

August 31, 2017

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification
90 Industrial Park Road, Middletown, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) antennas at the 155-foot level of the existing 185-foot tower at 90 Industrial Park Road in Middletown, Connecticut (the “Property”). The tower is owned by Crown Castle (“Crown”). The Council approved Cellco’s use of this tower in 2013. Cellco now intends to replace all of its antennas with three (3) model SBNHH-1D65B, 700 MHz antennas; three (3) SBNHH-1D65B, 850 MHz antennas; three (3) model SBNHH-1D65B, 1900 MHz antennas; and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) remote radio heads (“RRHs”) with three (3) newer model RRHs and install six (6) new RRHs behind its antennas. Included in Attachment 1 are specifications for Cellco’s replacement antennas and RRHs.

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 Daniel Drew, Mayor for the City of Middletown; James Samolis, Middletown Director of Planning, Conservation and Development; Crown, the owner of the tower; and 90 Industrial Park Road LLC, the owner of the Property.

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

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 at the 155-foot level on the 185-foot tower.

Robinson+Cole

Melanie A. Bachman, Esq.

August 31, 2017

Page 2

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*).

A copy of the parcel map and property owner information is included in Attachment 4. A Certificate of Mailing verifying that this filing was sent to municipal officials and the owner of the Property is included in Attachment 5.

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,



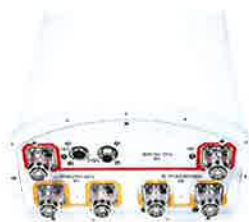
Kenneth C. Baldwin

Enclosures

Copy to:

Daniel Drew, Middletown Mayor
James Samolis, Middletown Director of Planning, Conservation and Development
Crown Castle
90 Industrial Park Road LLC
Tim Parks, Verizon Wireless

ATTACHMENT 1



SBNHH-1D65B

6-port sector antenna, 2x 698–896 and 4x 1695–2360 MHz, 65° HPBW, 2x RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR Return Loss, dB	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0	1.5 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
	0° 14.6	0° 14.5	0° 17.4	0° 17.8	0° 18.1	0° 18.2
Gain by Beam Tilt, average, dBi	7° 14.6	7° 14.4	3° 17.5	3° 17.9	3° 18.3	3° 18.4
	14° 14.2	14° 13.6	7° 17.4	7° 17.9	7° 18.2	7° 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

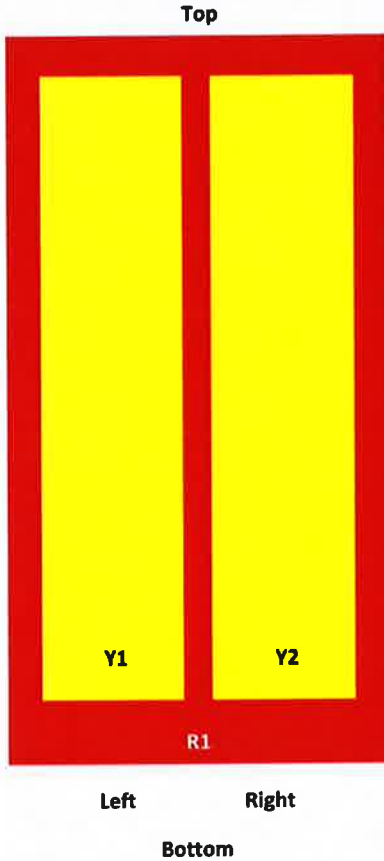
* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, [download the whitepaper Time to Raise the Bar on BSAs.](#)

Array Layout

SBNHH-1D65B

SBNHH 65

Array	Freq (MHz)	Conns	RET (MRET)	AISC RET UID
R1	698-896	1-2	1	AXXXXXXXXXXXXXXXXX.1
Y1	1695-2360	3-4	2	AXXXXXXXXXXXXXXXXX.2
Y2	1695-2360	5-6		



View from the front of the antenna
 (Sizes of colored boxes are not true depictions of array sizes)

General Specifications

Operating Frequency Band	1695 – 2360 MHz 698 – 896 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female

SBNHH-1D65B

Color	Light gray
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	618.0 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Loading, lateral	197.0 N @ 150 km/h 44.3 lbf @ 150 km/h
Wind Loading, rear	728.0 N @ 150 km/h 163.7 lbf @ 150 km/h
Wind Speed, maximum	241 km/h 150 mph

Dimensions

Length	1851.0 mm 72.9 in
Width	301.0 mm 11.9 in
Depth	180.0 mm 7.1 in
Net Weight, without mounting kit	18.4 kg 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (1) Low band (1)
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female 8-pin DIN Male
RET Interface, quantity	1 female 1 male

Packed Dimensions

Length	2025.0 mm 79.7 in
Width	390.0 mm 15.4 in
Depth	296.0 mm 11.7 in
Shipping Weight	31.0 kg 68.3 lb

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



SBNHH-1D65B

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note Severe environmental conditions may degrade optimum performance

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.

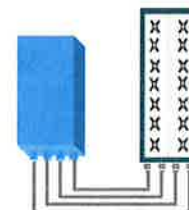


FEATURES

- 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

TECHNICAL SPECIFICATIONS

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.)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield)
Volume in L	38 (with solar shield)
Weight in kg (lb) (w/o mounting HW)	26 (57.2) (with solar shield)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) IP65
Wind load (@150km/h or 93mph)	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

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ALCATEL-LUCENT B25 RRH4X30

Alcatel-Lucent Band 25 Remote Radio Head 4x30W is the new 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 B25 RRH4x30 allows operators to have a compact radio solution to deploy LTE in the PCS band (1.9 GHz, 3GPP band 25), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B25 RRH4x30 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, LTE carriers from 3 MHz up to 20 MHz and up to 65 MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30 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 B25 RRH4x30 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.

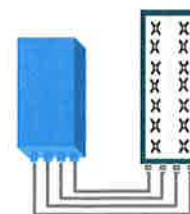


FEATURES

- Supporting LTE in 1.9 GHz band (PCS, 3GPP band 2 & 25)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- Ready for 3, 5, 10, 15 or 20MHz LTE carrier operation with 4Rx Diversity
- Ready to support up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- Convection-cooled (fan-less)
- Supports AISG 2.0 devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in PCS band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Full flexibility for multiple carriers operation over entire PCS spectrum
- Improves downlink spectral efficiency and cell edge throughput through MIMO4
- Increases LTE coverage thanks to 4-way Rx 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

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	3GPP bands 2 & 25 (PCS-G) DL: 1930 - 1995 MHz UL: 1850 - 1915 MHz
Instantaneous bandwidth - #carriers	65MHz – Up to 4 LTE carriers (in 40MHz occupied bandwidth)
LTE carrier bandwidth	3, 5, 10, 15 or 20 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure (3GPP band 2)	2.0 dB typ. (<2.5 dB max)
RX Diversity scheme	2 or 4 way Rx diversity
Sizes (HxWxD)(w/ solar shield) in mm (in.)	538 x 304 x 182 (21.2" x 12.0" x 7.2")
Volume (w/ solar shield) in L	30
Weight (w/ solar shield) in kg (lb)	24 (53)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	580W typical @100% RF load
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) IP65
Wind load (@150km/h or 93mph)	Frontal: <200N / Lateral : <150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5 (> 14dB)
CPRI ports	2 CPRI ports (HW ready for Rate7 / 9.8 Gbps)
AISG interfaces	1 AISG2.0 output (RS485), +24V/2A DC power Integrated Smart Bias Tees (x2)
Misc. Interfaces	1 external alarms connector (4 alarms) 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

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B25 RRH4x30

ALCATEL-LUCENT DATA SHEET REV1.1 – JANUARY 2015

ALCATEL-LUCENT B66A RRH4X45

The Alcatel-Lucent B66a Remote Radio Head 4x45 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. Its operational range covers beyond that of B4 (AWS) and B10 (AWS+).

Supporting 2Tx/4Tx MIMO and 2-way/4-way Rx diversity, the Alcatel-Lucent B66a RRH4x45 allows operators to have a compact radio solution to deploy LTE in the 2100 band (3GPP band 4, 10, and 66), providing them with the means to achieve high capacity, high quality, high reliability, large instantaneous bandwidth, and high coverage with minimum site requirements.

The Alcatel-Lucent B66a RRH4x45 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x90W or 4x45W RF output power. It also supports 4-way Rx diversity at the 70 MHz instantaneous bandwidth.



The Alcatel-Lucent B66a RRH4x45 is a compact (near zero-footprint) solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

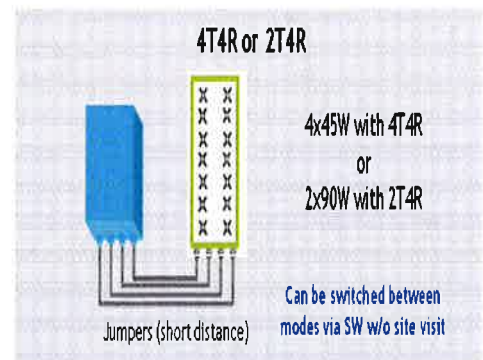
Its compactness and slim design makes the Alcatel-Lucent B66a RRH4x45 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 2110 - 2180 MHz band/DL, 1710-1780MHz/UL (3GPP band 4, 10, and 66a)
- LTE 2Tx or 4Tx MIMO (SW selectable)
- Configuration: 2T2R/2T4R/4T4R
- Output power: Up to 2x90W or 4x45W (SW configurable)
- 70MHz 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 AWS 1-3 band
- Selection of MIMO configuration (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through 4Tx MIMO
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



TECHNICAL SPECIFICATIONS

Features & Performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R selectable by SW)
Frequency band	AWS 1-3, B4/B66a DL: 2110-2180 MHz / UL: 1710-1780 MHz
Instantaneous bandwidth - #carriers	70 MHz – 4 LTE MIMO carriers (in 70 MHz occupied bandwidth)
LTE carrier bandwidth	5, 10, 15, 20 MHz
RF output power	2x90W or 4x45W (selectable by SW)
Noise figure – RX Diversity scheme Receiver Sensivity (FRC A1-3)	2 dB typical (<2.5 dB max) – 2 or 4 way Rx diversity -104.5 dBm maximum
Sizes (HxWxD) in mm (in.)	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield)
Volume in Liters	35.5 (with solar shield) 29.7 (without solar shield)
Weight in kg (lb) (w/o mounting HW)	25.8kg (56.8lb) (with solar shield)
DC voltage range	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	750W typical @100% RF load (in 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) UL50E Type 4 Enclosure
Wind load (@150km/h or 93mph)	250N (56lb) Frontal/150N (34lb) Lateral
Antenna ports	4 ports 4.3-10 female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate 7, 9.8 Gbps) SFP: SMDF (HW supports also SMSF and MMDF)
AISG interfaces	1 AISG 2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-487 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 / FCC Part 15 / GR-3178-CORE

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ATTACHMENT 2

Site Name: Middletown NW Tower Height: 185ft		General	Power	Density				
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*T-Mobile	6	639	185	1900	0.0430	1.0000	0.43%	
*T-Mobile	1	445	185	700	0.0050	0.4667	0.11%	
*MetroPCS CDMA	3	727	165	2135	0.0310	1.0000	0.31%	
*MetroPCS LTE	1	1200	165	2130	0.0171	1.0000	0.17%	
*AT&T	1	1313	175	734	0.0165	0.4893	0.34%	
*AT&T	2	565	175	880	0.0142	0.5867	0.24%	
*AT&T	2	875	175	1900	0.0220	1.0000	0.22%	
*AT&T	1	283	175	880	0.0036	0.5867	0.06%	
*AT&T	4	525	175	1900	0.0264	1.0000	0.26%	
Verizon PCS	1	5000	155	0.0748	1970	1.0000	7.48%	
Verizon Cellular	9	389	155	0.0524	869	0.5793	9.04%	
Verizon AWS	1	7400	155	0.1108	2145	1.0000	11.08%	
Verizon 700	1	2200	155	0.0329	746	0.4973	6.62%	
								36.37%
* Source: Siting Council								

ATTACHMENT 3

Date: April 21, 2017

Sean Dempsey
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
704.405.6565

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

Subject: Structural Analysis Report

Carrier Designation: Verizon Wireless Co-Locate
Carrier Site Number: 119681
Carrier Site Name: Middletown NW CT

Crown Castle Designation: Crown Castle BU Number: 825983
Crown Castle Site Name: MIDDLETOWN_1
Crown Castle JDE Job Number: 363360
Crown Castle Work Order Number: 1393243
Crown Castle Application Number: 330544 Rev. 4

Engineering Firm Designation: Paul J. Ford and Company Project Number: 37517-1854.001.7805

Site Data: 90 Industrial Park Road, Middletown, Middlesex County, CT
Latitude 41° 35' 8.3", Longitude -72° 42' 50.49"
185 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 1027907, in accordance with application 330544, revision 4.

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

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

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 with a maximum Topographic Factor, Kzt, of 1.0 were used in this analysis.

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:

Jonathan Sommer, EI
Structural Designer *PMF*



for Jacobs
AUG 17 2017

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

Table 1 - Proposed Antenna and Cable Information

Table 2 - Existing Antenna and Cable Information

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Table 5 - Tower Components vs. Capacity

4.1) Recommendations

5) APPENDIX A

tnxTower Output

6) APPENDIX B

Base Level Drawing

7) APPENDIX C

Additional Calculations

1) INTRODUCTION

This tower is a 185 ft Monopole tower designed by FRED A. NUDD CORPORATION in May of 1998. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-E.

2) ANALYSIS CRITERIA

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 with a maximum Topographic Factor, Kzt, of 1.0 were used in this analysis.

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
155.0	155.0	3	alcatel lucent	AWS4 (B66) 4x45 RRH	-	-	-
		3	alcatel lucent	RRH2X60-PCS			
		3	alcatel lucent	RRH2x60-700			
		12	andrew	SBNHH-1D65B 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
185.0	185.0	6	andrew	ETW190VS12UB	16	1-5/8	
		3	commscope	ATBT-BOTTOM-24V			
		3	commscope	LNx-6515DS-VTM w/ Mount Pipe			
		3	ems wireless	RR90-17-02DP w/ Mount Pipe			
		3	rfs celwave	APX16DWV-16DWVS-C w/ Mount Pipe			
		1	tower mounts	Sector Mount [SM 802-3]			
175.0	175.0	3	cci antennas	OPA-65R-LCUU-H6 w/ Mount Pipe	12	1-1/4	1
		6	ericsson	RRUS 11-700			
		3	ericsson	RRUS A2 MODULE			
		3	ericsson	RRUS-11 1900MHz			
		12	powerwave technologies	7020.00			
		6	powerwave technologies	7770.00 w/ Mount Pipe			
		12	powerwave technologies	LGP21401			
		2	raycap	DC6-48-60-18-8F			
165.0	165.0	3	rfs celwave	APXV18-206517S-C w/ Mount Pipe	6	1-5/8	
		1	tower mounts	Pipe Mount [PM 601-3]			
		3	alcatel lucent	RRH2X40-AWS			
155.0	155.0	6	antel	BXA-171063-12CF-EDIN-2 w/ Mount Pipe	-	-	2
		1	tower mounts	Platform Mount [LP 403-1]	2	1-5/8	1

Notes:

- 1) Existing Equipment
- 2) Equipment To Be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
GEOTECHNICAL REPORTS	Clarence Welti, 3/27/1998	3473514	CCISITES
TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Nudd, 98-5980, 5/1/1998	3880469	CCISITES
TOWER MANUFACTURER DRAWINGS	Nudd, 98-5980, 5/1/1998	3473517	CCISITES
TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	All-Points Tech, CT107572, 4/26/2005	3879955	CCISITES
POST-MODIFICATION INSPECTION	SGS, 146075, 12/30/2014	5512978	CCISITES
POST-MODIFICATION INSPECTION	SGS, 13068, 1/13/2015	5650784	CCISITES

3.1) Analysis Method

tnxTower (version 7.0.5.1), 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) The Nudd manufacturer's drawings specify an anchor rod that does not exist. From experience with Nudd monopoles, the anchors are likely A36 standard anchors and have been assumed as such.
- 5) 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	185 - 180	Pole	TP18x18x0.1875	1	-1.553	512.206	16.4	Pass
L2	180 - 153.75	Pole	TP26.5641x18x0.25	2	-9.901	1008.900	73.4	Pass
L3	153.75 - 152	Pole	TP27.135x26.5641x0.364	3	-10.189	1291.820	62.7	Pass
L4	152 - 151.25	Pole	TP27.3797x27.135x0.5407	4	-10.359	1921.510	44.1	Pass
L5	151.25 - 130	Pole	TP34.3125x27.3797x0.3914	5	-13.491	1756.950	77.3	Pass
L6	130 - 121	Pole	TP36.7356x31.8984x0.457	6	-17.734	2210.790	80.3	Pass
L7	121 - 115	Pole	TP38.6875x36.7356x0.4853	7	-19.417	2449.270	78.9	Pass
L8	115 - 114	Pole	TP39.0125x38.6875x0.5479	8	-19.735	2811.330	69.9	Pass
L9	114 - 95	Pole	TP45.1875x39.0125x0.4521	9	-23.474	2699.070	84.1	Pass
L10	95 - 91	Pole	TP45.8125x42.3332x0.5768	10	-28.712	3541.340	72.1	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L11	91 - 63.75	Pole	TP54.7113x45.8125x0.4837	11	-38.670	3571.190	88.1	Pass
L12	63.75 - 58	Pole	TP56.5891x54.7113x0.4797	12	-40.970	3608.270	90.6	Pass
L13	58 - 40	Pole	TP61.6875x56.5891x0.5425	13	-49.411	4246.830	87.2	Pass
L14	40 - 33	Pole	TP63.9583x61.6875x0.5298	14	-52.820	4576.200	84.1	Pass
L15	33 - 28	Pole	TP65.5804x63.9583x0.5972	15	-55.598	5075.500	78.0	Pass
L16	28 - 0	Pole	TP73.8125x65.5804x0.578	16	-71.812	5208.440	88.0	Pass
Summary								
Pole (L12)							90.6	Pass
RATING =							90.6	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	65.5	Pass
1	Base Plate	0	45.3	Pass
1	Base Foundation Steel	0	48.6	Pass
1	Base Foundation Soil Interaction	0	79.0	Pass
Structure Rating (max from all components) =				90.6%

Notes:

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

4.1) Recommendations

The monopole and its foundation have sufficient capacity to carry the proposed loading configuration. No modifications are required at this time.

APPENDIX A
TNXTOWER OUTPUT

Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

- 1) Tower is located in Middlesex County, Connecticut.
- 2) ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
- 3) Basic wind speed of 101 mph.
- 4) Structure Class II.
- 5) Exposure Category C.
- 6) Topographic Category 1.
- 7) Crest Height 0.000 ft.
- 8) Nominal ice thickness of 1.0000 in.
- 9) Ice thickness is considered to increase with height.
- 10) Ice density of 56.000 pcf.
- 11) A wind speed of 50 mph is used in combination with ice.
- 12) Temperature drop of 50.000 °F.
- 13) Deflections calculated using a wind speed of 60 mph.
- 14) A non-linear (P-delta) analysis was used.
- 15) Pressures are calculated at each section.
- 16) Stress ratio used in pole design is 1.
- 17) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder	Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption Poles ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
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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	185.000- 180.000	5.000	0.000	12	18.0000	18.0000	0.1875	0.7500	A36M-42 (42 ksi)
L2	180.000- 153.750	26.250	0.000	12	18.0000	26.5641	0.2500	1.0000	A36M-42 (42 ksi)
L3	153.750- 152.000	1.750	0.000	12	26.5641	27.1350	0.3640	1.4558	Reinf 36.31 ksi (36 ksi)
L4	152.000- 151.250	0.750	0.000	12	27.1350	27.3797	0.5407	2.1629	Reinf 36.26 ksi (36 ksi)
L5	151.250- 130.000	21.250	5.000	12	27.3797	34.3125	0.3914	1.5657	Reinf 38.07 ksi (38 ksi)
L6	130.000-	14.000	0.000	12	31.8984	36.7356	0.4570	1.8279	Reinf 36.52 ksi

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
L7	121.000-115.000	6.000	0.000	12	36.7356	38.6875	0.4853	1.9412	(37 ksi) Reinf 36.18 ksi (36 ksi)
L8	115.000-114.000	1.000	0.000	12	38.6875	39.0125	0.5479	2.1918	Reinf 36.53 ksi (37 ksi)
L9	114.000-95.000	19.000	6.000	12	39.0125	45.1875	0.4521	1.8086	Reinf 38.21 ksi (38 ksi)
L10	95.000-91.000	10.000	0.000	12	42.3332	45.8125	0.5768	2.3072	Reinf 37.17 ksi (37 ksi)
L11	91.000-63.750	27.250	0.000	12	45.8125	54.7113	0.4837	1.9346	Reinf 37.29 ksi (37 ksi)
L12	63.750-58.000	5.750	0.000	12	54.7113	56.5891	0.4797	1.9189	Reinf 37.19 ksi (37 ksi)
L13	58.000-40.000	18.000	0.000	12	56.5891	61.6875	0.5425	2.1701	Reinf 35.06 ksi (35 ksi)
L14	40.000-33.000	7.000	0.000	12	61.6875	63.9583	0.5298	2.1192	Reinf 38.23 ksi (38 ksi)
L15	33.000-28.000	5.000	0.000	12	63.9583	65.5804	0.5971	2.3886	Reinf 35.82 ksi (36 ksi)
L16	28.000-0.000	28.000		12	65.5804	73.8125	0.5780	2.3119	Reinf 34.68 ksi (35 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L1	18.6350	10.7543	435.5296	6.3769	9.3240	46.7106	882.5011	5.2929	4.3215	23.048
L2	18.6350	10.7543	435.5296	6.3769	9.3240	46.7106	882.5011	5.2929	4.3215	23.048
L3	27.5011	21.1828	1872.1706	9.4204	13.7602	136.0571	3793.5251	10.4255	6.4492	25.797
L4	28.0922	31.3735	2869.9859	9.5840	14.0559	204.1833	5815.3695	15.4411	6.2968	17.301
L5	28.3455	46.7307	4296.5447	9.6083	14.1827	302.9431	8705.9644	22.9994	5.8886	10.89
L6	34.8122	46.2653	5837.7553	11.2560	16.5234	353.3028	11828.874	22.7704	7.3241	16.027
L7	38.0315	56.6471	9501.3931	12.9776	19.0290	499.3100	19252.398	27.8800	8.5445	17.607
L8	40.0522	67.2922	12494.010	13.6540	20.0401	623.4497	25316.252	33.1192	8.8998	16.242
L9	40.3887	56.1397	10654.620	13.8046	20.2085	527.2353	21589.150	27.6302	9.2436	20.444
L10	45.9878	77.5541	17259.855	14.9488	21.9286	787.0929	34973.146	38.1697	9.7995	16.989
L11	47.4286	84.0161	21943.758	16.1944	23.7309	924.6924	44464.004	41.3502	10.7319	18.606
L12	56.6413	83.7732	31448.211	19.4149	28.3405	1109.6574	63722.602	41.2306	13.3770	27.884
L13	58.5853	97.9103	39256.517	20.0647	29.3131	1188.1786	70573.474	42.6582	13.8802	28.933

185 Ft Monopole Tower Structural Analysis
 Project Number 37517-1854.001.7805, Application 330544, Revision 4

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
			3				1			
	63.8636	106.8170	50973.891	21.8899	31.9541	1595.2210	103286.92	52.5721	15.0783	27.793
L14	63.8636	104.3323	49808.929	21.8945	31.9541	1558.7637	100926.39	51.3492	15.1124	28.525
			6				52			
	66.2145	108.2063	55565.818	22.7074	33.1304	1677.1845	112591.41	53.2558	15.7210	29.673
L15	66.2145	121.8323	62430.243	22.6833	33.1304	1884.3786	126500.59	59.9622	15.5405	26.024
			4				27			
	67.8938	124.9512	67348.626	23.2640	33.9706	1982.5547	136466.57	61.4972	15.9752	26.752
			5				89			
L16	67.8938	120.9736	65243.175	23.2709	33.9706	1920.5762	132200.36	59.5395	16.0266	27.729
			0				55			
	76.4163	136.2941	93302.829	26.2180	38.2349	2440.2546	189056.82	67.0798	18.2328	31.546
			9				27			
			6				83			

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _r	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1 185.000-180.000				1	1	1			
L2 180.000-153.750				1	1	1			
L3 153.750-152.000				1	1	1			
L4 152.000-151.250				1	1	1			
L5 151.250-130.000				1	1	1			
L6 130.000-121.000				1	1	1			
L7 121.000-115.000				1	1	1			
L8 115.000-114.000				1	1	1			
L9 114.000-95.000				1	1	1			
L10 95.000-91.000				1	1	1			
L11 91.000-63.750				1	1	1			
L12 63.750-58.000				1	1	1			
L13 58.000-40.000				1	1	1			
L14 40.000-33.000				1	1	1			
L15 33.000-28.000				1	1	1			
L16 28.000-0.000				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number		C _A A _A	Weight
				ft			ft ² /ft	klf
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	185.000 - 0.000	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.002
						1" Ice	0.398	0.004
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	185.000 - 0.000	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.004
LDF7-50A(1-5/8")	C	No	Inside Pole	185.000 - 0.000	10	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight kif
***						1" Ice	0.000	0.001
LDF6-50A(1-1/4")	C	No	Inside Pole	175.000 - 0.000	12	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001

LDF7-50A(1-5/8")	C	No	Inside Pole	165.000 - 0.000	6	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001

HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	155.000 - 0.000	2	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001

1 1/4" Flat Reinforcement	C	No	CaAa (Out Of Face)	37.000 - 0.000	1	No Ice 1/2" Ice 1" Ice	0.208 0.319 0.431	0.000 0.000 0.000
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	154.750 - 37.000	1	No Ice 1/2" Ice 1" Ice	0.167 0.278 0.389	0.000 0.000 0.000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
185									
Sector Mount [SM 802-3]	C	None		0.000	185.000	No Ice 1/2" Ice 1" Ice	24.410 31.390 38.370	24.410 31.390 38.370	0.930 1.362 1.794
LNx-6515DS-VTM w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	11.683 12.404 13.135	9.842 11.366 12.914	0.083 0.173 0.273
LNx-6515DS-VTM w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	11.683 12.404 13.135	9.842 11.366 12.914	0.083 0.173 0.273
LNx-6515DS-VTM w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	11.683 12.404 13.135	9.842 11.366 12.914	0.083 0.173 0.273
APX16DWV-16DWVS-C w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	6.824 7.275 7.719	3.494 4.263 4.960	0.061 0.110 0.165
APX16DWV-16DWVS-C w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	6.824 7.275 7.719	3.494 4.263 4.960	0.061 0.110 0.165
APX16DWV-16DWVS-C w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	6.824 7.275 7.719	3.494 4.263 4.960	0.061 0.110 0.165
RR90-17-02DP w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	185.000	No Ice 1/2" Ice 1" Ice	4.593 5.018 5.436	3.319 4.089 4.784	0.034 0.072 0.115
RR90-17-02DP w/ Mount Pipe	B	From Leg	4.000 0.000	0.000	185.000	No Ice 1/2"	4.593 5.018	3.319 4.089	0.034 0.072

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
			0.000			Ice	5.436	4.784	0.115
RR90-17-02DP w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	4.593	3.319	0.034
						No Ice	5.018	4.089	0.072
						1/2"	5.436	4.784	0.115
ATBT-BOTTOM-24V	A	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	0.104	0.065	0.003
						No Ice	0.148	0.102	0.004
						1/2"	0.199	0.147	0.006
ATBT-BOTTOM-24V	B	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	0.104	0.065	0.003
						No Ice	0.148	0.102	0.004
						1/2"	0.199	0.147	0.006
ATBT-BOTTOM-24V	C	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	0.104	0.065	0.003
						No Ice	0.148	0.102	0.004
						1/2"	0.199	0.147	0.006
(3) ETW190VS12UB	A	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	0.570	0.317	0.015
						No Ice	0.667	0.395	0.020
						1/2"	0.772	0.484	0.026
ETW190VS12UB	B	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	0.570	0.317	0.015
						No Ice	0.667	0.395	0.020
						1/2"	0.772	0.484	0.026
(2) ETW190VS12UB	C	From Leg	4.000 0.000 0.000	0.000	185.000	1" Ice	0.570	0.317	0.015
						No Ice	0.667	0.395	0.020
						1/2"	0.772	0.484	0.026
175 Sector Mount [SM 802-3]	C	None		0.000	175.000	1" Ice	24.410	24.410	0.930
						No Ice	31.390	31.390	1.362
						1/2"	38.370	38.370	1.794
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	5.793	4.516	0.086
						No Ice	6.268	5.508	0.143
						1/2"	6.697	6.213	0.208
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	5.793	4.516	0.086
						No Ice	6.268	5.508	0.143
						1/2"	6.697	6.213	0.208
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	5.793	4.516	0.086
						No Ice	6.268	5.508	0.143
						1/2"	6.697	6.213	0.208
OPA-65R-LCUU-H6 w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	9.895	7.179	0.099
						No Ice	10.470	8.362	0.175
						1/2"	11.010	9.259	0.261
OPA-65R-LCUU-H6 w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	9.895	7.179	0.099
						No Ice	10.470	8.362	0.175
						1/2"	11.010	9.259	0.261
OPA-65R-LCUU-H6 w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	9.895	7.179	0.099
						No Ice	10.470	8.362	0.175
						1/2"	11.010	9.259	0.261
(4) 7020.00	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice	0.102	0.175	0.002
						No Ice	0.147	0.239	0.005
						1/2"	0.199	0.311	0.009
(4) 7020.00	B	From Leg	4.000 0.000	0.000	175.000	1" Ice	0.102	0.175	0.002
						No Ice	0.147	0.239	0.005

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K	
			0.000			Ice 1" Ice	0.199	0.311	0.009
(4) 7020.00	C	From Leg	4.000 0.000 0.000	0.000	175.000	No Ice 1/2" Ice	0.102 0.147 0.199	0.175 0.239 0.311	0.002 0.005 0.009
(2) RRUS 11-700	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	2.522 2.719 2.923	1.068 1.211 1.361	0.055 0.074 0.097
(2) RRUS 11-700	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	2.522 2.719 2.923	1.068 1.211 1.361	0.055 0.074 0.097
(2) RRUS 11-700	C	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	2.522 2.719 2.923	1.068 1.211 1.361	0.055 0.074 0.097
(4) LGP21401	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	1.104 1.239 1.381	0.347 0.442 0.544	0.014 0.021 0.030
(4) LGP21401	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	1.104 1.239 1.381	0.347 0.442 0.544	0.014 0.021 0.030
(4) LGP21401	C	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	1.104 1.239 1.381	0.347 0.442 0.544	0.014 0.021 0.030
RRUS A2 MODULE	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	1.600 1.758 1.924	0.380 0.470 0.568	0.021 0.031 0.044
RRUS A2 MODULE	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	1.600 1.758 1.924	0.380 0.470 0.568	0.021 0.031 0.044
RRUS A2 MODULE	C	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	1.600 1.758 1.924	0.380 0.470 0.568	0.021 0.031 0.044
DC6-48-60-18-8F	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	0.917 1.458 1.643	0.917 1.458 1.643	0.019 0.037 0.057
DC6-48-60-18-8F	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	0.917 1.458 1.643	0.917 1.458 1.643	0.019 0.037 0.057
RRUS-11 1900MHz	A	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	2.522 2.719 2.923	1.020 1.158 1.304	0.044 0.063 0.086
RRUS-11 1900MHz	B	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	2.522 2.719 2.923	1.020 1.158 1.304	0.044 0.063 0.086
RRUS-11 1900MHz	C	From Leg	4.000 0.000 0.000	0.000	175.000	1" Ice No Ice 1/2" Ice	2.522 2.719 2.923	1.020 1.158 1.304	0.044 0.063 0.086
165 Pipe Mount [PM 601-3]	C	None		0.000	165.000	No Ice 1/2"	4.390 5.480	4.390 5.480	0.195 0.237

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft ft ft	Azimuth Adjustment	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
						Ice	6.570	6.570	0.280
						1" Ice			
APXV18-206517S-C w/ Mount Pipe	A	From Leg	1.000 0.000 0.000	0.000	165.000	No Ice	5.404	4.700	0.052
						1/2"	5.960	5.860	0.097
						Ice	6.481	6.734	0.150
						1" Ice			
APXV18-206517S-C w/ Mount Pipe	B	From Leg	1.000 0.000 0.000	0.000	165.000	No Ice	5.404	4.700	0.052
						1/2"	5.960	5.860	0.097
						Ice	6.481	6.734	0.150
						1" Ice			
APXV18-206517S-C w/ Mount Pipe	C	From Leg	1.000 0.000 0.000	0.000	165.000	No Ice	5.404	4.700	0.052
						1/2"	5.960	5.860	0.097
						Ice	6.481	6.734	0.150
						1" Ice			
155 Platform Mount [LP 403-1]	C	None		0.000	155.000	No Ice	18.850	18.850	1.500
						1/2"	24.300	24.300	1.797
						Ice	29.750	29.750	2.093
						1" Ice			
(4) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	8.419	7.420	0.081
						1/2"	8.956	8.454	0.153
						Ice	9.480	9.347	0.234
						1" Ice			
(4) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	8.419	7.420	0.081
						1/2"	8.956	8.454	0.153
						Ice	9.480	9.347	0.234
						1" Ice			
(4) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	8.419	7.420	0.081
						1/2"	8.956	8.454	0.153
						Ice	9.480	9.347	0.234
						1" Ice			
RRH2x60-700	A	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	3.500	1.816	0.060
						1/2"	3.761	2.052	0.083
						Ice	4.029	2.289	0.109
						1" Ice			
RRH2x60-700	B	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	3.500	1.816	0.060
						1/2"	3.761	2.052	0.083
						Ice	4.029	2.289	0.109
						1" Ice			
RRH2x60-700	C	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	3.500	1.816	0.060
						1/2"	3.761	2.052	0.083
						Ice	4.029	2.289	0.109
						1" Ice			
RRH2X60-PCS	A	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	2.200	1.723	0.055
						1/2"	2.393	1.901	0.075
						Ice	2.593	2.087	0.099
						1" Ice			
RRH2X60-PCS	B	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	2.200	1.723	0.055
						1/2"	2.393	1.901	0.075
						Ice	2.593	2.087	0.099
						1" Ice			
RRH2X60-PCS	C	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	2.200	1.723	0.055
						1/2"	2.393	1.901	0.075
						Ice	2.593	2.087	0.099
						1" Ice			
AWS4 (B66) 4x45 RRH	C	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	2.660	1.586	0.064
						1/2"	2.878	1.769	0.084
						Ice	3.104	1.959	0.108
						1" Ice			
AWS4 (B66) 4x45 RRH	A	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice	2.660	1.586	0.064
						1/2"	2.878	1.769	0.084
						Ice	3.104	1.959	0.108
						1" Ice			
AWS4 (B66) 4x45 RRH	B	From Leg	4.000 0.000	0.000	155.000	No Ice	2.660	1.586	0.064
						1/2"	2.878	1.769	0.084

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K	
			0.000			Ice 1" Ice	3.104	1.959	0.108
(2) DB-T1-6Z-8AB-0Z	C	From Leg	4.000 0.000 0.000	0.000	155.000	No Ice 1/2" Ice 1" Ice	4.800 5.070 5.348	2.000 2.193 2.393	0.044 0.080 0.120

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _Z ksf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L1 185.000-180.000	182.500	1.436	0.036	7.765	A	0.000	7.765	7.765	100.00	0.000	0.000
					B	0.000	7.765		100.00	0.000	0.000
					C	0.000	7.765		100.00	0.000	0.990
L2 180.000-153.750	166.034	1.408	0.035	50.461	A	0.000	50.461	50.461	100.00	0.000	0.000
					B	0.000	50.461		100.00	0.000	0.000
					C	0.000	50.461		100.00	0.000	5.364
L3 153.750-152.000	152.872	1.384	0.034	4.054	A	0.000	4.054	4.054	100.00	0.000	0.000
					B	0.000	4.054		100.00	0.000	0.000
					C	0.000	4.054		100.00	0.000	0.638
L4 152.000-151.250	151.624	1.382	0.034	1.764	A	0.000	1.764	1.764	100.00	0.000	0.000
					B	0.000	1.764		100.00	0.000	0.000
					C	0.000	1.764		100.00	0.000	0.274
L5 151.250-130.000	140.227	1.359	0.034	56.550	A	0.000	56.550	56.550	100.00	0.000	0.000
					B	0.000	56.550		100.00	0.000	0.000
					C	0.000	56.550		100.00	0.000	7.749
L6 130.000-121.000	125.434	1.327	0.033	27.316	A	0.000	27.316	27.316	100.00	0.000	0.000
					B	0.000	27.316		100.00	0.000	0.000
					C	0.000	27.316		100.00	0.000	3.282
L7 121.000-115.000	117.974	1.31	0.033	19.521	A	0.000	19.521	19.521	100.00	0.000	0.000
					B	0.000	19.521		100.00	0.000	0.000
					C	0.000	19.521		100.00	0.000	2.188
L8 115.000-114.000	114.499	1.302	0.032	3.352	A	0.000	3.352	3.352	100.00	0.000	0.000
					B	0.000	3.352		100.00	0.000	0.000
					C	0.000	3.352		100.00	0.000	0.365
L9 114.000-95.000	104.268	1.277	0.032	69.010	A	0.000	69.010	69.010	100.00	0.000	0.000
					B	0.000	69.010		100.00	0.000	0.000
					C	0.000	69.010		100.00	0.000	6.929
L10 95.000-91.000	92.990	1.246	0.031	15.569	A	0.000	15.569	15.569	100.00	0.000	0.000
					B	0.000	15.569		100.00	0.000	0.000
					C	0.000	15.569		100.00	0.000	1.459
L11 91.000-63.750	76.973	1.198	0.030	118.163	A	0.000	118.163	118.163	100.00	0.000	0.000
				3	B	0.000	118.163		100.00	0.000	0.000
					C	0.000	118.163		100.00	0.000	9.937
L12 63.750-58.000	60.859	1.14	0.028	27.606	A	0.000	27.606	27.606	100.00	0.000	0.000
					B	0.000	27.606		100.00	0.000	0.000
					C	0.000	27.606		100.00	0.000	2.097
L13 58.000-40.000	48.871	1.089	0.027	91.837	A	0.000	91.837	91.837	100.00	0.000	0.000
					B	0.000	91.837		100.00	0.000	0.000
					C	0.000	91.837		100.00	0.000	6.564
L14 40.000-33.000	36.479	1.024	0.025	37.939	A	0.000	37.939	37.939	100.00	0.000	0.000
					B	0.000	37.939		100.00	0.000	0.000
					C	0.000	37.939		100.00	0.000	2.719
L15 33.000-28.000	30.490	0.986	0.024	27.939	A	0.000	27.939	27.939	100.00	0.000	0.000
					B	0.000	27.939		100.00	0.000	0.000
					C	0.000	27.939		100.00	0.000	2.032
L16 28.000-0.000	13.724	0.85	0.021	168.362	A	0.000	168.362	168.362	100.00	0.000	0.000
				2	B	0.000	168.362		100.00	0.000	0.000

Section Elevation	z	K _z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
					C	0.000	168.362		100.00	0.000	11.377

Tower Pressure - With Ice

G_H = 1.100

Section Elevation	z	K _z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		ksf	in	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.000-180.000	182.500	1.436	0.009	2.3730	9.742	A	0.000	9.742	9.742	100.00	0.000	0.000
						B	0.000	9.742		100.00	0.000	0.000
						C	0.000	9.742		100.00	0.000	3.363
L2 180.000-153.750	166.034	1.408	0.009	2.3507	60.746	A	0.000	60.746	60.746	100.00	0.000	0.000
						B	0.000	60.746		100.00	0.000	0.000
						C	0.000	60.746		100.00	0.000	18.228
L3 153.750-152.000	152.872	1.384	0.008	2.3314	4.734	A	0.000	4.734	4.734	100.00	0.000	0.000
						B	0.000	4.734		100.00	0.000	0.000
						C	0.000	4.734		100.00	0.000	2.361
L4 152.000-151.250	151.624	1.382	0.008	2.3295	2.055	A	0.000	2.055	2.055	100.00	0.000	0.000
						B	0.000	2.055		100.00	0.000	0.000
						C	0.000	2.055		100.00	0.000	1.011
L5 151.250-130.000	140.227	1.359	0.008	2.3113	64.736	A	0.000	64.736	64.736	100.00	0.000	0.000
						B	0.000	64.736		100.00	0.000	0.000
						C	0.000	64.736		100.00	0.000	28.487
L6 130.000-121.000	125.434	1.327	0.008	2.2857	30.783	A	0.000	30.783	30.783	100.00	0.000	0.000
						B	0.000	30.783		100.00	0.000	0.000
						C	0.000	30.783		100.00	0.000	12.065
L7 121.000-115.000	117.974	1.31	0.008	2.2717	21.793	A	0.000	21.793	21.793	100.00	0.000	0.000
						B	0.000	21.793		100.00	0.000	0.000
						C	0.000	21.793		100.00	0.000	7.943
L8 115.000-114.000	114.499	1.302	0.008	2.2650	3.729	A	0.000	3.729	3.729	100.00	0.000	0.000
						B	0.000	3.729		100.00	0.000	0.000
						C	0.000	3.729		100.00	0.000	1.321
L9 114.000-95.000	104.268	1.277	0.008	2.2438	76.115	A	0.000	76.115	76.115	100.00	0.000	0.000
						B	0.000	76.115		100.00	0.000	0.000
						C	0.000	76.115		100.00	0.000	24.929
L10 95.000-91.000	92.990	1.246	0.008	2.2183	17.065	A	0.000	17.065	17.065	100.00	0.000	0.000
						B	0.000	17.065		100.00	0.000	0.000
						C	0.000	17.065		100.00	0.000	5.248
L11 91.000-63.750	76.973	1.198	0.007	2.1768	128.049	A	0.000	128.049	128.049	100.00	0.000	0.000
						B	0.000	128.049		100.00	0.000	0.000
						C	0.000	128.049		100.00	0.000	34.982
L12 63.750-58.000	60.859	1.14	0.007	2.1262	29.644	A	0.000	29.644	29.644	100.00	0.000	0.000
						B	0.000	29.644		100.00	0.000	0.000
						C	0.000	29.644		100.00	0.000	7.259
L13 58.000-40.000	48.871	1.089	0.007	2.0801	98.077	A	0.000	98.077	98.077	100.00	0.000	0.000
						B	0.000	98.077		100.00	0.000	0.000
						C	0.000	98.077		100.00	0.000	22.373
L14 40.000-33.000	36.479	1.024	0.006	2.0201	40.296	A	0.000	40.296	40.296	100.00	0.000	0.000
						B	0.000	40.296		100.00	0.000	0.000
						C	0.000	40.296		100.00	0.000	8.690
L15 33.000-28.000	30.490	0.986	0.006	1.9842	29.593	A	0.000	29.593	29.593	100.00	0.000	0.000
						B	0.000	29.593		100.00	0.000	0.000
						C	0.000	29.593		100.00	0.000	6.221
L16 28.000-0.000	13.724	0.85	0.005	1.8320	176.911	A	0.000	176.911	176.911	100.00	0.000	0.000
						B	0.000	176.911		100.00	0.000	0.000
						C	0.000	176.911		100.00	0.000	33.036

Tower Pressure - Service

G_H = 1.100

185 Ft Monopole Tower Structural Analysis
 Project Number 37517-1854.001.7805, Application 330544, Revision 4

Section Elevation ft	z ft	K _z	q _z ksf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L1 185.000-180.000	182.500	1.436	0.011	7.765	A	0.000	7.765	7.765	100.00	0.000	0.000
					B	0.000	7.765		100.00	0.000	0.000
					C	0.000	7.765		100.00	0.000	0.990
L2 180.000-153.750	166.034	1.408	0.011	50.461	A	0.000	50.461	50.461	100.00	0.000	0.000
					B	0.000	50.461		100.00	0.000	0.000
					C	0.000	50.461		100.00	0.000	5.364
L3 153.750-152.000	152.872	1.384	0.011	4.054	A	0.000	4.054	4.054	100.00	0.000	0.000
					B	0.000	4.054		100.00	0.000	0.000
					C	0.000	4.054		100.00	0.000	0.638
L4 152.000-151.250	151.624	1.382	0.011	1.764	A	0.000	1.764	1.764	100.00	0.000	0.000
					B	0.000	1.764		100.00	0.000	0.000
					C	0.000	1.764		100.00	0.000	0.274
L5 151.250-130.000	140.227	1.359	0.011	56.550	A	0.000	56.550	56.550	100.00	0.000	0.000
					B	0.000	56.550		100.00	0.000	0.000
					C	0.000	56.550		100.00	0.000	7.749
L6 130.000-121.000	125.434	1.327	0.010	27.316	A	0.000	27.316	27.316	100.00	0.000	0.000
					B	0.000	27.316		100.00	0.000	0.000
					C	0.000	27.316		100.00	0.000	3.282
L7 121.000-115.000	117.974	1.31	0.010	19.521	A	0.000	19.521	19.521	100.00	0.000	0.000
					B	0.000	19.521		100.00	0.000	0.000
					C	0.000	19.521		100.00	0.000	2.188
L8 115.000-114.000	114.499	1.302	0.010	3.352	A	0.000	3.352	3.352	100.00	0.000	0.000
					B	0.000	3.352		100.00	0.000	0.000
					C	0.000	3.352		100.00	0.000	0.365
L9 114.000-95.000	104.268	1.277	0.010	69.010	A	0.000	69.010	69.010	100.00	0.000	0.000
					B	0.000	69.010		100.00	0.000	0.000
					C	0.000	69.010		100.00	0.000	6.929
L10 95.000-91.000	92.990	1.246	0.010	15.569	A	0.000	15.569	15.569	100.00	0.000	0.000
					B	0.000	15.569		100.00	0.000	0.000
					C	0.000	15.569		100.00	0.000	1.459
L11 91.000-63.750	76.973	1.198	0.009	118.163	A	0.000	118.163	118.163	100.00	0.000	0.000
				3	B	0.000	118.163		100.00	0.000	0.000
					C	0.000	118.163		100.00	0.000	9.937
L12 63.750-58.000	60.859	1.14	0.009	27.606	A	0.000	27.606	27.606	100.00	0.000	0.000
					B	0.000	27.606		100.00	0.000	0.000
					C	0.000	27.606		100.00	0.000	2.097
L13 58.000-40.000	48.871	1.089	0.009	91.837	A	0.000	91.837	91.837	100.00	0.000	0.000
					B	0.000	91.837		100.00	0.000	0.000
					C	0.000	91.837		100.00	0.000	6.564
L14 40.000-33.000	36.479	1.024	0.008	37.939	A	0.000	37.939	37.939	100.00	0.000	0.000
					B	0.000	37.939		100.00	0.000	0.000
					C	0.000	37.939		100.00	0.000	2.719
L15 33.000-28.000	30.490	0.986	0.008	27.939	A	0.000	27.939	27.939	100.00	0.000	0.000
					B	0.000	27.939		100.00	0.000	0.000
					C	0.000	27.939		100.00	0.000	2.032
L16 28.000-0.000	13.724	0.85	0.007	168.362	A	0.000	168.362	168.362	100.00	0.000	0.000
				2	B	0.000	168.362		100.00	0.000	0.000
					C	0.000	168.362		100.00	0.000	11.377

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice

185 Ft Monopole Tower Structural Analysis
 Project Number 37517-1854.001.7805, Application 330544, Revision 4

Comb. No.	Description
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	185 - 180	Pole	Max Tension	26	0.000	-0.000	0.000
			Max. Compression	26	-8.544	0.548	0.252
			Max. Mx	20	-1.554	29.657	0.066
			Max. My	2	-1.553	0.049	29.798
			Max. Vy	20	-6.205	29.657	0.066
			Max. Vx	2	-6.228	0.049	29.798
			Max. Torque	18			-0.179
			Max Tension	1	0.000	0.000	0.000
L2	180 - 153.75	Pole	Max. Compression	26	-39.490	4.392	-1.935
			Max. Mx	20	-9.906	388.995	-0.568
			Max. My	14	-9.920	0.967	-389.136
			Max. Vy	20	-24.380	388.995	-0.568
			Max. Vx	14	24.267	0.967	-389.136
			Max. Torque	24			1.149
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-40.057	4.566	-2.033
L3	153.75 - 152	Pole	Max. Mx	20	-10.193	431.933	-0.798
			Max. My	14	-10.207	1.203	-431.873
			Max. Vy	20	-24.695	431.933	-0.798
			Max. Vx	14	24.583	1.203	-431.873
			Max. Torque	24			1.192
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-40.348	4.643	-2.077
			L4	152 - 151.25	Pole	Max Tension	1
Max. Compression	26	-40.348				4.643	-2.077

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft			
L5	151.25 - 130	Pole	Max. Mx	20	-10.370	450.507	-0.901			
			Max. My	14	-10.384	1.308	-450.361			
			Max. Vy	20	-24.834	450.507	-0.901			
			Max. Vx	14	24.720	1.308	-450.361			
			Max. Torque	24			1.210			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-46.187	6.404	-3.077			
			Max. Mx	20	-13.502	877.973	-3.044			
			Max. My	14	-13.515	3.511	-875.948			
			Max. Vy	20	-27.851	877.973	-3.044			
L6	130 - 121	Pole	Max. Vx	14	27.738	3.511	-875.948			
			Max. Torque	12			-1.647			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-53.420	8.023	-4.001			
			Max. Mx	20	-17.744	1288.693	-4.903			
			Max. My	14	-17.756	5.422	-1285.041			
			Max. Vy	20	-30.767	1288.693	-4.903			
			Max. Vx	14	30.653	5.422	-1285.041			
			Max. Torque	12			-2.074			
			Max Tension	1	0.000	0.000	0.000			
L7	121 - 115	Pole	Max. Compression	26	-56.179	8.765	-4.425			
			Max. Mx	20	-19.426	1477.045	-5.703			
			Max. My	14	-19.438	6.246	-1472.694			
			Max. Vy	20	-32.027	1477.045	-5.703			
			Max. Vx	14	31.913	6.246	-1472.694			
			Max. Torque	12			-2.269			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-56.680	8.892	-4.497			
			Max. Mx	20	-19.744	1509.180	-5.837			
			Max. My	14	-19.755	6.384	-1504.713			
L8	115 - 114	Pole	Max. Vy	20	-32.243	1509.180	-5.837			
			Max. Vx	14	32.129	6.384	-1504.713			
			Max. Torque	12			-2.302			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-62.832	10.615	-5.485			
			Max. Mx	20	-23.481	1946.383	-7.575			
			Max. My	14	-23.491	8.178	-1940.396			
			Max. Vy	20	-35.061	1946.383	-7.575			
			Max. Vx	14	34.947	8.178	-1940.396			
			Max. Torque	12			-2.752			
L9	114 - 95	Pole	Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-70.823	11.973	-6.264			
			Max. Mx	20	-28.719	2309.497	-8.918			
			Max. My	14	-28.728	9.565	-2302.339			
			Max. Vy	20	-37.519	2309.497	-8.918			
			Max. Vx	14	37.404	9.565	-2302.339			
			Max. Torque	12			-3.124			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-86.150	15.954	-8.553			
			Max. Mx	20	-38.675	3418.101	-12.584			
L10	95 - 91	Pole	Max. My	14	-38.682	13.364	-3407.739			
			Max. Vy	20	-44.021	3418.101	-12.584			
			Max. Vx	14	43.907	13.364	-3407.739			
			Max. Torque	12			-4.208			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-89.611	16.831	-9.057			
			Max. Mx	20	-40.975	3675.235	-13.358			
			Max. My	14	-40.980	14.169	-3664.197			
			Max. Vy	20	-45.432	3675.235	-13.358			
			Max. Vx	14	45.317	14.169	-3664.197			
L11	91 - 63.75	Pole	Max. Torque	12			-4.449			
			Max Tension	1	0.000	0.000	0.000			
			Max. Compression	26	-101.756	19.508	-10.603			
			Max. Mx	20	-49.413	4532.705	-15.780			
			Max. My	14	-49.417	16.689	-4519.552			
			Max. Vy	20	-49.898	4532.705	-15.780			
			Max. Vx	14	49.784	16.689	-4519.552			
			Max. Torque	12			-5.215			
			Max Tension	1	0.000	0.000	0.000			
			L12	63.75 - 58	Pole	Max. Compression	26	-101.756	19.508	-10.603
Max. Mx	20	-49.413				4532.705	-15.780			
L13	58 - 40	Pole	Max. My	14	-49.417	16.689	-4519.552			
			Max. Vy	20	-49.898	4532.705	-15.780			
			Max. Vx	14	49.784	16.689	-4519.552			
			Max. Torque	12			-5.215			
			Max Tension	1	0.000	0.000	0.000			
			L14	40 - 33	Pole	Max. Compression	26	-101.756	19.508	-10.603
						Max. Mx	20	-49.413	4532.705	-15.780

185 Ft Monopole Tower Structural Analysis
 Project Number 37517-1854.001.7805, Application 330544, Revision 4

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L15	33 - 28	Pole	Max. Compression	26	-106.599	20.540	-11.199
			Max. Mx	20	-52.823	4887.911	-16.720
			Max. My	14	-52.826	17.669	-4873.938
			Max. Vy	20	-51.602	4887.911	-16.720
			Max. Vx	14	51.488	17.669	-4873.938
			Max. Torque	12			-5.533
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-110.407	21.281	-11.627
			Max. Mx	20	-55.600	5148.944	-17.391
			Max. My	14	-55.603	18.369	-5134.384
L16	28 - 0	Pole	Max. Vy	20	-52.817	5148.944	-17.391
			Max. Vx	14	52.704	18.369	-5134.384
			Max. Torque	12			-5.769
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-132.131	25.347	-13.976
			Max. Mx	20	-71.812	6711.811	-21.136
			Max. My	14	-71.812	22.286	-6693.981
			Max. Vy	20	-58.906	6711.811	-21.136
			Max. Vx	14	58.797	22.286	-6693.981
			Max. Torque	12			-6.994

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	132.131	-0.001	0.000
	Max. H _x	21	53.870	58.889	-0.124
	Max. H _z	2	71.827	-0.124	58.779
	Max. M _x	2	6691.685	-0.124	58.779
	Max. M _z	8	6707.210	-58.888	0.124
	Max. Torsion	24	6.994	29.338	50.843
	Min. Vert	21	53.870	58.889	-0.124
	Min. H _x	9	53.870	-58.889	0.124
	Min. H _z	15	53.870	0.124	-58.779
	Min. M _x	14	-6693.981	0.124	-58.779
	Min. M _z	20	-6711.811	58.888	-0.124
	Min. Torsion	12	-6.994	-29.338	-50.843

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overtuning Moment, M _x kip-ft	Overtuning Moment, M _z kip-ft	Torque kip-ft
Dead Only	59.856	-0.000	0.000	0.935	1.867	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	71.827	0.124	-58.779	-6691.685	-17.702	-6.146
0.9 Dead+1.6 Wind 0 deg - No Ice	53.870	0.124	-58.777	-6651.426	-18.153	-6.138
1.2 Dead+1.6 Wind 30 deg - No Ice	71.827	29.554	-50.967	-5805.165	-3370.049	-3.651
0.9 Dead+1.6 Wind 30 deg - No Ice	53.870	29.554	-50.967	-5770.416	-3350.274	-3.644
1.2 Dead+1.6 Wind 60 deg - No Ice	71.827	51.064	-29.498	-3362.666	-5818.764	-0.177
0.9 Dead+1.6 Wind 60 deg - No Ice	53.870	51.064	-29.498	-3342.650	-5784.218	-0.174
1.2 Dead+1.6 Wind 90 deg - No Ice	71.827	58.888	-0.124	-18.849	-6707.210	3.344
0.9 Dead+1.6 Wind 90 deg - No Ice	53.870	58.889	-0.124	-19.008	-6667.478	3.344

185 Ft Monopole Tower Structural Analysis
 Project Number 37517-1854.001.7805, Application 330544, Revision 4

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
1.2 Dead+1.6 Wind 120 deg - No Ice	71.827	50.940	29.282	3330.359	-5798.836	5.969
0.9 Dead+1.6 Wind 120 deg - No Ice	53.870	50.940	29.282	3309.990	-5764.420	5.964
1.2 Dead+1.6 Wind 150 deg - No Ice	71.827	29.338	50.843	5787.526	-3335.458	6.994
0.9 Dead+1.6 Wind 150 deg - No Ice	53.870	29.338	50.843	5752.324	-3315.912	6.986
1.2 Dead+1.6 Wind 180 deg - No Ice	71.827	-0.124	58.779	6693.981	22.286	6.145
0.9 Dead+1.6 Wind 180 deg - No Ice	53.870	-0.124	58.779	6653.371	21.567	6.136
1.2 Dead+1.6 Wind 210 deg - No Ice	71.827	-29.554	50.967	5807.467	3374.641	3.650
0.9 Dead+1.6 Wind 210 deg - No Ice	53.870	-29.554	50.967	5772.132	3353.692	3.643
1.2 Dead+1.6 Wind 240 deg - No Ice	71.827	-51.064	29.498	3364.963	5823.365	0.177
0.9 Dead+1.6 Wind 240 deg - No Ice	53.870	-51.064	29.498	3344.362	5787.643	0.173
1.2 Dead+1.6 Wind 270 deg - No Ice	71.827	-58.888	0.124	21.136	6711.811	-3.343
0.9 Dead+1.6 Wind 270 deg - No Ice	53.870	-58.889	0.124	20.712	6670.903	-3.342
1.2 Dead+1.6 Wind 300 deg - No Ice	71.827	-50.940	-29.282	-3328.079	5803.428	-5.968
0.9 Dead+1.6 Wind 300 deg - No Ice	53.870	-50.940	-29.282	-3308.291	5767.839	-5.963
1.2 Dead+1.6 Wind 330 deg - No Ice	71.827	-29.338	-50.843	-5785.241	3340.041	-6.994
0.9 Dead+1.6 Wind 330 deg - No Ice	53.870	-29.338	-50.843	-5750.621	3319.323	-6.986
1.2 Dead+1.0 Ice+1.0 Temp	132.131	0.001	-0.000	13.976	25.347	0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	132.131	0.022	-14.078	-1733.652	22.032	-2.989
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	132.131	7.067	-12.203	-1501.319	-852.849	-1.769
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	132.131	12.219	-7.058	-862.915	-1492.324	-0.075
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	132.131	14.097	-0.022	10.500	-1725.049	1.639
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	132.131	12.197	7.020	884.898	-1488.664	2.914
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	132.131	7.030	12.181	1525.983	-846.508	3.409
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	132.131	-0.022	14.078	1761.976	29.354	2.990
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	132.131	-7.067	12.203	1529.644	904.235	1.770
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	132.131	-12.219	7.058	891.240	1543.712	0.076
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	132.131	-14.097	0.022	17.823	1776.437	-1.638
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	132.131	-12.197	-7.020	-856.575	1540.051	-2.914
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	132.131	-7.030	-12.181	-1497.660	897.894	-3.408
Dead+Wind 0 deg - Service	59.856	0.025	-11.599	-1315.526	-2.018	-0.153
Dead+Wind 30 deg - Service	59.856	5.832	-10.057	-1141.116	-661.407	-0.109
Dead+Wind 60 deg - Service	59.856	10.076	-5.821	-660.690	-1143.061	-0.035
Dead+Wind 90 deg - Service	59.856	11.621	-0.025	-2.976	-1317.919	0.048
Dead+Wind 120 deg - Service	59.856	10.052	5.778	655.791	-1139.130	0.118
Dead+Wind 150 deg - Service	59.856	5.789	10.033	1139.096	-654.598	0.157
Dead+Wind 180 deg - Service	59.856	-0.025	11.599	1317.436	5.845	0.153
Dead+Wind 210 deg - Service	59.856	-5.832	10.057	1143.027	665.235	0.109

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 240 deg - Service	59.856	-10.076	5.821	662.600	1146.888	0.035
Dead+Wind 270 deg - Service	59.856	-11.621	0.025	4.887	1321.746	-0.048
Dead+Wind 300 deg - Service	59.856	-10.052	-5.778	-653.881	1142.957	-0.118
Dead+Wind 330 deg - Service	59.856	-5.789	-10.033	-1137.185	658.426	-0.157

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 180	20.195	47	1.154	0.001
L2	180 - 153.75	18.991	47	1.144	0.001
L3	153.75 - 152	13.172	47	0.933	0.001
L4	152 - 151.25	12.833	47	0.919	0.001
L5	151.25 - 130	12.689	47	0.914	0.001
L6	135 - 121	9.815	47	0.772	0.000
L7	121 - 115	7.674	47	0.676	0.000
L8	115 - 114	6.853	47	0.631	0.000
L9	114 - 95	6.721	47	0.624	0.000
L10	101 - 91	5.160	47	0.524	0.000
L11	91 - 63.75	4.103	47	0.480	0.000
L12	63.75 - 58	1.885	47	0.302	0.000
L13	58 - 40	1.542	47	0.268	0.000
L14	40 - 33	0.709	47	0.175	0.000
L15	33 - 28	0.477	47	0.140	0.000
L16	28 - 0	0.342	47	0.118	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.000	Sector Mount [SM 802-3]	47	20.195	1.154	0.001	16844
175.000	Sector Mount [SM 802-3]	47	17.803	1.121	0.001	10642
165.000	Pipe Mount [PM 601-3]	47	15.521	1.041	0.001	6632
155.000	Platform Mount [LP 403-1]	47	13.419	0.944	0.001	5296

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 180	102.421	18	5.858	0.010
L2	180 - 153.75	96.321	18	5.810	0.009
L3	153.75 - 152	66.854	18	4.735	0.009
L4	152 - 151.25	65.134	18	4.664	0.009
L5	151.25 - 130	64.405	18	4.642	0.009
L6	135 - 121	49.831	18	3.922	0.007
L7	121 - 115	38.968	18	3.435	0.006
L8	115 - 114	34.801	18	3.205	0.005
L9	114 - 95	34.133	18	3.172	0.005
L10	101 - 91	26.206	18	2.661	0.004
L11	91 - 63.75	20.837	18	2.436	0.004
L12	63.75 - 58	9.572	18	1.535	0.002
L13	58 - 40	7.831	18	1.359	0.002

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L14	40 - 33	3.598	18	0.891	0.001
L15	33 - 28	2.425	18	0.712	0.001
L16	28 - 0	1.737	18	0.602	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.000	Sector Mount [SM 802-3]	18	102.421	5.858	0.010	3425
175.000	Sector Mount [SM 802-3]	18	90.310	5.693	0.009	2151
165.000	Pipe Mount [PM 601-3]	18	78.752	5.283	0.010	1330
155.000	Platform Mount [LP 403-1]	18	68.103	4.793	0.009	1058

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _v K	φP _n K	Ratio P _v / φP _n
L1	185 - 180 (1)	TP18x18x0.1875	5.000	0.000	0.0	10.754 3	-1.553	512.206	0.003
L2	180 - 153.75 (2)	TP26.5641x18x0.25	26.250	0.000	0.0	21.182 8	-9.901	1008.900	0.010
L3	153.75 - 152 (3)	TP27.135x26.5641x0.364	1.750	0.000	0.0	31.373 5	-10.189	1291.820	0.008
L4	152 - 151.25 (4)	TP27.3797x27.135x0.540	0.750	0.000	0.0	46.730 7	-10.359	1921.510	0.005
L5	151.25 - 130 (5)	TP34.3125x27.3797x0.39	21.250	0.000	0.0	40.697 2	-13.491	1756.950	0.008
L6	130 - 121 (6)	TP36.7356x31.8984x0.45	14.000	0.000	0.0	53.383 1	-17.734	2210.790	0.008
L7	121 - 115 (7)	TP38.6875x36.7356x0.48	6.000	0.000	0.0	59.697 3	-19.417	2449.270	0.008
L8	115 - 114 (8)	TP39.0125x38.6875x0.54	1.000	0.000	0.0	67.865 6	-19.735	2811.330	0.007
L9	114 - 95 (9)	TP45.1875x39.0125x0.45	19.000	0.000	0.0	62.290 8	-23.474	2699.070	0.009
L10	95 - 91 (10)	TP45.8125x42.3332x0.57	10.000	0.000	0.0	84.016 1	-28.712	3541.340	0.008
L11	91 - 63.75 (11)	TP54.7113x45.8125x0.48	27.250	0.000	0.0	84.451 6	-38.670	3571.190	0.011
L12	63.75 - 58 (12)	TP56.5891x54.7113x0.47	5.750	0.000	0.0	86.673 8	-40.970	3608.270	0.011
L13	58 - 40 (13)	TP61.6875x56.5891x0.54	18.000	0.000	0.0	106.81 70	-49.411	4246.830	0.012
L14	40 - 33 (14)	TP63.9583x61.6875x0.52	7.000	0.000	0.0	108.20 60	-52.820	4576.200	0.012
L15	33 - 28 (15)	TP65.5804x63.9583x0.59	5.000	0.000	0.0	124.95 10	-55.598	5075.500	0.011
L16	28 - 0 (16)	TP73.8125x65.5804x0.57	28.000	0.000	0.0	136.29 40	-71.812	5208.440	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux}	ϕM_{nx}	Ratio	M_{uy}	ϕM_{ny}	Ratio
			kip-ft	kip-ft	$\frac{M_{ux}}{\phi M_{nx}}$	kip-ft	kip-ft	$\frac{M_{uy}}{\phi M_{ny}}$
L1	185 - 180 (1)	TP18x18x0.1875	29.798	185.394	0.161	0.000	185.394	0.000
L2	180 - 153.75 (2)	TP26.5641x18x0.25	389.633	540.011	0.722	0.000	540.011	0.000
L3	153.75 - 152 (3)	TP27.135x26.5641x0.364	432.618	700.613	0.617	0.000	700.613	0.000
L4	152 - 151.25 (4)	TP27.3797x27.135x0.540 7	451.241	1038.058	0.435	0.000	1038.058	0.000
L5	151.25 - 130 (5)	TP34.3125x27.3797x0.39 14	880.083	1150.983	0.765	0.000	1150.983	0.000
L6	130 - 121 (6)	TP36.7356x31.8984x0.45 7	1292.008	1626.433	0.794	0.000	1626.433	0.000
L7	121 - 115 (7)	TP38.6875x36.7356x0.48 53	1480.875	1897.217	0.781	0.000	1897.217	0.000
L8	115 - 114 (8)	TP39.0125x38.6875x0.54 79	1513.100	2189.300	0.691	0.000	2189.300	0.000
L9	114 - 95 (9)	TP45.1875x39.0125x0.45 21	1951.433	2346.492	0.832	0.000	2346.492	0.000
L10	95 - 91 (10)	TP45.8125x42.3332x0.57 68	2315.417	3248.042	0.713	0.000	3248.042	0.000
L11	91 - 63.75 (11)	TP54.7113x45.8125x0.48 37	3426.408	3941.425	0.869	0.000	3941.425	0.000
L12	63.75 - 58 (12)	TP56.5891x54.7113x0.47 97	3684.050	4122.033	0.894	0.000	4122.033	0.000
L13	58 - 40 (13)	TP61.6875x56.5891x0.54 25	4543.092	5285.242	0.860	0.000	5285.242	0.000
L14	40 - 33 (14)	TP63.9583x61.6875x0.52 98	4898.908	5910.883	0.829	0.000	5910.883	0.000
L15	33 - 28 (15)	TP65.5804x63.9583x0.59 72	5160.375	6710.925	0.769	0.000	6710.925	0.000
L16	28 - 0 (16)	TP73.8125x65.5804x0.57 8	6725.667	7771.141	0.865	0.000	7771.141	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual	ϕV_n	Ratio	Actual	ϕT_n	Ratio
			V_u K	K	$\frac{V_u}{\phi V_n}$	T_u kip-ft	kip-ft	$\frac{T_u}{\phi T_n}$
L1	185 - 180 (1)	TP18x18x0.1875	6.228	256.103	0.024	0.129	375.922	0.000
L2	180 - 153.75 (2)	TP26.5641x18x0.25	24.408	504.448	0.048	0.728	1094.975	0.001
L3	153.75 - 152 (3)	TP27.135x26.5641x0.364	24.724	645.910	0.038	0.750	1420.625	0.001
L4	152 - 151.25 (4)	TP27.3797x27.135x0.540 7	24.929	960.756	0.026	0.178	2104.850	0.000
L5	151.25 - 130 (5)	TP34.3125x27.3797x0.39 14	27.940	878.477	0.032	0.178	2333.833	0.000
L6	130 - 121 (6)	TP36.7356x31.8984x0.45 7	30.857	1105.400	0.028	0.178	3297.908	0.000
L7	121 - 115 (7)	TP38.6875x36.7356x0.48 53	32.117	1224.630	0.026	0.178	3846.967	0.000
L8	115 - 114 (8)	TP39.0125x38.6875x0.54 79	32.334	1405.670	0.023	0.178	4439.217	0.000
L9	114 - 95 (9)	TP45.1875x39.0125x0.45 21	35.149	1349.530	0.026	0.178	4757.950	0.000
L10	95 - 91 (10)	TP45.8125x42.3332x0.57 68	37.607	1770.670	0.021	0.178	6586.017	0.000
L11	91 - 63.75 (11)	TP54.7113x45.8125x0.48 37	44.106	1785.600	0.025	0.177	7991.983	0.000
L12	63.75 - 58 (12)	TP56.5891x54.7113x0.47 97	45.516	1804.130	0.025	0.177	8358.167	0.000
L13	58 - 40 (13)	TP61.6875x56.5891x0.54 25	49.980	2123.420	0.024	0.177	10716.833	0.000
L14	40 - 33 (14)	TP63.9583x61.6875x0.52 98	51.684	2288.100	0.023	0.177	11985.416	0.000
L15	33 - 28 (15)	TP65.5804x63.9583x0.59	52.899	2537.750	0.021	0.177	13607.667	0.000

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L16	28 - 0 (16)	TP73.8125x65.5804x0.578	58.990	2604.220	0.023	0.177	15757.416	0.000

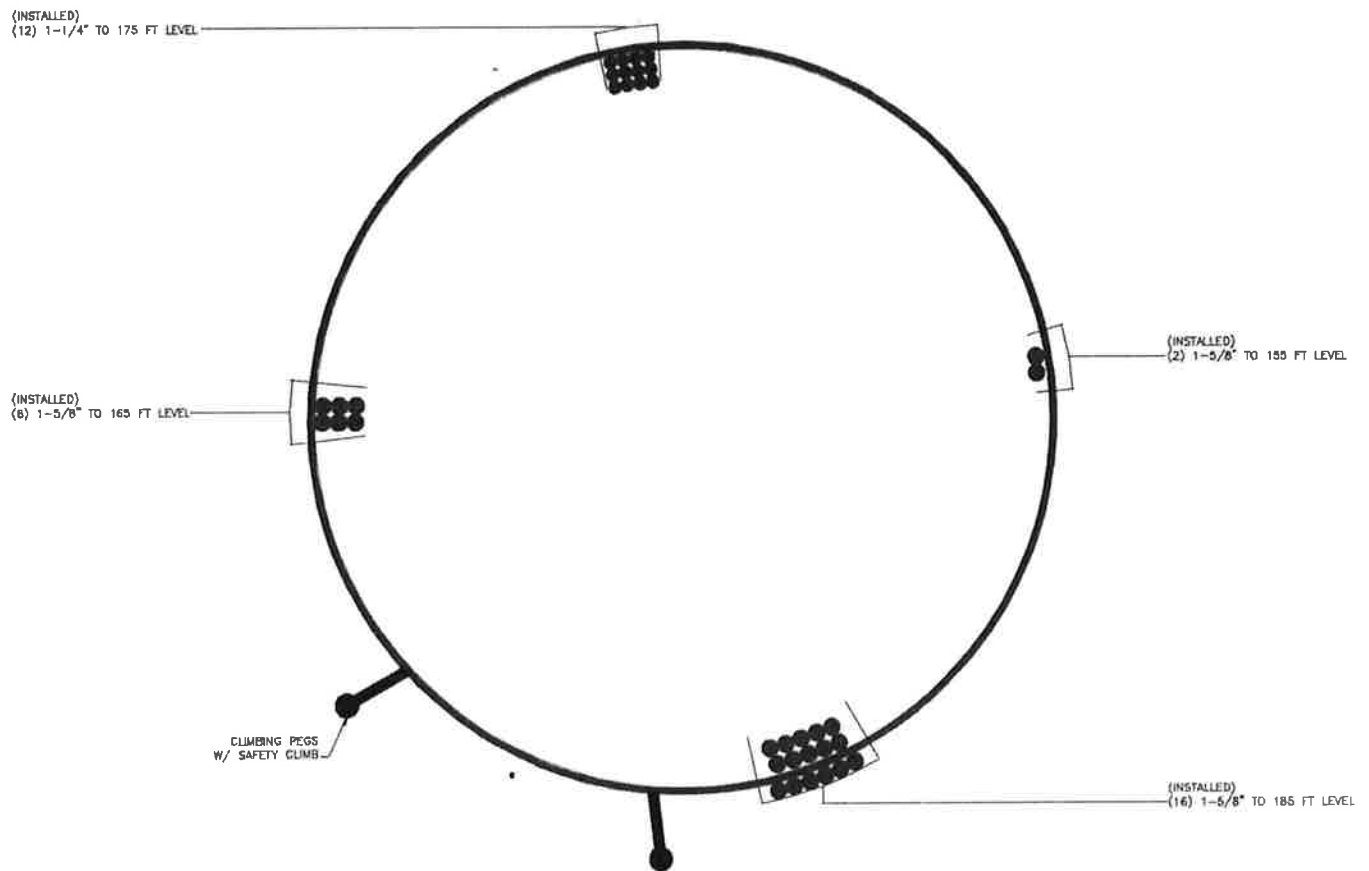
Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		ϕP_n	ϕM_{nx}	ϕM_{ny}	ϕV_n	ϕT_n			
L1	185 - 180 (1)	0.003	0.161	0.000	0.024	0.000	0.164	1.000	4.8.2
L2	180 - 153.75 (2)	0.010	0.722	0.000	0.048	0.001	0.734	1.000	4.8.2
L3	153.75 - 152 (3)	0.008	0.617	0.000	0.038	0.001	0.627	1.000	4.8.2
L4	152 - 151.25 (4)	0.005	0.435	0.000	0.026	0.000	0.441	1.000	4.8.2
L5	151.25 - 130 (5)	0.008	0.765	0.000	0.032	0.000	0.773	1.000	4.8.2
L6	130 - 121 (6)	0.008	0.794	0.000	0.028	0.000	0.803	1.000	4.8.2
L7	121 - 115 (7)	0.008	0.781	0.000	0.026	0.000	0.789	1.000	4.8.2
L8	115 - 114 (8)	0.007	0.691	0.000	0.023	0.000	0.699	1.000	4.8.2
L9	114 - 95 (9)	0.009	0.832	0.000	0.026	0.000	0.841	1.000	4.8.2
L10	95 - 91 (10)	0.008	0.713	0.000	0.021	0.000	0.721	1.000	4.8.2
L11	91 - 63.75 (11)	0.011	0.869	0.000	0.025	0.000	0.881	1.000	4.8.2
L12	63.75 - 58 (12)	0.011	0.894	0.000	0.025	0.000	0.906	1.000	4.8.2
L13	58 - 40 (13)	0.012	0.860	0.000	0.024	0.000	0.872	1.000	4.8.2
L14	40 - 33 (14)	0.012	0.829	0.000	0.023	0.000	0.841	1.000	4.8.2
L15	33 - 28 (15)	0.011	0.769	0.000	0.021	0.000	0.780	1.000	4.8.2
L16	28 - 0 (16)	0.014	0.865	0.000	0.023	0.000	0.880	1.000	4.8.2

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail	
L1	185 - 180	Pole	TP18x18x0.1875	1	-1.553	512.206	16.4	Pass	
L2	180 - 153.75	Pole	TP26.5641x18x0.25	2	-9.901	1008.900	73.4	Pass	
L3	153.75 - 152	Pole	TP27.135x26.5641x0.364	3	-10.189	1291.820	62.7	Pass	
L4	152 - 151.25	Pole	TP27.3797x27.135x0.5407	4	-10.359	1921.510	44.1	Pass	
L5	151.25 - 130	Pole	TP34.3125x27.3797x0.3914	5	-13.491	1756.950	77.3	Pass	
L6	130 - 121	Pole	TP36.7356x31.8984x0.457	6	-17.734	2210.790	80.3	Pass	
L7	121 - 115	Pole	TP38.6875x36.7356x0.4853	7	-19.417	2449.270	78.9	Pass	
L8	115 - 114	Pole	TP39.0125x38.6875x0.5479	8	-19.735	2811.330	69.9	Pass	
L9	114 - 95	Pole	TP45.1875x39.0125x0.4521	9	-23.474	2699.070	84.1	Pass	
L10	95 - 91	Pole	TP45.8125x42.3332x0.5768	10	-28.712	3541.340	72.1	Pass	
L11	91 - 63.75	Pole	TP54.7113x45.8125x0.4837	11	-38.670	3571.190	88.1	Pass	
L12	63.75 - 58	Pole	TP56.5891x54.7113x0.4797	12	-40.970	3608.270	90.6	Pass	
L13	58 - 40	Pole	TP61.6875x56.5891x0.5425	13	-49.411	4246.830	87.2	Pass	
L14	40 - 33	Pole	TP63.9583x61.6875x0.5298	14	-52.820	4576.200	84.1	Pass	
L15	33 - 28	Pole	TP65.5804x63.9583x0.5972	15	-55.598	5075.500	78.0	Pass	
L16	28 - 0	Pole	TP73.8125x65.5804x0.578	16	-71.812	5208.440	88.0	Pass	
							Summary		
							Pole (L12)	90.6	Pass
							RATING =	90.6	Pass

APPENDIX B BASE LEVEL DRAWING



APPENDIX C
ADDITIONAL CALCULATIONS

v4.4 - Effective 7-12-13

Asymmetric Anchor Rod Analysis

Moment =	6726	k-ft	TIA Ref.	G	Location =	Base Plate
Axial =	72.0	kips	ASIF =	N/A	η =	0.55 for BP, Rev. G Sect. 4.9.9
Shear =	59.0	kips	Max Ratio =	100.0%	Threads =	N/A for FP, Rev. G
Anchor Qty =	30					

**** 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	2.000	A36	36	58	0.0	68.00	0.00	3.14	67.97	63.42	71.36	0.00	116.00	61.5%
2	2.000	A36	36	58	15.0	68.00	0.00	3.14	69.61	65.06	73.00	0.00	116.00	62.9%
3	2.000	A36	36	58	30.0	68.00	0.00	3.14	71.20	66.66	74.59	0.00	116.00	64.3%
4	2.000	A36	36	58	45.0	68.00	0.00	3.14	72.30	67.76	75.69	0.00	116.00	65.2%
5	2.000	A36	36	58	60.0	68.00	0.00	3.14	72.60	68.05	75.98	0.00	116.00	65.5%
6	2.000	A36	36	58	75.0	68.00	0.00	3.14	71.95	67.41	75.34	0.00	116.00	64.9%
7	2.000	A36	36	58	90.0	68.00	0.00	3.14	70.46	65.91	73.85	0.00	116.00	63.7%
8	2.000	A36	36	58	105.0	68.00	0.00	3.14	68.40	63.86	71.79	0.00	116.00	61.9%
9	2.000	A36	36	58	120.0	68.00	0.00	3.14	66.24	61.70	69.63	0.00	116.00	60.0%
10	2.000	A36	36	58	135.0	68.00	0.00	3.14	64.50	59.96	67.89	0.00	116.00	58.5%
11	2.000	A36	36	58	150.0	68.00	0.00	3.14	63.65	59.10	67.04	0.00	116.00	57.8%
12	2.000	A36	36	58	165.0	68.00	0.00	3.14	63.91	59.37	67.30	0.00	116.00	58.0%
13	2.000	A36	36	58	180.0	68.00	0.00	3.14	65.19	60.64	68.57	0.00	116.00	59.1%
14	2.000	A36	36	58	195.0	68.00	0.00	3.14	67.09	62.54	70.47	0.00	116.00	60.8%
15	2.000	A36	36	58	210.0	68.00	0.00	3.14	69.09	64.55	72.48	0.00	116.00	62.5%
16	2.000	A36	36	58	225.0	68.00	0.00	3.14	70.72	66.17	74.10	0.00	116.00	63.9%
17	2.000	A36	36	58	240.0	68.00	0.00	3.14	71.81	67.06	74.99	0.00	116.00	64.6%
18	2.000	A36	36	58	255.0	68.00	0.00	3.14	71.62	67.07	75.00	0.00	116.00	64.7%
19	2.000	A36	36	58	270.0	68.00	0.00	3.14	70.81	66.26	74.19	0.00	116.00	64.0%
20	2.000	A36	36	58	285.0	68.00	0.00	3.14	69.44	64.90	72.83	0.00	116.00	62.8%
21	2.000	A36	36	58	300.0	68.00	0.00	3.14	67.94	63.39	71.32	0.00	116.00	61.5%
22	2.000	A36	36	58	315.0	68.00	0.00	3.14	66.76	62.22	70.15	0.00	116.00	60.5%
23	2.000	A36	36	58	330.0	68.00	0.00	3.14	66.31	61.76	69.70	0.00	116.00	60.1%
24	2.000	A36	36	58	345.0	68.00	0.00	3.14	66.75	62.20	70.14	0.00	116.00	60.5%
25	0.000	Other			45.0	169.81	4.02	4.02	225.14	219.32	225.14	285.10	285.10	79.0%
26	0.000	Other			165.0	169.81	4.02	4.02	202.59	196.77	202.59	285.10	285.10	71.1%
27	0.000	Other			285.0	169.81	4.02	4.02	216.52	210.70	216.52	285.10	285.10	75.9%
28	0.000	Other			105.0	169.81	4.02	4.02	215.19	209.37	215.19	285.10	285.10	75.5%
29	0.000	Other			210.0	169.81	4.02	4.02	218.43	212.62	218.43	285.10	285.10	76.6%
30	0.000	Other			335.0	169.81	4.02	4.02	205.05	199.24	205.05	285.10	285.10	71.9%

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 825983
 Site Name: Middletown_1
 App #:

Manufacturer: Other

Bolt Data

Qty:	24	Bolt Fu: 58 Bolt Fy: 36
Diam:	2	
Bolt Material:	Other	
Strength (Fu):	58 ksi	
Yield (Fy):	36 ksi	
Circle:	68 in	

Plate Data

Plate Outer Diam:	72.9375 in
Plate Inner Diam:	62 in (Hole @ Ctr)
Thick:	2 in
Grade:	36 ksi
Effective Width:	9.77 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:	0.375 in	
Width:	5 in	
Height:	18 in	
Thick:	1 in	
Notch:	1 in	
Grade:	50 ksi	
Weld str.:	70 ksi	

Pole Data

Pole OuterDiam:	73.8125 in
Thick:	0.4375 in
Pole Inner Diam:	72.9375 in
Grade:	42 ksi
# of Sides:	12 "0" IF Round
Fu	60 ksi

Reactions

Moment:	2391	ft-kips
Axial:	54.5	kips
Shear:	44.7	kips
Exterior Flange Run, T+q:	0	kips

Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
75.16

Elevation: 0 feet

Reactions adjusted to account for micropiles.

Interior Flange Plate Results

Controlling Bolt Axial Force:	72.6 Kips, Ext. Cu=Interior Cu
Plate Stress:	14.7 ksi
Allowable Plate Stress, ϕF_y :	32.4 ksi
Plate Stress Ratio:	45.3% Pass

Flexural Check

Stiffener Results

Horizontal Weld :	24.5% Pass
Vertical Weld:	12.4% Pass
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$:	2.4% Pass
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$:	18.2% Pass
Plate Comp. (AISC Bracket):	16.2% Pass

Pole Results

Pole Punching Shear Check:	4.5% Pass
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* 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

Factored Foundation Loads:

Factored Axial Load (+Comp, -Ten) = 54.5 LC1 40.875 LC2 kips
 Factored Horiz. Load at Top of Pier = 44.7 kips
 Factored OTM at Top of Pier = 2391 kips

LRFD Resistance and Load Factors:

Soil Bearing = 0.75 ϕ Dead Load Factors 1.2
 Soil Weight = 0.75 Concrete Weight = 0.75
 Concrete Weight = 1.2 0.9

Soil Properties:

Depth to Water Table = 16 ft
 Uplift Cone from Top of footing

Layer Thk ft	Soil Density pcf	Cohesion ksf	Friction Angle degrees	Ult Bearing ksf	Depth ft
5	120	1	0		5.00
2	130	1	0		7.00
2	120	1	0		9.00
2	110	1	0		11.00

Dimensions:

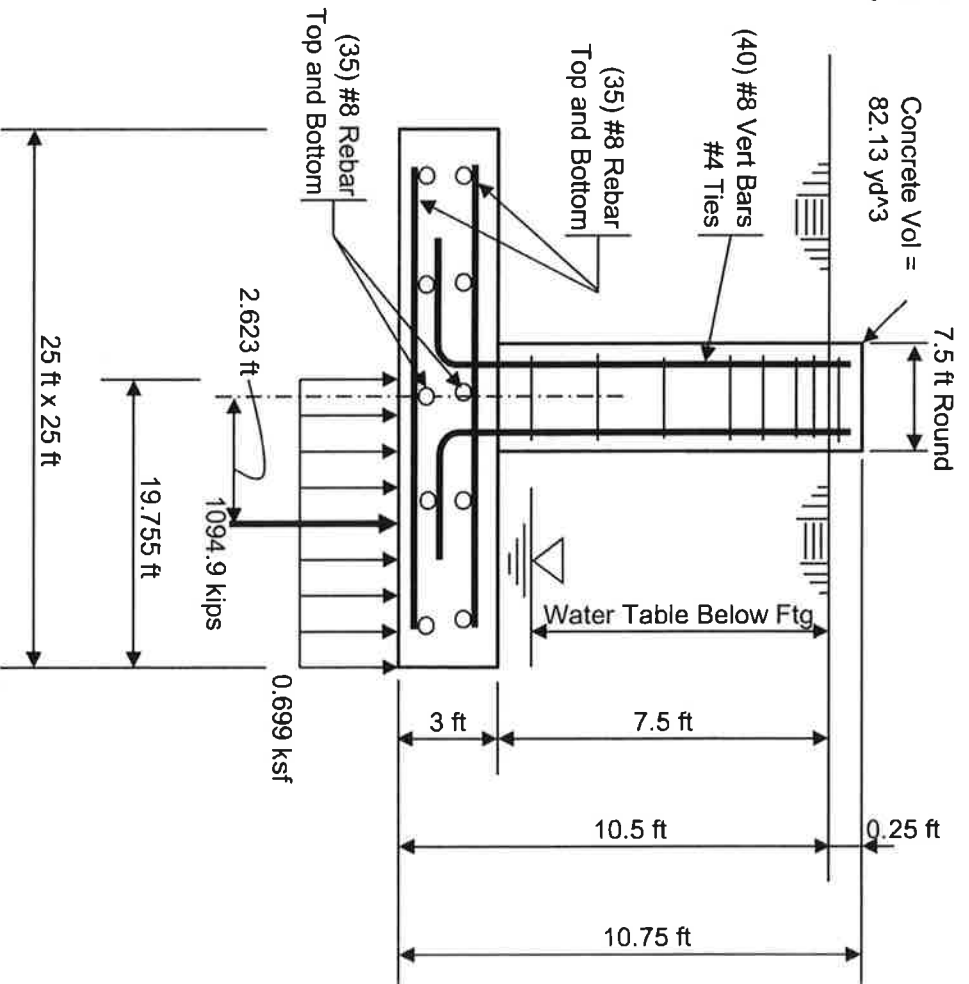
Pier Shape = Round
 Pier Width = 7.5 ft Diameter
 Pier Height above Grade = 0.25 ft
 Depth to Bottom of Footing = 10.5 ft
 Footing Thickness = 3 ft
 Footing Width, B = 25 ft
 Footing Length, L = 25 ft

Concrete:

Concrete Strength = 3 ksi
 Rebar Strength = 60 ksi

Summary Results:

Maximum Net Soil Bearing = 0.699 ksf Available 4.950 ksf
 Uplift = 0.0 kips 812.6 kips
 Punching Shear Stress = 0.029 ksi 0.164 ksi
 Bending Shear Stress = 144.0 kips 776.4 kips
 Bending Moment = 912.19 k-ft 3784.5 k-ft
 Conc Pier Reinforcing Steel = 2737.4 k-ft 5637.6 k-ft



Total Pad Reinf Stl = 55.30 in² >= 19.44 in² = Min Stl, OK
 Total Pier Reinf Stl = 31.60 in² < 31.81 in² = Min Stl
 Footing Thickness = 3.00 ft >= 1.53 ft = Min Ftg Thk, OK

Stress Ratio = 14.1% in Soil Bearing
 Stress Ratio = 0.0% in Uplift
 Stress Ratio = 17.9% in Punching Shear
 Stress Ratio = 18.5% in Bending Shear
 Stress Ratio = 24.1% in Bending Moment
 Stress Ratio = 48.6% in Pier Rebar

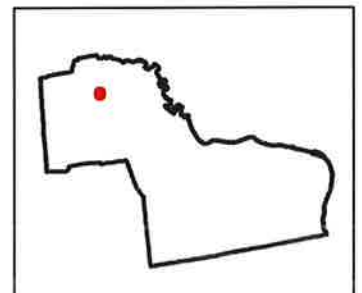
ATTACHMENT 4



City of Middletown, Connecticut

Map generated 6/27/2017

Map Legend: <http://gis.cityofmiddletown.com/middletownct/legend.pdf>
 Property Card: <http://gis.vgsi.com/MiddletownCT/Parcel.aspx?pid=396>



0 30 60 120 180 240 Feet 1 in = 94 ft

MAP FOR REFERENCE ONLY - NOT A LEGAL DOCUMENT

Because of different update schedules, current property assessments may not reflect recent changes to property boundaries. Check with the Board of Assessors to confirm boundaries uses at the time of assessment.

90 INDUSTRIAL PARK RD

Location 90 INDUSTRIAL PARK RD

Mblu 06 / / 0018 / /

Acct# R00347

Owner 90 INDUSTRIAL PARK ROAD
LLC

Assessment \$1,259,290

Appraisal \$1,798,980

PID 396

Building Count 1

Current Value

Appraisal			
Valuation Year	Improvements	Land	Total
2013	\$1,223,350	\$575,630	\$1,798,980

Assessment			
Valuation Year	Improvements	Land	Total
2013	\$856,350	\$402,940	\$1,259,290

Owner of Record

Owner 90 INDUSTRIAL PARK ROAD LLC
Co-Owner
Address 90 INDUSTRIAL PARK RD
MIDDLETOWN, CT 06457

Sale Price \$0
Certificate
Book & Page 1843/ 205
Sale Date 06/11/2015
Instrument 29

Ownership History

Ownership History					
Owner	Sale Price	Certificate	Book & Page	Instrument	Sale Date
90 INDUSTRIAL PARK ROAD LLC	\$0		1843/ 205	29	06/11/2015
ARMETTA PHILIP C	\$0		505/ 134	29	02/22/1978

Building Information

Building 1 : Section 1

Year Built: 1986
Living Area: 28,684
Replacement Cost: \$1,362,777
Building Percent Good: 85
Replacement Cost Less Depreciation: \$1,158,360

Building Attributes

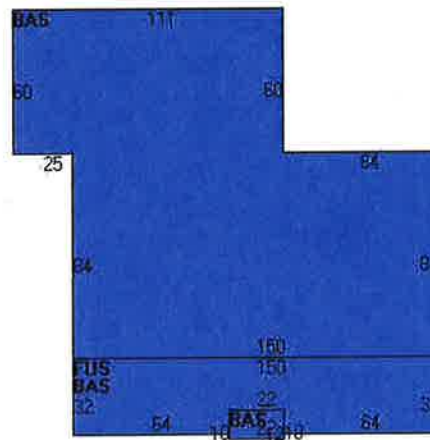
Field	Description
STYLE	Office/Warehs
MODEL	Industrial
Grade	C
Stories	1
Occupancy	2
Exterior Wall 1	Pre-finish Metl
Exterior Wall 2	Concrete
Roof Structure	Flat
Roof Cover	Tar and Gravel
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Concrete
Interior Floor 2	Carpet
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Partial
Bldg Use	Industrial
Cov Parking	0
Uncov Parking	0
Percent Fin	100
1st Floor Use	
Heat/AC	Heat/AC Pkg
Frame Type	Steel
Baths/Plumbing	Average
Ceiling/Walls	Typical
Rooms/Prtns	Average
Wall Height	25

Building Photo



(<http://images.vgsi.com/photos/MiddletownCTPhotos//\00\02\1>)

Building Layout



Building Sub-Areas (sq ft)			Legend	
Code	Description	Gross Area	Living Area	
BAS	First Floor	24,104	24,104	
FUS	Finished Upper Story	4,580	4,580	
		28,684	28,684	

Extra Features

Extra Features				Legend
Code	Description	Size	Value	Bldg #
A/C	Air Condition	8896 UNITS	\$18,900	1

Land

Land Use

Use Code 301
Description Industrial
Zone IT

Land Line Valuation

Size (Acres) 2.61
Frontage 0
Depth 0

Neighborhood 3100
Alt Land Appr No
Category

Assessed Value \$402,940
Appraised Value \$575,630

Outbuildings

Outbuildings						Legend
Code	Description	Sub Code	Sub Description	Size	Value	Bldg #
LT1	Lights-In W/PI			4 UNITS	\$210	1
PAV1	Paving	AS	Asphalt	51134 UNITS	\$28,120	1
PAV2	Paving	CN	Concrete	2100 UNITS	\$2,100	1
CSHD	Cell Shed			288 UNITS	\$5,470	1

Valuation History

Appraisal			
Valuation Year	Improvements	Land	Total
2015	\$1,223,350	\$575,630	\$1,798,980
2014	\$1,223,350	\$575,630	\$1,798,980
2013	\$1,223,350	\$575,630	\$1,798,980

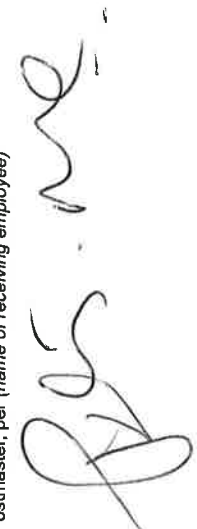


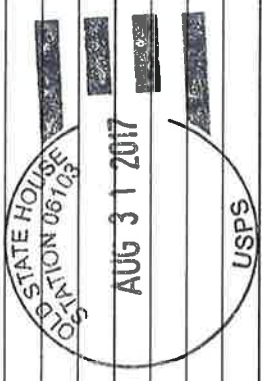
Assessment			
Valuation Year	Improvements	Land	Total
2015	\$856,350	\$402,940	\$1,259,290
2014	\$856,350	\$402,940	\$1,259,290
2013	\$856,350	\$402,940	\$1,259,290

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ATTACHMENT 5



Certificate of Mailing — Firm

Name and Address of Sender Kenneth C. Baldwin, Esq. Robinson & Cole LLP 280 Trumbull Street Hartford, CT 06103	TOTAL NO. of Pieces Listed by Sender <i>3</i>	TOTAL NO. of Pieces Received at Post Office™ <i>3</i>	Affix Stamp Here <i>Postmark with Date of Receipt.</i>
USPS® Tracking Number Firm-specific Identifier 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____	Postmaster, per (name of receiving employee) 		
	Address (Name, Street, City, State, and ZIP Code™) Daniel Drew, Mayor City of Middletown 245 deKoven Drive Middletown, CT 06457 Joseph Samolis, Director of Planning, Conservation and Development City of Middletown 245 deKoven Drive Middletown, CT 06524 90 Industrial Park Road LLC 90 Industrial Park Road Middletown, CT 06457		USPS Fee Special Handling Parcel Airlift