	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	180 - 133	Pole	TP27.99x18x0.25	1	-7.34	1109.25	85.7	Pass
L2	133 - 131	Pole	TP27.8996x26.6398x0.3125	2	-8.37	1422.52	81.1	Pass
L3	131 - 104.5	Pole	TP33.4638x27.8996x0.4395	3	-13.24	2263.25	81.9	Pass
L4	104.5 - 87.42	Pole	TP37.05x33.4638x0.4591	4	-15.77	2689.87	78.9	Pass
L5	87.42 - 69	Pole	TP40.2846x35.0462x0.5053	5	-22.52	3316.77	79.9	Pass
L6	69 - 42.88	Pole	TP45.76x40.2846x0.5153	6	-28.05	3735.60	80.7	Pass
L7	42.88 - 34.5	Pole	TP46.767x43.4193x0.5712	7	-31.52	4173.16	76.6	Pass
L8	34.5 - 0	Pole	TP54x46.767x0.5342	8	-41.00	4458.14	81.9	Pass
							Summary	
						Pole (L1)	85.7	Pass
						RATING =	**85.7**	**Pass**

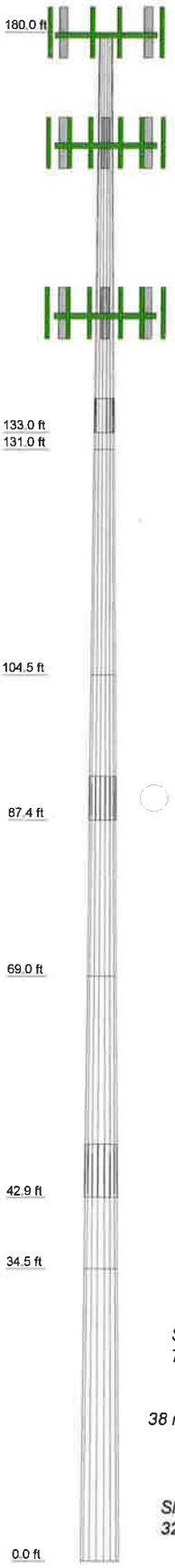
APPENDIX B

BASE LEVEL DRAWING

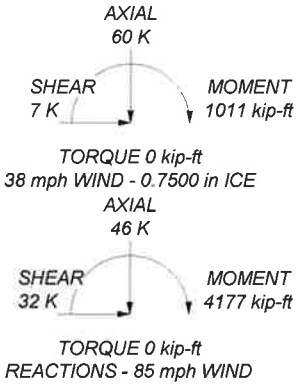


APPENDIX C

ADDITIONAL CALCULATIONS



Section	1	2	3	4	5	6	7	8
Length (ft)	47.00	6.00	26.50	17.08	23.59	26.12	14.63	34.50
Number of Sides	18	18	18	18	18	18	18	18
Thickness (in)	0.2500	0.3125	0.4395	0.4591	0.5053	0.5153	0.5712	0.5342
Socket Length (ft)	4.00			5.17		6.25		
Top Dia (in)	18.0000	26.6398	27.8996	33.4637	35.0462	40.2846	43.4193	46.7670
Bot Dia (in)	27.9900	27.8996	33.4637	37.0500	40.2846	45.7600	46.7670	54.0000
Grade	A572-65		Reinf 61.43 ksi			Reinf 65.00 ksi		
Weight (K)	2.9	0.5	3.8	2.9	4.8	6.2	4.0	9.9



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) DB980H90E-M w/ Mount Pipe	180	(2) FD9R6004/2C-3L	167
(2) DB980H90E-M w/ Mount Pipe	180	GPS_A	167
(2) DB980H90E-M w/ Mount Pipe	180	Platform Mount [LP 601-1]	167
6' x 2" Mount Pipe	180	TME-RRUS-11	148
6' x 2" Mount Pipe	180	TME-RRUS-11	148
6' x 2" Mount Pipe	180	TME-RRUS-11	148
Platform Mount [LP 601-1]	180	6' x 2" Mount Pipe	148
(2) HBXX-6516DS-A2M w/ Mount Pipe	167	6' x 2" Mount Pipe	148
(2) HBXX-6516DS-A2M w/ Mount Pipe	167	6' x 2" Mount Pipe	148
(2) HBXX-6516DS-A2M w/ Mount Pipe	167	Side Arm Mount [SO 102-3]	148
LNX-6514DS-A1M w/ Mount Pipe	167	(2) 7770.00 w/ Mount Pipe	147
LNX-6514DS-A1M w/ Mount Pipe	167	(2) 7770.00 w/ Mount Pipe	147
LNX-6514DS-A1M w/ Mount Pipe	167	(2) 7770.00 w/ Mount Pipe	147
RRH2x60-700	167	P65-17-XLH-RR w/ Mount Pipe	147
RRH2x60-700	167	P65-17-XLH-RR w/ Mount Pipe	147
RRH2x60-700	167	P65-17-XLH-RR w/ Mount Pipe	147
RRH2X60-PCS	167	(2) LGP21401	147
RRH2X60-PCS	167	(2) LGP21401	147
RRH2X60-PCS	167	(2) LGP21401	147
RRH2x60-AWS	167	(2) LGP21901	147
RRH2x60-AWS	167	(2) LGP21901	147
RRH2x60-AWS	167	(2) LGP21901	147
DB-T1-6Z-8AB-0Z	167	DC6-48-60-18-8F	147
DB-T1-6Z-8AB-0Z	167	6' x 2" Mount Pipe	147
(2) LPA-80080-6CF-EDIN w/ Mount Pipe	167	6' x 2" Mount Pipe	147
		6' x 2" Mount Pipe	147
(2) LPA-80063/6CF w/ Mount Pipe	167	Platform Mount [LP 601-1]	147
(2) LPA-80063/6CF w/ Mount Pipe	167	GPS_A	75
(2) FD9R6004/2C-3L	167	Side Arm Mount [SO 701-1]	75
(2) FD9R6004/2C-3L	167		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	Reinf 65.00 ksi	65 ksi	82 ksi
Reinf 61.43 ksi	61 ksi	77 ksi			

TOWER DESIGN NOTES

1. Tower is located in New London 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: 85.7%

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.4105

Job: 180' MP; Oakdale, CT; Walden/ Carolyn Besade			
Project: PJF 37515-2492 (BU 876371)			
Client: Crown Castle	Drawn by: Joshua Frybarger	App'd:	
Code: TIA/EIA-222-F	Date: 08/18/15	Scale: N	
Path:		Dwg No.	

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

TIA Rev F

Site Data

BU#:	
Site Name:	
App #:	
Pole Manufacturer:	*Other*

Reactions		
Moment:	3106.5	ft-kips
Axial:	36.8	kips
Shear:	25.6	kips

Reactions adjusted to account for additional anchors

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	63	in

Plate Data		
Diam:	69	in
Thick:	2	in
Grade:	60	ksi
Single-Rod B-eff:	10.71	in

Stiffener Data (Welding at both sides)		
Config:	1	*
Weld Type:	Fillet	
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:	0.75	in
Fillet V. Weld:	0.4375	in
Width:	7	in
Height:	20	in
Thick:	1	in
Notch:	0.75	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	54	in
Thick:	0.4375	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	

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

Anchor Rod Results

			Stiffened
Maximum Rod Tension:	145.6	Kips	Service, ASD
Allowable Tension:	195.0	Kips	Fty*ASIF
Anchor Rod Stress Ratio:	74.7%	Pass	

Base Plate Results

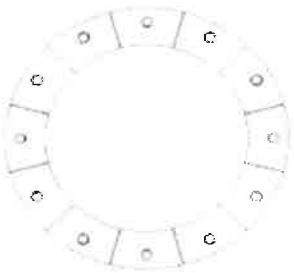
	Flexural Check		Stiffened
Base Plate Stress:	37.3	ksi	Service, ASD
Allowable Plate Stress:	60.0	ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	62.2%	Pass	Y.L. Length: N/A, Roark

Stiffener Results

Horizontal Weld :	54.7%	Pass
Vertical Weld:	33.5%	Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	10.7%	Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	41.9%	Pass
Plate Comp. (AISC Bracket):	45.5%	Pass

Pole Results

Pole Punching Shear Check:	9.3%	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

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v4.4 - Effective 7-12-13

Date: 8/18/2015
PJF Project: 37515-2492.001.7805
Client Ref. # BU 876371
Site Name: Walden / Carolyn Besade
Description: 180' MP
Owner: Crown Castle
Engineer: JJF

Asymmetric Anchor Rod Analysis

Moment =	4177	k-ft	TIA Ref.	F	Location =	Base Plate		
Axial =	46.0	kips	ASIF =	1.3333	η =	N/A	for BP, Rev. G Sect. 4.9.9	
Shear =	32.0	kips	Max Ratio =	105.0%	Threads =	N/A	for FP, Rev. G	
Anchor Qty =	20							

**** For Post Installed Anchors: Check anchors for embedment, epoxy/grout bond, and capacity based on proof load. ****

Item	Nominal Anchor Dia, in	Spec	Fy, ksi	Fu, ksi	Location, degrees	Anchor Circle, in	Area Override, in^2	Area, in^2	Max Net Compression, kips	Max Net Tension, kips	Load for Capacity Calc, kips	Capacity Override, kips	Capacity, kips	Capacity Ratio
1	2.250	#18J A615 Gr 75	75	100	0.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
2	2.250	#18J A615 Gr 75	75	100	22.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
3	2.250	#18J A615 Gr 75	75	100	45.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
4	2.250	#18J A615 Gr 75	75	100	67.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
5	2.250	#18J A615 Gr 75	75	100	90.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
6	2.250	#18J A615 Gr 75	75	100	112.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
7	2.250	#18J A615 Gr 75	75	100	135.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
8	2.250	#18J A615 Gr 75	75	100	157.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
9	2.250	#18J A615 Gr 75	75	100	180.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
10	2.250	#18J A615 Gr 75	75	100	202.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
11	2.250	#18J A615 Gr 75	75	100	225.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
12	2.250	#18J A615 Gr 75	75	100	247.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
13	2.250	#18J A615 Gr 75	75	100	270.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
14	2.250	#18J A615 Gr 75	75	100	292.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
15	2.250	#18J A615 Gr 75	75	100	315.0	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
16	2.250	#18J A615 Gr 75	75	100	337.5	63.00	0.00	3.98	150.23	145.63	145.63	0.00	195.00	74.7%
17	2.250	A193 Gr B7	105	125	11.3	74.00	0.00	3.98	175.89	171.29	171.29	0.00	218.68	78.3%
18	2.250	A193 Gr B7	105	125	101.3	74.00	0.00	3.98	175.89	171.29	171.29	0.00	218.68	78.3%
19	2.250	A193 Gr B7	105	125	191.3	74.00	0.00	3.98	175.89	171.29	171.29	0.00	218.68	78.3%
20	2.250	A193 Gr B7	105	125	281.3	74.00	0.00	3.98	175.89	171.29	171.29	0.00	218.68	78.3%
								79.58						

PAUL J. FORD & COMPANY
STRUCTURAL ENGINEERS
250 E. BROAD ST. SUITE 1500
COLUMBUS, OH 43215

PAGE 1 OF
BY JJF DATE 8/18/15
PROJECT BU 876371
CLIENT CROWN PROJ #37515-2498.001.7805

REACTIONS FROM TNX (WORKING LOADS)

M = 4177 k·ft
V = 32 k·ft

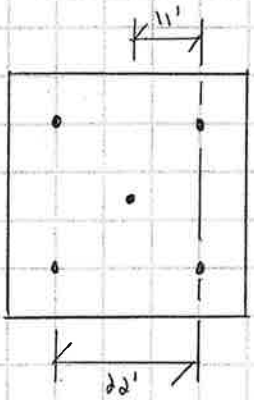
→ M_{TOT} = 4177 + 32(5') = 4337 k·ft

TENSION IN ROCK ANCHORS

1" WILLIAMS 150 KSI → F_{ULT} = 128 k

CONCRETE WT = (25')(25')(5')(0.150 k/ft³) = 468.75 k

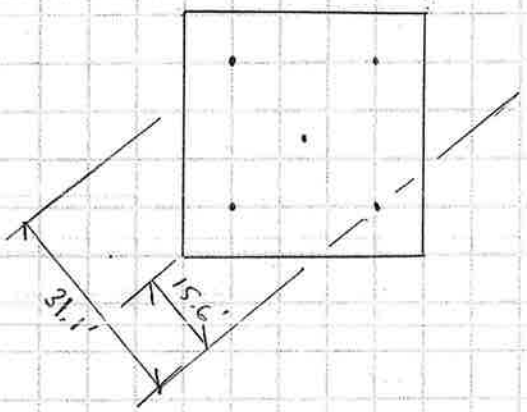
WIND INTO SIDE



$2(4337) = 2F(22') + 468.75(11')$

F_{ULT} = 79.9 k < 128 k (62.4%)

WIND INTO CORNER



$2(4337) = F(31.1') + 2[\frac{1}{2}F][15.6'] + 468.75(15.6')$

F_{ULT} = 29.2 < 128 k (22.8%)

General Information:
====================
File Name: g:\tower\375_crown_castle\2015\37515-2492_876371_walden - caro...\37515-2492.001.7805.col
Project:
Column: Engineer:
Code: ACI 318-08 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:
====================
f'c = 4 ksi fy = 60 ksi
Ec = 3605 ksi Es = 29000 ksi
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:
========
Rectangular: Width = 300 in Depth = 60 in

Gross section area, Ag = 18000 in^2
Ix = 5.4e+006 in^4 Iy = 1.35e+008 in^4
rx = 17.3205 in ry = 86.6025 in
Xo = 0 in Yo = 0 in

Reinforcement:
==============
Bar Set: ASTM A615

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 3	0.38	0.11	# 4	0.50	0.20	# 5	0.63	0.31
# 6	0.75	0.44	# 7	0.88	0.60	# 8	1.00	0.79
# 9	1.13	1.00	# 10	1.27	1.27	# 11	1.41	1.56
# 14	1.69	2.25	# 18	2.26	4.00			

Confinement: Tied; #3 ties with #10 bars, #4 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Layout: Rectangular
Pattern: Sides Different (Cover to transverse reinforcement)
Total steel area: As = 63.20 in^2 at rho = 0.35% (Note: rho < 0.50%)
Minimum clear spacing = 6.49 in

	Top	Bottom	Left	Right
Bars	40 # 8	40 # 8	0 # 3	0 # 3
Cover(in)	3	3	3	3

Factored Loads and Moments with Corresponding Capacities:
==

No.	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	0.00	1338.33	7941.20	5.934	3.05	56.13	0.05225	0.900

*** End of output ***