

April 9, 2015

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

Re: **Notice of Exempt Modification – Facility Modification
126 Pioneer Heights Road, Somers, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains fifteen (15) wireless telecommunications antennas at the 158-foot level on an existing 161-foot lattice tower at 126 Pioneer Heights Road in Somers (the “Property”). The tower is owned Crown Castle. Cellco’s use of the tower was approved by the Council in 1986 (Docket No. 58). Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model LNX-6514DS-VTM, 700 MHz antennas; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same 158-foot level on the tower. Cellco also intends to install six (6) remote radio heads (“RRHs”) behind its 1900 MHz and 2100 MHz antennas and two (2) HYBRIFLEX™ 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 Lisa Pellegrini, First Selectwoman of the Town of Somers. A copy of this letter is also being sent to Faye Gately and Lena Farnham, the owners 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).

13582411-v1

Robinson+Cole

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on its existing antenna platform at the 158-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.

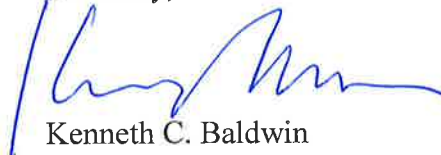
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table with Cellco's modified facility is included in Attachment 2.

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, with certain modifications, can support Cellco's proposed modifications. (See Structural Analysis Report and Modification Drawings 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:

Lisa Pellegrini, Somers First Selectwoman

Faye Gately and Lena Farnham

Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY



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

COMMSCOPE®

INX-6514DS-VTM

POWERED BY



Operating Frequency Band 698 – 896 MHz

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	181.0 mm 7.1 in
Length	1847.0 mm 72.7 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.

Product Specifications



HBXX-6517DS-VTM

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

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain, dBi	19.0	19.1	19.2
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	21	22	21
CPR at Sector, dB	10	11	9
Isolation, dB	30	30	30
VSWR Return Loss, dB	1.4 15.6	1.4 15.6	1.4 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0° 18.4	0° 18.4	0° 18.7
	3° 18.7	3° 18.7	3° 18.9
	6° 18.4	6° 18.5	6° 18.6
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9

* 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® quad
Band	Single band
Brand	DualPol® Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

POWERED BY



Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h 149.8 mph

Dimensions

Depth	166.0 mm 6.5 in
Length	1903.0 mm 74.9 in
Width	305.0 mm 12.0 in
Net Weight	19.5 kg 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator HBXX-6517DS-A2M
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

600899A-2 — 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.

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 1900A HW version
Features	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3 AISG 2.0 for RET/TMA
Power	Internal Smart Bias-T -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)



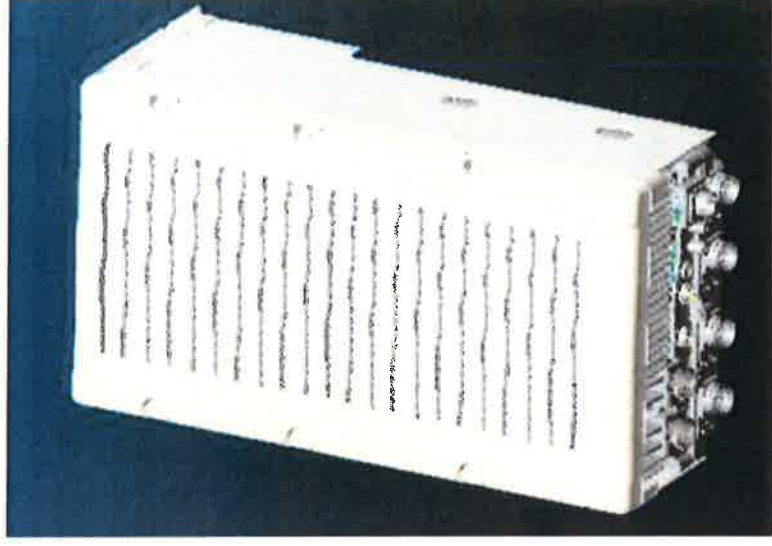
** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW

RRH2X60 - HW CHARACTERISTICS

LR14.3

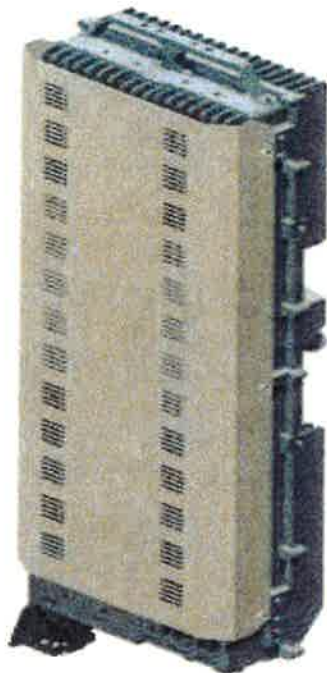
	RRH2X60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	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.

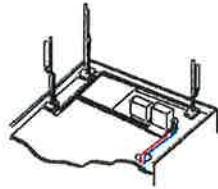
EASY INSTALLATION

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.

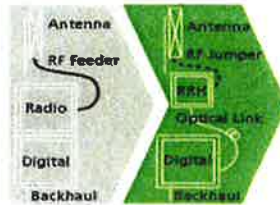
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

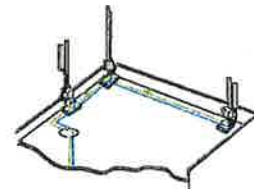
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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 daisy chaining 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

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.....Alcatel-Lucent

AT THE SPEED OF IDEAS™





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

Product Description

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

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

Features/Benefits

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

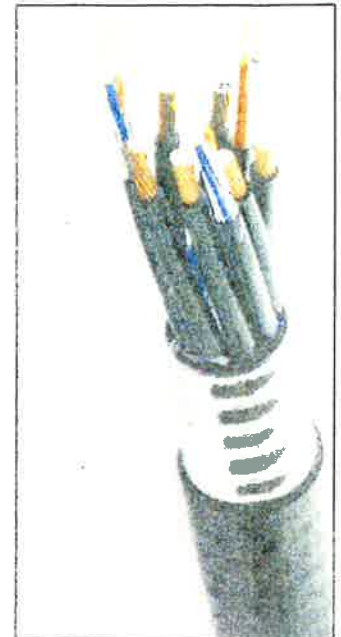


Figure 1: HYBRIFLEX Series

Technical Specifications

Structure			
Outer Conductor Armor	Corrugated Aluminum	(mm (in))	46.5 (1.83)
Jacket	Polyethylene, PE	(mm (in))	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		(kg/m (lb/ft))	1.9 (1.30)
Minimum Bending Radius, Single Bending		(mm (in))	200 (8)
Minimum Bending Radius, Repeated Bending		(mm (in))	500 (20)
Recommended/Maximum Clamp Spacing		(m (ft))	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		(Ω/km (Ω/1000ft))	068 (0.205)
DC-Resistance Power Cable, 8 4mm ² (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
Fiber Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		(μm)	50/125
Primary Coating (Acrylate)		(μm)	245
Buffer Diameter, Nominal		(μm)	900
Secondary Protection, Jacket, Nominal		(mm (in))	2.0 (0.08)
Minimum Bending Radius		(mm (in))	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
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
Environment			
Installation Temperature		(°C (°F))	-40 to +65 (-40 to 149)
Operation Temperature		(°C (°F))	-40 to +65 (-40 to 149)

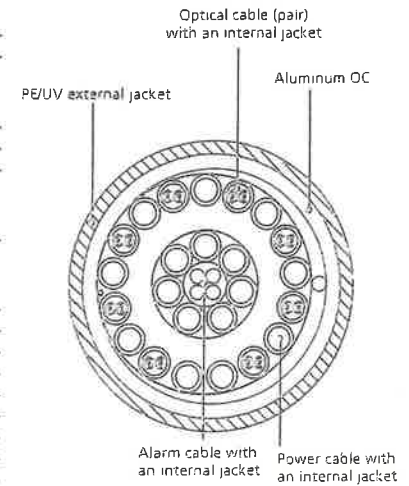


Figure 2: Construction Detail

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

ATTACHMENT 2

ATTACHMENT 3

Date: March 30, 2015



Jay Patton
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
(980) 209-8250

Vertical Structures, Inc.
309 Spangler Drive, Suite E
Richmond, KY 40475
(859) 624-8360
dward@verticalstructures.com

Subject: Structural Analysis Report

Carrier Designation:	Verizon Wireless Change-Out	
	Carrier Site Number:	HRT-2181
	Carrier Site Name:	Somers, CT
Crown Castle Designation:	Crown Castle BU Number:	806378
	Crown Castle Site Name:	HRT 086 943248
	Crown Castle JDE Job Number:	320547
	Crown Castle Work Order Number:	1012420
	Crown Castle Application Number:	279760 Rev. 1
Engineering Firm Designation:	Vertical Structures, Inc. Project Number:	2015-004-007
Site Data:	126 Pioneer Heights Road, Somers, CT, Tolland County	
	Latitude 41° 56' 55.98", Longitude -72° 29' 31.55"	
	161.375 Foot - Self Support Tower	

Dear Jay Patton,

Vertical Structures, Inc. is pleased to submit this "Structural Modification 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 757961.

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:

LC4.7: Modified Structure w/ Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

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

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

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

Respectfully submitted by:



Daryn Ward, P.E.
Project Engineer



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Required Modification Drawings

1) INTRODUCTION

This tower is a 161.375 ft Self Support tower designed by Rohn in 1986. The tower was originally designed for a 30 psf wind pressure in accordance with a previous revision of the EIA Standard. The tower has been reworked multiple times to accommodate additional loading. For the purpose of this analysis, the modifications detailed in Appendix D are considered complete.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice and 50 mph under service loads. Also, per Crown Castle's direction and in accordance with ASCE-7-05 we have considered a fastest mile wind speed of 38 mph with an escalating 1.0 inch ice thickness.

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
157.0	158.0	3	alcatel lucent	RRH2X60-PCS BTS	2	1 5/8	
		3	alcatel lucent	RRH2x60-AWS BTS			
		3	andrew	LNX-6514DS-VTM w/ Mount Pipe			
		1	celwave	DB-T1-6Z-8AB-0Z BTS			
		6	commscope	HBXX-6517DS-VTM w/ Mount Pipe			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
157.0	158.0	3	antel	BXA-70063-4CF-EDIN-X w/ Mount Pipe	18	1 5/8	3
		6	antel	LPA-185063/8CFx2 w/ Mount Pipe			
		2	antel	LPA-80063/4CF w/ Mount Pipe			
		2	antel	LPA-80063/4CFx5 w/ Mount Pipe			
		2	celwave	APL866513-42T6 w/ 8' Pipe Mount			
	1		Sector Mount [SM 504-3]	1			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
135.0	137.0	2	andrew	SBNH-1D6565C w/ Mount Pipe	1 2 13	3/8 3/4 1 1/4	1
		3	comm. components	DTMABP7819VG12A TMA			
		6	ericsson	RRUS-11 BTS			
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		3	powerwave technologies	LGP13519 Diplexer			
		4	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
	1	raycap	DC6-48-60-18-8F				
	135.0	1		Sector Mount [SM 504-3]			
125.0	126.0	3	alcatel lucent	1900MHz RRH (65MHz) TMA	1 3	5/8 1 1/4	1
		3	alcatel lucent	800MHz 2x50W RRH w/ Filter			
		3	alcatel lucent	TD-RRH8x20-25 BTS			
		1	celwave	APXV9ERR18-C-A20 w/ Mount Pipe			
		2	celwave	APXVSP18-C-A20 w/ Mount Pipe			
	3	celwave	APXVTM14-C-120 w/ Mount Pipe				
		125.0	1				
		1		Sector Mount [SM 402-3]			
113.0	113.0			Side Arm Mount [SO 101-3]	6	1 5/8	1
		1		AIR 21 B2A B4P w/ Mount Pipe	1	1 3/16	2
		3	ericsson	AIR 21 B4A B2P w/ Mount Pipe			
95.0	95.0	1		Pipe Mount	1	EW52	1
		1	andrew	UHX8-59H			
86.0	86.0	1		Pipe Mount	2	EW52	1
		1	andrew	UHX8-59H			
57.0	60.0	1		GPS	1	1/2	1
	57.0	1		Side Arm Mount [SO 202-1]			
48.0	50.0	1	lucent	KS24019-L112A	1	1/2	1
	48.0	1		Side Arm Mount [SO 202-1]			

- Notes:
 1) Existing Equipment
 2) Reserved Equipment
 3) Equipment To Be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
180	180	4	celwave	PD10017		
		4	rohn	3' Sidearm		
171	171	6	celwave	PD1132		
		3	rohn	6' Sidearm		
161	161	2		6' Std. Dish		
100	100	1	celwave	PD1109		
		1	rohn	6' Sidearm		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Change-Out Revision #1	279760	CCIsites
Tower Drawing	Rohn Drawing No. A861589-1	1918334	CCIsites
Foundation Drawing	Rohn Drawing No. C820155	1918334	CCIsites
Tower Leg Information	HEB September 3, 1999 Letter	821786	CCIsites
Geotechnical Report	FDH Project No. 06-10109G	1275233	CCIsites
Rework Design	All-Points Technology Job #CT105160	262063	CCIsites
Rework Drawings	Vertical Structures Job No. 2006-004-066, Rev. B	1278690	CCIsites
Rework Drawings	Vertical Structures Job No. 2011-004-006	2961397	CCIsites
Rework Drawings	Vertical Structures Job No. 2012-004-047	3265393	CCIsites
Post-Modification Inspection	TEP Project No. 127290	3684249	CCIsites
Rework Drawings	Vertical Structures Job No. 2015-004-007	N/A	Appendix D

3.1) Analysis Method

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

3.2) Assumptions

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

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail
T1	161.375 - 141.25	Leg	ROHN 2 STD	3	-21468.20	32298.46	66.5	Pass
T2	141.25 - 136.188	Leg	ROHN 2.5 EH	39	-23604.50	65601.99	36.0	Pass
T3	136.188 - 131.188	Leg	ROHN 2.5 EH	51	-32387.40	65600.53	49.4	Pass
T4	131.188 - 126.188	Leg	ROHN 2.5 EH	60	-39879.90	65600.53	60.8	Pass
T5	126.188 - 121.125	Leg	ROHN 2.5 EH	69	-53961.50	65601.99	82.3	Pass
T6	121.125 - 114.396	Leg	ROHN 3 EH	78	-59380.40	83786.24	70.9	Pass
T7	114.396 - 107.729	Leg	ROHN 3 EH	87	-71153.70	83784.51	84.9	Pass
T8	107.729 - 100.979	Leg	ROHN 3 EH	96	-88807.40	105836.47	83.9	Pass
T9	100.979 - 94.2292	Leg	ROHN 3.5 EH	108	-94541.10	110272.15	85.7	Pass
T10	94.2292 - 87.5625	Leg	ROHN 3.5 EH	117	-105506.00	110269.22	95.7	Pass
T11	87.5625 - 80.8125	Leg	ROHN 3.5 EH	126	-124218.00	132220.66	93.9	Pass
T12	80.8125 - 74.0625	Leg	ROHN 4 EH	138	-129507.00	139069.22	93.1	Pass
T13	74.0625 - 67.3958	Leg	ROHN 4 EH	147	-140446.00	161079.71	87.2	Pass
T14	67.3958 - 60.625	Leg	ROHN 4 EH	159	-157539.00	161110.37	97.8	Pass
T15	60.625 - 50.5208	Leg	ROHN 5 EH	171	-165162.00	177462.28	93.1	Pass
T16	50.5208 - 40.4167	Leg	ROHN 5 EH	180	-189787.00	217425.62	87.3 90.5 (b)	Pass
T17	40.4167 - 30.3125	Leg	ROHN 5 EH	192	-196466.00	217442.95	90.4	Pass
T18	30.3125 - 20.2083	Leg	ROHN 5 EH	204	-219938.00	233601.58	94.2	Pass
T19	20.2083 - 0	Leg	ROHN 6 STD w/ 2" B7 (Composite Controls) (VSI)	246	-248895.00	251897.00	98.8	Pass
T1	161.375 - 141.25	Diagonal	L1 3/4x1 3/4x3/16	12	-3088.97	8233.69	37.5 57.7 (b)	Pass
T2	141.25 - 136.188	Diagonal	L1 3/4x1 3/4x3/16	48	-2763.71	6292.83	43.9 50.3 (b)	Pass
T3	136.188 - 131.188	Diagonal	L1 3/4x1 3/4x3/16	57	-3935.94	5692.96	69.1 71.6 (b)	Pass
T4	131.188 - 126.188	Diagonal	L1 3/4x1 3/4x3/16	65	-4199.24	5163.16	81.3	Pass
T5	126.188 - 121.125	Diagonal	L2x2x3/16	75	-4966.59	7121.45	69.7 90.6 (b)	Pass
T6	121.125 - 114.396	Diagonal	L2 1/2x2 1/2x1/4	84	-5576.19	13636.32	40.9 86.6 (b)	Pass
T7	114.396 - 107.729	Diagonal	L2 1/2x2 1/2x1/4	93	-5836.91	12364.21	47.2 89.8 (b)	Pass
T8	107.729 - 100.979	Diagonal	L2 1/2x2 1/2x1/4	101	-6098.40	11251.04	54.2 95.1 (b)	Pass
T9	100.979 - 94.2292	Diagonal	L2 1/2x2 1/2x3/16	114	-6330.11	7928.39	79.8	Pass
T10	94.2292 - 87.5625	Diagonal	L2 1/2x2 1/2x1/4	123	-7545.69	9386.40	80.4	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (lb)	SF*P_allow (lb)	% Capacity	Pass / Fail	
T11	87.5625 - 80.8125	Diagonal	2L2 1/2x2 1/2x3/16x1/4	132	-8175.62	28255.60	28.9 37.4 (b)	Pass	
T12	80.8125 - 74.0625	Diagonal	L3x3x3/16	144	-8341.83	10664.01	78.2	Pass	
T13	74.0625 - 67.3958	Diagonal	L3x3x3/16	153	-8198.15	9783.97	83.8	Pass	
T14	67.3958 - 60.625	Diagonal	L3x3x3/16	165	-8382.49	9013.80	93.0	Pass	
T15	60.625 - 50.5208	Diagonal	2L3x3x3/16x1/4	177	-9542.40	29304.00	32.6 80.7 (b)	Pass	
T16	50.5208 - 40.4167	Diagonal	2L3x3x3/16x1/4	186	-9755.79	27080.03	36.0 81.6 (b)	Pass	
T17	40.4167 - 30.3125	Diagonal	2L3x3x1/4x1/4	198	-9700.09	32519.33	29.8 81.5 (b)	Pass	
T18	30.3125 - 20.2083	Diagonal	2L3x3x1/4x1/4	223	-10920.20	51914.48	21.0 86.7 (b)	Pass	
T19	20.2083 - 0	Diagonal	2L3 1/2x3 1/2x1/4x1/4	252	-10542.30	40256.47	26.2 86.1 (b)	Pass	
T18	30.3125 - 20.2083	Horizontal	L3x3x3/16	212	-3814.48	3955.01	96.4	Pass	
T8	107.729 - 100.979	Secondary Horizontal	L1 3/4x1 3/4x1/4	104	-1540.12	4951.99	31.1	Pass	
T11	87.5625 - 80.8125	Secondary Horizontal	L2x2x3/16	134	-2154.24	4040.92	53.3	Pass	
T13	74.0625 - 67.3958	Secondary Horizontal	L1 3/4x1 3/4x1/4	156	-2435.93	2783.06	87.5	Pass	
T14	67.3958 - 60.625	Secondary Horizontal	L2x2x3/16	167	-2732.27	2956.31	92.4	Pass	
T16	50.5208 - 40.4167	Secondary Horizontal	L2 1/2x2 1/2x3/16	188	-3291.22	4627.60	71.1	Pass	
T17	40.4167 - 30.3125	Secondary Horizontal	L3x3x1/4	200	-3407.40	9343.57	36.5 39.7 (b)	Pass	
T1	161.375 - 141.25	Top Girt	L2x2x1/8	5	-673.91	2488.54	27.1	Pass	
T2	141.25 - 136.188	Top Girt	L2x2x1/8	40	-378.65	2452.43	15.4	Pass	
T18	30.3125 - 20.2083	Redund Horz 1 Bracing	L2x2x3/16	236	-3814.48	7308.17	52.2	Pass	
T18	30.3125 - 20.2083	Redund Diag 1 Bracing	L2x2x3/16	237	-2220.11	5393.49	41.2	Pass	
							Summary		
							Leg (T19)	98.8	Pass
							Diagonal (T8)	95.1	Pass
							Horizontal (T18)	96.4	Pass
							Secondary Horizontal (T14)	92.4	Pass
							Top Girt (T1)	27.1	Pass
							Redund Horz 1 Bracing (T18)	52.2	Pass
							Redund Diag 1 Bracing (T18)	41.2	Pass
							Bolt Checks	95.1	Pass
							Rating =	98.8	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC4.7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	85.7	Pass
1	Base Foundation	0	39.5	Pass
1	Base Foundation Soil Interaction	0	91.8	Pass
1	Diagonal Connection Reinforcement	100 – 60	96.9	Pass
1	Redundant Member End Connections	30 – 20	52.6	Pass

Structure Rating (max from all components) =	98.8%
---	--------------

Notes:

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

4.1) Recommendations

The modifications detailed in Appendix D are required to remedy the deficiencies identified in Vertical Structures Job No. 2015-004-002.

APPENDIX A
TNXTOWER OUTPUT

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job HRT 086 943248, CT BU#806378 (Modified)	Page 1 of 30
	Project Vertical Structures Job No. 2015-004-007	Date 10:07:17 03/30/15
	Client Crown Castle	Designed by Daryn Ward

Tower Input Data

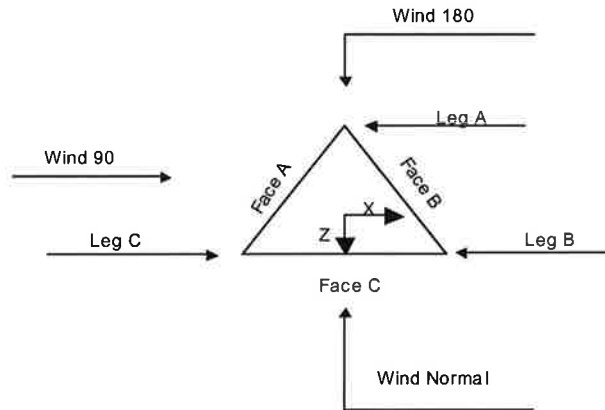
The main tower is a 3x free standing tower with an overall height of 161.38 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 6.52 ft at the top and 20.86 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

- Tower is located in Tolland County, Connecticut.
- Basic wind speed of 85 mph.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 38 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys √ Escalate Ice Always Use Max Kz Use Special Wind Profile √ Include Bolts In Member Capacity Leg Bolts Are At Top Of Section √ Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination | <ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area Use Clear Spans For KL/r √ Retension Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. √ Autocalc Torque Arm Areas SR Members Have Cut Ends √ Sort Capacity Reports By Component √ Triangulate Diamond Inner Bracing Use TIA-222-G Tension Splice Capacity Exemption | <ul style="list-style-type: none"> Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules √ Calculate Redundant Bracing Forces Ignore Redundant Members in FEA √ SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feedline Torque Include Angle Block Shear Check <li style="text-align: center;">Poles Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets |
|--|--|--|

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job HRT 086 943248, CT BU#806378 (Modified)	Page 2 of 30
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	Client Crown Castle	Designed by Daryn Ward



Triangular Tower

Tower Section Geometry

<i>Tower Section</i>	<i>Tower Elevation</i>	<i>Assembly Database</i>	<i>Description</i>	<i>Section Width</i>	<i>Number of Sections</i>	<i>Section Length</i>
	<i>ft</i>			<i>ft</i>		<i>ft</i>
T1	161.38-141.25			6.52	1	20.13
T2	141.25-136.19			6.56	1	5.06
T3	136.19-131.19			7.07	1	5.00
T4	131.19-126.19			7.58	1	5.00
T5	126.19-121.13			8.09	1	5.06
T6	121.13-114.40			8.60	1	6.73
T7	114.40-107.73			9.28	1	6.67
T8	107.73-100.98			9.96	1	6.75
T9	100.98-94.23			10.64	1	6.75
T10	94.23-87.56			11.32	1	6.67
T11	87.56-80.81			12.00	1	6.75
T12	80.81-74.06			12.68	1	6.75
T13	74.06-67.40			13.38	1	6.67
T14	67.40-60.62			14.07	1	6.77
T15	60.62-50.52			14.77	1	10.10
T16	50.52-40.42			15.77	1	10.10
T17	40.42-30.31			16.77	1	10.10
T18	30.31-20.21			17.81	1	10.10
T19	20.21-0.00			18.85	1	20.21

Tower Section Geometry (cont'd)

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	3 of 30
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Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	161.38-141.25	4.00	X Brace	No	No	0.7500	0.7500
T2	141.25-136.19	5.00	X Brace	No	No	0.7500	0.0000
T3	136.19-131.19	5.00	X Brace	No	No	0.0000	0.0000
T4	131.19-126.19	5.00	X Brace	No	No	0.0000	0.0000
T5	126.19-121.13	5.00	X Brace	No	No	0.0000	0.7500
T6	121.13-114.40	6.67	X Brace	No	No	0.7500	0.0000
T7	114.40-107.73	6.67	X Brace	No	No	0.0000	0.0000
T8	107.73-100.98	6.67	X Brace	No	Yes	0.0000	1.0000
T9	100.98-94.23	6.67	X Brace	No	No	1.0000	0.0000
T10	94.23-87.56	6.67	X Brace	No	No	0.0000	0.0000
T11	87.56-80.81	6.67	X Brace	No	Yes	0.0000	1.0000
T12	80.81-74.06	6.67	X Brace	No	No	1.0000	0.0000
T13	74.06-67.40	6.67	X Brace	No	Yes	0.0000	0.0000
T14	67.40-60.62	6.67	X Brace	No	Yes	0.0000	1.2500
T15	60.62-50.52	10.00	X Brace	No	No	1.2500	0.0000
T16	50.52-40.42	10.00	X Brace	No	Yes	0.0000	1.2500
T17	40.42-30.31	10.00	X Brace	No	Yes	1.2500	0.0000
T18	30.31-20.21	5.00	Double K1	No	Yes	0.0000	1.2500
T19	20.21-0.00	10.00	X Brace	No	No	1.2500	1.2500

Tower Section Geometry (cont'd)

Tower Elevation	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
ft						
T1 161.38-141.25	Pipe	ROHN 2 STD	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T2 141.25-136.19	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T3 136.19-131.19	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T4 131.19-126.19	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L1 3/4x1 3/4x3/16	A36 (36 ksi)
T5 126.19-121.13	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Single Angle	L2x2x3/16	A36 (36 ksi)
T6 121.13-114.40	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T7 114.40-107.73	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T8 107.73-100.98	Pipe	ROHN 3 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T9 100.98-94.23	Pipe	ROHN 3.5 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T10 94.23-87.56	Pipe	ROHN 3.5 EH	A572-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T11 87.56-80.81	Pipe	ROHN 3.5 EH	A572-50 (50 ksi)	Double Angle	2L2 1/2x2 1/2x3/16x1/4	A36 (36 ksi)
T12 80.81-74.06	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T13 74.06-67.40	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T14 67.40-60.62	Pipe	ROHN 4 EH	A572-50 (50 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)
T15 60.62-50.52	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Double Angle	2L3x3x3/16x1/4	A36 (36 ksi)
T16 50.52-40.42	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Double Angle	2L3x3x3/16x1/4	A36 (36 ksi)

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	4 of 30
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	Client	Crown Castle	Designed by	Daryn Ward

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T17 40.42-30.31	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Double Angle	2L3x3x1/4x1/4	A572-50 (50 ksi)
T18 30.31-20.21	Pipe	ROHN 5 EH	A572-50 (50 ksi)	Double Angle	2L3x3x1/4x1/4	A572-50 (50 ksi)
T19 20.21-0.00	Arbitrary Shape	ROHN 6 STD w/ 2" B7 (Composite Controls) (VSI)	A572-50 (50 ksi)	Double Angle	2L3 1/2x3 1/2x1/4x1/4	A572-50 (50 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 161.38-141.25	Equal Angle	L2x2x1/8	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T2 141.25-136.19	Equal Angle	L2x2x1/8	A36 (36 ksi)	Single Angle		A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T18 30.31-20.21	None	Single Angle		A36 (36 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Secondary Horizontal Type	Secondary Horizontal Size	Secondary Horizontal Grade	Inner Bracing Type	Inner Bracing Size	Inner Bracing Grade
T8 107.73-100.98	Equal Angle	L1 3/4x1 3/4x1/4	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T11 87.56-80.81	Equal Angle	L2x2x3/16	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T13 74.06-67.40	Equal Angle	L1 3/4x1 3/4x1/4	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T14 67.40-60.62	Equal Angle	L2x2x3/16	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T16 50.52-40.42	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T17 40.42-30.31	Equal Angle	L3x3x1/4	A36 (36 ksi)	Single Angle		A36 (36 ksi)

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Tower Section Geometry (cont'd)

Tower Elevation	Redundant Bracing Grade	Redundant Type	Redundant Size	K Factor
ft				
T18	A36	Horizontal (1)	Equal Angle	1
30.31-20.21	(36 ksi)	Diagonal (1)	Equal Angle	1

Tower Section Geometry (cont'd)

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
T1	1.62	0.1875	A36	1	1	1	30.0000	30.0000
161.38-141.25			(36 ksi)					
T2	0.34	0.1875	A36	1	1	1	30.0000	30.0000
141.25-136.19			(36 ksi)					
T3	0.34	0.1875	A36	1	1	1	30.0000	30.0000
136.19-131.19			(36 ksi)					
T4	0.34	0.1875	A36	1	1	1	30.0000	30.0000
131.19-126.19			(36 ksi)					
T5	0.34	0.1875	A36	1	1	1	30.0000	30.0000
126.19-121.13			(36 ksi)					
T6	0.36	0.1875	A36	1	1	1	30.0000	30.0000
121.13-114.40			(36 ksi)					
T7	0.36	0.1875	A36	1	1	1	30.0000	30.0000
114.40-107.73			(36 ksi)					
T8	0.36	0.1875	A36	1	1	1	30.0000	30.0000
107.73-100.98			(36 ksi)					
T9	1.99	0.5000	A572-50	1	1	1	30.0000	30.0000
100.98-94.23			(50 ksi)					
T10	2.36	0.5000	A572-50	1	1	1	30.0000	30.0000
94.23-87.56			(50 ksi)					
T11	2.13	0.5000	A572-50	1	1	1	Mid-Pt	30.0000
87.56-80.81			(50 ksi)					
T12	1.99	0.5000	A572-50	1	1	1	30.0000	30.0000
80.81-74.06			(50 ksi)					
T13	2.36	0.5000	A572-50	1	1	1	30.0000	30.0000
74.06-67.40			(50 ksi)					
T14	1.99	0.5000	A572-50	1	1	1	30.0000	30.0000
67.40-60.62			(50 ksi)					
T15	0.52	0.2500	A36	1	1	1	Mid-Pt	30.0000
60.62-50.52			(36 ksi)					
T16	0.75	0.2500	A36	1	1	1	Mid-Pt	30.0000
50.52-40.42			(36 ksi)					
T17	0.75	0.2500	A36	1	1	1	Mid-Pt	30.0000
40.42-30.31			(36 ksi)					
T18	0.75	0.2500	A36	1	1	1	Mid-Pt	60.0000
30.31-20.21			(36 ksi)					
T19	1.04	0.2500	A36	1	1	1	Mid-Pt	30.0000
20.21-0.00			(36 ksi)					

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Tower Section Geometry (cont'd)

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors ¹								
			Legs	X Brace Diags	K Brace Diags	Single Diags	Girts	Horiz.	Sec. Horiz.	Inner Brace	
			X Y	X Y	X Y	X Y	X Y	X Y	X Y	X Y	
T1	No	No									
161.38-141.25											
T2	No	No									
141.25-136.19											
T3	No	No									
136.19-131.19											
T4	No	No									
131.19-126.19											
T5	No	No									
126.19-121.13											
T6	No	No									
121.13-114.40											
T7	No	No									
114.40-107.73											
T8	No	No								0.5	
107.73-100.98										0.5	
T9	No	No								1	
100.98-94.23										1	
T10	No	No								1	
94.23-87.56										1	
T11	No	No								0.5	
87.56-80.81										0.5	
T12	No	No								1	
80.81-74.06										1	
T13	No	No								0.5	
74.06-67.40										0.5	
T14	No	No								0.5	
67.40-60.62										0.5	
T15	No	No								1	
60.62-50.52										1	
T16	No	No								0.5	
50.52-40.42										0.5	
T17	No	No								0.5	
40.42-30.31										0.5	
T18	No	No								1	
30.31-20.21										1	
T19	No	No								1	
20.21-0.00										1	

¹Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry (cont'd)

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Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 161.38-141.25	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 141.25-136.19	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 136.19-131.19	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 131.19-126.19	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 126.19-121.13	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 121.13-114.40	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 114.40-107.73	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 107.73-100.98	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 100.98-94.23	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T10 94.23-87.56	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T11 87.56-80.81	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T12 80.81-74.06	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T13 74.06-67.40	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T14 67.40-60.62	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T15 60.62-50.52	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T16 50.52-40.42	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T17 40.42-30.31	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T18 30.31-20.21	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T19 20.21-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry (cont'd)

Tower Elevation ft	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
in	in	in	in	in	in	in	in	
T1 161.38-141.25	2.5000	3.2813	2.5000	3.2813	0.0000	0.0000	0.0000	0.0000
T2 141.25-136.19	2.5000	3.5313	2.5000	3.5313	0.0000	0.0000	0.0000	0.0000

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Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T6 121.13-114.40	Flange	0.8750	0	0.5000	1	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
T7 114.40-107.73	Flange	0.8750	0	0.5000	1	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
T8 107.73-100.98	Flange	0.8750	4	0.5000	1	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	1
T9 100.98-94.23	Flange	0.8750	0	0.5000	2	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
T10 94.23-87.56	Flange	0.8750	0	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
T11 87.56-80.81	Flange	0.8750	4	0.5000	2	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	1
T12 80.81-74.06	Flange	1.0000	0	0.5000	2	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
T13 74.06-67.40	Flange	1.0000	0	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	1
T14 67.40-60.62	Flange	1.0000	4	0.5000	2	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	1
T15 60.62-50.52	Flange	1.0000	0	0.6250	1	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	0
T16 50.52-40.42	Flange	1.0000	4	0.6250	1	0.6250	0	0.0000	0	0.6250	0	0.6250	0	0.6250	1
T17 40.42-30.31	Flange	1.0000	0	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	1
T18 30.31-20.21	Flange	1.0000	6	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	1	0.6250	0
T19 20.21-0.00	Flange	1.0000	0	0.6250	1	0.6250	0	0.6250	0	0.6250	0	0.6250	0	0.6250	0
		A449		A325N		A325N		A325N		A325N		A325N		A325N	

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
EW52 (Verizon Wireless)	A	Yes	Ar (CfAe)	86.00 - 8.00	1.0000	0.45	1	1	1.7426	1.7426		0.59
LDF4-50A (1/2 FOAM) (Verizon Wireless)	A	Yes	Ar (CfAe)	60.00 - 8.00	1.0000	0.45	1	1	0.6300	0.6300		0.15
LDF7-50A (1-5/8 FOAM) (Verizon Wireless)	A	Yes	Ar (CfAe)	158.00 - 8.00	1.0000	0.4	20	7	0.2700 1.0000	1.9800		0.82
Feedline Ladder (1-1/2" Rails) (Af) (Verizon Wireless)	A	Yes	Af (CfAe)	161.38 - 8.00	0.5000	0.4	1	1	3.0000	1.5000	12.0000	3.66
** Feedline Ladder (1-1/2" Rails) (Af)	B	Yes	Af (CfAe)	137.00 - 10.00	0.5000	-0.4	1	1	3.0000	1.5000	12.0000	3.66

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
Feedline Ladder (1-1/2" Rails) (Af)	B	Yes	Af (CfAe)	161.38 - 137.00	0.5000	-0.4	1	1	3.0000	3.0000	12.0000	3.66
HB114-1-08U 4-M5J (1-1/4")	B	Yes	Ar (CfAe)	126.00 - 10.00	1.0000	-0.3	3	3	1.0000	1.5400		0.66
HB058-M12-XXXF (5/8")	B	Yes	Ar (CfAe)	126.00 - 10.00	1.0000	-0.3	1	1	0.8400	0.8400		0.25
EW52 (Verizon Wireless)	B	Yes	Ar (CfAe)	86.00 - 10.00	1.0000	-0.33	2	2	1.0000	1.7426		0.59
EW52 (Verizon Wireless)	B	Yes	Ar (CfAe)	95.00 - 86.00	1.0000	-0.33	1	1	1.0000	1.7426		0.59
LDF4-50A (1/2 FOAM)	B	Yes	Ar (CfAe)	50.00 - 8.00	2.0000	-0.32	1	1	0.6300	0.6300		0.15
** LDF6-50A (1-1/4 FOAM)	B	Yes	Ar (CfAe)	137.00 - 10.00	1.0000	-0.4	13	6	1.4500	1.5500		0.66
FB-L98-002-XXX (3/8")	B	Yes	Ar (CfAe)	137.00 - 10.00	1.0000	-0.4	1	1	0.3937	0.3937		0.10
WR-VG86ST-BRD (Power Cable)	B	Yes	Ar (CfAe)	137.00 - 10.00	1.0000	-0.4	2	2	1.0000	0.7760		0.15
** Feedline Ladder (1-1/2" Rails) (Af)	C	Yes	Af (CfAe)	147.00 - 10.00	0.5000	0.4	1	1	3.0000	3.0000	12.0000	3.66
*** 2" Solid Rod Reinf (Ar) (VSI)	A	No	Ar (Leg)	25.00 - 0.00	0.0000	-0.05	1	1	2.3330	2.3330		0.00
*** 2" Solid Rod Reinf (Ar) (VSI)	B	No	Ar (Leg)	25.00 - 0.00	0.0000	-0.05	1	1	2.3330	2.3330		0.00
*** 2" Solid Rod Reinf (Ar) (VSI)	C	No	Ar (Leg)	25.00 - 0.00	0.0000	-0.05	1	1	2.3330	2.3330		0.00
Feedline Ladder (1-1/2" Rails) (Af)	A	Yes	Af (CfAe)	113.00 - 8.00	0.5000	-0.4	1	1	3.0000	3.0000	12.0000	3.66
CR 50 1873 (1-5/8 FOAM)	A	Yes	Ar (CfAe)	113.00 - 8.00	1.0000	-0.4	6	6	1.0000	1.9800		0.83
1.2 Masterline Extreme Hybrid (1 3/16")	A	Yes	Ar (CfAe)	113.00 - 8.00	1.0000	-0.4	1	1	1.2000	0.0001		0.10

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A ft ² /ft	Weight plf

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Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight lb
T1	161.38-141.25	A	19.346	2.516	0.000	0.000	348.36
		B	0.000	5.031	0.000	0.000	73.66
		C	0.000	1.438	0.000	0.000	21.04
T2	141.25-136.19	A	5.847	0.633	0.000	0.000	101.55
		B	0.761	1.164	0.000	0.000	25.82
		C	0.000	1.266	0.000	0.000	18.53
T3	136.19-131.19	A	5.775	0.625	0.000	0.000	100.30
		B	4.686	0.625	0.000	0.000	63.20
		C	0.000	1.250	0.000	0.000	18.30
T4	131.19-126.19	A	5.775	0.625	0.000	0.000	100.30
		B	4.686	0.625	0.000	0.000	63.20
		C	0.000	1.250	0.000	0.000	18.30
T5	126.19-121.13	A	5.847	0.633	0.000	0.000	101.55
		B	6.962	0.633	0.000	0.000	74.86
		C	0.000	1.266	0.000	0.000	18.53
T6	121.13-114.40	A	7.772	0.841	0.000	0.000	134.99
		B	9.368	0.841	0.000	0.000	100.06
		C	0.000	1.682	0.000	0.000	24.63
T7	114.40-107.73	A	12.918	2.151	0.000	0.000	179.80
		B	9.281	0.833	0.000	0.000	99.13
		C	0.000	1.667	0.000	0.000	24.40
T8	107.73-100.98	A	14.479	2.531	0.000	0.000	194.40
		B	9.397	0.844	0.000	0.000	100.37
		C	0.000	1.688	0.000	0.000	24.70
T9	100.98-94.23	A	14.479	2.531	0.000	0.000	194.40
		B	9.509	0.844	0.000	0.000	100.83
		C	0.000	1.688	0.000	0.000	24.70
T10	94.23-87.56	A	14.300	2.500	0.000	0.000	192.00
		B	10.249	0.833	0.000	0.000	103.07
		C	0.000	1.667	0.000	0.000	24.40
T11	87.56-80.81	A	15.232	2.531	0.000	0.000	197.46
		B	11.130	0.844	0.000	0.000	107.42
		C	0.000	1.688	0.000	0.000	24.70
T12	80.81-74.06	A	15.459	2.531	0.000	0.000	198.38
		B	11.357	0.844	0.000	0.000	108.34
		C	0.000	1.688	0.000	0.000	24.70
T13	74.06-67.40	A	15.268	2.500	0.000	0.000	195.93
		B	11.217	0.833	0.000	0.000	107.00
		C	0.000	1.667	0.000	0.000	24.40
T14	67.40-60.62	A	15.507	2.539	0.000	0.000	198.99
		B	11.392	0.846	0.000	0.000	108.67
		C	0.000	1.693	0.000	0.000	24.78
T15	60.62-50.52	A	23.638	3.789	0.000	0.000	298.38
		B	17.001	1.263	0.000	0.000	162.17
		C	0.000	2.526	0.000	0.000	36.98
T16	50.52-40.42	A	23.671	3.789	0.000	0.000	298.48
		B	17.504	1.263	0.000	0.000	163.61
		C	0.000	2.526	0.000	0.000	36.98
T17	40.42-30.31	A	23.671	3.789	0.000	0.000	298.48
		B	17.531	1.263	0.000	0.000	163.69
		C	0.000	2.526	0.000	0.000	36.98
T18	30.31-20.21	A	25.534	3.789	0.000	0.000	298.48
		B	19.395	1.263	0.000	0.000	163.69
		C	1.863	2.526	0.000	0.000	36.98
T19	20.21-0.00	A	36.458	4.578	0.000	0.000	360.63
		B	25.675	1.276	0.000	0.000	165.68

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	12 of 30
	Project	Vertical Structures Job No. 2015-004-007	Date	10:07:17 03/30/15
	Client	Crown Castle	Designed by	Daryn Ward

Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	C_{AA} In Face ft ²	C_{AA} Out Face ft ²	Weight lb
		C	7.858	2.552	0.000	0.000	37.36

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} In Face ft ²	C_{AA} Out Face ft ²	Weight lb
T1	161.38-141.25	A	1.201	6.115	24.044	0.000	0.000	1300.77
		B		0.000	7.716	0.000	0.000	229.10
		C		0.000	2.204	0.000	0.000	65.46
T2	141.25-136.19	A	1.188	1.838	6.996	0.000	0.000	379.75
		B		0.667	2.968	0.000	0.000	106.30
		C		0.000	1.934	0.000	0.000	57.12
T3	136.19-131.19	A	1.183	1.811	6.907	0.000	0.000	374.32
		B		4.090	8.272	0.000	0.000	358.07
		C		0.000	1.907	0.000	0.000	56.20
T4	131.19-126.19	A	1.177	1.806	6.904	0.000	0.000	373.56
		B		4.077	8.269	0.000	0.000	357.06
		C		0.000	1.904	0.000	0.000	55.98
T5	126.19-121.13	A	1.172	1.824	6.987	0.000	0.000	377.42
		B		6.984	10.433	0.000	0.000	434.63
		C		0.000	1.925	0.000	0.000	56.44
T6	121.13-114.40	A	1.165	2.417	9.282	0.000	0.000	500.38
		B		9.392	13.968	0.000	0.000	579.21
		C		0.000	2.553	0.000	0.000	74.65
T7	114.40-107.73	A	1.157	5.287	17.730	0.000	0.000	710.66
		B		9.260	13.832	0.000	0.000	571.12
		C		0.000	2.524	0.000	0.000	73.52
T8	107.73-100.98	A	1.148	6.103	20.228	0.000	0.000	774.34
		B		9.327	13.999	0.000	0.000	575.37
		C		0.000	2.549	0.000	0.000	73.97
T9	100.98-94.23	A	1.139	6.072	20.215	0.000	0.000	770.90
		B		9.534	13.992	0.000	0.000	575.85
		C		0.000	2.542	0.000	0.000	73.47
T10	94.23-87.56	A	1.129	5.964	19.951	0.000	0.000	757.79
		B		11.330	13.812	0.000	0.000	592.39
		C		0.000	2.503	0.000	0.000	72.05
T11	87.56-80.81	A	1.119	7.725	20.185	0.000	0.000	786.75
		B		11.402	15.163	0.000	0.000	616.29
		C		0.000	2.527	0.000	0.000	72.39
T12	80.81-74.06	A	1.108	8.193	20.168	0.000	0.000	789.25
		B		11.326	15.511	0.000	0.000	618.16
		C		0.000	2.518	0.000	0.000	71.79
T13	74.06-67.40	A	1.096	8.038	19.901	0.000	0.000	774.72
		B		11.107	15.311	0.000	0.000	606.07
		C		0.000	2.478	0.000	0.000	70.28
T14	67.40-60.62	A	1.083	8.105	20.193	0.000	0.000	781.55
		B		11.192	15.540	0.000	0.000	610.62
		C		0.000	2.507	0.000	0.000	70.68
T15	60.62-50.52	A	1.065	14.152	30.093	0.000	0.000	1177.68
		B		16.518	23.171	0.000	0.000	901.03
		C		0.000	3.721	0.000	0.000	104.03
T16	50.52-40.42	A	1.039	14.082	30.036	0.000	0.000	1163.16
		B		18.425	23.142	0.000	0.000	908.69
		C		0.000	3.693	0.000	0.000	102.05
T17	40.42-30.31	A	1.008	13.823	29.966	0.000	0.000	1143.82
		B		18.178	23.107	0.000	0.000	891.84
		C		0.000	3.658	0.000	0.000	99.65

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	13 of 30
	Project	Vertical Structures Job No. 2015-004-007	Date	10:07:17 03/30/15
	Client	Crown Castle	Designed by	Daryn Ward

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft ²	A_F ft ²	C_{AA} In Face ft ²	C_{AA} Out Face ft ²	Weight lb
T18	30.31-20.21	A	1.000	17.213	29.948	0.000	0.000	1158.14
		B		21.540	23.098	0.000	0.000	906.51
		C		3.460	3.649	0.000	0.000	118.52
T19	20.21-0.00	A	1.000	31.210	36.184	0.000	0.000	1458.03
		B		33.298	23.336	0.000	0.000	982.71
		C		14.594	3.686	0.000	0.000	182.32

Feed Line Shielding

Section	Elevation ft	Face	A_R ft ²	A_R Ice ft ²	A_F ft ²	A_F Ice ft ²
T1	161.38-141.25	A	0.000	3.984	2.038	2.937
		B	0.000	1.146	0.469	0.844
		C	0.000	0.327	0.134	0.241
T2	141.25-136.19	A	0.000	1.248	0.676	0.957
		B	0.000	0.540	0.201	0.414
		C	0.000	0.309	0.132	0.237
T3	136.19-131.19	A	0.000	0.863	0.452	0.639
		B	0.000	1.211	0.375	0.896
		C	0.000	0.213	0.088	0.158
T4	131.19-126.19	A	0.000	0.841	0.443	0.625
		B	0.000	1.180	0.367	0.877
		C	0.000	0.208	0.086	0.154
T5	126.19-121.13	A	0.000	0.822	0.497	0.702
		B	0.000	1.596	0.583	1.362
		C	0.000	0.203	0.097	0.173
T6	121.13-114.40	A	0.000	0.873	0.665	0.937
		B	0.000	1.712	0.788	1.837
		C	0.000	0.215	0.130	0.231
T7	114.40-107.73	A	0.000	1.674	1.146	1.808
		B	0.000	1.655	0.769	1.788
		C	0.000	0.208	0.127	0.224
T8	107.73-100.98	A	0.000	2.608	1.618	2.587
		B	0.000	2.278	0.974	2.260
		C	0.000	0.286	0.161	0.283
T9	100.98-94.23	A	0.000	1.786	1.228	1.960
		B	0.000	1.576	0.748	1.730
		C	0.000	0.195	0.122	0.214
T10	94.23-87.56	A	0.000	1.740	1.210	1.926
		B	0.000	1.663	0.798	1.840
		C	0.000	0.190	0.120	0.210
T11	87.56-80.81	A	0.000	2.600	1.685	2.727
		B	0.000	2.440	1.136	2.560
		C	0.000	0.266	0.160	0.279
T12	80.81-74.06	A	0.000	1.794	1.497	2.429
		B	0.000	1.675	1.015	2.268
		C	0.000	0.180	0.140	0.244
T13	74.06-67.40	A	0.000	2.539	1.870	3.026
		B	0.000	2.369	1.268	2.823
		C	0.000	0.255	0.175	0.304
T14	67.40-60.62	A	0.000	2.486	1.912	3.085
		B	0.000	2.317	1.297	2.876
		C	0.000	0.249	0.179	0.309
T15	60.62-50.52	A	0.000	1.907	1.622	2.687
		B	0.000	1.691	1.080	2.383
		C	0.000	0.181	0.149	0.255

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job HRT 086 943248, CT BU#806378 (Modified)	Page 14 of 30
	Project Vertical Structures Job No. 2015-004-007	Date 10:07:17 03/30/15
	Client Crown Castle	Designed by Daryn Ward

Section	Elevation ft	Face	A_R	A_R	A_F	A_F
			ft ²	Ice ft ²	ft ²	Ice ft ²
T16	50.52-40.42	A	0.000	2.599	2.161	3.564
		B	0.000	2.419	1.477	3.317
		C	0.000	0.245	0.199	0.337
T17	40.42-30.31	A	0.000	2.473	2.249	3.679
		B	0.000	2.304	1.539	3.428
		C	0.000	0.233	0.207	0.346
T18	30.31-20.21	A	0.000	5.588	4.166	6.800
		B	0.000	5.203	2.851	6.332
		C	0.000	0.525	0.383	0.639
T19	20.21-0.00	A	0.000	2.001	2.145	3.501
		B	0.000	1.574	1.234	2.755
		C	0.000	0.157	0.165	0.275

Feed Line Center of Pressure

Section	Elevation ft	CP_x	CP_z	CP_x	CP_z
		in	in	Ice in	Ice in
T1	161.38-141.25	-1.9380	-10.6798	-0.9171	-5.3068
T2	141.25-136.19	-2.6899	-10.6571	-1.4099	-5.2938
T3	136.19-131.19	-1.8986	-16.6588	-0.8328	-10.4197
T4	131.19-126.19	-1.9874	-17.5438	-0.8832	-10.9952
T5	126.19-121.13	-1.1226	-19.2068	-0.3498	-12.2598
T6	121.13-114.40	-1.0890	-19.3082	-0.3589	-13.3344
T7	114.40-107.73	-7.3331	-15.3459	-5.0724	-10.5922
T8	107.73-100.98	-8.4022	-13.7642	-5.5936	-8.8408
T9	100.98-94.23	-8.3791	-13.8496	-6.2001	-10.1161
T10	94.23-87.56	-8.2740	-14.6706	-6.0663	-11.1818
T11	87.56-80.81	-7.7236	-15.1951	-5.5342	-10.3198
T12	80.81-74.06	-8.2096	-16.6224	-6.4429	-12.2830
T13	74.06-67.40	-7.5948	-15.3735	-5.6439	-10.5461
T14	67.40-60.62	-7.9620	-16.1129	-5.9301	-11.0871
T15	60.62-50.52	-10.6146	-21.8769	-8.5540	-17.5649
T16	50.52-40.42	-9.8466	-20.8210	-7.5684	-16.6772
T17	40.42-30.31	-10.0588	-21.2925	-7.8229	-17.2621
T18	30.31-20.21	-8.2307	-17.4193	-5.5682	-11.6936
T19	20.21-0.00	-7.4777	-14.0746	-6.1847	-12.1823

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:	Azimuth Adjustment	Placement	C_{AA}	C_{AA}	Weight	
			Horz Lateral			Vert	Front		Side
			ft	°	ft	ft ²	ft ²	lb	
Sector Mount [SM 504-3] (Verizon Wireless)	A	None		0.0000	157.00	No Ice	34.25	34.25	1707.90
						1/2" Ice	48.98	48.98	2286.00
						1" Ice	63.71	63.71	2864.10
						2" Ice	93.17	93.17	4020.30
						4" Ice	152.09	152.09	6332.70

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	15 of 30
	Project	Vertical Structures Job No. 2015-004-007	Date	10:07:17 03/30/15
	Client	Crown Castle	Designed by	Daryn Ward

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA}		Weight
			Horz	Lateral			Front	Side	
			ft	ft	°	ft	ft ²	ft ²	lb
(2) APL866513-42T6 w/ 8' Pipe Mount (VSI) (Verizon Wireless)	A	From Leg	4.25	-30.0000	157.00	No Ice	5.24	5.63	44.90
			-2.50			1/2" Ice	6.03	6.83	97.28
			1.00			1" Ice	6.75	7.88	156.17
						2" Ice	8.04	9.65	297.44
						4" Ice	10.78	13.41	711.44
(2) LPA-80063/4CF w/ Mount Pipe (VSI) (Verizon Wireless)	B	From Leg	4.25	-30.0000	157.00	No Ice	7.02	6.95	34.60
			-2.50			1/2" Ice	7.43	7.59	97.91
			1.00			1" Ice	7.86	8.25	167.60
						2" Ice	8.73	9.63	328.69
						4" Ice	10.57	12.73	761.38
(2) LPA-80063/4CFx5 w/Mount Pipe (Verizon Wireless)	C	From Leg	4.25	-30.0000	157.00	No Ice	7.73	7.75	45.55
			-2.50			1/2" Ice	8.46	8.87	116.68
			1.00			1" Ice	9.07	9.71	194.79
						2" Ice	10.32	11.43	375.62
						4" Ice	12.96	15.08	869.71
(2) HBXX-6517DS-VTM w/ Mount Pipe (Verizon Wireless)	A	From Leg	4.25	-30.0000	157.00	No Ice	9.16	7.14	72.20
			-2.50			1/2" Ice	9.91	8.44	143.79
			1.00			1" Ice	10.63	9.58	223.71
						2" Ice	12.03	11.55	412.53
						4" Ice	14.95	15.73	943.57
(2) HBXX-6517DS-VTM w/ Mount Pipe (Verizon Wireless)	B	From Leg	4.25	-30.0000	157.00	No Ice	9.16	7.14	72.20
			-2.50			1/2" Ice	9.91	8.44	143.79
			1.00			1" Ice	10.63	9.58	223.71
						2" Ice	12.03	11.55	412.53
						4" Ice	14.95	15.73	943.57
(2) HBXX-6517DS-VTM w/ Mount Pipe (Verizon Wireless)	C	From Leg	4.25	-30.0000	157.00	No Ice	9.16	7.14	72.20
			-2.50			1/2" Ice	9.91	8.44	143.79
			1.00			1" Ice	10.63	9.58	223.71
						2" Ice	12.03	11.55	412.53
						4" Ice	14.95	15.73	943.57
LNx-6514DS-VTM w/ Mount Pipe (Verizon Wireless)	A	From Leg	4.25	-30.0000	157.00	No Ice	8.80	7.24	62.30
			-2.50			1/2" Ice	9.56	8.52	133.45
			1.00			1" Ice	10.29	9.66	212.78
						2" Ice	11.67	11.59	399.94
						4" Ice	14.58	15.85	925.80
LNx-6514DS-VTM w/ Mount Pipe (Verizon Wireless)	B	From Leg	4.25	-30.0000	157.00	No Ice	8.80	7.24	62.30
			-2.50			1/2" Ice	9.56	8.52	133.45
			1.00			1" Ice	10.29	9.66	212.78
						2" Ice	11.67	11.59	399.94
						4" Ice	14.58	15.85	925.80
LNx-6514DS-VTM w/ Mount Pipe (Verizon Wireless)	C	From Leg	4.25	-30.0000	157.00	No Ice	8.80	7.24	62.30
			-2.50			1/2" Ice	9.56	8.52	133.45
			1.00			1" Ice	10.29	9.66	212.78
						2" Ice	11.67	11.59	399.94
						4" Ice	14.58	15.85	925.80
RRH2x60-AWS BTS (Verizon Wireless)	A	From Leg	4.25	-30.0000	157.00	No Ice	3.96	1.82	60.00
			-2.50			1/2" Ice	4.27	2.08	82.72
			1.00			1" Ice	4.60	2.36	109.06
						2" Ice	5.27	2.96	173.43
						4" Ice	6.72	4.25	354.26
RRH2x60-AWS BTS (Verizon Wireless)	B	From Leg	4.25	-30.0000	157.00	No Ice	3.96	1.82	60.00
			-2.50			1/2" Ice	4.27	2.08	82.72
			1.00			1" Ice	4.60	2.36	109.06
						2" Ice	5.27	2.96	173.43
						4" Ice	6.72	4.25	354.26
RRH2x60-AWS BTS (Verizon Wireless)	C	From Leg	4.25	-30.0000	157.00	No Ice	3.96	1.82	60.00
			-2.50			1/2" Ice	4.27	2.08	82.72

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	16 of 30
	Project	Vertical Structures Job No. 2015-004-007	Date	10:07:17 03/30/15
	Client	Crown Castle	Designed by	Daryn Ward

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz	Lateral					
			1.00						
						1" Ice	4.60	2.36	109.06
						2" Ice	5.27	2.96	173.43
						4" Ice	6.72	4.25	354.26
RRH2X60-PCS BTS (Verizon Wireless)	A	From Leg	4.25	-30.0000	157.00	No Ice	2.57	1.55	55.00
			-2.50			1/2" Ice	2.79	1.74	72.91
			1.00			1" Ice	3.02	1.95	93.69
						2" Ice	3.52	2.38	144.64
						4" Ice	4.61	3.34	289.50
RRH2X60-PCS BTS (Verizon Wireless)	B	From Leg	4.25	-30.0000	157.00	No Ice	2.57	1.55	55.00
			-2.50			1/2" Ice	2.79	1.74	72.91
			1.00			1" Ice	3.02	1.95	93.69
						2" Ice	3.52	2.38	144.64
						4" Ice	4.61	3.34	289.50
RRH2X60-PCS BTS (Verizon Wireless)	C	From Leg	4.25	-30.0000	157.00	No Ice	2.57	1.55	55.00
			-2.50			1/2" Ice	2.79	1.74	72.91
			1.00			1" Ice	3.02	1.95	93.69
						2" Ice	3.52	2.38	144.64
						4" Ice	4.61	3.34	289.50
DB-T1-6Z-8AB-0Z BTS (Verizon Wireless)	C	From Leg	4.25	-30.0000	157.00	No Ice	5.60	2.33	44.00
			-2.50			1/2" Ice	5.92	2.56	80.13
			1.00			1" Ice	6.24	2.79	120.22
						2" Ice	6.91	3.28	213.04
						4" Ice	8.37	4.37	454.67
**									
Sector Mount [SM 504-3]	A	None		0.0000	135.00	No Ice	34.25	34.25	1707.90
						1/2" Ice	48.98	48.98	2286.00
						1" Ice	63.71	63.71	2864.10
						2" Ice	93.17	93.17	4020.30
						4" Ice	152.09	152.09	6332.70
7770.00 w/ mount pipe	A	From Leg	3.50	46.0000	135.00	No Ice	6.22	4.35	56.90
			3.50			1/2" Ice	6.77	5.20	105.42
			2.00			1" Ice	7.30	5.92	160.42
						2" Ice	8.38	7.41	293.10
						4" Ice	10.69	10.76	679.83
7770.00 w/ mount pipe	B	From Leg	3.50	46.0000	135.00	No Ice	6.22	4.35	56.90
			3.50			1/2" Ice	6.77	5.20	105.42
			2.00			1" Ice	7.30	5.92	160.42
						2" Ice	8.38	7.41	293.10
						4" Ice	10.69	10.76	679.83
7770.00 w/ mount pipe	C	From Leg	4.00	36.0000	135.00	No Ice	6.22	4.35	56.90
			3.00			1/2" Ice	6.77	5.20	105.42
			2.00			1" Ice	7.30	5.92	160.42
						2" Ice	8.38	7.41	293.10
						4" Ice	10.69	10.76	679.83
LGP13519 Diplexer	A	From Leg	3.50	46.0000	135.00	No Ice	0.00	0.18	5.50
			3.50			1/2" Ice	0.00	0.25	7.92
			2.00			1" Ice	0.00	0.32	11.41
						2" Ice	0.00	0.49	22.43
						4" Ice	0.00	0.94	66.02
LGP13519 Diplexer	B	From Leg	3.50	46.0000	135.00	No Ice	0.00	0.18	5.50
			3.50			1/2" Ice	0.00	0.25	7.92
			2.00			1" Ice	0.00	0.32	11.41
						2" Ice	0.00	0.49	22.43
						4" Ice	0.00	0.94	66.02
LGP13519 Diplexer	C	From Leg	4.00	36.0000	135.00	No Ice	0.00	0.18	5.50
			3.00			1/2" Ice	0.00	0.25	7.92
			2.00			1" Ice	0.00	0.32	11.41

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	17 of 30
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	Client	Crown Castle	Designed by	Daryn Ward

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz Lateral	Vert					
SBNH-1D6565C w/ Mount Pipe	A	From Leg	3.50	46.0000	135.00	2" Ice	0.00	0.49	22.43
						4" Ice	0.00	0.94	66.02
						No Ice	11.45	9.60	95.30
						1/2" Ice	12.06	11.02	182.27
						1" Ice	12.69	12.29	278.99
						2" Ice	14.03	14.51	505.69
P65-17-XLH-RR w/ Mount Pipe	A	From Leg	3.50	46.0000	135.00	4" Ice	17.05	19.14	1129.60
						No Ice	11.47	8.70	88.20
						1/2" Ice	12.08	10.11	171.36
						1" Ice	12.71	11.38	264.18
						2" Ice	14.07	13.58	482.82
						4" Ice	17.08	18.18	1089.49
(2) P65-17-XLH-RR w/ Mount Pipe	B	From Leg	3.50	46.0000	135.00	No Ice	11.47	8.70	88.20
						1/2" Ice	12.08	10.11	171.36
						1" Ice	12.71	11.38	264.18
						2" Ice	14.07	13.58	482.82
						4" Ice	17.08	18.18	1089.49
						No Ice	11.47	8.70	88.20
P65-17-XLH-RR w/ Mount Pipe	C	From Leg	4.00	36.0000	135.00	1/2" Ice	12.08	10.11	171.36
						1" Ice	12.71	11.38	264.18
						2" Ice	14.07	13.58	482.82
						4" Ice	17.08	18.18	1089.49
						No Ice	11.47	8.70	88.20
						1/2" Ice	12.06	11.02	182.27
SBNH-1D6565C w/ Mount Pipe	C	From Leg	4.00	36.0000	135.00	1" Ice	12.69	12.29	278.99
						2" Ice	14.03	14.51	505.69
						4" Ice	17.05	19.14	1129.60
						No Ice	3.25	1.37	47.62
						1/2" Ice	3.49	1.55	68.42
						1" Ice	3.74	1.74	92.25
(2) RRUS-11 BTS (19.69 x 16.97 x 7.17)	A	From Leg	3.50	46.0000	135.00	2" Ice	4.27	2.14	149.81
						4" Ice	5.43	3.04	309.89
						No Ice	3.25	1.37	47.62
						1/2" Ice	3.49	1.55	68.42
						1" Ice	3.74	1.74	92.25
						2" Ice	4.27	2.14	149.81
(2) RRUS-11 BTS (19.69 x 16.97 x 7.17)	B	From Leg	3.50	46.0000	135.00	4" Ice	5.43	3.04	309.89
						No Ice	3.25	1.37	47.62
						1/2" Ice	3.49	1.55	68.42
						1" Ice	3.74	1.74	92.25
						2" Ice	4.27	2.14	149.81
						4" Ice	5.43	3.04	309.89
(2) RRUS-11 BTS (19.69 x 16.97 x 7.17)	C	From Leg	4.00	36.0000	135.00	No Ice	3.25	1.37	47.62
						1/2" Ice	3.49	1.55	68.42
						1" Ice	3.74	1.74	92.25
						2" Ice	4.27	2.14	149.81
						4" Ice	5.43	3.04	309.89
						No Ice	3.25	1.37	47.62
DTMABP7819VG12A TMA	A	From Leg	3.50	46.0000	135.00	1/2" Ice	1.14	0.40	19.18
						1" Ice	1.44	0.61	35.63
						2" Ice	1.77	0.86	60.23
						4" Ice	2.54	1.45	140.10
						No Ice	1.14	0.40	19.18
						1/2" Ice	1.28	0.51	26.48
DTMABP7819VG12A TMA	B	From Leg	3.50	46.0000	135.00	1" Ice	1.44	0.61	35.63
						2" Ice	1.77	0.86	60.23
						4" Ice	2.54	1.45	140.10
						No Ice	1.14	0.40	19.18
						1/2" Ice	1.28	0.51	26.48
						1" Ice	1.44	0.61	35.63
DTMABP7819VG12A TMA	C	From Leg	4.00	36.0000	135.00	2" Ice	1.77	0.86	60.23
						4" Ice	2.54	1.45	140.10
						No Ice	1.14	0.40	19.18
						1/2" Ice	1.28	0.51	26.48
						1" Ice	1.44	0.61	35.63
						2" Ice	1.77	0.86	60.23

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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 lb
DC6-48-60-18-8F	A	From Leg	3.50 3.50 2.00	46.0000	135.00	No Ice 2.57 1/2" Ice 2.80 1" Ice 3.04 2" Ice 3.54 4" Ice 4.66	4.32 4.60 4.88 5.49 6.80	18.90 50.21 85.17 166.87 382.77
** Sector Mount [SM 402-3]	A	None		0.0000	125.00	No Ice 18.91 1/2" Ice 26.78 1" Ice 34.65 2" Ice 50.39 4" Ice 81.87	18.91 26.78 34.65 50.39 81.87	850.68 1233.15 1615.62 2380.56 3910.44
APXVSP18-C-A20 w/ Mount Pipe	A	From Leg	1.28 -0.75 1.00	6.0000	125.00	No Ice 8.50 1/2" Ice 9.15 1" Ice 9.77 2" Ice 11.03 4" Ice 13.68	6.95 8.13 9.02 10.84 14.85	82.55 150.56 226.53 405.98 908.95
APXV9ERR18-C-A20 w/ Mount Pipe	B	From Leg	1.28 -0.75 1.00	46.0000	125.00	No Ice 8.50 1/2" Ice 9.15 1" Ice 9.77 2" Ice 11.03 4" Ice 13.68	7.47 8.66 9.56 11.39 15.53	87.55 158.03 236.54 421.23 935.37
APXVSP18-C-A20 w/ Mount Pipe	C	From Leg	1.28 -0.75 1.00	46.0000	125.00	No Ice 8.50 1/2" Ice 9.15 1" Ice 9.77 2" Ice 11.03 4" Ice 13.68	6.95 8.13 9.02 10.84 14.85	82.55 150.56 226.53 405.98 908.95
APXVTM14-C-120 w/ Mount Pipe	A	From Leg	1.28 -0.75 1.00	6.0000	125.00	No Ice 7.68 1/2" Ice 8.48 1" Ice 9.21 2" Ice 10.57 4" Ice 13.43	5.51 6.69 7.73 9.54 13.47	82.20 142.82 210.60 371.59 832.80
APXVTM14-C-120 w/ Mount Pipe	B	From Leg	1.28 -0.75 1.00	46.0000	125.00	No Ice 7.68 1/2" Ice 8.48 1" Ice 9.21 2" Ice 10.57 4" Ice 13.43	5.51 6.69 7.73 9.54 13.47	82.20 142.82 210.60 371.59 832.80
APXVTM14-C-120 w/ Mount Pipe	C	From Leg	1.28 -0.75 1.00	46.0000	125.00	No Ice 7.68 1/2" Ice 8.48 1" Ice 9.21 2" Ice 10.57 4" Ice 13.43	5.51 6.69 7.73 9.54 13.47	82.20 142.82 210.60 371.59 832.80
Pipe Mount [PM 601-3]	C	None		0.0000	125.00	No Ice 4.39 1/2" Ice 5.48 1" Ice 6.57 2" Ice 8.75 4" Ice 13.11	4.39 5.48 6.57 8.75 13.11	195.00 237.41 279.82 364.65 534.30
1900MHz RRH (65MHz) TMA	A	From Leg	1.28 -0.75 1.00	6.0000	125.00	No Ice 2.77 1/2" Ice 3.01 1" Ice 3.26 2" Ice 3.78 4" Ice 4.93	2.70 2.94 3.18 3.70 4.85	60.00 83.90 111.08 176.02 353.75
1900MHz RRH (65MHz) TMA	B	From Leg	1.28 -0.75 1.00	46.0000	125.00	No Ice 2.77 1/2" Ice 3.01 1" Ice 3.26 2" Ice 3.78 4" Ice 4.93	2.70 2.94 3.18 3.70 4.85	60.00 83.90 111.08 176.02 353.75
1900MHz RRH (65MHz)	C	From Leg	1.28	46.0000	125.00	No Ice 2.77	2.70	60.00

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	Client	Crown Castle		Designed by	Daryn Ward

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A _s Front	C _A A _s Side	Weight
			Horz	Lateral					
TMA			-0.75			1/2" Ice	3.01	2.94	83.90
			1.00			1" Ice	3.26	3.18	111.08
						2" Ice	3.78	3.70	176.02
						4" Ice	4.93	4.85	353.75
800MHz 2x50W RRH w/ Filter	A	From Leg	1.28		6.0000	No Ice	2.40	2.25	64.00
			-0.75			1/2" Ice	2.61	2.46	86.12
			1.00			1" Ice	2.83	2.68	111.30
						2" Ice	3.30	3.13	171.62
						4" Ice	4.34	4.15	337.52
800MHz 2x50W RRH w/ Filter	B	From Leg	1.28		46.0000	No Ice	2.40	2.25	64.00
			-0.75			1/2" Ice	2.61	2.46	86.12
			1.00			1" Ice	2.83	2.68	111.30
						2" Ice	3.30	3.13	171.62
						4" Ice	4.34	4.15	337.52
800MHz 2x50W RRH w/ Filter	C	From Leg	1.28		46.0000	No Ice	2.40	2.25	64.00
			-0.75			1/2" Ice	2.61	2.46	86.12
			1.00			1" Ice	2.83	2.68	111.30
						2" Ice	3.30	3.13	171.62
						4" Ice	4.34	4.15	337.52
TD-RRH8x20-25 BTS	A	From Leg	1.28		6.0000	No Ice	4.72	1.70	70.00
			-0.75			1/2" Ice	5.01	1.92	97.15
			1.00			1" Ice	5.32	2.15	127.83
						2" Ice	5.95	2.62	200.54
						4" Ice	7.31	3.68	396.84
TD-RRH8x20-25 BTS	B	From Leg	1.28		46.0000	No Ice	4.72	1.70	70.00
			-0.75			1/2" Ice	5.01	1.92	97.15
			1.00			1" Ice	5.32	2.15	127.83
						2" Ice	5.95	2.62	200.54
						4" Ice	7.31	3.68	396.84
TD-RRH8x20-25 BTS	C	From Leg	1.28		46.0000	No Ice	4.72	1.70	70.00
			-0.75			1/2" Ice	5.01	1.92	97.15
			1.00			1" Ice	5.32	2.15	127.83
						2" Ice	5.95	2.62	200.54
						4" Ice	7.31	3.68	396.84
**									
Side Arm Mount [SO 101-3]	C	None			0.0000	No Ice	7.50	7.50	252.00
						1/2" Ice	8.90	8.90	333.00
						1" Ice	10.30	10.30	414.00
						2" Ice	13.10	13.10	576.00
						4" Ice	18.70	18.70	900.00
(2) AIR 21 B4A B2P w/ Mount Pipe	A	From Leg	2.00		-4.0000	No Ice	7.14	5.96	117.05
			0.00			1/2" Ice	7.83	7.09	177.37
			0.00			1" Ice	8.43	7.96	244.68
						2" Ice	9.66	9.72	403.93
						4" Ice	12.25	13.45	854.96
AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	2.00		-4.0000	No Ice	7.14	5.96	117.05
			0.00			1/2" Ice	7.83	7.09	177.37
			0.00			1" Ice	8.43	7.96	244.68
						2" Ice	9.66	9.72	403.93
						4" Ice	12.25	13.45	854.96
AIR 21 B4A B2P w/ Mount Pipe	B	From Leg	2.00		-4.0000	No Ice	7.14	5.96	117.05
			0.00			1/2" Ice	7.83	7.09	177.37
			0.00			1" Ice	8.43	7.96	244.68
						2" Ice	9.66	9.72	403.93
						4" Ice	12.25	13.45	854.96
(2) AIR 21 B2A B4P w/ Mount Pipe	C	From Leg	2.00		-4.0000	No Ice	7.14	5.96	117.05
			0.00			1/2" Ice	7.83	7.09	177.37

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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 lb
			0.00			1" Ice 8.43	7.96	244.68
						2" Ice 9.66	9.72	403.93
						4" Ice 12.25	13.45	854.96
**								
4'x4" Pipe Mount (Verizon Wireless)	A	From Leg	0.50 0.00 0.00	0.0000	95.00	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00 2" Ice 0.00 4" Ice 0.00	1.32 1.58 1.84 2.46 3.89	44.00 56.99 73.03 114.89 241.97
4" Tube Face Mount (Verizon Wireless)	A	From Face	0.50 0.00 0.00	0.0000	95.00	No Ice 8.33 1/2" Ice 10.40 1" Ice 12.47 2" Ice 16.61 4" Ice 24.89	0.50 1.00 1.50 2.50 4.50	150.00 200.00 250.00 350.00 550.00
4" Tube Face Mount (Verizon Wireless)	B	From Face	0.50 0.00 0.00	0.0000	95.00	No Ice 8.33 1/2" Ice 10.40 1" Ice 12.47 2" Ice 16.61 4" Ice 24.89	0.50 1.00 1.50 2.50 4.50	150.00 200.00 250.00 350.00 550.00
4'x4" Pipe Mount (Verizon Wireless)	A	From Leg	0.50 0.00 0.00	0.0000	86.00	No Ice 0.00 1/2" Ice 0.00 1" Ice 0.00 2" Ice 0.00 4" Ice 0.00	1.32 1.58 1.84 2.46 3.89	44.00 56.99 73.03 114.89 241.97
4" Tube Face Mount (Verizon Wireless)	A	From Face	0.50 0.00 0.00	0.0000	86.00	No Ice 8.33 1/2" Ice 10.40 1" Ice 12.47 2" Ice 16.61 4" Ice 24.89	0.50 1.00 1.50 2.50 4.50	150.00 200.00 250.00 350.00 550.00
Side Arm Mount [SO 202-1] (Verizon Wireless)	C	From Leg	1.00 0.00 0.00	0.0000	57.00	No Ice 2.96 1/2" Ice 4.10 1" Ice 5.24 2" Ice 7.52 4" Ice 12.08	2.53 3.51 4.49 6.45 10.37	110.00 133.55 157.10 204.20 298.40
Generic GPS (VSI) (Verizon Wireless)	C	From Leg	2.00 0.00 3.00	0.0000	57.00	No Ice 1.40 1/2" Ice 1.70 1" Ice 1.90 2" Ice 2.20 4" Ice 2.50	1.40 1.70 1.90 2.20 2.50	25.00 30.00 35.00 40.00 45.00
KS24019-L112A	C	From Leg	2.00 0.00 2.00	0.0000	48.00	No Ice 0.10 1/2" Ice 0.18 1" Ice 0.26 2" Ice 0.42 4" Ice 0.74	0.10 0.18 0.26 0.42 0.74	5.00 6.50 8.00 11.00 17.00
Side Arm Mount [SO 202-1]	C	From Leg	1.00 0.00 0.00	0.0000	48.00	No Ice 2.96 1/2" Ice 4.10 1" Ice 5.24 2" Ice 7.52 4" Ice 12.08	2.53 3.51 4.49 6.45 10.37	110.00 133.55 157.10 204.20 298.40

Dishes

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Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight lb
UHX8-59H (Verizon Wireless)	A	Paraboloid w/Shroud (HP)	From Leg	1.00	46.0000		95.00	8.38	No Ice	461.00
				0.00					1/2" Ice	56.19
				0.00					1" Ice	57.29
									2" Ice	59.49
									4" Ice	63.89
UHX8-59H (Verizon Wireless)	A	Paraboloid w/Shroud (HP)	From Leg	1.00	-14.0000		86.00	8.38	No Ice	461.00
				0.00					1/2" Ice	56.19
				0.00					1" Ice	57.29
									2" Ice	59.49
									4" Ice	63.89

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load Allowable	Allowable Ratio	Criteria
T1	161.375	Leg	A325N	0.6250	4	4588.82	13354.70	0.344	✓	1.333 Bolt Tension
		Diagonal	A325N	0.5000	1	3134.39	4078.13	0.769	✓	1.333 Member Bearing
		Top Girt	A325N	0.5000	1	641.72	2718.75	0.236	✓	1.333 Member Bearing
T2	141.25	Diagonal	A325N	0.5000	1	2763.71	4123.34	0.670	✓	1.333 Bolt Shear
		Top Girt	A325N	0.5000	1	523.19	2718.75	0.192	✓	1.333 Member Bearing
T3	136.188	Diagonal	A325N	0.5000	1	3935.94	4123.34	0.955	✓	1.333 Bolt Shear
T4	131.188	Diagonal	A325N	0.5000	1	4199.24	4123.34	1.018	✓	1.333 Bolt Shear
T5	126.188	Leg	A325N	0.7500	4	11399.30	19173.10	0.595	✓	1.333 Bolt Tension
		Diagonal	A325N	0.5000	1	4926.04	4078.13	1.208	✓	1.333 Member Bearing
T6	121.125	Diagonal	A325X	0.5000	1	5491.64	4757.81	1.154	✓	1.333 Gusset Bearing
T7	114.396	Diagonal	A325X	0.5000	1	5694.81	4757.81	1.197	✓	1.333 Gusset Bearing
T8	107.729	Leg	A325N	0.8750	4	19180.00	26211.00	0.732	✓	1.333 Bolt Tension
		Diagonal	A325X	0.5000	1	6033.98	4757.81	1.268	✓	1.333 Gusset Bearing
		Secondary Horizontal	A325N	0.6250	1	1540.12	4757.81	0.324	✓	1.333 Gusset Bearing
T9	100.979	Diagonal	A325N	0.5000	2	3165.06	4123.34	0.768	✓	1.333 Bolt Shear
T10	94.2292	Diagonal	A325N	0.5000	2	3772.85	4123.34	0.915	✓	1.333 Bolt Shear
T11	87.5625	Leg	A325N	0.8750	4	26848.20	26048.80	1.031	✓	1.333 Bolt Tension
		Diagonal	A325N	0.5000	2	4114.59	8246.68	0.499	✓	1.333 Bolt Shear
		Secondary Horizontal	A325N	0.6250	1	2154.24	5437.50	0.396	✓	1.333 Member Bearing
T12	80.8125	Diagonal	A325N	0.5000	2	4170.92	4123.34	1.012	✓	1.333 Bolt Shear
T13	74.0625	Diagonal	A325N	0.5000	2	4099.08	4123.34	0.994	✓	1.333 Bolt Shear
		Secondary Horizontal	A325N	0.6250	1	2435.93	5800.00	0.420	✓	1.333 Member Bearing
T14	67.3958	Leg	A325N	1.0000	4	34157.20	34222.00	0.998	✓	1.333 Bolt Tension
		Diagonal	A325N	0.5000	2	4191.24	4123.34	1.016	✓	1.333 Bolt Shear

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Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load Allowable	Allowable Ratio	Criteria	
		Secondary Horizontal	A325N	0.6250	1	2732.27	5437.50	0.502	✓	1.333	Member Bearing
T15	60.625	Diagonal	A325N	0.6250	1	9264.91	8609.38	1.076	✓	1.333	Gusset Bearing
T16	50.5208	Leg	A325N	1.0000	4	41186.70	34134.30	1.207	✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	9359.97	8609.38	1.087	✓	1.333	Gusset Bearing
		Secondary Horizontal	A325N	0.6250	1	3291.22	5437.50	0.605	✓	1.333	Member Bearing
T17	40.4167	Diagonal	A325N	0.6250	1	9358.61	8609.38	1.087	✓	1.333	Gusset Bearing
		Secondary Horizontal	A325N	0.6250	1	3407.40	6442.72	0.529	✓	1.333	Bolt Shear
T18	30.3125	Leg	A325N	1.0000	6	31659.70	34346.10	0.922	✓	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	9947.40	8609.38	1.155	✓	1.333	Gusset Bearing
		Horizontal	A325N	0.6250	1	3814.48	5437.50	0.702	✓	1.333	Member Bearing
T19	20.2083	Diagonal	A325N	0.6250	1	9878.45	8609.38	1.147	✓	1.333	Gusset Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P P _a
T1	161.375 - 141.25	ROHN 2 STD	20.13	4.00	61.0 K=1.00	22.549	1.0745	-21468.20	24229.90	0.886
T2	141.25 - 136.188	ROHN 2.5 EH	5.07	5.01	65.0 K=1.00	21.838	2.2535	-23604.50	49213.80	0.480
T3	136.188 - 131.188	ROHN 2.5 EH	5.01	5.01	65.0 K=1.00	21.838	2.2535	-32387.40	49212.70	0.658
T4	131.188 - 126.188	ROHN 2.5 EH	5.01	5.01	65.0 K=1.00	21.838	2.2535	-39879.90	49212.70	0.810
T5	126.188 - 121.125	ROHN 2.5 EH	5.07	5.01	65.0 K=1.00	21.838	2.2535	-53961.50	49213.80	1.096
T6	121.125 - 114.396	ROHN 3 EH	6.74	6.68	70.5 K=1.00	20.841	3.0159	-59380.40	62855.40	0.945
T7	114.396 - 107.729	ROHN 3 EH	6.68	6.68	70.5 K=1.00	20.841	3.0159	-71153.70	62854.10	1.132
T8	107.729 - 100.979	ROHN 3 EH	6.76	3.45	36.4 K=1.00	26.326	3.0159	-88807.40	79397.20	1.119
T9	100.979 - 94.2292	ROHN 3.5 EH	6.76	6.68	61.3 K=1.00	22.489	3.6784	-94541.10	82724.80	1.143
T10	94.2292 - 87.5625	ROHN 3.5 EH	6.68	6.68	61.3 K=1.00	22.489	3.6784	-105506.00	82722.60	1.275
T11	87.5625 - 80.8125	ROHN 3.5 EH	6.76	3.43	31.5 K=1.00	26.965	3.6784	-124218.00	99190.30	1.252
T12	80.8125 -	ROHN 4 EH	6.76	6.68	54.3	23.671	4.4074	-129507.00	104328.00	1.241

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T13	74.0625 - 67.3958	ROHN 4 EH	6.68	3.42	K=1.00 27.8	27.417	4.4074	-140446.00	120840.00	1.162
T14	67.3958 - 60.625	ROHN 4 EH	6.78	3.42	K=1.00 27.8	27.423	4.4074	-157539.00	120863.00	1.303
T15	60.625 - 50.5208	ROHN 5 EH	10.12	10.02	K=1.00 65.4	21.782	6.1120	-165162.00	133130.00	1.241
T16	50.5208 - 40.4167	ROHN 5 EH	10.12	5.16	K=1.00 33.7	26.687	6.1120	-189787.00	163110.00	1.164
T17	40.4167 - 30.3125	ROHN 5 EH	10.12	5.16	K=1.00 33.7	26.689	6.1120	-196466.00	163123.00	1.204
T18	30.3125 - 20.2083	ROHN 5 EH	10.12	2.50	K=1.00 16.3	28.672	6.1120	-219938.00	175245.00	1.255
T19	20.2083 - 0	ROHN 6 STD w/ 2" B7 (Composite Controls) (VSI)	20.24	10.02	K=1.00 66.0	21.666	8.7220	-248895.00	188970.00	1.317

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T1	161.375 - 141.25	L1 3/4x1 3/4x3/16	7.00	3.50	K=1.00 122.3	9.945	0.6211	-3088.97	6176.81	0.500
T2	141.25 - 136.188	L1 3/4x1 3/4x3/16	7.74	4.01	K=1.00 140.2	7.601	0.6211	-2763.71	4720.80	0.585
T3	136.188 - 131.188	L1 3/4x1 3/4x3/16	8.15	4.22	K=1.00 147.4	6.876	0.6211	-3935.94	4270.79	0.922
T4	131.188 - 126.188	L1 3/4x1 3/4x3/16	8.58	4.43	K=1.00 154.7	6.236	0.6211	-4199.24	3873.34	1.084
T5	126.188 - 121.125	L2x2x3/16	9.01	4.64	K=1.00 141.4	7.472	0.7150	-4966.59	5342.42	0.930
T6	121.125 - 114.396	L2 1/2x2 1/2x1/4	10.40	5.39	K=1.00 131.8	8.596	1.1900	-5576.19	10229.80	0.545
T7	114.396 - 107.729	L2 1/2x2 1/2x1/4	10.94	5.66	K=1.00 138.4	7.795	1.1900	-5836.91	9275.48	0.629
T8	107.729 - 100.979	L2 1/2x2 1/2x1/4	11.50	5.94	K=1.00 145.1	7.093	1.1900	-6098.40	8440.39	0.723
T9	100.979 - 94.2292	L2 1/2x2 1/2x3/16	12.05	6.21	K=1.00 150.5	6.594	0.9020	-6330.11	5947.78	1.064
T10	94.2292 - 87.5625	L2 1/2x2 1/2x1/4	12.63	6.50	K=1.00 158.9	5.917	1.1900	-7545.69	7041.56	1.072
T11	87.5625 - 80.8125	2L2 1/2x2 1/2x3/16x1/4	13.22	6.79	K=1.00 109.5	11.746	1.8047	-8175.62	21197.00	0.386
T12	80.8125 - 74.0625	2L 'a' > 38.8661 in - 132 L3x3x3/16	13.80	7.08	K=1.00 142.6	7.339	1.0900	-8341.83	8000.01	1.043
T13	74.0625 - 67.3958	L3x3x3/16	14.43	7.40	K=1.00 148.9	6.734	1.0900	-8198.15	7339.81	1.117
T14	67.3958 - 60.625	L3x3x3/16	15.05	7.71	K=1.00 155.1	6.204	1.0900	-8382.49	6762.04	1.240

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T15	60.625 - 50.5208	2L3x3x3/16x1/4	17.35	8.96	121.0 K=1.00	10.086	2.1797	-9542.40	21983.50	0.434 ✓
T16	50.5208 - 40.4167	2L 'a' > 51.1759 in - 177 2L3x3x3/16x1/4	18.19	9.37	126.5 K=1.00	9.320	2.1797	-9755.79	20315.10	0.480 ✓
T17	40.4167 - 30.3125	2L 'a' > 53.5306 in - 186 2L3x3x1/4x1/4	19.07	9.82	132.7 K=1.00	8.485	2.8750	-9700.09	24395.60	0.398 ✓
T18	30.3125 - 20.2083	2L 'a' > 56.2683 in - 198 2L3x3x1/4x1/4	10.21	10.21	104.9 K=1.00	13.546	2.8750	-10920.20	38945.60	0.280 ✓
T19	20.2083 - 0	2L3 1/2x3 1/2x1/4x1/4 2L 'a' > 63.5487 in - 252	21.69	11.11	129.2 K=1.00	8.948	3.3750	-10542.30	30199.90	0.349 ✓

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T18	30.3125 - 20.2083	L3x3x3/16	18.33	18.33	234.2 K=1.00	2.722	1.0900	-3814.48	2967.00	1.286 ✓

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T8	107.729 - 100.979	L1 3/4x1 3/4x1/4	10.28	10.28	180.7 K=0.50	4.572	0.8125	-1540.12	3714.92	0.415 ✓
T11	87.5625 - 80.8125	L2x2x3/16	12.32	12.32	187.7 K=0.50	4.240	0.7150	-2154.24	3031.45	0.711 ✓
T13	74.0625 - 67.3958	L1 3/4x1 3/4x1/4	13.72	13.72	241.1 K=0.50	2.570	0.8125	-2435.93	2087.82	1.167 ✓
T14	67.3958 - 60.625	L2x2x3/16	14.41	14.41	219.4 K=0.50	3.102	0.7150	-2732.27	2217.79	1.232 ✓
T16	50.5208 - 40.4167	L2 1/2x2 1/2x3/16	16.25	16.25	197.0 K=0.50	3.849	0.9020	-3291.22	3471.57	0.948 ✓
T17	40.4167 - 30.3125	L3x3x1/4	17.28	17.28	175.2 K=0.50	4.868	1.4400	-3407.40	7009.43	0.486 ✓

Top Girt Design Data (Compression)

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T1	161.375 - 141.25	L2x2x1/8	6.52	6.52	196.8 K=1.00	3,854	0.4844	-673.91	1866.87	0.361 ✓
T2	141.25 - 136.188	L2x2x1/8	6.57	6.57	198.3 K=1.00	3,798	0.4844	-378.65	1839.78	0.206 ✓

Redundant Horizontal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T18	30.3125 - 20.2083	L2x2x3/16	4.58	4.58	139.6 K=1.00	7.668	0.7150	-3814.48	5482.50	0.696 ✓

Redundant Diagonal (1) Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T18	30.3125 - 20.2083	L2x2x3/16	5.33	5.33	162.4 K=1.00	5.659	0.7150	-2220.11	4046.13	0.549 ✓

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T1	161.375 - 141.25	ROHN 2 STD	20.13	0.06	1.0	30.000	1.0745	18355.30	32235.90	0.569 ✓
T2	141.25 - 136.188	ROHN 2.5 EH	5.07	5.01	65.0	30.000	2.2535	20231.30	67606.20	0.299 ✓
T3	136.188 - 131.188	ROHN 2.5 EH	5.01	5.01	65.0	30.000	2.2535	26684.00	67606.20	0.395 ✓
T4	131.188 - 126.188	ROHN 2.5 EH	5.01	5.01	65.0	30.000	2.2535	33776.70	67606.20	0.500 ✓
T5	126.188 - 121.125	ROHN 2.5 EH	5.07	0.06	0.8	30.000	2.2535	45597.30	67606.20	0.674 ✓
T6	121.125 - 114.396	ROHN 3 EH	6.74	6.68	70.5	30.000	3.0159	50530.10	90477.90	0.558 ✓
T7	114.396 - 107.729	ROHN 3 EH	6.68	6.68	70.5	30.000	3.0159	60994.80	90477.90	0.674 ✓
T8	107.729 -	ROHN 3 EH	6.76	0.08	0.9	30.000	3.0159	76724.60	90477.90	0.848 ✓

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T9	100.979 - 94.2292	ROHN 3.5 EH	6.76	6.68	61.3	30.000	3.6784	81172.90	110352.00	0.736
T10	94.2292 - 87.5625	ROHN 3.5 EH	6.68	6.68	61.3	30.000	3.6784	91244.90	110352.00	0.827
T11	87.5625 - 80.8125	ROHN 3.5 EH	6.76	0.08	0.8	30.000	3.6784	107393.00	110352.00	0.973
T12	80.8125 - 74.0625	ROHN 4 EH	6.76	6.68	54.3	30.000	4.4074	112019.00	132223.00	0.847
T13	74.0625 - 67.3958	ROHN 4 EH	6.68	3.25	26.4	30.000	4.4074	121730.00	132223.00	0.921
T14	67.3958 - 60.625	ROHN 4 EH	6.78	0.10	0.8	30.000	4.4074	136629.00	132223.00	1.033
T15	60.625 - 50.5208	ROHN 5 EH	10.12	10.02	65.4	30.000	6.1120	143262.00	183359.00	0.781
T16	50.5208 - 40.4167	ROHN 5 EH	10.12	0.10	0.7	30.000	6.1120	164747.00	183359.00	0.898
T17	40.4167 - 30.3125	ROHN 5 EH	10.12	4.86	31.7	30.000	6.1120	170587.00	183359.00	0.930
T18	30.3125 - 20.2083	ROHN 5 EH	10.12	0.10	0.7	30.000	6.1120	189958.00	183359.00	1.036
T19	20.2083 - 0	ROHN 6 STD w/ 2" B7 (Composite Controls) (VSI)	20.24	0.10	0.7	30.000	8.7220	214113.00	261660.00	0.818

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio P/P _a
T1	161.375 - 141.25	L1 3/4x1 3/4x3/16	7.00	3.50	78.3	29.000	0.3779	3134.39	10960.00	0.286
T2	141.25 - 136.188	L1 3/4x1 3/4x3/16	7.74	4.01	89.7	29.000	0.3779	2621.46	10960.00	0.239
T3	136.188 - 131.188	L1 3/4x1 3/4x3/16	8.15	4.22	94.3	29.000	0.3779	3883.73	10960.00	0.354
T4	131.188 - 126.188	L1 3/4x1 3/4x3/16	8.58	4.43	99.0	29.000	0.3779	4144.58	10960.00	0.378
T5	126.188 - 121.125	L2x2x3/16	9.01	4.64	90.3	29.000	0.4484	4926.04	13002.40	0.379
T6	121.125 - 114.396	L2 1/2x2 1/2x1/4	10.40	5.39	84.2	29.000	0.7753	5491.64	22484.10	0.244
T7	114.396 - 107.729	L2 1/2x2 1/2x1/4	10.94	5.66	88.4	29.000	0.7753	5694.81	22484.10	0.253
T8	107.729 - 100.979	L2 1/2x2 1/2x1/4	11.50	5.94	92.6	29.000	0.7753	6033.98	22484.10	0.268
T9	100.979 - 94.2292	L2 1/2x2 1/2x3/16	12.05	6.21	95.7	29.000	0.5886	6181.90	17069.70	0.362
T10	94.2292 - 87.5625	L2 1/2x2 1/2x1/4	12.63	6.50	101.4	29.000	0.7753	7279.00	22484.10	0.324
T11	87.5625 - 0	2L2 1/2x2 1/2x3/16x1/4	13.22	6.79	104.7	29.000	1.1777	8229.18	34154.30	0.241

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
	80.8125									✓
T12	80.8125 - 74.0625	2L 'a' > 38.8661 in - 131 L3x3x3/16	13.80	7.08	90.5	29.000	0.7296	8122.87	21158.70	0.384
T13	74.0625 - 67.3958	L3x3x3/16	14.43	7.40	94.5	29.000	0.7296	8019.29	21158.70	0.379
T14	67.3958 - 60.625	L3x3x3/16	15.05	7.71	98.5	29.000	0.7296	8256.67	21158.70	0.390
T15	60.625 - 50.5208	2L3x3x3/16x1/4	17.35	8.96	114.4	29.000	1.4238	9264.91	41291.00	0.224
T16	50.5208 - 40.4167	2L 'a' > 51.1759 in - 176 2L3x3x3/16x1/4	18.19	9.37	119.7	29.000	1.4238	9359.97	41291.00	0.227
T17	40.4167 - 30.3125	2L 'a' > 53.5306 in - 185 2L3x3x1/4x1/4	19.07	9.82	126.7	32.500	1.8750	9358.61	60937.50	0.154
T18	30.3125 - 20.2083	2L 'a' > 56.2683 in - 197 2L3x3x1/4x1/4	10.21	10.21	91.3	32.500	1.8750	9947.40	60937.50	0.163
T19	20.2083 - 0	2L3 1/2x3 1/2x1/4x1/4	21.69	11.11	122.2	32.500	2.2500	9878.45	73125.00	0.135
		2L 'a' > 63.5487 in - 251								✓

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T18	30.3125 - 20.2083	L3x3x3/16	18.33	18.33	234.2	29.000	0.7120	3814.48	20648.90	0.185

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T8	107.729 - 100.979	L1 3/4x1 3/4x1/4	10.28	10.28	233.3	29.000	0.4688	1540.12	13593.80	0.113
T11	87.5625 - 80.8125	L2x2x3/16	12.32	12.32	239.7	29.000	0.4308	2154.24	12492.70	0.172
T13	74.0625 - 67.3958	L1 3/4x1 3/4x1/4	13.72	13.72	311.2	29.000	0.4688	2435.93	13593.80	0.179
T14	67.3958 - 60.625	L2x2x3/16	14.41	14.41	280.2	29.000	0.4308	2732.27	12492.70	0.219
T16	50.5208 - 40.4167	L2 1/2x2 1/2x3/16	16.25	16.25	250.7	29.000	0.5710	3291.22	16559.90	0.199
T17	40.4167 - 30.3125	L3x3x1/4	17.28	17.28	223.0	29.000	0.9394	3407.40	27241.90	0.125

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	28 of 30
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	Client	Crown Castle	Designed by	Daryn Ward

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
										✓

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T1	161.375 - 141.25	L2x2x1/8	6.52	6.52	125.0	29.000	0.3047	641.72	8835.94	0.073
T2	141.25 - 136.188	L2x2x1/8	6.57	6.57	125.9	29.000	0.3047	523.19	8835.94	0.059

Redundant Horizontal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T18	30.3125 - 20.2083	L2x2x3/16	4.58	4.58	89.1	21.600	0.7150	3814.48	15444.00	0.247

Redundant Diagonal (1) Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P lb	Allow. P _a lb	Ratio $\frac{P}{P_a}$
T18	30.3125 - 20.2083	L2x2x3/16	5.33	5.33	103.7	21.600	0.7150	2220.11	15444.00	0.144

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail
T1	161.375 - 141.25	Leg	ROHN 2 STD	3	-21468.20	32298.46	66.5	Pass
T2	141.25 - 136.188	Leg	ROHN 2.5 EH	39	-23604.50	65601.99	36.0	Pass
T3	136.188 - 131.188	Leg	ROHN 2.5 EH	51	-32387.40	65600.53	49.4	Pass
T4	131.188 - 126.188	Leg	ROHN 2.5 EH	60	-39879.90	65600.53	60.8	Pass
T5	126.188 - 121.125	Leg	ROHN 2.5 EH	69	-53961.50	65601.99	82.3	Pass
T6	121.125 - 114.396	Leg	ROHN 3 EH	78	-59380.40	83786.24	70.9	Pass
T7	114.396 -	Leg	ROHN 3 EH	87	-71153.70	83784.51	84.9	Pass

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	29 of 30
	Project	Vertical Structures Job No. 2015-004-007	Date	10:07:17 03/30/15
	Client	Crown Castle	Designed by	Daryn Ward

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail
T8	107.729 107.729 - 100.979	Leg	ROHN 3 EH	96	-88807.40	105836.47	83.9	Pass
T9	100.979 - 94.2292	Leg	ROHN 3.5 EH	108	-94541.10	110272.15	85.7	Pass
T10	94.2292 - 87.5625	Leg	ROHN 3.5 EH	117	-105506.00	110269.22	95.7	Pass
T11	87.5625 - 80.8125	Leg	ROHN 3.5 EH	126	-124218.00	132220.66	93.9	Pass
T12	80.8125 - 74.0625	Leg	ROHN 4 EH	138	-129507.00	139069.22	93.1	Pass
T13	74.0625 - 67.3958	Leg	ROHN 4 EH	147	-140446.00	161079.71	87.2	Pass
T14	67.3958 - 60.625	Leg	ROHN 4 EH	159	-157539.00	161110.37	97.8	Pass
T15	60.625 - 50.5208	Leg	ROHN 5 EH	171	-165162.00	177462.28	93.1	Pass
T16	50.5208 - 40.4167	Leg	ROHN 5 EH	180	-189787.00	217425.62	87.3	Pass
T17	40.4167 - 30.3125	Leg	ROHN 5 EH	192	-196466.00	217442.95	90.5 (b) 90.4	Pass
T18	30.3125 - 20.2083	Leg	ROHN 5 EH	204	-219938.00	233601.58	94.2	Pass
T19	20.2083 - 0	Leg	ROHN 6 STD w/ 2" B7 (Composite Controls) (VSI)	246	-248895.00	251897.00	98.8	Pass
T1	161.375 - 141.25	Diagonal	L1 3/4x1 3/4x3/16	12	-3088.97	8233.69	37.5 57.7 (b)	Pass
T2	141.25 - 136.188	Diagonal	L1 3/4x1 3/4x3/16	48	-2763.71	6292.83	43.9 50.3 (b)	Pass
T3	136.188 - 131.188	Diagonal	L1 3/4x1 3/4x3/16	57	-3935.94	5692.96	69.1 71.6 (b)	Pass
T4	131.188 - 126.188	Diagonal	L1 3/4x1 3/4x3/16	65	-4199.24	5163.16	81.3	Pass
T5	126.188 - 121.125	Diagonal	L2x2x3/16	75	-4966.59	7121.45	69.7 90.6 (b)	Pass
T6	121.125 - 114.396	Diagonal	L2 1/2x2 1/2x1/4	84	-5576.19	13636.32	40.9 86.6 (b)	Pass
T7	114.396 - 107.729	Diagonal	L2 1/2x2 1/2x1/4	93	-5836.91	12364.21	47.2 89.8 (b)	Pass
T8	107.729 - 100.979	Diagonal	L2 1/2x2 1/2x1/4	101	-6098.40	11251.04	54.2 95.1 (b)	Pass
T9	100.979 - 94.2292	Diagonal	L2 1/2x2 1/2x3/16	114	-6330.11	7928.39	79.8	Pass
T10	94.2292 - 87.5625	Diagonal	L2 1/2x2 1/2x1/4	123	-7545.69	9386.40	80.4	Pass
T11	87.5625 - 80.8125	Diagonal	2L2 1/2x2 1/2x3/16x1/4	132	-8175.62	28255.60	28.9 37.4 (b)	Pass
T12	80.8125 - 74.0625	Diagonal	L3x3x3/16	144	-8341.83	10664.01	78.2	Pass
T13	74.0625 - 67.3958	Diagonal	L3x3x3/16	153	-8198.15	9783.97	83.8	Pass
T14	67.3958 - 60.625	Diagonal	L3x3x3/16	165	-8382.49	9013.80	93.0	Pass
T15	60.625 - 50.5208	Diagonal	2L3x3x3/16x1/4	177	-9542.40	29304.00	32.6 80.7 (b)	Pass
T16	50.5208 - 40.4167	Diagonal	2L3x3x3/16x1/4	186	-9755.79	27080.03	36.0 81.6 (b)	Pass
T17	40.4167 - 30.3125	Diagonal	2L3x3x1/4x1/4	198	-9700.09	32519.33	29.8 81.5 (b)	Pass
T18	30.3125 - 20.2083	Diagonal	2L3x3x1/4x1/4	223	-10920.20	51914.48	21.0 86.7 (b)	Pass
T19	20.2083 - 0	Diagonal	2L3 1/2x3 1/2x1/4x1/4	252	-10542.30	40256.47	26.2 86.1 (b)	Pass
T18	30.3125 -	Horizontal	L3x3x3/16	212	-3814.48	3955.01	96.4	Pass

tnxTower Vertical Structures, Inc. 309 Spangler Drive, Suite E Richmond, KY 40475 Phone: (859) 624-8360 FAX: (859) 624-8369	Job	HRT 086 943248, CT BU#806378 (Modified)	Page	30 of 30
	Project	Vertical Structures Job No. 2015-004-007	Date	10:07:17 03/30/15
	Client	Crown Castle	Designed by	Daryn Ward

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail	
T8	20.2083 107.729 - 100.979	Secondary Horizontal	L1 3/4x1 3/4x1/4	104	-1540.12	4951.99	31.1	Pass	
T11	87.5625 - 80.8125	Secondary Horizontal	L2x2x3/16	134	-2154.24	4040.92	53.3	Pass	
T13	74.0625 - 67.3958	Secondary Horizontal	L1 3/4x1 3/4x1/4	156	-2435.93	2783.06	87.5	Pass	
T14	67.3958 - 60.625	Secondary Horizontal	L2x2x3/16	167	-2732.27	2956.31	92.4	Pass	
T16	50.5208 - 40.4167	Secondary Horizontal	L2 1/2x2 1/2x3/16	188	-3291.22	4627.60	71.1	Pass	
T17	40.4167 - 30.3125	Secondary Horizontal	L3x3x1/4	200	-3407.40	9343.57	36.5	Pass	
T1	161.375 - 141.25	Top Girt	L2x2x1/8	5	-673.91	2488.54	39.7 (b)	Pass	
T2	141.25 - 136.188	Top Girt	L2x2x1/8	40	-378.65	2452.43	27.1	Pass	
T18	30.3125 - 20.2083	Redund Horz 1 Bracing	L2x2x3/16	236	-3814.48	7308.17	15.4	Pass	
T18	30.3125 - 20.2083	Redund Diag 1 Bracing	L2x2x3/16	237	-2220.11	5393.49	52.2	Pass	
							Summary		
							Leg (T19)	98.8	Pass
							Diagonal (T8)	95.1	Pass
							Horizontal (T18)	96.4	Pass
							Secondary Horizontal (T14)	92.4	Pass
							Top Girt (T1)	27.1	Pass
							Redund Horz 1 Bracing (T18)	52.2	Pass
							Redund Diag 1 Bracing (T18)	41.2	Pass
							Bolt Checks	95.1	Pass
							RATING =	98.8	Pass

APPENDIX B
BASE LEVEL DRAWING

APPENDIX C
ADDITIONAL CALCULATIONS



ANCHOR BOLT CALCULATIONS

Customer: Crown Castle
Site Name: HRT 086 943248, CT BU#806378
Job Number: 2015-004-007
Tower Model: 160' Rohn SSV Self-Supporting Tower
Date: 3/30/2015

Input Information:

# Bolts	6	
Bolt Diameter	1	in
Bolt Ultimate Tensile Strength, F_u	120	ksi
Steel Grade	A449	
Applied Shear	24.054	kips
Uplift per Leg	213.067	kips

Bolt Cross-Sectional Area, A	0.785	in ²
Applied Shear, f_v	5.10	ksi
Maximum Allowable Tensile Stress, F_t	39.6	ksi
Allowable Tension Force	186.61	kips
Maximum Allowable	248.75	kips
% Capacity	85.7%	

The Bolt Group is sufficient for the applied Uplift Force

Maximum Allowable Tensile Stress, F_t

$$0.43F_u - 1.8f_v \leq 0.33F_u$$

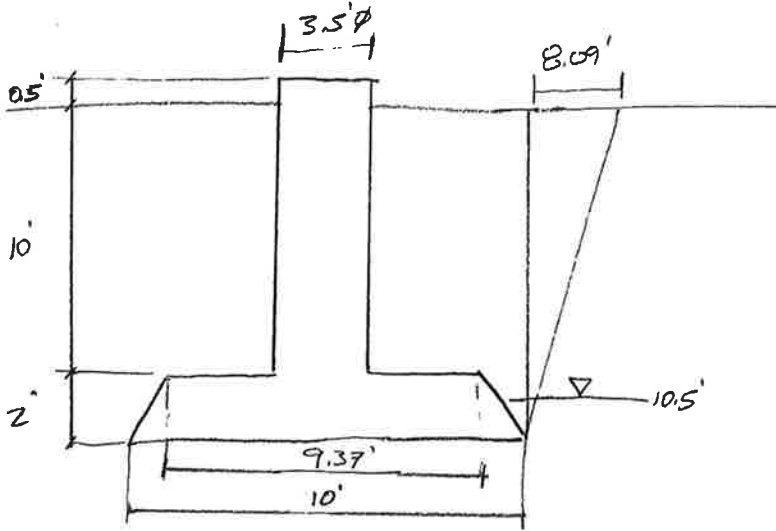
This equation is for threaded parts, A449 bolts over 1 1/2" dia. (threads included in shear plane) Manual of Steel Construction ASD, 9th Edition, pg. 5-74, Table J3.3

S. S. TOWER FOOTING ANALYSIS

**HRT 086 943248, CT BU#806378
VSI Job No. 2015-004-007**

**RICHMOND, KENTUCKY
3/30/2015 1:26:40 PM**

REACTION LOADS	P-DOWN = 247.761 KIPS P-SIDE = 27.180 KIPS P-UP = 213.067 KIPS
FOOTING DIMENSIONS	DEPTH = 12.5 FT. (OVERALL) PEDESTAL WIDTH = 42 IN. PAD WIDTH = 10. FT. PAD THICK. = 24 IN.
PEDESTAL PROJECTION ABOVE GRADE	0.5 FT.
CONCRETE STRENGTH	3.000 K.S.I.
PASSIVE SOIL PRESSURE	0.400 K.S.F./FT. DEPTH
ANGLE OF SOIL RESISTANCE	34 DEG.
WEIGHT OF SOIL, DRY	105 LB./CU.FT.
REINFORCING STEEL	PEDESTAL 8 NUMBER 12 BARS PAD, TOP 11 NUMBER 7 BARS BOTH WAYS PAD, BOTTOM 11 NUMBER 7 BARS BOTH WAYS
MAX. VERT. SOIL PRESSURE	APPLIED = 4.516 K.S.F. ALLOW. = 8.250 K.S.F.
UPLIFT RESISTANCE	See Hand Calcs on Next Page
PEDESTAL STEEL PERCENTAGE	0.80%
PEDESTAL, LEEWARD	DOWN LOAD = 322.09 KIPS BIAXIAL FACTOR = 1.049 MOMENT APPLIED = 4452.1 IN. KIPS MOMENT RESISTING = 19327.6 IN. KIPS
PEDESTALS, SIDE	DOWN LOAD = 22.55 KIPS BIAXIAL FACTOR = 1.01 MOMENT APPLIED = 4452.1 IN. KIPS MOMENT RESISTING = 14576.5 IN. KIPS
PEDESTAL, WINDWARD	UP LOAD = 251.91 KIPS MOMENT APPLIED = 3038.7 IN. KIPS MOMENT RESISTING = 10266.1 IN. KIPS
PAD PUNCHING SHEAR,	APPLIED = 0.062 K.S.I. ALLOW. = 0.219 K.S.I.
PAD, UPLOAD COND.	MOMENT APPLIED = 2002.9 IN. KIPS MOMENT RESISTING = 7899.9 IN. KIPS
PAD, DOWNLOAD COND.	MOMENT APPLIED = 2817.2 IN. KIPS MOMENT RESISTING = 7128.7 IN. KIPS
CONCRETE VOLUME REQUIRED	12.171 CU. YARDS PER FOOTING



$$\gamma_s = 105 \text{ pcf}$$

$$\phi = 34^\circ$$

$$\sigma_{ALL} = 8.25 \text{ ksf}$$

CONSERVATIVELY NEGLECT ADDITIONAL BALLAST FROM TRIANGULAR MAT

$$V_s = \frac{12}{3} (100 + 685.4 + \sqrt{100 \times 685.4}) - V_c = 4188.8 - V_c$$

$$V_c = \frac{3.5^2 \pi}{4} \times 10.5 + 9.37^2 \times 2 = 276.6 \text{ FE}^3$$

$$\therefore V_s = 3912.2 \text{ FE}^3$$

$$W_s = 0.105 (3912.2) = 410.8^k$$

$$W_c = 0.150 \left[\frac{3.5^2 \pi}{4} \times 10.5 + 9.37^2 \times 0.5 \right] + (0.15 - 0.0624) (9.37^2 \times 1.5) = 33.3^k$$

$$U_R = \frac{33.3^k}{1.25} + \frac{410.8^k}{2} = 232.0^k$$



REDUNDANT MEMBER END CONNECTION CALCULATIONS

Customer: Crown Castle
Site Name: HRT 086 943248, CT BU#806378
Job Number: 2015-004-007
Tower Model: 160' Rohn SSV Self-Supporting Tower
Date: 3/30/2015

Redundant Horizontals

Section No.	Elevation (ft)	Size	Bolt Grade	Bolt Size	Number Of Bolts	Connection Tensile Load	Connection Compressive Load	Connection Tension Allowable w/ 4/3	Connection Compression Allowable w/ 4/3	Bolt Shear Allowable w/ 4/3	Member % Capacity
T18	30.31 - 20.21	L2x2x3/16	A325N	0.625	1	3814.5 lb	-3814.5 lb	7250.0 lb	10875.0 lb	8590.0 lb	52.6%

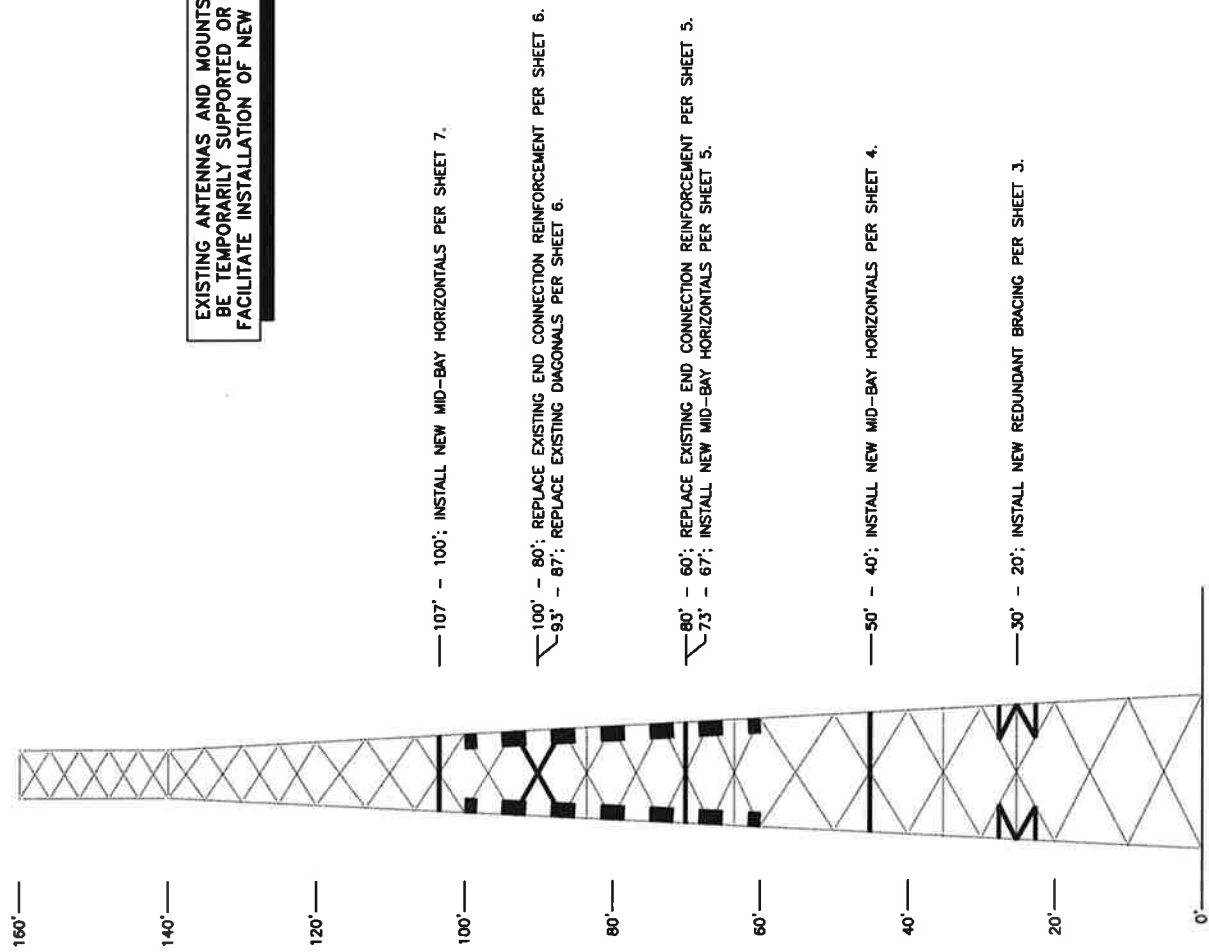
Redundant Diagonals

Section No.	Elevation (ft)	Size	Bolt Grade	Bolt Size	Number Of Bolts	Connection Tensile Load	Connection Compressive Load	Connection Tension Allowable w/ 4/3	Connection Compression Allowable w/ 4/3	Bolt Shear Allowable w/ 4/3	Member % Capacity
T18	30.31 - 20.21	L2x2x3/16	A325N	0.625	1	2220.1 lb	-2220.1 lb	7250.0 lb	10875.0 lb	8590.0 lb	30.6%

APPENDIX D
REQUIRED MODIFICATION DRAWINGS

TABLE OF CONTENTS	
SHEET NO.	DESCRIPTION
SHEET 1	MASTER DRAWING
SHEET 2	NOTES & GENERIC DETAILS
SHEET 3	REDUNDANT BRACING INSTALLATION (30' - 20')
SHEET 4	MID-BAY HORIZONTAL INSTALLATION (50' - 40')
SHEET 5	TOWER MODIFICATIONS (80' - 60')
SHEET 6	TOWER MODIFICATIONS (100' - 80')
SHEET 7	MID-BAY HORIZONTAL INSTALLATION (107' - 100')
SHEET 8	DETAIL & SECTION VIEWS
SHEET 9	DETAIL & SECTION VIEWS
SHEET 10	SECTION VIEWS
SHEET 11	PART DETAILS
SHEET 12	PART DETAILS
SHEET 13	PART DETAILS
S-7	CROWN CASTLE MI CHECKLIST

EXISTING ANTENNAS AND MOUNTS MAY NEED TO BE TEMPORARILY SUPPORTED OR RELOCATED TO FACILITATE INSTALLATION OF NEW REINFORCEMENT.



STRUCTURAL MODIFICATIONS:
 THIS DRAWING DEPICTS THE REWORK REQUIRED TO REMEDY THE DEFICIENCIES FOUND IN THE HRT 086, CT TOWER PER THE REPORT PUBLISHED BY VERTICAL STRUCTURES ON 1-27-15. JOB# 2015-004-002. (REWORK PER FINAL MODIFIED TOWER MODEL, JOB# 2015-004-007.)

A MINIMUM OF 144- 9/16"Ø & 24- 11/16"Ø FIELD DRILLED HOLES ARE REQUIRED FOR THESE MODIFICATIONS. HOLES MUST HAVE TWO COATS OF ZINC RICH COMPOUND PER NOTE 8 ON SHEET 2 BEFORE ASSEMBLY.

CROWN CASTLE BU# 806378	
DRAWN BY: J. COMBS	DATE 2-25-15
CHECKED BY: ANP	DATE
ENGR: DLW	DATE

REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

VERTICAL STRUCTURES INC.
 P.O. Box 106
 Richmond, KY 40476
 Phone: (609) 824-8900
 Fax: (609) 824-8900
 Email: info@verticalstructures.com

FOR
CROWN CASTLE
 2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT
 SHEET 1 OF 13 B TA2015004007-11 SCALE: NONE

TECHNICAL SPECIFICATION NOTES:

- CONTRACTOR: CALL VERTICAL STRUCTURES AT (859) 624-8360 TO MAKE SURE YOU HAVE THE LATEST REVISION OF THIS DRAWING.
- CONTACT THE ENGINEER CONCERNING ANY CHANGES OR MODIFICATIONS THAT MAY BE REQUIRED DUE TO THE EXISTING CONDITIONS.
- ALL S&E GRADE 5 BOLTS TO BE INSTALLED WITH ASTM A194 HEX OR ASTM A194 2H HEAVY HEX NUTS.
- ALL ASTM A325 AND ASTM A490 BOLTS TO BE INSTALLED WITH ASTM A194 2H HEAVY HEX NUTS.
- LOCKING MECHANISM FOR BOLTS TO BE PALNUTS OR LOCKWASHERS UNLESS NOTED OTHERWISE.
- ALL U-BOLTS TO BE INSTALLED WITH ASTM A194 2H HEAVY HEX NUTS AND LOCKWASHERS.
- ANY HARDWARE REMOVED FROM THE EXISTING TOWER MUST BE REPLACED WITH NEW HARDWARE OF EQUAL SIZE AND QUALITY UNLESS NOTED OTHERWISE.
- AFTER FIELD MODIFICATIONS OF ANY STEEL MEMBERS, COAT EXPOSED STEEL SURFACES IN ACCORDANCE WITH CCUSA POLICY "COLD GALVANIZING COMPOUNDS" (DOC# ENG-BUL-10149 REVISION "A" ISSUED 1/20/10; OR MOST RECENT REVISION). CONSULT CROWN CASTLE FOR COPIES OF THIS DOCUMENT.
- FINISHING SPECIFICATIONS - ALL MATERIAL TO BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
 - FABRICATED MATERIAL - ASTM A123.
 - HARDWARE - ASTM A153.
 - C. GUY WIRE - ASTM A475.
- ELEVATIONS SHOWN ARE NOMINAL AND NOT EXACT.
- ALL SHOP WELDING TO BE DONE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE. ALL WELDING TO BE DONE BY AWS CERTIFIED WELDER USING E70XX RODS.
- GUARANTEE PROPER FITUP. ALL DIMENSIONS USED IN FABRICATION DETAILS MUST BE FIELD VERIFIED.
- ALL CONSTRUCTION MUST BE PERFORMED IN ACCORDANCE WITH ANSI/TIA-1019-A STANDARD.

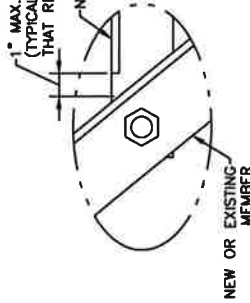
EOB SERVICES NOTE:

- VERTICAL STRUCTURES WILL REQUIRE A WRITTEN PURCHASE ORDER IN THE AMOUNT OF \$900 FOR ENGINEERING SERVICES. THIS FEE WILL INCLUDE SHOP DRAWING REVIEW AND MINOR ASSISTANCE THROUGH THE CONSTRUCTION AND MI PROCESSES. PLEASE SUBMIT THE PURCHASE ORDER AND SHOP DRAWINGS TO EDAPPROVAL@VERTICALSTRUCTURES.COM. VERTICAL STRUCTURES WILL SEND ACKNOWLEDGEMENT OF REQUEST AND HAVE ONE CALENDAR WEEK TO REVIEW SHOP DRAWINGS.

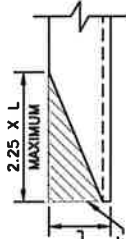
FIELD WELDING SPECIFICATION NOTES:

- SURFACES TO BE CLEARED OF GALVANIZATION BEFORE FIELD WELDING ANY MATERIAL.
- ALL CUTTING AND WELDING ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH CCUSA POLICY "CUTTING AND WELDING SAFETY PLAN" (DOC# ENG-PLN-10015 REVISION "D" ISSUED 12/8/10; OR MOST RECENT REVISION) ON AN ONGOING BASIS THROUGHOUT THE ENTIRE LIFE OF THE PROJECT. PRIOR TO BIDDING REWORK, CONTRACTOR MUST HAVE IN THEIR POSSESSION AND HAVE READ THIS DOCUMENT. CONSULT CROWN CASTLE FOR COPIES OF THIS DOCUMENT.
- ADDITIONAL WELDING NOTE:
 - WELDER TO USE E70XX RODS.

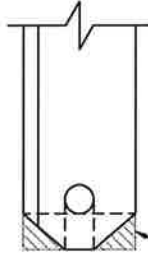
1" MAX. UNLESS OTHERWISE NOTED (TYPICAL FOR ANY CONNECTION THAT REQUIRES A BLOCK)



A. GENERIC BLOCK DETAIL
 ALL MEMBERS MUST BE INSTALLED AS SHOWN ON ELEVATION VIEW



B. GENERIC COPE DETAIL
 MAXIMUM AREA ALLOWED TO BE REMOVED ON ANY COPED MEMBER UNLESS OTHERWISE NOTED



C. GENERIC CLIP DETAIL
 MAXIMUM AREA ALLOWED TO BE REMOVED ON ANY CLIPPED MEMBER UNLESS OTHERWISE NOTED (TYPICAL)

REV.	A	ORIGINAL RELEASE	2-26-15	JAC
		DESCRIPTION	DATE	BY

P.O. Box 1496
 Richmond, KY 40476
 Phone: (859) 624-8360
 Fax: (859) 624-8369
 Email: engineering@verticalstructures.com



FOR

CROWN CASTLE

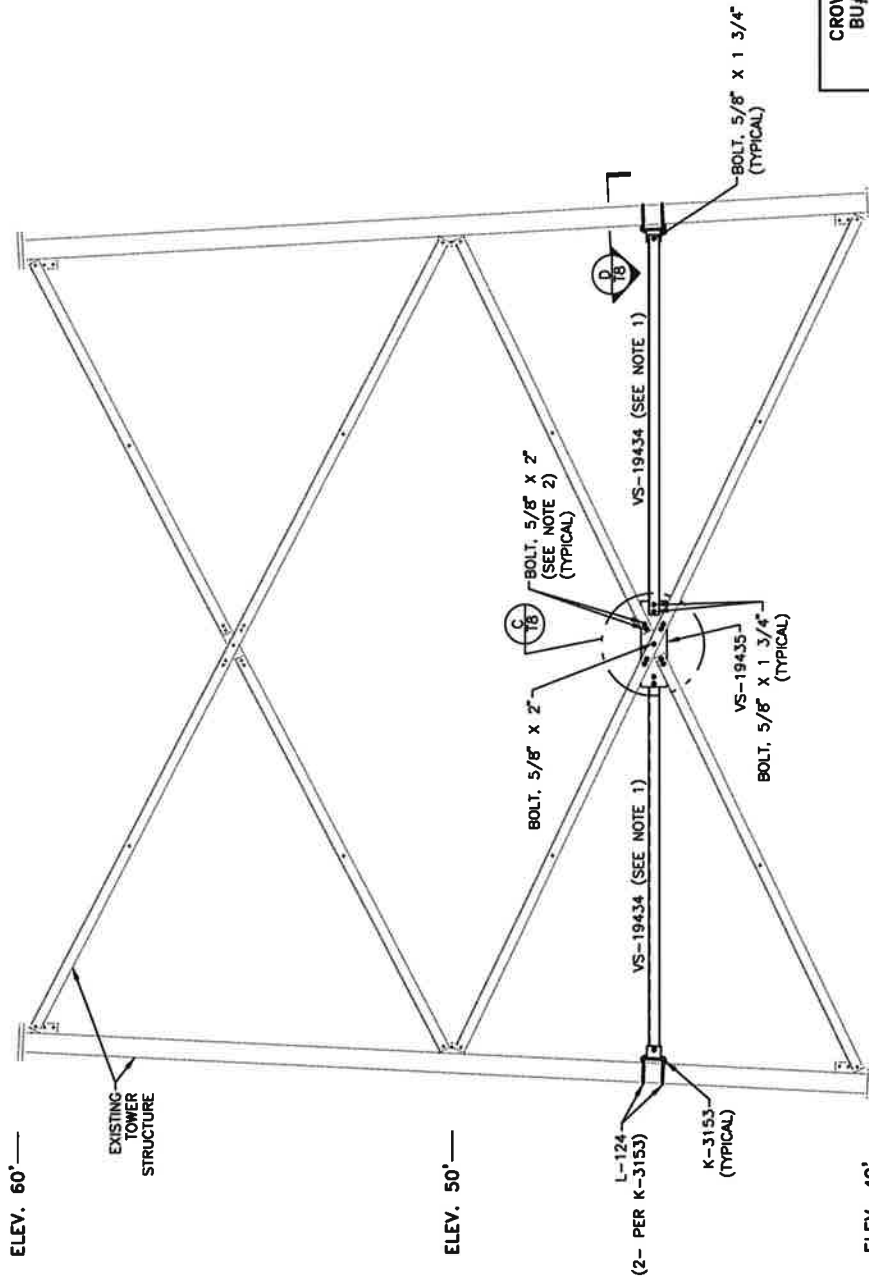
2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

SHEET 2 OF 13 B TA2015004007-72 SCALE: NONE

CROWN CASTLE BU# 806378	
DRAWN BY: J. COMBS	DATE 2-26-15
CHECK'D BY: ANP	DATE
ENGR DLW	DATE

BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
K-3153	3	LEG CLAMP, WELDMENT FOR A 5 9/16" O.D. PIPE	ASTM A36
VS-19434	6	MID-BAY HORIZONTAL, L 2 1/2" X 2 1/2" X 3/16"	ASTM A36
VS-19435	3	GUSSET PLATE, 3/8" THICK	ASTM A36
L-124	6	U-BOLT, 1/2" FOR A 5 9/16" O.D. PIPE	ASTM A36
XX5816	18	BOLT, 5/8" X 1 3/4"	ASTM A325
XX5820	27	BOLT, 5/8" X 2"	ASTM A325

- NOTES:
 1. MID-BAY HORIZONTALS MUST BE INSTALLED LEVEL.
 2. 24- 11/16" FIELD DRILLED HOLES ARE REQUIRED INTO VS-19435.



A ELEVATION VIEW

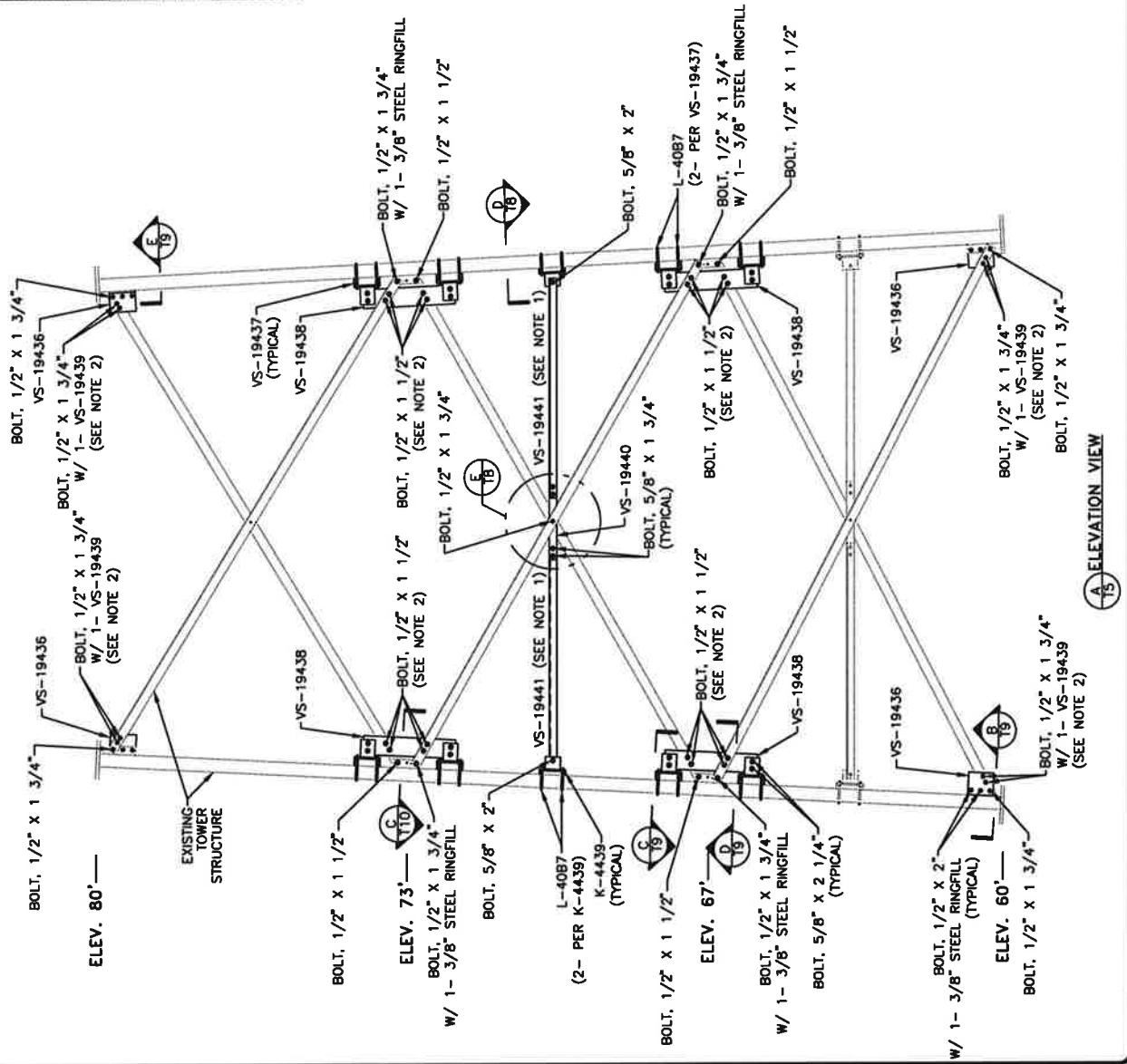
A	ORIGINAL RELEASE	2-26-15	JAC
REV.	DESCRIPTION	DATE	BY
P.O. Box 1496 Richmond, KY 40476 Phone: (609) 624-8292 Fax: (609) 624-8389 Email: engineering@verticalstructures.com			
FOR			
<h1>CROWN CASTLE</h1>			
2015 MODIFICATIONS TOWER REWORK FOR A 160' ROHN SSV S.S. TOWER SITE: HRT 086, CT			
SHEET 4 OF 13		B	TA2015004007-14
			SCALE: NONE

CROWN CASTLE	
BU # 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECK BY:	DATE
ANP	
ENGR:	DATE
DLW	

BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
K-4439	3	LEG CLAMP, WELDMENT FOR 4 1/2" O.D. PIPE	ASTM A36
VS-19436	12	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19437	12	LEG CLAMP, WELDMENT FOR 4 1/2" O.D. PIPE	ASTM A572 GRADE 50
VS-19438	12	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19439	12	SPACER PLATE, 3/16" THICK	ASTM A36
VS-19440	3	GUSSET PLATE, 3/8" THICK	ASTM A36
VS-19441	6	MID-BAY HORIZONTAL, L 1 3/4" X 1 3/4" X 1/4"	ASTM A36
L-4087	30	U-BOLT, 1/2" FOR A 4 1/2" O.D. PIPE	ASTM A193 GRADE B7
XX1214	60	BOLT, 1/2" X 1 1/2"	ASTM A325
XX1215	51	BOLT, 1/2" X 1 3/4"	ASTM A325
XX1220	24	BOLT, 1/2" X 2"	ASTM A325
XX5816	12	BOLT, 5/8" X 1 3/4"	ASTM A325
XX5820	6	BOLT, 5/8" X 2"	ASTM A325
XX5822	48	BOLT, 5/8" X 2 1/4"	ASTM A325
XY0067	36	STEEL RINGFILL, 3/8" THICK	-

- NOTES:
- MID-BAY HORIZONTALS MUST BE INSTALLED LEVEL.
 - 72- 9/16" FIELD DRILLED HOLES ARE REQUIRED INTO NEW TOWER STEEL.

EXISTING END CONNECTION AND GUSSET REINFORCEMENT MUST BE REMOVED TO ACCOMMODATE INSTALLATION OF NEW END CONNECTION REINFORCEMENT.



REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

P.O. Box 1098
Richmond, NY 10476
Phone: (859) 624-8360
Fax: (859) 624-8369
Email: engineering@verticalstructures.com

FOR

CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

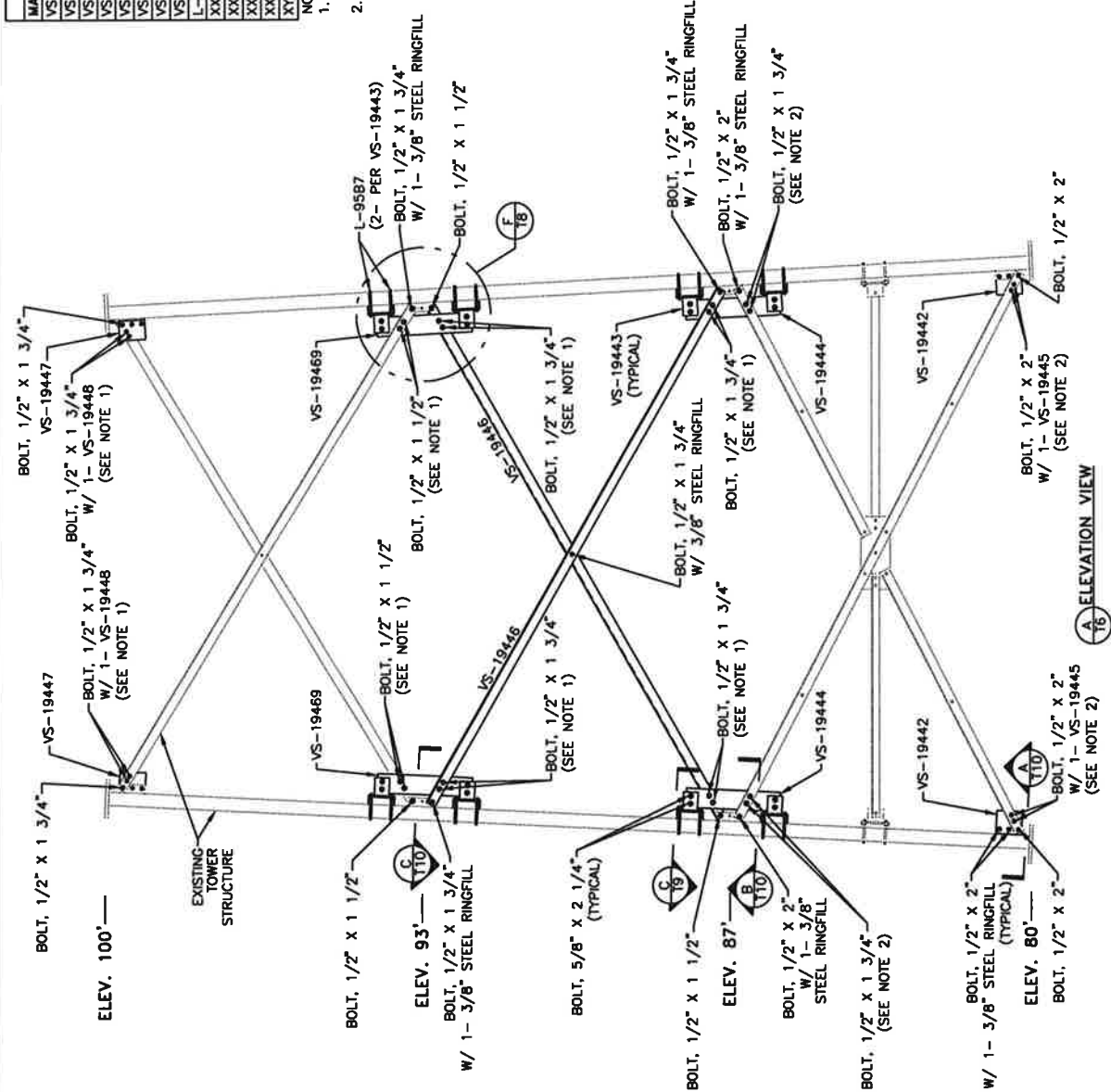
CROWN CASTLE BU # 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECKED BY:	DATE
AMP	
DATE:	DATE
D.W.	

15 ELEVATION VIEW

BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
VS-19442	6	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19443	12	LEG CLAMP, WELDMENT FOR 4" O.D. PIPE	ASTM A572 GRADE 50
VS-19444	6	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19445	6	SPACER PLATE, 3/16" THICK	ASTM A36
VS-19446	6	DIAGONAL, L 2 1/2" X 2 1/2" X 1/4"	ASTM A36
VS-19447	6	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19448	6	SPACER PLATE, 3/16" THICK	ASTM A36
VS-19469	6	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
L-9587	24	U-BOLT, 1/2" FOR A 4" O.D. PIPE	ASTM A193 GRADE B7
XX1214	21	BOLT, 1/2" X 1 1/2"	ASTM A325
XX1216	66	BOLT, 1/2" X 1 3/4"	ASTM A325
XX1220	48	BOLT, 1/2" X 2"	ASTM A325
XX5822	48	BOLT, 5/8" X 2 1/4"	ASTM A325
XY0067	42	STEEL RINGFILL, 3/8" THICK	-

- NOTES:
- 48 - 9/16" FIELD DRILLED HOLES ARE REQUIRED INTO NEW END CONNECTION REINFORCEMENT PLATES.
 - 24 - 9/16" FIELD DRILLED HOLES ARE REQUIRED INTO EXISTING DIAGONALS AND NEW TOWER STEEL. USE EXISTING BOLT HOLE GAUGE LINE.

EXISTING END CONNECTION AND GUSSET REINFORCEMENT MUST BE REMOVED TO ACCOMMODATE INSTALLATION OF NEW END CONNECTION REINFORCEMENT.



CROWN CASTLE BU# 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECKED BY:	DATE
ANP	
ENGR:	DATE
D/LW	

REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

FOR

VERTICAL STRUCTURES INC.

P.O. Box 1468
Richmond, KY 40476
Phone: (606) 854-8380
Fax: (606) 824-8369
Email: engineering@verticalstructures.com

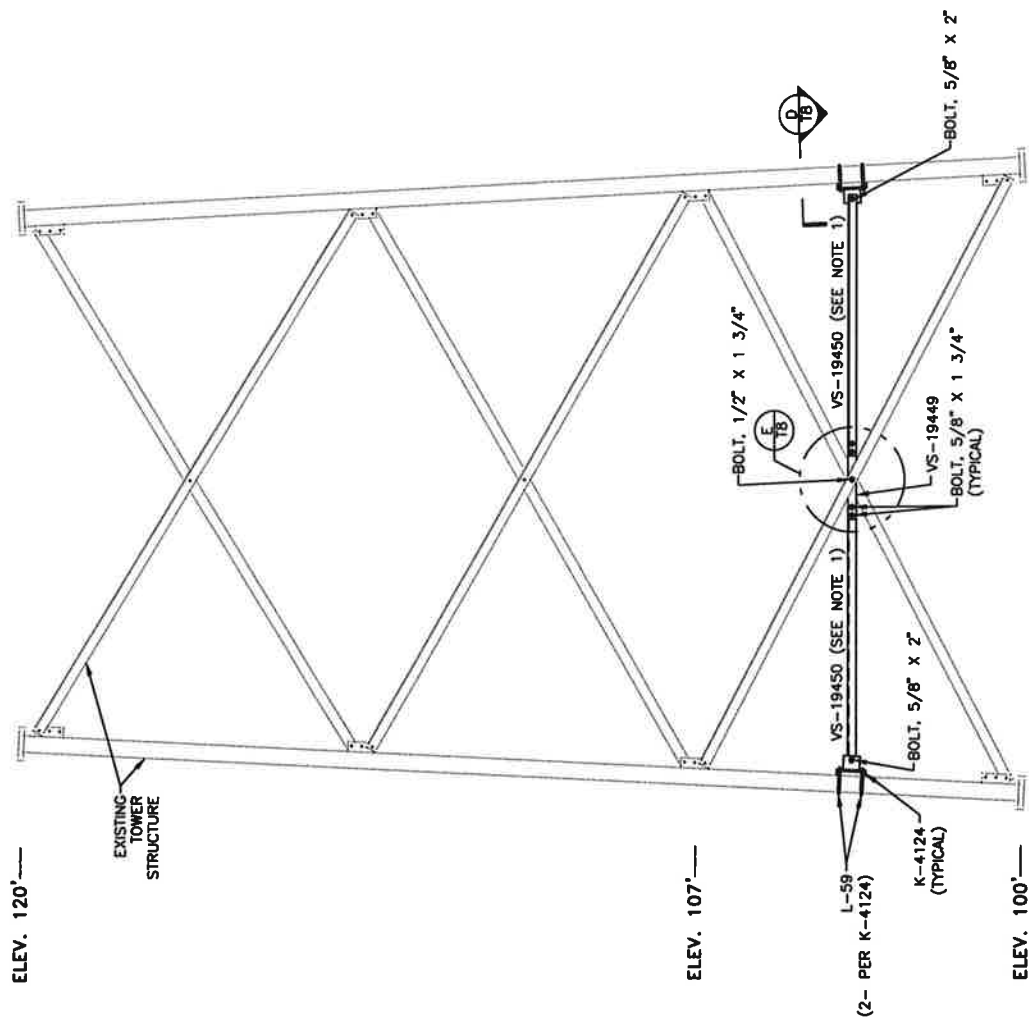
CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

SHEET 6 OF 13	B	TA2015004007-16	SCALE: NONE
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BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
K-4124	3	LEG CLAMP, WELDMENT FOR 3 1/2" O.D. PIPE	ASTM A36
VS-19449	3	GUSSET PLATE, 3/8" THICK	ASTM A36
VS-19450	6	MID-BAY HORIZONTAL, L 1 3/4" X 1 3/4" X 1/4"	ASTM A36
L-59	6	U-BOLT, 1/2" FOR A 3 1/2" O.D. PIPE	ASTM A36
XX1216	3	BOLT, 1/2" X 1 3/4"	ASTM A325
XX5816	12	BOLT, 5/8" X 1 3/4"	ASTM A325
XX5820	6	BOLT, 5/8" X 2"	ASTM A325

NOTE:
1. MID-BAY HORIZONTALS MUST BE INSTALLED LEVEL.



(A) ELEVATION VIEW

REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

FOR

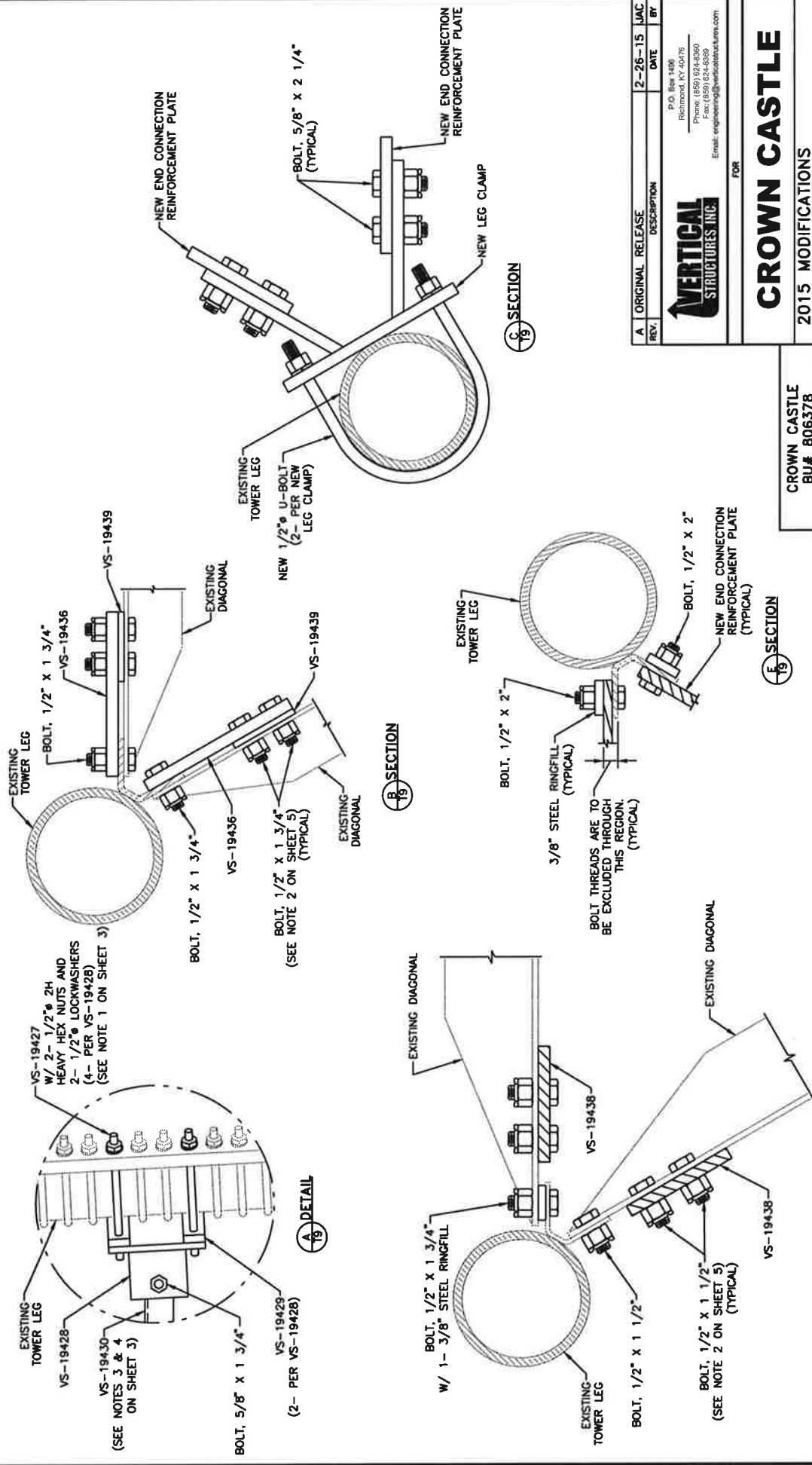
VERTICAL STRUCTURES INC.
P.O. Box 1498
Richmond, KY 40476
Phone: (609) 624-8980
Fax: (609) 624-5889
Email: engineering@verticalstructures.com

CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

SHEET 7 of 13 B TA2015004007-17 SCALE: NONE

CROWN CASTLE BU # 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECK BY:	DATE
AMP	
ENGR:	DATE
D.L.W.	



REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

P.O. Box 1406
Richmond, KY 40476
Phone: (859) 124-8260
Fax: (859) 124-8389
Email: engineering@verticalstructures.com

VERTICAL STRUCTURES INC.

FOR

CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

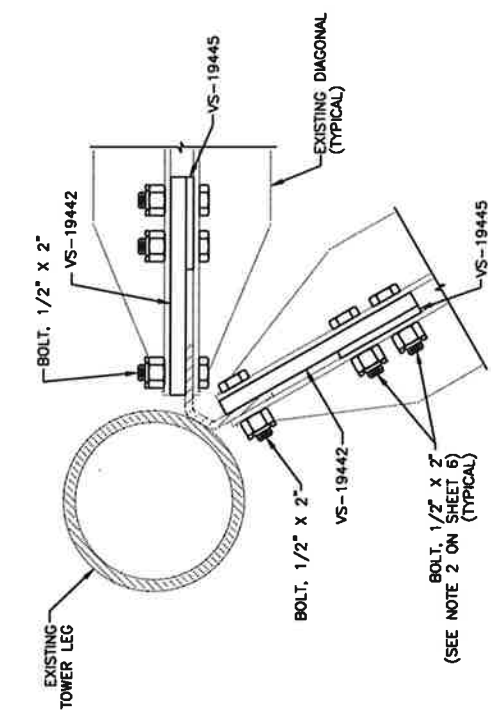
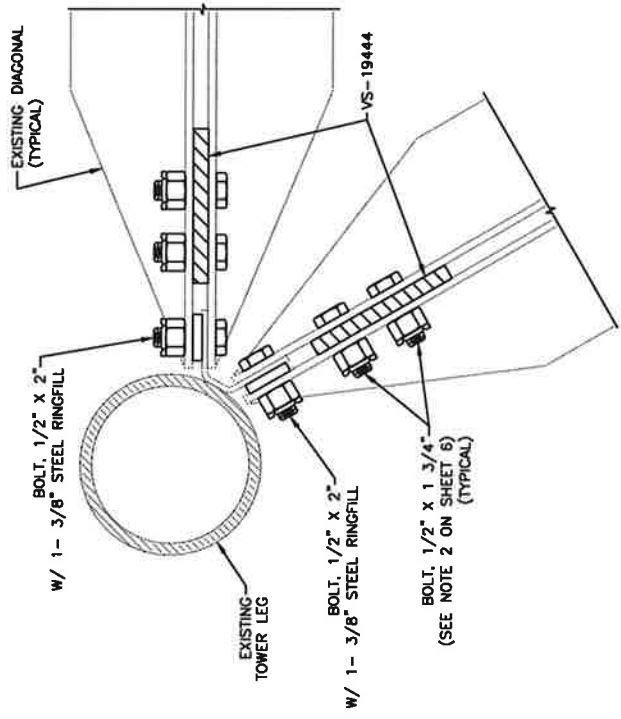
SHEET 9 OF 13 B TA2015004007-19 SCALE: NONE

CROWN CASTLE BU# 806378	
DATE	2-26-15
DATE	2-26-15
DATE	
DATE	

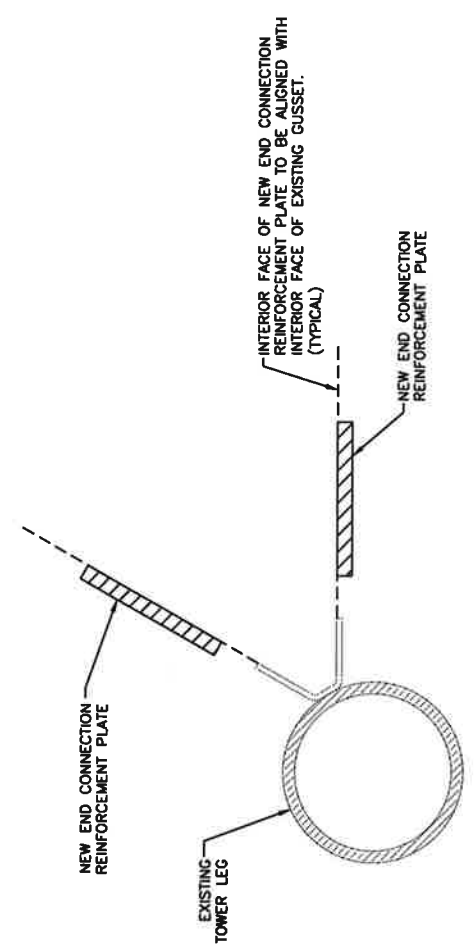
DESIGNER:
J. COMBS

CHECK BY:
ANP

ENGR:
DLW



B SECTION
T10



C SECTION
T10
DIAGONALS NOT SHOWN FOR CLARITY

REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

P.O. Box 1188
 Richmond, KY 40476
 Phone: (609) 624-8800
 Fax: (609) 624-8808
 Email: engineering@verticalstructures.com

VERTICAL STRUCTURES INC.

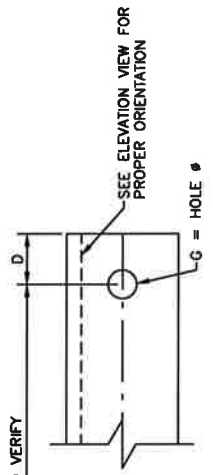
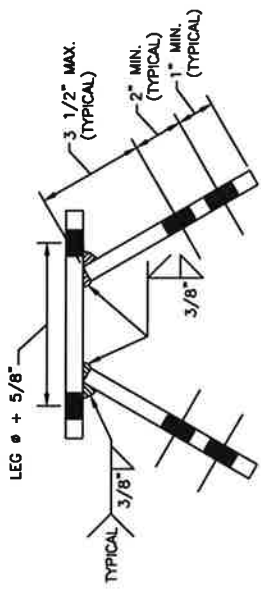
FOR

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

SHEET 10 OF 13	B TA2015004007-T10	SCALE: NONE
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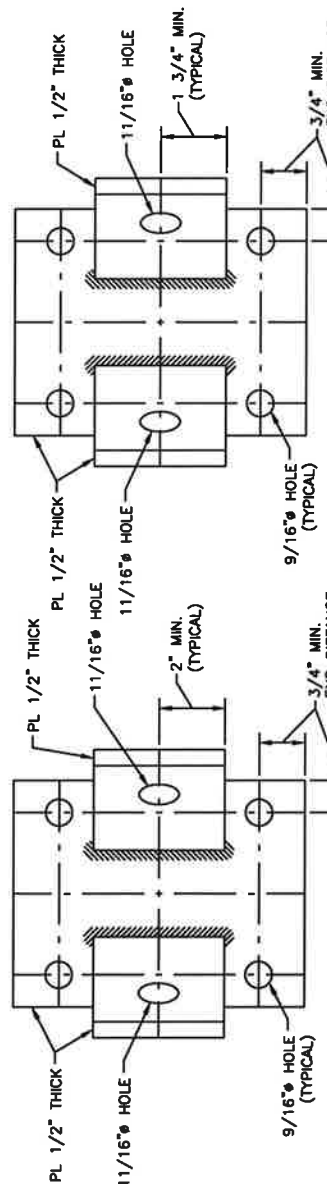
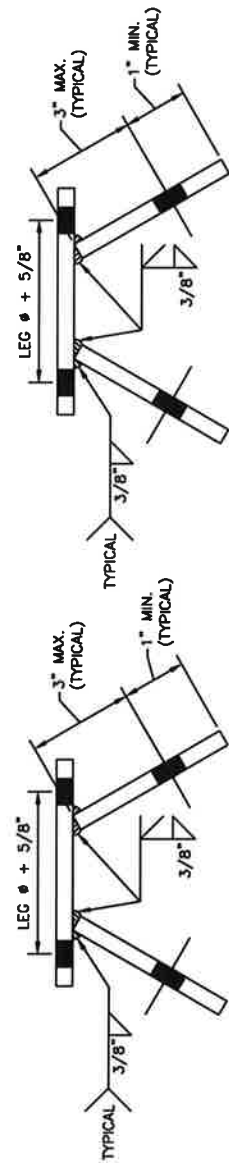
CROWN CASTLE BU# 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECK BY:	DATE
ANP	
ENGR	DATE
D/LW	



A = GAUGE LINE
 B = HOLE Ø
 C = HOLE Ø
 D = HOLE Ø
 E = HOLE Ø
 F = HOLE Ø
 G = HOLE Ø

(A) PART DETAIL

PART DETAIL CHART							
MARK NO.	A	B	C	D	E	F	G
VS-19430	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19431	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19432	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19433	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19434	1 1/4"	1" MINIMUM	2" MINIMUM	1" MINIMUM	11/16"	11/16"	11/16"
VS-19441	1"	1" MINIMUM	2" MINIMUM	1" MINIMUM	11/16"	11/16"	11/16"
VS-19446	1 1/4"	3/4" MINIMUM	N/A	3/4" MINIMUM	9/16"	N/A	9/16"
VS-19450	1"	1" MINIMUM	2" MINIMUM	1" MINIMUM	11/16"	11/16"	11/16"



(C) PART DETAIL
 (11) K-3153, K-4124, & K-4439

(D) PART DETAIL
 (11) VS-19428

(B) PART DETAIL
 (11) VS-19437 & VS-19443

REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

FOR

VERTICAL STRUCTURES INC.
 P.O. Box 1488
 Richmond, KY 40476
 Phone: (606) 624-6360
 Fax: (606) 624-6369
 Email: export@verticalstructures.com

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

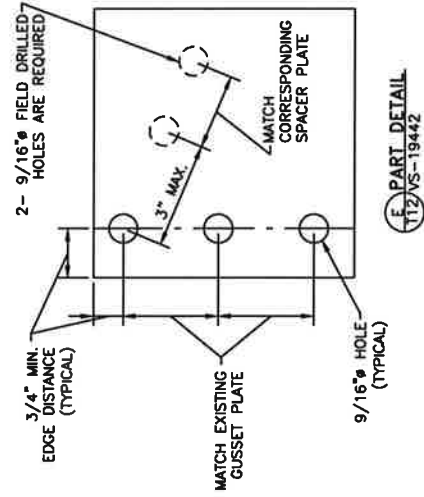
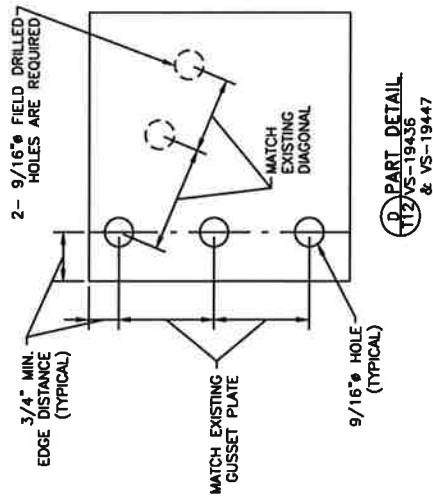
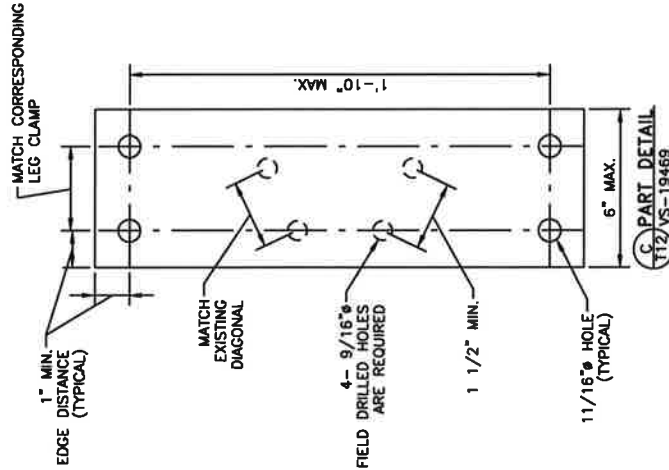
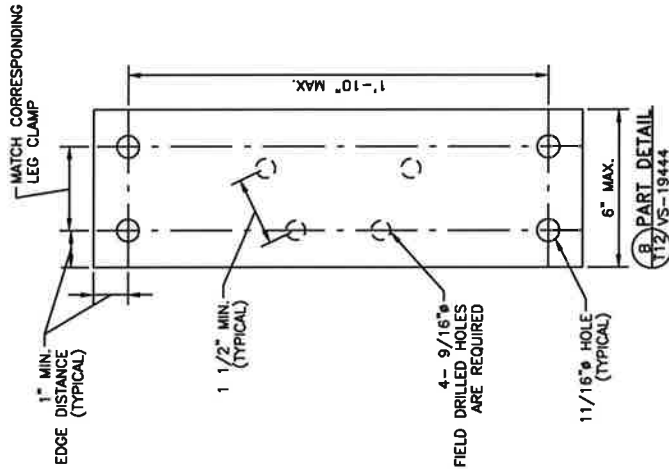
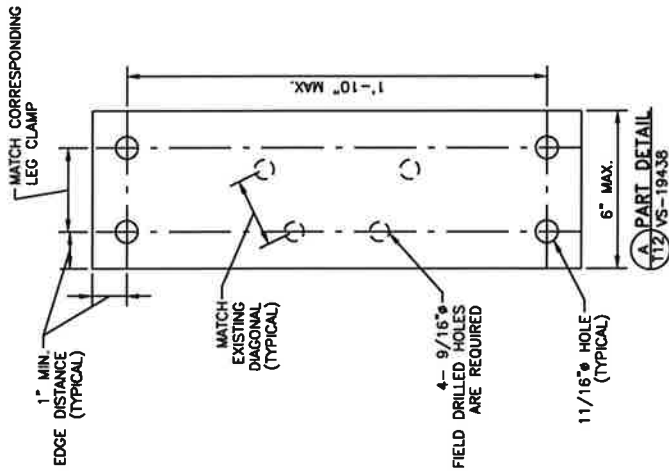
SHEET 11 OF 13 B TA2015004007-111 SCALE: NONE

CROWN CASTLE BU# 806378	
DATE	2-26-15
DATE	
DATE	

DESIGNER:
J. COMBS

CHECK BY:
ANP

ENGR:
DLW



REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

VERTICAL STRUCTURES INC.

FOR

CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

DATE	DATE	DATE
2-26-15		

SCALE: NONE

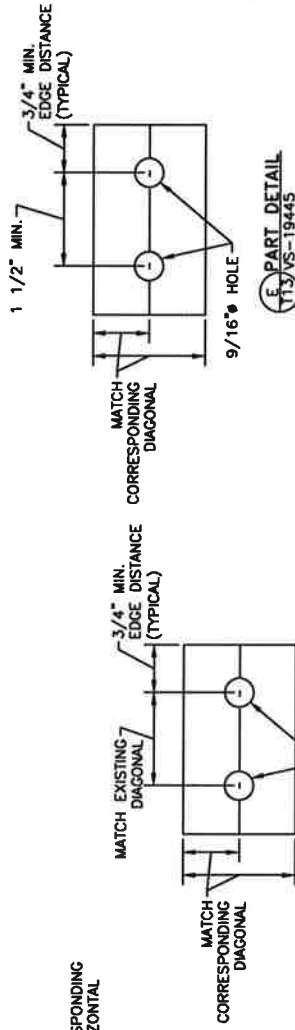
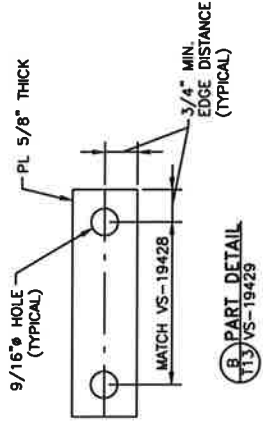
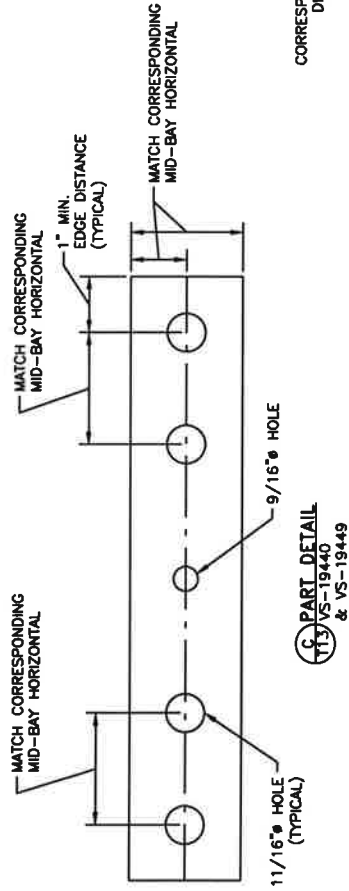
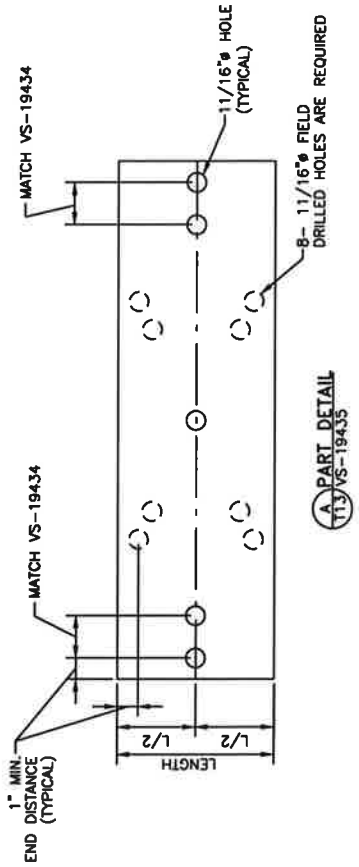
CROWN CASTLE BU# 806378	
DATE	DATE
2-26-15	

FRONTSPERSON:
J. COMBS

CHK'D BY:
ANP

ENGR:
DLW

SHEET 12 OF 13 B TA2015004007-112



P PART DETAIL
(113) VS-19439
& VS-19448

E PART DETAIL
(113) VS-19445

REV.	DESCRIPTION	DATE	JAC
A	ORIGINAL RELEASE	2-26-15	BT

FOR

VERTICAL STRUCTURES INC
P.O. Box 1986
Richmond, KY 40475
Phone: (609) 624-8360
Fax: (609) 624-8369
Email: engineering@verticalstructures.com

CROWN CASTLE BU# 806378	
DRAWN BY:	J. COMBS
DATE	2-26-15
CHK'D BY:	ANP
ENGR.	DJW
DATE	

CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

SHEET 13 OF 13 B TA2015004007-113 SCALE: NONE

MODIFICATION INSPECTION NOTES:

GENERAL

THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

THE MI IS TO CONFIRM INSTALLATION CONFORMANCE AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.

ALL MIs SHALL BE CONDUCTED BY A CROWN ENGINEERING VEEDOR (AEV) OR ENGINEERING SERVICE VEEDOR (AESV) THAT IS APPROVED TO PERFORM ELEVATED WORK FOR CROWN. SEE ENG-BUL-10173 LIST OF APPROVED MI VEEDORS.

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR COORDINATE AND COMMUNICATE AS SOON AS POSSIBLE. THE MI INSPECTOR SHALL BE PROVIDED WITH ALL INFORMATION REGARDING THE PROJECT. IF CONTACT INFORMATION IS NOT KNOWN, CONTACT YOUR CROWN POINT OF CONTACT (POC).

REFERS TO ENG-SOW-10007 : MODIFICATION INSPECTION SOW FOR FURTHER DETAILS AND REQUIREMENTS.

MI INSPECTOR

THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS

THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GENERAL CONTRACTOR (GC) INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO CROWN.

GENERAL CONTRACTOR

THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- DEVELOP A SCHEDULE TO CONDUCT ON-SITE MI INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS
- BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS

THE GC SHALL REPORT AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST AND ENG-SOW-10007.

RECOMMENDATIONS

THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING A MI REPORT:

- IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLY 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SMALL/VOLUNTARILY FOR ANY OUT WIRE TENSIONING OR RE-TENSIONING OPERATIONS.
- IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE ON-SITE VISIT INSPECTIONS TO ALLOW FOUNDATION AND MI INSPECTIONS TO COMMENCE WITH ONE SITE VISIT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON-SITE.

CANCELLATION OR DELAYS IN SCHEDULED MI

IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, CROWN SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF CROWN CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

MI CHECKLIST	
CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
PRE-CONSTRUCTION	
X	MI CHECKLIST DRAWING
X	EOR APPROVED SHOP DRAWINGS
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
N/A	FABRICATOR NDE INSPECTION
N/A	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
CONSTRUCTION	
X	CONSTRUCTION INSPECTIONS
N/A	FOUNDATION INSPECTIONS
N/A	CONCRETE COMP. STRENGTH AND SLUMP TESTS
N/A	POST INSTALLED ANCHOR ROD VERIFICATION
N/A	BASE PLATE GROUT VERIFICATION
N/A	CONTRACTOR'S CERTIFIED WELD INSPECTION
N/A	EARTHWORK: LIFT AND DENSITY
X	ON SITE COLD GALVANIZING VERIFICATION
N/A	OUT WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
ADDITIONAL TESTING AND INSPECTIONS:	
POST-CONSTRUCTION	
N/A	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
N/A	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	

NOTE: X DENOTES A DOCUMENT NEEDED FOR THE PM REPORT
N/A DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE PM REPORT

CORRECTION OF FAILING MIs

IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI (FAILED MIs), THE GC SHALL WORK WITH CROWN TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:

- CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI.
- ORIGINALLY FAILING MIs FOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION

MI VERIFICATION INSPECTIONS

CROWN RESERVES THE RIGHT TO CONDUCT A MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTIONS ON TOWER MODIFICATION PROJECTS.

ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS AND IN ACCORDANCE WITH ENG-SOW-10007.

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT AEV/ASV FROM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "PASSING MI" OR "PASS AS NOTED MI" REPORT FOR THE ORIGINAL PROJECT.

REQUIRED PHOTOS

BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

- PRE-CONSTRUCTION GENERAL SITE CONDITION PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION
- RAW MATERIALS
- CRITICAL DETAILS
- FOUNDATIONS OF MODIFICATIONS
- WELD PREPARATION AND TORQUE
- BOLT INSTALLATION AND TORQUE
- FINAL INSTALLED CONDITION
- CONSTRUCTION PHOTOGRAPHS
- FINAL IN-FIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN FROM THE GROUND SHALL BE CONSIDERED INADEQUATE. THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS. PLEASE REFER TO ENG-SOW-10007.

THE COMPANY OF THE CROWN CASTLE
 125 PIONEER HEIGHTS RD
 SOMERS, CT 06871
 TOLLAND COUNTY, USA

SITE NAME: HRT 088, CT
 BU NUMBER: 06378
 SITE ADDRESS:
 125 PIONEER HEIGHTS RD
 SOMERS, CT 06871
 TOLLAND COUNTY, USA

DRAWN BY: JAG DATE: 2/28/15
 CHECKED BY: DLW DATE:
 SCALE: AS SHOWN
 REVISION: 0

NO.	DATE	DESCRIPTION
1	12-21-15	ORIGINAL RELEASE PER 0171-001-007
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PRINT REQUIRED FOR PROFESSIONAL SEAL

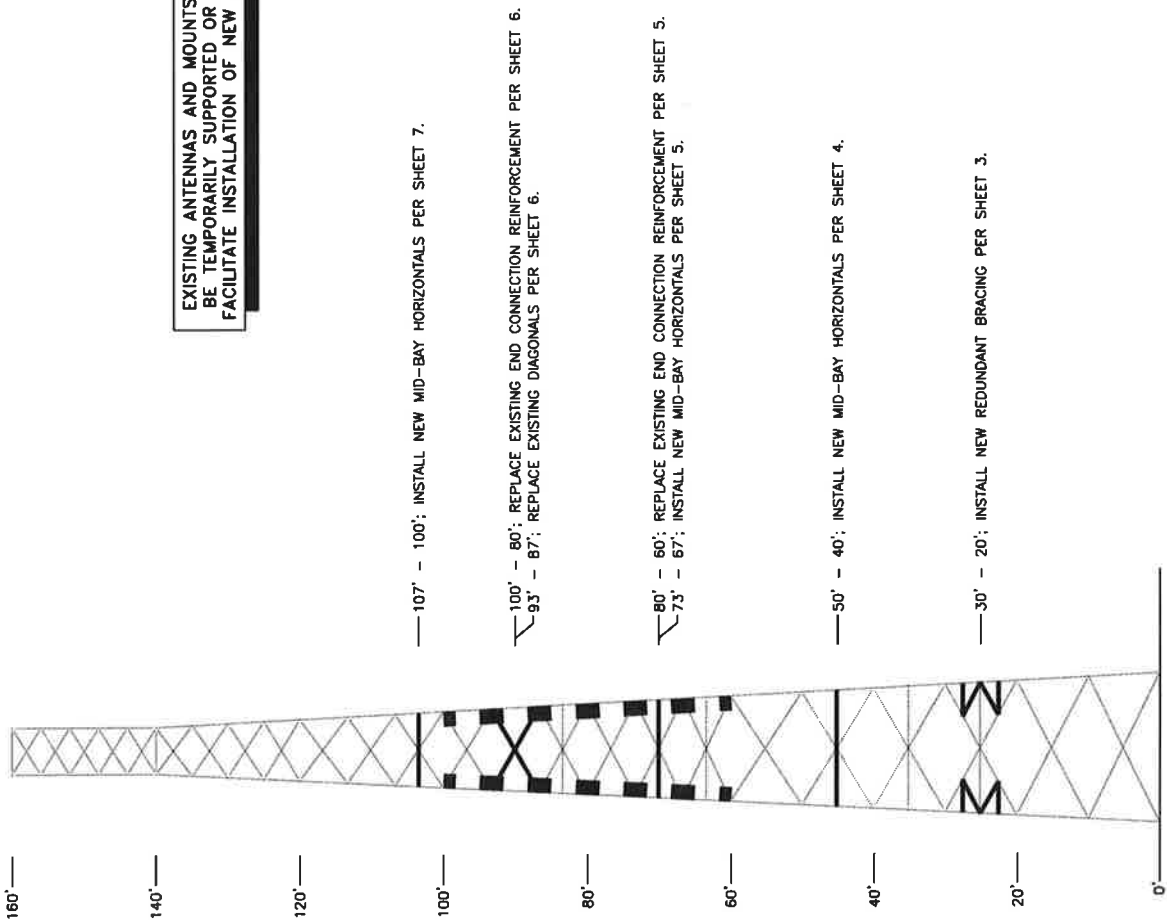
MODIFICATION INSPECTION CHECKLIST

S-7

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SHEET 2	NOTES & GENERIC DETAILS
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SHEET 4	MID-BAY HORIZONTAL INSTALLATION (50' - 40')
SHEET 5	TOWER MODIFICATIONS (80' - 60')
SHEET 6	TOWER MODIFICATIONS (100' - 80')
SHEET 7	MID-BAY HORIZONTAL INSTALLATION (107' - 100')
SHEET 8	DETAIL & SECTION VIEWS
SHEET 9	DETAIL & SECTION VIEWS
SHEET 10	SECTION VIEWS
SHEET 11	PART DETAILS
SHEET 12	PART DETAILS
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S-7	CROWN CASTLE MI CHECKLIST

STRUCTURAL MODIFICATIONS:
 THIS DRAWING DEPICTS THE REWORK REQUIRED TO REMEDY THE DEFICIENCIES FOUND IN THE HRT 086, CT TOWER PER THE REPORT PUBLISHED BY VERTICAL STRUCTURES ON 1-27-15.
 JOB# 2015-004-002. (REWORK PER FINAL MODIFIED TOWER MODEL, JOB# 2015-004-007.)

EXISTING ANTENNAS AND MOUNTS MAY NEED TO BE TEMPORARILY SUPPORTED OR RELOCATED TO FACILITATE INSTALLATION OF NEW REINFORCEMENT.



A MINIMUM OF 144- 9/16"Ø & 24- 11/16"Ø FIELD DRILLED HOLES ARE REQUIRED FOR THESE MODIFICATIONS. HOLES MUST HAVE TWO COATS OF ZINC RICH COMPOUND PER NOTE 8 ON SHEET 2 BEFORE ASSEMBLY.

CROWN CASTLE BU# 806378	
DRAFTSPERSON: J. COMBS	DATE: 2-26-15
CHK'D BY: ANP	DATE:
ENGR: DLW	DATE:

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

VERTICAL STRUCTURES INC.
 P.O. Box 1466
 Richmond, KY 40476
 Phone: (859) 924-8380
 Fax: (859) 924-4580
 Email: engineering@verticalstructures.com

A. ORIGINAL RELEASE	2-26-15	LAC
REV.	DESCRIPTION	DATE BY

CROWN CASTLE
 FOR
 SHEET 1 of 13 B TA2015004007-T1 SCALE: NONE

TECHNICAL SPECIFICATION NOTES:

1. CONTRACTOR: CALL VERTICAL STRUCTURES AT (859) 624-8360 TO MAKE SURE YOU HAVE THE LATEST REVISION OF THIS DRAWING. CONTACT THE ENGINEER CONCERNING ANY CHANGES OR MODIFICATIONS THAT MAY BE REQUIRED DUE TO THE EXISTING CONDITIONS.
2. ALL SAE GRADE 5 BOLTS TO BE INSTALLED WITH ASTM A194 HEX OR ASTM A194 2H HEAVY HEX NUTS.
3. ALL ASTM A194 2H HEAVY HEX BOLTS TO BE INSTALLED WITH ASTM A194 2H HEAVY HEX NUTS.
4. ALL ASTM A194 2H HEAVY HEX BOLTS TO BE PALNUTS OR LOCKWASHERS UNLESS NOTED OTHERWISE.
5. ALL U-BOLTS TO BE INSTALLED WITH ASTM A194 2H HEAVY HEX NUTS AND LOCKWASHERS.
6. ALL HARDWARE REMOVED FROM THE EXISTING TOWER MUST BE REPLACED WITH NEW HARDWARE OF EQUAL SIZE AND QUALITY UNLESS NOTED OTHERWISE.
7. AFTER FIELD MODIFICATIONS OF ANY STEEL MEMBERS, COAT EXPOSED STEEL SURFACES IN ACCORDANCE WITH CCUSA POLICY "COLD GALVANIZING COMPOUNDS" (DOC# ENG-BUL-10149 REVISION "A" ISSUED 1/20/10; OR MOST RECENT REVISION). CONSULT CROWN CASTLE FOR COPIES OF THIS DOCUMENT.
8. FINISHING SPECIFICATIONS - ALL MATERIAL TO BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
 - A. FABRICATED MATERIAL - ASTM A123.
 - B. HARDWARE - ASTM A153.
 - C. GUY WIRE - ASTM A475.
9. ELEVATIONS SHOWN ARE NOMINAL AND NOT EXACT.
10. ALL SHOP WELDING TO BE DONE IN ACCORDANCE WITH AWS D1.1 STRUCTURAL WELDING CODE. ALL WELDING TO BE DONE BY AWS CERTIFIED WELDER USING E70XX RODS.
11. IT IS THE RESPONSIBILITY OF THE MATERIAL SUPPLIER TO GUARANTEE PROPER FITUP. ALL DIMENSIONS USED IN FABRICATION DETAILS MUST BE FIELD VERIFIED.
12. ALL CONSTRUCTION MUST BE PERFORMED IN ACCORDANCE WITH ANS/71A-1019-A STANDARD.

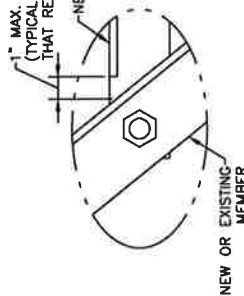
FOR SERVICES NOTE:

1. VERTICAL STRUCTURES WILL REQUIRE A WRITTEN PURCHASE ORDER IN THE AMOUNT OF \$900 FOR ENGINEERING SERVICES. THIS FEE WILL INCLUDE SHOP DRAWING REVIEW AND MINOR ASSISTANCE THROUGH THE CONSTRUCTION AND MI PROCESSES. PLEASE SUBMIT THE PURCHASE ORDER AND SHOP DRAWINGS TO EORAPPROVAL@VERTICALSTRUCTURES.COM. VERTICAL STRUCTURES WILL SEND ACKNOWLEDGEMENT OF REQUEST AND HAVE ONE CALENDAR WEEK TO REVIEW SHOP DRAWINGS.

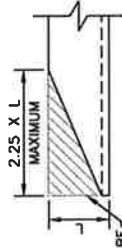
FIELD WELDING SPECIFICATION NOTES:

1. SURFACES TO BE CLEARED OF GALVANIZATION BEFORE FIELD WELDING ANY MATERIAL.
 2. ALL CUTTING AND WELDING ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH CCUSA POLICY "CUTTING AND WELDING SAFETY PLAN" (DOC# ENG-PLN-10015 REVISION "D" ISSUED 12/8/10; OR MOST RECENT REVISION) ON AN ONGOING BASIS THROUGHOUT THE ENTIRE LIFE OF THE PROJECT. PRIOR TO BIDDING REWORK, CONTRACTOR MUST HAVE IN THEIR POSSESSION AND HAVE READ THIS DOCUMENT. CONSULT CROWN CASTLE FOR COPIES OF THIS DOCUMENT.
- ADDITIONAL WELDING NOTE:
 A. WELDER TO USE E70XX RODS.

1" MAX. UNLESS OTHERWISE NOTED (TYPICAL FOR ANY CONNECTION THAT REQUIRES A BLOCK)

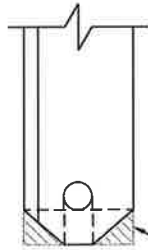


A. GENERIC BLOCK DETAIL
 ALL MEMBERS MUST BE INSTALLED AS SHOWN ON ELEVATION VIEW



MAXIMUM AREA ALLOWED TO BE REMOVED ON ANY COPED MEMBER UNLESS OTHERWISE NOTED

B. GENERIC COPE DETAIL



MAXIMUM AREA ALLOWED TO BE REMOVED ON ANY CLIPPED MEMBER UNLESS OTHERWISE NOTED (TYPICAL)

C. GENERIC CLIP DETAIL

REV.	DESCRIPTION	DATE	BY
A.	ORIGINAL RELEASE	2-26-15	LAC



P.O. Box 1486
 Richmond, KY 40476
 Phone: (859) 624-8360
 Fax: (859) 624-8998
 Email: engineering@verticalstructures.com

FOR

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

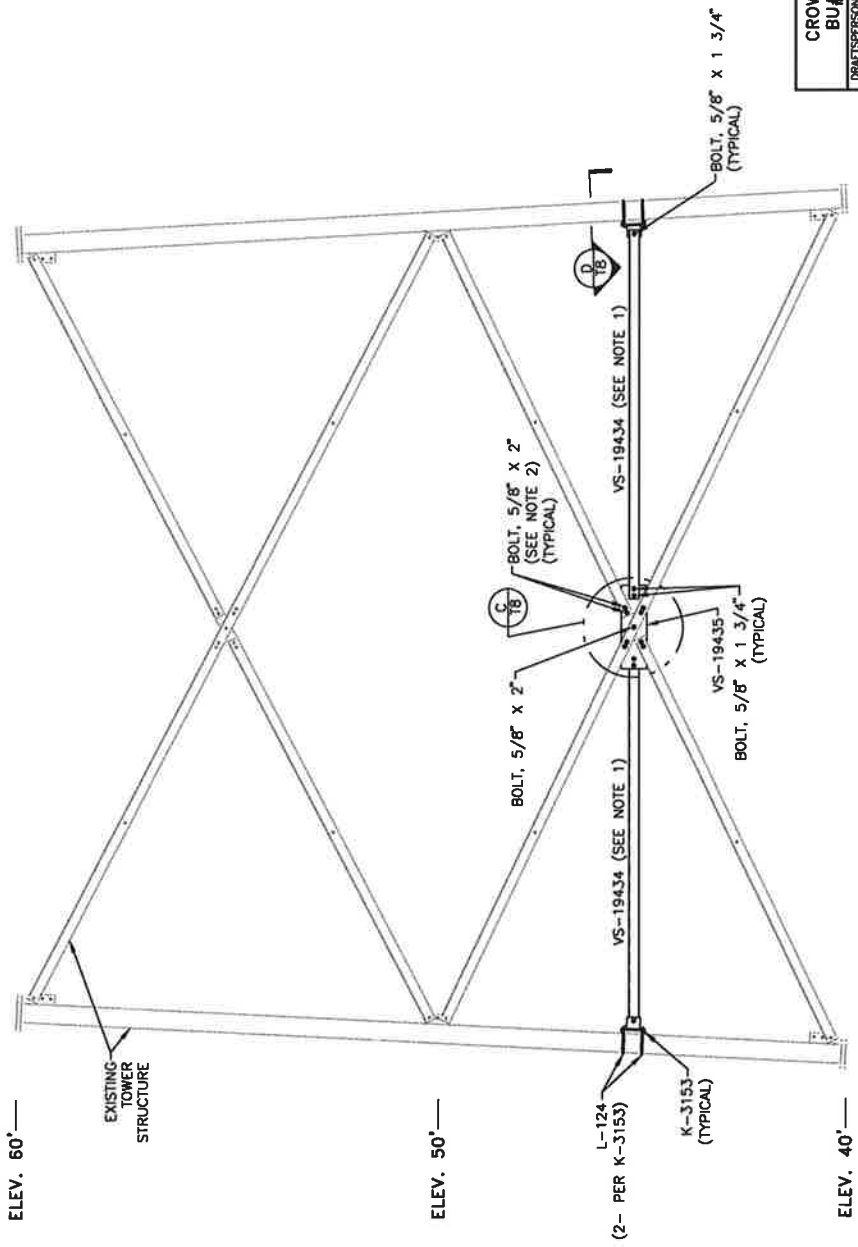
CROWN CASTLE
 BU# 806378

DRAWN BY:	J. COMBS	DATE:	2-26-15
CHECK BY:		DATE:	
APP:		DATE:	
ENGR:		DATE:	
DLW:		DATE:	

SHEET 2 OF 13 B TA2015004007-12 SCALE: NONE

BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
K-3153	3	LEG CLAMP WELDMENT FOR A 5 9/16" O.D. PIPE	ASTM A36
VS-19434	6	MID-BAY HORIZONTAL, L 2 1/2" X 2 1/2" X 3/16"	ASTM A36
VS-19435	3	GUSSET PLATE, 3/8" THICK	ASTM A36
L-124	6	U-BOLT, 1/2" FOR A 5 9/16" O.D. PIPE	ASTM A36
XX5816	18	BOLT, 5/8" X 1 3/4"	ASTM A325
XX5820	27	BOLT, 5/8" X 2"	ASTM A325

NOTES:
 1. MID-BAY HORIZONTALS MUST BE INSTALLED LEVEL.
 2. 24- 11/16" FIELD DRILLED HOLES ARE REQUIRED INTO VS-19435.



(A) ELEVATION VIEW

REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

FOR

VERTICAL STRUCTURES INC.
 P.O. Box 1406
 Richmond, KY 40476
 Phone: (606) 924-8390
 Fax: (606) 924-8390
 Email: engineering@verticalstructures.com

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

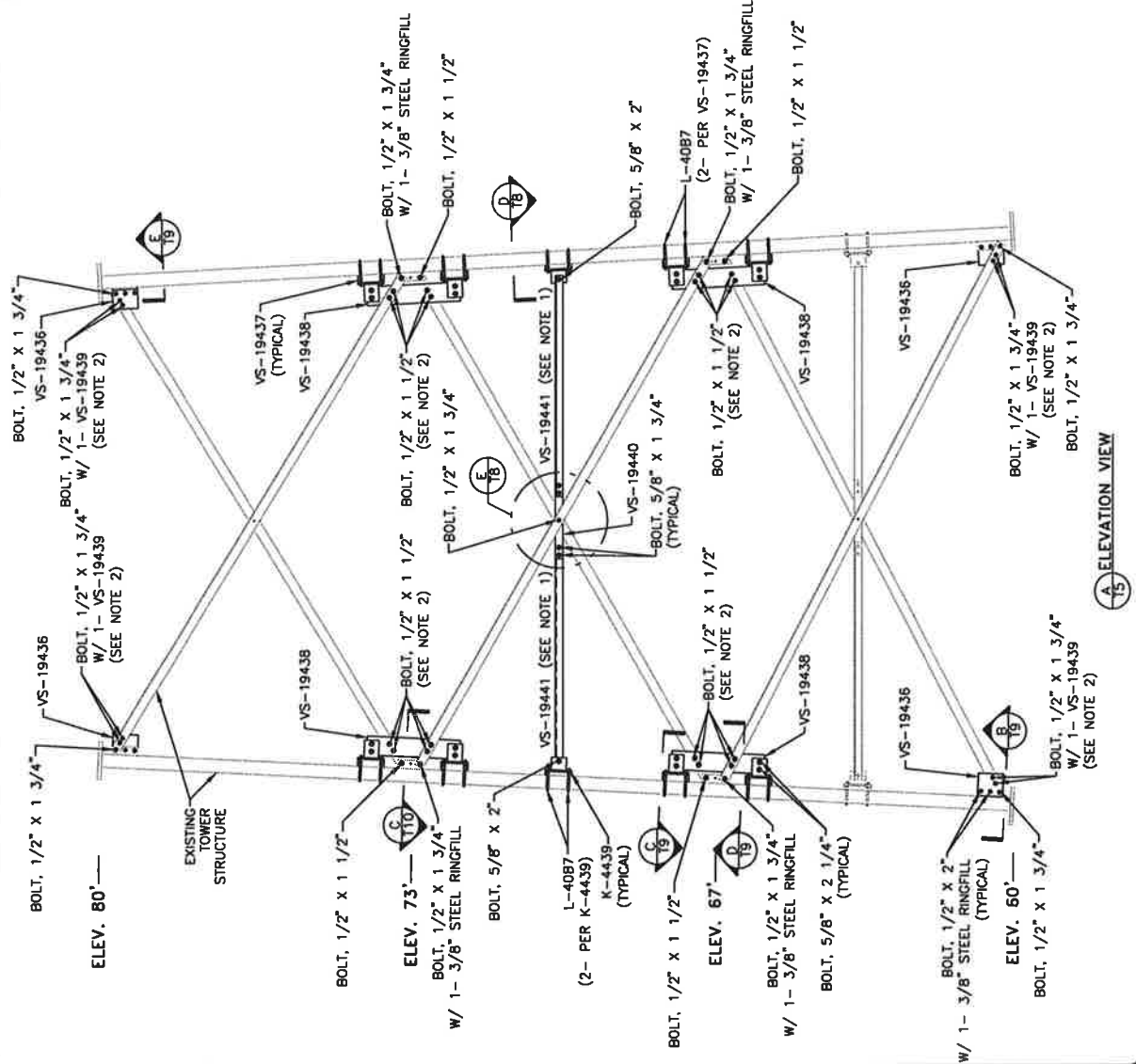
SHEET 4 OF 13 B TA2015004007-14 SCALE: NONE

CROWN CASTLE BU# 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECK BY:	DATE
ANP	
ENGR:	DATE
DLW	

BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
K-4439	3	LEG CLAMP, WELDMENT FOR 4 1/2" O.D. PIPE	ASTM A36
VS-19436	12	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19437	12	LEG CLAMP, WELDMENT FOR 4 1/2" O.D. PIPE	ASTM A572 GRADE 50
VS-19438	12	END CONNECTION REINFORCEMENT PLATE, 1/2" THICK	ASTM A572 GRADE 50
VS-19439	12	SPACER PLATE, 3/16" THICK	ASTM A36
VS-19440	3	GUSSET PLATE, 3/8" THICK	ASTM A36
VS-19441	6	MID-BAY HORIZONTAL, L 1 3/4" X 1 3/4" X 1/4"	ASTM A36
L-40B7	30	U-BOLT, 1/2" FOR A 4 1/2" O.D. PIPE	ASTM A193 GRADE B7
XX1214	60	BOLT, 1/2" X 1 1/2"	ASTM A325
XX1216	51	BOLT, 1/2" X 1 3/4"	ASTM A325
XX1220	24	BOLT, 1/2" X 2"	ASTM A325
XX5816	12	BOLT, 5/8" X 1 3/4"	ASTM A325
XX5820	6	BOLT, 5/8" X 2"	ASTM A325
XX5822	48	BOLT, 5/8" X 2 1/4"	ASTM A325
XY0067	35	STEEL RINGFILL, 3/8" THICK	ASTM A325

NOTES:
 1. MID-BAY HORIZONTALS MUST BE INSTALLED LEVEL.
 2. 72- 9/16" FIELD DRILLED HOLES ARE REQUIRED INTO NEW TOWER STEEL.

EXISTING END CONNECTION AND GUSSET REINFORCEMENT MUST BE REMOVED TO ACCOMMODATE INSTALLATION OF NEW END CONNECTION REINFORCEMENT.



CROWN CASTLE BU# 806378	
DATE	2-26-15
DATE	2-26-15
DATE	DATE
DATE	DATE

REV.	DESCRIPTION	DATE	JAC	BT
A	ORIGINAL RELEASE	2-26-15		



P.O. Box 1698
 Richmond, KY 40476
 Phone: (609) 624-8380
 Fax: (609) 624-8386
 Email: engineering@verticalstructures.com

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

SHEET 5 of 13

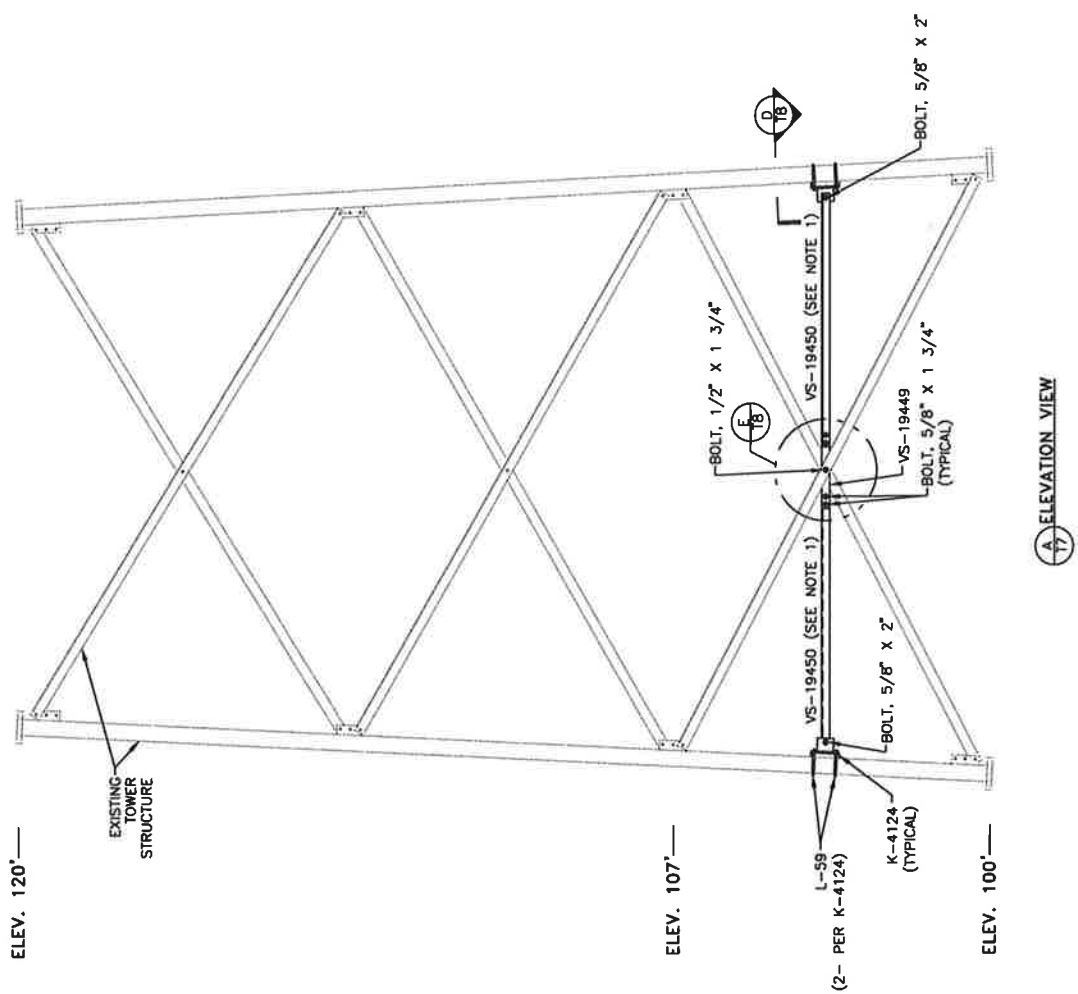
TA2015004007-15

SCALE NONE

ELEVATION VIEW

BILL OF MATERIALS			
MARK NO.	QTY.	DESCRIPTION	MATERIAL GRADE
K-4124	3	LEG CLAMP, WELDMENT FOR 3 1/2" O.D. PIPE	ASTM A36
VS-19449	3	GUSSET PLATE, 3/8" THICK	ASTM A36
VS-19450	6	MID-BAY HORIZONTAL, L 1 3/4" X 1 3/4" X 1/4"	ASTM A36
L-59	6	U-BOLT, 1/2" FOR A 3 1/2" O.D. PIPE	ASTM A325
XX1216	3	BOLT, 1/2" X 1 3/4"	ASTM A325
XX5816	12	BOLT, 5/8" X 1 3/4"	ASTM A325
XX3820	6	BOLT, 5/8" X 2"	ASTM A325

NOTE:
1. MID-BAY HORIZONTALS MUST BE INSTALLED LEVEL.



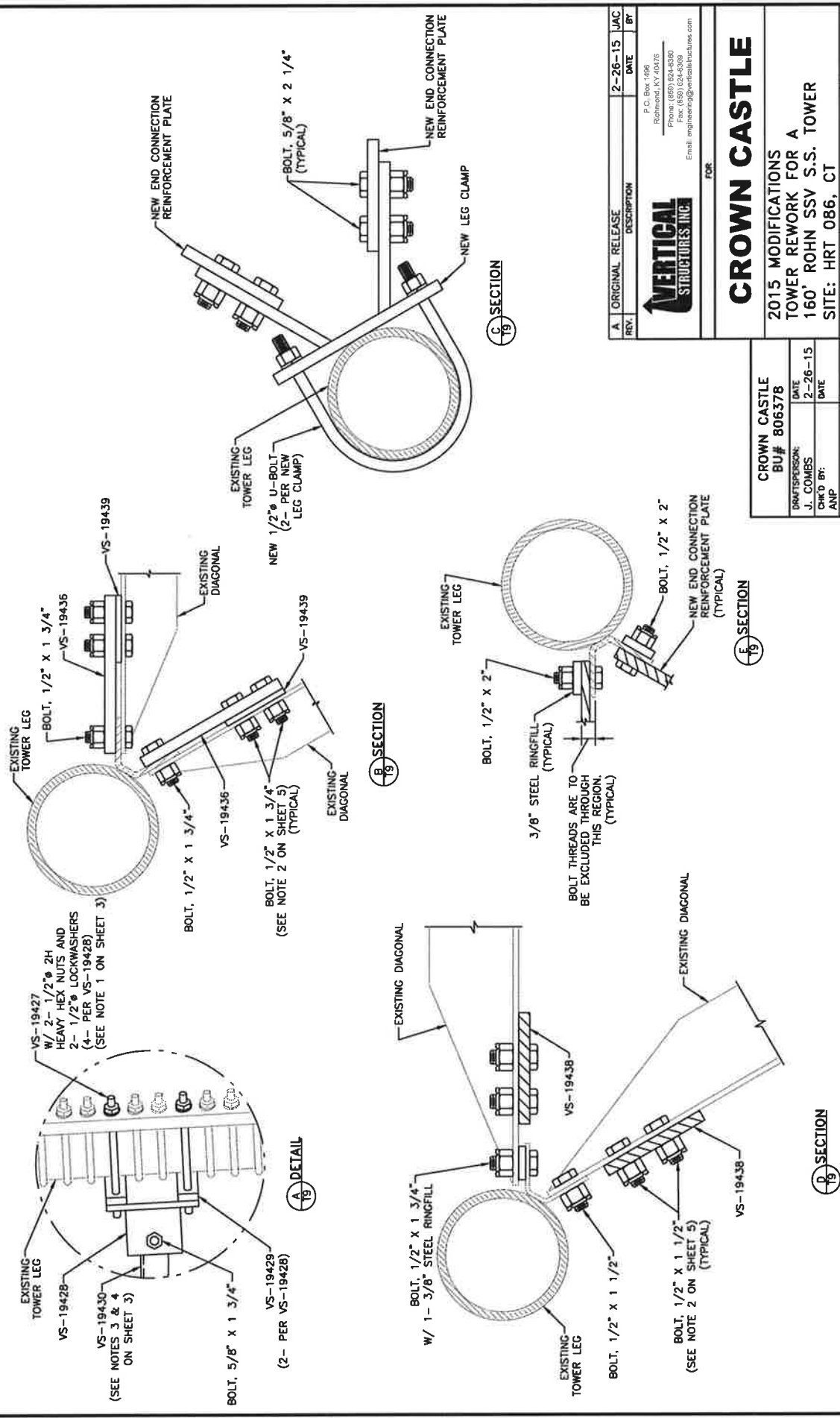
CROWN CASTLE BU# 806378	
DATE	2-26-15
DRW PERSON:	J. COMBS
CHECK BY:	ANP
ENGR:	
DLW:	

A	ORIGINAL RELEASE	2-26-15	JAC
REV.	DESCRIPTION	DATE	BY
VERTICAL STRUCTURES INC. P.O. Box 1408 Richmond, KY 40471 Phone: (859) 924-8380 Fax: (859) 924-8359 Email: engineering@verticalstructures.com			

CROWN CASTLE

2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

SHEET 7 OF 13 | B TA2015004007-17 | SCALE: NONE



REV.	DESCRIPTION	DATE	JAC
A	ORIGINAL RELEASE	2-26-15	BT

FOR

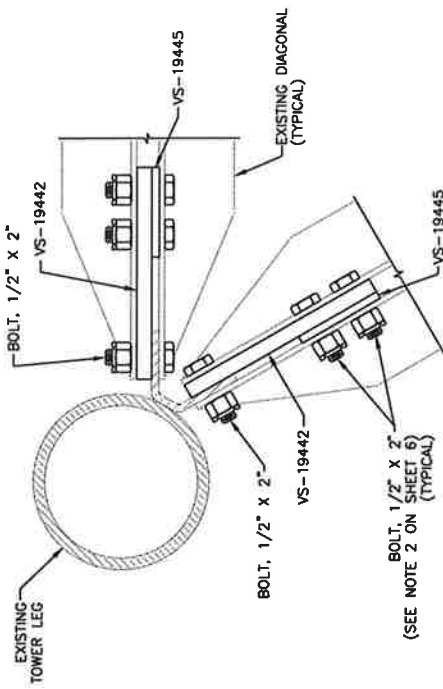
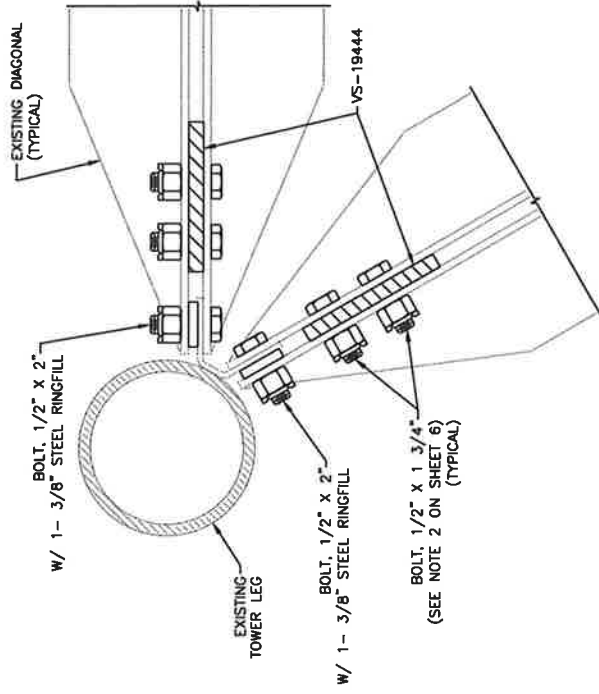
VERTICAL STRUCTURES INC.
 P.O. Box 1496
 Richmond, KY 40476
 Phone: (609) 624-6390
 Fax: (609) 624-6398
 Email: info@verticalstructures.com

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

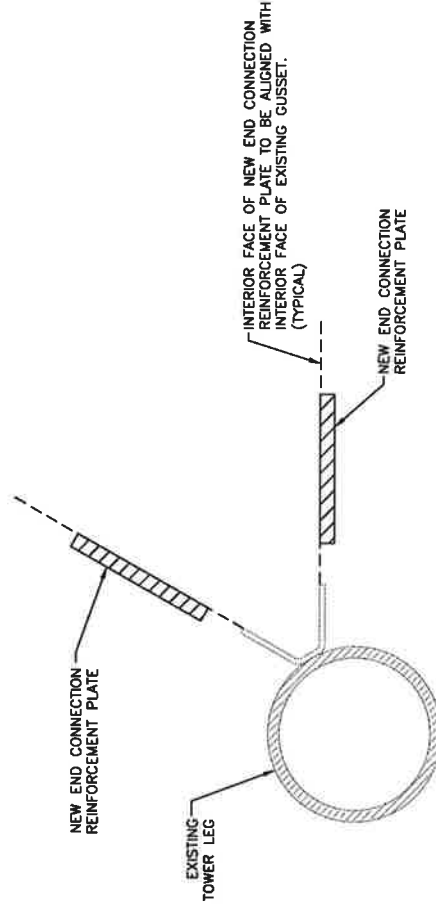
SHEET 9 OF 13 B TA2015004007-19 SCALE: NONE

CROWN CASTLE BU# 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECK BY:	DATE
ANP	
ENGR:	DATE
DLW	



A SECTION
T10

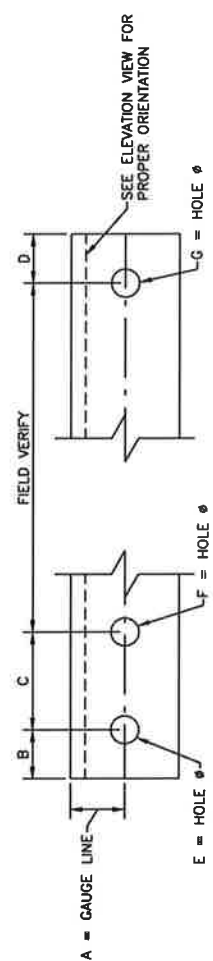
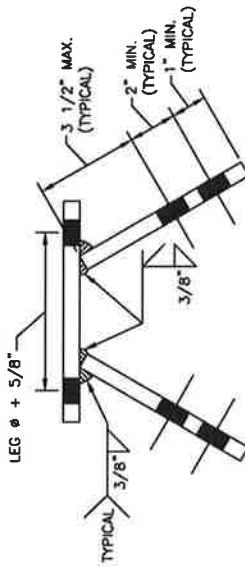
B SECTION
T10



C SECTION
T10
DIAGONALS NOT SHOWN FOR CLARITY

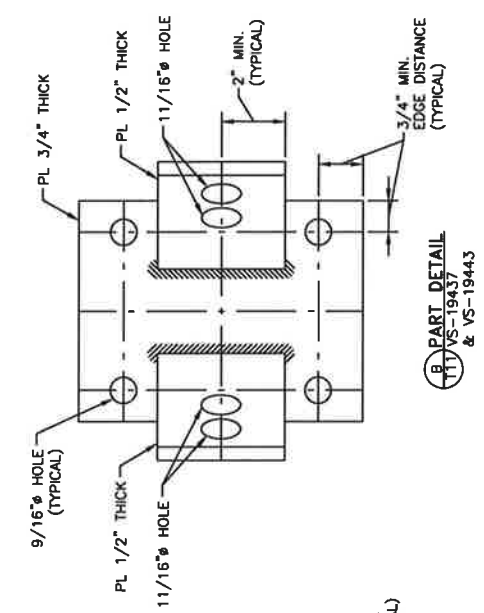
REV.	A	ORIGINAL RELEASE	2-26-15	JAC
		DESCRIPTION	DATE	BT
P.O. Box 1498 Richmond, KY 40476 Phone: (859) 624-8500 Fax: (859) 624-8509 Email: engineering@verticalstructures.com				
FOR				
<h1>CROWN CASTLE</h1>				
2015 MODIFICATIONS TOWER REWORK FOR A 160' ROHN SSV S.S. TOWER SITE: HRT 086, CT				
SHEET 10 OF 13			SCALE: NONE	

CROWN CASTLE BU# 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECKED BY:	DATE
ANP	
DESIGNED BY:	DATE
DLW	

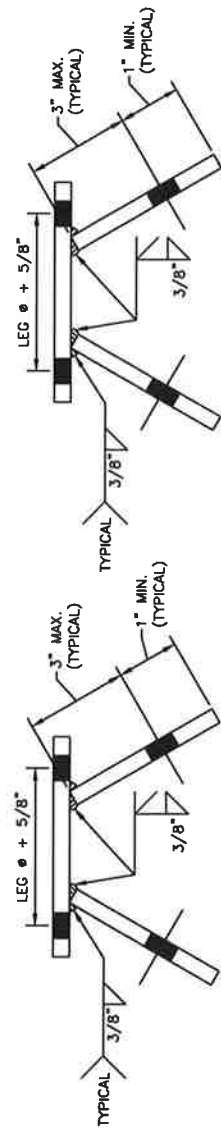


(A) PART DETAIL
11 VS-19437

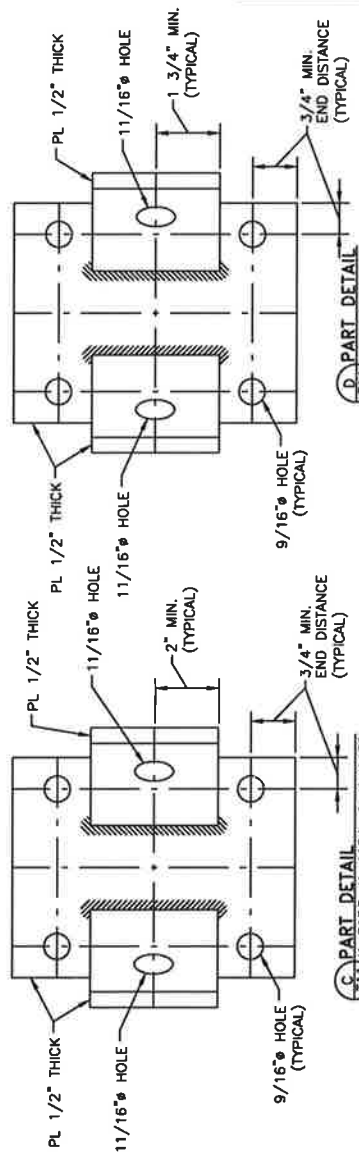
MARK NO.	A	B	C	D	E	F	G
VS-19430	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19431	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19432	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19433	1"	1" MINIMUM	N/A	1" MINIMUM	11/16"	N/A	11/16"
VS-19434	1 1/4"	2" MINIMUM	N/A	2" MINIMUM	11/16"	11/16"	11/16"
VS-19441	1"	1" MINIMUM	2" MINIMUM	1" MINIMUM	11/16"	11/16"	11/16"
VS-19445	1 1/4"	3/4" MINIMUM	N/A	3/4" MINIMUM	9/16"	N/A	9/16"
VS-19450	1"	1" MINIMUM	2" MINIMUM	1" MINIMUM	11/16"	11/16"	11/16"



(B) PART DETAIL
11 VS-19437
& VS-19443



(C) PART DETAIL
11 K-3153, K-4124, & K-4439



(D) PART DETAIL
11 VS-19428

REV.	DESCRIPTION	DATE	JAC	BT
A	ORIGINAL RELEASE	2-26-15		

FOR

VERTICAL STRUCTURES INC.
P.O. Box 1498
Richmond, KY 40478
Phone: (859) 524-8380
Fax: (859) 674-8389
Email: engineering@verticalstructures.com

CROWN CASTLE
2015 MODIFICATIONS
TOWER REWORK FOR A
160' ROHN SSV S.S. TOWER
SITE: HRT 086, CT

SHEET 11 OF 13 B TA2015004007-111 SCALE: NONE

DATE	DATE
2-26-15	

CROWN CASTLE
BU# 806378

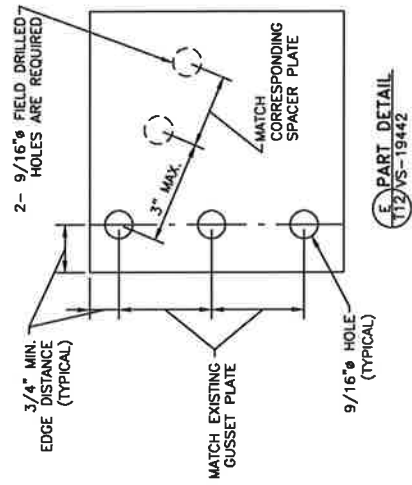
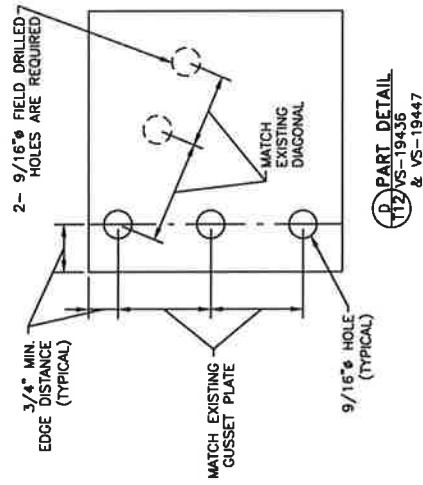
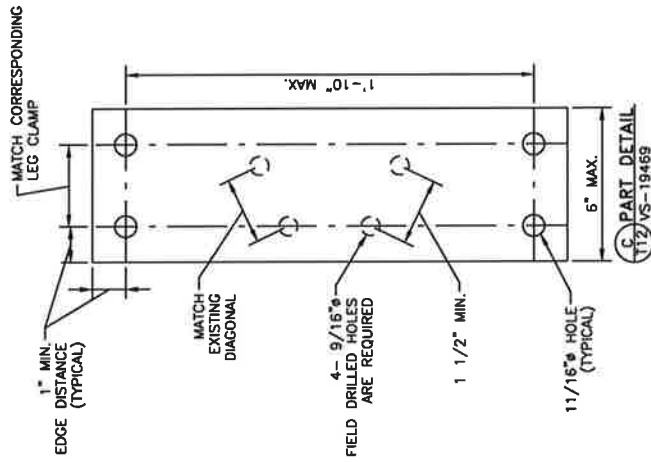
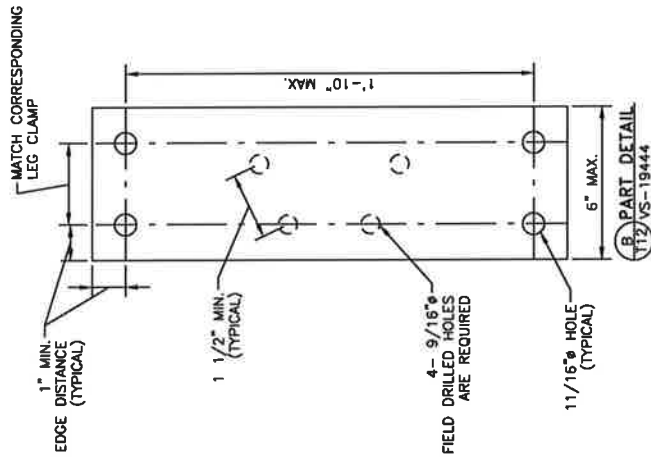
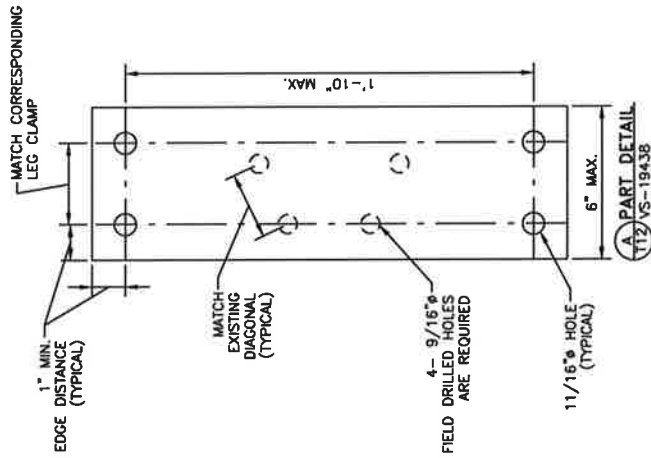
DATE: 2-26-15

DATE:

DATE:

DATE:

ENGINEER: DLW



REV.	DESCRIPTION	DATE	BY
A	ORIGINAL RELEASE	2-26-15	JAC

P.O. Box 1498
 Richmond, KY 40478
 Phone: (859) 824-4360
 Fax: (859) 824-4369
 Email: engineering@verticalstructures.com

VERTICAL STRUCTURES INC.

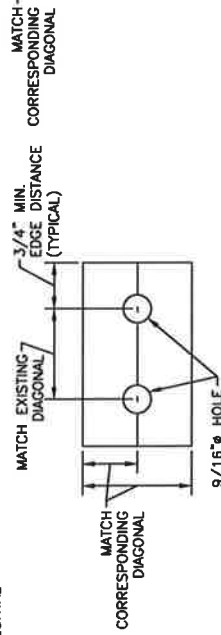
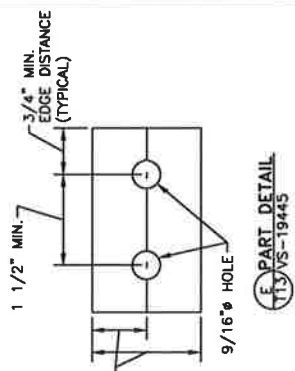
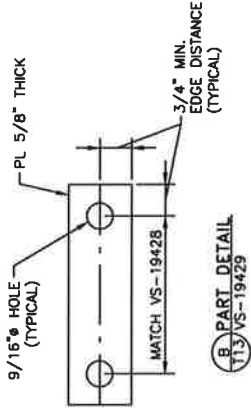
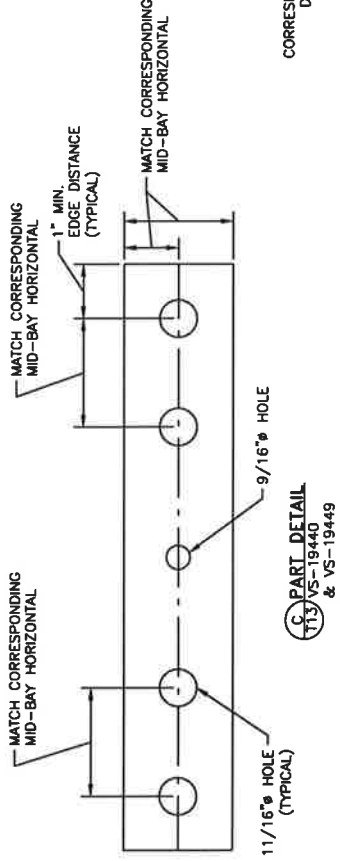
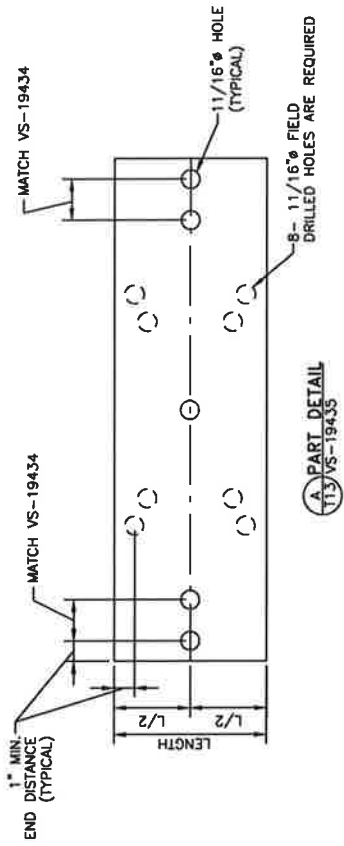
FOR

CROWN CASTLE

2015 MODIFICATIONS
 TOWER REWORK FOR A
 160' ROHN SSV S.S. TOWER
 SITE: HRT 086, CT

SHEET 12 OF 13	B	TA2015004007-112	SCALE: NONE
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CROWN CASTLE BU# 806378	
DRAWN BY:	DATE
J. COMBS	2-26-15
CHECKED BY:	DATE
ANP	
ENGR:	DATE
DLW	



A ORIGINAL RELEASE	2-26-15	JAC
REV.	DESCRIPTION	DATE
VERTICAL STRUCTURES INC. P.O. Box 1406 Richmond, KY 40476 Phone: (850) 824-8269 Fax: (850) 824-8266 Email: info@verticalstructures.com		

CROWN CASTLE	
2015 MODIFICATIONS TOWER REWORK FOR A 160' ROHN SSV S.S. TOWER SITE: HRT 086, CT	
SHEET 13 OF 13	SCALE: NONE

CROWN CASTLE BU# 806378	
DESIGNER:	DATE
J. COMBS	2-26-15
CHECK BY:	DATE
ANP	
ENGR:	DATE
DJW	

