STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION OF CELLCO PARTNERSHIP	:	SUB-PETITION NO. 1133
D/B/A VERIZON WIRELESS FOR A	:	INTERSTATE 84
DECLARATORY RULING FOR	:	MIDDLEBURY, CONNECTICUT
APPROVAL OF AN ELIGIBLE FACILITY	:	
REQUEST FOR MODIFICATIONS TO AN	:	
EXISTING TELECOMMUNICATIONS	:	
TOWER ALONG INTERSTATE 84 IN	:	
MIDDLEBURY, CONNECTICUT	:	OCTOBER 5, 2015

SUB-PETITION FOR DECLARATORY RULING:
ELIGIBLE FACILITIES REQUEST FOR MODIFICATIONS
THAT WILL NOT SUBSTANTIALLY CHANGE THE
PHYSICAL DIMENSIONS OF AN EXISTING TOWER

I. Introduction

Pursuant to Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, codified at 47 U.S.C. § 1455(a) ("Section 6409(a)") and the October 21, 2014 Report and Order (FCC-14-533) issued by the Federal Communications Commission ("FCC") (the "FCC Order"), Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby petitions the Connecticut Siting Council (the "Council") for a declaratory ruling ("Sub-Petition") that the proposed modifications to an existing Connecticut State Police tower located along Interstate 84 ("I-84") in the Town of Middlebury, Connecticut constitutes an Eligible Facilities Request ("EFR") under the FCC Order. Cellco has designated this site as its "Middlebury I-84 Facility".

II. Factual Background

The Connecticut State Police ("CSP") owns an existing 160-foot self-supporting lattice tower, located on the north side of I-84 and within the I-84 right of way, west of the South Street overpass in Middlebury, Connecticut. (*See* Attachment 1 – Site Vicinity Map and Site Schematic

(Aerial Photograph)). The CSP tower is currently shared by Federal and State law enforcement agencies, ConnDOT, AT&T, T-Mobile and Sprint at various heights.

III. Proposed Middlebury I-84 Facility

Cellco intends to install a total of four (4) (Model SBNHH-1D65B) antennas at the 75-foot level of the tower. Equipment associated with Cellco's antennas will be located on an 8' x 8' concrete slab to be installed directly beneath the tower. Power and telephone service to Cellco's equipment will extend from the existing utility service at the tower site. Cellco will also install a 15 kW back-up generator on a concrete pad to the north of the tower. Cellco will also install four (4) remote radio heads (RRHs) behind its antennas and one (1) HYBRIFLEX™ fiber optic antenna cable. Plans for Cellco's Middlebury I-84 Facility are included in Attachment 2. Specifications for Cellco's antennas, RRHs, antenna cable and back-up generator are included in Attachment 3. A Detailed Structural Analysis and Modification Report is included in Attachment 4. This report confirms that, with certain structural modifications, the existing CSP tower can support Cellco's proposed modifications.

IV. Discussion

A. The Proposed Modification Will Not Cause a Substantial Change to the Physical Dimensions of the Existing Tower or Base Station

Section 6409(a) provides, in relevant part, that "a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station." Pursuant to the FCC Order, the proposed modification does not substantially change the physical dimensions of the tower or base station if the following criteria are satisfied.

1. *The proposed modified facility will not increase the height of the tower by more than ten (10) percent or by the height of one additional antenna array with separation from*

the nearest existing antenna not to exceed twenty (20) feet, whichever is greater. Cellco proposes to install its antennas at the 75-foot level on the existing 160-foot tower.

2. *The proposed facility will not protrude from the edge of the structure more than six (6) feet.* Cellco's antennas will not protrude more than 6 feet from the edge of the tower.

3. *The proposed facility does not involve installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets.* Cellco intends to install two equipment cabinets beneath the tower to house its radio equipment.

4. *The proposed facility does not entail any excavation or deployment outside the current site of the base station.* All of Cellco's site improvements will occur within the limits of the existing facility compound.

5. *The proposed facility does not defeat the existing concealment elements of the base station.* None of the antennas on the existing CSP tower are concealed in any way. Likewise, Cellco does not intend to conceal its antennas.

6. *The proposed facility complies with conditions associated with the prior approval of construction or modification of the base station.* Cellco's proposed shared use of the CSP tower is consistent with existing uses at this site. Cellco is not aware of any conditions associated with any land use approvals obtained for the CSP tower.

B. FCC Compliance

Operation of Cellco's facility will not increase the radio frequency ("RF") emissions at the CSP tower site to a level at or above the FCC Safety standard. Far Field Calculation tables for Cellco's proposed antennas are included in Attachment 5.

C. Notice to the Town, Property Owner and Abutting Landowners

On October 5, 2015, a copy of this Sub-Petition was sent to the Middlebury's First Selectman Edward B. St. John and to the CSP, as the owner of the tower. *See* Attachment 6.

A copy of this Sub-Petition was also sent to four adjacent property owners near the existing CSP tower site and abutting that portion of the I-84 right of way. A sample cover letter and the list of those adjacent landowners who were sent a copy of the Sub-Petition is included in Attachment 7.

V. Conclusion

Based on the information provided above, Cellco respectfully submits that the proposed modification of the existing base station at the Property constitutes an "eligible facilities request" under Section 6409(a) and the FCC Order.

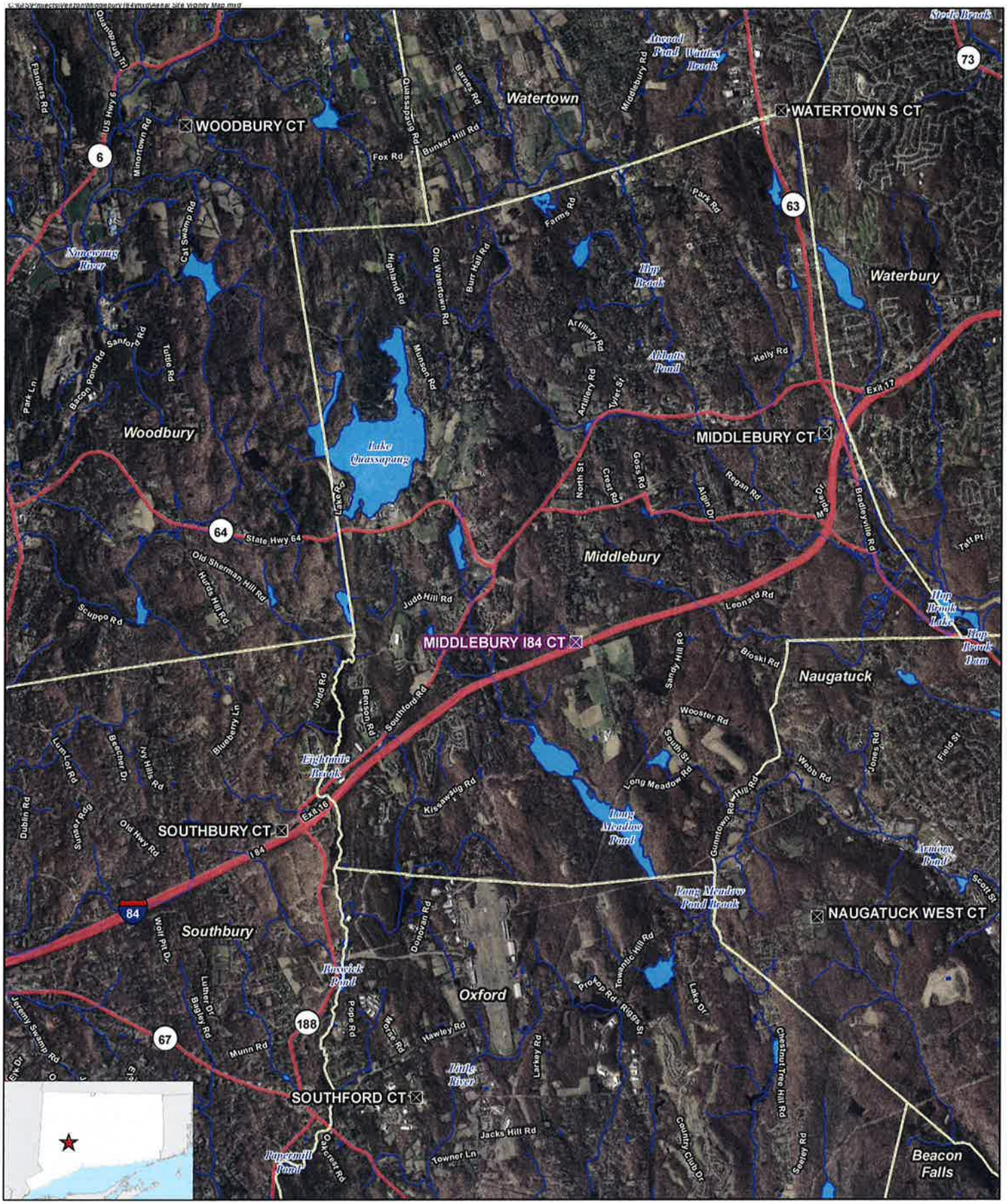
Respectfully submitted,

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

By _____

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597
(860) 275-8200
Its Attorneys

ATTACHMENT 1



Legend

- Proposed Verizon Wireless Facility
- Surrounding Verizon Wireless Facilities
- Municipal Boundary
- Watercourse
- Waterbody

Base Map Source: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 5,000 feet
Map Date: August 2015

N
W E
S

5,000 2,500 0 5,000 Feet

Site Vicinity Map

Proposed Wireless
Telecommunications Facility
Middlebury I84 CT
I-84 and South Street
Middlebury, Connecticut

Legend

Existing Fenced Tower Facility Compound

Approximate Parcel Boundary (CTDEEP GIS Parcels Last Updated 2010)

Site Schematic

Proposed Wireless
Telecommunications Facility
Middlebury I84 CT
I-84 and South Street
Middlebury, Connecticut

N
W E
S

150 75 0 150
Feet

verizon wireless

ALL-POINTS

Map Notes:
Base Map Source: ESRI World Imagery, NAIP 7/17/2014
Map Scale: 1 inch = 150 feet
Map Date: August 2015

ATTACHMENT 2

CELLCO PARTNERSHIP

d.b.a. verizon wireless

WIRELESS COMMUNICATIONS FACILITY

MIDDLEBURY I-84 CT

I-84 AND SOUTH STREET
MIDDLEBURY, CONNECTICUT 06762

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT TO: I-84 AND SOUTH STREET, MIDDLEBURY, CONNECTICUT

1. Turn Right onto Darlin Street.	0.1 MI
2. Take ramp right for CT-2 West toward Downtown Hartford	370 FT
3. Road name changes to Founders Bridge	0.3 MI
4. Road name changes to State St	0.2 MI
5. Turn left onto Columbus Blvd	417 FT
6. Turn left onto Grove St	470 FT
7. Take ramp left for I-84 West toward Waterbury	243 FT
8. Site is off I-84 to the right.	35.8 MI

GENERAL NOTES

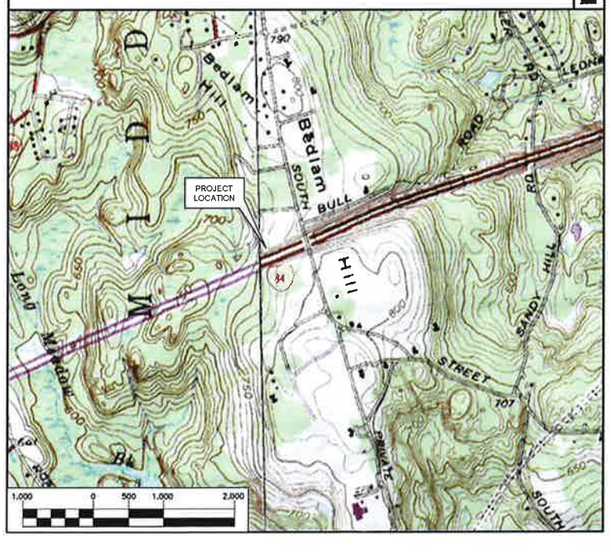
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

GENERAL NOTES

1. THE PROPOSED SCOPE OF WORK INCLUDES THE INSTALLATION OF A 8'X8' LEASE AREA FOR EQUIPMENT MOUNTED ON A CONCRETE SLAB TO BE LOCATED UNDER THE EXISTING TOWER.
2. A TOTAL OF FOUR (4) PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED ON AN EXISTING 160'± TALL LATTICE TOWER AT A CENTERLINE ELEVATION OF 75'± AGL.
3. ELECTRIC AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND TO THE PROPOSED EQUIPMENT SHELTER FROM AN EXISTING UTILITY BACKBOARD LOCATED ADJACENT TO FENCED COMPOUND.
4. FINAL DESIGN FOR TOWER AND ANTENNA MOUNTS SHALL BE INCLUDED IN THE D&M PLANS.
5. THE PROPOSED WIRELESS FACILITY INSTALLATION WILL BE DESIGNED IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2009 CONNECTICUT SUPPLEMENT.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	MIDDLEBURY I-84 CT
SITE ADDRESS:	1-84 AND SOUTH STREET MIDDLEBURY, CT
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON	ALEKSEY TYURIN VERIZON WIRELESS (860) 803-8213 KENNETH BALDWIN ROBINSON & COLE LLP (860) 275-8345
TOWER COORDINATES:	LATITUDE: 41°-30'-48.85" LONGITUDE: 73°-07'-26.68"

COORDINATES AND GROUND ELEVATION REFERENCED FROM RF DATA SHEET MIDDLEBURY 184 CT DATED 12/08/2014 PROVIDED BY VERIZON WIRELESS.

SITE INDEX

CELLCO PARTNERSHIP
DBA
verizon wireless

A&E FIRM
AECOM
500 ENTERPRISE DRIVE
SUITE 3B
ROCKY HILL, CONNECTICUT
1-(860)-529-8882

A&E SEAL

PROJECT NO: 60404004

JOB NO: VZ5-190

DRAWN BY: KAP

CHECKED BY: MJE

ISSUED FOR

A	08/27/15	REVIEW
0	09/21/15	SITING COUNCIL

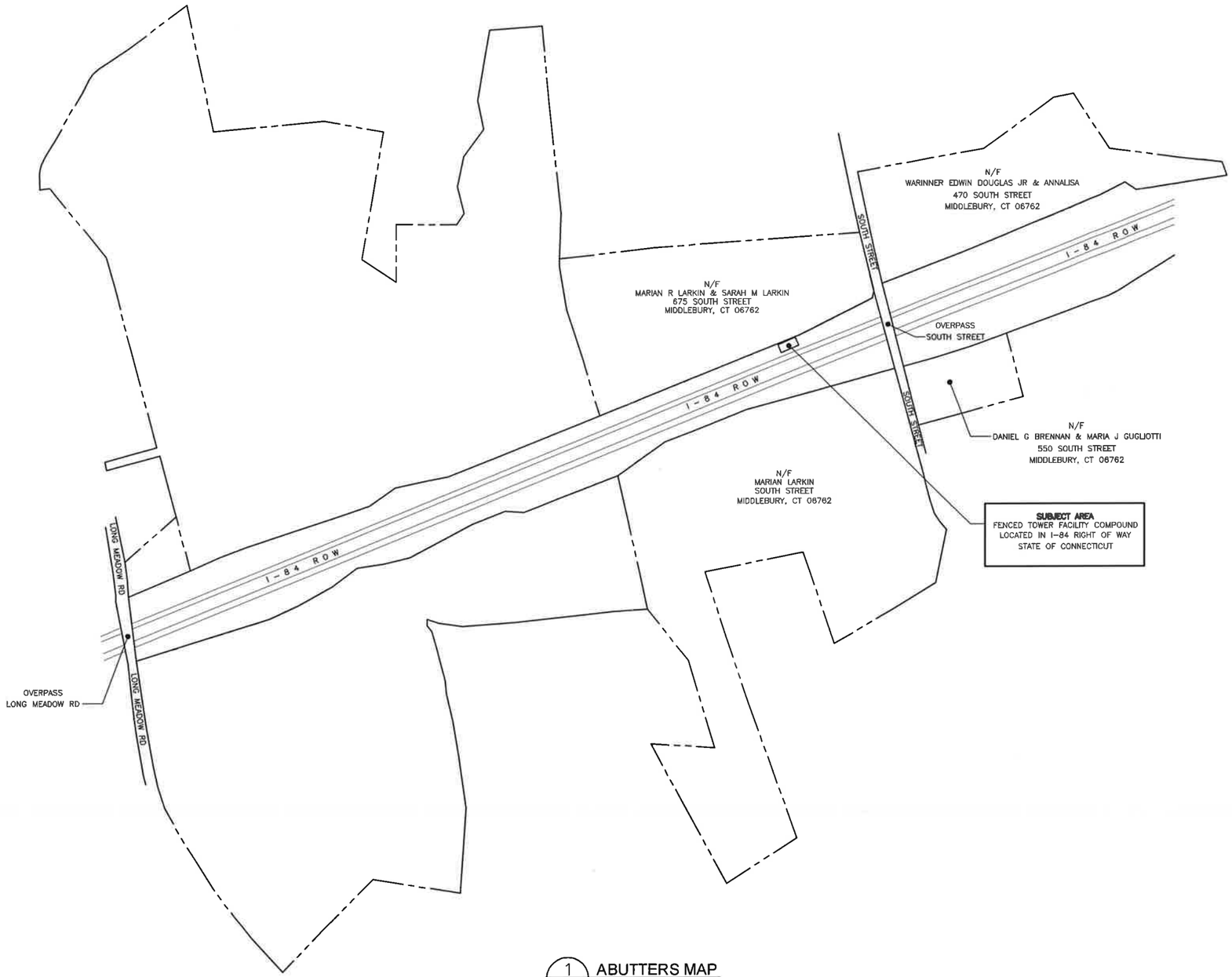
MIDDLEBURY I-84 CT

I-84 AND SOUTH STREET
MIDDLEBURY, CONNECTICUT
06762

SCALE:

TITLE SHEET - GENERAL NOTES AND PROJECT SUMMARY

T-1



1 SC-1 **ABUTTERS MAP**
SCALE: 1" = 400'-0"

GRAPHIC SCALE
400 0 200 400 800 2000
(IN FEET)
1 inch = 400 ft.

MAP REFERENCE NOTE:

PROPERTY LINES SHOWN HEREIN ARE REFERENCED FROM THE MIDDLEBURY GIS WEBSITE. PARCEL OWNERSHIP INFORMATION CONTAINED HEREIN REFERENCED FROM THE MIDDLEBURY GIS WEBSITE.

CELLCO PARTNERSHIP
DBA
verizon wireless

A&E FIRM
AECOM
500 ENTERPRISE DRIVE
SUITE 3B
ROCKY HILL, CONNECTICUT
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MIDDLEBURY I-84 CT

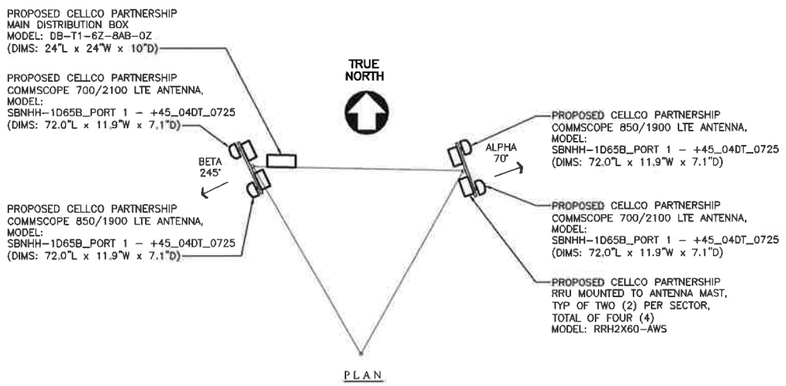
I-84 AND SOUTH STREET
MIDDLEBURY, CONNECTICUT
06762

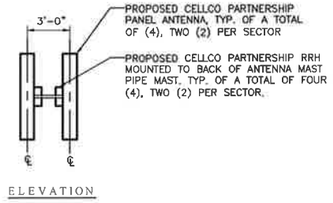
SCALE: AS SHOWN

ABUTTERS MAP

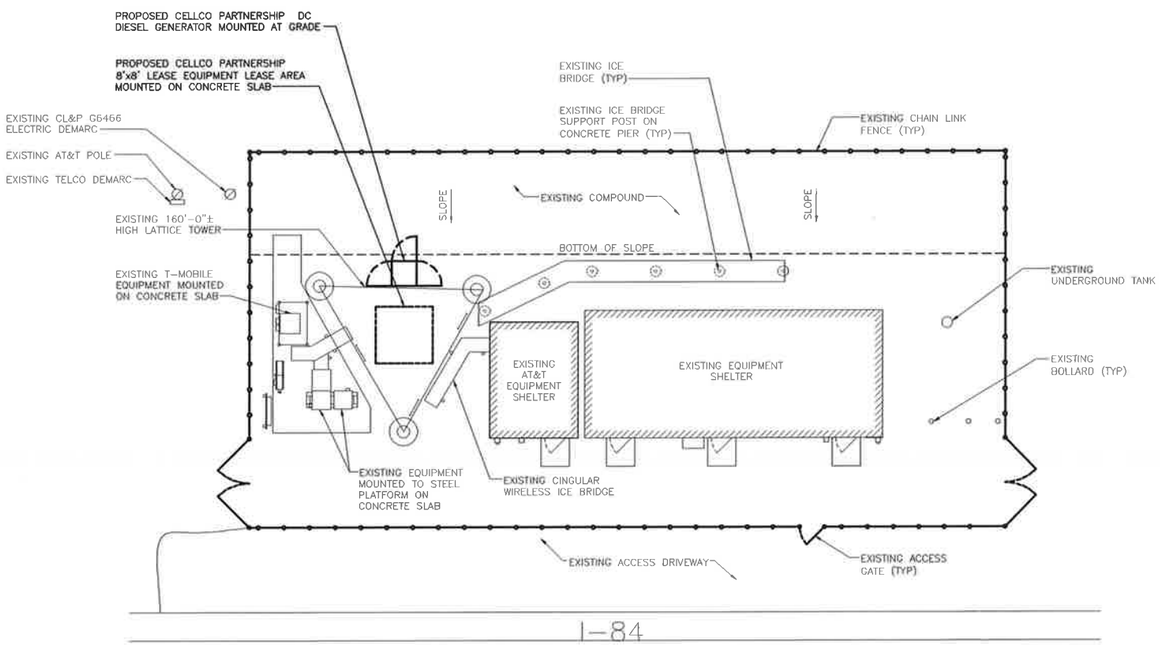
SC-1

VERIZON (AKA: CELLCO PARTNERSHIP) ANTENNA LEGEND				
	ANTENNA MODEL	DIMENSIONS LxWxD	TOTAL	CENTERLINE
PROPOSED	700/2100 LTE ANTENNA COMMSCOPE SBNHH-1D65B	72.0"x11.9"x7.1"	2	SECTOR A – 75' SECTOR B – 75'
PROPOSED	850/1900 LTE ANTENNA COMMSCOPE SBNHH-1D65B	72.0"x11.9"x7.1"	2	





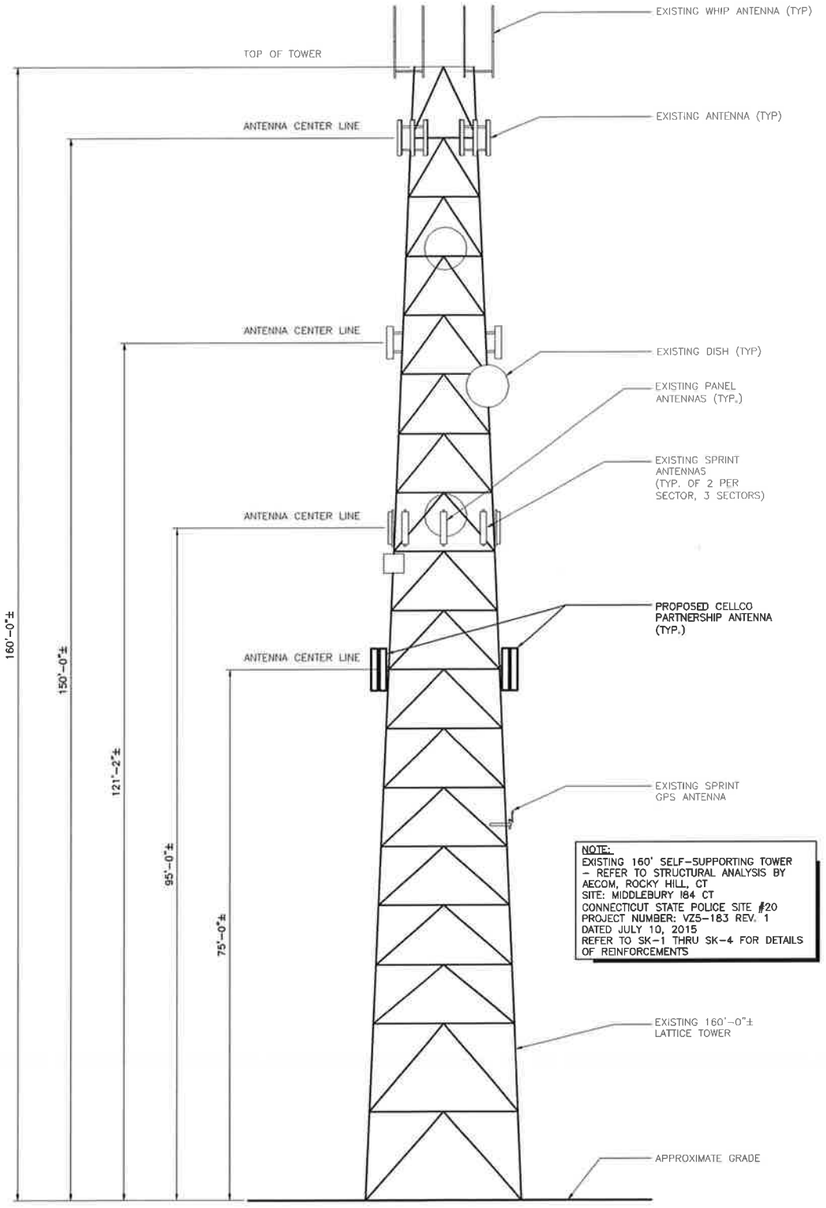
3 / SC-2 **ANTENNA SECTOR PLAN**
NOT TO SCALE



1 / SC-2 **EQUIPMENT / COMPOUND PLAN**
SCALE: 1" = 10'-0"

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.

NORTH



2 / SC-2 **TOWER ELEVATION**
SCALE: 1" = 10'-0"

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.

CELLCO PARTNERSHIP
DBA
verizon wireless

A&E FIRM
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MIDDLEBURY I-84 CT

I-84 AND SOUTH STREET
MIDDLEBURY, CONNECTICUT
06762

SCALE: AS SHOWN

COMPOUND PLAN, ANTENNA SECTOR PLAN AND ELEVATION

SC-2

ATTACHMENT 3

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

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

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Performance Note	Outdoor usage

Product Specifications

SBNHH-1D65B

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h | 150.0 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

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

Packed Dimensions

Depth	299.0 mm | 11.8 in
Length	1970.0 mm | 77.6 in
Width	409.0 mm | 16.1 in
Shipping Weight	31.0 kg | 68.3 lb

Regulatory Compliance/Certifications

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

Included Products

Product Specifications

SBNHH-1D65B

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

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

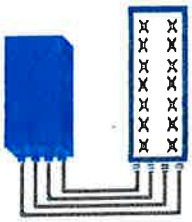
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

Alcatel·Lucent

TECHNICAL SPECIFICATIONS

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

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.

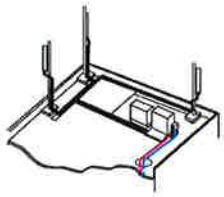
EASY INSTALLATION

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.



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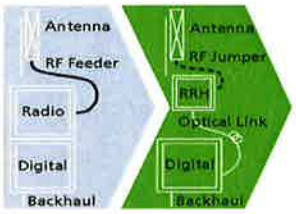
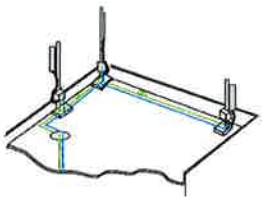


RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

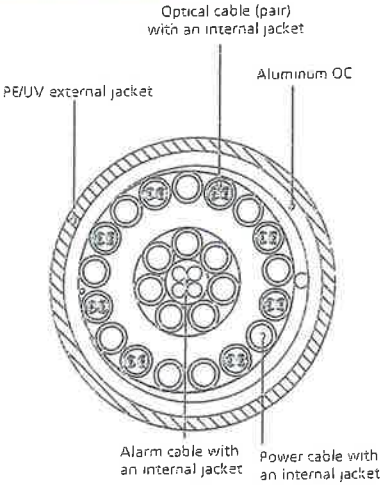
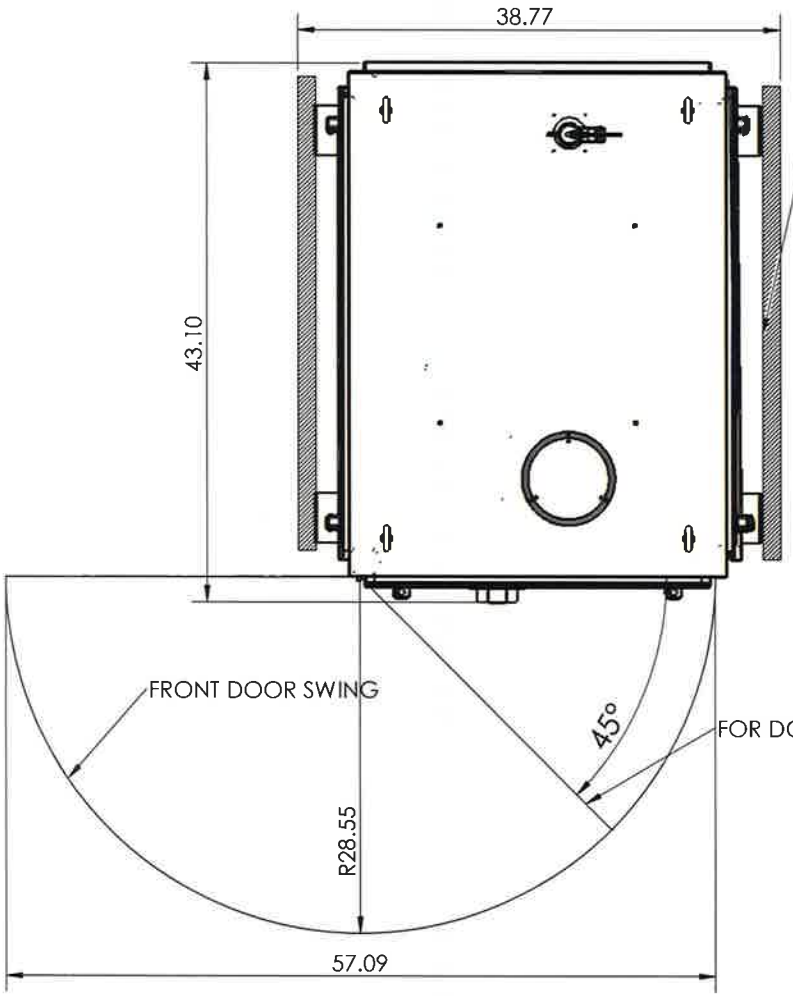


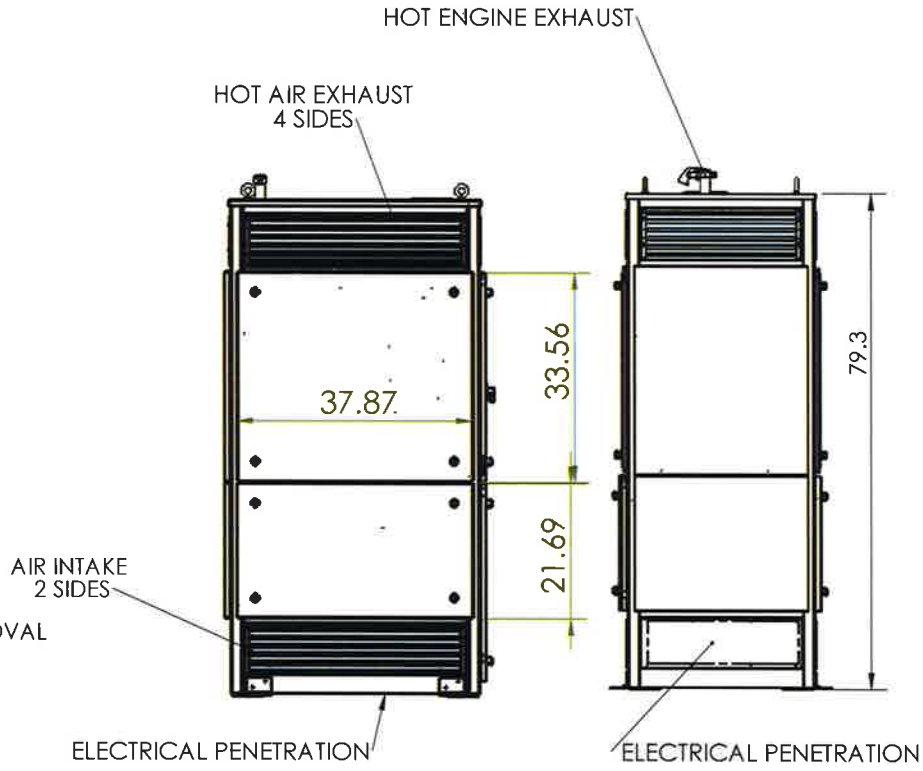
Figure 2: Construction Detail

* This data is provisional and subject to change

SERVICE AND OPERATION

88-25-0601 Aluminum Vertical Enclosure





RECOMMENDED ELECTRICAL PENETRATION:
1. LOWER REAR REMOVABLE PANEL.
2. THROUGH FLOOR PANEL AS SHOWN

COMMENTS:
DO NOT INSTALL INDOORS
USE OPEN FRAME ASSY FOR
INDOOR INSTALLATION

REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	--		

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

	APPROVALS	DATE
DRAWN	RICHARD RODRIGUEZ	02/19/13
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

POLAR POWER INC.
22520 AVALON BLVD. CARSON, CA 90745

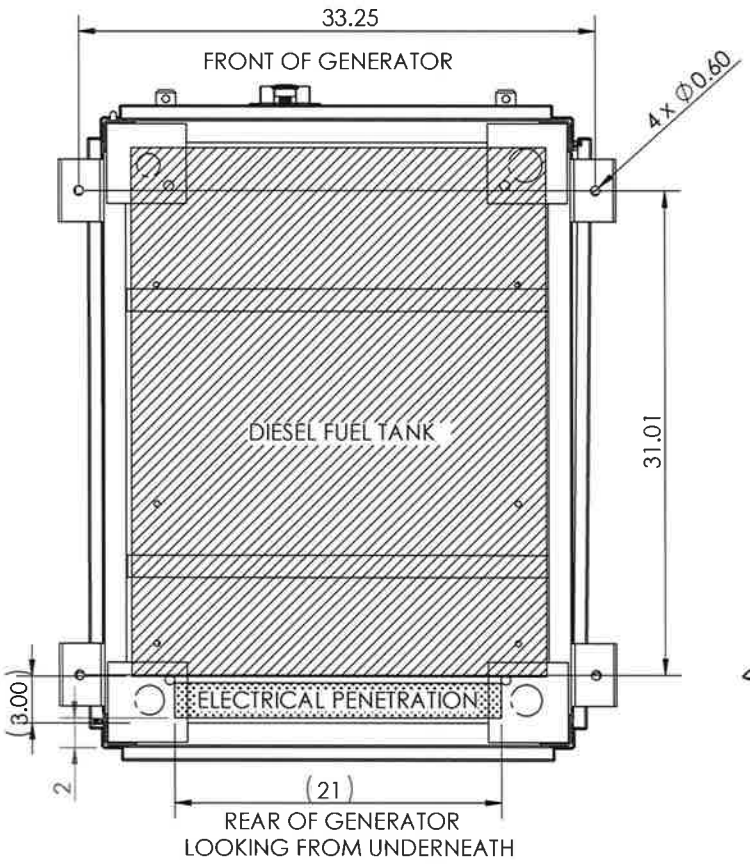
TITLE: 88-25-0601
AL Vertical Enclosure - Tall
(VT)

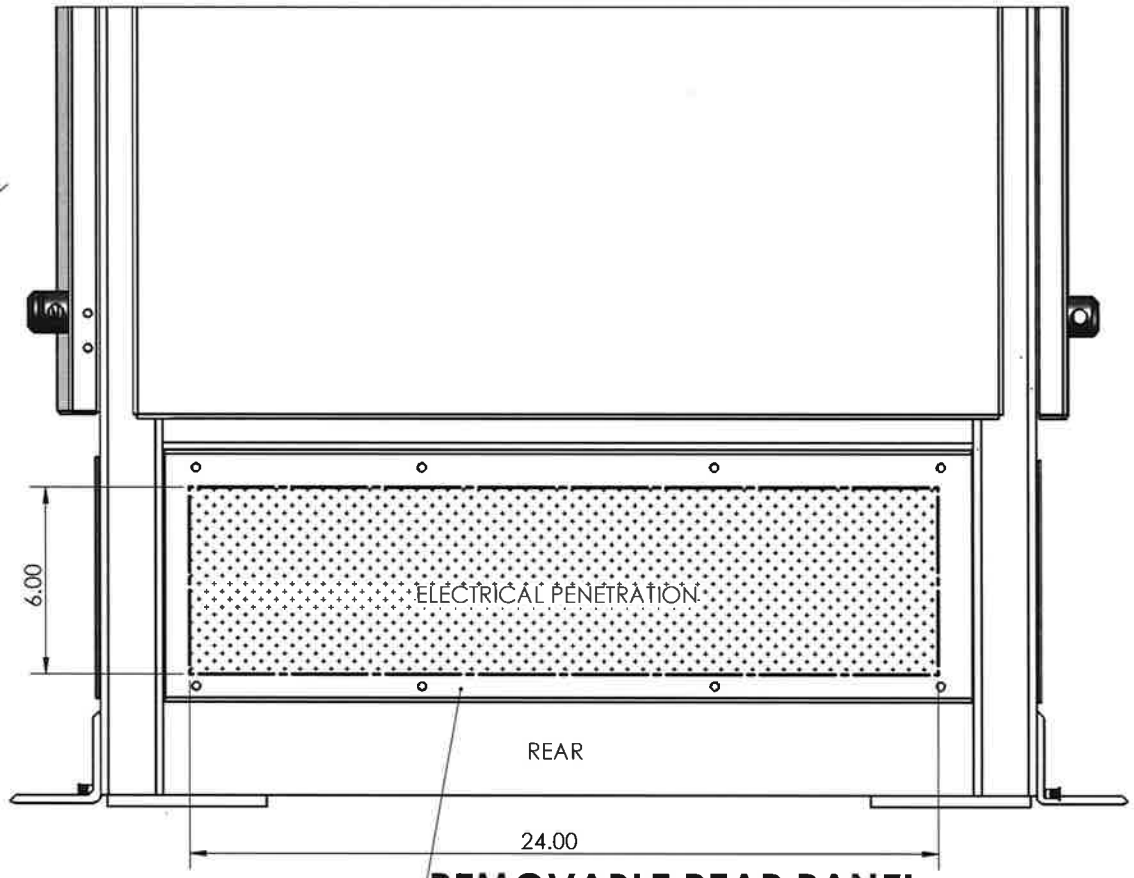
SIZE	DWG. NO.	REV
B	8340P-40415-001	A

SCALE: 1:1 | WEIGHT: | SHEET 1 OF 3

SERVICE AND OPERATION

ELECTRICAL PENETRATION AND BOLT DOWN DETAIL





REMOVABLE REAR PANEL

COMMENTS:
DO NOT INSTALL INDOORS
USE OPEN FRAME ASSY FOR
INDOOR INSTALLATION

REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	–		

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN RICHARD RODRIGUEZ	02/19/13
CHECKED	
ENG APPR.	
MFG APPR.	
Q.A.	

POLAR POWER INC.
22520 AVALON BLVD, CARSON, CA 90745

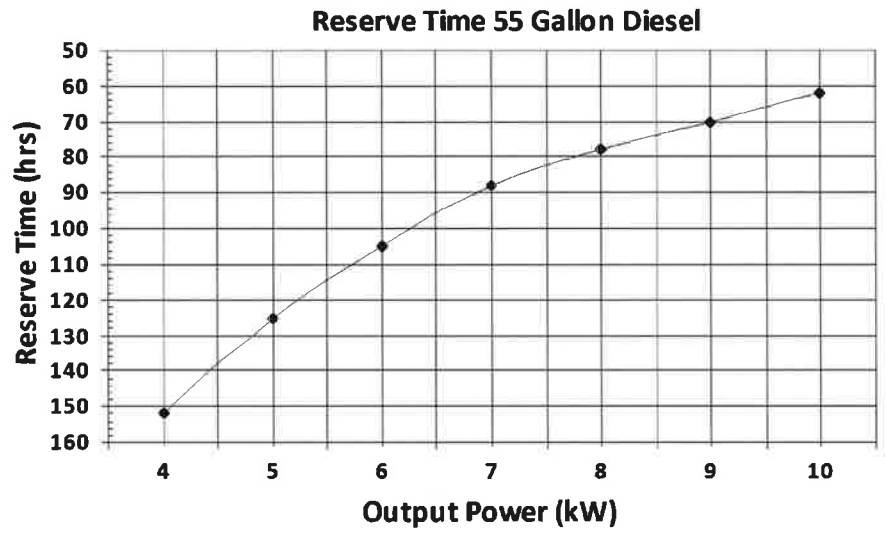
TITLE: AL Vertical Enclosure - Tall (VT)

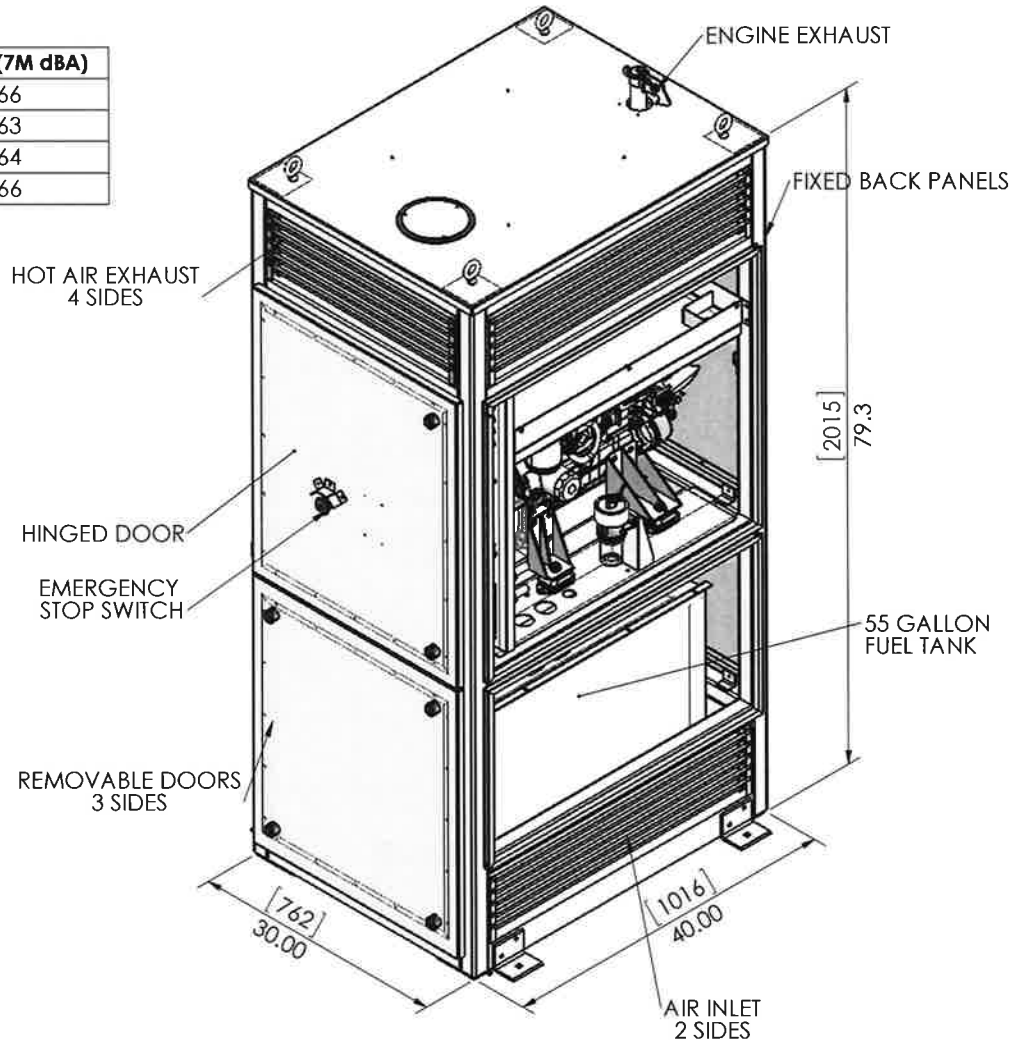
SIZE	DWG. NO.	REV
B	8340P-40415-001	A

SCALE: 1:1 | WEIGHT: | SHEET 2 OF 3

SERVICE AND OPERATION

DIESEL GEN PART #	POWER (kW)	MAX ENGINE HP	MAX RPM	NOISE (7M dBA)
8220I - 3CA1	8 - 10	18.5	2600	66
8220I - 3CA1	5 - 6	11.5	1800	63
8080P - 40205	4 - 5	11.0	2800	64
8340P-40415	14-17	28	2600	66





REV	DESCRIPTION	ECO#	BY	DATE
	INITIAL RELEASE	--		

COMMENTS:
DO NOT INSTALL INDOORS
USE OPEN FRAME ASSY FOR
INDOOR INSTALLATION

NEXT ASSY | USED ON
APPLICATION

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32" DECIMALS X.X±0.1" X.XX±0.03" X.XXX±0.010" ANGLES ±1/2°
MATERIAL
FINISH
DO NOT SCALE DRAWING

CAD GENERATED DRAWING
DO NOT MANUALLY UPDATE

APPROVALS	DATE
DRAWN RICHARD RODRIGUEZ	02/19/13
CHECKED	
ENG APPR.	
MFG APPR.	
Q.A.	

POLAR POWER INC.
22520 AVALON BLVD, CARSON, CA 90745

TITLE: AL Vertical Enclosure - Tall (VT)

SIZE	DWG. NO.	REV
B	8340P-40415-001	A

SCALE: 1:1 | WEIGHT: | SHEET 3 OF 3

ATTACHMENT 4

AECOM

Submitted to
Verizon Wireless
99 East River Drive
East Hartford, CT 06108

Submitted by
AECOM
500 Enterprise Drive,
Suite 3B
Rocky Hill, CT 06067
July 10, 2015

DETAILED STRUCTURAL ANALYSIS AND MODIFICATION OF AN EXISTING 160' SELF SUPPORTING LATTICE TOWER AND FOUNDATION FOR PROPOSED ANTENNA ARRANGEMENT

verizonwireless

Site ID : Middlebury I84 CT
Site Name: Connecticut State Police Site #20
Site Address: Intersection of I-84 and South Street
Middlebury, Connecticut
Connecticut State Police Site #20

60404004
VZ5-190 Rev. 2

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This report summarizes the structural analysis of the modified 160' self-supporting lattice tower located west of the intersection of I-84 and South Street in Middlebury, Connecticut. The analysis was conducted in accordance with the 2005 Connecticut State Building Code, the TIA/EIA-222-F standard, and the Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) and 90 mph (fastest mile) concurrent with ½" ice. Twist (rotation) and sway (deflection) were determined in accordance with Connecticut State Police Requirements for a wind velocity of 90 mph (fastest mile) concurrent with ½" ice. The antenna loading considered in the analysis consists of all existing, future, and proposed antennas, transmission lines, and ancillary items as outlined in the Introduction of this report.

The proposed Verizon antenna installation is listed below:

PROPOSED ANTENNA	CARRIER	ANTENNA CENTER ELEVATION
Install: **(2) SBNHH-1D65B Panel Antennas (Alpha & Beta Sectors for 700 MHz and shared with 2100 MHz (AWS))** **(2) SBNHH-1D65B Panel Antennas (Alpha & Beta Sectors for 850 MHz and shared with 1900 MHz (PCS))** **(2) 700 MHz RRH Units (Alpha & Beta Sectors for 700 MHz and shared with 2100 MHz (AWS)) (ALU RH_2x60 – 700 MHz)** **(2) 2100 MHz (AWS) Units (Alpha & Beta Sectors for 700 MHz and shared with 2100 MHz (AWS)) (ALU Rh_2x60 – AWS)** **(1) DB-T1-6Z-8AB-0Z Distribution Box** **(2) Antenna Mount Frames (Alpha & Beta Sectors)** **(1) 1-5/8" Fiber Optic Cable (HB158-1-08U8-S8J18)**	**Verizon (Proposed)**	**@ 75'**

The results of an initial analysis indicated the existing tower structure, foundation and anchor bolts did not have enough capacity for the proposed loading conditions. The tower structure and anchor bolts require modifications. Once the modifications indicated on sheets SK-1 through SK-4 are performed, the modified structure is considered structurally adequate with the wind load classification specified above with the existing and proposed antenna loading.

The tower deflection (sway) is 0.5831 degrees, and the tower rotation (twist) is 0.1519 degrees with a wind velocity of 90 mph concurrent with 0.5" ice. **The tower deflection and rotation are within the Connecticut State Police specification of 0.75 degrees for combined deflection (sway) and rotation (twist).**

The analysis results presented herewith are based upon the completion of previous tower modifications proposed by AECOM's tower modification analysis report, project number 36931450, signed and sealed on April 23, 2015. If the tower has not been modified to the specifications proposed by AECOM, please notify the engineer in writing immediately.

1. EXECUTIVE SUMMARY *(continued)*

This analysis is based on:

1) The tower structure's theoretical capacity not including any assessment of the condition of the tower.

2) Tower geometry, member sizes and foundation taken from Tower and Foundation reports prepared by Stainless, Inc. project number 358807 dated December 14, 1993.

3) Soil information taken from geotechnical report prepared by Dr. Clarence Welti, P.E., P.C., dated December 17, 2012.

4) Previous structural analysis and modification performed by AECOM on behalf of T-Mobile, project number NSS-025 Rev. 1 / 36931450, signed and sealed on April 23, 2015

5) Antenna inventory as specified in sections 2 and 6 of this report taken from inventory provided by the Connecticut State Police (CSP), May 6, 2015.

6) Updated inventory to initially proposed RFDS provided by Verizon Wireless via e-mail dated June 10, 2015.

7) Coax cable orientation as specified in section 6 of this report.

This report is only valid as per the assumptions and data utilized in this report for antenna inventory, mounts and associated cables. The user of this report shall field verify the antenna, cabling and mount configuration used, as well as the physical condition of the tower members, connections and foundations. Notify the engineer in writing immediately if any of the information in this report is found to be other than specified.

If you should have any questions, please call.

Sincerely,

AECOM, legacy URS Corporation AES

STATE OF CONNECTICUT
RICHARD A. SAMBOR
No. 9057
LICENSED
PROFESSIONAL ENGINEER

Richard A. Sambor, P.E.
Senior Structural Engineer

RAS/mcd
cc: IA, CF/Book – AECOM

2. INTRODUCTION

The subject tower is located west of the intersection of I-84 and South Street in Middlebury, Connecticut. The structure is a self-supporting three-legged 160' steel tapered lattice tower manufactured by Stainless Incorporated.

The inventory is summarized in the table below::

Antenna Type	***Carrier***	***Mount***	***Centerline Elevation***	***Cable***
4' Lightning Rod	(existing)	Pipe mount above	177'	---
16' Lightning Rod Mounting Pipe	(existing)	None	168'	---
Tower Light	(existing)	None	160'-6"	---
(3) 6' Microwave Dishes w/radomes	CSP 68 to 70 (future)	Leg Mounts	160'	---
(1) Celwave PD-83 antenna	CSP – 1 (existing)	(3) 4' Stand-off	160'	(1) 7/8" coax cable
(1) DB-228	FBI – 3 (existing)			(1) 7/8" coax cable
(2) OGT9-806 antennas (1) Decibel DB810K-Y	CSP 8 to 10 (existing)			(3) 1-5/8" coax cable
(6) SC479-HF1LDF (2) Tower Top Amplifier	CSP 40 to 47 (existing)			(6) 1-5/8" coax cable (2) 1/2" coax cables
(2) SC479-HF1LDF (inverted) (2) Tower Top Amplifier	CSP 64 to 67 (existing)			(2) 1-5/8" coax cable (2) 1/2" coax cables
(5) Filter/Diplexers	(existing)	(3) 4' Stand-offs (listed above)	155'	---
(1) Decibel DB304-A	ATF – 2 (existing)	*Shared with Above*	153'	(1) 7/8" coax cable
(2) OGT9-806 antennas (1) DB810K	CSP 11 to 13 (existing)	4' Stand-off	143'	(3) 1-5/8" coax cable
(3) Powerwave 7770 (3) Powerwave 7020 RET (6) TMAs (6) Diplexers (4) SBNH-1D6565C (2 A, 1 B & 1 C) (2) KMW AM-X-CD-16-65-00T (1 B & 1 C) (9) TMAs (6) Diplexers (1) Surge Suppressor	AT&T (existing)	(3) T-Frames	138'	(12) 1 1/4" coax cable (1) 3" Flex Conduit with 3 Fiber & 6 DC Cables
(1) SC479-HF1LDF (inverted)	CSP – 39 (existing)	Leg Mount	130'	(1) 1-5/8" coax cable

Antenna Type	*Carrier*	*Mount*	*Centerline Elevation*	*Cable*
(3) LNX-6515DS-VTM Panel Antennas (3) Smart Bias-T Units (3) EMS RR90-17-02-DP antennas (3) TMA Units	T-Mobile (existing)	(3) 2-Panel Antenna Mounts	125'	(12) 1 5/8" coax cable
(1) Celwave PD1142	DOT – 4 (existing)	3' Stand-off	122'	(1) 7/8" coax cable
(1) 20' Omni	EMS – 14 (reserved)	Leg Mount	115'	---
(2) 6' Dishes w/ Ice Canopy	CSP – 6 & 7 (existing)	(2) Dish Mounts	110'	(2) WEP65 coax cable
(3) RFS APXVSPP-C-20 Antennas (3) Andrew RRH 800 MHz 2x40W (3) Panasonic RRH 1900 MHz 2x40W	Sprint (existing)	Existing Pipe Mounts w/ (1) Commscope PM-SU35-48 Mount	97'	(6) 1 1/4" coax cable (3) Hybriflex cable
(1) PD10054	CSP – 5 (existing)	Leg Mount	85'	(1) 7/8" coax cable
(2) SBNHH-1D65B (1A & 1B) 700 MHz and shared with 2100 MHz (AWS)) (2) 700 MHz RRH Units (1A & 1B) 700 MHz and shared with 2100 MHz (AWS) (2) 2100 MHz (AWS) Units (1A & 1B) 700 MHz and shared with 2100 MHz (AWS) (2) SBNHH-1D65B (1A, 1B) 850 MHz and shared with 1900 MHz (PCS) (1) DB-T1-6Z-8AB-0Z Distribution Box	**Verizon (Proposed)**	**(2) Antenna Mount Frames (Alpha & Beta Sectors)**	**75'**	**(1) 1-5/8" Fiber Optic Cable (HB158-1-08U8-S8J18)**
GPS-TMG-HR-26NCM	Sprint (existing)	2' Stand-off	55'	(1) 1/2" coax cable

This structural analysis of the communications tower was performed by AECOM for Verizon. The purpose of this analysis was to investigate the structural integrity of the reinforced tower with its existing and proposed antenna loads. The analysis was conducted to evaluate twist (rotation), sway (deflection), and stress on the tower.

The analysis results presented herewith are based upon the completion of previous tower modifications proposed by AECOM's tower modification analysis report, project number 36931450, signed and sealed on April 23, 2015. If the tower has not been modified to the specifications proposed by AECOM, please notify the engineer in writing immediately.

3. ANALYSIS METHODOLOGY AND LOADING CONDITIONS

The structural analysis was done in accordance with the 2005 Connecticut State Building Code, TIA/EIA-222-F—Structural Standard for Steel Antenna Towers and Antenna Supporting Structures, the Connecticut State Police Requirements, and the American Institute of Steel Construction (AISC) Manual of Steel Construction—Allowable Stress Design (ASD).

The analysis was conducted using TNX Tower 6.1.3.1. Two load conditions were evaluated as shown below which were compared to allowable stresses according to AISC and TIA/EIA.

Load Condition 1 = 90 mph (fastest mile) Wind Load (without ice) + Tower Dead Load
Load Condition 2 = 90 mph (fastest mile) Wind Load (with ice) + Ice Load + Tower Dead Load

The TIA/EIA standard permits one-third increase in allowable stresses for towers and monopoles less than 700 feet tall. For purposes of this analysis, in computing the load capacity the allowable stresses of the tower members were increased by one-third.

4. FINDINGS AND EVALUATION

The stresses on the existing tower structure were evaluated to compare with the allowable stress in accordance with AISC. The results of an initial analysis indicated the tower structure, foundation and anchor bolts did NOT have enough capacity to support the proposed loading conditions. The tower structure, anchor and foundation require modifications. **Once the modifications indicated on SK-1 through SK-4 are performed, the modified structure is considered structurally adequate with the wind load classification specified with the existing and proposed loading noted herein.**

The tower deflection (sway) is 0.5831 degrees, and the tower rotation (twist) is 0.1519 degrees with a wind velocity of 90 mph concurrent with 0.5" ice. **The tower deflection and rotation are within the Connecticut State Police specification of 0.75 degrees for combined deflection (sway) and rotation (twist).**

Tower Base Reactions:

Description	Current
Axial Load (Kips)	73
Pier Compression (kips)	399
Pier Uplift (kips)	338
Overall Overturning (kip-ft)	7458
Overall Shear (kips)	79
Shear per Leg (kips)	45

Controlling Tower Component Stress vs. Capacity Summary:

Component / (Section No.)	Critical Component Size	Controlling Elevation	Stress (% capacity)	Pass/Fail
Tower Leg (T8)	HSS 6.875x0.4	37.5' – 50.0	95.9	Pass
Diagonal (T6)	2L3x2-1/2x1/4	58.333' – 66.667'	99.2	Pass
Horizontal (T2)	L2-1/2x2-1/2x3/16	125' – 150'	87.7	Pass
Top Girt (T9)	L4x4x1/4	25' – 37.5'	84.5	Pass
Redundant Horizontal Bracing (T9)	L2x2x5/16	25' – 37.5'	46.5	Pass
Redundant Diagonal Bracing (T9)	L2x2x5/16	25' – 37.5'	89.5	Pass
Inner Bracing (T7)	L2 1/2x2 1/2x3/16	0'-25'	12.0	Pass
Tower Anchor Bolts	(1) A325N 3/4" Bolts	66.667'	99.2	Pass
Modified Foundation Anchor Bolts	Tension & Shear	-----	79.4	Pass

Foundation Summary:

Component	Required / Allowable	Computed	% Capacity	Pass/Fail
Overturning Moment Factor of Safety	2.0 min	2.19	91.3	Pass
Foundation Bearing Pressure	4.5 ksf max	1.8135	42.1	Pass

Tower Twist & Sway at Top:

Description	Current	Total Allowable
Tower Sway (degrees)	0.5831	---
Tower Twist (degrees)	0.1519	
Total Deflection (degrees)	0.7350	0.75

5. CONCLUSIONS

The results of an initial analysis indicated the existing tower structure, foundation and anchor bolts did not have enough capacity for the proposed loading conditions. The tower structure and anchor bolts require modifications. Once the modifications indicated on sheets SK-1 through SK-4 are performed, the modified structure is considered structurally adequate with the wind load classification specified above with the existing and proposed antenna loading.

The tower deflection (sway) is 0.5831 degrees, and the tower rotation (twist) is 0.1519 degrees with a wind velocity of 90 mph concurrent with 0.5" ice. **The tower deflection and rotation are within the Connecticut State Police specification of 0.75 degrees for combined deflection (sway) and rotation (twist).**

The analysis results presented herewith are based upon the completion of previous tower modifications proposed by AECOM's tower modification analysis report, project number 36931450, signed and sealed on April 23, 2015. If the tower has not been modified to the specifications proposed by AECOM, please notify the engineer in writing immediately.

Limitations/Assumptions:

This report is based on the following:

1) Tower inventory as listed in this report.
2) Tower is properly installed and maintained.
3) All members are as specified in the original design documents and are in good condition.
4) All required members are in place.
5) All bolts are in place and are properly tightened.
6) Tower is in plumb condition.
7) All member protective coatings are in good condition.
8) All tower members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
9) Foundations are in good condition without defects and were properly constructed to support original design loads as specified in the original design documents.

AECOM is not responsible for any modifications completed prior to or hereafter in which AECOM is not or was not directly involved. Modifications include but are not limited to:

A. Adding antennas
B. Removing/replacing antennas
C. Adding coaxial cables

AECOM hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations, and conclusions are based upon information contained and set forth herein. If you are aware of any information which conflicts with that which is contained herein, or you are aware of any defects arising from original design, material, fabrication, or erection deficiencies, you should disregard this report and immediately contact AECOM. AECOM disclaims all liability for any representation, recommendation, or conclusion not expressly stated herein.

Ongoing and Periodic Inspection and Maintenance:

After the Contractor has successfully completed the installation and the work has been accepted, the owner will be responsible for the ongoing and periodic inspection and maintenance of the tower.

The owner shall refer to TIA/EIA-222-F for recommendations for maintenance and inspection. The frequency of the inspection and maintenance intervals is to be determined by the owner based upon actual site and environmental conditions. It is recommended that a complete and thorough inspection of the entire tower structural system be performed at least yearly and more frequently as conditions warrant. According to TIA/EIA-222-F section 14.1, Note 1; it is recommended that the structure be inspected after severe wind and/or ice storms or other extreme loading conditions.

6. DRAWINGS AND DATA

REINFORCEMENT DRAWINGS SK-1 THROUGH SK-4

GENERAL CONSTRUCTION NOTES

1. ALL WORK SHALL COMPLY WITH THE CONNECTICUT STATE BUILDING, SUPPLEMENTS AND AMENDMENTS AND LIFE SAFETY CODES.
2. CONTRACTOR IS TO REVIEW ALL DRAWINGS AND NOTES IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUB-CONTRACTORS AND ALL RELATED PARTIES. THE SUB-CONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND NOTES FOR THE INFORMATION THAT AFFECTS THEIR WORK.
3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON DRAWINGS.
4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION AND ELECTRICAL SUB-CONTRACTORS SHALL PAY FOR THEIR PERMITS.
6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS ON SITE AT ALL TIMES AND ENSURE THE DISTRIBUTION OF NEW DRAWINGS TO SUB-CONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. CONTRACTOR SHALL FURNISH 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
7. INSTALLATION OF THIS WIRELESS COMMUNICATIONS EQUIPMENT SITE REQUIRES WORK IN THE IMMEDIATE VICINITY OF EXISTING OPERATING TELECOMMUNICATION SYSTEMS. THE CONTRACTOR SHALL PROVIDE AND COORDINATE THE METHODS OF PROTECTION WITH THE VARIOUS TELECOMMUNICATION CARRIERS AND THE TOWER OWNER. THERE SHALL BE NO INTERRUPTION OF OPERATION WITHOUT TIMELY COORDINATION WITH AND APPROVAL BY THE VARIOUS COMMUNICATIONS OPERATORS.
8. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER MFR'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR ARCHITECT.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
10. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ARCHITECT FOR REVIEW. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTAL TO THE ARCHITECT FOR REVIEW.
11. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA. SUBMIT ANY DISCREPANCIES FROM THE DRAWINGS TO THE ARCHITECT.
12. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURE AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.
13. CONTRACTOR TO CONTACT "CALL BEFORE YOU DIG" AT 1-800-922-4455 TO VERIFY AND IDENTIFY THE EXACT LOCATIONS OF ALL UNDERGROUND UTILITIES AND OBSTRUCTIONS IDENTIFIED PRIOR TO COMMENCING WORK IN THE CONTRACT AREA.
14. EXISTING DIMENSIONS OF STRUCTURE SHOWN ON THESE DOCUMENTS ARE BASED ON ORIGINAL TOWER CONSTRUCTION DRAWINGS BY STAINLESS INC., DATED DECEMBER 1995, AND ARE NOT GUARANTEED. CONTRACTOR SHALL TAKE FIELD DIMENSIONS AS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK AND SHALL ASSUME FULL RESPONSIBILITY FOR THEIR ACCURACY. WHEN SHOP DRAWINGS BASED ON FIELD MEASUREMENT ARE SUBMITTED FOR REVIEW, DIMENSIONS ARE PROVIDED FOR THE ENGINEER'S REFERENCE ONLY.

STRUCTURAL NOTES

STRUCTURAL STEEL MATERIAL:

STRUCTURAL STEEL BEAMS, CHANNELS, PLATES..... A36
STRUCTURAL ANGLES..... A36
EXISTING TOWER LEG ..... A 572-Gr. 50 & Gr. 60

STRUCTURAL STEEL SHALL CONFORM TO ALL THE REQUIREMENTS OF THE ASTM SPECIFICATION, AS REFERENCED IN THE CODE.

UNLESS OTHERWISE NOTED, ALL STEEL WILL BE GALVANIZED IN ACCORDANCE WITH ASTM 123 AFTER FABRICATION. TOUCH UP ALL DAMAGED GALVANIZED STEEL WITH APPROVED COLD ZINC, "GALVANOX", "DRY GALV", "ZINC-IT", OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURERS GUIDELINES. TOUCH-UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT APPLIED IN SHOP OR FIELD.

SHOP AND ERECTION DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL STEEL WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. SUBMIT 2 SETS OF PRINTS FOR THE ENGINEER REVIEW.

MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

THE OMISSION OF ANY MATERIAL THAT WAS SHOWN ON THE CONTRACT DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR OF PROVIDING THE SAME.

ALL WELDING SHALL BE DONE BY A CERTIFIED WELDER IN ACCORDANCE WITH AWS STANDARDS, USING E70XX ELECTRODES UNLESS OTHERWISE NOTED. WHERE WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZED PER "PREQUALIFIED WELDED JOINTS" TABLES IN AISC "MANUAL OF STEEL CONSTRUCTION", NINTH EDITION.

STRUCTURAL NOTES (CONT.)

CONNECTIONS / FIELD ASSEMBLY:

BOLTED CONNECTIONS: UNLESS OTHERWISE NOTED, ALL JOINTS ARE SLIP CRITICAL TYPE, REQUIRING 5/8" DIA. A325-N BOLTS, A563 NUTS AND F436 WASHERS, ALL GALVANIZED. BEVELED WASHERS SHALL BE USED ON BEAM FLANGES HAVING A SLOPE GREATER THAN 1:20.

STRUCTURE IS DESIGNED TO BE LEVEL AND PLUMB, SELF-SUPPORTING AND STABLE AFTER WORK IS COMPLETED.

COMMENCEMENT OF WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION. NO MEMBER OF THE TOWER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY. THE CONTRACTOR SHALL BE AWARE OF WEATHER AND WIND CONDITIONS AND NOT PERFORM MEMBER REPLACEMENT IN A WIND.

INSPECTIONS:

SPECIAL INSPECTIONS ARE REQUIRED PER THE CODE.

OWNER WILL SUPPLY THE SERVICES OF A SPECIAL INSPECTOR AND TESTING AGENTS AS REQUIRED. CONTRACTOR SHALL COORDINATE INSPECTIONS OF FABRICATOR'S AND ERECTOR'S WORK AND MATERIALS TO MEET THE REQUIREMENTS OF THE STATEMENT OF SPECIAL INSPECTIONS FOR THIS PROJECT.

COPIES OF TESTING AND INSPECTION REPORTS WILL BE PROVIDED TO THE OWNER, BUILDING OFFICIAL, ENGINEER OF RECORD AND CONTRACTOR.

SOIL
1. SOIL BEARING CAPACITY OF 4500 PSF WAS USED FOR THE FOUNDATION DESIGN. SOIL BEARING CAPACITY WAS OBTAINED FROM DR. CLARENCE WELTI GEOTECHNICAL REPORT, DATED DECEMBER 17, 2012.
2. ALL SURFACES MUST BE FREE OF STANDING WATER PRIOR TO PLACING.
3. COMPACTED GRAVEL FILL PER CONNECTICUT DOT STANDARD SPEC. SECTION M.02.01 AND ASTM D1557.
4. CONTACT THE ENGINEER IF GROUND WATER IS IN ENCOUNTERED AND DEWATERING IS REQUIRED.
5. EXCAVATED SOIL SHALL BE PLACED IN 8" LOOSE DEPTH LAYERS AND COMPACTED TO AT LEAST 95% OF THE MAXIMUM DENSITY OBTAINED IN THE STANDARD COMPACTION TEST. BACKFILL MATERIAL SHALL BE FREE OF ORGANIC MATERIAL.

CONCRETE
1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE ACI 301, ACI 318 AND THE SPECIFICATION CAST-IN--PLACE CONCRETE.
2. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS, UNLESS NOTED OTHERWISE. CONCRETE SHALL BE AIR ENTRAINED TO (4% TO 6%) AND SLUMP OF 3" TO 5".
3. REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60, DEFORMED UNLESS NOTED OTHERWISE. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 WELDED STEEL WIRE FABRIC UNLESS NOTED OTHERWISE. SPLICES SHALL BE CLASS "B" AND ALL HOOKS SHALL BE STANDARD, UNO.
4. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL UNLESS SHOWN OTHERWISE ON DRAWINGS:

   CONCRETE CAST AGAINST EARTH.....3 IN.

   CONCRETE EXPOSED TO EARTH OR WEATHER:
   #6 AND LARGER.....2 IN.
   #5 AND SMALLER & WWF .....1 1/2 IN.

   CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
   SLAB AND WALL.....3/4 IN.
   BEAMS AND COLUMNS.....1 1/2 IN.

5. A CHAMFER 3/4" SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, UNO, IN ACCORDANCE WITH ACI 301 SECTION 4.2.4.
6. INSTALLATION OF CONCRETE EXPANSION/WEDGE ANCHOR, SHALL BE PER MANUFACTURER'S WRITTEN RECOMMENDED PROCEDURE. THE ANCHOR BOLT, DOWEL OR ROD SHALL CONFORM TO MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH OR AS SHOWN ON THE DRAWINGS. NO REBAR SHALL BE CUT WITHOUT PRIOR ENGINEERING APPROVAL WHEN DRILLING.
7. COLD WEATHER CONCRETE PLACING SHALL BE IN ACCORDANCE WITH ACI-306.
8. NO FOOTING SHALL BE PLACED ON FROZEN GROUND. UNCURED CONCRETE SHALL BE PROTECTED AGAINST FROST.
9. APPLY NON-SLIP BROOM FINISH IMMEDIATELY AFTER TROWEL FINISHING.

FOUNDATION NOTES
1. ALL FOOTINGS SHALL BEAR ON EXISTING UNDISTURBED ORGANIC FREE SOIL. ALL UNSUITABLE SOIL SHALL BE REMOVED AS DIRECTED BY THE ENGINEER AND REPLACED WITH COMPACTED GRAVEL PLACED IN 8" LAYERS AND COMPACTED TO 95% OF MODIFIED OPTIMUM DENSITY.
2. NO EXISTING REBAR SHALL BE CUT OR DAMAGED WHEN DRILLING HOLES IN EXISTING CONCRETE WITHOUT PRIOR ENGINEERING APPROVAL.

Project No.:	60404004
Designed by:	MCD
Drawn by:	GAT
Checked by:	KAB
Approved by:	RAS

AECOM
500 ENTERPRISE DRIVE
ROCKY HILL, CONNECTICUT
(860)-529-8882

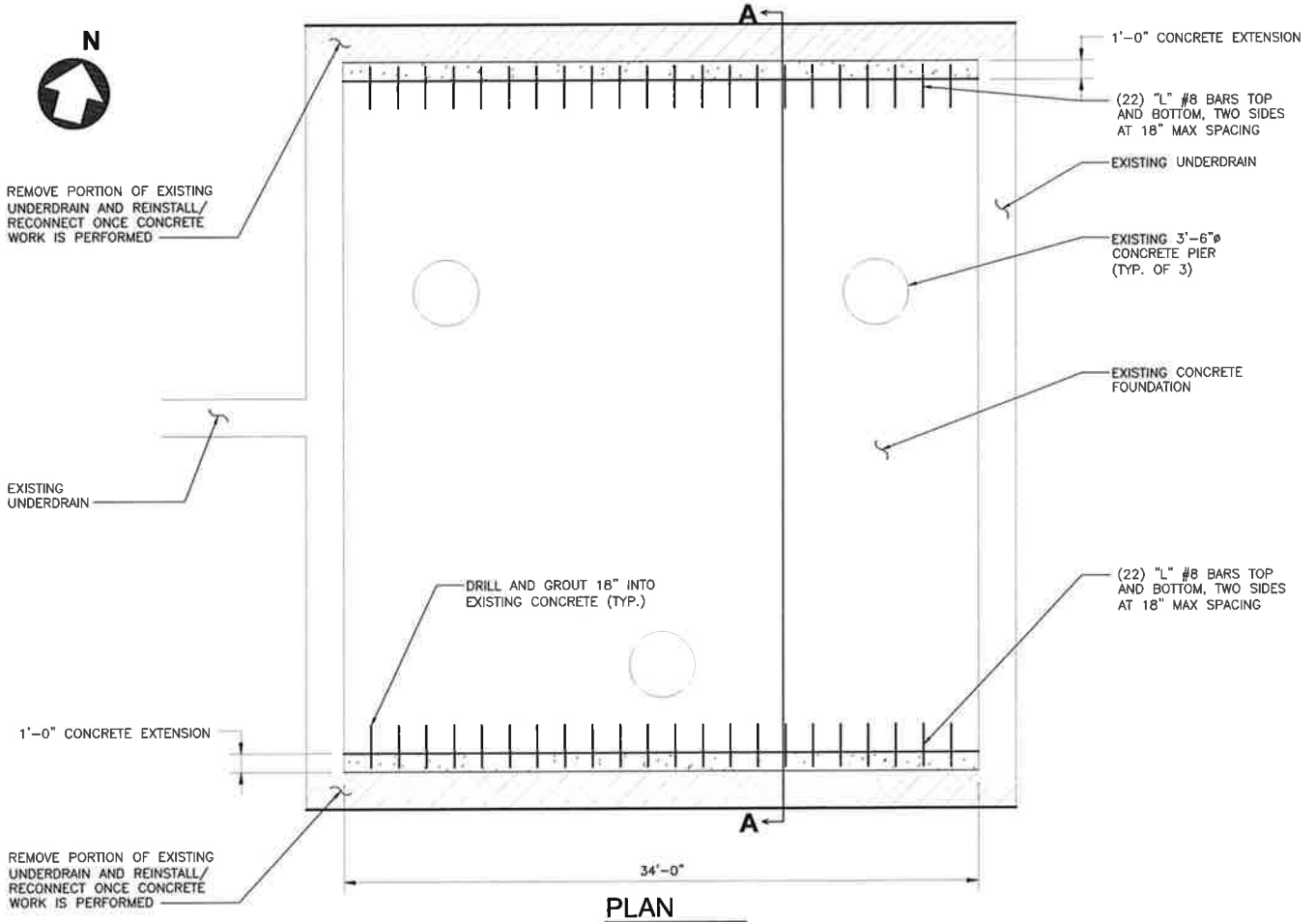
verizon wireless

SITE ADDRESS:
CSP #20, INTERSECTION OF I-84W & SOUTH ST
MIDDLEBURY, CONNECTICUT

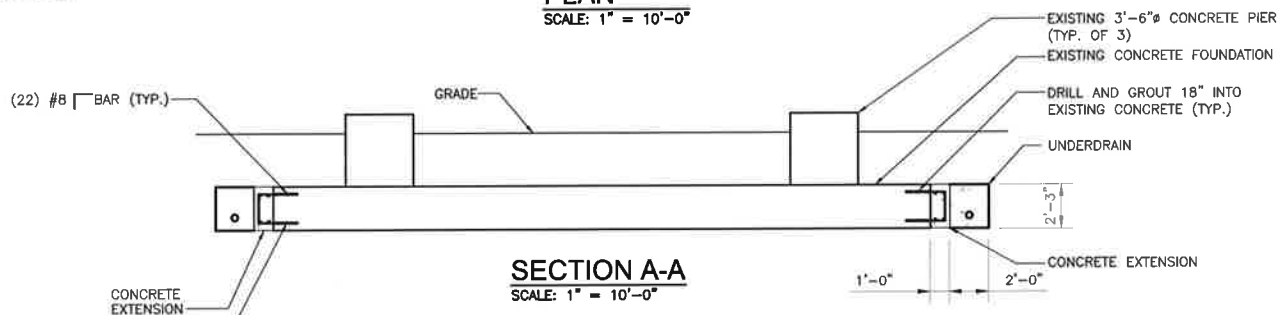
REV.	DATE:	DESCRIPTION

Scale:
Date: 07/10/15
Job No.VZ5-190
File No.

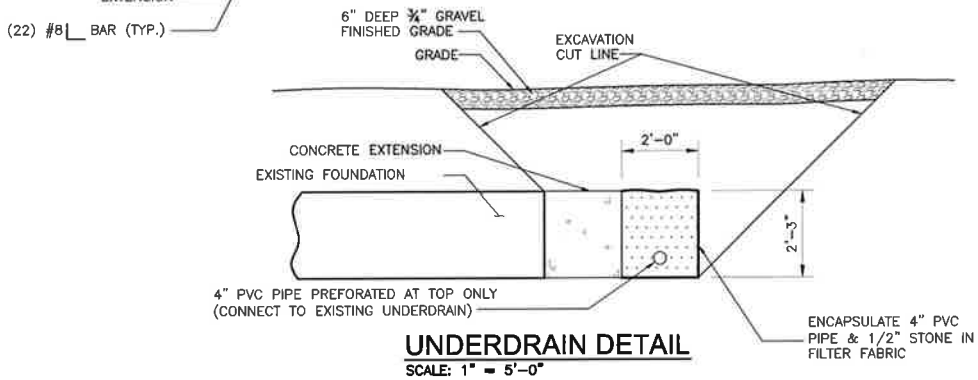
Dwg. No. SK-1
Dwg. 1 of 4



PLAN
SCALE: 1" = 10'-0"



SECTION A-A
SCALE: 1" = 10'-0"



UNDERDRAIN DETAIL
SCALE: 1" = 5'-0"

1 / SK-2 TOWER FOUNDATION REINFORCEMENT
NOTE: REFER TO SOIL NOTES ON SK-1 FOR BACKFILL REQUIREMENTS.

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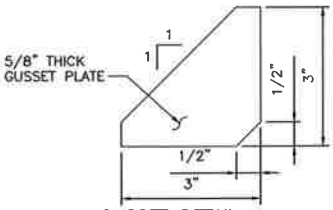
REV.	DATE:	DESCRIPTION

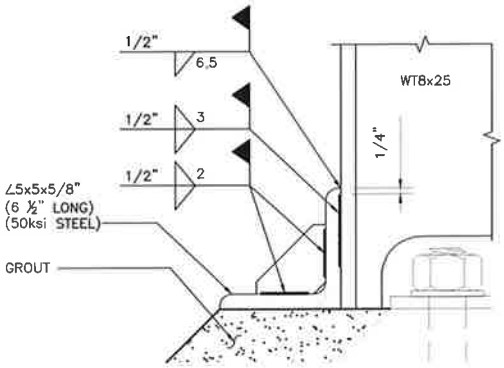
Scale: | Date: 07/10/15

Job No.VZ5-190 | File No. | Dwg. 2 of 4

Dwg. No. SK-2

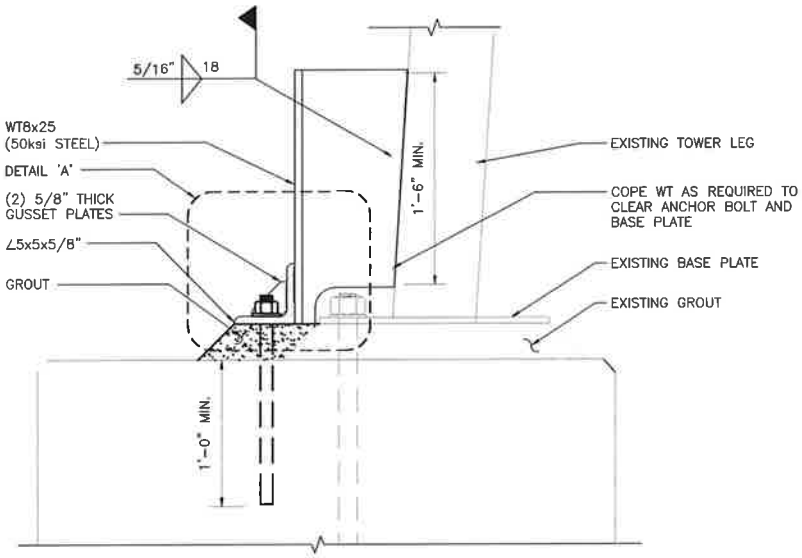


GUSSET DETAIL
SCALE: 3"=1'-0"

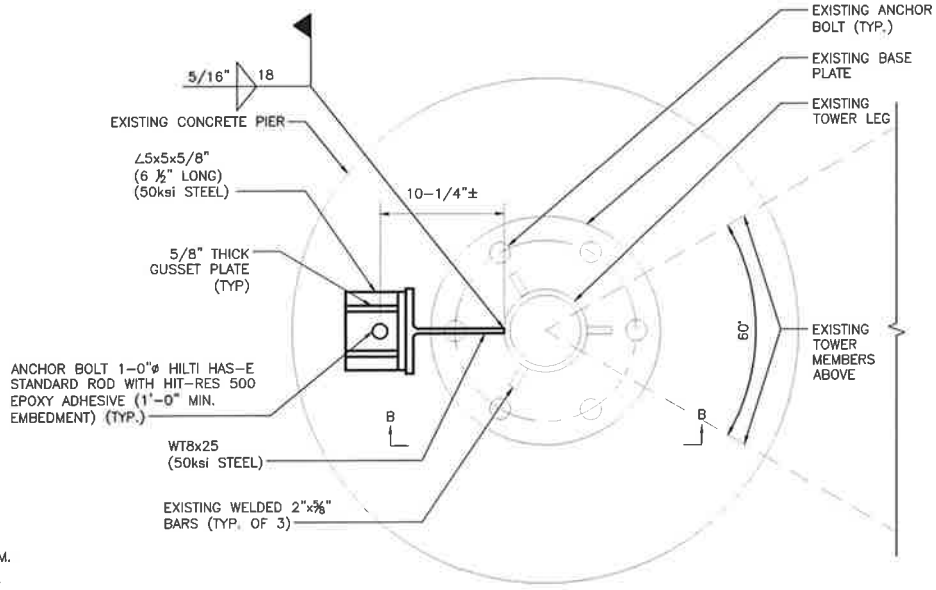


DETAIL 'A'
SCALE: 1 1/2"=1'-0"

NOTE:
ANCHOR BOLT NOT SHOWN FOR CLARITY



2 SK-3 **SECTION B-B**
SCALE: 3/4" = 1'-0"



GENERAL NOTES:
1. WT STEM SHALL BE COPED TO MATCH THE TAPER ANGLE OF TOWER LEG. CONTRACTOR SHALL VERIFY SLOPE OF THE TOWER LEG BEFORE ORDERING AND COPING THE WT STEM.
2. EXISTING CLIMBING CABLE ANCHOR SHALL BE ADJUSTED ABOVE PROPOSED WT BEAM WELDED TO TOWER LEG TO AVOID INSTALLATION CONFLICT.

1 SK-3 **ANCHOR BOLT MODIFICATION PLAN**
SCALE: 3/4" = 1'-0"

Project No.:	60404004
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Drawn by:	GAT
Checked by:	KAB
Approved by:	RAS

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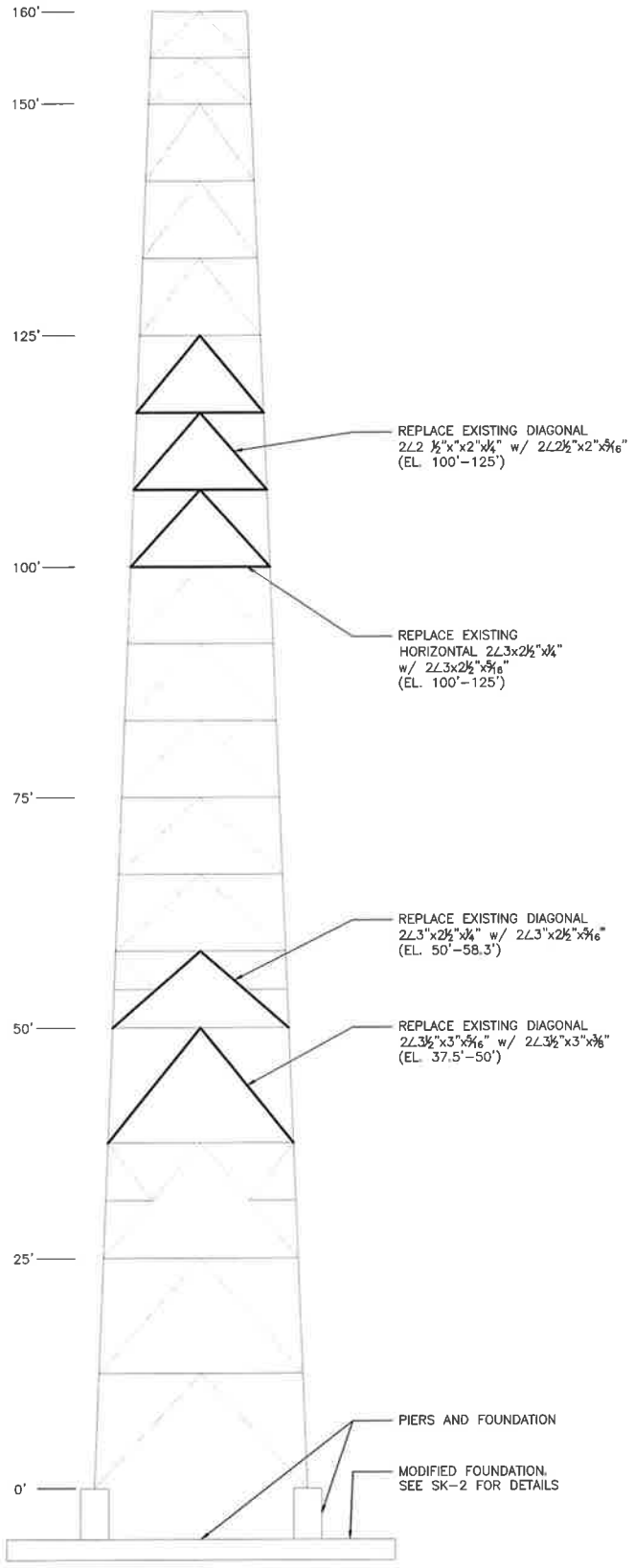
Scale:
Date: 07/10/15
Job No.VZ5-190
File No.
Dwg. 3 of 4

Dwg. No.
SK-3

NOTE:
SEE SK-1 FOR STRUCTURAL NOTES.



1 / SK-4 **TOWER ELEVATION**
SCALE: 1" = 20'-0"

Project No.:	60404004
Designed by:	MCD
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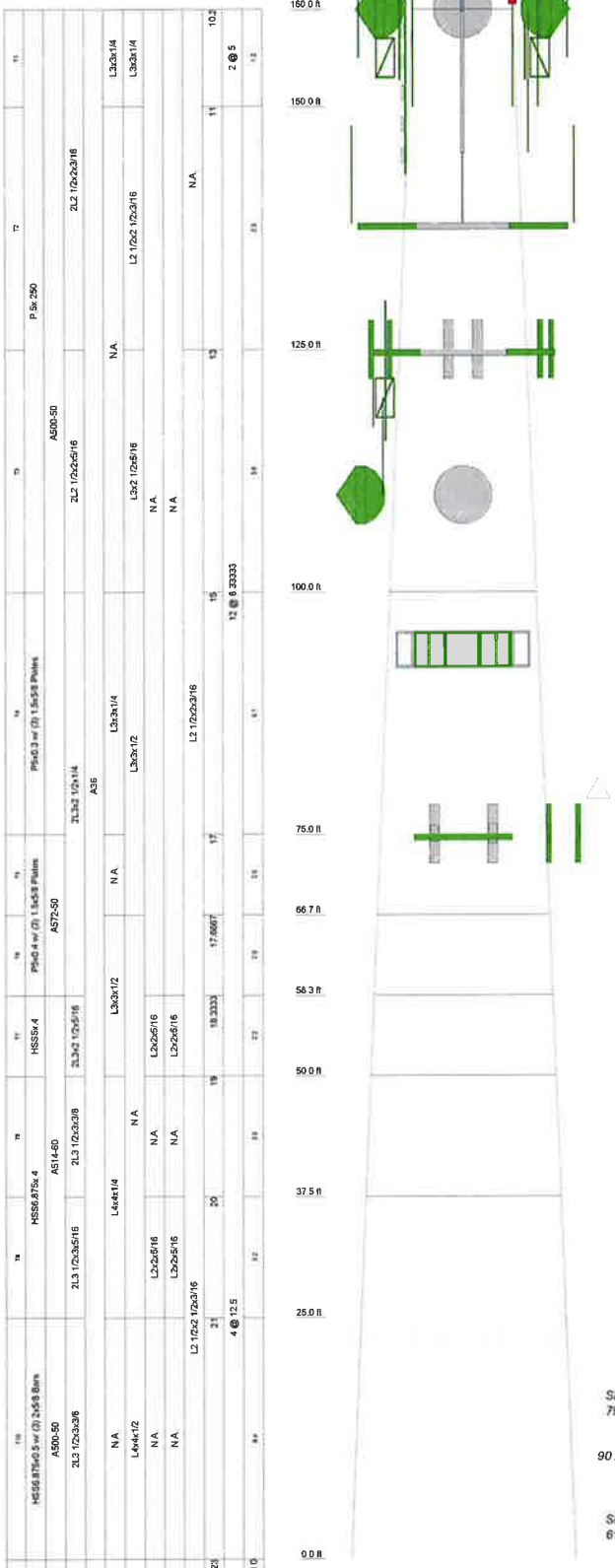
Scale: | Date: 07/10/15
Job No.VZ5-190 | File No.

Dwg. No. SK-4

Dwg. 4 of 4

TNX TOWER INPUT / OUTPUT SUMMARY



Section	10	11	12	13	14	15	16	17	18	19	20
Legs	HSS6.875x0.5 w/ (3) 2x5/8 Bars	HSS6.875x.4	P Sx .250		P5x0.3 w/ (3) 1.5x5/8 Plates		P5x0.4 w/ (3) 1.5x5/8 Plates	HSS5x.4			
Leg Grade	A500-50	A514-60	A500-50	A572-50							
Diagonals	2L3 1/2x3x3/8	2L3 1/2x3x5/16	2L3 1/2x3x3/8	2L3x2 1/2x5/16	2L3x2 1/2x1/4			2L3x2 1/2x5/16			
Diagonal Grade	A500-50				A36						
Top Girts	N.A.	L4x4x1/4		L3x3x1/2	L3x3x1/4			N.A.			
Horizontals	L4x4x1/2	N.A.		L3x3x1/2							
Red. Horizontals	N.A.	L2x2x5/16	N.A.	L2x2x5/16		N.A.					
Red. Diagonals	N.A.	L2x2x5/16	N.A.	L2x2x5/16		N.A.					
Inner Bracing	L2 1/2x2 1/2x3/16				L2 1/2x2x3/16						
Face Width (ft)	21	20		19		17		17.6667	15	13	11
# Panels @ (ft)	4 @ 12.5					12 @ 8.33333					2 @ 5
Weight (K)	33.0										10.2

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 5/8x4'	177	T-Frame (ATT)	138
16'x2.5" Pipe Mount	168	SC479-HF1LDF (CSP - 39 (inverted))	130 - 115.625
Tower Light	160.5	RR90-17-02DP (T-Mobile)	125
6'8"x4" Pipe Mount (CSP - Future)	160	RR90-17-02DP (T-Mobile)	125
6'8"x4" Pipe Mount (CSP - Future)	160	RR90-17-02DP (T-Mobile)	125
6'8"x4" Pipe Mount (CSP - Future)	160	DSM2 (T-Mobile)	125
PD83 (CSP - 1)	160	DSM2 (T-Mobile)	125
DB810K-Y (CSP - 9)	160	DSM2 (T-Mobile)	125
OGT9-806 (CSP - 10)	160	LNX-6515DS-VTM w/ 6' 2" sch 40 Pipe Mount (T-Mobile)	125
OGT9-806 (CSP - 8)	160	LNX-6515DS-VTM w/ 6' 2" sch 40 Pipe Mount (T-Mobile)	125
(2) SC479-HF1LDF (CSP - 40 .41)	160	LNX-6515DS-VTM w/ 6' 2" sch 40 Pipe Mount (T-Mobile)	125
(2) SC479-HF1LDF (CSP - 42 .44)	160	Bias-T Unit (T-Mobile)	125
TMA (CSP - 43)	160	Bias-T Unit (T-Mobile)	125
(2) SC479-HF1LDF (CSP - 45 .46)	160	Bias-T Unit (T-Mobile)	125
TMA (CSP - 47)	160	TMA (T-Mobile)	125
DB228-A (FBI - 2)	160	TMA (T-Mobile)	125
SC479-HF1LDF (CSP - 64 (inverted))	160 - 145	TMA (T-Mobile)	125
SC479-HF1LDF (CSP - 65 (inverted))	160 - 145	PD1142 (DOT - 4)	122
TMA (CSP - 66)	160	3' Sidearm	120
TMA (CSP - 67)	160	4'x96"x72" Ice Canopy	115
6' w/ Radome (CSP - Future)	160	3' Dia 20' Omni (EMS - 14)	115
6' w/ Radome (CSP - Future)	160	4'x96"x72" Ice Canopy	115
6' w/ Radome (CSP - Future)	160	6' w/ Radome (CSP - 6)	110
6' Side Arm	155	6' w/ Radome (CSP - 7)	110
6' Side Arm	155	6'x4" Pipe Mount	110
6' Side Arm	155	6'x4" Pipe Mount	110
Filter/Diplexer	155	APXVSPP18-C-A20 (Sprint)	97.3
Filter/Diplexer	155	PM-SU35-48 (Sprint)	97.3
Filter/Diplexer	155	RRH 1900 MHz 2x40W (Sprint)	97.3
Filter/Diplexer	155	RRH 1900 MHz 2x40W (Sprint)	97.3
Filter/Diplexer	155	RRH 1900 MHz 2x40W (Sprint)	97.3
DB304 (ATF - 2)	153	RRH 800MHz 2x50W (Sprint)	97.3
OGT9-806 (CSP - 13)	143	RRH 800MHz 2x50W (Sprint)	97.3
DB810K-Y (CSP - 12)	143	RRH 800MHz 2x50W (Sprint)	97.3
OGT9-806 (CSP - 11)	143	APXVSPP18-C-A20 (Sprint)	97.3
T-Frame (ATT)	138	APXVSPP18-C-A20 (Sprint)	97.3
T-Frame (ATT)	138	Sector Frame (Sprint)	94
SBNH-1D6565C (ATT)	138	Sector Frame (Sprint)	94
SBNH-1D6565C (ATT)	138	Sector Frame (Sprint)	94
SBNH-1D6565C (ATT)	138	PD10054 (CSP - 5)	85
AM-X-CD-16-65-00T-RET (6') (ATT)	138	RH_2x60-07-L (700 MHz) (VZW)	75
AM-X-CD-16-65-00T-RET (6') (ATT)	138	DC6-48-60-18-8F (VZW)	75
SBNH-1D6565C (ATT)	138	RRH_2x60-AWS (VZW)	75
7020 RET (ATT)	138	RRH_2x60-AWS (VZW)	75
7020 RET (ATT)	138	SBNHH-1D65B (VZW-850PCS)	75
7020 RET (ATT)	138	SBNHH-1D65B (VZW-700AWS)	75
(5) TMA (ATT)	138	5' T-arm (VZW)	75
(5) TMA (ATT)	138	RH_2x60-07-L (700 MHz) (VZW)	75
(5) TMA (ATT)	138	5' T-arm (VZW)	75
(4) Diplexer (ATT)	138	SBNHH-1D65B (VZW-850PCS)	75
(4) Diplexer (ATT)	138	SBNHH-1D65B (VZW-700AWS)	75
(4) Diplexer (ATT)	138	Stand off arm (Sprint)	55
Surge Suppressor (ATT)	138	GPS (Sprint)	55
7770.00 (ATT)	138		
7770.00 (ATT)	138		
7770.00 (ATT)	138		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A572-50	50 ksi	65 ksi
A36	36 ksi	58 ksi	A514-60	60 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower designed for a 90 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 90 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 90 mph wind.
4. TOWER RATING: 99.2%

MAX. CORNER REACTIONS AT BASE:
DOWN: 399 K
SHEAR: 45 K

UPLIFT: -338 K
SHEAR: 40 K

AXIAL
73 K

SHEAR 79 K — *MOMENT 7458 kip-ft*

TORQUE 80 kip-ft
90 mph WIND - 0.5000 in ICE
AXIAL
48 K

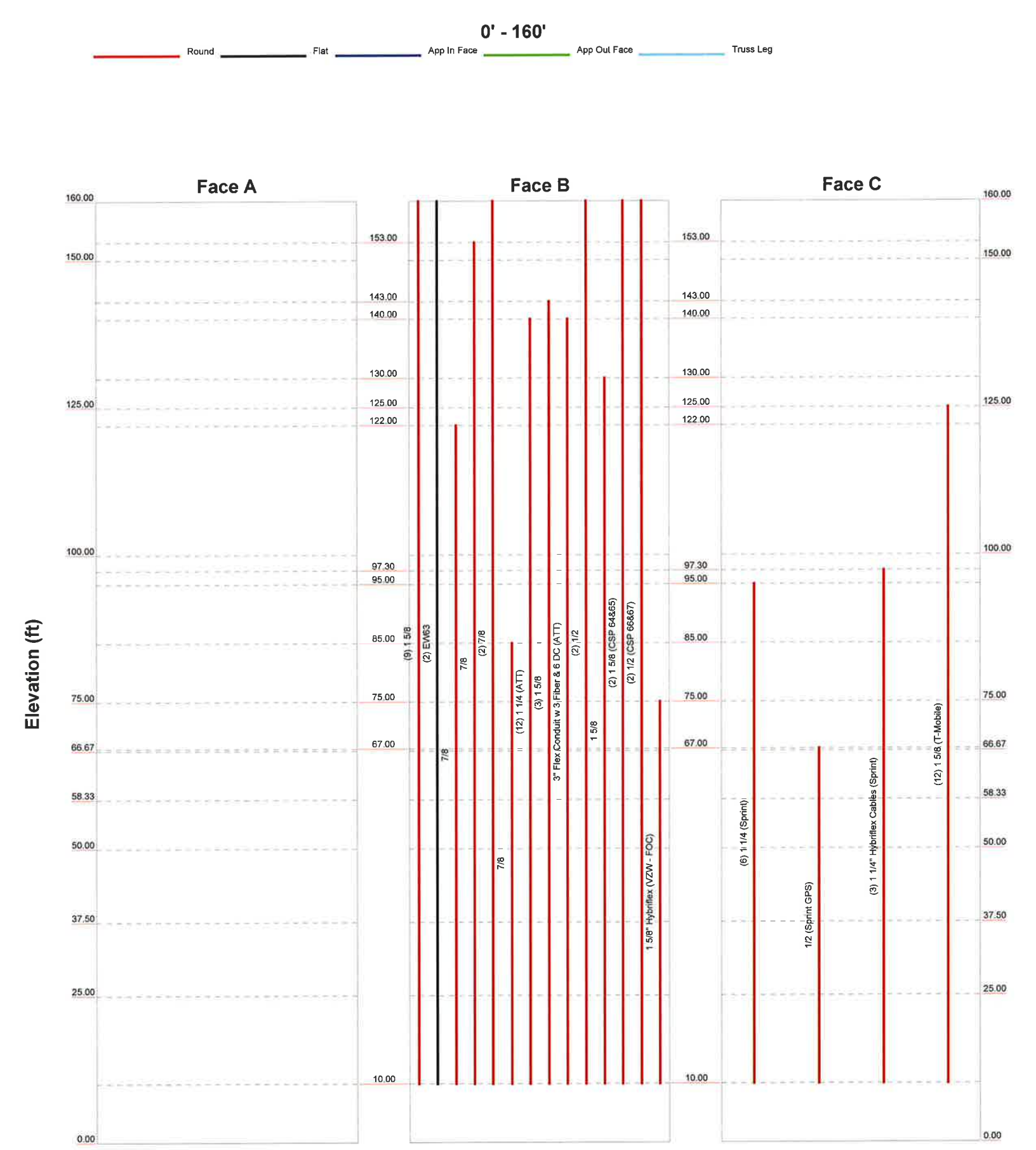
SHEAR 61 K — *MOMENT 5740 kip-ft*

TORQUE 57 kip-ft
REACTIONS - 90 mph WIND

AECOM
500 Enterprise Drive, Suite 3B
Rocky Hill, CT
Phone: 860-529-8882
FAX: 860-529-3991

Job:	160' Self Support Lattice - CSP #20
Project:	Structural Analysis
Client:	VZW / Updated VZ5-190
Drawn by:	MCD
Appd:	
Code:	TIA/EIA-222-F
Date:	07/10/15
Scale:	NTS
Path:	
Dwg No.	E-1

TNX TOWER FEEDLINE DISTRIBUTION CHART



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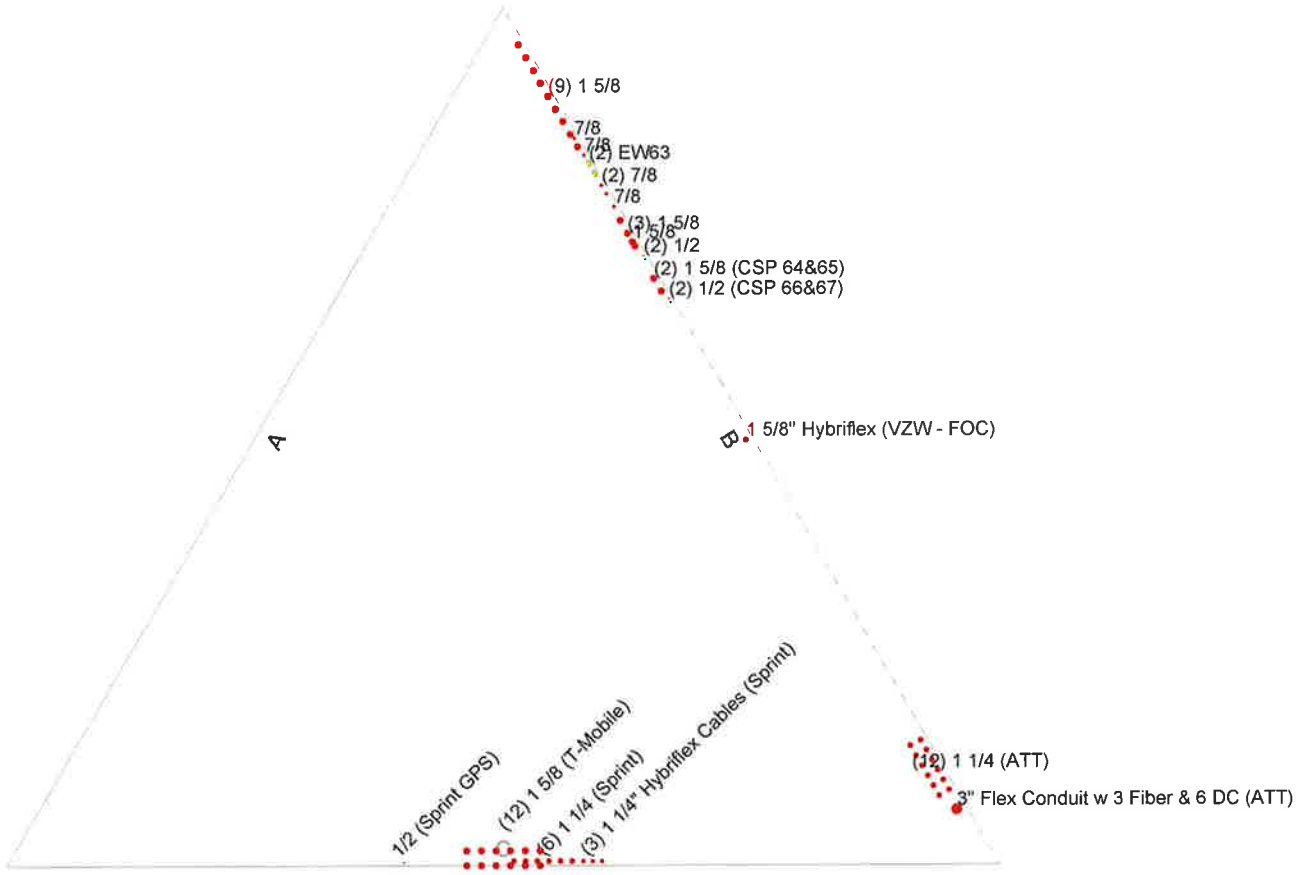
Phone: 860-529-8882
FAX: 860-529-3991

Job: 160' Self Support Lattice - CSP #20			
Project: Structural Analysis			
Client: VZW / Updated VZ5-190	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/10/15	Scale: N	
Path:		Dwg No.	

TNX TOWER FEEDLINE PLAN

Round Flat App In Face App Out Face



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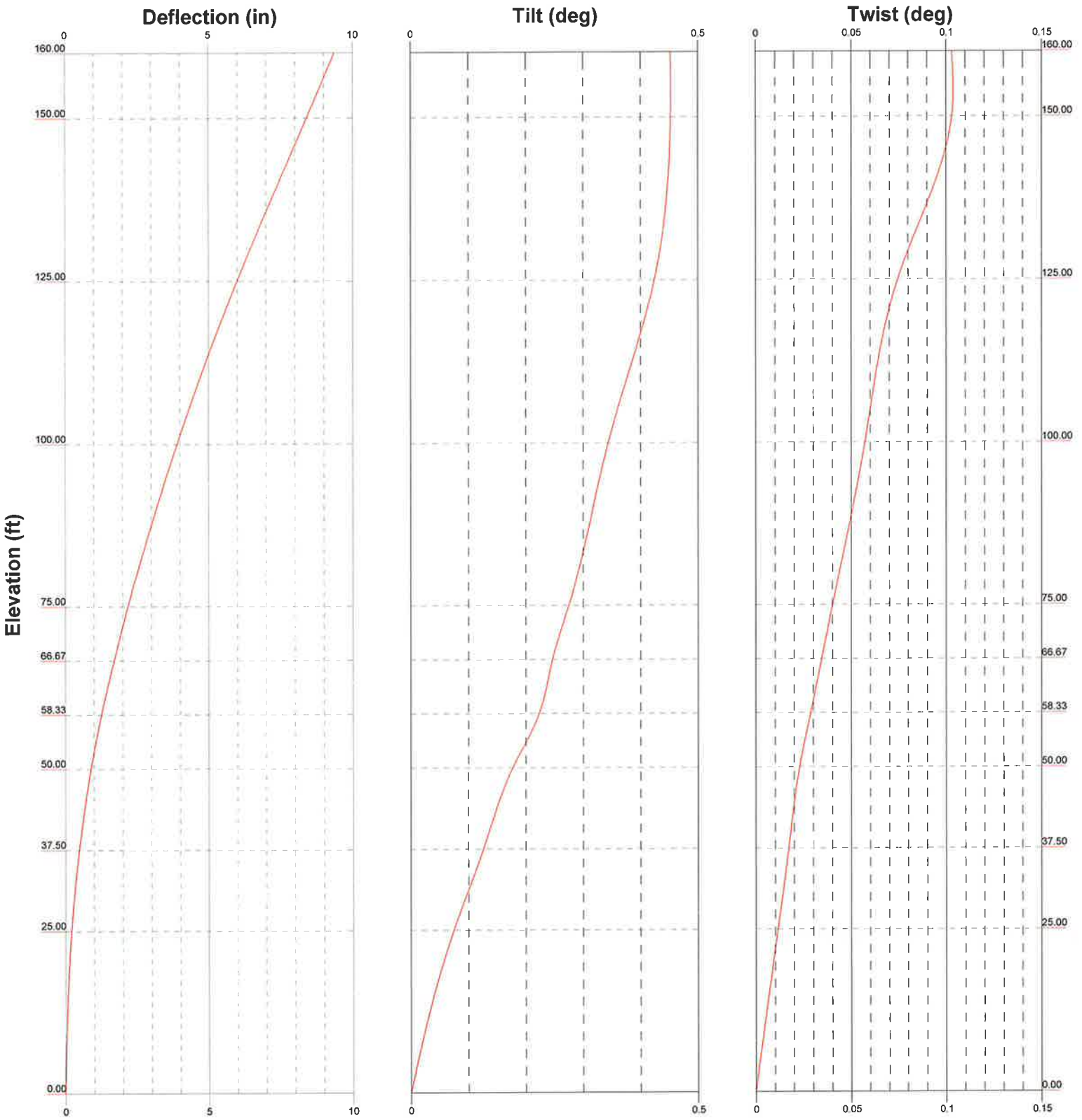
Code: TIA/EIA-222-F	Date: 07/10/15	Scale: N	
Path:		Dwg No.	

TNX TOWER DEFLECTION, TILT, AND TWIST

TIA/EIA-222-F - Service - 90 mph

Maximum Values



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Job: ***160' Self Support Lattice - CSP #20***			
Project: ***Structural Analysis***			
Client: VZW / Updated VZ5-190	Drawn by: MCD	App'd:	
Code: TIA/EIA-222-F	Date: 07/10/15	Scale: N	
Path:		Dwg No.	

TNX TOWER DETAILED OUTPUT

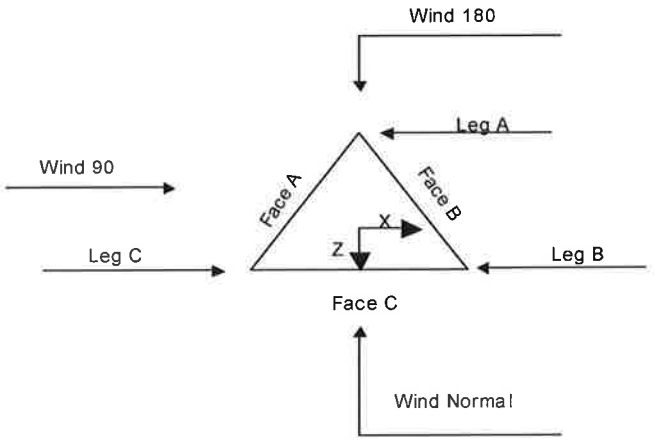
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 160.00 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 10.20 ft at the top and 23.00 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 90 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 90 mph is used in combination with ice.
Deflections calculated using a wind speed of 90 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

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	160.00-150.00			10.20	1	10.00
T2	150.00-125.00			11.00	1	25.00
T3	125.00-100.00			13.00	1	25.00
T4	100.00-75.00			15.00	1	25.00
T5	75.00-66.67			17.00	1	8.33
T6	66.67-58.33			17.67	1	8.33
T7	58.33-50.00			18.33	1	8.33
T8	50.00-37.50			19.00	1	12.50
T9	37.50-25.00			20.00	1	12.50
T10	25.00-0.00			21.00	1	25.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	160.00-150.00	5.00	K Brace Down	No	Yes	0.0000	0.0000
T2	150.00-125.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T3	125.00-100.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T4	100.00-75.00	8.33	K Brace Down	No	Yes	0.0000	0.0000
T5	75.00-66.67	8.33	K Brace Down	No	Yes	0.0000	0.0000

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T6	66.67-58.33	8.33	K Brace Down	No	Yes	0.0000	0.0000
T7	58.33-50.00	8.33	K1 Down	No	Yes	0.0000	0.0000
T8	50.00-37.50	12.50	K Brace Down	No	Yes	0.0000	0.0000
T9	37.50-25.00	12.50	K1 Down	No	Yes	0.0000	0.0000
T10	25.00-0.00	12.50	K Brace Down	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 160.00-150.00	Pipe	P.5x.250	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x3/16	A36 (36 ksi)
T2 150.00-125.00	Pipe	P.5x.250	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x3/16	A36 (36 ksi)
T3 125.00-100.00	Pipe	P.5x.250	A500-50 (50 ksi)	Double Angle	2L2 1/2x2x5/16	A36 (36 ksi)
T4 100.00-75.00	Arbitrary Shape	P5x0.3 w/ (3) 1.5x5/8 Plates	A500-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4	A36 (36 ksi)
T5 75.00-66.67	Arbitrary Shape	P5x0.4 w/ (3) 1.5x5/8 Plates	A572-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4	A36 (36 ksi)
T6 66.67-58.33	Arbitrary Shape	P5x0.4 w/ (3) 1.5x5/8 Plates	A572-50 (50 ksi)	Double Angle	2L3x2 1/2x1/4	A36 (36 ksi)
T7 58.33-50.00	Pipe	HSS5x.4	A514-60 (60 ksi)	Double Angle	2L3x2 1/2x5/16	A36 (36 ksi)
T8 50.00-37.50	Pipe	HSS6.875x.4	A514-60 (60 ksi)	Double Angle	2L3 1/2x3x3/8	A36 (36 ksi)
T9 37.50-25.00	Pipe	HSS6.875x.4	A514-60 (60 ksi)	Double Angle	2L3 1/2x3x5/16	A36 (36 ksi)
T10 25.00-0.00	Arbitrary Shape	HSS6.875x0.5 w/ (3) 2x5/8 Bars	A500-50 (50 ksi)	Double Angle	2L3 1/2x3x3/8	A36 (36 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 160.00-150.00	Single Angle	L3x3x1/4	A36 (36 ksi)	Solid Round		A36M-50 (50 ksi)
T4 100.00-75.00	Single Angle	L3x3x1/4	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T6 66.67-58.33	Single Angle	L3x3x1/2	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T7 58.33-50.00	Single Angle	L3x3x1/2	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T8 50.00-37.50	Single Angle	L4x4x1/4	A36 (36 ksi)	Single Angle		A36 (36 ksi)
T9 37.50-25.00	Single Angle	L4x4x1/4	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
T1 160.00-150.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T2 150.00-125.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T3 125.00-100.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x2 1/2x5/16	A36 (36 ksi)
T4 100.00-75.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/2	A36 (36 ksi)
T5 75.00-66.67	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/2	A36 (36 ksi)
T6 66.67-58.33	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/2	A36 (36 ksi)
T7 58.33-50.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L3x3x1/2	A36 (36 ksi)
T8 50.00-37.50	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T9 37.50-25.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/4	A36 (36 ksi)
T10 25.00-0.00	None	Flat Bar		A36 (36 ksi)	Single Angle	L4x4x1/2	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
T3 125.00-100.00	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T4 100.00-75.00	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T5 75.00-66.67	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T6 66.67-58.33	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T7 58.33-50.00	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)
T8 50.00-37.50	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T9 37.50-25.00	Equal Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T10 25.00-0.00	Solid Round		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T7	A36	Horizontal (1)	Equal Angle	L2x2x5/16	1
58.33-50.00	(36 ksi)	Diagonal (1)	Equal Angle	L2x2x5/16	1
T9	A36	Horizontal (1)	Equal Angle	L2x2x5/16	1
37.50-25.00	(36 ksi)	Diagonal (1)	Single Angle	L2x2x5/16	1

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 160.00-150.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	0.0000
T2 150.00-125.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000
T3 125.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000
T4 100.00-75.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000
T5 75.00-66.67	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000
T6 66.67-58.33	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000
T7 58.33-50.00	0.00	0.0000	A36 (36 ksi)	1	1	1.03	Mid-Pt	36.0000
T8 50.00-37.50	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000
T9 37.50-25.00	0.00	0.0000	A36 (36 ksi)	1	1	1.03	Mid-Pt	36.0000
T10 25.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	Mid-Pt	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	Yes	1	1	1	1	1	0.65	0.65	1
160.00-150.00				1	1	1	1	0.65	0.65	1
T2	Yes	Yes	1	1	1	1	1	0.65	0.65	1
150.00-125.00				1	1	1	1	0.65	0.65	1
T3	Yes	Yes	1	1	1	1	1	0.65	0.65	1
125.00-100.00				1	1	1	1	0.65	0.65	1
T4	Yes	Yes	1	1	1	1	1	0.65	0.65	1
100.00-75.00				1	1	1	1	0.65	0.65	1
T5	Yes	Yes	1	1	1	1	1	0.65	0.65	1
75.00-66.67				1	1	1	1	0.65	0.65	1
T6	Yes	Yes	1	1	1	1	1	0.65	0.65	1
66.67-58.33				1	1	1	1	0.65	0.65	1

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T7	Yes	Yes	1	1	1	1	1	0.65	0.65	1
58.33-50.00				1	1	1	1	0.65	0.65	1
T8	Yes	Yes	1	1	1	1	1	0.65	0.65	1
50.00-37.50				1	1	1	1	0.65	0.65	1
T9	Yes	Yes	1	1	1	1	1	0.65	0.65	1
37.50-25.00				1	1	1	1	0.65	0.65	1
T10	Yes	Yes	1	1	1	1	1	0.65	0.65	1
25.00-0.00				1	1	1	1	0.65	0.65	1

[1]*Note: 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)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
160.00-150.00														
T2	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
150.00-125.00														
T3	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
125.00-100.00														
T4	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
100.00-75.00														
T5 75.00-66.67	0.0000	0.75	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 66.67-58.33	0.0000	0.75	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 58.33-50.00	0.0000	0.75	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 50.00-37.50	0.0000	0.75	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 37.50-25.00	0.0000	0.75	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 25.00-0.00	0.0000	0.75	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 Vert. Top in	Diagonal Horiz. Top in	Diagonal Vert. Bot. in	Diagonal Horiz. Bot. in	K-Bracing Vert. Top in	K-Bracing Horiz. Top in	K-Bracing Vert. Bot. in	K-Bracing Horiz. Bot. in
T1	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
160.00-150.00								
T2	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
150.00-125.00								
T3	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
125.00-100.00								

Tower Elevation	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in	in	in	in	in	in	in	in
T4 100.00-75.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T5 75.00-66.67	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T6 66.67-58.33	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T7 58.33-50.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T8 50.00-37.50	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T9 37.50-25.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T10 25.00-0.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000

Tower Section Geometry *(cont'd)*

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.
T1 160.00-150.00	Flange	0.7500 A325X	6	0.7500 A325N	1	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T2 150.00-125.00	Flange	0.7500 A325X	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T3 125.00-100.00	Flange	0.7500 A325X	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T4 100.00-75.00	Flange	0.7500 A325X	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T5 75.00-66.67	Flange	0.8750 A325X	6	0.7500 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T6 66.67-58.33	Flange	0.8750 A325X	6	0.7500 A325N	1	0.6250 A325X	2	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T7 58.33-50.00	Flange	0.8750 A325X	6	0.7500 A325N	1	0.6250 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T8 50.00-37.50	Flange	1.0000 A325X	8	1.0000 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T9 37.50-25.00	Flange	1.0000 A325X	8	1.0000 A325N	1	0.6250 A325X	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0
T10 25.00-0.00	Flange	1.0000 A325X	8	1.0000 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	2	0.6250 A325N	0

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
1 1/4 (Sprint)	C	Yes	Ar (CfAe)	95.00 - 10.00	-0.5000	-0.04	6	6	1.5500	1.5500		0.66
1/2 (Sprint GPS)	C	Yes	Ar (CfAe)	67.00 - 10.00	-0.5000	0.1	1	1	1.5000	0.5800		0.25
1 5/8	B	Yes	Ar (CfAe)	160.00 - 10.00	-0.5000	-0.4	9	9	1.9800	1.9800		1.04
EW63	B	Yes	Af (CfAe)	160.00 - 10.00	-0.5000	-0.315	2	2	1.5742	1.5742	5.0668	0.51

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
7/8	B	Yes	Ar (CfAe)	122.00 - 10.00	-0.5000	-0.35	1	1	1.5000	1.1100		0.54
7/8	B	Yes	Ar (CfAe)	153.00 - 10.00	-0.5000	-0.33	1	1	1.5000	1.1100		0.54
7/8	B	Yes	Ar (CfAe)	160.00 - 10.00	-0.5000	-0.29	2	2	1.5000	1.1100		0.54
7/8	B	Yes	Ar (CfAe)	85.00 - 10.00	-0.5000	-0.27	1	1	1.1100	1.1100		0.54
1 1/4 (ATT)	B	Yes	Ar (CfAe)	140.00 - 10.00	-4.0000	0.38	12	6	1.5500	1.5500		0.66
1 5/8	B	Yes	Ar (CfAe)	143.00 - 10.00	-0.5000	-0.24	3	3	1.9800	1.9800		1.04
3" Flex Conduit w 3 Fiber & 6 DC (ATT)	B	Yes	Ar (CfAe)	140.00 - 10.00	-1.0000	0.43	1	1	3.0000	3.0000		3.00
1/2	B	Yes	Ar (CfAe)	160.00 - 10.00	-0.5000	-0.21	2	2	0.5800	0.5800		0.25
1 5/8	B	Yes	Ar (CfAe)	130.00 - 10.00	-0.5000	-0.23	1	1	1.9800	1.9800		1.04
1 1/4" Hybriflex Cables (Sprint)	C	Yes	Ar (CfAe)	97.30 - 10.00	-0.5000	-0.09	3	3	1.2500	1.2500		0.99
1 5/8 (T-Mobile)	C	Yes	Ar (CfAe)	125.00 - 10.00	-3.0000	0	12	6	1.9800	1.9800		1.04
1 5/8 (CSP 64&65)	B	Yes	Ar (CfAe)	160.00 - 10.00	-0.5000	-0.18	2	2	1.9800	1.9800		1.04
1/2 (CSP 66&67)	B	Yes	Ar (CfAe)	160.00 - 10.00	-0.5000	-0.16	2	2	0.5800	0.5800		0.25
1 5/8" Hybriflex (VZW - FOC)	B	Yes	Ar (CfAe)	75.00 - 10.00	-1.0000	0	1	1	1.6250	1.6250		1.48

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	160.00-150.00	A	0.000	0.000	0.000	0.000	0.00
		B	22.211	2.624	0.000	0.000	0.15
		C	0.000	0.000	0.000	0.000	0.00
T2	150.00-125.00	A	0.000	0.000	0.000	0.000	0.00
		B	82.256	6.559	0.000	0.000	0.60
		C	0.000	0.000	0.000	0.000	0.00
T3	125.00-100.00	A	0.000	0.000	0.000	0.000	0.00
		B	101.306	6.559	0.000	0.000	0.77
		C	24.750	0.000	0.000	0.000	0.31
T4	100.00-75.00	A	0.000	0.000	0.000	0.000	0.00
		B	102.508	6.559	0.000	0.000	0.77
		C	47.219	0.000	0.000	0.000	0.46
T5	75.00-66.67	A	0.000	0.000	0.000	0.000	0.00
		B	35.760	2.186	0.000	0.000	0.27
		C	17.329	0.000	0.000	0.000	0.16
T6	66.67-58.33	A	0.000	0.000	0.000	0.000	0.00
		B	35.760	2.186	0.000	0.000	0.27
		C	17.715	0.000	0.000	0.000	0.16
T7	58.33-50.00	A	0.000	0.000	0.000	0.000	0.00
		B	35.760	2.186	0.000	0.000	0.27
		C	17.715	0.000	0.000	0.000	0.16
T8	50.00-37.50	A	0.000	0.000	0.000	0.000	0.00
		B	53.641	3.280	0.000	0.000	0.41
		C	26.573	0.000	0.000	0.000	0.25
T9	37.50-25.00	A	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		B	53.641	3.280	0.000	0.000	0.41
		C	26.573	0.000	0.000	0.000	0.25
T10	25.00-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	64.369	3.936	0.000	0.000	0.49
		C	31.888	0.000	0.000	0.000	0.29

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	160.00-150.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		33.994	5.668	0.000	0.000	0.39
		C		0.000	0.000	0.000	0.000	0.00
T2	150.00-125.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		126.839	14.170	0.000	0.000	1.57
		C		0.000	0.000	0.000	0.000	0.00
T3	125.00-100.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		156.973	14.170	0.000	0.000	1.99
		C		37.250	0.000	0.000	0.000	0.77
T4	100.00-75.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		159.258	14.170	0.000	0.000	2.01
		C		75.294	0.000	0.000	0.000	1.13
T5	75.00-66.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		55.788	4.723	0.000	0.000	0.70
		C		27.773	0.000	0.000	0.000	0.40
T6	66.67-58.33	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		55.788	4.723	0.000	0.000	0.70
		C		28.826	0.000	0.000	0.000	0.41
T7	58.33-50.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		55.788	4.723	0.000	0.000	0.70
		C		28.826	0.000	0.000	0.000	0.41
T8	50.00-37.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		83.682	7.085	0.000	0.000	1.05
		C		43.240	0.000	0.000	0.000	0.62
T9	37.50-25.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		83.682	7.085	0.000	0.000	1.05
		C		43.240	0.000	0.000	0.000	0.62
T10	25.00-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		100.419	8.502	0.000	0.000	1.26
		C		51.888	0.000	0.000	0.000	0.74

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	160.00-150.00	A	0.000	0.000	0.000	0.000
		B	0.000	1.584	2.652	4.295
		C	0.000	0.000	0.000	0.000
T2	150.00-125.00	A	0.000	0.000	0.000	0.000
		B	0.000	3.821	5.957	9.552
		C	0.000	0.000	0.000	0.000
T3	125.00-100.00	A	0.000	0.000	0.000	0.000

Section	Elevation	Face	A_R	A_R Ice	A_F	A_F Ice
	ft		ft^2	ft^2	ft^2	ft^2
		B	0.000	4.373	7.375	11.796
		C	0.000	0.944	1.692	2.547
T4	100.00-75.00	A	0.000	0.000	0.000	0.000
		B	0.000	4.247	7.949	12.742
		C	0.000	1.829	3.442	5.488
T5	75.00-66.67	A	0.000	0.000	0.000	0.000
		B	0.000	1.448	2.703	4.344
		C	0.000	0.660	1.234	1.979
T6	66.67-58.33	A	0.000	0.000	0.000	0.000
		B	0.000	1.434	2.677	4.301
		C	0.000	0.678	1.250	2.033
T7	58.33-50.00	A	0.000	0.000	0.000	0.000
		B	0.000	2.869	4.455	7.158
		C	0.000	1.356	2.080	3.384
T8	50.00-37.50	A	0.000	0.000	0.000	0.000
		B	0.000	1.586	3.643	5.854
		C	0.000	0.750	1.701	2.768
T9	37.50-25.00	A	0.000	0.000	0.000	0.000
		B	0.000	3.175	5.595	8.991
		C	0.000	1.501	2.612	4.250
T10	25.00-0.00	A	0.000	0.000	0.000	0.000
		B	0.000	1.826	4.204	6.756
		C	0.000	0.863	1.963	3.194

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	160.00-150.00	2.5729	-15.1978	2.5605	-15.8656
T2	150.00-125.00	8.3836	-18.1864	8.8381	-18.9155
T3	125.00-100.00	11.0053	-13.4540	11.6539	-14.0082
T4	100.00-75.00	10.8454	-8.9528	11.8542	-9.1234
T5	75.00-66.67	11.9933	-9.1368	13.1075	-9.2734
T6	66.67-58.33	12.2723	-9.1934	13.3219	-9.1312
T7	58.33-50.00	12.1941	-9.1238	12.6518	-8.5952
T8	50.00-37.50	13.5970	-10.1592	14.9342	-10.2220
T9	37.50-25.00	12.9673	-9.6740	14.0195	-9.5302
T10	25.00-0.00	9.6640	-7.1987	11.3117	-7.7211

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral / Vert	Azimuth Adjustment	Placement		C_AA_A Front	C_AA_A Side	Weight
			ft / ft / ft	°	ft		ft^2	ft^2	K
Lightning Rod 5/8x4'	A	From Leg	0.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	0.25 0.66	0.25 0.66	0.03 0.03

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		*C_AA_A Front* *ft^2*	*C_AA_A Side* *ft^2*	*Weight* *K*
16'x2.5" Pipe Mount	A	From Leg	0.00 0.00 0.00	0.0000	168.00	No Ice 1/2" Ice	4.00 4.80	4.00 4.80	0.09 0.09
6'8"x4" Pipe Mount (CSP - Future)	A	From Leg	0.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.60 3.01	2.60 3.01	0.07 0.09
6'8"x4" Pipe Mount (CSP - Future)	B	From Leg	0.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.60 3.01	2.60 3.01	0.07 0.09
6'8"x4" Pipe Mount (CSP - Future)	C	From Leg	0.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.60 3.01	2.60 3.01	0.07 0.09
Tower Light	B	From Leg	0.00 0.00 0.00	0.0000	160.50	No Ice 1/2" Ice	0.50 0.60	0.50 0.60	0.00 0.00
PD83 (CSP - 1)	B	From Leg	3.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.43 4.30	2.43 4.30	0.02 0.04
DB810K-Y (CSP - 9)	A	From Leg	6.50 0.00 2.00	0.0000	160.00	No Ice 1/2" Ice	4.08 5.73	4.08 5.73	0.04 0.07
OGT9-806 (CSP - 13)	B	From Leg	6.50 0.00 0.00	0.0000	143.00	No Ice 1/2" Ice	2.15 3.25	2.15 3.25	0.02 0.03
DB810K-Y (CSP - 12)	A	From Leg	6.50 0.00 0.00	0.0000	143.00	No Ice 1/2" Ice	4.08 5.73	4.08 5.73	0.04 0.07
OGT9-806 (CSP - 10)	B	From Leg	6.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.15 3.25	2.15 3.25	0.02 0.03
OGT9-806 (CSP - 8)	C	From Leg	6.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	2.15 3.25	2.15 3.25	0.02 0.03
OGT9-806 (CSP - 11)	C	From Leg	6.50 0.00 0.00	0.0000	143.00	No Ice 1/2" Ice	2.15 3.25	2.15 3.25	0.02 0.03
6' Side-Arm	A	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	13.04 18.07	14.60 19.40	0.14 0.15
6' Side-Arm	B	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	13.04 18.07	14.60 19.40	0.14 0.15
6' Side-Arm	C	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	13.04 18.07	14.60 19.40	0.14 0.15
Filter/Diplexer	A	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	3.15 3.39	1.05 1.21	0.02 0.04
Filter/Diplexer	A	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	3.15 3.39	1.05 1.21	0.02 0.04
Filter/Diplexer	A	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	3.15 3.39	1.05 1.21	0.02 0.04
Filter/Diplexer	B	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	3.15 3.39	1.05 1.21	0.02 0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Filter/Diplexer	C	From Leg	3.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice	3.15 3.39	1.05 1.21	0.02 0.04
DB304 (ATF - 2)	C	From Leg	0.50 0.00 0.00	0.0000	153.00	No Ice 1/2" Ice	6.07 8.27	6.07 8.27	0.05 0.09
T-Frame (ATT)	A	From Leg	2.00 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	8.90 13.80	8.90 13.80	0.22 0.32
T-Frame (ATT)	B	From Leg	2.00 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	8.90 13.80	8.90 13.80	0.22 0.32
T-Frame (ATT)	C	From Leg	2.00 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	8.90 13.80	8.90 13.80	0.22 0.32
7770.00 (ATT)	A	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	10.03 10.61	5.60 6.15	0.02 0.07
7770.00 (ATT)	B	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	10.03 10.61	5.60 6.15	0.02 0.07
7770.00 (ATT)	C	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	10.03 10.61	5.60 6.15	0.02 0.07
PD1142 (DOT - 4)	C	From Leg	3.00 0.00 0.00	0.0000	122.00	No Ice 1/2" Ice	1.20 2.81	1.20 2.81	0.01 0.02
3' Sidearm	C	From Leg	1.50 0.00 0.00	0.0000	120.00	No Ice 1/2" Ice	5.90 6.60	5.90 6.60	0.13 0.15
6'x4" Pipe Mount	A	From Leg	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.09 2.46	2.09 2.46	0.05 0.07
6'x4" Pipe Mount	C	From Leg	0.50 0.00 0.00	0.0000	110.00	No Ice 1/2" Ice	2.09 2.46	2.09 2.46	0.05 0.07
GPS (Sprint)	B	From Face	3.00 0.00 0.00	0.0000	55.00	No Ice 1/2" Ice	0.44 0.56	0.44 0.56	0.00 0.00
Stand off arm (Sprint)	B	From Face	1.00 0.00 0.00	0.0000	55.00	No Ice 1/2" Ice	0.96 1.29	0.96 1.29	0.03 0.04
Sector Frame (Sprint)	A	From Face	0.50 0.00 0.00	0.0000	94.00	No Ice 1/2" Ice	9.00 12.00	3.00 3.50	0.25 0.32
Sector Frame (Sprint)	B	From Face	0.50 0.00 0.00	0.0000	94.00	No Ice 1/2" Ice	9.00 12.00	3.00 3.50	0.25 0.32
Sector Frame (Sprint)	C	From Face	0.50 0.00 0.00	0.0000	94.00	No Ice 1/2" Ice	9.00 12.00	3.00 3.50	0.25 0.32
4"x96"x72" Ice Canopy	A	From Leg	3.00 0.00 0.00	0.0000	115.00	No Ice 1/2" Ice	3.73 4.39	2.80 3.30	0.30 0.55
4"x96"x72" Ice Canopy	C	From Leg	3.00 0.00 0.00	0.0000	115.00	No Ice 1/2" Ice	3.73 4.39	2.80 3.30	0.30 0.55

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
SC479-HF1LDF (CSP - 39 (inverted))	C	From Leg	1.50 0.00 0.00	0.0000	115.63 - 130.00	No Ice 1/2" Ice	5.06 6.54	5.06 6.54	0.03 0.07
(2) SC479-HF1LDF (CSP - 40 & 41)	A	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	5.06 6.54	5.06 6.54	0.03 0.07
(2) SC479-HF1LDF (CSP - 42 & 44)	B	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	5.06 6.54	5.06 6.54	0.03 0.07
TMA (CSP - 43)	B	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
(2) SC479-HF1LDF (CSP - 45 & 46)	C	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	5.06 6.54	5.06 6.54	0.03 0.07
TMA (CSP - 47)	C	From Leg	1.50 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
SBNH-1D6565C (ATT)	A	From Leg	1.50 5.00 0.00	0.0000	138.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
SBNH-1D6565C (ATT)	A	From Leg	1.50 -5.00 0.00	0.0000	138.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
SBNH-1D6565C (ATT)	B	From Leg	1.50 5.00 0.00	0.0000	138.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
AM-X-CD-16-65-00T-RET (6') (ATT)	B	From Leg	1.50 -5.00 0.00	0.0000	138.00	No Ice 1/2" Ice	8.26 8.81	4.64 5.09	0.05 0.10
AM-X-CD-16-65-00T-RET (6') (ATT)	C	From Leg	1.50 5.00 0.00	0.0000	138.00	No Ice 1/2" Ice	8.26 8.81	4.64 5.09	0.05 0.10
SBNH-1D6565C (ATT)	C	From Leg	1.50 -5.00 0.00	0.0000	138.00	No Ice 1/2" Ice	11.41 12.03	7.70 8.29	0.06 0.13
7020 RET (ATT)	A	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	0.40 0.49	0.20 0.28	0.00 0.01
7020 RET (ATT)	B	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	0.40 0.49	0.20 0.28	0.00 0.01
7020 RET (ATT)	C	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	0.40 0.49	0.20 0.28	0.00 0.01
(5) TMA (ATT)	A	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
(5) TMA (ATT)	B	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
(5) TMA (ATT)	C	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	1.06 1.21	0.45 0.57	0.02 0.03
(4) Diplexer (ATT)	A	From Leg	1.50 0.00 0.00	0.0000	138.00	No Ice 1/2" Ice	0.23 0.30	0.17 0.24	0.01 0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(4) Diplexer	B	From Leg	1.50	0.0000	138.00	No Ice	0.23	0.17	0.01
(ATT)			0.00			1/2" Ice	0.30	0.24	0.01
			0.00						
(4) Diplexer	C	From Leg	1.50	0.0000	138.00	No Ice	0.23	0.17	0.01
(ATT)			0.00			1/2" Ice	0.30	0.24	0.01
			0.00						
Surge Suppressor	B	From Face	0.50	0.0000	138.00	No Ice	0.80	0.80	0.03
(ATT)			5.00			1/2" Ice	0.94	0.94	0.04
			0.00						
DB228-A	A	From Leg	1.50	0.0000	160.00	No Ice	7.30	7.30	0.07
(FBI - 3)			0.00			1/2" Ice	13.14	13.14	0.09
			0.00						
PD10054	B	From Leg	1.50	0.0000	85.00	No Ice	5.62	5.62	0.02
(CSP - 5)			0.00			1/2" Ice	5.90	5.90	0.02
			0.00						
3" Dia 20' Omni	C	From Leg	1.50	0.0000	115.00	No Ice	4.00	4.00	0.06
(EMS - 14)			0.00			1/2" Ice	6.00	6.00	0.10
			0.00						
APXVSPP18-C-A20	A	From Face	1.50	0.0000	97.30	No Ice	8.26	6.71	0.09
(Sprint)			0.00			1/2" Ice	8.81	7.66	0.15
			0.00						
APXVSPP18-C-A20	B	From Face	1.50	0.0000	97.30	No Ice	8.26	6.71	0.09
(Sprint)			0.00			1/2" Ice	8.81	7.66	0.15
			0.00						
APXVSPP18-C-A20	C	From Leg	1.50	0.0000	97.30	No Ice	8.26	6.71	0.09
(Sprint)			0.00			1/2" Ice	8.81	7.66	0.15
			0.00						
PM-SU35-48	C	From Leg	0.50	0.0000	97.30	No Ice	2.32	2.32	0.15
(Sprint)			0.00			1/2" Ice	2.82	2.82	0.18
			0.00						
RRH 1900 MHz 2x40W	A	From Face	0.50	0.0000	97.30	No Ice	2.49	3.34	0.10
(Sprint)			0.00			1/2" Ice	2.71	3.69	0.13
			0.00						
RRH 1900 MHz 2x40W	B	From Face	0.50	0.0000	97.30	No Ice	2.49	3.34	0.10
(Sprint)			0.00			1/2" Ice	2.71	3.69	0.13
			0.00						
RRH 1900 MHz 2x40W	C	From Face	0.50	0.0000	97.30	No Ice	2.49	3.34	0.10
(Sprint)			-5.00			1/2" Ice	2.71	3.69	0.13
			0.00						
RRH 800MHz 2x50W	A	From Face	1.00	0.0000	97.30	No Ice	2.49	2.34	0.07
(Sprint)			1.00			1/2" Ice	2.71	2.66	0.10
			0.00						
RRH 800MHz 2x50W	B	From Face	1.00	0.0000	97.30	No Ice	2.49	2.34	0.07
(Sprint)			1.00			1/2" Ice	2.71	2.66	0.10
			0.00						
RRH 800MHz 2x50W	A	From Face	1.00	0.0000	97.30	No Ice	2.49	2.34	0.07
(Sprint)			-5.00			1/2" Ice	2.71	2.66	0.10
			0.00						
RR90-17-02DP	A	From Leg	2.50	0.0000	125.00	No Ice	4.36	1.97	0.02
(T-Mobile)			1.50			1/2" Ice	4.77	2.31	0.04
			0.00						
RR90-17-02DP	B	From Leg	2.50	0.0000	125.00	No Ice	4.36	1.97	0.02
(T-Mobile)			1.50			1/2" Ice	4.77	2.31	0.04
			0.00						
RR90-17-02DP	C	From Leg	2.50	0.0000	125.00	No Ice	4.36	1.97	0.02
(T-Mobile)			1.50			1/2" Ice	4.77	2.31	0.04
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
DSM2	A	From Leg	0.50	0.0000	125.00	No Ice	2.03	1.56	0.09
(T-Mobile)			0.00			1/2" Ice	2.30	1.78	0.13
			0.00						
DSM2	B	From Leg	0.50	0.0000	125.00	No Ice	2.03	1.56	0.09
(T-Mobile)			0.00			1/2" Ice	2.30	1.78	0.13
			0.00						
DSM2	C	From Leg	0.50	0.0000	125.00	No Ice	2.03	1.56	0.09
(T-Mobile)			0.00			1/2" Ice	2.30	1.78	0.13
			0.00						
LNX-6515DS-VTM w/ 6' 2"	A	From Leg	2.00	0.0000	125.00	No Ice	11.45	9.12	0.07
sch 40 Piipe Mount			-1.50			1/2" Ice	12.06	10.21	0.15
(T-Mobile)			0.00						
LNX-6515DS-VTM w/ 6' 2"	B	From Leg	2.00	0.0000	125.00	No Ice	11.45	9.12	0.07
sch 40 Piipe Mount			-1.50			1/2" Ice	12.06	10.21	0.15
(T-Mobile)			0.00						
LNX-6515DS-VTM w/ 6' 2"	C	From Leg	2.00	0.0000	125.00	No Ice	11.45	9.12	0.07
sch 40 Piipe Mount			-1.50			1/2" Ice	12.06	10.21	0.15
(T-Mobile)			0.00						
Bias-T Unit	A	From Leg	2.00	0.0000	125.00	No Ice	0.08	0.07	0.00
(T-Mobile)			-1.50			1/2" Ice	0.12	0.11	0.00
			0.00						
Bias-T Unit	B	From Leg	2.00	0.0000	125.00	No Ice	0.08	0.07	0.00
(T-Mobile)			-1.50			1/2" Ice	0.12	0.11	0.00
			0.00						
Bias-T Unit	C	From Leg	2.00	0.0000	125.00	No Ice	0.08	0.07	0.00
(T-Mobile)			-1.50			1/2" Ice	0.12	0.11	0.00
			0.00						
TMA	A	From Leg	1.50	0.0000	125.00	No Ice	1.06	0.45	0.02
(T-Mobile)			0.00			1/2" Ice	1.21	0.57	0.03
			0.00						
TMA	B	From Leg	1.50	0.0000	125.00	No Ice	1.06	0.45	0.02
(T-Mobile)			0.00			1/2" Ice	1.21	0.57	0.03
			0.00						
TMA	C	From Leg	1.50	0.0000	125.00	No Ice	1.06	0.45	0.02
(T-Mobile)			0.00			1/2" Ice	1.21	0.57	0.03
			0.00						
SBNHH-1D65B	A	From Leg	2.00	0.0000	75.00	No Ice	8.43	5.42	0.04
(VZW-700&AWS)			-3.00			1/2" Ice	8.99	5.88	0.09
			0.00						
SBNHH-1D65B	A	From Leg	2.00	0.0000	75.00	No Ice	8.43	5.42	0.04
(VZW-850&PCS)			3.00			1/2" Ice	8.99	5.88	0.09
			0.00						
SBNHH-1D65B	B	From Leg	2.00	0.0000	75.00	No Ice	8.43	5.42	0.04
(VZW-700&AWS)			-3.00			1/2" Ice	8.99	5.88	0.09
			0.00						
SBNHH-1D65B	B	From Leg	2.00	0.0000	75.00	No Ice	8.43	5.42	0.04
(VZW-850&PCS)			3.00			1/2" Ice	8.99	5.88	0.09
			0.00						
5' T-arm	A	None		0.0000	75.00	No Ice	4.50	2.50	0.25
(VZW)						1/2" Ice	5.50	3.20	0.32
5' T-arm	A	None		0.0000	75.00	No Ice	4.50	2.50	0.25
(VZW)						1/2" Ice	5.50	3.20	0.32
RH_2x60-07-L (700 MHz)	A	From Leg	2.00	0.0000	75.00	No Ice	2.12	1.77	0.06
(VZW)			-3.00			1/2" Ice	2.32	1.97	0.08
			0.00						
RH_2x60-07-L (700 MHz)	B	From Leg	2.00	0.0000	75.00	No Ice	2.12	1.77	0.06
(VZW)			-3.00			1/2" Ice	2.32	1.97	0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
DC6-48-60-18-8F	C	None		0.0000	75.00	No Ice	1.27	1.27	0.02
(VZW)						1/2" Ice	1.46	1.46	0.04
RRH_2x60-AWS	A	From Leg	2.00	0.0000	75.00	No Ice	3.66	3.31	0.08
(VZW)			3.00			1/2" Ice	4.13	3.88	0.11
			0.00						
RRH_2x60-AWS	B	From Leg	2.00	0.0000	75.00	No Ice	3.66	3.31	0.08
(VZW)			3.00			1/2" Ice	4.13	3.88	0.11
			0.00						
SC479-HF1LDF	A	From Leg	1.50	0.0000	145.00 - 160.00	No Ice	5.06	5.06	0.03
(CSP - 64 (inverted))			0.00			1/2" Ice	6.54	6.54	0.07
			0.00						
SC479-HF1LDF	B	From Leg	1.50	0.0000	145.00 - 160.00	No Ice	5.06	5.06	0.03
(CSP - 65 (inverted))			0.00			1/2" Ice	6.54	6.54	0.07
			0.00						
TMA	A	From Leg	1.50	0.0000	160.00	No Ice	1.06	0.45	0.02
(CSP - 66)			0.00			1/2" Ice	1.21	0.57	0.03
			0.00						
TMA	B	From Leg	1.50	0.0000	160.00	No Ice	1.06	0.45	0.02
(CSP - 67)			0.00			1/2" Ice	1.21	0.57	0.03
			0.00						

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
6' w/ Radome	A	Paraboloid	From	1.00	0.0000		110.00	6.00	No Ice	28.27	0.23
(CSP - 6)		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00							
6' w/ Radome	C	Paraboloid	From	1.00	0.0000		110.00	6.00	No Ice	28.27	0.23
(CSP - 7)		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00							
6' w/ Radome	A	Paraboloid	From	1.00	0.0000		160.00	6.00	No Ice	28.27	0.23
(CSP - Future)		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00							
6' w/ Radome	B	Paraboloid	From	1.00	0.0000		160.00	6.00	No Ice	28.27	0.23
(CSP - Future)		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00							
6' w/ Radome	C	Paraboloid	From	1.00	0.0000		160.00	6.00	No Ice	28.27	0.23
(CSP - Future)		w/Radome	Leg	0.00					1/2" Ice	29.07	0.34
				0.00							

Tower Pressures - No Ice

$G_H = 1.129$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 160.00-150.00	155.00	1.556	32	110.170	A	10.889	8.342	8.342	43.38	0.000	0.000
					B	10.860	30.553		20.14	0.000	0.000
					C	10.889	8.342		43.38	0.000	0.000
T2 150.00-125.00	137.50	1.503	31	310.425	A	19.557	20.856	20.856	51.61	0.000	0.000
					B	20.158	103.111		16.92	0.000	0.000
					C	19.557	20.856		51.61	0.000	0.000
T3 125.00-100.00	112.50	1.42	29	360.425	A	23.281	20.856	20.856	47.25	0.000	0.000
					B	22.466	122.161		14.42	0.000	0.000
					C	21.589	45.606		31.04	0.000	0.000
T4 100.00-75.00	87.50	1.321	27	416.680	A	28.204	30.202	30.202	51.71	0.000	0.000
					B	26.814	132.710		18.93	0.000	0.000
					C	24.762	77.420		29.56	0.000	0.000
T5 75.00-66.67	70.83	1.244	26	150.004	A	9.964	10.067	10.067	50.26	0.000	0.000
					B	9.448	45.828		18.21	0.000	0.000
					C	8.730	27.396		27.87	0.000	0.000
T6 66.67-58.33	62.50	1.2	25	155.560	A	10.257	10.067	10.067	49.53	0.000	0.000
					B	9.767	45.828		18.11	0.000	0.000
					C	9.007	27.783		27.36	0.000	0.000
T7 58.33-50.00	54.17	1.152	24	159.031	A	13.957	6.952	6.952	33.25	0.000	0.000
					B	11.689	42.712		12.78	0.000	0.000
					C	11.878	24.667		19.02	0.000	0.000
T8 50.00-37.50	43.75	1.084	22	250.917	A	15.266	14.338	14.338	48.43	0.000	0.000
					B	14.903	67.979		17.30	0.000	0.000
					C	13.566	40.911		26.32	0.000	0.000
T9 37.50-25.00	31.25	1	21	263.417	A	19.771	14.338	14.338	42.04	0.000	0.000
					B	17.455	67.979		16.78	0.000	0.000
					C	17.159	40.911		24.69	0.000	0.000
T10 25.00-0.00	12.50	1	21	572.674	A	32.789	40.587	40.587	55.31	0.000	0.000
					B	32.520	104.956		29.52	0.000	0.000
					C	30.826	72.474		39.29	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.129$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 160.00-150.00	155.00	1.556	32	0.5000	111.004	A	10.889	14.033	10.011	40.17	0.000	0.000
						B	12.262	46.444		17.05	0.000	0.000
						C	10.889	14.033		40.17	0.000	0.000
T2 150.00-125.00	137.50	1.503	31	0.5000	312.510	A	19.557	32.849	25.027	47.76	0.000	0.000
						B	24.175	155.868		13.90	0.000	0.000
						C	19.557	32.849		47.76	0.000	0.000
T3 125.00-100.00	112.50	1.42	29	0.5000	362.510	A	23.281	33.677	25.027	43.94	0.000	0.000
						B	25.655	186.276		11.81	0.000	0.000
						C	20.734	69.982		27.59	0.000	0.000
T4 100.00-75.00	87.50	1.321	27	0.5000	418.765	A	28.204	43.774	34.373	47.75	0.000	0.000
						B	29.632	198.785		15.05	0.000	0.000
						C	22.716	117.239		24.56	0.000	0.000
T5 75.00-66.67	70.83	1.244	26	0.5000	150.699	A	9.964	14.779	11.458	46.31	0.000	0.000
						B	10.344	69.119		14.42	0.000	0.000
						C	7.986	41.893		22.97	0.000	0.000
T6 66.67-58.33	62.50	1.2	25	0.5000	156.255	A	10.257	14.877	11.458	45.59	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						B	10.679	69.231		14.34	0.000	0.000
						C	8.224	43.025		22.36	0.000	0.000
T7 58.33-50.00	54.17	1.152	24	0.5000	159.726	A	13.957	13.552	8.342	30.32	0.000	0.000
						B	11.523	66.472		10.70	0.000	0.000
						C	10.573	41.022		16.17	0.000	0.000
T8 50.00-37.50	43.75	1.084	22	0.5000	251.960	A	15.266	20.564	16.424	45.84	0.000	0.000
						B	16.497	102.661		13.78	0.000	0.000
						C	12.499	63.054		21.74	0.000	0.000
T9 37.50-25.00	31.25	1	21	0.5000	264.460	A	19.771	22.705	16.424	38.67	0.000	0.000
						B	17.865	103.213		13.56	0.000	0.000
						C	15.520	64.444		20.54	0.000	0.000
T10 25.00-0.00	12.50	1	21	0.5000	574.759	A	32.789	53.631	44.758	51.79	0.000	0.000
						B	34.535	152.224		23.97	0.000	0.000
						C	29.595	104.655		33.34	0.000	0.000

Tower Pressure - Service

$G_H = 1.129$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	155.00	1.556	32	110.170	A	10.889	8.342	8.342	43.38	0.000	0.000
160.00-150.00					B	10.860	30.553		20.14	0.000	0.000
					C	10.889	8.342		43.38	0.000	0.000
T2	137.50	1.503	31	310.425	A	19.557	20.856	20.856	51.61	0.000	0.000
150.00-125.00					B	20.158	103.111		16.92	0.000	0.000
					C	19.557	20.856		51.61	0.000	0.000
T3	112.50	1.42	29	360.425	A	23.281	20.856	20.856	47.25	0.000	0.000
125.00-100.00					B	22.466	122.161		14.42	0.000	0.000
					C	21.589	45.606		31.04	0.000	0.000
T4	87.50	1.321	27	416.680	A	28.204	30.202	30.202	51.71	0.000	0.000
100.00-75.00					B	26.814	132.710		18.93	0.000	0.000
					C	24.762	77.420		29.56	0.000	0.000
T5 75.00-66.67	70.83	1.244	26	150.004	A	9.964	10.067	10.067	50.26	0.000	0.000
					B	9.448	45.828		18.21	0.000	0.000
					C	8.730	27.396		27.87	0.000	0.000
T6 66.67-58.33	62.50	1.2	25	155.560	A	10.257	10.067	10.067	49.53	0.000	0.000
					B	9.767	45.828		18.11	0.000	0.000
					C	9.007	27.783		27.36	0.000	0.000
T7 58.33-50.00	54.17	1.152	24	159.031	A	13.957	6.952	6.952	33.25	0.000	0.000
					B	11.689	42.712		12.78	0.000	0.000
					C	11.878	24.667		19.02	0.000	0.000
T8 50.00-37.50	43.75	1.084	22	250.917	A	15.266	14.338	14.338	48.43	0.000	0.000
					B	14.903	67.979		17.30	0.000	0.000
					C	13.566	40.911		26.32	0.000	0.000
T9 37.50-25.00	31.25	1	21	263.417	A	19.771	14.338	14.338	42.04	0.000	0.000
					B	17.455	67.979		16.78	0.000	0.000
					C	17.159	40.911		24.69	0.000	0.000
T10 25.00-0.00	12.50	1	21	572.674	A	32.789	40.587	40.587	55.31	0.000	0.000
					B	32.520	104.956		29.52	0.000	0.000
					C	30.826	72.474		39.29	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	1	1	15.774	2.35	234.60	B
160.00-150.00			B	0.376	2.114	0.642	1	1	30.477			
			C	0.175	2.683	0.586	1	1	15.774			
T2	0.60	2.32	A	0.13	2.846	0.579	1	1	31.625	6.35	254.14	B
150.00-125.00			B	0.397	2.07	0.65	1	1	87.224			
			C	0.13	2.846	0.579	1	1	31.625			
T3	1.08	3.58	A	0.122	2.875	0.578	1	1	35.328	7.00	279.86	B
125.00-100.00			B	0.401	2.061	0.652	1	1	102.129			
			C	0.186	2.642	0.588	1	1	48.393			
T4	1.23	5.08	A	0.14	2.808	0.58	1	1	45.721	7.30	291.82	B
100.00-75.00			B	0.383	2.099	0.645	1	1	112.378			
			C	0.245	2.452	0.601	1	1	71.266			
T5	0.43	1.95	A	0.134	2.833	0.579	1	1	15.794	2.40	288.30	B
75.00-66.67			B	0.368	2.13	0.639	1	1	38.743			
			C	0.241	2.465	0.6	1	1	25.156			
T6	0.44	1.99	A	0.131	2.844	0.579	1	1	16.083	2.35	282.36	B
66.67-58.33			B	0.357	2.155	0.635	1	1	38.873			
			C	0.236	2.479	0.599	1	1	25.636			
T7	0.44	2.23	A	0.131	2.841	0.579	1	1	17.981	2.28	273.47	B
58.33-50.00			B	0.342	2.19	0.63	1	1	38.584			
			C	0.23	2.499	0.597	1	1	26.602			
T8	0.65	3.00	A	0.118	2.893	0.577	1	1	23.541	3.23	258.62	B
50.00-37.50			B	0.33	2.218	0.626	1	1	57.433			
			C	0.217	2.54	0.594	1	1	37.868			
T9	0.65	3.21	A	0.129	2.848	0.579	1	1	28.066	3.13	250.30	B
37.50-25.00			B	0.324	2.233	0.624	1	1	59.850			
			C	0.22	2.529	0.595	1	1	41.492			
T10	0.79	8.42	A	0.128	2.854	0.578	1	1	56.263	5.51	220.49	B
25.00-0.00			B	0.24	2.468	0.599	1	1	95.430			
			C	0.18	2.663	0.587	1	1	73.339			
Sum Weight:	6.46	32.98						OTM	3411.48 kip-ft	41.90		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	0.825	1	13.868	2.20	219.97	B
160.00-150.00			B	0.376	2.114	0.642	0.825	1	28.577			
			C	0.175	2.683	0.586	0.825	1	13.868			
T2	0.60	2.32	A	0.13	2.846	0.579	0.825	1	28.202	6.10	243.86	B
150.00-125.00			B	0.397	2.07	0.65	0.825	1	83.697			
			C	0.13	2.846	0.579	0.825	1	28.202			
T3	1.08	3.58	A	0.122	2.875	0.578	0.825	1	31.254	6.73	269.09	B
125.00-100.00			B	0.401	2.061	0.652	0.825	1	98.198			
			C	0.186	2.642	0.588	0.825	1	44.615			
T4	1.23	5.08	A	0.14	2.808	0.58	0.825	1	40.786	6.99	279.63	B
100.00-75.00			B	0.383	2.099	0.645	0.825	1	107.686			
			C	0.245	2.452	0.601	0.825	1	66.933			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T5	0.43	1.95	A	0.134	2.833	0.579	0.825	1	14.051	2.30	276.00	B
75.00-66.67			B	0.368	2.13	0.639	0.825	1	37.090			
			C	0.241	2.465	0.6	0.825	1	23.628			
T6	0.44	1.99	A	0.131	2.844	0.579	0.825	1	14.288	2.25	269.95	B
66.67-58.33			B	0.357	2.155	0.635	0.825	1	37.164			
			C	0.236	2.479	0.599	0.825	1	24.060			
T7	0.44	2.23	A	0.131	2.841	0.579	0.825	1	15.539	2.16	258.97	B
58.33-50.00			B	0.342	2.19	0.63	0.825	1	36.539			
			C	0.23	2.499	0.597	0.825	1	24.524			
T8	0.65	3.00	A	0.118	2.893	0.577	0.825	1	20.869	3.09	246.88	B
50.00-37.50			B	0.33	2.218	0.626	0.825	1	54.825			
			C	0.217	2.54	0.594	0.825	1	35.494			
T9	0.65	3.21	A	0.129	2.848	0.579	0.825	1	24.606	2.97	237.53	B
37.50-25.00			B	0.324	2.233	0.624	0.825	1	56.795			
			C	0.22	2.529	0.595	0.825	1	38.489			
T10	0.79	8.42	A	0.128	2.854	0.578	0.825	1	50.525	5.18	207.34	B
25.00-0.00			B	0.24	2.468	0.599	0.825	1	89.739			
			C	0.18	2.663	0.587	0.825	1	67.945			
Sum Weight:	6.46	32.98						OTM	3260.72 kip-ft	39.96		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	0.8	1	13.596	2.18	217.88	B
160.00-150.00			B	0.376	2.114	0.642	0.8	1	28.305			
			C	0.175	2.683	0.586	0.8	1	13.596			
T2	0.60	2.32	A	0.13	2.846	0.579	0.8	1	27.713	6.06	242.39	B
150.00-125.00			B	0.397	2.07	0.65	0.8	1	83.193			
			C	0.13	2.846	0.579	0.8	1	27.713			
T3	1.08	3.58	A	0.122	2.875	0.578	0.8	1	30.672	6.69	267.55	B
125.00-100.00			B	0.401	2.061	0.652	0.8	1	97.636			
			C	0.186	2.642	0.588	0.8	1	44.075			
T4	1.23	5.08	A	0.14	2.808	0.58	0.8	1	40.081	6.95	277.89	B
100.00-75.00			B	0.383	2.099	0.645	0.8	1	107.016			
			C	0.245	2.452	0.601	0.8	1	66.314			
T5	0.43	1.95	A	0.134	2.833	0.579	0.8	1	13.801	2.29	274.24	B
75.00-66.67			B	0.368	2.13	0.639	0.8	1	36.853			
			C	0.241	2.465	0.6	0.8	1	23.410			
T6	0.44	1.99	A	0.131	2.844	0.579	0.8	1	14.032	2.23	268.17	B
66.67-58.33			B	0.357	2.155	0.635	0.8	1	36.920			
			C	0.236	2.479	0.599	0.8	1	23.834			
T7	0.44	2.23	A	0.131	2.841	0.579	0.8	1	15.190	2.14	256.90	B
58.33-50.00			B	0.342	2.19	0.63	0.8	1	36.246			
			C	0.23	2.499	0.597	0.8	1	24.227			
T8	0.65	3.00	A	0.118	2.893	0.577	0.8	1	20.488	3.07	245.20	B
50.00-37.50			B	0.33	2.218	0.626	0.8	1	54.453			
			C	0.217	2.54	0.594	0.8	1	35.155			
T9	0.65	3.21	A	0.129	2.848	0.579	0.8	1	24.112	2.95	235.70	B
37.50-25.00			B	0.324	2.233	0.624	0.8	1	56.359			
			C	0.22	2.529	0.595	0.8	1	38.060			
T10	0.79	8.42	A	0.128	2.854	0.578	0.8	1	49.705	5.14	205.46	B
25.00-0.00			B	0.24	2.468	0.599	0.8	1	88.926			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
Sum Weight:	6.46	32.98	C	0.18	2.663	0.587	0.8	1 OTM	67.174 3239.18 kip-ft	39.68		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	0.85	1	14.140	2.22	222.06	B
160.00-150.00			B	0.376	2.114	0.642	0.85	1	28.848			
			C	0.175	2.683	0.586	0.85	1	14.140			
T2	0.60	2.32	A	0.13	2.846	0.579	0.85	1	28.691	6.13	245.33	B
150.00-125.00			B	0.397	2.07	0.65	0.85	1	84.200			
			C	0.13	2.846	0.579	0.85	1	28.691			
T3	1.08	3.58	A	0.122	2.875	0.578	0.85	1	31.836	6.77	270.62	B
125.00-100.00			B	0.401	2.061	0.652	0.85	1	98.759			
			C	0.186	2.642	0.588	0.85	1	45.154			
T4	1.23	5.08	A	0.14	2.808	0.58	0.85	1	41.491	7.03	281.37	B
100.00-75.00			B	0.383	2.099	0.645	0.85	1	108.356			
			C	0.245	2.452	0.601	0.85	1	67.552			
T5	0.43	1.95	A	0.134	2.833	0.579	0.85	1	14.300	2.31	277.76	B
75.00-66.67			B	0.368	2.13	0.639	0.85	1	37.326			
			C	0.241	2.465	0.6	0.85	1	23.847			
T6	0.44	1.99	A	0.131	2.844	0.579	0.85	1	14.544	2.26	271.72	B
66.67-58.33			B	0.357	2.155	0.635	0.85	1	37.408			
			C	0.236	2.479	0.599	0.85	1	24.285			
T7	0.44	2.23	A	0.131	2.841	0.579	0.85	1	15.888	2.18	261.04	B
58.33-50.00			B	0.342	2.19	0.63	0.85	1	36.831			
			C	0.23	2.499	0.597	0.85	1	24.821			
T8	0.65	3.00	A	0.118	2.893	0.577	0.85	1	21.251	3.11	248.56	B
50.00-37.50			B	0.33	2.218	0.626	0.85	1	55.198			
			C	0.217	2.54	0.594	0.85	1	35.834			
T9	0.65	3.21	A	0.129	2.848	0.579	0.85	1	25.101	2.99	239.35	B
37.50-25.00			B	0.324	2.233	0.624	0.85	1	57.232			
			C	0.22	2.529	0.595	0.85	1	38.918			
T10	0.79	8.42	A	0.128	2.854	0.578	0.85	1	51.345	5.23	209.22	B
25.00-0.00			B	0.24	2.468	0.599	0.85	1	90.552			
			C	0.18	2.663	0.587	0.85	1	68.715			
Sum Weight:	6.46	32.98						OTM	3282.26 kip-ft	40.24		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.39	1.72	A	0.225	2.516	0.596	1	1	19.249	3.08	308.13	B
160.00-150.00			B	0.529	1.865	0.713	1	1	45.360			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.225	2.516	0.596	1	1	19.249			
T2	1.57	3.38	A	0.168	2.707	0.584	1	1	38.752	8.93	357.30	B
150.00-125.00			B	0.576	1.821	0.739	1	1	139.405			
			C	0.168	2.707	0.584	1	1	38.752			
T3	2.76	4.87	A	0.157	2.745	0.583	1	1	42.901	9.91	396.25	B
125.00-100.00			B	0.585	1.814	0.744	1	1	164.302			
			C	0.25	2.437	0.602	1	1	62.859			
T4	3.14	6.93	A	0.172	2.693	0.585	1	1	53.815	9.89	395.74	B
100.00-75.00			B	0.545	1.848	0.722	1	1	173.103			
			C	0.334	2.209	0.627	1	1	96.220			
T5	1.10	2.59	A	0.164	2.72	0.584	1	1	18.592	3.24	388.43	B
75.00-66.67			B	0.527	1.867	0.712	1	1	59.543			
			C	0.331	2.217	0.626	1	1	34.205			
T6	1.11	2.64	A	0.161	2.732	0.583	1	1	18.933	3.15	377.44	B
66.67-58.33			B	0.511	1.886	0.703	1	1	59.375			
			C	0.328	2.224	0.625	1	1	35.108			
T7	1.11	2.92	A	0.172	2.691	0.585	1	1	21.887	2.97	356.44	B
58.33-50.00			B	0.488	1.916	0.692	1	1	57.495			
			C	0.323	2.237	0.623	1	1	36.139			
T8	1.67	3.84	A	0.142	2.8	0.58	1	1	27.200	4.26	341.09	B
50.00-37.50			B	0.473	1.938	0.684	1	1	86.724			
			C	0.3	2.296	0.616	1	1	51.331			
T9	1.67	4.22	A	0.161	2.733	0.583	1	1	33.011	4.03	322.14	B
37.50-25.00			B	0.458	1.961	0.677	1	1	87.730			
			C	0.302	2.29	0.617	1	1	55.258			
T10	2.00	10.62	A	0.15	2.77	0.582	1	1	63.977	6.77	270.61	B
25.00-0.00			B	0.325	2.232	0.624	1	1	129.500			
			C	0.234	2.488	0.598	1	1	92.161			
Sum Weight:	16.52	43.72						OTM	4669.66 kip-ft	56.22		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.39	1.72	A	0.225	2.516	0.596	0.825	1	17.343	2.94	293.55	B
160.00-150.00			B	0.529	1.865	0.713	0.825	1	43.214			
			C	0.225	2.516	0.596	0.825	1	17.343			
T2	1.57	3.38	A	0.168	2.707	0.584	0.825	1	35.329	8.66	346.46	B
150.00-125.00			B	0.576	1.821	0.739	0.825	1	135.174			
			C	0.168	2.707	0.584	0.825	1	35.329			
T3	2.76	4.87	A	0.157	2.745	0.583	0.825	1	38.827	9.64	385.42	B
125.00-100.00			B	0.585	1.814	0.744	0.825	1	159.812			
			C	0.25	2.437	0.602	0.825	1	59.231			
T4	3.14	6.93	A	0.172	2.693	0.585	0.825	1	48.879	9.60	383.89	B
100.00-75.00			B	0.545	1.848	0.722	0.825	1	167.917			
			C	0.334	2.209	0.627	0.825	1	92.245			
T5	1.10	2.59	A	0.164	2.72	0.584	0.825	1	16.848	3.14	376.62	B
75.00-66.67			B	0.527	1.867	0.712	0.825	1	57.733			
			C	0.331	2.217	0.626	0.825	1	32.808			
T6	1.11	2.64	A	0.161	2.732	0.583	0.825	1	17.138	3.05	365.56	B
66.67-58.33			B	0.511	1.886	0.703	0.825	1	57.506			
			C	0.328	2.224	0.625	0.825	1	33.669			
T7	1.11	2.92	A	0.172	2.691	0.585	0.825	1	19.445	2.87	343.94	B

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
58.33-50.00			B	0.488	1.916	0.692	0.825	1	55.478			
			C	0.323	2.237	0.623	0.825	1	34.289			
T8	1.67	3.84	A	0.142	2.8	0.58	0.825	1	24.529	4.12	329.73	B
50.00-37.50			B	0.473	1.938	0.684	0.825	1	83.837			
			C	0.3	2.296	0.616	0.825	1	49.144			
T9	1.67	4.22	A	0.161	2.733	0.583	0.825	1	29.551	3.88	310.66	B
37.50-25.00			B	0.458	1.961	0.677	0.825	1	84.604			
			C	0.302	2.29	0.617	0.825	1	52.542			
T10	2.00	10.62	A	0.15	2.77	0.582	0.825	1	58.239	6.45	257.98	B
25.00-0.00			B	0.325	2.232	0.624	0.825	1	123.456			
			C	0.234	2.488	0.598	0.825	1	86.981			
Sum Weight:	16.52	43.72						OTM	4519.96 kip-ft	54.34		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.39	1.72	A	0.225	2.516	0.596	0.8	1	17.071	2.91	291.47	B
160.00-150.00			B	0.529	1.865	0.713	0.8	1	42.908			
			C	0.225	2.516	0.596	0.8	1	17.071			
T2	1.57	3.38	A	0.168	2.707	0.584	0.8	1	34.841	8.62	344.91	B
150.00-125.00			B	0.576	1.821	0.739	0.8	1	134.570			
			C	0.168	2.707	0.584	0.8	1	34.841			
T3	2.76	4.87	A	0.157	2.745	0.583	0.8	1	38.245	9.60	383.87	B
125.00-100.00			B	0.585	1.814	0.744	0.8	1	159.171			
			C	0.25	2.437	0.602	0.8	1	58.713			
T4	3.14	6.93	A	0.172	2.693	0.585	0.8	1	48.174	9.55	382.19	B
100.00-75.00			B	0.545	1.848	0.722	0.8	1	167.176			
			C	0.334	2.209	0.627	0.8	1	91.677			
T5	1.10	2.59	A	0.164	2.72	0.584	0.8	1	16.599	3.12	374.93	B
75.00-66.67			B	0.527	1.867	0.712	0.8	1	57.475			
			C	0.331	2.217	0.626	0.8	1	32.608			
T6	1.11	2.64	A	0.161	2.732	0.583	0.8	1	16.881	3.03	363.87	B
66.67-58.33			B	0.511	1.886	0.703	0.8	1	57.239			
			C	0.328	2.224	0.625	0.8	1	33.464			
T7	1.11	2.92	A	0.172	2.691	0.585	0.8	1	19.096	2.85	342.15	B
58.33-50.00			B	0.488	1.916	0.692	0.8	1	55.190			
			C	0.323	2.237	0.623	0.8	1	34.025			
T8	1.67	3.84	A	0.142	2.8	0.58	0.8	1	24.147	4.10	328.11	B
50.00-37.50			B	0.473	1.938	0.684	0.8	1	83.425			
			C	0.3	2.296	0.616	0.8	1	48.831			
T9	1.67	4.22	A	0.161	2.733	0.583	0.8	1	29.057	3.86	309.02	B
37.50-25.00			B	0.458	1.961	0.677	0.8	1	84.157			
			C	0.302	2.29	0.617	0.8	1	52.154			
T10	2.00	10.62	A	0.15	2.77	0.582	0.8	1	57.419	6.40	256.18	B
25.00-0.00			B	0.325	2.232	0.624	0.8	1	122.593			
			C	0.234	2.488	0.598	0.8	1	86.242			
Sum Weight:	16.52	43.72						OTM	4498.58 kip-ft	54.07		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.39	1.72	A	0.225	2.516	0.596	0.85	1	17.615	2.96	295.64	B
160.00-150.00			B	0.529	1.865	0.713	0.85	1	43.521			
			C	0.225	2.516	0.596	0.85	1	17.615			
T2	1.57	3.38	A	0.168	2.707	0.584	0.85	1	35.818	8.70	348.01	B
150.00-125.00			B	0.576	1.821	0.739	0.85	1	135.778			
			C	0.168	2.707	0.584	0.85	1	35.818			
T3	2.76	4.87	A	0.157	2.745	0.583	0.85	1	39.409	9.67	386.97	B
125.00-100.00			B	0.585	1.814	0.744	0.85	1	160.454			
			C	0.25	2.437	0.602	0.85	1	59.749			
T4	3.14	6.93	A	0.172	2.693	0.585	0.85	1	49.584	9.64	385.58	B
100.00-75.00			B	0.545	1.848	0.722	0.85	1	168.658			
			C	0.334	2.209	0.627	0.85	1	92.813			
T5	1.10	2.59	A	0.164	2.72	0.584	0.85	1	17.097	3.15	378.31	B
75.00-66.67			B	0.527	1.867	0.712	0.85	1	57.992			
			C	0.331	2.217	0.626	0.85	1	33.007			
T6	1.11	2.64	A	0.161	2.732	0.583	0.85	1	17.394	3.06	367.26	B
66.67-58.33			B	0.511	1.886	0.703	0.85	1	57.773			
			C	0.328	2.224	0.625	0.85	1	33.875			
T7	1.11	2.92	A	0.172	2.691	0.585	0.85	1	19.794	2.88	345.72	B
58.33-50.00			B	0.488	1.916	0.692	0.85	1	55.766			
			C	0.323	2.237	0.623	0.85	1	34.553			
T8	1.67	3.84	A	0.142	2.8	0.58	0.85	1	24.910	4.14	331.36	B
50.00-37.50			B	0.473	1.938	0.684	0.85	1	84.250			
			C	0.3	2.296	0.616	0.85	1	49.456			
T9	1.67	4.22	A	0.161	2.733	0.583	0.85	1	30.046	3.90	312.30	B
37.50-25.00			B	0.458	1.961	0.677	0.85	1	85.050			
			C	0.302	2.29	0.617	0.85	1	52.930			
T10	2.00	10.62	A	0.15	2.77	0.582	0.85	1	59.058	6.49	259.79	B
25.00-0.00			B	0.325	2.232	0.624	0.85	1	124.320			
			C	0.234	2.488	0.598	0.85	1	87.721			
Sum Weight:	16.52	43.72						OTM	4541.35 kip-ft	54.60		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	1	1	15.774	2.35	234.60	B
160.00-150.00			B	0.376	2.114	0.642	1	1	30.477			
			C	0.175	2.683	0.586	1	1	15.774			
T2	0.60	2.32	A	0.13	2.846	0.579	1	1	31.625	6.35	254.14	B
150.00-125.00			B	0.397	2.07	0.65	1	1	87.224			
			C	0.13	2.846	0.579	1	1	31.625			
T3	1.08	3.58	A	0.122	2.875	0.578	1	1	35.328	7.00	279.86	B
125.00-100.00			B	0.401	2.061	0.652	1	1	102.129			
			C	0.186	2.642	0.588	1	1	48.393			
T4	1.23	5.08	A	0.14	2.808	0.58	1	1	45.721	7.30	291.82	B
100.00-75.00			B	0.383	2.099	0.645	1	1	112.378			
			C	0.245	2.452	0.601	1	1	71.266			
T5	0.43	1.95	A	0.134	2.833	0.579	1	1	15.794	2.40	288.30	B
75.00-66.67			B	0.368	2.13	0.639	1	1	38.743			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
			C	0.241	2.465	0.6	1	1	25.156			
T6	0.44	1.99	A	0.131	2.844	0.579	1	1	16.083	2.35	282.36	B
66.67-58.33			B	0.357	2.155	0.635	1	1	38.873			
			C	0.236	2.479	0.599	1	1	25.636			
T7	0.44	2.23	A	0.131	2.841	0.579	1	1	17.981	2.28	273.47	B
58.33-50.00			B	0.342	2.19	0.63	1	1	38.584			
			C	0.23	2.499	0.597	1	1	26.602			
T8	0.65	3.00	A	0.118	2.893	0.577	1	1	23.541	3.23	258.62	B
50.00-37.50			B	0.33	2.218	0.626	1	1	57.433			
			C	0.217	2.54	0.594	1	1	37.868			
T9	0.65	3.21	A	0.129	2.848	0.579	1	1	28.066	3.13	250.30	B
37.50-25.00			B	0.324	2.233	0.624	1	1	59.850			
			C	0.22	2.529	0.595	1	1	41.492			
T10	0.79	8.42	A	0.128	2.854	0.578	1	1	56.263	5.51	220.49	B
25.00-0.00			B	0.24	2.468	0.599	1	1	95.430			
			C	0.18	2.663	0.587	1	1	73.339			
Sum Weight:	6.46	32.98						OTM	3411.48 kip-ft	41.90		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	0.825	1	13.868	2.20	219.97	B
160.00-150.00			B	0.376	2.114	0.642	0.825	1	28.577			
			C	0.175	2.683	0.586	0.825	1	13.868			
T2	0.60	2.32	A	0.13	2.846	0.579	0.825	1	28.202	6.10	243.86	B
150.00-125.00			B	0.397	2.07	0.65	0.825	1	83.697			
			C	0.13	2.846	0.579	0.825	1	28.202			
T3	1.08	3.58	A	0.122	2.875	0.578	0.825	1	31.254	6.73	269.09	B
125.00-100.00			B	0.401	2.061	0.652	0.825	1	98.198			
			C	0.186	2.642	0.588	0.825	1	44.615			
T4	1.23	5.08	A	0.14	2.808	0.58	0.825	1	40.786	6.99	279.63	B
100.00-75.00			B	0.383	2.099	0.645	0.825	1	107.686			
			C	0.245	2.452	0.601	0.825	1	66.933			
T5	0.43	1.95	A	0.134	2.833	0.579	0.825	1	14.051	2.30	276.00	B
75.00-66.67			B	0.368	2.13	0.639	0.825	1	37.090			
			C	0.241	2.465	0.6	0.825	1	23.628			
T6	0.44	1.99	A	0.131	2.844	0.579	0.825	1	14.288	2.25	269.95	B
66.67-58.33			B	0.357	2.155	0.635	0.825	1	37.164			
			C	0.236	2.479	0.599	0.825	1	24.060			
T7	0.44	2.23	A	0.131	2.841	0.579	0.825	1	15.539	2.16	258.97	B
58.33-50.00			B	0.342	2.19	0.63	0.825	1	36.539			
			C	0.23	2.499	0.597	0.825	1	24.524			
T8	0.65	3.00	A	0.118	2.893	0.577	0.825	1	20.869	3.09	246.88	B
50.00-37.50			B	0.33	2.218	0.626	0.825	1	54.825			
			C	0.217	2.54	0.594	0.825	1	35.494			
T9	0.65	3.21	A	0.129	2.848	0.579	0.825	1	24.606	2.97	237.53	B
37.50-25.00			B	0.324	2.233	0.624	0.825	1	56.795			
			C	0.22	2.529	0.595	0.825	1	38.489			
T10	0.79	8.42	A	0.128	2.854	0.578	0.825	1	50.525	5.18	207.34	B
25.00-0.00			B	0.24	2.468	0.599	0.825	1	89.739			
			C	0.18	2.663	0.587	0.825	1	67.945			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
Sum Weight:	6.46	32.98						OTM	3260.72 kip-ft	39.96		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	0.8	1	13.596	2.18	217.88	B
160.00-150.00			B	0.376	2.114	0.642	0.8	1	28.305			
			C	0.175	2.683	0.586	0.8	1	13.596			
T2	0.60	2.32	A	0.13	2.846	0.579	0.8	1	27.713	6.06	242.39	B
150.00-125.00			B	0.397	2.07	0.65	0.8	1	83.193			
			C	0.13	2.846	0.579	0.8	1	27.713			
T3	1.08	3.58	A	0.122	2.875	0.578	0.8	1	30.672	6.69	267.55	B
125.00-100.00			B	0.401	2.061	0.652	0.8	1	97.636			
			C	0.186	2.642	0.588	0.8	1	44.075			
T4	1.23	5.08	A	0.14	2.808	0.58	0.8	1	40.081	6.95	277.89	B
100.00-75.00			B	0.383	2.099	0.645	0.8	1	107.016			
			C	0.245	2.452	0.601	0.8	1	66.314			
T5	0.43	1.95	A	0.134	2.833	0.579	0.8	1	13.801	2.29	274.24	B
75.00-66.67			B	0.368	2.13	0.639	0.8	1	36.853			
			C	0.241	2.465	0.6	0.8	1	23.410			
T6	0.44	1.99	A	0.131	2.844	0.579	0.8	1	14.032	2.23	268.17	B
66.67-58.33			B	0.357	2.155	0.635	0.8	1	36.920			
			C	0.236	2.479	0.599	0.8	1	23.834			
T7	0.44	2.23	A	0.131	2.841	0.579	0.8	1	15.190	2.14	256.90	B
58.33-50.00			B	0.342	2.19	0.63	0.8	1	36.246			
			C	0.23	2.499	0.597	0.8	1	24.227			
T8	0.65	3.00	A	0.118	2.893	0.577	0.8	1	20.488	3.07	245.20	B
50.00-37.50			B	0.33	2.218	0.626	0.8	1	54.453			
			C	0.217	2.54	0.594	0.8	1	35.155			
T9	0.65	3.21	A	0.129	2.848	0.579	0.8	1	24.112	2.95	235.70	B
37.50-25.00			B	0.324	2.233	0.624	0.8	1	56.359			
			C	0.22	2.529	0.595	0.8	1	38.060			
T10	0.79	8.42	A	0.128	2.854	0.578	0.8	1	49.705	5.14	205.46	B
25.00-0.00			B	0.24	2.468	0.599	0.8	1	88.926			
			C	0.18	2.663	0.587	0.8	1	67.174			
Sum Weight:	6.46	32.98						OTM	3239.18 kip-ft	39.68		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.15	1.18	A	0.175	2.683	0.586	0.85	1	14.140	2.22	222.06	B
160.00-150.00			B	0.376	2.114	0.642	0.85	1	28.848			
			C	0.175	2.683	0.586	0.85	1	14.140			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T2	0.60	2.32	A	0.13	2.846	0.579	0.85	1	28.691	6.13	245.33	B
150.00-125.00			B	0.397	2.07	0.65	0.85	1	84.200			
			C	0.13	2.846	0.579	0.85	1	28.691			
T3	1.08	3.58	A	0.122	2.875	0.578	0.85	1	31.836	6.77	270.62	B
125.00-100.00			B	0.401	2.061	0.652	0.85	1	98.759			
			C	0.186	2.642	0.588	0.85	1	45.154			
T4	1.23	5.08	A	0.14	2.808	0.58	0.85	1	41.491	7.03	281.37	B
100.00-75.00			B	0.383	2.099	0.645	0.85	1	108.356			
			C	0.245	2.452	0.601	0.85	1	67.552			
T5	0.43	1.95	A	0.134	2.833	0.579	0.85	1	14.300	2.31	277.76	B
75.00-66.67			B	0.368	2.13	0.639	0.85	1	37.326			
			C	0.241	2.465	0.6	0.85	1	23.847			
T6	0.44	1.99	A	0.131	2.844	0.579	0.85	1	14.544	2.26	271.72	B
66.67-58.33			B	0.357	2.155	0.635	0.85	1	37.408			
			C	0.236	2.479	0.599	0.85	1	24.285			
T7	0.44	2.23	A	0.131	2.841	0.579	0.85	1	15.888	2.18	261.04	B
58.33-50.00			B	0.342	2.19	0.63	0.85	1	36.831			
			C	0.23	2.499	0.597	0.85	1	24.821			
T8	0.65	3.00	A	0.118	2.893	0.577	0.85	1	21.251	3.11	248.56	B
50.00-37.50			B	0.33	2.218	0.626	0.85	1	55.198			
			C	0.217	2.54	0.594	0.85	1	35.834			
T9	0.65	3.21	A	0.129	2.848	0.579	0.85	1	25.101	2.99	239.35	B
37.50-25.00			B	0.324	2.233	0.624	0.85	1	57.232			
			C	0.22	2.529	0.595	0.85	1	38.918			
T10	0.79	8.42	A	0.128	2.854	0.578	0.85	1	51.345	5.23	209.22	B
25.00-0.00			B	0.24	2.468	0.599	0.85	1	90.552			
			C	0.18	2.663	0.587	0.85	1	68.715			
Sum Weight:	6.46	32.98						OTM	3282.26 kip-ft	40.24		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	11.77					
Bracing Weight	21.21					
Total Member Self-Weight	32.98			-9.50	-9.83	
Total Weight	47.82			-9.50	-9.83	
Wind 0 deg - No Ice		0.04	-60.61	-5886.71	-16.74	31.61
Wind 30 deg - No Ice		29.21	-51.07	-4989.33	-2845.80	2.01
Wind 45 deg - No Ice		41.03	-41.34	-4039.15	-3993.93	-11.06
Wind 60 deg - No Ice		50.02	-28.90	-2821.96	-4871.74	-23.85
Wind 90 deg - No Ice		58.59	0.30	27.71	-5708.16	-43.95
Wind 120 deg - No Ice		52.32	30.34	2930.53	-5077.04	-56.70
Wind 135 deg - No Ice		41.45	41.39	4024.40	-4051.74	-55.31
Wind 150 deg - No Ice		29.55	50.81	4931.87	-2891.22	-50.71
Wind 180 deg - No Ice		0.09	57.95	5628.98	-17.67	-30.12
Wind 210 deg - No Ice		-29.44	50.94	4948.97	2863.12	-2.01
Wind 225 deg - No Ice		-41.35	41.51	4040.77	4024.87	12.90
Wind 240 deg - No Ice		-52.25	30.34	2935.09	5051.44	25.10
Wind 270 deg - No Ice		-58.33	0.22	23.54	5659.95	44.23
Wind 300 deg - No Ice		-49.68	-28.81	-2808.06	4812.34	53.96
Wind 315 deg - No Ice		-40.73	-41.16	-4015.68	3938.62	53.88
Wind 330 deg - No Ice		-28.98	-50.84	-4961.28	2796.45	50.43

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Member Ice	10.74					
Total Weight Ice	72.97			-21.76	-30.97	
Wind 0 deg - Ice		0.04	-78.54	-7655.49	-37.89	46.97
Wind 30 deg - Ice		38.17	-66.64	-6523.53	-3743.14	6.59
Wind 45 deg - Ice		53.71	-54.06	-5293.52	-5254.09	-12.45
Wind 60 deg - Ice		65.56	-37.88	-3711.79	-6410.59	-31.13
Wind 90 deg - Ice		76.53	0.31	16.69	-7482.78	-61.14
Wind 120 deg - Ice		67.83	39.30	3796.74	-6616.62	-79.33
Wind 135 deg - Ice		54.15	54.10	5254.64	-5313.80	-78.36
Wind 150 deg - Ice		38.53	66.37	6440.66	-3790.17	-72.61
Wind 180 deg - Ice		0.10	75.93	7372.58	-39.21	-45.39
Wind 210 deg - Ice		-38.41	66.50	6458.06	3719.24	-6.59
Wind 225 deg - Ice		-54.05	54.22	5271.22	5244.19	14.35
Wind 240 deg - Ice		-67.75	39.31	3801.11	6548.40	32.36
Wind 270 deg - Ice		-76.26	0.22	12.04	7391.49	61.43
Wind 300 deg - Ice		-65.21	-37.79	-3697.82	6307.98	76.52
Wind 315 deg - Ice		-53.41	-53.87	-5269.65	5155.76	76.88
Wind 330 deg - Ice		-37.94	-66.40	-6494.87	3650.99	72.33
Total Weight	47.82			-9.50	-9.83	
Wind 0 deg - Service		0.04	-60.61	-5881.82	-1.12	31.61
Wind 30 deg - Service		29.21	-51.07	-4984.44	-2830.18	2.01
Wind 45 deg - Service		41.03	-41.34	-4034.26	-3978.30	-11.06
Wind 60 deg - Service		50.02	-28.90	-2817.06	-4856.12	-23.85
Wind 90 deg - Service		58.59	0.30	32.61	-5692.54	-43.95
Wind 120 deg - Service		52.32	30.34	2935.43	-5061.42	-56.70
Wind 135 deg - Service		41.45	41.39	4029.29	-4036.12	-55.31
Wind 150 deg - Service		29.55	50.81	4936.77	-2875.60	-50.71
Wind 180 deg - Service		0.09	57.95	5633.87	-2.05	-30.12
Wind 210 deg - Service		-29.44	50.94	4953.87	2878.75	-2.01
Wind 225 deg - Service		-41.35	41.51	4045.67	4040.49	12.90
Wind 240 deg - Service		-52.25	30.34	2939.98	5067.07	25.10
Wind 270 deg - Service		-58.33	0.22	28.43	5675.57	44.23
Wind 300 deg - Service		-49.68	-28.81	-2803.17	4827.96	53.96
Wind 315 deg - Service		-40.73	-41.16	-4010.78	3954.24	53.88
Wind 330 deg - Service		-28.98	-50.84	-4956.38	2812.07	50.43

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice

Comb. No.	Description
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice
19	Dead+Wind 0 deg+Ice
20	Dead+Wind 30 deg+Ice
21	Dead+Wind 45 deg+Ice
22	Dead+Wind 60 deg+Ice
23	Dead+Wind 90 deg+Ice
24	Dead+Wind 120 deg+Ice
25	Dead+Wind 135 deg+Ice
26	Dead+Wind 150 deg+Ice
27	Dead+Wind 180 deg+Ice
28	Dead+Wind 210 deg+Ice
29	Dead+Wind 225 deg+Ice
30	Dead+Wind 240 deg+Ice
31	Dead+Wind 270 deg+Ice
32	Dead+Wind 300 deg+Ice
33	Dead+Wind 315 deg+Ice
34	Dead+Wind 330 deg+Ice
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	160 - 150	Leg	Max Tension	22	2.09	-0.13	0.02
			Max. Compression	19	-5.12	-0.21	-0.04
			Max. Mx	27	1.17	0.25	0.04
			Max. My	26	-1.09	0.00	0.30
			Max. Vy	27	-1.06	-0.12	-0.02
			Max. Vx	31	-1.03	-0.00	-0.11
		Diagonal	Max Tension	25	4.79	0.00	0.00
			Max. Compression	25	-4.96	0.00	0.00
			Max. Mx	20	4.57	0.04	0.00
			Max. My	24	0.50	0.00	0.00
			Max. Vy	20	-0.02	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Horizontal	Max Tension	33	3.72	0.00	0.00
			Max. Compression	25	-3.76	0.03	0.01
			Max. Mx	22	0.05	0.03	0.00
			Max. My	23	2.75	0.02	0.01
			Max. Vy	22	0.03	0.03	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Top Girt	Max Tension	32	2.31	0.02	0.01

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	24	-2.51	0.03	0.01
			Max. Mx	22	-0.77	0.03	0.00
			Max. My	24	1.40	0.02	0.01
			Max. Vy	22	0.03	0.03	0.00
			Max. Vx	24	-0.00	0.00	0.00
T2	150 - 125	Leg	Max Tension	22	26.20	-0.09	0.08
			Max. Compression	19	-35.42	0.11	-0.02
			Max. Mx	27	13.67	2.37	0.09
			Max. My	31	-2.68	-0.04	2.39
			Max. Vy	27	-1.05	-1.37	0.09
			Max. Vx	31	-1.13	-0.04	-1.47
		Diagonal	Max Tension	26	12.85	0.00	0.00
			Max. Compression	26	-13.02	0.00	0.00
			Max. Mx	20	11.82	0.07	0.00
			Max. My	24	1.68	0.00	0.00
			Max. Vy	20	-0.03	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Horizontal	Max Tension	33	8.03	0.00	0.00
			Max. Compression	25	-8.11	0.03	0.02
			Max. Mx	22	0.32	0.04	0.01
			Max. My	25	-8.11	0.03	0.02
			Max. Vy	22	0.02	0.04	0.01
			Max. Vx	25	0.00	0.00	0.00
T3	125 - 100	Leg	Max Tension	32	73.94	-0.43	-0.15
			Max. Compression	19	-91.78	0.26	-0.09
			Max. Mx	22	40.63	-0.60	0.11
			Max. My	23	-6.99	-0.04	0.68
			Max. Vy	21	0.48	-0.53	0.29
			Max. Vx	30	0.62	-0.31	-0.63
		Diagonal	Max Tension	26	16.68	0.00	0.00
			Max. Compression	26	-17.03	0.00	0.00
			Max. Mx	20	16.29	0.13	0.00
			Max. My	24	1.81	0.00	0.01
			Max. Vy	20	0.05	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Horizontal	Max Tension	26	11.25	0.06	-0.00
			Max. Compression	25	-11.34	0.07	0.00
			Max. Mx	32	0.84	0.11	0.02
			Max. My	30	2.03	0.00	-0.02
			Max. Vy	32	0.04	0.11	0.02
			Max. Vx	30	0.00	0.00	-0.02
		Inner Bracing	Max Tension	23	0.00	0.00	0.00
			Max. Compression	33	-0.01	0.00	0.00
			Max. Mx	18	-0.00	-0.03	0.00
			Max. My	19	0.00	0.00	-0.00
			Max. Vy	18	0.02	0.00	0.00
			Max. Vx	19	-0.00	0.00	0.00
T4	100 - 75	Leg	Max Tension	22	131.59	-0.39	-0.03
			Max. Compression	19	-159.33	0.35	-0.04
			Max. Mx	22	91.38	-1.09	0.06
			Max. My	23	-9.38	-0.03	1.15
			Max. Vy	22	0.54	-1.09	0.06
			Max. Vx	23	-0.56	-0.03	1.15
		Diagonal	Max Tension	26	19.52	0.00	0.00
			Max. Compression	26	-19.98	0.00	0.00
			Max. Mx	20	18.44	0.16	0.00
			Max. My	24	1.93	0.00	0.01
			Max. Vy	20	0.05	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Horizontal	Max Tension	26	14.12	0.11	-0.00
			Max. Compression	26	-14.00	0.11	-0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	22	1.41	0.17	0.02
			Max. My	30	2.11	0.04	-0.03
			Max. Vy	22	0.07	0.17	0.02
			Max. Vx	30	0.01	0.04	-0.03
		Top Girt	Max Tension	26	12.26	0.06	-0.00
			Max. Compression	25	-12.21	0.06	0.01
			Max. Mx	22	0.43	0.08	0.03
			Max. My	30	1.96	0.03	-0.03
			Max. Vy	22	0.04	0.08	0.03
			Max. Vx	30	0.00	0.03	-0.03
		Inner Bracing	Max Tension	25	0.21	0.00	0.00
			Max. Compression	25	-0.21	0.00	0.00
			Max. Mx	18	-0.00	-0.04	0.00
			Max. My	19	0.01	0.00	-0.00
			Max. Vy	18	0.02	0.00	0.00
			Max. Vx	19	-0.00	0.00	0.00
T5	75 - 66.6667	Leg	Max Tension	22	152.05	-0.38	0.03
			Max. Compression	19	-183.47	0.93	-0.07
			Max. Mx	19	-183.47	0.93	-0.07
			Max. My	23	-12.78	-0.02	0.53
			Max. Vy	30	-0.14	0.92	0.01
			Max. Vx	24	0.16	-0.20	0.49
		Diagonal	Max Tension	26	21.10	0.00	0.00
			Max. Compression	26	-21.58	0.00	0.00
			Max. Mx	20	19.31	0.17	0.00
			Max. My	24	2.17	0.00	0.01
			Max. Vy	20	0.06	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Horizontal	Max Tension	26	15.53	0.12	-0.00
			Max. Compression	26	-15.42	0.12	-0.00
			Max. Mx	22	1.63	0.17	0.03
			Max. My	24	-0.58	0.06	-0.03
			Max. Vy	22	0.07	0.17	0.03
			Max. Vx	19	0.01	0.06	-0.03
		Inner Bracing	Max Tension	23	0.01	0.00	0.00
			Max. Compression	33	-0.02	0.00	0.00
			Max. Mx	18	-0.00	-0.04	0.00
			Max. My	24	0.01	0.00	-0.00
			Max. Vy	18	0.02	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
T6	66.6667 - 58.3333	Leg	Max Tension	22	173.49	-0.81	-0.01
			Max. Compression	19	-208.00	-0.96	-0.10
			Max. Mx	19	-208.00	-0.96	-0.10
			Max. My	23	-14.20	-0.18	1.62
			Max. Vy	19	0.29	0.93	-0.07
			Max. Vx	23	-0.26	-0.18	1.62
		Diagonal	Max Tension	26	21.58	0.00	0.00
			Max. Compression	26	-22.09	0.00	0.00
			Max. Mx	20	19.63	0.18	0.00
			Max. My	24	2.18	0.00	0.01
			Max. Vy	20	-0.06	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Top Girt	Max Tension	26	16.19	0.13	-0.00
			Max. Compression	26	-16.03	0.13	-0.00
			Max. Mx	22	0.78	0.18	0.02
			Max. My	30	1.52	0.07	-0.03
			Max. Vy	22	0.07	0.18	0.02
			Max. Vx	19	0.01	0.07	-0.03
		Inner Bracing	Max Tension	26	0.28	0.00	0.00
			Max. Compression	26	-0.28	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	18	-0.00	-0.05	0.00
			Max. My	24	0.26	0.00	-0.00
			Max. Vy	18	0.02	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
T7	58.3333 - 50	Leg	Max Tension	22	193.88	0.53	0.07
			Max. Compression	19	-232.05	-0.23	-0.13
			Max. Mx	19	-231.94	2.96	0.08
			Max. My	23	-15.06	-0.18	1.62
			Max. Vy	19	-0.98	2.96	0.08
			Max. Vx	23	0.68	-0.18	1.62
		Diagonal	Max Tension	26	21.94	0.00	0.00
			Max. Compression	26	-22.52	0.00	0.00
			Max. Mx	33	12.15	-0.26	0.01
			Max. My	34	-22.33	0.11	0.02
			Max. Vy	33	0.08	-0.26	0.01
			Max. Vx	33	0.00	0.00	0.00
		Top Girt	Max Tension	26	16.49	0.14	-0.00
			Max. Compression	26	-16.79	0.14	-0.00
			Max. Mx	22	0.31	0.22	0.02
			Max. My	30	1.80	0.06	-0.03
			Max. Vy	22	0.08	0.22	0.02
			Max. Vx	19	0.01	0.05	-0.03
		Redund Horz 1 Bracing	Max Tension	19	4.02	0.00	0.00
			Max. Compression	19	-4.02	0.00	0.00
			Max. Mx	32	2.08	-0.02	0.00
			Max. My	25	3.81	0.00	0.00
			Max. Vy	32	0.01	0.00	0.00
			Max. Vx	25	-0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	19	2.66	0.00	0.00
			Max. Compression	19	-2.66	0.00	0.00
			Max. Mx	20	2.30	-0.02	0.00
			Max. My	24	1.08	0.00	-0.00
			Max. Vy	20	0.01	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Inner Bracing	Max Tension	26	0.29	0.00	0.00
			Max. Compression	26	-0.29	0.00	0.00
			Max. Mx	18	-0.01	-0.05	0.00
			Max. My	24	0.27	0.00	-0.00
			Max. Vy	18	-0.02	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
T8	50 - 37.5	Leg	Max Tension	22	216.21	-0.07	0.05
			Max. Compression	19	-257.33	-1.38	-0.17
			Max. Mx	19	-257.33	-1.38	-0.17
			Max. My	23	-16.66	-0.22	1.84
			Max. Vy	30	0.19	-0.21	-0.05
			Max. Vx	24	-0.20	0.31	1.71
		Diagonal	Max Tension	26	27.38	0.00	0.00
			Max. Compression	26	-28.05	0.00	0.00
			Max. Mx	20	24.58	0.40	0.00
			Max. My	24	2.84	0.00	0.02
			Max. Vy	20	-0.10	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Top Girt	Max Tension	26	17.22	0.13	-0.00
			Max. Compression	26	-17.23	0.13	-0.00
			Max. Mx	22	0.75	0.26	0.05
			Max. My	30	1.66	0.00	-0.06
			Max. Vy	22	0.08	0.26	0.05
			Max. Vx	30	0.01	0.00	-0.06
		Inner Bracing	Max Tension	26	0.30	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	26	-0.30	0.00	0.00
			Max. Mx	18	-0.01	-0.06	0.00
			Max. My	24	0.27	0.00	-0.00
			Max. Vy	18	0.03	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
T9	37.5 - 25	Leg	Max Tension	22	245.16	0.82	0.04
			Max. Compression	19	-291.99	-3.34	-0.20
			Max. Mx	19	-291.75	7.29	0.16
			Max. My	23	-18.43	-0.40	2.75
			Max. Vy	19	1.74	7.29	0.16
			Max. Vx	23	-0.78	-0.40	2.75
		Diagonal	Max Tension	26	28.23	-0.29	0.01
			Max. Compression	26	-28.77	0.00	0.00
			Max. Mx	33	15.92	-0.41	0.02
			Max. My	25	-27.50	0.23	-0.04
			Max. Vy	33	0.10	-0.41	0.02
			Max. Vx	25	-0.01	0.00	0.00
		Top Girt	Max Tension	26	17.75	0.15	-0.00
			Max. Compression	26	-18.12	0.15	-0.00
			Max. Mx	22	0.35	0.27	0.05
			Max. My	30	1.72	0.02	-0.06
			Max. Vy	22	0.08	0.27	0.05
			Max. Vx	30	0.01	0.02	-0.06
		Redund Horz 1 Bracing	Max Tension	19	5.06	0.00	0.00
			Max. Compression	19	-5.06	0.00	0.00
			Max. Mx	18	0.35	-0.02	0.00
			Max. My	25	-1.20	0.00	0.00
			Max. Vy	18	-0.01	0.00	0.00
			Max. Vx	25	0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	19	3.97	0.00	0.00
			Max. Compression	19	-3.97	0.00	0.00
			Max. Mx	25	3.77	-0.03	0.00
			Max. My	24	1.60	0.00	-0.00
			Max. Vy	25	-0.01	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
		Inner Bracing	Max Tension	26	0.31	0.00	0.00
			Max. Compression	26	-0.31	0.00	0.00
			Max. Mx	18	-0.01	-0.07	0.00
			Max. My	24	0.29	0.00	-0.00
			Max. Vy	18	0.03	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
T10	25 - 0	Leg	Max Tension	22	308.50	-2.71	-0.01
			Max. Compression	19	-364.89	-0.00	0.00
			Max. Mx	19	-329.00	-3.34	-0.20
			Max. My	23	-19.75	-0.40	2.75
			Max. Vy	19	-0.62	2.96	-0.06
			Max. Vx	23	0.28	0.04	1.52
		Diagonal	Max Tension	26	27.73	0.00	0.00
			Max. Compression	26	-28.60	0.00	0.00
			Max. Mx	26	27.73	0.48	0.00
			Max. My	30	-1.46	0.00	0.02
			Max. Vy	26	-0.11	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Horizontal	Max Tension	26	19.00	0.27	-0.01
			Max. Compression	26	-18.96	0.27	-0.01
			Max. Mx	22	3.26	0.42	0.04
			Max. My	30	2.13	0.09	-0.06
			Max. Vy	22	0.13	0.42	0.04
			Max. Vx	30	0.01	0.09	-0.06

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Inner Bracing	Max Tension	23	0.00	0.00	0.00
			Max. Compression	33	-0.02	0.00	0.00
			Max. Mx	18	-0.01	-0.08	0.00
			Max. My	24	0.00	0.00	-0.00
			Max. Vy	18	0.03	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	30	394.53	38.02	-22.89
	Max. H_x	30	394.53	38.02	-22.89
	Max. H_z	21	-327.76	-32.46	21.85
	Min. Vert	22	-338.06	-34.45	20.80
	Min. H_x	22	-338.06	-34.45	20.80
	Min. H_z	29	375.41	35.05	-23.29
Leg B	Max. Vert	24	397.40	-37.48	-23.95
	Max. H_x	32	-333.23	33.67	21.69
	Max. H_z	33	-322.87	31.45	23.14
	Min. Vert	32	-333.23	33.67	21.69
	Min. H_x	24	397.40	-37.48	-23.95
	Min. H_z	25	378.03	-34.29	-24.69
Leg A	Max. Vert	19	398.76	1.18	44.53
	Max. H_x	31	23.73	10.51	1.42
	Max. H_z	19	398.76	1.18	44.53
	Min. Vert	27	-336.29	-1.15	-40.32
	Min. H_x	23	23.49	-10.49	1.37
	Min. H_z	27	-336.29	-1.15	-40.32

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	47.82	0.00	0.00	-9.50	-9.83	0.00
Dead+Wind 0 deg - No Ice	47.82	0.04	-60.61	-5740.06	-16.83	31.61
Dead+Wind 30 deg - No Ice	47.82	29.21	-51.07	-4867.61	-2775.40	1.99
Dead+Wind 45 deg - No Ice	47.82	41.03	-41.34	-3940.47	-3895.05	-11.08
Dead+Wind 60 deg - No Ice	47.82	50.02	-28.90	-2752.67	-4751.52	-23.88
Dead+Wind 90 deg - No Ice	47.82	58.59	0.30	27.65	-5567.47	-44.00
Dead+Wind 120 deg - No Ice	47.82	52.32	30.34	2857.04	-4950.05	-56.77
Dead+Wind 135 deg - No Ice	47.82	41.45	41.39	3925.54	-3953.13	-55.38
Dead+Wind 150 deg - No Ice	47.82	29.55	50.81	4809.94	-2821.06	-50.76
Dead+Wind 180 deg - No Ice	47.82	0.09	57.95	5490.22	-17.75	-30.13
Dead+Wind 210 deg - No Ice	47.82	-29.44	50.94	4827.12	2792.83	-1.99
Dead+Wind 225 deg - No Ice	47.82	-41.35	41.51	3942.00	3926.17	12.92
Dead+Wind 240 deg - No Ice	47.82	-52.25	30.34	2861.66	4924.39	25.13
Dead+Wind 270 deg - No Ice	47.82	-58.33	0.22	23.47	5519.18	44.28
Dead+Wind 300 deg - No Ice	47.82	-49.68	-28.81	-2738.80	4692.00	54.03
Dead+Wind 315 deg - No Ice	47.82	-40.73	-41.16	-3917.00	3839.59	53.94
Dead+Wind 330 deg - No Ice	47.82	-28.98	-50.84	-4839.55	2725.89	50.47

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Ice	72.97	0.00	0.00	-21.78	-30.99	0.00
Dead+Wind 0 deg+Ice	72.97	0.04	-78.54	-7458.20	-38.10	47.06
Dead+Wind 30 deg+Ice	72.97	38.17	-66.64	-6357.92	-3647.37	6.60
Dead+Wind 45 deg+Ice	72.97	53.71	-54.06	-5159.00	-5119.26	-12.47
Dead+Wind 60 deg+Ice	72.97	65.56	-37.88	-3617.17	-6246.33	-31.19
Dead+Wind 90 deg+Ice	72.97	76.53	0.31	16.52	-7291.33	-61.30
Dead+Wind 120 deg+Ice	72.97	67.83	39.30	3697.73	-6445.81	-79.56
Dead+Wind 135 deg+Ice	72.97	54.15	54.10	5119.72	-5179.44	-78.58
Dead+Wind 150 deg+Ice	72.97	38.53	66.37	6274.59	-3694.81	-72.81
Dead+Wind 180 deg+Ice	72.97	0.10	75.93	7182.87	-39.44	-45.49
Dead+Wind 210 deg+Ice	72.97	-38.41	66.50	6292.13	3623.50	-6.60
Dead+Wind 225 deg+Ice	72.97	-54.05	54.22	5136.44	5109.54	14.37
Dead+Wind 240 deg+Ice	72.97	-67.75	39.31	3702.19	6377.35	32.43
Dead+Wind 270 deg+Ice	72.97	-76.26	0.22	11.84	7199.79	61.58
Dead+Wind 300 deg+Ice	72.97	-65.21	-37.79	-3603.27	6143.38	76.74
Dead+Wind 315 deg+Ice	72.97	-53.41	-53.87	-5135.18	5020.55	77.10
Dead+Wind 330 deg+Ice	72.97	-37.94	-66.40	-6329.28	3554.82	72.52
Dead+Wind 0 deg - Service	47.82	0.04	-60.61	-5740.06	-16.83	31.61
Dead+Wind 30 deg - Service	47.82	29.21	-51.07	-4867.61	-2775.40	1.99
Dead+Wind 45 deg - Service	47.82	41.03	-41.34	-3940.47	-3895.05	-11.08
Dead+Wind 60 deg - Service	47.82	50.02	-28.90	-2752.67	-4751.52	-23.88
Dead+Wind 90 deg - Service	47.82	58.59	0.30	27.65	-5567.47	-44.00
Dead+Wind 120 deg - Service	47.82	52.32	30.34	2857.04	-4950.05	-56.77
Dead+Wind 135 deg - Service	47.82	41.45	41.39	3925.54	-3953.13	-55.38
Dead+Wind 150 deg - Service	47.82	29.55	50.81	4809.94	-2821.06	-50.76
Dead+Wind 180 deg - Service	47.82	0.09	57.95	5490.22	-17.75	-30.13
Dead+Wind 210 deg - Service	47.82	-29.44	50.94	4827.12	2792.83	-1.99
Dead+Wind 225 deg - Service	47.82	-41.35	41.51	3942.00	3926.17	12.92
Dead+Wind 240 deg - Service	47.82	-52.25	30.34	2861.66	4924.39	25.13
Dead+Wind 270 deg - Service	47.82	-58.33	0.22	23.47	5519.18	44.28
Dead+Wind 300 deg - Service	47.82	-49.68	-28.81	-2738.80	4692.00	54.03
Dead+Wind 315 deg - Service	47.82	-40.73	-41.16	-3917.00	3839.59	53.94
Dead+Wind 330 deg - Service	47.82	-28.98	-50.84	-4839.55	2725.89	50.47

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-47.82	0.00	0.00	47.82	0.00	0.000%
2	0.04	-47.82	-60.61	-0.04	47.82	60.61	0.000%
3	29.21	-47.82	-51.07	-29.21	47.82	51.07	0.000%
4	41.03	-47.82	-41.34	-41.03	47.82	41.34	0.000%
5	50.02	-47.82	-28.90	-50.02	47.82	28.90	0.000%
6	58.59	-47.82	0.30	-58.59	47.82	-0.30	0.000%
7	52.32	-47.82	30.34	-52.32	47.82	-30.34	0.000%
8	41.45	-47.82	41.39	-41.45	47.82	-41.39	0.000%
9	29.55	-47.82	50.81	-29.55	47.82	-50.81	0.000%
10	0.09	-47.82	57.95	-0.09	47.82	-57.95	0.000%
11	-29.44	-47.82	50.94	29.44	47.82	-50.94	0.000%
12	-41.35	-47.82	41.51	41.35	47.82	-41.51	0.000%
13	-52.25	-47.82	30.34	52.25	47.82	-30.34	0.000%
14	-58.33	-47.82	0.22	58.33	47.82	-0.22	0.000%
15	-49.68	-47.82	-28.81	49.68	47.82	28.81	0.000%
16	-40.73	-47.82	-41.16	40.73	47.82	41.16	0.000%
17	-28.98	-47.82	-50.84	28.98	47.82	50.84	0.000%
18	0.00	-72.97	0.00	0.00	72.97	0.00	0.000%
19	0.04	-72.97	-78.54	-0.04	72.97	78.54	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
20	38.17	-72.97	-66.64	-38.17	72.97	66.64	0.000%
21	53.71	-72.97	-54.06	-53.71	72.97	54.06	0.000%
22	65.56	-72.97	-37.88	-65.56	72.97	37.88	0.000%
23	76.53	-72.97	0.31	-76.53	72.97	-0.31	0.000%
24	67.83	-72.97	39.30	-67.83	72.97	-39.30	0.000%
25	54.15	-72.97	54.10	-54.15	72.97	-54.10	0.000%
26	38.53	-72.97	66.37	-38.53	72.97	-66.37	0.000%
27	0.10	-72.97	75.93	-0.10	72.97	-75.93	0.000%
28	-38.41	-72.97	66.50	38.41	72.97	-66.50	0.000%
29	-54.05	-72.97	54.22	54.05	72.97	-54.22	0.000%
30	-67.75	-72.97	39.31	67.75	72.97	-39.31	0.000%
31	-76.26	-72.97	0.22	76.26	72.97	-0.22	0.000%
32	-65.21	-72.97	-37.79	65.21	72.97	37.79	0.000%
33	-53.41	-72.97	-53.87	53.41	72.97	53.87	0.000%
34	-37.94	-72.97	-66.40	37.94	72.97	66.40	0.000%
35	0.04	-47.82	-60.61	-0.04	47.82	60.61	0.000%
36	29.21	-47.82	-51.07	-29.21	47.82	51.07	0.000%
37	41.03	-47.82	-41.34	-41.03	47.82	41.34	0.000%
38	50.02	-47.82	-28.90	-50.02	47.82	28.90	0.000%
39	58.59	-47.82	0.30	-58.59	47.82	-0.30	0.000%
40	52.32	-47.82	30.34	-52.32	47.82	-30.34	0.000%
41	41.45	-47.82	41.39	-41.45	47.82	-41.39	0.000%
42	29.55	-47.82	50.81	-29.55	47.82	-50.81	0.000%
43	0.09	-47.82	57.95	-0.09	47.82	-57.95	0.000%
44	-29.44	-47.82	50.94	29.44	47.82	-50.94	0.000%
45	-41.35	-47.82	41.51	41.35	47.82	-41.51	0.000%
46	-52.25	-47.82	30.34	52.25	47.82	-30.34	0.000%
47	-58.33	-47.82	0.22	58.33	47.82	-0.22	0.000%
48	-49.68	-47.82	-28.81	49.68	47.82	28.81	0.000%
49	-40.73	-47.82	-41.16	40.73	47.82	41.16	0.000%
50	-28.98	-47.82	-50.84	28.98	47.82	50.84	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000001
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000128
20	Yes	4	0.00000001	0.00000088

21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000001
23	Yes	4	0.00000001	0.00000078
24	Yes	4	0.00000001	0.00000142
25	Yes	4	0.00000001	0.00000136
26	Yes	4	0.00000001	0.00000111
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000088
29	Yes	4	0.00000001	0.00000115
30	Yes	4	0.00000001	0.00000130
31	Yes	4	0.00000001	0.00000077
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000085
34	Yes	4	0.00000001	0.00000110
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 150	9.371	35	0.4511	0.1052
T2	150 - 125	8.405	35	0.4504	0.1009
T3	125 - 100	5.989	35	0.4250	0.0751
T4	100 - 75	3.900	35	0.3429	0.0577
T5	75 - 66.6667	2.188	35	0.2730	0.0415
T6	66.6667 - 58.3333	1.700	35	0.2486	0.0356
T7	58.3333 - 50	1.258	35	0.2218	0.0297
T8	50 - 37.5	0.898	35	0.1778	0.0247
T9	37.5 - 25	0.495	35	0.1277	0.0178
T10	25 - 0	0.221	35	0.0739	0.0103

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
177.00	Lightning Rod 5/8x4'	35	9.371	0.4511	0.1052	87093
168.00	16'x2.5" Pipe Mount	35	9.371	0.4511	0.1052	87093
160.50	Tower Light	35	9.371	0.4511	0.1052	87093
160.00	6' w/ Radome	35	9.371	0.4511	0.1052	87093

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
155.00	6' Side-Arm	35	8.890	0.4509	0.1035	87093
153.00	DB304	35	8.697	0.4508	0.1026	63372
150.00	SC479-HF1LDF	35	8.405	0.4504	0.1009	54482
145.00	SC479-HF1LDF	35	7.916	0.4492	0.0970	139269
143.00	OGT9-806	35	7.719	0.4483	0.0950	Inf
138.00	T-Frame	35	7.229	0.4450	0.0897	59040
130.00	SC479-HF1LDF	35	6.456	0.4351	0.0805	23254
125.00	RR90-17-02DP	35	5.989	0.4250	0.0751	17798
122.81	SC479-HF1LDF	35	5.789	0.4194	0.0731	17328
122.00	PD1142	35	5.716	0.4172	0.0723	17337
120.00	3' Sidearm	35	5.538	0.4114	0.0706	17564
115.63	SC479-HF1LDF	35	5.158	0.3974	0.0673	18225
115.00	4"x96"x72" Ice Canopy	35	5.105	0.3953	0.0669	18324
110.00	6' w/ Radome	35	4.688	0.3777	0.0636	19152
97.30	APXVSPP18-C-A20	35	3.697	0.3344	0.0561	20820
94.00	Sector Frame	35	3.455	0.3247	0.0541	20589
85.00	PD10054	35	2.828	0.3002	0.0483	19927
75.00	SBNHH-1D65B	35	2.188	0.2730	0.0415	19775
55.00	GPS	35	1.104	0.2050	0.0276	9512

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	160 - 150	12.140	19	0.5831	0.1519
T2	150 - 125	10.893	19	0.5822	0.1456
T3	125 - 100	7.770	19	0.5498	0.1084
T4	100 - 75	5.065	19	0.4445	0.0828
T5	75 - 66.6667	2.843	19	0.3543	0.0587
T6	66.6667 - 58.3333	2.210	19	0.3226	0.0502
T7	58.3333 - 50	1.636	19	0.2880	0.0419
T8	50 - 37.5	1.168	19	0.2309	0.0348
T9	37.5 - 25	0.644	19	0.1660	0.0250
T10	25 - 0	0.287	19	0.0960	0.0145

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
177.00	Lightning Rod 5/8x4'	19	12.140	0.5831	0.1519	64906
168.00	16'x2.5" Pipe Mount	19	12.140	0.5831	0.1519	64906
160.50	Tower Light	19	12.140	0.5831	0.1519	64906
160.00	6' w/ Radome	19	12.140	0.5831	0.1519	64906
155.00	6' Side-Arm	19	11.519	0.5828	0.1494	64906
153.00	DB304	19	11.269	0.5827	0.1481	47206
150.00	SC479-HF1LDF	19	10.893	0.5822	0.1456	40328
145.00	SC479-HF1LDF	19	10.261	0.5806	0.1399	95378
143.00	OGT9-806	19	10.007	0.5795	0.1371	419187
138.00	T-Frame	19	9.373	0.5754	0.1294	47210
130.00	SC479-HF1LDF	19	8.374	0.5628	0.1161	18260

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
125.00	RR90-17-02DP	19	7.770	0.5498	0.1084	13936
122.81	SC479-HF1LDF	19	7.512	0.5428	0.1054	13562
122.00	PD1142	19	7.418	0.5399	0.1044	13567
120.00	3' Sidearm	19	7.187	0.5325	0.1019	13742
115.63	SC479-HF1LDF	19	6.695	0.5146	0.0970	14253
115.00	4"x96"x72" Ice Canopy	19	6.626	0.5118	0.0964	14329
110.00	6' w/ Radome	19	6.086	0.4893	0.0916	14968
97.30	APXVSPP18-C-A20	19	4.802	0.4336	0.0804	16222
94.00	Sector Frame	19	4.488	0.4210	0.0773	16009
85.00	PD10054	19	3.674	0.3895	0.0687	15411
75.00	SBNHH-1D65B	19	2.843	0.3543	0.0587	15229
55.00	GPS	19	1.435	0.2662	0.0389	7333

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	160	Leg	A325X	0.7500	6	0.00	19.44	0.000 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	4.79	12.23	0.391 ✔	1.333	Member Bearing
		Horizontal	A325X	0.6250	2	1.88	9.20	0.204 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.6250	2	1.25	6.44	0.194 ✔	1.333	Bolt Shear
T2	150	Leg	A325X	0.7500	6	1.09	19.44	0.056 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	12.85	12.23	1.050 ✔	1.333	Member Bearing
		Horizontal	A325X	0.6250	2	4.06	8.16	0.497 ✔	1.333	Member Bearing
T3	125	Leg	A325X	0.7500	6	6.80	19.44	0.350 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	17.03	18.56	0.918 ✔	1.333	Bolt Shear
		Horizontal	A325X	0.6250	2	5.67	9.20	0.616 ✔	1.333	Bolt Shear
T4	100	Leg	A325X	0.7500	6	15.40	19.44	0.792 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	19.52	16.31	1.197 ✔	1.333	Member Bearing
		Horizontal	A325X	0.6250	2	7.06	9.20	0.767 ✔	1.333	Bolt Shear
T5	75	Leg	A325X	0.8750	6	25.34	26.46	0.958 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	21.10	16.31	1.293 ✔	1.333	Member Bearing
		Horizontal	A325X	0.6250	2	7.77	9.20	0.844 ✔	1.333	Bolt Shear
T6	66.6667	Leg	A325X	0.8750	6	28.92	26.46	1.093 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	21.58	16.31	1.323 ✔	1.333	Member Bearing
		Top Girt	A325X	0.6250	2	8.10	9.20	0.880 ✔	1.333	Bolt Shear
T7	58.3333	Leg	A325X	0.8750	6	32.31	26.46	1.221 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	22.52	18.56	1.214 ✔	1.333	Bolt Shear
		Top Girt	A325X	0.6250	2	8.39	9.20	0.912 ✔	1.333	Bolt Shear
T8	50	Leg	A325X	1.0000	8	27.03	34.56	0.782 ✔	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	28.05	32.99	0.850 ✔	1.333	Bolt Shear
T9	37.5	Leg	A325X	1.0000	8	30.64	34.56	0.887 ✔	1.333	Bolt Tension

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T10	25	Diagonal	A325N	1.0000	1	28.23	27.19	1.038 ✔	1.333	Member Bearing
		Top Girt	A325X	0.6250	2	9.06	9.20	0.984 ✔	1.333	Bolt Shear
		Leg	A325X	1.0000	8	34.83	34.56	1.008 ✔	1.333	Bolt Tension
		Diagonal	A325N	1.0000	1	28.60	32.99	0.867 ✔	1.333	Bolt Shear
		Horizontal	A325X	0.6250	2	9.50	9.20	1.032 ✔	1.333	Bolt Shear

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 K	Allow. P_a K	Ratio P / P_a
T1	160 - 150	P.5x.250	10.01	5.01	35.7 K=1.00	26.418	3.7306	-5.12	98.56	0.052 ✔
T2	150 - 125	P.5x.250	25.03	8.34	59.5 K=1.00	22.798	3.7306	-35.42	85.05	0.417 ✔
T3	125 - 100	P.5x.250	25.03	8.34	59.5 K=1.00	22.798	3.7306	-91.78	85.05	1.079 ✔
T4	100 - 75	P5x0.3 w/ (3) 1.5x5/8 Plates	25.03	8.34	51.4 K=1.00	24.126	7.2544	-159.34	175.02	0.910 ✔
T5	75 - 66.6667	P5x0.4 w/ (3) 1.5x5/8 Plates	8.34	8.34	53.2 K=1.00	23.840	8.6530	-183.47	206.29	0.889 ✔
T6	66.6667 - 58.3333	P5x0.4 w/ (3) 1.5x5/8 Plates	8.34	8.34	53.2 K=1.00	23.840	8.6530	-208.00	206.29	1.008 ✔
T7	58.3333 - 50	HSS5x.4	8.34	4.17	30.7 K=1.00	32.038	5.7805	-232.05	185.20	1.253 ✔
T8	50 - 37.5	HSS6.875x.4	12.51	12.51	65.5 K=1.00	24.741	8.1367	-257.33	201.31	1.278 ✔
T9	37.5 - 25	HSS6.875x.4	12.51	6.26	32.7 K=1.00	31.679	8.1367	-291.99	257.76	1.133 ✔
T10	25 - 0	HSS6.875x0.5 w/ (3) 2x5/8 Bars	25.03	12.51	58.7 K=1.00	22.946	13.1229	-364.88	301.12	1.212 ✔

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	160 - 150	2L2 1/2x2x3/16	7.43	6.88	112.1 K=1.08	11.392	1.6200	-4.96	18.45	0.269 ✔
T2	150 - 125	2L2 1/2x2x3/16	10.57	9.96	151.3	6.523	1.6200	-13.02	10.57	1.232

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
					K=1.00					✔
T3	125 - 100	2L2 1/2x2x5/16	11.21	10.63	164.4 K=1.00	5.526	2.6200	-17.03	14.48	1.176 ✔
T4	100 - 75	2L3x2 1/2x1/4	11.91	11.21	142.4 K=1.00	7.367	2.6300	-19.98	19.38	1.031 ✔
T5	75 - 66.6667	2L3x2 1/2x1/4	12.15	11.46	145.5 K=1.00	7.052	2.6300	-21.58	18.55	1.164 ✔
T6	66.6667 - 58.3333	2L3x2 1/2x1/4	12.39	11.71	148.7 K=1.00	6.752	2.6300	-22.09	17.76	1.244 ✔
T7	58.3333 - 50	2L3x2 1/2x5/16	12.64	12.09	143.6 K=1.00	7.242	3.2422	-22.52	23.48	0.959 ✔
T8	50 - 37.5	2L3 1/2x3x3/8	16.01	15.22	167.5 K=1.00	5.320	4.5900	-28.05	24.42	1.149 ✔
T9	37.5 - 25	2L3 1/2x3x5/16	16.33	15.55	154.2 K=1.00	6.280	3.8700	-28.77	24.30	1.184 ✔
T10	25 - 0	2L3 1/2x3x3/8	16.99	16.06	176.8 K=1.00	4.780	4.5900	-28.60	21.94	1.304 ✔

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 150	L3x3x1/4	10.60	10.18	102.7 K=0.78	12.633	1.4400	-3.76	18.19	0.207 ✔
T2	150 - 125	L2 1/2x2 1/2x3/16	12.33	5.96	139.3 K=0.96	7.694	0.9020	-8.11	6.94	1.169 ✔
T3	125 - 100	L3x2 1/2x5/16	14.33	6.96	154.5 K=0.97	6.260	1.6200	-11.34	10.14	1.118 ✔
T4	100 - 75	L3x3x1/2	16.33	7.86	155.1 K=0.96	6.210	2.7500	-14.00	17.08	0.820 ✔
T5	75 - 66.6667	L3x3x1/2	17.00	8.20	161.1 K=0.96	5.751	2.7500	-15.42	15.82	0.975 ✔
T10	25 - 0	L4x4x1/2	22.00	10.59	155.6 K=0.96	6.165	3.7500	-18.96	23.12	0.820 ✔

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 150	L3x3x1/4	10.20	9.39	120.7 K=1.00	10.183	1.4400	-2.51	14.66	0.171 ✔
T4	100 - 75	L3x3x1/4	15.00	7.29	137.8 K=0.93	7.868	1.4400	-12.21	11.33	1.078 ✔
T6	66.6667 - 58.3333	L3x3x1/2	17.67	8.33	158.0 K=0.92	5.981	2.7500	-16.03	16.45	0.975 ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	58.3333 - 50	L3x3x1/2	18.33	8.67	163.8 K=0.92	5.566	2.7500	-16.79	15.31	1.097 ✔
T8	50 - 37.5	L4x4x1/4	19.00	9.29	131.3 K=0.94	8.667	1.9400	-17.23	16.81	1.025 ✔
T9	37.5 - 25	L4x4x1/4	20.00	9.52	134.2 K=0.93	8.295	1.9400	-18.12	16.09	1.126 ✔

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	58.3333 - 50	L2x2x5/16	4.58	4.38	134.6 K=1.00	8.241	1.1500	-4.02	9.48	0.424 ✔
T9	37.5 - 25	L2x2x5/16	5.00	4.71	145.0 K=1.00	7.099	1.1500	-5.06	8.16	0.620 ✔

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	58.3333 - 50	L2x2x5/16	6.07	5.66	174.1 K=1.00	4.927	1.1500	-2.66	5.67	0.470 ✔
T9	37.5 - 25	L2x2x5/16	7.85	7.38	227.0 K=1.00	2.897	1.1500	-3.97	3.33	1.193 ✔

Inner Bracing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	125 - 100	L2 1/2x2x3/16	7.17	7.17	201.4 K=1.00	3.681	0.8090	-0.01	2.98	0.004 ✔
T4	100 - 75	L2 1/2x2x3/16	7.50	7.50	210.8 K=1.00	3.361	0.8090	-0.21	2.72	0.078 ✔
T5	75 - 66.6667	L2 1/2x2x3/16	8.50	8.50	238.9 K=1.00	2.617	0.8090	-0.02	2.12	0.007 ✔
T6	66.6667 - 58.3333	L2 1/2x2x3/16	8.83	8.83	248.2 K=1.00	2.423	0.8090	-0.28	1.96	0.142 ✔
T7	58.3333 - 50	L2 1/2x2x3/16	9.17	9.17	257.6 K=1.00	2.250	0.8090	-0.29	1.82	0.160 ✔
T8	50 - 37.5	KL/R > 250 (C) - 184 L2 1/2x2 1/2x3/16	9.50	9.50	230.3 K=1.00	2.815	0.9020	-0.30	2.54	0.117

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T9	37.5 - 25	L2 1/2x2 1/2x3/16	10.00	10.00	242.4 K=1.00	2.541	0.9020	-0.31	2.29	0.137 ✔
T10	25 - 0	L2 1/2x2 1/2x3/16 KL/R > 250 (C) - 242	11.00	11.00	266.7 K=1.00	2.100	0.9020	-0.02	1.89	0.011 ✔

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 150	P.5x.250	10.01	5.01	35.7	30.000	3.7306	1.96	111.92	0.018 ✔
T2	150 - 125	P.5x.250	25.03	8.34	59.5	30.000	3.7306	26.20	111.92	0.234 ✔
T3	125 - 100	P.5x.250	25.03	8.34	59.5	30.000	3.7306	73.94	111.92	0.661 ✔
T4	100 - 75	P5x0.3 w/ (3) 1.5x5/8 Plates	25.03	8.34	51.4	30.000	7.2544	131.59	217.63	0.605 ✔
T5	75 - 66.6667	P5x0.4 w/ (3) 1.5x5/8 Plates	8.34	8.34	53.2	30.000	8.6530	152.05	259.59	0.586 ✔
T6	66.6667 - 58.3333	P5x0.4 w/ (3) 1.5x5/8 Plates	8.34	8.34	53.2	30.000	8.6530	173.50	259.59	0.668 ✔
T7	58.3333 - 50	HSS5x.4	8.34	4.17	30.7	36.000	5.7805	193.88	208.10	0.932 ✔
T8	50 - 37.5	HSS6.875x.4	12.51	12.51	65.5	36.000	8.1367	216.21	292.92	0.738 ✔
T9	37.5 - 25	HSS6.875x.4	12.51	6.26	32.7	36.000	8.1367	245.16	292.92	0.837 ✔
T10	25 - 0	HSS6.875x0.5 w/ (3) 2x5/8 Bars	25.03	12.51	58.7	30.000	13.1229	308.50	393.69	0.784 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	160 - 150	2L2 1/2x2x3/16	7.43	6.88	108.6	29.000	0.9689	4.79	28.10	0.170 ✔
T2	150 - 125	2L2 1/2x2x3/16	10.57	9.96	155.4	29.000	0.9689	12.85	28.10	0.457 ✔
T3	125 - 100	2L2 1/2x2x5/16	11.21	10.63	168.6	29.000	1.5548	16.68	45.09	0.370

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T4	100 - 75	2L3x2 1/2x1/4	11.91	11.21	145.8	29.000	1.6444	19.52	47.69	0.409 ✔
T5	75 - 66.6667	2L3x2 1/2x1/4	12.15	11.46	149.0	29.000	1.6444	21.10	47.69	0.442 ✔
T6	66.6667 - 58.3333	2L3x2 1/2x1/4	12.39	11.71	152.2	29.000	1.6444	21.58	47.69	0.453 ✔
T7	58.3333 - 50	2L3x2 1/2x5/16	12.64	12.09	146.8	29.000	2.0215	21.94	58.62	0.374 ✔
T8	50 - 37.5	2L3 1/2x3x3/8	16.01	15.22	171.2	29.000	2.8097	27.38	81.48	0.336 ✔
T9	37.5 - 25	2L3 1/2x3x5/16	16.33	15.55	157.5	29.000	2.3752	28.23	68.88	0.410 ✔
T10	25 - 0	2L3 1/2x3x3/8	16.99	16.06	180.4	29.000	2.8097	27.73	81.48	0.340 ✔

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T1	160 - 150	L3x3x1/4	10.60	10.18	131.4	29.000	0.9394	3.72	27.24	0.136 ✔
T2	150 - 125	L2 1/2x2 1/2x3/16	12.33	5.96	183.8	29.000	0.5710	8.03	16.56	0.485 ✔
T3	125 - 100	L3x2 1/2x5/16	14.33	6.96	112.2	29.000	1.0392	11.25	30.14	0.373 ✔
T4	100 - 75	L3x3x1/2	16.33	7.86	105.1	29.000	1.7813	14.12	51.66	0.273 ✔
T5	75 - 66.6667	L3x3x1/2	17.00	8.20	109.6	29.000	1.7813	15.53	51.66	0.301 ✔
T10	25 - 0	L4x4x1/2	22.00	10.59	104.2	29.000	2.5313	19.00	73.41	0.259 ✔

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 K	Allow. P_a K	Ratio P / P_a
T1	160 - 150	L3x3x1/4	10.20	9.39	126.2	29.000	0.9394	2.31	27.24	0.085 ✔
T4	100 - 75	L3x3x1/4	15.00	7.29	94.1	21.600	1.4400	12.26	31.10	0.394 ✔
T6	66.6667 - 58.3333	L3x3x1/2	17.67	8.33	114.0	29.000	1.7813	16.19	51.66	0.314 ✔
T7	58.3333 - 50	L3x3x1/2	18.33	8.67	118.5	29.000	1.7813	16.49	51.66	0.319 ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T8	50 - 37.5	L4x4x1/4	19.00	9.29	89.2	21.600	1.9400	17.22	41.90	0.411 ✔
T9	37.5 - 25	L4x4x1/4	20.00	9.52	93.3	29.000	1.3144	17.75	38.12	0.466 ✔

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	58.3333 - 50	L2x2x5/16	4.58	4.38	87.4	21.600	1.1500	4.02	24.84	0.162 ✔
T9	37.5 - 25	L2x2x5/16	5.00	4.71	94.1	21.600	1.1500	5.06	24.84	0.204 ✔

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 K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T7	58.3333 - 50	L2x2x5/16	6.07	5.66	113.0	21.600	1.1500	2.66	24.84	0.107 ✔
T9	37.5 - 25	L2x2x5/16	7.85	7.38	147.3	21.600	1.1500	3.97	24.84	0.160 ✔

Inner Bracing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T3	125 - 100	L2 1/2x2x3/16	7.17	7.17	143.4	21.600	0.8090	0.00	17.47	0.000 ✔
T4	100 - 75	L2 1/2x2x3/16	7.50	7.50	150.1	21.600	0.8090	0.21	17.47	0.012 ✔
T5	75 - 66.6667	L2 1/2x2x3/16	8.50	8.50	170.1	21.600	0.8090	0.01	17.47	0.000 ✔
T6	66.6667 - 58.3333	L2 1/2x2x3/16	8.83	8.83	176.7	21.600	0.8090	0.28	17.47	0.016 ✔
T7	58.3333 - 50	L2 1/2x2x3/16	9.17	9.17	183.4	21.600	0.8090	0.29	17.47	0.017 ✔
T8	50 - 37.5	L2 1/2x2 1/2x3/16	9.50	9.50	146.5	21.600	0.9020	0.30	19.48	0.015 ✔
T9	37.5 - 25	L2 1/2x2 1/2x3/16	10.00	10.00	154.2	21.600	0.9020	0.31	19.48	0.016 ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio P / P_a
T10	25 - 0	L2 1/2x2 1/2x3/16	10.50	10.50	162.0	21.600	0.9020	0.00	19.48	0.000 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	160 - 150	Leg	P.5x.250	3	-5.12	131.38	3.9	Pass
T2	150 - 125	Leg	P.5x.250	24	-35.42	113.37	31.2	Pass
T3	125 - 100	Leg	P.5x.250	54	-91.78	113.37	81.0	Pass
T4	100 - 75	Leg	P5x0.3 w/ (3) 1.5x5/8 Plates	93	-159.34	233.30	68.3	Pass
T5	75 - 66.6667	Leg	P5x0.4 w/ (3) 1.5x5/8 Plates	132	-183.47	274.98	66.7 71.9 (b)	Pass
T6	66.6667 - 58.3333	Leg	P5x0.4 w/ (3) 1.5x5/8 Plates	147	-208.00	274.98	75.6 82.0 (b)	Pass
T7	58.3333 - 50	Leg	HSS5x.4	162	-232.05	246.87	94.0	Pass
T8	50 - 37.5	Leg	HSS6.875x.4	189	-257.33	268.35	95.9	Pass
T9	37.5 - 25	Leg	HSS6.875x.4	204	-291.99	343.60	85.0	Pass
T10	25 - 0	Leg	HSS6.875x0.5 w/ (3) 2x5/8 Bars	231	-364.88	401.39	90.9	Pass
T1	160 - 150	Diagonal	2L2 1/2x2x3/16	11	-4.96	24.60	20.1 29.4 (b)	Pass
T2	150 - 125	Diagonal	2L2 1/2x2x3/16	29	-13.02	14.09	92.4	Pass
T3	125 - 100	Diagonal	2L2 1/2x2x5/16	59	-17.03	19.30	88.2	Pass
T4	100 - 75	Diagonal	2L3x2 1/2x1/4	101	-19.98	25.83	77.4 89.8 (b)	Pass
T5	75 - 66.6667	Diagonal	2L3x2 1/2x1/4	137	-21.58	24.72	87.3 97.0 (b)	Pass
T6	66.6667 - 58.3333	Diagonal	2L3x2 1/2x1/4	153	-22.09	23.67	93.3 99.2 (b)	Pass
T7	58.3333 - 50	Diagonal	2L3x2 1/2x5/16	172	-22.52	31.30	72.0 91.1 (b)	Pass
T8	50 - 37.5	Diagonal	2L3 1/2x3x3/8	195	-28.05	32.55	86.2	Pass
T9	37.5 - 25	Diagonal	2L3 1/2x3x5/16	214	-28.77	32.40	88.8	Pass
T10	25 - 0	Diagonal	2L3 1/2x3x3/8	236	-28.60	29.24	97.8	Pass
T1	160 - 150	Horizontal	L3x3x1/4	10	-3.76	24.25	15.5	Pass
T2	150 - 125	Horizontal	L2 1/2x2 1/2x3/16	28	-8.11	9.25	87.7	Pass
T3	125 - 100	Horizontal	L3x2 1/2x5/16	58	-11.34	13.52	83.9	Pass
T4	100 - 75	Horizontal	L3x3x1/2	100	-14.00	22.76	61.5	Pass
T5	75 - 66.6667	Horizontal	L3x3x1/2	136	-15.42	21.08	73.1	Pass
T10	25 - 0	Horizontal	L4x4x1/2	235	-18.96	30.82	61.5 77.4 (b)	Pass
T1	160 - 150	Top Girt	L3x3x1/4	5	-2.51	19.55	12.8 14.6 (b)	Pass
T4	100 - 75	Top Girt	L3x3x1/4	95	-12.21	15.10	80.9	Pass
T6	66.6667 - 58.3333	Top Girt	L3x3x1/2	149	-16.03	21.92	73.1	Pass
T7	58.3333 - 50	Top Girt	L3x3x1/2	164	-16.79	20.40	82.3	Pass
T8	50 - 37.5	Top Girt	L4x4x1/4	191	-17.23	22.41	76.9	Pass
T9	37.5 - 25	Top Girt	L4x4x1/4	206	-18.12	21.45	84.5	Pass
T7	58.3333 - 50	Redund Horz 1 Bracing	L2x2x5/16	176	-4.02	12.63	31.8	Pass
T9	37.5 - 25	Redund Horz 1 Bracing	L2x2x5/16	218	-5.06	10.88	46.5	Pass
T7	58.3333 - 50	Redund Diag 1 Bracing	L2x2x5/16	177	-2.66	7.55	35.3	Pass
T9	37.5 - 25	Redund Diag 1	L2x2x5/16	219	-3.97	4.44	89.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P_{allow} K	% Capacity	Pass Fail
		Bracing						
T3	125 - 100	Inner Bracing	L2 1/2x2x3/16	64	-0.01	3.97	0.3	Pass
T4	100 - 75	Inner Bracing	L2 1/2x2x3/16	128	-0.21	3.62	5.8	Pass
T5	75 - 66.6667	Inner Bracing	L2 1/2x2x3/16	142	-0.02	2.82	0.6	Pass
T6	66.6667 - 58.3333	Inner Bracing	L2 1/2x2x3/16	158	-0.28	2.61	10.6	Pass
T7	58.3333 - 50	Inner Bracing	L2 1/2x2x3/16	184	-0.29	2.43	12.0	Pass
T8	50 - 37.5	Inner Bracing	L2 1/2x2 1/2x3/16	199	-0.30	3.39	8.8	Pass
T9	37.5 - 25	Inner Bracing	L2 1/2x2 1/2x3/16	226	-0.31	3.06	10.3	Pass
T10	25 - 0	Inner Bracing	L2 1/2x2 1/2x3/16	242	-0.02	2.52	0.8	Pass
							Summary	
						Leg (T8)	95.9	Pass
						Diagonal (T6)	99.2	Pass
						Horizontal (T2)	87.7	Pass
						Top Girt (T9)	84.5	Pass
						Redund Horz 1 Bracing (T9)	46.5	Pass
						Redund Diag 1 Bracing (T9)	89.5	Pass
						Inner Bracing (T7)	12.0	Pass
						Bolt Checks	99.2	Pass
						RATING =	**99.2**	**Pass**

ANCHOR BOLT EVALUATION

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ANCHOR BOLT ANALYSIS

Input Data

Max Pier Reactions:

Uplift:	Uplift := 338·kips	*user input*
Shear:	Shear := 45·kips	*user input*
Compression:	Compression := 399·kips	*user input*

Anchor Bolt Data:

Use ASTM A36 per page 4.1 of structural analysis dated November 23, 1993

Number of Anchor Bolts = N	N := 6	*user input*	
Bolt Ultimate Strength:	$F_u := 58 \cdot ksi$	*user input*	
Bolt Yield Strength:	Fy := 36·ksi	*user input*	
Bolt Modulus:	E := 29000 ksi	*user input*	
Thickness of Anchor Bolts	D := 1.75in	*user input*	
Threads per Inch:	n := 5	*user input*	
Coefficient of Friction:	μ := 0.55	*user input*	(for baseplate with grout ASCE 10-97)

Anchor Bolt Area:

Gross Area of Bolt:

$$A_g := \frac{\pi}{4}\cdot D^2 \qquad A_g = 2.405\cdot in^2$$

Net Area of Bolt:

$$A_n := \frac{\pi}{4}\cdot\left(D - \frac{0.9743\cdot in}{n}\right)^2 \qquad A_n = 1.899\cdot in^2$$

Check Tensile Forces:

Maximum Tensile Force (Gross Area):

$$AllowableTension := 1.33\cdot\left(0.33\cdot A_g\cdot F_u\right) \qquad AllowableTension = 61.2\cdot kips$$

Note: 1.33 increase allowed per TIA/EIA

Maximum Tensile Force (Net Area):

$$F_{net.area} := 1.33\cdot\left(0.60\cdot A_n\cdot Fy\right) \qquad F_{net.area} = 54.6\cdot kips$$

Note: 1.33 increase allowed per TIA/EIA

Applied Tension:

$$MaxTension := \frac{Uplift}{N} \qquad MaxTension = 56.3\cdot kips$$

Check Stresses:

$$\frac{MaxTension}{F_{net.area}} = 1.03$$

$$Condition1 := if\left(\frac{MaxTension}{F_{net.area}} \le 1.00, "OK", "Overstressed"\right)$$

Condition1 = "Overstressed"

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Check Anchor Bolt Area:

Based on the ASCE 10-97 Design of Latticed Steel Transmission Structures

Required Area:

$$A_{s1} := \frac{Uplift}{Fy} + \frac{Shear}{\mu \cdot 0.85 \cdot Fy} \qquad A_{s1} = 12.1 \cdot in^2$$

$$A_{s2} := \left| \frac{Shear - (0.3 \cdot Compression)}{\mu \cdot 0.85 \cdot Fy} \right| \qquad A_{s2} = 4.4 \cdot in^2$$

Provided Area:

$$A_{sprovided} := A_n \cdot N \qquad A_{sprovided} = 11.4 \cdot in^2$$

$$Condition2 := if\left(\frac{A_{s1}}{A_{sprovided}} \le 1.00, "OK", "Overstressed" \right) \qquad \frac{A_{s1}}{A_{sprovided}} = 1.058$$

Condition2 = "Overstressed"

$$Condition3 := if\left(\frac{A_{s2}}{A_{sprovided}} \le 1.00, "OK", "Overstressed" \right) \qquad \frac{A_{s2}}{A_{sprovided}} = 0.39$$

Condition3 = "OK"

Additional capacity required:

$$ASD_{CapReq} := \left(MaxTension - F_{net.area}\right) \cdot N \qquad ASD_{CapReq} = 10594.8 \cdot lbf$$

See Hand Calculations for proposed anchor modifications

AECOM

Job Middlebury CSP tower | Project No. VEW-190R2 | Page ____ of ____
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Strength Check (ASD) 9th Ed. | Checked by ____ | Date ____
Reference

Anchor Capacity needed (From Previous Sheet) = 10594.8 lbf

℄ Leg to ℄ Modified Anchorbolt = $d = 1.17$ ft $\therefore M = \frac{10594.8 \times 1.17}{1}$

$= 12395.92$ lbft

$V = 10594.8$ lbf

Check wt 8X25 @ 50ksi → 18" Length

$A_{web} = 0.38" \times 18" = 6.84 in^2$

$S_{web} = \frac{0.38" \times (18 in)^2}{6} = 20.52 in^3$

Check web strength:

$$\frac{\frac{12.39592 \text{ kip} \times 12 \text{ in/ft}}{20.52 in^3}}{50ksi \times 0.66} + \frac{\frac{10.5948 kip}{6.84 in^2}}{50ksi \times 0.4} = 0.2971 \leq 1 \text{ (OK)}$$

Check weld Strength:
5/16" E weld @ 17.5" Length (Both sides) w/ E70 Electrode

$A_{weld} = 5/16 \times \sqrt{2} \times 2 \times 17.5 = 7.734 in^2$

$S_{weld} = \frac{5/16 \times (17.5)^2}{6} \times 2 = 31.901 in^3$

$$\frac{\frac{12.3952 \times 12}{31.90} + \frac{10.5948 kip}{7.732}}{70ksi \times 0.3} = 0.29 \leq 1 \text{ (OK)}$$

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Description Anchor Bolt Modification | Computed by MCD | Sheet ____ of ____
Strength check (ASD) 9th Ed. | Checked by ____ | Date ____
Reference

- From Hilti 2009 Product Catalog:

Using (1)" anchor to concrete @ 12" embed (Hilti-500 Epoxy Adhesive)

– tensile bond capacity/anchor for f'c = 3000 psi:
= 17,935 lbs

- Apply Reduction Factors:

(1) support + anchor ≈ 7.75 to closest edge

$0.3\left(\frac{7.75''}{12''}\right) + 0.55 = 0.7438 \times 17{,}935\ \text{lbs} = 13{,}339\ \text{lbs}$ (capacity)

total tension = 13,339 > 10594.8 kip ∴ ok

$\frac{10594.8\ \text{kip}}{13{,}339\ \text{kip}} = 79.4\%$

Note: Reduction factors come from Hilti 2009 - Page 272

FOUNDATION EVALUATION

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PIER AND MAT FOUNDATION ANALYSIS - 3 PIERS

TOWER FORCES:

Moment Caused by Tower	$M_t := 7458\,kip\cdot ft$
Shear at Base of Tower	$S_t := 79\,kip$
Max Compressive Force	$C_t := 399\,kip$
Max Uplift	$U_t := 338\,kip$
Height of Tower	$H_t := 160\,ft$
Width of Tower at Base	$W_t := 23\,ft$
Weight of Tower	$WT_t := 1\,kip$

NOTE: Weight of Tower is incorporated into the other loads listed above and is therefore set equal to one for programming.

FOOTING DIMENSIONS:

Width of Footing	$W_f := 34\,ft + 2ft$
Overall Depth of Footing	$D_f := 5ft$
Length of Pier	$L_p := 3.75\,ft$
Extension of Pier Above Grade	$L_{pag} := 1\,ft$
Diameter of Pier	$d_p := 3.5\,ft$
Thickness of Footing	$T_f := 2.25\,ft + 0ft$
Reinforement Cover:	$Cvr := 3in$

MATERIAL PROPERTIES:

Compressive Strength of Concrete	$f'c := 3000\,psi$	Unit Weight of Soil	$\gamma_s := 125\,pcf$
Yield Strength of Steel Reinforcement	$fy := 60000\,psi$	Unit Weight of Concrete	$\gamma_c := 150\,pcf$
Internal Friction Angle of Soil	$\phi_s := 34\,deg$	Depth to Neglect	$n := 0\,ft$
Allowable Bearing Capacity	$q_s := 4500\,psf$	Cohesion of Clay Type Soil Note: Use 0 for Sandy Soil	$c := 0\,ksf$

Coefficient of Lateral Soil Pressure $K_p := \frac{1 + \sin(\phi_s)}{1 - \sin(\phi_s)}$ $K_p = 3.5371$

What is Position of Center of Tower with respect to Center of Pad? 1=Offset 2=Not Offset $Pos_{tower} := 2$

STEEL REINFORCING:

PIER REINFORCEMENT:

Bar Size	$BSpier := 9$	Bar Diameter	$d_{bpier} := 1.128\,in$
Number of Bars	$NBpier := 9$	Bar Area	$A_{bpier} := 1\,in^2$

PAD REINFORCEMENT:

Bar Size	$BS_{pad} := 11$	Bar Diameter	$d_{bpad} := 1.410\,in$
Number of Bars	$NB_{pad} := 32$	Bar Area	$A_{bpad} := 1.56\,in^2$

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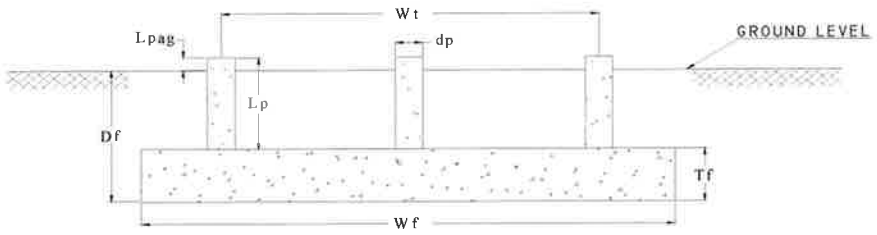
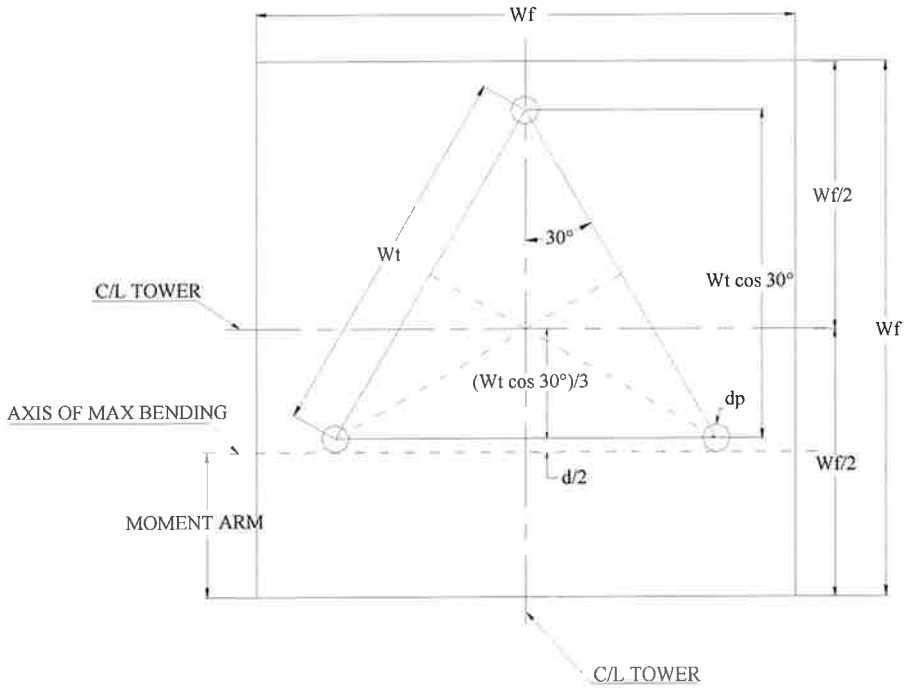
FOUNDATION OVERVIEW



ELEVATION



PLAN

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STABILITY OF FOOTING

Factor of Safety Req'd: $FS_{req} := 2$

Passive Pressure:

$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pn} = 0 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{pt} = 1.2159 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}]$ $\quad P_{top} = 1.2159 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p}$ $\quad P_{bot} = 2.2107 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2}$ $\quad P_{ave} = 1.7133 \cdot ksf$

Shear:

$T_{pp} := if[n < (D_f - T_f), T_f, (D_f - n)]$ $\quad T_{pp} = 2.25 \cdot ft$

$A_{pp} := W_f \cdot T_{pp}$ $\quad A_{pp} = 81 \cdot ft^2$

Ultimate Shear: $S_u := P_{ave} \cdot A_{pp}$ $\quad S_u = 138.7772 \cdot kip$

Weight of Concrete Pad: $WT_c := \left(W_f^2 \cdot T_f\right) \cdot \gamma_c + \left[0ft^3 \cdot (\gamma_c - \gamma_s)\right] + 0ft^3 \cdot \gamma_c$ $\quad WT_c = 437.4 \cdot kip$

Weight of Soil: above Footing: $WT_{s1} := W_f^2 \left(\left|D_f - T_f\right|\right) \cdot \gamma_s$ $\quad WT_{s1} = 445.5 \cdot kip$

Weight of Soil Wedge at back face: $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\phi_s)}{2} \cdot W_f\right] \cdot \gamma_s$ $\quad WT_{s2} = 37.9411 \cdot kip$

Distance to center of Tower Leg from Edge of Footing:

$X_{t1} := \frac{W_f}{2} - \frac{W_t \cdot \cos(30 \cdot deg)}{2}$ $\qquad X_{t2} := \frac{W_f}{2} - \frac{W_t \cdot \cos(30 \cdot deg)}{3}$

$X_t := if(Pos_{tower} = 1, X_{t1}, X_{t2})$ $\quad X_t = 11.3605 \cdot ft$

Additional Offset of Footing:

$X_{off1} := \frac{W_f}{2} - \left(\frac{W_t \cdot \cos(30 \cdot deg)}{3} + X_t\right)$ $\qquad X_{off2} := 0$

$X_{off} := if(Pos_{tower} = 1, X_{off1}, X_{off2})$ $\quad X_{off} = 0 \cdot ft$

Resisting Moment:

$M_r := (WT_c + WT_{s1}) \cdot \frac{W_f}{2} + WT_t \cdot \left(\frac{W_f}{2} - X_{off}\right) + S_u \cdot \frac{T_{pp}}{3} + WT_{s2} \cdot \left(W_f + \frac{T_{pp} \cdot \tan(\phi_s)}{3}\right)$

$M_r = 17399.3563 \cdot kip \cdot ft$

Overturning Moment: $M_{ot} := M_t + S_t \cdot (L_p + T_f) + WT_t \cdot X_{off}$ $\quad M_{ot} = 7932 \cdot kip \cdot ft$

Factor of Safety: $FS := \frac{M_r}{M_{ot}}$ $\quad FS = 2.19$

$SafetyCheck := if(FS > FS_{req}, "Okay", "No Good")$ $\quad SafetyCheck = "Okay"$

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BEARING PRESSURE CHECK:

Pressure Applied:

$LOAD_{tot} := WT_c + WT_{s1} + WT_t$ $\quad LOAD_{tot} = 883.9 \cdot kip$

$A_{mat} := W_f^{\,2}$ $\quad A_{mat} = 1296 \cdot ft^2$

$S := \frac{W_f^{\,3}}{6}$ $\quad S = 7776 \cdot ft^3$

$P_{max} := \frac{LOAD_{tot}}{A_{mat}} + \frac{M_{ot}}{S}$ $\quad P_{max} = 1.7021 \cdot ksf$

$P_{min} := \frac{LOAD_{tot}}{A_{mat}} - \frac{M_{ot}}{S}$ $\quad P_{min} = -0.338 \cdot ksf$

$MaxPressure := if\left(P_{max} < q_s, \text{"Okay"}, \text{"No Good"}\right)$ $\quad MaxPressure = \text{"Okay"}$

$MinPressure := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < q_s\right), \text{"Okay"}, \text{"No Good"}\right]$ $\quad MinPressure = \text{"No Good"}$

Distance to Resultant of Pressure Distribution:

$$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3}$$ $\quad X_p = 10.0116 \cdot ft$

Distance to Kern:

$X_k := \frac{W_f}{3}$ $\quad X_k = 12 \cdot ft$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity:

$e := \frac{M_{ot}}{LOAD_{tot}}$ $\quad e = 8.9739$

Adjusted Soil Pressure:

$$q_a := \frac{2 \cdot LOAD_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)}$$ $\quad q_a = 1.8135 \cdot ksf$

Revised Maximum:

$q_{max} := if\left(X_p < X_k, q_a, P_{max}\right)$ $\quad q_{max} = 1.8135 \cdot ksf$

$PressureCheck := if\left(q_{max} < q_s, \text{"Okay"}, \text{"No Good"}\right)$ $\quad PressureCheck = \text{"Okay"}$

CHECK PUNCHING AND BEAM SHEAR:

Load Factor: (EIA 3.1.1) $LF := if\left[H_t \le 700\cdot ft, 1.3, if\left[H_t \ge 1200, 1.7, 1.3 + \left(\frac{H_t - 700}{1200 - 700}\right)\cdot 0.4\right]\right]$ $LF = 1.3$

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := .85$ (ACI 9.3.2.3)

$d := T_f - Cvr - .5\cdot in$ $d = 23.5\cdot in$

Factored load: $FL := LF\cdot\frac{C_t}{W_f^2}$ $FL = 0.4002\cdot ksf$

$V_{req} := \frac{FL\cdot\left(X_t - 0.5\cdot d_p - d\right)\cdot W_f}{\phi_c}$ $V_{req} = 129.7113\cdot kip$

ACI 11.3.1.1 $V_{Avail} := 2\cdot\sqrt{f'c\cdot psi}\cdot W_f\cdot d$ $V_{Avail} = 1112.0959\cdot kip$

$BeamShearCheck := if\left(V_{req} < V_{Avail}, "Okay", "No Good"\right)$ $BeamShearCheck = "Okay"$

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.12.2.1)

$b_o := \left(d_p + d\right)\cdot\pi$ $b_o = 17.1479\cdot ft$

$V_{req} := FL\cdot\frac{W_f^2 - \left(d_p + d\right)^2\cdot\frac{\pi}{4}}{\phi_c}$ $V_{req} = 599.2173\cdot kip$

$V_{Avail} := 4\cdot\sqrt{f'c\cdot psi}\cdot b_o\cdot d$ $V_{Avail} = 1059.448\cdot kip$

$PunchingShearCheck := if\left(V_{req} < V_{Avail}, "Okay", "No Good"\right)$ $PunchingShearCheck = "Okay"$

TENSILE REINFORCEMENT IN PAD:

$\phi_m := .90$ per ACI 9.3.2.2

Applied Moments:

$$M_{nT} := LF\cdot\left[U_t\cdot\left(W_t\cdot\sin(60\cdot deg) - \frac{d_p}{2}\right) + S_t\cdot\left(D_f + L_{pag}\right)\right] - WT_t\cdot X_{off}$$

$$M_{nS} := -1\cdot\left[\frac{1}{2}\cdot\left(\frac{W_f}{2} + \frac{W_t}{3}\cdot\cos(30\cdot deg) - \frac{d_p}{2}\right)^2\cdot W_t\cdot\left[\gamma_s\cdot\left(T_{pp} - T_f\right)\right] + WT_{s2}\cdot\left[\frac{W_f}{2} + \frac{W_t}{3}\cdot\cos(30\cdot deg) - \frac{d_p}{2} + \left(D_f - n\right)\cdot\tan\left(\phi_s\right)\right]\right]$$

$$M_{nC} := -1\cdot\left[\frac{1}{2}\cdot\left(\frac{W_f}{2} + \frac{W_t}{3}\cdot\cos(30\cdot deg) - \frac{d_p}{2}\right)^2\cdot W_t\cdot\left(\gamma_c\cdot T_f\right)\right]$$

Design Moment: $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m}$ $M_n = 6188.3986\cdot kips\cdot ft$

Required Reinforcement:

ACI 10.2.7.3 $\beta := if\left[f'c \le 4000\cdot psi, .85, if\left[f'c \ge 8000\cdot psi, .65, .85 - \left(\dfrac{\frac{f'c}{psi} - 4000}{1000}\right)\cdot .05\right]\right]$ $\beta = 0.85$

Effective Width: $b_{eff} := W_t\cdot\cos(30\cdot deg) + d_p$ $b_{eff} = 281.023\cdot in$

$A_s := \dfrac{M_n}{\phi_m\cdot fy\cdot d}$ $A_s = 58.5191\cdot in^2$

$a := \dfrac{A_s\cdot fy}{\beta\cdot f'c\cdot b_{eff}}$ $a = 4.8997\cdot in$

$A_s := \dfrac{M_n}{fy\cdot\left(d - \frac{a}{2}\right)}$ $A_s = 58.7967\cdot in^2$

$\rho := \dfrac{A_s}{b_{eff}\cdot d}$ $\rho = 0.0089$

$d = 1.9583$

Temperature and Shrinkage: (ACI 7.12.2.1b)

$\rho_{sh} := if(fy \geq 60000 \cdot psi, 0.0018, 0.0020)$ $\rho_{sh} = 0.0018$

Area Required: $As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right)$ $As = 58.7967 \cdot in^2$

Area Provided: $As_{prov} := A_{bpad} \cdot NB_{pad}$ $As_{prov} = 49.92 \cdot in^2$

$PadReinforcement := if(As_{prov} > As, "Okay", "No Good")$ $PadReinforcement = "No Good"$

DEVELOPMENT LENGTH OF PAD REINFORCEMENT:

TENSION (ACI 12.2.3)

Bar Spacing: $B_{sPad} := \frac{W_f - 2 \cdot Cvr - NB_{pad} \cdot d_{bpad}}{NB_{pad} - 1}$ $B_{sPad} = 12.2865 \cdot in$

Development Length Factors:

Reinforcement Location Factor	$\alpha := 1.0$
Coating Factor	$\beta := 1.0$
Concrete strength Factor	$\lambda := 1.0$
Reinforcement Size Factor	$\gamma := 1.0$

Spacing or Cover Dimension: $c := if\left(Cvr < \frac{B_{sPad}}{2}, Cvr, \frac{B_{sPad}}{2}\right)$ $c = 3 \cdot in$

Transverse Reinforcement Index As allowed by ACI 12.2.4 $k_{tr} := 0$

Development Length: $L_{dbt} := \frac{3}{40} \cdot \frac{fy}{\sqrt{f'c \cdot psi}} \cdot \frac{\alpha \cdot \beta \cdot \gamma \cdot \lambda}{\frac{c + k_{tr}}{d_{bpad}}} \cdot d_{bpad}$ $L_{dbt} = 54.4464 \cdot in$

$L_{dbmin} := 12 \cdot in$

Minimum Development Length: (ACI 12.2.1) $L_{dbtCheck} := if(L_{dbt} \geq L_{dbmin}, "Use L.dbt", "Use L.dbmin")$ $L_{dbtCheck} = "Use L.dbt"$

Available Length in Pad: $L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr$ $L_{Pad} = 75 \cdot in$

$LpadTension := if(L_{Pad} > L_{dbt}, "Okay", "No Good")$ $LpadTension = "Okay"$

REINFORCEMENT IN PIER:

Pier Area:

(ACI 10.8.4 and 10.9.1)

$A_p := \frac{\pi \cdot d_p^{\,2}}{4}$ $\quad A_p = 1385.4424 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p$ $\quad A_{smin} = 6.9272 \cdot in^2$

$A_{sprov} := NBpier \cdot A_{bpier}$ $\quad A_{sprov} = 9 \cdot in^2$

$SteelAreaCheck := if(A_{sprov} > A_{smin}, "Okay", "No Good")$ $\quad SteelAreaCheck = "Okay"$

NOTE: Anchor Bolts are not accounted for in reinforcement calculation and will provide additional reinforcement to satisfy minimum requirement of steel.

Bar Spacing In Pier: $B_{sPier} := \frac{d_p \cdot \pi}{NBpier} - d_{bpier}$ $\quad B_{sPier} = 13.5328 \cdot in$

Diamter of Reinforcement Cage: $Diam_{cage} := d_p - 2 \cdot Cvr$ $\quad Diam_{cage} = 36 \cdot in$

Maximum Moment in Pier: $M_p := (S_t \cdot L_p) \cdot LF$ $\quad M_p = 4621.5 \cdot kips \cdot in$

Pier Check evaluated from outside program and results are listed below;

(defined variables) $(f'_c \;\; f_y \;\; cl \;\; Spiral) = (3 \;\; 60 \;\; 4 \;\; 0)$

The required input is column diameter in inches, number of reinforcing bars, bar size number, factored axial load in kips and moment in kip inches:

$(D \;\; N \;\; n \;\; P_u \;\; M_{xu}) := (42 \;\; 9 \;\; 9 \;\; 479 \;\; 4266)$

Clears any previous output: $(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) := (0 \;\; 0 \;\; 0 \;\; 0)$

$(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) := \phi P'_n(D, N, n, P_u, M_{xu})^T$

The Output is given as useable axial load in kips, moment capacity in kip inches, splicing stress in ksi, and reinforcement ratio:

$(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho) = (1517.62 \;\; 13516.0059 \;\; -48.3896 \;\; 0.0065)$

Column size and reinforcement may be changed to match capacity to the applied load.

$AxialLoadCheck := if(\phi P_n \geq P_u, "Okay", "No Good")$ $\quad AxialLoadCheck = "Okay"$

$BendingCheck := if(\phi M_{xn} \geq M_{xu}, "Okay", "No Good")$ $\quad BendingCheck = "Okay"$

AECOM

				Page	of
Job	160' Stainless Lattice Tower - Middlebury, CT	Project No.	VZ5-190 Rev. 2	Sheet 9	of 10
Description	Modified Foundation Analysis	Computed by	MCD	Date	07/10/15
		Checked by		Date	

DEVELOPMENT LENGTH OF PIER REINFORCEMENT:

TENSION (ACI 12.2.3)

Spacing and Cover: $Cvr = 3\cdot in$ $B_{sPier} = 13.5328\cdot in$

Factors for development:

Reinforcement Location Factor	$\alpha := 1.0$
Coating Factor	$\beta := 1.0$
Concrete strength Factor	$\lambda := 1.0$
Reinforcement Size Factor	$\gamma := 1.0$

Spacing or Cover Dimension: $c := if\left(Cvr < \frac{B_{sPier}}{2}, Cvr, \frac{B_{sPier}}{2}\right)$ $c = 3\cdot in$

Transverse Reinforcement: As allowed by ACI 12.2.4 $k_{tr} := 0$

$$L_{dbt} := \frac{3}{40}\cdot\frac{fy}{\sqrt{f'c\cdot psi}}\cdot\frac{\alpha\cdot\beta\cdot\gamma\cdot\lambda}{\frac{c+k_{tr}}{d_{bpier}}}\cdot d_{bpier} \qquad L_{dbt} = 34.8457\cdot in$$

Minimum Development Length: (ACI 12.2.1) $L_{dbmin} := 12\cdot in$

$L_{dbtCheck} := if\left(L_{dbt} \geq L_{dbmin}, "Use\ L.dbt", "Use\ L.dbmin"\right)$ $L_{dbtCheck} = "Use\ L.dbt"$

COMPRESSION: (ACI 12.3.2)

$$L_{dbc1} := \frac{.02\cdot d_{bpier}\cdot fy}{\sqrt{f'c\cdot psi}} \qquad L_{dbc1} = 24.7132\cdot in$$

$L_{dbmin} := 0.0003\cdot\frac{in^2}{lb}\cdot\left(d_{bpier}\cdot fy\right)$ $L_{dbmin} = 20.304\cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right)$ $L_{dbc} = 24.7132\cdot in$

AECOM

				Page	of
Job	160' Stainless Lattice Tower - Middlebury, CT	Project No.	VZ5-190 Rev. 2	Sheet 10	of 10
Description	Modified Foundation Analysis	Computed by	MCD	Date	07/10/15
		Checked by		Date	

Available Length in Pier:

$L_{pier} := L_p - 3 \cdot in$ $\quad L_{pier} = 42 \cdot in$

$L_{piertension} := if\left(L_{pier} > L_{dbt}, "Okay", "No Good"\right)$ $\quad L_{piertension} = "Okay"$

$L_{piercompression} := if\left(L_{pier} > L_{dbc}, "Okay", "No Good"\right)$ $\quad L_{piercompression} = "Okay"$

Available Length in Pad:

$L_{pad} := T_f - 3 \cdot in$ $\quad L_{pad} = 24 \cdot in$

$L_{padtension} := if\left[L_{pad} > \left(L_{dbt} - L_{pier}\right), "Okay", "No Good"\right]$ $\quad L_{padtension} = "Okay"$

$L_{padcompression} := if\left[L_{pad} > \left(L_{dbc} - L_{pier}\right), "Okay", "No Good"\right]$ $\quad L_{padcompression} = "Okay"$

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of $6 billion.

More information on AECOM and its services can be found at www.aecom.com.

500 Enterprise Drive, Suite 3B
Rocky Hill, CT 06067
860-529-8882
Fax: 860-529-3991

ATTACHMENT 5

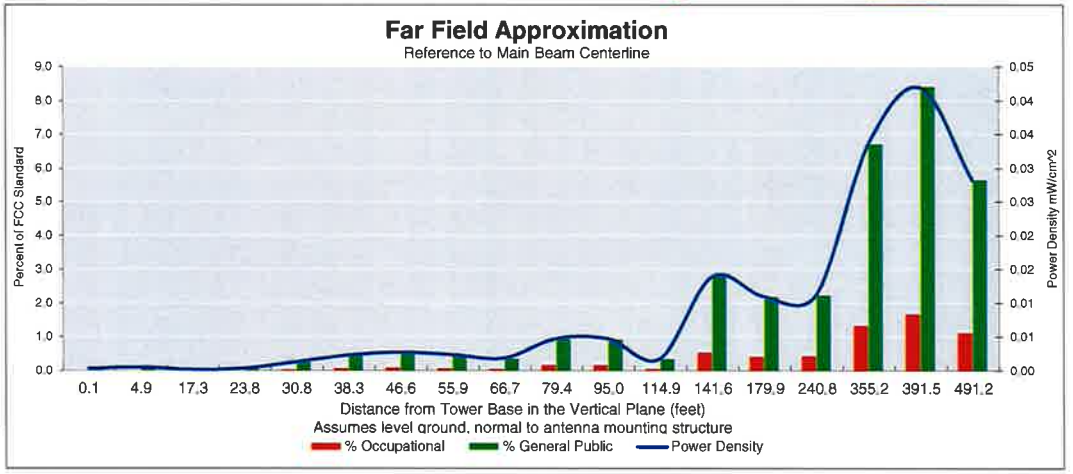
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MIDDLEBURY I84 CT**
Site #:	2-0367
Date:	08/20/15
Name:	Jaime Laredo
File Name:	MIDDLEBURY I84 CT - FF POWER (LTE-700).xlsx

Operating Freq. (MHz):	**746.0**
Antenna Height (ft):	**72.0**
Antenna Gain (dBi):	**14.8**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**6.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**1047.8**
No. of Channels:	**1.0**



Calc Angle	90.0	86.0	76.0	71.0	66.0	61.0	56.0	51.0	46.0	41.0	36.0	31.0	26.0	21.0	16.0	11.0	10.0	8.0
Solve for r, dx to antenna	69.0	69.2	71.1	73.0	75.5	78.9	83.3	88.8	96.0	105.2	117.4	134.0	157.5	192.6	250.5	361.8	397.6	496.0
Distance from Antenna Structure Base in Horizontal plane	0.1	4.9	17.3	23.8	30.8	38.3	46.6	55.9	66.7	79.4	95.0	114.9	141.6	179.9	240.8	355.2	391.5	491.2
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03	0.04	0.03
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.6	0.4	0.5	1.3	1.7	1.1
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	1.0	0.9	0.4	2.8	2.2	2.3	6.7	8.4	5.7

Antenna Type: **SBNHH-1D65B**

Max%: **8.43%**

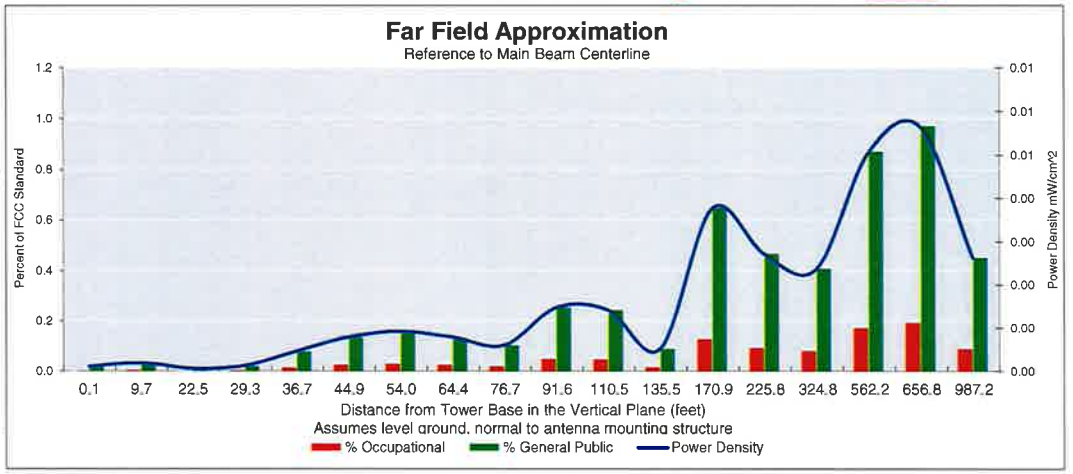
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MIDDLEBURY I84 CT**
Site #:	2-0367
Date:	08/20/15
Name:	Jaime Laredo
File Name:	MIDDLEBURY I84 CT - FF POWER (Cellular).xlsx

Operating Freq. (MHz):	**869.0**
Antenna Height (ft):	**72.0**
Antenna Gain (dBi):	**15.5**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**330.1**
No. of Channels:	**9**



Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0
Solve for r, dx to antenna	69.0	69.7	72.6	75.0	78.2	82.3	87.6	94.4	103.2	114.7	130.3	152.1	184.3	236.1	332.0	566.5	660.4	989.7
Distance from Antenna Structure Base in Horizontal plane	0.1	9.7	22.5	29.3	36.7	44.9	54.0	64.4	76.7	91.6	110.5	135.5	170.9	225.8	324.8	562.2	656.8	987.2
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.1
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.3	0.2	0.1	0.7	0.5	0.4	0.9	1.0	0.5

Antenna Type: **SBNHH-1D65B**

Max%: **0.97%**

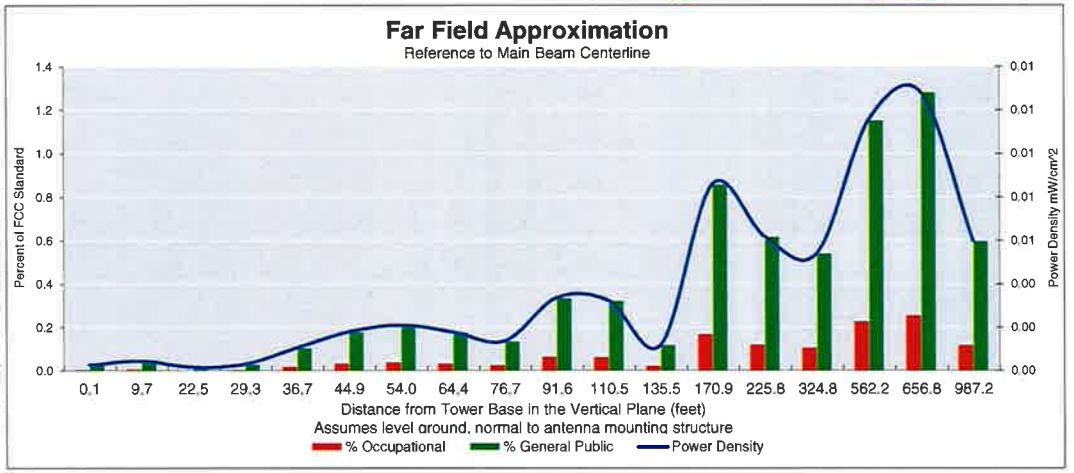
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MIDDLEBURY I84 CT**
Site #:	2-0367
Date:	08/20/15
Name:	Jaime Laredo
File Name:	MIDDLEBURY I84 CT - FF POWER (PCS).xlsx

Operating Freq. (MHz):	**1970.0**
Antenna Height (ft):	**72.0**
Antenna Gain (dBi):	**18.0**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**420.4**
No. of Channels:	**7**



Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0
Solve for r, dx to antenna	69.0	69.7	72.6	75.0	78.2	82.3	87.6	94.4	103.2	114.7	130.3	152.1	184.3	236.1	332.0	566.5	660.4	989.7
Distance from Antenna Structure Base in Horizontal plane	0.1	9.7	22.5	29.3	36.7	44.9	54.0	64.4	76.7	91.6	110.5	135.5	170.9	225.8	324.8	562.2	656.8	987.2
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.1	0.1	0.2	0.3	0.1
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.9	0.6	0.5	1.2	1.3	0.6

Antenna Type: **SBNHH-1D65B**

Max%: **1.28%**

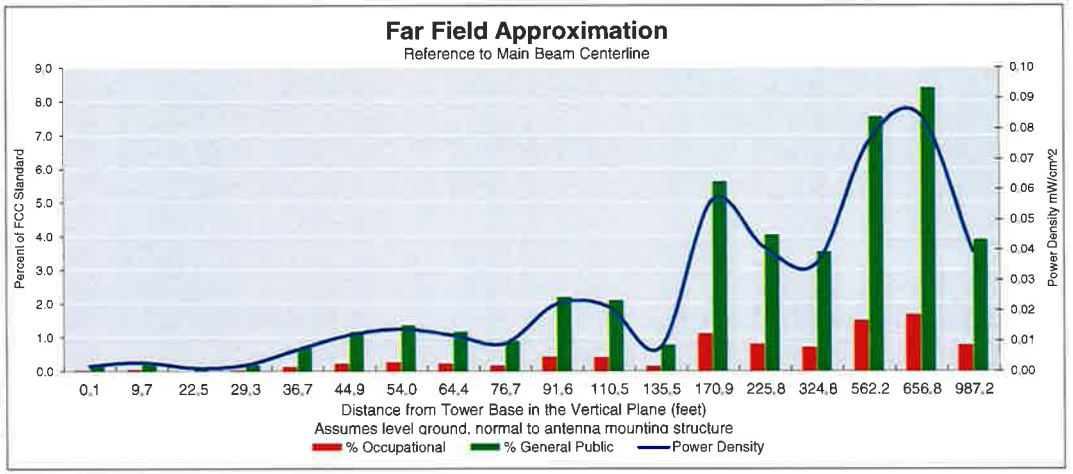
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**MIDDLEBURY I84 CT**
Site #:	2-0367
Date:	08/20/15
Name:	Jaime Laredo
File Name:	MIDDLEBURY I84 CT - FF POWER (LTE-AWS).xlsx

Operating Freq. (MHz):	**2145.0**
Antenna Height (ft):	**72.0**
Antenna Gain (dBi):	**18.6**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**2443.2**
No. of Channels:	**1**



Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0
Solve for r, dx to antenna	69.0	69.7	72.6	75.0	78.2	82.3	87.6	94.4	103.2	114.7	130.3	152.1	184.3	236.1	332.0	566.5	660.4	989.7
Distance from Antenna Structure Base in Horizontal plane	0.1	9.7	22.5	29.3	36.7	44.9	54.0	64.4	76.7	91.6	110.5	135.5	170.9	225.8	324.8	562.2	656.8	987.2
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.06	0.04	0.04	0.08	0.08	0.04
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.1	0.2	0.3	0.2	0.2	0.4	0.4	0.2	1.1	0.8	0.7	1.5	1.7	0.8
Percent of General Population Standard	0.2	0.3	0.1	0.2	0.7	1.2	1.4	1.2	0.9	2.2	2.1	0.8	5.6	4.1	3.6	7.6	8.4	3.9

Antenna Type: **SBNHH-1D65B**

Max%: **8.42%**

ATTACHMENT 6

Robinson + Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

October 5, 2015

Via Certificate of Mailing

Edward B. St. John, First Selectman
Town of Middlebury
1212 Whittemore Road
Middlebury, CT 06762

Re: **Proposed Modifications to the Existing Connecticut State Police ("CSP") Tower Along Interstate 84 Near South Street in Middlebury, Connecticut**

Dear Mr. St. John:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing CSP tower along I-84, near South Street in Middlebury. Cellco plans to install four (4) antennas at the 75-foot level of the 160-foot lattice tower. Equipment associated with Cellco's antennas will be located on an 8-foot by 8-foot concrete pad at the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent a copy of this Sub-Petition.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Robinson+Cole

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

Robinson + Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

October 5, 2015

Via Certificate of Mailing

Connecticut State Police
1111 Country Club Road
Middletown, CT 06457

Re: **Proposed Modifications to the Existing Connecticut State Police ("CSP") Tower Along Interstate 84 Near South Street in Middlebury, Connecticut**

Dear Sir or Madam:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing CSP tower along I-84, near South Street in Middlebury. Cellco plans to install four (4) antennas at the 75-foot level of the 160-foot lattice tower. Equipment associated with Cellco's antennas will be located on an 8-foot by 8-foot concrete pad at the base of the tower.

As presented in the Sub-Petition, the proposed facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent a copy of this Sub-Petition.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment

ATTACHMENT 7

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

October 5, 2015

Via Certificate of Mailing

«Name_and_Address»

Re: **Proposed Modifications to the Existing Connecticut State Police ("CSP") Tower Along Interstate 84 Near South Street in Middlebury, Connecticut**

Dear «Salutation»:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to share the existing CSP tower along I-84, near South Street in Middlebury. Cellco plans to install four (4) antennas at the 75-foot level of the 160-foot lattice tower. Equipment associated with Cellco's antennas will be located on an 8-foot by 8-foot concrete pad at the base of the tower.

The facility improvements constitute a eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation Act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the Sub-Petition.

This notice is being sent to you because you are listed as an owner of land that abuts the Property. If you have any questions regarding the Sub-Petition, the Council's process for reviewing the Sub-Petition or the details of the filing itself, please feel free to contact me at the number listed above. You may also contact the Council directly at 860-827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS

ABUTTING PROPERTY OWNERS

INTERSTATE 84 @ SOUTH STREET, MIDDLEBURY, CONNECTICUT

	Property Address	Owner's and Mailing Address
1.	675 South Street	Marian R. Larkin & Sarah M. Larkin 675 South Street Middlebury, CT 06762
2.	South Street	Marian R. Larkin P.O. Box 177 Middlebury, CT 06762
3.	470 South Street	Annalisa & Edwin Douglas Warinner, Jr. 470 South Street Middlebury, CT 06762
4.	550 South Street	Daniel G. Brennan & Maria J. Gugliotti 550 South Street Middlebury, CT 06762