ROBINSON & COLE LLP

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

April 22, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
237 Godfrey Road, Weston, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 164.5-foot level of the existing 185-foot tower at 237 Godfrey Road in Weston, Connecticut (the "Property"). The tower and the Property are owned by the Town of Weston. The Council approved Cellco's use of this tower in 2009. Cellco now intends to modify its facility by replacing six (6) of its existing antennas with three (3) model 742 213V01, 1900 MHz antennas and three (3) model 742 213V01, 2100 MHz antennas, all at the same 164.5-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable attached to the leg of the lattice tower. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Gayle Weinstein, Weston's First Selectman.

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

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1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be located at the 164.5-foot level on the 185-foot tower.

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

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

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

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Gayle Weinstein, Weston First Selectman
Sandy M. Carter

ATTACHMENT 1

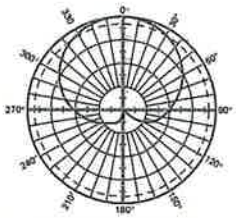
KATHREIN
SCALA DIVISION

742 213V01

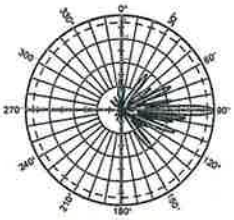
65° Panel Antenna

Kathrein's X-polarized adjustable electrical downtilt antennas offer the wireless carrier the ability to tailor polarization diversity sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

- 0-6° downtilt range.
- UV resistant pulltruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accomodate future 3G / UMTS applications.



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–6° electrical downtilt

General specifications:

Frequency range	1710–2200 MHz
VSWR	< 1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)
Maximum input power	300 watts per input (at 50°C)
Electrical downtilt continuously adjustable	0–6 degrees
Connector	2 x 7-16 DIN female
Isolation	>30 dB
Cross polar ratio Main direction 0° Sector ±60°	 25 dB (typical) >10 dB
Tracking, average	0.5 dB
Squint	±2.0°
Weight	19.8 lb (9 kg) 24.3 lb (11 kg) clamps included
Dimensions	76.9 x 6.1 x 2.8 inches (1954 x 155 x 70 mm)
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N) M (Medium)
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	88 x 6.8 x 3.6 inches (2235 x 172 x 92 mm)
Shipping weight	28.7 lb (13 kg)
Mounting	Fixed mounts for 2 to 4.6 inch (50 to 115 mm) OD masts are included and tilt options are available.
See reverse for order information.	

Specifications:	**1710–1880 MHz**	**1850–1990 MHz**	**1920–2200 MHz**
Gain	19 dBi	19.2 dBi	19.5 dBi
+45° and -45° polarization horizontal beamwidth	67° (half-power)	65° (half-power)	63° (half-power)
+45° and -45° polarization vertical beamwidth	4.7° (half-power)	4.5° (half-power)	4.3° (half-power)
Sidelobe suppression for first sidelobe above main beam	0° 2° 4° 6° T 18 18 16 15 dB	0° 2° 4° 6° T 18 18 17 16 dB	0° 2° 4° 6° T 18 18 18 18 dB

*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

RoHS
Lead-Free

11271-B
936.3740/b

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.

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

The Alcatel-Lucent RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-07-U is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-07-U is compact and weights less than 23 kg (50 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

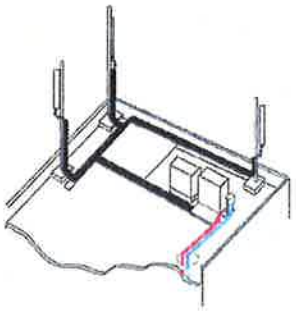
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-07-U provides more RF power while at the same time consuming less electricity.

Features

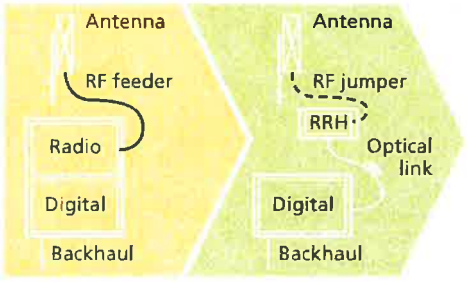
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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

Benefits

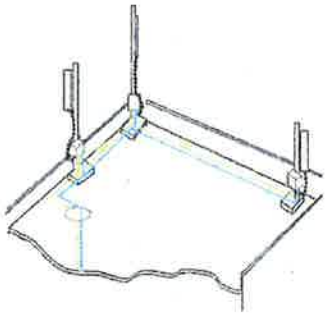
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

Operating environment

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

RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - ¬ 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - ¬ TMA
  - ¬ Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - ¬ One SM fiber (9/125 µm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - ¬ Two MM fibers (50/125 µm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

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

Alarms and ports

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

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CPG2809100913 (09)

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX⁹ accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

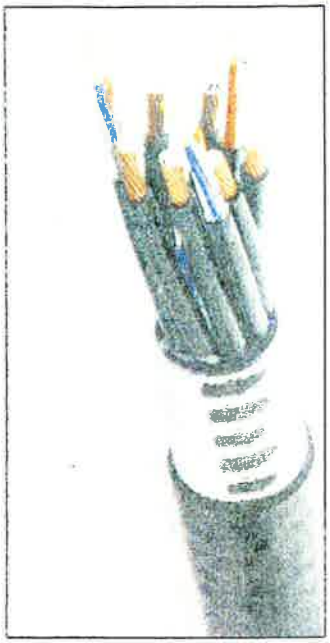


Figure 1: HYBRIFLEX Series

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-93-658 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)

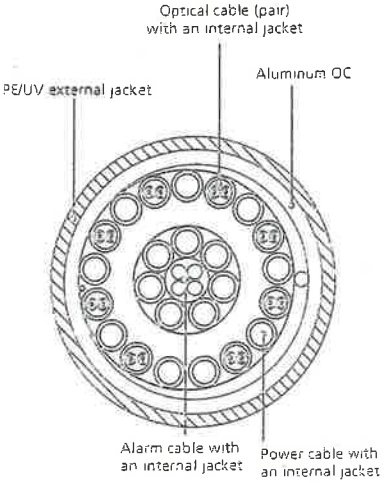


Figure 2: Construction Detail

* This data is provisional and subject to change

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

ATTACHMENT 2

	General	Power	Density					
Site Name: Weston N								
Tower Height: 185Ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Weston Police			145	0.0007	465.2125	0.3101	0.22%	
*Weston FD			145	0.0007	453.85	0.3026	0.23%	
*Weston EMS			145	0.0007	453.5125	0.3023	0.23%	
*Weston Public Works			145	0.0007	460.0375	0.3067	0.22%	
*Sprint CDMA/LTE	2	693	177	0.0159	1900	1.0000	1.59%	
*Sprint CDMA/LTE	1	390	177	0.0045	850	0.5667	0.79%	
*AT&T UMTS	1	500	152	0.0078	880	0.5867	1.33%	
*AT&T UMTS	2	500	152	0.0156	1900	1.0000	1.56%	
*AT&T GSM	2	427	152	0.0133	1900	1.0000	1.33%	
*AT&T GSM	4	296	152	0.0184	880	0.5867	3.14%	
*AT&T LTE	1	500	152	0.0078	740	0.4933	1.58%	
*T-Mobile	8	145	185	0.0122	1935	1.0000	1.22%	
Verizon	**15**	**354**	**164.5**	**0.0706**	**1970**	**1.0000**	**7.06%**	
Verizon	**9**	**379**	**164.5**	**0.0453**	**869**	**0.5793**	**7.82%**	
Verizon	**1**	**1750**	**164.5**	**0.0233**	**2145**	**1.0000**	**2.33%**	
Verizon	**1**	**791**	**164.5**	**0.0105**	**698**	**0.4653**	**2.26%**	
								32.89%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

185-ft Existing Sabre Lattice Tower

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Weston North

237 Godfrey Road
Weston, CT

Centek Project No. 14001.010

Date: April 9, 2014

Prepared for:
Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon on the existing self-supporting lattice tower located in Weston, Connecticut.

The host tower is a 185-ft, three legged, tapered steel lattice tower originally designed and manufactured by Sabre. The manufacturer's drawings and calculations were unavailable for use in this report. The existing tower geometry, structure member sizes and foundation information were obtained from a previous structural report prepared by URS Corporation job no. 36922261 (VZ5-103) dated October 5, 2012.

Antenna and appurtenance information were obtained from the aforementioned URS structural report and a Verizon RF data sheet.

The tower consists of ten (10) tapered vertical sections consisting of structural steel pipe legs conforming to ASTM A572 Gr. 50. Diagonal lateral support bracing consists of structural steel angle shapes conforming to ASTM A36. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by welded and bolted gusset connections. The width of the tower face is 5.00-ft at the top and 21.00-ft at the base.

Verizon proposes the replacement of six (6) of the existing fifteen (15) panel antennas and the installation of six (6) remote radio heads and one (1) main distribution box mounted to the existing T-Frames. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The existing, proposed and future loads considered in this analysis consist of the following:

- MUNICIPAL (EXISTING):
  Antenna: One (1) 10-ft ∅ Omni-directional (whip) antenna and two (2) 10-ft dipoles leg mounted to the top of the tower.
  Coax Cable: Three (3) 7/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- T-MOBILE (Existing):
  Antenna: Three (3) RFS APX16DWV-16DWVS-C-A20 panel antennas and six (6) TMA's mounted on three (3) 12-ft T-Frames with a RAD center elevation of ±185-ft above the existing tower base.
  Coax Cable: Twelve (12) 1-5/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- SPRINT (EXISTING):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) ALU 1900 MHz RRH' and three (3) ALU 800 MHz RRH's mounted on three (3) 12-ft T-Frames with a RAD center elevation of ±177-ft above the existing tower base.
  Coax Cables: Three (3) 1-1/4" ∅ Hybriflex cables running on a leg/face of the existing tower as specified in Section 3 of this report.

- AT&T (Existing):
  Antennas: Six (6) Powerwave 7770 panel antennas, three (3) Powerwave P65-16-XLH-RR panel antennas, six (6) Powerwave LGP21401 TMA's, six (6) Ericsson RRUS-11 remote radio heads and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted on three (3) 10-ft T-Frames with a RAD center elevation of ±154.5-ft above the existing tower base.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 3" flex conduit running on the leg/face of the existing tower as specified within Section 3 of this report.
- MUNICIPAL (EXISTING):
  Antenna: Four (4) 7-ft ∅ Omni-directional (whip) antennas mounted on two (2) 6-ft side arms with an elevation of ±152-ft above the existing tower base.
  Coax Cable: Two (2) 7/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- MUNICIPAL (EXISTING):
  Antenna: Four (4) 10-ft ∅ dipole antennas mounted on two (2) 6-ft side arms with an elevation of ±141.5-ft above the existing tower base.
  Coax Cable: Two (2) 7/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- UNKNOWN (Existing):
  Antenna: One (1) 3-ft ∅ dish antenna on a 5-ft T-Arm with an elevation of ±138-ft above the tower base.
  Coax Cable: One (1) 1/2" ∅ coax cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Three (3) Antel BXA-70063-6CF, four (4) Decibel DB846F65ZAXY and two (2) Decibel DB846H80E-SX panel antennas mounted on three (3) 15-ft T-Frames with a RAD center elevation of ±164.5-ft above the existing tower base.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on a leg/face of the existing tower as specified in Section 3 of this report.
- VERIZON (EXISTING TO REMOVE):
  Antennas: Six (6) Antel LPA-185063-8CF panel antennas mounted on three (3) 15-ft T-Frames with a RAD center elevation of ±164.5-ft above the existing tower base.
- **VERIZON (PROPOSED):**
  Antennas: Six (6) Kathrein 742-213 panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on three (3) 15-ft T-Frames with a RAD center elevation of ±164.5-ft above the existing tower base.
  Coax Cables: One (1) 1-5/8" ∅ fiber cables running on a leg/face of the existing tower as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- **All coax cables routed as specified within Section 3 of this report.**

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice tower structure and its components.

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Weston; v = 105 mph (3 second gust) equivalent to v = 85 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA and Appendix-K wind speeds are equal.	
Load Cases:	Load Case 1; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower"Section Capacity Table", this tower was found to be at **95.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T5)	100'-0" - 120'-0"	92.2%	**PASS**
Diagonal (T2)	160'-0" - 180'-0"	95.8%	**PASS**

Foundation and Anchors

The existing foundation consists of three (3) 3.5-ft ∅ x 5-ft long reinforced concrete piers on a 30.5-ft square x 1.5-ft thick reinforced concrete pad. The foundation information was taken from the aforementioned URS structural analysis. The tower legs are connected to the three (3) reinforced concrete piers by means of six (6) 1-1/2" ∅ ASTM A449 anchor bolts per leg embedded into the concrete foundation structure.

- The tower reactions developed from the governing Load Case 1 were used in the verification of the foundation and anchor bolts:

Leg Reactions	Vector	Proposed Tower Reactions
Leg	Shear	**30 kips**
	Compression	**288 kips**
	Uplift	**249 kips**
Base	Shear	**46 kips**
	Compression	**45 kips**
	Moment	**4960 kip-ft**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad and Piers	OTM[2]	2.0	2.45	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	49.4%	**PASS**

Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by Verizon Wireless. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Carlo F. Centore, PE
Principal ~ Structural Engineer

STATE OF CONNECTICUT
CARLO F. CENTORE
No. 18084
LICENSED
PROFESSIONAL ENGINEER

Prepared by:

Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

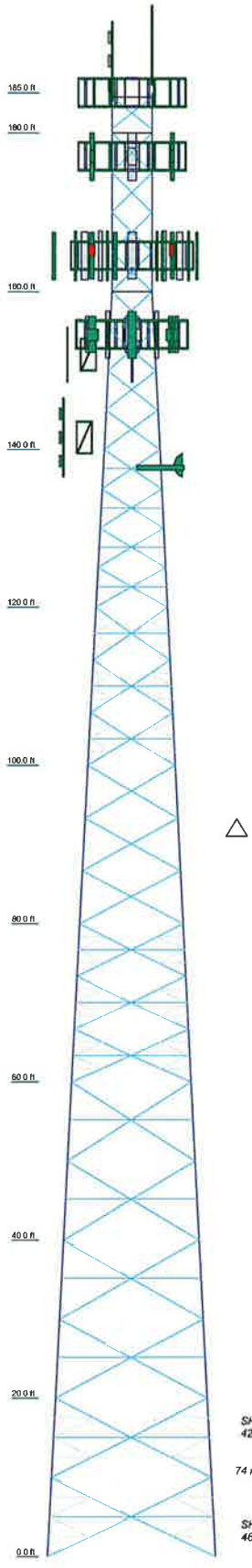
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly RISA Tower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	7	6	5	4	3	2	1
Legs	HSS8.625x.322	P5.563x0.5	HSS8.563x.375	HSS5.563x.258	P4x.318	P2.875x.375	HSS2.875x.203
Leg Grade	A572-50						A
Diagonals	L3 1/2x3 1/2x1/4	L3x3x1/4	L3x3x3/16	L2 1/2x2 1/2x3/16	L2x2x1/4	L2x2x1/8	
Diagonal Grade	A36						
Top Girts			N.A.			L2x2x1/8	
Horizontals	L3 1/2x3 1/2x1/2	N.A.	L3x3x3/8	L2 1/2x2 1/2x3/8	N.A.		
Sec. Horizontals	N.A.	L3x3x1/2	L3x3x7/16	N.A.	L2x2x1/4	N.A.	
Red. Horizontals	L3x3x1/2	N.A.	L3x3x1/2	L3x3x1/2	N.A.		
Red. Diagonals	L3x3x1/2	N.A.	L3x3x1/2	L3x3x1/2	N.A.		
Face Width (ft) 21	15	11	15	11	7		
# Panels @ (ft)	4 @ 5	4 @ 10	6 @ 3.33333	3 @ 6.66667	6 @ 3.33333	12 @ 5	1 @ 4
Weight (K) 28.5	4.6	12.7	4.6	1.5	3.3	8.9	4.5



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MAX. CORNER REACTIONS AT BASE:
DOWN: 288 K
UPLIFT: -249 K
SHEAR: 30 K

AXIAL
73 K
SHEAR 42 K *MOMENT 4770 kip-ft*

TORQUE 17 kip-ft
74 mph WIND - 0.5000 in ICE
AXIAL
45 K
SHEAR 46 K *MOMENT 4960 kip-ft*

TORQUE 18 kip-ft
REACTIONS - 85 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10' x 3" Dia Omni	191	742-213 (Verizon - Proposed)	164.5
10' Dipole	189	742-213 (Verizon - Proposed)	164.5
10' Dipole	189	742-213 (Verizon - Proposed)	164.5
APX16DWV-16DWVS-C-A20 (T-Mobile - Existing)	185	742-213 (Verizon - Proposed)	164.5
APX16DWV-16DWVS-C-A20 (T-Mobile - Existing)	185	RRH2x40 AWS (Verizon - Proposed)	164.5
APX16DWV-16DWVS-C-A20 (T-Mobile - Existing)	185	RRH2x40 AWS (Verizon - Proposed)	164.5
(2) TMA 10"x8"x3" (T-Mobile - Existing)	185	RRH2x40 AWS (Verizon - Proposed)	164.5
(2) TMA 10"x8"x3" (T-Mobile - Existing)	185	DB-T1-6Z-8AB-0Z (Verizon - Proposed)	164.5
(2) TMA 10"x8"x3" (T-Mobile - Existing)	185	Valmont 15' T-Frame P/N 860109 (Verizon - Existing)	164.5
Pirod 12' T-Frame Sector Mount (1) (T-Mobile - Existing)	185	Valmont 15' T-Frame P/N 860109 (Verizon - Existing)	164.5
Pirod 12' T-Frame Sector Mount (1) (T-Mobile - Existing)	185	Valmont 15' T-Frame P/N 860109 (Verizon - Existing)	164.5
Pirod 12' T-Frame Sector Mount (1) (T-Mobile - Existing)	185	(2) LGP21401 TMA (ATI - Existing)	154.5
APXV9PP18-C-A20 (Sprint - Existing)	177	(2) LGP21401 TMA (ATI - Existing)	154.5
APXV9PP18-C-A20 (Sprint - Existing)	177	(2) LGP21401 TMA (ATI - Existing)	154.5
APXV9PP18-C-A20 (Sprint - Existing)	177	(2) RRUS-11 (ATI - Existing)	154.5
FD-RRH 2x50 800 (Sprint - Existing)	177	(2) RRUS-11 (ATI - Existing)	154.5
FD-RRH 2x50 800 (Sprint - Existing)	177	(2) RRUS-11 (ATI - Existing)	154.5
FD-RRH 2x50 800 (Sprint - Existing)	177	DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	154.5
FD-RRH 4x45 1900 (Sprint - Existing)	177	Pirod 10' PCS Frame (1) (ATI - Existing)	154.5
FD-RRH 4x45 1900 (Sprint - Existing)	177	Pirod 10' PCS Frame (1) (ATI - Existing)	154.5
FD-RRH 4x45 1900 (Sprint - Existing)	177	Pirod 10' PCS Frame (1) (ATI - Existing)	154.5
Pirod 12' T-Frame Sector Mount (1) (Sprint/Nextel - Existing)	177	(2) 7770.00 (ATI - Existing)	154.5
Pirod 12' T-Frame Sector Mount (1) (Sprint/Nextel - Existing)	177	(2) 7770.00 (ATI - Existing)	154.5
Pirod 12' T-Frame Sector Mount (1) (Sprint/Nextel - Existing)	177	(2) 7770.00 (ATI - Existing)	154.5
DB846F65ZAXY (Verizon - Existing)	164.5	P65-16-XLH-RR (ATI - Existing)	154.5
BXA-70063/6CF (Verizon - Existing)	164.5	P65-16-XLH-RR (ATI - Existing)	154.5
DB846F65ZAXY (Verizon - Existing)	164.5	P65-16-XLH-RR (ATI - Existing)	154.5
DB846H80E-5X (Verizon - Existing)	164.5	(2) 7' Whip	152
BXA-70063/6CF (Verizon - Existing)	164.5	(2) 7' Whip	152
DB846H80E-5X (Verizon - Existing)	164.5	Pirod 6' Side Mount Standoff (1)	152
DB846F65ZAXY (Verizon - Existing)	164.5	Pirod 6' Side Mount Standoff (1)	152
BXA-70063/6CF (Verizon - Existing)	164.5	(2) 10' Dipole	141.5
DB846F65ZAXY (Verizon - Existing)	164.5	(2) 10' Dipole	141.5
742-213 (Verizon - Proposed)	164.5	Pirod 6' Side Mount Standoff (1)	141.5
742-213 (Verizon - Proposed)	164.5	Pirod 6' Side Mount Standoff (1)	141.5
		6 ft T-Frame	138
		3-ft dish	138

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	HSS2.375x.154		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

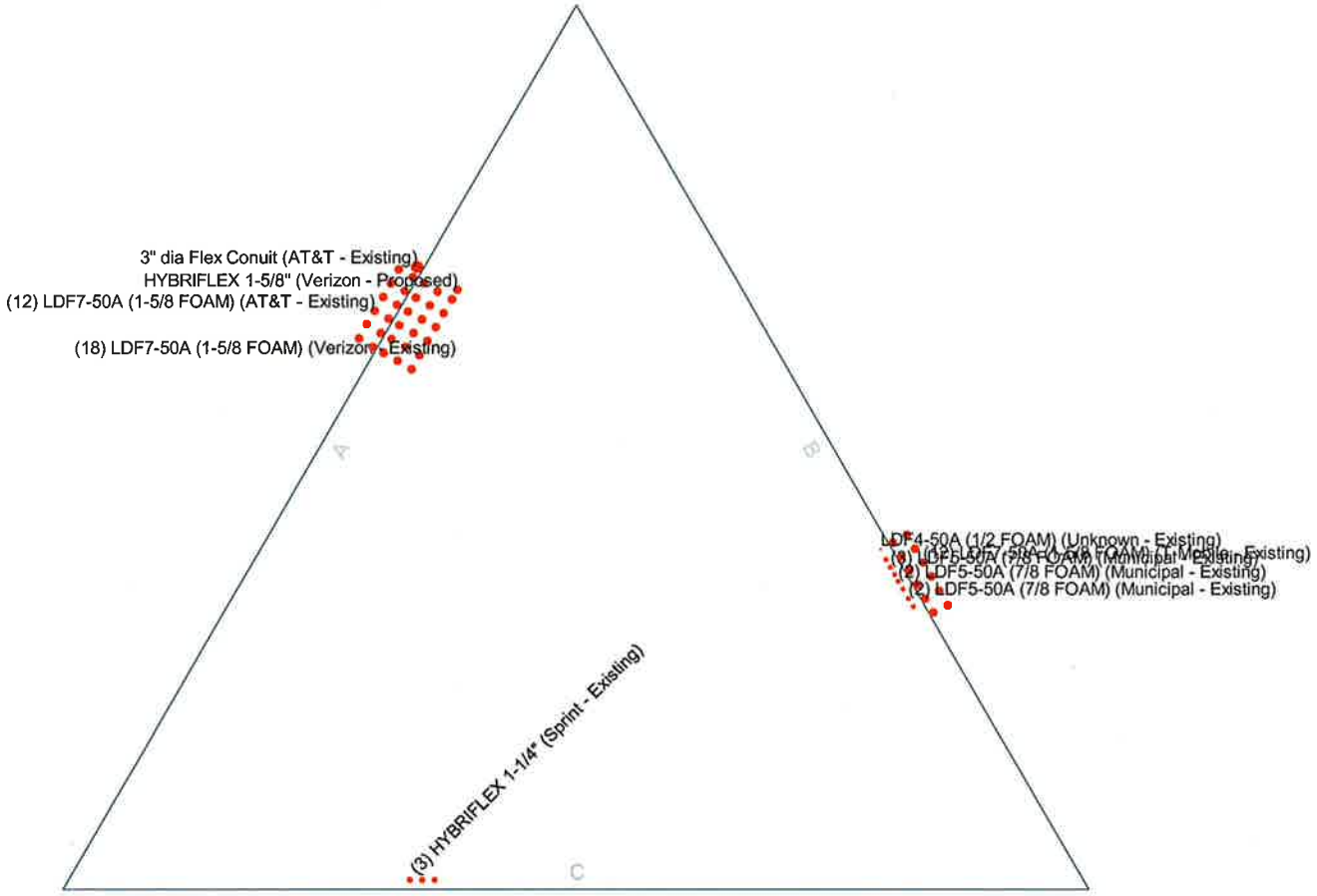
1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 95.8%

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	14001.010 - Weston North
Project:	185' Lattice Tower - 237 Godfrey Road, Weston, CT
Client:	Verizon Wireless
Drawn by:	TJL
App'd	
Code:	TIA/EIA-222-F
Date:	04/09/14
Scale:	NTS
Path:	
Dwg No.	E-1

Feedline Plan

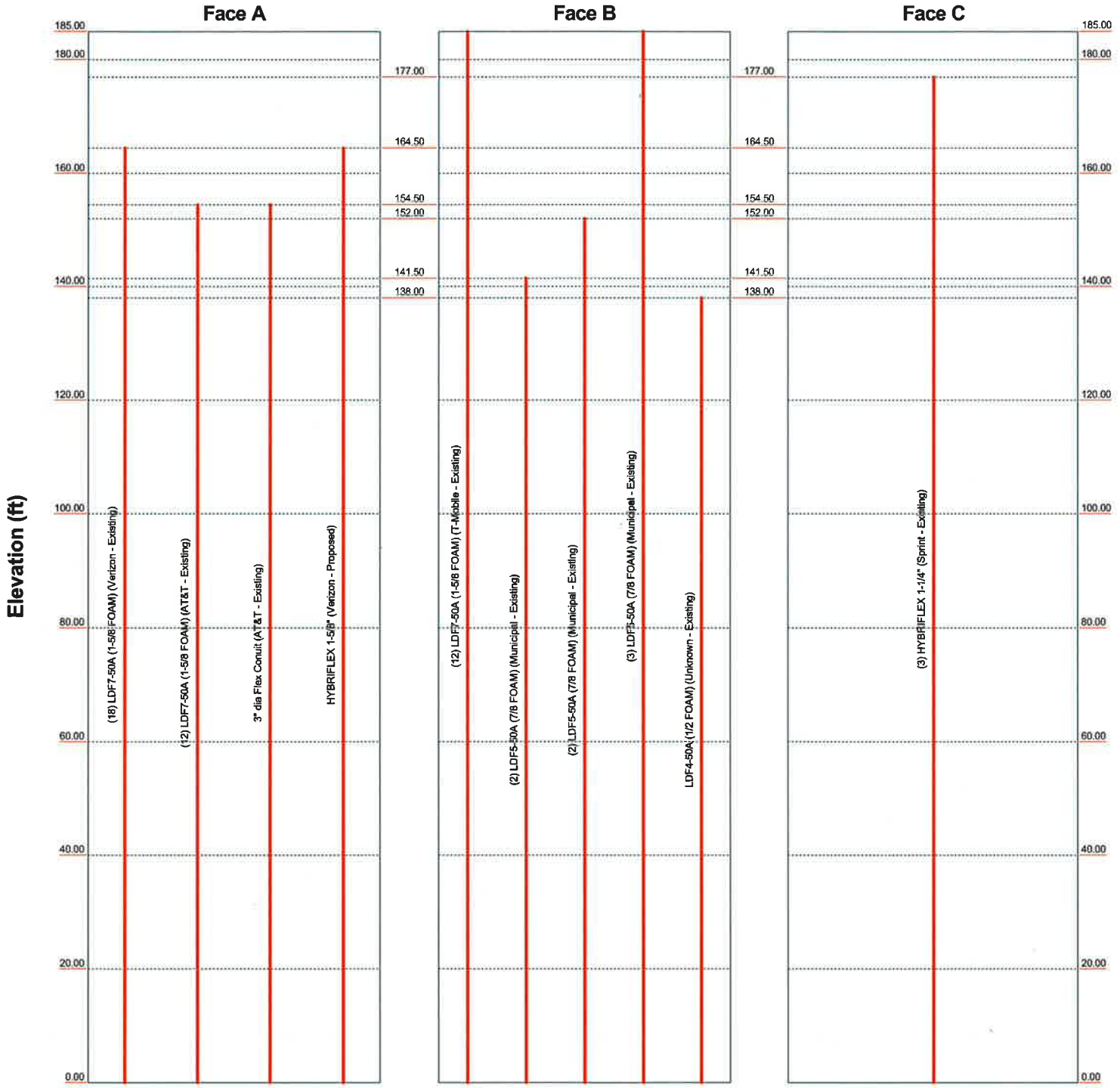
Round Flat App In Face App Out Face



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **14001.010 - Weston North**		
	Project: ***185' Lattice Tower - 237 Godfrey Road, Weston, CT***		
	Client: Verizon Wireless	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 04/09/14	Scale: NTS
	Path:		Dwg No. E-7

Feedline Distribution Chart
0' - 185'

Round | Flat | App In Face | App Out Face | Truss Leg



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: **14001.010 - Weston North**		
	Project: ***185' Lattice Tower - 237 Godfrey Road, Weston, CT***		
	Client: Verizon Wireless	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 04/09/14	Scale: NTS
	Path:		Dwg No. E-7

tnxTower	Job	Page
	14001.010 - Weston North	1 of 39
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 185' Lattice Tower - 237 Godfrey Road, Weston, CT	Date 12:24:11 04/09/14
	Client Verizon Wireless	Designed by TJL

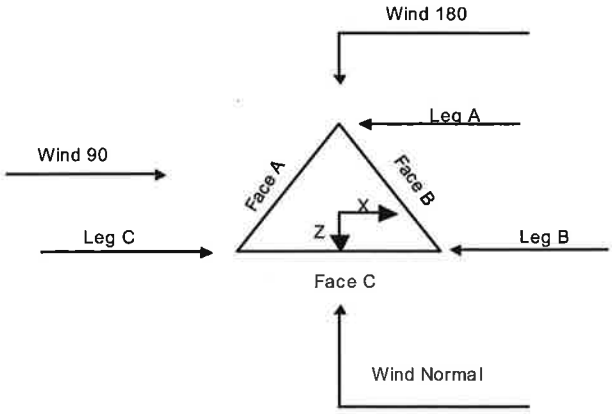
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 185.00 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 5.00 ft at the top and 21.00 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
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, feedline 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		



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	185.00-180.00			5.00	1	5.00
T2	180.00-160.00			5.00	1	20.00
T3	160.00-140.00			5.00	1	20.00
T4	140.00-120.00			7.00	1	20.00
T5	120.00-100.00			9.00	1	20.00
T6	100.00-80.00			11.00	1	20.00
T7	80.00-60.00			13.00	1	20.00
T8	60.00-40.00			15.00	1	20.00
T9	40.00-20.00			17.00	1	20.00
T10	20.00-0.00			19.00	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	185.00-180.00	4.00	X Brace	No	No	6.0000	6.0000
T2	180.00-160.00	5.00	X Brace	No	No	0.0000	0.0000
T3	160.00-140.00	5.00	X Brace	No	No	0.0000	0.0000
T4	140.00-120.00	5.00	X Brace	No	Yes	0.0000	0.0000
T5	120.00-100.00	3.33	Double K1	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	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T7	80.00-60.00	3.33	Double K1	No	Yes	0.0000	0.0000
T8	60.00-40.00	10.00	X Brace	No	Yes	0.0000	0.0000
T9	40.00-20.00	10.00	X Brace	No	Yes	0.0000	0.0000
T10	20.00-0.00	5.00	Double K1	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 185.00-180.00	Pipe	HSS2.375x.154	A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T2 180.00-160.00	Pipe	HSS2.875x.203	A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T3 160.00-140.00	Pipe	P2.875x.375	A572-50 (50 ksi)	Equal Angle	L2x2x1/8	A36 (36 ksi)
T4 140.00-120.00	Pipe	P4x.318	A572-50 (50 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T5 120.00-100.00	Pipe	HSS5.563x.258	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T6 100.00-80.00	Pipe	HSS5.563x.375	A572-50 (50 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)
T7 80.00-60.00	Pipe	HSS5.563x.375	A572-50 (50 ksi)	Equal Angle	L3x3x3/16	A36 (36 ksi)
T8 60.00-40.00	Pipe	P5.563x0.5	A572-50 (50 ksi)	Equal Angle	L3x3x1/4	A36 (36 ksi)
T9 40.00-20.00	Pipe	HSS8.625x.322	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	A36 (36 ksi)
T10 20.00-0.00	Pipe	HSS8.625x.322	A572-50 (50 ksi)	Equal Angle	L3 1/2x3 1/2x1/4	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 185.00-180.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T2 180.00-160.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T3 160.00-140.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Equal 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
T5 120.00-100.00	None	Single Angle		A36 (36 ksi)	Equal Angle	L2 1/2x2 1/2x3/8	A36 (36 ksi)
T7 80.00-60.00	None	Single Angle		A36 (36 ksi)	Equal Angle	L3x3x3/8	A36 (36 ksi)
T10 20.00-0.00	None	Single Angle		A36 (36 ksi)	Equal Angle	L3 1/2x3 1/2x1/2	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
T4 140.00-120.00	Equal Angle	L2x2x1/4	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T8 60.00-40.00	Equal Angle	L3x3x7/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T9 40.00-20.00	Equal Angle	L3x3x1/2	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T5	A36	Horizontal (1)	Single Angle	L3x3x1/2	1
120.00-100.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x1/2	1
T7	A36	Horizontal (1)	Single Angle	L3x3x1/2	1
80.00-60.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x1/2	1
T10	A36	Horizontal (1)	Single Angle	L3x3x1/2	1
20.00-0.00	(36 ksi)	Diagonal (1)	Single Angle	L3x3x1/2	1

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 185.00-180.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

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
T5 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T7 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T8 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T9 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T10 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	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	1	1	1
185.00-180.00				1	1	1	1	1	1	1
T2	Yes	Yes	1	1	1	1	1	1	1	1
180.00-160.00				1	1	1	1	1	1	1
T3	Yes	Yes	1	1	1	1	1	1	1	1
160.00-140.00				1	1	1	1	1	1	1
T4	Yes	Yes	1	1	1	1	1	1	1	1
140.00-120.00				1	1	1	1	1	1	1
T5	Yes	Yes	1	1	1	1	1	1	1	1
120.00-100.00				1	1	1	1	1	1	1
T6	Yes	Yes	1	1	1	1	1	1	1	1
100.00-80.00				1	1	1	1	1	1	1
T7	Yes	Yes	1	1	1	1	1	1	1	1
80.00-60.00				1	1	1	1	1	1	1
T8	Yes	Yes	1	1	1	1	1	1	1	1
60.00-40.00				1	1	1	1	1	1	1
T9	Yes	Yes	1	1	1	1	1	1	1	1
40.00-20.00				1	1	1	1	1	1	1
T10	Yes	Yes	1	1	1	1	1	1	1	1
20.00-0.00				1	1	1	1	1	1	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		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 185.00-180.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T2 180.00-160.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T3 160.00-140.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T4 140.00-120.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T5 120.00-100.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 100.00-80.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T7 80.00-60.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T8 60.00-40.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T9 40.00-20.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T10 20.00-0.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1

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 185.00-180.00	Flange	0.7500 A325N	6	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 180.00-160.00	Flange	0.7500 A325N	6	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325N	0
T3 160.00-140.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.7500 A325X	0
T4 140.00-120.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0
T5 120.00-100.00	Flange	1.0000 A325N	6	0.6250 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0
T6 100.00-80.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0
T7 80.00-60.00	Flange	1.0000 A325N	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0
T8 60.00-40.00	Flange	1.2500 A325N	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0
T9 40.00-20.00	Flange	1.2500 A325N	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0	0.6250 A325N	0
T10 20.00-0.00	Flange	1.5000 A449	6	0.7500 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325X	0	0.6250 A325N	0	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
LDF7-50A (1-5/8 FOAM) (T-Mobile - Existing)	B	Yes	Ar (CfAe)	185.00 - 0.00	0.0000	0.15	12	6	1.9800	1.9800		0.82
LDF7-50A (1-5/8 FOAM) (Verizon - Existing)	A	Yes	Ar (CfAe)	164.50 - 0.00	-9.0000	0.15	18	6	1.9800	1.9800		0.82
LDF7-50A (1-5/8 FOAM) (AT&T - Existing)	A	Yes	Ar (CfAe)	154.50 - 0.00	0.0000	0.15	12	6	1.9800	1.9800		0.82
LDF5-50A (7/8 FOAM) (Municipal - Existing)	B	Yes	Ar (CfAe)	141.50 - 0.00	-2.0000	0.17	2	2	1.0900	1.0900		0.33
LDF5-50A (7/8 FOAM) (Municipal - Existing)	B	Yes	Ar (CfAe)	152.00 - 0.00	-2.0000	0.15	2	2	1.0900	1.0900		0.33
LDF5-50A (7/8 FOAM) (Municipal - Existing)	B	Yes	Ar (CfAe)	185.00 - 0.00	-2.0000	0.13	3	3	1.0900	1.0900		0.33
LDF4-50A (1/2 FOAM) (Unknown - Existing)	B	Yes	Ar (CfAe)	138.00 - 0.00	-2.0000	0.11	1	1	0.6300	0.6300		0.15
3" dia Flex Conuit (AT&T - Existing)	A	Yes	Ar (CfAe)	154.50 - 0.00	0.0000	0.2	1	1	3.0000	3.0000		5.00
HYBRIFLEX 1-5/8" (Verizon - Proposed)	A	Yes	Ar (CfAe)	164.50 - 0.00	-9.0000	0.2	1	1	1.9800	1.9800		1.90
HYBRIFLEX 1-1/4" (Sprint - Existing)	C	Yes	Ar (CfAe)	177.00 - 0.00	-1.5000	0.15	3	3	1.5400	1.5400		1.30

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	185.00-180.00	A	0.000	0.000	0.000	0.000	0.00
		B	6.313	0.000	0.000	0.000	0.05
		C	0.000	0.000	0.000	0.000	0.00
T2	180.00-160.00	A	5.197	0.000	0.000	0.000	0.07
		B	25.250	0.000	0.000	0.000	0.22
		C	6.545	0.000	0.000	0.000	0.07
T3	160.00-140.00	A	41.080	0.000	0.000	0.000	0.55
		B	27.703	0.000	0.000	0.000	0.23
		C	7.700	0.000	0.000	0.000	0.08
T4	140.00-120.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.462	0.000	0.000	0.000	0.25

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
		C	7.700	0.000	0.000	0.000	0.08
T5	120.00-100.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.567	0.000	0.000	0.000	0.25
		C	7.700	0.000	0.000	0.000	0.08
T6	100.00-80.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.567	0.000	0.000	0.000	0.25
		C	7.700	0.000	0.000	0.000	0.08
T7	80.00-60.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.567	0.000	0.000	0.000	0.25
		C	7.700	0.000	0.000	0.000	0.08
T8	60.00-40.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.567	0.000	0.000	0.000	0.25
		C	7.700	0.000	0.000	0.000	0.08
T9	40.00-20.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.567	0.000	0.000	0.000	0.25
		C	7.700	0.000	0.000	0.000	0.08
T10	20.00-0.00	A	47.900	0.000	0.000	0.000	0.63
		B	33.567	0.000	0.000	0.000	0.25
		C	7.700	0.000	0.000	0.000	0.08

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	185.00-180.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		10.063	0.000	0.000	0.000	0.16
		C		0.000	0.000	0.000	0.000	0.00
T2	180.00-160.00	A	0.500	7.823	0.000	0.000	0.000	0.20
		B		40.250	0.000	0.000	0.000	0.64
		C		10.795	0.000	0.000	0.000	0.13
T3	160.00-140.00	A	0.500	61.205	0.000	0.000	0.000	1.42
		B		44.953	0.000	0.000	0.000	0.67
		C		12.700	0.000	0.000	0.000	0.15
T4	140.00-120.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.628	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15
T5	120.00-100.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.900	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15
T6	100.00-80.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.900	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15
T7	80.00-60.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.900	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15
T8	60.00-40.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.900	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15
T9	40.00-20.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.900	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15
T10	20.00-0.00	A	0.500	71.233	0.000	0.000	0.000	1.61
		B		56.900	0.000	0.000	0.000	0.76
		C		12.700	0.000	0.000	0.000	0.15

Feed Line Shielding

Section	Elevation	Face	A_R	A_R Ice	A_F	A_F Ice
	ft		ft^2	ft^2	ft^2	ft^2
T1	185.00-180.00	A	0.000	0.000	0.000	0.000
		B	0.000	0.597	0.749	1.195
		C	0.000	0.000	0.000	0.000
T2	180.00-160.00	A	0.000	0.401	0.533	0.803
		B	0.000	2.065	2.591	4.130
		C	0.000	0.554	0.672	1.108
T3	160.00-140.00	A	0.000	2.923	3.924	5.846
		B	0.000	2.147	2.646	4.293
		C	0.000	0.606	0.735	1.213
T4	140.00-120.00	A	0.000	3.992	5.369	7.985
		B	0.000	3.174	3.751	6.348
		C	0.000	0.712	0.863	1.424
T5	120.00-100.00	A	0.000	6.959	13.018	19.360
		B	0.000	5.559	9.123	15.464
		C	0.000	1.241	2.093	3.452
T6	100.00-80.00	A	0.000	2.039	3.427	5.096
		B	0.000	1.628	2.401	4.071
		C	0.000	0.363	0.551	0.909
T7	80.00-60.00	A	0.000	6.618	13.351	19.855
		B	0.000	5.287	9.356	15.860
		C	0.000	1.180	2.146	3.540
T8	60.00-40.00	A	0.000	1.994	4.023	5.982
		B	0.000	1.593	2.819	4.779
		C	0.000	0.356	0.647	1.067
T9	40.00-20.00	A	0.000	1.952	4.395	6.535
		B	0.000	1.559	3.080	5.220
		C	0.000	0.348	0.706	1.165
T10	20.00-0.00	A	0.000	4.436	9.596	14.270
		B	0.000	3.544	6.724	11.399
		C	0.000	0.791	1.543	2.544

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	185.00-180.00	5.8019	-0.5494	5.7902	-0.5334
T2	180.00-160.00	4.3770	-0.2143	4.4621	-0.1278
T3	160.00-140.00	1.2096	-4.9223	1.4831	-4.6806
T4	140.00-120.00	1.2517	-5.8326	1.8359	-5.5769
T5	120.00-100.00	0.9002	-4.5168	1.3658	-4.3218
T6	100.00-80.00	1.5658	-8.3421	2.5895	-8.4964
T7	80.00-60.00	0.9121	-5.0830	1.4655	-4.9383
T8	60.00-40.00	1.6608	-9.5862	2.8909	-9.9422
T9	40.00-20.00	1.4794	-8.7827	2.7236	-9.5190
T10	20.00-0.00	1.1409	-6.9309	2.0546	-7.2756

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10' x 3" Dia Omni	B	From Leg	0.00 0.00 0.00	0.0000	191.00	No Ice 1/2" Ice	3.00 4.03	3.00 4.03	0.03 0.05
10' Dipole	A	From Leg	0.00 0.00 0.00	0.0000	189.00	No Ice 1/2" Ice	4.00 6.00	4.00 6.00	0.05 0.07
10' Dipole	C	From Leg	0.00 0.00 0.00	0.0000	189.00	No Ice 1/2" Ice	4.00 6.00	4.00 6.00	0.05 0.07
APX16DWV-16DWVS-C-A20 (T-Mobile - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-C-A20 (T-Mobile - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-C-A20 (T-Mobile - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
(2) TMA 10"x8"x3" (T-Mobile - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	0.00 0.00	0.29 0.38	0.02 0.02
(2) TMA 10"x8"x3" (T-Mobile - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	0.00 0.00	0.29 0.38	0.02 0.02
(2) TMA 10"x8"x3" (T-Mobile - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	0.00 0.00	0.29 0.38	0.02 0.02
Pirod 12' T-Frame Sector Mount (1) (T-Mobile - Existing)	A	From Leg	1.50 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	13.60 18.40	13.60 18.40	0.47 0.60
Pirod 12' T-Frame Sector Mount (1) (T-Mobile - Existing)	B	From Leg	1.50 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	13.60 18.40	13.60 18.40	0.47 0.60
Pirod 12' T-Frame Sector Mount (1) (T-Mobile - Existing)	C	From Leg	1.50 0.00 0.00	0.0000	185.00	No Ice 1/2" Ice	13.60 18.40	13.60 18.40	0.47 0.60
APXVSPP18-C-A20 (Sprint - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVSPP18-C-A20 (Sprint - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVSPP18-C-A20 (Sprint - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
FD-RRH 2x50 800 (Sprint - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	177.00	No Ice 1/2" Ice	2.40 2.61	2.25 2.46	0.06 0.09
FD-RRH 4x45 1900 (Sprint - Existing)	A	From Leg	3.00 0.00	0.0000	177.00	No Ice 1/2" Ice	2.71 2.94	2.78 3.02	0.06 0.08

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
			0.00						
FD-RRH 4x45 1900	B	From Leg	3.00	0.0000	177.00	No Ice	2.71	2.78	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.94	3.02	0.08
			0.00						
FD-RRH 4x45 1900	C	From Leg	3.00	0.0000	177.00	No Ice	2.71	2.78	0.06
(Sprint - Existing)			0.00			1/2" Ice	2.94	3.02	0.08
			0.00						
Pirod 12' T-Frame Sector	A	From Leg	1.50	0.0000	177.00	No Ice	13.60	13.60	0.47
Mount (1)			0.00			1/2" Ice	18.40	18.40	0.60
(Sprint/Nextel - Existing)			0.00						
Pirod 12' T-Frame Sector	B	From Leg	1.50	0.0000	177.00	No Ice	13.60	13.60	0.47
Mount (1)			0.00			1/2" Ice	18.40	18.40	0.60
(Sprint/Nextel - Existing)			0.00						
Pirod 12' T-Frame Sector	C	From Leg	1.50	0.0000	177.00	No Ice	13.60	13.60	0.47
Mount (1)			0.00			1/2" Ice	18.40	18.40	0.60
(Sprint/Nextel - Existing)			0.00						
(2) 7770.00	A	From Face	2.00	0.0000	154.50	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
(2) 7770.00	B	From Face	2.00	0.0000	154.50	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
(2) 7770.00	C	From Face	2.00	0.0000	154.50	No Ice	5.88	2.93	0.04
(AT&T - Existing)			0.00			1/2" Ice	6.31	3.27	0.07
			0.00						
P65-16-XLH-RR	A	From Face	2.00	0.0000	154.50	No Ice	8.40	4.70	0.06
(AT&T - Existing)			0.00			1/2" Ice	8.95	5.15	0.11
			0.00						
P65-16-XLH-RR	B	From Face	2.00	0.0000	154.50	No Ice	8.40	4.70	0.06
(AT&T - Existing)			0.00			1/2" Ice	8.95	5.15	0.11
			0.00						
P65-16-XLH-RR	C	From Face	2.00	0.0000	154.50	No Ice	8.40	4.70	0.06
(AT&T - Existing)			0.00			1/2" Ice	8.95	5.15	0.11
			0.00						
(2) LGP21401 TMA	A	From Face	2.00	0.0000	154.50	No Ice	0.95	0.37	0.02
(AT&T - Existing)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) LGP21401 TMA	B	From Face	2.00	0.0000	154.50	No Ice	0.95	0.37	0.02
(AT&T - Existing)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) LGP21401 TMA	C	From Face	2.00	0.0000	154.50	No Ice	0.95	0.37	0.02
(AT&T - Existing)			0.00			1/2" Ice	1.09	0.48	0.02
			0.00						
(2) RRUS-11	A	From Face	2.00	0.0000	154.50	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	B	From Face	2.00	0.0000	154.50	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
(2) RRUS-11	C	From Face	2.00	0.0000	154.50	No Ice	2.99	1.25	0.05
(AT&T - Existing)			0.00			1/2" Ice	3.23	1.41	0.07
			0.00						
DC6-48-60-18-8F Surge	A	From Face	2.00	0.0000	154.50	No Ice	2.23	2.23	0.02
Arrestor			0.00			1/2" Ice	2.45	2.45	0.04
(AT&T - Existing)			0.00						
Pirod 10' PCS Frame (1)	A	From Leg	1.50	0.0000	154.50	No Ice	9.00	9.00	0.25
(AT&T - Existing)			0.00			1/2" Ice	13.20	13.20	0.35

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						
Pirod 10' PCS Frame (1)	B	From Leg	1.50	0.0000	154.50	No Ice	9.00	9.00	0.25
(AT&T - Existing)			0.00			1/2" Ice	13.20	13.20	0.35
			0.00						
Pirod 10' PCS Frame (1)	C	From Leg	1.50	0.0000	154.50	No Ice	9.00	9.00	0.25
(AT&T - Existing)			0.00			1/2" Ice	13.20	13.20	0.35
			0.00						
DB846F65ZAXY	A	From Leg	3.00	0.0000	164.50	No Ice	7.03	6.16	0.02
(Verizon - Existing)			-6.00			1/2" Ice	7.54	6.62	0.07
			0.00						
BXA-70063/6CF	A	From Leg	3.00	0.0000	164.50	No Ice	7.73	4.16	0.02
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
DB846F65ZAXY	A	From Leg	5.00	0.0000	164.50	No Ice	7.03	6.16	0.02
(Verizon - Existing)			6.00			1/2" Ice	7.54	6.62	0.07
			0.00						
DB846H80E-SX	B	From Leg	3.00	0.0000	164.50	No Ice	5.09	6.06	0.02
(Verizon - Existing)			-6.00			1/2" Ice	5.55	6.52	0.05
			0.00						
BXA-70063/6CF	B	From Leg	3.00	0.0000	164.50	No Ice	7.73	4.16	0.02
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
DB846H80E-SX	B	From Leg	5.00	0.0000	164.50	No Ice	5.09	6.06	0.02
(Verizon - Existing)			6.00			1/2" Ice	5.55	6.52	0.05
			0.00						
DB846F65ZAXY	C	From Leg	3.00	0.0000	164.50	No Ice	7.03	6.16	0.02
(Verizon - Existing)			-6.00			1/2" Ice	7.54	6.62	0.07
			0.00						
BXA-70063/6CF	C	From Leg	3.00	0.0000	164.50	No Ice	7.73	4.16	0.02
(Verizon - Existing)			0.00			1/2" Ice	8.27	4.60	0.06
			0.00						
DB846F65ZAXY	C	From Leg	5.00	0.0000	164.50	No Ice	7.03	6.16	0.02
(Verizon - Existing)			6.00			1/2" Ice	7.54	6.62	0.07
			0.00						
742-213	A	From Leg	3.00	0.0000	164.50	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	A	From Leg	3.00	0.0000	164.50	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	B	From Leg	3.00	0.0000	164.50	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	B	From Leg	3.00	0.0000	164.50	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	C	From Leg	3.00	0.0000	164.50	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			-4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
742-213	C	From Leg	3.00	0.0000	164.50	No Ice	5.17	2.99	0.02
(Verizon - Proposed)			4.00			1/2" Ice	5.65	3.57	0.05
			0.00						
RRH2x40-AWS	A	From Leg	3.00	0.0000	164.50	No Ice	0.00	1.59	0.04
(Verizon - Proposed)			0.00			1/2" Ice	0.00	1.80	0.06
			0.00						
RRH2x40-AWS	B	From Leg	3.00	0.0000	164.50	No Ice	0.00	1.59	0.04
(Verizon - Proposed)			0.00			1/2" Ice	0.00	1.80	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
RRH2x40-AWS	C	From Leg	3.00	0.0000	164.50	No Ice	0.00	1.59	0.04
(Verizon - Proposed)			0.00			1/2" Ice	0.00	1.80	0.06
			0.00						
DB-T1-6Z-8AB-0Z	C	From Leg	3.00	0.0000	164.50	No Ice	5.60	2.33	0.04
(Verizon - Proposed)			0.00			1/2" Ice	5.92	2.56	0.08
			0.00						
Valmont 15' T-Frame P/N	A	From Leg	2.00	0.0000	164.50	No Ice	13.90	13.90	0.39
860109			0.00			1/2" Ice	20.00	20.00	0.53
(Verizon - Existing)			0.00						
Valmont 15' T-Frame P/N	B	From Leg	2.00	0.0000	164.50	No Ice	13.90	13.90	0.39
860109			0.00			1/2" Ice	20.00	20.00	0.53
(Verizon - Existing)			0.00						
Valmont 15' T-Frame P/N	C	From Leg	2.00	0.0000	164.50	No Ice	13.90	13.90	0.39
860109			0.00			1/2" Ice	20.00	20.00	0.53
(Verizon - Existing)			0.00						
(2) 7' Whip	A	From Leg	6.00	0.0000	152.00	No Ice	1.74	1.74	0.04
			0.00			1/2" Ice	2.60	2.60	0.05
			0.00						
(2) 7' Whip	C	From Leg	6.00	0.0000	152.00	No Ice	1.74	1.74	0.04
			0.00			1/2" Ice	2.60	2.60	0.05
			0.00						
Pirod 6' Side Mount Standoff	A	From Leg	3.00	0.0000	152.00	No Ice	4.97	4.97	0.07
(1)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00						
Pirod 6' Side Mount Standoff	C	From Leg	3.00	0.0000	152.00	No Ice	4.97	4.97	0.07
(1)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00						
(2) 10' Dipole	A	From Leg	6.00	0.0000	141.50	No Ice	4.00	4.00	0.05
			0.00			1/2" Ice	6.00	6.00	0.07
			0.00						
(2) 10' Dipole	C	From Leg	6.00	0.0000	141.50	No Ice	4.00	4.00	0.05
			0.00			1/2" Ice	6.00	6.00	0.07
			0.00						
Pirod 6' Side Mount Standoff	A	From Leg	3.00	0.0000	141.50	No Ice	4.97	4.97	0.07
(1)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00						
Pirod 6' Side Mount Standoff	C	From Leg	3.00	0.0000	141.50	No Ice	4.97	4.97	0.07
(1)			0.00			1/2" Ice	6.12	6.12	0.13
			0.00						
6-ft T-Frame	B	From Leg	0.00	0.0000	138.00	No Ice	15.10	15.10	0.29
			0.00			1/2" Ice	19.50	19.50	0.40
			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

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight K
3-ft dish	B	Paraboloid w/o Radome	From Leg	2.00 0.00 0.00	0.0000		138.00	3.00	No Ice 1/2" Ice	3.14 3.41	0.08 0.10

Tower Pressures - No Ice

$G_H = 1.119$

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	182.50	1.63	30	25.990	A	2.850	1.979	1.979	40.98	0.000	0.000
185.00-180.00					B	2.101	8.292		19.04	0.000	0.000
					C	2.850	1.979		40.98	0.000	0.000
T2	170.00	1.597	30	104.792	A	9.253	14.781	9.583	39.87	0.000	0.000
180.00-160.00					B	7.195	34.833		22.80	0.000	0.000
					C	9.115	16.128		37.96	0.000	0.000
T3	150.00	1.541	29	124.798	A	6.879	50.679	9.599	16.68	0.000	0.000
160.00-140.00					B	8.156	37.302		21.12	0.000	0.000
					C	10.067	17.299		35.08	0.000	0.000
T4	130.00	1.48	27	166.675	A	11.817	61.256	13.356	18.28	0.000	0.000
140.00-120.00					B	13.435	46.817		22.17	0.000	0.000
					C	16.323	21.056		35.73	0.000	0.000
T5	110.00	1.411	26	209.283	A	22.296	66.474	18.574	20.92	0.000	0.000
120.00-100.00					B	26.192	52.141		23.71	0.000	0.000
					C	33.222	26.274		31.22	0.000	0.000
T6	90.00	1.332	25	249.283	A	13.074	66.474	18.574	23.35	0.000	0.000
100.00-80.00					B	14.099	52.141		28.04	0.000	0.000
					C	15.950	26.274		43.99	0.000	0.000
T7 80.00-60.00	70.00	1.24	23	289.283	A	39.962	66.474	18.574	17.45	0.000	0.000
					B	43.957	52.141		19.33	0.000	0.000
					C	51.167	26.274		23.98	0.000	0.000
T8 60.00-40.00	50.00	1.126	21	329.283	A	22.063	66.474	18.574	20.98	0.000	0.000
					B	23.267	52.141		24.63	0.000	0.000
					C	25.439	26.274		35.92	0.000	0.000
T9 40.00-20.00	30.00	1	18	374.393	A	27.392	76.698	28.798	27.67	0.000	0.000
					B	28.707	62.365		31.62	0.000	0.000
					C	31.081	36.498		42.61	0.000	0.000
T10 20.00-0.00	10.00	1	18	414.393	A	46.466	76.698	28.798	23.38	0.000	0.000
					B	49.337	62.365		25.78	0.000	0.000
					C	54.519	36.498		31.64	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.119$

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	182.50	1.63	23	0.5000	26.406	A	2.850	4.238	2.813	39.68	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
185.00-180.00						B	1.656	13.703		18.31	0.000	0.000
						C	2.850	4.238		39.68	0.000	0.000
T2	170.00	1.597	22	0.5000	106.458	A	8.984	25.231	12.917	37.75	0.000	0.000
180.00-160.00						B	5.656	55.995		20.95	0.000	0.000
						C	8.679	28.051		35.17	0.000	0.000
T3	150.00	1.541	21	0.5000	126.466	A	4.956	76.621	12.938	15.86	0.000	0.000
160.00-140.00						B	6.509	61.145		19.12	0.000	0.000
						C	9.589	30.433		32.33	0.000	0.000
T4	130.00	1.48	21	0.5000	168.344	A	9.201	92.528	16.694	16.41	0.000	0.000
140.00-120.00						B	10.838	78.742		18.64	0.000	0.000
						C	15.763	37.276		31.48	0.000	0.000
T5	110.00	1.411	20	0.5000	210.952	A	15.955	99.314	21.913	19.01	0.000	0.000
120.00-100.00						B	19.850	86.381		20.63	0.000	0.000
						C	31.863	46.499		27.96	0.000	0.000
T6 100.00-80.00	90.00	1.332	18	0.5000	250.952	A	11.405	97.708	21.913	20.08	0.000	0.000
						B	12.430	83.785		22.78	0.000	0.000
						C	15.592	40.850		38.82	0.000	0.000
T7 80.00-60.00	70.00	1.24	17	0.5000	290.952	A	33.458	104.299	21.913	15.91	0.000	0.000
						B	37.454	91.298		17.02	0.000	0.000
						C	49.773	51.204		21.70	0.000	0.000
T8 60.00-40.00	50.00	1.126	16	0.5000	330.952	A	20.103	99.848	21.913	18.27	0.000	0.000
						B	21.307	85.915		20.44	0.000	0.000
						C	25.019	42.953		32.24	0.000	0.000
T9 40.00-20.00	30.00	1	14	0.5000	376.062	A	25.252	110.911	32.137	23.60	0.000	0.000
						B	26.567	96.971		26.01	0.000	0.000
						C	30.622	53.982		37.99	0.000	0.000
T10 20.00-0.00	10.00	1	14	0.5000	416.062	A	41.792	115.887	32.137	20.38	0.000	0.000
						B	44.663	102.447		21.85	0.000	0.000
						C	53.517	61.000		28.06	0.000	0.000

Tower Pressure - Service

$G_H = 1.119$

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	182.50	1.63	10	25.990	A	2.850	1.979	1.979	40.98	0.000	0.000
185.00-180.00					B	2.101	8.292		19.04	0.000	0.000
					C	2.850	1.979		40.98	0.000	0.000
T2	170.00	1.597	10	104.792	A	9.253	14.781	9.583	39.87	0.000	0.000
180.00-160.00					B	7.195	34.833		22.80	0.000	0.000
					C	9.115	16.128		37.96	0.000	0.000
T3	150.00	1.541	10	124.798	A	6.879	50.679	9.599	16.68	0.000	0.000
160.00-140.00					B	8.156	37.302		21.12	0.000	0.000
					C	10.067	17.299		35.08	0.000	0.000
T4	130.00	1.48	9	166.675	A	11.817	61.256	13.356	18.28	0.000	0.000
140.00-120.00					B	13.435	46.817		22.17	0.000	0.000
					C	16.323	21.056		35.73	0.000	0.000
T5	110.00	1.411	9	209.283	A	22.296	66.474	18.574	20.92	0.000	0.000
120.00-100.00					B	26.192	52.141		23.71	0.000	0.000
					C	33.222	26.274		31.22	0.000	0.000
T6	90.00	1.332	9	249.283	A	13.074	66.474	18.574	23.35	0.000	0.000
100.00-80.00					B	14.099	52.141		28.04	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	15.950	26.274		43.99	0.000	0.000
T7 80.00-60.00	70.00	1.24	8	289.283	A	39.962	66.474	18.574	17.45	0.000	0.000
					B	43.957	52.141		19.33	0.000	0.000
					C	51.167	26.274		23.98	0.000	0.000
T8 60.00-40.00	50.00	1.126	7	329.283	A	22.063	66.474	18.574	20.98	0.000	0.000
					B	23.267	52.141		24.63	0.000	0.000
					C	25.439	26.274		35.92	0.000	0.000
T9 40.00-20.00	30.00	1	6	374.393	A	27.392	76.698	28.798	27.67	0.000	0.000
					B	28.707	62.365		31.62	0.000	0.000
					C	31.081	36.498		42.61	0.000	0.000
T10 20.00-0.00	10.00	1	6	414.393	A	46.466	76.698	28.798	23.38	0.000	0.000
					B	49.337	62.365		25.78	0.000	0.000
					C	54.519	36.498		31.64	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	0.05	0.14	A	0.186	2.644	0.588	1	1	4.013	0.52	104.52	B
185.00-180.00			B	0.4	2.064	0.652	1	1	7.503			
			C	0.186	2.644	0.588	1	1	4.013			
T2	0.36	0.63	A	0.229	2.501	0.597	1	1	18.075	2.04	101.94	B
180.00-160.00			B	0.401	2.062	0.652	1	1	29.908			
			C	0.241	2.465	0.6	1	1	18.785			
T3	0.85	0.94	A	0.461	1.956	0.678	1	1	41.264	2.57	128.71	A
160.00-140.00			B	0.364	2.139	0.638	1	1	31.942			
			C	0.219	2.533	0.595	1	1	20.352			
T4	0.95	1.61	A	0.438	1.993	0.668	1	1	52.737	3.22	160.93	A
140.00-120.00			B	0.361	2.145	0.637	1	1	43.241			
			C	0.224	2.517	0.596	1	1	28.865			
T5	0.95	3.87	A	0.424	2.018	0.662	1	1	66.286	3.91	195.28	A
120.00-100.00			B	0.374	2.117	0.641	1	1	59.638			
			C	0.284	2.339	0.611	1	1	49.281			
T6	0.95	1.93	A	0.319	2.246	0.622	1	1	54.417	3.37	168.50	A
100.00-80.00			B	0.266	2.391	0.606	1	1	45.697			
			C	0.169	2.701	0.585	1	1	31.311			
T7	0.95	5.59	A	0.368	2.131	0.639	1	1	82.442	4.51	225.39	A
80.00-60.00			B	0.332	2.214	0.626	1	1	76.612			
			C	0.268	2.385	0.607	1	1	67.103			
T8	0.95	3.53	A	0.269	2.382	0.607	1	1	62.404	3.46	173.23	A
60.00-40.00			B	0.229	2.502	0.597	1	1	54.381			
			C	0.157	2.746	0.583	1	1	40.746			
T9	0.95	4.04	A	0.278	2.356	0.609	1	1	74.134	3.62	180.76	A
40.00-20.00			B	0.243	2.458	0.6	1	1	66.137			
			C	0.181	2.662	0.587	1	1	52.491			
T10	0.95	6.85	A	0.297	2.303	0.615	1	1	93.639	4.46	223.21	A
20.00-0.00			B	0.27	2.38	0.607	1	1	87.196			
			C	0.22	2.532	0.595	1	1	76.221			
Sum Weight:	7.94	29.13						OTM	2621.29 kip-ft	31.68		

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	0.05	0.14	A	0.186	2.644	0.588	0.8	1	3.443	0.49	98.66	B
185.00-180.00			B	0.4	2.064	0.652	0.8	1	7.083			
			C	0.186	2.644	0.588	0.8	1	3.443			
T2	0.36	0.63	A	0.229	2.501	0.597	0.8	1	16.224	1.94	97.04	B
180.00-160.00			B	0.401	2.062	0.652	0.8	1	28.469			
			C	0.241	2.465	0.6	0.8	1	16.962			
T3	0.85	0.94	A	0.461	1.956	0.678	0.8	1	39.888	2.49	124.42	A
160.00-140.00			B	0.364	2.139	0.638	0.8	1	30.311			
			C	0.219	2.533	0.595	0.8	1	18.338			
T4	0.95	1.61	A	0.438	1.993	0.668	0.8	1	50.374	3.07	153.71	A
140.00-120.00			B	0.361	2.145	0.637	0.8	1	40.554			
			C	0.224	2.517	0.596	0.8	1	25.600			
T5	0.95	3.87	A	0.424	2.018	0.662	0.8	1	61.827	3.64	182.14	A
120.00-100.00			B	0.374	2.117	0.641	0.8	1	54.399			
			C	0.284	2.339	0.611	0.8	1	42.637			
T6	0.95	1.93	A	0.319	2.246	0.622	0.8	1	51.802	3.21	160.40	A
100.00-80.00			B	0.266	2.391	0.606	0.8	1	42.877			
			C	0.169	2.701	0.585	0.8	1	28.121			
T7	0.95	5.59	A	0.368	2.131	0.639	0.8	1	74.449	4.07	203.54	A
80.00-60.00			B	0.332	2.214	0.626	0.8	1	67.820			
			C	0.268	2.385	0.607	0.8	1	56.870			
T8	0.95	3.53	A	0.269	2.382	0.607	0.8	1	57.992	3.22	160.98	A
60.00-40.00			B	0.229	2.502	0.597	0.8	1	49.728			
			C	0.157	2.746	0.583	0.8	1	35.658			
T9	0.95	4.04	A	0.278	2.356	0.609	0.8	1	68.655	3.35	167.40	A
40.00-20.00			B	0.243	2.458	0.6	0.8	1	60.396			
			C	0.181	2.662	0.587	0.8	1	46.275			
T10	0.95	6.85	A	0.297	2.303	0.615	0.8	1	84.346	4.02	201.06	A
20.00-0.00			B	0.27	2.38	0.607	0.8	1	77.329			
			C	0.22	2.532	0.595	0.8	1	65.317			
Sum Weight:	7.94	29.13						OTM	2468.89 kip-ft	29.51		

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	0.05	0.14	A	0.186	2.644	0.588	0.85	1	3.586	0.50	100.13	B
185.00-180.00			B	0.4	2.064	0.652	0.85	1	7.188			
			C	0.186	2.644	0.588	0.85	1	3.586			
T2	0.36	0.63	A	0.229	2.501	0.597	0.85	1	16.687	1.97	98.26	B
180.00-160.00			B	0.401	2.062	0.652	0.85	1	28.829			
			C	0.241	2.465	0.6	0.85	1	17.418			
T3	0.85	0.94	A	0.461	1.956	0.678	0.85	1	40.232	2.51	125.49	A
160.00-140.00			B	0.364	2.139	0.638	0.85	1	30.719			
			C	0.219	2.533	0.595	0.85	1	18.842			
T4	0.95	1.61	A	0.438	1.993	0.668	0.85	1	50.965	3.11	155.52	A
140.00-120.00			B	0.361	2.145	0.637	0.85	1	41.226			
			C	0.224	2.517	0.596	0.85	1	26.416			
T5	0.95	3.87	A	0.424	2.018	0.662	0.85	1	62.942	3.71	185.43	A
120.00-100.00			B	0.374	2.117	0.641	0.85	1	55.709			

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	0.284	2.339	0.611	0.85	1	44.298			
T6	0.95	1.93	A	0.319	2.246	0.622	0.85	1	52.455	3.25	162.43	A
100.00-80.00			B	0.266	2.391	0.606	0.85	1	43.582			
			C	0.169	2.701	0.585	0.85	1	28.918			
T7	0.95	5.59	A	0.368	2.131	0.639	0.85	1	76.447	4.18	209.00	A
80.00-60.00			B	0.332	2.214	0.626	0.85	1	70.018			
			C	0.268	2.385	0.607	0.85	1	59.428			
T8	0.95	3.53	A	0.269	2.382	0.607	0.85	1	59.095	3.28	164.04	A
60.00-40.00			B	0.229	2.502	0.597	0.85	1	50.891			
			C	0.157	2.746	0.583	0.85	1	36.930			
T9	0.95	4.04	A	0.278	2.356	0.609	0.85	1	70.025	3.41	170.74	A
40.00-20.00			B	0.243	2.458	0.6	0.85	1	61.831			
			C	0.181	2.662	0.587	0.85	1	47.829			
T10	0.95	6.85	A	0.297	2.303	0.615	0.85	1	86.669	4.13	206.60	A
20.00-0.00			B	0.27	2.38	0.607	0.85	1	79.796			
			C	0.22	2.532	0.595	0.85	1	68.043			
Sum Weight:	7.94	29.13						OTM	2506.99 kip-ft	30.05		

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	0.16	0.27	A	0.268	2.383	0.607	1	1	5.421	0.54	108.76	B
185.00-180.00			B	0.582	1.817	0.743	1	1	11.830			
			C	0.268	2.383	0.607	1	1	5.421			
T2	0.97	1.11	A	0.321	2.241	0.623	1	1	24.695	2.13	106.30	B
180.00-160.00			B	0.579	1.818	0.741	1	1	47.151			
			C	0.345	2.183	0.631	1	1	26.371			
T3	2.25	1.45	A	0.645	1.783	0.782	1	1	64.890	2.77	138.41	A
160.00-140.00			B	0.535	1.859	0.716	1	1	50.285			
			C	0.316	2.253	0.621	1	1	28.490			
T4	2.52	2.40	A	0.604	1.801	0.756	1	1	79.175	3.28	163.78	A
140.00-120.00			B	0.532	1.862	0.714	1	1	67.093			
			C	0.315	2.257	0.621	1	1	38.897			
T5	2.52	5.35	A	0.546	1.847	0.722	1	1	87.687	3.55	177.31	A
120.00-100.00			B	0.504	1.895	0.699	1	1	80.260			
			C	0.371	2.123	0.64	1	1	61.640			
T6	2.52	2.73	A	0.435	1.999	0.666	1	1	76.519	3.16	158.15	A
100.00-80.00			B	0.383	2.098	0.645	1	1	66.469			
			C	0.225	2.515	0.596	1	1	39.931			
T7	2.52	7.64	A	0.473	1.937	0.684	1	1	104.834	3.91	195.37	A
80.00-60.00			B	0.443	1.986	0.67	1	1	98.611			
			C	0.347	2.178	0.631	1	1	82.105			
T8	2.52	4.63	A	0.362	2.143	0.637	1	1	83.706	3.14	156.79	A
60.00-40.00			B	0.324	2.234	0.624	1	1	74.878			
			C	0.205	2.578	0.592	1	1	50.426			
T9	2.52	5.43	A	0.362	2.144	0.637	1	1	95.887	3.19	159.56	A
40.00-20.00			B	0.329	2.223	0.625	1	1	87.177			
			C	0.225	2.515	0.596	1	1	62.785			
T10	2.52	9.08	A	0.379	2.107	0.643	1	1	116.336	3.81	190.26	A
20.00-0.00			B	0.354	2.163	0.634	1	1	109.590			
			C	0.275	2.364	0.609	1	1	90.644			

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:	21.04	40.09						OTM	2540.60 kip-ft	29.46		

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	0.16	0.27	A	0.268	2.383	0.607	0.8	1	4.851	0.53	105.72	B
185.00-180.00			B	0.582	1.817	0.743	0.8	1	11.499			
			C	0.268	2.383	0.607	0.8	1	4.851			
T2	0.97	1.11	A	0.321	2.241	0.623	0.8	1	22.898	2.08	103.75	B
180.00-160.00			B	0.579	1.818	0.741	0.8	1	46.019			
			C	0.345	2.183	0.631	0.8	1	24.635			
T3	2.25	1.45	A	0.645	1.783	0.782	0.8	1	63.899	2.73	136.29	A
160.00-140.00			B	0.535	1.859	0.716	0.8	1	48.984			
			C	0.316	2.253	0.621	0.8	1	26.572			
T4	2.52	2.40	A	0.604	1.801	0.756	0.8	1	77.335	3.20	159.98	A
140.00-120.00			B	0.532	1.862	0.714	0.8	1	64.925			
			C	0.315	2.257	0.621	0.8	1	35.744			
T5	2.52	5.35	A	0.546	1.847	0.722	0.8	1	84.496	3.42	170.86	A
120.00-100.00			B	0.504	1.895	0.699	0.8	1	76.290			
			C	0.371	2.123	0.64	0.8	1	55.267			
T6	2.52	2.73	A	0.435	1.999	0.666	0.8	1	74.238	3.07	153.44	A
100.00-80.00			B	0.383	2.098	0.645	0.8	1	63.983			
			C	0.225	2.515	0.596	0.8	1	36.812			
T7	2.52	7.64	A	0.473	1.937	0.684	0.8	1	98.142	3.66	182.90	A
80.00-60.00			B	0.443	1.986	0.67	0.8	1	91.120			
			C	0.347	2.178	0.631	0.8	1	72.150			
T8	2.52	4.63	A	0.362	2.143	0.637	0.8	1	79.685	2.99	149.26	A
60.00-40.00			B	0.324	2.234	0.624	0.8	1	70.617			
			C	0.205	2.578	0.592	0.8	1	45.422			
T9	2.52	5.43	A	0.362	2.144	0.637	0.8	1	90.836	3.02	151.16	A
40.00-20.00			B	0.329	2.223	0.625	0.8	1	81.864			
			C	0.225	2.515	0.596	0.8	1	56.661			
T10	2.52	9.08	A	0.379	2.107	0.643	0.8	1	107.978	3.53	176.59	A
20.00-0.00			B	0.354	2.163	0.634	0.8	1	100.657			
			C	0.275	2.364	0.609	0.8	1	79.941			
Sum Weight:	21.04	40.09						OTM	2457.46 kip-ft	28.21		

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	0.16	0.27	A	0.268	2.383	0.607	0.85	1	4.994	0.53	106.48	B
185.00-180.00			B	0.582	1.817	0.743	0.85	1	11.582			
			C	0.268	2.383	0.607	0.85	1	4.994			

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	0.97	1.11	A	0.321	2.241	0.623	0.85	1	23.347	2.09	104.39	B
180.00-160.00			B	0.579	1.818	0.741	0.85	1	46.302			
			C	0.345	2.183	0.631	0.85	1	25.069			
T3	2.25	1.45	A	0.645	1.783	0.782	0.85	1	64.147	2.74	136.82	A
160.00-140.00			B	0.535	1.859	0.716	0.85	1	49.309			
			C	0.316	2.253	0.621	0.85	1	27.052			
T4	2.52	2.40	A	0.604	1.801	0.756	0.85	1	77.795	3.22	160.93	A
140.00-120.00			B	0.532	1.862	0.714	0.85	1	65.467			
			C	0.315	2.257	0.621	0.85	1	36.532			
T5	2.52	5.35	A	0.546	1.847	0.722	0.85	1	85.294	3.45	172.47	A
120.00-100.00			B	0.504	1.895	0.699	0.85	1	77.282			
			C	0.371	2.123	0.64	0.85	1	56.860			
T6	2.52	2.73	A	0.435	1.999	0.666	0.85	1	74.808	3.09	154.62	A
100.00-80.00			B	0.383	2.098	0.645	0.85	1	64.604			
			C	0.225	2.515	0.596	0.85	1	37.592			
T7	2.52	7.64	A	0.473	1.937	0.684	0.85	1	99.815	3.72	186.02	A
80.00-60.00			B	0.443	1.986	0.67	0.85	1	92.993			
			C	0.347	2.178	0.631	0.85	1	74.639			
T8	2.52	4.63	A	0.362	2.143	0.637	0.85	1	80.690	3.02	151.14	A
60.00-40.00			B	0.324	2.234	0.624	0.85	1	71.682			
			C	0.205	2.578	0.592	0.85	1	46.673			
T9	2.52	5.43	A	0.362	2.144	0.637	0.85	1	92.099	3.07	153.26	A
40.00-20.00			B	0.329	2.223	0.625	0.85	1	83.192			
			C	0.225	2.515	0.596	0.85	1	58.192			
T10	2.52	9.08	A	0.379	2.107	0.643	0.85	1	110.067	3.60	180.01	A
20.00-0.00			B	0.354	2.163	0.634	0.85	1	102.890			
			C	0.275	2.364	0.609	0.85	1	82.616			
Sum Weight:	21.04	40.09						OTM	2478.24 kip-ft	28.53		

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	0.05	0.14	A	0.186	2.644	0.588	1	1	4.013	0.18	36.16	B
185.00-180.00			B	0.4	2.064	0.652	1	1	7.503			
			C	0.186	2.644	0.588	1	1	4.013			
T2	0.36	0.63	A	0.229	2.501	0.597	1	1	18.075	0.71	35.27	B
180.00-160.00			B	0.401	2.062	0.652	1	1	29.908			
			C	0.241	2.465	0.6	1	1	18.785			
T3	0.85	0.94	A	0.461	1.956	0.678	1	1	41.264	0.89	44.54	A
160.00-140.00			B	0.364	2.139	0.638	1	1	31.942			
			C	0.219	2.533	0.595	1	1	20.352			
T4	0.95	1.61	A	0.438	1.993	0.668	1	1	52.737	1.11	55.68	A
140.00-120.00			B	0.361	2.145	0.637	1	1	43.241			
			C	0.224	2.517	0.596	1	1	28.865			
T5	0.95	3.87	A	0.424	2.018	0.662	1	1	66.286	1.35	67.57	A
120.00-100.00			B	0.374	2.117	0.641	1	1	59.638			
			C	0.284	2.339	0.611	1	1	49.281			
T6	0.95	1.93	A	0.319	2.246	0.622	1	1	54.417	1.17	58.31	A
100.00-80.00			B	0.266	2.391	0.606	1	1	45.697			
			C	0.169	2.701	0.585	1	1	31.311			
T7	0.95	5.59	A	0.368	2.131	0.639	1	1	82.442	1.56	77.99	A
80.00-60.00			B	0.332	2.214	0.626	1	1	76.612			

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	0.268	2.385	0.607	1	1	67.103			
T8	0.95	3.53	A	0.269	2.382	0.607	1	1	62.404	1.20	59.94	A
60.00-40.00			B	0.229	2.502	0.597	1	1	54.381			
			C	0.157	2.746	0.583	1	1	40.746			
T9	0.95	4.04	A	0.278	2.356	0.609	1	1	74.134	1.25	62.55	A
40.00-20.00			B	0.243	2.458	0.6	1	1	66.137			
			C	0.181	2.662	0.587	1	1	52.491			
T10	0.95	6.85	A	0.297	2.303	0.615	1	1	93.639	1.54	77.24	A
20.00-0.00			B	0.27	2.38	0.607	1	1	87.196			
			C	0.22	2.532	0.595	1	1	76.221			
Sum Weight:	7.94	29.13						OTM	907.02 kip-ft	10.96		

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 ft²	F K	w plf	Ctrl. Face
T1	0.05	0.14	A	0.186	2.644	0.588	0.8	1	3.443	0.17	34.14	B
185.00-180.00			B	0.4	2.064	0.652	0.8	1	7.083			
			C	0.186	2.644	0.588	0.8	1	3.443			
T2	0.36	0.63	A	0.229	2.501	0.597	0.8	1	16.224	0.67	33.58	B
180.00-160.00			B	0.401	2.062	0.652	0.8	1	28.469			
			C	0.241	2.465	0.6	0.8	1	16.962			
T3	0.85	0.94	A	0.461	1.956	0.678	0.8	1	39.888	0.86	43.05	A
160.00-140.00			B	0.364	2.139	0.638	0.8	1	30.311			
			C	0.219	2.533	0.595	0.8	1	18.338			
T4	0.95	1.61	A	0.438	1.993	0.668	0.8	1	50.374	1.06	53.19	A
140.00-120.00			B	0.361	2.145	0.637	0.8	1	40.554			
			C	0.224	2.517	0.596	0.8	1	25.600			
T5	0.95	3.87	A	0.424	2.018	0.662	0.8	1	61.827	1.26	63.03	A
120.00-100.00			B	0.374	2.117	0.641	0.8	1	54.399			
			C	0.284	2.339	0.611	0.8	1	42.637			
T6	0.95	1.93	A	0.319	2.246	0.622	0.8	1	51.802	1.11	55.50	A
100.00-80.00			B	0.266	2.391	0.606	0.8	1	42.877			
			C	0.169	2.701	0.585	0.8	1	28.121			
T7	0.95	5.59	A	0.368	2.131	0.639	0.8	1	74.449	1.41	70.43	A
80.00-60.00			B	0.332	2.214	0.626	0.8	1	67.820			
			C	0.268	2.385	0.607	0.8	1	56.870			
T8	0.95	3.53	A	0.269	2.382	0.607	0.8	1	57.992	1.11	55.70	A
60.00-40.00			B	0.229	2.502	0.597	0.8	1	49.728			
			C	0.157	2.746	0.583	0.8	1	35.658			
T9	0.95	4.04	A	0.278	2.356	0.609	0.8	1	68.655	1.16	57.92	A
40.00-20.00			B	0.243	2.458	0.6	0.8	1	60.396			
			C	0.181	2.662	0.587	0.8	1	46.275			
T10	0.95	6.85	A	0.297	2.303	0.615	0.8	1	84.346	1.39	69.57	A
20.00-0.00			B	0.27	2.38	0.607	0.8	1	77.329			
			C	0.22	2.532	0.595	0.8	1	65.317			
Sum Weight:	7.94	29.13						OTM	854.29 kip-ft	10.21		

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	0.05	0.14	A	0.186	2.644	0.588	0.85	1	3.586	0.17	34.65	B
185.00-180.00			B	0.4	2.064	0.652	0.85	1	7.188			
			C	0.186	2.644	0.588	0.85	1	3.586			
T2	0.36	0.63	A	0.229	2.501	0.597	0.85	1	16.687	0.68	34.00	B
180.00-160.00			B	0.401	2.062	0.652	0.85	1	28.829			
			C	0.241	2.465	0.6	0.85	1	17.418			
T3	0.85	0.94	A	0.461	1.956	0.678	0.85	1	40.232	0.87	43.42	A
160.00-140.00			B	0.364	2.139	0.638	0.85	1	30.719			
			C	0.219	2.533	0.595	0.85	1	18.842			
T4	0.95	1.61	A	0.438	1.993	0.668	0.85	1	50.965	1.08	53.81	A
140.00-120.00			B	0.361	2.145	0.637	0.85	1	41.226			
			C	0.224	2.517	0.596	0.85	1	26.416			
T5	0.95	3.87	A	0.424	2.018	0.662	0.85	1	62.942	1.28	64.16	A
120.00-100.00			B	0.374	2.117	0.641	0.85	1	55.709			
			C	0.284	2.339	0.611	0.85	1	44.298			
T6	0.95	1.93	A	0.319	2.246	0.622	0.85	1	52.455	1.12	56.20	A
100.00-80.00			B	0.266	2.391	0.606	0.85	1	43.582			
			C	0.169	2.701	0.585	0.85	1	28.918			
T7	0.95	5.59	A	0.368	2.131	0.639	0.85	1	76.447	1.45	72.32	A
80.00-60.00			B	0.332	2.214	0.626	0.85	1	70.018			
			C	0.268	2.385	0.607	0.85	1	59.428			
T8	0.95	3.53	A	0.269	2.382	0.607	0.85	1	59.095	1.14	56.76	A
60.00-40.00			B	0.229	2.502	0.597	0.85	1	50.891			
			C	0.157	2.746	0.583	0.85	1	36.930			
T9	0.95	4.04	A	0.278	2.356	0.609	0.85	1	70.025	1.18	59.08	A
40.00-20.00			B	0.243	2.458	0.6	0.85	1	61.831			
			C	0.181	2.662	0.587	0.85	1	47.829			
T10	0.95	6.85	A	0.297	2.303	0.615	0.85	1	86.669	1.43	71.49	A
20.00-0.00			B	0.27	2.38	0.607	0.85	1	79.796			
			C	0.22	2.532	0.595	0.85	1	68.043			
Sum Weight:	7.94	29.13						OTM	867.47 kip-ft	10.40		

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	9.73					
Bracing Weight	19.40					
Total Member Self-Weight	29.13			-16.80	3.65	
Total Weight	45.01			-16.80	3.65	
Wind 0 deg - No Ice		-0.03	-45.57	-4932.06	5.06	0.21
Wind 30 deg - No Ice		22.02	-38.04	-4174.52	-2405.80	-8.51
Wind 60 deg - No Ice		37.60	-21.75	-2407.56	-4124.58	-14.54
Wind 90 deg - No Ice		43.91	-0.09	-32.37	-4793.90	-17.08
Wind 120 deg - No Ice		39.41	22.70	2426.92	-4244.24	-15.82
Wind 150 deg - No Ice		21.88	37.98	4130.55	-2381.64	-8.85
Wind 180 deg - No Ice		-0.08	43.35	4740.54	17.62	-0.15
Wind 210 deg - No Ice		-22.02	38.04	4141.09	2412.82	8.51
Wind 240 deg - No Ice		-39.57	22.76	2439.62	4276.34	15.60
Wind 270 deg - No Ice		-43.96	0.02	-11.43	4807.48	17.38

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
Wind 300 deg - No Ice		-37.57	-21.64	-2387.67	4125.36	14.69
Wind 330 deg - No Ice		-21.96	-37.99	-4164.48	2400.92	8.56
Member Ice	10.96					
Total Weight Ice	72.69			-43.72	3.73	
Wind 0 deg - Ice		-0.03	-42.43	-4726.34	5.59	1.55
Wind 30 deg - Ice		20.78	-35.92	-4044.60	-2313.11	-7.05
Wind 60 deg - Ice		35.67	-20.63	-2350.44	-3982.05	-13.45
Wind 90 deg - Ice		41.47	-0.07	-55.69	-4613.80	-16.49
Wind 120 deg - Ice		36.70	21.15	2286.88	-4044.72	-15.65
Wind 150 deg - Ice		20.67	35.88	3949.42	-2294.66	-9.68
Wind 180 deg - Ice		-0.06	41.14	4551.26	14.40	-1.48
Wind 210 deg - Ice		-20.78	35.92	3957.30	2320.36	7.05
Wind 240 deg - Ice		-36.83	21.19	2295.98	4071.68	14.10
Wind 270 deg - Ice		-41.51	0.01	-40.06	4626.39	16.73
Wind 300 deg - Ice		-35.65	-20.54	-2335.47	3984.91	14.93
Wind 330 deg - Ice		-20.74	-35.88	-4037.14	2311.89	9.44
Total Weight	45.01			-16.80	3.65	
Wind 0 deg - Service		-0.01	-15.77	-1701.23	1.66	0.07
Wind 30 deg - Service		7.62	-13.16	-1439.10	-832.55	-2.95
Wind 60 deg - Service		13.01	-7.53	-827.70	-1427.28	-5.03
Wind 90 deg - Service		15.20	-0.03	-5.83	-1658.88	-5.91
Wind 120 deg - Service		13.64	7.85	845.14	-1468.69	-5.47
Wind 150 deg - Service		7.57	13.14	1434.63	-824.19	-3.06
Wind 180 deg - Service		-0.03	15.00	1645.70	6.01	-0.05
Wind 210 deg - Service		-7.62	13.16	1438.27	834.80	2.95
Wind 240 deg - Service		-13.69	7.88	849.53	1479.61	5.40
Wind 270 deg - Service		-15.21	0.01	1.42	1663.40	6.01
Wind 300 deg - Service		-13.00	-7.49	-820.81	1427.37	5.08
Wind 330 deg - Service		-7.60	-13.14	-1435.63	830.68	2.96

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp

Comb. No.	Description
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	185 - 180	Leg	Max Tension	4	2.47	-0.38	0.22
			Max. Compression	19	-4.07	-0.42	-0.25
			Max. Mx	18	-3.65	-0.42	-0.11
			Max. My	15	-4.05	0.01	0.49
			Max. Vy	23	-1.20	0.42	-0.24
			Max. Vx	15	-1.39	0.01	0.49
		Diagonal	Max Tension	16	1.22	0.00	0.00
			Max. Compression	16	-1.33	0.00	0.00
			Max. Mx	15	-0.21	0.01	0.00
			Max. My	16	-1.31	0.00	0.00
			Max. Vy	15	0.01	0.01	0.00
			Max. Vx	17	0.00	0.00	0.00
		Top Girt	Max Tension	23	0.69	0.00	0.00
			Max. Compression	4	-0.64	0.00	0.00
			Max. Mx	14	0.03	-0.01	0.00
			Max. My	24	0.05	0.00	0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
T2	180 - 160	Leg	Max Tension	4	26.55	-0.32	0.18
			Max. Compression	19	-30.92	-0.18	-0.12
			Max. Mx	11	-1.36	-0.74	-0.01
			Max. My	8	-3.88	0.01	0.72
			Max. Vy	5	-1.33	-0.36	0.01
			Max. Vx	2	1.36	-0.02	0.36
		Diagonal	Max Tension	4	5.21	0.00	0.00
			Max. Compression	10	-5.38	0.00	0.00
			Max. Mx	19	3.61	0.03	0.00
			Max. My	13	-3.12	-0.00	-0.01
			Max. Vy	19	-0.01	0.03	0.00
			Max. Vx	13	0.00	-0.00	-0.01
		Top Girt	Max Tension	4	0.07	0.00	0.00
			Max. Compression	10	-0.02	0.00	0.00
			Max. Mx	14	0.02	-0.01	0.00
			Max. My	24	0.02	0.00	0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
T3	160 - 140	Leg	Max Tension	4	68.18	-0.10	0.05

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	15	-75.88	0.31	0.12
			Max. Mx	21	63.00	-0.37	-0.14
			Max. My	11	-3.45	-0.01	-0.56
			Max. Vy	8	-1.03	-0.30	-0.06
			Max. Vx	11	-1.07	-0.02	-0.36
		Diagonal	Max Tension	9	5.17	0.00	0.00
			Max. Compression	9	-5.26	0.00	0.00
			Max. Mx	15	4.09	0.02	-0.00
			Max. My	17	-4.42	-0.00	0.01
			Max. Vy	15	-0.01	0.02	-0.00
			Max. Vx	17	-0.00	0.00	0.00
		Top Girt	Max Tension	4	0.75	0.00	0.00
			Max. Compression	10	-0.76	0.00	0.00
			Max. Mx	15	-0.69	-0.01	0.00
			Max. My	17	-0.36	0.00	0.00
			Max. Vy	15	0.01	0.00	0.00
			Max. Vx	17	-0.00	0.00	0.00
T4	140 - 120	Leg	Max Tension	4	103.69	0.06	0.01
			Max. Compression	15	-113.85	-1.50	-0.00
			Max. Mx	15	-113.85	-1.50	-0.00
			Max. My	11	-4.33	-0.10	-1.18
			Max. Vy	15	0.93	0.87	-0.00
			Max. Vx	11	0.70	-0.10	-1.18
		Diagonal	Max Tension	9	5.45	0.00	0.00
			Max. Compression	9	-5.57	0.00	0.00
			Max. Mx	17	4.02	0.03	0.00
			Max. My	17	-4.33	0.00	0.01
			Max. Vy	17	0.02	0.03	0.00
			Max. Vx	17	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	15	1.97	0.00	0.00
			Max. Compression	15	-1.97	0.00	0.00
			Max. Mx	14	0.12	-0.05	0.00
			Max. My	24	1.70	0.00	0.00
			Max. Vy	14	-0.02	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
T5	120 - 100	Leg	Max Tension	4	130.18	1.40	-0.00
			Max. Compression	15	-144.55	3.07	-0.03
			Max. Mx	15	-142.53	5.30	0.03
			Max. My	11	-4.65	-0.30	-1.58
			Max. Vy	15	-6.11	5.26	0.04
			Max. Vx	11	1.29	-0.30	-1.58
		Diagonal	Max Tension	4	7.79	0.04	-0.00
			Max. Compression	10	-8.48	0.00	0.00
			Max. Mx	23	1.97	0.10	0.00
			Max. My	16	0.93	-0.05	-0.00
			Max. Vy	23	-0.04	0.10	0.00
			Max. Vx	16	0.00	0.00	0.00
		Horizontal	Max Tension	15	2.51	0.00	0.00
			Max. Compression	15	-2.51	0.02	0.01
			Max. Mx	15	-0.71	0.03	0.02
			Max. My	24	-0.69	0.03	0.02
			Max. Vy	15	-0.03	0.03	0.02
			Max. Vx	24	-0.00	0.00	0.00
		Redund Horz 1 Bracing	Max Tension	23	5.96	0.00	0.00
			Max. Compression	4	-5.46	0.00	0.00
			Max. Mx	14	0.33	-0.01	0.00
			Max. My	17	2.96	0.00	0.00
			Max. Vy	14	0.02	0.00	0.00
			Max. Vx	17	-0.00	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
		Redund Diag 1 Bracing	Max Tension	4	3.39	0.00	0.00
			Max. Compression	23	-3.79	0.00	0.00
			Max. Mx	16	2.71	-0.01	0.00
			Max. My	23	1.41	0.00	0.00
			Max. Vy	16	0.02	0.00	0.00
			Max. Vx	23	-0.00	0.00	0.00
T6	100 - 80	Leg	Max Tension	4	158.00	-0.85	0.02
			Max. Compression	15	-175.46	-0.85	-0.00
			Max. Mx	15	-156.15	-1.04	0.00
			Max. My	11	-6.32	-0.15	-1.24
			Max. Vy	23	-0.33	0.93	-0.00
			Max. Vx	11	-0.19	-0.15	-1.24
		Diagonal	Max Tension	9	5.74	0.00	0.00
			Max. Compression	9	-5.92	0.00	0.00
			Max. Mx	15	4.49	0.06	0.00
			Max. My	17	-4.88	0.01	0.01
			Max. Vy	17	0.03	0.05	0.01
			Max. Vx	17	-0.00	0.00	0.00
T7	80 - 60	Leg	Max Tension	4	180.61	0.86	-0.00
			Max. Compression	15	-203.46	2.29	-0.01
			Max. Mx	10	-200.31	4.93	-0.12
			Max. My	11	-9.32	-0.22	-2.24
			Max. Vy	15	-5.40	4.77	0.01
			Max. Vx	11	1.69	-0.22	-2.24
		Diagonal	Max Tension	4	7.28	0.03	-0.00
			Max. Compression	10	-8.14	0.00	0.00
			Max. Mx	23	2.97	0.12	0.00
			Max. My	17	-4.50	-0.07	0.01
			Max. Vy	23	-0.04	0.12	0.00
			Max. Vx	24	0.00	0.00	0.00
		Horizontal	Max Tension	15	3.53	0.00	0.00
			Max. Compression	15	-3.53	0.05	0.03
			Max. Mx	23	-0.83	0.07	0.03
			Max. My	24	-0.83	0.06	0.04
			Max. Vy	15	-0.04	0.06	0.04
			Max. Vx	24	-0.01	0.00	0.00
		Redund Horz 1 Bracing	Max Tension	23	5.19	0.00	0.00
			Max. Compression	4	-4.70	0.00	0.00
			Max. Mx	14	0.29	-0.02	0.00
			Max. My	25	2.79	0.00	0.00
			Max. Vy	14	0.02	0.00	0.00
			Max. Vx	25	-0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	4	2.65	0.00	0.00
			Max. Compression	23	-3.10	0.00	0.00
			Max. Mx	16	2.26	-0.02	0.00
			Max. My	23	0.92	0.00	0.00
			Max. Vy	16	0.02	0.00	0.00
			Max. Vx	23	0.00	0.00	0.00
T8	60 - 40	Leg	Max Tension	4	202.27	0.81	0.03
			Max. Compression	15	-228.78	-1.98	-0.01
			Max. Mx	15	-228.40	2.63	0.01
			Max. My	11	-10.96	-0.13	-2.49
			Max. Vy	15	0.91	2.63	0.01
			Max. Vx	11	0.73	-0.13	-2.49
		Diagonal	Max Tension	9	6.94	0.00	0.00
			Max. Compression	10	-7.25	0.00	0.00
			Max. Mx	17	5.29	0.12	0.01
			Max. My	23	-7.14	0.03	-0.02

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	17	0.04	0.11	0.01
			Max. Vx	17	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	15	3.97	0.00	0.00
			Max. Compression	15	-3.97	0.00	0.00
			Max. Mx	14	0.34	-0.37	0.00
			Max. My	24	3.40	0.00	0.01
			Max. Vy	14	0.09	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
T9	40 - 20	Leg	Max Tension	4	223.50	0.34	0.05
			Max. Compression	15	-254.11	-7.41	-0.01
			Max. Mx	15	-254.11	-7.41	-0.01
			Max. My	11	-11.82	-0.46	-5.01
			Max. Vy	15	2.38	4.69	0.01
			Max. Vx	11	-1.52	-0.46	-5.01
		Diagonal	Max Tension	25	7.75	0.00	0.00
			Max. Compression	10	-8.45	0.00	0.00
			Max. Mx	15	4.36	0.18	0.01
			Max. My	19	-7.55	0.05	0.02
			Max. Vy	17	0.06	0.18	0.01
			Max. Vx	25	0.00	0.00	0.00
		Secondary Horizontal	Max Tension	15	4.41	0.00	0.00
			Max. Compression	15	-4.41	0.00	0.00
			Max. Mx	14	0.56	-0.52	0.00
			Max. My	24	3.78	0.00	0.01
			Max. Vy	14	0.11	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
T10	20 - 0	Leg	Max Tension	4	242.60	1.38	-0.01
			Max. Compression	15	-280.93	6.36	0.02
			Max. Mx	17	217.53	12.48	0.06
			Max. My	11	-13.72	-0.97	-4.57
			Max. Vy	2	-8.11	10.05	-0.00
			Max. Vx	11	2.13	-0.97	-4.57
		Diagonal	Max Tension	25	10.64	0.07	0.01
			Max. Compression	19	-11.22	0.00	0.00
			Max. Mx	23	4.56	0.18	0.01
			Max. My	25	-4.66	-0.10	-0.01
			Max. Vy	23	-0.06	0.18	0.01
			Max. Vx	25	0.00	0.00	0.00
		Horizontal	Max Tension	15	4.87	0.00	0.00
			Max. Compression	15	-4.87	0.09	0.06
			Max. Mx	15	-2.14	0.25	0.08
			Max. My	25	-1.63	0.24	0.09
			Max. Vy	15	-0.09	0.25	0.08
			Max. Vx	25	-0.01	0.00	0.00
		Redund Horz 1 Bracing	Max Tension	10	7.41	0.00	0.00
			Max. Compression	25	-6.93	0.00	0.00
			Max. Mx	25	2.87	-0.04	0.00
			Max. My	24	4.93	0.00	0.00
			Max. Vy	25	0.03	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	25	3.84	0.00	0.00
			Max. Compression	10	-4.39	0.00	0.00
			Max. Mx	26	3.39	-0.05	0.00
			Max. My	23	1.95	0.00	0.00
			Max. Vy	26	0.03	0.00	0.00
			Max. Vx	23	-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	10	287.26	25.78	-15.39
	Max. H_x	10	287.26	25.78	-15.39
	Max. H_z	17	-232.37	-24.41	14.48
	Min. Vert	4	-249.11	-22.26	13.30
	Min. H_x	17	-232.37	-24.41	14.48
	Min. H_z	10	287.26	25.78	-15.39
Leg B	Max. Vert	6	285.37	-25.67	-15.33
	Max. H_x	25	-232.09	24.36	14.50
	Max. H_z	25	-232.09	24.36	14.50
	Min. Vert	12	-248.60	22.21	13.29
	Min. H_x	6	285.37	-25.67	-15.33
	Min. H_z	6	285.37	-25.67	-15.33
Leg A	Max. Vert	2	287.75	0.00	29.99
	Max. H_x	11	15.64	2.15	1.42
	Max. H_z	2	287.75	0.00	29.99
	Min. Vert	8	-247.16	-0.01	-25.85
	Min. H_x	5	16.80	-2.15	1.51
	Min. H_z	21	-228.35	-0.05	-28.26

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	45.01	0.00	0.00	-16.80	3.65	-0.00
Dead+Wind 0 deg - No Ice	45.01	-0.03	-45.57	-4960.24	5.08	0.18
Dead+Wind 30 deg - No Ice	45.01	22.02	-38.04	-4198.56	-2419.62	-8.59
Dead+Wind 60 deg - No Ice	45.01	37.60	-21.75	-2421.52	-4148.35	-14.66
Dead+Wind 90 deg - No Ice	45.01	43.91	-0.09	-32.65	-4821.49	-17.21
Dead+Wind 120 deg - No Ice	45.01	39.41	22.70	2440.74	-4268.53	-15.91
Dead+Wind 150 deg - No Ice	45.01	21.88	37.98	4154.32	-2395.34	-8.87
Dead+Wind 180 deg - No Ice	45.01	-0.08	43.35	4767.90	17.76	-0.12
Dead+Wind 210 deg - No Ice	45.01	-22.02	38.04	4164.91	2426.77	8.59
Dead+Wind 240 deg - No Ice	45.01	-39.57	22.76	2453.52	4300.84	15.73
Dead+Wind 270 deg - No Ice	45.01	-43.96	0.02	-11.55	4835.15	17.51
Dead+Wind 300 deg - No Ice	45.01	-37.57	-21.64	-2401.46	4149.12	14.79
Dead+Wind 330 deg - No Ice	45.01	-21.96	-37.99	-4188.43	2414.71	8.58
Dead+Ice+Temp	72.69	0.00	0.00	-43.99	3.76	-0.00
Dead+Wind 0 deg+Ice+Temp	72.69	-0.03	-42.43	-4769.95	5.63	1.52
Dead+Wind 30 deg+Ice+Temp	72.69	20.78	-35.92	-4082.06	-2334.53	-7.21
Dead+Wind 60 deg+Ice+Temp	72.69	35.67	-20.63	-2372.29	-4018.99	-13.74
Dead+Wind 90 deg+Ice+Temp	72.69	41.47	-0.07	-56.27	-4656.56	-16.81
Dead+Wind 120 deg+Ice+Temp	72.69	36.70	21.15	2307.97	-4082.13	-15.90
Dead+Wind 150 deg+Ice+Temp	72.69	20.67	35.88	3986.06	-2315.92	-9.79
Dead+Wind 180 deg+Ice+Temp	72.69	-0.06	41.14	4593.56	14.58	-1.45
Dead+Wind 210 deg+Ice+Temp	72.69	-20.78	35.92	3994.02	2341.92	7.22
Dead+Wind 240 deg+Ice+Temp	72.69	-36.83	21.19	2317.19	4109.37	14.38
Dead+Wind 270 deg+Ice+Temp	72.69	-41.51	0.01	-40.44	4669.27	17.05
Dead+Wind 300 deg+Ice+Temp	72.69	-35.65	-20.54	-2357.12	4021.86	15.19
Dead+Wind 330 deg+Ice+Temp	72.69	-20.74	-35.88	-4074.49	2333.28	9.55
Dead+Wind 0 deg - Service	45.01	-0.01	-15.77	-1727.47	4.16	0.06

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 30 deg - Service	45.01	7.62	-13.16	-1463.91	-834.87	-2.98
Dead+Wind 60 deg - Service	45.01	13.01	-7.53	-848.97	-1433.10	-5.08
Dead+Wind 90 deg - Service	45.01	15.20	-0.03	-22.31	-1666.02	-5.95
Dead+Wind 120 deg - Service	45.01	13.64	7.85	833.55	-1474.66	-5.50
Dead+Wind 150 deg - Service	45.01	7.57	13.14	1426.49	-826.48	-3.08
Dead+Wind 180 deg - Service	45.01	-0.03	15.00	1638.84	8.54	-0.04
Dead+Wind 210 deg - Service	45.01	-7.62	13.16	1430.16	842.15	2.98
Dead+Wind 240 deg - Service	45.01	-13.69	7.88	837.98	1490.64	5.44
Dead+Wind 270 deg - Service	45.01	-15.21	0.01	-15.01	1675.55	6.06
Dead+Wind 300 deg - Service	45.01	-13.00	-7.49	-842.03	1438.16	5.12
Dead+Wind 330 deg - Service	45.01	-7.60	-13.14	-1460.41	837.96	2.97

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-45.01	0.00	0.00	45.01	0.00	0.000%
2	-0.03	-45.01	-45.57	0.03	45.01	45.57	0.000%
3	22.02	-45.01	-38.04	-22.02	45.01	38.04	0.000%
4	37.60	-45.01	-21.75	-37.60	45.01	21.75	0.000%
5	43.91	-45.01	-0.09	-43.91	45.01	0.09	0.000%
6	39.41	-45.01	22.70	-39.41	45.01	-22.70	0.000%
7	21.88	-45.01	37.98	-21.88	45.01	-37.98	0.000%
8	-0.08	-45.01	43.35	0.08	45.01	-43.35	0.000%
9	-22.02	-45.01	38.04	22.02	45.01	-38.04	0.000%
10	-39.57	-45.01	22.76	39.57	45.01	-22.76	0.000%
11	-43.96	-45.01	0.02	43.96	45.01	-0.02	0.000%
12	-37.57	-45.01	-21.64	37.57	45.01	21.64	0.000%
13	-21.96	-45.01	-37.99	21.96	45.01	37.99	0.000%
14	0.00	-72.69	0.00	-0.00	72.69	-0.00	0.000%
15	-0.03	-72.69	-42.43	0.03	72.69	42.43	0.000%
16	20.78	-72.69	-35.92	-20.78	72.69	35.92	0.000%
17	35.67	-72.69	-20.63	-35.67	72.69	20.63	0.000%
18	41.47	-72.69	-0.07	-41.47	72.69	0.07	0.000%
19	36.70	-72.69	21.15	-36.70	72.69	-21.15	0.000%
20	20.67	-72.69	35.88	-20.67	72.69	-35.88	0.000%
21	-0.06	-72.69	41.14	0.06	72.69	-41.14	0.000%
22	-20.78	-72.69	35.92	20.78	72.69	-35.92	0.000%
23	-36.83	-72.69	21.19	36.83	72.69	-21.19	0.000%
24	-41.51	-72.69	0.01	41.51	72.69	-0.01	0.000%
25	-35.65	-72.69	-20.54	35.65	72.69	20.54	0.000%
26	-20.74	-72.69	-35.88	20.74	72.69	35.88	0.000%
27	-0.01	-45.01	-15.77	0.01	45.01	15.77	0.000%
28	7.62	-45.01	-13.16	-7.62	45.01	13.16	0.000%
29	13.01	-45.01	-7.53	-13.01	45.01	7.53	0.000%
30	15.20	-45.01	-0.03	-15.20	45.01	0.03	0.000%
31	13.64	-45.01	7.85	-13.64	45.01	-7.85	0.000%
32	7.57	-45.01	13.14	-7.57	45.01	-13.14	0.000%
33	-0.03	-45.01	15.00	0.03	45.01	-15.00	0.000%
34	-7.62	-45.01	13.16	7.62	45.01	-13.16	0.000%
35	-13.69	-45.01	7.88	13.69	45.01	-7.88	0.000%
36	-15.21	-45.01	0.01	15.21	45.01	-0.01	0.000%
37	-13.00	-45.01	-7.49	13.00	45.01	7.49	0.000%
38	-7.60	-45.01	-13.14	7.60	45.01	13.14	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	0.00000069
4	Yes	4	0.00000001	0.00000059
5	Yes	4	0.00000001	0.00000098
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000075
8	Yes	4	0.00000001	0.00000054
9	Yes	4	0.00000001	0.00000068
10	Yes	4	0.00000001	0.00000046
11	Yes	4	0.00000001	0.00000099
12	Yes	4	0.00000001	0.00000056
13	Yes	4	0.00000001	0.00000076
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000209
16	Yes	4	0.00000001	0.00000217
17	Yes	4	0.00000001	0.00000228
18	Yes	4	0.00000001	0.00000245
19	Yes	4	0.00000001	0.00000216
20	Yes	4	0.00000001	0.00000222
21	Yes	4	0.00000001	0.00000225
22	Yes	4	0.00000001	0.00000221
23	Yes	4	0.00000001	0.00000218
24	Yes	4	0.00000001	0.00000246
25	Yes	4	0.00000001	0.00000226
26	Yes	4	0.00000001	0.00000222
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
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

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	185 - 180	9.210	27	0.4920	0.0277
T2	180 - 160	8.684	27	0.4898	0.0274
T3	160 - 140	6.663	27	0.4423	0.0286
T4	140 - 120	4.891	27	0.3716	0.0235
T5	120 - 100	3.445	27	0.2967	0.0164
T6	100 - 80	2.319	27	0.2236	0.0127
T7	80 - 60	1.454	27	0.1700	0.0087
T8	60 - 40	0.817	27	0.1164	0.0058
T9	40 - 20	0.380	27	0.0777	0.0036

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T10	20 - 0	0.110	27	0.0385	0.0017

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
191.00	10' x 3" Dia Omni	27	9.210	0.4920	0.0277	59913
189.00	10' Dipole	27	9.210	0.4920	0.0277	59913
185.00	APX16DWV-16DWVS-C-A20	27	9.210	0.4920	0.0277	59913
177.00	APXVSPP18-C-A20	27	8.371	0.4864	0.0275	42212
164.50	DB846F65ZAXY	27	7.101	0.4567	0.0285	21025
154.50	(2) 7770.00	27	6.146	0.4236	0.0279	16672
152.00	(2) 7' Whip	27	5.918	0.4149	0.0274	16202
141.50	(2) 10' Dipole	27	5.014	0.3771	0.0241	14531
138.00	3-ft dish	27	4.732	0.3643	0.0228	14312

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	185 - 180	26.456	2	1.4134	0.0827
T2	180 - 160	24.946	2	1.4072	0.0818
T3	160 - 140	19.139	2	1.2700	0.0826
T4	140 - 120	14.052	2	1.0670	0.0680
T5	120 - 100	9.897	2	0.8520	0.0480
T6	100 - 80	6.662	2	0.6419	0.0369
T7	80 - 60	4.180	2	0.4882	0.0253
T8	60 - 40	2.349	2	0.3343	0.0167
T9	40 - 20	1.094	2	0.2230	0.0103
T10	20 - 0	0.316	10	0.1106	0.0049

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
191.00	10' x 3" Dia Omni	2	26.456	1.4134	0.0827	19921
189.00	10' Dipole	2	26.456	1.4134	0.0827	19921
185.00	APX16DWV-16DWVS-C-A20	2	26.456	1.4134	0.0827	19921
177.00	APXVSPP18-C-A20	2	24.046	1.3975	0.0816	14220
164.50	DB846F65ZAXY	2	20.396	1.3117	0.0825	7296
154.50	(2) 7770.00	2	17.654	1.2164	0.0808	5795
152.00	(2) 7' Whip	2	17.000	1.1913	0.0793	5634
141.50	(2) 10' Dipole	2	14.402	1.0828	0.0697	5059
138.00	3-ft dish	2	13.593	1.0459	0.0658	4983

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	185	Leg	A325N	0.7500	6	0.41	19.43	0.021 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	1.22	4.08	0.299 ✔	1.333	Member Bearing
		Top Girt	A325N	0.6250	1	0.69	4.08	0.169 ✔	1.333	Member Bearing
T2	180	Leg	A325N	0.7500	6	4.43	19.43	0.228 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	5.21	4.08	1.277 ✔	1.333	Member Bearing
		Top Girt	A325N	0.6250	1	0.07	4.08	0.017 ✔	1.333	Member Bearing
T3	160	Leg	A325N	1.0000	6	11.36	34.56	0.329 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	5.17	4.08	1.268 ✔	1.333	Member Bearing
		Top Girt	A325N	0.6250	1	0.75	4.08	0.185 ✔	1.333	Member Bearing
T4	140	Leg	A325N	1.0000	6	17.26	34.56	0.500 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	5.45	6.12	0.891 ✔	1.333	Member Bearing
T5	120	Leg	A325N	1.0000	6	21.65	34.55	0.627 ✔	1.333	Bolt Tension
		Diagonal	A325X	0.6250	1	7.79	6.12	1.273 ✔	1.333	Member Bearing
T6	100	Leg	A325N	1.0000	6	26.33	34.56	0.762 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	5.74	6.12	0.938 ✔	1.333	Member Bearing
T7	80	Leg	A325N	1.0000	6	30.06	34.55	0.870 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	7.28	6.80	1.071 ✔	1.333	Member Bearing
T8	60	Leg	A325N	1.2500	6	33.66	54.00	0.623 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	7.25	9.28	0.781 ✔	1.333	Bolt Shear
T9	40	Leg	A325N	1.2500	6	37.18	53.99	0.689 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	8.45	9.28	0.910 ✔	1.333	Bolt Shear
T10	20	Leg	A449	1.5000	6	40.38	61.23	0.659 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.7500	1	11.22	9.28	1.210 ✔	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	185 - 180	HSS2.375x.154	5.00	4.00	60.7 K=1.00	22.597	1.0027	-4.07	22.66	0.180 ✔
T2	180 - 160	HSS2.875x.203	20.00	5.00	63.0 K=1.00	22.194	1.5948	-30.92	35.40	0.873

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	160 - 140	P2.875x.375	20.03	5.01	67.2 K=1.00	21.443	2.9452	-75.88	63.15	1.201 ✔
T4	140 - 120	P4x.318	20.03	2.59	23.8 K=1.00	27.886	3.6784	-113.85	102.58	1.110 ✔
T5	120 - 100	HSS5.563x.258	20.03	1.67	10.6 K=1.00	29.201	4.0294	-144.55	117.66	1.228 ✔
T6	100 - 80	HSS5.563x.375	20.03	6.68	43.4 K=1.00	25.350	5.7167	-175.46	144.92	1.211 ✔
T7	80 - 60	HSS5.563x.375	20.03	1.67	10.8 K=1.00	29.183	5.7167	-203.46	166.83	1.220 ✔
T8	60 - 40	P5.563x0.5	20.03	5.17	34.5 K=1.00	26.580	7.9529	-228.78	211.39	1.082 ✔
T9	40 - 20	HSS8.625x.322	20.03	5.15	21.0 K=1.00	28.194	7.8461	-254.10	221.22	1.149 ✔
T10	20 - 0	HSS8.625x.322	20.03	2.50	10.2 K=1.00	29.238	7.8461	-280.93	229.41	1.225 ✔

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 $\frac{P}{P_a}$
T1	185 - 180	L2x2x1/8	6.40	2.94	96.5 K=1.09	13.153	0.4844	-1.33	6.37	0.208 ✔
T2	180 - 160	L2x2x1/8	7.07	3.23	103.1 K=1.06	12.369	0.4844	-5.38	5.99	0.897 ✔
T3	160 - 140	L2x2x1/8	8.40	4.07	122.9 K=1.00	9.822	0.4844	-5.07	4.76	1.066 ✔
T4	140 - 120	L2x2x3/16	10.08	4.86	147.9 K=1.00	6.827	0.7150	-5.29	4.88	1.084 ✔
T5	120 - 100	L2 1/2x2 1/2x3/16	6.15	5.61	103.2 K=1.19	12.563	0.9020	-8.47	11.33	0.748 ✔
T6	100 - 80	L2 1/2x2 1/2x3/16	14.32	6.95	168.5 K=1.00	5.263	0.9020	-5.92	4.75	1.248 ✔
T7	80 - 60	L3x3x3/16	7.90	7.36	107.0 K=1.14	11.893	1.0900	-8.14	12.96	0.628 ✔
T8	60 - 40	L3x3x1/4	19.30	9.52	193.0 K=1.00	4.007	1.4400	-7.20	5.77	1.248 ✔
T9	40 - 20	L3 1/2x3 1/2x1/4	21.03	10.25	177.2 K=1.00	4.758	1.6900	-8.45	8.04	1.050 ✔
T10	20 - 0	L3 1/2x3 1/2x1/4	11.18	10.49	117.8 K=1.02	10.602	1.6900	-11.22	17.92	0.626 ✔

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 $\frac{P}{P_a}$
T5	120 - 100	L2 1/2x2 1/2x3/8	10.67	10.20	146.2 K=0.90	6.987	1.7300	-2.51	12.09	0.207 ✔
T7	80 - 60	L3x3x3/8	14.67	14.20	161.0 K=0.86	5.761	2.1100	-3.53	12.15	0.290 ✔
T10	20 - 0	L3 1/2x3 1/2x1/2	20.50	19.78	183.9 K=0.82	4.415	3.2500	-4.87	14.35	0.340 ✔

Secondary Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T4	140 - 120	L2x2x1/4	8.74	8.41	210.4 K=0.82	3.373	0.9380	-1.97	3.16	0.624 ✔
T8	60 - 40	L3x3x7/16	16.48	16.02	257.6 K=0.78	2.250	2.4300	-3.97	5.47	0.726 ✔
T9	40 - 20	KL/R > 250 (C) - 383 L3x3x1/2 KL/R > 250 (C) - 404	18.49	17.77	281.6 K=0.77	1.883	2.7500	-4.41	5.18	0.851 ✔

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	185 - 180	L2x2x1/8	5.00	4.53	136.8 K=1.00	7.982	0.4844	-0.64	3.87	0.166 ✔
T2	180 - 160	L2x2x1/8	5.00	4.53	136.8 K=1.00	7.982	0.4844	-0.02	3.87	0.006 ✔
T3	160 - 140	L2x2x1/8	5.00	4.49	135.5 K=1.00	8.131	0.4844	-0.76	3.94	0.192 ✔

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 $\frac{P}{P_a}$
T5	120 - 100	L3x3x1/2	2.67	2.43	85.0 K=1.70	14.788	2.7500	-5.44	40.67	0.134 ✔
T7	80 - 60	L3x3x1/2	3.67	3.43	95.3 K=1.35	13.565	2.7500	-4.70	37.30	0.126 ✔
T10	20 - 0	L3x3x1/2	5.13	4.77	109.0 K=1.11	11.811	2.7500	-6.93	32.48	0.213 ✔

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 $\frac{P}{P_a}$

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 $\frac{P}{P_a}$
T5	120 - 100	L3x3x1/2	3.07	2.80	88.8 K=1.54	14.352	2.7500	-3.79	39.47	0.096 ✔
T7	80 - 60	L3x3x1/2	3.95	3.70	98.0 K=1.29	13.232	2.7500	-3.10	36.39	0.085 ✔
T10	20 - 0	L3x3x1/2	5.82	5.41	115.6 K=1.04	10.902	2.7500	-4.39	29.98	0.146 ✔

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	185 - 180	HSS2.375x.154	5.00	4.00	60.7	30.000	1.0027	2.47	30.08	0.082 ✔
T2	180 - 160	HSS2.875x.203	20.00	5.00	63.0	30.000	1.5948	26.55	47.85	0.555 ✔
T3	160 - 140	P2.875x.375	20.03	5.01	67.2	30.000	2.9452	68.18	88.36	0.772 ✔
T4	140 - 120	P4x.318	20.03	2.59	23.8	30.000	3.6784	103.69	110.35	0.940 ✔
T5	120 - 100	HSS5.563x.258	20.03	1.67	10.6	30.000	4.0294	130.18	120.88	1.077 ✔
T6	100 - 80	HSS5.563x.375	20.03	6.68	43.4	30.000	5.7167	158.00	171.50	0.921 ✔
T7	80 - 60	HSS5.563x.375	20.03	1.67	10.8	30.000	5.7167	180.61	171.50	1.053 ✔
T8	60 - 40	P5.563x0.5	20.03	5.17	34.5	30.000	7.9529	202.27	238.59	0.848 ✔
T9	40 - 20	HSS8.625x.322	20.03	5.15	21.0	30.000	7.8461	223.50	235.38	0.950 ✔
T10	20 - 0	HSS8.625x.322	20.03	2.50	10.2	30.000	7.8461	242.60	235.38	1.031 ✔

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	185 - 180	L2x2x1/8	6.40	2.94	58.9	21.600	0.4844	1.22	10.46	0.117 ✔
T2	180 - 160	L2x2x1/8	7.07	3.23	64.5	21.600	0.4844	5.21	10.46	0.498 ✔
T3	160 - 140	L2x2x1/8	8.01	3.88	76.9	21.600	0.4844	5.17	10.46	0.494 ✔
T4	140 - 120	L2x2x3/16	8.81	4.23	84.9	21.600	0.7150	5.45	15.44	0.353 ✔
T5	120 - 100	L2 1/2x2 1/2x3/16	5.87	5.33	86.4	21.600	0.9020	7.79	19.48	0.400 ✔
T6	100 - 80	L2 1/2x2 1/2x3/16	14.32	6.95	109.3	21.600	0.9020	5.74	19.48	0.295 ✔
T7	80 - 60	L3x3x3/16	7.90	7.36	97.8	21.600	1.0900	7.28	23.54	0.309 ✔
T8	60 - 40	L3x3x1/4	19.30	9.52	124.8	21.600	1.4400	6.94	31.10	0.223 ✔
T9	40 - 20	L3 1/2x3 1/2x1/4	21.03	10.25	114.4	21.600	1.6900	7.75	36.50	0.212 ✔
T10	20 - 0	L3 1/2x3 1/2x1/4	11.63	10.94	123.7	21.600	1.6900	10.64	36.50	0.291 ✔

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 $\frac{P}{P_a}$
T5	120 - 100	L2 1/2x2 1/2x3/8	10.67	10.20	162.6	21.600	1.7300	2.51	37.37	0.067 ✔
T7	80 - 60	L3x3x3/8	14.67	14.20	186.7	21.600	2.1100	3.53	45.58	0.077 ✔
T10	20 - 0	L3 1/2x3 1/2x1/2	20.50	19.78	223.9	21.600	3.2500	4.87	70.20	0.069 ✔

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T4	140 - 120	L2x2x1/4	8.74	8.41	165.7	21.600	0.9380	1.97	20.26	0.097 ✔
T8	60 - 40	L3x3x7/16	16.48	16.02	212.4	21.600	2.4300	3.97	52.49	0.076 ✔
T9	40 - 20	L3x3x1/2	18.49	17.77	237.4	21.600	2.7500	4.41	59.40	0.074 ✔

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 $\frac{P}{P_a}$
T1	185 - 180	L2x2x1/8	5.00	4.53	92.0	21.600	0.4844	0.69	10.46	0.066 ✔
T2	180 - 160	L2x2x1/8	5.00	4.53	92.0	21.600	0.4844	0.07	10.46	0.007 ✔
T3	160 - 140	L2x2x1/8	5.00	4.49	91.2	21.600	0.4844	0.75	10.46	0.072 ✔

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 $\frac{P}{P_a}$
T5	120 - 100	L3x3x1/2	2.50	2.27	30.3	21.600	2.7500	5.96	59.40	0.100 ✔
T7	80 - 60	L3x3x1/2	3.50	3.27	43.7	21.600	2.7500	5.19	59.40	0.087 ✔
T10	20 - 0	L3x3x1/2	5.13	4.77	63.7	21.600	2.7500	7.41	59.40	0.125 ✔

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 $\frac{P}{P_a}$
T5	120 - 100	L3x3x1/2	3.07	2.80	37.4	21.600	2.7500	3.39	59.40	0.057 ✔
T7	80 - 60	L3x3x1/2	3.95	3.70	49.4	21.600	2.7500	2.65	59.40	0.045 ✔
T10	20 - 0	L3x3x1/2	5.82	5.41	72.3	21.600	2.7500	3.84	59.40	0.065 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	185 - 180	Leg	HSS2.375x.154	2	-4.07	30.20	13.5	Pass
T2	180 - 160	Leg	HSS2.875x.203	14	-30.92	47.18	65.5	Pass
T3	160 - 140	Leg	P2.875x.375	45	-75.88	84.19	90.1	Pass
T4	140 - 120	Leg	P4x.318	75	-113.85	136.74	83.3	Pass
T5	120 - 100	Leg	HSS5.563x.258	114	-144.55	156.84	92.2	Pass
T6	100 - 80	Leg	HSS5.563x.375	234	-175.46	193.18	90.8	Pass
T7	80 - 60	Leg	HSS5.563x.375	255	-203.46	222.38	91.5	Pass
T8	60 - 40	Leg	P5.563x0.5	375	-228.78	281.79	81.2	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T9	40 - 20	Leg	HSS8.625x.322	396	-254.10	294.88	86.2	Pass
T10	20 - 0	Leg	HSS8.625x.322	417	-280.93	305.80	91.9	Pass
T1	185 - 180	Diagonal	L2x2x1/8	11	-1.33	8.49	15.6	Pass
							22.4 (b)	
T2	180 - 160	Diagonal	L2x2x1/8	19	-5.38	7.99	67.3	Pass
							95.8 (b)	
T3	160 - 140	Diagonal	L2x2x1/8	54	-5.07	6.34	80.0	Pass
							95.1 (b)	
T4	140 - 120	Diagonal	L2x2x3/16	81	-5.29	6.51	81.3	Pass
T5	120 - 100	Diagonal	L2 1/2x2 1/2x3/16	172	-8.47	15.11	56.1	Pass
							95.5 (b)	
T6	100 - 80	Diagonal	L2 1/2x2 1/2x3/16	240	-5.92	6.33	93.6	Pass
T7	80 - 60	Diagonal	L3x3x3/16	313	-8.14	17.28	47.1	Pass
							80.3 (b)	
T8	60 - 40	Diagonal	L3x3x1/4	381	-7.20	7.69	93.6	Pass
T9	40 - 20	Diagonal	L3 1/2x3 1/2x1/4	402	-8.45	10.72	78.8	Pass
T10	20 - 0	Diagonal	L3 1/2x3 1/2x1/4	465	-11.22	23.88	47.0	Pass
							90.7 (b)	
T5	120 - 100	Horizontal	L2 1/2x2 1/2x3/8	122	-2.51	16.11	15.6	Pass
T7	80 - 60	Horizontal	L3x3x3/8	263	-3.53	16.20	21.8	Pass
T10	20 - 0	Horizontal	L3 1/2x3 1/2x1/2	425	-4.87	19.12	25.5	Pass
T4	140 - 120	Secondary Horizontal	L2x2x1/4	84	-1.97	4.22	46.8	Pass
T8	60 - 40	Secondary Horizontal	L3x3x7/16	383	-3.97	7.29	54.4	Pass
T9	40 - 20	Secondary Horizontal	L3x3x1/2	404	-4.41	6.90	63.8	Pass
T1	185 - 180	Top Girt	L2x2x1/8	5	-0.64	5.15	12.4	Pass
							12.7 (b)	
T2	180 - 160	Top Girt	L2x2x1/8	17	0.07	13.95	0.5	Pass
							1.3 (b)	
T3	160 - 140	Top Girt	L2x2x1/8	47	-0.76	5.25	14.4	Pass
T5	120 - 100	Redund Horz 1 Bracing	L3x3x1/2	152	-5.44	54.21	10.0	Pass
T7	80 - 60	Redund Horz 1 Bracing	L3x3x1/2	293	-4.70	49.73	9.5	Pass
T10	20 - 0	Redund Horz 1 Bracing	L3x3x1/2	446	-6.93	43.30	16.0	Pass
T5	120 - 100	Redund Diag 1 Bracing	L3x3x1/2	192	-3.79	52.61	7.2	Pass
T7	80 - 60	Redund Diag 1 Bracing	L3x3x1/2	333	-3.10	48.51	6.4	Pass
T10	20 - 0	Redund Diag 1 Bracing	L3x3x1/2	456	-4.39	39.96	11.0	Pass

	Summary	
Leg (T5)	92.2	Pass
Diagonal (T2)	95.8	Pass
Horizontal (T10)	25.5	Pass
Secondary Horizontal (T9)	63.8	Pass
Top Girt (T3)	14.4	Pass
Redund Horz 1 Bracing (T10)	16.0	Pass
Redund Diag 1 Bracing (T10)	11.0	Pass
Bolt Checks	95.8	Pass

tnxTower	Job	Page
	14001.010 - Weston North	39 of 39
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Project 185' Lattice Tower - 237 Godfrey Road, Weston, CT	Date 12:24:11 04/09/14
	Client Verizon Wireless	Designed by TJL

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
						RATING =	**95.8**	**Pass**

Program Version 6.0.0.8 - 9/7/2011 File:J:/Jobs/1400100.WI/010 - Weston North/Backup Documentation/Calcs/ERI Files/185-ft Lattice Weston.eri

CENTEK engineering
Centered on Solutions
63-2 North Branford Road
Branford, CT 06405
www.centekeng.com
P: (203) 488-0580
F: (203) 488-8587

Subject:	FOUNDATION ANALYSIS
Location:	Weston, CT
Rev. 0: 4/09/14	Prepared by: T.J.L. Checked by: C.F.C. Job No. 14001.010

Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 4960 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$S_t := 46 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$WT_t := 1 \cdot kip$	(User Input from tnxTower)	
Max Compression Force =	$C_t := 288 \cdot kip$	(User Input from tnxTower)	
Max Uplift Force =	$U_t := 249 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 185 \cdot ft$	(User Input)	
Tower Width =	$W_t := 21 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 2$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 6.5 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 1.5 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 30.5 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 5.0 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 3.5 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 32 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 6000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 125 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 1 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 7$	(User Input)	
Bar Diameter =	$d_{bpier} := 0.875 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 14$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 3 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 10$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.27 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 58$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 10$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.27 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 58$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =

$$A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.601 \cdot in^2$$

Pad Top Reinforcement Bar Area =

$$A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 1.267 \cdot in^2$$

Pad Bottom Reinforcement Bar Area =

$$A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 1.267 \cdot in^2$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3.255$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := if(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}) = 150 \cdot pcf$

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 125 \cdot pcf$

Passive Pressure = $P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0.407 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 2.034 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 2.034 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.644 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 2.339 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 1.5$

$A_p := W_f \cdot T_p = 45.75$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 107.02 \cdot kip$

Weight of Concrete Pad = $WT_{pad} := (W_f^2 \cdot T_f) \cdot \gamma_c = 209.306 \cdot kip$

Weight of Concrete Piers = $WT_{pier} := 3 \cdot \left[\left(L_p \cdot \frac{d_p^2 \cdot \pi}{4} \right) \cdot \gamma_c \right] = 21.648 \cdot kip$

Total Weight of Concrete = $WT_c := WT_{pad} + WT_{pier} = 231 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left(W_f^2 - 3 \cdot \frac{d_p^2 \cdot \pi}{4} \right) \cdot (L_p - L_{pag}) \cdot \gamma_s = 507 \cdot kip$

Weight of Soil Back Face = $WT_{s2} := \left[\frac{\tan(\Phi_s) \cdot (D_f)^2}{2} \cdot W_f \right] \cdot \gamma_s = 50 \cdot kip$

Tower Offset = $X_{t1} := \left[\frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{2} \right]$ $X_{t2} := \frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{3}$

$X_t := if(Pos_t, X_{t1}, X_{t2}) = 6.157$

$X_{off} := \frac{W_f}{2} - \left[\frac{(W_t \cdot \cos(30 \cdot deg))}{3} + X_t \right] = 3.031$

Resisting Moment = $M_r := (WT_c + WT_{s1}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + WT_{s2} \cdot \left[W_f + \frac{\tan(\Phi_s) \cdot (L_p - L_{pag})}{3} \right] = 12890 \cdot ki$

Overturning Moment = $M_{ot} := OM + S_t \cdot (L_p + T_f) = 5259 \cdot kip \cdot ft$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 2.45$

Factor of Safety Required = $FS_{req} := 2$

$OverTurning\_Moment\_Check := if(FS \geq FS_{req}, "Okay", "No Good")$

$OverTurning\_Moment\_Check = "Okay"$

Bearing Pressure Caused by Footing:

Total Load = $Load_{tot} := WT_c + WT_{s1} + WT_t = 739 \cdot kip$

Area of the Mat = $A_{mat} := W_f^2 = 930.25$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 4728.77 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.907 \cdot ksf$

$Max\_Pressure\_Check := if\left(P_{max} < q_s, "Okay", "No\ Good"\right)$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.318 \cdot ksf$

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

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 8.714$

Distance to Kern = $X_k := \frac{W_f}{6} = 5.083$

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

Eccentricity = $e := \frac{M_{ot}}{Load_{tot}} = 7.117$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot Load_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e\right)} = 1.986 \cdot ksf$

$q_{adj} := if\left(P_{min} < 0, P_a, P_{max}\right) = 1.986 \cdot ksf$

$Pressure\_Check := if\left(q_{adj} < q_s, "Okay", "No\ Good"\right)$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 3.062 \times 10^3 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if\left(P_b > LF \cdot C_t, "Okay", "No\ Good"\right)$

Bearing_Check = "Okay"

Shear Strength of Concrete:

Beam Shear:

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

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - \frac{d_{bbot}}{2} = 14.365 \cdot in$

$FL := \frac{C_t}{W_f^2} = 0.3096 \cdot ksf$

$V_{req} := LF \cdot FL \cdot \left(X_t - 0.5 \cdot d_p - d\right) \cdot W_f = 40.4 \cdot kip$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \, d = 565 \cdot kip$ (ACI-2008 11.2.1.1)

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

Beam_Shear_Check = "Okay"

Punching Shear:

(Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear =

$b_o := \left(d_p + d\right) \cdot \pi = 14.8$

Required Shear Strength =

$V_{req} := LF \cdot FL \cdot \left[W_f^2 - \left(d_p + d\right)^2 \cdot \frac{\pi}{4}\right] = 376.8 \cdot kips$

Available Shear Strength =

$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 547 \cdot kip$ (ACI-2008 11.11.2.1)

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

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$$M_{nT} := LF\cdot\left[U_t\cdot\left(W_t\cdot\sin(60\cdot deg) - \frac{d_p}{2}\right) + S_t\cdot\left(D_f + L_{pag}\right)\right] - WT_t\cdot X_{off} = 5882\cdot ft\cdot k$$

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

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

Design Moment = $M_n := \dfrac{M_{nT} + M_{nS} + M_{nC}}{\phi_m} = 4244.7\cdot kips\cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500\cdot psi \le f_c \le 4000\cdot psi \\ 0.65 & \text{if } f_c > 8000\cdot psi \\ \left[0.85 - \left[\dfrac{\left(\dfrac{f_c}{psi} - 4000\right)}{1000}\right]\cdot 0.5\right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$$b_{eff} := W_t\cdot\cos(30\cdot deg) + d_p = 260.238\cdot in$$

$$d := T_f - Cvr_{pad} - \frac{d_{bbot}}{2} = 14.365\cdot in$$

$$A_s := \frac{M_n}{\left(f_y\cdot d\right)} = 59.098\cdot in^2$$

$$a := \frac{A_s\cdot f_y}{\beta\cdot f_c\cdot b_{eff}} = 4.007\cdot in$$

$$A_s := \frac{M_n}{f_y\cdot\left(d - \frac{a}{2}\right)} = 68.677\cdot in^2$$

$$\rho := \frac{A_s}{b_{eff}\,d} = 0.01837$$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases} = 0.0018 \qquad \text{(ACI -2008 7.12.2.1)}$$

Check Bottom Bars:

$$As := \begin{cases} \left(\rho \cdot b_{eff} \cdot d\right) & \text{if } \left(\rho \cdot b_{eff} \cdot d\right) > \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d \\ \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d & \text{otherwise} \end{cases} = 68.677 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 73.5 \cdot in^2$$

$$Pad\_Reinforcement\_Bot := if\left(As_{prov} > As, \text{"Okay"}, \text{"No Good"}\right)$$

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 68.7 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 73.5 \cdot in^2$$

$$Pad\_Reinforcement\_Top := if\left(As_{prov} > As, \text{"Okay"}, \text{"No Good"}\right)$$

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 5.02 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 2.512 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0 \qquad \text{(ACI-2008 12.2.3)}$$

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 45.7 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in \qquad \text{(ACI-2008 12.2.1)}$$

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

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr_{pad} = 54 \cdot in$$

$$Lpad\_Check := if\left(L_{Pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"}\right)$$

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier =

$$A_p := \frac{\pi \cdot d_p^2}{4} = 1385.44 \cdot in^2$$

$$A_{smin} := 0.01 \cdot 0.05 \cdot A_p = 0.69 \cdot in^2 \qquad \text{(ACI-2008 10.8.4 \& 10.9.1)}$$

$$A_{sprov} := NB_{pier} \cdot A_{bpier} = 8.42 \cdot in^2$$

$$Steel\_Area\_Check := if\left(A_{sprov} > A_{smin}, "Okay", "No Good"\right)$$

Steel_Area_Check = "Okay"

Bar Spacing In Pier =

$$B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 8.55 \cdot in$$

Diameter of Reinforcement Cage =

$$Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 36 \cdot in$$

Maximum Moment in Pier =

$$M_p := \left[S_t \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF = 4047 \cdot in \cdot kips$$

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

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{C_t \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$$

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) = (42 \;\; 14 \;\; 7 \;\; 383.9 \;\; 4047)$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$$

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

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = (1348.7 \;\; 14217.3 \;\; -60 \;\; 0)$$

$$Axial\_Load\_Check := if\left(\phi P_n \geq P_u, "Okay", "No Good"\right)$$

Axial_Load_Check = "Okay"

$$Bending\_Check := if\left(\phi M_{xn} \geq M_{xu}, "Okay", "No Good"\right)$$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 57 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 15 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 18.16 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 11.621 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right)$

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 16.602 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 15.75 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 16.602 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

Tie Size and Spacing in Column:

Minimum Tie Size =

$Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 3$

Used #3 Ties

Seismic Factor =

$z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 14 \cdot in$

$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 18 \cdot in$

$s_{lim3} := D_f \cdot z = 78 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing =

$s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 14 \cdot in$

Number of Ties Required =

$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 4.857$

Check Anchor Steel Embedment:

Depth Available =

$D_{ab} := L_{st} - A_{BP} = 5 \cdot ft$

Length of Anchor Bolt =

$L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 10.87 \cdot ft$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

SITE NAME	WESTON NORTH CT	ECP & CELL #	5	0228
Note: AWS Add (Root Metric Site).		LATITUDE	41-14-31.19 N	
		LONGITUDE	73-21-51.52 W	
		STRUCTURE TYPE	Lattice	

AWS - LTE ANTENNA ADD	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	2100 MHz BBU	2100 MHz BBU	2100 MHz BBU
ANTENNA TYPE	742213_2110_P45_04.0	742213_2110_P45_04.0	742213_2110_P45_04.0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	340	120	240
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL	1 x ALU RH_2X40-AWS	1 x ALU RH_2X40-AWS	1 x ALU RH_2X40-AWS
SECTOR DISTRIBUTION BOX			
MAIN DISTRIBUTION BOX	1 x DB-T1-6Z-8AB-0Z		
700 LTE - CURRENT CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	700 eNodeB	700 eNodeB	700 eNodeB
ANTENNA TYPE	BXA-70063-6CF-750MHZ	BXA-70063-6CF-750MHZ	BXA-70063-6CF-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	340	110	240
DOWN TILT (MECH/DEG)	0	0	3
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
700 Mhz - LTE Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	700 eNodeB	700 eNodeB	700 eNodeB
ANTENNA TYPE	BXA-70063-6CF-750MHZ	BXA-70063-6CF-750MHZ	BXA-70063-6CF-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	340	110	240
DOWN TILT (MECH/DEG)	0	0	3
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
RRH - QTY/MODEL			
850 CELLULAR - CURRENT CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	Cellular Mod 4.0B	Cellular Mod 4.0B	Cellular Mod 4.0B
ANTENNA TYPE	DB846F65ZAXY_869_0	DB846H80E-SX_0	DB846F65ZAXY_869_0
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	340	120	240
DOWN TILT (MECH/DEG)	2	2	2
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL	Not Used x FD9R6004/2C-3L	Not Used x FD9R6004/2C-3L	Not Used x FD9R6004/2C-3L
850 CELLULAR - FUTURE CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	Cellular Mod 4.0B	Cellular Mod 4.0B	Cellular Mod 4.0B
ANTENNA TYPE	DB846F65ZAXY_869_0	DB846H80E-SX_0	DB846F65ZAXY_869_0
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	340	120	240
DOWN TILT (MECH/DEG)	2	2	2
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEXER - QTY / MODEL			
DIPLEX WITH LTE CABLE			
1900 PCS - CURRENT CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	LPA-185063/8CF	LPA-185063/8CF	LPA-185063/8CF
QTY OF ANTENNAS PER FACE	2	2	2
ORIENTATION (DEG)	340	120	240
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE	YES	YES	YES
1900 PCS - FUTURE CONFIG	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS Mod 4.0B	PCS Mod 4.0B	PCS Mod 4.0B
ANTENNA TYPE	742213_1950_P45_02.0	742213_1950_P45_02.0	742213_1950_P45_02.0
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	340	120	240
DOWN TILT (MECH/DEG)	0	0	0
RAD CTR (FT AGL)	162	162	162
TMA - QTY / MODEL			
DIPLEX WITH CELLULAR CABLE			

NUMBER OF CABLES NEEDED				FIBER LINES MODEL NUMBER			
TOTAL # FIBER LINES	1	TOTAL # OF MAINLINES	18	FIBER LINE MODEL #			HB158-1-08U8-S8J18
TOTAL # TOP JUMPERS	3	TOTAL # OF TOP JUMPERS	18	FIBER TOP JUMPER MODEL #			HB114-1-08U4-S4J18
EQUIPMENT CABLE ORDERING		MAIN CABLE #	18	+	0	TOP JUMPER #	18 + 0

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular-A Band	PCS-F/AWS Band	700 MHz C-Block	Cellular (Watts)	20
TX: 869-880/890-891.5 MHz	TX: 1970-1975/2145-2155 MHz	TX: 746-757 MHz	PCS (Watts)	16
RX: 824-835/845-846.5 MHz	RX: 1890-1895/1745-1755 MHz	RX: 776-787 MHz	LTE/AWS (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1-A	800	Tx1/Rx0	RED	A5-A	800	Tx2/Rx0	BLUE	A9-A	800	Tx3/Rx0	GREEN
A1-B	1900	Tx1/Rx0	RED/WHITE	A5-B	1900	Tx2/Rx0	BLUE/ WHITE	A9-B	1900	Tx3/Rx0	GREEN/WHITE
A2	700	Tx1/Rx0	RED/ORANGE	A6	700	Tx2/Rx0	BLUE/ ORANGE	A10	700	Tx3/Rx0	GREEN/ORANGE
A3	700	Tx4/Rx1	RED/RED/ORANGE	A7	700	Tx5/Rx1	BLUE/BLUE/ORANGE	A11	700	Tx6/Rx1	GREEN/GREEN/ORANGE
A4-B	1900	Tx4/Rx1	RED/RED/WHITE	A8-B	1900	Tx5/Rx1	BLUE/BLUE/WHITE	A12-B	1900	Tx6/Rx1	GREEN/GREEN/WHITE
A4-A	800	Tx4/Rx1	RED/RED	A8-A	800	Tx5/Rx1	BLUE/BLUE	A12-A	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

RF ENGINEER	RF MANAGER	INITIALS	DATE
Prepared by: Jaime Laredo	Robert Hesselbach	JL	12/16/2013

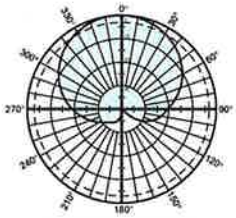
KATHREIN
SCALA DIVISION

742 213V01

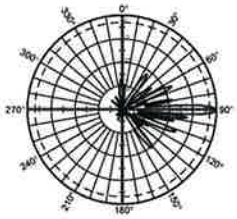
65° Panel Antenna

Kathrein's X-polarized adjustable electrical downtilt antennas offer the wireless carrier the ability to tailor polarization diversity sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

- 0-6° downtilt range.
- UV resistant pulltruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accomodate future 3G / UMTS applications.



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–6° electrical downtilt

General specifications:

Frequency range	1710–2200 MHz
VSWR	< 1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)
Maximum input power	300 watts per input (at 50°C)
Electrical downtilt continuously adjustable	0–6 degrees
Connector	2 x 7-16 DIN female
Isolation	>30 dB
Cross polar ratio Main direction 0° Sector ±60°	 25 dB (typical) >10 dB
Tracking, average	0.5 dB
Squint	±2.0°
Weight	19.8 lb (9 kg) 24.3 lb (11 kg) clamps included
Dimensions	76.9 x 6.1 x 2.8 inches (1954 x 155 x 70 mm)
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N) M (Medium)
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	88 x 6.8 x 3.6 inches (2235 x 172 x 92 mm)
Shipping weight	28.7 lb (13 kg)
Mounting	Fixed mounts for 2 to 4.6 inch (50 to 115 mm) OD masts are included and tilt options are available.
See reverse for order information.	

Specifications:	**1710–1880 MHz**				**1850–1990 MHz**				**1920–2200 MHz**			
Gain	19 dBi				19.2 dBi				19.5 dBi			
+45° and -45° polarization horizontal beamwidth	67° (half-power)				65° (half-power)				63° (half-power)			
+45° and -45° polarization vertical beamwidth	4.7° (half-power)				4.5° (half-power)				4.3° (half-power)			
Sidelobe suppression for first sidelobe above main beam	0° 18	2° 18	4° 16	6° T 15 dB	0° 18	2° 18	4° 17	6° T 16 dB	0° 18	2° 18	4° 18	6° T 18 dB

TÜV

RoHS
Lead-Free

11271-B
936.3740/b

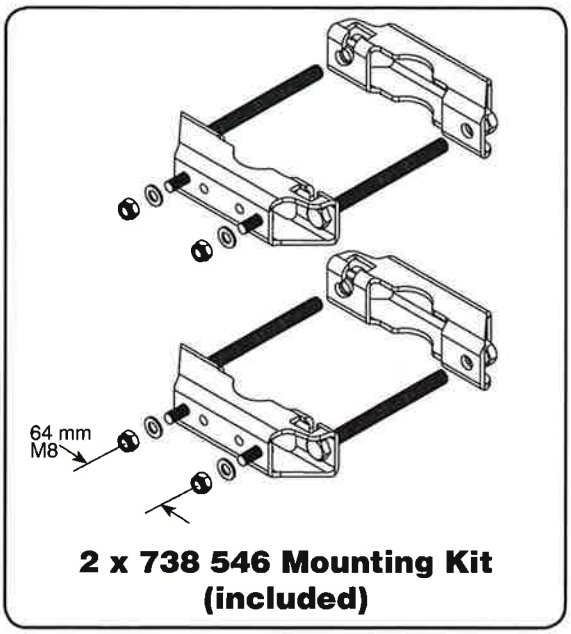
*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

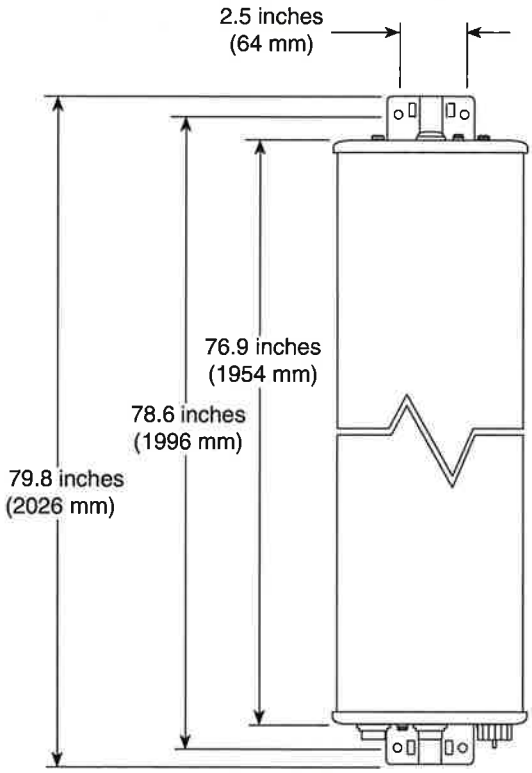
KATHREIN
SCALA DIVISION

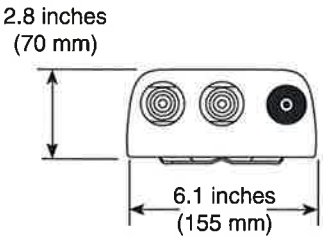
742 213V01

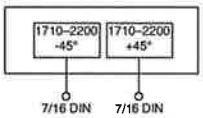
65° Panel Antenna



2 x 738 546 Mounting Kit (included)







Mounting Options:

Model	Description
2 x 738 546 (included)	Mounting Kit for 2 to 4.6 inch (50 to 115 mm) OD mast. 4.4 lb (2 kg)
850 10013	Tilt Mount Kit 0–11 degrees downtilt angle. 7.4 lb (3.7 kg)
742 263	Three-panel Sector Mounting Kit (120 deg. ea.) for 3.5 inch (89 mm) OD mast.

Order Information:

Model	Description
742 213V01	Antenna with 7-16 DIN connectors 0°–6° adjustable electrical downtilt

All specifications are subject to change without notice. The latest specifications are available at www.kathrein-scala.com.

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Email: communications@kathrein.com Internet: www.kathrein-scala.com

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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

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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

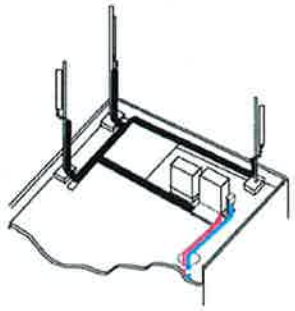
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

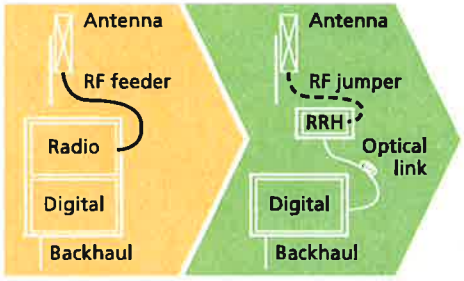
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

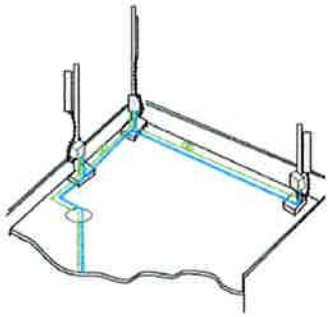
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

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

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

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CPG2809100912 (09)

Alcatel·Lucent

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

The RFS Distribution Box design comes with the option for pluggable over voltage protection (OVP) for up to 6 remote radios and the connection for 6 pairs of optical fiber with LC optical fiber cable management. There is a hybrid cable input with a jumper configuration for power and optical fiber to the remote radio heads (RRHs). A custom wall, a 2-inch pole, and an H-Frame mounting bracket are included. Both the compact and standard design are available with lightening protection.

Features/Benefits

- Designed to accommodate varying diameters of HYBRIFLEX™ (combined power and fiber optic) cables – up to 2 inches
- Supports Single- and Multi-Mode Optical fiber
- NEMA 4x rated enclosure – allows **flexibility for indoor or outdoor installation** on a roof or tower top
- Weatherproof enclosure and ports – **improves system reliability**
- Modular design – makes replacement or addition of OVP easy without removal of other components within the box
- Strikesorb OVP technology – protects equipment from damaging surges up to 60 kA on an 8/20 waveform and up to 5 kA on a 10/350 waveform (certain models only)
- Low residual voltage and high impedance – **ideally suited for RRH technology** – won't shut down the RRH the way spark gap technology does (certain models only)

Technical Specifications

Mechanical Specifications

Model Number	DB-B1-6C-8AB-0Z	DB-T1-6Z-8AB-0Z
Enclosure Design	Standard, 6 OVP's	Standard without OVP
Dimensions - H x W x D, mm (in)	610 x 610 x 254 (24 x 24 x 10)	610 x 610 x 254 (24 x 24 x 10)
Weight, kg (lb)	20 (44)	20 (44)
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum	
Fiber Connection Method	LC-LC Single- or Multi-mode duplex	
Environmental Rating	NEMA 4x	
Operating Temperature, °C (°F)	-40 to +80 (-40 to +176)	
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs	

Electrical Specifications

Nominal Operating Voltage	48 VDC	
Nominal Discharge Current (I_n) per UL 1449 3rd Ed	20 kA 8/20 µs	N/A
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs	N/A
Maximum Impulse (Lightning) Current (I_{imp}) per IEC 61643-1	5 kA 10/350 µs	N/A
Maximum Continuous Operating Voltage (U_c)	75 VDC	N/A
Voltage Protection Rating per UL1449 3rd Ed	400 V	N/A
Protection Class as per IEC 61643-1	Class 1	N/A
Strikesorb OVP Compliance	ANSI/UL 1449-3rd Ed	N/A
	IEEE C62.41	N/A
	NEMA LS-1	N/A
	IEC 61643-1	N/A
	IEC 61643-12	N/A
	EN 61643-11	N/A

* This data is provisional and subject to change.

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